

NORTHWEST PASSAGES

Navigating the Canadian Arctic from
Gjoa to Harry DeWolf



Edited by
P. Whitney Lackenbauer and Adam Lajeunesse

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Contents

List of Acronyms *i*

Adam Lajeunesse and P. Whitney Lackenbauer, Introduction *ix*

1. Janice Cavell, "Who Discovered the Northwest Passage?" *1*

2. Roald Amundsen, "To the North Magnetic Pole and Through the North-West Passage" *37*

3. Shelagh Grant, "Why *St. Roch*? Why the Northwest Passage? Why 1940? New Answers to Old Questions" *63*

4. Peter Kikkert and P. Whitney Lackenbauer, "'On Hallowed Ground': *St. Roch*, Sovereignty, and the 1944 Northwest Passage Transit" *77*

5. Michael Whitby, "Showing the Flag Across the North: HMCS *Labrador* and the 1954 Transit of the Northwest Passage" *99*

6. Adam Lajeunesse and P. Whitney Lackenbauer, "Opening an Arctic Escape Route: The Bellot Strait Expedition" *107*

7. Captain Paul Moise Fournier, "Report of CCGS *John A. Macdonald* Arctic Voyage 1967" *141*

8. P. Whitney Lackenbauer and Adam Lajeunesse, "Observing the *Manhattan* Voyages, 1969/70: Lieutenant Commander Erling Stolee's Reports from CCGS *John A. Macdonald* and CCGS *Louis St. Laurent*" *161*

9. A.H.G. Storrs and Thomas C. Pullen, "SS *Manhattan* in Arctic Waters" *189*

10. Thomas C. Pullen, "Cruise Ship Completes Epic Voyage Through Northwest Passage: The 1984 Voyage of M/S *Lindblad Explorer*" *205*

11. Captain J.T. Howell, "U.S. Coast Guard Cutter *Polar Sea*, Arctic East/West Summer 1985 Operations" *217*

12. Thomas C. Pullen, "Diary of the 1988 Voyage by *Society Explorer* Through the Northwest Passage, West to East" *239*

13. Transportation Safety Board of Canada, "The Grounding of *Hanseatic* in Simpson Strait, August 1996" 267
14. James Delgado, "Voyage of Discovery: *Nadon/St. Roch II* (2000)" 283
15. Natasha Singer, "Break on Through: *Healy*, 2003" 287
16. Transportation Safety Board of Canada, "The Grounding of *Clipper Adventurer* in Coronation Gulf, August 2010" 299
17. Emma Stewart and Jackie Dawson, "A Matter of Good Fortune: The Grounding of *Clipper Adventurer* in the Northwest Passage" 335
18. Tim Keane and Gary Bishop, "Logbook of M/V *Nunavik's* Commercial Transit of the Northwest Passage, September–October 2014" 345
19. Mathieu Landriault, "Social Media, Arctic Tourism, and *Crystal Serenity*, 2016" 367
20. C3 (Coast to Coast to Coast) Team, "*Polar Prince* and the Canada C3 Expedition, 2017" 389
21. Zhu Bing, Yuan Dongfang, and Xia Yinyue, "Practice Voyage and Exploration of the Northwest Passage by the R/V *Xuelong* in the Arctic" 415
22. Transportation Safety Board of Canada, "The Grounding of *Akademik Ioffe* in Nunavut, August 2018" 425
23. Jane Kritzer and Shayla Fitzsimmons, "The Interconnected Northwest Atlantic: U.S. Coast Guard Cutter *Healy*, 2021" 465
24. Commander Corey Gleason, "HMCS *Harry DeWolf* Transits the Arctic, 2021" 479
- Further Reading 491

Acronyms

A/A/C	Assistant Commissioner	AOPV	Arctic and Offshore Patrol Vessel
AB2	Aviation Boatswain's Mate Petty Officer 2nd Class	APPC	Arctic Pollution Prevention Certificate
acc.	Accession	approx.	approximately
ACIA	Arctic Climate Impact Assessment	AR	Authorized Representative
ACND	Advisory Committee on Northern Development	ASPPR	Arctic Shipping Pollution Prevention Regulations
AD	Anno Domini	ASSPPR	Arctic Shipping Safety and Pollution Prevention Regulations
AECO	Association of Arctic Expedition Cruise Operators	Asst. Commr.	Assistant Commissioner
AES-AWS 85	Arctic East Summer/Arctic West Summer 1985	ATL	Arctic Transportation Limited
AES-85	Arctic East Summer 1985	Aug.	August
AFB	Air Force Base	AVDET	Aviation Detachment
AHTS	Anchor Handling Tug Supply	AWPPA	<i>Arctic Waters Pollution Prevention Act</i>
AINA	Arctic Institute of North America	AWS-85	Arctic West Summer 1985
AIRSS	Arctic Ice Regime Shipping System	B.C.	British Columbia
AIS	automatic identification system	BIMCO	Baltic and International Maritime Council
AJISS	Joint Support Ship In-Service Support	Brg.	Bearing
AK	Alaska	BRM	bridge resource management
ALCAN	Aluminum Company of Canada	C	Celsius
AMOC	Atlantic Meridional Overturning Circulation	CA	California
AMSA	Arctic Marine Shipping Assessment	CAF	Canadian Armed Forces
Anon	Anonymous	CAMSAR Manual	<i>Canadian Aeronautical and Maritime Search and Rescue Manual</i>
		Can	Canada
		Capt.	Captain
		CAS	Chief of the Air Staff

CBC	Canadian Broadcasting Corporation	cm	centimetre(s)
CBE	Commander of the Most Excellent Order of the British Empire	Cmdr	Commander
CCG	Canadian Coast Guard	Cmmdr	Commander
CCGDSEVENTEEN	Commander Coast Guard District Seventeen (U.S.)	CMSS	Centre for Military and Strategic Studies/Centre for Military, Security and Strategic Studies
CCGDTHIRTEEN	Commander Coast Guard District Thirteen (U.S.)	CNS	Chief of the Naval Staff
CCGS	Canadian Coast Guard Ship	CNTS	Chief of Naval Technical Services
CD	Canadian Forces' Decoration	CO	Commanding Officer
CDN	Canadian	COLREG	<i>Convention on the International Regulations for Preventing Collisions at Sea</i>
CDT	Central Daylight Time	COMLANTAREA	Commander Atlantic Area (U.S. Coast Guard)
CE	Common Era	Comms	communications
CEO	Chief Executive Officer	COMPACAREA	Commander Pacific Area (U.S. Coast Guard)
CFPF	Centre on Foreign Policy and Federalism	COMSCLANT	Commander, Military Sealift Command Atlantic (U.S.)
CG	Coast Guard	CO ²	carbon dioxide
CGAI	Canadian Global Affairs Institute	COVID	Coronavirus disease
CGC	Coast Guard Cutter	Coxn	Coxswain
CGS	Canadian Government Ship	Cpl.	Corporal
CGS	Chief of the General Staff	CPP	controllable-pitch propeller
CHARS	Canadian High Arctic Research Station	CRC	Consolidated Regulations of Canada
CHS	Canadian Hydrographic Service	cSt	centistoke
CIOOS	Canadian Integrated Ocean Observing System	CTD	conductivity, temperature, depth
Circ.	Circular	C3	Coast to Coast to Coast
CJOC	Canadian Joint Operations Command	CWC	Cabinet War Committee
C/L	centreline/centerline	D	degrees
CLIA	Cruise Lines International Association	DCASS	Documents on Canadian Arctic Sovereignty and Security

DCER	<i>Documents on Canadian External Relations</i>	ENE	East-Northeast
deg	degree(s)	ESE	East-Southeast
DEW Line	Distant Early Warning Line	ETA	estimated time of arrival
DFO	Department of Fisheries and Oceans (Canada)	F	Fahrenheit
DHH	Directorate of History and Heritage (Canada)	FAA	Federal Aviation Administration (U.S.)
DIAND	Department of Indian and Northern Affairs (Canada)	Fahr.	Fahrenheit
DMA	Defense Mapping Agency (U.S.)	FID	Falkland Islands Dependencies
DND	Department of National Defence (Canada)	Fig.	Figure
DNPO	Director of Naval Plans and Operations (Royal Canadian Navy)	fms	fathoms
Doc.	Document	fn.	footnote
DOC	document of compliance	FOC	Full Operational Condition
DPA	Designated Person Ashore	fo'c'sle	forecastle
DR	dead reckoning	for'd	forward
DR	Deviation Report	ft	foot/feet
DRDC	Defence Research and Development Canada	GAC	Global Affairs Canada
DSC	digital selective calling	gal	gallon
DSC	Distinguished Service Cross	GMDSS	Global Maritime Distress and Safety System
DSO	Distinguished Service Order	GNR	Guns N' Roses
DSS	decision support system	Govt.	Government
dwt	deadweight tonnage	GPS	Global Positioning System
E	East	GRT	gross register tonnage
ECDIS	Electronic Chart Display and Information System	GT	gross tonnage
ECS	Electronic Chart System	h	hours
ED	Existence Doubtful	HBC	Hudson's Bay Company
EGC	Enhanced Group Calling	H.B. Coy.	Hudson's Bay Company
ENC	electronic navigational chart	HDW	HMCS <i>Harry DeWolf</i>
		helo	helicopter
		HF	high frequency
		HMC	His/Her Majesty's Canadian
		HMCS	His/Her Majesty's Canadian Ship
		HMS	His/Her Majesty's Ship (U.K.)
		hp	horsepower

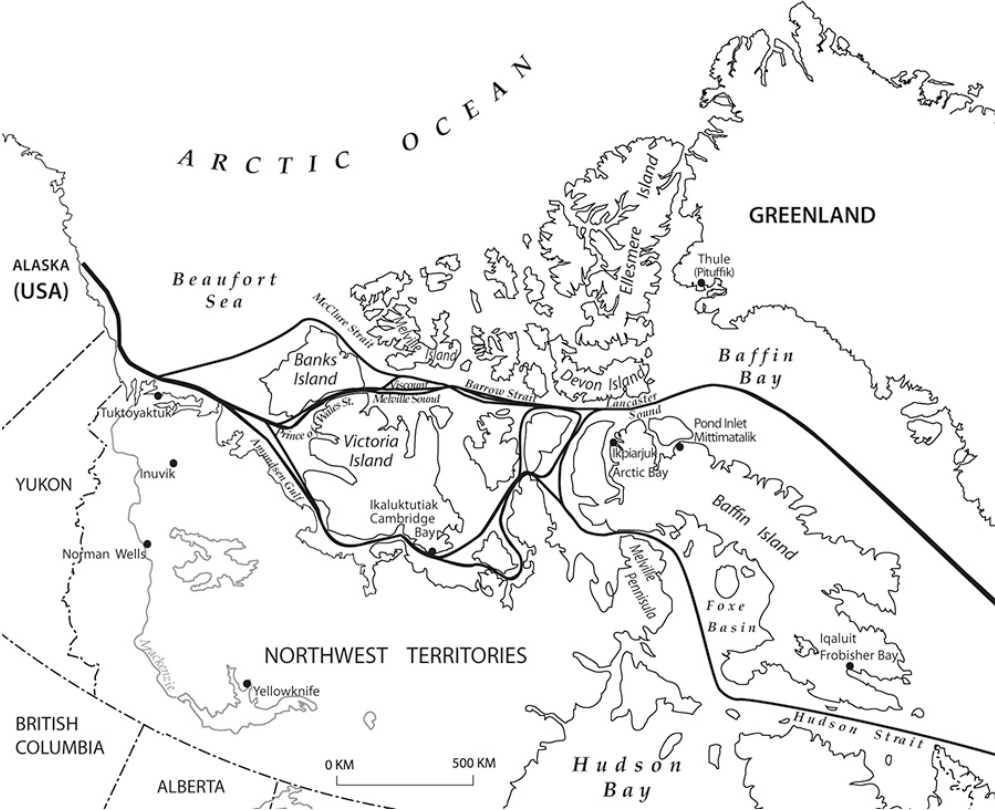
HQ	Headquarters	Is	Island
hr	hour	ISCOM	Island Commander
IAATO	International Association of Antarctica Tour Operators	ISM Code	International Safety Management Code
IACS	International Association of Classification Societies	ITK	Inuit Tapiriit Kanatami
IAMSAR	International Aeronautical and Maritime Search and Rescue	IUMI	International Union of Marine Insurance
ICCL	International Council of Cruise Lines	JRCC	Joint Rescue Coordination Centre
ICJ	International Court of Justice	kg(s)	kilogram(s)
ICS	International Chamber of Shipping	kHz	kilohertz
ICS	International Classification Societies	km(s)	kilometre(s)
IEC	International Electrotechnical Commission	km ²	kilometre(s) square
IFO	intermediate fuel oil	kts	knots
IHO	International Hydrographic Organization	kW	kilowatt(s)
IMO	International Maritime Organization	L	litre(s)
in.	inch	Lab.	HMCS <i>Labrador</i>
Insp.	Inspector	LAC	Library and Archives Canada
inst.	instant	lat.	latitude
IOC	Initial Operational Condition	lbs.	pounds
IOOS	U.S. Integrated Ocean Observing System	LCM	landing craft, mechanized
IO RAS	P.P. Shirshov Institute of Oceanology of the Russian Academy of Sciences	LCVP	landing craft, vehicle and personnel
IQ	Inuit Qaujimajatuqangit (Inuit Traditional Knowledge)	Lieut.	Lieutenant
IRB	inshore rescue boat	LISC	low impact shipping corridor
		long.	longitude
		LR	Lloyd's Register
		Lt.	Lieutenant
		LT	Local Time
		LTF	Land Task Forces (Canadian Army)
		Lt(N)	Lieutenant (Naval)
		m	metre(s)
		M	minutes
		MAJAID	major aeronautical disaster
		MAJMAR	major maritime disaster

MARPAC	Maritime Forces Pacific (Canada)	n.	note
MARPOL	<i>International Convention for the Prevention of Pollution from Ships</i>	NA	National Archives (U.K.)
MBA	Master of Business Administration	NAADSN	North American and Arctic Defence and Security Network
MCR	maximum continuous rating	NAC	National Archives of Canada
MCTS	Marine Communications and Traffic Services	NAD 83	North American Datum of 1983
MDE	main diesel engine	NAFO	Northwest Atlantic Fisheries Organization
MEDEVAC	medical evacuation	NA-NU	Operation <i>Nunakput</i>
MEH	<i>Mabel E. Holland</i>	NARA	National Archives and Records Administration (U.S.)
MGO	marine gas oil	NARW	North Atlantic right whales
MHz	megahertz	NASA	National Aeronautics and Space Administration
min	minute(s)	NA-TA	Operation <i>Nannok-Tatigiit</i>
MLB	CCGS <i>Martha L. Black</i>	NATO	North Atlantic Treaty Organization
MLLW	mean lower low water	NAVAREA	Navigational Area
mm	millimetre(s)	NAVPOLAR-	Naval Polar
MMSI	Mobile Maritime Service Identification	OCEANCEN	Oceanography Center (U.S.)
mm ² /s	square millimetre(s) per second	NAVSAT	navigational satellite
MoU	Memorandum of Understanding	NAVTEX	Navigational Telex
M/S	Merchant Ship/Motor Ship	NAVWARN	Navigational Warning
MSA	Marine Safety Advisory	NBDP	Narrow Band Direct Printing
MSC	Marine Safety Committee (International Maritime Organization)	NE	Northeast
MSI	Marine Safety Information	NERACOOOS	Northeastern Regional Association of Coastal Ocean Observing Systems
MSTS	Military Sea Transportation Service (U.S.)	Nfld.	Newfoundland
MT	metric tons	NHH	Naval History and Heritage
m ³	cubic metre(s)	NM	nautical miles
MV	Motor Vessel	NNE	North-Northeast
N	North		

NNF	Nanisivik Naval Fuelling Facility	PD	Position Doubtful
NNW	North-Northwest	PDI	power distance index
no.	number	P.E.I.	Prince Edward Island
NOAA	National Oceanic and Atmospheric Administration (U.S.)	PFD	personal floatation device
NORDREG	Northern Canada Vessel Traffic Services Zone Regulations	pop.	population
NOSC	Naval Ocean Systems Center (U.S.)	pos.	position
NOTMAR	Notice to Mariners	PR	CCGS <i>Pierre Radisson</i>
NOTSHIP	Notice to Shipping	PRI	Prince Regent Inlet
nr.	near	Prof.	Professor
N.S.	Nova Scotia	PSC	Port State Control
NTCL	Northern Transportation Company Limited	P. Star	USCGC <i>Polar Star</i>
NU	Nunavut	Pt.	Point
NW	Northwest	Pt B	Point Barrow
NWMP	North-West Mounted Police	PTSD	post-traumatic stress disorder
NWP	Northwest Passage	PYA	physician assistant
N.W.T.	Northwest Territories	QIA	Qikiqtani Inuit Association
N.Y.	New York	QM	Quarter Master
O.C.	Officer Commanding	QSEMS	Quality, Safety, and Environmental Management System
Oct.	October	QSEP	Quality, Safety, and Environmental Protection
OOW	officer of the watch	qt	quart
OPCON	Operational Control	RAMN	Radio Aids to Marine Navigation
Ops	Operations	RBC	Royal Bank of Canada
OS	Ordinary Seaman	RCAF	Royal Canadian Air Force
PA	Position Approximate	RCMP	Royal Canadian Mounted Police
P&I	protection and indemnity	RCN	Royal Canadian Navy
Paris MoU	Paris Memorandum of Understanding on Port State Control	recce	reconnaissance
PA system	public address system	recon	reconnaissance
PC	Polar Class	Res.	Resolution
PCIJ	Permanent Court of International Justice	rev.	revised
		RG	Record Group
		RGS	Royal Geographical Society
		RN	Royal Navy (U.K.)

RNC	raster navigation chart	SPRI	Scott Polar Research Institute
RO	recognized organization	sq	square
RPM	revolutions per minute	SRR	search and rescue region
R/V	Research Vessel	SRU	search and rescue unit
SAMOS	Shipboard Automated Meteorological and Oceanographic System	SS	Steamship
SAR	search and rescue or synthetic aperture radar	SSD	single steel drilling
SAR Convention	<i>International Convention on Maritime Search and Rescue</i>	SSRCA	Ship <i>St. Roch</i> Commemorative Association
SatCom	satellite communications	SSW	South-Southwest
SCU	System Control and Alarm Unit	stbd	starboard
SD	Sounding Doubtful	STCW	Standards of Training, Certification and Watchkeeping
SE	Southeast	SUNAC	Operation <i>Support of North Atlantic Construction</i>
Sept.	September	Supt.	Superintendent
Sergt.	Sergeant	S/V	Sailing Vessel
Sgd	Signed	SW	Southwest
Sgt.	Sergeant	t	tons/tonnes
shp	shaft horsepower	TC	Transport Canada
SI	International System (of units)	Temp.	temperature
SIKU	Indigenous Knowledge Social Network	TG	Task Group
SMC	safety management certificate	TM	transducer module
SMS	safety management system	Tokyo MoU	Tokyo Memorandum of Understanding on Port State Control
SOA	speed of advance	TRAPS	Towed Reelable Active Passive Sonar
SOG	speed over the ground	TSB	Transportation Safety Board of Canada
SOI	Students on Ice	Tuk	Tuktoyaktuk
SOLAS	<i>International Convention for the Safety of Life at Sea, 1974</i>	UBC	University of British Columbia
SOP	standard operating procedure	U.K.	United Kingdom
SP	Sailing Plan	UN	United Nations
		UNB	University of New Brunswick

UNESCO	United Nations Educational, Scientific and Cultural Organization	VCNS	Vice Chief of the Naval Staff
U.S. or U.S.A.	United States	VDR	voyage data recorder
USAF	United States Air Force	vertrep	vertical replenishment
USCG	United States Coast Guard	VHF	very high frequency
USCGC	United States Coast Guard Cutter	vis	visibility
USD	United States dollars	W	West
USN	United States Navy	WA	Washington
USNS	United States Naval Ship	WDGF	Walter and Duncan Gordon Foundation
USS	United States Ship	WSW	West-Southwest
USSR	Union of Soviet Socialist Republics	WWII	World War Two
UTC	Coordinated Universal Time	WWNWS	World-Wide Navigational Warning Service
		yr(s)/yrs	year(s)



Routes of the Northwest Passage. Map by Jennifer Arthur-Lackenbauer

The Northwest Passage: An Introduction and Historical Overview

Adam Lajeunesse and P. Whitney Lackenbauer

In August 2016, the luxury cruise ship *Crystal Serenity* was in the middle of a groundbreaking voyage, carrying 1,700 passengers and crew through the Northwest Passage. After years of planning and consultations with Canadian government agencies, the ice-class 1C (light) ship entered the ice-choked Victoria Strait. Watching the ship's Automatic Identification System (AIS) transponder from Ottawa, officials from the Department of Transport became increasingly concerned as *Serenity* came to a dead stop and sat immobile in the ice for over an hour. Eventually, contact was made to ensure that the vessel had not suffered some calamity. As it turned out, the ship's crew had spotted a polar bear on an ice floe, and the wealthy passengers were taking turns zipping out in zodiacs to take pictures of the animal, who seemed bored but increasingly annoyed by the nosey tourists.

Serenity was soon on its way and completed its voyage safely, but Ottawa's concerns were well founded. Stretching 2,200 kilometres¹ through sometimes poorly charted, ice-infested channels, the Northwest Passage is one of the most dangerous sea routes in the world. The idea that climate change has transformed it into an easy highway is now common in popular media commentary, yet this assumption is highly problematic. Even in the relatively ice-free summer months, when wide sections of the route are open water, masses of rock-hard old ice still float down from the polar basin to clog off choke points and create serious hazards to shipping.² As such, ship transits through the Northwest Passage have always been perilous affairs.

Beyond the dangers imposed by ice and uncharted shoals, the Northwest Passage has been the source of – or stage for – decades of political and security challenges. Dating back to the middle of the twentieth century, the question of sovereignty over these waters emerged as an intractable disagreement between Canada and the United States. Questions of ownership and transit rights sparked decades of bilateral negotiations and political crises as American voyages through the passage took on outsized

symbolic importance. Despite years of discussion and innovative diplomatic mechanisms to manage disagreement, the political and legal dispute over Canada's Arctic waters continues to remain just below the surface.

Closely connected to questions of sovereignty and jurisdiction are matters of defence and security. For much of its modern history, the Northwest Passage and the surrounding territory constituted a front line in the Cold War. From the establishment of weather and radar stations stretching its length in the 1950s, to the fear of Soviet missile-firing submarines prowling the route in the 1970s and 1980s, the question of defence has long been a central concern for the Canadian government.

The nexus between sovereignty and security has thus dominated political thinking about the Northwest Passage. Often the two terms are used interchangeably, a factor that has confused debates and led to rhetoric divorced from evidence and reality. While interrelated, sovereignty is a question of legal ownership – the recognized right to control and govern territory. With respect to the Northwest Passage, the sovereignty question relates to Canada's position that the waters within the Canadian Arctic Archipelago are historic internal waters over which Ottawa exercises full control. Defence and security considerations are different, speaking instead to obligations to fulfill sovereign responsibilities or to prevent hostile actors from damaging the region or using it as an avenue to attack targets further south.³

This volume brings together some of the most compelling histories of key transits of the Northwest Passage. It seeks to bring to life abstract concepts such as sovereignty and security, to show how they have played out, and to demonstrate what sovereignty and security really look like. These voyage histories begin in the mid-eighteenth century, with Janice Cavell's account (chapter one) of the McClure expedition and the question of discovery. Who really discovered the Northwest Passage? Was it Robert McClure, who transited the route in 1855 (partially by sled), or was it one of the other British captains seeking fame – and an admiralty reward?

Today, these questions seem misguided. The Northwest Passage was "discovered" long before the arrival of the British. It was and remains Inuit Nunangat, part of the Inuit homeland in which people have used the waters and ice since time immemorial. This Indigenous use is the heart of Canada's modern claim to sovereignty.⁴ Despite this legal and historical reality, those early British voyages retain a great deal of currency in popular Canadian conceptions of sovereignty. In 2014, when the wreck of HMS *Erebus* was found in Victoria Strait, Prime Minister Stephen Harper exalted how the

Franklin Expedition vessel had “laid the foundations of Canada’s Arctic sovereignty” – despite the voyage’s disastrous conclusion.⁵ While neither Franklin, nor any other British explorer, actually laid a legal claim to the waters of the Northwest Passage,⁶ Canadians still look to that age of “heroic” Victorian exploration as underpinning national sovereignty.

Chapter two recounts the story of Norwegian explorer Roald Amundsen’s 1905 transit of the Northwest Passage aboard *Gjøa*. Long before the Canadian state had expressed any serious interest in Arctic maritime sovereignty, Amundsen and his crew became the first to successfully navigate the route by sea. In many ways, the voyage of *Gjøa* represented the end of the heroic age of Arctic exploration, defined by sailing ships and the European drive to “conquer” the great unknown Arctic. The early twentieth century saw a transition in the concept of “sovereignty” from pure discovery to occupation. Even as large swaths of the Arctic Archipelago remained undiscovered, the Canadian government – driven by voyages like Amundsen on *Gjøa* and the presence of American and Scottish whalers – moved to assert its claims to the region through a series of official expeditions into the Northwest Passage, matched by flag planting and proclamations designed to assert authority in and over Arctic lands and waters.⁷ Between 1904 and 1911, Captain Joseph-Elzéar Bernier led several voyages to the Eastern Arctic on the government ship *Arctic*, culminating in the placement of a cairn and plaque on Melville Island claiming the entire Arctic Archipelago for Canada. To give practical weight to this claim, the federal government established North-West Mounted Police/Royal Canadian Mounted Police (RCMP) posts along its Arctic mainland coastline and on the Arctic Islands, eventually extending to Craig Harbour (1922) and Bache Peninsula (1926) on Ellesmere Island.⁸ The resupply of these remote outposts was conducted by the annual Eastern Arctic Patrol, inaugurated in 1922. Led by a civil servant, the maritime patrol transported doctors, scientists, court officials, and police to visit coastal camps and later settlements across the Eastern Arctic. After a short hiatus following the sinking of HMCS *Nascopie* in 1947, the patrol resumed in 1950 with a particular focus on testing Inuit for tuberculosis, many of whom were evacuated to southern hospitals – a practice that continued until 1968.⁹

Although Canadian agents had made Arctic voyages a more regular – and less dramatic – practice, none made a full transit of the Northwest Passage until the Second World War. Chapters three and four offer histories of that first Canadian transit. In 1940, the RCMP schooner *St. Roch* made the trip from west to east. Shelagh Grant charts this voyage, which was

remarkable for its navigational accomplishments – the first ship to make the passage in a single season. The *St. Roch* voyage also represented an interesting shift in how Canada used the route. As Whitney Lackenbauer and Peter Kikkert show, the transit was intended to demonstrate Canadian sovereignty in the face of growing American interest. Concerned that Canada was not demonstrating an adequate degree of “control and administration” over the region to establish its “effective occupation,” and inspired by Britain’s efforts to secure its Antarctic territorial claims over the Falkland Islands Dependencies, Ottawa conceived of *St. Roch*’s 1944 passage as a way to strengthen Canada’s occupation of the territory and reassert its legal claim. The voyage was also the first strategic employment of the passage for defence purposes. In her research, Grant emphasizes Canadian interest in the security of Greenland, as part of the broader question of North American security. While *St. Roch* did not support an actual Canadian occupation of Greenland, it was the first instance of a Canadian effort to project power through the Northwest Passage.

Soon after *St. Roch* completed its groundbreaking transit, questions of sovereignty and security began to assume their modern form. At the start of the Cold War, American activity in Canada’s Arctic waters expanded dramatically, and the Department of External Affairs grappled with legal questions of transit rights, jurisdiction, and control.¹⁰ When the U.S. pushed for access to Canada’s Far North to build airfields and weather stations, Canadian officials proved apprehensive in authorizing new installations, and journalists began to talk about a looming sovereignty crisis. Some scholars argue that Canadian apathy in the face of American security interests threatened our sovereignty in the late 1940s,¹¹ while others paint a more benign portrait of bilateral cooperation, with Canadian policy-makers preserving and extending Canadian sovereignty through quiet diplomacy and careful negotiations that continued into the 1950s and beyond.¹² Whatever the verdict, the notion that there were “no boundaries upstairs” when it came to North American air defence had entered the military imagination.¹³ In an era of nuclear competition, the Arctic could no longer be simply ignored as a strategic avenue of approach, ushering in a process of military modernization that dramatically transformed the region.¹⁴

While American activity created new “sovereignty” pressures, the threat posed by the Soviet Union created dramatic new defence concerns. Polar projection maps revealed how Canada’s strategic situation had changed. The polar routes were now the shortest lines between Soviet air bases and North American cities. In the 1950s, the Americans decided to build an extensive

network of radar chains to provide advance warning so they could protect the U.S. Air Force's nuclear deterrent and the industrial heartland of North America. The most northern of the radar networks was the Distant Early Warning (DEW) Line, a mega-project staggering in both its scale and the speed with which it was constructed. To build and support this work, American vessels surged into the passage. Over time, the size and scope of the Arctic convoys grew. During the construction phase from 1955–57, the U.S. Military Sea Transportation Service (MSTS) moved over 460,000 tons of equipment and supplies into the Canadian Arctic, including enough gravel to build two copies of the Great Pyramid of Giza.¹⁵

While the days of explorers in wooden ships seeking to pick their way through the icy waters were over, these modern expeditions were far from routine. Task forces continued to face the age-old environmental challenges associated with unpredictable ice conditions, harsh weather, and extreme isolation. Ships charted and cleared Arctic approaches and landed enormous loads of construction equipment and materiel over Arctic beaches. Risks abounded. During the first DEW Line sealift in 1955, the U.S. Navy and Coast Guard sent fifty-three ships into the Western Arctic Archipelago, and by the end of the expedition, only four remained undamaged. At the end of the season, the U.S. Navy announced to the press that it was “winning” its battle with the Arctic ice,¹⁶ yet such victory clearly came at a steep price.¹⁷ The Arctic was far from a safe or easy highway.

Examining the development of this “modern” exploration, chapters five and six provide in-depth examinations of two remarkable voyages during this period by HMCS *Labrador* (Canada's first heavy icebreaker and main contribution to the DEW Line operations) and the U.S.–Canadian expedition to chart Bellot Strait. Both voyages demonstrated the growing nexus between sovereignty and security. Ostensibly, these missions were undertaken with clear operational goals, to establish defence infrastructure and facilitate military transport. Beneath the surface bubbled questions of ownership and control. While Ottawa recognized the operational need for the American fleets to build the DEW Line, some politicians and senior officials found it disconcerting to see so many stars and stripes flying over waters that Canada considered its own. In this context, the significance of *Labrador's* voyages was well stated in the ship's unofficial history: “it marked the first incursion of a Canadian naval vessel into waters which the US Navy and Coast Guard might well be excused for considering *mare nostrum*.”¹⁸

That presence allowed Canada to not only support vital defence work but to claim a proportionate share in the mission, dispelling any notion that the

Northwest Passage was turning into an American lake. During the Bellot Strait expedition, *Labrador* rushed to chart the new passage from the east before its American counterparts could arrive from the west. That same spirit of competition animated the American side as well. When word arrived of *Labrador's* arrival at Bellot Strait, there was more grumbling than celebration. USCGC *Storis* crew member James Jones lamented the Canadian triumph, writing that "we got gypped out of it."¹⁹

The Royal Canadian Navy's Arctic foray was brief, however, and it opted out of its Arctic role when it transferred *Labrador* to the Coast Guard in 1957.²⁰ Nevertheless, the DEW Line and previous military development projects reshaped the socio-economic and cultural geographies of Arctic Canada. Although planners had intended to protect local Inuit so that military activities did not disrupt their lives, this proved impossible once airplanes and ships began shipping southern materiel into the Arctic. "Every place a box landed became a beach-head for industrialized society," documentary filmmaker Kevin McMahon later observed. "The boxes soon became the foundation for the Canadian government, which the military had given cause to worry about its sovereignty."²¹

The defence operations of the 1950s catalyzed modern Canadian sovereignty policies, and, over the course of the decade, External Affairs conducted extensive surveys of the country's position and international law. Nevertheless, the intensity of the Arctic activity died out by the end of the decade. As joint defence projects were completed, and intercontinental ballistic missiles made regional air defence less important, the American presence diminished – and, with it, Canada's acute concern about sovereignty. Instead, commercial shipping increased significantly in the 1960s, driven by community resupply and resource exploration. From the 1960s to the 1970s, between 90,000 and 110,000 short tons of supplies travelled to the Canadian Arctic by sealift, with most of the work done by private companies.²² This expansion brought none of the previous political drama, because this activity had no clear sovereignty or security implications.

While less dramatic than the American defence operations of the 1950s, commercial shipping in the 1960s nevertheless reshaped the region. The Geological Survey of Canada undertook large-scale aerial surveys in the 1950s, which outlined promising geological conditions, and, by the end of that decade, it published estimates defining a wide variety of minerals and hydrocarbon reserves spread across the Arctic Islands.²³ By 1960, the government had issued over forty million acres of exploration permits.²⁴ While the geology was promising, the question of transportation remained

unsettled, and the need for effective and reliable shipping quickly became clear. In a spirit of optimism, Cam Sproule (the CEO of J.C. Sproule and Associates and a pioneer in early Arctic resource exploration) wrote in a 1962 issue of *Oilweek* that “it should not take science long to devise icebreakers that could move more or less at will through the Arctic Islands for at least the greater part of the year.” Only a decade earlier, American crews were still learning how to drive their icebreakers in the polar waters. Now, Sproule was telling the world that large-scale submarine freight traffic was “so far advanced as to be practically assured within the next five to eight years.”²⁵ More than an ambitious outlier, this enthusiasm represented the newfound energy and optimism of Arctic resource promoters and their determination to open the Northwest Passage to Canadian shipping.

In this context, Canadian icebreaker operations produced essential insights into the feasibility of Eastern Arctic navigation for a large-scale mining operation. Captain Paul M. Fournier’s account of CCGS *John A. Macdonald*’s Arctic voyage in 1967 (chapter seven) shows how difficult navigation through the Northwest Passage could still be – even for a purpose-built heavy icebreaker. Documenting the conditions facing *Macdonald*, Fournier dispels the common notion that steel ships and modern technology had made Arctic operations easy and predictable. His account highlights common difficulties experienced by Arctic navigators: the winds, fog, changing visibility, ice coverage/concentration, snow, sea swells, and ice floes. In documenting such tribulations, Fournier paints a challenging picture, from the loss of part of *Macdonald*’s propeller blade and its efforts to salvage a crashed helicopter, to a diversion to rendezvous with another vessel whose crew member required prompt medical aid for perforated stomach ulcers.²⁶

Chapters eight and nine examine how this perceived resource rush intersected with questions of sovereignty. In 1968, Atlantic Richfield and Humble Oil made a major oil discovery at Prudhoe Bay on Alaska’s North Slope, and, as in the Arctic Islands, the question of transportation was central to moving resources to southern refineries. Testing whether the Northwest Passage could be travelled safely represented one option. The ship the Americans sent through Canadian waters was the 150,000-ton SS *Manhattan*, a retrofitted oil tanker and one of the most ice-capable vessels in the world at the time. If the tests proved successful, plans called for the construction of twenty-six to thirty massive 1,200-foot-long icebreaking Ultra Large Crude Carriers of 350,000 tons, capable of carrying one million barrels of oil each.²⁷ Overall, *Manhattan*’s voyage was a success. The supertanker reached

Prudhoe Bay in September 1969 and returned to the Eastern Seaboard the following month. While McClure Strait had proven impenetrable, the more southerly route through Amundsen Gulf was accessible and was transited without incident.

The Government of Canada did not eschew the possibility of regular oil shipments through the Northwest Passage, given the oil, gas, and mineral development opportunities that would be opened by Arctic shipping.²⁸ The presence of *Manhattan* in Canadian waters, however, resurrected the frame of Arctic shipping as a question of sovereignty. CCGS *John A. Macdonald* and the U.S. Coast Guard cutter (USCGC) *Northwind* accompanied the supertanker. For the government of Pierre Trudeau, *Northwind*'s participation added a layer of political sensitivity to what would otherwise have been a purely commercial experiment. By 1969, the Canadian government had settled on claiming the waters of the Northwest Passage as historic internal waters, but it had not proclaimed this formally. Instead of doing so, and provoking an explicit legal rebuke from Washington, Ottawa sought to assert its control in a more informal fashion.²⁹ That process was made more awkward by the U.S. administration's refusal to request formal permission for *Northwind*'s transit. Consequently, *Manhattan*'s 1969 voyage took on a new political significance, now representing a challenge to Canadian sovereignty.³⁰

Previous studies have examined the legal and political drama that the voyage generated, highlighting the interplay between environmental considerations, international law, domestic politics, and the growing Canadian sense of Arctic nationalism.³¹ Initially, Canada adopted a "policy of practical co-operation," seeking to facilitate and cooperate with the experiment while ensuring Canada's *de facto* sovereignty. This, officials hoped, would at least delay a confrontation with the U.S. over sovereignty and reinforce Canada's claims to the passage. However, this policy fell out of favour as the government intensified its sovereignty emphasis throughout 1969, prompting Ottawa to begin formulating a long-term Arctic policy. From *Manhattan*'s voyage came Canada's modern Arctic environmental shipping framework (in the form of the *Arctic Waters Pollution Prevention Act*) and a decade of Canadian efforts to shepherd the developing law of the sea into a form consistent with Canada's vision of Arctic sovereignty and stewardship.³²

While the *Manhattan* voyage drove the Nixon and Trudeau governments into years of political wrangling, the voyage itself exemplified exceptional cooperation. Chapters eight and nine offer first-hand accounts of that

cooperation from Royal Canadian Navy (RCN) Lieutenant-Commander Erling Stolee, the Department of National Defence observer assigned to CCGS *John A. Macdonald* (the primary escort to *Manhattan*) in 1969 and CCGS *Louis S. St-Laurent* (which undertook the escort task in 1970); Antony G. Storrs, Director of Maritime Operations, Department of Transport; and Thomas C. Pullen, Canada's observer aboard *Manhattan*. In contrast to the tense political atmosphere sparked by the voyage, these histories paint a clear picture of the operational partnership and camaraderie between American and Canadian sailors.

Stolee's report and journal entries on the summer 1969 voyage onboard CCGS *John A. Macdonald* furnish a rich description of the "High Arctic" marine environment, with particular focus on defining the various forms of ice encountered in Canada's Arctic Archipelago. "Arctic ice along the route intended for *Manhattan*'s voyage had not previously been described and identified sufficiently for her purpose," he notes. By extension, the problems that a tanker would encounter while operating in an ice environment remained "unknowns" when planners devised their pilot project. Accordingly, "the world's foremost ice authorities were brought together" to address "the problem of defining ice – one of the core preoccupations associated with the test voyage."³³ In his close observations from July–October 1969, Stolee describes the wondrous landscapes through which *Macdonald* passed, documents the various ships encountered en route, and carefully assesses the performance of *Manhattan* and its instrumentation. The prose with which he captures the voyage is evocative and precise, offering the reader first-hand insights on what transpired, as well as his thoughts on the broader implications for Canada. "This concept of forcing a supertanker, such as *Manhattan*, through the Northwest Passage is imaginative – the route is shorter by several thousand miles than any other Europe-Pacific passages, and Canada stands to gain from a successful venture," he noted on 11 July 1969. His tone was celebratory, not narrowly defensive or nationalistic. Entering Lancaster Sound on 17 August, he exclaimed that "[t]o be entering these waters at last, where so much of mankind's finest history has been written, is a humbling and joyful occasion."³⁴ His journal is filled with similar expressions of intrigue with and awe of the Arctic environment.

Aboard *Manhattan*, Pullen tells the same story – of operational challenges, harsh weather, and the critical need for operational cooperation. On numerous occasions, the mighty tanker found itself stuck in the thick ice, only to be extricated by its Canadian escorts. "In the eastern Arctic, that is east of Resolute, the sea ice is mostly first-year, a thickness of six or seven

feet, by Arctic standards relatively easy to handle,” Pullen observed. “West of Resolute in Viscount Melville Sound and M’Clure Strait and, indeed, in the Beaufort Sea, the ice is chiefly multi-year ice, much thicker and much harder. As one moves west through the Northwest Passage, then so do conditions become increasingly more difficult.” The long-term development of an Arctic shipping route – which seemed so close to Pullen and Storrs – meant a focus on the operational and engineering requirements raised by *Manhattan’s* voyage. That narrow focus was representative of how most Arctic maritime practitioners worked; both Canadian and American mariners concentrated on those navigational challenges thrown up by the Northwest Passage, while the politicians far away worried about the more abstract questions of sovereignty.

Like the surge in defence-related shipping in the 1950s, the hydrocarbon frenzy soon faded. When the U.S. oil companies chose not to send Alaskan oil by tanker but by pipeline, the sovereignty question lost its urgency. Although Canadian resource shipping boomed in the 1970s and 1980s, the domestic nature of this activity stripped it of the political significance surrounding the *Manhattan* voyage. The Arctic faded from the public eye, particularly as the economic boom and shipping dreams that had come in the wake of *Manhattan* ended in the early 1980s, driven onto the rocks by the high cost of Arctic activities and the collapsing price of oil. Drilling activity in the Far North dried up, and several of the largest companies folded. Dome Petroleum – the country’s leader in Arctic offshore operations – was the most dramatic example, collapsing completely in 1987. Low metal prices also helped scuttle the dreams of an Arctic bonanza. By the late 1980s, the resource industries had largely evacuated the region. What the Canadian government had expected to evolve into a major shipping route quickly reverted to a region of regular sealifts and light tourist activity.

In 1985, the question of sovereignty was again propelled to the forefront of the Canadian government agenda by an American transit. This time, it was the U.S. Coast Guard icebreaker *Polar Sea*. Like *Manhattan* sixteen years earlier, the *Polar Sea* voyage was never designed to challenge Canadian sovereignty.³⁵ The purpose of the transit was simply to move the ship from east to west quickly to undertake missions in Greenland and Alaska, thus compensating for an overtaxed U.S. icebreaker fleet. Despite these benign intentions, it triggered a strong Canadian reaction, with Canadian newspapers calling the voyage an invasion and a purposeful challenge to national sovereignty.³⁶

Chapter eleven reproduces Captain J.T. Howell's log of *Polar Sea's* transit. Although his account makes the transit seem routine, receiving less mention than the vessel's other taskings in Greenland and the Beaufort Sea, the passage presented its own challenges. These are revealed in Howell's reflections on the ice and weather conditions – and the measures required to overcome them. While icebreaker technology improved operations, the political environment remained tumultuous. As with the voyage of *Manhattan*, the Canadian government was forced into a political corner when the U.S. reiterated its legal position that vessels had the right to uninterrupted transit passage through a route that connected two bodies of high seas. Canada disagreed and boldly stated its position that these were historic internal waters over which Canada had complete sovereignty and control. In 1985, Prime Minister Brian Mulroney declared straight baselines around the Arctic Islands, formally clarifying where Canada exercised sovereignty and ending any ambiguity presented by previous governments seeking to avoid direct legal confrontation with the United States.

Negotiations with the Americans ultimately yielded the 1988 Canada–U.S. Arctic Cooperation Agreement, which bypassed the fundamental disagreement over sovereignty but created an effective framework for managing future U.S. icebreaker operations.³⁷ Since that time, U.S. Coast Guard icebreakers have transited Canada's Arctic waters without fanfare or political trouble. Chapter fifteen is Natasha Singer's account of one such voyage by USCGC *Healy*, which transited in 2003. This account also shows how much easier the passage was becoming as climate change reduced the region's ice cover. While generations of Canadian and American mariners had struggled through the region, *Healy* found open waters. Singer recounts how "950 miles south of the North Pole, off northwestern Greenland," *Healy* "was having trouble finding any ice to break at all."

The introduction of cruise tourism to the North American High Arctic added private foreign enterprise to a region that had long been the maritime preserve of government vessels and Canadian-flagged commercial ships. In 1984, Lindblad Travel, a New York agency, organized and conducted the first tourist voyage through the Northwest Passage. Captain Pullen participated in planning the expedition and also served as Ice Master and lecturer as the ice-strengthened passenger ship M/S *Lindblad Explorer* ³⁸ transited the Northwest Passage on its voyage from St. John's, Newfoundland, to Yokohama, Japan. With ninety-eight passengers aboard, the cruise ship traversed the passage in twenty-three days, representing only the thirty-third time a vessel had completed a full passage and the first time that the

Northwest Passage was used as a route to Asia. In chapter ten, Pullen's diary entries document his observations, which, when compared to earlier and later missions, show how rapidly the Arctic was changing. During *Lindblad Explorer's* transit through the Chukchi Sea to Point Barrow, Pullen recounts the ship struggling through heavy pack and multi-year ice towards Tuktoyaktuk and Holman in the Canadian Arctic Islands. Thirty years earlier, when Pullen commanded *Labrador*, these same waters would have been nearly impassable to such a vessel. In the early years of the DEW Line operations, ship damage in the area was extremely common. Indeed, the entire purpose of Pullen's 1957 survey of Bellot Strait had been to find an eastern escape route in case heavy sea ice closed the Beaufort Sea prematurely. Now, cruise ship operators sought to promote a Northwest Passage voyage as safe, comfortable, and enjoyable.³⁹

Although other tourist companies sought to capitalize on this demonstration of feasibility by *Lindblad Explorer*, only two crossings succeeded over the following four years.⁴⁰ In chapter twelve, Pullen recounts his experiences on the 1988 voyage of *Society Explorer* from west to east through the passage – his fourth complete transit. When the North American Arctic cruise industry picked up tempo in the 1990s, however, annual voyages into Canada's Arctic waters became the norm. The perils of Arctic travel did not disappear, however. Chapter thirteen documents the grounding of the cruise ship *Hanseatic* in Simpson Strait in 1996. This ice-strengthened passenger vessel specializing in expedition and adventure cruises ran aground on a shoal and had to evacuate its passengers ashore, who were thankfully rescued by a nearby Russian vessel. CCGS *Henry Larsen* and CCGS *Louis S. St. Laurent* were tasked with aiding in the post-grounding response, but neither could reach the scene due to their deep draughts. Aids to navigation in the area were not accurately placed, and *Hanseatic's* crew had not managed the Arctic environment appropriately.

Chapter sixteen offers a similar account, this time of the grounding of the cruise ship *Clipper Adventurer* in 2010. The Transportation Safety Board of Canada report offers an account of the ship's grounding in Coronation Gulf and the rescue of its passengers by CCGS *Amundsen*. This chapter highlights the dangers posed by pleasure craft operating so far from search and rescue infrastructure, in a region with rudimentary hydrographic surveying. Expanding on the lessons learned from this incident, Emma Stewart and Jackie Dawson examine the risks posed by the Canadian Arctic cruise industry in chapter seventeen. While the grounding of *Clipper Adventurer* did not cause an environmental catastrophe or loss of life, Stewart and Dawson

argue that “the incident showed the stark reality of the individual, cultural, and environmental risks associated with polar travel,” insisting that “it should send a warning to decision-makers about the complexities of managing and governing cruise activities in Arctic waters.” The future of that industry remains uncertain.

In 2016, *MV Crystal Serenity* became the first large cruise ship to make the transit. Arriving in the Beaufort area from Alaska, *Serenity* found no ice at all and, in an effort to give its customers the Arctic experience, actually sailed north in search of the diminishing sea ice. In contrast, one of the most important lessons drawn by the U.S. Navy from its DEW Line operations was never to send a deep-draft ship east of Point Barrow – unless you wanted that ship damaged.⁴¹ The evolution of the cruise industry in the region showed just how dramatically the Northwest Passage had changed. In chapter nineteen, Mathieu Landriault provides insights into Canadians’ perceptions about Arctic cruise operations, using the *Crystal Serenity* voyages as a lens to assess the changing nature of the media landscape. He notes that while sovereignty concerns remained an issue, the new dangers posed by thin-skinned ships traversing hazardous waters, environmental degradation, and safety had finally trumped those traditional fears of sovereignty and conventional security.

These fears played out with the grounding of the passenger vessel *Akademik Ioffe* near Kugaaruk, Nunavut, in August 2018. Sailing through narrows in a remote area that had never been surveyed to modern standards and where none of the vessel’s crew had ever been before, the ship ran aground at a speed of 7.6 knots before the bridge team could take evasive action. Chapter twenty-two reproduces excerpts from the Transportation Safety Board of Canada report on the incident, including the post-grounding search and rescue assistance provided by the Canadian Coast Guard vessels *Pierre Radisson* and *Amundsen* and by five Canadian Armed Forces aircraft. Despite serious damage to its hull, *Akademik Ioffe* self-refloated, and its passengers were evacuated onto the sister passenger vessel *Akademik Sergey Vavilov*. In addition to recounting events, the chapter also provides substantive insights into charting in Canadian Arctic waters, the national search and rescue system, and previous occurrences of groundings in the region.

Other chapters furnish more celebratory stories. In chapter fourteen, historian James Delgado recounts the Vancouver Maritime Museum’s efforts to retrace *St. Roch*’s original circumnavigation of North America through the Northwest Passage with its *St. Roch II* Voyage of Rediscovery. After a year

and a half of planning, the RCMP catamaran *Nadon* assumed the name *St. Roch II* in 2000 and departed Vancouver on Canada Day. During its summer transit of the passage, Delgado recounts how the vessel successfully chose a route that “largely avoided the Arctic’s risks – ice, bad weather, and the often extreme conditions at the top of the world – because it was a particularly warm summer.” Arriving at Halifax’s King’s Wharf on 11 October 2000, exactly fifty-eight years after Larsen did following his transit, *St. Roch II* raised public awareness about the original ship and launched fundraising efforts to pay for the continued preservation of *St. Roch*.

Seventeen years later, the Canada C3 (coast to coast to coast) voyage completed a 150-day sailing journey from Toronto to Victoria via the Northwest Passage as a signature project for Canada’s 150th anniversary of Confederation. The expedition vessel, the 67-metre (220-foot) former Canadian Coast Guard icebreaker *MV Polar Prince*, was fitted with the latest satellite technologies to enable Canadians from coast to coast to coast to follow the journey. As participants recount in chapter twenty, scientists, artists, Indigenous Elders, historians, community leaders, youth ambassadors, journalists, and educators sought to use the transit “to celebrate Canada and draw it closer together.”⁴²

Other ships transited the Northwest Passage for commercial purposes, propelled by new mines and a growing population. While these voyages are neither less dramatic than an icebreaker transit nor as celebrated as a cruise ship voyage, they have long made up the backbone of Arctic maritime activity. Chapter eighteen is the logbook of *M/V Nunavik*, an icebreaking bulk carrier owned and operated by the Canadian shipping company Fednav. In 2014, *Nunavik* made history as the first cargo ship to complete an unescorted voyage through the Northwest Passage, carrying a cargo of nickel concentrate from Deception Bay in northern Quebec to smelters in northern China. *Nunavik*’s voyage was an early example of China’s broader strategy to develop northern resources to fuel its own growth.

Many recent Arctic narratives cast suspicion on China, based on concern that the Asian power will seek to undermine the sovereignty of Arctic states and co-opt regional governance mechanisms to facilitate access to resources and new sea routes to fuel and connect its growing global empire.⁴³ Analysts have fixated on China’s Arctic maritime capabilities to analyze and infer the possible Arctic interests of this self-declared “near-Arctic” state. Is China using the cover of polar scientific research and thinly veiled language in an attempt to normalize its presence and advantageously position itself?⁴⁴ In 2017, the icebreaker *Xue Long* made China’s first transit of the Northwest

Passage, which some commentators suggested exemplified a new sovereignty and security dynamic. In chapter twenty-one, Chinese scientists Zhu Bing, Yuan Dongfang, and Xia Yinyue summarize this “practice voyage” through the Northwest Passage to gain “navigation practice and exploration research” that would enable the “regular use of the Northwest Passage by Chinese ships.” This maiden transit “opens up a new maritime channel from the North American Economic Circle (Atlantic coast) to the Northeast Asian Economic Circle,” the authors proclaim, “accruing rich navigational experience ... and promoting China’s navigation of the Arctic.”

Although China’s interest in the Arctic region has been the subject of considerable study in the past decade,⁴⁵ its intentions for and position on the Northwest Passage remain to be determined. Still, officials in Ottawa are taking note. Canada’s 2024 defence policy update and its Arctic foreign policy highlight Chinese malign influence and potentially disruptive behaviour in the region (as elsewhere).⁴⁶ It is unlikely that a direct Chinese challenge will materialize to mimic the sovereignty anxieties of the *Manhattan* or *Polar Sea* crises, or the Soviet military threat that sparked the construction of the DEW Line. Instead, Canadian statements point to emerging “hybrid” threats, below the threshold of armed conflict, that involve hostile state or state-backed proxy actors testing Canadian control and capabilities in the region or prodding the still-sensitive question of sovereignty to create new gaps and seams between Canada and its American partners.

Historically, Canadian officials expected potential challenges to sovereignty from American state vessels. HMCS *Labrador* was sent to the Arctic to remove the impression that American ships had a monopoly over the region, and challenges emerged again in the 1970s and 1980s as U.S. Coast Guard ships refused to request permission to transit. Yet, despite these tensions, the two states remained close friends and partners – even expanding their cooperation in Arctic defence while simultaneously arguing over questions of sovereignty.⁴⁷ In chapter twenty-three, Jake Kritzer, Executive Director of the Northeastern Regional Association of Coastal Ocean Observing Systems (NERACOOS), and Shayla Fitzsimmons, Executive Director of the Canadian Integrated Ocean Observing System (CIOOS) Atlantic Regional Association, recount USCGC *Healy*’s historic scientific expedition in the Northwest Passage and Baffin Bay in the fall of 2021. *Healy*’s first transit through the Northwest Passage in nearly twenty years was completed in cooperation with Canada and saw a team of distinguished American scientists carry out a diverse research program

during the voyage. The chapter shares observations about changing ocean ecosystems, uncertainties brought on by climate change that affect Indigenous Peoples, and Canada–U.S. policy priorities focused on keeping the Arctic peaceful and ensuring that the benefits of economic development accrue to the people living in the region. It concludes with an appeal for ocean users across the Northwest Atlantic and Arctic Oceans to “create communities of practice, learning networks, integrated data and modelling systems, training and capacity-building programs, and other tools for the collaboration and scaling needed to meet the challenges before us.”

These challenges span the entire defence, security, and safety spectrum. Akin to *Labrador*’s concept of operations in the 1950s, Canada has built a new fleet of patrol vessels designed to enhance its presence in the Arctic to “assert” sovereignty and bolster national security.⁴⁸ In chapter twenty-four, Commander Corey Gleason, the first commanding officer of HMCS *Harry DeWolf*, the Navy’s first Arctic and Offshore Patrol Vessel (AOPV), recounts the Royal Canadian Navy’s first transit of the passage since 1955. Deployed under the banner of Operation *Nanook* from 3 August to 15 September 2021, the ship began in Halifax, Nova Scotia, and transited the Northwest Passage east to west using the route of the Franklin Expedition and Roald Amundsen on *Gjøa*, before ending in Esquimalt, British Columbia. Gleason describes radar and sea trials, interoperability training with the RCMP and Army elements, exercising a maritime response to a mass rescue operation, and community engagement activities. The AOPV’s icebreaking capabilities proved essential when the ship encountered varied ice conditions. “The RCN could not operate in ice before the AOPVs – their introduction has made it possible to operate in 10/10th ice (100 percent ice),” he explains. “The ship encountered old ice from McClure Strait and M’Clintock Channel clogging Larsen Sound and Victoria Strait.” Civilian shipping required Coast Guard escort, but *Harry DeWolf* proved its autonomous capability. “The work done by [*Harry DeWolf*] in the North illustrated that its capabilities are applicable anywhere in the world,” Gleason concludes. “This very Canadian ship fits into a scalable RCN and will operate on the lower spectrum of warfare, filling the operational space of maritime security and disaster relief operations, while the frigates and Canadian Surface Combatants are free to operate exclusively in the higher spectrum of warfare.”

While future threats and challenges remain opaque, the past century of Arctic navigation provides a wealth of experience and lessons learned. The region is changing rapidly, and the dangers and opportunities presented by Arctic shipping are, likewise, evolving. The region is facing new defence and

security threats, as well as new sovereignty challenges, including from a United States that is now openly seeking foreign annexations. Safety concerns are proliferating, as well. In 2024, the Northwest Passage saw twenty-eight passenger cruise or private yacht voyages.⁴⁹ While the vast majority of these are conducted safely and in full compliance with Canadian law and regulations, the new diversity of actors has also created new complications. Canada will continue to face an ever-evolving and complex set of challenges in its Arctic. How well it responds may depend on how well it understands its history.

Notes

¹ Measured from Lancaster Sound to the Beaufort Sea through the most commonly used southerly route.

² For the most comprehensive and recent work on this process, see Alison J. Cook, et al., “Sea Ice Choke Points Reduce the Length of the Shipping Season in the Northwest Passage,” *Communications Earth & Environment* 5, no. 362 (2024): 1–11, <https://www.nature.com/articles/s43247-024-01477-6.pdf>.

³ See P. Whitney Lackenbauer and Peter Kikkert, eds., *The Canadian Forces and Arctic Sovereignty: Debating Roles, Interests, and Requirements, 1968-1974* (Waterloo: Laurier Centre for Military Strategic and Disarmament Studies/WLU Press, 2010); P. Whitney Lackenbauer, *From Polar Race to Polar Saga: An Integrated Strategy for Canada and the Circumpolar World*, Foreign Policy for Canada’s Tomorrow no. 3 (Toronto: Canadian International Council, 2009); and P. Whitney Lackenbauer, “Threats Through, To, and In the Arctic: A Canadian Perspective,” in *On Thin Ice? Perspectives on Arctic Security*, eds. Duncan Depledge and P. Whitney Lackenbauer (Peterborough: North American and Arctic Defence and Security Network, 2021), 35–47.

⁴ For an explicit example, see Secretary of State for External Affairs Joe Clark’s statement during the *Polar Sea* crisis: Canada, House of Commons, *Debates*, 10 September 1985, 33rd Parliament, 1st Session, 6463. See also Inuit Tapiriit Kanatami (ITK), *Nilliajut: Inuit Perspectives on Security, Patriotism and Sovereignty* (Ottawa: Inuit Qaujisarvingat/Inuit Knowledge Centre, 2013).

⁵ “Franklin Ship Discovery: Stephen Harper’s Full Statement,” CBC News, 9 September 2014, <https://www.cbc.ca/news/politics/franklin-ship-discovery-stephen-harper-s-full-statement-1.2760566>.

⁶ Donat Pharand, “The Arctic Waters and the Northwest Passage: A Final Revisit,” *Ocean Development & International Law* 38, no. 1–2 (2007): 9–10.

⁷ On sovereignty in the Canadian Arctic before the Second World War, see Gordon W. Smith, *A Historical and Legal Study of Sovereignty in the Canadian North: Terrestrial Sovereignty, 1870–1939*, ed. P. Whitney Lackenbauer (Calgary:

University of Calgary Press, 2014), and Janice Cavell and Jeff Noakes, *Acts of Occupation: Canada and Arctic Sovereignty, 1918-25* (Vancouver: UBC Press, 2010).

⁸ William R. Morrison, *Showing the Flag: The Mounted Police and Canadian Sovereignty in the North, 1894-1925* (Vancouver: UBC Press, 1985).

⁹ See C.S. Mackinnon, "Canada's Eastern Arctic Patrol 1922-68," *Polar Record* 27, no. 161 (1991): 93-101.

¹⁰ See, for example, P. Whitney Lackenbauer and Peter Kikkert, "Sovereignty and Security: Canadian Diplomacy, the United States, and the Arctic, 1943-1968," in *In the National Interest: Canadian Foreign Policy and the Department of Foreign Affairs and International Trade, 1909-2009*, eds. Greg Donaghy and Michael K. Carroll (Calgary: University of Calgary Press, 2011), 101-20, and Adam Lajeunesse, *Lock, Stock, and Icebergs: A History of Canada's Arctic Maritime Sovereignty* (Vancouver: UBC Press, 2016).

¹¹ See, for example, Shelagh D. Grant, *Sovereignty or Security? Government Policy in the Canadian North, 1936-1950* (Vancouver: UBC Press, 1988); Adam Lajeunesse, "Lock, Stock, and Icebergs? Defining Canadian Sovereignty from Mackenzie King to Stephen Harper," CMSS Occasional Paper no. 1 (Calgary: Centre for Military and Strategic Studies, 2007); and J.L. Granatstein, "The North to 1968," in *The Arctic in Question*, ed. Edgar Dosman (Toronto: Oxford University Press, 1976), 13-33.

¹² See, for example, David Bercuson, "Continental Defense and Arctic Security, 1945-50," in *The Cold War and Defense*, eds. Keith Neilson and Ronald Haycock (New York: Praeger, 1990), 153-70; P. Whitney Lackenbauer, "Right and Honourable: Mackenzie King, Canadian-American Bilateral Relations, and Canadian Sovereignty in the Northwest, 1943-1948," in *Mackenzie King: Citizenship and Community*, eds. John English, Kenneth McLaughlin, and P. Whitney Lackenbauer (Toronto: Robin Brass Studio, 2002), 151-68; Lackenbauer and Kikkert, "Sovereignty and Security," 101-20; P. Whitney Lackenbauer and Peter Kikkert, "The Dog in the Manger—and Letting Sleeping Dogs Lie: The United States, Canada and the Sector Principle, 1924-1955," in *International Law and Politics of the Arctic Ocean: Essays in Honour of Donat Pharand*, eds. Suzanne Lalonde and Ted L. McDorman (Leiden: Brill, 2014), 216-39; and Daniel Heidt and P. Whitney Lackenbauer, *The Joint Arctic Weather Stations: Science and Sovereignty in the High Arctic, 1946-1972* (Calgary: University of Calgary Press, 2022).

¹³ See Joseph Jockel, *No Boundaries Upstairs: Canada, the United States, and the Origins of North American Air Defence, 1945-1958* (Vancouver: UBC Press, 1987).

¹⁴ On this theme, see Matthew Farish and P. Whitney Lackenbauer, "High Modernism in the Arctic: Planning Frobisher Bay and Inuvik," *Journal of Historical Geography* 35, no. 3 (2009): 517-44, and P. Whitney Lackenbauer and Matthew Farish, "The Cold War on Canadian Soil: Militarizing a Northern Environment," *Environmental History* 12, no. 4 (2007): 920-50.

¹⁵ Western Electric, *The DEW Line Story* (c. 1960). See also P. Whitney Lackenbauer and Matthew Farish, eds., *The Distant Early Warning (DEW) Line Coordinating Committee: Minutes and Progress Reports, 1955-63*, Documents on

Canadian Arctic Sovereignty and Security (DCASS) no. 15 (Calgary and Waterloo: Centre for Military, Security and Strategic Studies/Arctic Institute of North America/Centre on Foreign Policy and Federalism, 2019).

¹⁶ “Arctic Radar Line Gains,” *New York Times*, 11 September 1955.

¹⁷ Comdr, Amphibious Group Three, “CTG 5.1: Operational Report Project 572, 1955,” 1955, Naval History and Heritage Command (NHH), Waldo K. Lyon Papers.

¹⁸ Quoted in Kenneth C. Eyre, *Custos Borealis: The Military in the Canadian North, 1898-1975*, ed. P. Whitney Lackenbauer (Peterborough: North American and Arctic Defence and Security Network, 2020), 190.

¹⁹ Dick Judge, *The Historic Northwest Passage and the CGC Storis* (Bloomington: Author House, 2007), 157, 159.

²⁰ On HMCS *Labrador*, see also J.M. Leeming, “HMCS *Labrador* and the Canadian Arctic,” in *RCN in Retrospect, 1910-1968*, ed. James A. Boutilier (Vancouver: UBC Press, 1982), 286–307; Naval Historical Section, Royal Canadian Naval Headquarters, *HMCS Labrador: An Operational History*, eds. P. Whitney Lackenbauer, Adam Lajeunesse, and Lieutenant(N) Jason Delaney (Antigonish: Mulroney Institute on Government, Arctic Operational History Series 1, 2017); and P. Whitney Lackenbauer and Elizabeth Elliot-Meisel, eds., “One of the Great Polar Navigators”: Captain T.C. Pullen’s Personal Records of Arctic Voyages, Part 1: Government Roles, DCASS no. 12 (Calgary and Waterloo: Centre for Military, Security and Strategic Studies/Arctic Institute of North America/Centre on Foreign Policy and Federalism, 2018).

²¹ Kevin McMahon, *Arctic Twilight: Reflections on the Destiny of Canada’s Northern Land and People* (Toronto: James Lorimer & Company, 1988), 11. On this theme, see also P. Whitney Lackenbauer and Ryan Shackleton, “Inuit-Air Force Relations in the Qikiqtani Region During the Early Cold War,” in *De-Icing Required! The Historical Dimension of the Canadian Air Force’s Experience in the Arctic*, eds. P. Whitney Lackenbauer and W.A. March (Trenton: Canadian Forces Air Warfare Centre, *Sic Itur Ad Astra: Canadian Aerospace Power Studies* vol. 4, 2012), 73–94; Lackenbauer, “At the Crossroads of Militarism and Modernization: Inuit-Military Relations in the Cold War Arctic,” in *Roots of Entanglement: Essays in the History of Native-Newcomer Relations*, eds. Myra Rutherdale, Kerry Abel, and P. Whitney Lackenbauer (Toronto: University of Toronto Press, 2018), 116–58; and P. Whitney Lackenbauer, “Military Modernization and Inuit: Anthropologist J.D. Ferguson and the DEW Line in the Western Canadian Arctic,” in *Distant Early Warning Systems: From the Cold War to the Cosmos*, ed. Julie Decker (Munich: Hirmer, 2025), 185–94.

²² Christopher Wright, *Arctic Cargo: A History of Marine Transportation in Canada’s North* (self-published, 2016), 291.

²³ Gordon H. Jones, “Economic Development – Oil and Gas,” in *A Century of Canada’s Arctic Islands, 1880-1980*, ed. Morris Zaslow (Ottawa: Royal Society of Canada, 1981), 222.

²⁴ Penelope E. Grey and Laura K. Krowchuk, *Spirit of Success: The Sproule Story* (Calgary: Sproule Associates Ltd., 1997), 223.

²⁵ Grey and Krowchuk, *Spirit of Success*, 62.

²⁶ On the 1967 voyage, see also P. Whitney Lackenbauer and Elizabeth Elliot-Meisel, eds., *"A Highly-Coveted Consultant": Captain T.C. Pullen's Contributions to Arctic Knowledge, Volume 2: Consulting*, DCASS no. 20 (Calgary: Centre for Military, Security and Strategic Studies/Arctic Institute of North America, 2022), 47–63.

²⁷ Minutes of the 73rd Meeting of the ACND, 19 December 1968, Library and Archives Canada (LAC), RG 112, vol. 29803, file 170-80/A6, pt. 7, reproduced in P. Whitney Lackenbauer and Daniel Heidt, eds., *The Advisory Committee on Northern Development: Context and Meeting Minutes, 1948-71*, rev. ed., DCASS no. 4 (Calgary and Waterloo: Centre for Military and Strategic Studies/Centre on Foreign Policy and Federalism, 2019), 836–49.

²⁸ Cabinet Conclusions, 11 September 1969, LAC, RG 2, Privy Council Office, series A-5-a, vol. 6340.

²⁹ Memorandum for Cabinet, 20 March 1969, LAC, RG 12, vol. 5561, file 8100-15-4-2, pt. 1.

³⁰ On maritime sovereignty issues, see Donat Pharand, *Canada's Arctic Waters in International Law* (Cambridge: Cambridge University Press, 1988); Pharand, "The Arctic Waters and the Northwest Passage," 3–69; Michael Byers, *International Law and the Arctic* (Cambridge: Cambridge University Press, 2013); and P. Whitney Lackenbauer, Suzanne Lalonde, and Elizabeth Riddell-Dixon, *Canada and the Maritime Arctic: Boundaries, Shelves, and Waters* (Peterborough: North American and Arctic Defence and Security Network, 2020).

³¹ William D. Smith, *Northwest Passage: The Historic Voyage of the S.S. Manhattan* (New York: American Heritage Press, 1970); John Kirton and Don Munton, "The Manhattan Voyages and Their Aftermath," in *Politics of the Northwest Passage*, ed. Franklyn Griffiths (Montreal and Kingston: McGill-Queen's University Press, 1987), 67–97; Lackenbauer and Kikkert, *The Canadian Forces and Arctic Sovereignty*; and Ross Coen, *Breaking Ice for Arctic Oil: The Epic Voyage of the SS Manhattan Through the Northwest Passage* (Fairbanks, AK: University of Alaska Press, 2012).

³² See, for example, Thomas M. Tynan, "Canadian-American Relations in the Arctic: The Effect of Environmental Influences Upon Territorial Claims," *The Review of Politics* 41, no. 3 (1979): 402–27; Donald M. McRae, "The Negotiation of Article 234," in *Politics of the Northwest Passage*, ed. Franklyn Griffiths (Montreal and Kingston: McGill-Queen's University Press, 1987), 98–114.

³³ P. Whitney Lackenbauer and Adam Lajeunesse, eds., *In Manhattan's Wake: Lieutenant E.B. Stolee's Accounts of the Canadian Arctic Voyages of CCGS John A. Macdonald and Louis St. Laurent, 1969/70* (Antigonish: Mulroney Institute on Government, 2019), 3.

³⁴ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 55.

³⁵ Rob Huebert, "Steel, Ice and Decision-Making. The Voyage of the Polar Sea and Its Aftermath: The Making of Canadian Northern Foreign Policy" (unpublished Ph.D. dissertation, Dalhousie University, 1994); Huebert, "Polar Vision or Tunnel Vision: The Making of Canadian Arctic Waters Policy," *Marine*

Policy 19, no. 4 (1995): 343–63; and Adam Lajeunesse, “When Irish Eyes Are Smiling: Arctic Sovereignty and the Impact of Personal Diplomacy,” in *History Has Made Us Friends: Reassessing the Special Relationship Between Canada and the United States*, eds. Donald E. Abelson and Stephen Brooks (Montreal and Kingston: McGill-Queen’s University Press, 2024), 256–76.

³⁶ See, for example, Franklyn Griffiths, “Arctic Authority at Stake,” *Globe and Mail*, 13 June 1985.

³⁷ Christopher Kirkey, “Smoothing Troubled Waters: The 1988 Canada-United States Arctic Co-operation Agreement,” *International Journal* 50, no. 2 (1995): 401–26.

³⁸ *Lindblad Explorer*, built in 1969 and known as “the little red ship,” was the first vessel specifically designed and built for cruise tourism in the polar regions. It earned “an esteemed reputation in the niche polar travel sector” before becoming the first cruise ship to sink in polar waters when off the coast of the Antarctic Peninsula in 2007. All onboard were safely evacuated. See E.J. Stewart and D. Draper, “The Sinking of the MS *Explorer*: Implications for Cruise Tourism in Arctic Canada,” *Arctic* 61, no. 2 (2008): 224.

³⁹ See Christopher Wright, *Of Penguins and Polar Bears: A History of Cold Water Cruising* (Cheltenham: The History Press, 2020).

⁴⁰ John Marsh and Susan Staple, “Cruise Tourism in the Canadian Arctic and Its Implications,” in *Polar Tourism: Tourism in the Arctic and Antarctic Regions*, eds. Colin Michael Hall and Margaret E. Johnston (Chichester: John Wiley and Sons, 1995), 63–72. See also C.S. Jones, “Arctic Ship Tourism: An Industry in Adolescence,” *The Northern Raven* 13, no. 1 (1999): 28–31.

⁴¹ G.C. Towner, Commander Amphibious Group Three, to Commander MSTs Pacific Area (CTF 5), Operational Report of Arctic Operations 1956 (Project 572), 28 September 1956, in COM PHIB GRU 3, CTG 5.1, Operational Report of Joint Task Group West, 1956, National Archives and Records Administration (NARA), RG 313, entry UD-13C 11, box 7, file Operational Report of Joint Task Group West 1956, 3.

⁴² Canada C3, <https://canadac3.ca/en/expedition/>.

⁴³ See, for example, Linda Jakobson, “China Prepares for an Ice-Free Arctic,” *SIPRI Insights on Peace and Security* 2010, no. 2 (2010); Anne-Marie Brady, *China as a Polar Great Power* (Cambridge: Cambridge University Press, 2017); and P. Whitney Lackenbauer, Adam Lajeunesse, James Manicom, and Frédéric Lasserre, *China’s Arctic Ambitions and What They Mean for Canada* (Calgary: University of Calgary Press, 2018).

⁴⁴ Bryan J.R. Millard and P. Whitney Lackenbauer, “Trojan Dragons? Normalizing China’s Presence in the Arctic,” Canadian Global Affairs Institute *Policy Paper* (June 2021), https://www.cgai.ca/trojan_dragons_normalizing_chinas_presence_in_the_arctic.

⁴⁵ See, for example, Justin Barnes, Heather Exner-Pirot, Lassi Heininen, and P. Whitney Lackenbauer, eds., *China’s Arctic Engagement: Following the Polar Silk Road to Greenland and Russia* (Peterborough/Akureyri: North American and Arctic Defence and Security Network Engage Series/Arctic Yearbook, 2021),

and Adam Lajeunesse and P. Whitney Lackenbauer, *Selling the 'Near-Arctic' State: China's Information and Influence Operations in the Arctic* (Washington: Wilson Center, 2024).

⁴⁶ Department of National Defence (DND), *Our North, Strong and Free* (2024), <https://www.canada.ca/content/dam/dnd-mdn/documents/corporate/reports-publications/2024/north-strong-free-2024.pdf>, and Global Affairs Canada (GAC), *Canada's Arctic Foreign Policy* (2024), <https://www.international.gc.ca/gac-amc/publications/transparence-transparence/arctic-arctique/arctic-policy-politique-arctique.aspx?lang=eng>. See also P. Whitney Lackenbauer, ed., *Canadian Arctic Defence and Foreign Policy: Recent Developments* (Peterborough: North American and Arctic Defence and Security Network, 2025).

⁴⁷ Adam Lajeunesse, "A Very Practical Requirement: Under-Ice Operations in the Canadian Arctic, 1960–1986," *Cold War History* 13, no. 4 (2013): 507–24.

⁴⁸ On language around sovereignty, see P. Whitney Lackenbauer, "Towards a Comprehensive Approach to Canadian Security and Safety in the Arctic," in *Breaking Through? Understanding Sovereignty and Security in the Circumpolar Arctic*, eds. Wilfrid Greaves and P. Whitney Lackenbauer (Toronto: University of Toronto Press, 2021), 137–67.

⁴⁹ Robert Headland, "Northwest Passage Transits to End of the 2024 Navigation Season," Scott Polar Research Institute, revised 4 January 2025, <https://www.spri.cam.ac.uk/resources/infosheets/northwestpassage.pdf>.

1

Who Discovered the Northwest Passage?

Janice Cavell*

Introduction

In 1855, a parliamentary committee declared that Captain Robert McClure had discovered the – or rather, a – Northwest Passage. On the committee's recommendation, McClure and his men were awarded £10,000 for their achievement. McClure himself received a knighthood. But even before these awards were made, the decision was controversial, and McClure is now seldom if ever credited as the discoverer. Over the years, Sir John Franklin, John Rae, and Roald Amundsen have all had their champions, and no consensus has yet emerged.

There are several Northwest Passages, and the nineteenth-century definition of discovering a passage involved both geography and navigation. That the process of discovery extended over many decades and was carried out by several different forms of travel adds further complications. This article outlines the stages of exploration and the claims put forward by explorers (or by their supporters). It concludes that it is impossible to single out one individual as the passage's true discoverer, but McClure's claim deserves more attention than it has received since the 1850s.

The Search for the Passage by Ship and Boat, 1818–39

The search for the passage was renewed in 1818, at the urging of Admiralty official John Barrow. Conveniently, the government provided a definition of discovery when it passed an act that both confirmed and

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modified a long-standing award of £20,000, first offered in 1745. Under the new act, anyone who could “find out and sail through” a northern channel all the way from Atlantic to Pacific would still receive £20,000, but “proportionate rewards” were introduced for those who first “accomplished certain portions” of the passage.¹ The details were worked out by the Board of Longitude and authorized by an order-in-council.² Increments of £5,000 were offered for passing meridians 110°, 130°, and 150° W (West). Once these three rewards were collected, the explorer who completed the last stage would receive only the remaining £5,000.³

The key criteria, then, were geographically discovering all or part of a passage and demonstrating that it was navigable for ships by actually sailing through it. The introduction of the intermediate awards raised the possibility that the explorer who first reached the Pacific through the Arctic would share the financial prize equally with three others. In terms of money, the last stage was worth no more than the first. Indeed, if one explorer reached the first three milestones and another completed the passage, the first captain’s monetary reward would be much greater than his successor’s. Whether the fame would be shared in the same way was naturally not considered in the official documents, although the explorers themselves must have wondered.

The first effort was led in 1818 by John Ross, who turned back at the entrance to Lancaster Sound, believing it was a dead end. During his 1819–20 voyage in *Hecla* and *Griper*, Edward Parry sailed through Lancaster Sound and its continuation, Barrow Strait, as far as Melville Island. He was stopped just off the Dundas Peninsula by exceptionally heavy pack ice. This ice, he recorded, “was as solid and compact, to all appearance, as so much land.”⁴ Parry therefore returned to England, where he claimed the first of the £5,000 awards. The scheme was then altered and enriched, with £5,000 for passing 130° W, £5,000 for passing 150° W, and £10,000 for reaching the Pacific.⁵

Parry suspected that he had nearly accomplished the passage, but he also knew that such ice as he had seen near Melville Island might be a permanent barrier. Parry had in fact almost reached the Beaufort Sea, which was the source of the heavy ice. But, he reasoned, there must be another passage in a lower latitude, where ice conditions would be better. Moreover, Parry had found that the best way to navigate through Arctic waters was near a coastline, in water deep enough for ships but shallow enough that heavy ice would be grounded well offshore, leaving a lane of comparatively open water. Along the coast of the continent, explorers could be “sure that the land will not fail us.”⁶

Parry made his next effort through Hudson Strait and Fury and Hecla Strait, but he was again blocked by ice. On his third voyage, he tried Prince Regent Inlet, but he lost one of his ships and was forced to return. Many explorers hoped that the land on the west side of this inlet (later called Boothia) was an island and that it would be possible to follow the coastline from the bottom of the Gulf of Boothia westward to the Bering Strait. In 1829–33, John Ross made another attempt through Prince Regent Inlet, but he did not get far enough south to clear this question up. His nephew, James Clark Ross, travelled to the western coast of Boothia and reached King William “Land” (actually an island), which he believed was connected with Boothia.

In 1819, Barrow had decided to supplement Parry’s explorations from the east with modest but potentially useful efforts in the western Arctic. John Franklin had accordingly carried out two overland expeditions that reached the Arctic Ocean via the Coppermine River in 1819–22 and the Mackenzie River in 1825–27, then surveyed the continental coast in boats. On his first expedition, Franklin travelled as far east as the Kent Peninsula; on the second, Franklin himself went west, past the Alaska border, while another party led by John Richardson sailed east from the mouth of the Mackenzie to the mouth of the Coppermine. During this boat voyage, Richardson passed the next intermediate milestone, longitude 130° W. But, as he regretfully observed, because “it was not contemplated, in framing the Order, that the discovery should be made from west to east, and in vessels so small,” he “could not lay claim to the pecuniary reward.”⁷ Franklin correctly believed that the waters charted during his expeditions were navigable by ships, yet navigation had taken place only in boats. In 1828, the remaining awards were cancelled, probably as a result of this development.

After 1828, naval exploration in the Arctic ceased for several years. Ross’s expedition to Prince Regent Inlet was privately sponsored, as was George Back’s journey down the Great Fish (Back) River in 1833–35, which was initially intended to be a search for the long-absent Ross. Back received word of Ross’s safe return to England during the early part of his journey, and therefore he was instructed by the committee in charge of the expedition to first survey the Arctic coast westward as far as Franklin’s Point Turnagain on the Kent Peninsula, then attempt to connect that coast with the Rosses’ discoveries.⁸ Ice conditions prevented even the first attempt, but looking east from the mouth of Chantrey Inlet, Back saw what he described as “strong inferences in favour of the existence of a southern channel to Regent’s Inlet.”⁹

Back had at least established that the coast at the mouth of the Back River was in roughly the same latitude as Point Turnagain. The interest aroused by

this result was great enough to win approval for a new Admiralty expedition, intended to chart the coast between Prince Regent Inlet and Point Turnagain. In 1836, Back was instructed to sail to the northwest corner of Hudson Bay, then travel overland from there to the Gulf of Boothia.¹⁰ However, the ice was exceptionally bad in that year. Back's ship, *Terror*, was severely damaged, and the overland attempt never took place.

The unknown coast from Point Turnagain to just beyond Chantrey Inlet was finally charted by two Hudson's Bay Company (HBC) employees, Peter Warren Dease and Thomas Simpson, during boat expeditions in 1838 and 1839. After reaching the area previously visited by Back and proceeding a little farther east, they, too, thought they saw a way into the Gulf of Boothia ahead of them. Dease and Simpson landed on the southwest coast of King William Island, believing it was part of Boothia, and built a large cairn at Cape Herschel.¹¹ Simpson intended to return the next year and continue into the Gulf of Boothia,¹² but in the interim, he died.

Even though Boothia is actually a peninsula, not an island, Dease and Simpson had come very close to joining their discoveries with those made by Parry's second and third expeditions and by the Rosses. Contrary to the expectations held in 1818, after Parry's first voyage, efforts from the east in ships had made only modest advances. In contrast, boat exploration from the west had been outstandingly successful. Given this situation, it might well have been asked whether discovering the Northwest Passage still meant sailing all the way through it in a ship.

The framers of the 1818 award scheme had envisioned an east-to-west process of discovery in which the last explorer would voyage into the final remaining unknown area, then emerge through the Bering Strait. But now, both the eastern and the western ends had been charted, and an unknown "last link" – to quote a famous phrase – lay somewhere between them. It was possible that the next explorer might join the known area in the east with the known area in the west, establishing the fact that a water connection between Atlantic and Pacific did exist north of the continent. This would be a key geographical discovery. However, if the geographical puzzle was solved without navigation in ships, even if soundings or other observations indicated navigability, then according to the logic employed in 1818, the Northwest Passage would be known, yet not truly discovered. But must the 1818 criteria still be applied?

Dease and Simpson themselves believed they had discovered the passage, and Simpson's memorial tablet praised him for this feat.¹³ If a strait between Boothia and the mainland had in fact proved to be the last link, the claim

might have received attention in later years, but since there is no such channel, it was forgotten.

A New Ship Expedition, 1836–48

During the 1830s, Barrow envisioned a new ship expedition that would begin by following Parry's original route through Lancaster Sound and Barrow Strait, then turn southwest toward the Bering Strait. On his voyages to and from Melville Island in 1819–20, Parry had found land both north and south of the waters now collectively known as Parry Channel. On the northern side, he saw and named North Devon (Devon Island) and Cornwallis, Bathurst, and Byam Martin Islands, plus many smaller islands. He observed that the passage to the north between North Devon and Cornwallis Island, which he named Wellington Channel, appeared to be free of ice. On the south side, the land west of Prince Regent Inlet was glimpsed only intermittently. Parry gave this land the general name of North Somerset. Two prominent capes were named Bunny and Walker. Parry thought there was likely a southward-leading channel west of Cape Bunny. West of Cape Walker, the southern land disappeared altogether; there, although Parry did not realize it, Parry Channel widens out into Viscount Melville Sound. Finally, southwest of Melville Island, Parry saw a coast to which he gave the name Banks Land.¹⁴

Barrow was convinced that west and south of Cape Walker there was only open sea except for Banks Land, Wollaston Land, and Victoria Land, all of which he assumed were comparatively small. The two latter lands had been sighted by Richardson and Simpson, respectively, and were in fact the southwestern and southeastern parts of Victoria Island, which occupies most of the area thought by Barrow to be water. Barrow scoffed at Parry's belief that safe navigation was possible only along a coastline; instead, he proposed that a route be sought directly from Cape Walker to the Bering Strait.¹⁵

In 1836, the Royal Geographical Society (RGS) asked Franklin, Richardson, and John Ross to comment on Barrow's proposal. Franklin recommended that the survey of the continental coast from the Gulf of Boothia to Point Turnagain be completed first. The same expedition could explore from Boothia to Cape Walker "and thereby gain well-grounded information" to guide the ships that Franklin hoped would later be sent in search of the passage.¹⁶ Richardson agreed with this plan, and he also thought there should be further surveys in the western Arctic, including investigation of Wollaston Land. There was, he observed, no need for open sea in the unknown space to make the Northwest Passage practicable; rather,

the discovery of a strait leading southwest from Cape Walker could also mean success.¹⁷ Richardson thought it best to determine the route before sending out two ships – preferably with steam power, so they could push through ice in a narrow channel – to navigate it.

Finally, John Ross criticized Barrow but endorsed Franklin's and Richardson's plans. He opined that there was continuous land west of Cape Walker. His reason for this belief was that the Melville Island ice drifted east through Barrow Strait. Since the prevailing winds were from the northwest, he thought it would go south instead unless blocked by land. According to Ross, success would most likely be achieved "by keeping close to the shore, from Cape Walker, westward."¹⁸ But unknown to Ross, although much ice drifted through Barrow Strait, even more was carried southeast through M'Clintock Channel.

The RGS recommended Franklin's proposal to the government, and the result was Back's abortive 1836–37 attempt (see above). However, the instructions did not include exploration towards Cape Walker. After Back's failure, Barrow was eager to go ahead without further reconnaissance. Action in the north was delayed by James Ross's voyage to the Antarctic in HMS *Erebus* and HMS *Terror*. In December 1844, Barrow finally put forward a new Arctic proposal.¹⁹ The expedition would use Ross's ships, which had been strengthened for their Antarctic venture. Confident that *Erebus* and *Terror* could plunge into the unknown without significant danger, Barrow did not modify his 1836 plan.

Although Franklin agreed with Barrow that he should turn southwest after passing Cape Walker, he had very different – and far more accurate – expectations about what he would find there. As he explained in several letters written during the early part of his voyage,²⁰ because Parry had seen muskoxen on Melville Island, Franklin was convinced there must be extensive land between the continent and Parry's discoveries, providing "a track ... not greatly broken by wide channels of water."²¹

There was, Franklin hoped, a strait between Banks Land and Wollaston Land that would lead him to the southwest. In other words, his goal was to find what is now called Prince of Wales Strait, which would indeed have been an ideal route. Anticipating the need to push through ice in a strait, he insisted that the ships be equipped with auxiliary steam engines.²² Franklin did not say so, but he probably accepted John Ross's theory that land continued far west of Cape Walker. If Ross was right, then Franklin could sail between the shore and the ice until he reached the strait between this new

land and Banks Land. But Ross was wrong, and the wide opening of M'Clintock Channel lay across Franklin's planned route.

Franklin's letter to Richardson went into more detail than the others because Richardson believed the route through Prince Regent Inlet held great promise. Franklin, however, thought the Gulf of Boothia was probably too dangerous for ships. That area, he told Richardson, should be surveyed in boats. In addition, Franklin was not sure that any of the waters explored by Dease and Simpson (Dease Strait, Queen Maud Gulf, Simpson Strait, and the southern end of Rasmussen Basin) were navigable by ships. However, "once to the west of Point Turnagain our ships might with safety go."²³ Franklin accordingly showed no interest in Parry's theory about a channel leading south from Cape Bunny, and in any case, he agreed with James Ross, who believed the continental coast likely extended all the way from Boothia to Cape Walker.²⁴

Franklin's orders – which he no doubt helped to draft – instructed him not to examine any openings to either the north or the south until he reached Cape Walker. "From that point," the orders continued, "we desire that every effort be used to endeavour to penetrate to the southward and westward in a course as direct towards Bhering's Strait as the position and extent of the ice, or the existence of land, at present unknown, may admit." If Franklin could not progress in this direction, he was authorized to try Wellington Channel and look for a route north of Melville Island. Then he could winter at a spot of his choosing and decide his own course in the second season.²⁵ As Franklin explained to his correspondents,²⁶ with three years' supplies he would have time to try several routes. "I shall of course," he assured Richardson, "despatch parties in boats and by land to examine into and find out passages in places where it may be difficult & only productive of delay in taking the ships."²⁷

In the first year, Franklin was unable to follow his preferred route, and he therefore sailed up Wellington Channel. After circumnavigating Cornwallis Island, he wintered at Beechey Island, near the southwestern corner of Devon Island. In 1846, he arrived off the north coast of King William Island by an unknown route. The ships wintered there in the ice. On 11 June 1847, Franklin died; on 22 April 1848, the men abandoned the ships, which had drifted slightly southwest into Victoria Strait. Led by Francis Crozier, they trekked down the west coast of King William Island toward Chantrey Inlet, apparently hoping to travel up the Back River to safety. On the way, they passed Dease and Simpson's cairn at Cape Herschel. The rest is conjecture.

Parry's hunch about a channel leading south from Cape Bunny was correct. The northern part of this channel is now called Peel Sound, while the southern part has been named Franklin Strait. During the Franklin search, Peel Sound was visited in 1849, 1851, 1852, 1858, and 1859; in each of these years, it was solidly blocked with ice. West of Cape Walker, M'Clintock Channel leads south and then southeast, providing another possible route to King William Island. One of its shores was examined in 1851 and 1859. Since the ice conditions seen there were even worse than in Peel Sound, it has generally been assumed that Franklin must have found Peel Sound open for once. Then, confronted with the stream of ice pouring down M'Clintock Channel and into Victoria Strait, he supposedly chose to push his ships into this pack.²⁸ Victoria Strait leads south to Queen Maud Gulf – east of the area where Franklin believed his ships could “with safety go.” Such a move, then, would have been at odds with the intentions he had outlined to Richardson.

When Franklin's men passed Cape Herschel, discoveries from the east had finally overlapped with those from the west. Geographically, Victoria Strait was the last link in a chain of waters joining the Atlantic and the Pacific. However, even if Victoria Strait had been ice-free, Franklin himself would not have regarded reaching Cape Herschel as equivalent to discovering the Northwest Passage, because he was not sure the waters between Cape Herschel and Point Turnagain were navigable. Nevertheless, when his expedition's story became known, Franklin was almost universally hailed as the discoverer. In terms of geography alone, the accolade was merited – although, since it was not clear whether Franklin was still alive when the link was confirmed, the title should have been shared with Crozier. However, Franklin and Crozier themselves would have been the first to acknowledge that their passage might not be navigable.

Whether *Erebus* and *Terror* reached Victoria Strait by way of Peel Sound and Franklin Strait or by way of M'Clintock Channel might seem to be a minor question, but in fact it was central to the perception of Franklin as the hero of the Northwest Passage. This matter is discussed in detail below; here, it is sufficient to observe that ice conditions on both routes were likely difficult in 1846. If both were feasible, Franklin would have preferred M'Clintock Channel because it was farther west and might have led to the vicinity of Point Turnagain. But if there was clearly no possibility of progress by this route, he could indeed have tried Peel Sound, hoping it would turn westward. Or he might have realized the dangers of M'Clintock Channel too late – a forgotten theory that deserves reconsideration.

The Search for Franklin and for the Passage, 1848–54

When a search for Franklin was discussed in 1847, Richardson's first thought was that the ships had gone beyond Cape Walker and then been crushed by ice. He recommended that a boat expedition should check Wollaston and Victoria Lands for survivors.²⁹ Richardson's proposal was approved, and he was joined by John Rae of the HBC, who had made an important coastal survey in 1846–47. Richardson and Rae searched the western continental coast but were unable to cross to Wollaston Land in either 1848 or 1849 because of unusually heavy ice in Dolphin and Union Strait.

James Ross, meanwhile, proposed a two-ship eastern search. One ship would winter on Melville Island and then explore the coasts of Banks Land by sledge, possibly joining with Richardson's party; the other would try Wellington Channel, then winter on North Somerset and examine the nearby coasts.³⁰ This plan was also approved, but to his astonishment, in 1848, Ross was unable to reach Melville Island or even to pass from Lancaster Sound into Barrow Strait. Both his ships wintered at the entrance to Prince Regent Inlet.

From there, Ross sledged partway down the east coast of Peel Sound in 1849. His observations reduced Parry's North Somerset to what is now called Somerset Island. However, Ross did not realize it was an island, supposing instead that it was the northern end of Boothia. Nor did he realize that Peel Sound was a strait, because he could see only isolated points of land to the west. These appeared like scattered small islands, when in fact they were headlands on Prince of Wales Island. One of Ross's officers, Leopold McClintock, later recounted that it seemed any attempt to take a ship into this area "would not only fail, but lead to almost inevitable risk of destruction" because of the exceptionally heavy ice.³¹

The next eastern attempt was made by Horatio Austin with a squadron of ships in 1850–51. Like Ross, Austin could not reach Melville Island. He took up winter quarters at Griffith Island, south of Cornwallis Island. A sledge party under William Browne examined the west side of Peel Sound, which was given the name Peel Strait. Browne considered that "this channel is rarely, if ever, sufficiently open for the purposes of navigation."³² At the same time, on the other side of Prince of Wales Island, Sherard Osborn covered part of the eastern shore of M'Clintock Channel and reached a similar conclusion. He reported that "huge masses of ice" were pressed up into ridges, sometimes resembling "a heavy cross sea suddenly frozen solid."³³ However, Osborn did not realize he was looking at a channel

through which a large part of the Viscount Melville Sound ice was carried to the southeast. Instead, he thought it was a bay (later marked on some maps as Osborn Bay) and that Prince of Wales Island continued westward.

On his return to Griffith Island, Osborn was met with the news that open water had been found up Wellington Channel.³⁴ Since all routes to the south seemed impassable, the attention of most explorers in the eastern Arctic was concentrated on Wellington Channel for the next few years.

There was, however, one more search in the vicinity of North Somerset. In 1851, Lady Franklin sent out an expedition commanded by William Kennedy. Because of continued unusual ice conditions in Barrow Strait, Kennedy was unable to get to Griffith Island and so was not aware of what Austin's men had done. He wintered in Prince Regent Inlet; from there, he made his way to the southern end of Peel Sound on foot, following the narrow strait that divides Somerset Island from Boothia. Kennedy named it Bellot Strait.

From the western end of Bellot Strait, he crossed Peel Sound over the ice, intent on reaching the area west of Cape Walker. Looking northward, Kennedy felt sure he saw land from one shore to another. He travelled to the west coast of Prince of Wales Island, then returned to the east coast – that is, to the west side of Peel Sound – well to the north of the place where he had first crossed from Somerset Island.³⁵ Kennedy therefore unfortunately did not realize his earlier mistake. After his return, the name Peel Strait was changed to Peel Sound because of his report that the southern end was closed.³⁶

A western ship expedition had set out in 1850. It consisted of two vessels, *Enterprise*, captained by Richard Collinson, and *Investigator*, captained by Robert McClure. The orders left the two leaders free to decide their own course once in the north. The ships separated during the outward voyage, and McClure – seemingly eager to operate independently of Collinson, his senior officer – rushed into the Arctic alone. He quickly discovered the southern part of Banks Island, then followed its eastern coast into Prince of Wales Strait. He wintered in the ice near the strait's northern end and after a short sledge journey was able to confirm on 26 October 1850 that it opened into Viscount Melville Sound. Although Melville Island was not visible, the explorers' sight reportedly "embraced a distance which precluded the possibility of any land lying" between them and it.³⁷ In 1851, McClure sailed farther north, but he still could not reach the sound by ship. In an extraordinarily bold move, he then turned south and went around the island to M'Clure Strait at its northern end, experiencing unprecedented danger

from the heavy Beaufort Sea ice. Because the water was deep just off the northwestern coast, the ice was pressed very close to the land, leaving barely enough room for *Investigator* to slip by. McClure was happy to take up winter quarters in the safety of a bay, to which he gave the apt name Bay of Mercy. From there, McClure sledged to Winter Harbour, Parry's old winter quarters on Melville Island, establishing beyond doubt that his discoveries and Parry's were connected by water.

McClure had found not one but two Northwest Passages – one of them the passage sought by Franklin. And unlike Franklin and Crozier, he knew the distance separating him from previously navigated waters was short. McClure desperately hoped to take his ship eastward and back to England, but *Investigator* remained frozen in from the autumn of 1851 until the spring of 1853, when it was abandoned. McClure had left a message at Winter Harbour, which was found by a party from a new eastern expedition led by Sir Edward Belcher. Belcher's main purpose was to explore Wellington Channel, but Henry Kellett had been sent westward to look for Collinson and McClure with two ships, *Resolute* and *Intrepid*. McClure wanted to remain in *Investigator*, but Kellett, appalled by the crew's poor condition, would not permit it.

When the news reached England, Parry marvelled that McClure had stood on "the very land I saw in coming from the eastward, but could not reach; so that there we are met within 60 miles."³⁸ Nothing new would have been proved by taking *Investigator* through waters already sailed by Parry. Nevertheless, the requirement for a discoverer to navigate the entire passage was firmly engrained in the minds of naval officers. McClure therefore fell back on the weak argument that he had travelled from Pacific to Atlantic, partly in different ships and partly on foot over a frozen channel. This claim won him a monetary award and his knighthood, but few Arctic experts were convinced. As a result, there has never been enough emphasis on the fact that McClure brought his ship very close to the farthest point reached by Parry's vessels, or that the intervening waters were quite certainly navigable when free (or partly free) of ice. The route west of Banks Island was clearly far too dangerous for any further attempts there, but Prince of Wales Strait was a different matter. In 1850 and 1851, Austin and Kennedy were unable to pass through an area that Parry had navigated with relative ease, so McClure's failure to get through in those years should not have been taken as proof that the strait's northern end was always blocked.

Collinson wintered in Hong Kong in 1850–51, then headed north and followed McClure's route up Prince of Wales Strait just after McClure himself

had left it. *Enterprise* reached the northern end of the strait but could not pass through into Viscount Melville Sound. Collinson wintered on the west coast of Victoria Island and sent a sledge party to Melville Island. This journey confirmed beyond all doubt that Prince of Wales Strait was connected to the waters reached by Parry.

In 1852, Collinson sailed *Enterprise* to Cambridge Bay on the southeast coast of Victoria Island, proving that much of Dease and Simpson's route was navigable. The next spring, he sledged along the island's east coast and came close to the scene of the Franklin tragedy, for he was on the west side of Victoria Strait. Collinson reached Gateshead Island at the junction of Victoria Strait and M'Clintock Channel. As he realized after finding a cairn and note near the farthest point of his journey, he had been preceded in the summer of 1851 by Rae, who had covered the same area by boat.³⁹ It was Rae who bestowed the name Victoria Strait.

Both Rae and Collinson deduced that there was a water connection to Barrow Strait north of them. Rae noted that the flood tide came from the north,⁴⁰ while Collinson observed that the ice was "pressed upon the shore from a northern direction."⁴¹ Collinson, who travelled in the spring, recorded fairly heavy ice in Victoria Strait, while Rae, travelling in the summer, did not. Both, however, observed unusually heavy floes at the junction with M'Clintock Channel.⁴² Collinson thought there was likely a strait from this point to Cape Walker, and he hoped that Franklin had not entered it only to become trapped in the ice.⁴³

Neither Rae nor Collinson considered Victoria Strait unnavigable. Indeed, Collinson was convinced there was no navigable passage through Viscount Melville Sound and therefore Victoria Strait and the waters west of Cape Bunny were the last links.⁴⁴ He of course knew nothing about the reports by Browne and Kennedy, which might have modified his views. When the ice broke out of Cambridge Bay in the summer of 1853, Collinson initially intended to continue to the northeast. As he later recounted, "our egress by Peel Inlet appeared to me quite as feasible as the western route." But after examining the ship's stores, he realized that the full allowance of coal for heating and cooking had not been loaded at the dockyard.⁴⁵

Collinson decided to return westward, where driftwood was abundant. One of his officers later claimed that this was merely an excuse and that the captain was "running away" from danger.⁴⁶ However, Collinson knew that the discoveries he had already made would count for nothing because McClure and Rae had preceded him. He therefore had every motivation to attempt the Northwest Passage through Victoria Strait and Peel Sound.

Given the possibility that he might be forced to spend yet another winter in the Arctic, Collinson's retreat was a rare example of caution even when daring might have made him famous.

Both Rae and Collinson picked up debris that evidently came from a Royal Navy ship, since it bore the government's "broad arrow" mark. However, neither man immediately associated these items with Franklin, reasoning instead that they might have drifted south from the search vessels in Barrow Strait. Collinson accordingly did not have the prospect of determining Franklin's fate to tempt him toward King William Island.

After his 1851 search, Rae returned to the task of surveying the remaining unknown continental coastline. To that end, in 1854, he travelled overland from Repulse Bay to the farthest point reached by Dease and Simpson (the Castor and Pollux River), intending to continue north to Bellot Strait. On the outward journey, he met an Inuk who told him that some white men had died far to the west. The man said he had never been in this place himself and could not guide Rae there. Rae then travelled along the east side of Rae Strait and realized that King William "Land" was an island.

Because of poor weather conditions, Rae doubted he could reach Bellot Strait, and he turned back. At Pelly Bay he again met Inuit. This time, he obtained detailed information about the dead white men and concluded that the place where they died must be Chantrey Inlet. He received the impression that the men had been seen alive on King William Island in the spring of 1850, having abandoned their ships in the ice. Their corpses had reportedly been found in the summer of that year on the Adelaide Peninsula and Montreal Island.⁴⁷

Rae Strait was part of the route followed when Roald Amundsen navigated from Atlantic to Pacific in 1903–06. However, Rae's reports to the HBC and the RGS said nothing whatever about the possibility of having found a link in the Northwest Passage. To the HBC, Rae emphasized his chagrin over the failure of his coastal survey, without any suggestion that the discovery of Rae Strait compensated for this disappointment.⁴⁸ There was, indeed, no reason for him to consider Rae Strait in relation to the Northwest Passage problem. Peel Sound, which would also be part of Amundsen's route, had been declared a dead end by Kennedy. Even if Rae doubted Kennedy's report, on the evidence of his own eyes in 1851 he was more likely to have believed that the wider, and presumably much deeper, Victoria Strait was the logical next step for any navigator who managed to pass through Peel Sound. That he did so consider it was shown the next year.

The Debates of 1855

Belcher, Kellett, McClure, and Rae all returned to England in the autumn of 1854; Collinson, too, was back in 1855. McClure assiduously lobbied politicians for a monetary reward,⁴⁹ but at the same time, Rae's news inspired Lady Franklin, Richardson, and others, including Sir Roderick Murchison, the influential president of the RGS, to mount a rival claim on behalf of Franklin and his men. Peel Sound, some members of this group reasoned, must be a strait after all and navigable in some years. They all agreed that if the men of *Erebus* and *Terror* died in Chantrey Inlet, then they had reached the area discovered by Back, Dease, and Simpson. Collinson had brought his ship almost to this point, and after his return, he championed the idea that there was a navigable passage through Victoria Strait. McClure had confirmed the existence of his first passage in October 1850; if Franklin's men had reached the continent in the spring or summer of that year, they had priority.

In June 1855, the appointment of a parliamentary select committee to investigate McClure's claim was ordered. The committee's hearings were held in July. Before the first hearing, Franklin's supporters opened their campaign with a letter to the *Times* from Richardson. Richardson asserted that Franklin was the first discoverer of a Northwest Passage and McClure the second. That Franklin's ships had been abandoned "in a waterway continuous with the sea that washes the continent" was, he wrote, proved by the relics Collinson found near Cambridge Bay.⁵⁰ Therefore, according to Richardson, Collinson might be considered a third discoverer. Richardson knew that Rae had retrieved other items two years before Collinson, and since he and Rae were on good terms, it is difficult to see why he gave the accolade to Collinson. Possibly the fact that Collinson had arrived in Cambridge Bay by ship influenced Richardson's thinking.

Rae penned an immediate response. He made no argument against Richardson's claims about Franklin and McClure, but he wrote that there was "one portion" of Richardson's letter with which he could not agree. Collinson, Rae insisted, had "nothing but theory to guide him in supposing that a channel leading northward to Barrow's Strait existed," because he brought back no definitive tidal observations. Rae did not think mere deduction could entitle anyone "to stand number three on this list as discoverer of a north-west passage," but if such a criterion were accepted, then

I should certainly have priority to Captain Collinson, as I in the summer of 1851 ... had an opportunity of watching ... the direction of the tides; the flood invariably came from the northward, and the

ebb returned in that direction (as shown in my chart of 1851) thus proving clearly that there was a water communication between Victoria Strait and Peel Sound to the northward.⁵¹

Evidently, Rae accepted the theory that Victoria Strait was part of a navigable Northwest Passage.

Rae did not ask for the opportunity to speak at the select committee's hearings. However, both Murchison and the newly appointed hydrographer of the Royal Navy, Captain John Washington, gave testimony on Franklin's behalf. To reinforce the points they made, Lady Franklin addressed a letter to the committee, in which she argued that Peel Sound and Victoria Strait were parts of "a more navigable passage" than the ones found by McClure.⁵²

The first witnesses were Back and Kellett, who both supported McClure. Back declared that if *Investigator* had been equipped with a steam engine, McClure would probably have got through, and he insisted that McClure had not only found but "made" the passage, ignoring all cavils about the fact that *Investigator* had been abandoned. Kellett stated that McClure had priority of discovery over Collinson, but he did not address Franklin's possible claim. He agreed with a committee member's suggestion that, "geographically speaking," McClure had "performed" the passage, but he denied that steam power would have brought *Investigator* through.⁵³

On the second day, James Ross argued that Parry, Franklin, Richardson, and McClure were joint discoverers of McClure's passages, and he slyly pointed out that McClure was not the first to journey from ocean to ocean through the Arctic, since a small party of *Investigator*'s men, led by Samuel Gurney Cresswell, had preceded the others and arrived in England in 1853. Captain Washington then spoke in favour of Franklin, describing Victoria Strait as the final "link" and "the only portion required to solve the problem." However, Washington had to admit that McClure had travelled right through the archipelago, while Franklin had not.⁵⁴

Next came McClure's own testimony. He declared that he would have made the passage with the aid of steam; that even without it, *Investigator* could have got through in 1854; and that if he had received no aid from Kellett, he would still have made his escape without losing more than a few men.⁵⁵ However, these claims were firmly contradicted by Dr. William Domville of *Resolute* and by Rear-Admiral W.A.B. Hamilton, the secretary of the Admiralty. Hamilton put it tactfully, and yet with the utmost clarity, when he suggested that McClure's very courage and determination had led him to take "a more sanguine view ... than the facts and circumstances warranted."⁵⁶

Murchison testified on the final day. He began by stating that McClure was entitled to a reward for being the first to have “gone through ... in attempting to make that passage.” Nevertheless, in his view, “that those men whose relics were found near the mouth of the Back River have effected what must be called a North-west Passage, cannot be doubted.” Murchison admitted that Franklin’s men had not reached Chantrey Inlet in a ship; but, he argued, how did that make their case different from McClure’s? ⁵⁷ Murchison also read from Beaufort’s strongly worded memo: “Let due honours and rewards be showered on the heads of those who have nobly toiled in deciphering the puzzling Arctic labyrinth ... but let the name of discoverer of the North-west Passage be for ever linked to that of Sir John Franklin.” Murchison suggested that McClure should not be commended for having discovered “the” Northwest Passage – a move that was all the more logical because McClure himself had found two passages.⁵⁸ The last word went to Collinson, who affirmed that Victoria Strait was “the only way in which the passage can be made.”⁵⁹

The committee’s report duly and cautiously stated that McClure and his men were “undoubtedly the first who have passed by water from sea to sea, and have returned to this country a living evidence of the existence of a North-west Passage,” and that they had completed “the last link in the chain of discovery.” Whether Franklin had a superior claim was described as a matter on which the committee could not judge.⁶⁰

A few months later, Richardson wrote a short biography of Franklin for the new edition of the *Encyclopaedia Britannica*. He borrowed the term used in the committee’s report when he declared that Franklin and his men had forged the “last link” with their lives.⁶¹ Lady Franklin had her heart set on a monument naming Sir John as the passage’s discoverer, since a mere committee report would “be as air, when set against such an imperishable record.”⁶² Then there was the hope of finding Franklin’s journals. An expedition down the Back River led by James Anderson of the HBC found traces of the lost explorers but no documents. When this unsatisfactory result was announced in January 1856, Lady Franklin and many others refused to accept it as final.

McClintock, the Peel Sound Theory, and Franklin as the True Discoverer

The conclusion that Franklin had passed through Peel Sound was not universally accepted. Geographer John Brown had deduced that there must be a strait between Victoria Island and Prince of Wales Island. Immediately

after Collinson's return, Brown suggested this theory to him, and Collinson agreed that it was quite plausible.⁶³ Collinson then referred to the possibility of a new strait in his report to the RGS.⁶⁴ The idea was also taken up by geographer Alexander Findlay⁶⁵ and naval officer Alexander Becher.⁶⁶

The young Arctic officers George Richards⁶⁷ and Bedford Pim⁶⁸ were not entirely convinced by Brown, who maintained that Kennedy's report about Peel Sound was probably correct.⁶⁹ Instead, Richards favoured an attempt by Peel Sound, with sledge journeys to investigate the possible new strait. Pim thought two ships should be sent out, one by Collinson's route and one by Peel Sound, while another party descended the Back River in boats.

McClintock, who after serving under James Ross in 1848–49 had made extensive sledge journeys during Austin's and Belcher's expeditions, was also thinking about a new search, and Lady Franklin favoured him as leader.⁷⁰ Because the government declined to act, and McClintock therefore led a small private expedition, there was no possibility of sending out more than one ship. But in any case, McClintock appeared interested only in Peel Sound. During a lecture, he explained that in 1849, "we travelled down along the *leeward side* of the strait, where all the ice-pressure was most apparent,"⁷¹ but in 1851, Browne, on the windward side, had observed smooth ice near shore, "so as to show that water must have existed the previous autumn."⁷²

McClintock's published plan stated that he would attempt to pass through Peel Sound and if unsuccessful would try Bellot Strait. His aim was to reach Victoria Island and winter there, then sledge to King William Island. From his Victoria Island base, he could easily return home via the Bering Strait.⁷³ In other words, McClintock hoped not only to determine Franklin's fate but to navigate the Northwest Passage. His plan did not specify which route he would take between Peel Sound and Victoria Island, but after the expedition, he claimed that he had never intended to try Victoria Strait. Instead, he recounted that Rae's 1854 discovery had inspired him to consider a route east of the island.⁷⁴

In 1858, McClintock's *Fox* advanced only twenty-five miles into Peel Sound before being blocked by ice. After several attempts in Bellot Strait, he finally reached its western end, only to find the exit sealed off by the Peel Sound pack. To the north, McClintock saw ice "of more than one winter's growth, apparently immovable in consequence of the numerous islets and rocks which rise through and hold it fast." To the south, the ice was "much more broken up." McClintock patiently waited until late September, when only four miles of ice separated him from open water to the south.⁷⁵ As if to acknowledge the different conditions north and south of his position, he

gave the southern passage its own name, Franklin Channel, later changed to Franklin Strait.⁷⁶

McClintock turned back and wintered at the eastern end of Bellot Strait. In the autumn of 1858, his plan was to sledge to the mouth of the Back River, examining one side of King William Island on his outward journey and the other on his return journey. Allen Young would chart the unknown shores of Peel Sound and Franklin Strait while William Hobson completed the survey of the continental coast by travelling south along Boothia. Then there was the matter of Brown's supposed new strait – although McClintock curiously did not mention Brown as the originator of this theory. Once their first tasks were completed, Young was to follow the southwestern shore of Prince of Wales Island and Hobson the northeastern shore of Victoria Island, to determine whether such a strait existed.⁷⁷

On a preliminary trip to Boothia early in 1859, McClintock himself completed the continental survey. From the Inuit, he learned that Franklin's ships had been abandoned off the west coast of King William Island.⁷⁸ McClintock then altered the plan, assigning Hobson the task of searching this coast from north to south, while he himself would examine the straits between Boothia and King William Island, proceed to the Chantrey Inlet area, then return up the west coast of King William Island, so that it would be searched twice.⁷⁹ In his narrative, McClintock declared that his observations on this journey reinforced his pre-existing belief in a navigable channel east of the island,⁸⁰ but it seems possible that his original hypothesis was weaker than he admitted and that the theory took on new importance when the Inuit told him that the eastern straits were open every summer. By the time McClintock received Hobson's and Young's reports, his bias in favour of the eastern route was strong.

From the northwest coast of King William Island, Hobson observed that the ice was "very rough, and crushed up into large masses."⁸¹ McClintock himself wrote in the first edition of his narrative that Victoria Strait was "full of" and "choke[d] up" with such ice⁸²; in a later edition, he modified his statement somewhat, writing merely that "a large proportion" of the ice in the strait was of an exceptionally rough nature.⁸³ However, in a part of Hobson's report not quoted by McClintock, the former observed that although the ice pressure along the coast was often severe, the "general character" of the ice itself was "not particularly heavy; I can only remember one place where there was ice which bore the appearance of age."⁸⁴ McClintock had previously insisted that his own observations made on the leeward side of Peel Sound in 1849 were less valid than those made by

Browne on the windward side. Yet he declared that Victoria Strait was unnavigable based on selective reporting from the leeward side,⁸⁵ even though Rae and Collinson had drawn no such conclusion from the windward side.

Young travelled along the coast of Prince of Wales Island as far as, and a little beyond, the point reached by Osborn from the other direction in 1851, thus confirming the existence of Brown's new channel. According to McClintock, Young was convinced the channel was "quite unnavigable" because of the "continuous ice-stream" pushed through it by the winds and current.⁸⁶ The clear implication was that Franklin could not have taken that route.

According to McClintock's reconstruction, in 1846 Peel Sound and Franklin Strait were not just barely navigable but quite open. Then, "leaving clear water behind him," Franklin "pressed his ships into the pack when he attempted to force through Victoria Strait." The result was a combination of triumph and tragedy, made even more tragic in retrospect by the knowledge of how "very different the result *might* and probably *would* have been" if only Franklin had "known of the existence of a ship-channel, sheltered by King William Island." This sheltered channel, McClintock declared, was the final link of the only navigable Northwest Passage. But the way to it was through Peel Sound, which McClintock himself had failed to navigate.⁸⁷ Not until years later did McClintock plainly admit that, at most, Peel Sound was open only once every four or five years.⁸⁸ Whether such a route could really be considered navigable was a question he preferred to avoid.

Moreover, Young's report was less categorical than McClintock's summary of it. Young wrote that it did not seem impossible for a ship to drift through M'Clintock Channel with the ice, and his comments show a clear reluctance to generalize from the observations of one journey.⁸⁹ Sixteen years later, after leading an expedition of his own to the area (see below), Young publicly stated that whether Franklin went by Peel Sound or M'Clintock Channel was "not known."⁹⁰

Hobson retrieved the famous Franklin record at Victory Point, King William Island. It consisted of two messages. The first was written by Graham Gore at the outset of a sledge journey in May 1847. The key fact it revealed was that *Erebus* and *Terror* spent the expedition's second winter in the ice in latitude 70°05' N (North), longitude 98°23' W – that is, just north of King William Island. The second message, written by James Fitzjames in April 1848, added that the ships had been beset since 12 September 1846, that Franklin had died on 11 June 1847, and that the vessels had been abandoned

five leagues (approx. twenty-eight kilometres) north-northwest of Victory Point. The survivors planned to start for the Back River the next day. McClintock found a skeleton a few miles beyond Cape Herschel, proving that during the retreat, Franklin's men passed the Dease and Simpson cairn.⁹¹

The first part of the Victory Point record offered the tantalizing possibility that Cape Herschel had been reached during the May 1847 sledge trip, and that Gore had returned and reported the good news before Franklin's death. McClintock subscribed, though only tentatively, to this version of events.⁹² However, he was quite uncompromising in his statements that Franklin had discovered the Northwest Passage, even if it was not the navigable passage.⁹³

There were some protests against McClintock's theories. When he told his story at a meeting of the RGS, Belcher opined that Franklin had reached King William Island by way of M'Clintock Channel, and that if he had followed the western shore of Victoria Strait, he might have got through.⁹⁴ Privately, Richardson agreed about Franklin's route, but he mildly observed that, "as no one can be so well qualified as [McClintock] is to form a correct judgement on this point I readily defer to his opinion."⁹⁵ Others may well have shared this reluctance to challenge McClintock.

Only Brown publicly dissented at any length. He observed that M'Clintock Channel was both wide and, as the heavy ice floating in it indicated, deep. "Through such a channel," Brown wrote, "there must be[,] ... at times, a passage practicable for ships." The amount of pack would naturally vary from year to year, perhaps giving Franklin an opportunity. Nevertheless, Brown conceded that Franklin had more likely been beset in Viscount Melville Sound and carried unwillingly down M'Clintock Channel.⁹⁶

That both M'Clintock Channel and Peel Sound contained heavy ice in 1846 seems highly likely, given that neither of them was ever observed in anything approaching a navigable condition during the search period. In Peel Sound, Franklin's ships would have been immobilized by ice such as the search parties reported. But in the far wider M'Clintock Channel, the current and the prevailing northwest winds could have carried the trapped ships to King William Island. It generally was – and still is – assumed that *Erebus* and *Terror* were beset in the same spot where they wintered in 1846–47, but Brown correctly pointed out that this was not stated in the Victory Point record. The location of the wintering was given by Gore in 1847 and the date of besetment by Fitzjames in 1848, and there was accordingly no clear implication that the ships had been trapped north of King William Island on 12 September 1846. Moreover, if Franklin deviated significantly from his

original plan by turning southward to the east, rather than to the west, of Cape Walker, it is strange that neither officer mentioned this fact. Brown showed excessive dogmatism by insisting that Franklin undoubtedly took M'Clintock Channel⁹⁷; nevertheless, his arguments have merit, and it seems reasonable to consider the question of Franklin's route as unresolved – and perhaps unresolvable.⁹⁸

Although Brown's reconstruction was plausible, it won no favour with his countrymen. According to Brown, Franklin had been caught helplessly in the ice and current, then carried to the southeast, where he had no wish to go. McClintock, in contrast, portrayed Franklin as carrying out his plans with initial luck as he passed triumphantly through Peel Sound. Then, faced with the barrier of ice in Victoria Strait, Franklin had supposedly refused to abandon his chosen path. McClintock's version was supported by Charles Weld, the secretary of the Royal Society, who was Franklin's nephew by marriage. According to Weld, in 1845 Franklin had taken a map and "pointed ... to the western entrance of Simpson Strait," saying, "If I can but get down there, my work is done; for from thence it would be all plain sailing to the westward."⁹⁹ Weld never mentioned this alleged comment until early 1860, and it is incompatible with what Franklin himself wrote in 1845. However, the anecdote reinforced McClintock's telling of Franklin's story as one of success followed by tragedy. It was accordingly repeated by McClintock's friend Osborn¹⁰⁰ and many other writers.

Reviewers of McClintock's book readily accepted his claim that because Franklin's expedition had been the first to prove there was a water connection, Sir John was the true discoverer.¹⁰¹ A few letters were written to the press on McClure's behalf, but McClure himself, though bitterly resentful, remained silent. In 1860, the RGS awarded its gold medal to Lady Franklin, in recognition of the fact that her husband had, "in a geographical sense, firmly established the existence of a North-West Passage."¹⁰² In 1866, a statue funded by a government grant commemorated Franklin as the discoverer, depicting him at the moment when he announced to his crew that the passage's existence was confirmed.¹⁰³

McClure believed that his opponents could "never do away with" his feat of crossing the archipelago.¹⁰⁴ He was not wrong, for after his death the *Times* praised him for both "discovering and completing" the passage.¹⁰⁵ This tribute drew an immediate response from Lady Franklin, who extolled McClure's feats of navigation but insisted on her husband's priority as the discoverer, citing the RGS award as proof that high authorities had

acknowledged Sir John's claim.¹⁰⁶ McClure's cause was taken up with passion by Alexander Armstrong, who had served as *Investigator's* doctor.

Armstrong accused Murchison and others of having indulged "the weakness or the ambition" of Lady Franklin, to McClure's detriment.¹⁰⁷ He argued that only if survivors from *Erebus* and *Terror* had been rescued and brought home by Collinson could Franklin be said to have discovered a passage.¹⁰⁸ McClintock ended the dispute by observing that he had seen both M'Clure Strait and Victoria Strait and was convinced that neither would ever be navigated. Instead, "the only way to accomplish the transit by ship" lay east of King William Island.¹⁰⁹

Two years later, Lady Franklin died, having secured for her husband a memorial in Westminster Abbey that described him as the discoverer. Yet the issues of navigability and actual navigation, so pointedly raised by McClintock in 1873,¹¹⁰ remained to haunt advocates of both Franklin and McClure. George Richards concluded that neither man was the discoverer. "In awarding the palm," he wrote, "a compromise was offered which history will not ratify; but will probably pronounce the verdict that the Passage has not been accomplished at all."¹¹¹

The Question of Navigability

At the end of the Franklin search, four Northwest Passages had been geographically discovered – that is, two or more explorers had travelled from one end of each passage to the other by various combinations of ship, boat, and foot travel.

1. Lancaster Sound, Barrow Strait, Peel Sound (or Lancaster Sound, Prince Regent Inlet, Bellot Strait, Peel Sound), Franklin Strait, Victoria Strait, and the western Arctic coastal waters.
2. Lancaster Sound, Barrow Strait, Viscount Melville Sound, and Prince of Wales Strait.
3. Lancaster Sound, Barrow Strait, Viscount Melville Sound, and M'Clure Strait.
4. Lancaster Sound, Barrow Strait, Peel Sound (or Lancaster Sound, Prince Regent Inlet, Bellot Strait, Peel Sound), Franklin Strait, James Ross Strait, Rae Strait, Simpson Strait, and the western Arctic coastal waters.

Note that Davis Strait and Baffin Bay on the east and the Bering Strait, Chukchi Sea, and Beaufort Sea on the west are common to all the above routes. Bellot Strait is here considered as a variation on the Peel Sound routes because whether ships could pass through its western end depended on ice

conditions in Peel Sound. Franklin might have reached Victoria Strait by Viscount Melville Sound and M'Clintock Channel, while Hudson Strait, Fury and Hecla Strait, the Gulf of Boothia, and Prince Regent Inlet provided a possible alternative to Baffin Bay and Lancaster Sound. Though these water connections were known, neither route was generally considered as part of a Northwest Passage.

None of the passages had been navigated from end to end. Therefore, in the terminology used in 1818, they had been found out but not sailed through, and hence not discovered as navigable passages. Yet because there was no more geographical finding out to do along the four routes, anyone sailing from ocean to ocean would not meet both original criteria. It was a strange and paradoxical situation. Several passages had been mapped, yet no explorer could make an unchallengeable claim to have discovered a passage. Nor, even though navigation was the missing element, could anyone establish a true discovery claim by navigating.

Whether the passages were navigable was a matter for speculation. By two different routes, McClure had brought *Investigator* very close to waters sailed by Parry's *Hecla* and *Griper*. Collinson's *Enterprise* had almost reached the spot where *Erebus* and *Terror* were abandoned. Only in the fourth passage was there a major gap of navigation, since at least the distance from the bottom of Franklin Strait to Cambridge Bay, and possibly more, remained unsailed by ships. Nevertheless, most historians have followed McClintock, assuming that this fourth passage was the most navigable, and indeed that it was probably the only navigable passage for sailing ships. The fact that, in 1903–06, Amundsen found Peel Sound open and took his vessel, the sloop *Gjøa*, east of King William Island and then to the Bering Strait naturally reinforces this view.

However, sloops have only one mast and are classified as sailboats, not ships. The fifty-seven-ton *Gjøa*¹¹² was tiny compared to the ships used in nineteenth-century British exploration, which were themselves not large by naval standards. Horatio Nelson's *Victory* was more than three thousand tons, and the last wooden battleships, launched in the 1850s, were close to seven thousand tons.¹¹³ *Hecla*, *Griper*, *Erebus*, and *Terror* were 375, 180, 372, and 326 tons, respectively,¹¹⁴ while *Investigator* was 480 tons and *Enterprise* 530 tons.¹¹⁵ Franklin might have sent boat or sledge parties to James Ross Strait and Rae Strait in 1846–47, but as Woodman has pointed out, he would surely have considered this route unnavigable for his ships.¹¹⁶ Accordingly, *Gjøa*'s exploits in such shallow coastal waters did not fulfill the requirements set out in 1818.

Climate is another important factor bearing on the question of navigability. Scientists from the Polar Continental Shelf Project, which began in the late 1950s, were able to outline the fluctuations in the Canadian Arctic's climate over the preceding seven hundred years through melt layers and pollen concentrations in ice cores from the Devon Ice Cap. Their data showed that the decades between 1810 and 1860 were among the coldest periods in that entire time span. Conditions were at their very worst in the 1840s and 1850s. Immediately after the Franklin search, temperatures began to rise, and by the 1960s, they were well above the seven-hundred-year average.¹¹⁷ The impact of ice conditions on navigation was therefore anything but a constant factor. Clearly, passages that were not navigable during the main period of British Arctic exploration must have been so, to varying degrees, at other times. Between 1859 and 1950, most summers had temperatures slightly above the seven-hundred-year average. Reports from expeditions in this period are accordingly a better source regarding navigability than those written between 1818 and 1859.

Voyages After 1859

On the route advocated by McClintock, the first attempt was made by his former subordinate Young in *Pandora*. In 1875, Young sailed down Peel Sound to a point just north of Bellot Strait, where from a hill he saw "one unbroken pack extending from shore to shore, and as far as the visible horizon to the southward." Convinced that Peel Sound was rarely open, Young feared to winter in the strait because he might not get out the next year.¹¹⁸

Young was followed by Amundsen in 1903. In what the Inuit later told him was an exceptionally open season, Amundsen was amazed to encounter almost no ice in Peel Sound.¹¹⁹ Navigation through James Ross Strait proved difficult, and *Gjøa* twice went aground there.¹²⁰ Simpson Strait also posed a serious challenge, and Amundsen described the eastern part of Queen Maud Gulf as "a most disconcerting chaos" of rocks and reefs, where "we bungled through zigzag, as if we were drunk."¹²¹

In his journal, Amundsen wrote that he had completed the "missing link" when he reached Cambridge Bay,¹²² but in his narrative, he nevertheless depicted himself as wracked with anxiety about whether the passage would be accomplished until the moment he sighted a whaling ship off Banks Island.¹²³ Amundsen mistakenly believed that McClure and Rae had jointly been given the monetary award for discovering the passage, and in his autobiography, he explained that while both these men deserved rewards

“for their hardships and achievements,” his own voyage was “the first and only actual navigation” of the entire passage.¹²⁴ Although he had formerly named Franklin and his men as the first discoverers,¹²⁵ it seems that he actually considered this title his own.

Amundsen rated Collinson’s contribution higher than McClure’s because McClure’s routes were never navigable.¹²⁶ However, the observations of another explorer contradicted the assertion about McClure. In 1906, Joseph-Elzéar Bernier found the ice at the eastern end of M’Clure Strait “not much heavier” than elsewhere, with “openings all along the land of Melville Island as far west as we could see.”¹²⁷ In 1908, from the same position, he saw no ice at all. Wintering on Melville Island, Bernier observed some open water in the strait as late as October.¹²⁸ One of his officers, Octave Morin, made a sledge journey to Prince of Wales Strait, where he found smooth new ice, indicating open water the year before.¹²⁹ Ignoring the dangers on the west coast of Banks Island, Bernier wanted to try the passage by this route, but when he again sailed to M’Clure Strait, he found dramatically different conditions. Second officer Robert Janes, who was in the crow’s nest, commented that “I never saw such ice; it must have been 50 to 60 feet thick.”¹³⁰

In 1915, Vilhjalmur Stefansson tried to take his schooner, *Polar Bear*, through Prince of Wales Strait, but he was stopped by ice and wintered on Victoria Island. However, sledge parties reported only young ice in Viscount Melville Sound, and over the next few years, Stefansson’s observations convinced him that the sound was navigable “at least two years out of three” and that the passage could likely be made through Prince of Wales Strait “quite as easily” as by Amundsen’s route.¹³¹ In 1916, Stefansson proceeded north by sledge and ordered *Polar Bear*’s captain, Henry Gonzales, to take the ship to Melville Island. Gonzales did not, later claiming that the ice had been too heavy, but another expedition member reported that Prince of Wales Strait had in fact been ice-free and that Gonzales was simply afraid to go so far north.¹³²

In 1940, when Henry Larsen was instructed to sail through the passage from west to east in the eighty-ton schooner *St. Roch*, his first plan was to try Prince of Wales Strait. Circumstances made this impossible, so he settled for Amundsen’s route. Near King William Island, navigation was difficult, especially in James Ross Strait, and ice conditions on the west coast of Boothia were exceptionally bad. Larsen was forced to winter at Pasley Bay, Boothia, in 1941–42. In the summer of 1942, the ice was again extremely heavy. With great difficulty, Larsen made his way to Bellot Strait. At first, the strait seemed like an ice-free refuge, but disaster nearly struck when the

current swept floes from Peel Sound in just behind the ship and more pack was sighted ahead.¹³³

In 1944, sailing from east to west, Larsen met broken but closely packed ice in Viscount Melville Sound, which he avoided by a detour north of Byam Martin Island. M'Clure Strait was filled with the heaviest floes seen on the voyage, but Prince of Wales Strait was reached without much difficulty. From that point on it was clear sailing.¹³⁴ Larsen not only became the first navigator to make a passage in one season: he did it in an astonishing eighteen days. But, as Larsen cautioned, "Our voyage showed that the Northwest Passage can be traversed in a single year, but does not prove that this could be accomplished every year."¹³⁵

Victoria Strait After 1859

As Dunbar pointed out, after 1859 ship expeditions avoided Victoria Strait as if it were cursed, so it is impossible to know how much conditions there varied during the nineteenth century.¹³⁶ Dunbar, a leading expert on Arctic ice, was evidently skeptical of the common assumption that navigating the strait had been utterly impossible, and she noted the influence of McClintock's report, which made it difficult for others to believe "that the ice could have been different" in some years.¹³⁷

Even in the early part of the twentieth century, Victoria Strait was seldom visited. By the 1960s, it was often navigable and occasionally ice-free.¹³⁸ It is now the most commonly used passage, except for by large vessels.¹³⁹

In 1914, *Erebus* was found in Wilmot and Crampton Bay on the southeastern side of Queen Maud Gulf. Two years later, *Terror* was also found, in Terror Bay on the southwest coast of King William Island. Both ships, therefore, survived the most constricted part of Victoria Strait, near the Royal Geographical Society Islands. The wreck of *Terror* is in remarkably good condition. While the wreck of *Erebus* is less so, the fatal damage was evidently done after Victoria Strait was left behind. These finds prove that even in the 1840s and 1850s, ships could pass through the supposedly unnavigable strait without being destroyed. It is possible that, as Woodman speculated, some of Franklin's men returned to the vessels and sailed them southward after ice conditions eased.¹⁴⁰ However, even if this was the case, the survivors never reached previously navigated waters.

Conclusion

Ship expeditions between 1859 and 1950 were too infrequent to yield conclusive data, and they tell us nothing at all about Victoria Strait. However,

they certainly suggest that under average conditions, the passage through Prince of Wales Strait was just as reliably navigable as Amundsen's route, and quite possibly more so. Prince of Wales Strait was the link sought by Franklin: it is reasonably well sheltered from the Beaufort Sea ice, its depth gives it a significant advantage over the route east of King William Island, and the passage through it and Parry Channel was almost completely navigated during a period when the Arctic climate was at its coldest. Parry and McClure were the joint discoverers of this passage. Parry has long been among the most renowned polar explorers, but McClure deserves more recognition than he has received from historians.

There is sometimes a tendency for historians to bestow the status of true discoverer on explorers they particularly admire. For example, Neatby wrote that "for daring and sheer achievement Franklin stands alone; and succeeding generations have rewarded him in associating his name pre-eminently with the Passage" – a view in which Neatby entirely concurred.¹⁴¹ McGoogan alleged that Simpson's death was providential because it prevented an unworthy man from finding the passage.¹⁴² In his opinion, it was only right for Rae – "a peerless figure" – to reveal the Arctic's "ultimate secret."¹⁴³ McGoogan put forward a dramatic narrative in which the machinations of Lady Franklin and her supporters were directed not against McClure but against Rae – even though Rae had never claimed to be the discoverer.¹⁴⁴ McGoogan's books feature such inaccuracies as the statements that Victoria Strait was "forever impenetrable to sailing ships"¹⁴⁵ and that Larsen's voyage through Prince of Wales Strait was possible only because he "relied almost entirely" on *St. Roch's* engine.¹⁴⁶

McClure's character, in contrast to Parry's, Franklin's, and Rae's, is not admirable from any point of view. He was callous, vindictive, and obsessively ambitious; his only good traits were courage and superb seamanship. Yet the entire process of European discovery, in the Arctic and elsewhere, is now generally viewed with cynicism. McClure was no hero, but do we really still need supposedly flawless heroes? It should surely be possible to point out the virtues of the route he discovered without any implication that he himself deserves to be admired.

Notes

¹ United Kingdom, Parliament, *An Act for More Effectually Discovering the Longitude at Sea, and Encouraging Attempts to Find a Northern Passage Between the Atlantic and Pacific Oceans, and to Approach the Northern Pole* (1818), 58 Geo. III, c. 20.

² United Kingdom, Privy Council, Order-in-Council, 19 March 1819, *London Gazette* 17461, 20 March 1819: 501–02.

³ United Kingdom, Parliament, *An Act to Amend an Act of the Fifty-Eighth Year of His Late Majesty, for More Effectually Discovering the Longitude at Sea, and Encouraging Attempts to Find a Northern Passage Between the Atlantic and Pacific Oceans, and to Approach the Northern Pole* (1821), 1–2 Geo. IV, c. 2.

⁴ W.E. Parry, *Journal of a Voyage for the Discovery of a North-West Passage from the Atlantic to the Pacific: Performed in the Years 1819–20, in His Majesty's Ships Hecla and Griper* (London: John Murray, 1821), 250.

⁵ United Kingdom, Privy Council, Order-in-Council, 23 February 1821, *London Gazette* 17684, 27 February 1821: 497–98.

⁶ Parry, *Journal of a Voyage for the Discovery of a North-West Passage*, 298.

⁷ In J. Franklin, *Narrative of a Second Expedition to the Shores of the Polar Sea, in the Years 1825, 1826, and 1827* (London: John Murray, 1828), 258.

⁸ G. Back, *Narrative of the Arctic Land Expedition to the Mouth of the Great Fish River, and Along the Shores of the Arctic Ocean, in the Years 1833, 1834, and 1835* (London: John Murray, 1836), 19.

⁹ Back, *Narrative of the Arctic Land Expedition*, 425.

¹⁰ G. Back, *Narrative of an Expedition in H.M.S. Terror, Undertaken with a View to Geographical Discovery on the Arctic Shores, in the Years 1836–7* (London: John Murray, 1838), 1, 6–15.

¹¹ T. Simpson, *Narrative of the Discoveries on the North Coast of America; Effected by the Officers of the Hudson's Bay Company During the Years 1836–39* (London: Richard Bentley, 1843), 371–80.

¹² A. Simpson, *The Life and Travels of Thomas Simpson, the Arctic Discoverer* (London: Richard Bentley, 1845), 329, 340–44.

¹³ Simpson, *The Life and Travels of Thomas Simpson*, 328, 397–402; W. Barr, “Richard Cyriax’s Note Concerning Thomas Simpson’s Claim of Having Discovered the Northwest Passage,” *Polar Record* 36, no. 197 (2000): 114–15, <https://doi.org/10.1017/S0032247400016211>.

¹⁴ Parry, *Journal of a Voyage for the Discovery of a North-West Passage*, 52–74, 238, 265.

¹⁵ J. Barrow, J. Richardson, J. Franklin, F. Beaufort, and J. Ross, “Communications on a North-West Passage, and Further Survey of the Northern Coast of America,” *Journal of the Royal Geographical Society of London* 6 (1836): 36–37.

¹⁶ Barrow et al., “Communications on a North-West Passage,” 45.

¹⁷ Barrow et al., “Communications on a North-West Passage,” 40.

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- ¹⁸ Barrow et al., "Communications on a North-West Passage," 50.
- ¹⁹ In R.J. Cyriax, *Sir John Franklin's Last Arctic Expedition: A Chapter in the History of the Royal Navy* (London: Methuen, 1939), 18–20.
- ²⁰ J. Franklin, Letter to J. Richardson, 7 July 1845, Gell of Hopton Hall Papers, Derbyshire Record Office, D3311/53; J. Franklin, Letter to J.C. Ross, 9 July 1845, Scott Polar Research Institute, MS 248/316/25; J. Franklin, Letter to W.E. Parry, 10 July 1845, Scott Polar Research Institute, MS 438/18/7.
- ²¹ J. Franklin, Letter to J.C. Ross, 9 July 1845, Scott Polar Research Institute, MS 248/316/25.
- ²² Cyriax, *Sir John Franklin's Last Arctic Expedition*, 24–25.
- ²³ J. Franklin, Letter to J. Richardson, 7 July 1845, Gell of Hopton Hall Papers, Derbyshire Record Office, D3311/53.
- ²⁴ J. Franklin, Letter to J.C. Ross, 9 July 1845, Scott Polar Research Institute, MS 248/316/25; J. Franklin, Letter to W.E. Parry, 10 July 1845, Scott Polar Research Institute, MS 438/18/7.
- ²⁵ United Kingdom, Admiralty, Orders to J. Franklin, 1848, in United Kingdom, House of Commons, Arctic Expedition: Return to an Address of the Honourable the House of Commons, dated 21 March 1848, 3–7.
- ²⁶ See especially J. Franklin, Letter to J.C. Ross, 9 July 1845, Scott Polar Research Institute, MS 248/316/25.
- ²⁷ J. Franklin, Letter to J. Richardson, 7 July 1845, Gell of Hopton Hall Papers, Derbyshire Record Office, D3311/53.
- ²⁸ L.H. Neatby, *In Quest of the North West Passage* (Toronto: Longmans, Green, 1958), 181; A. Savours, *The Search for the North West Passage* (New York: St. Martin's Press, 1999), 293; G. Williams, *Arctic Labyrinth: The Quest for the Northwest Passage* (Toronto: Viking Canada, 2009), 345, 355.
- ²⁹ J. Richardson, Letter to W.E. Parry, 25 February 1847, in United Kingdom, House of Commons, Arctic Expedition: Return to an Address of the Honourable the House of Commons, dated 21 March 1848, 24–26.
- ³⁰ J.C. Ross, Search Proposal, 2 December 1847, in United Kingdom, House of Commons, Arctic Expedition: Return to an Address of the Honourable the House of Commons, dated 21 March 1848, 29–30.
- ³¹ F.L. McClintock, "Reminiscences of Arctic Ice-Travel in Search of Sir John Franklin and His Companions," *Journal of the Royal Dublin Society* 1, no. 4 (1857): 195.
- ³² W.H. Browne, "Report of the Proceedings of the Sledge "Enterprise," in Charge of Lieut. W. H. Browne, Her Majesty's Ship "Resolute," Commencing 15th April, Ending 28th May 1851," in *Additional Papers Relative to the Arctic Expedition Under the Orders of Captain Austin and Mr. William Penny* (London: G.E. Eyre and W. Spottiswoode, 1851), 75.
- ³³ S. Osborn, "Journal," in *Additional Papers Relative to the Arctic Expedition Under the Orders of Captain Austin and Mr. William Penny* (London: G.E. Eyre and W. Spottiswoode, 1851), 102. See also W. Barr, "Searching for Franklin Where He Was Ordered to Go: Captain Erasmus Ommanney's Sledging Campaign to

Cape Walker and Beyond, Spring 1851," *Polar Record* 52, no. 4 (2016): 474–98, <https://doi.org/10.1017/S0032247416000188>.

³⁴ S. Osborn, *Stray Leaves from an Arctic Journal; Or, Eighteen Months in the Polar Regions, in Search of Sir John Franklin's Expedition, in the Years 1850–51* (London: Longman, Brown, Green and Longmans, 1852), 222.

³⁵ W. Kennedy, *A Short Narrative of the Second Voyage of the Prince Albert, in Search of Sir John Franklin* (London: W.H. Dalton, 1853), 134.

³⁶ McClintock, "Reminiscences of Arctic Ice-Travel," 195n.

³⁷ S. Osborn, ed., *The Discovery of the North-West Passage by H.M.S. "Investigator," Capt. R. M'Clure, 1850, 1851, 1852, 1853, 1854* (London: Longman, Brown, Green, Longmans, and Roberts, 1856), 138.

³⁸ In Anon, "The Discovery of the North-West Passage," *Times*, 2 November 1853, 12.

³⁹ See W.G. McKenzie, "The Identity of Gateshead Island," *Polar Record* 17, no. 110 (1975): 545–59, <https://doi.org/10.1017/S0032247400032514>.

⁴⁰ J. Rae, "Recent Explorations Along the South and East Coast of Victoria Land," *Journal of the Royal Geographical Society of London* 22 (1852): 93.

⁴¹ In United Kingdom, House of Commons, Report from the Select Committee on Arctic Exploration (1855), 32.

⁴² Rae, "Recent Explorations Along the South and East Coast of Victoria Land," 85–90; R. Collinson, *Journal of H.M.S. Enterprise, on the Expedition in Search of Sir John Franklin's Ships by Behring Strait, 1850–55*, ed. T.B. Collinson (London: Sampson Low, Marston, Searle, & Rivington, 1889), 288.

⁴³ R. Collinson, Letter to J. Barrow Jr., 4 July 1854, British Library, Additional Manuscripts 35308, ff. 20–22.

⁴⁴ In United Kingdom, House of Commons, Report from the Select Committee on Arctic Exploration, 31–32.

⁴⁵ R. Collinson, "Account of the Proceedings of H.M.S. Enterprise from Behring Strait to Cambridge Bay," *Journal of the Royal Geographical Society of London* 25 (1855): 203.

⁴⁶ W. Barr, *Arctic Hell-Ship: The Voyage of HMS Enterprise 1850–1855* (Edmonton: University of Alberta Press, 2007), 181.

⁴⁷ J. Rae, "Arctic Exploration, with Information Respecting Sir John Franklin's Missing Party," *Journal of the Royal Geographical Society of London* 25 (1855): 250–51.

⁴⁸ J. Rae, "Report to Archibald Barclay," 1 September 1854, in *Further Papers Relative to the Recent Arctic Expeditions in Search of Sir John Franklin and the Crews of H.M.S. "Erebus" and "Terror"* (London: G.E. Eyre and W. Spottiswoode, 1855), 835–44; Rae, "Arctic Exploration, with Information Respecting Sir John Franklin's Missing Party."

⁴⁹ G.M. Stein, *Discovering the North-West Passage: The Four-Year Arctic Odyssey of H.M.S. Investigator and the McClure Expedition* (Jefferson, North Carolina: McFarland & Company, 2015), 237–38.

⁵⁰ J. Richardson, Letter to the Editor, *Times*, 23 June 1855, 5.

⁵¹ J. Rae, Letter to the Editor, *Times*, 25 June 1855, 11.

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- ⁵² In United Kingdom, House of Commons, Report from the Select Committee on Arctic Exploration, xviii.
- ⁵³ In United Kingdom, House of Commons, Report from the Select Committee on Arctic Exploration, 5.
- ⁵⁴ In United Kingdom, House of Commons, Report from the Select Committee on Arctic Exploration, 11.
- ⁵⁵ In United Kingdom, House of Commons, Report from the Select Committee on Arctic Exploration, 16–18.
- ⁵⁶ In United Kingdom, House of Commons, Report from the Select Committee on Arctic Exploration, 25.
- ⁵⁷ In United Kingdom, House of Commons, Report from the Select Committee on Arctic Exploration, 18–19.
- ⁵⁸ In United Kingdom, House of Commons, Report from the Select Committee on Arctic Exploration, 20.
- ⁵⁹ In United Kingdom, House of Commons, Report from the Select Committee on Arctic Exploration, 31–32.
- ⁶⁰ United Kingdom, House of Commons, Report from the Select Committee on Arctic Exploration, iii, vi, viii–ix.
- ⁶¹ J. Richardson, “Franklin, Sir John,” *Encyclopaedia Britannica*, 8th ed. (1856).
- ⁶² S. Cracroft, Letter to R. Murchison, 7 July 1855, British Library, Additional Manuscripts 46125, ff. 449–50.
- ⁶³ See B. Pim, “Plan for a Farther Search After the Remains of the Franklin Expedition,” *Proceedings of the Royal Geographical Society of London* 1, no. 6 (1856): 213.
- ⁶⁴ Collinson, “Account of the Proceedings of H.M.S. Enterprise,” 202.
- ⁶⁵ A.G. Findlay, “On the Probable Course Pursued by Sir John Franklin’s Expedition,” *Journal of the Royal Geographical Society of London* 26 (1856): 26–35.
- ⁶⁶ [A.B. Becher], “Reflections on Sir John Franklin’s Expedition, and Where His Ships Were Most Probably Beset in the Ice,” *Nautical Magazine* 25, no. 3 (1856): 121–47.
- ⁶⁷ G.H. Richards, Letter, *Proceedings of the Royal Geographical Society of London* 1, no. 4 (1856): 94–95.
- ⁶⁸ Pim, “Plan for a Farther Search.”
- ⁶⁹ In Pim, “Plan for a Farther Search,” 212.
- ⁷⁰ S. Cracroft, Letter to R. Murchison, 19 January 1855, British Library, Additional Manuscripts 46125, ff. 238–39.
- ⁷¹ McClintock, “Reminiscences of Arctic Ice-Travel,” 195.
- ⁷² Browne, “Report of the Proceedings of the Sledge “Enterprise”.”
- ⁷³ F.L. McClintock, Letter to S.R. Graves, *Times*, 4 June 1857, 10.
- ⁷⁴ F.L. McClintock, *The Voyage of the “Fox” in the Arctic Seas: A Narrative of the Discovery of the Fate of Sir John Franklin and His Companions*, 1st ed. (London: John Murray, 1859), 313, 315–16.
- ⁷⁵ McClintock, *The Voyage of the “Fox” in the Arctic Seas: A Narrative of the Discovery*, 196.

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- ⁷⁶ F.L. McClintock, *The Voyage of the "Fox" in the Arctic Seas in Search of Franklin and His Companions*, 3rd ed. rev. (London: John Murray, 1869), 168.
- ⁷⁷ McClintock, *The Voyage of the "Fox" in the Arctic Seas: A Narrative of the Discovery*, 200.
- ⁷⁸ McClintock, *The Voyage of the "Fox" in the Arctic Seas: A Narrative of the Discovery*, 234, 251.
- ⁷⁹ McClintock, *The Voyage of the "Fox" in the Arctic Seas: A Narrative of the Discovery*, 255.
- ⁸⁰ McClintock, *The Voyage of the "Fox" in the Arctic Seas: A Narrative of the Discovery*, 313–14.
- ⁸¹ Quoted in McClintock, *The Voyage of the "Fox" in the Arctic Seas: A Narrative of the Discovery*, 341.
- ⁸² McClintock, *The Voyage of the "Fox" in the Arctic Seas: A Narrative of the Discovery*, 314, 341.
- ⁸³ McClintock, *The Voyage of the "Fox" in the Arctic Seas in Search of Franklin and His Companions*, 299.
- ⁸⁴ In D.R. Stenton, "A Most Inhospitable Coast: The Report of Lieutenant William Hobson's 1859 Search for the Franklin Expedition on King William Island," *Arctic* 67, no. 4 (2014): 519, <https://doi.org/10.14430/arctic4424>.
- ⁸⁵ McClintock, *The Voyage of the "Fox" in the Arctic Seas: A Narrative of the Discovery*, 314.
- ⁸⁶ McClintock, *The Voyage of the "Fox" in the Arctic Seas: A Narrative of the Discovery*, 338.
- ⁸⁷ McClintock, *The Voyage of the "Fox" in the Arctic Seas: A Narrative of the Discovery*, 341.
- ⁸⁸ F.L. McClintock, Letter to J.G. Bennett, 3 November 1875, *New York Herald*, 18 November 1875, 3.
- ⁸⁹ A. Young, Report to F.L. McClintock, 17 August 1859, Library and Archives Canada, MG24 H27, microfilm reel A-34.
- ⁹⁰ A. Young, Letter to J.G. Bennett, 26 October 1875, *New York Herald*, 9 November 1875, 3. See also A. Young, Letter to the Editor, *Times*, 5 November 1875, 4.
- ⁹¹ McClintock, *The Voyage of the "Fox" in the Arctic Seas: A Narrative of the Discovery*, 274–78.
- ⁹² McClintock, *The Voyage of the "Fox" in the Arctic Seas: A Narrative of the Discovery*, 286; McClintock, *The Voyage of the "Fox" in the Arctic Seas in Search of Franklin and His Companions*, 257, 267.
- ⁹³ McClintock, *The Voyage of the "Fox" in the Arctic Seas: A Narrative of the Discovery*, 316; McClintock, *The Voyage of the "Fox" in the Arctic Seas in Search of Franklin and His Companions*, 267.
- ⁹⁴ In F.L. McClintock, "Discoveries by the Late Expedition in Search of Sir John Franklin and His Party," *Proceedings of the Royal Geographical Society of London* 4, no. 1 (1859): 8–9.
- ⁹⁵ J. Richardson, Letter to J. Franklin, 11 October 1859, Scott Polar Research Institute, MS 1503/59.

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- ⁹⁶ J. Brown, *The North-West Passage, and the Plans for the Search for Sir John Franklin. A Review, with Maps, &c. Second Edition, with a Sequel, Including the Voyage of the "Fox"* (London: E. Stanford, 1860), 31.
- ⁹⁷ Brown, *The North-West Passage, and the Plans for the Search for Sir John Franklin*, 32–33.
- ⁹⁸ See also C.G. Hickey, J.M. Savelle, and G.B. Hobson, "The Route of Sir John Franklin's Third Arctic Expedition: An Evaluation and Test of an Alternative Hypothesis," *Arctic* 46, no. 1 (1993): 78–81, <https://doi.org/10.14430/arctic1325>.
- ⁹⁹ [C.R. Weld], "Franklin's Fate, and the Voyage of the "Fox,"" *Fraser's Magazine* 61, no. 362 (1860): 226.
- ¹⁰⁰ S. Osborn, *The Career, Last Voyage and Fate of Captain Sir John Franklin* (London: Bradbury and Evans, 1860), 45.
- ¹⁰¹ E.g., Anon, "Presentation of the Gold Medals to Lady Franklin and to Captain Sir F.L. McClintock," *Journal of the Royal Geographical Society* 30 (1860): 151; F. Lushington, "Arctic Enterprise and Its Results Since 1815," *Macmillan's Magazine* 1, no. 4 (1860): 275.
- ¹⁰² Anon, "The Fate of Franklin," *Good Words* 1, nos. 8, 9, 10: xcv.
- ¹⁰³ Anon, "Statue to Sir John Franklin," *Times*, 16 November 1866, 10.
- ¹⁰⁴ R. le M. McClure, Letter to J. Barrow Jr., 6 February 1860, British Library, Additional Manuscripts 35309, ff. 132–33.
- ¹⁰⁵ Anon, "Naval and Military Intelligence," *Times*, 22 October 1873, 5.
- ¹⁰⁶ J. (Jane) Franklin, Letter to the Editor, *Times*, 28 October 1873, 5.
- ¹⁰⁷ A. Armstrong, Letter to the Editor, *Times*, 31 October 1873, 6.
- ¹⁰⁸ A. Armstrong, Letter to the Editor, *Times*, 5 November 1873, 7.
- ¹⁰⁹ F.L. McClintock, Letter to the Editor, *Times*, 15 November 1873, 9.
- ¹¹⁰ McClintock, Letter to the Editor, *Times*, 15 November 1873, 9.
- ¹¹¹ In Collinson, *Journal of H.M.S. Enterprise*, x–xi.
- ¹¹² K.-G. Kjær, "The Arctic Vessel *Gjøa*," *Polar Record* 41, no. 4 (2005): 355, <https://doi.org/10.1017/s0032247405004663>.
- ¹¹³ O. Parkes, *British Battleships, "Warrior" 1860 to "Vanguard" 1950: A History of Design, Construction and Armament* (London: Seeley, 1957), 7.
- ¹¹⁴ Parry, *Journal of a Voyage for the Discovery of a North-West Passage*, i; A.W.H. Pearsall, "Bomb Vessels," *Polar Record* 16, no. 105 (1973): 782, <https://doi.org/10.1017/S0032247400063865>.
- ¹¹⁵ Stein, *Discovering the North-West Passage*, 18.
- ¹¹⁶ D.C. Woodman, *Unravelling the Franklin Mystery: Inuit Testimony* (Montreal and Kingston: McGill-Queen's University Press, 1991), 75. See also R. Potter, "A "Navigable" Northwest Passage? Visions of the North" (blog), posted on 29 September 2012, <http://visionsnorth.blogspot.com/2012/>.
- ¹¹⁷ B.T. Alt, R.M. Koerner, D.A. Fisher, and J.C. Bourgeois, "Arctic Climate During the Franklin Era, as Deduced from Ice Cores," in *The Franklin Era in Canadian Arctic History, 1845–1859*, ed. P.D. Sutherland, Mercury Series, Archaeological Survey of Canada Paper 131 (Ottawa: National Museum of Man, 1985), fig. 12.

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- ¹¹⁸ A. Young, *The Two Voyages of the 'Pandora' in 1875 and 1876* (London: Edward Stanford, 1879), 56.
- ¹¹⁹ R. Amundsen, *The North West Passage*, vol. 1 (London: Archibald Constable, 1908), 55, 58–59, 215.
- ¹²⁰ Amundsen, *The North West Passage*, vol. 1, 62–70.
- ¹²¹ R. Amundsen, *The North West Passage*, vol. 2 (London: Archibald Constable, 1908), 119.
- ¹²² R. Amundsen, *Roald Amundsen's Diary from the Northwest Passage* (Oslo: Fram Museum, 2017), 517.
- ¹²³ Amundsen, *The North West Passage*, vol. 2, 123–26.
- ¹²⁴ R. Amundsen, *My Life as an Explorer* (Garden City, New York: Doubleday, 1927), 61.
- ¹²⁵ Amundsen, *The North West Passage*, vol. 1, 48–49.
- ¹²⁶ Amundsen, *The North West Passage*, vol. 2, 106.
- ¹²⁷ J.-E. Bernier, *Report on the Dominion Government Expedition to [the] Arctic Islands and the Hudson Strait on Board the C.G.S. "Arctic," 1906–1907* (Ottawa: King's Printer, 1909), 19.
- ¹²⁸ J.-E. Bernier, *Report of the Dominion of Canada Government Expedition to the Arctic Islands and Hudson Strait on Board the D.G.S. "Arctic"* (Ottawa: Government Printing Bureau, 1910), 38, 80–81, 85.
- ¹²⁹ Bernier, *Report of the Dominion of Canada Government Expedition to the Arctic Islands and Hudson Strait on Board the D.G.S. "Arctic,"* 133.
- ¹³⁰ Quoted in J.-E. Bernier, *Report on the Dominion Government Expedition to the Northern Waters and Arctic Archipelago of the D.G.S. "Arctic" in 1910* (Ottawa, 1911), 29.
- ¹³¹ V. Stefansson, *The Friendly Arctic: The Story of Five Years in Polar Regions* (New York: Macmillan, 1921), 430–31.
- ¹³² H. Noice, *With Stefansson in the Arctic* (New York: Dodd, Mead & Co., n.d. [1925]), 208, 242.
- ¹³³ J.L. Robinson, "Conquest of the Northwest Passage by R.C.M.P. Schooner *St. Roch*," *Canadian Geographical Journal* 30, no. 2 (1945): 54, 59–65; H. Larsen, *The North-West Passage, 1940–1942 and 1944* (Vancouver, British Columbia: City Archives, 1954), 24–25.
- ¹³⁴ Robinson, "Conquest of the Northwest Passage by R.C.M.P. Schooner *St. Roch*," 66–73; Larsen, *The North-West Passage*, 39–45.
- ¹³⁵ In Robinson, "Conquest of the Northwest Passage by R.C.M.P. Schooner *St. Roch*," 73.
- ¹³⁶ M. Dunbar, "The Effect of Sea Ice Conditions on Maritime Arctic Expeditions During the Franklin Era," in *The Franklin Era in Canadian Arctic History, 1845–1859*, ed. P.D. Sutherland, Mercury Series, Archaeological Survey of Canada Paper 131 (Ottawa: National Museum of Man, 1985), 114–21.
- ¹³⁷ Dunbar, "The Effect of Sea Ice Conditions on Maritime Arctic Expeditions During the Franklin Era," 120.
- ¹³⁸ Alt et al., "Arctic Climate During the Franklin Era, as Deduced from Ice Cores," fig. 8.

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- ¹³⁹ R.K. Headland, *Transits of the Northwest Passage to End of the 2017 Navigation Season* (Cambridge: Scott Polar Research Institute, 2017), 1.
- ¹⁴⁰ Woodman, *Unravelling the Franklin Mystery*.
- ¹⁴¹ Neatby, *In Quest of the North West Passage*, 182.
- ¹⁴² K. McGoogan, *Fatal Passage: The Untold Story of John Rae, the Arctic Adventurer Who Discovered the Fate of Franklin* (Toronto: HarperCollins, 2001), 190.
- ¹⁴³ McGoogan, *Fatal Passage*, 305.
- ¹⁴⁴ McGoogan, *Fatal Passage*; K. McGoogan, *Lady Franklin's Revenge: A True Story of Ambition, Obsession and the Remaking of Arctic History* (Toronto: HarperCollins, 2005); K. McGoogan, *Dead Reckoning: The Untold Story of the Northwest Passage* (Toronto: HarperCollins, 2017).
- ¹⁴⁵ McGoogan, *Fatal Passage*, 169.
- ¹⁴⁶ McGoogan, *Fatal Passage*, 258.



2

To the North Magnetic Pole and Through the North-West Passage

Captain Roald Amundsen*

To Sir John Franklin must be given the honour of having discovered the North-West Passage, and to Admiral Sir Robert McClure that of being the first to pass through it, partly in his vessel the *Investigator* and partly on foot. On the foundations laid by the splendid work done and the rich fund of experience gained by English navigators in these regions, I succeeded – in the track of Sir James Ross, Dr. John Rae, Admiral Sir Leopold M'Clintock, Sir Allen Young, and many others – in making my way in the *Gjøa* to the region around the Earth's north magnetic pole, and, furthermore, in sailing through the North-West Passage in its entirety. If I have thus been the first to sail through the North-West Passage, it is with pleasure that I share the honour with those brave English seamen – the seamen who here, as in most of the other parts of the world, have taken the lead and shown us the way.

It was the Norwegian minister to England, Dr. Fridtjof Nansen, who, by his great experience and his many good counsels, made the *Gjøa* Expedition what it was: one in all respects well planned and excellently equipped. In order not to tire my hearers, I will give in as few words as possible the earlier history of the expedition.

The scheme of the *Gjøa* Expedition I had a welcome opportunity of laying before the Norwegian Geographical Society on November 25, 1901. It was briefly as follows: With a small vessel and a few companions, to penetrate into the regions around the Earth's north magnetic pole, and by a series of accurate observations, extending over a period of two years, to relocate the

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pole observed by Sir James Ross in 1831, and also to make investigations in its immediate vicinity. This was the chief object of the expedition.

The condition of the ice still farther west allowing of it, it was furthermore my intention to attempt to sail through the North-West Passage in its entire extent, this being a problem which for centuries had defied the most persistent efforts. I chose a small vessel, with the view to be better able to pass through the sounds of these regions, which are narrow, shallow, and generally packed with ice. In preferring a small number of members to a larger one, it was – apart from want of space – because, in the event of such a misfortune occurring to us as the loss of our vessel, it would be easier to find means of subsistence for a small than for a greater number of men.

My undertaking, as soon as it became known, awakened great interest in very wide circles, and several wealthy men came forward and supported the enterprise with donations. It would take too long to name all the persons who gave the expedition pecuniary support, but I must in respectful gratitude mention the names of their Majesties King Haakon and King Oscar II.

The vessel of the *Gjøa* Expedition was built in Hardanger in 1872, and was my only contemporary on the trip. She had originally been used in the herring fisheries along the Norwegian coast; later she was sold to Tromsø, whence she sailed for many years in the Arctic sealing trade. She had weathered many a storm, though not always [scatheless]. After my purchase of her, I had a small petroleum motor, of 39 indicated horse-power, put into her, to help us along in calm weather. The ice-sheathing, which before only reached a couple of planks under the water-line, I had lengthened right down to the keel; stout cross-beams were put into the hold and connected with massive joints to the deck and keelson, and the old hempen rigging was replaced by wire rigging.

I had chosen my companions by degrees. First in order I must mention the man who sacrificed his life in the service of the expedition, Gustav Juel Wiik. He was born in 1878, at Horten, and thus lived to be somewhat over twenty-seven years of age. From six weeks' study shortly before the departure of the expedition, at the Magnetic Observatory at Potsdam, where he particularly studied the use of self-registering magnetic instruments, he returned with the most excellent testimonials for industry and thoroughness. I had a good opportunity of seeing, during our three years of work together, that these testimonials were not exaggerated, and the magnetic data we brought back with us I owe, in the first instance, to this young man's painstaking and accurate labour. In addition to his position as assistant in the meteorological observations, he was also the second engineer.

The second in command of the expedition was Lieut. [Lieutenant] Godfred Hansen, of the Danish navy, born in Copenhagen in 1875. His lighthearted disposition was of absolute benefit to us, and during the three years – more than three years – that he and I spent together in the little cabin of the *Gjøa*, 6 x 9 feet, I became more and more attached to him. It was prophesied before our departure from Norway, that within a year we should not be able to bear the sight of one another; this prophecy, however, we thoroughly gave the lie to, and I almost think we could have managed three years more. He was the navigator of the expedition, the astronomer, geologist, surgeon, photographer, electrician, and an expert in dealing with our explosives. He also played star-parts as meteorologist and magnetician. Sergeant Peder Ristvedt was born in Sandsvär in 1873. Besides being first engineer, he was also our meteorologist, smith, clockmaker, copper and tinsmith, gunsmith, etc. I knew Ristvedt before I engaged him, as he had taken part as assistant in my first expedition in the *Gjøa* in 1901. I was thus aware of what I was doing when I secured the service of this capable man and pleasant companion. Anton Lund was the first mate of the expedition. He was born at Tromsö in 1864, and was thus the oldest member of the expedition. He had sailed from his earliest youth on our Norwegian sloops to the Arctic [O]cean, and was consequently an unusually experienced man in all matters connected with the condition of the ice and navigation through it. Helmer [Hanssen] was born in the [Vesterålen] islands in 1870. He had previously been a peasant, fisherman, and Arctic navigator. His position was that of second mate, and he was careful and conscientious in all that he did. Last of all, then, comes the cook, Adolf Henrik Lindström, born at Hammerfest in 1865. He took part in Sverdrup's expedition in the *Fram*, and had thus extensive experience as an Arctic cook. I will confine myself to informing you that, besides providing us for three years with excellently prepared food, served to the minute, he voluntarily filled the vacant posts of botanist and zoologist. His kitchen work ended, he was pretty sure to be seen abroad on arctic summer evenings with his botanical collecting-box, his shotgun, and his butterfly-net, and woe to the flower, bird, or insect which came his way! After this description of my comrades, I feel sure that none of my hearers will be surprised that we succeeded in accomplishing what we did.

At twelve o'clock on the night between June 16 and 17, 1903, we cast off, and the *Gjøa* was towed down the Christiania fjord. It poured with rain, and was as dark as in a sack. Some of my friends tried to console me by saying that the weather was much the same when Nansen started in 1893, and that

it was a good omen. However, I had never been a believer in omens, and I therefore felt myself, in spite of these auspicious torrents, very uncomfortable in my soaking clothes. At six in the morning we entered the harbour at Horten, where we took our explosives aboard. At eleven in the forenoon the last tie which bound us to home was broken, for the tow-rope snapped, and left the *Gjøa* to her own fate. We were then just outside Färder lighthouse. After the tug had given us the proper farewell civilities, it stood up the fjord again, and the *Gjøa*, by her own exertions, worked her way slowly forwards against a southerly breeze. The voyage across the Atlantic has been made countless times, and does not offer any particular interest. A great number of people had, indeed, designed this ocean as the *Gjøa's* last resting-place; but, in spite of many prophecies and many warnings, our good little *Gjøa* quietly and calmly worked her way onwards, giving not a moment's thought to all the wiseacres. How glorious it was to have exchanged the narrow hot streets for the open sea! and not only we human beings enjoyed the change, but our dogs likewise. We had, I should explain, six dogs with us which had taken part in Sverdrup's expedition, and they seemed to enjoy the voyage exceedingly, running about and getting into as much mischief as was to be attained. Their spirits were particularly high on rough days, as then they had an agreeable change in their otherwise somewhat monotonous diet (consisting of a stockfish and a quart of water), in the shape of the delicious viands sacrificed to them by my seasick companions.

On July 9 we sighted the first ice, in the vicinity of Cape Farewell, the southern extremity of Greenland, and on the 11th the land round the cape itself appeared in sight. The wind, which had not been particularly favourable to us up to this, did not improve now, and our voyage up the whole of the west coast of Greenland was thus one single struggle against the ever-prevailing north wind. We had to console ourselves with the proverb that "it is an ill wind which blows nobody any good." Though the contrary wind from the north hindered our progress, it at any rate set the ice in motion southwards, and made a way for us.

The voyage, which had hitherto been somewhat monotonous, became more lively on the appearance of the ice. Icebergs of varying shape glided past us and took captive our attention. Now and then we made an excursion into the drift-ice, and shot some of the beautiful large bladder-nose seal that were lying about on the higher parts of the ice. Both men and dogs were longing for fresh meat, and this sealflesh provided us with an agreeable change in our menu.

On July 24 we sighted [Disko Island], and the day afterwards anchored at Godhavn, whither the Royal Danish Greenland Trading Company had been kind enough to bring some of our equipment in their ships. Here we spent five days, enjoying the great hospitality of the inspector and the governor of the colony. After having taken a series of magnetic and astronomical observations, and shipped all our things, we left the place on July 31.

On August 8 we reached Holm [I]sland, which marks the beginning of the redoubtable Melville [B]ay. The ice was packed close, but, however, proved to be broken. We kept cruising backwards and forwards alongside the edge, watching for an opportunity to enter it, and at last, on the evening of the 10th, it so far slackened that we were able to slip in. In thick fog, we wound our way about through fairly practicable ice, a few icebergs now and then breaking up the dense masses of the fog with the strength of their flashes, calling to us their own warning. On August 13, at half-past two in the morning, we saw the last of this fog, the *Gjøa* quietly and calmly gliding out of the thick masses, which had surrounded us as in a nightmare for several days, into a new world, lighted up by the loveliest sunshine, and with a marvellously beautiful view. In the east we saw the head of Melville [B]ay filled with impenetrable icefields; in the north lay the fine mountain scenery around Cape York, beckoning and calling to us in the sunshine – the feeling was overwhelming; before us, shining in blue and white, lay the huge masses of drift-ice. There was not much open water to be seen from the masthead, but then we did not want very much. On August 15 we reached Dalrymple [R]ock, where two Scotch captains, Milne and Adams, had left a largish dépôt for us. Here we fell in with the Danish Literary Greenland Expedition, and spent a few lively and pleasant hours with the members of it. On August 17 we continued our voyage, and bore across Baffin [B]ay, in sight of the Carey [I]slands. It was lucky for us that we met with calm weather here, for with our deeply laden vessel a storm might have had serious consequences. Besides our sky-scraping deck cargo, there were on the top of it all our eighteen dogs, the greater number of which had been shipped at Godhavn. By way of making the time go quicker, they had divided themselves into two about equally strong sides, and from time to time made inroads on each other's territory. This game, needless to say, was hardly to the liking of the man who happened to have the watch, and many a round oath found its way out into the world. On August 20 we stood into Lancaster [S]ound; a few icebergs, which had collected round Cape Horsburgh, and some slack ice stretched straight across the sound. We kept in under the northern shore. The

land made an exceedingly barren impression; there was no vegetation to be seen, and the mountains were high and table-topped. It was, however, not often that we were able to see land, the fog for the most part being thick and heavy.

On August 22 we reached Beechey [I]sland, where I had arranged to stop and take a series of magnetic observations, which were to decide our future course. Before the departure of the expedition, several persons more interested than learned in terrestrial magnetism had written to me, pretending by a subtle method, which, however, they did not disclose, to have discovered that the magnetic pole had moved, with a speed of I don't know how many miles in the year, in a north-westerly direction, and was now on Prince Patrick's Land. They might as well have said in the moon for all they knew.

Beechey [I]sland gives a barren and dismal impression; and particularly sad are the ruins of the house erected by the British Government for the succour of the Franklin Expedition. Five graves did not make it any more cheerful. The memorial stone to Sir John Franklin was the only thing which in the least brightened all this sadness – a handsome marble tablet, put up to his memory by his faithful wife.

The magnetic observations indicated the pole as being in a southerly direction, and Prince Patrick Land was this time left in peace. We left Beechey [I]sland on the 24th, and shaped the course for Peel [S]ound, entering those waters in dense fog. The ice was the whole time fairly practicable, and we met only loose streams which presented no hindrance. At [Prescott Island] the compass, which for some time had been somewhat sluggish, entirely refused to act, and we could as well have used a stick to steer by. Navigation, as we now practised it, was at first a somewhat unfamiliar proceeding, and when one watch released the other, and the fog lay close and compact, as it always did, strange remarks might have been heard. "What are you steering?" would ask the relieving watch, in a cross and sleepy tone. "Supposed to be steering south, but ain't sure we're not going north;" and as he handed the tiller to the other, one would hear, "Steady—so." So there one would be at two o'clock in the morning, just up from a comfortable warm berth, the fog pouring down over everything, and absolutely nothing to be seen in any direction, and one was to steer steady! This was certainly great fun; but custom is a remarkable thing. Within a short time we became quite at home even with this sort of navigation, and we made way. On August 28 we passed the spot where Sir Allen Young was stopped in his vessel the *Pandora* by impenetrable ice. Later in the forenoon the western entrance to Bellot [S]trait,

where Sir Leopold M'Clintock in vain tried to get through, was passed. Now began our voyage along the west coast of Boothia Felix – a voyage that more than once looked dark for us. We were not hindered by ice to any great extent; the land lead was, as a rule, so wide that we could get along without difficulty; but that which was worse for us was the shoal water, the constant fog, and the pitch-dark nights. On August 31 we struck ground for the first time. The weather, however, was fine, and we got off without injury. In the evening we anchored off a low island to wait for daybreak, for I no longer dared to go on now that the nights were so dark, and in such foul waters. How peaceful everything was that evening! It was an unusually dark night and absolutely calm, and what greatly increased our already romantic position was the fact that we – I confess it openly and without shame – had no idea where we were! The land had been mapped in winter, and many of the small islands which we came across were not marked at all, the snow covering them at the time having rendered them invisible. All was so peaceful, quiet, and calm. We had all retired, and left the watch to one of the engineers whose turn it happened to be. I had just got out my log to enter the events of the day, when I was suddenly interrupted by the cry of fire. I knew what this meant on board a small vessel carrying 7000 gallons of petroleum, great quantities of gunpowder and explosives, and whose whole hull was, besides, saturated with tar. We were all up on deck in less time than it takes to tell it. The first thing that met our eyes was an enormous pillar of fire rising up through the engine-room skylight. Things didn't look peaceful any longer. We all ran like mad for vessel and life! The engineer on watch had not left his post; he was holding out bravely down below in the suffocating smoke, trying to the best of his abilities to subdue the fire, which had arisen in some cotton permeated with petroleum. This was Wiik. We succeeded by united exertions in becoming master of the fire, and got off without much damage.

The evening of this same day we beat up under an islet and anchored there. We took this to be one of the small islands lying north of Maltby Island. It was then blowing hard and night coming on. At four the next morning we weighed, and continued our course. It was a fine morning, partially clear, and with a westerly breeze. I was at the tiller, and my two comrades were hoisting the sails. Suddenly there was a shock, and we struck three times. All expedients to get off were in vain, and there we were for thirty hours. A strong breeze blew up from the north, and came to our assistance, and under crowded sail we succeeded in forcing the *Gjøa* across a 200-yard-long bank, and out into comparatively deep water. We only lost our false keel; but from

that day to this it has been a matter of wonder to me that human handiwork could have withstood the treatment which the *Gjøa* underwent on that occasion. During this enforced delay we got a determination for position, and thus knew where we were. About midday we cast anchor off Cape Christian Frederik, on Boothia Felix, so as to get things a little in order after grounding. The wind was then slack and off shore. At eleven in the evening, it suddenly went over to the south-east, and blew hard. There was no question, in the darkness and the shoal and foul sea outside, of getting under way. There was only one thing to be done, and that was to pay out our cables to the bitter end and await results. The wind soon increased to a gale, the seas were high and short, shaking our chain cables violently. The land did not look as well now as when we came in and anchored into it to leeward. All hands were on deck, and getting ready for the stranding which seemed inevitable. Each man had had his work allotted to him, and at the moment when the cables gave would be in readiness at his post. The petroleum motor was going at full speed, and the vessel was kept well up to the wind and sea, by which means I hoped to ease a little the violent strain on the cables. We had anchored at midday on the 3rd, and it was not till four o'clock on the 8th that the wind dropped sufficiently for us to get out again. Then another drifting night in pitch darkness among shoals and rocks, and then at last release. It is impossible to describe the well-being, the feeling of calm and safety, which came over us after these ten days of ceaseless fighting, when we dropped anchor on September 9, at half-past three in the afternoon, at the head of Petersen [B]ay, in King William Land. There, approached by a narrow inlet, lay the harbour which was to be our place of sojourn for two years – “Gjøahavn,” or Gjøa [H]arbour. A fresh land breeze prevented us from standing in, and it was not till the evening of the 12th that it fell sufficiently for us to beat up against it and drop anchor. Now we could breathe. We had done a good bit of work.

“Gjøahavn” was all that the heart could desire, small and land-locked. Low sandy land, covered with moss, rose gently upwards from all sides, until it reached a height of 150 feet, and thus formed a sheltered little basin where we could lie safe and snug. The day after our arrival here I rowed ashore with my instruments to ascertain the state of the magnetism in this area, and, strange as it may sound, we had found the very spot which, according to my scheme, was the most suitable for a magnetic station – about a hundred nautical miles from the magnetic polar area. There was no longer any doubt; this would be our home for the next two years. The time after this was very busy. The vessel was hauled close up to the shore, which fell

abruptly away, a conveying rope rigged to the masthead, and all our provisions passed ashore by means of it. Everything was put in order, and the house which we built covered over with a sail.

Then came the observatories, and of them a mushroom growth sprang up. First the magnetic variation house, then a dwelling-house for the meteorologist and magnetician, the two latter being built of empty provision cases filled with sand. After that came the house for the absolute magnetic observations: the walls were built of blocks of snow, and the roof made out of thin transparent sailcloth. Finally, we built the astronomical observatory, which was known as "Uranienborg," this also being of snow, with a sailcloth roof. Besides all this building, we had done another good stroke of work in the shape of killing a hundred reindeer, and we had thus abundant provisions for ourselves and our dogs throughout the winter. The ice formed on October 1 and 2. The vessel was then covered with a winter awning, and everything got ready to receive the approaching winter.

On October 29 the first Eskimo made their appearance. Expectation on this point had always run high, and we had talked daily about meeting with them. Sir John Ross, in his description of his voyage, gives the word "Teima" as the usual salutation between white man and Eskimo; and we had therefore carefully laid this word to heart in order at once to check any warlike desires, should they be apparent. This first meeting was exceedingly ridiculous, and is one of our liveliest reminiscences. With two companions, armed to the teeth – namely, Anton Lund and Helmer [Hanssen] – I started off to meet the Eskimo, walking first myself, with two comrades following me at about three paces' distance. They had shouldered their guns, and had such a fierce expression on their faces that it alone would have been enough to put a warlike detachment to flight, to say nothing of the five unfortunate Eskimo who were approaching us. The step and set-up of my detachment were unexceptionable. Arrived at about a hundred paces from us, the Eskimo stopped, and we, not wishing to show less strategic ability, did likewise. Now, I thought, is the moment to set this matter at rest, and shouted "Teima" at the top of my voice. It did not seem to affect them in the least, and, after a short parley among themselves, they recommenced their march on us. They were five in number, had formed in a sort of fighting line, and now advanced towards us smiling and humming. Two of them had their bows firmly secured to their backs, and the three others were apparently unarmed. We on our side, of course, reassumed our advance, repeatedly shouting, "Teima, teima," and the Eskimo answered, but with quite another word, namely, "Manik-tu-mi." We now approached one another quickly, and finally ended

by meeting. It was a remarkable encounter. The Eskimo stroked and patted us both in front and behind, all shouting "Manik-tu-mi" as hard as they could. We, true to our original plan of campaign, copied our adversaries, and shouted and howled, patted and slapped, to the best of our ability.

They were fine men, these Eskimo, tall and strongly built, and in their appearance reminded me more of Indians than of Eskimo, having the redskin type of complexion; they were, moreover, slim, and, as I said before, tall. The ordinary broad and fleshy Eskimo nose was exchanged for one better in shape, somewhat hooked; their hair was cut short, with the exception of a small crest of long hair which stretched from one temple round the nape of the neck to the other temple. We now proceeded, laughing the whole time, to the vessel. These Eskimo called themselves "Ogluli Eskimo," and looked upon the North American coast from Back [R]iver westwards to Adelaide [P]eninsula as their hunting-fields. We made many good friends among this race, but it was not till later, when we met with the "Nechjilli Eskimo," that we made inseparable allies.

On November 2 the permanent station began its work. I will try, in as few words as possible, to explain terrestrial magnetism and the use of our magnetic instruments.

Terrestrial magnetic power is, with regard to direction and force, different on every point of the surface of the Earth, nor is it always the same in one and the same place. It is subject to regular daily and yearly changes, and, similarly, there often occur irregular more or less violent disturbances. Finally, small displacements show themselves from year to year, which continue in the same manner for a long series of years. All this has been discovered through observations undertaken during the course of time at various parts of the surface of the globe, partly during travels, and partly by permanent stations. A careful study of all the available material which had been acquired by observation caused the great German mathematician and physicist, Gauss, in the thirties of last century, to form a theory as to the sequence and varied appearance of the phenomena of terrestrial magnetism at a certain moment of time according to the geographical latitude and longitude. It thus became possible to construct three different maps, of which two show the direction of the force, and the third its strength. The reason why two maps are necessary for direction is because the direction must be given both in relation to the north and to the south geographical line, and in proportion to the horizontal plane of a place. The direction of the terrestrial magnetic force in relation to the north-to-south line can be observed by the help of the compass, which, as we know, generally points somewhat east or

west of this same north. This divergence is called the variation or the declination. On a magnetic map lines are drawn which show the direction of the magnetic needle at every point of the Earth's surface. These lines, which are called magnetic meridians, converge at two points – the north magnetic pole, on the Arctic coast of North America, and the south magnetic pole, in the interior of the Antarctic continent. Each of the lines indicates, as will be understood, the direction one would go if he followed exactly the direction indicated by the north or south end of the magnetic needle. In the first case, one would at length arrive at the north magnetic pole; in the other, at the south magnetic pole.

If a magnetic needle [can] be placed so that it can turn on an axis through its centre of gravity – exactly like a grindstone – the needle will of itself adopt a diagonal position when the plane of revolution is identical with the direction which the needle of a compass indicates. An instrument of the kind is called an ["inclinorium,"] and the angle which the dipping-needle forms with the horizontal plane is called the magnetic inclination of a place. Here, in our parts, the north end of the needle points down towards the earth; in Australia, on the contrary, it is the southern end which dips. At the north magnetic pole the dipping-needle assumes a vertical position with its north end down; at the south magnetic pole it assumes a vertical position with its south end down. The inclination, then, at both their points is 90° , and decreases according[ly] as the distance becomes greater from them. On a series of points within the tropical zone the inclination is 0° ; that is to say, the dipping-needle places itself exactly horizontally, and that line which we may imagine as drawn through all these points is called the "magnetic equator." It is situated partly above, partly beneath, the Earth's geographical equator.

The force of terrestrial magnetism works, as will be understood, with its whole strength in the direction given by the dipping-needle, and it may be asked, How great is this force in the different places? In order to discover this we must imagine the force dissolved into two parts, one part working horizontally, and one part working vertically. It is evident that it is the horizontal part of the force which causes the needle to take a set position, and if we know all about this force – "horizontal intensity," as it is called – and at the same time know the inclination, it is easy, by a simple calculation, to find the collective strength, the total intensity. For the determination of horizontal intensity two methods are adopted, either each one alone or preferably, for the sake of comparison, simultaneously. One method consists [of] placing a magnetic bar by the side of a needle at a given distance from it, and observing how many degrees the needle moves away from its original

position. It is clear that the weaker the horizontal intensity the greater the oscillation of the needle, and when the strength of the magnetic bar is known, it is possible, by the aid of the angle of oscillation and the distance, to calculate the horizontal intensity.

The other method is to note the time of oscillation of a magnetic bar suspended by a thread in such a manner that it can revolve in the horizontal plane. When the magnet is allowed to be at rest, it sets, under the influence of horizontal intensity, in the direction of the needle. Brought out of equilibrium by a little push, it will swing backwards and forwards, and the stronger the horizontal intensity, the sooner it will come to rest again, or, in other words, the shorter will be the time of each individual oscillation. When the strength of the oscillatory magnet is known, and observation is made of how many seconds are necessary for an oscillation, the horizontal intensity can be calculated.

Maps are constructed to give an idea of the value of horizontal intensity, expressed in so-called electric units, on the different parts of the Earth. A line passes through all the places where the horizontal intensity is the same. The horizontal intensity decreases towards the magnetic poles. It is, therefore, matter of consequence that terrestrial magnetism here, where the inclination is 90° , acts with its whole strength vertically downwards, and thus cannot have any effect in a horizontal direction.

Although the magnetic maps are very dissimilar, they are alike in one respect, namely, that the magnetic poles are the points of mark on the surface of the Earth, and it is obvious that magnetic investigations just at these points, or in their immediate vicinity, must be of the greatest interest to the science of terrestrial magnetism. The Gauss theory by no means solves all the riddles presented by the phenomena of terrestrial magnetism, but continual efforts are being made to complete these riddles by the collection of as reliable and comprehensive observations as it is possible to procure.

The magnetic work of the *Gjöa* expedition is intended to be a contribution to this object. But the difficulties were not small. The very fact that horizontal intensity, as we have heard, becomes, in the vicinity of the magnetic poles, so infinitesimally small, renders necessary extraordinary precautions for the determination of this itself, as well as of the variation. The *Gjöa* expedition's equipment of instruments was calculated for this purpose. The magnets, fourteen in number, were chosen with great care in Potsdam just before our departure. The inclination we were able to determine by the help of three inclinoria of varying construction, and for the determination of the declination we had two different instruments.

Added to these were a set of self-registering variation apparatus[es]; that is to say, three instruments permanently erected in a dark room, each instrument containing a small magnetic needle, two of the latter being suspended by a fine quartz thread, the third oscillating on a fine bearing in such a manner that the needle with its movements followed the declination, the second the horizontal intensity, and the third the inclination, even its minutest changes. Each needle was provided with a looking-glass, which reflected the light from a lamp on to a drum covered with photographic paper, which, by means of clockwork, made one revolution during the course of the twenty-four hours. It was arranged so that the reflection from each of the three needles struck the drum at different heights, and caused a little dark spot; but when the drum with its paper revolved, each of these spots was continued, forming a consecutive dark line. There were thus three dark lines across each other on the paper, when after the lapse of twenty-four hours it was taken off.

After what we have already heard, it will easily be understood that it would not have done to select the pole itself for a permanent observation station, even had we known beforehand its exact situation, and could have foreseen that it would keep immovable on one of the same spot. Advised by Prof. [Professor] Adolf Schmidt, I therefore decided to make the base station, where the instruments for variation were to be erected, at such a distance from the pole that the inclination would be about 89° . This requirement was fulfilled by Gjöahavn, which accordingly became our headquarters. We constantly made excursions hence to adjacent parts of the country, and right in to Boothia Felix, where I succeeded by the help of declination in absolutely proving what of late has been assumed on theoretic grounds, namely, that the magnetic pole has not an immovable and stationary situation, but, in all probability, is in continual movement. In what manner this movement takes place our considerable amount of material acquired by observation will, when it has been worked out, give instructive information.

The magnetic observations were kept going day and night, without interruption, for nineteen months. Meteorological observations were also taken the whole of the time. Prof. Mohn had equipped the expedition with a complete set of meteorological instruments, and made it his business that the meteorologist of the expedition should receive the best instruction. The meteorologist, Dr. Aksel Steen, was my magnetic counsellor at home in Norway, before the departure of the expedition, and many a good bit of advice did he give me. The astronomical equipment was for the greater part due to Prof. Geelmuyden.

The Eskimo came and went now as often as they liked, and in a short time became quite at home with us. Towards Christmas they all disappeared, with the exception of an old man, Teraiu, with his wife, Kaijoggolo, and little son, Nutara. They came and lived with us during the whole of the coldest part of the winter, the rest of the tribe having gone westward to capture seal.

Christmas was now approaching with rapid steps, and countless preparations were made. The days had begun to be shorter and the cold sharper. Then came Christmas Eve, the first on board the *Gjøa*. The weather was splendid, absolutely still, and sparkingly bright. The thermometer -40° Fahr. [Fahrenheit] (-40° C. [Celsius]). And what a Christmas Eve it was out here! Was not heaven itself sending us a greeting? The most glorious aurora we had yet seen lighted up the entire sky, in chasing rays from the horizon towards the zenith. The rays seemed to be racing one another, racing to see which would be the first in the wild chase. Then they all suddenly unite, as if at a given signal, and change into the shape of a soft, delicately-formed ribbon, twisting in light and graceful movements. It is as if the unquiet beams had now sought rest. Are they, perhaps, thinking of something new? Then suddenly the beautiful ribbon is, as it were, torn in many pieces. Again begins the chase, again the wild flight. It is difficult to imagine what the next step will be. It seems as if the zenith would now be chosen as the central point for the whole movement. And so it is. Suddenly, as if by magic, the most glorious corona streams forth from it.

Christmas goes, the New Year comes. The many holidays have already begun to tire us, and we take up our work again with pleasure. The first item on our programme is the equipment for my approaching sledge journey to the immediate area of the magnetic pole. The original plan was that I should make this expedition with one companion and provisions for three months, supported by a relieving expedition under Lieut. Hansen with one man. There were consequently four of us who were obliged to have their things in order by a certain date. In one thing there was a general consensus of opinion, namely, that Eskimo fur garments were the most suitable for this climate. We had, therefore, taken time by the forelock and bartered with the Eskimo for the lightest and finest reindeer-skin clothing we could get. After many small trials, too, we all agreed that snow-huts were far superior to tents when the temperature was below -22° Fahr. (-30° C.). I therefore started a class, with old Teraiu – the Eskimo who stayed with us, with his family – as teacher. We all four joined, and now built a snow-hut regularly every forenoon. Sometimes one of us was master builder and the others masons, sometimes the other. Old Teraiu, who could not understand what we were building all

these huts for, shook his head pensively, evidently in the conviction that we had taken leave of our senses. Sometimes he would throw out his arms to indicate the overwhelming number of houses, and exclaim, "Iglu amichjui—amichjui—amichjui!" Which means, "This is a dreadful lot of houses." But in this, too, we arrived at what we wanted: we became at last good snow builders.

On February 29 we took our sledges up on to the heights in order to be ready for a start the next morning. The day for the beginning of our sledge-journey broke clear and still. The temperature was not exactly summery, the thermometer reading nearly -64° Fahr. (-53° C.).

One sledge had a team of seven, mostly young dogs, for we had lost all the others during the course of the winter from one or other mysterious disease: the other sledge was hauled by three men. We found it difficult to make any way; the sledges ran badly. The snow in this severe cold was like sand, and advance very heavy. After terrible labour we made 4 miles the first day. Before we could go to rest we had to build our house. Thanks to the many huts we had built before that winter, we did this fairly quickly – in about an hour and a half. The temperature, which had sunk to about -70° Fahr. (-57° C.), did not tempt us to be out longer than was absolutely necessary. As soon, therefore, as we had finished the hut, we went in and walled up the entrance with a large block of snow. The cooking apparatus was set going, and it was soon warm and cosy in our little snow-house. In spite of the low temperature – about -77° Fahr. (-62° C.) – the lowest we observed, we spent in all respects a comfortable night. The next day, after ceaseless toil from morning to evening, we managed to cover 3½ miles. I realized now that this sort of thing was not good enough, and decided to make the depôt where we were, return to the vessel, and wait for warmer weather.

On March 16 I again made another attempt to move this depôt somewhat farther out. It was on this trip that we first met with the Nechjilli Eskimo, and accompanied them home to their snow-huts, which lay among the pressure ridges in Rae [S]trait. Our first meeting with this tribe was thoroughly friendly and hearty. Their camps consisted of sixteen snow-huts, inhabited by about a hundred people. In appearance and dress, they were exactly like our former friends the Ogluli Eskimo.

When my companion and I were about to begin to build our house of snow, they all came and gave us to understand that they wished to help us. We gladly left the work to them, and after the lapse of half an hour our hut was completely finished. The following morning occurred a scene which

very clearly shows in what respect the whites are held among these savages. From our earlier Eskimo friends, the Ogluli Eskimo, we had learned that the word "miki" meant a dog. As all our dogs were young and not up to much work, I asked one of our new friends – a man named Attikleura, who appeared to be the chief of the tribe – to lend me his dogs the next day. He thought a good deal when I asked him to do this, looked at me, and smiled faintly, but made no answer. I, however, did not give in, but repeated my request. He nodded his head, and we did not mention the matter again, as I now considered it settled. When I came out of the hut in the morning, Attikleura's little son was standing near the door. I did not take much notice of him, but went on to his father's hut to ask what had become of the dogs. I naturally used the word "miki" which I had learned. He looked at me in astonishment, and made me understand that I had got his "miki." As I persistently denied this, he made signs to me that we should go out. He went straight over to his little boy, pointed to him, and said, "Ona mikaga," which is to say, "Here is my boy." Now everything was clear to me. "Miki" did not mean with this tribe "dog," but "child." So great was then their fear of us that he had without demur given his son away. I let him understand that I had made a mistake; the whole thing ended by hearty laughter on both sides.

After two days' march we came across, at Matty [I]sland, a small camp, consisting of six huts. These belonged to some Ichjuachtorvik Eskimo, as they called themselves, who were from the east coast of Boothia Felix, near the place where Ross wintered in the *Victory*. These people made a very bad impression on me, and I said to my companion in the evening that we had better lash everything securely on the sledges, and let the dogs sleep near them. In the morning when it was time to start we missed a saw, an axe, and a knife. I made the Eskimo understand that they must return the stolen articles, but they pretended that they had no knowledge of the matter. After addressing myself to them two or three times in vain, I grew tired of it, and got out one of our carbines. I then explained to them as well as I could that I knew who the thieves were, and that I would shoot them if the articles were not given back. This worked. The things were returned in a hurry. I did not dare to make any dépôt in the neighbourhood of these thieves, but retraced my steps, and confided everything to the care of our new friends, the Nechjilli Eskimo. I was never disappointed in the confidence I placed in these people; they were what they appeared to be from the very first moment – thoroughly honest. Quite a crowd of them joined company with us, and returned to the *Gjøa*, staying with us for a few days.

On April 6 I started off with Sergeant Peder Ristvedt to make magnetic investigations in the vicinity of the pole. We were equipped for three months, but our nine dogs were not equal to drawing the heavily loaded sledges. We had a couple of Eskimo with us who were going out to capture seal. It was a lovely day, and curious as it may sound, felt quite summer-like with a temperature of -22° Fahr. (-30° C.). We had, of course, been used to a much lower temperature during the two preceding months, February giving an average of about -45° Fahr. (-43° C.). This was the reason why we perspired as if we were in the tropics that day with its -22°. We had to throw off garment after garment, and only stopped when modesty demanded it of us. This sledge trip was not very successful. An injury to my leg, which I incurred, kept me lying in my bag for a week. I had, however, the satisfaction of getting as close to the pole as was necessary. We had been obliged on our way to cache one of our sledges, and provisions for a month, in order to hasten our advance. This was, unluckily, in the neighbourhood of the Ichjuachtorvik Eskimo hunting grounds. When we came back to fetch our things, everything, with the exception of 10 lbs. [pounds] of pemmican, had been stolen. We were thus obliged to return home after only two months' absence.

In the beginning of June, large numbers of Eskimo appeared at the ship with blubber and skins of seals for sale which they had caught during the course of the winter months. We paid them in wood and iron. In the middle of July most of them left us again, to hunt reindeer and catch salmon in different directions. In the summer of 1904, Lieut. Hansen went [on] a rowing expedition with one man to Cape Crozier, about 100 miles distant, to put down a large dépôt. The latter was for use on his sledge-journey to the east coast of Victoria [L]and, planned for the spring of 1905. Gustav Wiik had all this time had sole charge of the magnetic observations of the station, and had done excellent work. The summer was short and cheerless. The vessel slipped the ice on July 22. Of birds of passage we saw swans, geese, loons, ducks, eiders, and many small birds. The ptarmigan came in March and went in November, the only stationary animals were the Arctic fox, the stoat, and the lemming. The vegetation was rich, and large tracts were to be seen quite covered with flowers. There were butterflies, flies, and some other insects, not to omit several milliards of gnats. The winter set in somewhat earlier this year than the preceding one, and the ice formed a week sooner. The reindeer, of which there had been great numbers the previous autumn, were this year very seldom to be seen. The whole of our winter provision thus consisted in 1904 of only twenty deer, and these we had shot far inland, whereas, in 1903, we could have killed as many as we liked quite close to the vessel. However,

the Eskimo, who had spent the summer reindeer-hunting in Northern America, brought us a quantity of venison, and from other quarters we procured salmon, cod, and trout, so that we were well provided for the next winter too. In the middle of October the Eskimo returned from their summer excursions, and then visited us in great numbers, but went off again to fish before the darkest part of the winter set in. Towards Christmas they returned to the vessel, and we then had the pleasure of their company for nearly two months. On November 20 we had a visit from an Eskimo family of a quite strange tribe. They proved to be Kinepatu Eskimo from Chesterfield [I]nlet, near Hudson [B]ay. The man's name was Atagala. He knew English sufficiently to explain that near where he lived two large vessels were lying. For an old Mauser rifle and four hundred cartridges he undertook to take a mail down to them and return with an answer, about 1500 miles. On May 20, the next year, a sledge-team of ten dogs swung into our harbour. It was Atagala. He brought us a mail from the *Arctic*, a ship belonging to the Canadian government, which was wintering at Cape Fullerton, in Hudson [B]ay. She had originally been the *Gauss*, and was built by the German South Polar Expedition, but was now out to inspect and choose suitable spots for small garrisons. Major Moodie was in chief command, and Captain Bernier in command of the ship. An American whaler, the *Era*, was also wintering at the same place. Captain Comer, of the *Era*, and Major Moodie sent me ten sledge-dogs, as I had written to the former, telling them that the greater number of our dogs had died in the course of the first winter.

During our seventeen months' intercourse with the Nechjilli Eskimo we became by degrees so intimate with some of them that they little by little lost the mistrust they usually have for strangers, and showed us complete confidence. We, however, never really acquired their language, and, consequently, could not thoroughly understand their life. What I have to tell about them, however, is based partly on careful observation, and partly on information from the Eskimo themselves, and this being the case, I venture to think that my information regarding one of the most interesting and least-known races of the world is correct. What adds greatly to the value of these searches is the series of splendid photographs taken by Lieut. Hansen during our sojourn in those parts.

Nechjilli, which the Nechjilli Eskimo look upon as their home, are the banks of the great Willersted [L]ake on Boothia [I]sthmus, and of the little bit of river which flows from the lake into the sea. Unfortunately, we never had time to pay them a visit, but from the Eskimo's often repeated descriptions I know what the country looks like, and what their life is there. From the time

the ice breaks up in June or July to January or February the next year, it is here that they live – in summer in their tents, and, when the snow falls, in their snow-houses. Often in transition periods, from winter to summer and summer to winter, when the snow – as it is in the month of June – is too waterlogged to be used for the building of entire snow-huts, they are obliged to use a construction the walls of which consist of snow and the roof of skins, a combination of snowhut and tent; or, as often happens in September, when the cold strikes in and the lakes freeze before the snow comes, they are obliged to construct a building of ice with a skin roof.

When an Eskimo is about to build a snow house, he is always careful first to consult his “hervond.” This is simply a stick of straightened horn taken from the antlers of the reindeer. At the lower end it has a ferrule of musk-ox bone, and at the upper a handle of reindeer bone. It is about a yard long. With his keen glance he now scans the country, and at the place which pleases him best thrusts his “hervond” into the snow. He does this in order to find out its quality, for it is as important for an Eskimo to find good snow for his building as it is for a bricklayer to have lime for his stone. A very long experience is required in order to test the snow in this manner, and, when several Eskimo are together, it is a task generally left to the oldest ones. The most suitable snow is that of a solid and compact kind, with a superincumbent layer of loose snow, about a foot in depth. Nor must the underlying snow be too hard, or it will be difficult to cut out the blocks. The site once chosen, the upper loose snow is shovelled away, and is laid round the spot where the house is to be. When the underlying hard layer is laid bare, the builder begins with his knife – which is usually long-bladed and long-handled – to cut out and build up the blocks. The house is constructed from inside, and the blocks are cut exclusively from the building site: it is seldom that an Eskimo has resort to the snow outside. The blocks are cut out of snow with a high edge, and that is the reason why the site can contain sufficient material. The hut is built spirally, in such a way that the succeeding block is always supported on a preceding one, and in shape much resembled a large beehive. Our greatest difficulty was always when we had to decrease and build the roof. The blocks are then placed in a very inclined position, one may say almost rocking. But the Eskimo are born to this way of building. Where one of them puts the block there it stays, even if it forms an angle of 45° with the horizontal plane. The structure is completed by a little, dexterously placed, plug of snow in the apex of the roof. After the house is up, there will be a mass of refuse snow lying inside it. With this the sleeping-bench and fireplace are made. Meanwhile, the lady of the house has not been without occupation outside.

The loose snow, which was shovelled away at the beginning, she uses to caulk all the holes and cracks with, and if she has any to spare she throws it over the entire house, which helps a very great deal in making it warm and draughtless. When all is finished inside, an aperture is cut in the wall of the same height as the bench. The man comes out and the woman takes his place. First of all, the large watertight kayak-skin is handed in and is spread over the entire bench; then comes the turn of all the reindeer-skins – soft, large, and warm; then the rest of the effects, such as cooking-utensils, a drying-grill, blubber for the lamp, and a number of other things which the Eskimo find indispensable. When all this is done, the housewife is walled in. It will be asked, What was this immured lady doing inside the hut? Perhaps it will not be indiscreet of me to poke a little hole in the wall and peep in. In the name of knowledge everything is permissible, so with a “ski” staff, which I happened to have with me, I made a hole in the wall and opened a way into the sight of this mysterious interior.

The first thing she does is to put the lamp in place and make a fire. After that she fills the cooking-pot with snow, and hangs it over the flames to melt into water for her thirsty husband. As soon as she is satisfied that the lamp-flame is burning to its greatest extent, she turns her attention to arranging other things, the sleeping-bench is levelled and flattened, reindeer-skins placed in order on it, and everything made as comfortable and cosy as possible. All being arranged, she seats herself before the fireplace and seems to be particularly anxious to make the fire burn as brightly and give out as much heat as possible. Now I understand why it is she is walled up in this house – in order to warm it and make the blocks of snow sink, so that the whole will form a close and compact wall. But she will certainly not succeed in this if I continued at my peeping, so I fill it up again and take myself off. Meanwhile, the man has built the passage, 9 to 12 feet in length, which leads into the house. But he will certainly not dare to make a hole in the wall and put it in communication with the interior of the house before he receives higher orders from his better half. He amuses himself meanwhile with his friends, who are in a similar situation, and whiles away the time in joking and conversation. They are a fine group of men who are standing there, ranging tall, from 5 feet 9 inches to 6 feet, though there are some short ones among them. They are powerfully built, the life they lead inducing all-round development. The ladies’ pellucid voices are now heard, and the expectant husbands can complete their structures by knocking a hole through the wall from the passage to the hut.

Let us now pay a visit to one of these camps, and see what Eskimo life is here in these burrows of snow immediately after their construction. The huts are of different sizes. Some people like them high, some low. The circumference is from 30 to 45 feet, according to the size of the family. It is the month of January, and the cold is severe. They, therefore, live two families together, so as to be warmer. The members of the family have just assembled after the building operations and a long day's sledging. The housewife sits in her accustomed place and croons her monotonous chant, consisting of four words and as many notes, which are repeated in varying forms. These sounds, when they are repeated often enough, we found unendurably monotonous. Politely to request them to be quiet was of no use; but we found another most effective means, namely, to give a vocal performance of our own at the same time. Then we had peace, for our many tones, no doubt, sounded as awful to Eskimo ears as their four did to ours. Well, this was not very polite on a first call, but, anyhow, they were not offended.

The first thing an Eskimo does when he enters his hut is to take off his outer coat and beat all his clothes quite free from snow. This he does so that the latter shall not have time to melt and wet his clothes. If he intends to be in the whole evening, he takes off his other outer garments. If any of them have become wet during the course of the day, they are thrown to the lady of the establishment, who puts them up on the grill to dry. His hunger has now to be appeased, and the most tempting pieces of meat and fish are brought out – of course, frozen stiff. But this does not affect the Eskimo in the least; once down it melts soon enough, and enormous quantities disappear. Their knives are their only eating implement, but these they handle with dexterity. They hold the piece of meat fast with their teeth and the left hand, and with lightning rapidity pass the knife right under their noses, and cut off a piece of meat so close in to their lips that one is astonished that the latter do not go too. One large bit of blubber after the other goes the same way.

The family having thus finished this important business, a nap will possibly be to their taste, and the entrance is carefully bricked in from the inside. They now proceed to undress till they are quite naked, and then sleep the sleep of the just under large coverings of reindeer-skin shared in common, possibly till late the next day. This, however, depends upon whether they have enough food. If the man intends to live here for any length of time, he chops himself a window the following day out of the ice on the nearest fresh-water pool, and inserts it in the wall immediately above the entrance. His

dame can then see to do her work by daylight. She has plenty to look after. She sits by the fire, which is her accustomed place, with her legs tucked up under her, and watches the flames and her offspring, who are running in and out playing. She smiles and looks absolutely happy. Probably it is the two small physiognomies, encrusted with soot and train-oil, which call these pleasant thoughts. It is not so long since the youngest left her hood, where children are carried till they are about two years old. Their play grows less by degrees, and the youngest one goes up to his mother and looks inquiringly in her face. She knows her boy, she does. The children here are not weaned so quickly, and mother's milk is to their taste long after they begin to walk. I have even seen boys ten years of age lay their arrows aside and take part in the repast.

But see, here comes a friend, of the same sex, of course. She has come to pass the time of day; is bored, perhaps, in her own hut. It is Alo-Alo, a young and attractive woman. The sharp cold has given her a fresh colour, and the pretty brown eyes with the blue whites look very much as if they could hide something behind them. Out of her hood sticks up a little wondering face; it is her year-old son "Akla," or the brown bear. Conversation is soon in full swing, and the two women seem to have a great deal that is amusing to tell one another. Suddenly the baby in the hood begins to move, and with incredible rapidity and quite unparalleled adroitness changes place from the hood to his mother's lap. He has his wishes complied with, and is going to be put back in his warm, cosy place, when his mother discovers that he is more than usually dirty to-day. The washing process which then takes place must be very practical when water is scarce. She licks the child clean, and then puts him back. If it has been a fine day, the men have been out on the ice to capture seal, and are now coming back in the dusk. They seldom return home empty-handed, but have a seal or two with them, which are then handed over to the housewife, who has to see to their partition. The entrails, which are the greatest delicacy they know, go to the one who has caught the seal; the rest is divided among all. After supper they often require a little diversion in the long winter evenings. They then assemble in the largest hut, and spend a few hours together, singing and dancing. These huts are often quite handsome structures, and I have seen them 14 feet high and 25 feet in diameter. On these occasions the women all sit round in a circle and begin their monotonous chanting, the men entering the circle one by one to perform a kind of solo dance, beat a frame covered with thin tanned reindeer-hide, and scream something perfectly dreadful. What astonished me most at these festivities was the singing of the women. I had always

thought that all their tunes – or rather variations on the five notes – were impromptu, but here I had certain proof that they really were songs, for I heard as many as twenty women singing together at these gatherings for a whole hour at a time, without any of them falling out of the melody. In my opinion this almost points to musical gifts.

The next evening the magician of the tribe will perhaps give a representation in the same hut. This is a very serious affair – the only performance we never had an official invitation to. We tricked them all the same, and found out what went on. The hut is made almost dark, only quite a little flame being allowed to burn, which, of course, made things the more mysterious – complete darkness would be too dull. The magician and his assistant (usually his wife) take their places on the bench, and the company sit at the other end of the hut. Absolute darkness broods over the performers. The two now begin to utter loud howls, and, on the whole, lead one to suppose they are killing one another. After this farce has been going on for half an hour the noise grows less, and by degrees everything becomes quiet. The light is made stronger, and, to the apparent surprise of everybody, the magician now exhibits two holes in his coat, which, before the light had been subdued, was quite whole – one hole in his chest and the other in his back, and they go to prove, of course, that during this turbulent scene he has run himself through with his spear. Judging by appearances, the Eskimo all take this very seriously; but when later I joked with them about it they laughed and said that the whole thing was nonsense.

Any real sign of astonishment these people seldom show. One of the few times that I can remember seeing any trace of this was when I sent a messenger to the ship – I was then in camp about 10 miles away taking magnetic observations – with a letter in which I asked for a certain quantity of ammunition. When he returned the next day and I told him before he gave me the consignments that I knew how many cartridges he had with him of each kind, and that he might count them himself, he was astonished to see that I was right, and much impressed by the use we put our writing to. They often amused themselves later by scribbling some strokes on a bit of paper and giving it to us. We always pretended to be highly astonished, and read it out loud; this greatly amused them. Family life gave us the impression, as a rule, of being happy, though I know of cases where the husband ill-treated his wife. The male sex being so much more numerous than the female, it was not unusual to find marriages where the wife had two husbands. The reverse relationship I never met with. In general, the husband was spokesman and

the wife obeyed blindly, but elderly widows were sometimes personages of great influence.

The religious opinions of the Eskimo were like our own in that they had an understanding of a good and an evil being, of punishment and reward. If a man had behaved as he should in this life, then he would go to the hunting-fields in the moon; and had he been a bad man he must go under the earth. During the whole of our stay among them there only occurred, as far as I know, four births and two deaths. The latter, in both cases, being suicide. It is not considered to be wrong; but is, however, only resorted to when the pain in an illness is too great to be borne. The way in which they do it is, I think, peculiar to them alone. A sealskin thong is stretched across the hut 2 feet above the floor. The sick person is left alone in the hut and the others go outside; they, however, have peepholes in the wall, through which they follow events. The sick person now kneels down and endeavours to suffocate himself by pressing his throat against the strained thong. If the unfortunate person is unable to do the business for himself, or it seems to be taking too long, one of those outside comes in and expedites matters by pressing his head down on the thong. Fighting with closed fists occurs now and then, and murder is not unknown. It thus happened in the summer of 1904, at the station, that a boy twelve years of age accidentally shot another boy of seven in a tent. The father of the boy who was killed immediately seized the other, who, for that matter, was his adopted son, and dragged him out of the tent and stabbed him to death. Their dead they sew up in a reindeer-skin, and lay them on the ground. A few articles, such as a bow, spear, arrows, and other things, are placed beside them. We found many an interesting object in this manner.

On April 2, Lieut. Hansen and Sergeant Ristvedt started on their sledge-journey to chart the east coast of Victoria Land. They had two sledges, twelve dogs, and equipment for seventy days. The provisions were measured as shortly as possible so as to reduce weight. All the same, it is very necessary on a long journey of the kind that everything should be carefully planned so as really to hold out the requisite time. The depôt, which had been made the year before, had been entirely spoiled by bears, but Lieut. Hansen and his companion shot bears, seals, and reindeer, and thus spun the journey out for eighty-four days. Excellent work was done. The east coast of Victoria Land was charted right up to the 72nd parallel. The land, formerly seen by Dr. Rae, at the south end of Victoria Strait, proved to be a group of over a hundred small low islands. These were charted on the way back. An interesting event from this journey was the meeting with another unknown Eskimo tribe, the

“Kiilnermium Eskimo,” whose hunting-fields extend from the Coppermine [R]iver eastwards. These Eskimo, like the others mentioned, have no connection with civilization. We, of course, received our bold companions with flags waving on their return, and a feast to commemorate it.

On June 1 we dismantled the observatory containing the magnetic self-registering instruments. For nineteen full months Wiik had kept this going, and had done work which will, without doubt, be rich in results.

On August 13, at three o'clock in the morning, we continued our way westwards, and I am not sure that the little brown-eyed people in there on the beach were quite cheerful that morning. Hardly, for they were losing several rich and great friends. They waved long to us – probably a farewell for life; and if some traveller, many years later, pays this place a visit, the numerous tent rings will remind him of the many happy days the *Gjöa* expedition spent here with their friends the Nechjilli Eskimo. The day afterwards we stopped at a place called by the Eskimo, Kamiglu. Here we took an Eskimo boy named Manni on board. He won us one and all by his openness and honesty; and even the cook, who hated Eskimo, had I think a warm feeling somewhere at the bottom of his heart for him. It was my intention to bring him home and show him a little of the world he could never have imagined, and to send him back again, in the event of his wishing it; but he was accidentally drowned at Herschel [I]sland. After passing through narrow and shallow waters we came out, on August 21, in Dolphin and Union [S]trait. Now we could breathe! On the forenoon of August 28, we sighted a sailing-ship. It was a proud moment for us all when we hoisted our flag and bore down on the American.

On September 3 we were stopped by ice at King Point, and soon after that were beset for a third winter. However, we were in high feather all the same; on the shore lay the finest driftwood that could be desired, the sea was full of fish, and not far off there were hares in thousands. On the shore, some fathoms in past us, lay the nipped whaler *Bonanza*. The first thing we did was to build ourselves a house of drift timber, and after that the observatories were put up. From October 20 to March 12 I was out travelling with the *Gjöa's* mails, Lieut. Hansen having command on board meanwhile. This winter was exceedingly severe and disagreeable. On my return everything was in the best order; but on March 26 [Wiik] became ill and had to take to his berth. He died on the 26th. It was a hard blow to lose a comrade so near home. It was not until May 9 that we were able to bury him, the ground up to then being too hard frozen. In the [meantime] his coffin stood in our dwelling house on shore, which we gave up to it, nailing up the door. Later on we put

up a large cross with an inscription on it at the north end of his grave, and when the flowers came, decorated it with them. It is situated on a very prominent point, and will be a landmark for the numerous ships which pass by it.

The spring was a cheerful time. The continual passage of Eskimo and whites made the time pass quickly. On July 2 we got out of the ice, and brought up under the *Bonanza*, so as to avoid the ice which was drifting backwards and forwards in the land lead.

On July 11 two of the American whalers came to our place to collect driftwood, and the same evening we stood out. We took a last farewell of our comrade whom we were leaving behind us out there, and dipped our flag as a last mark of honour to him as we passed under his grave. Already at Herschel [I]sland we were stopped by the ice, and were kept there a whole month. After many narrow passages and abrupt turns, we stood down [Bering Strait] on August 30. The day afterwards we went into Nome, a gold-digging town in Alaska. The reception we received and the enthusiasm our enterprise had aroused there we shall never forget.

On September 5 the *Gjøa* set sail southward under Lieut. Hansen's command for San Francisco, and on the 7th I left with the magnetic instruments for Sitka, in order to conclude our work. On October 19 we met again in San Francisco, where we confided the vessel to the hands of the American navy. There rests the old *Gjøa*, and greatly does she need it.

3

Why *St. Roch*? Why the Northwest Passage? Why 1940? New Answers to Old Questions

Shelagh Grant*

For almost half a century, the reasons behind orders sending the Royal Canadian Mounted Police (RCMP) schooner *St. Roch* through the Northwest Passage during the Second World War have puzzled historians and other scholars. True, there were rumours of a defence-related mission, but there was no hard evidence, no tangible proof. Nor did the captain, Sergeant (Sgt.) Henry Larsen, provide many clues other than that “Canada was at war and the government had realized the need to demonstrate the country’s sovereignty over the Arctic islands,”¹ a statement not verified in official documents. Then, unexpectedly last year, during research on Canadian wartime relations with Greenland, two memos were found in RCMP archival files that directly linked the voyage of *St. Roch* to a government plan to defend and occupy the island in the spring of 1940.² Subsequent evidence from Larsen’s personal papers confirms that the captain was fully aware of the original purpose of his mission.³

Although these memos might appear to contradict Larsen’s own explanation, careful study of the documents and related circumstances suggests that the reference to sovereignty in the autobiography published posthumously could also be defined in very broad terms to include security considerations. Omission of any reference to the initial motive behind the orders was entirely in keeping with his responsibility as a member of the

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Royal Canadian Mounted Police to maintain a confidence in the national interest. Today, the rationale for that secrecy is no longer valid, and the once-secret documents explaining the circumstances and events are now accessible to the public. Perhaps it was a stroke of fate that this information should come to light during the fiftieth-anniversary celebrations of the venerable ship's historic voyage through the Northwest Passage. Along with pride of achievement is now added new pride of a greater purpose.

What was the crisis that triggered Canadian plans to occupy Greenland, and what possible role was the RCMP expected to play? These questions involve a much longer narrative, already related by James Eayrs and C.P. Stacey, whose accounts were based primarily on files originating with External Affairs and National Defence respectively.⁴ The RCMP commissioner's files do not contradict these narratives, but they do add further details of police involvement. A synopsis of events provides background to the involvement of *St. Roch* and explanation of the secrecy surrounding her mission.

In the winter and early spring of 1940, public attention was focused on events abroad as Germany advanced across Europe. When Denmark fell on 9 April 1940, British and Canadian military strategists were understandably concerned about the future of the Danish colony of Greenland. In light of the increasing German U-boat activity in the North Atlantic, defence of the large ice-covered island was considered a matter of high priority, partially because of its location on the periphery of North America and its excellent harbours for submarine bases, but also because of the cryolite mine situated on the shores of an isolated twelve-mile fiord in southwest Greenland.

Cryolite was crucial in the production of aluminum, and this one mine represented the only natural source available to the Allied war industries. Although a synthetic substitute had recently come on the market, the Greenland mine was the only known source of the raw mineral, with the only refineries being in Denmark, the Penn-Salt Company in the United States, and the Aluminum Company of Canada (ALCAN), located at Arvida, Quebec. Previously, Britain relied on production from Danish smelters and to a lesser extent upon Norwegian refineries that used the synthetic alternative. With both countries now in German hands, the Allies were dependent on United States and Canadian production. As long as the United States remained neutral and was utilizing vast quantities of aluminum for its own war industry, it was considered urgent that ALCAN gain assured access to the Greenland cryolite. Should Germany have decided to take over or

merely sabotage the mine, the effect would have crippled the British and Canadian war efforts.⁵

Adding to the urgency were “reports of enemy ships heading in the direction of Iceland and Southern Greenland”⁶ and requests from the United Kingdom “of utmost importance to obtain maximum possible tonnage of aluminum from Canada.”⁷ Encouraged to take action by officials of the U.K. government⁸ and the Aluminum Company of Canada,⁹ it is not surprising that Canada would seriously consider all means to protect Allied interests. At first hesitant to commit forces and concerned about the “danger of disturbing American opinion,” Mackenzie King finally agreed, with the proviso that Canada was merely looking into the defence of Greenland in cooperation with British forces, otherwise Canada would be “blamed for taking over.”¹⁰

High-level discussion followed based on reports prepared by External Affairs.¹¹ Initially, the objective was clearly precautionary: “to prevent enemy nationals gaining a foothold there and giving them an opportunity to sabotage the cryolite mines.” In the Royal Canadian Navy’s (RCN) estimation, only a small force would be required to occupy the island, “and a small police detail at the two or three more important centres is all that will be necessary to maintain.” Whether this was a realistic assessment or not, the navy did not have frigates or destroyers available for the mission, nor would “any of these ships be risked in the ice conditions prevalent in the Davis Strait.” Instead, it was suggested that CGS *N.B. McLean* could “easily be armed with 4 in. [inch] guns.”¹²

On 14 April, a sub-committee meeting chaired by the director of Military Operations and Intelligence supported plans for the defence of the mine and occupation of the former Danish colony, with the recommendation that an advance party of one hundred – including twelve RCMP officers and constables – proceed to Greenland in early May aboard the icebreaker CGS *N.B. McLean*. The expedition was given the illustrious name of “Force X,” and all supplies and participants were to be mobilized and ready for departure within two weeks. Their task was to select gun sites and lay out a military camp in preparation for the arrival of the main contingent. Clearly, though, RCMP detachments were considered critical to the success of the mission.¹³

The Chiefs of Staff Committee subsequently issued a formal document that expanded on the details to include specific lists of participants and necessary equipment. The main body of the occupation force would constitute an army unit of approximately 250 to arrive in early June. In

addition to the mine location, small occupation forces would be posted to the two Danish administrative centres, Godhavn and Godthaab, on the west coast of Greenland. The cost of establishing and maintaining the occupation forces for one year was estimated at \$585,000, excluding purchase of armaments and RCMP expenses.¹⁴

After the 14 April meeting, Inspector (Insp.) T.B. Caulkin, A/A/C "G" Division, sent a memo to the commissioner suggesting the names of four officers for Greenland duty. He also raised the question of employing *St. Roch*:

It is considered that the R.C.M.P. schooner *St. Roch* would be of inestimable value to our Personnel stationed at Godhavn and Godthaab and would be in communication with the Force Headquarters by wireless.

If approval is given to have the *St. Roch* proceed from the Pacific to the Eastern theatre, I feel confident that Sergt. [Sergeant] Larsen would prove a valuable man in that area in several different ways.

If the *St. Roch* should go, consideration might be given to increasing the personnel on the boat, also whether she should be armed with at least a machine gun.

Further, arrangements would have to be made for some fuel to be sent in for her, such as diesel oil, etc., this could be despatched from Montreal later.¹⁵

Considering that, in 1940, Canada had no arctic airstrips and no RCN vessels available for polar navigation, the RCMP schooner was a logical support ship and patrol vessel.

After the retirement of CGS *Beothic* in 1932, the Canadian government had rented space on the Hudson's Bay Company ship *Nascopie* for the Eastern Arctic Patrol, which supplied the RCMP posts and provided medical aid to the isolated communities. While *Nascopie* was also participating in the war effort, it was still needed to supply the company's fur trading posts. Thus, it was logical that the RCMP should have its own means of supply and transportation in the Eastern Arctic quite apart from other duties it might fulfill as part of security measures. *St. Roch* was the only ice-capable police vessel of any appreciable size available for arctic patrols and, if necessary, to serve as a communications and supply link with the proposed Canadian occupation forces in Greenland and the newly established consulate. The ship's home port was Vancouver, as its primary function since 1930 had been to supply and patrol the Western Arctic. The plan to bring the ship to the Eastern Arctic through the Northwest Passage seemed a logical solution,

since a southern route through the Panama Canal would have destroyed any attempt at keeping the mission secret.

As a consequence, on 16 April, Commissioner Wood wrote to Insp. James Fripps, of the West Coast "E" Division, with explicit instructions to contact Sgt. Larsen and discuss the matter. Fripps's reply was:

Strictly Confidential Vancouver, B.C. 22. April. 1940.

Re: Schooner "St. Roch" — R.C.M. Police,

1. This will acknowledge receipt of your letter dated the 16th inst. [instant], on the 19th. inst. I proceeded to Victoria and on the 20th inst. I discussed the matter with Sgt. Larsen that it was your intention if possible to have the schooner "St. Roch" proceed through the North-West Passage to Greenland after she had discharged the supplies for Coppermine and Cambridge Bay Detachments. Sgt. Larsen stated he would be pleased to make this proposed patrol as he always had a desire to travel through the North-West Passage. He recommended that the St. Roch should pass through the North-West Passage during the month of August, not later, and to do this it was absolutely essential that the "St. Roch" depart from Vancouver not later than the 20th. of June next.
2. Further he recommended that no extra duties should be given to the "St. Roch" other than delivering supplies to the Detachments. Sgt. Larsen will require an Admiralty Chart of Greenland and the North-West Passage. This would include Baffin Island.

Fripps concludes the memo with "I impressed upon Sgt. Larsen that this matter was to be treated strictly confidential and not to be discussed with any other member of the Force." He also refers to a previous request for a "sea skiff" and outboard motor made by Larsen to Insp. Caulkin while in Ottawa.¹⁶

Together, these two memos testify that approval for *St. Roch's* voyage was not confirmed until mid-April, that approval was related directly to the proposed occupation of Greenland, and that besides Larsen and Commissioner Wood, both Insp. Fripps and Insp. Caulkin were fully informed of the plans. The second memo also confirms, however, that Larsen was indeed in Ottawa in early spring and, as suggested in his autobiography, may well have discussed the feasibility of taking the ship to the Eastern Arctic with his commanding officer and perhaps informally with the commissioner. Formal approval came later.

Additional evidence supports the contention that Larsen was fully aware of the primary purpose of the voyage. In correspondence with the current RCMP commissioner in 1957, Larsen defended himself against implied criticism by the captain of *Nascopie* and explained the circumstances leading to *St. Roch*'s voyage through the Passage in 1940–42:

The reason for this, I believe, was that prior to the "St. Roch" leaving Vancouver on its eastward journey through the Arctic, Denmark had been invaded and Greenland was more or less left on its own. Had the "St. Roch" managed to navigate the Northwest Passage that year it is my understanding that our Government was planning to send her to Greenland. I believe also that a Canadian Consulate was established in Greenland about that time, and I understand this was one of the reasons why the "St. Roch" was instructed to proceed eastward in 1940.¹⁷

The last statement is particularly important, since discussion of a Canadian consulate in Greenland did not arise until April 1940 and was not approved until mid-May. This reference to the consulate partly explains the continuation of the voyage after the "occupation" plans were cancelled. Larsen also claimed that the fuel left at Pond Inlet by *Nascopie* in 1940 was for use by the RCMP ship that was expected to winter in Greenland¹⁸ or "some designated spot in the Eastern Arctic."¹⁹ The question of who would protect or defend Greenland was not officially decided until the following year. In the same letter, Larsen also alludes to sovereignty reasons and "being utilized to advantage in the Eastern Arctic," with specific reference to the closure of the police posts at Dundas Harbour, Craig Harbour, and Bache Peninsula.²⁰ This rationale was likely part of earlier informal discussions, since sovereignty concerns *per se* do not appear in the memos confirming approval and instructions in mid-April, unless defined to include national security and defence. When considering the 1940 police memos, together with Larsen's later explanations, it appears there may have been multiple reasons for the voyage, perhaps shifting in priority relative to changing circumstances in 1940.

In wartime especially, events rarely happen as planned, and the Canadian strategy to occupy Greenland was no exception. The initial rationale for "Force X" was the mistaken belief that a small Canadian occupation force would be more acceptable to the neutral United States than British intervention, which would have clearly violated the principles of the Monroe Doctrine.²¹ This opinion could not have been further from the truth.

At a meeting between Prime Minister King and President Roosevelt on 2 May 1940, Roosevelt made it clear that the United States wished no occupying force on Greenland, but he admitted that if there were a German attack, then "it would be necessary for Allied Naval Forces to take action." Secretary of State Hull seemed to be of a different mind, referring to considerations of the Monroe Doctrine.²² That same day, the acting minister of National Defence abruptly ordered the demobilization of "Force X" and "all action in connection with it suspended."²³ Supplies already in storage were dispersed and mobilization orders cancelled.

As explained in confidential memos and minutes, the U.S. secretary of state was "insistently anxious" that any plans to occupy Greenland be dropped.²⁴ The ensuing discussions and debates clarified the State Department's contention that the current interpretation of the Monroe Doctrine rejected the right of *any* third party to interfere in the political or military affairs of Greenland. As an alternative, the State Department believed the mine could be defended by local residents with armaments supplied by the United States. Pressured by British officials to take action, yet unwilling to oppose the firm wishes of the United States, Canadian officials were caught in a dilemma.²⁵

One might well ask why, if "Force X" was cancelled, was *St. Roch* still proceeding to Greenland? When viewed in retrospect, the emotions and fears attached to Germany's march across Europe may seem unwarranted, but in the summer of 1940, the security of Greenland and the Eastern Arctic was considered critical to prevent the spread of hostilities to North America. And as Canadian fears mounted, a number of defensive contingency plans were hastily set in motion in an effort to stem the advance of the aggressors. With increasing enemy activity in the North Atlantic and without a firm commitment by the United States to defend Greenland, the decision to have *St. Roch* on standby in the Eastern Arctic seems logical. Whether it was feasible depended on the ability of the captain and *St. Roch* to navigate the Northwest Passage.

As events unfolded, the governors of North and South Greenland claimed constitutional powers to take absolute control in the event of an emergency, yet they were without military capabilities to defend against an enemy attack. The Danish minister in Washington, meanwhile, claimed that he in turn represented the two governors and established the American-Danish Greenland Commission to act as an advisory body.²⁶ In 1940, neither the United Kingdom nor Canada was prepared to challenge the legitimacy

of these actions. Still at issue was the status of existing contracts for the cryolite production.

Prior to the fall of Denmark, the Penn Salt Company of Philadelphia had retained a monopoly over the North American market, which involved one-third of the mine's exports. The Aluminum Company of Canada, however, had hoped to acquire the European contracts with the Danish refineries, assuring Allied control of all exports not under contract to Penn Salt. In addition, this would strengthen the wartime economy by adding revenue to the Canadian treasury. The proposal was presented at a meeting attended by representatives of the Canadian and U.S. governments, the chairman of the American-Danish Greenland Commission, and the presidents of Penn Salt and the Aluminum Company of Canada. As expected, the American representatives refused to entertain any proposal that did not give the United States company clear access to the mine's postwar production.²⁷

While negotiations continued in an attempt to resolve the impasse, *Nascopie* had departed from Halifax without fanfare and was heading northward to Greenland, ostensibly "to deliver staple supplies" as a relief measure, but with the expressed hope that "arrangements could be made also for return cargo of about two thousand tons" of cryolite. On board was the Canadian vice-consul to Greenland, A.E. Porsild.²⁸ Others included Canadian artillery officers, mining engineers, and RCMP officers. At the same time, another vessel, *Julius Thomsen*, was en route to Greenland from England, carrying the new Canadian consul and senior diplomat, K.P. Kirkwood, along with several British naval officers.²⁹

Also heading for Greenland and several days in the lead was the United States Coast Guard cutter *Comanche*, carrying armaments and the newly appointed U.S. consul. First on his agenda was a tour of the cryolite mine, which would also allow the American ship to guard the fiord against any uninvited "visitors" who might wish to assume control of the mine.³⁰ In Vancouver, meanwhile, *St. Roch* continued preparations for its voyage through the Northwest Passage.

The arrival of *Nascopie* and *Julius Thomsen* in Greenland did not escape the attention of the outspoken assistant U.S. secretary of state, Adolf Berle, who called two emergency meetings on 3 June – first with British diplomats, then with the Canadians. In his view, the presence of Canadian and British military officers aboard the two ships represented a blatant attempt by the Aluminum Company of Canada to secure possession of the cryolite mine. Admitting he was dispensing with diplomatic niceties, Berle declared that the president had been notified of Canada's actions and had stated he would

be “very angry” if Canada attempted to occupy Greenland. The assistant secretary went on to say that “this was not the time for this type of 1890 imperialism and that the days of Cecil Rhodes had passed.” In his opinion, this incident only confirmed his belief that “the Aluminum Company of Canada was trying to take advantage of the present situation in order to get control of the cryolite mine.” Canadian officials were given a clear warning that the defence of the mine was not their responsibility and that access to the cryolite was dependent upon cooperation with the United States.³¹

Three days later, the question of Greenland’s and Iceland’s futures evoked a long and heated debate in the United States Senate. Citing the Monroe Doctrine as the basis for the U.S.’s right to intervene, the Senate was also told of Greenland’s economic importance, not just because of the cryolite but for its potential resources of mica, graphite, gold, and hydro-electric power. Also discussed was the possibility of negotiating a purchase or takeover of the island.³² Yet, regardless of the urgency expressed in the debate, it was almost a year before the United States would formally and unilaterally assume full responsibility for the defence of Iceland and Greenland. At that time, the United States again firmly rejected Canada’s offer of assistance, stating that its participation was “not required.”³³

Although ice-bound in the Western Arctic the first winter, *St. Roch* continued to plough eastward on its voyage through the Northwest Passage, apparently still under secret orders and with extra supplies for the next year picked up at Tuktoyaktuk. When the Japanese bombed Pearl Harbor on 7 December 1941, the schooner was again stuck fast in the ice, this time just south of Boothia Peninsula. Now well past the halfway mark, there was no recourse but to continue. According to Larsen, by the time they had reached Pond Inlet, the Americans had “pretty well taken over in Greenland.”³⁴ As the fortunes of war continued to favour the Allies in the North Atlantic, *St. Roch* was ordered to return west in 1944, this time via Lancaster Sound.

Given that the 1940 voyage of *St. Roch* was approved initially because of Canadian plans to occupy Greenland and continued for a number of wartime-related considerations, there are still a number of questions outstanding. Why, when acknowledging the fact to his commanding officer in 1957, would Larsen fail to mention the defence of Greenland in his autobiography? Why mention an earlier discussion with the commissioner in Ottawa, if the orders were not finalized and approved until mid-April? Why was the manuscript of the autobiography not published during his lifetime? Are there logical reasons to explain these actions by a man known

for his honesty, integrity, and loyalty to the traditions of the Force? There are reasons – some more obvious than others.

In the first instance, the proposed Canadian occupation of Greenland was “top secret,” and Larsen was specifically warned that “the matter was strictly confidential and not to be discussed with any member of the Force.”³⁵ Indeed, one account alleged that even his wife did not know of the ship’s destination.³⁶ Initially a military secret, diplomatic concerns compounded the potential sensitivities that might result from the inopportune disclosure of the Canadian plans. Thus, it was expected that Larsen and his superiors would be bound by their strict code of ethics to maintain that confidence.

But why was it important to maintain the secrecy about “Force X” over twenty years after the fact? As noted above, both James Eayrs in 1965 and C.P. Stacey in 1970 freely discussed the plans to occupy Greenland in their respective publications covering the events of the Second World War. Here, too, there is a logical explanation, particularly obvious to an historian, concerning the twenty-five-year rule restricting the public disclosure of confidential government documents relating to Canadian–American relations. The fact that Larsen did not submit his manuscript for publication during his lifetime may suggest he had valid reasons. Henry Larsen died in September 1964 – one year short of being released from the limitation of the twenty-five-year rule. Would the manuscript have been changed otherwise? Only Larsen could have answered that question.

Was Larsen less than truthful in his autobiography? Hardly. In the first place, if there were omissions or “poetic licence,” it was only in an unpublished manuscript that continued to “maintain the confidence,” as instructed in April 1940. Likely, Larsen and the commissioner did discuss sovereignty concerns and possible plans for *St. Roch* in the Eastern Arctic as suggested, but apparently without final approval until the Greenland situation became critically unstable. In an earlier report, Larsen did state that it was “the spring of 1940” when they received their assignment from Commissioner Wood.³⁷ If there were discrepancies, they were rooted in the code of ethics governing RCMP actions in “national interests” – and a tribute to an officer of the highest integrity.

St. Roch’s two voyages through the Northwest Passage were just cause for celebration in a war-weary Canada – a truly notable achievement by a Canadian ship in her own arctic waters. This venture was not “something of a stunt or a trip to compete with the *Nascopie*,”³⁸ as implied by the Hudson’s Bay Company captain, but a fitting tribute to the prowess of the hardy *St. Roch* and the able men who sailed her into the annals of history half a century

ago. As for Henry Asbjørn Larsen? In his words, “had it not been for the war, we would never have had the occasion or opportunity to make this passage.”³⁹ Yet those who knew him also knew he was “delighted to have the opportunity. ... A correct and careful police officer, he was an adventurer at heart.”⁴⁰

Notes

¹ H.A. Larsen, in cooperation with Frank R. Sheer and Edvard Omholt-Jensen, *The Big Ship: An Autobiography of Henry A. Larsen* (Toronto: McClelland and Stewart, 1967).

² T.B. Caulkin, Memo undated, but refers to military communiques of 13–15 April 1940, National Archives of Canada (NAC), RCMP Records, RG 18 (acc. 85-86/048)/34/ G-809-8-1941; J. Fripps, Memo from Commanding Officer of “E” Division to the RCMP Commissioner, 22 April 1940, NAC, RCMP Records, RG 18 (acc. 85-86/048) 34/G-809-8-1941.

³ H.A. Larsen, Memo to the RCMP Commissioner, 13 November 1957 (Copies of letters from Larsen to the RCMP commissioner were discovered among Larsen’s personal papers by his daughter and subsequently copied and forwarded to the author by Christopher Rowley and Jane Armstrong, of CineNova Productions, a firm currently producing a documentary film on *St. Roch’s* 1940–42 voyage through the Northwest Passage); H.A. Larsen, Memo to the RCMP Commissioner, 15 November 1957 (as above).

⁴ J. Eyars, *In Defence of Canada: Appeasement and Rearmament* (Toronto: University of Toronto Press, 1965), 169–71; C.P. Stacey, *Arms, Men and Governments: The War Policies of Canada, 1939-1945* (Ottawa: Department of National Defence, 1970), 367–70.

⁵ Department of External Affairs, Memorandum, initialled NAR, with reference to telegram from United Kingdom Aluminum Controller, 11 April 1940, NAC, RG 25/2731/267J-40/1; Department of External Affairs, “Proposals for a Canadian Policy Relating to Greenland,” 6 May 1940, NAC, RG 25/2731/267J-40/1. Department of External Affairs Records, RG 25/2731/267J-40 (including file pocket), Pts 1–6, contains multiple memos, telegrams, and reports related to the vulnerability of Greenland after the fall of Denmark, the plans for a Canadian occupation force, discussions with the U.S. State Department regarding access to cryolite production, the appointment of a Canadian consul and vice-consul to Greenland, and subsequent events. The sequence of events can be pieced together from numerous documents from 26 April through 6 May. Specific documents will be listed by dates or by their signature.

⁶ Secretary of State for External Affairs, Telegram to the Secretary of State for Dominion Affairs, London, 9 April 1940, NAC, RG 25/2731/267J-40/1.

⁷ Department of External Affairs, Memorandum, initialled NAR, with reference to telegram from United Kingdom Aluminum Controller, 11 April 1940, NAC, RG 25/2731/267J-40/1.

⁸ V. Massey, Telegram Cypher No. 527, the Canadian High Commissioner in London to the Secretary of State for External Affairs, 2 May 1940, NAC, RG 25/2731/267J-40/1.

⁹ F.W. Bruce, Letter to Norman Robertson, External Affairs, 9 April 1940, NAC, Department of External Affairs Records, RG 25/2731/267J-40/1; Bruce, Letter to Norman Robertson, 11 April 1940, NAC, RG 25/2731/267J-40/1; and Bruce, Letter to H.L. Keenleyside, External Affairs, 27 April 1940, NAC, RG 25/2731/267J-40/1.

¹⁰ O.D. Skelton, Note to file on discussion with the Prime Minister with handwritten notes taken at the meeting, 12 April 1940, NAC, RG 25/2731/267J-40/1.

¹¹ O.D. Skelton, "Secret" letter, 12 April 1940, from the Under-Secretary to the Acting Deputy Minister of National Defence (Naval and Air), J.L. Ralston, with enclosures of two reports dated 10 and 11 April 1940, "The Position of Greenland" and "Canada, Greenland, and the Monroe Doctrine," NAC, Records of the Department of National Defence, RG 24/3919/1037-6-1/1.

¹² Department of National Defence, Memorandum to Chief of Naval Staff from Commander, D.O.D, 13 April 1940, "Occupation and Defence of Greenland," copy on file at NAC, RG 18 (acc. 85-86-/048) 34/G-809-8-1941. RG 24/3919/1037-6-1/1 contains all memos, reports, and correspondence related to the plans to occupy and defend Greenland. Specific documents will be listed by date or under the name of the sender, if signed. Copies of unsigned documents originating from the department but found in other files will be listed below.

¹³ Department of National Defence, Report of the Joint Sub-Committee of the Chiefs of Staff Committee, "Defence of Ivigtut, Greenland," 13 April 1940, RCMP copy in NAC, RG 18 (acc. 85-85/048) 34/G-809-8-1941; Department of National Defence, General Staff Instruction No. 1, Copy #10 to RCMP Commissioner, issued in confirmation of decisions made at a meeting held under the Chairmanship of the Director of Military Operations and Intelligence, 14 April 1940, NAC, RG 18 (acc. 85-85/048) 34/G-809-8-1941 (copies also in RG 24/3919/1037-6-1/1).

¹⁴ Department of National Defence, Preliminary report and confirmation of decisions made at 14 April meeting on "Occupation and Defence of Ivigtut, Greenland," by the Joint Planning Sub-Committee of the Chiefs of Staff Committee, 15 April 1940, copy in NAC, RG 18 (acc. 85-86/048) 34/G-809-8-1941; Department of National Defence, Chiefs of Staff Committee, "Defence of Ivigtut, Greenland," signed by Major-General T.V. Anderson (CGS [Chief of the General Staff]), Rear-Admiral Percy W. Nelles (CNS [Chief of the Naval Staff]), and Air-Commodore L.S. Breadner (Acting CAS [Chief of the Air Staff]), 15 April 1940, RCMP commissioner's copy found in NAC, RG 18 (85-86/048) 34/G-809-8-1941, while other copies and related documents were found in NAC, RG 24/3919/1037-6-1/1 and in RG 25/2731/267J-40/1.

¹⁵ T.B. Caulkin, Memo undated, but refers to military communiques of 13–15 April 1940, NAC, RCMP Records, RG 18/(acc. 85-86/048)/34/ G-809-8-1941.

¹⁶ J. Fripps, Memo from Commanding Officer of “E” Division to the RCMP Commissioner, 22 April 1940, NAC, RCMP Records, RG 18 (acc. 85-86/048) 34/G-809-8-1941.

¹⁷ H.A. Larsen, Memo to the RCMP Commissioner, 13 November 1957, from Larsen’s personal papers.

¹⁸ H.A. Larsen, Memo to the RCMP Commissioner, 13 November 1957, from Larsen’s personal papers.

¹⁹ H.A. Larsen, Memo to the RCMP Commissioner, 15 November 1957, from Larsen’s personal papers.

²⁰ H.A. Larsen, Memo to the RCMP Commissioner, 15 November 1957, from Larsen’s personal papers.

²¹ O.D. Skelton, “Secret” letter, 12 April 1940, from the Under-Secretary to the Acting Deputy Minister of National Defence (Naval and Air), J.L. Ralston, with enclosures of two reports dated 10 and 11 April 1940, “The Position of Greenland” and “Canada, Greenland, and the Monroe Doctrine,” NAC, Records of the Department of National Defence, RG 24/3919/1037-6-1/1.

²² O.D. Skelton, Memo to file, “Greenland,” on meeting between the King, Roosevelt, and Hull, 2 May 1940, NAC, RG 25/2731/267J-40/1.

²³ Department of National Defence, Memorandum to Chief of General Staff, Chief of Naval Staff, and Chief of Army Services from Military Secretary, 2 May 1940, NAC, RG 24/3919/1037-6-1/1.

²⁴ E. Reid, Copy of memo to the Prime Minister from Canadian Legation in Washington, 6 May 1940, NAC, RG 25/2731/267J-40/1.

²⁵ A. Eden, Letter to Canadian High Commissioner, 2 May 1940, with reference to previous letter 15 April 1940, outlining scale of probable attack and suggested defensive measures, NAC, RG 25/2731/267J-40/1; Department of External Affairs, “Proposals for a Canadian Policy Relating to Greenland,” 6 May 1940, NAC, RG 25/2731/267J-40/1; and Department of External Affairs, Memorandum on a meeting held in the office of American–Danish Greenland Commission in Washington, 22 May 1940, NAC, RG 25/2731/267J-40/1.

²⁶ This file contains multiple memos, telegrams, and reports related to the vulnerability of Greenland after the fall of Denmark, the plans for a Canadian occupation force, discussions with the U.S. State Department regarding access to cryolite production, the appointment of a Canadian consul and vice-consul to Greenland, and subsequent events. The sequence of events can be pieced together from numerous documents from 26 April through 6 May. Specific documents will be listed by dates or by their signature, NAC, Department of External Affairs Records, RG 25/2731/267J-40 (including file pocket), Pts 1–6.

²⁷ Department of External Affairs, Memorandum on a meeting held in the office of American–Danish Greenland Commission in Washington, 22 May 1940, NAC, RG 25/2731/267J-40/1.

²⁸ O.D. Skelton, Correspondence with Governors Brun and Svane, of North and South Greenland respectively, 20 May 1940, NAC, RG 25/2731/267J-40/1.

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- ²⁹ E. Reid, Telegram to the Secretary of State for External Affairs, 3 June 1940, NAC, RG 25/2731/267J-40/1.
- ³⁰ O.D. Skelton, "Memorandum for the Prime Minister," 14 May 1940, NAC, RG 25/2731/267J-40/1.
- ³¹ Department of External Affairs, Telegram and memo from the Canadian Legation in Washington, 3 June 1940, concerning a meeting called by Assistant U.S. Secretary of State Adolf Berle, NAC, RG 25/2731/267J-40/1.
- ³² United States Government, The Congressional Record – Senate, 6 June 1940:11707–22.
- ³³ Department of External Affairs, Aide Memoire from the Department of State, Washington, 6 June 1941, NAC, RG 25/2731/267J-40/6.
- ³⁴ H.A. Larsen, Memo to the RCMP Commissioner, 13 November 1957, from Larsen's personal papers.
- ³⁵ J. Fripps, Memo from Commanding Officer of "E" Division to the RCMP Commissioner, 22 April 1940, NAC, RCMP Records, RG 18 (acc. 85-86/048) 34/G-809-8-1941.
- ³⁶ G.J. Tranter, *Plowing the Arctic: Being an Account of the Voyage of the R.C.M.P. 'St. Roch' Through the North West Passage from West to East* (Toronto: Longmans, Green, 1945), 2.
- ³⁷ H.A. Larsen, n.d. (but from content appears to be mid- to late 1940s), NAC, RG 18 (acc. 85-86/048) 14/G-577-14/supp "G".
- ³⁸ H.A. Larsen, Memo to the RCMP Commissioner, 15 November 1957, from Larsen's personal papers.
- ³⁹ H.A. Larsen, Memo to the RCMP Commissioner, 15 November 1957, from Larsen's personal papers.
- ⁴⁰ F. Roots, Author's personal correspondence from Dr. Roots, Science Advisor Emeritus, Department of the Environment, 14 August 1992.

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“On Hallowed Ground”: *St. Roch*, Sovereignty, and the 1944 Northwest Passage Transit

Peter Kikkert and P. Whitney Lackenbauer*

At noon on 28 August 1944, the Royal Canadian Mounted Police (RCMP) schooner *St. Roch* anchored at the entrance of Winter Harbour, Melville Island. The previous days had brought blinding snow, thick fog, and worsening ice conditions as the ship manoeuvred through the northerly route of the Northwest Passage. Now, “very thick weather” kept the crew from sailing into the cove. When the conditions improved a few hours later, the ship moved inside Winter Harbour, carefully dodging the “large pieces of heavy ice” that crowded its waters. Led by their captain, Sub-Inspector Henry Asbjørn Larsen, the crew rowed ashore to visit one of the most famous sites on Canada’s High Arctic islands: Parry’s Rock.

In 1819, the Royal Navy’s William Edward Parry had taken HMS *Hecla* and HMS *Griper* through unusually ice-free waters in the channel that now bears his name (Parry Channel), achieving a furthest west record in the quest for the Northwest Passage. Parry and his men became the first Europeans to visit Melville Island, where they were frozen in for ten months in the anchorage that Parry named Winter Harbour. While there, Parry had left a clear sign of his expedition’s presence, carving *Hecla* and *Griper* into a large sandstone rock, along with the names of several crewmembers.¹

As Larsen and his men surveyed Parry’s Rock, they saw another milestone in the history of exploration in the Arctic Archipelago – the plaque of Joseph-Elzéar Bernier. Between 1904 and 1911, Bernier had made

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extensive government-sponsored voyages into the waters of the Arctic Archipelago to intercept and impose licences on foreign whalers, collect customs duties, and conduct geographical research. He also performed ceremonies of possession on northern islands to reinforce Canada's sovereignty. In 1908–09, Bernier decided to follow Parry's example and overwinter at Winter Harbour. On 1 July 1909, Bernier marched his entire crew to Parry's Rock, where they installed a large copper plate which took possession for "the Dominion of Canada, of the whole Arctic Archipelago lying to the north of America from long. [longitude] 60 W. [West] to 141 W., up to lat. [latitude] 90 North."²

During their pilgrimage to Parry's Rock, Larsen also took his men to a tiny, dilapidated shack that stood about a mile away. Bernier had constructed the hut as a storehouse when he revisited Winter Harbour during his 1910 expedition. He had filled the hut with food and equipment in case any other expedition that visited Melville Island ever required assistance. When Larsen inspected the storehouse, he noted that it now stood empty, save for a few rusty tins of flour and tea – its supplies used by the members of the Canadian Arctic Expedition who had visited the spot in 1916 and 1917. The leader of that expedition, Vilhjalmur Stefansson, insisted on visiting Parry's Rock because it was the "one spot among the Canadian arctic islands that has been really well located," allowing him to reinforce the "certainty of [the] longitudes" taken by his expedition.³ During the visits, Stefansson's hungry party had feasted on the pilot bread, flour, port, honey, and preserved fruit left by Bernier and used the iron shoeing for their sled.

As the crew surveyed the plundered hut, a bottle hanging from the rafters caught their attention. It contained a written notice from RCMP Inspector Alfred Herbert Joy, who, from March–May 1929, with another constable, the Inughuit hunter and guide Nukappiannguaq, and two dog teams, travelled 1,700 miles from Dundas Harbour on Devon Island in the eastern archipelago to Winter Harbour on Melville Island, covering Loughheed, King Christian, Ellef Ringnes, Cornwall, and Axel Heiberg Islands along the way.⁴ In Larsen's account of his 1944 voyage, he described Joy's effort as "perhaps the longest and most famous patrol in Arctic history."⁵

From Parry's Rock, to Bernier's hut, to Stefansson's waste, to Joy's bottle – Larsen and his crew marched through the annals of British and Canadian Arctic exploration during their short stay on Melville Island. Larsen called the cairns, caches, memorials, and graves that littered the northern islands "the keystone of Canada's Arctic sovereignty."⁶ By visiting these sites and literally touching these "keystones," Larsen was reaffirming the connection

between past and present British and Canadian activities in the Arctic Archipelago. Now, as their last act on Melville Island, his crew joined their predecessors by leaving a record of their own visit at Parry's Rock. Larsen then guided his ship out of Winter Harbour and into the icy waters of Viscount Melville Sound,⁷ before heading southwest into "waters never before traversed by any vessel, the eastern entrance to McClure Strait." The crew of *St. Roch* were eager to make some history of their own.

The activities of Larsen and his crew at Winter Harbour and Parry's Rock highlight the main purpose of their voyage: sovereignty. The 1944 voyage of *St. Roch* through the Northwest Passage has received little attention compared to the ship's famous 1940–42 west–east transit, the secret orders and objectives for which have inspired considerable commentary from Arctic scholars.⁸ While several authors, including Larsen, have provided narratives of the 1944 transit and indicated that sovereignty concerns were the primary motivation for the expedition,⁹ little additional detail has been provided on the government's rationale for sending *St. Roch* back through the Passage. Why, during the height of the Second World War, did the government dispatch Larsen and his crew to the uninhabited northern half of the Arctic Archipelago, where there was no one to police or administer? The notoriety gained for being the first to transit the northern route of the Passage no doubt influenced the decision, but concern over American intentions in the High Arctic, how officials understood the rules and requirements of territorial acquisition, and the influence of British policies in the Antarctic all provided impetus for the expedition and dictated its objectives.

Sovereignty, the RCMP, and the Construction of St. Roch

From the moment *St. Roch* was launched in 1928, sovereignty concerns shaped its mandate and mission, and never more so than during its historic 1944 voyage. Canada's lingering concerns about its sovereignty in the High Arctic are well documented in existing scholarship. In 1880, Britain gifted to Canada whatever territories or territorial rights it had in the Arctic Archipelago. The completeness of Britain's own title at that time, and the extent of its territories, remained uncertain. Over the next two decades, Canada did little to consolidate its administrative or practical control over its new territorial gift – its claim continued to rest on British acts of discovery and little more. At the turn of the twentieth century, however, the presence of foreign explorers in the Arctic Archipelago and the expansion of American whaling operations into the Beaufort Sea finally forced the Canadian government to consider the strength of its sovereignty. Canada's response to

these activities was to embark “on a long range, though relatively low-key, program of finding out more about her northern territories, securing Canadian sovereignty, and advancing the frontiers of scientific knowledge.”¹⁰ To extend Canada’s regulation and control over the region, the North-West Mounted Police (NWMP) established posts on Herschel Island in the Beaufort Sea and Cape Fullerton on the northwest shore of Hudson Bay in 1903. Following the footsteps of earlier Canadian northern voyages led by William Wakeham and Albert Peter Low, Bernier began his patrols of the waters of Hudson Bay and the Arctic islands. Between 1913 and 1918, the government also sponsored Vilhjalmur Stefansson’s two-pronged Canadian Arctic Expedition in the Western Arctic, which explored and took possession of several islands for Canada, adding several thousand square kilometres to the country’s territory, while clarifying cartographically ambiguous territory such as Prince Patrick Island.¹¹

Concurrent to the government’s efforts to show the flag and assert its control in the Arctic, Senator Pascal Poirier offered an easier and far more definite method for securing sovereignty: the sector principle. In a speech to his Senate colleagues in Ottawa, Poirier advised that:

In future partition of northern lands, a country whose possession today goes up to the Arctic regions, will have a right, or should have a right, or has a right to all the lands that are to be found in the waters between a line extending from its eastern extremity north, and another line extending from the western extremity north. All the lands between the two lines up to the north pole should belong and do belong to the country whose territory abuts up there.¹²

Such a system would allow the Canadian government to insist that “from 141 to 60 degrees west we are on Canadian territory.... No foreigner has a right to go and hoist a flag on it up to the north pole.”¹³ While the Canadian government never officially entrenched the sector principle in federal statute, it remained an important component of Ottawa’s Arctic sovereignty strategy in the decades that followed.

The Canadian government continued to utilize the newly renamed Royal Canadian Mounted Police (RCMP) to secure its sovereignty in the years following the First World War. The police presence grew in the Western Arctic, with new posts at Tree River, Aklavik, Cambridge Bay, and Kugluktuk. When Ottawa thought that Denmark might challenge Canada’s sovereignty over Ellesmere Island in the early 1920s, it led to a flurry of legal appraisals emphasizing “the need for ‘acts of occupation’ even on remote

and uninhabited northern islands like Ellesmere.”¹⁴ Consequently, when the Liberal government of William Lyon Mackenzie King came to power at the end of 1921, it instituted an annual ship patrol in the Eastern Arctic and started to expand the RCMP’s permanent presence on the Arctic islands, beginning with new posts at Pond Inlet on Baffin Island and Craig Harbour on Ellesmere Island in 1922 – the first police presence in the Qikiqtaaluk Region. Additional posts followed at Pangnirtung in 1923 and Dundas Harbour, Devon Island, in 1924.¹⁵

Despite the government’s “acts of occupation,” Ottawa realized in 1925 that the United States did not accept Canada’s sovereignty over the entire Arctic Archipelago. By this point, Washington had adopted the Hughes Doctrine, which demanded settlement and use of polar lands as a requisite of territorial acquisition.¹⁶ The State Department did not accept “that such occupation has been effected by Canada in some of the islands,” particularly the uninhabited ones north of Parry Channel.¹⁷ The matter became a concern in the spring of 1925, when the U.S. government decided to sponsor an expedition led by Donald MacMillan and Richard Byrd that intended to aerially explore the area between Canada’s northernmost islands and the North Pole that summer, using bases on Axel Heiberg and Ellesmere Islands.¹⁸ The State Department had not consulted with Ottawa on this mission or applied for any permissions or permits – although it also chose not to explicitly and publicly challenge Canada’s claim.

In response, Ottawa established the Northern Advisory Board to discuss the implications of the American expedition on Canada’s sovereignty and lay out possible policy alternatives. After careful deliberation, the Board decided to continue relying on the internationally accepted method of effective occupation to strengthen Canada’s claims, supported by a government announcement of a sector claim in the House of Commons.¹⁹ On 1 June 1925, Minister of the Interior Charles Stewart stood in the House of Commons and claimed all the land between Canada’s coasts and “right up to the North Pole.”²⁰ Once again, Ottawa turned to the RCMP to safeguard its sovereignty in the Arctic, constructing new posts on Ellesmere Island’s Bache Peninsula in 1926 and another at Lake Harbour in 1927. From their posts, RCMP officers sought to extend Canada’s occupation and control with long sled patrols that covered much of the High Arctic islands – including Inspector Joy’s epic 1,700-mile trek from Devon Island to Melville Island.

With growing concerns in Ottawa about Canada’s sovereignty over the Arctic islands, the RCMP considered another measure to expand its activities in the region – a small schooner that could resupply the police posts, allow

for patrols in the summer months, and sail wherever a stronger government presence might be required. "It was a demonstration of sovereignty; fixed during the winter and mobile during the short navigation season," historian William Morrison explains. This ship represented "the answer to the problem posed as early as 1900 by [NWMP] Comptroller Frederick White – how to make the police on the Arctic coast more mobile and thus more effective?"²¹ The minister of justice concurred with the plan in 1925, and the government let a construction contract to the Burrard Dry Dock Company of North Vancouver in 1927 to build the vessel. It was ready the following year and named *St. Roch* – "guardian of the poor" – after a parish in the constituency of Justice Minister Ernest Lapointe. Gordon Smith described:

The *St. Roch* was 104 feet in length, 25 feet in beam, with draft when loaded of 12½ feet and net tonnage of 80 tons. Designed especially for Arctic service, she had a saucer-shaped cross section, which enabled her to rise above the crushing pressure of surrounding ice rather than being squeezed in it. For greater strength, the ship was built solidly of heavy Douglas fir, with a complete outside sheeting of Australian ironbark. She had schooner rigging and was equipped with a 150-horsepower diesel engine.²²

The rounded hull meant that the ship rocked and heaved heavily in open seas, but what it lacked in comfort it compensated for in strength and dependability.

During the ship's maiden voyage to the Arctic in 1928, Henry Asbjørn Larsen was thrust into a leadership role when the skipper (Captain William Hugh Gillen) left the ship at Herschel Island in late August. Born in the village of Fredrikstad on the east coast of Norway's Oslo Fjord in 1899, Larsen had served on merchant ships for most of his life and even spent some time in the Canadian Arctic.²³ Now, under Larsen's command, *St. Roch* spent twelve summers and four winters patrolling the Western Canadian Arctic and resupplying RCMP detachments along the Arctic coastlines.²⁴ According to his daughter Doreen Larsen Reidel, "these voyages were undertaken largely through uncharted waters, without the benefit of sonar, aerial ice reconnaissance, regular radio contact and relying on navigational methods dating back hundreds of years."²⁵ Larsen explained in more detail the myriad government tasks performed by *St. Roch* in addition to its formal "policing" responsibilities:

Firstly, to uphold and enforce Canada's sovereignty of her Arctic Islands; to act as administrators for the North-West Territories Council; maintaining game laws; making general checkups of

Eskimos' living conditions; compiling Vital Statistics; authorizing the issuing of rations for the destitute aged and infirm Eskimos; taking of census; settling of any disputes which might arise; conveying children to and from the residential schools at Aklavik; and transferring sick Eskimos for treatment and hospitalization at Aklavik. Sometimes we assist in securing suitable Eskimos, with their families, who we transport from the Coronation Gulf area to the Mackenzie River Delta to learn to herd and look after the reindeer herd provided by the Canadian Government for the Eskimos in that area.²⁶

St. Roch continued to fulfill these roles even as the Great Depression necessitated the closure of certain RCMP posts in the North, including the Bache Peninsula and Dundas Harbour detachments.²⁷

In response to Canada's weakened efforts at occupation in the Arctic Archipelago, in 1936 T.L. Cory, solicitor of Canada's Northwest Territories Branch of the Department of the Interior, furnished a legal appraisal of Canada's position that read like a call to action. He worried about the strength of Canada's title and wanted the government to invest more in its Arctic. Cory's appraisal highlighted the American demand for "rigorous occupation" and accordingly emphasized the need for a stronger physical presence in the region. Despite the placement of several RCMP posts along the eastern fringe of Canada's "vast Arctic claim," he worried about "all the unoccupied islands lying to the west and within the Canadian Arctic sector" – such as Melville Island. He envisioned parties "empowered to administer the laws of Canada" establishing substations across the Archipelago, supported by a fleet of Arctic-capable airplanes and capable of carrying "active jurisdiction into many of our outlying Western islands."²⁸ In the end, the cost proved prohibitive, and Ottawa barely considered the plan at the time. Cory's ideas, however, ultimately would have an impact on *St. Roch* and its 1944 voyage through the Passage.

St. Roch and the First West–East Transit of the Northwest Passage, 1940–42

At the end of the 1930s, Larsen, *St. Roch*, and the scattered RCMP posts that remained open through the Great Depression continued to function as the cornerstone of Canada's sovereignty in the Arctic.²⁹ When the Second World War broke out, however, *St. Roch* was recalled to Vancouver to be assigned other duties. The war had prompted the closure of the Craig Harbour RCMP post in 1940, which left no official government presence in

the islands north of Parry Channel – the area of the Archipelago where the U.S. had refused to acknowledge Canada’s sovereignty. How would the abandonment of this post for the duration of the war affect Canada’s claim? Max Wershof, a young lawyer at External Affairs, concluded that,

it seems to me that even a temporary abandonment of the Craig Harbour post must weaken – though it will not nullify – Canada’s claim, not only to Ellesmere Island but also to all the islands lying north of Viscount Melville Sound and Lancaster Sound – unless a suitable substitute for the Craig Harbour post is provided. The islands lying north of the aforementioned line may, I think, be considered as a group. Craig Harbour is the only post in this area. If it is abandoned, without a substitute, there will be no one physically present in the area to symbolize effective occupation.

Wershof, however, offered a potential solution. He cited William Edward Hall’s *Treatise on International Law* to note that the abandonment of territorial title does not happen immediately in places where a state had sustained an occupation for “some time.” If the “[abandonment] has been voluntary, the title of the occupant may be kept alive by acts, such as the assertion of claim by inscriptions, which would be insufficient to confirm the mere act of taking possession.” In Wershof’s assessment, temporary visits and cairns could sustain Canada’s title until a permanent occupation was restored.³⁰

Historian Janice Cavell criticizes Wershof, T.L. Cory, and other External Affairs officials who doubted the strength of Canada’s sovereignty in the 1940s, suggesting that they demonstrated “little knowledge of international law on the polar regions” and ignored or misunderstood the impact of the 1933 *Eastern Greenland* decision on territorial claims in the Arctic. In the dispute between Denmark and Norway over Greenland, the Permanent Court of International Justice (PCIJ) had accepted a modest threshold for effective occupation in the polar regions. Cavell argues that Canadian officials who had grappled with the “Arctic policy regime” in the 1920s, such as Secretary of State for External Affairs O.D. Skelton, understood the impact of the *Eastern Greenland* decision and recognized that Canada’s title was strong. Skelton passed away in 1941, however, before he could write a comprehensive treatise on Canada’s sovereignty in the Arctic, and Cavell alleges that his younger colleagues like Wershof floundered without his “insider knowledge.”³¹

In her critique, Cavell overestimates the clarity on the rules of territorial acquisition that existed at the time and underestimates the confusion that permeated the legal landscape of the polar regions. By the 1940s, the doctrine

of effective occupation, the most important justification for territorial acquisition, remained unclear and open to interpretation. "The word 'occupation' itself is ... a legal term of art," legal scholar Humphrey Waldock explained in 1948. "It is the Latin *occupatio* meaning appropriation, not occupation in its sense of 'settling on'... it means, in international law, the appropriation of sovereignty."³² Jurists and state officials, however, spilt much ink debating the level and kind of state activity the doctrine demanded – especially in the harsh environment of the polar regions.³³ How much uninhabited or sparsely populated territory could a state claim to occupy through a settlement or an administrative post? Could Canada's control be extended to all of the islands in the northern half of the Archipelago through an occupied police post on Ellesmere Island? How continuous did an occupation have to be to maintain a state's territorial rights? What impact might technological innovations (such as long-range aircraft, mechanical vehicles, advanced icebreakers, and stations that allowed people to overwinter relatively comfortably in the harshest polar regions) have on the requirements of occupation?

Like Cavell, historians and lawyers often point to the *Palmas Island* (1928), *Clipperton Island* (1931), and *Eastern Greenland* (1933) cases – which all dealt with state title over uninhabited or sparsely populated territory – as pivotal decisions that brought immediate clarity to the international law of territorial acquisition.³⁴ Certainly, many international legal experts recognized the potential impact of these cases on polar territorial claims, particularly the PCIJ's decision in the *Eastern Greenland* case.³⁵ For the majority of practitioners, however, the judicial nature of polar sovereignty remained ambiguous. From its release in 1933, various legal experts questioned the value of the *Eastern Greenland* decision as a precedent. Commentators underlined the volume of variables that complicated the case: the role played by foreign recognition; the length of time involved; the careful balancing of legal values carried out by the court; the court's failure to lay out the acts required to create and maintain a right to sovereignty; and the existence of a dissenting opinion and separate opinions in the ruling that could have played an important role in future cases.³⁶ In light of these factors, Professor of International Law and former Solicitor of the State Department Charles Cheney Hyde concluded that the decision "may perhaps be deemed to lack the significance otherwise to be assigned to it as an enunciation of legal principle concerning" the acquisition of territorial sovereignty.³⁷ No one could predict with certainty how the arguments, conclusions, and opinions of the *Eastern Greenland* decision would be applied to future polar disputes.

State officials involved in researching polar claims recognized the shades of grey that continued to surround the requirements of effective occupation and the rules of territorial acquisition. In 1944, a Canadian External Affairs report captured the essence of the problem when it explained that “there may be some doubt whether Canada is actually extending enough jurisdiction throughout lands already discovered to make her claim to those territories unquestionable.... Precise information as to what constitutes ‘control and administration’ is scarce.”³⁸

In short, the concerns that many Canadian officials had about the strengths of their country’s sovereignty over the northern islands of the Arctic Archipelago are understandable when viewed in the international legal context of the 1940s. Legal ambiguities at the time precluded them from any assurance that Canada had done enough to secure its title to all of the Arctic islands. These considerations played a role in the government’s decision to send *St. Roch* through the Northwest Passage in spring 1940. Other factors also inspired the decision to secretly move *St. Roch* from Vancouver to the Eastern Arctic: the need to defend Greenland in the face of increased German activity in the North Atlantic, concern over the security of the island’s cryolite mines (crucial in the production of aluminum), and the possibility that a Canadian occupation force might have to be deployed, supplied, and supported.³⁹ Still, Larsen believed that sovereignty represented the main driver. “It was a great moment for me,” he later explained. “Canada was at War and the Government realizing the need to demonstrate sovereignty over the Arctic Islands, was continuing to entrust the discharge of that responsibility to the Royal Canadian Mounted Police as it had done for decades, ever since the first detachment was built at Cape Fullerton on the West side of Hudson Bay 1903.”⁴⁰ Larsen was ordered to sail *St. Roch* through the northerly route of the Northwest Passage, utilizing Prince of Wales Strait and Viscount Melville Sound, which would have allowed them to visit some of the unoccupied islands in the northern half of the Archipelago – just as Wershof had advised in his appraisal.⁴¹

Heading out in the summer of 1940, Larsen ran into heavy ice conditions that slowed his progress and delayed his resupply of the Western Arctic RCMP posts. Battling through heavy ice, *St. Roch*’s crew wintered at Walker Bay on the west coast of Victoria Island. The ship resumed its voyage on 31 July 1941, but, once again facing heavy ice conditions, Larsen decided that the northern route was impractical and adjusted his plans to take the route charted by Amundsen in 1903–05, south of King William Island and through Bellot Strait before heading into Baffin Bay. Ice halted the crew’s progress at

Pasley Bay on the west coast of Boothia Peninsula, where they were frozen in until August 1942. Rather than sitting idle during the long winters, members of the nine-man crew⁴² embarked on lengthy sled patrols across the adjacent islands. In early August 1942, the crew managed to extract *St. Roch* from Pasley Bay and head north, pushing through Bellot Strait, despite ice barriers, strong currents, and whirlpools. The ship then proceeded up Prince Regent Inlet to Lancaster Sound, entered Navy Board Inlet, and on 6 September arrived at Pond Inlet on the northeast tip of Baffin Island. On 11 November, a naval escort took *St. Roch* into Halifax Harbour, thus completing the twenty-eight-month voyage and the first transit of the Northwest Passage from west to east. "It had not been an easy trip," Larsen noted in a typically understated quip, adding that "without hesitation I would say that most ships encountering the conditions we faced would have failed."⁴³

St. Roch and the Northerly Route

Despite the accomplishment of Larsen and his crew, concerns within Ottawa about Canada's sovereignty in the Arctic continued to intensify as the war went on. By the time *St. Roch* returned to Halifax in 1942, the exigencies of continental defence had started to transform the Canadian North. In the Northwest, the Americans assisted in the completion of the Northwest Staging Route and constructed the Alcan Highway (Alaska Highway) and the Canol pipeline, bringing an influx of forty thousand American personnel into the region. In the Northeast, ambitious plans for the Crimson Route, an alternate path for ferrying planes and materials to Britain, involved installations at Churchill, Manitoba; Southampton Island in Hudson Bay; Fort Chimo (Kuujuaq); Frobisher Bay (Iqaluit); Padloping Island, Merchants Bay; and other northern sites. Historians have pointed out the local and national controversies that accompanied these northern projects, and Prime Minister King, paranoid that American developments, conducted in the name of military security, would undermine Canada's sovereignty and control, took action to reassert Ottawa's authority on the ground in the North in 1943 and 1944.⁴⁴

Although the northern islands of the Arctic Archipelago where Ottawa had the most concern about its territorial title were untouched by these wartime projects, what if the Americans decided that they wanted to build airfields on these islands? By the fall of 1943, rumours had started to circulate within the Canadian government about the American desire to build defence and aviation infrastructure in the High Arctic.⁴⁵ When Brian Roberts, an

Antarctic expert with the British Foreign Office, visited Ottawa at that time, his Canadian peers worriedly told him about future American “pretensions in the Arctic.”⁴⁶ If the Americans wanted to expand their efforts into the High Arctic, would they ask permission? Recent history and the Hughes Doctrine suggested they would not. In his 1940 report on the Craig Harbour closure, Wershof had noted that “a weakening of Canada’s legal claim may not be important if the Government is confident that no serious challenge will ever be forthcoming.” With American interest in the High Arctic growing, such a challenge seemed more plausible than ever.

In early 1944, a series of government officials highlighted their concern over the status of Canada’s Arctic sovereignty. J.G. Wright, a member of the Northwest Territories Administration, argued that the far and western islands, which had never been home to a permanent RCMP presence, were administered “mostly in theory” and advised that Ottawa establish weather and scientific stations in the region to strengthen Canada’s claim.⁴⁷ An assessment prepared by J.R.B. Chaput for John Read, the External Affairs’ legal adviser, also advised that a Canadian expedition would do much to extend the government’s administration of and control in the region.⁴⁸ R.A. Gibson, Deputy Commissioner of the Northwest Territories, responded to a media report raising the issue of Arctic sovereignty by suggesting that the government extend the patrols of the RCMP in the Arctic, either using *St. Roch* or the airplanes of the Royal Canadian Air Force (RCAF).⁴⁹ Gibson’s suggestion provided the initial push that began the planning for *St. Roch*’s 1944 voyage.

At this point, Canadian officials received further impetus to take action in the Arctic when they learned what Britain was doing to protect its territorial claims in the Antarctic.⁵⁰ Ottawa had long looked to British legal assessments regarding their sovereignty over the Falkland Islands Dependencies (FID, encompassing a slice of the Antarctic continent, South Georgia, South Sandwich Islands, the South Shetlands, and South Orkneys) for guidance and confirmation of its own approaches and policies in the Arctic. Since the beginning of the century, the British had adopted a version of effective occupation in the polar regions that was less stringent than Ottawa’s. In the harsh polar environment, they insisted that control could consist of the occasional visit by state officials, administrative acts, legislation, and whatever level of control was required over the points of access to a polar interior or hinterland.⁵¹ Early in the war, however, the United States Antarctic Service Expedition had set up camps in the FID, and Chile and Argentina had challenged Britain’s title with overlapping claims of their

own. These developments, technological innovations, and the legal position of the U.S. led Foreign Office legal adviser William Eric Beckett to assert that the requirements of effective occupation in the polar regions had become more onerous, demanding continuous “physical occupation and use.”⁵² As the British explained to the Canadians in 1943, “we have made little use of the islands [in the Antarctic] and our legal position is therefore becoming weaker.”⁵³

During the Antarctic summer of 1942–43, Ottawa learned that London had dispatched HMS *Carnarvon Castle* on an “administrative tour” of the FID on the pretext of countering Axis raider activity. The ship’s crew obliterated sovereignty markers left in the South Shetlands by previous Argentine expeditions and replaced them with British emblems to mark their presence. In early 1944, the British told the Canadians about the recently launched Operation *Tabarin* – an expedition to establish permanent bases in the FID, from which parties could conduct scientific research and surveys, and provide a source of administration.⁵⁴ As historian Peter Beck has observed, the British initiatives in the Antarctic influenced how Canadians viewed their position in the Arctic during the war.⁵⁵ Certainly, the kinds of activities conducted by the British and their new approach to polar sovereignty would have been fresh in the minds of Canadian officials as they prepared to send *St. Roch* north again in 1944.

Ongoing concern over the strength of Canada’s claim to the northern half of the Archipelago, worry over American intentions, and British actions in the Antarctic all spurred on and shaped *St. Roch*’s attempt on the Northwest Passage. Larsen was again ordered to take the Passage’s northern route and visit the western islands north of Parry Channel that T.L. Cory, Max Wershof, and J.G. Wright had expressed concerns about, including Cornwallis, Bathurst, and Melville Islands. J.R.B. Chaput advised that Larsen take no action that could be construed as Canada taking possession of new land within the Archipelago – the country had already claimed all of it and any suggestion to the contrary might encourage rival claims. Rather than taking possession, Larsen and his crew would leave “suitable records at all points” visited, visible demonstrations that they had ventured to the northern half of the Archipelago to extend Canada’s administration and control over the region. If ice conditions were poor, Larsen was ordered to overwinter at Winter Harbour, from which “patrols by dog team would visit various Arctic Islands within a radius of two hundred miles.” During its transit, *St. Roch* would also collect topographical information, make other scientific observations, and investigate the possibilities of reopening the Craig

Harbour and Dundas Harbour RCMP posts in the near future, as well as establishing a new detachment at Winter Harbour. While in the southern waters of the Archipelago, the ship would fulfill its primary function of resupplying RCMP posts and administering Inuit.⁵⁶

Larsen and *St. Roch* prepared to head northwards once again in the name of Canada's Arctic sovereignty. Since their arrival in Halifax in 1942, Larsen and seven other crewmembers had been awarded the Polar Medal,⁵⁷ and the ship had sailed north again in July 1943 to provision detachments along the Labrador and eastern Baffin Island coasts before returning to Halifax that October. The following winter, it underwent an extensive refit and had a three-hundred-horsepower engine installed at Lunenburg Foundry & Engineering. When he received his orders to head north in the summer of 1944, all but two of Larsen's crew from 1940–42 had taken up other assignments, so he quickly found replacements. Now expanded to thirteen members, the crew included a mix of seasoned Arctic hands and two young Newfoundland seamen with no previous experience. "Well here we are again not quite ready for the great adventure of again trying to make the North West Passage," he wrote in his diary. "We must do all in our power ... to uphold Canada's claim to these valuable islands and bulwark for our northern frontiers. Canada and its people have adopted me as one of their own sons, and it's up to me to be worthy of such an honour."⁵⁸

Although the ship had to divert to Sydney for minor repairs soon after leaving Halifax on 22 July 1944, it overcame fog and ice to reach Pond Inlet on 15 August. Here, Inuit guide Joe Panipakuttuk, several of his family members, and seventeen dogs embarked on this ship.⁵⁹ Once they left Baffin Island two days later, Larsen and his crew focused their attention on the islands of the northern Archipelago, where there was no one to police or regulate. The ship sailed west, encountering foul weather as it travelled to Dundas Harbour, Devon Island, where they investigated the "unoccupied" (not abandoned) police buildings that had stood empty since 1933. Next, Larsen and his crew ventured to Beechey Island, where they visited the graves of the deceased members of Franklin's ill-fated expedition buried there, the cenotaph erected to commemorate those who perished on Sir Edward Belcher's mission to find Franklin, the cache established in 1854 known as Northumberland House, and the remains of John Ross's old yacht, *Mary*. Captain Bernier had also visited Beechey in 1906, and Larsen and his men located the cairn in which he had left his records, attaching an account of their own visit.⁶⁰

The ship ventured along Parry Channel, their initial attempts to land on Bathurst Island thwarted by thick pack ice moving quickly eastward, which ensnared them for some twenty miles. They eventually made it ashore at Cape Cockburn but failed to locate the cairn left there by Bernier. With Bernier's cairn missing, Larsen wanted to be sure that he left a lasting sign of his expedition's presence, and "in a conspicuous place close to jutting rock about 300 feet high we built a cairn for our records."⁶¹ From Bathurst, the ship travelled to the north end of Byam Martin Island, where Larsen anchored, went ashore, built a cairn, and deposited a cylinder. The weather had started to worsen, with wind, fog, sleet, and ice impeding the ship's movements. By 27 August, *St. Roch* made it to Dealy Island and found the large cairn (a pile of stones, three barrels, and a tall spar) and storehouse built by Captain Henry Kellett when he overwintered there with HMS *Resolute* in 1852–53. Here, Larsen and his men collected a few souvenirs, including tins that contained ox cheek soup made in London in 1850.

After their stop on Melville Island, Larsen and his crew turned into Viscount Melville Sound and headed for Prince of Wales Strait. Despite the expedition's rapid progress, it was not a smooth transit. On 31 August, in Prince of Wales Strait, they encountered the heaviest ice thus far and became locked in for a short period, near where Captains Parry and Bernier had been forced to turn around on previous attempts. "But there was no turning back for us," Larsen recounted in his autobiography, and he "began to negotiate the narrow passages between the gigantic floes of old blue ice from the Polar Sea itself."⁶² Overcoming ice, thick fog, mist, and heavy rain that temporarily set them off course, they navigated through the strait, reaching Walker Bay on 4 September. "We had gotten through the part of the Passage that no one else had; everybody was feeling pretty good," recalled crewmember Stan McKenzie upon reaching this location where the ship had wintered in 1940–41. "The *St. Roch* rode at anchor as though catching her breath ... and for the first time the northern route of the Northwest Passage had been traversed."⁶³

Getting through in a single season, however, was not a preordained conclusion. The ship encountered heavy ice and hurricane-force winds along the coastline near Tuktoyaktuk and again faced the prospect of becoming frozen in. When the weather opened sufficiently on 17 September, Larsen pushed through for Herschel Island. There, the crew unloaded coal, fuel drums, and supplies and set up the Panipakuttuk family in a house for the winter, before the ship departed hastily as the harbour began to freeze over. Overcoming heavy ice through to Point Barrow, the ship crossed through the Bering Strait on 27 September and arrived in Vancouver on 16 October. The

ship had travelled 11,740 kilometres in eighty-six days, becoming the first vessel to complete the Passage in a single year and the first to transit it in both directions.

Reflecting on the Accomplishment

St. Roch's 1944 transit of the northern route was a remarkable achievement, filled with risk and reward. Larsen and his crew were showered with accolades and honours for their historic achievement. "The newspapers were full of the story, and Larsen, his crew and his ship were hailed and honoured by the city [of Vancouver] and the nation," historian James Delgado observed. "For Henry Larsen, it meant a promotion to subinspector and the award of the Patron's Gold Medal by the Royal Geographical Society. The Royal Geographical Society also elected Larsen a Fellow, as did the Royal Canadian Geographical Society and the Arctic Institute of North America."⁶⁴ Members of his crew received the Polar Medal in recognition of their achievement – except the Inuk Joe Panipakuttuk, who, with his family, waited on Herschel Island for the ship's return before they made their trek home.⁶⁵

For the Canadian government, one of the most important components of the entire expedition now began in earnest – getting the word out about *St. Roch's* accomplishments. In the months that followed, Larsen published his official account, while the government provided information for additional stories in *Maclean's* and the *Canadian Geographical Journal*.⁶⁶ While articles hailed the expedition's unprecedented transit of the Passage's northerly route, officials ensured that they also highlighted how many of the routes taken by *St. Roch* were the same as those previously taken by the Royal Navy and other Canadian vessels, and that previous expeditions had visited and even temporarily occupied the same places visited by Larsen and his crew.⁶⁷ In his own accounts of the voyage, Larsen highlighted his use of Royal Navy charts, which he described as "marvelous" and "absolutely correct."⁶⁸ He also tied together the activities of the Royal Navy with the efforts of the RCMP and his own accomplishments on *St. Roch*:

It is true that many pioneers were defeated by the North; but I think it was because of the slow and cumbersome ships of those days, rather than the ice and inhospitableness of the land. Ships at that time were powered, in most cases, only by sail or inadequate steam engines, and when winter held them in a frozen berth there was often a crew of over a hundred to be fed. These men lived in cramped quarters for long tiresome months with little means of

diversion and practically no opportunity to travel. Yet a few of the more intrepid set out on foot to explore and chart the country and claim it for the Empire. And this is the spirit we must not let die in Canada.

In their own way the Mounted Police are endeavouring to do their part. They have made long patrols which frequently surpassed those of many explorers. I have in mind the long overland journeys of ex-Asst. Commr. [Assistant Commissioner] C. D. LaNauze, then inspector; ex-Asst. Commr. T. B. Caulkin, then sergeant major; the late Inspector Joy; the present-serving Sgt. [Sergeant] Major H. W. Stallworthy and Cpl. [Corporal] R. W. Hamilton, and of many others....

But getting back to the early explorers. When I reached places which had known the footsteps of such men as Sir Edward Parry, Sir John Ross, Capt. [Captain] Henry Kellett, Capt. Francis L. M'Clintock, Capt. Robert M'Clure, Sir John Franklin and others, I felt that I was on hallowed ground. I pictured them and their crews wintering in isolation and discomfort in crowded ships, optimistically waiting for favourable ice conditions; some of them perished, all risked death—to carry the proud flag of Britain into new territory. When entering Erebus Bay last year I fancied I could see the tall majestic ships of Franklin who wintered there 99 yrs [years] before.⁶⁹

Connecting Larsen's 1944 voyage to these previous exploits not only placed the captain and his crew in a proud lineage of explorers, but it also helped to confirm that the parts of the Arctic that he visited were hallowed *Canadian* ground. Government discussions and legal appraisals conducted in the lead-up to *St. Roch's* 1944 expedition, as well as the orders given to Larsen, indicated how Canadian officials understood Canada's Arctic sovereignty up to and during the Second World War. Faced with uncertainty about how secure Canada's claims to "effective occupation" actually were, *St. Roch's* wartime activities fulfilled Wershof's advice that "the title of the occupant may be kept alive by acts, such as the assertion of claim by inscriptions" until occupation could be renewed. On remote, uninhabited islands, Larsen and his crew visited cairns and memorials that Larsen called the "keystone of Canada's Arctic sovereignty" – visits that, in Larsen's view, were as important as the records and milestones set by *St. Roch* in transiting the Passage in a single season by the northern route. *St. Roch* proved a convenient vehicle to proactively demonstrate Canada's ongoing Arctic

interest and capability, showing the world that Canada was still active in the region – just as Britain and its dominion had been for over a century.

Notes

¹ See, for instance, Glyn Williams, *Arctic Labyrinth: The Quest for the Northwest Passage* (Toronto: Viking Canada, 2009), 193. Parry's Rock stands 3 metres high and 5.5 metres long.

² On Bernier's voyages, see Yolande Dorion-Robitaille, *Captain JE Bernier's Contribution to Canadian Sovereignty in the Arctic* (Ottawa: Indian and Northern Affairs, 1978); Janice Cavell, "'As Far as 90 North': Joseph Elzéar Bernier's 1907 and 1909 Sovereignty Claims," *Polar Record* 46, no. 239 (2010): 372–76; and Alan MacEachern, "J. E. Bernier's Claims to Fame," *Scientia Canadensis* 33, no. 2 (2010): 43–73.

³ Vilhjalmur Stefansson, "The Activities of the Canadian Arctic Expedition from October, 1916, to April, 1918," *Geographical Review* 6, no. 4 (October 1918): 354–69.

⁴ William R. Morrison, *Showing the Flag: The Mounted Police and Canadian Sovereignty in the North, 1894–1925* (Vancouver: UBC Press, 1985), 170.

⁵ Henry A. Larsen, *The North-West Passage 1940–1942 and 1944: The Famous Voyages of the Royal Canadian Mounted Police Schooner "St. Roch"* (Ottawa: Queen's Printer, 1958), 44.

⁶ Henry Larsen, "Our Return Voyage Through the North-West Passage," *RCMP Quarterly* 10, no. 4 (1945): 320.

⁷ Larsen, *North-West Passage*, 44.

⁸ See, for instance, Shelagh D. Grant, "Why the *St. Roch*? Why the Northwest Passage? Why 1940? New Answers to Old Questions," *Arctic* 46, no. 1 (March 1993): 82–87; Gordon W. Smith, *A Historical and Legal Study of Sovereignty in the Canadian North: Terrestrial Sovereignty, 1870–1939*, ed. P. Whitney Lackenbauer (Calgary: University of Calgary Press, 2014). See also G.J. Tranter, *Plowing the Arctic: Being an Account of the Voyage of the R.C.M.P. 'St. Roch' Through the North West Passage from West to East* (Toronto: Longmans, Green, 1945).

⁹ Larsen, *North-West Passage*; Larsen, "Return Voyage," 298–320; Doreen Larsen Riedel, "The More Northerly Route: Looking Back 70 Years," *Argonauta* 32, no. 1 (Winter 2015): 5–18; Janice Cavell, "Introduction," in *Documents on Canadian External Relations (DCER): The Arctic, 1874–1949* (Ottawa: Global Affairs Canada, 2016), xxxiv–xxxv.

¹⁰ Richard Diubaldo, *Stefansson and the Canadian Arctic* (Montreal and Kingston: McGill-Queen's University Press, 1978), 7.

¹¹ See, for example, Morrison, *Showing the Flag*; Shelagh Grant, *Polar Imperative: A History of Sovereignty in North America* (Vancouver: Douglas & McIntyre, 2010); Peter Kikkert and P. Whitney Lackenbauer, eds., *Legal Appraisals of Canada's Arctic Sovereignty: Key Documents, 1904–58*, Documents on Canadian

Arctic Sovereignty and Security (DCASS) No. 2 (Calgary: Centre for Military and Strategic Studies, 2014); and Smith, *Historical and Legal Study of Sovereignty*.

¹² Quoted in Ivan Head, "Canadian Claims to Territorial Sovereignty in the Arctic Regions," *McGill Law Journal* 9 (1963): 203–04, and in Donat Pharand, *Canada's Arctic Waters in International Law* (Cambridge: Cambridge University Press, 1988), 9–10.

¹³ Canada, Senate *Debates*, 20 February 1907, 271.

¹⁴ Janice Cavell and Jeff Noakes, *Acts of Occupation: Canada and Arctic Sovereignty, 1918–25* (Vancouver: UBC Press, 2010), 6. Cavell and Noakes argue that, in reality, Rasmussen and the Danish government never denied Canadian sovereignty, and they allege that Stefansson stoked sovereignty concerns in the hopes that he would be rewarded with a new expedition to occupy the northern islands. See also Smith, *Historical and Legal Study*, 215–66.

¹⁵ For more on Canadian government activity in the Arctic in the early 1920s, see Morrison, *Showing the Flag*; Janice Cavell, "The Origins of Canada's First Eastern Arctic Patrol, 1919–1922," *Polar Record* 45, no. 233 (2009): 97–112; Peter Schledermann, "The Muskox Patrol: High Arctic Sovereignty Revisited," *Arctic* 58, no. 1 (2003): 101–09; and Smith, *Historical and Legal Study*, 341–67.

¹⁶ P. Whitney Lackenbauer and Peter Kikkert, "The Dog in the Manger – and Letting Sleeping Dogs Lie: The United States, Canada and the Sector Principle, 1924–1955," in *The Arctic Ocean: Essays in Honour of Donat Pharand*, eds. Suzanne Lalonde and Ted McDorman (Leiden: Brill, 2014), 216–39.

¹⁷ Suggested Draft Note to the British Embassy, Department of State, Division of Western European Affairs, 16 September 1925, U.S. National Archives and Records Administration (NARA), RG 59, CDF 1910–1929, box 7156, file 800.014.

¹⁸ John H. Bryant and Harold N. Cones, *Dangerous Crossings: The First Modern Polar Expedition, 1925* (Annapolis: Naval Institute Press, 2000).

¹⁹ For a further explanation of the important role that James White played in Canada's legal strategy, see Cavell and Noakes, *Acts of Occupation*, 75, 221, 227.

²⁰ Canada, House of Commons *Debates*, 1 June 1925, 3773.

²¹ Morrison, *Showing the Flag*, 175–76.

²² Smith, *Historical and Legal Study*, 371. See also Henry A. Larsen, *The Big Ship* (Toronto: McClelland and Stewart, 1967), 36–39, and James P. Delgado, *Arctic Workhorse: The RCMP Schooner St. Roch* (Vancouver: Touch Wood Editions, 2003), 53–63.

²³ Larsen, *Big Ship*, 1–2, 27, 34–35.

²⁴ A.E. Porsild, "Henry Asbjorn Larsen (1899–1964)," *Arctic* 18, no. 1 (1965): 67; Larsen, *North-West Passage*, 7.

²⁵ Doreen Larsen Riedel, quoted in Ship St. Roch Commemorative Association (SSRCA), *St. Roch: RCMP Patrol Vessel St. Roch Commemorative* (Dartmouth, 2007), 5.

²⁶ Larsen, *North-West Passage*, 8–9.

²⁷ Report of a Conversation on 6 February 1940, with Major McKeand of the Department of Mines and Resources, Memorandum from Third Secretary,

Department of External Affairs, to Under-Secretary of State for External Affairs, 6 February 1940, document 547 in Cavell, *DCER: Arctic*, document 547, 819–21.

²⁸ T.L. Cory, compiled for the Northwest Territories Council, British Sovereignty in the Arctic, 3 June 1936, Library and Archives Canada (LAC), RG 25, vol. 4253, file 9057-40, pt. 4. See also Laurent Beaudry, Under-Secretary of State for External Affairs, to T.L. Cory, 20 March 1937, LAC, RG 25, vol. 1658, file 1933-253.

²⁹ Cavell, "Introduction," in *DCER: Arctic*, xxxii.

³⁰ Memorandum from Third Secretary, Department of External Affairs, to Under-Secretary of State for External Affairs, 6 February 1940, in Cavell, *DCER: Arctic*, document 547, 819–21; Report of a Conversation on 6 February 1940, with Major McKeand of the Department of Mines and Resources, Memorandum from Third Secretary, Department of External Affairs, to Under-Secretary of State for External Affairs, 6 February 1940, in Cavell, *DCER: Arctic*, document 547, 819–21.

³¹ Skelton did not accept Wershof's opinion that the closure of the Craig Harbour post for the duration of the war would "seriously weaken Canada's claim." Cavell, "Introduction," in *DCER: Arctic*, xxxiii, n. 41.

³² C.H.M. Waldock, "Disputed Sovereignty in the Falkland Islands Dependencies," *British Yearbook of International Law* 25 (1948): 317, fn. 2.

³³ See, for example, Martti Koskenniemi, *The Gentle Civilizer of Nations: The Rise and Fall of International Law, 1870-1960* (Cambridge: Cambridge University Press, 2001), 121–55.

³⁴ For such analysis of the *Eastern Greenland* case, see, for example, Smith, *Historical and Legal Study*, 313–20; Cavell and Noakes, *Acts of Occupation*, 246–47, 260; and Grant, *Polar Imperative*, 193 and 242.

³⁵ See, for example, J.S. Reeves, "George V Land," *American Journal of International Law* 28, no. 1 (January 1934): 119, and Anonymous, "The Legal Status of Eastern Greenland," *Geographical Journal* 82, no. 2 (1933): 151–56. For examples of state legal appraisals that analyze and assess these three cases, see Law Officers of the Foreign Office and Colonial Office, Paper B on the Legal Authorities, 12 January 1947, United Kingdom National Archives (NA), FO 371/61288, and E.R. Hopkins, Legal Adviser for External Affairs, Legal Aspects of Sovereignty in the Canadian Arctic, 22 January 1949, LAC, RG 2, vol. 122, file A-25.

³⁶ Judge Dionisio Anzilotti offered the dissenting opinion, while Walther Schücking and Wang Chung-hui offered the separate opinions.

³⁷ C.C. Hyde, "Acquisition of Sovereignty over Polar Areas," *Iowa Law Review* 19, no. 293 (1933–34): 287, n. 3.

³⁸ J.R.B. Chaput, Memorandum for the Legal Adviser, Proposed Voyage of the RCMP in the Arctic, 21 May 1944, LAC, RG 85, vol. 268, file 1003-6-1.

³⁹ Grant, "Why the *St. Roch*?" 85; Smith, *Historical and Legal Study of Sovereignty*, 376. See also Sgt. F.S. Farrar, "Arctic Assignment: The Story of the *St. Roch*," in *Great Stories of Canada Series*, ed. B. Bonnezen (Toronto: Macmillan, 1955), 21, 24, 34, 36.

⁴⁰ Larsen autobiography manuscript, 745–46, quoted in Smith, *Historical and Legal Study*, 372–73. See also Larsen, *Big Ship*, 140–42.

⁴¹ Larsen to O.C. (Officer Commanding) “G” Division, RCMP, 12 November 1940, LAC, RG 18, vol. 8139, file “Patrols and Mileage of St. Roch Detachment.”

⁴² In his 12 November 1940 report to the Officer Commanding “G” Division, Larsen listed his crew as F.S. Farrar, first mate; M.F. Foster, chief engineer; J. Friederick; B.C. Hadley; P.G. Hunt; W.J. Parry; A.J. Chartrand; and J.M. Monette. Constable Albert “Frenchy” Chartrand, a popular member of the crew with extensive Arctic experience, died from a heart attack in February 1942.

⁴³ Quoted in Delgado, *Arctic Workhorse*, 38.

⁴⁴ For overviews on wartime developments, see Shelagh Grant, *Sovereignty or Security?: Government Policy in the Canadian North, 1936-1950* (Vancouver: UBC Press, 1988), and Ken Coates, P. Whitney Lackenbauer, William Morrison, and Greg Poelzer, *Arctic Front: Defending Canada in the Far North* (Toronto: Thomas Allen, 2008).

⁴⁵ *Minutes and Documents of the C.W.C.*, Doc. No. 704, Memo, Heeney to C.W.C. (Cabinet War Committee), 3 February 1944; Minutes of meeting of Canadian officials in Ottawa, 26 January 1944, LAC, RG 85, vol. 823, file 7140; and Malcolm Macdonald, Note on Developments in North-Western Canada, 6 April 1943, NA, DO 35/1645.

⁴⁶ G.E. Boyd Shannon, Note, 17 November 1943, NA, DO 35/1423; Brian Roberts, Journal of Visit to the United States and Canada, August–November 1943, Scott Polar Research Institute (SPRI), MS 1308/5 BJ, Roberts, Brian.

⁴⁷ Wright to Gibson, 9 February 1944, LAC, RG 85, vol. 823, file 7140.

⁴⁸ Chaput, Memorandum for the Legal Adviser, 21 May 1944.

⁴⁹ Letter from Deputy Commissioner of Northwest Territories to Commissioner, Royal Canadian Mounted Police, 27 January 1944, in Cavell, *DCER: Arctic*, document 570, 849.

⁵⁰ N. Robertson, Secretary of State for External Affairs, to the Canadian Minister to Argentina, 23 February 1944, LAC, RG 25, vol. 4524, file 9090-A-40, pt. 1.

⁵¹ Brian Roberts, Journal of Visit to the United States and Canada, August–November 1943, SPRI, MS 1308/5 BJ, Roberts, Brian.

⁵² W.E. Beckett, Note, 16 September 1942, NA, FO 371/30313. See also Statement by Foreign Office Legal Adviser on the Necessity of Physical Occupation as a Means of Securing Sovereignty in the Polar Regions, Polar Committee Meeting, 31 October 1946, LAC, RG 25, vol. 3347, file 9092-A-40.

⁵³ N. Robertson, Secretary of State for External Affairs, to the Canadian Minister to Argentina, 23 February 1943, LAC, RG 25, vol. 4524, file 9090-A-40, pt. 1.

⁵⁴ Secretary of State for Dominion Affairs to the Under Secretary of State for External Affairs, 6 May 1944, LAC, RG 25, vol. 4524, file 9090-A-40, pt. 1. The history of Operation *Tabarin* has been well covered. See, for example, John R. Dudeney and David Walton, “From Scotia to ‘Operation Tabarin’: Developing British Policy for Antarctica,” *Polar Record* 48, no. 247 (2002): 342–60; Vivian Fuchs, *Of Ice and Men: The Story of the British Antarctic Survey, 1943-1973* (Shropshire: Anthony Nelson, 1982); Stephen Haddelsey, *Operation Tabarin:*

Britain's Secret Wartime Expedition to Antarctica, 1944-1946 (Stroud: History Press, 2014); and Andrew Taylor, *Two Years Below the Horn: A Canadian's Experiences in Antarctica, 1944-46*, eds. Daniel Heidt and P. Whitney Lackenbauer (Winnipeg: University of Manitoba Press, 2017).

⁵⁵ Peter Beck, "Through Arctic Eyes: Canada and Antarctica, 1945-62," *Arctic* 48, no. 2 (1995): 138-40.

⁵⁶ Chaput, Memorandum for the Legal Adviser, 21 May 1944; Under-Secretary of State for External Affairs to Director, Lands, Parks and Forests Branch, Department of Mines and Resources, 1 June 1944, LAC, RG 25, vol. 3347, file 9061-A-40; D.J. Martin, Supt. (Superintendent) Commanding G Division, to the Officer Commanding, RCMP, H Division, Halifax, N.S. (Nova Scotia), 9 May 1944, LAC, RG 85, vol. 268, file 1003-6-1; Commissioner S.T. Wood, West Through the North West Passage, 20 October 1944, LAC, RG 85, vol. 268, file 1003-6-1; R.A. Gibson to the Commissioner, RCMP, 19 July 1944, LAC, RG 85, vol. 268, file 1003-6-1.

⁵⁷ "R.C.M.P. Who Made Perilous Northern Passage Get Honors," *Ottawa Journal*, 1 January 1943, 3.

⁵⁸ Larsen quoted in Delgado, *Arctic Workhorse*, 40.

⁵⁹ See Joe Panipakuttuk, "The Reminiscences of Joe Panipakuttuk," *North*, xvi (January/February 1969): 10-17, reproduced in P. Whitney Lackenbauer and Shelagh Grant, eds., *"The Adventurous Voyage": St. Roch and the Northwest Passage, 1940-42 and 1944*, Arctic Operational History Series, vol. 7 (Antigonish: Mulroney Institute on Government, 2019).

⁶⁰ Larsen, "Return Voyage," 320.

⁶¹ Larsen, *North-West Passage*, 41.

⁶² Larsen, *Big Ship*, 189.

⁶³ McKenzie quoted in Ship St. Roch Commemorative Association, *St. Roch* (Halifax: Ship St. Roch Commemorative Association, 2007), 9.

⁶⁴ Delgado, *Arctic Workhorse*, 43. "As with my earlier promotions, this one too, I realized was due to my serving aboard the *St. Roch* in the Arctic," Larsen noted. "I felt a deep sense of gratitude." Henry Larsen, *Big Ship*, 194.

⁶⁵ On Panipakuttuk's journey, see P. Whitney Lackenbauer and Shelagh Grant, eds., *"The Adventurous Voyage": St. Roch and the Northwest Passage, 1940-42 and 1944*, Arctic Operational History Series, vol. 7 (Antigonish: Mulroney Institute on Government, 2019), 37-41, 43-44.

⁶⁶ See J.G. Wight to Gibson, 4 December 1944, LAC, RG 85, vol. 268, file 1003-6-1; Lewis Robinson, "Conquest of the Northwest Passage by RCMP Schooner *St. Roch*," *Canadian Geographical Journal* 30, no. 2 (February 1945): 52-73; and Bruce McLeod, "Nor'West Passage," *Maclean's*, 1 March 1945.

⁶⁷ D.L. McKeand to Mr. Gibson, Bureau of Northwest Territories and Yukon Affairs, 2 December 1944, LAC, RG 85, vol. 268, file 1003-6-1.

⁶⁸ W.E.G. Macdonald, "New *St. Roch* Record," *Scarlet and Gold* 26 (1944): 17-24.

⁶⁹ H.A. Larsen, "Our Return Voyage Through the North-west Passage," *Royal Canadian Mounted Police Quarterly* 10, no. 4 (April 1945): 318.

5

Showing the Flag Across the North: HMCS *Labrador* and the 1954 Transit of the Northwest Passage

Michael Whitby*

In late September 1954, the Canadian naval icebreaker HMCS *Labrador* passed southward down the Bering Strait between the Diomed Islands and Cape Prince of Wales towards the Bering Sea and the Pacific. Having entered the Arctic from the Atlantic, she became the first warship, the first large ship, and the first icebreaker to transit the storied Northwest Passage. It was an incredible achievement that brought welcome publicity to the Royal Canadian Navy (RCN) and demonstrated that the service had the capability to work in the North, a region of growing strategic consequence. But although *Labrador's* transit of the Northwest Passage has long been celebrated, the reason why she was sent on that mission has largely remained unexplained. The answer lies, as it so often does in the Canadian context, in our complex relationship with the United States. It reminds us not only of the tension and anxiety that routinely accompany even the closest cooperation, but also how the navy can play an important role in protecting and projecting national interests.

Although other navies had demonstrated interest in northern operations in the years immediately following the Second World War – in March 1946, for example, the United States Navy (USN) undertook Operation *Frostbite* in which the fleet carrier USS *Midway* tested cold weather capabilities in the Davis Strait – the RCN had been unable to do so, mainly due to the severity of postwar budget cuts. In May 1947, the Director of Naval Plans and Intelligence observed that while ships of the Royal Navy, the USN, the Royal

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Canadian Mounted Police (RCMP), and other Canadian government departments had operated in the Canadian North, no ship of the RCN had ever entered northern waters. "In view of the growing importance of the Canadian north," Captain Horatio Nelson Lay noted, "and the possibility that in a future emergency Naval operations may be conducted in these waters, it is essential that the R.C.N. should be familiar with the operating problems and conditions." As a result of these observations – which had a distinctively timeless ring to them – in September 1948 the aircraft carrier HMCS *Magnificent* trained in the approaches to Hudson Strait while her accompanying destroyers *Nootka* and *Haida* penetrated into Hudson Bay itself. As well, in 1949, the frigate *Swansea* cruised off Greenland and visited Iqaluit on Baffin Island.

While traditional naval operations in northern waters quickly evaporated, oceanographic research and other scientific studies continued on a regular basis and featured increasingly close cooperation between American and Canadian defence scientists. Most particularly, scientists working for the Canadian Defence Research Board, the Pacific Naval Laboratory, and the U.S. Navy Electronics Laboratory conducted a series of joint research programs in the Beaufort and Chukchi Seas areas of the western Arctic. Although the Canadian research vessel HMCS *Cedarwood* made a valuable contribution to this effort through 1947 to 1949, American ships carried the brunt of the load. Indeed, from 1949 to 1954, when HMCS *Labrador* became operational, the only major vessels operating in the western Arctic were the USN icebreaker *Burton Island* and the U.S. Coast Guard icebreaker *Northwind*. They usually embarked Canadian scientists and occasionally RCN personnel, but it was chiefly an American effort.

The impending arrival of *Labrador* changed the landscape. The lead USN scientist, Dr. Waldo Lyon, who visited naval headquarters in Ottawa in late 1953 to discuss the following year's program, which for the first time would include the RCN icebreaker, noted the change. His biographer noted that Lyon "came away from the meeting with a sense that *Labrador* opened new doors for his Canadian partners. "Note interest much increased in Arctic," he wrote in his journal." Moreover, "there had been a change from the previous Canadian role as junior partner to the United States in arctic research" to one of "leadership and acceptance of long term planning and work."¹

Despite the increased confidence stemming from *Labrador's* impending arrival, Canadian naval staff officers were nonetheless concerned that the USN would trump them by using its experience and presence in the western

Arctic to transit the Northwest Passage. The Department of External Affairs was also uneasy about sustained American operations in what the government claimed as Canadian territorial waters. These concerns, and the promise of the positive publicity that would come from a successful transit, caused the RCN to push *Labrador* northward, and into the Northwest Passage, earlier than would be considered normal or, perhaps, even prudent.

As one of only two heavy icebreakers in Canadian service – the Coast Guard's *D'Iberville* became operational in 1953 – decisions about *Labrador*'s employment were handled differently than other warships. Although she was to be based at Halifax, due to the various demands on her services from other government departments as well as the RCN's own requirements, it was decided that Flag Officer Atlantic Coast would maintain only administrative control of the ship and that operational control would reside at Naval Service Headquarters in Ottawa. The Director of Naval Plans and Operations (DNPO) – Captain Dudley King during the period under consideration – would be the coordinating authority for all matters pertaining to the ship, and to facilitate that activity, an "Arctic Desk" was established within his organization. As a result of this set up, the senior naval brass in Ottawa was more directly involved in the ship's program than would have been the norm, which also eased the inclusion of a "political" dimension into her activities.

Decisions about *Labrador*'s deployment were also complicated by the fact that her completion was lagging some six weeks behind schedule. At a 13 January 1954 meeting chaired by the Chief of the Naval Staff (CNS), Vice-Admiral Rollo Mainguy, it was revealed that she would not be ready for acceptance until August 1954, too late in the season for Arctic operations if she was also to complete a full workup program off Halifax. Comprehensive workups were seen as particularly important since *Labrador* was an entirely new class of ship.

Labrador had important commitments the first season, including resupply missions to Department of Transport stations at Resolute and Eureka. If completion of the ship was late, obviously plans had to be compressed or foregone entirely if she was to make it to the Arctic at all. The ship's prospective commanding officer proposed a solution. Captain O.C.S. Robertson – dubbed "Long Robbie" because of his six-foot, seven-inch frame – was a skilled seaman who had spent the previous summer with the icebreaker *USS Burton Island*, a near sister to *Labrador*, in the Beaufort Sea. He would be comfortable taking the ship into the North with a two-week workup or less provided he was given most of the ship's company prior to

the shipbuilder's trials. Along with other shortcuts, like not sandblasting the hull, this was deemed tolerable, and *Labrador's* acceptance was set at 15 July 1954, which would enable her to carry out the resupply missions and perhaps take on the Northwest Passage.

The idea of *Labrador* trying the Northwest Passage arose from concerns about the potential movements of the U.S. icebreakers that had been operating in the western Arctic as part of the Joint Canadian–American Beaufort Sea Expedition. In a December 1953 memo requesting permission to plan a transit by *Labrador*, the DNPO noted that, “For various reasons, including those of sovereignty, Canada is reluctant to permit ships of other nations to proceed at will through the waters of the Canadian Arctic.” He also noted that Captain Robertson had told him that when he had accompanied USS *Burton Island* during the 1953 season as Canada's senior representative, he was under instructions “to permit the eastern passage by US ships only if, in his opinion, the return to the westward would be truly hazardous.”² Thus, an “accidental” passage based on safety concerns was all Canada would accept. In February 1954, however, there were informal indications that the United States planned to send its icebreakers through the Northwest Passage that summer.

Matters concerning the law of the sea were in a state of flux at this time, with different states or groups of states claiming and recognizing different territorial limits and archipelagic rights. It is evident from planning memos that elements within the Canadian government were concerned that they had no legal entitlement to block an American transit of the Northwest Passage, which could affect claims of sovereignty.³ Although this was never stated explicitly, the DNPO clearly thought that the appeal of an American transit might dissipate if *Labrador* beat the United States to it. At any rate, it was believed that as a result of the publicity associated with a successful passage by *Labrador*, sovereignty claims over the Arctic might be strengthened, and Canada might be less reluctant to allow U.S. ships to take the Northwest Passage in the future, which would relieve a certain amount of tension in the Canada–U.S. relationship.

Apart from strengthening Canada's position, the DNPO also thought the attendant publicity would benefit the navy. In a memo, he said:

I am convinced that there is a certain amount of kudos to be gained by the Royal Canadian Navy if one of HMC Ships were to be the first Naval ship of any nation, not only to traverse the Northwest Passage but also to circumnavigate the North American continent

in one 'season'. It is an opportunity which, like the conquest of Everest, will occur but once!

The Vice Chief of the Naval Staff (VCNS), Rear-Admiral Wallace Creery, shared this enthusiasm for the mission but sought reaction from the scientific and naval technical communities. The research program would have to be cut back in some areas if the ship attempted the passage, but the RCN's Director of Scientific Services and the Dominion Hydrographer were willing to accept that. The Dominion Hydrographer noted that "the psychological value of such an accomplishment in opening up the Arctic would outweigh most other considerations." The Chief of Naval Technical Services (CNTS) cautioned:

it was a somewhat ambitious programme for the maiden voyage of a new ship with inexperienced personnel and it would obviously be preferable to carry out initial ice-breaking operations of LABRADOR closer to support facilities. That said, "Nothing ventured nothing won."⁴

It was obviously risky to send a new, untried ship into such a hazardous environment, and the consequences of failure, like the fruits of success, could be immense. Imagine the embarrassment if *Labrador* had to be towed to safety by an American icebreaker, particularly if the U.S. ship completed the Northwest Passage in doing so! But the prize was deemed worth that risk, and the confidence in the ship ultimately proved justified. Although there were some technical failures during the passage, all were overcome by the ship's engineering department. (As an indication of what could go wrong, *Labrador's* steering failed as she negotiated severe rapids on her maiden voyage down the St. Lawrence River to Halifax, causing great consternation on the bridge.)

Based on these recommendations, the operation was approved in principle, at least until 13 August 1954. At that point, *Labrador* should have completed her resupply commitments and would be poised either to withdraw from the Arctic eastward by the way she came or to push through westward to complete the transit of the Northwest Passage. Headquarters decided to leave the final decision to the man on the spot, Robertson, who, depending upon the condition of the ship, crew, and ice, would signal his intentions to Ottawa. To avoid the consequences of a failed attempt, headquarters decided to keep news of the transit confidential until it was successfully completed. Indeed, even the Royal Canadian Air Force (RCAF), which requested the ship's program so it could arrange critical ice reconnaissance, was kept in the dark.

The Americans were one group that had to be informed. Not only would *Labrador* be able to conduct valuable oceanographic work with *Burton Island* and *Northwind* in the Viscount Melville Sound–Prince of Wales Strait–Beaufort Sea area if she attempted the passage, but, ironically, American authorities would have to be informed that the Canadian icebreaker was going to transit Alaskan waters on her way out of the Arctic. Moreover, it appears from an account of an informal meeting in Washington between *Labrador's* navigator and a USN hydrographer where the Canadian officer was gathering charts for the operation that the Americans suspected that the RCN icebreaker might attempt the Northwest Passage.⁵ Certainly, based on that meeting, in May the USN requested details of *Labrador's* program. The Canadians responded in mid-June, about a month before *Labrador's* departure, mentioning that the icebreaker would likely attempt the transit.⁶ It is not known how American authorities reacted, but post-operational accounts of *Burton Island* and *Northwind's* activities contain no hint that they had intended to attempt a transit that season. When *Labrador* completed the passage successfully that September, she had the spotlight to herself.

As the senior naval officers had predicted, the glare of publicity on the heels of the successful passage was bright indeed. Congratulatory signals flowed into naval headquarters, and newspapers trumpeted the success. Seventeen reporters scurried onboard *Labrador* the moment she went alongside in Esquimalt, and Robertson had to endure a four-hour press conference. Popular enthusiasm was unbridled, and after a port visit to Vancouver, Robertson complained that the crew had become social magnets, attracting the interest of what today would be dubbed Arctic groupies.⁷

Although important, publicity was secondary to the navy's objective of helping to solidify Canadian interests in the North. Beating the Americans through the Northwest Passage appears to have had no adverse impact on the U.S.–Canadian relations in the region. Indeed, relations probably grew stronger as *Labrador's* capability brought them into closer partnership in subsequent joint operations such as constructing the Distant Early Warning (DEW) Line and charting the waters and coastline of the Arctic. But by transiting the Northwest Passage, *Labrador* had made a point for Canada. She had made a statement reinforcing sovereignty; perhaps that is all that is required or, indeed, all that can really be done.

Notes

This article is based on research conducted for the Official History of the RCN, 1945–68. The author has profited from discussion with team members, Dr. Isabel Campbell, Lieutenant (Navy) (LT(N)) Richard Mayne, and LT(N) Jason Delaney. Any views stated are the author's.

¹ William M. Leary, *Under Ice: Waldo Lyon and the Development of the Arctic Submarine* (College Station: Texas A&M University Press, 1999), 72.

² DNPO, "The Northwest Passage-HMCS LABRADOR," 18 December 1953. Unless mentioned otherwise, all citations are from Library and Archives Canada (LAC), RG 24 (acc. 83-84/167), box 3922, 8375-AW 50 vol. 1.

³ For Canadian concerns, see Department of External Affairs, *Documents on Canadian External Relations*, vol. 19 (1953), 1047–53 and vol. 20 (1954), 1139.

⁴ CNTS, "The Northwest Passage-HMCS LABRADOR," 22 February 1954.

⁵ T.A. Irvine, *The Ice Was All Between* (Toronto: Longman, Greens and Co., 1959), 20–21. Irvine was *Labrador's* hydrography officer.

⁶ Naval Secretary, "HMCS LABRADOR-Programme for 1954," 15 June 1954; Commanding Officer (CO) *Labrador*, "HMCS LABRADOR-Programme," 2 June 1954.

⁷ CO *Labrador*, Report of Proceedings October 1954, Directorate of History and Heritage (DHH), 81/520 Labrador 8000.



6

Opening an Arctic Escape Route: The Bellot Strait Expedition

Adam Lajeunesse and P. Whitney Lackenbauer*

In 1957, the construction of the Distant Early Warning (DEW) Line's string of Arctic radar stations entered its third season, and the U.S. Military Sea Transportation Service (MSTS) – which had been created eight years earlier to control, operate, and administer ocean transportation for the American military services – prepared to send its convoys of supply vessels into Canadian waters to finish the project.¹ Operating these icebreaking and construction fleets over the past two seasons had proven a crash course in Arctic operations, accelerating the U.S. Navy's (USN) and Coast Guard's (USCG) learning curves and bringing into focus many of the dangers involved in operating large numbers of thin-skinned ships in the waters of the Canadian Arctic Archipelago. The MSTS inherited one persistent worry from past Arctic enterprises, extending as far back as the whaling fleets and Victorian explorers of the nineteenth century: the prospect of being trapped by the ice as the region froze back up in the fall.

In the eastern Canadian Arctic, cargo ships had access to a reasonably reliable gateway through Lancaster Sound and Baffin Bay into the Atlantic Ocean. These were some of the last areas of the Arctic to ice up in the fall, with parts of Baffin Bay still navigable well into November. In the western Canadian Arctic, entering and exiting the region was a more precarious proposition. Ships moving east over the top of Alaska into Canadian waters had to pass between the Beaufort Sea icepack and the coastal area surrounding Point Barrow. In the summer months, the ice receded from the coast, allowing ships to pass along a narrow but navigable waterway

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between Alaska and the permanent pack ice farther north – a tenuous route at best. During the 1955 and 1956 DEW Line sealifts, difficult ice conditions and strong currents repeatedly closed this escape route on the MSTs fleet as it tried to exit west. In his 1955 report to the Navy, the commander of Amphibious Group Three (the task force assigned to sealift material to the central DEW Line stations), Rear Admiral G.C. Towner, noted that calling the north Alaska coast a “route” was a misnomer, given that it was never open in any “ordinary sense.” Icebreakers were repeatedly beset, cargo vessels suffered heavy damage, and schedules were impossible to maintain as the ice crashed south into the shore, only then to recede, “like the opening and closing of a series of doors.”²

For the ships operating east of Point Barrow, failure to slip through that door before it closed for the winter meant being crushed by the ice or, in the best-case scenario, being trapped until the next season’s thaw. Relying on luck to preserve dozens of vessels carrying hundreds of crew members and service personnel was poor policy, and, beginning in 1956, the U.S. Navy started to examine potential escape routes to the east.³ Finding reliable routes was no less important to modern vessels than it had been to previous generations of explorers and whalers.

While narratives surrounding Arctic exploration during the so-called “heroic age” of the nineteenth and early twentieth centuries are plentiful, there is comparatively little scholarship on modern exploration during and after the Second World War. Nevertheless, Canadian and American planners, backed by scientific research programs, icebreakers, airplanes, and complex logistical systems, set out to understand and master this “hostile environment” in the interests of science and continental defence during this period.⁴ The postwar naval and coast guard task forces that operated in the region faced age-old environmental challenges associated with unpredictable ice conditions, weather, and extreme isolation. Over time, the size and scope of Arctic convoys grew, requiring innovative planning, elaborate preparations, and complex joint (Canada–U.S.) interdepartmental/interagency coordination. These “modern voyages” of exploration made an expanded security footprint in the Arctic possible and facilitated the establishment and sustainment of stations in parts of the Arctic that were hitherto inaccessible to non-Indigenous people, culminating with the construction of the DEW Line.⁵

This article narrates the difficulties experienced by the eastern and western units of the Bellot Strait survey group created in 1957 to chart a usable Northwest Passage for deep-draft ships, advance hydrographic

sounding efforts, and mark the route with aids to navigation. While historian P.J. Capelotti and retired Coast Guardsman Dick Judge have chronicled the details of this historic operation, the academic community has largely overlooked it.⁶ The role of the Canadian icebreaker HMCS *Labrador* has similarly received only passing reference.⁷ Drawing on the work of Capelotti and Judge, we use records from American and Canadian archives as well as private letter collections and diaries to incorporate U.S. Coast Guard and Royal Canadian Navy (RCN) perspectives, revealing how the North American partners overcame environmental challenges to achieve the first “triple feat of circumnavigation” and the first hydrographic survey of the narrow, swift-flowing Bellot Strait which separates continental America from the Arctic Islands. The story also serves as a reminder of the enduring history of U.S. Coast Guard and Navy operations in Canada’s Arctic waters in collaboration with their Canadian counterparts.

Between the end of the Second World War and the completion of the DEW Line, the U.S. Navy and Coast Guard sent dozens of icebreakers and cargo ships to the waters of the Canadian Arctic Archipelago. Although the U.S. Coast Guard manages the country’s icebreaker fleet today, both the Navy and the Coast Guard had icebreakers in the mid-1950s. The Navy operated five polar icebreakers (four Wind-class vessels and USS *Glacier*), while the Coast Guard operated three, along with a fleet of light ice-strengthened buoy tenders and other smaller vessels – such as *Storis*, *Spar*, and *Bramble*. Often working together, the Navy and Coast Guard vessels kept shipping lanes open and supported cargo vessel operations in the polar regions.⁸ This combined capacity dramatically outweighed what the Canadian government had to offer, and, accordingly, American vessels completed much of the early postwar charting and surveying in the North American Arctic, transported materiel and personnel to establish radar and weather stations, and resupplied Canadian and American forces stationed in the Arctic islands.

Despite persistent Canadian worries about sovereignty, Canadian and U.S. officials applied lessons from missions such as Task Force 80 (1948) to subsequent resupply activities, ensuring a smooth operational relationship into the 1950s.⁹ From 1951–52, for example, MSTs ships embarked on Operation Support of North Atlantic Construction (SUNAC) and ventured into the Labrador Sea, Davis Strait, and Baffin Bay to construct radar outposts along Canada’s northeastern shore and western Greenland, as well as enlarging the U.S. Air Force (USAF) base at Thule (Operation *Blue Jay*). Crews honed their skills in a challenging operational environment, and, even

with the benefit of “modern” technology, ships frequently sustained damage during these voyages, and captains begrudgingly accepted that they had to adapt or yield to environmental conditions.¹⁰

A changing strategic threat environment prompted a dramatic heightening of tempo in North American Arctic operations in the 1950s. The Soviet-backed invasion of South Korea and the USSR’s development of the hydrogen bomb – and the long-range aircraft required to drop these warheads on North American cities – amplified American concerns about Soviet intentions and capabilities. The U.S. response was to establish a network of early warning radar stations stretching across the North American Arctic from Alaska to Greenland. The DEW Line was designed to give American bombers enough notice to launch in the case of a Soviet attack, thus keeping the country’s response capacity (and, by extension, deterrence) intact.

Paid for and constructed by the United States, the DEW Line involved an extraordinary feat of “geographical engineering, planned and sequenced in minute detail,”¹¹ that fundamentally reshaped Arctic logistics, communications, and ultimately the region’s human geographies.¹² During the construction phase from 1955–57, the MSTs moved over 460,000 tons of equipment and supplies into the Canadian Arctic, including enough gravel to build two copies of the Great Pyramid of Giza.¹³ “Stretching for 2,500 miles across the Arctic, it required the biggest task-force of ships since the invasion of Europe and the largest air operation since the Berlin airlift to take in the supplies,” Canadian Department of Northern Affairs and National Resources official Charles Marshall trumpeted in a 1957 magazine article. “More than 7,000 men laboured through two short Arctic construction seasons to complete the work on schedule. Small wonder that many consider the project one of the most dramatic engineering achievements of our time and a milestone in the development of the Arctic.”¹⁴

Although Canadian and American officials had already established solid working relationships that facilitated the cooperative shipment of thousands of tonnes of *matériel* to isolated stretches of Arctic coastline, these North American Arctic operations resurrected Canadian sensitivities about sovereignty. The U.S. acknowledged Canadian terrestrial sovereignty over the islands of the Arctic Archipelago, but the escalating tempo and scale of maritime activities in the waters between the islands raised questions about control over practical activities therein.¹⁵ Creative diplomacy and mutual accommodation ultimately prevailed, but senior Canadian decision-makers offered frequent pledges to “Canadianize” Arctic operations and “keep the

Canadian Arctic Canadian.”¹⁶ Canada’s limited icebreaking capacity and prioritization of operations in Hudson Bay and the St. Lawrence and Saguenay Rivers meant that its resources were always limited. As such, it continued to rely on the Americans to shoulder the brunt of the Arctic operational burden in the early 1950s.¹⁷ The archival record demonstrates that there was no insidious plot by the U.S. Navy or Coast Guard to monopolize the sealift supporting the Joint Arctic Weather Stations and no nefarious intent to build a rival claim to sovereignty over the High Arctic islands. Instead, American officials eagerly awaited new Canadian capacity that would contribute substantively to resupply efforts.¹⁸ The commissioning of the upgraded Wind-class icebreaker HMCS *Labrador* into the Royal Canadian Navy in July 1954 thus represented a powerful instrument offering a much-welcomed capacity to contribute to joint Arctic construction projects.¹⁹

From the onset, HMCS *Labrador*’s operators gave less thought to questions of sovereignty and jurisdiction than to practical considerations of navigation. The DEW Line mission required that it partake “in one of the greatest seaborne operations ever attempted in the Far North,” the RCN service magazine *Crowsnest* informed its readers at the time. The ship’s “principal and most testing assignment” in 1955 was to serve from mid-June through September “as senior ship of a task group of some fourteen ships charged with the delivery of thousands of tons of supplies to build DEW Line sites in the Foxe Basin area of the Eastern Arctic.” This meant delivering personnel, equipment, and supplies, as well as completing “numerous other associated tasks requiring a high degree of operational efficiency and an equivalent amount of effort.” These included “the survey of previously uncharted waters, selection and survey of landing sites, installation of navigational control stations and, most important, the safe passage, through hazardous, ice-infested seas, of the ships comprising the Task Group.”²⁰

Labrador completed all its tasks, but operating in the Arctic Archipelago remained a dangerous proposition. During the 1955 sealift into the Western Arctic, for instance, five ships lost or damaged their anchors, fourteen lost or damaged rudders, and there were thirteen groundings, twenty-two instances of damaged propellers and shafts, forty-three electrical casualties, forty-four ships with hull damage, and twenty-eight cases of “miscellaneous” damage. On average, two U.S. ships sustained damage each day.²¹

The shared mission of running task groups to build the DEW Line and execute what was described at the time as “probably the greatest single construction order in history”²² proved daunting. Shepherd and then

landing enormous loads of construction equipment and materiel by landing craft over Arctic beaches, after first charting and clearing the approaches, posed enormous challenges. "The work was not glamorous or adventurous," Captain Owen Robertson explained about *Labrador's* Arctic voyages. "Most of it was just plain hard work, long-hours, bad weather and monotony; but we did know that what we were doing was important to Canada – that was our reward."²³ Conducting preliminary reconnaissance of unknown waters, surveying new routes, charting beaches and anchorages, undertaking scientific research, or carrying out rescue operations entailed adaptability in the face of uncertainty, and ice convoy work could be strenuous and dangerous. These operations yielded valuable lessons that informed future convoy operations and Arctic navigation more broadly.²⁴

During the summer of 1956, *Labrador's* primary task was assisting with the sea supply of the DEW Line stations in the Eastern Arctic. The captain of the Department of Transport patrol ship *C.D. Howe*, sitting comfortably off Coral Harbour, was reputed to have said that "because ice conditions were so bad this year the sealift ships would never get through and that *Labrador* would not make it either," RCN Captain Thomas C. Pullen noted on 1 August. "Well, here we are! Silly old man." After erecting beacons in Foxe Basin, *Labrador* joined the U.S. Navy icebreaker *Edisto* to convoy supply ships to the DEW Line sites. Operating in largely uncharted waters, they began a hydrographic survey of Fury and Hecla Strait, a welcome "break from the flat monotony of Foxe Basin, rocky and interesting," as Pullen recorded on 16 September.²⁵ Subsequently, *Labrador* made four attempts to push through Bellot Strait but each time encountered waters shoaled to within twenty feet of the bottom of the ship. In discovering a deep channel on the side of the channel, *Labrador* also identified "Magpie Rock" in the middle – a menacing obstacle "over which the water is boiling and frothing at six to eight knots, maybe ten."²⁶ When Pullen and *Labrador* docked in Halifax on 13 October, the captain took stock of his achievements: "103 days away, 100 days at sea, ... steamed 18,606 miles, approximately 12,000 of which were in uncharted waters. Had several close calls – the worst occurring in Foxe Basin when we were within seven feet of taking the ground off the southwest corner of Rowley Island, and in Bellot Strait when prudence kept us from attempting a passage."²⁷ Confirming an eastern outlet through Bellot Strait, which would provide an alternative for the western convoys if their northern Alaskan route became unnavigable, remained imperative.

Aerial surveys flown in 1956 showed a potentially navigable passage south of Victoria Island, up Franklin Strait, and through the uncharted Bellot

Strait. The route had potential. If ice in the Beaufort Sea closed that path to shipping, then, theoretically, ships might be able to travel through the Arctic Islands to exit through Baffin Bay or Hudson Strait. On a map, this looked like an easy alternative. Despite years of charting, however, the hydrography of this route – and its hidden dangers – remained relatively unknown. USCG cutter *Storis* and USS *Requisite* (a repurposed minesweeper) had spent the 1955 and 1956 seasons charting the western half of this route: Amundsen Gulf to Dolphin and Union Strait, Coronation Gulf, and Queen Maud Gulf. At the end of the 1956 expedition, these ships requested permission to continue towards Bellot Strait, but the chief of the MSTs denied it, asserting that the mission was impracticable (particularly for the thin-skinned *Requisite*). The route from Queen Maud Gulf to Bellot Strait was shallow, uncharted, and dangerous; only small, shallow-draft vessels had traversed this route historically.²⁸ To be considered viable for American supply vessels and icebreakers, a passage with at least a thirty-five-foot draft needed to be found, charted, and marked with navigational aids.²⁹

In early 1957, the new MSTs chief made the passage a priority and formed a Bellot Strait survey group labelled Task Group (TG) 6.5. This group was split in two: Captain Thomas Pullen commanded the East Unit (TG 6.5.0), comprised of HMCS *Labrador*; while USCG Captain Harold L. Wood commanded the West Unit (TG 6.5.1), comprising USCGC *Storis*, *Spar*, and *Bramble*. The plan was for *Labrador* to retry the eastern approaches to Bellot Strait and, once there, meet up with *Storis*, *Spar*, and *Bramble* coming from Alaska to chart the western approaches through Queen Maud Gulf and Simpson Strait, Rae Strait, and James Ross Strait.³⁰ The lion's share of the work fell to the three U.S. Coast Guard vessels, which had to chop through over 1,800 miles of ice, sounding and mapping the area from Point Barrow to the Eastern Arctic.

Tasked with moving through thousands of miles of uncharted and dangerous waters, none of the three U.S. Coast Guard ships had heavy icebreaking capability. *Storis* had spent the past two years charting the region with *Requisite*, but it was only classified as a light icebreaker. Built in 1941 for service in the easier waters around Greenland, the ship was originally supposed to be named *Eskimo*, though that was changed after the State Department feared the term (which means eaters of raw meat) would be offensive to the Greenlandic Inuit. Instead, the ship was given a Scandinavian name commonly taken to mean "great ice."³¹ *Spar* and *Bramble* were both ice-strengthened buoy tenders, built in 1944 with ice belts at their waterlines. What the three ships lacked was the horsepower of purpose-built

icebreakers. Working in waters choked with ice, an icebreaker requires the horsepower to back up and ram ice repeatedly. At 1,200 horsepower, the engines on both *Bramble* and *Spar* were not powerful enough to escape heavy ice. *Storis*'s 1,800-shaft-horsepower (shp) engines were stronger but still only appropriate for the light ice more commonly found off southern Greenland. To put the ship's capabilities into perspective, the Wind-class cutters boasted 12,000 shp, while the modern Polar class is equipped with 18,000 shp engines. Yet, despite the importance of the operation, the three light ships were all that the U.S. could spare, since its heavy icebreakers were committed to escorting DEW Line convoys and resupplying the joint bases scattered across the Eastern Arctic.

Preparations for the operation began in early 1957, and naval officials made every effort to strengthen the ships for the trial ahead. Installing additional steel ice belts at and below the waterline on the hulls of both *Spar* and *Bramble* would protect them from ice as well as uncharted pinnacles and dangerous rock formations in the shallow waters of the Canadian Arctic. After years of losing propeller blades in the North, the U.S. Navy and Coast Guard had enhanced their designs to better withstand the ice, and a new stainless-steel propeller on *Bramble* replaced its bronze screw. New equipment loaded onto the ships included an evaporator for producing freshwater and an early type of side-scanning sonar called a Honeywell unit. The ships also had six months of Arctic stores, including three thousand new books added to combat the boredom and fatigue common on Arctic cruises.³²

News of the operation began to leak out in the middle of May when *Storis* suddenly returned to its homeport of Juneau, Alaska, in the middle of a cruise. There, the Coast Guard told the crew to spend time with their families because they might not see them again for six months. Few operations requiring a light icebreaker required six months to complete, and rumours spread that the ship was going to transit the Northwest Passage.³³ *Storis* crew member Ken Fisher knew something big was in the works when he was interviewed by a psychologist. For its part, the U.S. Coast Guard had never attempted such an ambitious Arctic cruise before; not only would it be long and difficult, but there was a distinct possibility that the ships would be stuck in the region for the winter. As such, the Coast Guard wanted to make sure that the crews were mentally capable and subjected some crew members to a brief psychological interview as part of a general health assessment.³⁴ Members of the news media, captivated by the prospect of an American squadron making the fabled Northwest Passage, bombarded the Coast Guard with requests for interviews, tours, and even permission to

accompany the ships. "The brass hats are lining up like crows, in Washington, waiting for a chance to climb on board," Captain Wood wrote to his wife. "Send me my bottle of chlorophyll Aspirin ... I'll need it!"³⁵

On 19 May, *Spar* left its home port of Bristol, Rhode Island, for Panama. One week later, its sister ship *Bramble* departed Miami to rendezvous with *Spar* in the Panama Canal Zone. Continuing along the western coast of the United States, the two vessels reached Seattle on the morning of 27 June and moored alongside *Storis*, which itself had just arrived from Ketchikan, Alaska, to have a helicopter landing platform installed on the deck.³⁶ On 1 July, after taking on final supplies, the three ships departed as a group for the Arctic.

Moving north across the Gulf of Alaska to the Bering Strait, the squadron enjoyed good weather. The transit into the Bering Sea and the Arctic beyond was a long one, however, and the crew had little to occupy their time in these ice-free waters. A beard-growing contest on *Storis* provided limited amusement. After a week at sea, the Gulf of Alaska became rough, and life aboard the three small ships became increasingly uncomfortable – a state of affairs, crew member Dick Judge remembers, that the men's increasingly itchy faces only worsened.³⁷

Passing Big Diomed Island, the closest Russian territory to Alaska, broke the monotony on 10 July. When radar aboard *Storis* indicated Soviet fighter aircraft approaching the squadron from the west, the ship was called to general quarters and the crew manned the ship's guns. Fortunately, the alert proved false; although *Storis* was armed with a twenty-five-millimetre cannon, depth charges, and a quad twenty-millimetre anti-air weapon (enough to make it a threat to enemy shipping in the Second World War), those armaments were insufficient to handle Soviet jet fighters. Passing through waters close to the Soviet Union always heightened tensions – and required vigilance.³⁸

The Arctic ice ultimately posed a more acute threat to the vessels than the Soviets. The squadron transited the Alaskan coast without incident and was in Canadian waters by 16 July. Off Cape Parry, *Storis* rammed a mass of old ice, giving the crew a nasty shock and a worrisome beginning to the trip. The vessels had not even entered the Arctic Archipelago but were already encountering eight feet of ice, which covered the entire entrance to Amundsen Gulf. Other ships already in the Western Arctic reported the worst ice conditions that many of the Arctic veterans had ever experienced. The shipping season had barely begun, and already the ice had damaged six transport ships.³⁹

Taking advantage of the region's nearly continuous daylight, *Storis's* two Bell helicopters zipped back and forth looking for leads and scouting the icepack ahead. This information from their airborne scouts enabled the three ships to pick their way through leads in the ice. "Our helicopters are worth their weight in cold cash," Captain Wood wrote in a letter home.⁴⁰ After a week in Amundsen Gulf, the ships arrived at Dolphin and Union Strait, the shallow and sometimes dangerous entrance to the southern leg of the Northwest Passage. Unbroken, thick winter ice awaited the ships. Again, the helicopters were sent out to look for a way through.

Operating helicopters off the flight deck of a small icebreaker was always a dangerous proposition, and on 20 July, *Storis* suffered its first casualty. An attempt to take off by one of the Bells was cut short by the failure of the ground crew to detach one of the tie-downs holding the aircraft to the deck. The strap flipped the helicopter over, sending it tumbling overboard. The plexiglass cockpit shattered, and one of the pontoons broke off. Amazingly, no one was killed, and only the pilot was injured. The helicopter, however, was a total wreck.⁴¹ Reduced to one aircraft, the squadron found itself in a difficult position, since two were needed to meet safety guidelines. Luckily for *Storis*, the icebreaker USS *Burton Island* was operating nearby in the Beaufort Sea and had a spare that it delivered promptly.

Progress was slow through the thick winter ice in Dolphin and Union Strait, and, for several days after the helicopter crash, the ships were beset in the ice. The pressure on the sides of the cutters was "terrific" and held them firmly in place. Ice on the starboard side of the three ships slowly pushed inwards, eventually tipping the vessels up to 10° to port.⁴² In an effort to rock themselves free, the crews weighted booms and swung them back and forth. This action proved futile, but when the shifting ice slowly released *Spar* from its grasp, the ship made painstaking progress to break the ice and release the pressure on the other two ships. The effort ground to a rapid halt when the ice re-trapped *Spar*, pushing it over 8° and ending the rescue. The gunner's mate aboard *Storis* attempted to extricate the ship with explosives, but this accomplished little more than a four-foot-wide hole in the ice. Crewman Judge sarcastically noted that if they could do that two hundred more times, they might even strike water.⁴³ The crew realized that only a change in wind and current would release them. The waiting game, known to so many Arctic expeditions, had begun.

The ever-shifting ice opened modestly on 26 July, allowing the task group to move slowly forward in a column formation for nearly three-quarters of a mile. Although individual ships became stuck, the others were able to ride

up beside them to release the pressure and maintain forward momentum. The captains of all three ships agreed that their ice-strengthened hulls were important and that the thin-skinned vessels, like USS *Requisite*, should not be used for such tasks in the future.⁴⁴

The task group was beset once again after it proceeded into Coronation Gulf. The helicopters zipped forward to search for a navigable route, their work supplemented by Canadian ice reconnaissance flights from Cambridge Bay. The situation reached crisis levels on 29 July, when *Storis* rammed an immovable ice floe. *Spar*, travelling astern, had to slow to avoid a collision. Having lost momentum, the ships sat trapped for two long days while northern winds carried more ice down around them. Ice floes forced their way under *Spar*, jamming the rudder, tilting the ship by 20°, and pushing it upward and into *Storis*. Wedged together, the ships' crews were close enough to pass back and forth between the vessels.⁴⁵ To prevent excessive damage, the crews rigged airplane tires as fenders – which the extreme pressure soon flattened into large gaskets. As the two ships scraped against one another, *Spar*'s anchor threatened to pierce *Storis*'s hull and had to be dropped onto the ice to prevent a breach. *Storis*'s crew was surprised to see that the crash of the anchor barely dented the ice.⁴⁶

The ice pushed the ships south towards the coast until they were only seven hundred yards away from dry land, with a mere fourteen feet between their hulls and the seabed below. On the beach, the crews could see the floes pushing inwards and piling up, creating a pile of jagged, rock-hard ice fifty feet high. Damage control teams patrolled the ships with emergency equipment, expecting punctures at any moment. The ice pressure lifted *Storis* nine feet above the waterline, making its entire propeller visible to the crew of *Spar* – who could at least confirm that the blades were in good shape.⁴⁷

Amongst the crew, rumours began to circulate that the ships would be stuck in the Arctic for the year and that the Coast Guard would soon start removing men to Edmonton, leaving behind only a skeleton crew to maintain the ships. "We were stuck," recalled Jim Loback, a petty officer onboard *Storis*, "and there were rumors that they were going to start taking people off."⁴⁸ By this point, crew members assumed that there was now no water at all beneath the ships. All the three vessels could do, Captain Wood noted, was "sweat it out." The three Coast Guard cutters had little choice but to wait patiently. On the third day, however, the pressure began to ease and *Storis* and *Spar* dropped into liquid water, managing to push towards *Bramble*, which was still beset five miles away. Once reunited, the task group followed what Wood called a "tortuous lead" north for twenty-one miles,

where they came to the edge of the ice, almost at the shore of Victoria Island.⁴⁹ The task group had travelled roughly 340 miles into the Canadian Arctic Archipelago and still had to cover 600 miles to get to Bellot Strait.

Proceeding through Dolphin and Union Strait, the ships enjoyed improving conditions and focused on tasks unrelated to immediate survival. In Coronation Gulf, they surveyed a previously uncharted island and took soundings. On 5 August, they entered Dease Strait, still feeling their way through small leads and cracks in the ice near the shoreline of Victoria Island. The next day, the task group arrived at Cambridge Bay, a small Inuit settlement with a DEW Line station and a Royal Canadian Mounted Police (RCMP) detachment. The crew was granted a brief shore leave, but walking on the rough terrain inspired little excitement. The Hudson's Bay Company store had no furs or Inuit art for sale, and Wood noted that the sparsely stocked shelves contained nothing that the crew could not buy down south at Sears for one third the price.⁵⁰ *Bramble* broke the ice in the bay, and the force sounded the area to improve charts for the MSTs supply ships that were due later in the season. Divers also went below to inspect the hulls and noted that the weeks of hard icebreaking had actually caused minimal damage. A four-foot section of *Bramble's* port bilge keel was badly dented and *Spar's* propeller had been damaged, but both ships could push on.⁵¹

The brief encounter with Inuit at Cambridge Bay affirmed that the waters through which the vessels sailed formed part of Inuit Nunangat – the Inuit homeland in Canada. Located on the southeast coast of Victoria Island, Ikaluktutiak ("the fair fishing place" in Inuinnaqtun) had been a hub for Inuit activity since time immemorial. In 1839, Hudson's Bay Company explorers Peter Warren Dease and Thomas Simpson had crossed over Dease Strait and named Cambridge Bay after the Duke of Cambridge, a patron of science and exploration. Richard Collinson and the crew of HMS *Enterprise* became the first Europeans to winter in the bay in 1852 when he extolled the resourcefulness, hardiness, and cheerfulness of Inuinnaits. But these explorers – like the American crews in the 1950s – did not draw substantively upon Inuit Qaujimajatuqangit (Indigenous knowledge) to facilitate their exploration. Diamond Jenness recorded a vast amount of information about Inuinnaits societies during the Canadian Arctic Expedition (1914–17), the Kitikmeot soon became known as one of the best fox fur-producing regions in the Arctic, and the Royal Canadian Mounted Police and then Anglican missionaries established a regional presence in the 1920s. The RCMP's famous patrol vessel, *St. Roch*, often overwintered in the bay and occasionally provided transportation to travelling Inuinnaits. Nevertheless,

none of the MSTs planners or ships' captains capitalized on local knowledge in 1957 when passing through Inuit Nunangat – a telling statement about their faith in modern technology and dismissal of Indigenous knowledge and ways of knowing.⁵²

From Cambridge Bay, the task group enjoyed a comparatively easy passage east through Queen Maud Gulf. One of the more dangerous areas of the Arctic Archipelago to navigate, this area is fraught with shoals and subject to rapid changes in current and wind that draw ice down from M'Clintock Channel and can push ships against the coast. Thankfully, calm conditions prevailed, and the ships set to work erecting shore aids and charting safe routes for cargo ships, taking miles of soundings in the ensuing weeks – a routine task made difficult by the still constant fog and shifting ice conditions. The ships accelerated the pace when they learned that the MSTS convoys had entered the Arctic and were en route to Queen Maud Gulf. In a letter home, Captain Wood explained that his philosophy was to “wait until the ice is out of the way!” While fine in theory, he noted that the Coast Guard hardly subscribed to it in practice. “I was my own boss, as far as the final decision concerning running of the survey was concerned, but I didn't control the advance of the re-supply units, and they were rapidly overtaking us.” In addition to the survey work, the task group had a gentlemen's agreement to assist the resupply convoys. Time was pressing, and many shore radar reflectors and aids to navigation needed to be installed before the supply ships arrived.⁵³

Simpson Strait is a narrow, dangerous passage separating King William Island from the Canadian mainland. Surveying the area before the arrival of the MSTS convoy, *Storis* grounded on 14 August. Although the ship's charts showed the area to be clear, it ran onto a previously unmarked shoal. In order to extricate itself, the cutter waited for the tide to raise the water level by nine inches, and, when it did, *Storis* managed to pull off without tearing its hull.⁵⁴ Divers were immediately sent below to inspect the damage and found a bilge keel torn back from the hull “like an opened sardine can.”⁵⁵ Thankfully, the tear did not compromise the integrity of the hull, and the ship proceeded under its own power back into Queen Maud Gulf.

By the middle of August, the supply ships arrived in the Gulf and exchanged mail and movies with the small Coast Guard fleet for several days while resupplying the task group.⁵⁶ *Storis*, meanwhile, rendezvoused with the Navy's salvage tug USS *Grapple*, which dispatched its own divers to seal the remaining bilge.⁵⁷ With the work completed, *Storis* returned to Simpson Strait and safely escorted a convoy which unloaded its cargo at Gjoa Haven.

The markers and charting established by the task group allowed for an easy mission for the MSTs ships, which completed their work and soon proceeded safely westward towards Alaska.

While the three U.S. Coast Guard vessels struggled through the Central Arctic, HMCS *Labrador* approached from the east. For Canada, and for Captain Pullen in particular, charting the strait had a significance beyond the operational requirements created by the DEW Line. If Bellot Strait could be opened, it would represent a new link in the Northwest Passage – a route that had fired the British imagination for generations. The Arctic had brought the Pullen family particular fame, beginning with the *Labrador* captain's great-uncle. Commander (later Vice-Admiral) W.J.S. Pullen commanded the depot ship *North Star* on the 1852–54 Belcher expedition to find Franklin, with his younger brother T.C. Pullen (later Captain) as his second-in-command.⁵⁸ Thanks to their exploits, when Tom Pullen sailed in the Arctic a century later, "there were four Pullen place-names to remind him of his great-uncles."⁵⁹

In 1880, when Canada inherited the British Empire's remaining Arctic holdings, it incorporated this distant realm into its identity as a northern nation.⁶⁰ Practical action to administer and develop the region, however, was limited. The searches from Franklin had proven that the Northwest Passage offered no viable route to "the Orient." Norwegian explorer Roald Amundsen transited the Passage from 1903–06, but this feat was not repeated until Henry Larsen's transits in the RCMP schooner *St. Roch* in 1940 and 1942.⁶¹ Although Royal Canadian Navy personnel had participated in the dangerous "Murmansk Run" from Britain to Russia and plied convoy Arctic routes close to Iceland and Greenland during the Second World War, no RCN warship ventured into the region until HMCS *Magnificent*, *Haida*, and *Nootka* undertook operations in Hudson Bay in 1948 and HMCS *Cedarwood* travelled into the Western Arctic the following year. All were brief excursions by thin-skinned vessels.⁶² For reasons of national pride, officials wanted a more permanent Canadian presence as well as a ship to chart the Northwest Passage. For Pullen, whose ship had been turned back by Bellot Strait the previous season, this offered a chance at redemption.

By late June, when *Labrador* took on provisions and eight thousand barrels of diesel fuel in Halifax for its upcoming journey, a thousand hours of labour had been invested in overhauling its engines and boilers. Aboard were 226 officers, men, and civilian scientists, as well as a U.S. Navy liaison officer and a team of American reporters and photographers. Most of the ship's complement was new, as nearly 60 percent of the crew that had

reached Bellot Strait in 1956 had been transferred that winter, depriving the ship of some core Arctic experience.⁶³ More disconcerting was news, received when *Labrador* set to sea on 25 June, that USCGC *Eastwind* had burned out one of its two main motors, thus forcing its return to Boston for repairs. The icebreaker count for the entire Eastern Arctic was therefore reduced by 25 percent for the season. Supporting the sealift and resupply effort would fall to HMCS *Labrador*, USS *Edisto*, and USCGC *Westwind*.⁶⁴

Heading north, *Labrador* collected the tankers USS *Kankakee* and *Memphis*, waiting off Hamilton Inlet to resupply the USAF's Strategic Air Command base at Goose Bay, before moving into the ice at 4:30 a.m. It was an inauspicious beginning to the operating season. The Canadians were impressed by how well the captain of *Kankakee* handled his twenty-two-thousand-ton tanker, which was crewed by the U.S. Navy, by driving it like a destroyer while keeping close and following in *Labrador's* wake. By contrast, *Memphis* was a civilian vessel on contract to the MSTs, and the differences in style and capability were readily apparent. While *Kankakee* kept in close formation, *Memphis* continued to lag behind, unable to keep up speed and maintain course. Captain Pullen soon learned that *Memphis* ruptured a forward tank, spilling eight hundred barrels of bunker fuel into the pristine sub-Arctic waters. Had Pullen pushed too hard? Did he fail to appreciate the limitations of the thin-skinned tanker that he was responsible for leading? In his report afterwards, Pullen wrote with bitter exasperation that "she had nobody to thank but herself."⁶⁵ The captain of *Memphis* would have told a different story – one more critical of Pullen's hard-driving, impatient, even brash style.

That night, *Edisto* arrived to assist. The last time the two icebreakers had been together was September of 1956, when the American vessel lost one of its propellers in the thick ice of Foxe Basin. Since that time, *Edisto* had procured two new propellers, and its captain had "every intention of hanging onto them this year." *Labrador's* crew was pleased to reunite with *Edisto* but more than pleased to turn over *Memphis*, which, Pullen recalled, was still "stumbling along several miles astern of USS *Kankakee*." With "some relish," *Labrador* left *Edisto* and proceeded, with *Kankakee* close behind, out of the Inlet and back into open water.⁶⁶

Not far from Hamilton Inlet, *Labrador* resumed its course through dense fog and close pack ice. Visibility reduced to mere yards as the ship's bridge crew relied on its radar to spot obstacles. Pullen recalled being on the bridge when his lookout suddenly pointed "in an urgent manner," and "out of the murk came a vast mass of white towering above the ship – an iceberg

undetected by radar.”⁶⁷ The captain ordered “all stop,” and the icebreaker shuddered to a halt, brushing the iceberg with its forecastle and dumping ice across the deck.⁶⁸ The radar had been unable to tell the difference between the ice and the swells around it. The Arctic learning curve was steep; haste or impatience could lead to disaster, and sometimes luck was all that stood between a ship and an unfortunate end.

A week of easier cruising brought the ship to Baffin Island, where *Labrador* dropped off survey crews and divers to spend a week examining and developing beaches for future use. By mid-June, with its survey work complete, the icebreaker proceeded across Davis Strait to Greenland to pick up a party of distinguished guests led by the head of the Greenland Department of the Danish Government and the Canadian ambassador to Denmark. Amongst the party was Danish scientist Dr. Niels Bohr (of Manhattan Project fame) and seven other politicians, diplomats, and scientists who had arranged the visit when *Labrador* was in Copenhagen the previous April. The pickup was scheduled to take place in the Greenlandic town of Narssaq, but, to Captain Pullen’s dismay, a survey of the maps showed three Narssaqs on the island – one of which was on the far eastern coast. Pullen was forced to gamble and chose the nearest town. Upon arriving on 15 June, he received word from the light boat *Pogo* that they had guessed correctly. For five days the ship was a guest in Greenlandic waters, sailing north to Grønnedal and Gothaab.

Its diplomatic duties complete, *Labrador* proceeded back across Davis Strait and reached Resolution Island, a small body off the southeast coast of Baffin Island, on 21 June. The hydrographers the ship had left there had completed their work and were anxious to leave the foggy, windswept island. A U.S. Air Force officer, who had left camp to go mountain climbing and had not returned, delayed the departure. Search parties from the ship were sent out, and *Labrador*’s helicopters scouring the rocky landscape soon discovered his body. The officer had apparently slipped and plunged nine hundred feet onto the rocks below. After recovering the body, the ship resumed with its survey work, albeit in a more sombre mood.⁶⁹

Less than a week of operations along southern Baffin Island passed before the next mountaineering emergency struck. On 26 June, the ship’s two Bell helicopters flew off with the hydrographer and his equipment. At 12:15 p.m., a faint voice came over the radio, reporting that “one Fan [helicopter] had crashed but both occupants were all right.” The helicopter had crashed atop and then rolled down Peter Point Mountain – a twenty-four-thousand-foot peak on the south shore of Frobisher Bay. The ship’s second Bell helicopter

flew to the rescue, but violent wind eddies spun it out of control and smashed it against the rocks, leaving four men stranded.⁷⁰ Captain Pullen called an emergency conference, and participants agreed that the mountain was too dangerous to climb in the fog and wind. The storm had to be waited out. Thankfully, the captain had insisted that all helicopters carry sleeping bags and emergency supplies in anticipation of this sort of situation. Nonetheless, the stranded men had little food and water. Supplies could not be airdropped because the fierce winds would destroy any parachutes, and any water containers dropped with a parachute would explode on impact. The ship's civilian oceanographer, Arthur Collin, offered an ingenious solution: rather than drop water, why not send ice cubes that could be melted?⁷¹ The third and final aircraft was dispatched carrying sacs of ice cubes, tins of food, and a CO₂ canister filled with hot soup. The package dropped from five hundred feet and landed right on target.⁷² It was an impressive feat given that the HUP helicopter was a larger twin-bladed machine and less manoeuvrable than the smaller helicopters preferred for Arctic operations.

All day and night, the stranded men huddled on their perch. When the next morning failed to bring a break in the weather, Pullen grew desperate and organized a volunteer party to scale the peak. Before they began, however, the storm suddenly abated. When the helicopter arrived on the mountain top, with the wind picking up and a wall of fog rolling back towards it, the four tired men hastily piled into the aircraft. The pilot lifted off even before the last man was fully aboard. Pullen recalled how "the owner of the dangling legs quickly realized he was dangling not four feet from the rocks but twelve hundred feet. He wasted no time in reaching the interior of the HUP [aircraft]."⁷³ The dehydrated men were in generally good condition, although the soup sent to them had been so salty that they consumed their water far faster than expected.

The rescue was a success, but the ship had lost its two Bell helicopters, and its remaining HUP Retriever aircraft was unable to land on uneven ground. This was a serious problem given the ship's limited ice-spotting capacity and the aircraft's inability to land civilian hydrographers on the rocky Arctic islands.⁷⁴ To compensate for the loss, the U.S. Coast Guard loaned one of its Bells from *Eastwind*, which had undertaken repairs in record time and returned to the eastern Canadian Arctic to conduct resupply duties.

After its dramatic rescue efforts, *Labrador* returned to more routine survey and escort duties in early August. The MSTs ships required icebreaker support to enter harbours, and the Canadian vessel worked with its U.S.

Coast Guard counterparts for the next three weeks to clear paths for the convoys. Ships were stymied by ice, there were close calls on uncharted shoals, and USS *Tamalpais*, a twenty-two-thousand-ton replenishment oiler loaded with aviation fuel, nearly collided with *Labrador*. Nevertheless, the RCN icebreaker completed its escort duties on 20 August and entered Prince Regent Inlet, off the northern coast of Baffin Island, heading for Bellot Strait.⁷⁵ Pullen was anxious to get there, as there were obvious political benefits for Canada in charting the passage before the Americans did. It was also a matter of pride for the captain to achieve what he had attempted unsuccessfully the previous year. Radio interference had left the Canadians out of contact with the U.S. Coast Guard squadron approaching from the west, so they had little sense of the progress that Captain Wood and his ships were making. "Wouldn't it be shattering," Pullen was overheard saying to his officers, "if the little American ships were already on the eastern side by the time we got there?"⁷⁶ When *Labrador* arrived at the eastern entrance to Bellot on the evening of 21 August, its captain was relieved to see that *Storis*, *Spar*, and *Bramble* were not there waiting.

Labrador's plan was to set up a base at Fort Ross, an abandoned Hudson's Bay Company post on Somerset Island that the ship had scouted in 1956, where the crew installed a navigation beacon to study the tides in preparation for the transit. The Bell helicopter, secured from *Eastwind* two weeks earlier, joined the Canadian HUP in scouting obstacles along the route from the skies, while the small hydrographic survey launch *Pogo* took soundings on the surface.⁷⁷ The bridge welcomed evidence suggesting that the channel was between fifty and one hundred fathoms deep, which could accommodate even deep-draft cargo ships. The only serious obstacle appeared to be Magpie Rock – the feature that had nearly ended *Labrador's* career the year before.⁷⁸

That evening, as the crew wound down its efforts for the day, the watch noticed a strange boat flying a homemade Canadian ensign heading towards the ship. A puzzled Pullen brought the icebreaker to a halt and allowed the small craft to pull alongside. Seven Inuit, clad in mukluks and parkas, clambered aboard. The leader explained in halting English that his settlement was caught between hunting seasons and required provisions. Pullen agreed to help and ordered his men to collect bags of flour, sugar, and tea. Twenty minutes later, with the provisions ready on deck, the crew realized that they had lost the Inuit visitors onboard the ship. A hastily organized search found the seven men in the cafeteria watching an old movie with crew members. They left reluctantly. The next day, the crew spotted the

same seven Inuit, who again climbed aboard the ship. When asked what they needed, the Inuit explained that they very much wanted to see the end of the movie.⁷⁹

On 22 August, Pullen prosecuted Operation *Bellot* in earnest. With favourable weather, the aircraft launched at the crack of dawn. *Pogo* and *Labrador's* other motor cutters were in the water, conducting survey work throughout the day and ferrying men and supplies to the temporary survey camp at Fort Ross. The aircraft and boats focused their efforts on three possible obstacles. The first was Magpie Rock, whose existence was known but not its extent. The second was a possible shoal halfway through the strait, which RCMP Superintendent Larsen had reported during *St. Roch's* 1944 voyage. The third was possible shoal water off the western approaches to Bellot, which could prevent deep-draft ships from entering the strait.⁸⁰ Pullen was elated when *Pogo* returned through the strait at 1600 with good news. "Lieutenant Norton reported ... no rocks or shoals encountered except for Magpie Rock," the captain noted. "I had been given to understand there was a rock at the halfway point and there was a strong suspicion that off the western entrance, between Pemmican Rock and the Archedeckne Islands, that shoal water might spoil our attempt to locate a deep water channel. So once Magpie is charted and a channel past it developed we're 'in.'"⁸¹

By the end of 23 August, the triangulation work was complete, radar beacons installed, and surveying work well underway. The icebreaker and *Pogo* probed the strait as far as Magpie Rock, when the weather changed abruptly. Ice appeared in the narrows and began to advance rapidly with the accelerating wind and tide, which tossed chunks as large as houses into the air as they moved towards the ship. Pullen ordered a retreat; however, the storm soon ended as quickly as it began, reminding the crew of just how unpredictable and dangerous Arctic navigation can be.⁸²

Watching the ship from the heights of Somerset Island, hydrographer Stewart Dunbrack and a team of crew members and civilian scientists continued the work of mapping the strait. In a spare moment, Dunbrack set off to explore the hills behind the fort. Atop one, he found a crew member comfortable and cluelessly seated upon a pile of rocks which, the day before, the ship's photographer had used as a tripod. Dunbrack quickly recognized the pile for what it was: a cairn. Removing the top rocks, he found six bottles left by previous visitors, the earliest from the Hudson's Bay Company ship *Nascopie's* visit in September 1937 when its crew established the small fort. It also contained a note from 1942 from Mrs. W.A. Heslop – the only non-

Indigenous woman to have wintered at Somerset Island – recounting her two years at the fort.⁸³

The next day, Pullen decided to attempt the transit. He ordered the ship's tanks flooded to increase its draft so that, if grounded, he could order the crew to "pump water like mad and raise the ship." At 9:00 in the morning, *Labrador* set off into the fast-running eastern current with *Pogo* in the lead, sounding as they went. The weather was perfect and the ice relatively light. At Magpie Rock, the waters were "seething," but *Pogo* reported sixty feet under the keel. By 9:15, the ships were past the obstacle, with Captain Pullen on the bridge shaking his fist at it.⁸⁴ "When abeam Magpie out of the east flew a great four-engined USN aircraft stuffed with press people representing NY [New York] Times, Newsweek, Time, etc.," Pullen recorded in his diary. "It flew in at the most crucial moment. I had luckily insisted that my largest white ensign fly from the ensign staff on the flightdeck, to the annoyance I'm sure of the fliers, so that press photos would not mistake the identity of the ship. As the USN craft buzzed the ship my ensign was there large as life."⁸⁵ The jubilation was short lived. Fighting against the tidal stream overwhelmed *Pogo's* engines, and the small boat had to be hauled aboard. While stopped to hoist it in, *Labrador* itself was swept back into shoal water north of Magpie Rock, and, for a few tense moments, it appeared as though the icebreaker would be carried into serious trouble.⁸⁶ Instead, the ship recovered and resumed its course through the narrows.

Halfway through the strait, the progress slowed as the ice began to thicken – from 5/10 to 10/10 (meaning from 50 percent coverage increasing to 100 percent). For two hours, *Labrador's* advance was slow as it punched through thick floes. Above the ship, the clouds hung low against the high cliffs on either side, creating the impression of travelling in a tunnel. After two hours, the icebreaker cleared the strait and emerged into the open water of Peel Sound.⁸⁷ "At 1125 cleared the western end and there was much jubilation, and for me, relief," Pullen recorded in his diary. "We are the fourth vessel of note to make it [after] *Fort James*, *Aklavik*, both H.B. Coy. [Hudson's Bay Company] schooners, and the *St Roch*, and the first of consequence, drawing 29 feet mean for this transit." He promptly signalled American and Canadian naval authorities with the news: "Passage of Bellot Strait accomplished – southbound in Franklin Strait."⁸⁸ A channel fifty feet deep had been discovered running the entire length of the strait, "the sun was shining, the sea was blue, and everybody was in good spirits."⁸⁹

On 23 August, while still in Queen Maud Gulf, the U.S. task group received word that HMCS *Labrador* had entered Bellot Strait. After the weeks

of tough slogging through the ice in the western Canadian Arctic, the Americans were reserved in their applause, given that the Canadian icebreaker had completed a shorter and easier trip. *Storis* crew member James Jones lamented that *Labrador* was “doing a lot we should be doing.” Four days later, with the American ships in James Ross Strait, Jones wrote in his log that “the *Labrador* is still taking all the glory.”⁹⁰ Nevertheless, the American crews welcomed the news that there was a navigable strait. This meant that the task group had completed its mission and that the three U.S. ships did not have to backtrack across the entire Canadian Arctic to gamble on an escape across Point Barrow.

To get to Bellot Strait, the task group’s West Unit (TG 6.5.1) had to travel another 250 miles through potentially dangerous waters. In previous years, *Storis* had reached as far as Queen Maud Gulf before having to turn back. James Ross and Rae Straits were uncharted and only transited by two previous vessels. The explorer Roald Amundsen’s *Gjoa* had run aground there in 1904, and Captain Larsen’s *St. Roch* did the same in 1941.⁹¹ Those ships drew only thirteen and ten feet of water respectively, and Captain Wood and his subordinates feared that it might be impossible to identify a deep-draft route. Records left by previous expeditions were sparse. *Gjoa* made many meteorological observations but took few hydrographic soundings. Although *St. Roch* charted its course in more detail and even included some water depths, its precise route was unclear and its records considered of dubious value. Captain Wood wrote that “to all intents and purposes, we were in virgin territory.”⁹²

As summer came to an end, the resupply convoys began retreating safely to the west. The ice above Point Barrow remained safely to the north, meaning the eastern escape route was not needed that year. As the civilian fleets exited the Arctic, the three American vessels pushed eastward into still uncertain waters. Survey work commenced at a cautious pace in Rae Strait, James Ross Strait, and Franklin Strait, given that these waters were known to be shallow and filled with uncharted shoals. Strong tidal currents posed an additional danger as they brought rock-hard old ice down into the narrow straits from M’Clintock Channel farther north. The ice break-up had been two weeks late in 1957, and areas that would normally have been clear by the end of August remained dangerous, but the ships managed to find safe passages and establish new aids to navigation. Following in the footprints of earlier explorers like Amundsen and Larsen was an honour as well as a challenge. Captain Wood wrote to his wife that “though we didn’t suffer the severe hardships of early explorers, and although we had mechanical and

electronic contrivances of which those people didn't ever dream ... we're still very proud of the fact that in three short summers ... and particularly in the last one, we were able to gather for our forces, more hydrographic information about these waters than had been amassed in the last four hundred years. It's a good feeling to have had a part in something like that."⁹³

On 3 September, the U.S. Coast Guard squadron under Captain Wood arrived in Franklin Strait to the southwest of Bellot Strait. There it met with *Labrador*, which was completing its hydrographic charting off Pasley Bay. The Coast Guard vessels tied up alongside the Canadian icebreaker for well-earned rest and celebration. The commanding officers and executive officers of all three ships were invited to a mess dinner held by Pullen in *Labrador*'s wardroom – a “delightful dinner” followed by port, a Canadian toast to the president of the United States, and a reciprocal American toast to the queen.⁹⁴ The ships' crews enjoyed a similar exchange. For the Americans, the trip to *Labrador* was particularly enjoyable: while U.S. Coast Guard vessels were dry, Royal Canadian Navy ships offered a daily rum ration.⁹⁵

Soon thereafter the four vessels set to work charting the western entrance to Bellot Strait. *Storis* sent its boats to the shore to drop off a tidal observation party and pick up a Canadian team that had been there for the past ten days. The Canadians enthusiastically accepted the invitation back to the American cutter as they had only eaten canned stew heated over a fire during their time ashore – to their dismay, they found that *Storis*'s galley was serving stew that day. The American landing party erected a cairn to mark their accomplishment, in which they stashed a list of the three vessels' crews, a stamped envelope addressed to U.S. Coast Guard headquarters in Washington (so that the next explorer to arrive could send home any message they desired), and a quart of mayonnaise.⁹⁶

On 6 September, the four ships proceeded through Bellot Strait in a column led by *Labrador*. Once clear, they landed shore parties at Fort Ross, where the men marked their achievement by placing documents into the cairn that Dunbrack had discovered the week before. Moving into Prince Regent Inlet, Captain Wood brought his squadron seventy miles north to where, in 1825, Royal Navy Captain Henry Parkyns Hoppner's vessel *Fury* was damaged by ice and grounded on what became Fury Beach. Wood was aware of the significance of the site and made a point of examining the artifacts strewn about the beach. He picked up enough nails from the wreck site for each crew member to have one as a souvenir.⁹⁷ They also brought back to the ship a selection of artifacts to be given to the Maritime Museum in Halifax.

Travelling north through Prince Regent Inlet, the American ships finally entered better-charted waters, which enabled them to engage in activities other than survey work. Looking for entertainment, the crews practised their gunnery on a passing iceberg. The crestfallen gunners soon observed that their three-inch deck guns barely dented the hulking block of ice. Meanwhile, *Labrador* spent another four days completing its survey before heading home. "At 0730 I took off, with four on the line, at 14 knots and full of confidence, the ship swept past Magpie Rock and through the Strait without any hesitation," Pullen recorded in his diary on 11 September. "Stood out into Peel Sound and then north to Resolute. Goodbye to Bellot, scene of so much activity and work and worry. The job's done and done well."⁹⁸ Outside applause for the achievement began arriving before the Bellot Strait survey group had even left the region. As U.S. Navy Admiral Roy Gano messaged to *Labrador* on 7 September 1957:

The determination of a useable deep water channel from Shepherds [sic] Bay in the Central Canadian Arctic eastward through Bellot Strait to the open Atlantic is an achievement of the first order. Upon completion of this historic Northwest Passage from the Pacific Ocean to the Atlantic Ocean, the first time in history for any US flag vessel, I extend to all concerned my heartiest congratulations for an operation smartly and smoothly executed.

It is worthy of note that this operation was carried out with such skill and initiative as to require no directives to the Task Group during the period of its existence: that this undertaking was planned by the US Navy, executed by the Royal Canadian Navy and the U.S. Coast Guard, with the Task Group under the operational control of a Canadian officer, ice reconnaissance support was supplied by the Royal Canadian Air Force, the U.S. Hydrographic Office provided the ice forecasting; and both the RCN and USN provided the basic communications networks. As an outstanding example of what can be achieved by Canadian and U.S. nationals of various services working together in a spirit of effective co-operation, I consider Operation Bellot to be without peer. Again my congratulations to all involved.⁹⁹

Similarly, when the U.S. Coast Guard cutters crossed the Arctic Circle on 12 September during their homeward journey, "congratulatory telegrams rained down" on the ships "from admirals and department secretaries."¹⁰⁰

By early October, all of the ships had arrived safely back at their home ports. For *Labrador*, the mission represented a historic success. A new

Northwest Passage had been established for deep-draft ships. The Royal Canadian Navy heralded it as a triumph, while the MSTs's leadership expressed relief that the danger of its ships being trapped in the Arctic had been considerably reduced.¹⁰¹ Captain Pullen admired the cooperative bilateral working relationship, which made the continent safe for all North Americans, regardless of borders and boundaries. But despite *Labrador's* myriad successes during its 1957 mission, it ended on a dour note. While the ship was operating in Lancaster Sound on 23 September, Pullen recorded in his diary how he, Commander C.A. Law, and Commander D.E. Fairney were sitting in the captain's "cabin at about 2100 having our evening cup of coffee when a signalman handed me one of the most shattering messages I have ever received and which explained why a lot of things to us up here have seemed odd." It hit him "like a kick in the stomach," reading:

1. As a measure of economy it has been decided to transfer the operation of *Labrador* to the Department of Transport about 1 April 1958.
2. It is realized that this step will be deeply regretted by officers and men of the RCN particularly those who are now serving or have served in the ship.
3. However such considerations must give way to those of economy if we are to make our most effective contribution to the defence of Canada and NATO [the North Atlantic Treaty Organization].
4. The exploits of *Labrador* and the reputation she has gained for efficiency have done much for the prestige of Canada and the RCN. As the development of the Arctic continues this work will not be forgotten. (?)
5. Further information on the programme up to 1 April will be promulgated.¹⁰²

The message left Pullen and his fellow officers "stunned." The captain was dismayed at the thought of having to communicate the news to the ship's company, lamenting that this would "put the cat among the chickens." He cursed "those devils" at Naval Headquarters in Ottawa, noting specifically Captain W.M. Landymore, the Director of Naval Plans and Operations, and Rear-Admiral H.N. Lay.¹⁰³ "Blast their eyes. Why couldn't they have waited until we got back?" In the midst of this angst, *Labrador* rescued five survivors from *Pamir*, a German four-mast barque that had capsized in the North Atlantic two days earlier. Pullen ended his diary entry for 23 September by noting, "What a black day this has been."¹⁰⁴

In the end, the RCN's foray into the Cold War Arctic proved brief. The Navy had little operational interest in the North, and *Labrador* was an anomaly in an anti-submarine warfare-oriented navy. The RCN preferred to focus on the Atlantic theatre and opted out of its Arctic role in 1958 when it paid off *Labrador* as a naval ship and transferred it to the Department of Transport.¹⁰⁵ "No ship has done more for Canada than *Labrador*," Pullen wrote in his diary on 11 October 1957. "No ship is better known to the people in Canada and abroad than *Labrador*, and yet the experts, in their purblind wisdom, have decided that she has nothing to contribute in a war that will never be fought. And so she is got rid of so that a couple of obsolete frigates can be commissioned." Even the news that the U.S. submarine *Nautilus* had reached 87°N via Kennedy Channel "has had no effect" on senior decision-makers, Pullen lamented. "All our inspired leaders can think of is fighting World War II over again in the N. [North] Atlantic."¹⁰⁶ He appealed to his brother, Rear-Admiral H.F. Pullen, the Flag Officer Atlantic Coast, in hopes that he could convince senior leadership to reverse the decision, but his effort came to naught. *Labrador's* transfer to the Department of Transport was completed in 1958.¹⁰⁷

For the three U.S. Coast Guard vessels involved in the West Unit of the 1957 Bellot Strait Expedition, the transit represented an equally impressive accomplishment: a fourteen-thousand-mile, triple circumnavigation of the continent. The mission marked the first transit of the Northwest Passage by U.S. ships and the first successful convoy across the route, and *Bramble* and *Spar* were the first buoy tenders to complete the passage.¹⁰⁸ The ships left behind new navigational aids and brought back new hydrographic information and charts, encompassing nearly two thousand miles of largely unknown sea routes stretching from the Beaufort Sea to Baffin Bay. "Even though the *Storis* was greeted in Boston by the vice commandant of the Coast Guard, Capt. [Captain] Wood was awarded the Coast Guard Commendation Medal, and a specially-commissioned bronze plaque was bolted onto the vessel to commemorate the expedition, the magnitude of the achievement was not immediately clear," Capelotti noted. Only over time would the participants come to fully internalize the significance of the historic 1957 voyage.¹⁰⁹

The success of the 1957 operations went far beyond the opening of Bellot Strait to deep-draft ships; the broader resupply operation also highlighted Canadian and American mariners' increasing competence in Arctic operations. The initial surge of American ships into the Arctic during the 1955 season brought significant damage to the commercial and icebreaking

fleet, with the MSTs alone sustaining 164 vessel casualties, including 44 ships with hull damage and 13 groundings.¹¹⁰ Many lessons were learned from those initial voyages: steel propellers replaced bronze ones, larger ships were removed from shallower routes, and captains developed a new and healthy respect for the ice.¹¹¹ By 1957, operations had become far more routine: thirty-seven ships reported some ice damage, most of which was described as “relatively minor,” and only one ship needed to be towed.¹¹² The dangers of Arctic operations and the high costs of failure encouraged mariners to learn and adapt quickly.

For Captain Pullen, the voyage proved his strong leadership style, willingness to take risks, and skills as a polar navigator – as well as his propensity to push his ship and those in his convoy to their limits. Although his actions ultimately achieved results favourable to Canada, his impatience (particularly as the leader of a task group of ice-strengthened ships that relied upon the support of his icebreaker to operate safely) also appears to have created or amplified dangerous situations. While he blamed others for the problems that they encountered, he certainly bore some of the responsibility for mishaps or accidents that could have been avoided through prudence. “Pullen of the Arctic” emerged with the reputation as North America’s foremost expert on Arctic navigation and icebreaking over the course of his life,¹¹³ but Operation *Bellot* demonstrated that he, too, had faced a learning curve. Nevertheless, Pullen was successful in his mission, and his caution in mapping *Bellot* derived from his failure to transit the strait the previous year.

Since the *Bellot* Strait operation, the U.S. Coast Guard cutters *Staten Island*, *Polar Sea*, *Polar Star*, *Healy*, and *Maple* have transited the Northwest Passage on more than a dozen occasions, following in the wake of *Storis*, *Bramble*, and *Spar*. U.S. Coast Guard officials are finalizing plans with their Canadian counterparts for the medium icebreaker *Healy* to transit the Northwest Passage on an eastward course from Dutch Harbor, Alaska, to Nuuk, Greenland, in late summer 2021. Affirming the two countries’ longstanding partnership, the arrangement falls within the 1988 U.S.–Canada Arctic Cooperation Agreement, wherein Washington “pledges that all navigation by US icebreakers within waters claimed by Canada to be internal will be undertaken with the consent of the Government of Canada.”¹¹⁴ During its voyage, it may cross paths with Canada’s new Arctic and Offshore Patrol Vessel, HMCS *Harry DeWolf*, which is planning to circumnavigate North America on a northern and westward course from its home port in Halifax, through the Northwest Passage, late this summer. *DeWolf* will be the first

Royal Canadian Navy ship to make the trip since *Labrador* in 1957. If the ships meet, we hope that they will raise a toast to Captain Thomas Pullen (RCN), Commander H.L. Wood (USCG), and the rest of the officers and crews who preceded them sixty-four years ago, rekindling the bonds of bilateral cooperation that historically opened the Canadian Arctic to deep-draft ships and that continue to animate our Arctic relations as “premier partners” today.¹¹⁵

Notes

¹ On the MSTS, see Salvatore Mercogliano, “Sealift: The Evolution of American Military Sea Transportation” (PhD dissertation, University of Alabama, 2004).

² Cmmdr, Amphibious Group Three, “CTG 5.1: Operational Report Project 572, 1955,” Waldo K. Lyon Papers, Naval History and Heritage Command (NHH).

³ U.S. Navy, “Post Operation Report: MSTS Arctic Operations” (1957).

⁴ Matthew Farish, “Frontier Engineering: From the Globe to the Body in the Cold War Arctic,” *Canadian Geographer* 50, no. 2 (2006): 177–96; and Farish, *The Contours of America’s Cold War* (Minneapolis: University of Minnesota Press, 2010).

⁵ See, for example, Richard Morenus, *DEW Line: Distant Early Warning – The Miracle of America’s First Line of Defense* (New York: Rand McNally, 1957); Daniel Heidt and P. Whitney Lackenbauer, “Sovereignty for Hire: Civilian Contractors and the Distant Early Warning (DEW) Line,” in *De-Icing Required: The Canadian Air Force’s Experience in the Arctic*, eds. P.W. Lackenbauer and W.A. March (Trenton: Canadian Forces Air Warfare Centre, 2012), 95–112; Matthew Farish and P. Whitney Lackenbauer, “Western Electric Turns North: Technicians and the Transformation of the Cold War Arctic,” in *Ice Blink: Navigating Northern Environmental History*, eds. Stephen Bocking and Brad Martin (Calgary: University of Calgary Press, 2016), 259–90; and P. Whitney Lackenbauer and Matt Farish, *The Distant Early Warning (DEW) Line Coordinating Committee: Minutes and Progress Reports, 1955–63*, Documents on Canadian Arctic Sovereignty and Security (DCASS) no. 15 (Calgary: Arctic Institute of North America, 2019).

⁶ P.J. Capelotti, “Across the Top of the World: The U.S. Coast Guard’s 1957 Northwest Passage Expedition” (Washington: USCG Historian’s Office, 2007); and Dick Judge, *The Historic Northwest Passage and the CGC Storis: The Story of a Young Man Growing Up in the Coast Guard in the 1950s* (self-published, 2007).

⁷ P. Whitney Lackenbauer and Elizabeth Elliot-Meisel, eds., “One of the Great Polar Navigators:” *Captain T.C. Pullen’s Personal Records of Arctic Voyages, Volume 1: Official Roles*, DCASS no. 12 (Calgary: Arctic Institute of North America, 2017); and P. Whitney Lackenbauer, Adam Lajeunesse, and Jason Delaney,

HMCS Labrador: *An Operational History* (Antigonish: Mulroney Institute on Government, Arctic Operational History Series, vol. 1, 2017).

⁸ The USN icebreakers were transferred to the USCG between 1965 and 1966. See Peter Kikkert, "'The United States Cannot Afford to Lag Behind Russia': Making the Case for an American Nuclear Icebreaker, 1957-1961," *The Northern Mariner* 31, no. 1 (2021).

⁹ See Peter Kikkert and P. Whitney Lackenbauer, "Setting an Arctic Course: Task Force 80 and Canadian Control in the Arctic, 1948," *The Northern Mariner* 21, no. 4 (2011): 327-58.

¹⁰ Daniel Heidt and P. Whitney Lackenbauer, *The Joint Arctic Weather Stations: Science and Sovereignty in the High Arctic, 1946-72* (Calgary: University of Calgary Press, 2022).

¹¹ Farish, *The Contours of America's Cold War*, 184.

¹² Mercogliano, "Sealift: The Evolution of American Military Sea Transportation."

¹³ Western Electric, *The DEW Line Story* (c. 1960).

¹⁴ C.J. Marshall, "North America's Distant Early Warning Line," *Geographical Magazine* 29, no. 12 (1957): 616.

¹⁵ See, for example, Donat Pharand, *Canada's Arctic Waters in International Law* (Cambridge: Cambridge University Press, 1988); Elizabeth Elliot-Meisel, *Arctic Diplomacy: Canada and the United States in the Northwest Passage* (New York: Peter Land, 1998); P. Whitney Lackenbauer and Peter Kikkert, "Sovereignty and Security: The Department of External Affairs, the United States, and Arctic Sovereignty, 1945-68," in *In the National Interest: Canadian Foreign Policy and the Department of Foreign Affairs and International Trade, 1909-2009*, eds. Greg Donaghy and Michael Carroll (Calgary: University of Calgary Press, 2011), 101-20; Adam Lajeunesse, *Lock, Stock, and Icebergs: The Evolution of Canada's Arctic Maritime Sovereignty* (Vancouver: UBC Press, 2016); and Adam Lajeunesse, "A Gentleman's Agreement: Sovereignty, Defence and Canadian-American Diplomacy in the Arctic," in *Breaking Through: Understanding Sovereignty and Security in the Circumpolar Arctic*, eds. Wilfrid Greaves and P. Whitney Lackenbauer (Toronto: University of Toronto Press, 2021), 45-61.

¹⁶ Advisory Committee on Northern Development (ACND) Meeting Minutes, 10 March 1949, in P. Whitney Lackenbauer and Daniel Heidt, eds., *The Advisory Committee on Northern Development: Context and Meeting Minutes, 1948-66*, DCASS no. 4 (Calgary: Arctic Institute of North America, 2015), 117.

¹⁷ G.L. Magann to William Snow, 14 March 1949, National Archives and Records Administration (NARA), RG 59, entry 1177, PJBD Subject Files, 1940-59, box 5, f. PJBD-General, 1948-56.

¹⁸ Office of the Chief of Naval Operations to Dr. Reichelderfer, 30 September 1949, NARA, RG 27, entry 5, box 3, f. 'Arctic Operations, 1950.'

¹⁹ On the history of HMCS *Labrador*, see John Leeming, "HMCS *Labrador* and the Canadian Arctic," in *RCN in Retrospect*, ed. James Boutillier (Vancouver: UBC Press, 1982), 286-307.

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- ²⁰ "The Labrador and the DEW Line," *Crowsnest* 8, no. 3 (1956), reprinted in Adam Lajeunesse and P. Whitney Lackenbauer, eds., *Canadian Armed Forces Arctic Operations, 1945-2015: Historical and Contemporary Lessons Learned* (Fredericton: Gregg Centre for the Study of War and Society, 2017), 184.
- ²¹ Commander, MSTs, to Chief of Naval Operations, "MSTs Arctic Operations 1955," 15 February 1955, NARA, RG 313, entry UD-13C 11, box 5.
- ²² Morenus, *DEW Line*, quoted in Farish, *Contours of America's Cold War*, 185.
- ²³ O.C.S. Robertson, "Foreword" to T.A. Irvine, *The Ice Was All Between Us* (Toronto: Longmans Green, 1959), xxii.
- ²⁴ See Lackenbauer, Lajeunesse, and Delaney, *HMCS Labrador*, and Lackenbauer and Elliot-Meisel, "One of the Great Polar Navigators."
- ²⁵ Pullen Diary, 16 September 1956, in Lackenbauer and Elliot-Meisel, "One of the Great Polar Navigators."
- ²⁶ Pullen Diary, 25 September 1956, in Lackenbauer and Elliot-Meisel, "One of the Great Polar Navigators."
- ²⁷ Pullen Diary, 13 October 1956, in Lackenbauer and Elliot-Meisel, "One of the Great Polar Navigators."
- ²⁸ U.S. Navy Photographic Center, "US Navy Photographic Report (Newsreel): MSTs Operations 1957" (1958).
- ²⁹ Excerpts from the Journal and Letters of Captain Harold L. Wood, USCG, provided to the authors by the Wood family.
- ³⁰ U.S. Navy, *MSTs Post Operation Report* (1957).
- ³¹ U.S. Coast Guard, "Storis, 1942," U.S. Coast Guard, <https://www.history.uscg.mil/>.
- ³² Capelotti, "Across the Top of the World," 12.
- ³³ Capelotti, "Across the Top of the World," 10.
- ³⁴ Judge, *The Historic Northwest Passage and the CGC Storis*, 100–01.
- ³⁵ P.J. Capelotti, "Fog, Wind, and Ice: Navigating the Northwest Passage," *Proceedings* 135, no. 2 (February 2009).
- ³⁶ Capelotti, "Fog, Wind, and Ice: Navigating the Northwest Passage."
- ³⁷ Judge, *The Historic Northwest Passage*, 104.
- ³⁸ Judge, *The Historic Northwest Passage*, 107.
- ³⁹ Capelotti, "Fog, Wind, and Ice."
- ⁴⁰ Excerpts from the Journal and Letters of Captain Harold L. Wood.
- ⁴¹ Excerpts from the Journal and Letters of Captain Harold L. Wood, USCG, 20 July 1957.
- ⁴² Excerpts from the Journal and Letters of Captain Harold L. Wood, USCG, 20 July 1957.
- ⁴³ Judge, *The Historic Northwest Passage*, 130.
- ⁴⁴ Excerpts from the Journal and Letters of Captain Harold L. Wood, 26 July 1957.
- ⁴⁵ Capelotti, "Across the Top of the World," 14.
- ⁴⁶ Excerpts from the Journal and Letters of Captain Harold L. Wood, 24 July 1957.

⁴⁷ Excerpts from the Journal and Letters of Captain Harold L. Wood, 30 July 1957.

⁴⁸ Capelotti, "Fog, Wind, and Ice."

⁴⁹ Excerpts from the Journal and Letters of Captain Harold L. Wood.

⁵⁰ Excerpts from the Journal and Letters of Captain Harold L. Wood, 9 August 1957.

⁵¹ Capelotti, "Across the Top of the World," 16.

⁵² For a brief history of the community, see Peter Kikkert and P. Whitney Lackenbauer, "A History of Ikaluktuuttiaq," in *A Guidebook for Research with Nunavut Communities, Iqaluktuuttiaq* (Cambridge Bay) Edition (Cambridge Bay, NU: Polar Knowledge Canada/Pitquhirnikkut Ilihautiniq, 2016), 14–31. On perceptions of what the DEW Line meant for Inuit at the time, see Lackenbauer, "At the Crossroads of Militarism and Modernization: Inuit-Military Relations in the Cold War Arctic," in *Roots of Entanglement: Essays in Native-Newcomer Relations*, eds. Myra Rutherdale, Lackenbauer, and Kerry Abel (Toronto: University of Toronto Press, 2018), 116–58.

⁵³ Excerpts from the Journal and Letters of Captain Harold L. Wood, 8 September 1957.

⁵⁴ Excerpts from the Journal and Letters of Captain Harold L. Wood, 14 August 1957.

⁵⁵ Judge, *The Historic Northwest Passage*, 153.

⁵⁶ Capelotti, "Across the Top of the World," 18.

⁵⁷ Judge, *The Historic Northwest Passage*, 153.

⁵⁸ David Maclellan, "Pullen of the Arctic," *Canadian Geographic* 104, no. 2 (1984).

⁵⁹ Captain Tom Pullen obituary, *Daily Telegraph* [London], clipping provided by the Pullen family.

⁶⁰ See, for example, Shelagh D. Grant, "Myths of the North in the Canadian Ethos," *Northern Review* 3, no. 4 (1989); Renée Hulan, *Northern Experience and the Myths of Canadian Culture* (Montreal and Kingston: McGill-Queen's University Press, 2001), 3–28; Kerry Abel and Ken Coates, "The North and the Nation," in *Northern Visions: New Perspectives on the North in Canadian History*, eds. Abel and Coates (Peterborough: Broadview, 2001), 1–21; and Ken Coates, P. Whitney Lackenbauer, Bill Morrison, and Greg Poelzer, *Arctic Front: Defending Canada in the Far North* (Toronto: Thomas Allen, 2008).

⁶¹ RCMP officer Bill White suggests that Larsen's achievement was preceded by other Canadian ships. White alleges that "the so-called Northwest Passage was a busy bloody highway by this time with trading posts all along it and supply ships like the *Chimo* and the *Aklavik* going this way and that way every year. Not too many crossed through from west to east, but I know the *Aklavik* did it in 1938 and Henry [Larsen] knew it too." Patrick White, *Mountie in Mukluks: The Arctic Adventures of Bill White* (Madeira Park, B.C.: Harbour Publishing, 2004), 227–28.

⁶² W.A.B. Douglas, Roger Sarty, and Michael Whitby, *A Blue Water Navy: The Official Operational History of the Royal Canadian Navy in the Second World War, 1943–1945, Volume II, Part 2* (St. Catharines: Vanwell Publishing, 2007); Isabel

Campbell, "Making a Difference in Arctic Naval Research, HMCS *Cedarwood*, 1948-1956," *Canadian Naval Review* 8, no. 1 (Spring 2012): 10-14; Michael Whitby, "Deployments by Ships of the Royal Canadian Navy into Canadian Northern Waters, 1949-2014," *Canadian Naval Review*, BroadSides Forum (November 2014); and Campbell, "A Reassessment of the Royal Canadian Navy's 1948 Voyages into Hudson Bay and its Place in Oceanographic Research," *International Journal of Maritime History* 31, no. 4 (2019): 826-41.

⁶³ "HMCS Labrador: Report of Summer Operations, 1957," Directorate of History and Heritage (DHH), Department of National Defence, 81/550-8000, box 54A, part 5. Please note that this report is also reproduced in Lackenbauer and Elliot-Meisel, "*One of the Great Polar Navigators*."

⁶⁴ Pullen to Office of Flag Officer Atlantic Coast, H.M.C. Dockyard, Halifax, 6 July 1957, Hudson's Bay Company (HBC) Archives, E346/8/1 vol. 2.

⁶⁵ "HMCS Labrador: Report of Summer Operations, 1957."

⁶⁶ "HMCS Labrador: Report of Summer Operations, 1957."

⁶⁷ "HMCS Labrador: Report of Summer Operations, 1957."

⁶⁸ Thomas Pullen, "We Found a New Northwest Passage," *Saturday Evening Post*, 10 May 1958.

⁶⁹ Pullen, "We Found a New Northwest Passage."

⁷⁰ Pullen, "We Found a New Northwest Passage." Pullen noted a close call on Greenland earlier that month, when a Canadian sailor on a day-long excursion whose ambition exceeded his mountaineering skills found himself trapped on a mountain face. The Danes rescued the young man, and Pullen made a point of asking Ottawa to send a formal thank-you note to the Greenlandic government. "HMCS Labrador: Report of Summer Operations, 1957," DHH, 81/550-8000, box 54A, part 5.

⁷¹ Pullen, "We Found a New Northwest Passage."

⁷² Pullen, "HMCS Labrador: Report of Summer Operations, 1957."

⁷³ Pullen, "HMCS Labrador: Report of Summer Operations, 1957."

⁷⁴ When asked if they would not mind being winched in and out of the HUP as it circled, the hydrographers refused. Pullen admitted that he could not blame them. Pullen, "HMCS Labrador: Report of Summer Operations, 1957."

⁷⁵ "HMCS Labrador: Report of Summer Operations, 1957."

⁷⁶ J.H. MacDonald, "HMCS Labrador, Bellot Strait Survey and the Northwest Passage," DHH, 81/520-8000, box 54A, part 2.

⁷⁷ Eric Fernberg, "A Tough Little Boat: The Pogo - HMCS Labrador's Hydrographic Survey Launch," *Canadian Military History* 5, no. 2 (1996): 71-76.

⁷⁸ Pullen, "We Found a New Northwest Passage."

⁷⁹ Pullen, "We Found a New Northwest Passage."

⁸⁰ "HMCS Labrador: Report of Summer Operations, 1957."

⁸¹ Pullen Diary, 22 August 1957, in Lackenbauer and Elliot-Meisel, "*One of the Great Polar Navigators*," 112.

⁸² Pullen Diary, 23 August 1957, in Lackenbauer and Elliot-Meisel, "*One of the Great Polar Navigators*," 113.

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- ⁸³ J.H. MacDonald, "HMCS Labrador, Bellot Strait Survey and the Northwest Passage."
- ⁸⁴ Pullen, "We Found a New Northwest Passage."
- ⁸⁵ Pullen Diary, 24 August 1957, in Lackenbauer and Elliot-Meisel, *"One of the Great Polar Navigators,"* 113–14.
- ⁸⁶ "HMCS Labrador: Report of Summer Operations, 1957."
- ⁸⁷ Pullen, "We Found a New Northwest Passage."
- ⁸⁸ Pullen Diary, 24 August 1957, in Lackenbauer and Elliot-Meisel, *"One of the Great Polar Navigators,"* 114.
- ⁸⁹ "HMCS Labrador: Report of Summer Operations, 1957."
- ⁹⁰ Judge, *The Historic Northwest Passage and the CGC Storis*, 157, 159.
- ⁹¹ See P. Whitney Lackenbauer and Shelagh Grant, eds., *"The Adventurous Voyage": St. Roch and the Northwest Passage, 1940-42 and 1944* (Antigonish: Mulroney Institute on Government, Arctic Operational History Series, vol. 7, 2019).
- ⁹² Excerpts from the Journal and Letters of Captain Harold L. Wood, USCG.
- ⁹³ Excerpts from the Journal and Letters of Captain Harold L. Wood, USCG.
- ⁹⁴ Excerpts from the Journal and Letters of Captain Harold L. Wood, USCG.
- ⁹⁵ Capelotti, "Across the Top of the World," 20.
- ⁹⁶ Excerpts from the Journal and Letters of Captain Harold L. Wood, USCG, 4 September 1957.
- ⁹⁷ Capelotti, "Fog, Wind, and Ice."
- ⁹⁸ Pullen Diary, 11 September 1957, in Lackenbauer and Elliot-Meisel, *"One of the Great Polar Navigators,"* 141.
- ⁹⁹ Quoted in Lackenbauer and Elliot-Meisel, *"One of the Great Polar Navigators,"* 138–39.
- ¹⁰⁰ Capelotti, "Across the Top of the World," 4-5.
- ¹⁰¹ MacDonald, "HMCS Labrador, Bellot Strait Survey and the Northwest Passage."
- ¹⁰² Pullen Diary, 23 September 1957, in Lackenbauer and Elliot-Meisel, *"One of the Great Polar Navigators,"* 149–50.
- ¹⁰³ On these deliberations, see file "Notes Used in Preparing History HMCS Labrador," DHH, 81/520-8000.
- ¹⁰⁴ Pullen Diary, 23 September 1957, in Lackenbauer and Elliot-Meisel, *"One of the Great Polar Navigators,"* 150.
- ¹⁰⁵ See also Ken Eyre, *Custos Borealis: The Military in the Canadian North*, ed. P. Whitney Lackenbauer (Peterborough: North American and Arctic Defence and Security Network, 2020), and J.M. Leeming, "HMCS Labrador and the Canadian Arctic," 286–307.
- ¹⁰⁶ Pullen Diary, 11 October 1957, in Lackenbauer and Elliot-Meisel, *"One of the Great Polar Navigators,"* 157.
- ¹⁰⁷ On the occasion of paying off *Labrador*, Minister of National Defence George Pearkes applauded "the splendid record established by the ship under the White Ensign." It had been the only naval icebreaker in the Commonwealth, but "now, with her transfer, trained and experienced personnel will be made
- 138 Lajeunesse and Lackenbauer

available to help man our fighting ships, whose operation is our primary task." Priority Message, Minister of National Defence to *Labrador*, 21 November 1957, DHH, 81/520-8000.

¹⁰⁸ Capelotti, "Across the Top of the World," 5.

¹⁰⁹ Capelotti, "Across the Top of the World," 14–15.

¹¹⁰ Cmmdr, MSTs, to Chief of Naval Operations, "MSTs Arctic Operations 1955," 15 February 1955, NARA, RG 313, entry UD-13C 11, box 5.

¹¹¹ Air Officer Commanding Tactical Air Command, Royal Canadian Air Force (RCAF), "Task Force 572," 27 September 1955, NARA, RG 313, entry UD-13C 11, box 8.

¹¹² MSTs, "Post Operation Report" (1957), 4.

¹¹³ Graham Rowley, "Captain T.C. Pullen, RCN: Polar Navigator," *The Northern Mariner* 2, no. 2 (1992): 47; and Lackenbauer and Elliot-Meisel, "One of the Great Polar Navigators."

¹¹⁴ Levon Sevunts, "U.S. Coast Guard to Send Icebreaker Through Northwest Passage with Canada's Consent," *CBC News*, 13 March 2021, <https://www.cbc.ca/news/politics/icebreaker-northwest-passage-1.5948475>. See also Peter Kikkert and P. Whitney Lackenbauer, "Handshakes or Arm Wrestling? The United States, Canada and Icebreakers in the Arctic," *Canadian Global Affairs Institute Policy Perspective* (August 2020), https://www.cgai.ca/handshakes_or_arm_wrestling_the_united_states_canada_and_icebreakers_in_the_arctic.

¹¹⁵ P. Whitney Lackenbauer and Rob Huebert, "Premier Partners: Canada, the United States and Arctic Security," *Canadian Foreign Policy Journal* 20, no. 3 (Fall 2014): 320–33.



7

Report of CCGS *John A. Macdonald* Arctic Voyage 1967

Captain Paul Moise Fournier*

July 8th

At 22:00 Hours, after completion of loading 580 tons of general cargo, and 237 tons of diesel oil in bulk for Eureka Weather Station, total bunker on board 1,867.32 tons, the C.C.G.S. *John A. MacDonald* [sic] departed Montreal on her annual Arctic Voyage. At 24:00 Hours, position abeam Verchères. Distance made good in past 24 hours, 26 miles. Average speed 13 knots.

July 9th

At 07:58 Hours, dropped anchor in Quebec Harbour. No berth available at [Queen's] Wharf. The C.C.G.S. *Eider* came alongside with Hydrographers and gear. At 09:52 Hours, anchor up and proceeded down river. At 18:08 Hours, pilot disembarked at [Les Escoumins] Pilot Station. The vessel continued her course passing north of Anticosti Island. At 24:00 Hours, position Lat. [Latitude] 49° 05' N [North]. Long. [Longitude] 67° 54' W [West]. Course 063° True. Speed 12 knots. Wind S.S.W. [south-southwest] force 5 knots. Clear, visibility 15 miles. Distance made good in past 24 hours, 299 miles. Average speed 13.36 knots.

July 10th

At 08:00 Hours, position Lat. 49° 41.5' N. Long. 65° 46' W. Speed 11 knots on 3 engines, 110 R.P.M. [revolutions per minute]. At 24:00 Hours, position Lat. 50° 01' N. Long. 61° 05' W. Course 090° True. Speed 11 knots. Wind calm. Clear, visibility of 15 miles. Distance made good in past 24 hours, 276 miles. Average speed 11.5 knots.

* Department of Transport file 9176-JAM.

July 11th

At 03:30 Hours, abeam Cape Whittle, distance 10.5 miles off. At 16:00 Hours, Point Amour abeam. At 24:00 Hours, position Lat. 52° 56' N. Long. 56° 30' W. Course 000° True. Speed 13.5 knots. Wind N.W. [northwest] force 20 knots. Distance made good in past 24 hours, 303 miles. Average speed 12.6 knots.

July 12th

At 02:22 Hours, abeam Roundhill Island, distance 3.8 miles off. Bound Goose Bay to pick up Helicopters. At 17:00 Hours, anchored off Epinette Point, Lake Melville[,] awaiting Helicopters. At 18:45 Hours, Helicopters CF-CAB and CF-DTU landed on board. Vessel got underway immediately. At 24:00 Hours, position Lat. 54° 12' N. Long. 58° 23' W. Course 055° True. Speed 13 knots. Overcast, visibility 10 miles. Distance made good in past 24 hours, 309 miles. Average speed 12.9 knots.

July 13th

At 05:42 Hours, steaming in a heavy swell and dense fog. Weather and sea unfavorable to carry out Hydrographic Project 47.2 and 47.3. A Northerly course was shipped for the Eastern Boundary of the Baffin Pack, bound Milne Inlet. At 08:00 Hours, position Lat. 54° 56' N. Long. 56° 35' W. Course 000° True. Speed 11 knots on 3 engines, 110 R.P.M. Wind N.N.E. [north-northeast] force 12 knots. Dense fog. Heavy Easterly swell. At 24:00 Hours, position Lat. 57° 49' N. Long. 56° 10' W. Course 000° True. Speed 10.5 knots. Wind N.E. [northeast] 10 knots. Heavy swell. Overcast and fog patches. Distance made good in past 24 hours, 270 miles. Average speed 11.2 knots.

July 14th

At 08:00 Hours, position Lat. 59° 26' N. Long. 55° 49' W. Course 000° True. Speed 11 knots. Fog and mist, visibility ½ mile. Heavy Easterly swell. At 24:00 Hours, position Lat. 62° 33' N. Long. 56° 00' W. Cloudy and visibility 10 miles. Distance made good in past 24 hours, 280 miles. Average speed 11.6 knots.

July 15th

At 08:00 Hours, position Lat. 64° 14' N. Long. 55° 40' W. Cloudy and visibility 10 miles. Moderate Easterly swell. At 24:00 Hours, position Lat. 67° 20' N. Long. 55° 45' W. Course 000° True. Speed 12 knots. Wind E.S.E. [east-

southeast] force 6 knots. Overcast, visibility 5 miles. Distance made good in past 24 hours, 283 miles. Average speed 11.8 knots.

July 16th

At 08:00 Hours, position Lat. 68° 57' N. Long. 55° 50' W. following Eastern Boundary of Baffin Pack. At 24:00 Hours, position Lat. 72° 06' N. Long. 57° 35' W. Course 347° True. Speed 11 knots. Wind S.E. [southeast] force 7 knots. Overcast, visibility 5 miles. Distance made good in past 24 hours, 283 miles. Average speed 11.8 knots.

July 17th

At 08:00 Hours, position Lat. 73° 37' N. Long. 58° 48' W. Course 347° True. Overcast and light rain. At 14:48 Hours, position Lat. 74° 53.5' N. Long. 60° 00' W. Alter course to 296° True. Vessel entered Baffin Pack. 7/10 coverage thick winter ice and numerous icebergs. Vessel passed 8 miles South of Cape York under similar ice conditions. At 24:00 Hours, position Lat. 75° 46' N. Long. 66° 25' W. Course 275° True. Speed 12 knots. Wind calm. Overcast, rain and fog. Distance made good in past 24 hours, 295 miles. Average speed 12.3 knots.

July 18th

At 04:00 Hours, position Lat. 76° 02' N. Long. 69° 20' W. Alter to 270° True. Speed 11.6 knots. Ice concentration 8/10, 6/10 winter and 2/10 polar. Numerous bergs. At 12:00 Hours, position Lat. 75° 53' N. Long. 75° 15' W. Course 270° True. At 14:00 Hours, Coburg Island, bearing 271° True, distance 30 miles. Vessel clear of ice[,] alter course for Pond Inlet 180° True following the Western Boundary of Baffin Pack. At 24:00 Hours, position Lat. 73° 59' N. Long. 76° 30' W. Course 170° True. Ice 1/10 coverage. Speed 11.5 knots. Overcast and fog, visibility ½ mile. Distance made good in past 24 hours, 277 miles. Average speed 11.5 knots.

July 19th

At 07:15 Hours, entered fast ice in Pond Inlet. At 08:00 Hours, position Lat. 72° 48' N. Long. 77° 03' W. Course 278° True. Butting heavy winter ice in Pond Inlet. At 24:00 Hours, position Lat. 72° 48' N. Long. 77° 25' W. [P]rogress made since noon, 11 miles or approximately 1 mile per hour. Winter fast ice, average 52 inches thick. Distance made good in past 24 hours, 113 miles. Average speed 4.7 knots. NOTE: Pond Inlet, Eclipse Sound and Milne Inlet

were found fast ice 10/10 coverage 52 to 57 inches thick. Vessel making very slow progress[,] about one length to each charge.

July 20th

Vessel continued on her way to Milne Inlet through fast ice 52 to 56 inches thick, making very slow progress, the ice having retained some of its winter hardness. At 24:00 Hours, position Lat. 72° 45' N. Long. 78° 17' W. Progress 13 miles in 24 hours. Average speed 0.62 knots per hour.

July 21st

Vessel continued working in Eclipse Sound under similar ice conditions as yesterday. At 24:00 Hours, position Lat. 72° 41' N. Long. 79° 23' W. Distance made good in past 24 hours, 21 miles. Average speed 0.89 knots per hour.

July 22nd

Vessel working in Eclipse Sound[,] fast ice 52 to 56 inches thick[,] making slow progress. At 24:00 Hours, position Lat. 72° 34' N. Long. 80° 07' W. Distance made good in past 24 hours[,] 16 miles. Average speed 0.67 knots.

July 23rd

Vessel working in Milne Inlet through fast ice[,] making slow progress. At 24:00 Hours, position Lat. 72° 18' N. Long. 80° 30' W. Progress in past 24 hours, 19 miles. Average speed 0.79 knots.

July 24th

At 16:20 Hours, vessel clear of ice in Koluktoo Bay and proceeded towards Camp Site. At 17:36 Hours, dropped anchor at Camp Site, Milne Inlet, position Lat. 71° 53.8' N. Long. 80° 53.1' W. At 24:00 Hours, anchored in Milne Inlet. Distance made good in past 24 hours, 35 miles. Average speed 3.85 knots.

July 25th

Vessel remained anchored in Milne Inlet, position Lat. 71° 54' N. Long. 80° 55' W. Wind N.E. force 20 knots.

July 26th

Vessel remained at Milne Inlet.

July 27th

Vessel remained at Milne Inlet.

July 28th

At 08:57 Hours, hove up and proceeded towards Pond Inlet following the broken track. At 16:20 Hours, dropped anchor off Pond Inlet Settlement in [an] open water area approximately 7 miles wide by 2 miles long caused by the warmer water flowing from Salmon River. At 24:00 Hours, position anchored at Pond Inlet Lat. 72° 42' N. Long. 78° 01' W. Wind calm. Distance made good in past 24 hours, 90.5 miles. Average speed 12.2 knots.

July 29th

At 08:00 Hours, commenced discharging cargo. At 19:30 Hours, cargo [operation] ceased for the night.

July 30th

At 08:00 Hours, resumed cargo operations. At 14:30 Hours, completed discharging cargo. Vessel remained anchored at Pond Inlet. Under present ice conditions no hydrographic work carried out.

July 31st

Remained anchored at Pond Inlet. No change in ice conditions.

August 1st

At 04:30 Hours, hove up and proceeded out into Eclipse Sound. Ice drifting at the anchorage. At 05:30 Hours, stopped in fast ice in Eclipse Sound, position Lat. 72° 46' N. Long. 78° 07' W.

August 2nd

Remained laying to in Eclipse Sound in fast ice, position Lat. 72° 46' N. Long. 78° 07' W. Easterly gale and foggy weather unfavorable condition for hydrographic work.

August 3rd

Laying to in fast ice in Eclipse Sound, position Lat. 72° 46' N. Long. 78° 07' W.

August 4th

At 19:15 Hours, vessel underway bound Clyde River. Ice in Eclipse Sound and Pond Inlet now very soft and breaking up. At 20:12 Hours, abeam

[Beloeil] Island. At 24:00 Hours, position Lat. 72° 36' N. Long. 74° 24' W. Course 103° True. Speed 13 knots.

August 5th

At 08:00 Hours, position Lat. 71° 43' N. Long. 70° 29' W. Course 130° True. Speed 11 knots. Steaming in open water. At 11:00 Hours, encountered heavy ice 10/10 coverage 30 miles off[f] Erik Point and continued under same conditions[,] rounding Cape Christian to Lat. 70° 52' N. Long. 67° 41' W. thence open water to Clyde River. At 19:30 Hours, anchored in Clyde River and commenced discharging cargo. At 21:00 Hours, ice drifting to the landing causing difficulty for [Self-Propelled] Barges. At 22:30 Hours, barges returned to ship and discharging operation ceased for the night. Distance made good in past 24 hours, 214 miles. Average speed 11.2 knots.

August 6th

At 03:00 Hours, resumed discharging cargo with rising tide. At 15:46 Hours, work completed at Clyde River. Hove up and proceeded towards Cape Dyer. At 24:00 Hours, position Lat. 69° 22' N. Long. 65° 25' W. Course 145° True. Speed 12 knots. Vessel proceeding towards Cape Dyer following Baffin coast in open water. Wind S.E. force 5 knots. Overcast and rain. Distance made good in past 24 hours, 99 miles. Average speed 12.03 knots.

August 7th

At 08:00 Hours, position Lat. 68° 00' N. Long. 63° 35' W. From Clyde River to Cape Dyer encountered open pack ice 2/10 to 6/10 winter and polar. At 16:30 Hours, dropped anchor off Cape Dyer Landing. Exeter Bay was found ice free. At 24:00 Hours, position anchored in Exeter Bay at Lat. 66° 34.6' N. Long. 61° 41.7' W. Wind calm. Distance made good in past 24 hours, 213 miles. Average speed 12.9 knots.

August 8th

At 17:21 Hours, crew worked all day to salvage crashed helicopter CF-CAG and now returning on board. Damaged helicopter now stored in this vessel's hangar. At 18:46 Hours, hove up and proceeded towards Broughton Island. From Cape Dyer to Broughton Is. [Island] ice was found 1/10 to 2/10. At 24:00 Hours, position Lat. 67° 09' N. Long. 61° 54' W. Course 307° True. Speed 11 knots. Cloudy, visibility 10 miles. Distance made good in past 24 hours, 57 miles. Average speed 10.9 knots.

August 9th

At 05:48 Hours, dropped anchor in Broughton Island. At 08:00 Hours, commenced discharging heavy equipment. At 14:50 Hours, discharging of heavy equipment completed and proceeded towards Thule, Greenland[,] following the Baffin coast. Ice 4/10 to 6/10 coverage. At 24:00 Hours, position Lat. 69° 10' N. Long. 65° 10' W. Vessel clear of ice and proceeding on 3 engines at 110 R.P.M. Distance made good in past 24 hours, 179 miles. Average speed 12 knots. Weather, cloudy, visibility 10 miles.

August 10th

Vessel on passage towards Thule, Greenland. Ice was encountered off Cape Christian 10/10 winter and polar at Lat. 70° 31' N. Long. 69° 29' W. to Lat. 71° 13' N. Long. 68° 17' W. Thence followed the Western boundary of the Baffin Pack to midnight, position Lat. 73° 10' N. Long. 71° 40' W. Course 350° True. Speed 11.5 knots. Overcast and rain. Distance made good in past 24 hours, 288 miles. Average speed 12.0 knots.

August 11th

At 08:00 Hours, position Lat. 74° 50' N. Long. 71° 00' W. At 17:27 Hours, tied up alongside wharf at Thule. Distance made good in past 24 hours, 221 miles. Average speed 12.6 knots.

August 12th

At 08:00 Hours, commenced loading cargo. At 18:00 Hours, completed loading cargo, departed Thule bound Resolute Bay. At 24:00 Hours, position Lat. 75° 57' N. Long. 72° 40' W. Distance made good in past 24 hours, 66 miles. Average speed 11.0 knots.

August 13th

At 08:00 Hours, position Lat. 75° 03' N. Long. 77° 10' W. Set course 220° True. Speed 10.8 knots. At 24:00 Hours, position Lat. 74° 22' N. Long. 87° 08' W. Course 270° True. Speed 10.8 knots on 3 engines at 110 R.P.M. Wind E.S.E. force 5 knots. Clear. Steaming in open water. Distance made good in past 24 hours, 260 miles. Average speed 10.8 knots.

August 14th

At 03:45 Hours, encountered ice at abeam Beechey Island, ice extended to Cornwallis Island with a narrow lead 3 miles wide along the shore to Resolute Bay. Resolute was found fast ice. At 11:00 Hours, commenced

breaking ice in Resolute Bay. At 12:06 Hours, Resolute Bay completely broken, dropped anchor. Wind N.E. force 25 knots. At 20:03 Hours, ice commenced moving out, vessel changed anchorage. At 23:00 Hours, Resolute Bay completely clear of ice. Distance made good in past 24 hours, 147 miles. Average speed 12 knots.

August 15th

At 19:00 Hours, departed Resolute Bay bound Grise Fiord. At 24:00 Hours, position Lat. 74° 35' N. Long. 91° 22' W. Steaming on 3 engines at 110 R.P.M. Course 105° True. Speed 11.8 knots. Wind N.N.W. [north-northwest] force 20 knots. Distance made good in past 24 hours, 59 miles. Average speed 11.8 knots.

August 16th

At 08:00 Hours, position Lat. 74° 22' N. Long. 82° 52' W. Course 090° True. At 21:35 Hours, position Lat. 75° 25' N. Long. 79° 10' W. received call from S.S. *Denmark Hill* having a seriously ill crew member, requesting medical treatment, soonest. Course was altered immediately and proceeded at all speed to rendez-vous with *Denmark Hill*. At 24:00 Hours, position Lat. 74° 53' N. Long. 77° 30' W. Course 136° True. Speed 16.5 knots. Overcast and rain, visibility 2 miles. Distance made good in past 24 hours, 289 miles. Average speed 12 knots.

August 17th

At 00:33 Hours, helicopter airborne with Medical Officer bound to C.C.G.S. *N.B. McLean*. Medical Officer and Male Nurse were ferried by *N.B. McLean's* barge to *Denmark Hill* and there treated patient who apparently has perforated stomach [ulcers]. Medical Officer requested that Nurse from *N.B. McLean* remain on board the S.S. *Denmark Hill* until the vessel arrived at Resolute Bay. At 03:05 Hours, helicopter returned from *N.B. McLean* with Medical Officer. At 16:00 Hours, encountered thick winter ice approximately 20 miles from Grise Fiord. At 18:06 Hours, dropped anchor 2 cables off Grise Fiord Beach in 8/10 of ice. M/V *Sir John [Crosbie]* immediately came alongside and commenced transferring cargo. At 24:00 Hours, anchored at Grise Fiord Lat. 76° 25' N. Long. 82° 59' W. Transferring cargo. Distance made good in past 24 hours, 205 miles. Average speed 11.3 knots.

August 18th

At 00:25 Hours, completed transferring cargo from M/V *Sir John* [Crosbie]. Hove up and proceeded towards Resolute Bay. At 08:00 Hours, position Lat. 75° 33' N. Long. 79° 20' W. Course 130° True. Speed 10.3 knots, on 3 engines at 110 R.P.M. Wind N.N.W. force 20 knots. At 24:00 Hours, position Lat. 74° 23' N. Long. 87° 34' W. Course 270° True. Speed 12 knots. Cloudy with fog patches. Distance made good in past 24 hours, 287 miles. Average speed 11.5 knots.

August 19th

At 08:00 Hours, position Lat. 74° 36' N. Long. 94° 12' W. At 08:50 Hours, dropped anchor in Resolute Bay. At 16:00 Hours, commenced discharging cargo. At 20:00 Hours, cargo operation suspended for the night. Overcast and rain. Distance made good in past 24 hours, 121 miles. Average speed 13.5 knots.

August 20th

At 06:00 Hours, resumed discharging cargo. At 22:00 Hours, cargo operation suspended for the night.

August 21st

At 06:00 Hours, resumed discharging cargo. At 11:20 Hours, completed discharging cargo and commenced loading. At 13:02 Hours, hove up and proceeded outside the Bar with high water. Two more barges of cargo to come from ashore. At 13:23 Hours, anchored outside Resolute Shallow Bar awaiting [...] remainder of cargo. At 20:55 Hours, completed loading. Wind S.E. force 35 knots. Overcast and fog patches. Remained at Resolute Bay awaiting orders from H.Q. [Headquarters].

August 22nd

At 11:45 Hours, hove up and proceeded towards Eureka. At 13:41 Hours, transferred hydrographers and equipment to C.C.G.S. *d'Iberville*. At 24:00 Hours, position Lat. 74° 23' N. Long. 87° 44' W. Course 090° True. Speed 12 knots. Distance made good in past 24 hours, 128 miles. Average speed 10.08 knots.

August 23rd

At 08:00 Hours, position Lat. 74° 21' N. Long. 82° 30' W. Course 090° True. Light wind. Overcast and fog patches. At 24:00 Hours, position Lat. 76° 12'

N. Long. 86° 22' W. Course 285° True. Speed 13 knots. Overcast and clear. Wind E.N.E. [east-northeast] force 15 knots. Distance made good in past 24 hours, 315 miles. Average speed 13.1 knots.

August 24th

At 04:00 Hours, steaming through Hells Gate, ice 4/10 consisting of large floes. At 08:00 Hours, steaming in Norwegian Bay position Lat. 77° 21' N. Long. 85° 53' W. Course 000° True. Speed 10 knots. Ice 9/10 coverage[,] 7/10 thick winter, 2/10 polar. At 16:00 Hours, entered Eureka Sound which was found open water. At 24:00 Hours, position Lat. 79° 57' N. Long. 86° 38' W. Distance made good in past 24 hours, 298 miles. Average speed 12.4 knots.

August 25th

At 00:45 Hours, dropped anchor off Eureka Landing, Lat. 79° 59' N. Long. 85° 57' W. At 04:00 Hours, commenced discharging cargo. Wind West, force 15 knots. At 21:50 Hours, discharging operation suspended for the night. Distance made good in past 24 hours, 8 miles. Average speed 11.16 knots.

August 26th

At 04:00 Hours, resumed cargo operations. At 10:25 Hours, C.C.G.S. *Labrador* came alongside and commenced transferring bunker. At 11:00 Hours, completed discharging and backloading cargo at Eureka. At 22:45 Hours, completed bunker transfer from *Labrador*, received 205 tons. At 23:40 Hours, hove up and proceeded towards Tanquary Fiord. At 24:00 Hours, position Lat. 79° 59' N. Long. 86° 13' W. Course 272° True. Speed 14 knots. Distance made good in past 24 hours, 2 miles. Average speed 5 knots.

August 27th

From Eureka to Tanquary 2/10 to 5/10 of ice encountered, mainly open pack with several good leads. At 10:45 Hours, dropped anchor at Landing Beach at Tanquary Fiord, Lat. 81° 24' N. Long. 76° 56' W. Light Easterly wind, fine and clear. At 20:54 Hours, cargo discharging operation completed[,] also 10 passengers embarked. Hove up and proceeded towards Greely Fiord. At 24:00 Hours, position Lat. 80° 49' N. Long. 79° 20' W. Distance made good in past 24 hours, 199 miles. Average speed 14.4 knots.

August 28th

At 02:08 Hours, dropped anchor in Greely Fiord, Lat. 80° 36' N. Long. 79° 31' W. and commenced landing cargo immediately. At 04:06 Hours, completed

discharging cargo at Greely Fiord, hove up and proceeded towards Cape Sparbo. In Tanquary Fiord and Greely Fiord encountered occasional ice belts 2/10 to 5/10, Eureka Sound was open water to Norwegian Bay entrance, where the ice was found unchanged from inward trip, 9/10 coverage. At 24:00 Hours, position Lat. 77° 56' N. Long. 89° 10' W. Course 217° True. Speed 12.5 knots. Overcast and fog. Distance made good in past 24 hours, 272 miles. Average speed 12.28 knots.

August 29th

At 08:00 Hours, position Lat. 76° 40' N. Long. 89° 32' W. steaming through Hells Gate open water. At 16:35 Hours, dropped anchor off Cape Sparbo and commenced discharging cargo and seven passengers evacuated. At 19:15 Hours, work completed at Cape Sparbo. Hove up and proceeded towards Resolute Bay. At 24:00 Hours, position Lat. 75° 58' N. Long. 81° 24' W. Distance made good in past 24 hours[,] 239 miles.

August 30th

At 08:00 Hours, position Lat. 74° 37' N. Long. 78° 52' W. Vessel proceeding towards Resolute Bay. Light winds. Lancaster Sound ice free. At 24:00 Hours, position Lat. 74° 31' N. Long. 90° 20' W. Course 287° True. Speed 11.2 knots on 3 engines at 110 R.P.M. Light S.E. winds. Fog and snow. Distance made good in past 24 hours, 293 miles. Average speed 12.2 knots.

August 31st

At 10:40 Hours, dropped anchor in Resolute Bay and landed 19 passengers and gear. At 17:30 Hours, wind increased to gale force, hove up and changed anchorage for safety. At 18:55 Hours, vessel anchored with two anchors in Resolute Bay, position Lat. 74° 41' N. Long. 94° 51' W. At 24:00 Hours, North-west gale 45 knots. Overcast and snow. Distance made good in past 24 hours, 77 miles. Average speed 11.1 knots.

September 1st

At 08:00 Hours, anchored Resolute Bay. Wind N.W. 25 knots. Overcast and snow flurries. At 20:50 Hours, hove up and proceeded out of Resolute Bay bound Western Arctic via Peel Sound and Victoria Strait. At 24:00 Hours, position Lat. 74° 12' N. Long. 95° 12' W. Various courses through large ice floes following leads. Wind N.W. force 9 knots. Overcast and snow flurries. Distance made good in past 24 hours[,] 32 miles. Average speed 10.1 knots.

September 2nd

At 08:00 Hours, steaming through Peel Sound in open water on 3 engines. Position Lat. 72° 33' N. Long. 96° 06' W. Wind S.W. [southwest] force 9 knots. Overcast and snow flurries. At 13:30 Hours, encountered ice, position Lat. 71° 30' N. Long. 96° 30' W. At 16:00 Hours, steaming through 10/10 ice, 7/10 thick winter, 3/10 polar with full power on and heeling system working. Progress 8 knots per hour. At 22:00 Hours, position Lat. 70° 28' N. Long. 98° 28' W. Stopped for the night. Ice 10/10 coverage ridging and heavy pressure. Wind N.E. force 13 knots. Overcast and snow, visibility 0. Distance made good in past 24 hours, 244 miles. Average speed 11.09 knots.

September 3rd

At 05:00 Hours, vessel underway through 10/10 coverage, 3/10 polar with numerous pressure ridges. At 12:00 Hours, position Lat. 69° 56' N. Long. 99° 36' W. Course 201° True. Speed 6 knots. Heavy ice 10/10 coverage. Wind N.E. force 35 knots. Thick snow visibility ¼ mile. At 16:00 Hours, position Lat. 69° 33' N. Long. 100° 28' W. Overcast and snow. Wind N. x E. [east] force 25 knots. Due to poor visibility and low land, very difficult to pick up any target on radar, therefore, steaming mostly on D.R. [dead reckoning] position. Ice 9/10 winter and polar with several small bergs and ice islands. At 17:10 Hours, position Lat. 69° 21' N. Long. 100° 27' W. Course 180° True. Speed 8 knots on 6 engines. Proceeding with caution, depth of approximately 12 fathoms of water, ice 6/10 heavy winter. At 20:00 Hours, position Lat. 68° 51' N. Long. 101° 16' W. in open water various depths from 10 to 20 fathoms passing East of Jenny Lind Island. At 24:00 Hours, position Lat. 68° 36' N. Long. 102° 46' W. Course 283° True. Speed 11.5 knots on 3 engines. Wind N.W. force 25 knots. Overcast, snow. Distance made good in past 24 hours, 162 miles. Average speed 8.5 knots.

September 4th

At 08:00 Hours, vessel proceeded Westward on various courses following recommended track. Position Lat. 68° 55' N. Long. 107° 09' W. Course 249° True. Speed 12 knots on 3 engines. Vessel continued through the day following recommended track. At 24:00 Hours, position Lat. 69° 03' N. Long. 116° 38' W. Course 255° True. Speed 13 knots. Wind East force 10 knots. Cloudy visibility 10 miles. Distance made good in past 24 hours, 317 miles. Average speed 13.25 knots.

September 5th

At 08:00 Hours, position Lat. 69° 54' N. Long. 121° 28' W. Course 290° True. Speed 13 knots. Overcast and snow. At 14:30 Hours, stopped off Cape Parry to rendez-vous with C.C.G.S. *Camsell*. At 15:39 Hours, vessel underway Westward through 5/10 to 6/10 thick winter ice. At 16:30 Hours, stopped in ice. At 24:00 Hours, position Lat. 70° 17' N. Long. 125° 51' W.[,] vessel laying to in 5/10 ice off Cape Parry. Distance made good in past 24 hours, 216 miles. Average speed 11.35 knots.

September 6th

At 06:00 Hours, vessel underway towards Tuktoyaktuk. Ice from Cape Parry to Baillie Island 8/10 thick winter. At 20:00 Hours, dropped anchor position Lat. 70° 05.5' N. Long. 131° 46.5' W. in open water. Standing by for N.T.C.L. [Northern Transportation Company Limited] vessels. At 24:00 Hours, remained anchored at same position. Overcast and rain. Air Temp. [temperature] Low 28° High 35°. Distance made good in past 24 hours, 151 miles. Average speed 11.2 knots.

September 7th

Vessel remained anchored in same position awaiting tanker *Pinnebog*, bound Eastward. Wind E.N.E. force 10 knots. Overcast, visibility 5 miles. Air Temp. Low 28° High 36°.

September 8th

Vessel remained at same position. At 20:55 Hours, commenced escorting tanker *Pinnebog* Eastward. At 24:00 Hours, position Lat. 70° 23' N. Long. 130° 55' W. Course 045° True. Speed 8 knots. Wind N.E. force 20 knots. Air Temp. Low 33° High 36°. Ice 2/10 thick winter. Distance made good in past 24 hours, 24 miles. Average speed 8 knots.

September 9th

At 08:00 Hours, position Lat. 70° 29' N. Long. 129° 21' W. escorting tanker *Pinnebog* East bound. Ice 2/10 to 3/10 thick winter. At 14:25 Hours, detached tanker *Pinnebog* in open water off Cape Parry and proceeded Westward on 3 engines at 110 R.P.M. Course 270° True. At 19:15 Hours, stopped in ice position Lat. 70° 06' N. Long. 126° 05' W. standing by for shipping. At 24:00 Hours, position Lat. 70° 06' N. Long. 126° 05' W. Ice 7/10 thick winter. Wind N.E. force 15 knots. Overcast, visibility 5 miles. Air Temp. Low 31° High 34°. Distance made good in past 24 hours, 186 miles. Average speed 9.6 knots.

September 10th

Remained laying to in ice 5/10 thick winter standing by for shipping. Wind N.E. force 20 knots. Air Temp. Low 30° High 33°. Distance made good in past 24 hours, 15 miles. Average speed 9.09 knots.

September 11th

At 10:40 Hours, vessel underway Eastward. At 16:00 Hours, vessel rendezvous with Tug *Radium Dew* and assisted towards Tuktoyaktuk. Position Lat. 70° 19.5' N. Long. 128° 51' W. Ice 1/10 to 3/10 coverage. At 19:32 Hours, detached Tug *Radium Dew* in open water off[f] Baillie Island and proceeded towards Tuktoyaktuk. At 22:40 Hours, dropped anchor position Lat. 70° 48' N. Long. 129° 64' W. Overcast and thick snow. Distance made good in past 24 hours, 136 miles. Average speed 11.3 knots.

September 12th

At 07:00 Hours, hove up and proceeded towards Tuktoyaktuk. At 13:28 Hours, dropped anchor in position Lat. 69° 57' N. Long. 133° 05' W. Wind N.E. force 25 knots. Overcast and fog. Air Temp. Low 31° High 33°. Distance made good in past 24 hours, 73 miles. Average speed 11.2 knots.

September 13th

At 08:00 Hours, vessel anchored off[f] Tuktoyaktuk position Lat. 69° 57' N. Long. 133° 05' W. awaiting bunker. Wind N.E. force 35 knots. At 22:10 Hours, Tug *Radium Dew* and barge arrived alongside with bunker. Transfer commenced immediately. Wind N.E. force 10 knots. Overcast and fog.

September 14th

At 06:50 Hours, completed bunker transfer of 442.5 long tons of diesel bunker. *Radium Dew* departed. At 24:00 Hours, vessel remained anchored off Tuktoyaktuk position Lat. 69° 57' N. Long. 133° 05' W. Wind E.N.E. force 20 knots. Overcast and fog.

September 15th

At 09:37 Hours, hove up and proceeded towards Baillie Island on 3 engines at 110 R.P.M. At 23:40 Hours, stopped in ice 6/10 coverage off Baillie Island. At 24:00 Hours, position Lat. 70° 38' N. Long. 127° 04' W. Wind East force 15 knots. Overcast and rain. Distance made good in past 24 hours, 134 miles. Average speed 9.5 knots.

September 16th

Vessel remained laying to in ice 5/10 coverage. Standing by for shipping. At 24:00 Hours, position Lat. 70° 47' N. Long. 127° 30' W. Ice 8/10 winter and polar. Overcast and snow flurries. Air Temp. Low 28° High 34°. Distance made good in past 24 hours, 24 miles.

September 17th

Vessel laying to in ice standing by for shipping. At 24:00 Hours, position Lat. 70° 56' N. Long. 127° 45' W. setting to the N.W. with the ice pack. Wind E.N.E. force 25 knots. Overcast and snow flurries. Distance made good in past 24 hours, 12 miles.

September 18th

Vessel laying to in ice drifting with the pack in a N.W. direction. At 24:00 Hours, position Lat. 71° 12' N. Long. 128° 23' W. Wind N.E. force 15 knots. Clear. Ice 10/10 thick winter and polar.

September 19th

At 16:00 Hours, position Lat. 71° 24' N. Long. 127° 55' W. Request was received from Capt. [Captain] Garvey, Supt. [Superintendent] N.T.C.L.[,] to proceed towards Queen [Maud] Gulf to assist vessel *Frank Broderick*. Vessel immediately proceeded Eastwards. At 24:00 Hours, position Lat. 70° 19' N. Long. 124° 45' W. Course 110° True. Speed 14 knots. Wind North force 10 knots. Overcast and snow flurries. Air Temp. Low 21° High 26°. Distance made good in past 24 hours, 105 miles. Average speed 13.04 knots.

September 20th.

At 08:00 Hours, position Lat. 69° 32' N. Long. 119° 23' W. Course 118° True. Speed 14 knots. Open water. At 24:00 Hours, position Lat. 68° 27' N. Long. 110° 38' W. Course 070° True. Speed 13 knots. Overcast and snow flurries. Wind N.W. force 25 knots. Distance made good in past 24 hours, 334 miles. Average speed 13.9 knots.

September 21st

At 10:50 Hours, the M/V *Frank Broderick* reported that she was clear of ice and making good progress in open water. Reversed course and proceeded towards Cambridge Bay. At 13:13 Hours, dropped anchor off Cambridge Bay position Lat. 69° 04' N. Long. 105° 19' W. At 24:00 Hours, remained anchored

same position awaiting M/V *Frank Broderick*[,] now discharging cargo at Cambridge Bay. Wind W.S.W. [west-southwest] force 10 knots. Overcast and snow flurries. Distance made good in past 24 hours, 188 miles. Average speed 14.1 knots. No ice encountered from Baillie Island to present position.

September 22nd

Vessel remained at anchor off Cambridge Bay. Wind N.N.W. force 15 knots. Cloudy. Air Temp. Low 18° High 24°.

September 23rd

At 08:45 Hours, hove up and proceeded Westward with M/V *Frank Broderick*. At 16:00 Hours, *Frank Broderick* reported that the L.C.M. [landing craft mechanized] 6431 which she was towing to Tuktoyaktuk flooded and is unable to pump with her bilge pump. The L.C.M. was then brought alongside this vessel[,] pumped out, and hoisted on deck. Upon examination it was found that the craft was damaged and leaking in No. 1 tank and that all of her manhole tank tops were also leaking. All of her double bottom tanks were flooded. Her well deck was then completely drained and necessary repairs will be carried out. At 24:00 Hours, position Lat. 68° 37' N. Long. 113° 30' W. Course 340° True. Speed 13.5 knots. Wind N.W. force 12 knots. Overcast, clear. Air Temp. Low 19° High 28°. Distance made good in past 24 hours, 194 miles. Average speed 13.7 knots.

September 24th

At 08:00 Hours, position Lat. 69° 08' N. Long. 117° 23' N. Wind N.W. force 15 knots. Open water. Crew employed working on L.C.M. making her seaworthy. At 20:35 Hours, landed L.C.M. at Cape Parry Beach, picked up mail and proceeded towards Point Barrow. At 24:00 Hours, position Lat. 70° 19' N. Long. 125° 00' W. Course 290° True. Speed 13 knots. Open water. Wind E.S.E. force 8 knots. Cloudy. Air Temp. Low 24° High 29°. Distance made good in past 24 hours, 272 miles. Average speed 12.53 knots.

September 25th

At 08:00 Hours, position Lat. 70° 33' N. Long. 130° 45' W. Course 257° True. Speed 15 knots. Occasional strings of new ice. At 24:00 Hours, position Lat. 70° 13' N. Long. 143° 32' W. Course 288° True. Speed 16 knots. Occasional strings of new ice. Wind calm. Overcast. Air Temp. Low 25° High 32°. Distance made good in past 24 hours, 396 miles. Average speed 15.8 knots.

September 26th

At 08:00 Hours, position Lat. 70° 58' N. Long. 149° 43' W. Course 288° True. Ice 5/10 thick winter. At 12:00 Hours, position Lat. 71° 19' N. Long. 152° 40' W. Course 285° True. Encountered 10/10 coverage, rafting with heavy pressure. At 23:00 Hours, Point Barrow, Brg. [bearing] 090°, distance 26 miles. Vessel clear of ice. At 24:00 Hours, position Lat. 71° 10' N. Long. 158° 35' W. Course 242° True. Speed 14 knots. Ice 4/10 new. Overcast and snow. Air Temp. Low 24° High 27°. Distance made good in past 24 hours, 325 miles. Average speed 13 knots.

September 27th

At 08:00 Hours, position Lat. 71° 19' N. Long. 164° 40' W. Course 330° True. Speed 14 knots. Approaching Arctic Pack. 1/10 polar. At 12:50 Hours, reduced speed to 3 engines at 110 R.P.M. At 14:00 Hours, entered Arctic Pack 10/10, 3/10 to 6/10 polar, 4/10 new ice. At 15:06 Hours, stopped awaiting [U.S.C.G.C.] *Staten Island*. Position Lat. 72° 37' N. Long. 165° 24' W. At 24:00 Hours, laying to in ice awaiting *Staten Island*. Calm and clear. Air Temp. Low 19° High 25°. Distance made good in past 24 hours, 217 miles. Average speed 14.4 knots.

September 28th

At 08:00 Hours, laying to in ice, position Lat. 72° 37' N. Long. 165° 24' W. At 20:00 Hours, underway assisting U.S.C.G.C. *Staten Island* Northward toward U.S.C.G.C. *Northwind*. At 24:00 Hours, position Lat. 73° 00' N. Long. 168° 43' W. Open water. Course 345° True. Speed 13.5 knots. Wind E.S.E. force 10 knots. Distance made good in past 24 hours, 66 miles. Average speed 11.0 knots.

September 29th

At 03:45 Hours, stopped for period of darkness. Ice 8/10 polar, 1/10 young ice rafted. At 07:00 Hours, underway towards *Northwind* assisting *Staten Island*. Overcast and fog. Visibility ¼ mile. Ice 6/10 polar, 3/10 thick winter and 1/10 new. Continued through the day under similar ice conditions following leads. Progress hampered by poor visibility. At 22:00 Hours, stopped for the night in 6/10 medium winter, 3/10 polar and 1/10 new ice. Position Lat. 75° 09' N. Long. 169° 02' W. Distance made good in past 24 hours, 125 miles. Average speed 6.67 knots.

September 30th

At 07:00 Hours, underway. Course 020° True. At 12:00 Hours, ice 7/10 polar, 3/10 thick winter rafting and covered with snow. Making very slow progress, ice under pressure. At 21:30 Hours, stopped for the night in position Lat. 76° 39' N. Long. 169° 20' W. Ice 7/10 arctic pack, 2/10 thick winter and 1/10 new ice, ridging. Very difficult to locate leads due to snow coverage and poor visibility. Wind S.E. force 15 knots. Overcast and snow flurries. Air Temp. Low 21° High 25°. Distance made good in past 24 hours, 100 miles. Average speed 6.9 knots.

October 1st

At 07:15 Hours, underway with *Staten Island*. Overcast and snow. Ice 7/10 polar, 2/10 thick winter and 1/10 new. At 12:00 Hours, D.R. position Lat. 77° 20' N. Long. 169° 35' W. Making very slow progress. Ice under pressure and heavily ridged. Overcast and snow. Visibility ¼ to ½ mile. At 18:58 Hours, stopped for the night. Ice conditions unchanged. Wind S.W. force 15 knots. Air Temp. Low 24° High 28°. Distance made good in past 24 hours, 27 miles. Average speed 2.39 knots.

October 2nd

At 08:00 Hours, overcast and snow. Visibility 0. Waiting for better visibility. At 09:30 Hours, visibility improving. Helicopters out spotting leads. Wind changed to Westerly and eased the pressure off the ice. Ice 7/10 polar, 3/10 thick winter with few leads. Continued through the day under same ice conditions. At 24:00 Hours, position Lat. 78° 40' N. Long. 167° 07' W. Ice 8/10 polar, 1/10 thick winter. Vessel working through a heavy ridge of polar to reach *Northwind's* position. Wind N.W. force 15 knots. Air Temp. Low 2° High 24°. Overcast and snow flurries. Distance made good in past 24 hours, 76 miles. Average speed 5.37 knots.

October 3rd

At 00:30 Hours, reached U.S.C.G.C. *Northwind's* position Lat. 78° 43' N. Long. 167° 00' W. and proceeded Southward with both vessels, *Northwind* following this vessel. Ice 8/10 polar and 2/10 thick winter with occasional leads. At 02:36 Hours, stopped for the night in position Lat. 78° 35' N. Long. 167° 18' W. At 07:31 Hours, underway with helicopters spotting for leads. Overcast and light snow. Visibility ¼ to ½ mile. At 12:30 Hours, *Staten Island* having difficulty to follow the track behind the *Northwind*. At 16:00 Hours, *Staten Island* beset between large polar floes. Turned back and broke her out.

Making slow progress with both vessels having difficulty to follow track. Ice under heavy pressure. Ice 6/10 polar pack, 2/10 thick winter and 1/10 new ice. Ridges between cracks. At 20:20 Hours, stopped for the night. Wind South force 15 knots. Overcast and snow. Air Temp. Low 10° High 20°. At 24:00 Hours, position Lat. 77° 46' N. Long. 168° 40' W. Distance made good in past 24 hours, 66 miles. Average speed 4.15 knots.

October 4th

At 07:50 Hours, underway South bound. Ice conditions unchanged. Noon position Lat. 77° 38' N. Long. 168° 38' W. Making slow progress through 8/10 polar and 2/10 thick winter. At 21:00 Hours, stopped for the night, position Lat. 76° 59' N. Long. 168° 30' W. Overcast and snow. Visibility ½ mile. U.S.C.G.C. *Staten Island* alongside and commenced transferring bunker. Distance made good in past 24 hours, 49 miles. Average speed 3.64 knots.

October 5th

At 07:45 Hours, underway. During the night received 123 tons of bunker from *Staten Island*. Overcast and fog. Progress very slow. At 19:15 Hours, stopped for the night. Ice 4/10 polar, 4/10 thick winter and 2/10 young rafting. Wind South 8 knots. Air Temp. Low 29° High 34°. U.S.C.G.C. *Staten Island* alongside and commenced transferring bunker. At 24:00 Hours, position Lat. 76° 40' N. Long. 167° 16' W. Distance made good in past 24 hours, 43 miles. Average speed 3.86 knots.

October 6th

At 03:00 Hours, *Staten Island* completed bunker transfer, 240 tons received. At 08:28 Hours, underway. Overcast with fog. Continued during the day making slow progress. Ice 10/10, 2/10 polar, 7/10 thick winter and 1/10 new ice with occasional leads. At 19:10 Hours, stopped waiting for *Northwind* to secure her after mast which fell on her funnel. At 20:00 Hours, stopped for the night while *Northwind* having repairs made to her mast. Position Lat. 75° 33' N. Long. 166° 40' W. Ice 6/10 arctic pack, 3/10 thick winter and 1/10 new. Wind S.W. force 10 knots. Air Temp. Low 28° High 32°. Distance made good in past 24 hours, 69 miles. Average speed 5.33 knots.

October 7th

At 08:00 Hours, underway. Ice 2/10 arctic pack, 6/10 thick winter and 2/10 winter with pressure. At 10:30 Hours, commenced feeling a vibration on the Port Shaft believed to be caused by the loss of part of a propellor blade.

Course 150° True. Steamed all day under similar ice conditions. Ice 10/10, no leads. Making slow progress. At 24:00 Hours, position Lat. 74° 30' N. Long. 165° 30' W. Wind West force 5 knots. Distance made good in past 24 hours, 74 miles. Average speed 4.6 knots.

October 8th

At 01:13 Hours, stopped for the night. U.S.C.G.[C.] *Glacier* sighted, Brg. 189° True and reported stuck in the ice. At 07:55 Hours, underway and proceeding towards U.S.C.G.[C.] *Glacier* who has been beset in ice since 23:00 Hours last night and requested assistance. At 11:40 Hours, Freed U.S.C.G.[C.] *Glacier* beset in a large floe and proceeded Southwards with *Glacier* in the lead. Vessels are now 24 miles from Southern Boundary of Arctic Pack. At 14:46 Hours, all vessels clear of ice. Detached from convoy and proceeded independently Southward, bound Victoria, B.C. [British Columbia.] Immediately after being in open water reduced R.P.M. on Port Shaft to 130 which appears to be the best R.P.M. for least vibration. At 24:00 Hours, position Lat. 71° 36' N. Long. 167° 00' W. Overcast and snow. Course 184° True. Speed 15 knots. Distance made good in past 24 hours, 165 miles. Average speed 9.6 knots.

October 9th to 16th

The trip to Victoria, B.C. was made without incident with clear weather, passing through Unimak Pass then by great circle course to Vancouver Island. Although we had a heavy beam swell, the vessel was fairly comfortable due to the Flume Stabilization System. On October 16th, 1967 at 17:01 Hours, Pilot Mr. P. Farley boarded, proceeded inwards. At 17:42 Hours, alongside Colwood Oil Jetty, Esquimalt, B.C. and Finished With Engines, taking on bunker. Thus completing the C.C.G.S. *John A. MacDonald's* [sic] 1967 Arctic Voyage.

TOTAL TIME STEAMED	1,476:00 Hours
TOTAL DISTANCE STEAMED	16,057.00 Miles
TOTAL FUEL CONSUMED	2,529.68 Tons
AVERAGE SPEED	10.13 Knots

Respectfully submitted,

P.M. Fournier, Master,
C.C.G.S. *John A. MacDonald* [sic].

8

Observing the *Manhattan* Voyages, 1969/70: Lieutenant Commander Erling Stolee's Reports from CCGS *John A. Macdonald* and CCGS *Louis St. Laurent*

P. Whitney Lackenbauer and Adam Lajeunesse*

In July 1968, the American energy companies Humble Oil and Atlantic Richfield announced the discovery of the largest oil field in North America at Prudhoe Bay on the northern coast of Alaska. Its discovery came just as continental oil production was peaking. The question was how to get the resource to market. In the mid-1960s, geographer Trevor Lloyd had presciently noted that “even if oil in commercial quantities were to be discovered shortly, there might well be considerable delay before it could reach world markets as the method of transportation is still to be determined.”¹ The oil companies’ initial answer was a grand experiment: the voyage of a reinforced ice-breaking supertanker across the Canadian Northwest Passage to test the viability of shipping oil from northern Alaska to refineries on the Eastern Seaboard of the United States. “The chief technique of Arctic navigation in the past had been to avoid ice whenever

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possible,” journalist William D. Smith explained in his 1970 book *Northwest Passage*. This time it would be different: “Rather than avoid the ice [the ship] would seek it.”²

The vessel chosen was the 115,000 deadweight ton super-tanker SS *Manhattan*. Over two months in the summer of 1969, the vessel travelled from New York to Prudhoe Bay and back again, testing everything from ice dynamics to hull pressure and design. “This was no wooden ship of stouthearted men fighting off scurvy, starvation, and death,” historian Ross Coen noted, “yet the *Manhattan* would still achieve the holy grail of polar exploration, a prize that for centuries had eluded the best of mariners – including Franklin, Frobisher, and Hudson.” Nevertheless, on 15 September 1969, “just seven weeks after a human being first set foot on the moon, the *Manhattan* closed another chapter in the annals of exploration when she became the first commercial vessel to complete a transit of the Northwest Passage.”³ In April 1970 the ship returned to Canadian Arctic waters, albeit with the more modest objective of conducting winter ice tests in Lancaster Sound without hazarding the full passage. Both voyages were impressive technical successes and, even today, *Manhattan* remains the largest ship to ever travel this fabled route.

While the American tanker made headlines, it owed its achievements to the support provided by the Canadian Coast Guard (CCG), particularly the escort services of the icebreakers CCGS *John A. MacDonald* and *Louis St. Laurent*. These ships kept the tanker moving when it became stuck in heavy ice and facilitated the use of the more ambitious northern route through Viscount Melville Sound and Prince of Wales Strait. When the *Manhattan*’s voyage stimulated unexpected political sensitivity, the operational presence of these two heavy Canadian icebreakers also assumed symbolic significance, providing Canada with a visible demonstration of capacity and control in what otherwise might have been misperceived as an exclusively American venture through Canadian waters.

September 2019 marks the 50th anniversary of the *Manhattan*’s voyage. In recognition of this occasion, we reflect back on first-hand accounts by Royal Canadian Navy (RCN) Lieutenant Commander Erling Stolee,⁴ the Department of National Defence observer assigned to CCGS *John A. Macdonald* (the primary escort to *Manhattan*) in 1969 and CCGS *Louis St. Laurent* (which undertook the escort task in 1970). These sources provide a detailed, day-by-day account of the voyages and of the CCG’s unheralded role in facilitating them, offering glimpses of the dangers and difficulties of operating in the High Arctic. Stolee’s reports also provide fascinating insight into life aboard a coast guard icebreaker, including traditions, command

structures and culture, as well as issues of logistics, morale, and the unique psychology of sailors operating in the North. Readers today will also find Stolee's broader critique of government policy both interesting and prescient.

Northern Development

The importance of *Manhattan's* voyage in Canadian Arctic history is well documented. When the *Manhattan* experiment was launched in the late 1960s, both the Canadian and American governments were broadly supportive because they saw in it a means to generate employment and spur development while strengthening national security and improving account balances. For the United States in particular, the prospect of a major new oil supply was welcome. In 1967, the first Arab oil embargo had increased crude prices around the world and threatened to cut off the easy access to oil that fueled the global economy. At the time, prices were kept under control only by tapping spare capacity in the US, but the event raised the spectre of a broader and more coordinated embargo with more serious repercussions,⁵ given that the American ability to expand production in the face of an emergency was running out.⁶

The discoveries at Prudhoe Bay in northern Alaska were game-changing for the North American oil market. Initial estimates put the reserve at between five and ten billion barrels of oil, increasing US proven reserves by a third and making it by far the largest oil field on the continent.⁷ The oil companies' immediate concern was how to move the crude to market. From the North Slope of Alaska, oil had to travel roughly 3,200 km by sea to refineries in Washington State; 4,100 to San Francisco; or 8,000 to the East Coast through the Northwest Passage. Pipeline proponents favoured a line stretching nearly 1,300 km from Prudhoe Bay to Valdez in southern Alaska, avoiding ice-covered waters but having to reckon with two major mountain ranges, a series of rivers, and vast tracts of swampy terrain. In 1968 it seemed that tanker transportation would be both easier and cheaper, and the oil companies set upon testing it.⁸

Actually building a tanker fleet capable of regularly and safely transiting the Northwest Passage was a tall order. Canadian and American experience in Arctic shipping was limited to purpose-built icebreakers or seasonally employed cargo ships incapable of handling thick multiyear ice. Despite having operated ships in the region for seven decades, Canada also had a poor understanding of Arctic ice dynamics. Most importantly, there was little information on shipping through the Parry Channel, given that most northern marine activity took place along the easier, but narrower and shallower, southern routes. There was no past precedent of deep draft

commercial operations through the Viscount Melville Sound, McClure Strait, or the Beaufort Sea to offer any guidance.⁹

SS *Manhattan* was tasked with acquiring the information needed to build fleets of icebreaking tankers. When constructed in 1961, the ship had been designed for the open seas, but Humble Oil leased the ship and soon converted it into the world's largest icebreaking vessel. Over a mere nine months, *Manhattan* was refitted by a team of 10,000 workers, working over 2.5 million man hours. The ship's bow was replaced with a specially designed icebreaking section, and an ice belt of high tensile steel stretched around its entire length, adding 10,000 tons of Arctic-ready steel to buttress the hull against ice. To assist in the myriad of tests and measurements that the vessel was supposed to undertake, sophisticated sensor and computer equipment were also brought onboard. In the end, the budget for the project reached \$26 million USD (about \$200 million in 2019 dollars).¹⁰ Ready to sail by the end of August 1969, her crew was comprised of 54 men, handpicked from hundreds of Humble employees who had put their names forward. Joining them were 72 others, including scientists, communication specialists, pilots, reporters, and public relations experts.¹¹

For the United States, this effort made sense. Both the government and the independent oil companies saw the need to access Alaskan oil as quickly as possible. For Canada, the *Manhattan* project was viewed as an opportunity that could be leveraged to serve Canadian national interests. For Pierre Trudeau's Liberal government, the experiment held out the prospect of realizing broader economic and social objectives in the North. Arctic oil from the Beaufort Sea and Arctic Islands could reduce Canada's own energy imports, provide a new source of federal revenue, and create jobs for Northerners. As the Deputy Minister of Indian Affairs and Northern Development (DIAND) noted in late 1968, "the development of a navigable northern sea route would benefit the Canadian economy and be a spur to northern development."¹² In his report, Stolee shared this view that "Canada stands to gain from a successful venture."¹³

With Canadian interests seemingly served by the *Manhattan* and northern development, the Trudeau government embraced the voyage as a cooperative endeavor – and that cooperation was essential. Only three months after the announcement of the Prudhoe Bay discoveries, Imperial Oil (leading a consortium of oil companies) requested a meeting with the Canadian departments concerned with Arctic development. Here, oil company representatives conveyed their interest in conducting an Arctic tanker experiment and informed the Canadian government that they had already begun the process of procuring the test vessel that would become the

renovated *Manhattan*. Requests were naturally made for Canadian icebreaker support and any ice data that the government could provide.¹⁴ From the beginning the American oil companies were keenly interested in official Canadian input and participation in what was, for them, a leap into the great unknown. Stolee notes in his report how “Arctic ice along the route intended for *Manhattan*’s voyage had not previously been described and identified sufficiently for her [*Manhattan*’s] purposes.” Furthermore, “the problems of a tanker in an ice environment were unknown in 1968 and as the ice and the ship intimately affect each other, Humble Oil’s problem was analogous to that of a doctor prescribing medicine for a disease that has neither name nor patients.” The oil companies believed that consultation with Canadian government agencies was essential and engaged with federal officials on a regular basis throughout 1968 and 1969.

The ability of a large tanker to navigate the Northwest Passage was highly uncertain in 1969, and the Canadian government saw the successful development of a northern sea route as aligned with its own interests. It promised ice charts and weather forecasting but ultimately its main contribution to the mission was the provision of Coast Guard heavy icebreakers. In December 1968, the Advisory Committee on Northern Development (ACND), an interdepartmental body tasked with managing policy questions surrounding northern development, agreed to send CCGS *John A. MacDonald* to cooperate with the *Manhattan* on its 1969 voyage. For the *Manhattan*’s return trip in 1970, Canada dispatched its newest ship – the 15,324-ton CCGS *Louis St. Laurent* – commissioned only the year before. It was hoped and assumed that by providing such assistance the overall enterprise could be made to succeed, while also framing the project as a joint endeavour and thus avoiding the appearance of a unilateral American operation in Canadian waters.¹⁵

Sovereignty in Question?

While the *Manhattan*’s voyage was conceived as a scientific and commercial endeavor, the tanker took on a political significance before ever reaching the Arctic. The spectacle of so massive a ship traversing the heretofore largely unnavigable Northwest Passage alarmed the Canadian public. Part of that concern related to the uncertain status of those waters in international law. Since at least the 1950s, Canada and the United States had disagreed over the legal status of the waters of the Northwest Passage.¹⁶ For Canada, the waters in its Arctic Archipelago were historic internal waters over which the country enjoyed complete sovereignty. While no Canadian government had ever enacted that position into legislation, a belief in the

country's Arctic sovereignty – over both land and ice – was a fundamental assumption that underlay Canada's northern policy.

This assumption of ownership was clear in Ottawa's cooperation with the United States in northern defence projects during the 1950, and Canadian officials explicitly conveyed this position to their American counterparts on several occasions in the early 1960s. While no American government had ever challenged Canada's maritime sovereignty position, neither had they accepted it explicitly. Joint defence cooperation after the Second World War deliberately side-stepped the matter of maritime sovereignty where possible by focusing on operational requirements, relying on purposefully ambiguous phrasing when it came to permissions and shipping waivers to keep sensitive sovereignty issues off the table and ensure that they did not disrupt shared commitments to continental defence.¹⁷

While there was never any serious desire in Washington to challenge Canada's sovereignty position, the Americans harboured broader international reasons not to accept it explicitly. In 1969, the American position suggested that the Northwest Passage constituted international waters, with Canadian territorial waters extending only 3 nautical miles (NM) from the coast. Because the US asserted that the passage constituted an international strait, through which the United States (and all foreign-flagged vessels) enjoyed the right of innocent passage, it insisted that Canadian control within those territorial waters was also limited. Although no precise legal criteria existed to determine what constituted an international strait, customary law recognized two main factors: one geographic (meaning that a strait must connect two bodies of high seas) and the other functional (meaning that it must have been a useful passage for international traffic).¹⁸

While the Northwest Passage clearly met the geographic requirement, the functional one invited differences of legal opinion. In his extensive work on the subject, scholar Donat Pharand explained the difficulties of applying functional criteria to an area like the Northwest Passage that has seen so little commercial activity.¹⁹ The standard for functional use was set in the *Corfu Channel* case, which came before the International Court of Justice (ICJ) in 1949. Here, the ICJ was given shipping statistics for the Corfu Channel from 1 April 1936 to 31 December 1937 – amounting to 2,884 transits by vessels of various states that had put into Corfu while passing through (this excluded transiting ships that did not put into the port).²⁰ This was fairly light traffic, yet it dwarfed the six foreign vessels that had transited the Northwest Passage by 1969. Furthermore, none of these six constituted what might be considered 'normal' international navigation. They were made by the small Norwegian sloop *Gjoa* from 1903-6; the USCG icebreakers *Storis*, *Spar*, and

Bramble in 1957; and the US submarines *Seadragon* and *Skate* in 1960 and 1962 respectively.²¹ For Canada, this clearly differentiated the Northwest Passage from the world's 'useful' straits. In US officials' eyes, however, the functional element was secondary to the geographic criteria, leaving the Northwest Passage a strait that *could* be used for international navigation.²²

Prior to 1969, this legal and political disagreement remained in the background, with both sides effectively agreeing to disagree behind closed doors. In Ottawa the Trudeau government hoped and assumed that *Manhattan's* voyage could be undertaken in a spirit of cooperation and mutual benefit, without reference to awkward questions of sovereignty and jurisdiction. Initially that seemed possible. In the lead up to the mission Canadian officials worked closely with the American oil companies to plan the pilot project – cooperation that led the ACND to assume that Canadian sovereignty was not at stake and that the optics of Canadian control were adequately protected through its participation and presence (including the assistance provided by Captain Thomas C. Pullen, the former commander of HMCS *Labrador*, who served as a Canadian representative on *Manhattan*).²³ Canada provided charts and ice-reporting and *John A. MacDonald* and *Louis St. Laurent* supported the American tanker. Political scientists John Kirton and Don Munton also noted that, because Humble Oil had notified Ottawa of the transit and requested CCG assistance, this implied at least a recognition of Canadian sovereignty.²⁴ As such, the Trudeau government assumed that Canadian sovereignty was sufficiently protected by this control – all of which provided a clear enough demonstration that the passage was being made possible only through Canadian assistance.²⁵

The Manhattan "Crisis"

The assumption that the *Manhattan* voyage could be kept within the confines of a commercial experiment soon foundered on the realities of Canadian nationalism and deep-seated suspicion of American intentions. The unique and dramatic nature of the transit infused it with a degree of notoriety in the Canadian press, sparking public demands for a more direct and forceful approach to upholding national sovereignty. At the heart of this crisis was Washington's refusal to request formal permission to transit what Canada considered its waters – both for *Manhattan* as well as the US Coast Guard Cutter (USCGC) icebreakers *Northwind*, *Glacier*, and *Staten Island* that joined the CCG in providing support at various points throughout the mission.

In June 1969, in response to growing public concern, the Department of External Affairs offered an "informal suggestion" to the US State Department

that it formally request permission to transit – which Canada would happily grant, of course. The Americans turned down this request on the pretext that compliance would have set a damaging precedent at a time when many countries were unilaterally extending their own territorial seas or maritime jurisdiction over strategically and commercially significant straits in other parts of the world.²⁶ In a 1970 note, the State Department warned that “if Canada had the right to claim and exercise exclusive pollution and resources jurisdiction on the high seas, other countries could assert the right to exercise jurisdiction for other purposes, some reasonable and some not, but all equally invalid according to international law.”²⁷ Accordingly, the Americans bluntly notified Ottawa that the United States did not recognize Canadian sovereignty over the waters of the Arctic Archipelago or to any waters outside its three-mile territorial sea.²⁸

The US government’s refusal to request permission to transit the Northwest Passage exacerbated the Canadian public’s concern over the voyage. Strategist Kenneth Eyre described these sovereignty fears as having “bordered on near hysteria,” while legal scholar Maxwell Cohen wrote of a public “panic” and “near paranoia” as the “voyages made Canadians feel that they were on the edge of another American “steal” of Canadian resources and “rights.”²⁹ Trudeau’s trusted advisor Ivan Head wrote that there emerged, “with a suddenness wholly uncharacteristic of Canadian public mood swings, a cacophony of anti-American sentiment ... [and] a jingoistic cry for assertive Canadian territorial claims, which ... reach[ed] crescendo pitch at the time of the voyage.”³⁰

The intensity of this public reaction caught the Canadian government off guard. Ottawa was used to managing questions of sovereignty and American activity in the Arctic through quiet diplomacy, with little fanfare.³¹ Canada’s observer aboard the tanker, T.C. Pullen, was equally shocked by the nationalistic press reports depicting the voyage as a direct challenge to Canadian sovereignty.³² Secretary of State for External Affairs Mitchell Sharp expressed a similar concern, telling the *Globe and Mail* that “it is wholly misleading ... to portray the *Manhattan* passage as a test of Canada’s sovereignty in the Arctic, the issue simply does not arise.”³³ Unconvinced by government statements of this nature, journalists continued to feed public anxieties about American encroachment on Canadian rights.³⁴

Surprising or not, politicians had to take public concern into account – particularly growing fears that an American refusal to request permission to enter those waters might lead to a dangerous precedent. After all, the *Manhattan* voyage was intended as a trial run, the first of many such transits. As Stolee points out, if the voyage was a success, the oil companies’ plans

called for the construction of 26 to 30 massive 1,200-foot long icebreaking Ultra Large Crude Carriers of 250,000 tons, each capable of carrying one million barrels.³⁵ If *Manhattan* could transit the Northwest Passage without explicit Canadian permission, what control would the country have over the hundreds of tanker voyages to follow in its wake? In December 1969 the *New York Times* quoted an oil company spokesman as saying that the voyage of *Manhattan* “could result in the establishment of a new commercial shipping route through the Arctic region with broad implications for future Arctic development and international trade.”³⁶ If this came to pass, the northern waters would no longer be the near-exclusive preserve of Canadian icebreakers and joint defence operations; tanker shipping would mean the continuous presence of foreign flagged commercial vessels using the Northwest Passage as a strait “which are used for international navigation” – the simple definition given to international straits by the 1958 United Nations Convention on the Territorial Sea and the Contiguous Zone.³⁷

The establishment of an international commercial strait outside of Canadian control was unacceptable to decision makers in Ottawa. They expressed this view to the State Department in April 1970, unequivocally stating that “the Canadian government is aware of U.S.A. interest in ensuring freedom of transit through international straits, but rejects any suggestion that the Northwest Passage is such a strait ... The Northwest Passage has not attained the status of an international strait by customary usage nor has it been defined as such by conventional international law.”³⁸

Manhattan, Canadian Coast Guard Icebreakers, and the Test Voyages of 1969-70

Faced with this difficult situation, the ACND and the Interdepartmental Committee on Territorial Waters submitted a joint review of Arctic sovereignty in March 1969, outlining three possible options. First, Canada could assert its Arctic claims by formalizing its sovereignty with domestic legislation. That might have elicited an American challenge and a case before the ICJ, which senior civil servants doubted Canada’s ability to win. A defeat could deal an irrecoverable blow to Canada’s position,³⁹ and this move more generally would have serious political and economic consequences. The second option was to simply accept the American position and allow unimpeded foreign transit – an option never seriously considered given the national interests involved. The third option was to try and maintain the status quo, assert control with a physical presence, and hope that the issue could be managed rather than resolved.⁴⁰ Senior officials rejected the first option as excessively dangerous and the second as political suicide. That left

building on the status quo.⁴¹ In its first memorandum to Cabinet, the Task Force on Northern Development (set up that year to provide policy advice) avoided any reference to a political solution and instead recommended that the government respond to the challenge by increasing its northern activity to ensure a continuation of “effective occupation.”⁴² Showing the flag was integral to this strategy.

Canadian Coast Guard icebreakers were an essential component of this approach. In 1968, Department of External Affairs legal advisor Leonard Legault explained to the ACND that “if a foreign state opened and made use of the sea route [the Northwest Passage] without reference to or real assistance from the coastal state, a presumption might arise that the area in question was part of the high seas.” Conversely, “under international law, the fact that navigation in a particular area of the sea was possible only because of the aids provided by the coastal state was an important element, among others, in establishing and proving that state’s claim to sovereignty over the area.”⁴³ Put simply, if the United States could demonstrate that its ships were able to transit the Northwest Passage without outside assistance, a precedent for future voyages might be set. If Canada showed that such passage was possible only with Canadian assistance, however, the precedent would reinforce Canadian ownership and control. As such, the tasking of *John A. Macdonald* was as much an expression of Canadian sovereignty and control as it was support to *Manhattan*. As historian Ross Coen points out “the Canadian government did not ask but rather informed Humble Oil that it would be sending its own icebreaker ... to escort the tanker.”⁴⁴

Displacing 9,300 tons, CCGS *John A. Macdonald* was the heaviest icebreaker in the Coast Guard fleet when it was deployed north in the summer of 1969. Launched ten years earlier, it boasted 15,000 ship horsepower and the ability to break 18 feet of ice. It also was “beautifully appointed” compared to its American coast guard counterparts, as Smith described:

There were no gray steel bulkheads but wood panelling in all quarters. The *Macdonald* was immaculate from her completely enclosed bridge to her dinner table and her diesel-electric engine room. She carried a complement of about ninety compared with almost two hundred on the smaller [U.S.] Coast Guard Wind class ships. On Wind class ships the men sleep in very close quarters, and many of the rooms are located over the roaring engines. The “Mac” has only two or three men to a room and singles for the officers.⁴⁵

Even more impressive was CCGS *Louis St. Laurent*, Canada’s newest and most powerful icebreaker. Launched in October 1969, the ship displaced 15,300 tons, could call upon 25,000 horsepower, and could break ice ridges

over 42 feet thick. Together, the Canadian ships represented the most powerful icebreaking duo in the Western world and dramatically outclassed their American counterparts.

Until the arrival of the *Polar*-class in late 1970s the USCG fleet was built around seven *Wind*-class vessels dating back to the Second World War. These ships were roughly half the size of *St. Laurent* with no more than 40% its engine strength. The largest American icebreaker then in service was USCGC *Glacier*, essentially an improved *Wind*-class. While still a small vessel at 8,450 tons, it had a more powerful engine with an output of 21,000 horsepower. The American vessels *Staten Island*, *Glacier*, and *Northwind* would accompany the *Manhattan* at various points in her journey, working with the Canadian icebreakers. It was clear, however, that their performance was decidedly inferior, leaving much of the heavy icebreaking to the Canadian ships.

Stolee's report and journal entries on the summer 1969 voyage onboard CCGS *John A. Macdonald* furnish a rich description of the "high Arctic" marine environment, with particular focus on defining the various forms of ice encountered in Canada's Arctic Archipelago. "Arctic ice along the route intended for MANHATTAN'S voyage had not previously been described and identified sufficiently for her purpose" he notes. By extension, the problems that a tanker would encounter while operating in an ice environment remained "unknowns" when planners devised their pilot project. Accordingly, "the world's foremost ice authorities were brought together" to address "the problem of defining ice – one of the core preoccupations associated with the test voyage."⁴⁶

In his close observations from July-October 1969, Stolee described the wondrous landscapes through which *Macdonald* passed, documented the various ships encountered en route, and carefully assessed the performance of *Manhattan* and its instrumentation. The prose with which he captures the voyage is evocative and precise, offering the reader first-hand insights on what transpired as well as his thoughts on the broader implications for Canada. "This concept of forcing a supertanker, such as MANHATTAN, through the Northwest Passage is imaginative – the route is shorter by several thousand miles than any other Europe-Pacific passages, and Canada stands to gain from a successful venture," he noted on 11 July 1969. His tone was celebratory, not narrowly defensive or nationalistic. Entering Lancaster Sound on 17 August, he exclaimed: "To be entering these waters at last, where so much of mankind's finest history has been written, is a humbling and joyful occasion." He marveled at a glacier, described the wreck of an old whaling ship, and observed a polar bear and cub dining on a narwhal

carcass.⁴⁷ His journal is filled with similar expressions of intrigue and awe with the Arctic environment.

On 31 August, *Macdonald* met up with *Manhattan* in Frobisher Bay. "Set course north for the Baffin Ice Pack in which MANHATTAN will blood herself," Stolee recorded in his diary. "She is powerful looking with a wicked, snarling snout."⁴⁸ He documents the CCG's frequent efforts to free the tanker and its US escorts when they became stuck during ice trials. He also describes *Manhattan's* decision to abandon plans to attempt McClure Strait, which would have represented the first westbound passage through Parry Sound. Although the ship "had more than exceeded her planned performance" by 12 September, conditions proved that "she is simply not designed for McClure concentrations, either by horse-power or general hull design."⁴⁹ In announcing this decision at a press conference, Haas explained:

Gentlemen, we have decided to turn the ship about and take the southern route through the Prince of Wales Strait. This is the likely route of the year-round vessels. We are in the middle of a large polar floe that is beyond the capabilities of this test vessel. We are not here to make history for its own sake. If we were to continue we would be jeopardizing the mission which after all is to collect data to build bigger and better ships. These ships will have to be able to defeat this kind of ice. They will not be able to avoid it if they are to carry oil all year round. This kind of ice constitutes a real danger to icebreakers. The *Macdonald's* propellers are being hit constantly by the large slabs of polar ice that we have been breaking. We risk losing our icebreaker assistance. We would then be all alone and in real danger.⁵⁰

After arriving at Point Barrow, Alaska, on 21 September, Stolee noted:

We have now completed the western transit of the Northwest Passage, an accomplishment which few have achieved. The circumstances of our journey are so different from those of Parry in 1819-20 and McClure in 1850-54 that one would hardly know the voyages cover the same waters. The odd snow storm and the biting wind from the north which blew a few times hinted at the miseries which the early explorers must have suffered when "wintering" in the north. Parry wintered in Winter Harbour, Melville Island, during the winter of 1819-20, we used Winter Harbour as an airstrip to bring in mail and stores; McClure wintered in Mercy Bay, Banks Island, in the winter of 1851-2. We reached that longitude before turning back towards Prince of Wales in our 1969 attempt. McClure crossed from Mercy Bay to Winter Harbour during the winter of 1852 to get food and became the first man to complete the Northwest Passage; we crossed these waters twice by ship and complained if the showers didn't work and fresh grape-fruit ran out. Such is life!⁵¹

Macdonald escorted *Manhattan* during its return trip eastward through the Northwest Passage in September and October 1969. Stolee notes repeated efforts to “unstick” the tanker when it became beset in the frozen seas, particularly during the three weeks spent testing various types of ice and collecting data in Viscount Melville Sound. The superior performance of the Canadian icebreakers was valuable to the Canadian government, demonstrating the tanker’s inability to transit unassisted (or even with American assistance). On several occasions the heavy tanker needed Canadian assistance, not surprising given Stolee’s observation that 1969 was a terrible year for ice. The most dangerous situation occurred in McClure Strait on 11-12 September 1969 where *Manhattan* ground to a halt in a solid block of old ice stretching 3.5 NM across. After twelve hours of backing up and ramming without success, Captain Paul Fournier of *Louis St. Laurent* remarked “it’s as though she were sailing through a granite quarry.”⁵² While *Manhattan* was larger with more powerful engines than either Canadian icebreaker, she was far less maneuverable, had little reverse power, and was a sitting duck once she lost momentum. “She is almost impossible to turn in ice,” Stolee recounted, “and has difficulty in backing up.”⁵³ Eventually *Manhattan* was freed by the Canadian escorts, a gratifying experience for the crew. In a sentiment that likely applied to both sailors and government officials alike, one junior officer onboard *MacDonald* commented: “it’s not that we don’t want the mission to succeed. We most certainly do. But the fact is that every one of us has been on his knees praying that [the] big bastard would get stuck just once.”⁵⁴

In addition to helping *Manhattan*, the Canadian icebreakers found themselves assisting their under-powered American escorts. In the thick ice of Viscount Melville Sound, *MacDonald* was twice forced to assist USCGC *Westwind*. Rather than demonstrating an independent ability to support the tanker, the US icebreakers often forced the convoy to slow and became, at one point, “a hindrance in this ice.”⁵⁵ Finally admitting defeat, *Northwind* broke off from the group and headed south to take an easier route through Coronation Gulf while *Manhattan* continued with Canadian support along a more northerly route.

Stolee ended his journal as an observer when the *Manhattan* wrapped up its official trials on 26 October. It completed its round trip on 8 November, stopping into Halifax under the escort of the two Canadian icebreakers. Canadian transport minister Don Jamieson welcomed them back at a reception at Dalhousie University, praising the crews for their contributions to northern knowledge and noting a sense of national pride in their

performance. Stan Haas of Humble Oil took the stage at the banquet hall to personally thank the crew of *Macdonald*. "When we encountered the heavier ice in Melville Sound ... we Texans had not yet learned all the lessons," he proclaimed. "But during the voyage to Prudhoe Bay and Point Barrow, Alaska, the *John A. MacDonald* steamed along at our stern waiting for a call for assistance from us and then answered that call as required with a vigor and enthusiasm typical of the character of the ship and her master."⁵⁶ The voyage had proven that icebreakers were essential enablers to facilitate the transit of large tankers through the passage, and the Canadians took justifiable pride in their role in the test run.

Stolee was adamant that the purpose of polar icebreakers was to aid shipping. "As a test vehicle MANHATTAN answered many questions and was successful in her goal of establishing and validating information from which to design successful northern tankers," he summarized. The voyage indicated that "'mass' is the key to breaking Arctic ice," but that "economic feasibility is the ultimate consideration for successful exploitation of the Northwest Passage." This equation also had to factor in global energy markets, as well as the construction and operating costs associated with ice-strengthened tankers, the short shipping season, and the lack of existing infrastructure in the North American Arctic.⁵⁷

While an overall success, the experiment revealed obvious problems with northern shipping. The *Manhattan* spent several days stuck in the ice, raising fears that the Northwest Passage would not be conducive to tight shipping schedules. "Production facilities and refineries have to know exactly how much oil is arriving and on what date," Coen explained, and delays would "create surplus product at the other end of the route. Costs would skyrocket."⁵⁸ There were also still significant technological challenges to overcome. Communications in the Arctic were hindered by a lack of infrastructure, atmospheric interference, and the region's topography – issues that plagued the Royal Canadian Navy (RCN) in its operations throughout the 1970s. In a moment of levity, Stolee points out that the *Manhattan's* integrated position/navigation and impact/sideslip measure system "has proved about as useful as a piglet feeding system on a boar." In calculating speed the ship had to resort to measuring "by fleet-footed ice scientists who form an endless chain on the starboard side forward, and in succession rush aft past several measured marks on deck yelling 'Mark' when abeam."⁵⁹

Questions of safety remained as well. *Manhattan* had been holed on two separate occasions during its journey. One breach was below the waterline –

but not severe enough to penetrate both hulls. The second was in the afterpeak, a small compartment used to store fresh water.⁶⁰ While the vessels meant to follow *Manhattan* would have been stronger, the risk of serious damage or sinking would have remained a perpetual concern. Smith observed that “the skippers of the *Manhattan* had learned to respect the ice.”⁶¹

Stolee also acknowledged the human dimension to successful Arctic operations. “Icebreakers work long months in Arctic isolation deprived of most outside stimuli – even the sight of navigation lights at night is non-existent,” he reported. “Lack of outside stimuli force men to rely on themselves and measure reality from within their own consciousness. Working conditions are exacting and often uncomfortable and weaknesses in character soon become apparent, training schemes are desirable to weed out misfits and orientation is necessary to teach men to cope with problems of Arctic living.” Extracts from his journal describe the motivations of “old timers,” informal social relations on a ship at sea,⁶² and the tediousness of crisscrossing waters to test ice conditions. He observed how months spent in the ice led to frayed nerves and interpersonal tension, with each sailor coming to think that “I am sane but the rest of you bastards are owly.”⁶³

Rather than promoting a military-type discipline approach (as one might expect from a Department of National Defence observer), Stolee advocated for “high standards of accommodation, recreational facilities and pay,” self-discipline, and an acceptance of duty – a philosophy that “produces strongly motivated, independent character.”⁶⁴ He challenged assumptions that icebreakers had “military purpose” and thus a military role, downplaying international security threats and instead amplifying the more appropriate and practical utility provided by a civilian presence. “An icebreaker has an important role as an expression of sovereignty and, when providing services to world shipping in the Arctic, she becomes a tangible expression of Canada,” he emphasized. “The tangibility of the expression does not lie in military manning of the vessel.”⁶⁵

These opinions reflected a vigorous debate then occurring within federal government circles about the role of the Canadian Forces in strengthening Canada’s legal sovereignty position. Stolee’s journal entry of 29 July 1969 opined:

The defence of the Arctic seem an insurmountable problem, but two questions - what purpose would an enemy have in using the area and what harm would this do to us - gives some indication how to tackle the problem. The most pressing danger may be friendly neighbours moving in to exploit the riches of the empty land and turning it, forever, into a source area for raw material rather than a land in which people

settle and live. Defence measures appropriate to a “sovereignty” threat are quite different to those required to counter an “aggressor nation”. No case for special Arctic measures need be made to counter the later threat.⁶⁶

This sober assessment downplayed the value of a military presence to bolster Canadian legal sovereignty, reflective of assessments emanating from the Department of External Affairs.⁶⁷ Instead, Stolee emphasized the importance of practical measures.

Unlike today, government conversations in 1969/70 seldom linked Inuit to sovereignty, and these permanent Arctic residents and rightsholders factor comparatively little in Stolee’s account. Despite having limited interactions with Indigenous peoples as the ship sailed through Inuit Nunangat (the Inuit homeland within Canadian borders), he nevertheless weighed in on Ottawa’s poor record when it came to Inuit. “One of the delights of being an Arctic novice lies in anticipation of wondrous things to come,” Stolee recorded in his journal on 17 July 1969:

One of these is encountering the Eskimo and the days and evenings pass listening to those who saw and knew these people before government bureaucracy took to “fathering” them. Otherwise reasonable men become abusive in describing the harm this has done. For instance, moving them to areas where it is administratively easy to “care” for them and where indoor toilets, Hershey Bars and soda pop can be provided doesn’t make very self reliant people. An Eskimo who is torn from his hunting ground and ancestral lands, given his “civilized” pittance to eat and carefully manipulated loses all dignity and pride. All he really required was a subsidy on what he could produce and then allowed to come to terms with civilization in his own way. “Pacification” of the north consists in spending money so that the white administrators feel they are serving in a community with amenities similar to down “home”. The Eskimo has less and less place in the “civilizing” of the north.⁶⁸

This commentary, critical of the federal government’s encroachment on Inuit life, revealed an obvious frustration with the “welfare colonialism” that had already transformed the Arctic.⁶⁹ The following year, the visit from an Inuk and his sled dog team drew a cynical view of how far realities deviated from romantic ideals “of yore.”⁷⁰ Encounters with Inuit were positive and celebratory. A visit of Inuit school children, whose smiling faces “shine like sun through a rain cloud,” to the ship meant games, tours, movies, and “a gooey snack of ice-cream, cake, soft drinks and candy.”⁷¹

Of greater concern than the impact of this new shipping route on Inuit was the spectre of pollution in the country’s pristine northern environment.

In part, these fears stemmed from the potential environmental degradation which would follow the grounding of an oil-laden tanker – a potential scenario in an area packed with hazardous multi-year ice floes. “Oil pollution is a hazard associated with tanker operations,” Stolee noted.

Some of this results from negligence and malpractice and the cumulative effect is significant. This type can be controlled by legislation, inspection and co-operation of the oil companies concerned in tanker operations. The greater hazards arise from accidental damage to a ship and the total volume of oil discharged in this fashion each year is astonishing. MANHATTAN struck an iceberg on her return journey which holed one tank and ruptured two others. There is no doubt that the opening of the Northwest Passage to tanker trade will introduce oil pollution into the Arctic. The frequency and degree are matters policy i.e. safety standards in construction, masters and mates, provision of ice pilots and aids must all be laid down early in the game.⁷²

Disastrous under normal circumstances, Stolee acknowledged that oil spills in the High North would have been especially devastating. Because of the minute rate of hydrocarbon decomposition at frigid temperatures, as well as the region’s minimal biodiversity and slow plant growth rate, the contamination from such an accident might have been catastrophic to local ecosystems.⁷³ A string of recent disasters had added urgency to the issue. In 1967 the Liberian tanker *Torrey Canyon* had struck a reef and spilled 868,700 barrels of oil between the Cornish mainland and the Scilly Islands. Two years later a Union Oil platform off Santa Barbara blew out, spilling more than 80,000 barrels of oil onto the California coastline. In a disaster closer to home, the Liberian-flagged *Arrow* ran aground off Nova Scotia in early 1970, spilling all 108,000 barrels of oil stored in her bunkers. These incidents came in quick succession and, in the case of the *Arrow*, in Canadian waters in the midst of the controversy over the *Manhattan*. Concern that such a disaster could occur in the Arctic was hardly a sensational fear, given that icebergs and hard multi-year ice made the region a far more hazardous environment for a supertanker than the waters off Nova Scotia. That *Manhattan* had suffered damage during the transit offered ample proof of this. If the Northwest Passage were to emerge as a year-round shipping route, with 26-30 vessels making nine to ten voyages a year,⁷⁴ the odds of a catastrophe would increase exponentially.

Over the winter of 1969 Humble Oil engineers analyzed the wealth of data generated over the preceding months. They decided upon a second voyage to test winter conditions, because any future fleet would need to operate year-round, a second voyage was deemed necessary to test winter conditions. More data was therefore required from the Arctic winter to

complement those completed the year before in “primarily sun-battered summer ice. Again *Manhattan* headed north and, again, Stolee participated as an observer. The second voyage began in early April when the Arctic ice was at its thickest and Stolee joined CCGS *Louis St Laurent* in Halifax as it prepared to escort *Manhattan* on its second trip. “The purpose of the second MANHATTAN journey is to pin down power requirements for successful ice tankers,” he recorded on 9 April after speaking with Stan Haas, Humble Oil’s project manager:

Hull formation, bow design, propeller and rudder arrangements, heeling systems, etc., have been established from information derived last year. Power requirements are critical and it is hoped that by steaming MANHATTAN through even thickness, confined ice, as in ECLIPSE SOUND, absolute power values can be acquired and suitable curves plotted for large ships.⁷⁵

By April, the long winter had forged a solid ice pack that held the entire Northwest Passage in its grip, Coen described. “This would provide the ideal conditions for more testing.”⁷⁶

The second *Manhattan* voyage was also a trial for the new Canadian icebreaker *St. Laurent*. When she commenced her escort in early April 1970 the ship was just out of refit, with “all the subsequent difficulties associated with dockyard ‘mateys’, oily rags and wiring diagrams awry.”⁷⁷ On 22 April the icebreaker’s flight deck lift broke down, leaving Stolee and Lieutenant Taylor to walk back across the ice from *Manhattan*, an uncomfortable journey “against an easterly wind, over hummocks and ridges and along the flats like noble explorers of old.”⁷⁸ The reports described “teething troubles” including power failures aboard the ship, overly complex control systems, and personnel running them with too little indoctrination and training. Most concerning to Stolee, the *St. Laurent* lacked sufficient range and sustaining capabilities for an Arctic season, and depended upon *Manhattan* for water replenishment. “It is incredible,” Stolee wrote, “that the ship cannot operate for more than a week and a half in ice without a resupply of fuel and water.... Officially she can last a whole ARCTIC summer (the Replenishment Run) because she then steams at one third power and spends most of her time at anchor waiting off-loading.” Public relations efforts aside, he assessed that “no rationalization will make *St. Laurent* an effective ARCTIC icebreaker with her limited range and endurance.”⁷⁹ While many of the issues identified in the first year were remedied, issues of limited range continued to plague the ship until 1988 when it underwent major refit to extend the hull and replace its inefficient propulsion system.⁸⁰

The 1970 voyage did not attempt to transit the entire Northwest Passage, as had been done the year before. Instead, the expedition was confined to the

Eastern Arctic channels, where the desired ice conditions could be found. On this journey, Stolee documents how *Manhattan* and *St. Laurent* fought heavy pack ice in Baffin Bay for more than two weeks, making little more than three hundred miles amidst massive ice floes and towering pressure ridges. With the ship in Eclipse Sound on 12 May, he toured the bowels of the vessels just as it made a ten-knot charge into heavy ice. With ice crashing around him the noise and vibrations were harrowing. It was a moving experience that Stolee describes in detail:

Crescendoes of sound rose and fell and weird harmonies amplified each other into death cries of anguished monsters. When the charge halted eerie silence reigned in the vast, cold tomb where seconds previously a host of [Valkyrie] shrieked their [Götterdämmerung]. It is a chill and wretched place.⁸¹

The Arctic winter was a poor host for any ship, even one as large as *Manhattan*. With limited astern power, the tanker became stuck repeatedly – a problem compounded by snow on the ice pack that increased the friction on the ship's hull. Still, the mission continued productively for four weeks of ice testing, led by the U.S. Army Cold Regions Research and Engineering Laboratory near Bylot Island, which measured temperature, compression and tensile strength, and salinity. Concurrently, the ships' officers recorded the tanker's velocity and engine performance. In the last week of May *Manhattan* and *Louis St. Laurent* turned south for home, stopping only in Pond Inlet to donate four thousand pounds of food to the hamlet.⁸²

Like its Northwest Passage transit the year before, *Manhattan's* 1970 voyage was considered a resounding success. Canadian politicians looked to see and be seen aboard the ship, anxious to promote northern development and assert Canadian sovereignty. Occasionally these visits intruded on the ships' operations. Jean Chrétien, Minister of Northern Affairs, visited both *Manhattan* and *Louis St. Laurent* in May 1970, where he seemed to receive a grudging welcome. Stolee describes his arrival with the air of an inconvenienced officer just trying to go about his work. "For chauvinistic reasons, best known to parliamentarians," the naval observer recounted, "it has been decreed that the 'royal entourage' will transfer in our short range helicopters." The situation left the crew "immobilized for three days, as our choppers are restricted to twenty miles over ice. One wonders why the visit could not have done when the ships were working at POND INLET. It is annoying to be diddled by politicians."⁸³

The second *Manhattan* voyage ended at Chester, Pennsylvania on 13 June 1970 where Humble Chairman Mike Wright extolled its importance. Optimistic industry officials believed that the future of Arctic shipping had arrived. The Northwest Passage could become a viable commercial sea route,

it seemed, and Humble Oil soon contracted Newport News Shipbuilding to design the next generation of icebreaking supertankers, each nearly three times *Manhattan's* size. Evaluations and re-evaluations of the economics of moving Alaskan oil continued to change, however, and by that autumn the pipeline alternative seemed to enjoy the edge in cost efficiency. Consequently, Humble Oil announced on 21 October 1970 that it was suspending its icebreaker project. Initial estimates, which had given tankers an advantage over the terrestrial route, had not taken into consideration the difficulties presented by northern operations, for which there were no easy answers. The 60 cents/barrel transportation cost by tanker, assumed a few years earlier, had increased to \$1.20 by the end of 1970. That March, Humble estimated costs for its loading and unloading facilities at roughly \$1.1 billion, with much of the expense coming from the massive amount of dredging that would have been required to deepen sea lanes and build a port in the shallow waters of Prudhoe Bay. The projected thirty icebreaking tankers would have cost an additional \$2.2 billion. Against the estimated \$1 billion for a pipeline across Alaska to Valdez, the Northwest Passage appeared uneconomical.⁸⁴

Concluding Thoughts

The *Manhattan* represented the greatest challenge ever mounted to the domination of the north by ice. To the ice scientists the voyage meant a possible breakthrough in knowledge and money for their esoteric and underfunded field; for the ship's officers and crew, it carried the hope of career opportunities. The naval architects and designers saw the possibility of creating a whole new world of shipping; to Humble it represented potential savings of billions of dollars.

William D. Smith (1970)⁸⁵

While the *Manhattan* voyages have become embedded in narratives emphasizing competing ideas about Arctic sovereignty between the United States and Canada, Stolee's narratives serve as a poignant reminder that, at the time, the prospect of opening the Arctic to development electrified the Canadian imagination as well. "The concept of forcing a supertanker, such as MANHATTAN, through the Northwest Passage is imaginative – the route is shorter by several thousand miles than any other Europe-Pacific passages and Canada ... stands to gain from a successful venture," Stolee noted in his journal.⁸⁶ Unwilling to invest the massive capital needed to facilitate large-scale development itself, Ottawa had an abiding interest in this American experiment to explore the prospect of accessing the vast resources of Canada's Arctic Archipelago. Mitchell Sharp, the Canadian Secretary of State for External Affairs, insisted at the time that "the *Manhattan* project would not have been possible without ... extensive Canadian input, consisting of

preparatory studies extending for many years over a vast area of the North.” He emphasized that this was “no time for wide-ranging assertions of sovereignty – rather Canada must concentrate on specific objectives, the most important of which is the opening up of the Canadian Arctic region for development.”⁸⁷ Indeed, while *Manhattan* was transiting the Northwest Passage in 1969 and 1970, Ottawa’s immediate requirement was simple: to assist the supertanker and to be seen doing so.

Cheeky Canadian newspaper headlines boasting how “Canadian David Saves Yankee Goliath” celebrated the Coast Guard icebreakers charging through the ice to cut swathes around the supertanker and free her from the Arctic’s icy clutches.⁸⁸ Stolee’s journals are filled with such examples. Nevertheless, he suggested that “Canada’s contribution to this venture is open to debate,” pointing to a general asymmetry in the willingness to invest significant resources – both material and intellectual – to address the deep challenges that Arctic ice conditions posed to economic development:

On the one hand icebreakers and ice reconnaissance were provided by the Department of Transport but on the other hand the experts and the impetus came from the States. If the route proves economically feasible, trade will go through and icebreaker assistance will be required on occasion to free tankers which may get trapped. (This is not an ice convoy concept.) These icebreakers need an ice capability equal to the large tankers and such icebreakers are being designed and built for the US Coast Guard. Canada has not announced an equivalent programme. The problem exists of identifying and defining ice conditions in order to route large tankers through Viscount Melville Sound, the Beaufort Sea and along the northern continental reaches. This problem along with navigational systems required to assist in its solution are being considered seriously in the United States. Canada seems prepared to adopt the resultant recommendations without offering alternatives of her own.⁸⁹

Ironically, while the RCN observer lamented Canada’s modest interest and capabilities, American officials and journalists made parallel comments about their own country’s comparative lack of capacity and commitment. Congressman Howard Pollack, Alaska’s only member in the US House of Representatives at the time, deemed it “unacceptable to our national pride to discover that the U.S. icebreaker [*Northwind*] could not keep up to a commercial tanker and had to let the Canadians do the job alone.”⁹⁰

The *Manhattan* voyages also led the Government of Canada to rearrange the traditional order of its maritime priorities. The Arctic was no longer a mere space – it was a *place* of intrinsic value for which Canadians insisted that their government assume responsibility as stewards. Consequently, the political controversy had long-lasting effects. In April 1970, Parliament

passed the *Arctic Waters Pollution Prevention Act* – path-breaking environmental legislation which continues to underpin Canada’s marine protection regulations in the Arctic a half century later. The voyage also catalyzed an enduring discussion about what steps Canada should take to secure its Arctic sovereignty, leading to nearly two decades of efforts to shape international environmental protection regulations and the law of the sea to meet Canada’s regulatory and political objectives in the North.⁹¹ Although Canada did not declare outright sovereignty over the waters of its Arctic Archipelago until 1985, it generated political impetus to move beyond the status quo and the Department of External Affairs began laying the groundwork for a more explicit declaration of sovereignty.⁹²

“Whatever diplomatic hostilities may have existed between Canada and the United States did not extend to the crews of the *Manhattan* and the *John A. Macdonald*, who unfailingly supported one [an]other,” Coen observed. “Theirs was a single expedition, not two that happened to be operating at the same time and in the same geographical space.”⁹³ Stolee’s narrative offers deep support for this assessment, revealing how essential this cooperation was to the safety and success of the voyage. Smith, a reporter onboard *Manhattan* in 1969, described the stop in Halifax after the eastbound transit of 1969. The stop was made to:

officially... acknowledge our debt to the Canadian government for its assistance on the project; unofficially, to honour our gallant companion, the “Johnny Mac.” She had been our mentor, our rescuer, and our friend. Her crew, our drinking buddies, had helped to give a sense of belonging and pride to the disparate bunch of hired hands on the tanker. The *Manhattan* had much to be proud of, and no small amount of the credit was due to the little red and white Canadian icebreaker.⁹⁴

Smith’s time aboard *Manhattan* mirrors the spirit of Stolee’s report, which captures the sense of camaraderie between the US civilian crew and the Canadian Coast Guard and between the Canadians and Americans that worked side-by-side to make sure the *Manhattan* got through. The spirit of the mission was defined not by competition over sovereignty or jurisdiction, but a common sense of purpose and a driving desire to see this exceptional voyage succeed.

Notes

¹ Trevor Lloyd, "New Perspective on the North," *Foreign Affairs* 42:2 (1964): 306.

² William D. Smith, *Northwest Passage* (New York: American Heritage Press, 1970), 18.

³ Ross Coen, *Breaking Ice for Arctic Oil* (College, AK: University of Alaska Press, 2012), 5.

⁴ Lieutenant-Commander (RCN) Erling Brynjulf Stolee (U-71510) was appointed as a Naval Cadet in the University Naval Training Division of the Royal Canadian Naval Reserve in 1948 and served in HMCS *Nonsuch* – a Royal Canadian Navy Reserve Division located in Edmonton, Alberta. After his transfer to the RCN, he was appointed as a Lieutenant with a promotion to Lieutenant-Commander in 1960. Subsequently, he served in National Defence Headquarters on the Staff of the Chief of Logistics Engineering and Development. <https://www.nauticapedia.ca/database/Query/Biolist3.php?&name=Stolee%2C%20Erling%20Brynjulf&id=25965&Page=63&input=1>.

⁵ This occurred in 1973 when the second Arab oil embargo raised global crude prices 82% in one year and caused considerable supply disruption in the American market.

⁶ US production peaked at roughly 10 million barrels per day in 1979, falling thereafter until the advent of shale oil rejuvenated the industry in the mid-2010s.

⁷ Coen, *Breaking Ice for Arctic Oil*, 24. In 2009 Prudhoe Bay's reserves were estimated to be 15.7 billion barrels produced with an additional 35-36 billion in proved reserves remaining (including nearby fields subsequently discovered); NETL, *Alaska North Slope Oil and Gas A Promising Future or an Area in Decline?* Addendum Report DOE/NETL-2009/1385 (April 2009).

⁸ A.H.G. Storrs and T.C. Pullen, "S.S. Manhattan in Arctic Waters," *Canadian Geographic Journal* 80:5 (1970): 167 and Cohen, *Breaking Ice for Arctic Oil*, 29.

⁹ Adam Lajeunesse, *Lock, Stock, and Icebergs: The Evolution of Canada's Arctic Maritime Sovereignty* (Vancouver: University of British Columbia Press, 2016), 139.

¹⁰ A.H.G. Storrs to Dr. Claude Isbister, March 5, 1969, Library and Archives Canada (hereafter LAC), RG 12, vol. 5561, file 8100-15-4-2, pt. 1.

¹¹ Cohen, 63.

¹² 73rd meeting of the Committee, 19 December 1968, in P. Whitney Lackenbauer and Dan Heidt, eds., *The Advisory Committee on Northern Development: Context and Meeting Minutes, 1946-66*, Documents on Canadian Arctic Sovereignty and Security vol. 4 (2015), document 73.

¹³ P. Whitney Lackenbauer and Adam Lajeunesse, eds., *In Manhattan's Wake: Lieutenant E.B. Stolee's Accounts of the Canadian Arctic Voyages of CCGS John A. Macdonald and Louis St. Laurent, 1969/70* (Antigonish: Mulroney Institute on Government, 2019), 39.

¹⁴ A.H.G. Storrs to Dr. Claude Isbister, March 5, 1969, LAC, RG 12, vol. 5561, file 8100-15-4-2, pt. 1.

¹⁵ Edgar Dosman, "The Northern Sovereignty Crisis," in *The Arctic in Question*, ed. Dosman (Toronto: Oxford University Press, 1976), 39-40.

¹⁶ See Elizabeth B. Elliot-Meisel, *Arctic Diplomacy: Canada and the United States in the Northwest Passage* (New York: Peter Lang, 1998); P. Whitney Lackenbauer and Peter Kikkert, "Sovereignty and Security: The Department of External Affairs, the United States, and Arctic Sovereignty, 1945-68," *Serving the National Interest: Canada's Department of Foreign Affairs and International Trade, 1909-2009*, Greg Donaghy and Michael Carroll eds. (Calgary: University of Calgary Press, 2011); and Lajeunesse, *Lock, Stock, and Icebergs*.

¹⁷ Lajeunesse, *Lock, Stock, and Icebergs*, 128, 140.

¹⁸ In 1959 conventional law surrounding international straits was defined by the: United Nations, Convention on the High Seas, adopted at Geneva, Switzerland on April 29, 1958, Article 16. This convention was, however, ambiguous on the criteria for defining these straits. The relevant precedent from customary law providing that framework was: International Court of Justice, *Fisheries Case*, Judgment of December 18, 1951.

¹⁹ Donat Pharand, "The Arctic Waters and the Northwest Passage: A Final Revisit," *Ocean Development and International Law* 38:1 (2007): 37-39.

²⁰ International Court of Justice, *Corfu Channel Case*, Judgment of April 9, 1949: I.C.J. Reports, 1949, *Merits*, 29.

²¹ Lajeunesse, *Lock, Stock, and Icebergs*, 155.

²² For an example of the American perspective on the functional criteria see: Richard J. Grunawalt, "United States Policy on International Straits," *Ocean Development and International Law* 18:456 (1987): 456.

²³ See P. Whitney Lackenbauer and Elizabeth Elliot-Meisel, eds., *"One of the Great Polar Navigators": Captain T.C. Pullen's Personal Records of Arctic Voyages*, Volume 1: *Official Roles* (Calgary and Waterloo: Centre for Military, Strategic and Security Studies/Centre on Foreign Policy and Federalism/Arctic Institute of North America, 2018).

²⁴ John Kirton and Don Munton, "The Manhattan Voyages and their Aftermath," *Politics of the Northwest Passage*, Franklyn Griffiths ed. (Kingston: McGill-Queen's University Press, 1987), 71.

²⁵ Dosman, "Northern Sovereignty Crisis," 39-40.

²⁶ On the question of the Northwest Passage as precedent setting see: Suzanne Lalonde and Frederic Lasserre, "The Position of the United States on the Northwest Passage: Is the Fear of Creating a Precedent Warranted," *Ocean Development and International Law* 44:1 (2013).

²⁷ David Meren and Bora Plumptre, "Rights of Passage: The Intersecting of Environmentalism, Arctic Sovereignty, and the Law of the Sea, 1968-82," *Journal of Canadian Studies* 47:1 (Winter 2013): 182.

²⁸ Dosman, "Northern Sovereignty Crisis," 40.

²⁹ Kenneth Eyre, "Forty Years of Military Activity in the Canadian North, 1947-87," *Arctic* 40:4 (December, 1987): 296.

³⁰ Ivan Head and Pierre Trudeau, *The Canadian Way: Shaping Canada's Foreign Policy, 1968-1984* (Toronto: McClelland and Stewart, 1995), 29-30.

³¹ On this see for instance: Lackenbauer and Kikkert, "Sovereignty and Security."

³² Ken Coates et al., *Arctic Front: Defending Canadian Interests in the Far North* (Toronto: Thomas Allen & Son Ltd., 2008), 93.

³³ Whitney Lackenbauer and Peter Kikkert, "Building on Shifting Sands: The Canadian Armed Forces, Sovereignty and the Arctic, 1968-1972" in *Canadian Arctic Sovereignty and Security: Historical Perspectives* (Calgary: Centre for Military and Strategic Studies, 2011), 288.

³⁴ Coates et al. *Arctic Front*, 94 and Shelagh Grant, *Polar Imperative* (Toronto: Douglas & McIntyre, 2010), 348-349.

³⁵ Minutes of the 73rd meeting of the ACND, December 19, 1968, LAC, RG 112, vol. 29803, file 170-80/A6, pt. 7.

³⁶ "Oil Concerns seek a Northwest Passage to Unlock the Arctic," *Wall Street Journal*, 17 December 1968.

³⁷ UN Convention on the Territorial Sea and the Contiguous Zone, done at Geneva on 29 April 1958, entered into force on 10 September 1964 (United Nations, Treaty Series, vol. 516), Article 16.

³⁸ Quoted in Donat Pharand, *The Law of the Sea of the Arctic with Special Reference to Canada* (Ottawa: University of Ottawa Press, 1973), 59.

³⁹ Minutes of the 73rd meeting of the ACND, December 19, 1968, LAC, RG 112, vol. 29803, file 170-80/A6, pt. 7.

⁴⁰ Memorandum for Cabinet, March 20, 1969, LAC, RG 12, vol. 5561, file 8100-15-4-2, pt. 1.

⁴¹ Dosman, "Northern Sovereignty Crisis," 39-40.

⁴² Kirton and Munton, "Manhattan Voyages and their Aftermath," 75.

⁴³ 73rd meeting of the ACND, 19 December 1968 LAC, RG 112, vol. 29803, file 170-80/A6, pt. 7.

⁴⁴ Coen, *Breaking Ice for Arctic Oil*, 8.

⁴⁵ Smith, *Northwest Passage*, 146. Smith and other commentators also note that the Canadian ships boasted a bar while the U.S. coast guard ships did not, thus making the Canadian icebreakers a popular destination for their American counterparts.

⁴⁶ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 3.

⁴⁷ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 55.

⁴⁸ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 59.

⁴⁹ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 68.

⁵⁰ Quoted in Smith, *Northwest Passage*, 127.

⁵¹ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 72-73.

⁵² Dosman, "Northern Sovereignty Crisis," 39.

⁵³ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 65.

⁵⁴ Quoted in Smith, *Northwest Passage*, 113, and Coen, *Breaking Ice for Arctic Oil*, 125.

⁵⁵ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 64.

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- ⁵⁶ Coen, *Breaking Ice for Arctic Oil*, 154.
- ⁵⁷ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 4.
- ⁵⁸ Coen, *Breaking Ice for Arctic Oil*, 162.
- ⁵⁹ Lackenbauer and Lajeunesse, *In Manhattan's Wake* e, 81.
- ⁶⁰ Coen, *Breaking Ice for Arctic Oil*, 158.
- ⁶¹ Smith, *Northwest Passage*, 134.
- ⁶² On this theme, see also Smith, *Northwest Passage*, 37.
- ⁶³ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 41.
- ⁶⁴ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 35.
- ⁶⁵ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 36.
- ⁶⁶ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 47.
- ⁶⁷ P. Whitney Lackenbauer and Peter Kikkert, eds., *The Canadian Forces and Arctic Sovereignty: Debating Roles, Interests, and Requirements, 1968-1974* (Waterloo: Laurier Centre for Military Strategic and Disarmament Studies / WLU Press, 2010).
- ⁶⁸ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 43.
- ⁶⁹ See, for example, Robert Paine, "The Nursery Game: Colonizers and Colonized in the Canadian Arctic," *Etudes/Inuit/Studies* (1977); John David Hamilton, *Arctic Revolution: Social Change in the Northwest Territories, 1935-1994* (St. Catharines: Dundurn, 1994); and David Damas, *Arctic Migrants/Arctic Villagers: The Transformation of Inuit Settlement in the Central Arctic* (Montreal: McGill-Queen's University Press, 2002).
- ⁷⁰ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 110. See also page 111 on Inuit at a church service.
- ⁷¹ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 112.
- ⁷² Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 32.
- ⁷³ Department of National Defence (DND), Directorate of Continental Plans, "Law of the Sea – Future Implications for Sovereignty," April 28, 1970, DND, Directorate of History and Heritage (DHH), file 82/125.
- ⁷⁴ Coen, *Breaking Ice for Arctic Oil*, 84 and 162.
- ⁷⁵ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 92.
- ⁷⁶ Coen, *Breaking Ice for Arctic Oil*, 157.
- ⁷⁷ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 90.
- ⁷⁸ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 100.
- ⁷⁹ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 111.
- ⁸⁰ Charles D. Maginley, *The Canadian Coast Guard 1962-2002* (St. Catharines: Vanwell, 2002), 53.
- ⁸¹ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 109.
- ⁸² Coen, *Breaking Ice for Arctic Oil*, 158.
- ⁸³ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 113.
- ⁸⁴ Coen, *Breaking Ice for Arctic Oil*, 160-63. The US federal government approved plans to build the Trans-Alaska Pipeline in November 1973 and construction was expedited by the Arab oil embargo and the subsequent global fuel shortages that same year.
- ⁸⁵ Smith, *Northwest Passage*, 68.

⁸⁶ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 39.

⁸⁷ Quoted in Thomas Tynan, "Canadian-American Relations in the Arctic: The Effect of Environmental Influences Upon Territorial Claims," *The Review of Politics* 41:3 (1979).

⁸⁸ Smith, *Northwest Passage*, 113.

⁸⁹ Lackenbauer and Lajeunesse, *In Manhattan's Wake*, 4.

⁹⁰ Quoted in Coen, *Breaking Ice for Arctic Oil*, 129.

⁹¹ On this process see: D.M. McRae, "The Negotiation of Article 234," in *Politics of the Northwest Passage*, Franklyn Griffiths ed. (Montreal and Kingston: McGill-Queen's University Press, 1987), 102-04.

⁹² See Lackenbauer and Kikkert, "Sovereignty and Security."

⁹³ Coen, *Breaking Ice for Arctic Oil*, 8.

⁹⁴ Smith, *Northwest Passage*, 189.



9

SS *Manhattan* in Arctic Waters

A.H.G. Storrs and T.C. Pullen*

This is an edited version of the talk given to the Annual General Meeting of the Society on 3rd March 1970, by Rear Admiral A.H.G. Storrs, director of the Marine Operations Branch of the Department of Transport, who was on the icebreaker John A. Macdonald, and Captain T.C. Pullen, who was the official Canadian observer aboard the S.S. Manhattan. The speaker on the various aspects of the presentation is identified in each case.

Admiral Storrs: "We are here to talk about the *Manhattan's* voyage. Where did it start? The study in '68 by Humble Oil and its partners on the north slope of Alaska brought in two wells which showed that there was substantial oil. This was important because it proved what seismologists and petrologists had been saying for a long time – this was oil territory. The proved reserves of the northwest slope were five to ten billion barrels and less firm estimates showed between 30 to 40 billion barrels. Now what does all this mean?

"World consumption of oil is 15 billion barrels a year. So the proved reserve of the northwest slope is slightly less than one year's consumption for the whole world. The proved reserve for the whole world is around 420 billion barrels – most of it in the Middle East – and ten billion barrels isn't much out of that. But, out of these 420 billion barrels, the U.S. proved reserve is about 30 billion, so the northwest slope represents another one-third on top of that. This is really very significant because not only does it mean a major addition to the proved reserve of the U.S., which is not growing but is diminishing as consumption rises, but also it is important strategically because it allows the U.S. a little freedom from dependence on offshore oils

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– if not permanently, at least for a certain period. Now when the dimensions of this field had been proved[,] the question arose – what to do about it?

“A field of that size and in that location needs a substantial extraction each year for it to be economic and worthwhile. The easiest way of getting it out is across Alaska and down to the west coast of the U.S., but the west coast alone cannot absorb enough to make it worthwhile to develop the field. So the next problem was how to get it to the east coast if it is going to be exploited.”

Captain Pullen: “This brings us now to the transportation problem and the various alternatives which were examined by the oil companies. The first, of course, was to build a pipeline across Alaska to a warm-water port on the south coast of Alaska – a 48 inch pipeline – then by tanker down the west coast to the Seattle area, where another 48 inch pipeline could transport it across the continent to Chicago and the east coast market. There were proposals that the oil should go by tanker to the Panama Canal, be piped across the isthmus and then by tanker again to the east coast market. It was also suggested that oil go all the way by giant tanker around Cape Horn and up to the east coast. Then, of course, there is the all-Canadian pipeline to the east coast market. Of the various pipeline alternatives, the one that is particularly attractive from the American point of view is the trans-Alaska pipeline system, tanker to the Seattle area and then into a transcontinental pipeline. The pipeline solution that is attractive to Canada is the all-Canadian pipeline up the Mackenzie.

“Another solution, the one that we’re here to talk about tonight, is the all-tanker route through the Northwest Passage. This has great possibilities because the cost is much less by ship than by pipeline; so much so that it is almost half the cost of the all-pipeline solution. With a daily output of crude at Prudhoe Bay of one million barrels[,] the annual savings would come to 180 million dollars. Since the output of crude at Prudhoe is expected to be at least two million, this figure can be doubled – a saving of virtually one million dollars a day. Small wonder that a company like Humble Oil would investigate most thoroughly the all-tanker solution. The point should be made that the cost advantage of tankers over pipelines has become less favourable in recent months[,] but it is still sufficiently favourable to encourage further tests. The recent announcement that *Manhattan* is going north again is certainly evidence of continuing interest. For those who are statistically-minded, a daily output of two million barrels, if stacked on end,

would make a column of oil drums 100 miles high. We are talking of a daily output in tonnage of 300,000 tons or just under 100 million gallons a day.

“Now, just what is the Northwest Passage? A map of Arctic Canada shows two main routes through the archipelago. From Lancaster Sound, at the eastern entrance, one route runs west past Resolute through Viscount Melville Sound, then down through Prince of Wales Strait, or through M’Clure Strait, into Amundsen Gulf. That is the deepwater Northwest Passage. The other route is along the coast of Alaska, past Prudhoe Bay, and along the north Canadian coast, under the islands as it were. That is the shallow coastal route followed by some explorers.

“The first man to achieve the Northwest Passage was Captain Robert M’Clure, Royal Navy, who in 1850 came into the Arctic from the west and wintered in 1850–51 in Prince of Wales Strait, having been blocked by ice conditions there. He retreated and went west about Banks Island, only to become icebound at the northwest corner of the island. After two years fast in the ice, he abandoned his ship, *H.M.S. Investigator*, and completed the Northwest Passage on foot across Viscount Melville Sound in 1854, returning to England in a ship of the Belcher expedition, *H.M.S. North Star*, commanded by W.J.S. Pullen, R.N. [Royal Navy], which had come in from the eastern Arctic. So to him goes the honour of completing the passage, but not completely by ship. It was not until 1906 that Amundsen in his ship *Gjoa* achieved the passage[,] but it took him three years to do it. He came by way of Baffin Bay to Barrow Strait and then south among the islands, wintering in the vicinity of King William Island, and then working his way along the coast, the shallow water route – eventually getting out to the west in 1906.

“That brings us to the forties and Henry Larsen of the R.C.M.P. [Royal Canadian Mounted Police][,] who achieved the first passage from west to east and was also the first man to achieve the passage in the other direction – east to west in a single season. His route – eastbound: the coastal one, the return to the west by deep water route by Viscount Melville Sound and Prince of Wales Strait. Then in the fifties came the next achievement – the Royal Canadian Navy’s *Labrador*, under the then Captain Robertson in 1954; her route from east to west, following in Larsen’s tracks, and she had the added distinction of becoming the first deep draft ship to make the Northwest Passage and the first ship to circumnavigate North America. She returned to Halifax, her point of origin, by way of the Panama Canal. Next we have a U.S. achievement – the U.S. Coast Guard’s cutters *Storis*, *Spar* and *Bramble* from the west following Larsen’s first route, but varying it by passing through Bellot Strait and thence east. That was in 1957. Lastly, but by no

means least, the achievement of the now famous Canadian Coast Guard ship, the *John A. Macdonald*, under Captain Fournier, from east to west through Lancaster Sound and via another version of the coastal route in 1967.

"To put the achievement of the Northwest Passage into perspective with regard to the *Manhattan*, it should be appreciated that up to last year, the *Macdonald* was the biggest ship to make the Northwest Passage. She displaced nearly 9,000 tons, compared to the *Manhattan's* 155,000 tons. Now what is so difficult about the Northwest Passage? The answer is, of course, – ice. Ice in all its infinite forms is the chief obstacle and it must be admitted that even today – 1970 – there is still a great lack of precise knowledge of the behaviour of ships and a lack of knowledge of ice conditions in the Arctic on a year round basis. Sea water in the Arctic[,] which freezes in October[,] reaches a thickness of about seven feet by the following June and is known as first-year ice. Much of the ice melts during the ensuing summer but that which does not, continues to grow during the following winter and attains a thickness of nearly ten feet. In the process it becomes much harder and is called second-year ice. This same process, repeated over a third winter, does not produce a similar increase in thickness, but it does add to the hardness of the ice – the salt content being further removed. It is known thereafter as multi-year ice.

"Pressure was, of course, one of the bug bears of the old explorers in their fragile little wooden vessels. Ice, when it is under the influence of wind and currents, forms ridges, it overlaps, and generally becomes all jumbled up, adding to the difficulties of little ships trying to pass through it, and not only little ships but big ships too. Winds and currents create these difficulties and it is only in bays and sheltered areas that ice remains flat and undisturbed. In the eastern Arctic, that is east of Resolute, the sea ice is mostly first-year, a thickness of six or seven feet, by Arctic standards relatively easy to handle. West of Resolute in Viscount Melville Sound and M'Clure Strait and, indeed, in the Beaufort Sea, the ice is chiefly multi-year ice, much thicker and much harder. As one moves west through the Northwest Passage, then so do conditions become increasingly more difficult."

Admiral Storrs: "Given the economic desirability of moving all this oil and, given the conditions in the Arctic which have just been described, the problem was how to find out whether ships could navigate through the Northwest Passage all year round, because all year round navigation was essential if the quantities of oil that had to be moved were to be moved. Now, how to find out? When the Humble Oil people and ourselves got down to it,

we were appalled at the lack of real definitive knowledge that we had on this subject. There is a fair amount of knowledge on ice itself, its characteristics, its behaviour, gathered by the Polar Continental Shelf Project of the Department of Energy, Mines and Resources, but the relationship of ships to the ice environment is not too well known. The Department of Transport had been operating in the Arctic for a good many years with the annual re-supply of posts and installations in the north[,] but all this was confined to the so-called open navigation season of six weeks or a couple of months in the summer and to the relatively easy part of the Arctic east of Resolute Bay, or along the shoreline in the western Arctic. There wasn't much knowledge of ship behaviour in between, or of ship behaviour outside the open season[,] and what knowledge there was, was confined to icebreakers. There was no knowledge of large bulk carrier behaviour. The only place where we had knowledge was in the Gulf of St. Lawrence where winter navigation had been in effect and growing year by year for about ten years or so and even there, there was no measured and defined, codified knowledge. What was needed was a base from which to work – a good knowledge of how a ship of known size and power behaved in ice of a given character, because given that base, there were formulae developed by the Russians and Americans with which one could project known behaviour to ice of a different character and to ships of a different size and a different performance. But where to start?

“The only ship which we could find which had any of this definitive knowledge was a relatively small vessel, the *Imperial Acadia*, a 10,000-ton deadweight tanker which had been running around in the Gulf for some years. She had never had occasion to make actual measurements of the ice she operated in and the estimates of ice thickness were very approximate. However, three captains of the ship were able to give us some reasonable information on which the Humble Oil people could base their projections and they went to work. The theoretical sizes of ships that they thought might be able to transit the Northwest Passage 12 months of the year came out at something in the order of 250,000 tons and 60 to 70 thousand horsepower.

“From 10,000 tons to 250,000 tons is a big jump and on the way up the curve can drift off in all sorts of directions, so obviously the Humble Oil Company couldn't make a decision then and there, although oil companies are pretty robust about this sort of thing. They had to get a base a little closer to the eventual ship that could make a better jumping off point for their calculations. So the answer was a trial – a trial with the biggest tanker they could get that could cope with conditions – and this was the reason for the *Manhattan*. The *Manhattan* was in effect a half scale model of what

theoretically was the ship that should be able to cope 12 months of the year with the Northwest Passage. The object of the exercise was to measure, to test, to find out precisely the performance of this half scale model in ice in the Arctic from these precise measurements to make the calculations again and try to find out whether a bigger ship should be able to do the job, or whether it shouldn't."

Captain Pullen: "This brings us to a description of the vehicle selected for Humble Oil's Arctic tanker test. *Manhattan* was built in 1961 at Quincy, Massachusetts, at a time when designers were still trying to solve the problems of building giant ships. A very great deal of steel went into her construction, as much as is now going into 250,000-ton ships being built in Europe, yet she has half the displacement. Not only was she strongly built, but she was extremely powerful for her displacement, developing 43,000 shaft horsepower. She met the special requirements of Humble Oil in that she had twin propellers and rudders so that in the unhappy event of serious ice damage she stood a better chance of being able to limp home. Her displacement of 115,000 tons deadweight is the weight of cargo she can carry. Her loaded displacement is 155,000 tons. She is 1,005 feet long, 150 feet wide, and draws 53 to 55 feet of water.

"Her original bow was cut off and replaced by an ice breaking version which was designed by the U.S. Coast Guard working in conjunction with the Massachusetts Institute of Technology in Boston. It's an ice breaking bow which achieves its purpose by breaking ice downwards as opposed to the Alexbow [principle] of ploughing the ice up and thrusting it aside. This latter was not considered for *Manhattan* as it is a completely unproved concept of ice breaking. The *Manhattan's* bow was made deliberately wider than the remainder of the ship, something of an arrowhead shape, on the theory that once the ice was broken it would escape around the shoulder of the ship and pass down the side without causing a binding effect on the hull. They also added an ice belt in the event she might become crushed in the ice. It extended the whole length of the ship and stands out an additional nine feet on each side. It was fabricated of a very strong steel – high tensile steel. They added internal stiffening for the wing tanks of the ship – also against pressure. They made a double skin around the engine room and the boiler room so that in the event the skin was punctured there, she wouldn't flood. They added a helicopter platform at the stern. They built in a heeling system – a means whereby water can be pumped from one side of the ship to the other so that she can be made to roll when stuck in ice to help her to break

free. They added a great deal of sophisticated instrumentation for testing the effects of ice on the structure of the ship. They fitted her with closed circuit television. They gave her exotic communications equipment and in every way fitted the vessel for the great task on which she was about to embark.

"So, with 10,000 tons of additional steel to make her into an ice-breaking tanker, the ship was completed. All the ice-strengthening features that went into the conversion were fabricated from high tensile steel, yet her original hull was built of mild steel. The lesson of this will be apparent later. Her original crew numbered about 62, but for the Arctic tanker test it jumped to 125; her anchors each weighed 35 tons; each link of her anchor cable weighed nearly 200 pounds; everything about that ship is awesome and big. The conversion was done quickly, but not quite quickly enough to get the ship north in time for ideal testing conditions. In fact, she entered the Northwest Passage in September, the easiest time of the year for ice navigation and precisely what had not been planned. However, there was nothing that could be done about it and much good was achieved notwithstanding."

Admiral Storrs: "The *Manhattan* left Delaware Capes on August 25th, looked in at Halifax to pick up some extra people, scientists and so forth, and then set off up Davis Strait and Baffin Bay. Off Frobisher she rendez-vous'd with the Canadian Coast Guard icebreaker *John A. Macdonald*, commanded by Captain Paul Fournier, and with the U.S. Coast Guard icebreaker *Northwind*. Unfortunately the *Northwind* developed machinery trouble and had to peel off just as we got to the really serious ice of M'Clure Strait. The *Northwind* then took the "coastal route", already described, and ended up in the western Arctic about the same time as the *Manhattan* and *Macdonald*, which had plunged their way through all the heavy going."

Captain Pullen: "Various parts of the *Manhattan*, including the bow, were thoroughly instrumented with strain gauges, to record ice impact and stresses and strains on the structure of the ship. There was a satellite navigational system to fix her position to a very high degree of accuracy – some said four places of decimals – from orbiting earth satellites. The cost of this complicated installation was \$200,000 and great were the hopes for it. But unfortunately the speed measuring equipment, which was an essential part of it, failed because of damage from ice passing under the hull. There was, therefore, no accurate speed input to the computer. The computer, thus frustrated, generated false answers. There was also no speed measurement for the ice tests the ship had to carry out. I have to record that to offset this

latter shortcoming we watched graduates of the University of Alaska on the fo'c'sle throwing pieces of wood over the side and shouting "Mark!" Others at the stern called "Mark!" when the pieces passed by. By measuring the time taken for those pieces of two by four to travel the length of the ship, and by knowing the length of the ship, it was possible to calculate her speed. This mixture of satellite navigational equipment and two by fours, we thought, was a happy blend of ancient and modern."

Admiral Storrs: "The first ice encountered was in Baffin Bay, where it is quite usual to find pack ice remaining well into the summer season along the Baffin coast. It isn't very serious ice, not very consolidated and getting quite soft. When she first encountered this she approached in a very genteel manner, nudged it at about one-half knot, shoved it gently and then gave it a pat and it didn't seem too hostile, so she shoved it again. After that experience, they gradually gained more and more confidence until finally they were dashing about at 12 knots or more with great chunks of ice flying off all over like shrapnel. However, she was so well built and so strong that happily nothing happened. The *Manhattan* proved to be a good deal handier than expected. With her twin rudders and twin screws[,] she was a very lively vessel considering her size.

"When the ships left Thule, they cut across to the entrance to [Parry] Channel and Lancaster Sound and there were met by a group of parliamentarians who had gone up to greet the *Manhattan*. Some of them went off in an aircraft to overfly her at the entrance to Lancaster Sound and say "Welcome to Canadian waters" or words to that effect. But the fog was so thick that the aircraft wasn't seen by the ship and the ship wasn't seen by the aircraft. Others had stayed behind and had embarked in the *Labrador*. They met the *Manhattan* when the fog cleared just off Resolute and greeted them, went on board and had a tour of the ship.

"West of Resolute, the *Manhattan* encountered progressively more severe conditions and the ship showed up very well. Everyone was tremendously pleased and started to think happily of being able to go through M'Clure Strait and down the west side of Banks Island. However, just a little bit west of the longitude of the Prince of Wales Strait they found severe, true Arctic conditions[,] and these proved too much for the ship. It was here that there occurred what was perhaps the most dramatic incident of the whole trip when one afternoon they found themselves in a polar floe. Perhaps they had not intended to get into it, possibly because of not being able to fly a reconnaissance with the helicopter, since there were plenty of easy

conditions around it. But in the event it turned out to be an excellent test. As the afternoon wore on[,] the going got more difficult. The *Manhattan* would progress about half a ship's length and come to a halt. The *Macdonald* would come up alongside her and break a path to ease off and remove some of the constraining ice at the *Manhattan's* side, and then she'd back off again. This demonstrated one of the flaws of the ship in that her stern power was so limited that she couldn't back off far enough [so] that she could get a really good rush at the ice when she went ahead again. Finally she was only backing off about one-quarter of the ship's length. So, in the evening, they called it a day and thought they'd wait until the next morning to decide what to do.

"Next morning Captain Fournier and I went off in the helicopter to take a look and we found that the floe was about five miles in diameter, almost a circular floe, and conditions were relatively easy all around it. There was a certain amount of open water, smaller floes, and new ice, around it but by then the *Manhattan* was right in the middle of it and the track astern was closing slowly. On our return, the *Macdonald* turned around with great difficulty and went out to the edge of the floe to test conditions. For awhile we thought the best thing to do, because the conditions ahead were even worse than those astern, was to back the *Manhattan* out. So the *Macdonald* backed up to her with the idea of putting a line on the *Manhattan* in order to help her astern. Eventually, however, it was decided to try to continue ahead through the floe.

"Having decided to go ahead, rather than back up, the first thing they did was to see if they could get more power. They closed down all the generators; closed down all the heat; closed down all the auxiliary machinery and got about three per cent more steam for the turbines. The *Macdonald* loosened up the ice around her and then *Manhattan* backed off as far as she could go and really had a go at it with everything opened up wide. The difference in that ship was the highlight of the trip for me – it was an astonishing performance. She was a different vessel entirely. The first time she got about three-quarters of a length and you could see the difference sitting alongside in the *Macdonald*. She backed off again and the next time she did about two ships' lengths. The third time she just kept going. She went charging through this very heavy ice, ice up to 20 feet in thickness, and maintained a speed of four knots or so, these huge masses of ice being thrust aside by the bow, tilted up on edge, pushed down and shoved aside, as this great ship just kept going.

"This was very dramatic because it presented the question of whether there was a sort of peak or hump in the relationship of power to displacement.

It was obvious that with the power normally available she was having all sorts of difficulties in that kind of ice; but once having got this extra power, small though it was, it was evident that a ship of this size and this displacement could do all sorts of things that we hadn't expected her to do in this kind of ice. Of course, when it was over, everything had to be turned on and we were back to normal.

"Having experienced this difficulty in this particular ice floe[,] they then went back to the original plan. It really didn't seem to make sense to try to get through M'Clure Strait simply for the sake of publicity, because the object of the exercise was to test not to achieve, so they turned back to go through Prince of Wales Strait. Approaching Prince of Wales Strait the *Macdonald* lost a blade off one of her wing propellers. This was a blow because, although it didn't make that much difference to her icebreaking capabilities, it caused a great deal of vibration in open water and left a great deal larger gap between blades for the chunks of ice to get in, thus increasing the possibility of losing another blade. So from there on we had to be a little more cautious. But anyway we got through the Prince of Wales Strait, then down into open water and up to Sachs Harbour on the west side of Banks Island, where she stayed at anchor for a few hours for personnel transfers.

"From Sachs Harbour the two ships proceeded west without incident to Prudhoe Bay. The depth of the water there is such that you have to anchor about 18 miles off land. A barrel of Prudhoe Bay crude oil in a gold painted barrel was brought off and placed on board the *Manhattan*, a momentous occasion and a day to remember. From Prudhoe Bay we went a little farther west to Point Barrow, which is the northernmost point of Alaska, and then turned back. During this time, we were joined by the U.S. Coast Guard icebreaker *Staten Island* which replaced the *Northwind* for the return voyage.

"It had been the original intention to go off north into the polar pack to test but the season was getting a bit late and the experiences of M'Clure Strait, coupled with the loss of the *Macdonald's* propeller blade, changed the decision. Rather than go off into the polar pack and take chances, the best thing to do seemed to be to retrace our steps and go back into an area which would give more or less the same test conditions but without risk of the possible embarrassment of getting stuck in the ice for the winter."

Captain Pullen: "On the eastbound leg of the *Manhattan's* voyage we encountered a variety of conditions which challenged all on board. The first thing that made itself apparent early on was a condition we did not expect to find in the Arctic. *Manhattan* began steaming through pancake ice, circular

fragments of ice with their edges all curled up, looking like saucers – less than a foot thick. It was of a sticky consistency. It clung to the ship's side and moved with the tanker. As she steamed along it got thicker and wider, so ahead of her she was pushing an ever-growing mountain of gelatinous slush until she ran out of power and was stuck fast. The *John A. Macdonald* and the *Staten Island* also became stuck in the slush and stayed there for half an hour. The *Staten Island* was the first to extricate herself, followed by the *Macdonald*, and they loyally came to our assistance. In due course we too were on our way. Only a mile away the ships found completely different, and easier, ice conditions. This will be an additional challenge to ship operations in that area and I don't really know what the solution to it is. Some sort of hull-washing technique might work.

"Most of October was spent in Viscount Melville Sound carrying out ice tests, important work, but boring for those not intimately involved. Our activities there included an attack on an ice island fragment, becoming stuck in slush and problems in locating level ice in which to test the ship's performance. We never did find that level ice which is the reason for the spring test into the eastern Arctic. While the *Manhattan* was in the southern portion of Viscount Melville Sound, Canada's newest and biggest and finest icebreaker, the [*Louis. S. St-Laurent*], came in to provide assistance. I can still picture her, charging up at 12 knots, spray and ice flying from her bow, the flag of Canada stiff in the breeze and Captain Dufour on the bridge. She passed the *Manhattan*[,] relieving the pressure around the great ship so she was able to manoeuvre once again. On the other side our loyal friend, the *Macdonald*, was doing the same for us and you could see the ice ease and crack between the ships. Thus in echelon formation the three ships were able to advance, each making it easy for the other when each ship individually would not have been able to move. It was a classic demonstration of ice breaking technique and the Americans in the *Manhattan* were most impressed. As the Canadian representative on board, I stood on the bridge listening to glowing comments on the Canadian icebreakers' achievements, bathing in their reflected glory, and enjoying it immensely.

"At the eastern entrance to Lancaster Sound, we had a collision between the giant ship and an iceberg, albeit a small one. The captain on the watch had seen this berg ahead and had prudently altered course to starboard to enter a great ice floe in order to avoid the berg. Unfortunately for him, he misjudged his angle of attack and instead of entering the floe the ship caromed off it and was inexorably committed to hit the berg while moving at eight knots. By chance, I happened to be on the bridge with a strange

camera and that's why the pictures are underexposed. Nearly everybody else was aft to lunch. Initial contact produced an explosion of ice fragments which showered onto the bow of the *Manhattan*. As contact continued this ice continued to cascade onto the ship. I fully expected to see the ice breaking bow severely damaged, even crushed, but instead the ship merely rebounded to the right. For 155,000 tons to bounce like that is no mean feat. The iceberg passed close aboard down the *Manhattan's* port side with ship's rudders hard over to swing her stern away from the ice to protect her propellers and rudders from damage. I might also add that all the ice that fell onto the *Manhattan's* fo'c'sle, with great American enterprise, was bagged, wheelbarrowed away, and put into the deep freeze to cool the drinks for those expected on board for the homecoming celebrations in New York.

"*Manhattan's* performance during the voyage demonstrated, among other things, that she had inadequate astern power, which has already been mentioned. A lot of her problems were caused by inexperienced handling, which is perfectly understandable in the circumstances. The ship's machinery never failed. There was no damage to her rudders or her propellers. They were as new when the ship was docked on her return, despite the fact that a great quantity of heavy ice went under the whole length of the ship to be chewed up by the propellers and spat out in her wake. As regards damage, when she was pumped out and riding light, a hole in her plating was revealed, about 350 feet back from the bow and 30 feet under the waterline with the ship at her loaded draft. It was caused by the ship falling onto a heavy floe at 4:30 on a particular morning in Lancaster Sound, which we all remember. The damage was not discovered until the ship was homeward bound in Baffin Bay and they were trying to lighten the ship so she could get into Halifax Harbour. However, no matter how hard they pumped, they couldn't get the waterline in at least one of the wing tanks below sea level – obviously because they were engaged in the fruitless task of circulating Baffin Bay through the ship's pumps. I would like to emphasize that this damage was in the mild steel portion of the old hull. The high tensile steel ice belt was as new, quite undamaged. The lesson is, of course, that ships destined for Arctic service will not be built of mild steel but will have a very high percentage of high tensile steel in their make-up. After the collision with the iceberg described earlier there was no damage to the bow at all. The paint was just barely scratched, not a dent, and that, too, was high tensile steel."

Admiral Storrs: "Well, where does all this lead us? Let me stress again that the object of the *Manhattan's* voyage was not to achieve anything – she did not go up there to penetrate the Northwest Passage. She went up there to gather information and a tremendous amount of raw information was gathered. The ship was strain-gauged throughout; every bit of performance measured; every kind of ice that she penetrated was tested, measured, and they carried back hundreds of yards of cores. All this data is now being digested, evaluated, analysed. Out of this will come the estimate of what kind of ship can operate throughout the Northwest Passage 12 months of the year and from that will have to be done estimates of whether this is going to make economic sense.

"Obviously these are to be very expensive ships indeed. Also, the terminal at the west end is budgeted for at something like half a million dollars, because building a terminal to accommodate tankers and pump oil on board in the middle of the Arctic pack, in the western Arctic, completely unprotected by any kind of offshore islands or land, in the middle of winter, is a most formidable task. Whether this will be economically sensible still remains to be seen. Before a [decision] is taken another test must be done to relate the information obtained in the easiest time of the year to what it is like in the winter. They weren't able to go up in February or early March when the temperatures are really low, so are now aiming for April tests. Although the temperatures aren't at their lowest, the ice is probably at its thickest and they will then be able to evaluate the results they got in the summertime in terms of conditions at a much more severe time of year."

Captain Pullen: "This brings us to some thoughts on the ultimate ship that could go into service if the tanker solution comes about. She would be a vessel with a loaded displacement of some 350,000 tons, or a deadweight capacity of something like 300,000 tons. She'd be about 1,200 feet long, nearly 200 feet wide and draw 85 feet of water. She would generate at least 100,000 shaft horsepower – probably on two screws. She'd have twin rudders, a built-in heeling system to break her loose in the event of really severe conditions, possibly some form of hull-washing, and a helicopter deck. She would probably not carry helicopters as a matter of course but they would be flown on board when required. The cost of this great vessel would be between 60 and 70 million dollars, which can be compared to about 30 million for the same sort of tanker operating in the temperate zones. Icebreakers like the *Macdonald* and the [*St-Laurent*], but very much bigger and more powerful, will be required. They will be there to assist these great ships on those

hopefully rare occasions when they become temporarily beset. They will be there to police, to keep a lookout for pollution, for search and rescue, for disasters of any sort."

Admiral Storrs: "Now suppose it is decided that this operation is practical in technical terms, suppose it is decided that it's acceptable and feasible in economic terms. Where do we go from there? Conditions in the winter are unspeakably appalling. Quite apart from the ice that's been described earlier, you have, of course, continuous darkness for a good deal of the time, gales of about 60 knots or so are not infrequent, the average temperature in the coldest part of the year is 40 below and it goes down to 60 below, and the whole thing is really pretty bleak. Can ships really maintain this kind of service? If we get up to shipping something like a million barrels a day or more, there are going to be needed 26 or 30 odd tankers and on any one day there would be six of these great vessels of 300,000 tons or so in the Canadian section of the Northwest Passage. What are the dangers? Well, I think enough is known and will be known about the requirements for ship construction to withstand the kind of conditions described[,] and I don't think there's very much danger of damage or serious damage that would cause fracturing of the hull from the ice itself. We would expect that the people on board are competent to handle and navigate their ships in this kind of condition. There will be the proper aids to navigation, there will be hydrography. The greatest dangers are those that you find anywhere else, the danger of collision and the danger of navigational error and stranding.

"There isn't an awful lot of risk of collision. The figures quoted are only a fraction of the number of ships travelling around in the Gulf of St. Lawrence or on the coast. Stranding from navigational error is not really a serious risk. The navigational problems of the Arctic are not too severe. Given reasonable aids to navigation, and proper equipment on board, there should be little risk of accidental stranding. There is always the risk that these great ships may become beset for a day or two, or longer, and that with the ice under constant motion at certain times, then the ship could perhaps be carried into shallow water and perhaps forced aground. I would think that the complete breakup of a ship is unlikely. Don't forget that in the Arctic the presence of the ice exercises a smoothing effect. You don't get the tremendous seas for instance that caused the break-up of the *Arrow* down in [Chedabucto] Bay. This possibility of becoming stuck in the ice with the risk of driving ashore is one of the reasons why there will have to be ice-breakers.

"Now where does this leave us? One of the conclusions that seems to be fairly apparent out of the *Manhattan's* experience is that there are three fairly distinct zones in the Arctic during the more severe times of the year. Up as far as Resolute is an area where the predominant feature is winter ice. There isn't much second-year ice. Once inside Lancaster Sound there aren't many bergs, there is rarely any multi-year ice and, when there is, it is not in any great quantity. On the whole, the ice conditions are relatively easy because winter ice is a lot softer than second or multi-year ice. From Resolute west to the entrance to Prince of Wales Strait through Viscount Melville Sound you find a more severe set of conditions. A great deal of old ice drives in through M'Clure Strait from the west and sometimes does not clear away for years on end. Nevertheless, it is somewhat sheltered by the islands and sometimes, in the summertime, fairly open ice conditions and open water do develop. Severe as it is, it isn't nearly as bad as it is to the westward. The characteristic of the north coast of Canada, past the Mackenzie Delta, and along the north coast of Alaska is that in the summertime the Arctic pack moves away to the northward and you have a fair amount of open water on the coast. But in the winter, with prevailing northwesterly winds, the Arctic pack is driven down onto the coast. There are no off-shore islands to form a protective barrier and the ice is subjected to pressures generated by winds blowing over hundreds of miles of Arctic Ocean icefields.

"It seems clear that, given the technology of ship construction and of ship operation today, winter navigation for a very extended season, if not for the whole year, is within our capability as far west as Resolute. From Resolute to Banks Island or the entrance to Prince of Wales Strait, a reasonable consensus is that it's probable, no more than that. From Banks Island west, the optimists think that it's probable, but many people who know what it's like wonder if ever it will be possible for surface vessels to travel along the more exposed parts in winter. From our own domestic point of view, the results are encouraging because already today there are mineral resources in our eastern Arctic waiting to be developed. If surface navigation to the eastern Arctic is possible for even nine or ten months of the year, then it looks as if the development of these resources in the Arctic is already within our grasp.

"Before any such movement takes place we must provide the facilities and the kind of support that passage of these ships will need through our Canadian Arctic. First and foremost this involves the production of charts, because a large part of this route is unsurveyed at the moment. There are a few reconnaissance surveys but they are fairly sketchy and something a lot better than that is going to be needed for safe passage. So the first step is

hydrography and the production of charts. Next is the installation of aids to navigation of a greater or less degree of sophistication. The navigational problems there are not too serious but we must make 100 per cent sure because of the tremendous penalties of failure on this route. The aid to navigational systems which is installed must be a very good one. Additional ice reconnaissance will be needed though this will be essentially a strengthening and extension of the system that we now have for providing ice information to mariners in the Arctic during the summer season. Finally, we must have icebreakers to provide rescue service, not to actually escort these ships through the ice because they must be able to do it on their own, but to get them out of trouble when they get into it. Inevitably these great vessels will get stuck now and again [and] somebody has to get them out, because when they do get stuck there is the risk of disaster. These icebreakers must be able to do the job under all the conditions that can be foreseen, they must certainly be of a kind we have never seen before in this country, of formidable size and horsepower.

“Whether or not Humble Oil decides to go for tankers on this route, the voyage of the *Manhattan* has shown that the use of sea transportation for the development of resources in our own part of the Arctic may be just around the corner rather than a vague dream for the future.”

10

Cruise Ship Completes Epic Voyage Through Northwest Passage: The 1984 Voyage of M/S *Lindblad Explorer*

Thomas Pullen*

On September 11, 1984, the M/S *Lindblad Explorer* slipped around Point Barrow, Alaska, into the Chukchi Sea, and into the record books. She had just completed a transit of the Northwest Passage, and in doing so became the first passenger ship to accomplish the feat. She did not “conquer” it – any such claim would be an affront to a polar environment which rarely relaxes its unforgiving and icy grip. But 23 days out of St. John’s, Nfld. [Newfoundland], and three days ahead of schedule, she emerged undamaged, undaunted and triumphant. Seventeen days later she completed her voyage at Yokohama.

The records will list this as the 33rd complete transit of the passage since Roald Amundsen first completed it in his sturdy little 47-ton *Gjoa* in 1906. Indeed, to mark the occasion, *Explorer* took the same route, visiting Gjoa Haven on King William Island where the great Norwegian explorer passed two years. It is also another step, and a significant one, in the growing use by ships, domestic and foreign, of our northern waterways.

For this polar voyage our ship was flying the unfamiliar black, yellow and green colours of the Bahamas. Her officers were Swedish, and very good too, while the Filipino crew impressed everyone with their efficiency and

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cheerfulness in what to them were abnormal conditions. The master, Hasse Nilsson, had been in command for 12 years of truly global exploration with emphasis on Antarctica where cruising expeditions were pioneered. Since then more than 40 south polar visits have been logged. Antarctic pack-ice, however, is no match for our Arctic variety.

Lindblad Explorer bears little resemblance to any other cruise ship. Compared to most she is small, but this confers special advantages. Likely the most significant is her shallow draft of 15 feet, enabling her to probe bays, rivers and small ports barred to her much larger sisters. Displacing only 2,500 tons and 250 feet overall, *Explorer* has been strengthened for ice navigation with a double hull and extra plating. She has a cruising speed of 14 knots and a remarkable range of 6,000 nautical miles. Her accommodations provide for 98 passengers in cabins that could be classified as comfortably adequate, but hardly up to "Love Boat" standards – but then she is an expedition ship with somewhat different objectives.

Catering, however, was first class, particularly considering the cramped galley facilities. Wind and waves had to be unusually severe to prevent intrepid "Lindbladders" from swooping en masse like gannets to the dining saloon when meals were proclaimed. There were other distinctions. A scheduled lecture on, say, "Tubenoses and Salt Glands" would command a packed house of entranced bird lovers, but assuredly would produce nothing but yawning indifference on board the "love boats" of our time.

Planning for this 1984 odyssey began in 1982. Factors governing this particular attempt included careful timing so *Explorer* would benefit from the most favourable ice conditions along the most suitable route, one acceptable to Canada's regulatory and operational authorities.

As word spread that such a bold venture was in the works, as far back as 1982 enthusiastic veterans of other cruises promptly booked space for this once-in-a-lifetime experience. The ship was fully booked a year before the attempt. In the months leading up to sailing day there was a waiting list long enough to fill the ship thrice over.

So it was, then, that 98 camera-encumbered passengers embarked in St. John's on August 20. Fifty-eight were Americans; there were seven each from Australia and Germany, six from Britain and five Canadians. The remainder included nationals from Norway, Mexico, Japan, Austria, Switzerland and Sweden. The oldest at 87, and three others in their eighties, set an example for enthusiastic participation. Always among the first ashore when the rubber Zodiac fleet hit the beaches, they were scrambling over rocks and kelp

and then up and away across the beckoning tundra. The youngest passenger was 22, and the average age 66.

At 3 p.m. *Explorer* slipped her lines and manoeuvred unaided into the centre of a fog-shrouded harbour. To a cacophony of whistle blasts from every ship in sight, *Explorer* sailed slowly out of St. John's, gliding past famous Cabot Tower atop Signal Hill, invisible far above in the swirling mists. Then, as the ship began to lift and fall slowly to the cold, gray swell, the rock-bound cliffs of Newfoundland were swallowed by the fog. We were alone in the North Atlantic.

* * *

Our course was northerly and would be so for days as we climbed the "latitude ladder" for nearly 1,600 miles. Those early days were intended for emergency drills, ship familiarization, meeting the staff and ship's officers, and generally settling in. Our first port of call on August 23 was [Narsarsuaq] on the southwest corner of Greenland, and later at nearby [Narsaq], where [Erik] the Red established the first European settlement in 982 AD.

Most passengers were unaware of it but our first encounter with ice came as we neared the coast during the night. Ahead lay heavy chunks of "storis", hard old blue ice carried by the current down the east coast of Greenland and around notorious Cape Farewell, its southernmost tip, then to be borne north and posing a significant threat to shipping. In the darkness, in fog, with searchlights probing the area directly ahead and on either bow, with radars hard at work, *Explorer* sidestepped all this ice, any piece of which could have inflicted serious damage.

Two days later and farther up the coast, at Itivdlek Fiord, a day was spent "tundra rambling". Our expedition leader, Michael McDowell, an Australian with many years of cruising experience for Salén Lindblad, which is the operating company, tried to find some point of interest every day or so to get people ashore for exercise and visits to these highlights. Later we visited the village of the same name at the entrance to the fiord. Its chief feature, in the face of litter and junk strewn all about, was the little Lutheran church which exemplified loving care and cleanliness. The interior was strikingly beautiful. Itivdlek also happens to straddle the Arctic Circle, 66° 33' N [North], and the crossing called for a celebration. The upper deck swimming pool was filled with salt water and ice, while selected brave individuals exposed themselves to cardiac arrest as they plunged and frolicked. More prudent types marked the occasion from afar with champagne.

Following a visit to Jakobshavn for fuel to see us the rest of the way to Japan, our course was shaped northwesterly on a direct line for north Baffin

Island. Being able to steer such a course was the first indication that we were being blessed with unbelievably easy ice conditions. Customarily, shipping is obliged to take a longer route following the Greenland coast and then do an end-run around the Baffin Bay pack-ice in the northern part of that huge bay. This year it appeared as if that pack had vanished.

And so on August 28, under overcast skies which had dogged our progress since sailing, we made our first contact with Canada at Buchan Gulf and beyond, Cambridge Fiord, the latter a spectacular gash in the rock, both about 100 miles southeast of Pond Inlet. For much of the day we explored the several arms of this rarely viewed scenic wonder. This part of Baffin Island is riddled with inspiring scenery, all seldom visited[,] as the paucity of charted soundings attest. Granitic cliffs rise vertically to heights of 4,000 feet and more; the ship's echo-sounder confirmed that the black waters beneath were almost as deep.

Thence north to Pond Inlet and westward across Eclipse Sound, between Baffin and Bylot islands, still in ice-free waters. We anchored off Nungovik, an Eskimo archeological site. Here Dr. Graham Rowley of Ottawa gave an explanation of the remains of both the Thule and Dorset cultures on a day when, at last, we were blessed by blue skies and warm sunshine.

Continuing north up Navy Board Inlet, an accumulation of wind-driven ice called for some expert ship-handling, and on the afternoon of August 29 we were into Lancaster Sound, eastern gateway to Parry Channel and the Northwest Passage, and westbound at last at 14 knots.

* * *

Of all the creatures to be seen and appreciated during any cruise in Arctic waters, the magnificent polar bear stands supreme in its appeal. We were fortunate to come across seven, some on ice floes, some on land. All of them precipitated what can only be described as a "photo frenzy".

The magic words "polar bear" were guaranteed to trigger a stampede to every vantage point, including the bridge. Amateur and professional photographers with two or more cameras, video recorders, unwieldy tripods and telephoto lenses like gun barrels, would capture the dramatic scene as Captain Nilsson gently edged as close as he dared without spooking the puzzled animals.

On one occasion during a lecture, just when the staff instructor had said Henry Hudson always seemed to have trouble with his crews, a German passenger gazing out the window shouted the electrifying news. Within seconds the lecture room was abandoned, the passengers leaving a trail of overturned chairs and a dumfounded lecturer in their wake. Hudson was not

the only person to have trouble with his people. On this occasion a mother bear and her cub were on a nearby floe sniffing the wind and gazing at this strange intruder. Bears and cameras were almost eyeball to eyeball for an enchanting few minutes in bright sunshine.

Another encounter later involved a lone bear, a giant male, which had just completed a satisfying meal of seal. Bloody evidence on the ice indicated that this was so, for there was nothing left of the victim – it had been consumed, lock, stock and whiskers. This splendid pure white bear was rolling around on his back, feet waving in the air, in a demonstration of unalloyed contentment. An occasional move to get on his feet to peer uncertainly at us, then more happy wallowing. A delightful scene duly recorded on film for future enjoyment.

It should be observed that on these meetings between bear and man, great care is taken not to harass the creatures. It is a rare privilege to be able to see these animals in their natural habitat.

No Arctic cruise would be complete without a visit to that most famous of all historic spots – Beechey Island. It is strategically located off the southwest corner of Devon Island where Lancaster Sound meets Barrow Strait. The island was named by Captain Parry for Lieut. [Lieutenant] F.W. Beechey, RN [Royal Navy], whom he sent ashore in 1819 to make astronomical observations. Since then, every ship, every seaborne expedition to penetrate these waters has visited this famous Arctic rendezvous. They have been doing so for 160 years or more and will continue to do so. It is a very special place. *Explorer* added to the total by anchoring there on August 29 and a flood of red parkas (issued to all passengers) poured ashore to examine this overwintering spot where Sir John Franklin's ill-fated ships *Erebus* and *Terror* passed the winter of 1845–46.

To those among us who were historically minded there was much to see, rather too much as it transpired. The Franklin and Bellot memorials, and what remains of Northumberland House, built by Cmdr. [Commander] W.J.S. Pullen, RN, in 1853, are there of course; so is the mast of the yacht *Mary*, dating from John Ross in 1851, still standing, though at a drunken angle, serving as a convenient scratching post for passing bears.

A mile along the beach are the four grave markers of men of the Franklin era who died on duty. These have recently been in the news as scientists, to some of whom nothing seems sacred, have exhumed at least one body to satisfy themselves that men died of pneumonia in the polar regions as elsewhere – then and now. It is hoped the results of all this questionable activity can be justified.

Not only are 19th Century graves being disturbed, [but] 20th Century ones are being added.

Besides the Franklin memorial there is an assortment of recent additions. Someone with a cement mixer, a supply of plaques, plus an excess of misplaced zeal, has added five modern memorials which bear no relation whatever to the sad and sombre significance of this polar place.

The sooner Beechey Island is declared an historic site, either by the territorial government or the national authority, the better. There was much unfavourable comment from knowledgeable polar people, including members of the Explorers' Club.

* * *

Drifting pack-ice appeared to be blocking our path across Barrow Strait following a visit to Resolute Bay. On closer approach however, it became possible to outflank it by diverting to the eastward, thereby gaining access to Peel Sound west of Somerset Island and to ice-free waters once again. A routine run south of 60 miles brought us a side trip into Bellot Strait from the west. This narrow and notorious waterway boasts a tidal stream which, on a full flood or ebb tide, can attain speeds of eight knots and move with it a tumbling mass of ice floes. The combined effect of these forces poses a risk to any ship trapped in the middle.

Bellot Strait got its name from the French naval officer who found it in 1849 during the Franklin search era of Arctic exploration. It was here M'Clintock's little ship *Fox* was very nearly wrecked on a rock in 1858 by the rushing waters. Henry Larsen's RCMP [Royal Canadian Mounted Police] schooner *St. Roch* was similarly threatened in 1942. She too was swept through helplessly in the tidal rush and ice, nearly coming to grief on the same hazard.

In 1957, HMCS *Labrador*, attempting to transit the strait from the east, suddenly found herself in the grip of the current and in rapidly shoaling water. She was within seconds of grounding. Only prompt use of her powerful engines extricated her from disaster. She was later to survey the strait and identify the exact location of this menace to shipping, naming it Magpie Rock in the process.

Transit of Bellot Strait is now reasonably routine as an alternative route for Northwest Passage voyagers, provided ships take care not to become engulfed in pack-ice in the process. Navigational aids were installed by the navy at that time (1957) and by using these *Explorer* was able to sweep serenely past Magpie Rock without difficulty, then anchoring off Fort Ross at its eastern entrance.

Passengers had no sooner landed for a tundra ramble and to look at the buildings than Keith Shackleton, staff member on lookout duty atop the high ground nearby, spotted a polar bear about a quarter of a mile away, "... and he is coming in our direction in a rather determined fashion". Thus this excursion ashore was brief as everybody had to be corralled and sent back to the ship. (Shackleton, by the way, is a relative of the great Antarctic explorer and is a renowned marine painter.)

Our return run through the strait was uneventful. It is of interest that Zenith Point, a low, gravelly spit of land, marks the northernmost point of continental America. This visit certainly brought memories for me, since 27 years earlier I had commanded the naval icebreaker *Labrador* during the survey and the near-miss on that wretched rock.

* * *

Continuing south we reached the shallow and navigationally challenging part of our route – James Ross Strait, between Boothia Peninsula and King William Island. The date was September 1.

This waterway had been transited before by at least nine other vessels, all small, but some drew more water than *Explorer*.

The sparse and inadequate soundings on the only chart indicated that most of those who had preceded us had had little interest except getting through. The Canadian Hydrographic Service, however, had supplied us with a most helpful plotting sheet.

At dawn, we anchored in the misty northern approaches and sent away a rubber Zodiac under Chief Officer Leif Skog. It was equipped with a radio, echo-sounder and radar reflector. For hours, bobbing about in the rough waters, track soundings were obtained and radioed to the ship whose radar exercised the necessary control. When all was done, a navigable 14-mile channel with a minimum depth of 30 feet had been determined. Equally important, these data were committed to the plotting sheet for use by those who might come after.

This is what polar navigation is all about – or should be. This was a substantial contribution, for until then the maximum depth was thought to be less than 20 feet.

During this activity the Canadian Coast Guard ship *Camsell* helped by contributing her track soundings. She had come from the west, via ice-free Victoria Strait, to provide us with icebreaker support in case of need.

Every day was full of interest and most passengers made the most of it. Not only was it possible to watch and record wildlife of every sort, majestic scenery and dazzling varieties of ice, there were lectures and talks morning

and afternoon – 43 of them altogether. Subjects embraced such topics as “Glaciation: Causes and Effects”; “An Introduction to the Pinnipeds”; “Bend, Fold and Mutilate: Metamorphic Rocks”; and “Bird Migration and Navigation”. In addition to the expedition leader, there were 10 staff members, all with top-notch qualifications in a variety of disciplines – geology, glaciology, biology, ornithology, archeology and paleontology, to name some. There were also professionals in history, art, ice, diving and photography. Graham Rowley, the other Canadian on staff and 1963 Massey Medallist, contributed his special knowledge and expertise in Arctic anthropology and archeology.

During a visit to one settlement, a little girl said she would give anything to go on a voyage such as ours, prompting a response from one passenger: “It’s not all that rosy, you know. We have to go to school too.”

Not only did the staff give lectures, [but] they also had to answer questions, hundreds of them, day and night. (“What are the chances of running into a World War II floating mine in these waters?”) Staff members also drove the Zodiac rubber boats between ship and shore. Loading and unloading at the gangway in a swell, or on a wave-pounded beach, called for great skill, care and tact. Some passengers were not as limber as they would have liked, but the ritual was so well developed that no untoward incident occurred during the 23 occasions the Zodiacs were used.

* * *

The transit of James Ross Strait had consumed only half a day although three had been allocated for its safe navigation. With time in hand it was possible to make an unscheduled visit to the hamlet of Spence Bay at the head of the bay of the same name. The icebreaker *Camsell* was already at anchor there and we were able to exchange views as to our prospects farther west where ice lay across our track.

Next came Gjoa Haven on the southwest tip of King William Island; here we inspected the snug cove where Amundsen and his great-hearted crew of six wintered 80 years before. Following the safe navigation of narrow and tortuous Simpson Strait and Requisite Channel, brief stops were made at [Todd] Island, where stragglers from Franklin’s expedition were said to have perished; at Anderson Bay, site of an Eskimo summer camp; and finally, at Cambridge Bay. The last-named is by Arctic standards something of a metropolis, being a DEW [L]ine station and also a key administration, transportation and supply centre. The skeletal remains of the *Baychimo* (originally *Maud*, a later and less successful endeavour by Amundsen) were inspected.

All these calls at settlements were very successful. An enthusiastic welcome was given to all Lindbladders, many of whom were invited into homes and given a warm reception. Drum dances, Inuit games, tours, food and drink were all laid on. The amount of money which changed hands in return for local crafts must have totalled many thousands of dollars. In return, the locals were invited to come on board. In what is very much an adult environment in the confines of a small ship, it was an uplifting experience to hear the squeals and giggles of children rushing about in strange surroundings, or the ecstatic expressions and bulging cheeks as they devoured assorted delights from the galley – especially from the pastry chef.

Those were all happy times and surely proof that, if properly handled, and timely notice is given when possible, future visits can only bring mutual goodwill. They are events for both the visitors and the visited.

* * *

With renewed reports that difficult ice conditions awaited us off Alaska, where onshore winds can jam the pack-ice onto the coast with unforgiving power, it was decided to forego a number of planned visits and run for it. Better to achieve the Passage, albeit early, than ruin our chances by lollygagging about taking in the sights and then find the way out blocked. By September 6 *Explorer* was off Cape Parry, steering across the bay in open water, and planning to pass by the famous Smoking Hills. The day was clear and bright, windless and warm – well above freezing.

During the morning, *Camsell's* helicopter flew overhead to shatter our illusions by announcing that we were heading up a blind alley; not far ahead were nine miles of impenetrable pack-ice – impenetrable for the likes of us that is. It was suggested we retreat, swing north, then west, to reach easier conditions. This we did, eventually coming upon *Camsell* leading two little ships, the Canadian Coast Guard Ship [*Nahidik*], designed for the Mackenzie River and not working the heavy pack-ice, and the river tug *Angus Sherwood*. We joined this westbound procession because the conditions were more than we could manage alone at that time. The ice extended only six miles or so and then once more we were in open water and westbound, leaving the other ships to go about their business.

After a few hours anchored in Herschel Island's Pauline Cove, for a last tundra ramble on Canadian soil, *Explorer* hurried westward past Barter Island (U.S.) into Alaskan waters. Skies became dark and overcast, fog and mist moved in, and as we progressed there was a noticeable increase in the ice cover. During the night of September 9, we anchored, for the second time, to assess the situation and await daylight. It seemed that conditions were

deteriorating the farther along the coast we advanced, so next morning we weighed anchor, reversed course and began a long retreat.

It is very easy to blunder too far into pack-ice and find it is impossible to manoeuvre, to turn, or retreat. The plan was to regain easier conditions and then close the coast and pick our way along, inside the heavy grounded ice, yet as near to the land as water depths would permit. Some of the floes were very heavy indeed, 20 feet or more above the sea and grounded in 60 feet.

Our course was eventually altered westward again. At one stage Captain Nilsson tried to pass inshore between two islands to determine if there was sufficient water depth. There was not, as the mud churned up by the propeller bore witness. One foot under the keel is barely enough. Later on, a second attempt was made, this time successfully, and we bowled along in fine style in open water.

It soon became obvious *Explorer* was safely beyond this well-known “choke point” for ice and, as our ice maps indicated, there was nothing but clear sailing all the way to Barrow. How quickly do fortunes change – from some concern about the formidable barrier confronting us, to open water and brightening skies a short while later. It had been an excellent job of ice navigation by the ship’s officers and a satisfaction to everyone to have got through unaided.

* * *

By midday the ship was anchored off the little community of Barrow and there was a well-deserved cork-popping celebration to mark completion of the Northwest Passage. Congratulatory messages from all over the world began to flood in. Interest in our progress had been intense, but nowhere more so than in Sweden and New York. After the tension of previous weeks there was a very noticeable easing of strain. The real celebration, however, was scheduled to take place later in Tokyo upon the real completion of the Northwest Passage.

After embarking a pilot, a requirement while we were in U.S. waters, *Explorer* continued on her way, but now our heading had a strong southerly component as historic landmarks passed down our port side – Cape Franklin, Icy Cape and Cape Hope. On September 13, with Cape Prince of Wales, westernmost point of continental America[,], faintly visible on our eastern horizon, we anchored off Little Diomed Island.

This rocky islet, less than a mile in any direction and 1,300 feet high, boasts only a tiny settlement, Iglood, of 125 Inuit. A mile or more to the west lies the brooding presence of the Soviet Union’s Big Diomed. Between the two runs the International Date Line. When it is Saturday on the smaller

island it is simultaneously Sunday on the larger where, because of this, it would be a great mistake to think the Russian residents get a head start on their hymn singing. Nowadays there is no communication or fraternization between these two inhospitable outposts of the two super powers.

Years back the Soviets relocated the residents of Big Diomedes to Siberia. This caused understandable distress among those folk left on Little Diomedes, for the population had been as one. The bigger island is three times or more larger in all directions, and 1,667 feet high. The only human presence there now is Russian, and military at that. To stray across that date line into Soviet waters is to invite trouble in a hurry.

* * *

We maintained a southerly heading into the Bering Sea[,] in the course of which the ship was buffeted by gale force winds as a number of fruitless attempts were made to visit wildlife habitats – fur seals, walrus and the like. Sea and swell ruled out any thoughts of beach landings by our Zodiacs. On September 17, conditions improved and in warm sunshine and calm seas a successful visit was made to St. Paul Island in the Pribilofs.

Many thousands of playful, curious fur seal pups were porpoising just off the landing site and mingled with our fleet of boats, to the delight of the passengers. Later, en route to nearby St. George Island, we came upon a huge concentration of short-tailed shearwaters feeding greedily on the krill-rich waters. These birds migrate to southern Australia. In preparing for their long flight they had stuffed themselves to the point where trying to fly on our approach was a futile fluttering of overloaded wings.

Next, the Aleutian Islands with short visits to the uninhabited neighbouring islands of Gareloi and Semisopochnoi, both volcanic, to inspect the sea otters.

On September 20 our pilot left us at Shemya, and then the final run south through more turbulent seas for four days to Hokkaido Island, north Japan, for a brief visit to Kushiro.

Then, on a warm, sunny September 29 morning, right on schedule, *Lindblad Explorer*, dressed overall with bright signal flags and flying the Bahamian and Japanese colours, entered Yokohama harbour to berth at midday.

After 8,920 nautical miles and 40 days, the voyage was safely accomplished, navigation of the Northwest Passage achieved, and by the first passenger ship to do so.

What is also significant, *Lindblad Explorer* became the first ship to sail across the top of America from Atlantic to Pacific and all the way to the Orient,

which in fact was man's dream for five centuries. Of all the 32 ships and small craft which preceded us since Amundsen, none ever reached the "spice islands" or the "riches of the Indies". This voyage stands alone as a feat unequalled.

11

U.S. Coast Guard Cutter *Polar Sea*, Arctic East / West Summer 1985 Operations

Captain J.T. Howell, U.S. Coast Guard*

SHIP'S OPERATIONS

A. VESSEL OPERATIONS

1. Narrative Summary

a. General Operations.

- (1) CGC POLAR SEA departed Seattle at 1017V on 06 June for Arctic East Summer/Arctic West Summer 1985 (AES-AWS 85). Upon departure, POLAR SEA CHOPPED to COMPACAREA [Commander Pacific Area] and remained under their operational control until departure from the Panama Canal.
- (2) Specific tasking for AES/AWS-85
 - (a) Annual Greenland resupply operations (PACER GOOSE 85) sponsored by Headquarters, USAF [U.S. Air Force] Command under the operational control of Commander, Military Sealift Command Atlantic (COMSCLANT).
 - (b) Recharging the RACON located on Mehlmania Island, Sondre Stromfjord, Greenland.
 - (c) Provide support to the U.S. Army for OPERATION RED ROCK in vicinity of Thule, Greenland.

* Original held at the National Archives and Records Administration, College Park, Maryland.

- (d) Provide platform and support in the Beaufort Sea to the Naval Ocean Systems Center (NOSC) for oceanographic data collection and related activities.
- (e) Provide platform and support to the Maritime Administration for the collection of data relating to ice and environmental properties in the Beaufort Sea and Prince William Sound. The actual data collection was to be accomplished by scientific personnel from ARCTEC, Inc.

b. Seattle to St. John's, Newfoundland

- (1) Transit to the Panama Canal was uneventful arriving at the Pacific Terminal on 18 June. Panama Canal Authorities and Admeasurer personnel boarded POLAR SEA at the sea buoy. The ship's copy of the Panama Canal Tonnage Certificate which had been left with Panama Canal Officials in April 1984 was returned. Upon completion of the boarding, POLAR SEA proceeded to Rodman Naval Station and moored.
- (2) POLAR SEA CHOPPED to COMLANTAREA [Commander Atlantic Area] upon departing Rodman Naval Station on the morning of 20 June. The transit through the canal was uneventful, arriving at the Atlantic Terminal early in the morning on 21 June. The transit to St. John[']s Newfoundland was via the Windward Passage. On 23 June, as POLAR SEA was approaching the Windward Passage, information was received via the American Red Cross that a family member of one of the ship[']s personnel was seriously injured in a motor vehicle accident. Through coordination between the Miami Operations Center and the Coast Guard Liaison Officer at Guantanamo Bay, a humanitarian evacuation was executed. A Coast Guard helicopter being used on law enforcement patrol in the area was used for the transfer.
- (3) A U. S. Navy target drone was recovered in position 29-25N [North] 68-03W [West]. The appropriate U. S. Navy command was notified. They made arrangements to have custody of the drone [transferred] to U. S. Navy personnel upon arrival at St. John[']s, Newfoundland.
- (4) On 26 June, during the transit to the east of Bermuda, the winds freshened. Several sailboats that were in a race from the East Coast of the United States to Bermuda began reporting

difficulties. POLAR SEA made an effort to assist the S/V SPINDRIFT who reported one of their crew was experiencing symptoms of a heart attack. POLAR SEA diverted to their position which was approximately 60 NM [nautical miles] to the south. Shortly after diverting, good communications were established between the S/V SPINDRIFT and Bermuda Radio. S/V SPINDRIFT reported it would arrive in Bermuda before a rendezvous could be made. POLAR SEA resumed base course. POLAR SEA was diverted late that afternoon by COMLANTAREA in an attempt to intercept a high interest vessel. Contact was never made with the vessel. After five hours, POLAR SEA was directed to resume normal transit. The remainder of the transit to St. John[']s was uneventful, arriving there on 29 July.

c. St. John[']s, Newfoundland to Thule, Greenland.

- (1) POLAR SEA moored at St. John[']s at 290821 NFLD [Newfoundland] time at fuel pier 23. Fueling was completed by early evening and shifted berths to Pier 18. AVDET 107 was embarked (with CG-1367 and CG-1393) on 1 July. POLAR SEA departed St. John[']s on the morning of 2 July enroute Sondre Stromfjord.
- (2) On 4 July POLAR SEA CHOPPED to COMSCLANT in position 60-00.0N 53-17.8W. POLAR SEA arrived at the entrance to Sondre Stromfjord on 5 July in company with the supply ship M/V [GREEN WAVE]. The RACON on Mehlmania Island was not operating. The M/V [GREEN WAVE] proceeded into the fjord on the range structure. Flight quarters were held that afternoon to transport the RACON servicing team and replacement batteries to the RACON structure. The recharge of the RACON and repainting of the range structures were accomplished within four hours. The intensity of the RACON signal was considered weak after recharging. On the following day the servicing team returned to the RACON site to rewire the RACON to the batteries. The wiring inspection on 5 July revealed a marginal wiring system. Upon completion, a strong signal was received at 10 NM. During the rewiring, cleanup of approximately 30 old expended batteries was accomplished by vertrep [vertical replenishment] from the site to POLAR SEA. Deteriorating

weather during the late afternoon terminated further activity on Mehlmania Island. POLAR SEA departed the area enroute Gronnedal, Greenland.

- (3) Transit to Gronnedal was uneventful[,] arriving there on the morning of 8 July. POLAR SEA anchored one mile west of the pier in 25 fathoms of water. The ASB [a type of barge] and LCVP [landing craft, vehicle and personnel] were used to transport personnel both for official calls and liberty. POLAR SEA weighted anchor midday on 9 July enroute Thule.
- (4) Four ARCTEC Inc technicians who had joined POLAR SEA in St. John[']s to complete various instrument installations, had completed their work on 9 July. On 10 July, POLAR SEA diverted to the vicinity of Godthaab and debarked the technicians via helicopter. Permission to fly into Godthaab was requested and received from Island Commander (ISCOM) while at Gronnedal. Later that afternoon, as POLAR SEA passed by Sondre Stromfjord, the remainder of the abandoned batteries were recovered by helicopter.
- (5) Late in the evening of 11 July, POLAR SEA entered Baffin Bay in ice free waters. The middle route to Thule was decided upon based on current ice information and historical ice data for that particular time of year. Two small concentrations of sea ice were [encountered] during the transit, both of which required only a minor deviation from track to avoid. POLAR SEA anchored .5 NM off Delong Pier on 13 July. The harbor was ice free with the exception of numerous growlers and bergy bits originating from the glaciers in Wolstenholme Fjord. While numerous, they imposed no restriction to navigation for unescorted ships. These conditions were to remain unchanged for the entire time POLAR SEA was at Thule.
- (6) Support to the U. S. Army for Operation Red Rock entailed initial survey of Nuna Beach. The overall scope of the operation was the tasking of a U. S. Army unit in the summer cleanup of an abandoned site at Nuna Beach and various sites inland. The job included the transport of fuel drums and various abandoned equipment to a staging area at Nuna Beach, located at the head of [Wolstenholme] Fjord, approximately ten miles north of Thule. The debris was transported from Nuna Beach to Thule by Army LCM's

[landing craft, mechanized]. The LCM's were delivered by the M/V [GREEN WAVE]. A detailed survey of Nuna Beach and its approach was conducted on 15 July using the ASB. The survey team included personnel from POLAR SEA and an advanced Army team. An acceptable approach was found and documented by the U. S. Army personnel. The LCMs were water born on 16 July and actual cleanup efforts began on 17 July. For the remainder of the operation, POLAR SEA provided communication support to the LCM's during their transit to and from Thule and Nuna Beach.

- (7) A one day good will cruise to Wolstenholme Fjord for 150 U. S. A. F. personnel was conducted on 20 July. In addition, an aerial reconnaissance of the area surrounding Thule was conducted that same day upon request by the U. S. A. F. The intent was to locate abandoned sites or debris stockpiles within the surrounding area of Thule. One additional flight in support of the U. S. A. F. was conducted on 27 July.
- (8) POLAR SEA med-moored to Delong Pier on the morning of 29 July and refueled. POLAR SEA remained med-moored until departure from Thule on 1 August.

d. Thule, Greenland to Prudhoe Bay, Alaska.

- (1) POLAR SEA departed Thule on the morning of 1 August enroute Prudhoe Bay, Alaska via the Northwest Passage. Embarked at Thule were three technicians from ARCTEC, Inc, 2 civilian Coast Guard employees and one representative from the Naval Civil Engineering Lab at Port Hueneme, California. Actual data collecting was not scheduled for any portion of the transit.
- (2) POLAR SEA CHOPPED to CCGDSEVENTEEN [Commander Coast Guard District Seventeen] at position 74-54.1N 077-00.0W. Arrangements had been made by the United States and Canada to have two Canadian Coast Guard Officers join the POLAR SEA at a designated rendezvous point prior to commencing the transit. The two Canadian Coast Guard officers were embarked onboard CCGS JOHN A. McDONALD [sic]. POLAR SEA rendezvoused with JOHN A. McDONALD [sic] at the entrance to Lancaster Sound early on the morning of 2 August. The transfer to POLAR SEA was accomplished by using JOHN A McDONALD's [sic]

helicopter. Upon embarking the personnel, POLAR SEA proceeded to Resolute, NWT [Northwest Territories] where two additional Canadian guests were to be embarked. The transit through Lancaster Sound was ice free, encountering light ice conditions 15 NM south of Resolute early in the morning of 3 August. Mr. Greg MCAVOY, Intera Inc.[.] and Mr. Ruddy COCKNEY, District Manager Indian Affairs North, were embarked on the afternoon of 3 August by the JOHN A. McDONALD's [sic] helicopter. In addition, Mr. Larry SOLER, INTERA Inc, also came aboard and gave a briefing on the ice conditions that were to be expected for the remainder of the transit through the Northwest Passage. On conclusion of the brief, he was debarked by the JOHN A McDONALD's [sic] helicopter. Current ice information revealed that the most desired route would be to transit the northern portion of Viscount Melville Sound until Dundas Peninsula, Melville Island, then south to the entrance of Prince of Wales Strait. POLAR SEA departed the vicinity of Resolute late on the afternoon of 3 August. POLAR SEA arrived off Dundas Peninsula on the morning of 5 August after an uneventful transit from Resolute. Transit across Viscount Melville Sound to the entrance of Prince of Wales Strait took three days of heavy icebreaking arriving at the entrance to Prince of Wales [Strait] at midnight, on 8 August. The ice edge was transited south of Princess Royal Islands [sic]. The remainder of the Northwest Passage was made in ice free water. Late on the evening of 7 August, prior to making the entrance to Prince of Wales Strait, POLAR SEA was overflown by a Canadian twin otter from which 2 canisters containing a Canadian flag and a letter to the Commanding Officer opposing the Northwest Passage transit were dropped. One cannister fell short of [its] mark while the other one landed on the deck. After a series of low passes, the aircraft departed the area without further incident.

- (3) Arrival at Tuktoyaktuk N.W.T. for debarking the Canadian guests was scheduled for 9 August. However, heavy ice conditions were [encountered] after transit of the Amundsen Gulf. SOA [speed of advance] was reduced to 2-3 kts [knots], with arrival in the vicinity of Tuktoyaktuk being made on the

morning of 10 August. Plans had been made to have a Canadian Coast Guard helicopter remove the guests. However, due to operational commitments, the helicopter was not available on the morning of 10 August. One of the Canadians had prior commitments that could not be delayed any further. He arranged via radio for the charter of a commercial helo [helicopter] the afternoon of 10 August. All guests departed on that particular flight.

- (4) POLAR SEA proceeded towards Prudhoe Bay upon departure of the Canadian guests. Shortly [thereafter], it was discovered that the starboard hub was leaking hydraulic fluid. While the leakage was abnormal, it imposed no serious restriction on ice breaking capabilities. POLAR SEA arrived in the vicinity of Prudhoe Bay, Alaska on 12 August. The remainder of the guests that were onboard for the Northwest Passage were debarked at that time. While awaiting for the arrival [of] the next project's personnel, the time was used to accomplish various ships maintenance and repair projects. Five personnel from the Naval Ocean Systems Center (NOSC), San Diego, CA [California] were embarked on 16 August. Departure from Prudhoe Bay enroute the eastern Beaufort Sea was made on the afternoon of 16 August.

e. Beaufort Sea Operations.

- (1) The NOSC project was scheduled from 16 August - 16 September. The overall scope of operations was to conduct CTD [conductivity, temperature, depth] casts from the eastern Beaufort Sea westward to the Chukchi Sea. Due to heavy ice conditions in the eastern Beaufort Sea, the CTD casts were required to [begin] at the 134W longitude line vice the desired 130W [longitude] line. Generally, the CTD casts were conducted in a North/South creep along predetermined longitude lines. Heavy ice conditions precluded northerly progress at times. Throughout the period, a portable CTD unit was embarked on the ship's helicopters to increase the range and diversity of casts in areas of heavy ice concentrations. On 25 August, one of the NOSC scientist[s] required debarking while in vicinity of Prudhoe Bay due to a worsening medical condition. No special medical requirements were necessary as his condition was not serious.

- (2) The remainder of the NOSC project went according to plan with minor setbacks experienced due to heavy ice conditions in several areas of the Beaufort Sea. On 31 August, an inoperative SALARGOS meteorological buoy was recovered at position 73-09N 151-19W. The buoy had been established by personnel from a now abandoned ice camp in the early part of 1985. The cause of the malfunction was due to polar bear tampering. On that same day, a crewman became ill and required treatment at a shore based medical facility. POLAR SEA temporarily secured CTD casts and proceeded to Pt. [Point] Barrow to MEDEVAC [medical evacuation] that crewman. Transfer was made on 1 September via ship's helicopter. The patient and the attending ship's PYA [physician assistant] were subsequently [transferred] to the U.S.A.F. Hospital at Elmendorf AFB [Air Force Base], Anchorage via commercial carrier. The PYA rejoined the ship on 3 September. The final CTD cast for the NOSC project was completed on 14 September. NOSC personnel were debarked at Pt. Barrow on 16 September.
- (3) Data collecting for the NOSC project was completed on the evening of 14 September. POLAR SEA arrived off Pt. Barrow on 15 September in preparation for the personnel/cargo transfer scheduled for 16 September. The next project involved ARCTEC INC who had arrived in Pt. Barrow on 15 September and were ready to board. Initial plans were to use the ship[']s LCVP to conduct the transfer due to the large amount of bulk cargo that ARCTEC was loading for the upcoming project. However, a gale that lasted from 15-17 September precluded the use of the LCVP due to heavy beach surf. The blustery weather also precluded the use of the ship[']s helicopters. ARCTEC elected to hire a Pt. Barrow based Bell 212 to conduct the transfer of both personnel and cargo. The transfer commenced on the afternoon of 15 September. By that evening, a total of 210,000 pounds of cargo and four personnel had been transferred from Pt. Barrow to POLAR SEA. The Bell 212 was also used to transfer off the NOSC personnel. The remainder of the ARCTEC personnel were transferred using the Bell 212 on 16 September. Upon

completion of the personnel transfer, POLAR SEA departed enroute the Western Beaufort Sea.

- (4) Leg I involved coring [operations] using three different types of units: a gravity core, cone and doppler penetrometer. The project lasted from 16-29 September with nine being conducted. Initially, due to the weight of the cone penetrometer, the support structure was determined to be unable to support that weight. Various modifications to the unit were required. These modifications were made in time to make the cone penetrometer operational in the early phases of the data collecting. Coring operations concluded on 25 September. The remaining portion of Leg I entailed scanning sonar tows in the vicinity of the Barrow Canyon. The planned outline for this operation was initially [laid] out in a series of predetermined legs. However, upon arrival at the project site the ice pack had moved south into this area. The ice concentrations were generally 5-8/10ths first year thin/medium with large floes. This required constant modifications to the towing patterns. While straight legs averaging 8-10 miles in length were desired, this was seldom achieved due to the ice floes. This phase of the project ended on the evening of 28 September.
- (5) Personnel changeout for Leg I and Leg II A was conducted on 29 September in the vicinity of Pt. Barrow. Good weather allowed the transfer to be conducted using the ship[']s helicopters. The Pt. Barrow Search and Rescue Bell 214 assisted in the transfer of cargo. POLAR SEA departed the area late in the evening of 29 September enroute the Beaufort Sea to an operating area approximately 50-100 NM north of Pt. Barrow. Leg II A's scope of operations involved global load testing and environmental data collecting. As in previous operations of this nature, the operations involved profiling ice ridges and gathering the global load data at the conclusion of the profiling. Leg II A concluded on 5 October with a personnel changeout conducted in the vicinity of Pt. Barrow. Leg II B was conducted from 5-13 October in the same area as Leg II A and under the same operating parameters. Personnel from the Leg II B phase were disembarked in the vicinity of Pt. Barrow on 13 October. Four personnel from ARCTEC INC

remained aboard for the transit from Pt. Barrow to Prince William Sound, where Leg III was scheduled.

- (6) The hydraulic oil leak from the starboard hub that developed on 10 August was required by OPCODE [Operational Control] to be stopped prior to entering Prince William Sound. It was decided that POLAR SEA would make a port call in Kodiak for four days and attempt repairs using the ship's divers. POLAR SEA arrived in Kodiak on 19 October and repair efforts commenced immediately. After four days of repair efforts, the leakage rate was reduced to 1 qt/hr [quart/hour]. This amount was determined to be unacceptable due to the sensitive ecological environment of Prince William Sound. Based on this, Leg III was cancelled and POLAR SEA was directed to return to Seattle and terminate AWS-85 operations. POLAR SEA departed Kodiak on 23 October enroute Seattle.
- (7) During the transit to Seattle, POLAR SEA encountered an intense low off the north coast of Vancouver Island on the early morning of 26 October. The subsequent rough seas resulted in a crewman to lose his balance on the bridge and be propelled into fixed bridge equipment. The individual died shortly after receiving the injuries. The primary cause of death was due to massive head injuries as a result of several impacts to fixed bridge equipment. Two other personnel that were on the bridge at the time of the incident received injuries in their attempt to assist the individual. One [individual] received an injury a few hours later. While a MEDEVAC using a Canadian helicopter was considered, the [tumultuous] seas, adverse weather, and grave unstable condition of the individual precluded the MEDEVAC. The condition of the three other injured individuals did not warrant a MEDEVAC for the given weather conditions. They were attended to by the PYA and two of the injured were transferred to a Seattle hospital on arrival at Pier 37 on 27 October.

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Navigation

A. ICE OPERATIONS

1. The experience level of onboard personnel having sailed in the Eastern Arctic was limited. Consequently, all available reference material,

principally past cruise reports, were studied. Several conferences concerning POLAR SEA's tasking for AES-85 provided excellent ice information and local knowledge of anticipated operations during PACER GOOSE. Becoming familiar with information discussing the historic ice conditions of the eastern Arctic proved very valuable. Ice information from NAVPOLAROCEANCEN [Naval Polar Oceanography Center] proved to be very accurate and timely. NAVPOLAROCEANCEN provided all information requested. APT [Automatic Picture Transmission from weather satellites] pictures of northern Baffin Bay were also helpful in determining the route from south Greenland to Thule AFB.

2. Arctic East Summer/PACER GOOSE Operations.

- a. Limited sea ice was encountered during AES/PACER GOOSE. Based on current ice information and historical ice data for Baffin Bay, the middle route was chosen from Disko Island to Cape Atholl. POLAR SEA encountered sea ice in position 73-00N 62-00W. Due to poor visibility, the size of the pack was not determined. Rather than penetrate the pack, POLAR SEA diverted to the east and within 10 NM had resumed course. Another isolated band of ice was encountered in approximate position 75-34N 67-05W. A slight course change to the west was required.
- b. Of some preliminary concern while transiting the western Greenland coastline was the presence of icebergs. To add to the concern was the common occurrence of fog. The radar return quality for icebergs in Baffin Bay had yet to be tested. During the entire operating period, there were only two occasions where icebergs failed to be detected by the radar at a range of less than 2 NM. On both occasions, the iceberg[']s face was sloping away from the ship, not allowing the radar beam to get a good return. On the average, the majority of icebergs were picked up by the radar at 8-12 NM. Within 48 hours, confidence in the radar[']s ability to detect all icebergs increased considerably, no matter what the visibility.
- c. Actual ship operations in the vicinity of Thule were limited. With the exception of numerous bergy bits and growlers originating from Wolstenholme Fjord, the entire Thule area was ice free. The area was declared open for navigation to all shipping on 17 July 1985. While at anchor off DeLong Pier, there was a requirement to constantly push encroaching bergy bits away from the starboard side where the [accommodation] ladder was rigged. On one occasion when the USNS MAUMEE was med-moored at DeLong Pier, POLAR SEA was

called upon to push large bergy bits away from the MAUMEE. An attempt was made but was for the most part unsuccessful. Flat bowed vessels, like the LCM or LCVP's, proved far superior in performing this task.

3. Northwest Passage Transit

- a. Prior to departing Thule, all available information on anticipated and actual ice conditions in the Northwest Passage were reviewed. Of particular assistance was the Canadian Arctic Sailing Directions and Ice Atlas. The heaviest ice conditions were expected while crossing Viscount Melville Sound. Turbines were anticipated for this leg of the passage.
- b. POLAR SEA entered Lancaster Sound having crossed Baffin Bay in ice free water. Current ice information indicated that ice existed west of Resolute. This information proved correct with ice being encountered approximately 20 miles south of Resolute. The ice conditions were light, being for the most part 5-6/10ths first year thin/medium. Initial transit required a Main diesel engine (MDE) configuration of 1-2-1. The route taken from Resolute was north of Lowther Island thence west to Byam Martin Island. In the vicinity of Lowther Island, all 6 MDE's were required to maintain an average of 6-7 knots through 9/10ths first year thin ice.
- c. On 4 August, approximately 20 miles south of Byam Martin Island, flight quarters were conducted to locate the traditional shore lead that [develops] from Byam Martin Island west to Dundas Peninsula on Melville Island. Ice conditions up to this point were 9-10/10ths first year thin with a steady speed of advance (SOA) of 4-5 knots being made on a 2-2-2 MDE configuration. The shore lead was located as anticipated on the evening of 4 August. The shore lead existed to Dundas Peninsula.
- d. Starting on 4 August, the Canadian Armed Forces began daily fly overs using a P-3C. While not the original intent, the P-3C provided good information on ice conditions along the intended track throughout the transit of the Northwest Passage.
- e. Prior to starting the transit across Viscount Melville Sound, all available ice charts were studied in detail. Additionally, INTRA Inc, Inuvik, NWT, provided a technician with current synthetic [aperture] radar (SAR) pictures of the area. Several giant floes existed approximately midway across Viscount Melville Sound to the entrance of Prince of Wales Strait. From all available information,

multiyear and first year thick ice was expected. In preparation for this, the centerline (C/L) turbine was placed on-line with 2 diesels per wing shaft. From the picture, a base track was [laid] out. A SOA of 2 knots was common through rubble and medium size flows of first year medium ice. By the morning of 6 August, progress has been stopped due to worsening ice conditions; principally first year thick and multiyear floes. Three gas turbines were required at this point. The effort to avoid large floes was still paramount. By the afternoon of 6 August, with fog hampering progress and disallowing flight quarters, it became evident that the only route into Prince of Wales Strait was a straight shot. A brief period of clearing allowed an ice recon [reconnaissance] to be flown late that afternoon. The straight shot proposal was supported by the ice recon as a giant floe of multiyear ice existed between POLAR SEA and the entrance to Prince of Wales Strait. The floe was 50 NM long and 20 NM wide. POLAR SEA was to position itself at the narrowest portion of the floe. This required a run of approximately 15-17 NM. The transit of the [floe] began late on the evening of 6 August with all 3 MGT's. Severe vibrations caused by the milling of the multiyear ice caused several repairable casualties to the propulsion and steering systems. Each casualty required stopping and effecting repairs. By the afternoon of 7 August, POLAR SEA had transited approximately half way across the floe. Up to this point, backing and [aggressive] ramming was required and anticipated for the remainder of the transit to Prince of Wales Strait. By late afternoon on 7 August, transit of the giant flow was completed. Prince of Wales Strait was entered early in the morning of 8 August. The turbines were no longer required in the vicinity of Princess Royal Islands [sic], at which time diesels were used. Approximately 20 NM south of the Princess Royal Islands, open water was entered.

- f. The heeling system was not used as one tank system was inoperative, one tank system was used to store contaminated oil/water, and the one remaining system was not enough to improve icebreaking capability.

4. *Naval Ocean Systems Center (NOSC) Project: 16 August - 16 September*

- a. Transit of Amundsen Gulf was in open water. Ice was entered at position 71-00N 127-00W, shortly after entering the Beaufort Sea. On 9 August, ice conditions quickly worsened to 10/10ths first year thick and medium. The remainder of the transit to Tuktoyaktuk was

attempted on 6 MDEs. But due to time constraints of the Canadian guests, the center line turbine was put on the line. By late evening on 9 August, the ice conditions were mostly 10/10ths first year thick, necessitating all three MGT's to continue progress to Tuktoyaktuk. A steady progress of 3-4 knots was maintained. After completing the personnel transfer at Tuktoyaktuk, POLAR SEA proceeded to Prudhoe Bay. The ice conditions moderated at longitude 135W enabling POLAR SEA to go to 6 MDE's. Open water was entered at the eastern limits of Mackenzie Bay and existed to Barter Island. This permitted a 1-1-1 MDE configuration. However, north of Barter Island, conditions worsened again to 8-9/10th's first year thick and multiyear. Summer melting of the ice was at its peak which rendered the ice passable. Slow steady progress was made. These ice conditions existed until arrival at Prudhoe Bay on 13 August. The ice conditions between Barter Island and Prudhoe Bay continually plagued progress for the remainder of the time POLAR SEA operated in this area. The ice edge consistently ran along the 10 fathom curve. Due to the numerous shoals south of the 10 fathom curve, navigation in this area was never considered.

- b. The NOSC personnel were embarked on 16 August in vicinity of Prudhoe Bay. The scope of their project entailed CTD casts across the entire North Slope. The casts were to begin at 130-00W, and advance northward as far as the ice would allow. Having just transited this area from Tuktoyaktuk, slow progress was expected. The consumption of fuel was expected to be high for the NOSC project due to the area being covered. Based on this, the use of turbines were [sic] limited to emergency situations only in order to have sufficient fuel for all intended projects.
- c. POLAR SEA proceeded eastward with 6 MDEs along 71-00N toward 134W longitude. Heavy ice conditions at 134W had reduced the SOA to 1-2 knots with backing and ramming. The decision was made to stop the easterly transit and proceed northward along the 134W longitude line. On 18 August, POLAR SEA stopped northerly progress at 71-30N due to worsening ice conditions, that being 10/10ths first year medium/thick. Long range ice recon revealed [similar] conditions to the north. Transit was altered to the southwest. An increase in multiyear ice was encountered. Again, backing and ramming was required. At approximate position 71N 135-30W, attempts to advance west northwest were abandoned due to heavy

ice conditions. POLAR SEA proceeded southward into Mackenzie Bay. Originally, project plans were to proceed to 73-74N latitude in the Eastern Beaufort Sea. Ice conditions found were far worse than projected. Attempts by ice recon flights to find easier routes through the ice pack were unsuccessful. NOSC personnel elected to depart the Eastern Beaufort due to ice conditions and resulting slow progress. Conceivably, more than half of the [allotted] project time could easily have been devoted to operations in the Eastern Beaufort had NOSC elected to continue attempts to reach the northern CTD cast sites.

- d. After two days of conducting CTD casts in Mackenzie Bay, POLAR SEA proceeded north along the 140W [longitude]. Again, progress was reduced to backing and ramming at 71N latitude. A west course along 71N to 144W [longitude] skirted the heavy ice. At 144W, a northerly course was attempted but again stopped at 71N latitude on 15 August. During this period frequent ice recon flights to the north and northwest revealed the same heavy ice conditions. Efforts to continue north were abandoned late on the evening of 25 August.
 - (1) By 25 August, it began to appear that penetration of the pack north of 71N would be both time and fuel consuming. The use of portable CTD unit deployed by helicopter proved very successful. Rather than spend a great amount of time and fuel in achieving these sites by ship, stations were made quickly using this method. It became apparent that the portable CTD unit would be used extensively north of the 71N latitude line in the upcoming weeks.
 - (2) Frequent fog began to plague progress during this period. As would be expected, during periods of low visibility, an increase in fuel consumption was noted. The radar proved of limited use when operating in 9-10/10ths ice concentrations. It was often necessary to stop and wait for improved conditions.
- e. On 26 August, northerly progress was once again stopped just north of 71N at [longitude] 148-00W. Ice conditions at this location were extremely hostile. Penetration into the pack would have required turbines. Several attempts at backing and ramming with 6 MDEs resulted in half a ship length progress. Again, the deployment of the portable CTD unit by helicopter prevented a shut out in this area. Efforts to continue north above 71N looked dismal for the future.

- (1) An additional request was made by NOSC to attempt to recover a weather ice buoy that had [prematurely] stopped operating. The position of the buoy was 73N 151W. Based on ice conditions recently found north of 71N latitude, it didn't look promising.
- f. On 28 August, westerly progress to 150W [longitude] was made through 8-9/10ths first year thin-medium along the 71N latitude line. Surprisingly, ice conditions improved considerably to 8-10/10th first year thin and remained so until 73N 151W. The actual ice conditions found were in disagreement with the ice charts. The station was located and recovered on 31 August. Due to the requirement to medevac a crewman, POLAR SEA departed the site on the afternoon of 31 August enroute Pt. Barrow. 9-10/10ths first year thin ice prevailed to 72N at which point the ice edge was transited into open water.
 - (1) While operating west of 150W longitude, a SOA of 4-5 kts was common. Low visibility had minimum effects on progress.
 - (2) A [noticeable] increase in milling ice [occurred] during this period. This was commonly [occurring] in ice conditions of 8-10/10ths first year. The cause was determined to be a decrease in the stern draft due to fuel consumption. Fuel in the forward tanks were [transferred] aft increasing the draft by the stern. The incidents of milling decreased considerably.
 - g. The remainder of NOSC operations from 1-15 September was within a 75 mile radius of Pt. Barrow. Ice conditions were generally light to ice free. The ice charts became more accurate west of 154W and proved valuable in planning ships operations. The NOSC project concluded on 15 September at Pt. Barrow.
 - h. At the conclusion of the NOSC project, the southerly migration of the ice pack had started. A three day gale at the time of the NOSC and ARCTEC Leg I changeout on 15-17 September increased the rate of the drift. Upon completion of the transfer, POLAR SEA proceeded to the Western Beaufort Sea. The ice edge was transited at latitude 71-45N. For the remainder of AWS-85 operations the ice edge continued to migrate south. The entire ARCTEC project, including Leg I, II A and II B[,] were conducted in 5-10/THS ice.
 - i. With the decrease in air temperatures, new/young ice became [prevalent] where open water had earlier existed. However, continued use of a 1-1-1 MDE configuration was satisfactory while

transiting in the young/new ice. On occasion, worsening ice conditions required an increase to a 1-2-1 configuration. These light ice conditions allowed for a relatively low fuel consumption rate [throughout] Leg I with an average daily use of approximately 6000 gal [gallons]/day. Leads and light ice conditions were taken advantage of whenever possible as Leg I operations did not require stations to be taken at exact locations. This allowed for the flexibility in conducting the coring stations in the best ice free areas.

- j. Coring station 8 was required to be conducted in an area of new ice. POLAR SEA anchored as at the previous sites. It was initially thought that the new ice would impose no restriction to the coring operations. However, the new ice was drifting at approximately 0.5NM which created a questionable [environment for] safe coring operations. The main problem was that the drifting ice began to carry the cable and unit away. This was a surprise because of the minimum thickness of the ice. The problem resolved itself when the drift subsided to less [than] 0.3 knots. At a drift of less than 0.3 knots, the cables that supported the coring unit were able to slice through the drifting ice with minimum interference to the operation.

5. *Leg II*

- a. Leg II operations, both phase A and B, were conducted in 8-10/10ths ice conditions with 5/10ths young 5/10th first year thin/medium [prevalent]. During transits, the leads or areas of light ice conditions were followed. Again, the rate of fuel consumption was low due to that fact, averaging 6000 gal/day during transits. The scope of operations during this period entailed ice ridge profiling which required day light operations. Consequently, most transits from the different sites were conducted during the evenings. Fortunately, there existed enough light ice conditions to allow for a relatively easy passage to each station.
- b. During Leg II, the use of aerial recon to locate future ice ridge sites was used. Once located, the site was marked by a series of orange traffic cones to facilitate the visual location as POLAR SEA came into the area. This process worked well as long as the time interval between the establishment of the cone to when the ship was in the area did not exceed 12 hours. It was found that after this time period the drifting of the pack was not always concurrent with the conditions of the area just left. This hampered locating the designated floes to a degree.

- c. The majority of transits between sites were conducted at night. This created on occasion difficulty in locating designated future sites. Several ideas were experimented with in an attempt to mark the new site with some sort of illuminating device. Strobe and fixed lights proved unsuccessful due to the quick drain on the battery due to the cold [temperatures]. The use of CHEM-lights was also tried. The rapid decrease in illumination was also noted due to the temperatures.

B. PRE-DEPLOYMENT PREPARATIONS

1. Due to the short preparation time prior to deploying on AES/AWS-85, the entire Greenland, Canadian Arctic and Eastern Seaboard of North America chart portfolios and associated publications were ordered via priority two message. Applicable charts of the west coast of Greenland were received from the USCGC NORTHWIND. Canadian Arctic charts of the Northwest Passage were borrowed from the USCGC POLAR STAR. While all the requested charts were on order, the receipt of those from the USCGC NORTHWIND and USCGC POLAR STAR were deemed necessary in the event the shipment from the DMA [Defense Mapping Agency] was delayed. The DMA shipment was received 4 days prior to deploying. Additional publications relevant to the Northwest Passage transit were provided by Commandant (G-010).

C. ITEMS OF INTEREST.

1. Thule Harbor Chart (DMA 38343) was adequate. However, several charted objects no longer exist. Other prominent objects in the area are not charted. POLAR SEA used NORTHWIND's chart Nr. 38343 because they had charted several objects in areas that were otherwise shown void. The exact control and surveying technique is unknown. However, they provided reliable fixes.
2. Due to the reported and charted depth along Delong Pier, it was determined that POLAR SEA would med-moor to refuel. To facilitate navigating into the pier and positioning the ship for the med-mooring, a drop buoy was established 200 yards off the pier using horizontal sextant angles. The intent of the buoy was to mark the drop spot for the port anchor. Ship[']s distance from the pier was determined by horizontal [sextant] angles during the mooring evolution.
3. A sounding of the Delong Pier face was conducted using the ASB with the ROSS SQN-18 depth sounder. Exact position of each sounding was charted by horizontal sextant angle. The minimum depth recorded was 35 feet,

corrected for MLLW [mean lower low water]. However, this depth still proved too shallow for POLAR SEA to moor alongside.

4. Chart 38582, ANCHORAGES IN ARSUK FJORD, proved to be of limited value in precision navigation and anchoring. There are very few charted objects in Gronnedal and precision anchoring was difficult. The large scale and overall [nondescript] shore line rendered the radar useless for navigation with the exception of closest point of land. Anchorage was determined by depth of water.

5. Mehlmania RACON. After recharge and service, the racon signal was received at a distance of 10-12 NM to seaward. The original intent of the RACON was to identify the entrance to Sondre Stromfjord for ships servicing Sondre Strom AFB. However, due to the advance in navigational equipment, principally NAVSAT [navigational satellite], approaching ships are able to accurately determine their position well in advance prior to entering the fjord. The likelihood of confusing Sondre Stromfjord entrance with other entrances is unlikely. For this reason, the RACON is no longer considered necessary.

6. After thoroughly sounding the area surrounding position 72-34N, 167-24W, the 22 fathom curve shown on DMA chart number 16003 could not be located. Soundings taken at that position consistently were no less than 25 fathoms.

D. TRACKLINES

Plates 1, 2, 3 and 4

CHRONOLOGICAL LIST OF MAJOR EVENTS

DATE	EVENT
6 June 1985	Departed Seattle enroute Panama Canal. CHOP COMPACAREA
18 June 1985	Arrive Rodman Naval Station, Panama Canal, Panama.
20 June 1985	Underway enroute St. John[']s, Newfoundland[.] Commenced transit of Panama Canal. CHOP COMLANTAREA
21 June 1985	Completed transit of Panama Canal.
23 June 1985	Conducted Humanitarian Evacuation in Windward Passage of crewman using USCG HH-52A from Guantanamo Bay.
29 June 1985	Arrive St. John[']s[.] Newfoundland.
1 July 1985	Embarked AVDET 107, HH52A CG-1367 and CG-1393
2 July 1985	Underway enroute Sondre Stromfjord
4 July 1985	CHOP to COMSCLANT in position 60-00.0N 53-27.8W
5 July 1985	Arrive vicinity of Sondre Stromfjord[.] Greenland. Recharged Mehlmania Island RACON.
6 July 1985	Completed partial cleanup/repainting of RACON site and day boards on Mehlmania Island. Underway enroute Gronnedal, Greenland.
8 July 1985	Anchored off Gronnedal, Greenland.
9 July 1985	Underway enroute Thule AFB, Greenland.
10 July 1985	Completed cleanup of Mehlmania Island RACON site. Crossed Arctic Circle at longitude 54-46.5W
13 July 1985	Anchored off Delong Pier, Thule, Greenland. Commence U. S. Army Operation Red Rock support.
17 July 1985	Seaward approach to Thule AFB classified as open to unescorted vessels.
29 July 1985	Med-moored to west end of Delong Pier; refueled.
1 August 1985	Underway enroute Prudhoe Bay, Alaska via Northwest Passage.

2 August 1985	CHOP CCGDSEVENTEEN in position 74-54N 77-00W. Rendezvous with CCGS John A. MacDONALD [sic]. Embarked via Canadian helicopter Capt [Captain] D. JOHNS and Capt G. BARRY; standing into Lancaster Sound
3 August 1985	Arrive vicinity of Resolute[,] NWT, embarked Northwest Passage transit guests.
9 August 1985	Standing into Beaufort Sea; Northwest Passage transit completed.
10 August 1985	Arrived vicinity of Tuktoyaktuk[,] NWT, debarked Canadian guests.
13 August 1985	Arrived vicinity of Prudhoe Bay, Alaska
16 August 1985	Embarked Naval Ocean Systems Center (NOSC) personnel; departed for operations in Beaufort Sea.
31 August 1985	Medevac for crewman to Pt. Barrow, AK [Alaska]. personnel. Underway enroute Western Beaufort
15 September 1985	Arrived vicinity Pt. Barrow, concluded NOSC project, embarked ARCTEC Leg I, debarked NOSC
16 September 1985	Completed Leg I loading, departed vicinity Pt. Barrow enroute Western Beaufort Sea.
29 September 1985	Concluded Leg I vicinity Pt. Barrow, debarked Leg I personnel, embarked Leg II A personnel, departed enroute Beaufort Sea.
5 October 1985	Concluded Leg II A vicinity Pt. Barrow, debarked Leg II A personnel, embarked Leg II B personnel, enroute Beaufort Sea.
13 October 1985	Concluded Leg II B vicinity Pt. Barrow, debarked Leg II B personnel, encountered hurricane force winds on departure from Pt. Barrow.
15 October 1985	Crossed Arctic Circle at longitude 168-10.3W; completed 98 days of high latitude operations north of Arctic Circle.
17 October 1985	Transited Unimak Pass.
18 October 1985	Encountered hurricane force winds vicinity Shumagin Islands.
19 October 1985	Arrived Kodiak, commenced repair to starboard hub.

22 October 1985	Repair to starboard hub unsuccessful, OPCODE cancelled Leg III in Prince William Sound, directed to terminate AWS-85.
23 October 1985	Departed Kodiak enroute Seattle, WA [Washington].
24 October 1985	CHOP from CCGDSEVENTEEN to COMPACAREA in position 54-38.0N 139-55.7W.
26 October 1985	Encountered storm vicinity north Vancouver Island, rough seas resulted in one death to crewman and injury to three others.
27 October 1985	Arrive Seattle; debark AVDET [Aviation Detachment] 107 helicopters CG-1367 and CG-1393; CHOP from COMPACAREA to CCGDTHIRTEEN [Commander Coast Guard District Thirteen].

12

Diary of the 1988 Voyage by *Society Explorer* Through the Northwest Passage, West to East

Thomas Pullen*

Wednesday Aug. 17

Uneventful flight to Vancouver via Winnipeg. Brief meeting with Brian and Sarah at the former, then on to Seattle. Society Expeditions dinner party with Susan Zehnder, Heinz Aye, Victoria and Peter Cox.

Thursday Aug. 18

Press interviews a.m. then to the airport. Flight to Anchorage and another hotel - this one very comfortable - the "Clarion["]". Not so with our digs in Seattle - the "Camion". Welcome dinner where we, with other staff members, were introduced. I thought Alan's reference to the bar (in the ship) and Betty was in questionable taste. Weary. Turned in early.

Friday Aug. 19

Inevitable bus tour and then our flight to Dutch [Harbor] where, in a crosswind, our pilot came in fast touching down hard, hit the brakes and everything else to stop us before the end of a very short runway. There was very little left when we stopped. A lengthy delay before getting the luggage and, finally, off by school bus to join the little red ship once more - for the fifth time. A friendly welcome and champagne in the Explorers' Lounge where we met a few more affable souls. The ship sailed at 1900 and we are on our way.

* Original held in Hudson's Bay Company Archives, Archives of Manitoba, Thomas C. Pullen Collection, H2-201-1-6, acc. 2007/007.

With the pack under pressure on the coast at Barrow and onshore winds I fret that a challenge will meet us so early in the voyage. Heinz Aye (hereafter H) has all my ice information and reports of my two telecons with Ice Central in Ottawa while at Anchorage - and not promising either. Can only hope that by the time we make Point Barrow the winds will be favourable and there is room to squeak through.

Hope my request to Brian Veal of Ice Central to include us in the daily sitrep on ice and weather which is made to the icebreakers will bear fruit (it did not). Turned in early feeling rung out. Our quarters are very fine though no larger than the pilot's cabin of 1984.

Sat Aug. 20

Ship moving about enough to cause distress for a few passengers. Following wind and sea as we make for the [Pribilofs] (St George and St Paul Islands). Gave the radio officer information on Fax schedules for the ice reports. What reports we have posted on the bridge indicate northerly winds at Barrow and eastward to Barter Island. Chatted with Jack Johnson, the U.S. pilot we are obliged to take. He seems to have heard of me. Why we need his services I cannot see and he wants to stay to Tuk.

Arrived off St George at noon and anchored. During the forenoon two bowhead whales in sight with H announcing enthusiastically over the P.A. [public address] system "Picture, picture, picture" and away we went in careful pursuit but with no real results.

Captain's introduction of the staff. By what I hope was a slip of the tongue I was referred to as "Mister". Champagne all-round and then H's welcoming dinner. We sat with Ralf Zander.

Sun Aug. 21

0700 anchored off St Paul Is [Island]. Sent for a Telex ice report as the Fax is useless. A super ice chart came back but the information it contained is discouraging, with N [north] and NE [northeast] winds pushing the pack on the coast from Barter Is. almost to Herschel Is. Little indication of improvement.

(P.S. The situation was discouraging. The ice chart for Aug 20 had a note on it for me to the effect that the "lead nr. [near] Point Barrow slightly closing due to forecasted onshore flow". The pack (2/10 multi-year & 4/10 thick first-yr [year]) was on the coast at both Cape Simpson and Cape Halkett while there was also 6/10 thick first-yr from Barter Is eastward to Komakuk Beach and also between Herschel Is and Shingle Point. The daily drift of the pack was shown as 5 nm [nautical miles] to the westward. To assist H to

understand the ice charts I coloured them as follows: Blue - open water, yellow - 5/10 or less = navigable with care, red - no go and dark red - the arctic pack 9+/10 mostly multi-yr. On this date there was absolutely no route available to a ship like ours, hence the message I prepared for the office in Seattle.

Spent a long time discussing the situation with H during which I recommended that we should not round Point Barrow and head for Tuk [Tuktoyaktuk] until there was some assurance the pack, not far off the coast most of the way, would not close in on us or behind us, effectively trapping the ship. H asked me to draft a message outlining the situation and the possibility (of) the Tuk passenger exchange taking place at Barrow. Worked on this all p.m. and then another long meeting when we massaged it into final form:

“A marked change in wind direction is needed soon to open our route from Point Barrow to Tuk presently blocked by heavy pack pressing on the coast, in particular 9/10ths plus ice between Barter and Herschel Islands, unchanged since early August.”

“If, repeat if, waiting for favourable conditions is called for on arrival Barrow, and because of the very exposed nature of the north Alaskan coast, it is intended to do this in ice-free waters southwest of Pt. [Point] Barrow. At least five days could be taken from the programme for such a contingency.”

“What is very latest date you need from us to initiate arrangements to fly Tuk-bound passengers to Barrow?”

Earlier our talk centered on the ship's draft and entering Tuk. Ralf Zander went off in a zodiac to check - 16 ft [feet] aft, or just a little less, and 13 ft plus for'd [forward]. I composed a message to Marsh Dempster on the subject to see if at that draft we can get in. His reply (Telex communications at sea are now so good and quick) within hours reports 16 feet too deep but that the pilot is still available. However, it is still by no means certain we will reach Tuk at this stage.

Mon Aug. 22

A forenoon zodiac cruise along the precipitous cliffs of St Matthew Is. Seabirds in great numbers but I especially enjoyed the crested and horned puffins. Took a few pictures including, of course, the ship which no one else thought worthy (of attention).

During the noon hour we shifted our position for a landing and then ashore for a vigorous walk. Great quantities of wooden flotsam, plastic and

metal containers, rope, packing cases, beer tins and other evidence of the sea's rejection of man's garbage.

Joined Guy Morrison, our Canadian bird expert, and shared the sighting of some rare McKay's buntings - old and young. A special treat for life listers and birders generally. Also a snowy owl, evidence of many lemmings. Returned with wet and muddy boots. Dennis and Sabena Mense, joint expedition leaders, expressing delight that we have at last ventured out of the ship.

The evening pre-dinner recaps. are turning into prolonged affairs - lectures almost. Guy is good but goes on a bit but Poppy, our anthropologist, is a terror - "umming" and "awing" and wittering on and on.

The August 22 telexed ice chart shows a rather better situation at the Barter Is. choke point. Had a good session with H as we discussed possibilities. Suggested an ice recco be flown when we arrive at Barrow to get a hands-on feeling for conditions right up to date. Well received. Told me Werner had called in response to our message and they were investigating flights and so forth.

P.S. The latest ice chart was markedly improved and possibly navigable eastward from Pt Barrow as far as Barter Island but after that definitely a no-go situation. There was still too much heavy ice lurking off-shore for my liking.

Tues Aug. 23

Anchored before 0800 off Boxer Bay but we decided to remain on board. Diary writing in Explorers' lounge a chancy business. First Neal Prince (precious) of New York wanted a full explanation of the ice chart and Egg Code. A pause and then the same treatment for Patrick Strachan of Victoria, B.C. [British Columbia] (who was with us during) the 1986 failed NWP [Northwest Passage] attempt.

Busy drafting a message for H to set up an ice recce [reconnaissance] from Barrow to Herschel, with Alaska Marine Agencies in Anchorage.

In the p.m. much hubbub associated with a visit to the Soviet port of Provideniya - a first of some sort. H very excited. A Russian-speaking American from Gambell conducted a 90 minute telephone discussion with the Mayor of P [Provideniya]. Much talk of the impact on our program. We'll lose a day but worth it. Left Gambell after 1800 heading for P where we are due at 2300. When we cross the International Date Line it becomes Thursday and our clocks go back three hours in one gulp to P time.

At 1225 (0024 new time) awakened by an announcement from Alan that we are alongside in P, that our passports will be returned to us and we are

to remain in our cabins until the Russian Customs & Immigration officials inspect us to ensure we are who we are. Passengers and crew - seems a great folderol for a few short hours - visit but anything to achieve Heinz's determination for a "first". I got up and dressed to await the "knock on the door in the middle of the night". In due course it came when I was met by a Soviet official in green cap and uniform - who examined and kept our passports. Turned in for a few hours sleep and up at 0700.

Thurs Aug. 25

Rain. Forbidden to photograph the harbour. Off at 0950 for a bus tour - crowded. First stop (of many) at City Hall where we all mustered for speeches of welcome and replies. Much applause and all-round bonhomie. Then numerous photographers went about photographing everyone - several times in fact. One man had four flash cameras.

Then a succession of visits at high speed (for these "roads") lurching and heaving to a machine shop (poor facilities), to a steel fabricating shop (ditto), to others including the school library, nursery school and where little children are fed. We saw 4-year olds with impeccable manners at their midday meal, then the museum and, at 1330, back to the ship. Still raining. Security guards on the dock and a guard ship anchored close by outside on our starboard side. Our program changed again as we got next to Nome to re-enter the U.S.

A very good drum dancing performance after tea - the best we've seen anywhere. The lounge jammed to the deckhead for the dancing followed by speeches, translations of speeches, presentations, and vigorous embraces. The children were very appealing in their costumes. Thoroughly enjoyable.

Another great passport ritual to clear the ship for sailing. The 6th for B [Betty] and the 5th for me. The Russian officials, smartly turned out in their uniforms, were a little less formal at the end.

Did not bother to watch the departure maneuvers nor take illegal pictures - too dark and too rainy. A cheerful dinner party with Charles Swithinbank joining us - six in all. At 2100 it suddenly became midnight and Aug. 25th as we cross the International Date Line during the night.

Thurs Aug. 25

Wind and sea kicked up considerably - awoke with the ship cavorting about - still a good turnout at breakfast. Telephone call from Roy Friis in Tuk. Advised him of the possibility of the passenger exchange being done at Barrow, that I would call him back to advise what the plan is and with another careful look at our maximum draft, if in fact we do come to Tuk.

Understood from Ralf that it is nearly 15 ft. Roy's voice very faint especially with nearby background hubbub. (Visit to Nome now cancelled in favour of Barrow)

Closed the Diomedes. Received an ice map for August 24 based on stale data really, which gave a promising overview and which encouraged H. Then at 1600 three more came in dated 25 August and based on up-to-date satellite and ice recce information. The scene is now discouraging with three choke points, east of Barter Is. and both sides of Point Barrow. H now depressed.

P.S. H blew hot and cold and was too easily discouraged. The Aug 25 ice chart pretty well convinced me the traditional route along the Alaskan coast was, for 1988, a no-go proposition and Brian Veal's words were becoming increasingly significant, in that the best route appeared to be to seaward of the pack. From Barrow a vast area of 3/10 pack (easily navigable for this ship) leading to open water was beckoning but first we had somehow to get through xx miles of 6/10 thick first-yr and then yy nm of 9/10+ equally heavy going, or so the ice chart seemed to indicate.

A possible alternative is opening well to seaward which could prove to be significant. I hope so. No response to our request for info. concerning an ice recce flight along the coast to Herschel Is. Jack J. checking with Anchorage office. Two ice charts of James Ross and Barrow Strait showing a blockage still in Larsen Sound. Victoria Strait showing signs of opening and could prove to be the preferred route. But first we have to get there. During the p.m. making nothing in the Chukchi Sea.

Fri Aug. 26

Wind and sea up during the night - NNE Force 8. The ship jumping about but mostly pitching. No ice chart during the forenoon, possibly due to lack of fresh data. This wind, if it is the same force and direction, will pack the north (Alaskan) coast for certain. Looks as if we will be two days late at Barrow and even it may be inaccessible or threatened by the pack.

Tried, but seem to have failed, to persuade H not to use "knots per hour" in his enthusiastic sitreps to the passengers. Slow progress - four knots. Asked by H if I would say a few words at re-cap or "wash-up" as I call it. Complied. Invited to dine with H and three other passengers. A long session listening to a torrent of self-adulation from H about his experiences - they are impressive but we were a captive audience.

Sat Aug. 27

Sea moderated during the night. Gave a talk to the passengers on "Hummocks, Bummocks & Sastrugi" at 0930. during which we encountered an increasing amount of ice - first sighted at breakfast in small quantities. As I talked the ice increased substantially. By the time I could get away we were in the thick of it.

The next two hours on the bridge with H and Jack J. extricating ourselves. Reversing course until 1230 when it became possible to begin hauling gradually around to the SE [southeast], then E [east], and then onto a course for Barrow inshore. H at one point becoming very down at such an unexpected turn of events. Much telephoning to find that the beach off Barrow is clear of ice.

1320. No ice in sight on the starboard side through my cabin window - long may it remain so. Last night H told us Society Expeditions had been obliged to post \$1 1/2 million bond with the Canadian Government before the voyage was permitted. News to me. Apparently in '85 it was \$1 million. By this morning the passengers had the '88 figure as high as \$10 million! (Note. Oct 10 I was advised by Werner Zehnder that it was the U.S. Govt. [Government] not Canada, that required the bond)

During our ice encounter H closed the bridge to passengers which had my approval. 1450. Wainwright bearing 100 deg [degrees] (True). The coast abeam distant 12 nm. H once again in high spirits and regaling us with Antarctic feats of derring-do.

We appear to be safely inshore of the pack and our ETA [estimated time of arrival] Barrow is now 2100. Officialdom awaits us. Jack J advises that his wife in Seward reports our visit to Provideniya is national news and described as "mischievous".

If we do an ice recce it will be in a [Navajo]-type aircraft. Also arranged for Charles Swithinbank to be one of the team. He asked and I kick myself for not having thought of it myself first.

Reminded by B this day 52 years ago we parted on Bronte beach when I went off to join the navy.

Ice-free run up to Barrow anchoring at 2100. Spoke at the re-cap on plans for Sunday. Drinks at 1830 with Peggy and Dick Krementz and others. He has charts for the whole voyage. Sent a message to **Martha L. Black** asking for an opinion as to the better route - coastal or NE into 3/10ths after negotiating a 12 mile band of heavy ice.

P.S. My actual message read: "For Master and Ice Observer (who I knew - Larry Solar - from 1986) Reference 1800Z 27 Aug 88. Alaskan coast ice chart

just received. Request ASAP your opinions on committing ourselves to coastal route or what appears to be an alternative 60 nm north of the coast through an area of mostly 3/10 ice. Our ETA Point Barrow 2100 local time today Saturday bound Tuk. What is your present position please?"

A helpful reply recommending the latter. H in a lather of indecision. Ice Recce laid on for 0700.

Sun Aug. 28

Up at 0630. H, J.J. and Chas. S. on the bridge discussing **M.L. Black's** reply and canvassing my opinion. I opted for the route north about the heavy 9/10+ ice extending all along the coast, and threatening the coastal route which is the traditional way to go - but not this year. It is already on the coast at Cape Halkett and east of Barter Is. according to the ice map for this date.

P.S. This recommendation by me was one of the key factors in the entire voyage. If I had opted for the coastal route I wonder what would have happened. With H being so unsure I do not believe he would have gone against my advice. The plan was to steer for the narrowest neck of 9+ (7/10 thick first-year and 3/10 old ice) as shown on the ice chart for Aug 27.

H makes a meal of any decision but after extracting a definite recommendation from me several times, and supported thus by everyone else, we eventually shaped our course on a northeasterly heading and set out.

M.L. Black's response to my message was timely and helpful indeed.

Brian Veal of Ice Central suggested before I left Ottawa I recall that our proposed route appeared to be the way to go - and is now proved right but it will be a challenge whatever way we go.

Weather and visibility conditions generally, particularly at Dead Horse (Prudhoe Bay) where we have to refuel, unsuitable for flying, so the ice recce to Herschel and return goes by the board.

Lunch with B helping three visitors from Barrow (referred to inelegantly, but accurately as I recall, as Muck City). Weighed at 1400 and headed north about Captain Beechey's Point Barrow, then altering north eastward toward the pack ice lying in wait and visible ahead of the ship.

Entered the pack shown on the ice chart to be 5/10 but it seemed rather heavier. Steering toward the narrow band on the 28th - no - 27th chart as 9+ thick winter and multi-year to break into more 5/10 to the NE.

P.S. We were not aware at the time but I subsequently discovered that the so-called neck marked A on the 27 Aug chart (3/10) was just a computer extrapolation. It certainly did not reflect the conditions we encountered struggling to the northeast.

A lot of bridge time with H getting discouraged. Advising and soothing and helping as much as he would accept. A long time on the bridge. Got away for dinner which B had organized but was called back and I never did get a decent bite.

A fine polar bear sighted on a floe - on his hindlegs for a better look. Aye in transports of delight - all thought of progress instantly abandoned and announcing "picture, picture, picture" producing a stampede of people and cameras. We struggled along in close pack until after midnight when it became unproductive to continue and we hove to for the rest of the night.

H gets discouraged too easily and with no urging would quite happily retreat to Barrow. Fatigue I feel (is part of the problem) but he needs to be kept encouraged. Weary.

Mon Aug. 29

This was the day of the bear sighting - not yesterday. It is so hectic and time demanding I cannot recall events.

Called at 0525. Up to continue - slow going. H spent too much time going north and south looking for a lead to the east. There were no leads and there were dire threats: "Vis is too much, ve go back" and "No vay we get through" and other signs of irresolution. I took up a position right beside H and succeeded in getting him to head into the pack, on an easterly heading, to take a nibble and test it.

This we did and at first it was soft going but unfortunately we soon came up against an old floe which blocked the way. This called for a deal of maneuvering and more indications of retreat. However, we pressed on and H learned a lot about ice, shiphandling in ice, and we advanced through what he thought had been an impenetrable barrier. He was unaware that he should have his rudder amidships when moving astern, did not know (what) "his" ice horn was for. We worked as a team and he accepted my instructions on throttle use, using floes to assist in turning the ship, on speed, on rudder, and it was a good forenoon's activity and eventually open water appeared but it served only as a polynya with yet more heavy pack to be dealt with (beyond).

P.S. I believe this forenoon activity turned out to be the key to the whole voyage. I stood beside him with the engine controller between us and together we headed east easing the ship into the pack. For hours I explained how to nudge the ice, keep power on without gaining damaging speed, telling him when to ease up, when to put the boots to her, how not to kill headway by over-use of the rudder but instead to use ice floes to change

direction, and so forth. It was a great success. He became very excited deciding that the pack was not such an obstruction after all.

During this there were reports to be made and then no time for lunch. Krista, thanks to B's intervention, appeared with a platter of sandwiches. A tiring business but Heinz, after the morning's performance, pronounced me the best Ice Master. A piece of hyperbole but acceptable after a long session in the ice. I told him I would be prepared to certify him (now) as competent in ice. He said Antarctic ice was nothing like this - while Charles Swithinbank, the academic, averred that there were some pretty able Soviet icebreaker captains and I would agree - also that H (who says he has completed 52 Antarctic voyages and has never seen ice like the stuff we have just been through) was ignoring the heavy pack to be found in the Weddell Sea.

At it all pm and after dinner. A long day and we are not making significant progress. When we stop for the dark hours the current carries us back a goodly distance.

Note: At this time the question of asking for icebreaker assistance was raised by H, and by Seattle through H, to me. Before formally asking for such help I sent a message to **M.L. Black** with our position and saying that we were "experiencing difficulty making headway through heavy pack where promising conditions on the ice charts do not square with the ice we were experiencing. Would your operational commitments enable you to respond to a call for assistance from us to Nordreg [Northern Canada Vessel Traffic Services Zone Regulations] to-morrow Tuesday at the latest". Captain Mellis replied that such a request would have to go to higher authority, which I knew, and that anyway he was four days eight hours away in Victoria Strait. So that gambit did not work.

P.S. The actual messages read: To **Martha L. Black** (for Capt. [Captain] Mellis). Our 300500Z Position 71 deg 38 min [minutes] N 155 deg 41 min W [West]. Experiencing continuing difficulty making headway through heavy pack. Forecast conditions on ice charts do not square with those we are actually confronting. Would your operational commitments enable you to respond to a call for assistance from us to Nordreg to-morrow Tuesday at latest." His reply was: "It read: "I understand that your present position is 71 deg 38 min N 155 deg 41 min W. With reference to your query concerning whether operational commitments would enable CCGS Martha L. Black to respond to a call from you for assistance, be advised that this is a decision that can only be made by District Manager Hay River (ye gods) in liaison with the Director Northern Region CCG [Canadian Coast Guard] Ottawa. In

addition our present position is Victoria Strait and our transit time to your position would be 4 days 8 hours."

Tues Aug. 30

Call at 0500 (on my own initiative) to contact Carol Stephenson early in her office four hours later. She was supportive and will examine the problem and call back. She did and had a lot of information, all of it useful. The best news is that **Pierre Radisson** (Claude Guimond - Ho-kay Ho-kay & No Problem no prob-lem fame) is topping up with fuel and is ready to give us a hand. This is a development that was preceded last night by a call (by me) to William (because I could not raise Carol or Len Forrest at their home numbers). Briefed W and I felt confident he would get the ball rolling. I wanted to know what the reaction and response would be to a request (from me) for icebreaker assistance with us so far away and in Alaskan waters.

Carol advised, to my great relief, that **Pierre Radisson** is in readiness, that a ship, **Mount Fuji**, 30 ft draft 25,000 dwt [deadweight tonnage] or more, will be rounding Pt Barrow Sept 4 to follow our route (and is she in for a surprise!) The M/V **Western Polaris**[,] a U.S. seismic vessel, is 30 nm SE of Barter Is. delayed by heavy ice. A drill rig, the **[Kulluk]**, off Tuk leaves 31st with the **Terry Fox**, "**Kalvik**" & "**Ikaluk**", all icebreakers, for Belcher 141 West on the U.S./Can [Canada] border ETA 3 Sept. The M.V. **Arctic Ivik** is in the Tuk area, a smaller harbour tug on charter by ATL [Arctic Transportation Limited] to Gulf. The "**Canmar Explorer III**", drill ship, escorted by the Arctic Class III icebreaker **Robert [LeMeur]**, leaves Tuk Sept 2 for Barrow which means the drill ship will complete the Northwest Passage, albeit interrupted by a number of years, and can be added to my NWP list. The icebreaker will then return to Tuk, maybe with the Fuji. The SSD [single steel drilling] **Caisson** moves to Pauline Cove on the 10th.

This was the day that a report came from the **M.L. Black** that David Cowper in **Mabel E Holland** had been sighted in Queen Maud Gulf bound for Cambridge Bay, pumping 200 gals [gallons] of water leaking in every day. Am so relieved and pleased for him. His plan is to overwinter at Tuk and set off for the Pacific in 1989.

H organized two ice recce flights from Barrow ahead and on either side to find the best route through the 8 to 9/10th heavy pack blocking our way through to that elusive area of 5/10ths lying to the eastward.

Endless talk with H about the best route to take, the results of the recon [reconnaissance] flights, ice conditions and icebreaker help, and all the while a sense of irresolution, a pusillanimous approach, to this challenge posed by a bad ice year along the Alaskan coast.

(I am) reluctant to ask for help because I think with a little more determination we could get through and I don't want to destroy my credibility with our Coast Guard. I did tell Carol this would be the last NWP by Society Expeditions.

Finally bit the bullet and sent to Nordreg: "Request icebreaker assistance. Our position 71 deg 48 min N 155 deg 38 min W 1740Z. Steering 045 deg True, speed two knots or less toward reported easing of conditions 100 miles ahead. Ice conditions being experienced now and reported athwart our track by local ice recon eight to ten tenths. Bound Tuktoyaktuk. Sgd [Signed]: Master[.]" His name, my text.

So much going on it is difficult to recall the sequence of events. To save time I called Ottawa and passed the same message to Ivan Cote. A while later Dave Johns (DJ) called back to tell me **Pierre Radisson** would be sailed very shortly. My relief on hearing this considerably tempered by the time, distance, cost, and possible political implications involved. Very conscious of the degree of support I'm being given. Considerable relief shown by H. Next was a message asking if I had checked all possible commercial alternatives. I immediately got on to the expensive ship-shore telephone and contacted the only possibilities - Gulf and Dome. The former advised they had nothing available and eventually Dome was also a no-go and so Nordreg was advised thus clearing my yardarm and the use of a C.G. [Coast Guard] icebreaker legitimized as it were.

Despite all our efforts we remain not very far from Pt Barrow. It is very slow work. Stopped for the dark hours at 2300 and a quiet few hours sleep.

Wed Aug. 31

Moving again at 0600. Very little overnight drift - SE 0.8 nm. I was able to attend Charles Swithinbank's talk and slide show of the **Manhattan** voyage.

Reminded of the arctic motto "haven't you heard, it[']s all been changed" when a call came from Ottawa (DJ) telling me that **Radisson** will not now be coming but will remain in the vicinity of Cambridge Bay to see us through the Larsen Sound leg - or so I understood. Instead the USCG [U.S. Coast Guard] **Polar Star** is coming sailing from Nome, Alaska, to-morrow. A message from USCG Ops [Operations] in Anchorage that we should confirm there are no U.S. civilian ships available and capable of doing the task. Fair enough.

So another flurry of telephone calls to Anchorage and Prudhoe Bay. The only candidate was Crawley Maritime of Seattle and I talked to Carl Stubbs, who I met some years ago on another arctic-related job. He offered an icebreaking barge pushed by two tugs in stern notches. The tugs designed

for the task were unavailable but he wanted to talk to the principals of a company in New York who had two laid up somewhere. Sounded like a lash-up job and in my opinion totally unsuitable but Stubbs wanted to get the opinion of his own marine experts. O.K. I called USCG and got into an argument of sorts with a U.S. Lieutenant who said it was not my opinion that mattered, nor H's either, as to what was suitable and what was not, and that U.S. taxpayers should not have to rescue passengers stuck in the ice where they had no business being. I became a mite testy but we eventually cooled it and agreed to see what Stubbs came up with.

He (Stubbs) called shortly after to say his marine people were not in favour of the barge idea in the circumstances. I called Anchorage and had a pleasant talk this time with Lt. [Lieutenant] Flory and it was agreed **Polar Star** would sail the evening of the next day. Altogether a hectic period including a message covering the matter to all involved.

Stopped in the afternoon and now that an icebreaker is coming a diminished resolve to press on is apparent.

A baby Beluga whale swimming around the ship - mistaking us for mother maybe - was the opinion of some. Weather quite good but we'll have to make more effort to help ourselves which we are perfectly capable of doing. Very weary after a tense day.

Thurs Sept. 1

Up at 0700. Temp. [Temperature] 28 deg F [Fahrenheit]. Drifted less than a mile while stopped. 10/10ths loose pack all about us. Only 107 nm from Pt. Barrow. 360 to go to reach open water. Beluga still with us.

DJ calls from Ottawa for a report on our situation. **Polar Star** ETA 031900. I brief H and call Roy Friis at Tuk to arrange 100 tons of fresh water @ 16 1/2 cents per gallon during a six hour stay.

Most of the day spent stopped while zodiacs go away with passengers to plant flags on floes, take pictures and have fun - getting them out of the ship and into the fresh air - plus hot spiced cognac fruit juice (gloog) on return. Good for morale and not a waste of time for that reason. (But) time now to force on. I explained earlier to H that if an icebreaker is en route to our assistance we have to be seen to be doing more than just sitting idle.

1620 Hoisted all rubber boats. H decided to go east into the pack as tho' it was a new idea - whatever - "iss goot". We are heading east.

1630 Working into and through easy ice.

1720 Open water, fog.

1730 Daily ice chart arrived.

1800 Cruising along with an excess of timidity making for open water[,]
reaching it in 20 minutes. Later, at 1900, I left the bridge to rest my legs and
no sooner was I below than a USN [U.S. Navy] patrol aircraft buzzed us three
times. I never saw it and efforts to raise it on radio were fruitless. (I suspect
it was checking us out and a good thing we were seen to be moving east)

Talked with a Los Angeles newspaper and endeavoured to set the record
straight - i.e. we were not "trapped" in the ice but "stopped". However, the
truth is not sufficiently lurid for the media. Turned the phone over to H who
settled in for a 30 minute wildly exaggerated discourse of our situation and
prospects.

2300 Hove to for the night.

Fri Sept. 2

0630 under way. 1 to 2/10ths, poor vis [visibility]. The urging to get
cracking is paying off.

0710 To the bridge. Fog and open water go together and that is what
we've got. Ship has consumed enough fuel to make her tender as she
responds to rudder movements.

0800 Bowling along making good easting. Herschel Is. visit scrubbed.
Steering direct for Tuk.

0915 In the radio office trying to work **Polar Star** but a lot of background
noise and a very faint voice. Made out three questions they had - what speed
(answer 8 knots), did we have a helo [helicopter] (negative) and did we still
need assistance (please standby was my response to that). Off to discuss with
H but by the time we wanted to get back to **Polar Star** we had lost touch.

1015 CANICE 3, the Canadian ice reconnaissance aircraft[,]
calls in - loud and clear - flying ahead to tell us about conditions on our track.

1030 Still trying to raise **Polar Star** - static and now a hammering sound -
impossible. Radio still has problems it seems. Ice 9/10ths, one mile visibility
in fog.

1045 320 nm to open water. The scene on this bridge is something to
behold. Passengers asking questions, bridge doors being banged open and
shut, the buzz of the SatCom [satellite communications] phone, plus the roar
of the port lifeboat diesel being run up in the background and voices from
two bridge radio speakers, all contributing to a sense of confusion.

1110 CANICE 3 calls in 80 nm east of us and going on, voice fading.

1125 Oral report of ice - Fax to follow. Very hard to hear, kept fading.

1157 Below to rest my legs and have a beer.

1330 On the bridge drafting messages re customs clearance and ETA Tuk.
Discussions with H.

1415 Drafting message to Tuk agent (Capt Smith). Anxious to get an ice chart. It['s Friday and a holiday weekend coming up and people ashore will be heading for home. H occupies the radio office for a prolonged press conference (in which he revels) and I cannot get through to Ice Central.

1500 Message sent by me to **Polar Star** indicating we wish her to continue in our direction but that we will release her as soon as attainment of open water is assured.

1540 Called DJ re lack of ice intelligence and he suggested Nordreg and the fellow there promised to try and help.

1550 Talked with **Polar Star** (just legible or is it comprehensible) and advised him (her captain) that after one more recon we could be in a position to release her. Message (in) we are to get another recon to-morrow.

Barbecue dinner. Canadian get-together (Patrick & Jean Strachan) also Dennis and Sabena & Guy Morrison. We took our Canadian flag and B handed out NWT [Northwest Territories] pins. Later there was dancing. Talked with a German professional photographer who gave me some tips and strongly recommended Fuji film for its outstanding colour quality - especially blues and greens (ice!).

Easy running through fog and mist at slow speed.

Sat Sept. 3

WW II [World War II] started all those years ago but that, in the present company, is hardly a conversation starter. Our 0700 pos. [position] 71 deg 30 min N 142 deg 00 min W speed 12 in fog.

0725 CANICE3 overheard working SD III.

0740 We are in touch. Most helpful. Got promising report of good conditions and clear visibility ahead.

0750 B and I left the bridge for breakfast and as the door closed behind us there were long blasts on the whistle to signal we had emerged as through a curtain into bright sunshine, blue skies and seas. Lovely and thus it remained all day to the delight (and relief) of all.

0825 Talked to **Polar Star** with advance word that we were able to continue on our own unaided and tried to express gratitude.

About this time we crossed into Canadian waters as it were - joy amongst the Canadians who attributed the marked change to that fact. Sent our position to Nordreg and later another with all the details they demand, and before long a reply arrived giving us permission to enter, which we already have.

Ice is easily navigable, strings and belts 2 to 3/10ths.

In the afternoon at H's request because he wanted to sleep, would I help Franze the Second Officer through the ice. He and I had a fine time and for the most part I left him to it. H should give him more opportunities to handle the ship. Given trust and the confidence of his captain he would become a better officer and he is a good one now. I discussed this with H and he absolutely refuses, as he puts it, to risk the ship. I disagree strongly with this attitude.

A warm sunny afternoon. Everyone out taking pictures pictures pictures and enjoying a glassy calm sea - extraordinary. Two seals sighted and by me one walrus.

Charles Swithinbank asked me why Canada signed the Antarctic Treaty in May this year. Haven't any idea but, like a midshipman, I will find out. Spoke to Roy Friis at Tuk about our ETA and how he is to meet us - all arranged.

Sun Sept. 4

A scratching sound at our door finally wakened me. A nervous [Filipino] from the bridge reporting I was needed. Time 0300. Up and dressed to find there was some misunderstanding and I was not needed at all. I decided to stay and chat with the Second Mate. Lovely night - brilliant array of northern lights, moon, stars. We moved slowly towards our rendezvous. Peaceful. It is many years since I kept a middle watch - or part of one at least, and all of the morning watch which was 46 years ago before my first command. Approached Tuk, picked up our pilot, Roy Friis, who knew all about me. We had met during an ice recce during the (1983) Northern Light barge operation.

Entry into Tuk was an interesting operation. We were drafting 15 ft and the maximum allowed. It was slow going through muddy water but all went well and after a struggle to berth the ship in a strong off-jetty wind, accomplished the operation. Remained on board and tried to snatch an hour or so of sleep but, alas, loud banging on the door interrupted that plan. Two chaps from shore welcomed me heartily but for the life of me I could not place them. Later at sea the next day I had a radio call from Keith Jones who must have been one of them but I still cannot place him or them and felt badly.

Roy Friis on board at 1530 to report the NE wind was lowering the level of the channel so much we run aground (if we sail as planned) though he didn't say that and H, after some humming and hawing[,] decided to remain overnight.

Mon Sept. 5

Had ten hours solid sleep, the first for a long time. Awoke with the ship outbound and the promise of fine weather. No wind to speak of. Our departure was uneventful but the local who promised to come out and take Roy back never showed up - typical - necessitating a long zodiac trip in and out by Dennis and a long wait for him to return. Away we went at full speed steering first for Cape Bathurst then Holman direct in worsening weather conditions - all day.

Cheerful dinner party with Guy Morrison, Have, Isobel, Fred and Inini and good wine. Later that evening a presentation was made to H by the "Lost Tribe of Tuktoyaktuk" (our 25 new passengers) acclaiming his feat in getting the ship through the ice. Later still, following dinner, a card was slipped under our door, anonymously, which pleased both of us. Who? It was addressed to "Captain T.C. Pullen and his lovely lady Betty" and read "On behalf of the others in the ship who were not the lost tribe of Tuktoyaktuk we wish to confer an honorary degree in calm poise and charm to the captain who deserves much acclaim for getting the good ship Explorer through the ice to Tuk."

Tues Sept. 6

Rough seas, strong winds. Anchored off Holman rather far from the settlement. Excessive caution I thought. B and I landed with H who went directly to the Post Office with 3,000 post cards which rather overwhelmed the staff of one. Thence to the fine new municipal office building where the mayor did not seem willing to meet H - resplendent in his patch-festooned parka and white fur cap - hat really. Once his worship had completed his coffee-making chores he removed to his office by then wearing a baseball cap and colourful wind-cheater - badges of office? He appeared rather offhand but it may have been shyness. Next to the little church where there is a fine rendering of the Last Supper in sealskins. Finally to Holman's impressive new school with facilities that equal any in the south. Many chattering happy polite healthy youngsters milling about.

Back to the ship which was bursting with a horde of visitors. "The last zodiac for shore is ready to leave" kept coming over the PA system with a marked reluctance on the part of our contented coke-guzzling guests to leave. Weighed and proceeded at 2000 and were soon pitching and rolling on our way to a rendezvous[.] I set up with David Cowper in **Mabel E Holland** sheltering in the lee of Cape Young.

Wed Sept. 7

H rather uncertain about going into the unsounded bay where David is lying. Gale force winds and steep seas which could be seen crashing onto the exposed coast facing the watery onslaught from the NE. Up early and with Ralf Zander as he made the approach. H arrived and I was pleased to watch him take the ship into the unnamed bay and also uncharted bay. Anchored as close as we should prudently go. Well done H. On the radio with D who was obviously surprised and delighted to see us - "it[']s absolutely marvellous" came over the air repeatedly (as close as D can get to being excited).

Ralf went with a zodiac to fetch him and we, B and I, had a heart-warming greeting at the head of the gangway. Up to the bridge after he had divested himself of his well-worn outer protective garments to meet an enthusiastic H. A shower followed by breakfast in the officers['] dining saloon. At 0930 a jammed and expectant audience filled the lecture room. I introduced David and he gave us all an excellent talk, unrehearsed, followed by questions all of which lasted an hour. H thanked him. Coffee and great chatter in the dining saloon with the wind blowing hard and the seas rolling in. Eventually it was time to go. Much picture-taking and then Ralf returned David to **M.E.H. [Mabel E. Holland]** and his lonely vigil. His next sheltered stop lies 135 nm to the west along this exposed coast. He must await a break in the weather before setting forth. It was a good visit and I am grateful to H. for seeing it through.

We weighed and proceeded towards Cambridge Bay.

Thurs Sept. 8

Arrived off Cambridge Bay in and after rough seas and winds of 30 plus knots. At 0145 called by H (no phone in our cabin) to talk with **Pierre Radisson** who I saw passing down our port side - a blaze of light. A great discussion. She is being deployed to Tuk. Up at 0600. Called **M.L. Black** and found that she was at anchor inside. Tried to carry on a reasonably intelligent conversation with them while H was shouting more at me at the same time. Found that our chart of the approaches and harbour is out of date with respect to channel markers. In the end she said she would come out and lead us in which is a great relief for H and most considerate of her - and so we entered safely to anchor two or more cables off the jetty. **M.L.B. [Martha L. Black]** anchored nearby.

Ralf (as Staff Captain and captain in waiting he seems to have a lot of odd tasks to perform) went over to and brought Captain Mellis and Larry (the beard) Solar, Ice Observer, back for discussions. Larry, who looks like an

enormous Farley Mowat and twice as pleasant, brought a collection of the latest ice and weather charts while Capt M had nautical ditto. Very useful exchange of views. H wanted me to ask for an escort out but I felt reluctant to keep asking for favours. He did it himself and M agreed. A very prolonged talk between H and M as to routes and times with the former incapable it seemed of coming to a decision. After a glass and the supply of soda water, cigars and other commodities, M and S returned to their ship.

A wet windy visit (ashore for the passengers) and a rude reception given to the first group to visit the DEW [Distant Early Warning] [L]ine station. Neither B nor I went ashore. Under way during dinner and after parting company from **M.L.B.** set off to the east for Gjoa Haven.

Fri Sept. 9

Spent an interesting two hours on the bridge during the transit of Simpson Strait. Anchored off Gjoa Haven at 1415 and went ashore where we found a telephone and made two collect calls to Donnally (Pullen) and Noel (Quinn). All is well. Attended drum dancing and throat singing which is a repetitious performance. Wandered about meeting, greeting and dodging high-speed three wheelers. 1800 returned to the ship. Dinner with Ralf as our guest plus Guy Morrison.

We will remain at anchor until 0200. To-day is the 85th anniversary of Roald Amundsen's arrival here in 1903 so our visit is timely. H brought off the local quality for cokes and talk.

Sat Sept. 10

Up on the bridge just after sunrise - 0630 - when the transit of Simpson Strait had been completed. All forenoon in Requisite Channel and towards a 1330 rendezvous with **M.L.B.** but which (for lack of time) was cancelled. Instead, I talked with Larry S. and took down all his latest ice information. Pressing on and making nothing in Victoria Strait. Warned H about the need to watch the depthfinder and of the need to be alert in what are still poorly surveyed waters.

Gave a talk on Bellot Strait to the passengers. On to the bridge at 1800 and because of ice had to refuse a dinner invitation.

As we made progress the ice appeared in increasing quantities and generally as described by Larry S. During the first watch we trended north and east to seek open water. Finally H and I remained to indulge in shiphandling sinuosities through and around the pack including a number of heavy floes. A deal of crunching, bumping and crashing to remind our

passengers of where we were. It took hours trying to end-run the pack so we could steer for Bellot to the north.

By 0330 we rounded the pack by which time the ship was at the northern entrance to James Ross Strait. In open water I left the bridge at 0345 and H followed at 0400. A long day and far more ice time than I expected.

Sun Sept. 11

A sound sleep and B got me breakfast so I did not have to rush. A shower and ready for another day. Approaching Bellot[,] a few strings and belts of old ice off its western entrance. A quick lunch and then into the strait. Guy Morrison spotted a polar bear far up on the rocky hills on our port side, tiny, being so far away but a bear all right. Very observant of him.

A smooth run. A few multi-year floes in the middle and quite a lot in the vicinity of good old Magpie Rock swirling about in the eddies but we were able to steer around them. Magpie had a thick flat chunk of ice perched on top but little eddying nearby. Everyone interested in seeing the rock site and also Zenith Point, northernmost tip of (continental) North America.

H anchored off Fort Ross - much too far (in my opinion) from the landing place. Hasse Nilsson would have gone much closer to the beach. It makes for hard work for the zodiacs.

Ashore with B and everyone else. Good weather but a cold wind. A number of heavy multi-year floes grounded near the landing beach. Fort Ross building vastly changed from the shambles it was in 1986. Evidence of Caroline's hand with everything neatly stowed and arranged. Signed (B did) the book H left there in 1985. Inspected the M'Clintock memorial, flagpole and the other hut which is in a sorry state with all the windows broken - bears? Eskimos? Climbed the higher ground for pictures. A glass of hot "gloog" and back to the ship.

An enormous heavy old floe drifted onto the ship but passed slowly and safely down the starboard side and clear.

1830 underway and into Prince Regent Inlet[;] however a vista of pack ice athwart our track indicated a long night of ice navigation. I could not equate the situation with Larry S's confident assertion that P.R.I. [Prince Regent Inlet] was open water. It could have been a belt of ice with open water beyond but (from our low vantage point) that we could not determine. After a brief discussion (remarkable for H who goes on and on regurgitating even the simplest of decisions) we turned back with my full concurrence to go by way of Peel Sound.

A Canadian dinner with flags and champagne. Dennis and Sabena Mense, Guy Morrison, Jean and Patrick Strachan, Jan Tennant, Roger Matheson and ourselves.

An ice-free run, for the most part, through the strait. The same block of ice was sitting atop Magpie but this time there was the furious turbulence with which I associate the rock.

Turned in at 2330 and enjoyed an uninterrupted night as Ralf and others took **Explorer** up the clear waters of Peel Sound with the pack lying against the western side.

Mon Sept. 12

A tap on our door at 0630. Up, washed, dressed and to the bridge. We were just a few miles to the west of Limestone Island with ice to the west, ahead and on our starboard bow. H asked me "vich vay ice master?" To the northeast around the pack I replied which was the response he wanted or expected. It was the only option and so off we went in open water all the way to Resolute where we anchored at 1100.

Spotted **Des Groseilliers** anchored outside. Spoke [to] them on Channel 6. Female French voice at the other end. **John A Macdonald** (now there's a good icebreaker) reported 30 nm to the west off Cape [Airy].

Passengers went off in [T]win Otters to inspect muskox and beluga. Remained on board. In the p.m. an invasion by barge of 25 from the icebreaker who, after a perfunctory look around, attacked the bar and with gusto proceeded to enjoy themselves.

The uniform of the officers is smart - naval buttons too. Some of the males very unkempt with long hair and scraggly beards. A French-speaking group - all of them it seems. Quebec-based and some with a little English. Our Swiss passengers could not understand them and the Andre's [sic] from Paris only the odd word.

At 2030 H, Ralf Zander, the 2nd and 3rd officers, Chief (Engineer) and myself went away by zodiac to visit the 'breaker after we had shifted our anchorage close abeam. Ralf commented that the cream of the team was out of the ship and what might the passengers get up to? Later, we learned that as soon as we left the gangway a voice announced over the P.A. system "At last, the ship is ours!" Dick Krementz at play.

A rating was at the gangway when we arrived and someone led us through passageways and up a number of stairways to the captain's cabin ([Gérard] Guesneau) who greeted us, organized drinks and chatted of this and that. A female, whose identity and name I did not catch, was already ensconced - informal attire. Maybe his wife for all I know.

A quick tour of the bridge and after expressing our thanks, departure. A lot of our passengers went over and all seem to have been impressed. The bridge, of course, is gigantic especially compared with ours. They are expecting orders to head for home. I suspect she has not been very busy and has had a lot of anchor time. I would like to have had a chance to inspect her log. Resolute, not my favourite place but an important way station. Now we will be heading east, not north, and completion of the Northwest Passage is assured.

Tues Sept. 13

Under way during the night for the short run across Wellington Channel to Beechey Is. Anchored at 0750. At 0830 gave a brief 25 min. [minute] talk to the passengers on the history of the island and what is there, stressing that it is a place of ships and seamen - a naval place. Also emphasis on the aura of sadness, frustrated hopes and melancholy. Well received I think. I also stressed my strong objections to all the modern clutter that has been deposited there. With my binoculars I could see that the mast of the yacht "Mary" (John Ross) has fallen down, either pushed by bears using it as a scratching post, or on account of the bloody idiots who make a game of throwing rusty barrel hoops over the top, and the cumulative weight became sufficient to fell it. It has been leaning at an angle for years. Must get the Coast Guard to [re-erect] it, they have plenty of time for such things it seems.

Ashore at 0930 landing near the graves and was soon surrounded by red-coats asking questions. Never did get a close look but all seemed in order and no sign of the recent exhumation activities. Set off with H and B to walk along the beach to Northumberland House & etc. Had a thorough look around while answering queries and posing with H for pictures. A little ceremony at my **Labrador** cairn with H while we stuffed a document into the **Lab.** [**Labrador**] copper pipe. Cold work with bare hands. Took plenty of pictures. Some of the hardier souls climbed atop Beechey and after some difficulty located the Franklin cairn and reported a new pole has been erected - steel - and thin with no barrels so likely invisible from seaward. It was all very evocative and possibly my (our) last visit but I am grateful for the opportunity. I still deplore the modern additions and many passengers agreed with my views.

Mid-day we left Erebus Bay and shaped our course east along the Devon Is. coast. No ice to be seen. At 1800 we sighted a large berg, 160 ft high, visually at 24 miles. H closed and circled it so all could look with wonder and take pictures. Much excitement and a great amount of film was exposed.

Calm sea, blue sky as we glide by the coast of Devon Is. and we look forward to the end of this voyage now scheduled for Narsarsuaq instead of St John's, Nfld [Newfoundland].

Wed Sept. 14

Anchored off Nungavik, Navy Board Inlet, location of an archaeological dig. Ashore and a good hike with my friend across the tundra, eventually to the shore and then back to the landing beach. A helicopter overhead first heard by B, and then the **Des Groseilliers** came into view homeward bound after what I would suspect has not been a very strenuous season.

On the bridge earlier with H discussing the visit p.m. to the Sermilik Glacier on Bylot Is. 3 1/2 miles off its foot (such as it is) the closest sounding is 407 fms [fathoms] and he dismissed my gentle persuasion that he might go a little nearer as too dangerous. Good grief, the water is 2,442 ft deep. Such timidity, some expedition ship. I could not believe it. In the event we made an unhesitating perfunctory sweep past (in deep water) and headed for Pond Inlet settlement.

I wrote an entry (at his request) for Heinz's personal record book plus a picture of a polar bear and one of my bookplates.

Went ashore for a walkabout, the place has grown impressively, population now approaching 1,000 and 550 are under 16. Went in search of Herman Steltner. He spotted us and shortly were inside meeting Sophie and hearing a full report since we were last here in 1986 and S collapsed in the **World Discoverer's** lounge. We thought (then) she might have had a stroke, but not so. He has a very low opinion of the Yellowknife Govt, (according to him) a gang of neo-fascists and if he is right something should be done. He excluded John Parker, the commissioner who, Sophie said, had been made powerless. Interesting visit.

Sailed at 1930 and at 2000 the NWP dinner at which we were two of H's guests at his table. He proposed a toast to me as Ice Master[,] in the process making a flattering speech about me[,] only part of which I could hear. It was as unexpected as it was pleasant to receive such a public tribute. He did the same for Alan, our hard-driven cruise director.

Thurs Sept. 15

We had entered Coutts Inlet at dawn and by the time I got up the head of the inlet, 38 nm in, was in sight. Where we turned was a perfect specimen of a growler which was recorded on film by me for future use.

This was the wedding day for Stewardess Isobel and Erhart, the electrician. Everyone dressed and a ceremony conducted by the inimitable

Aye. It was a Spartan affair and bore no relation to the service in the book of Common Prayer. I suppose it is legal, being a Bahamian ship. Much joy, giving of presents, we the passengers did a whip round and came up with more than \$500. More champagne. [Filipino] dinner, dancing, frivolity. Turned in earlyish and had a good night's sleep. Still catching up. Asked by Sabena if I would talk on the NWP to-morrow. I would and will.

[page missing]

Sat Sept. 17

At one point we passed between two huge bergs, vertical walls of gleaming, glistening and menacing ice 120 ft high. Glad we did not tarry. Took a great many photos, having to change film fumbling with cold fingers in a great rush. Twelve of us and everyone enjoyed the outing.

Weighed and left Jacobshavn just before dinner to continue southward overnight. During the evening went to a movie **Bounty** (version 3) and no better than its predecessors. During the performance we started to roll more heavily than usual and one especially heavy lurch resulted in a great crash of equipment and a cessation of the screen action - briefly alas. An uncomfortable night wallowing and making sleeping difficult.

Sun Sept. 18

Up at 0700, dressed quickly and to the bridge where H and Ralph were making their approach to [Holsteinsborg]. R told me the lights on the two range marks were visible 12 nm to seaward. H told me he had included in his report that this NWP transit was my fourth. Enjoyed the entry and berthing which was well executed though it should with the availability of a 400 hp [horsepower] bow thruster. Nice to walk down a gangway instead of a zodiac ride. By bus to the school for a walkabout. Back to the jetty and a walk to the local marina where a helpful local told us where John Bockstoce's **Belvedere** is lying. He understood and pointed to the very inner-most head of the harbour and inaccessible on foot. Got as close as possible and took two pictures with a 50 mm [millimetre] lens when I should have had at least 200. During all this the coastal ship **Disko** came in berthing ahead of us. Same red painted hull and about the same size, carrying a large number of passengers.

Slipped and proceeded at 1200 to make room for an incoming general cargo ship - also red.

We continued coastwise to Itivdleq Fjord to anchor off the settlement. 65 people went ashore but we did not having been here twice before. Instead

some Egyptian P.T.[†] and then I went to Charles Swithinbank's second lecture on Ice Sheets. 97% of all water on the face of the earth is salt water and 99% of the remainder is ice and 1% is fresh water. An impressive statement. He showed some excellent sides of tabular bergs and I must ask if I may acquire copies.

Highlights. For myself I would list, not in order of preference, the following:

- 1 The visit to Siberia and Provideniya
- 2 Our struggle through the ice in the Beaufort Sea
- 3 The navigation of the shallow channel into Tuk.
- 4 Visit to Holman and in particular the school there
- 5 The rendezvous with David Cowper
- 6 CCGS **Martha L Black** & her help in entering & leaving Cambridge Bay plus Larry Solar's ice information
- 7 Welcome at Gjoa Haven & telephone calls home
- 8 My first navigation of Victoria Strait, the ice & the historical significance of the place
- 9 Bellot Strait, east & west, Magpie Rock & Fort Ross
- 10 CCGS **Des Groseilliers** at Resolute
- 11 Beechey Island
- 12 Encounter with large berg in Lancaster Sound
- 13 Ditto with berg in Baffin Bay and the polar bear
- 14 Zodiac cruise around the bergs at Jacobshavn
- 15 Completion of my fourth NWP transit

In retrospect I should add the day in fog, mist and overcast skies when we were approaching the Alaska-Yukon border and suddenly towards noon, as though through a curtain, we glided into bright sunshine, calm seas and blue sky without a cloud to be seen. Everyone's spirits rose and life took on a cheerier note. This was another timely happening, and a good one, a succession of which punctuated our voyage.

[†] *Editors' note:* Derogatory British military slang meaning "to go to sleep," describing how "arms are folded across your chest when you sneak off for a cheeky sports afternoon nap." Julian Perreira, "British Military Slang Or Phrases You Need To Know 2," *BFBS*, 8 October 2019, <https://www.forcesnews.com/military-life/fun/british-military-slang-or-phrases-you-need-know-2>.

Dinner as guests of Alan Billingsborough, Cruise Director, others included Guy M, Charles S, Ellen and B. Ellen told me that Sabena's introduction to my talk the other day was meant not only as that but also as a sincere tribute and recognition of my role as Ice Master in getting the ship through the Alaskan ice.

Alan, in so many words, asked me what I thought of H - a question I did not answer in such circumstances in public, albeit staff, feeling it would be improper whatever my views. There seems to be a feeling that he has too massive an ego and that he is always grandstanding. I suppose it is a result of all the voyages he has done, including 52 to Antarctica, where he is the focus of admiring attention. I understand Alan refers to him as Bozo (the clown).

Mon Sept. 19

Arrived [Godthaab][,] now Nuuk[,] in good time and overcast skies. Watched our approach, embarking the pilot and berthing. So easy with that bowthruster. By bus to the museum and we were impressed. Three buildings, one houses examples of kayaks and oomiaks, also a dory; another some fine sculptures; the last and largest displays many items of interest but the most intriguing is that showing the mummies from Umanak, north of Disko, 400 yrs old of women and at least one infant.

This day I wrote the Introduction to the log of the voyage at Heinz's request. It is a challenge to satisfy his penchant for the high-flown phrase and hyperbole while telling the truth. Sailed out into Davis Strait. During the evening the weather deteriorated and the ship became quite active. Turned in early but with so much pitching, rolling and lurching, it was hard to get much rest.

Tues Sept. 20

Not much sleep. Visit to [Frederikshab] cancelled due to weather delays so our course was directed towards [Narsarsuaq]. A day rolling along in a confused swell. Gordon Fountain gave us an informal talk about Admiral Byrd and his 1932 expedition to Little America (mid-point of the Ross ice shelf) on board the barquentine **Bear**.

Captain's farewell dinner but before that in the Explorers' Lounge he made a lengthy speech, including a large chunk of "hidden corners stuff", and in the course of which he made a number of flattering references to my contribution as Ice Master and also presented me with a silver bottle opener. Much applause. Gratifying and appreciated. Champagne flowed again.

When we reach N [Narsarsuaq] in the morning the ship will have covered 5,483 nm. It has been an interesting voyage full of happenings and of the six I have made with Lindblad and Society Expeditions this has been unquestionably the best.

Wed Sept. 21

Up early, finished packing and then watched the berthing operation. H always makes a meal of it as though he was berthing a battle cruiser. B and I reluctantly vacated our cabin - 144 - as did everyone else theirs. Waited and wrote as time dragged on. Finally, buses to the hotel; for a fine lunch and yet more waiting. An impressive sculpture of a polar bear and two cubs in the foyer, standing about 12 ft tall, all white. B took a pic.

In the end the chartered 727 arrived with the new lot of passengers. After more delay, we straggled along to the next waiting place - and eventually boarded. Three hours later into Halifax and after a quick rush through Immigration and Customs back onto a now empty plane save for three of us (Roger Matheson of Vancouver) and off to Ottawa.

So ends another adventure, a fourth successful transit of the NWP and it has been a challenging time. Who would have reckoned on Alaskan ice being the problem. Our attention has been focussed on Larsen Sound and Franklin Strait for too long. Nature is still calling the shots.

-oo0oo-

Ottawa Fri Oct. 7

The ice conditions have steadily and quite rapidly deteriorated off the Alaskan coast. I called Dave Johns, Coast Guard, to-day and he confirmed that the arctic pack is hard on the coast from Icy Cape to, and around, Point Barrow. **Pierre Radisson** despatched to assist **Martha L. Black** around Pt B [Point Barrow] and into open water, in this both ships were unsuccessful and **M.L.B.** has severely damaged both her propellers - loss of blades and bending of the remainder. (Able to make nine knots)

Polar Star was involved too and to no avail. DJ told me the pack is under pressure and now **P. Star** [**Polar Star**] cannot get through to the west and open water. She is down to 40% fuel remaining (those thirsty gas turbines) and has also lost the use of her centerline turbine. **M.L.B.** and **P.R.** [**Pierre Radisson**] have retreated eastward and are presently in the vicinity of Jenny Lind Is. and escape to the east is assured.

DJ told me also in confidence the **John A Macdonald** is topping right up with fuel in readiness for despatch to the western arctic to succor the U.S. icebreaker. What price a Polar icebreaker! Shallow draft icebreakers with

their twin screws are vulnerable to damage in heavy going i.e. **M.L.B.** and even **P.R.** which draws only 23 ft because she is designed for the St Lawrence Seaway locks.

Ottawa, Tuesday Oct. 10

According to C.G., **Martha L. Black** is now at Pond Inlet and **Pierre Radisson** in Lancaster Sound transferring fuel to **Sir John Franklin. Polar Star**, whose center shaft is now operational, failed again to break through to and around Point Barrow. Permission has been sought, and given, for her to transit Canadian waters to get to the east.

13

The Grounding of *Hanseatic* in Simpson Strait, August 1996

Transportation Safety Board of Canada*

Summary

While on passage from Gjoa Haven to Resolute Bay, the “HANSEATIC” ran aground in Simpson Strait. The weather was fine and clear and the vessel was being navigated visually, by reference to shore ranges, and by radar. The passage plan was disrupted when it was assumed that a buoy, which had been left in the strait from the previous navigation season, was marking a shoal. The buoy had been moved out of position by ice.

The Board determined that the “HANSEATIC” grounded because the bridge team did not strictly adhere to the plan that had been prepared for navigating the vessel through the strait. Relying on a navigation buoy left in the strait from the previous navigation season contributed to the grounding.

Factual Information

1.1 Particulars of the Vessel

Name	“HANSEATIC”
Official number	720407
Port of registry	Nassau, Bahamas
Flag	Bahamas

* Marine Investigation Report M96H0016, Grounding – Passenger vessel “HANSEATIC,” Simpson Strait, Northwest Territories, 29 August 1996.

Type	Passenger
Gross Tons¹	8,378
Length	122.80 m [metres]
Draught	4.8 m (max)
Built	1991, Rauma, Finland
Propulsion	Two 2,940 kW [kilowatt] diesel engines, driving two controllable-pitch propellers
Owners	Bunnys Adventure & Cruise Shipping Co., Hamburg, Germany
Passengers	149
Crew	110

1.1.1 Description of the Vessel

The “HANSEATIC” is of typical passenger ship construction with the superstructure extending the entire length of the vessel abaft a short foredeck. The navigation bridge is situated at the forward end of the superstructure.

The navigation bridge is of modern design. The control console is situated forward in the wheel-house. There are three radars in the wheel-house, one to each side and one near the centerline.

The view forward is unobstructed but, because of the superstructure, it is not possible to see astern from inside the wheel-house. To improve visibility astern, the bridge wings extend outside the superstructure. A manoeuvring console with a gyro-repeater is fitted on each wing.

The “HANSEATIC” is an up-market passenger vessel which, since 1993, has specialized in what have been variously described in the maritime press as expedition cruises or adventure cruises. Where no port facilities exist, the vessel’s outfit of small boats allows passengers to disembark for tours ashore.

The vessel’s hull is ice-strengthened.

1.2 History of the Voyage

On 29 August 1996, the “HANSEATIC” was in the eleventh day of a Northwest Passage cruise which had started in Nome, Alaska, and was to

have terminated in Greenland. The cruise had taken the vessel to several communities in Alaska, Yukon and the Northwest Territories.

On the morning of 29 August, the "HANSEATIC" made an eastbound passage in Simpson Strait to the village of Gjoa Haven where she was to anchor for part of the day, while passengers went ashore for a tour of the village. During the trip, several buoys were unexpectedly found in the strait. The master had not anticipated seeing any buoys in the strait because the Arctic Canada Traffic System (NORDREG [Northern Canada Vessel Traffic Services Zone Regulations] CANADA) had advised him that the buoys for Simpson Strait were still on board the CCGS "SIR WILFRID LAURIER", as the ice breaker had not yet had an opportunity to position them. The majority of the range markers for the various legs of the inbound passage were positioned ahead of the vessel and the passage was straightforward and uneventful. Little attention was paid to the buoys or whether they were in their charted positions.

The "HANSEATIC" left Gjoa Haven in the afternoon of 29 August for Resolute Bay. Initially, the voyage to Resolute required that the "HANSEATIC" retrace her morning passage through Simpson Strait, in a westerly direction. The route involves many alterations of course and, as on the inward passage, the master had the conduct of the vessel. With him on the bridge were a helmsman and the chief officer who assisted with the navigation. The ship, which has an operating speed of 14 knots, was making about 10 knots and no difficulty was experienced with the initial part of the transit. A position taken at 1738² confirmed that the vessel was proceeding parallel to, and approximately a cable south of, the 288° course line indicated on the chart for the ranges on Eta Island. The vessel was south of the charted course line to avoid a 6.1 metre shoal reported near the track. Once past the shoal, and approximately half way along this leg, the "HANSEATIC" was brought back towards the 288° course line. At 1745, a check of the ship's position by the chief officer showed the vessel abeam of the northwest extremity of Saatuq Island and almost exactly on the 288° course line. The vessel was at this point about half a mile from the next alter-course position, and the chief officer turned his attention to setting up the radar for the next leg.

Meanwhile, the master was monitoring the vessel's position relative to the 288° course line by reference to the Eta Island ranges. Because the ranges were astern of the vessel, and with the helm orders ranging from 290° to 293°, the master had to frequently go out to the starboard wing of the bridge to check the ranges. The master was reportedly keeping the ship on a heading

which was increasingly to starboard of the course line to counteract the effect on the vessel of the northwest wind.

As the “HANSEATIC” approached the alter-course position, the master was aware that the ship was north of the ranges, but the sight of a green buoy on the starboard side gave him confidence that she would pass clear of a shoal lying just to the north of the course line. However, the buoy had not been removed at the end of the previous navigation season and the winter ice had moved it about 200 metres to the northeast. Consequently, the “HANSEATIC” did not clear the shoal and ran aground in position 68° 33.75' N [North], 097° 32.2' W [West].

As the vessel was not considered to be in any danger, during the next few days, while awaiting assistance, passengers were afforded the opportunity to explore adjacent islands, using the ship’s boats. On 05 September 1996, with the exception of a few who had requested to be flown home, the passengers were transferred to another vessel to carry on with their Northwest Passage cruise.

Following several unsuccessful attempts, the vessel was finally refloated on 08 September 1996, with the help of the tug “EDGAR KOTOKAK” and the coast guard cutter “NAHIDIK”.

1.3 Injuries to Persons

No one was injured as a result of the grounding.

1.4 Damage

Damage was limited to the underwater hull between frames 77 and 126. The shell plating was holed and severely rippled on both sides of the centreline girder but there was no pollution as a result of the occurrence.

1.5 Certification

1.5.1 Vessel

The vessel was certificated, crewed and equipped in accordance with existing regulations.

1.5.2 Vessel’s Navigation Personnel

Both the master and the chief officer held qualifications appropriate for the tonnage of the vessel on which they were serving and for the voyage being undertaken.

1.6 Personnel Experience

The master of the "HANSEATIC" had 26 years' experience as master on a wide variety of passenger vessels. Although he had sailed in the Canadian Arctic on several occasions, this was his first voyage through Simpson Strait.

The chief officer of the "HANSEATIC" had 25 years' sea-going experience, 10 as master. He had seven months' experience on board the "HANSEATIC" as chief officer.

1.7 Bridge Team

The master, chief officer and helmsman were on the bridge prior to, and at the time of, the grounding. Although an ice navigator was on board the "HANSEATIC", at this time of year the vessel was permitted to navigate in the Simpson Strait area without his aid, and he was not on the bridge during the passage.

The bridge team was well rested at the time of the occurrence.

1.8 Environmental Information

1.8.1 Weather

The weather was fine and clear with a northwesterly wind of 17 to 21 knots. The sea was calm in the sheltered waters of the strait and the visibility was reported to be about 5 miles. The air temperature was 7C [Celsius]; the sea temperature was 4C.

1.8.2 Tide and Tidal Stream

According to the *Sailing Directions - Arctic Canada, Volume I*, the average tidal range in Simpson Strait is about 0.6 m. The range for the tidal cycle during which the grounding occurred was calculated to be about 0.5 m. The grounding occurred about four hours after high water.

The *Sailing Directions* advise that "the tidal stream, from brief and broken observations, is rectilinear, running roughly parallel to the axis of the strait..." They also caution that "...tidal streams up to 4 knots, and up to 7 knots near Eta Island, have been experienced, with marked changes of direction, tide-rips and backeddies around the islets and shoals." On Canadian Hydrographic Service (CHS) chart No. 7735, tide rips are indicated in the area of the grounding.

From an analysis of the information available, the Institute of [Ocean] Sciences in Sidney, B.C. [British Columbia], formed the opinion that they "...would not expect there to be a strong deflection of the current from the along-channel direction in the vicinity of the range line..." They concluded

that "...currents were unlikely to be a significant factor in carrying the *Hanseatic* off the range line."

1.9 Navigation of the Vessel

1.9.1 Navigation Equipment

The vessel's navigation equipment was reportedly in satisfactory condition. Two radar sets were being used in the navigation of the vessel and no deficiency was reported.

The Global Positioning System (GPS) was not being used. Positions obtained by GPS in Simpson Strait can be off by as much as one mile, when plotted on the chart. This lack of precision is due to the inaccuracy of geographical coordinates on charts of the area.

1.9.2 Charts and Publications

The marine chart being used by the vessel was the CHS chart No. 7735, Simpson Strait.

Many areas of the Arctic coast are either incompletely or inaccurately charted, or both. The geographical coordinates are not accurate on some charts (including chart No. 7735) but the shore lines and other features on chart No. 7735 are correctly depicted relative to each other. Positions obtained from the radar and by visual means will be accurately represented on the chart.

The *Sailing Directions - Arctic Canada, Volumes 1 and 3* are relevant to the area of the occurrence and these publications were on board the "HANSEATIC".

1.9.3 Aids to Navigation

The *Sailing Directions* advise that the channel through Simpson Strait is marked by beacons, beacon ranges and buoys. The *Sailing Directions* also advise that the buoys in Simpson Strait are seasonal. However, because the Canadian Coast Guard (CCG) policy is that the operational requirement for ice-breakers takes precedence over the removal of the buoys in the strait, the buoys are not always removed at the end of the shipping season. Each season, the CCG does not consider the strait to be buoyed until a Notice to Shipping is issued, specifically stating that the buoys for the area have been deployed. Such a Notice to Shipping had not been issued at the time of the occurrence. Although the buoys are built to be expendable, some of the buoys are not destroyed during the winter and remain afloat in the strait or grounded on adjacent beaches. Buoys that remain afloat are almost invariably displaced from their charted positions. While the buoy that marked the shoal on which the "HANSEATIC" grounded had been moved about 200 metres to the

northeast, the buoy that marked the shoal on the other side of the channel was found some 1,300 metres to the west of its charted position.

A stretch of some 20 miles of the navigation channel depicted on CHS chart No. 7735 comprises eleven legs, eight of which are defined by a set of shore range markers. Persons experienced in navigating in the Arctic advise that, because some of the range markers are built on low islands, they may be pushed out of position by the ice and mariners must be cautious when using them. Six of the eight sets of range markers are ahead for an eastbound vessel.

The 108°-288° range markers on Eta Island were checked after the “HANSEATIC” grounding and were found to be in their correct positions.

All aids to navigation in Simpson Strait are unlit.

1.9.4 Cautionary Notes Regarding Buoyage

Canadian publications relevant to a passage through Simpson Strait contain several warnings against relying on buoys in the area.

A note on chart No. 7735 states that “the channel leading through Simpson Strait is marked by seasonal buoys which are liable to be displaced by ice.” All *Sailing Directions* published by the Department of Fisheries and Oceans (DFO) advise that “mariners should not rely on buoys being in their charted positions at all times. Buoys should be regarded as warning markers and ... Masters should always navigate by bearings or angles on fixed shore objects.” The *Sailing Directions - Arctic Canada, Volume 1* also warns that “buoys laid in Arctic waters must be regarded merely as temporary and very unreliable aids to navigation ... and they are always liable to be carried away by the movement of ice...” The *Sailing Directions - Arctic Canada, Volume 3* advises that “buoys in Simpson Strait are seasonal and consist of four oil drums welded together end-to-end and painted red or green. Some years, because of ice conditions, it is not possible to lay the buoys, and since buoys in these ice-strewn waters cannot be depended upon to remain in their correct positions for very long, little reliance can be placed on them.”

1.10 Passage Planning and Bridge Resource Management

The master and the chief officer had been involved in the planning of the passage. The *Sailing Directions* describe the passage through Simpson Strait as probably “the greatest navigational hazard in the whole mainland passage ... because of numerous shoals, narrow channels and strong tidal streams”. This publication also states that “numerous dangerous shoals ... lie close to the channel and it is probable that these are altered considerably by ice action each season.”

In describing the topography, the *Sailing Directions* advise that “on the north side of Simpson Strait, the ... coast presents a low, regular and rather featureless appearance, with no distinctive landmarks[,]” while the south “... coast is somewhat higher than the north coast but its overall elevation is moderate gradually rising to distant hills ... The islands in Simpson Strait consist mainly of stones and large boulders, and ... tend to blend in with each other and with the adjacent shoreline.”

For the passage in Simpson Strait, the master had the conduct of the ship and the chief officer was assisting by plotting the vessel's position. In the parts of the strait where the alignment of the channel is indicated by shore leading marks (ranges), any lateral displacement of the vessel from the alignment could be quickly detected by the master. To indicate the vessel's progress along the alignment of the channel, radar distances and bearings of the shore were to be obtained and plotted by the chief officer. No supplementary parallel indexing was being used when the vessel was on the Eta Island range markers, but parallel indexing was to be used on the next leg. With the vessel proceeding westbound on these two legs, the range markers were astern. When the vessel was proceeding on the Eta Island course, the radar distance ranges used varied with the application.

1.11 Ice Navigator

According to the *Arctic Shipping Pollution Prevention Regulations*, the “HANSEATIC” was not required to carry an ice navigator, although an ice navigator had been on board since the vessel departed Nome. The “HANSEATIC” was in open water at the time of the grounding and the ice navigator was not on the bridge--nor was he required to be.

1.12 Post-grounding Assistance and Refloating the Vessel

1.12.1 Assistance

Following the grounding, the master contacted NORDREG to inform them of the situation and to request towage assistance. The CCGS “NAHIDIK” was in the area and was tasked to assist the stranded vessel. The “NAHIDIK” was on the scene at 0334, 30 August.

In the morning of 30 August, the CCGS “HENRY LARSEN” was also tasked to be part of the response. However, her draught prevented her from entering the channel and she had to remain about a hundred nautical miles from the site. On 05 September 1996, the CCGS “LOUIS ST.LAURENT” was tasked to replace the “HENRY LARSEN” but her draught was also too great for her to reach the scene.

1.12.2 Refloating Operation

On 30 August, the “NAHIDIK” twice attempted to free the “HANSEATIC” by pulling her from the stern. On the second attempt, the tow line parted and work was suspended for the day. Another attempt was planned for 31 August but the “NAHIDIK” damaged her foremast while manoeuvring to receive an anchor from the “HANSEATIC” and all further attempts were cancelled pending the arrival of commercial assistance.

On 05 September, the passengers left the vessel. Those who had not requested to be flown home were transferred by air to a Russian passenger ship with ice-breaking capability, the “KAPITAN DRANITSYN”. The owners of the “HANSEATIC” had chartered the “KAPITAN DRANITSYN”, which had been available in the area after a promotional engagement. Ten crew members from the “HANSEATIC” also transferred to the Russian vessel to assist with the passengers.

On 07 September, the “HANSEATIC” off-loaded an anchor and chain, and most of her fuel to a barge brought alongside by the Canadian tug “EDGAR KOTOKAK”. The lifeboats and zodiacs were put in the water. The next day, 08 September, the “NAHIDIK” and the “EDGAR KOTOKAK” were made fast to the “HANSEATIC” and the stranded vessel was successfully refloated at 1033.

1.12.3 Search and Rescue

Although no distress call was sent by the “HANSEATIC”, the [Joint] Rescue Coordination Centre at Trenton was notified of the grounding. There is not a lot of marine activity in the Canadian Arctic and no primary marine Search and Rescue (SAR) resource is assigned to the area.

The major marine activity in the area consists mostly of commercial resupply and government operations. During the last eight summers, on average, three passenger vessels cruised for two to three weeks in the Canadian Arctic. Coast Guard ice-breakers and DFO scientific vessels provide secondary coverage during the summer and early fall.

Most marine SAR incidents in the area are resolved with the use of primary air resources as opposed to marine resources. Three C-138 Twin Otter aircraft and one C-130 Hercules aircraft provide coverage throughout the region.

Traffic in Simpson Strait is minimal and no shipping accident had previously been reported in the area, since computerized records were begun in 1975.

1.13 Policy Regarding Passengers

It is the on-board policy to allow passengers on the bridge of the “HANSEATIC” while the ship is underway. The navigating personnel are used to the presence of passengers and reportedly are not distracted by them. The cruise director and about twenty passengers were present on the bridge during the westbound transit of Simpson Strait. They were standing in a designated area confined by ropes at the back of the bridge, in silence. The master did not realize they were there until after the grounding, and it is unlikely they distracted him.

The passengers present on the bridge described the atmosphere as being serious and professional.

1.14 Situational Awareness

Situational awareness can be defined as the accurate perception of the factors and conditions affecting the crew and the operations of the vessel during a specific period of time. This is developed by using “all the knowledge that is accessible and can be integrated into a coherent picture, when required, to assess and cope with a situation.”³

A person performing a complex task such as ship navigation depends on situational awareness when making and carrying out plans throughout the operation. Situational awareness does not happen instantaneously, but develops on three different levels. First, the person has to perceive the situational elements from information displays, communication, or from external references. The person then integrates the information by using his/her experience and knowledge. Finally, the person projects the information into the future to make and modify plans as tasks are completed or delayed and new developments arise. In general, it can be expected that poor or unsuccessful performance will occur if there are problems at any one of these situational awareness levels.⁴

One of the ways that the integration of information can be erroneous is when a person is affected by confirmation bias. This is a tendency to seek information to confirm that which we already believe to be true. Information that is inconsistent with the chosen hypothesis is then ignored or discounted.

Analysis

2.1 The Tidal Stream

The *Sailing Directions* warn of the vagaries of the tidal stream in Simpson Strait but it was not possible to determine with any certainty what part, if any, the current played in the grounding of the “HANSEATIC”. The radar

had not been set up for parallel indexing on this leg and the only on-going means of promptly detecting lateral movement caused by the current would have been to keep the shore range markers in line. However, when the vessel was brought back to the course line, she was allowed to cross it and to continue with the range markers open. Range markers that are already open do not readily indicate to the observer that further, gradual deviation from the ranges is taking place.

The positions plotted by the chief officer at 1738 and 1745 show the vessel being brought back to the course line between these times. The 1745 position, taken from the radar some 2-3 minutes before the vessel grounded, showed the vessel to be slightly north of, but close to, the line of the ranges. This position suggests the possibility that the current contributed to the grounding of the "HANSEATIC". However, the direction and distance of the grounding position from the 1745 position, $308 \times 3\frac{1}{2}$ cables, calls into question the reliability of the 1745 position. The course required to be made good to keep the vessel on the line of the ranges was 288 and, with up to 5 leeway being allowed for the northwest wind, the vessel was steering 293. A rectilinear tidal stream parallel to the axis of the strait would basically be in line with the 288 course. For the 1745 position to have been accurate there would need to have been an aberration in the rectilinear tidal stream. To sweep the vessel 20 off the course line (15 if she was not making the leeway), over the last $3\frac{1}{2}$ cables before the grounding, would have required an aberration in the tidal stream sufficient to produce a 3 knot component at right-angles to the line of the ranges. The analysis by the Institute of Ocean Sciences discounted such a cross-channel component, and observations from the stranded vessel did not detect any such anomaly on subsequent tides. Also, a dramatic deviation of this magnitude from the vessel's heading is not reflected in the actions of the master who, of those involved with the navigation, was the one constantly monitoring the range markers. The master did not detect a need for corrective action and, on the contrary, was increasing the leeway correction, to the opposite hand, just prior to the grounding. This would suggest that in plotting the 1745 position the distance off Saatuq Island was underestimated, and that the "HANSEATIC" was not making 5 leeway but was gradually deviating further from the line of the ranges.

2.2 Navigating on the Ranges

On the morning eastbound passage, most of [the] ranges had the markers ahead of the vessel and in that respect the afternoon westbound passage was less straightforward. Nevertheless, the plan that was prepared for the

passage of the “HANSEATIC” through Simpson Strait should have allowed the vessel to safely transit the area. Both the master and the chief officer were experienced navigators. However, by allowing the vessel to run north of the course line with the ranges open, the master lost the considerable contribution the ranges were making to keeping the vessel out of danger. Attempting to estimate how far a vessel is displaced from the course line by assessing the relative position of two “open” range markers provides, at best, imprecise results. As a vessel proceeds further away from the range markers, maintaining the same angular separation of the markers translates into a further displacement from the intended track. The degree of precision needed to safely navigate the “HANSEATIC” through Simpson Strait required that the vessel be kept on the line of the ranges; it would have been expedient to have promptly adjusted any allowance for leeway and/or set as soon as the ranges showed the vessel leaving the course line. This would be particularly appropriate when passing close to a shoal that the *Sailing Directions* warn could have been altered by ice action.

As there was the possibility that ice had displaced the range beacons, good seamanship suggests that parallel indexing should have been employed, to back up the ranges. And as it was likely that the gradually sloping terrain would have produced a less-well-defined radar image, it would have been prudent to have set up the parallel indexing using points on both sides of the channel, and to have checked the distance from land on both sides of the channel when taking positions from the radar display.

2.3 Plotting of Positions

As the passage was planned, the main purpose of the positions plotted by the chief officer was to allow him to monitor the vessel’s progress along the course line, with lateral displacement from the course line being determined by reference to the ranges. When the vessel was on a leg without ranges or was intentionally running off the ranges, as when clearing the 6.1 metre shoal reported near the track, the positions plotted by the chief officer served to determine both progress along the intended course line and lateral deflection from it. This was also the case just before the grounding, when the master allowed the vessel to run north of the ranges. During this time the chief officer plotted a position, taken from the radar at 1745, some 2-3 minutes before the vessel grounded. This position showed the vessel to be slightly north of, but close to, the line of the ranges. Other evidence suggests that the 1745 position was not accurate. The chief officer who plotted the 1745 position was also monitoring the vessel’s progress and, shortly before taking the position, had seen that the vessel was on the ranges. The 1745 position

was, however, reportedly derived from a distance and bearing taken from the radar display. An accurate position at this point might have given the bridge team sufficient time to take action to avoid the shoal.

The position in which the vessel grounded is only about 1½ cables outside the line of the ranges, and the 1745 position was plotted from a fix taken less than three minutes before the vessel would have come up with the shoal. In such circumstances, where time and distance are critical, it is prudent to supplement manual plotting with parallel indexing, to allow the navigator to react quickly enough.

2.4 Composition of Bridge Team

It cannot be determined conclusively whether there would have been sufficient time for the bridge team to take corrective action had the 1745 position shown the vessel to be heading into danger. There was little time for the chief officer to resume monitoring the ranges after he had plotted the 1745 position. However, it should not have been necessary for the chief officer to divert his attention at such a critical time in order to set up the radar for parallel indexing on the next leg. More than one radar was available, and with the vessel only on the shorter legs for a few minutes, another, possibly junior, officer could have prepared a radar set for parallel indexing on the next course. Such an addition to the bridge team, by attending to supplementary detail, would have allowed the master and chief officer to concentrate fully on the navigation of the vessel, particularly critical in this most-demanding section of the strait.

2.5 The Role of Confirmation Bias in Course Selection

The master of the “HANSEATIC” was aware that the ship was north of the course line; he was also aware that there was a shoal just to the north of the course line, in the last half mile before the alter-course position. However, he believed that the vessel was still in the channel. Contributing to this assessment was the influence of confirmation bias. The two most obvious cues available to the bridge team with respect to the vessel’s position were the open range markers and the green buoy. The open range markers in themselves were not easy to interpret and required supplementary input before a decision on corrective action could be made. Previous exposure to warnings against relying on buoys during navigation did not overcome the reassuring sight of the green buoy (on the starboard bow, where it was expected to be). In addition, a lack of conflicting information from the chief officer’s radar plot reinforced his incorrect assessment of the vessel’s position, and no other action was taken to verify that position.

Consideration was given to the possibility that a left-right reversal error could have accounted for the erroneous heading. This is one of the more common errors to occur in situations such as that faced by the master, in which the range markers are astern of the vessel. However, this type of error--the master calling for a starboard heading adjustment when he meant a port adjustment--is usually recognized immediately, and then corrected. It should have been readily apparent that the ranges were continuing to widen and the vessel's head was moving to starboard. That the master repeatedly called for further starboard heading adjustments does not support the hypothesis that left-right reversal error accounted for his behaviour.

Findings

1. A passage plan was prepared for Simpson Strait which employed the navigational experience of the master and the chief officer.
2. The passage plan made use of the range markers in the area and positions derived from the radar display.
3. Parallel indexing was not used to supplement the passage plan on all course legs.
4. The vessel was allowed to proceed off the ranges when this was not necessary to avoid a navigational hazard.
5. Buoys had not been removed from Simpson Strait at the end of the previous navigation season.
6. Some buoys were not destroyed by the winter ice and a critical buoy was displaced only about a cable from its charted position.
7. Despite warnings in the relevant navigational publications, the displaced buoy was used as a navigation mark.
8. The vessel grounded on the shoal that the buoy had been positioned to mark during the previous navigation season.
9. During the inbound passage the bridge team did not determine if the buoys unexpectedly found in the strait were in their charted positions.
10. A position plotted on the chart some 2-3 minutes before the grounding was probably inaccurate.

Causes and Contributing Factors

The "HANSEATIC" grounded because the bridge team did not strictly adhere to the plan that had been prepared for navigating the vessel through the strait. Reliance upon a navigation buoy left in the strait from the previous navigation season contributed to the grounding.

Appendices

Appendix A – Photographs (Source: Transportation Safety Board of Canada (TSB))

Photo 1. HANSEATIC aground in Simpson Strait

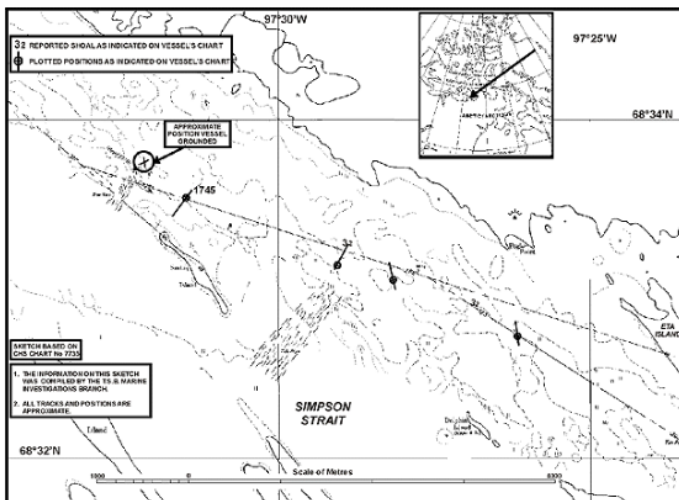


Photo 2. HANSEATIC aground in Simpson Strait



Appendix B - Sketch of Area of Grounding

Photo 3. Sketch of Area of Grounding (Source: TSB)



Notes

¹ Units of measurement in this report conform to International Maritime Organization (IMO) standards or, where there is no such standard, are expressed in the International System (SI) of units.

² All times are CDT [Central Daylight Time] (Coordinated Universal Time minus five hours) unless otherwise noted.

³ N.B. Sarter and D.D. Woods, "Situation Awareness: A Critical but Ill Defined Phenomenon," *International Journal of Aviation Psychology* 1, no. 1 (1991): 45–57.

⁴ M.R. Endsley, "Situational Awareness in Dynamic Human Decision Making: Theory," in *Situational Awareness in Complex Systems*, Proceedings of a CAHFA Conference, 1–3 February 1993 (Daytona Beach, Florida: Embry-Riddle Aeronautical University Press, 1994), 27–58.

14

Voyage of Discovery: *Nadon/St. Roch II* (2000)

James Delgado*

In 1997, the Vancouver Maritime Museum launched the *St. Roch* Preservation Campaign to start an endowment fund for the ship and to raise the money for a new shelter. ... In 2001, the City of Vancouver rebuilt the leaking north wall of the shelter, reducing the number of leaks in the building to a minimum, while the Province of British Columbia funded a new series of exhibits to surround *St. Roch* and better tell the story of the ship and her crew.

The major initiative of the *St. Roch* Preservation Campaign was a two-year project, the *St. Roch II* Voyage of Rediscovery. After a year and a half of planning, a modern, high-speed Royal Canadian Mounted Police (RCMP) catamaran, *Nadon* (designated as *St. Roch II* for the voyage), set out from Vancouver to retrace *St. Roch*'s original route through the Northwest Passage. Its mission was not just to relive history but to boldly blaze its own path through the north in a small, aluminum-hulled vessel built for coastal patrols. The goal of the voyage was simple and two-fold – to raise national and international awareness of the history and significance of *St. Roch* and to build up the permanent endowment fund for the ongoing preservation, maintenance, operation, and interpretation of the ship.

Nadon/St. Roch II pulled away from Canada Place on the Vancouver waterfront on 1 July 2000, as flags whipped in the wind and an RCMP honour guard fired a volley of rifle shots into the sky. The six-month, twenty-four-thousand-nautical-mile voyage, commanded by Sergeant Ken Burton of the

* Pages 47-51 excerpted from *Arctic Workhorse: The RCMP Schooner St. Roch*, copyright © 2003 by James P. Delgado. Reprinted with permission of TouchWood Editions. touchwoodeditions.com.

RCMP, involved not just the catamaran and a rotating crew of RCMP officers but also the Coast Guard icebreaker *Simon Fraser*, commanded by Captain Robert Mellis, and a crew of volunteers from across Canada. Thousands bade the two ships bon voyage from Canada, and more than a million people followed the voyage via the World Wide Web. An on-board educator, Carolyn Dymond, made regular postings via the Internet to the interactive, bilingual website, thanks to the Vancouver Foundation and the Vancouver School Board.

From Vancouver, *Nadon* and *Simon Fraser* headed up the coast, through the stormy Gulf of Alaska. Heavy seas pounded the tiny catamaran, just as they had hit *St. Roch* several decades earlier. *Nadon's* tough aluminum hull survived, but more fragile electronics shorted out, leaving the ship without electrical power, radar, or radio. The crew stood a continual watch for more than forty-eight hours, unable to sleep as the shallow-draft hull slammed into the waves. After temporary repairs, Burton and his crew headed north through an ice-free Bering Strait into the ice-choked Beaufort Sea. The pack ice blocked the way east, and several large ships stood by waiting for an opening, but Burton, relying on his ship's shallow draft, ran in close to the shore, where the ice did not reach. His risky manoeuvre paid off when *Nadon* was the first vessel of the season to reach Tuk (Tuktoyaktuk) from the west. A number of observers who believed that the "ice is going to crush that boat like a beer can" were proved wrong.

Burton and Mellis, navigating along *St. Roch's* original track from 1940–42, made an ice-free transit of the Northwest Passage in a single month. To many observers, it was clear that the climate in the Arctic had changed since Larsen's day. As well, the entire north had changed. No longer the frontier that *St. Roch* had served, it is a series of communities and a land that has only recently been returned to Inuit self-government as the new territory of Nunavut, meaning "our land." There were ties to the past.

Along the way, the crew lived up to the original spirit of *St. Roch* by being more than just a police vessel. Scientists from the Institute of Ocean Sciences, near Victoria, made surveys from both ships. Archaeologists looked for traces of the lost Franklin expedition: Inuit guide Louie Kamookak showed Burton and his crew the skeletal remains and graves of some of Franklin's men on a small, isolated islet in the Todd Islands, just south of King William Island, but no other sign of Franklin or his ships emerged despite hours of slow examination of the seabed with sophisticated sonar.

However, Burton, Mellis, and their crews made other important connections with the past. The two ships anchored at many of Larsen's old

moorages, and in several communities Inuit Elders talked about their memories of *St. Roch*, her crew, and “Hanorie.” At Taloyoak (Spence Bay), *Nadon*’s crew presented Special Constable Adam Totalik, one of Larsen’s original guides, with a Long Service Medal. At Pasley Bay, the crew went ashore for a memorial service for Albert Chartrand and placed a large plaque with the RCMP crest on the cairn that marks the grave. At Pond Inlet, members of the Panipakuttuk family – including some who had sailed with Larsen in 1944 – came aboard for a tour. Descendants of *St. Roch*’s crew also sailed aboard *Nadon* and *Simon Fraser*, including Art Tomsett (1950–51), Billy Cashin (1944–48), Dean Hadley (1940–42), and Hugh Parry, whose father, W.J. (Dad) Parry, sailed with Larsen from 1928 to 1934 and through the passage in 1940 to 1942. Henry Larsen’s children, Gordon, Doreen, and Beverly, as well as some of their children, also came aboard at key locations. Eager to join in, a number of retired members of the RCMP, many of whom had met or were inspired by Henry Larsen, also joined the crew and assisted at the two ships’ many community visits.

The route largely avoided the Arctic’s risks – ice, bad weather, and the often extreme conditions at the top of the world – because it was a particularly warm summer. But two incidents reminded everyone of how dangerous this part of Canada still is. An Inuit hunting party whose boat had broken down was stranded on shore and Search and Rescue authorities asked *Nadon* to provide assistance. There was no one else to help and no other boat to turn to, so, despite heavy surf, the crew risked the landing to save the family. *Nadon*’s specially equipped Zodiac overturned, and the crew was dumped into the frigid water off the barren and isolated Boothia Peninsula coast. The boat’s operator, Corporal Mike Hartung, recovered the Zodiac and crew in the heavy surf and continued the mission, saving the hunters who were already suffering from exposure and lack of food after days in the open.

Another time, anchored for the night, *Nadon* went adrift when a small iceberg – the only ice in the vicinity – grounded on the catamaran’s anchor chain and slowly dragged her into shoaling waters. As Burton and crew struggled to free the vessel, they had to face down an angry polar bear that stood on the ice, paws on *Nadon*. In the desperate attempt to push off and cut the anchor cable, crewmember Roger Kembel broke ribs when a pike pole slipped free of the ice and struck him.

The voyage through the Arctic ended, symbolically, on 11 October 2000, when *Nadon* moored at Halifax’s King’s Wharf – exactly where *St. Roch* had tied up at the end of her first Northwest Passage transit – fifty-eight years to

the day from the original ship's arrival. Flying *St. Roch's* original blue ensign, presented to the voyage by Doreen Larsen Riedel, who had cherished the flag as a special gift from her father, *Nadon* approached the wharf as the crowd cheered and the band struck up a welcome. It was a very different and more public welcome than the wartime, no-fuss entry of *St. Roch* on 11 October 1942.

From Halifax, *Nadon* retraced her predecessor's circumnavigation, running south along the Atlantic seaboard of the United States, through the Caribbean and the Panama Canal and up the Pacific Coast. Returning to Canadian waters on 14 December 2000, *Nadon* tied up in front of the Vancouver Maritime Museum, in full view of *St. Roch*, in the middle of a freezing cold rainstorm on 16 December. "Coldest day of the entire voyage," quipped Sergeant Burton.

The voyage was a unique opportunity that comes rarely, in which people, be they the crew, the volunteers, or the public who watched, can experience a convergence of the past, present, and future. Reawakened to the nationally significant story of *St. Roch*, governments, corporations, and private individuals stepped forward to ensure the ship's ongoing preservation. Since the voyage was completed, the fund for the ship has grown, and gifts continue to come in. The task is not yet over, nor are the coffers full. More effort, and more support, is needed, but the task ahead is clear, and the voyage's partners, particularly Akan, Trendwest Resorts, the RCMP, the Canadian Coast Guard, and the Millennium Bureau of Canada, as well as all the other sponsors and supporters, charted the way.

15

Break on Through: *Healy*, 2003

Natasha Singer*

The dream of a Northwest Passage linking the Atlantic to the riches of Asia has driven explorers and visionary adventurers for centuries. With climate change in the air, Natasha Singer braves the frigid 900-mile journey to find out if the old, mythic dream is becoming an epic new reality.

The weather reports from the top of the world last summer were not good. Miles of sea ice went missing in the Arctic Ocean. Biologists warned that polar bears would soon have no place to live. The 170-square-mile Ward Hunt Ice Shelf, at the northern end of Ellesmere Island, broke apart for the first time in thousands of years. And 950 miles south of the North Pole, off northwestern Greenland, the U.S. Coast Guard's newest and largest icebreaker, the *Healy*, was having trouble finding any ice to break at all.

It was August in this lonely corner of the Arctic Ocean, and the iceboat's chief, Captain Daniel K. Oliver, picked up his binoculars and took in the view from the *Healy's* bridge. There was not much to report in the way of upcoming hazards. We were surrounded by deep blue sea.

During routine ice-breaking, there is usually a lot to do on the *Healy* – scrutinizing satellite images for ice migration, replotting the ship's course, crushing big chunks into smaller chunks – but absent the frozen obstacle course, life on board slowed down considerably. The 92 members of the crew piled too much food on their trays from the all-you-can-eat buffet and wandered the floors. Even the announcements broadcast over the shipwide intercom grew lethargic. Instead of "Attention, all hands! Following is a test of the flight-crash alarm!" or "Secure all doors and hatches!" we got "Now, all hands! There will be a morale skeet shoot at fifteen hundred on the flight

* Originally published as "Break On Through: *Healy*, 2003," in *Outside* magazine (2 January 2004).

deck.” And “Now, for the attention of all hands, there will be a pudding-eating contest on the mess deck.”

Not that the *Healy* eschews diversions: For example, there are Polar Bear initiation rites (in which “Bluenoses” – Arctic first-timers – prove their mettle by swimming in frigid water) and Ice Liberty (a few hours of shore leave on an ice floe during which each Coastie is allotted a ration of two beers). But the lack of any kind of ice whatsoever made even boozing on a berg – or any other ice-related fun – impossible.

The *Healy* had just departed the harbor of the U.S. Air Force’s Thule Air Base, in Greenland, and was sailing to its next assignment, in the Beaufort Sea, north of Alaska. The ship was going to smash through the 900-mile-long Northwest Passage from the Atlantic to the Pacific. The only other time the *Healy* accomplished this was on its maiden voyage, in July 2000 – a test to see whether this behemoth ice-breaking machine could survive the waterway.

Built with state-of-the-art laboratories and sonar mapping systems, the four-year-old, 420-foot, 16,000-ton, \$350 million Coast Guard icebreaker was designed to be a platform for Arctic exploration. The ship’s crew regularly hosts visiting research teams who do everything from collecting water samples to monitoring how clams survive on the polar seafloor. Although no extensive experiments were planned for this voyage, scientists – like Dave Monahan, director of ocean mapping for the Canadian Hydrographic Service, who was on board to map spots on the passage’s seafloor that have remained blank on nautical charts for 500 years – would be gathering anecdotal information.

As the *Healy* cruised through calm seas, Captain Oliver, a soft-spoken 46-year-old from California, underlined the fact that, on a calm day like today, even a yacht would be able to sail unhindered to the Alert radar station – the Canadian Forces’ acoustic surveillance facility about 400 miles away on the tip of Ellesmere Island and the northernmost permanently inhabited spot in the world.

“Don’t forget: The Alert station is named after the HMS *Alert*, a steamship that got up that far in 1876,” the captain said. “Back in the 19th century, when they didn’t even have icebreakers, a lot of navigators made it up to Alert, because there was open water.”

The captain was making an important point: If wooden schooners could sail that far more than a hundred years ago, then the recent disappearance of Arctic ice might be the result of the earth’s naturally cyclical climate, rather than human-induced global warming. Blame Mother Nature or human

nature, but my mission was the same: to conquer the passage and jump ship when the boat arrived at Barrow, Alaska, 14 days later.

On the bridge, Captain Oliver set down his binoculars. "Six weeks ago, I suspect, there would have been so much ice, we wouldn't have been able to cross the Northwest Passage."

THE NORTHWEST PASSAGE – a labyrinth that runs from Greenland to Alaska around 90 major and some 30,000 minor islands – has always been a Holy Grail-cum-icy death trap for mariners. As far back as Columbus, cartographers dreamed of a quick maritime route to the Orient from Europe. Often they drew the mythical strait on their maps without knowing its exact location.

Naturally, this raised expectations. In 1497, explorer John Cabot sailed as far as the southeastern shore of what is now Canada and claimed it for England. He was followed by such single-minded British adventurers as Henry Hudson, who was left to drift in a small dinghy – in the same bay that bears his name today – during a 1610 mutiny on his fourth attempt to find the passage. By the mid-1800s, the quest for a shipping shortcut had crystallized around the Parry Channel, an 800-mile deep-water route from Baffin Bay to McClure Strait, just east of the Beaufort Sea, named after the British naval explorer Sir William Parry.

The search for an Arctic thruway became a worldwide obsession. In 1845, when the ice swallowed up British rear admiral Sir John Franklin's ships *Erebus* and *Terror*, along with 133 crewmen, newspaper accounts of the tragedy inspired 40 separate rescue expeditions. Historians credit Royal Navy captain Robert McClure, who, between 1850 and 1853, sailed all but 200 miles of the route (and walked and sledded the rest of the way)[.] with the first traverse by a European. But it wasn't until 1906 that Norwegian explorer Roald Amundsen, the first man to reach the South Pole, finally accomplished the first complete ocean-to-ocean transit. With Amundsen's success, and the completion of the Panama Canal in 1914, the obsession ran its course. Nearly a century later, fewer than 5,000 people have made it all the way through.

If it weren't for the fact that recent NASA [National Aeronautics and Space Administration] satellite data showed Arctic ice coverage to be shrinking, shipping magnates, government officials, and political scientists would probably still be ignoring the Northwest Passage. But the lack of ice has rekindled interest. A viable route through the Arctic could save time and

money; from Europe to Japan, it's 6,000 miles shorter than the Panama Canal route.

This only causes headaches for Canada, whose government sees the Northwest Passage as a proprietary waterway, as Canadian as Lake Winnipeg. The United States and Europe – relying on the United Nations' International Law of the Sea definition of an "international strait" as a body of water that connects two oceans – view the passage as the world's property. In 1969, the SS *Manhattan*, a tanker in the Humble Oil and Refining Company fleet, crossed the Northwest Passage without asking our northern neighbor's permission. Even though Canadian politicians objected vociferously, Ottawa provided two icebreaker escorts that helped free the American ship from 25 separate jams. Nowadays, the U.S. State Department notifies Canada of American icebreaker travel plans, and Canada responds by "granting permission" that the U.S. never asked for in the first place.

In diplomatic terms, you could call this a stalemate. According to Morris Maduro, a political-science professor at the University of Alberta, "in five years the passage will be navigable in summer, and in ten years, the winter. This will be one of the hottest issues dividing Canada from the U.S." That seems slightly alarmist. But as defense analyst Rob Huebert, associate director of the University of Calgary's [Centre] for Military and Strategic Studies, points out, Canada is not prepared to handle the environmental disasters, mass tourism, maritime accidents, potential terrorist activity, and contraband smuggling that a new Canada Canal could entail. As sea ice recedes, he told me, "America's back door swings wide open."

More worrisome is the fact that only 150 full-time Canadian soldiers are guarding the 2.5 million square miles that constitute the northern areas of Nunavut, the Northwest Territories, and the Yukon Territory. There are also a few thousand volunteer Canadian Rangers – aboriginal reservists equipped with World War I-era Enfield rifles. As Colonel Norris Pettis, commander of the Canadian Forces Northern Area, tried to reassure me, the Rangers serve as the nation's "eyes and ears in the middle of nowhere." When I asked a spokesman in Canada's Department of National [Defence] how the military is readying for an open Northwest Passage, I received a release stating that an Arctic Capabilities Study recommended "slightly increasing the number of personnel" and providing the Inuit [R]angers with "GPS systems, radios, binoculars, and camping equipment."

To be fair, there are other organizations (the Canadian Coast Guard and the Canadian Air Force, for instance) watching the Arctic. But even Gary Sidock, director of operational services for the Canadian Coast Guard's

Central and Arctic region, conceded that such surveillance will never be enough.

"Can I tell you there is a picket fence around Canada? No," Sidock told me. "The Arctic is an easy place to hide in – but you have to get there first. And it's an isolated and inaccessible spot."

UNLIKE FRESHWATER ICEBERGS, sea ice is not romantic. It is neither majestic nor soaring. It does not give off that otherworldly spectral glow of pure whiteness born of glacial snow. Its verticality does not threaten ocean liners with a predatory, awe-inspiring loom. It is not prehistoric in origin. Quite the contrary: Most sea ice is younger than a decade. It is flat and flawed. It is often pockmarked, dirty with algae, and lumpy with protruding hummocks. It forms into small pizzas, called "pancake ice," and coagulates into larger 60-foot disks, called "ice cakes." It sets into mile-long floes that crash into one another, forming uneven bands of "ice ridges" that can grow into heaps ten feet tall and harden like a scab over a wound. And when summer temperatures degrade the ice, it is dismissed as "rotten."

Even so, polar ice is menacing. It can be as crumbly as a saltine one minute and as hard as anthracite the next. If its pressurized floes are thick and unbroken, it can stop an icebreaker dead or slice the steel hull of a lesser ship like a can opener. And just like all things harsh and unpredictable and carnivorous, Arctic ice is easy to fall in love with.

But for the first few days after the *Healy* chugged away from Thule, there wasn't any.

Sure, there were a few picturesquely clichéd glacial icebergs vamping it up in the vast open expanse of Baffin Bay, but none of the saltwater ice in question. And 300 miles west of Thule, when the *Healy* crossed into the narrows of Lancaster Sound, the official entrance to the Northwest Passage, there was nothing but water.

Unlike freshwater glaciers, which freeze at 32 degrees Fahrenheit, the salinity of seawater requires 28.8 degrees to freeze. So sea-ice melt serves as an early warning system for the earth's climate; less ice means air and ocean temperatures are heating up. In that sense, the Arctic is a litmus test of climate change.

In August 2000, a front-page article in *The New York Times* interpreted the "first" sighting of open water at the North Pole in perhaps "more than 50 million years" as "evidence that global warming may be real and already affecting climate." In an April 2001 report titled "Naval Operations in an Ice-Free Arctic," the U.S. Office of Naval Research stated that over the last

quarter-century, “submarine data reveal a 40 percent decrease in Arctic sea ice volume,” and satellite data “demonstrate a decrease in sea ice extent of 3 percent per decade.”

The old Arctic hands on the *Healy* didn’t seem overly concerned. Yes, the ice coverage had recently shrunk somewhat, they said, but a lot of ice was simply being blown into other sections of the passage, clogging it up and making it harder to navigate. On a lower deck, in one of the ship’s cavernous lab spaces, 59-year-old Dave Monahan talked to me about the passage’s current state as he monitored a computer that, every few seconds, recorded time, date, water depth, and ship’s location. Hardly anyone ever asks his Hydrographic Service for an official map of the area, he said. Ice or no ice, he believed that the waterway remained too dangerous to be a commercial route.

“The good news is, the chances of crashing into another vessel up here are rather small,” Monahan told me, laughing at his own understatement. “The bad news is that we haven’t mapped all the shoals in the Northwest Passage by a long shot. We don’t know the tides and currents. There are no navigational aids, like lighthouses or buoys, nobody and nothing to help you if your radar goes down. There’s dense fog. And then, of course, there’s always the ice, the ice, the ice.”

One afternoon, six days into our journey, as I paced my spartan cabin and looked longingly out the tiny porthole, the Arctic finally began to live up to its reputation. First, by the barren shores of Bathurst Island, a few chunks of ice drifted by like albino lily pads. Then came a few ice pizzas. Then a floating football field appeared, its ragged and ruffled ridges indicating a considerable keel. Crashing into it felt like a 3 on the Richter scale.

The cylindrically hulled *Healy* drove up on top of the massive floe until the heft of the boat sent dozens of cracks spidering across the surface. The floe split and hunks the size of double-decker buses cleaved off, some bouncing along the ship’s flanks as it plowed through, others flipping over helplessly, exposing their baby-blue underbellies as if they were giving up and crying uncle.

In previous centuries, when Arctic explorers looking for the Northwest Passage got mired in ice, they had very few options. They drifted wherever the floes took them or threw ropes down and ordered crews to haul the ship by hand into the nearest open channel, a procedure called “warping.” Or they abandoned ship altogether and slogged to shore, hoping to regain their vessels when the ice thawed. More often, they watched with dread as the ice ground their schooners to sawdust. The wrecks later washed ashore on the

passage's uninhabited islands, which are still littered with the bones of stranded sailors cannibalized by their frostbitten, scurvy-crazed compatriots.

None of this befell the *Healy*. Instead, one of the ice pilots simply gunned the throttle and sped up.

IN 1903, THE FIRST YEAR of what would be a three-year crossing of the Northwest Passage, Roald Amundsen wrote that ice conditions "had been unusually favorable. We had made headway with ease... As far as we could judge, the year 1903 must have been a very favorable one as regards ice."

Amundsen's accounts, as well as those of British naval explorers – such as Sir James Clark Ross, who discovered the location of the magnetic North Pole in 1831 – used to be consulted by Arctic adventurers looking for pertinent navigational tips. But recently, scientists have started reading these explorers' logs to look for clues about environmental change. Kevin Wood, the Knauss Marine Policy Fellow at the U.S. National Oceanic and Atmospheric Administration, spent the past year using the data on ice extent, ice thickness, melt and freeze dates, along with temperatures recorded by 44 Arctic expeditions, to reconstruct the polar climate during the 1800s. In a recent issue of the geophysics journal *Eos*, Wood and co-author James Overland concluded that "19th-century explorers did not usually encounter more formidable ice than explorers in the 20th century."

Wandering around the *Healy*'s decks, in balmy 20-degree temperatures, carrying the leather-bound tomes of one 19th-century explorer or another, Wood, a 41-year-old climatologist, scrutinized the occasional glaciated island as it went by and compared it with explorers' descriptions from previous centuries. The book he was reading when the *Healy* first hit the ice was *The Voyage of the Fox in the Arctic Seas*, by Captain Francis McClintock, who wrote in 1860 that he was astonished by "the total absence of ice in Barrow Strait. I was here at this time in 1854 – still frozen up – and doubts were entertained as to the possibility of escape." In other words, radical climate change is not just a modern phenomenon; it's also a historical feature of the passage. Wood put it this way: "Based on 19th-century material in which explorers encountered extreme ice variability and ran into both warm seasons and cold seasons, I don't see anything surprising here."

Wood isn't the only one looking to the past for answers. Using two centuries' worth of temperature and ice records from Russian, U.S., and Canadian archives, Igor Polyakov, a physical oceanographer at the International Arctic Research Center of the University of Alaska, has come to a similar conclusion.

"The ice was thick in the 1920s, thin in the 1930s and 1940s, thick again in the 1960s and 1970s, and thinner in recent decades," Polyakov told me from his office in Fairbanks. "Our research shows that a big portion of the changes we are seeing are due to a cycle of multi-decade variability. Any prediction here would be speculative, but I can advise people not to throw out their winter clothes."

I was glad I took his advice. Several nights later, the view from the bridge looked as if we'd landed on the moon. A thick white crust stretched all the way to the horizon. The uneven topography alternated between blocks of ice mesas, deep ice craters, bony ice ridges, and rolling ice dunes glowing an otherworldly sapphire-blue.

An announcement came over the intercom: "QM1 Grob has the conn." This meant that the floes were so thick that Quarter Master Dave Grob, a 35-year-old Arizonan with wire-rimmed glasses and trim brown hair, had been dispatched 106 feet above sea level to the aloft conning tower to steer the ship through the hazardous maze. The glassed-in ice pilot's tower is the modern-day equivalent of a crow's nest, three vertical ladders above the bridge. Grob was giddy as hell up there, because the gnarly floes offered a rare challenge to a jaded ice-breaker.

"Did you see the size of that chunk?" he asked me once I'd shimmied up the ladders and into the conn. "It's awesome!"

In the ten years Grob has been with the Coast Guard, he's worked on patrol boats in Florida and scuba-dived under the North Pole, but piloting an iceboat still gets his adrenaline pumping. Off the starboard, he pondered a field of primordially crusty, mustard-colored ice. It gave him the willies.

"You got to wonder about the history of that ice, where it came from and what those old explorers felt like," he said, turning on the searchlights and beaming them at a ridged wall ahead of us, at 11 o'clock. He had no choice but to plow into it head-on. Small pieces cracked off, but a huge chunk stayed intact and the *Healy* teetered slowly up and down while the Doppler Speed Log – the naval equivalent of a speedometer – steadily dropped.

Grob eyed the floe, estimating its strength. Then he flipped on an additional engine and revved it up. The ice finally cracked and the ship was free. "Ice-breaking is like driving an SUV," he said. "It's smoother on the road, but it's made for extreme terrain. Like all off-roading, it's man and machine versus nature. But you still have to be careful, or nature wins."

IT'S SAFE TO SAY that most humans will never experience the hazards of the Northwest Passage. But Captain Oliver had navigated through here in 2000, and now, ten days into our journey and about 600 miles into the

passage, with satellite images showing miles of impassable frozen sea between 20 and 30 feet thick, he wasn't going to let a few ice cubes stop him.

We were in Viscount Melville Sound, where, in 1819, Sir William Parry and his crew got stuck in the ice. They ducked into a bay he dubbed Winter Harbour and waited for the spring thaw. The *Healy* was far better equipped to handle dicey situations than a wooden sloop, but the harsh Arctic environment still made stranding a possibility.

The captain dispatched Yves Sivret, a 40-year-old ice ace on loan from the Canadian Ice Service, to go out with the ship's regular ice-reconnaissance helicopter team and have a look. The hope was that Sivret, a specialist in aerial ice analysis, would spot flaws in the floes and find a way out.

Hovering at 1,500 feet in the chopper, the blocked entrance to McClure Strait in sight, Sivret sweated through his padded neon-orange survival suit and stroked his Viking beard. An icefield the size of New York's Central Park butted up against another one the size of the Washington Mall. Even more problematic than the floes' extensive reaches were their high ridges and eerie turquoise glow – indications that this was solid pack ice that could bog down and ensnare the icebreaker.

"Can we go higher?" he asked the pilot, Gary Naus, who pushed the helicopter up to 3,000 feet.

Every few minutes, flight mechanic Ray O'Dell radioed the ship with the exact amount of time left before "splash" – the moment the helicopter would run out of gas and drop into the Arctic Ocean.

"Five-zero to splash," O'Dell informed the mother ship.

"Splash?" Sivret said. "It's more like five-zero to splat, with ice this thick out there!"

Such thick ice seemed to call into question the 40 percent decrease in Arctic ice thickness quoted in the U.S. Navy study. As Dennis Conlon, the author of the report, later told me, "None of those submarine measurements pertain to your area of interest," because those subs never traveled through the passage to begin with.

Some scientists even dispute the importance of the 40 percent decrease the submarines reported in the higher latitudes. Greg Holloway, a polar expert at Canada's Institute of Ocean Science[s], points out that "the ice may have been 40 percent thinner in the few locations that the submarines went, but it wasn't that much thinner Arctic-wide. It was probably even 40 percent thicker in other sections of the Arctic. There is a big variability in ice from year to year due to wind and temperature. Most of the ice was still there. It just moved around."

I had come north to see ice, and now I was seeing how bad it could get. Earlier in the summer, on a quest to row a collapsible rubber boat solo across the Northwest Passage, Dom Mee, a former British marine commando and ocean rower, experienced the same kind of here-today-gone-tomorrow phenomenon. The ice got so bad that he was ultimately trapped for three days, only 35 miles from his destination at Victory Bay, on Baffin Island, and forced to abandon the trip, which he later described as “absolute hell.”

From his heli-perch above Melville Sound, Sivret spotted a variation in the ice plates a few miles away. On closer inspection, he zeroed in on a patchwork of pale colors – gray chunks the size of city blocks whose dullness indicated weak “first-year” ice, thin floes that formed last summer and, having survived another August, would age into thicker “multiyear” ice. Here and there, he could see a few pools of open water. He turned to pilot Naus and said, “Tell the captain the bad news is there’s miles of multiyear ice. The good news is we can go around it to the southeast.”

The ice recon [reconnaissance] completed, the chopper headed back to the *Healy* with “three-zero to splash.” In the flight hangar, Sivret stripped off his survival suit. Underneath, his light-blue oxford was soaked, proving that the Northwest Passage could still make a sea hound sweat.

“I’m going to brief the captain,” he said. “But first I’m going to change my shirt.”

That’s the trouble with ice: It’s unpredictable. When it comes out of nowhere and surrounds you, threatening to hold you hostage for the winter, your first priority is to get away from it. And when it vanishes unexpectedly and you’re back in the safe monotony of open water, you miss its jagged menace.

Being on the *Healy* as it picked its way through the Northwest Passage was like going to a summer camp where the strangers you meet on the first day become your best friends. Though the camaraderie would remain, the awe-inspiring ice responsible for bonding us Bluenoses with the crew disappeared as we sailed out of the passage and into the slate-colored chop of Alaska’s Beaufort Sea. Being iceless again was a letdown. But at least I had managed to document some mammoth floes, however many – or few – of them are left.

That Arctic sea ice, as recorded by NASA satellites, has decreased by about 3 percent per decade over the past 30 years is a fact that many climate researchers acknowledge. But it’s about the only thing they can agree on. They disagree on whether the warming trend is permanent or temporary, earth-shattering or a minor blip on a millennial time scale, naturally

geothermal or artificially human-induced. That's why, ten days after *The New York Times* ran its August 2000 front-page story under the headline "Ages-Old Icecap at North Pole Is Now Liquid, Scientists Find," the newspaper was compelled to run a correction, and its reporter, John Noble Wilford, wrote a follow-up piece headlined "Open Water at Pole Is Not Surprising, Experts Say."

"When there has been an ice decrease in one piece of the Arctic, people make the leap that the decrease correlates to the entire Canadian archipelago," says John Falkingham, director of ice forecasting at the Canadian Ice Service. "But we don't have any data to support this, because there is no systematic observation of glaciers and ice shelves in the north."

The Arctic's erratic behavior is one of its charms, but that same ineffability is what makes it hard for scientists – or, for that matter, governments and political analysts – to come to conclusions. Scientists point out that those talking heads who claim the Northwest Passage is about to be ice-free year-round are neglecting the fact that the near-total lack of sunlight between October and March means that, barring a realignment of the solar system or catastrophic global warming, winter will always freeze the Arctic. Which is another way of saying that North America's back door is not wide open, though it certainly may be ajar.

We have a very poor understanding of the Arctic," says John Stone, executive director for climate change at Environment Canada, the government science ministry. "There are disturbing warning signs, and you cannot ignore them. But we don't have enough data right now. The only thing we can be sure of in the Arctic is that we are in for more surprises."

The surprise when the *Healy* entered the Beaufort Sea was that, once again, we couldn't find any ice to party on. The normally stoical voice reverberating over the *Healy's* intercom system could not mask its disappointment. "Attention, all hands! Due to extremely lame ice conditions, Ice Liberty has been canceled."

Unlike hundreds of their predecessors, the crew had successfully weathered the legendary passage and its predatory ice. But, a hundred years after Amundsen, the journey ended without a triumphal on-ice celebration.

As the *Healy's* helicopter carried me to the permafrosted dust bowl of Barrow, my last impression was this: Arctic ice is like a polar bear – sometimes it vanishes into the landscape, and sometimes, just when you let your guard down, it materializes out of nowhere, brandishing its deadly white teeth.



16

The Grounding of *Clipper Adventurer* in Coronation Gulf, August 2010

Transportation Safety Board of Canada*

Summary

On 27 August 2010 at approximately 1832 Mountain Daylight Time, the passenger vessel *Clipper Adventurer* ran aground in Coronation Gulf, Nunavut while on a 14-day Arctic cruise. On 29 August, all 128 passengers were transferred to the CCGS *Amundsen* and taken to Kugluktuk, Nunavut. The *Clipper Adventurer* was refloated on 14 September 2010 and escorted to Port Epworth, Nunavut. There was minor pollution and no injuries.

Factual Information

Particulars of the Vessel

Vessel Information

Type	Passenger
Gross tonnage	4376
Length¹	90.91 m [metres]
Draught	Forward: 4.5 m Aft: 4.6 m

* Marine Investigation Report M10H0006, Grounding – Passenger vessel *Clipper Adventurer*, Coronation Gulf, Nunavut, 27 August 2010.

Built	1975, Kraljevica, Yugoslavia
Propulsion	2 x B & W 3884 kW [kilowatt], twin propellers
Passengers	128
Crew	69
Registered owner	Adventurer Owner Ltd., Nassau, Bahamas
Manager	International Shipping Partners, Inc., Miami, Florida, United States
Charterer(s)	Adventure Canada Ltd., Mississauga, Ontario

Description of the Vessel

The *Clipper Adventurer* is of typical passenger vessel construction with the superstructure extending the entire length of the vessel abaft a short foredeck. The vessel has an ice-strengthened hull. The vessel has 2 controllable-pitch propellers and 2 semi-balanced articulated flap rudders for improved vessel manoeuvrability. The navigation bridge is situated at the forward end of the superstructure. The navigational equipment is comprised of 2 radars, 2 Electronic Chart Systems (ECS), 2 Global Positioning Systems (GPS), 1 echosounder, a NAVTEX [Navigational Telex], and a GMDSS [Global Maritime Distress Safety System] station with Inmarsat-C Enhanced Group Calling (EGC). The *Clipper Adventurer* is also fitted with a forward-looking sonar mounted on the head of the bulbous bow; however, it was unserviceable at the time of the occurrence. Since 1998, the *Clipper Adventurer* has been extensively used in adventure cruises.

Voyage Planning

According to the International Maritime Organization (IMO),² a voyage plan, or passage plan, should be completed by all vessels. It consists of 4 stages:

- Appraisal of all the available information about the intended voyage, including a review of the charts and publications, prediction of the vessel's condition, assessment of the dangers expected, gathering of information about the local weather and environmental conditions

and noting of how to obtain weather forecasts and local warnings while en route.

- Planning of the intended voyage including no-go areas and areas where special precautions must be taken.
- Execution of the passage plan, taking into account the prevailing conditions.
- Monitoring of the vessel's progress against the intended plan continuously throughout the voyage, including gathering the pertinent local warnings for the intended voyage.

Photo 1. *Clipper Adventurer*



(Source: Transportation Safety Board of Canada (TSB))

The IMO has further recognized that ships operating in the Arctic and Antarctic are exposed to a number of risks such as poor weather conditions and that the relative lack of good charts, communication systems, and other navigational aids pose a challenge for mariners.³ In November 2007, the IMO adopted the resolution *Guidelines on Voyage Planning for Passenger Ships Operating in Remote Areas*. These guidelines indicate that the voyage planning should take into account the source, date and quality of the hydrographic data of charts used; safe areas; no-go areas; surveyed marine corridors if available; and contingency plans for emergencies in the event of limited assistance being available in areas remote from SAR [search and rescue] facilities.

Based on IMO Resolution A893(21) and SOLAS [International Convention for the Safety of Life at Sea],⁴ the International Chamber of Shipping (ICS) produced the *Bridge Procedures Guide*.⁵ This publication provides valuable guidance for bridge teams and indicates that, before voyage planning can commence, a passage plan appraisal is to be completed

that includes gathering and studying the charts, publications, and other information appropriate for the voyage. Only official nautical charts and publications are to be used for voyage planning and must be corrected to the latest available Notices to Mariners (NOTMAR) and local area warnings. In addition, the Canadian *Charts and Nautical Publications Regulations, 1995* and, in particular, section 7 reads as follows:

The master of a ship shall ensure that the charts, documents and publications required by these Regulations are, before being used for navigation, correct and up-to-date, based on information that is contained in the *Notices to Mariners, Notices to Shipping* or radio navigational warnings.

One of the *Clipper Adventurer* management company's procedural manuals pursuant to its Quality, Safety, and Environmental Management System (QSEP manual 3) concerns vessel operations and provides the following guidance to the master and bridge team for voyage planning:

- The master has an overall responsibility for the implementation of the Quality, Safety, and Environmental Protection (QSEP) program on the vessel. He has to ensure that a passage plan is prepared from berth to berth.
- The passage plan should be made in accordance with the ICS Bridge Procedures Guide.⁶
- Prior to departure, the navigation officer has to prepare a passage plan and verify that the navigation equipment is tested and ready. The officer must ensure availability of charts for the voyage and that these charts are corrected to the latest NOTMAR. The officer must attach any other temporary navigation warnings to the charts.
- The *Clipper Adventurer* was to carry Transport Canada's (TC) *Guidelines for the Operation of Passenger Vessels in Canadian Arctic Waters*⁷ on board. The Guidelines observe that waters north of 60° N [North] are not well surveyed and soundings in many areas are based on reconnaissance surveys and are not up to international standards. They also refer to Canadian Notices to Shipping (NOTSHIPS) indicating that they are broadcast by Marine Communications and Traffic Services (MCTS).

In October 2009, the *Clipper Adventurer* was chartered for the Arctic 2010 cruise season by a Canadian adventure tour company. According to the agreement, the vessel was to be managed by a ship management company based in the United States. Voyage planning, including the choice of sailing

routes between destinations, was the responsibility of the master and his bridge team.

During the winter before the scheduled cruise, the *Clipper Adventurer's* navigation officers and the charterer prepared an itinerary. The initial itinerary did not include Port Epworth, a geological point of interest. On 23 February 2010, the charterer requested that the itinerary be modified to include a stop in Port Epworth on day 14 of the cruise. On 08 May 2010, a modified itinerary was circulated by email to the charterer, master, and ship management company. On 03 August 2010, the navigation officer (second officer) completed the ship management company's Voyage Planning Form⁸ which was subsequently signed by the master and the bridge team. This 1-page form included a list of waypoints, courses, distances between waypoints, and the under-keel clearance for each leg of the voyage, including the passage from Port Epworth to Kugluktuk. Publications for the intended voyage were listed on the form, including the following to be used when operating in polar waters:

- IMO A 26/Res. [Resolution] 1024 – Guidelines for Ships Operating in Polar Waters
- MSC [Marine Safety Committee]⁹ 1/Circ. [Circular] 1184 – Enhanced Contingency Planning Guidance for Passenger Ships Operating in Areas Remote from SAR Facilities
- IMO A 25/Res. 999 – Guidelines on Voyage Planning for Passenger Ships Operating in Remote Areas
- MSC 1/Circ. 1185 – Guide for Cold Water Survival

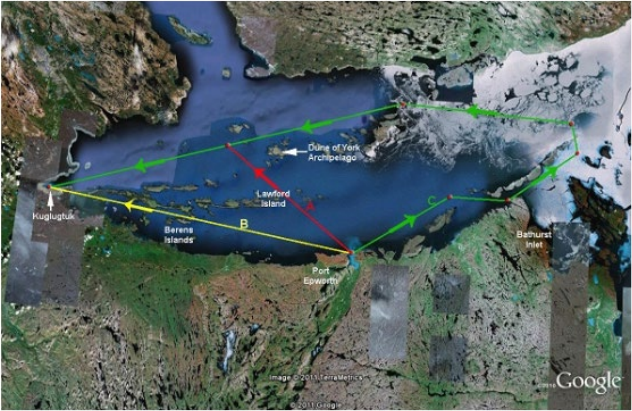
However, the 1-page form did not indicate that the 4 stages of voyage planning were completed by the bridge team, nor did it contain information indicating that the *ICS Bridge Procedure Guide* was used as a guideline for the voyage planning, as referenced in the company QSEP. The completed form does not indicate that the bridge team complied with the company QSEP, nor does it indicate that the team used the voyage planning appraisal form from the *ICS Bridge Procedures Guide*. The *Bridge Procedures Guide* lists voyage planning steps including the requirement to access local marine safety information and local warnings [...].

The master and bridge team considered two routes from Port Epworth to Kugluktuk. The first (A) was a course north from Port Epworth, crossing an archipelago on a single line of soundings before proceeding west parallel to the islands, also on a single line of soundings. A second option (B) of proceeding west between the southern shoreline of Coronation Gulf and the archipelago using a single line of soundings was also considered.

Subsequently, in Port Epworth, a third alternative route (C) was available to the bridge team that consisted of using their reciprocal track (which they had already successfully navigated) northeast back to the main east–west surveyed channel. (Figure 1 and accompanying table). The bridge team elected to take the first option (A).

Throughout the voyage planning process, the master and ship management company were aware that the forward looking sonar was not serviceable. Additionally, they did not make plans to use one or more of the vessel’s portable echo-sounder equipped inflatables to precede the vessel, a risk mitigation method previously used by the vessel in other unsurveyed areas in the Arctic and Antarctica.

Figure 1. A) Route chosen by the *Clipper Adventurer* - B) Second route option - C) Reciprocal track



(Source: TSB)

Route	Approximate distance (nm [nautical miles])	Speed required (knots)	Time required (hours–min [minutes]) to reach destination ([Kugluktuk], NU [Nunavut])
A	90	6	15h 07 min
B	85	6	14h 10 min
C	200	13	15h 23 min

Forward Looking Sonar

In 2006, the *Clipper Adventurer* was equipped with a 3-dimensional forward looking sonar that was fitted into the bulbous bow and was mainly used to determine ice-aging. This unit can be used to detect hazards, notably when operating in inadequately surveyed waters.¹⁰ The unit enables a range of 330 m with a 90° field-of-view, or 440 m with a 60° field-of-view.

There was a technical problem with the unit in the spring of 2010. The manufacturer worked remotely with the crew to perform some limited analysis of the unit. Subsequently, the *Clipper Adventurer* was dry docked in Helsingborg, Sweden for bottom painting. At that time, the cable connector on the transducer module (TM) was reported to have been damaged during the dry docking. However, the vessel was refloated and departed for North America with the sonar out of service. This meant that the next opportunity for repair would be after the 2010 Arctic cruise season. The carriage of a forward looking sonar is not mandatory by Canadian Regulations, nor is it a recommended requirement in the IMO *Guidelines for Ships Operating in Polar Waters* (A26/Res.1024).

History of the Voyage

On 14 August 2010, the *Clipper Adventurer* embarked 128 passengers and departed from Kangerlussuaq, Greenland, bound for Kugluktuk, Nunavut, on a scheduled 2-week Arctic cruise. A bridge watch system of 4 hours on, 8 hours off was shared between the 3 bridge watch officers. There was a quartermaster assigned to each watch who, in addition to his other duties, acted as a lookout. The master's schedule was not fixed since he was required to be available as necessary throughout the voyage. The *Clipper Adventurer* was transiting in surveyed areas for most of the voyage. On day 13, however, the *Clipper Adventurer* transited between Bathurst Inlet and Port Epworth, an area that was largely unsurveyed, consisting primarily of single lines of soundings.

On 27 August, the vessel made a port stop in Port Epworth. The vessel was scheduled to complete its itinerary in Kugluktuk at 0800¹¹ the next morning. Before departing anchorage, the bridge team prepared courses from Port Epworth to Kugluktuk using Canadian Hydrographic Service (CHS) chart N°. 7777. The shore excursion to Port Epworth ended and the vessel got underway at 1700, 3 hours ahead of schedule. At the time of departure, the chief officer, quartermaster and master were on the bridge.

Normal practice by the bridge team was to record GPS position on the hour. The position at 1800 was noted in the deck logbook and plotted. Two

Figure 2. A) Clipper Adventurer Arctic itinerary for 2010 before the addition of Port Epworth



(Source: TSB)

other positions had also been plotted on the paper chart at 1730 and 1755. The ECS was used by the bridge team to monitor the vessel's progress using a raster navigation chart (RNC) CHS N°. 7777.

The chief officer who was in charge of the watch monitored the vessel's progress using parallel indexing on the starboard radar and monitored the water depth on the echo-sounder. The master monitored the port radar when on the bridge. Once clear of Port Epworth and on course 300° gyro, the vessel was placed on autopilot and proceeded at 13.9 knots.¹² The quartermaster remained on the bridge, to take over the steering when required. Shortly after departing Port Epworth, the chief officer marked a depth of 66 m on the chart in an area near where the chart indicated a depth of 40 m.

At 1832, the vessel ran aground on a shoal in position 67° 58.2' N and 112° 40.3' W [West] and listed 5° to portside. The vessel grounded on hard rock shelf from approximately the forepeak to amidships.

After the grounding, the chief officer stopped the main engines and closed all watertight doors from the bridge. The crew carried out emergency procedures, including sounding the tanks and lowering the lifeboats. Following the sounding of the tanks, the crew reported to the master that 7 tanks/compartments were breached.

At 1853, the master attempted to contact Marine Communications and Traffic Services (MCTS) Inuvik by cell phone, but was unsuccessful. At 1855, the master contacted the company's Designated Person Ashore (DPA) by satellite phone. At 1903, the master sent a marine telex to Northern Canada Vessel Traffic Services Zone (NORDREG) Iqaluit reporting that they had run

aground. At 1910, all passengers were mustered to the main lounge and stood down at approximately 2030. At 1915, NORDREG Iqaluit relayed the message to MCTS Inuvik.

Events Following the Grounding

Master's Initial Attempts to Refloat

On 28 August 2010, at 0055 in Arctic twilight, ballasting of the afterpeak and transferring of fuel between tanks began in preparation for an attempt to refloat the vessel. Between 0205 and 0400, the main engines were operated astern and the bow thruster run as needed in an unsuccessful effort to back off from the shoal. At 0930, a second attempt was made to refloat using the vessel's bow anchors in addition to the engines and bow thruster. This second attempt was also unsuccessful. The management company's emergency response team, which had assembled at the company headquarters upon receiving notification of the grounding from the master, was not made aware of these attempts in advance. During these attempts, the passengers' routine continued as normal. They were not re-mustered but were kept informed of the actions being taken. The management company dispatched a representative to the vessel who arrived a few days later.

During its investigation, the TSB [Transportation Safety Board of Canada] assessed the stability condition of the vessel before grounding, as well as the stability and structural condition during the first attempt by the master to refloat the vessel. The results show that the vessel had sufficient stability to remain afloat and stable if refloating had been successful. The longitudinal bending and shearing stresses did not exceed the allowable residual stresses in the damaged condition.

Search and Rescue

On 27 August at 1915, Joint Rescue Co-ordination Centre (JRCC) Trenton was advised of the grounding and initiated an Enhanced Group Calling (EGC) SafetyNet broadcast with distress priority at a 200-mile radius around the *Clipper Adventurer*. At 1932, the CCGS *Amundsen* was tasked and underway from Lady Franklin Point towards the grounding site. JRCC initially tasked a Hercules aircraft, with SAR kits on board with an ETA [estimated time of arrival] of 3 hours. However, it was stood down when the *Clipper Adventurer* advised NORDREG Iqaluit, at 1933, that the vessel was not taking on water and was in no immediate danger. At 2151, all broadcasts from MCTS Inuvik and MCTS Prescott via EGC were suspended.

On 29 August at 1000, the CCGS *Amundsen* arrived on scene and conducted hydrographic surveys of the area throughout to ensure its own

safety. The passengers were transferred from the *Clipper Adventurer*¹³ to the *Amundsen* and taken to Kugluktuk. All 69 crew members remained on board the *Clipper Adventurer*. On 29 August, the CCGS *Sir Wilfrid Laurier* was tasked with assisting with pollution control at the grounding of the *Clipper Adventurer* and arrived on scene during the afternoon of 31 August.

Salvage Operation

On 01 September 2010, a dive team and a salvage company, engaged by the ship management company to refloat the *Clipper Adventurer*, arrived on site. The dive team discovered that the hull had sustained extensive damage from the forepeak to aft of amidships and that 13 double-bottom tanks and compartments including 4 full diesel oil tanks were holed, as opposed to the 7 originally reported by the crew.

The damaged tanks were double-bottom ballast water and fuel tanks. The contents of those containing fuel oil were transferred to other tanks. Given the density of salt water and the pressure of the ingress, the fuel oil floated over the water within the tank and as a result there was minor pollution. As a precaution, the crew deployed absorbent oil booms around the vessel to contain any pollution.

There was a deflection of the hull bottom in way of the boiler and machinery space, with vertical deflections of 1 to 5 cm [centimetres] in way of the boilers (Appendix C). As a result, the salvors declined to use the main engines during the refloating operation and Transport Canada (TC) and [Lloyd's Register] (LR) (the vessel's classification society), subsequently barred their use during the tow to Cambridge Bay and Nuuk, Greenland. A salvage planning meeting was held on board with all concerned parties including representatives of the owner, insurer, LR, Canadian Coast Guard, TC, flag state, and the vessel's crew.

Between 03 and 04 September, the salvage company engaged the AHTS *Alex Gordon*¹⁴ and the tug *Point Barrow*, which had arrived on scene. TC requested stability calculations for the vessel's condition before allowing the initial salvage attempt. On 06 September, with the wind north-westerly at 40–45 knots, gusting 49 knots, with approximately 2 to 3 m seas, the vessel began rolling heavily, pitching, and pounding on the sea floor. This expedited the need for an initial attempt to tow the vessel off using the *Alex Gordon*. However, this attempt was unsuccessful and the vessel sustained further damage from boulders on the seabed (Appendix C).

On 08 September, the tug *Nunakput* was engaged by the salvage company and arrived at 1615 on 10 September. On 11 September, 2 more salvage attempts were made using roller bags and 3 tugs,¹⁵ but these were also

unsuccessful. Non-essential personnel were then transferred to the CCGS *Sir Wilfrid Laurier*.

Between [...] 11 and 14 September, the vessel sustained further damage due to the prevailing adverse weather conditions. On 13 September the salvage company engaged a fourth tug, the *Kooktook*. On 14 September at 0900, with weather conditions again deteriorating, another attempt was made using the tugs *Nunakput*, *Kooktook*, *Point Barrow* and *Alex Gordon*. At 1340, the vessel broke free from the bottom and accelerated rapidly off the shoal.

Photo 2. *Clipper Adventurer* being towed to Cambridge Bay



(Source: TSB)

The salvage plan required hydrographic surveying of the shoal area and the route to Port Epworth and then as needed to Cambridge Bay. This was performed by Canadian Hydrographic Service (CHS) personnel on board the CCGS *Sir Wilfrid Laurier*.

On 14 September at 1904, the *Clipper Adventurer* anchored safely at Port Epworth. Winds continued to build throughout the evening to 50 knots, with gusts to 58 knots recorded in the wheelhouse despite being inside the protected anchorage of Port Epworth. Winds likely exceeded 60 knots at the grounding site. Throughout the night, the crew continued to monitor machinery spaces. No water ingress was reported.

On 17 September, the *Clipper Adventurer* was towed and escorted to Cambridge Bay, arriving on 18 September for additional inspections by the Classification Society and temporary repairs. The vessel departed Cambridge Bay on 25 September, arriving in Pond Inlet on 28 September for an escort handover to Canadian tug *Ocean Delta*. The *Clipper Adventurer* departed Pond Inlet with tug *Ocean Delta* on 07 October and arrived in Nuuk, Greenland on 12 October. Additional temporary repairs were completed in Greenland, allowing the vessel to transit to Iceland and finally [Gdańsk],

Poland[,] where permanent repairs were completed, including replacement of the forward looking sonar.

Environmental Conditions

At the time of the occurrence, visibility was clear, the wind was north at 4 knots, the seas were calm and the outlook was good. The tide was at 0.4 m, its highest, and the water was clear. Sunset occurred at 2137.

Personnel Certification and Experience

The master, officers and crew all held certificates of competency valid for the vessel and voyage being undertaken.

The master had at least 35 years of polar experience of which 15 seasons had been spent in the Canadian Arctic. He had worked for the ship management company of the *Clipper Adventurer* for several years. He held a valid Unlimited Master Mariner certificate issued in 1979 in Sweden with a STCW [Standards of Training, Certification and Watchkeeping]¹⁶ continued proficiency certificate valid until November 2010. This was the master's first voyage to Port Epworth, although he had been in the Coronation Gulf the previous year.

The chief officer had navigation experience in ice and in remote areas since 2003, with 4 seasons experience in the Canadian Arctic, and on other cruises with this master for 3 years. He held a valid Chief Officer Unlimited certificate issued in the Republic of Argentina and a Bahamian STCW endorsement as Master 1600 GRT [gross register tonnage] or less.

Vessel Certification

The vessel was designed and constructed for unrestricted international voyages and was classed 100 A1 Ice Class 1A Passenger Ship by Lloyd's Register. The vessel was crewed, equipped and certified in accordance with existing regulations and held a valid Safety Management Certificate¹⁷ as required by the International Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM [International Safety Management] Code). The Document of Compliance (DOC) was issued by Bureau Veritas on behalf of the Bahamas Authority on 20 November 2007 and was valid until 4 April 2012.

Canadian Hydrographic Service

The Canadian Hydrographic Service (CHS) is a branch of the Department of Fisheries and Oceans Canada. Its mission is to survey and chart Canada's oceans, lakes and rivers to ensure their safe, sustainable and navigable use,

and to produce accurate publications including charts for the purpose of navigational safety. CHS publishes and maintains 946 nautical charts in paper and electronic format and over 100 companion publications. Each year it receives orders from 800 chart dealers worldwide and distributes nearly 300 000 nautical charts, tide tables and other nautical publications.

CHS Central and Arctic is responsible for conducting surveys in the Arctic. According to CHS, less than 10% of the Canadian Arctic is surveyed to modern standards, and many charts include information that was obtained more than 50 years ago [...] using less reliable technologies than are available today. The routes commonly used are those that have been surveyed more extensively.

Discovery of the Shoal

CHS conducts surveys to collect high-resolution data on the depth, shape, and structure of Canada's oceans, lakes, and rivers for the purpose of producing and updating charts and other navigational publications. When survey work is completed, the data is combined with shoreline and other navigation and topographical data for integration into a navigational chart.¹⁸ CHS accepts outside sources of data to issue a chart modification if they consider the information to be sufficiently accurate and if it will serve to improve safety for mariners, in accordance with International Hydrographic Organization (IHO), SOLAS Chapter V¹⁹ and CHS standards and processes.

The shoal on which the *Clipper Adventurer* grounded had been previously discovered on 13 September 2007 by the CCGS *Sir Wilfrid Laurier* while conducting scientific research. The CCGS *Sir Wilfrid Laurier* reported the shoal to MCTS Iqaluit, who then broadcast a NOTSHIP²⁰ for CHS Chart N°. 7777 indicating that, "a shoal was discovered between the Lawson Islands and the Home Islands in the Southern Coronation Gulf in position 67° 58.25' N, 112° 40.39' W. Charted depth in area 29 m. Least depth found 3.3 m. Isolated rock. Refer to NAD 83 [North American Datum of 1983] datum." It was still in effect at the time of the grounding.

When the CCG[S] *Sir Wilfrid Laurier's* crew first discovered the shoal in 2007[,] they were aware of the risks of crossing an island archipelago on a single line of soundings. They were transiting the area from the north at reduced speed. The bridge team was monitoring the depth sounder and lookouts scanning ahead for discoloration of the water indicative of shallower water.

Figure 3. Three dimensional survey image of the shoal in the way of the grounded vessel.²¹

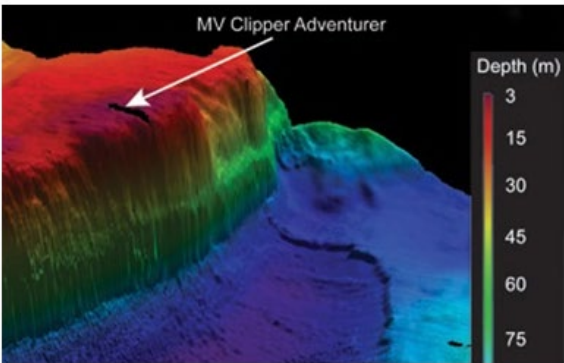


Photo 2. *Clipper Adventurer* aground



(Source: TSB)

On 14 September 2007, CHS Central and Arctic regional office received the information about the shoal discovered by the CCGS *Sir Wilfrid Laurier*. It first established that there was a NOTSHIP that had been issued. Then, based on the preliminary information received, it determined the location would require more extensive surveying prior to issuing a permanent chart correction. In late 2007, there was an exchange of information between the CCGS *Sir Wilfrid Laurier* and CHS Central and Arctic regarding the reported shoal. CHS Central and Arctic determined that the depth surveys conducted by the CCGS *Sir Wilfrid Laurier* were not up to CHS standards. CHS standards are based on those of the International Hydrographic Organization (IHO). In accordance with IHO Regulation B-611.9,²² permanent chart updates should not be made based on a single vessel report, with the exception of instances where:

- they originate from recognized survey vessels, research ships or other vessels/masters known to be reliable;
- they are reports of shoal depths, preferably accompanied by supporting evidence, e.g., an unambiguous echo-sounder trace, for areas where it is unlikely that corroboration can be obtained;²³
- they are the sole source of information in a remote area;
- they are of particular significance to navigation; or
- the location is in an area where the level of information flow and lines of communication are poor.

Notwithstanding the above, CHS Central and Arctic requires validated data with systematic coverage and a sufficient level of confidence before permanently modifying a chart. For example, it requires 3 types of hydrographic soundings in order to convey an accurate depiction of a hazard on charts: representational (periphery), significant (depths leading to peaks) and critical (peaks). In the summer of 2008, a CHS team of hydrographers on board the CCGS *Sir Wilfrid Laurier* evaluated the accuracy of the data collected the previous year and confirmed that it was not sufficient to produce a chart correction according to CHS Central and Arctic practice.

On 4 September 2008, the passenger vessel *Akademik Ioffe* transited south into Port Epworth along the same line of soundings as the *Clipper Adventurer* was to later follow. The vessel's logbook recorded a depth of 16 m when passing near the 29 m sounding on the CHS chart N^o. 7777 in proximity to the shoal at 67° [58.4'] N, 112° 40.0' W. The vessel was not aware of NOTSHIP A102/07. At that time, the NOTSHIP was no longer being broadcast by radio but was available by other means (see list below).

CHS Central and Arctic has a prioritized list of areas to be surveyed. While CHS does not have dedicated vessels for surveys, CHS Central and Arctic typically plans to have 1 or 2 teams conducting surveys in the Arctic for several weeks during the summer navigation season and takes advantage of situations where CCG [Canadian Coast Guard] vessel routes and activities coincide with planned survey site locations on an opportunity basis.

In 2009, CHS had planned to survey the shoal based on their prioritized list. However, there was no opportunity at that time to survey the shoal using CCG vessels. Subsequent to the grounding of the *Clipper Adventurer*, a team of CHS hydrographers on board the CCGS *Sir Wilfrid Laurier* completed a survey of the area. On 8 October 2010, CHS chart N^o. 7777 was corrected by a permanent indication of the shoal and a NOTMAR was issued.

Notices to Shipping and Notices to Mariners

Canada uses the term “Notice to Shipping (NOTSHIP)” to warn mariners about local navigation hazards. This term is not used outside of Canada, whereas the terms Local Warning and Navigational Warning are more widely used and recognized by foreign crews. For example, Canadian radio broadcasts use the term “Notice to Shipping,” which is referred to in some other publications that the vessel is required [to] have on board, such as the RAMN [Radio Aids to Marine Navigation] and the Sailing Directions. Before the 2011 Arctic season, there remained 5 active written NOTSHIPS issued since June 2006 referring to navigational hazards in the Arctic (i.e., shoal, rocks, and an islet). Two of these 5 sites have been surveyed. However, CHS is awaiting tidal corrections to release the NOTMARs for these 2 sites. For the remaining sites, CHS have not issued permanent chart corrections. NOTSHIPs are issued by the Canadian Coast Guard (CCG) [MCTS] stations and remain active until a NOTMAR is issued or until the information is no longer necessary to mariners. In the Canadian Arctic, NOTSHIP A102/07 was available

- by radio broadcast according to the schedule advertised in the Radio Aids to Marine Navigation (RAMN) for a period of 14 days in the Arctic (which includes the CCG website link), twice daily during broadcast by MCTS;
- through NAVTEX within the 250 to 300 nautical miles (nm) range (Narrow Band Direct Printing Marine Telex) for 14 days after the shoal was discovered in 2007 (A102/07);
- through HF [High Frequency] Narrow Band Direct Printing (HF-NBDP) (8 MHz [megahertz]) receivers that can be used where service is available as an alternative to Inmarsat-C. The range of this broadcast is 800 miles, dependent upon radio propagation. In this instance, Notice to Shipping A102/07 was broadcast as a NAVAREA XVIII message (NAVAREA 5/10).²⁴
- through online access to CCG website;²⁵
- through a weekly list that is faxed or emailed to subscribers;
- by request to MCTS; and,
- effective since 01 July 2010, by SafetyNET Broadcast twice daily through Inmarsat-C for NAVAREA [Navigational Area]/METAREA²⁶ warnings for a period of 6 weeks as per IMO standards. In this instance the broadcast of NAVAREA XVIII 5/10 was effective on 01 July 2010 for a period of 50.5 days ending on 20 August 2010.

In 2010, the CCG assumed the responsibility of NAVAREA coordination for NAVAREAs XVII and XVIII as part of the World-Wide Navigational Warning Service (WWNWS). The service was in “Initial Operational Condition” (IOC) effective July 1, 2010. During the IOC period, the Canadian Coast Guard did not guarantee service availability as this service was provided on a test basis. The service entered “Full Operational Condition” (FOC) in June 2011.

Transmissions were sent twice a day for each NAVAREA/METAREA XVII and XVIII warnings by Inmarsat-C SafetyNET. Due to satellite coverage limitations above 76° N latitude, these messages were also broadcasted on a test basis by HF-NBDP. At the start of IOC, all previously issued but still active Notices to Shipping (NOTSHIPS) that met the criteria for NAVAREA warnings were broadcast via Inmarsat-C SafetyNet and HF NBDP NAVAREA XVIII warning 5/10. This HF NBDP broadcast (8416.5 MHz) was included in RAMN 2010.

CHS issues chart and publication corrections in the form of NOTMAR. These can be permanent, temporary or preliminary. NOTMAR are issued when hazards are confirmed, but may also be issued when surveys have not been completed to CHS standards. In such cases, NOTMAR take one of the following forms:

- Position Approximate (PA)
- Position Doubtful (PD)
- Existence Doubtful (ED)
- Sounding Doubtful (SD).

PAs can be used to indicate that the position of a shoal, wreck or navigational hazard has not been determined or does not remain fixed. PDs are used to indicate that a wreck, a shoal or other navigational hazard has been reported in various positions but not confirmed in any of them. In 1960, CHS utilized PDs on chart No. 7777 to indicate reported shoals that were not confirmed (Appendix D). These symbols are part of IHO standards.

Over time, it became CHS Central and Arctic’s systematic practice to avoid PA or PD chart corrections due to possible inaccuracies in the information provided to them. The rationale is that should a PA or PD be placed on a chart in an incorrect location based on incomplete information, mariners may be misled or could contact another unreported hazard. Consequently, CHS Central and Arctic relies on the use of NOTSHIPs to warn mariners rather than issuing PA and PD chart corrections for reported navigational hazards that have not been surveyed to CHS standards.

Northern Canada Vessel Traffic Services

NORDREG is the Canadian Arctic marine traffic system created pursuant to the *Northern Canada Vessel Traffic Services Zone Regulations*. The system is designed to ensure that the most effective services are available to accommodate current and future levels of marine traffic. Participation is mandatory for all vessels of over 300 gross tonnage. NORDREG is operated by CCG MCTS personnel from the Iqaluit, Nunavut MCTS Centre. The MCTS Centres forward messages and are in continuous contact with NORDREG. The NORDREG system keeps track of all traffic north of 60° N, as well as within Ungava Bay and the southern part of Hudson Bay, providing recommended routes and general ice conditions. Vessels entering the NORDREG system must provide a sailing plan report that includes the vessel's intended route. On 18 August 2010, NORDREG received the sailing plan report from the *Clipper Adventurer*, which included a stop at Port Epworth. When receiving these reports and providing routing advice, NORDREG does not issue to vessels the written NOTSHIPS applicable to their routes, which is consistent with existing CCG levels of service²⁷ for all MCTS Centres and NORDREG procedures for issuing NOTSHIPS. However, NORDREG does advise mariners at the end of each broadcast, twice daily, that all active NOTSHIPS are available via the Internet.

Chart Dealers and Chart No. 7777

CHS-approved third-party chart dealers stock and sell charts and related publications. Some dealers provide customers with information on how to maintain their charts current to recent NOTMAR. Others have created chart correction tools such as tracings of NOTMAR and can be hired to perform audits of chart portfolios. The *Clipper Adventurer's* management company used a chart correction service to ensure that its charts were up-to-date. However, this did not include the provision of NOTSHIPS. In 2009, the *Clipper Adventurer* purchased CHS chart No. 7777. This chart was stamped as being corrected with NOTMARs up to 25 July 2008. The last NOTMAR issued was dated 04 June 2004 and had been applied to chart No. 7777.

The chart's source classification diagram indicated that the area around Port Epworth contained soundings from sources other than CHS and without specific dates for each one. The distance between the spot soundings on the single-line varied between 0.4 nm to 0.7 nm. There were no bathymetric contours indicated on the chart in this area. The intended route between Port Epworth and Kugluktuk was along a single line of soundings

with uncharted waters all around. The shoal was located on the vessel's intended route. The bridge team used the vessel's Electronic Chart System (ECS) to monitor the progress of the vessel as displayed on raster navigation chart (RNC) CHS No. 7777.

Safety Management Systems

International Safety Management Code

The *International Management Code for the Safe Operation of Ships and Prevention of Pollution (ISM)* has the overall aim of providing an international standard for the safe management and operation of ships and for pollution prevention. Effective safety management requires large and small organizations to be cognizant of the risks involved in their operations, to competently manage those risks and to be committed to operating safely. In order to accomplish this, a vessel operator must evaluate existing and potential risks, establish safety policies and related procedures to mitigate those identified risks and provide a means to continuously gauge performance through audits, so as to improve organizational safety where necessary. The resulting documented, systematic approach helps ensure that individuals at all levels of an organization have the knowledge and the tools to effectively manage risk, as well as the necessary information to make sound decisions in any operating condition. This includes both routine and emergency operations.

Companies operating passenger vessels such as the *Clipper Adventurer* have been required to comply with the provisions of the ISM code since July 1998. The company that managed the *Clipper Adventurer* charters and manages passenger vessels worldwide and has had several ships sailing the Arctic on previous voyages. The company has dedicated shore teams responsible for managing each ship with respect to maintenance, staffing, budgeting and purchasing. The shore team reviews each proposed itinerary to verify that cruises can be undertaken. The itinerary is then passed on to the vessel's bridge team to complete the requisite passage plan.²⁸

One of the key functions of a safety management system (SMS) is to manage risk proactively. This includes the identification, assessment and analysis of risk, and the establishment of safeguards against all identified risks. Prior to the grounding, the management company QSEP did not identify all of the risks associated with navigation in poorly charted areas or put in place specific procedures or guidelines for operating in the Arctic, including ensuring that the voyage plan was revised in conjunction with the management company; that the forward looking sonar unit was operable;

that zodiacs with portable echo-sounders were used when necessary; that vessels transited at lower speed when operating in poorly charted areas; and that local navigation warnings were obtained.

Internal Audit

The objectives of the ship management company's internal audit program are to verify the effectiveness of the QSEMS [Quality, Safety, and Environmental Management System] and the compliance of the officers and crew.

Internal audits are conducted by ship management annually. In 2009, the company's auditor conducted an internal audit using a document checklist based on the company's *Audit Program*. Items verified included the Voyage Planning form, Deck Logbook entries and chart corrections. The 2010 audit for *Clipper Adventurer* was scheduled for September or October. The audit was postponed following the grounding and took place when the vessel arrived in Poland for repairs.

Voyage Data Recorder

Various modes of transportation have used data recorders to assist accident investigators. The aviation industry has enjoyed the benefits of flight data and cockpit voice recorders for many years, but experience with voyage data recorders (VDRs) in the maritime industry is relatively new. In addition to bridge audio, a VDR is capable of recording such parameters as time; vessel heading and speed; gyrocompass; alarms; VHF [very high frequency] radiotelephone communications; radar; the echo-sounder[;] status of hull openings; wind speed and direction; and rudder/engine orders and responses.

Following the grounding, the bridge team was required by the company Quality, Safety, and Environmental Protection (QSEP) program to activate the "backup memory button" from the VDR System Control and Alarm Unit (SCU) located on the bridge (Figure 4). Several requests to backup the data were made by the company following requests by the TSB. The vessel's flag state (Bahamas) also requires that VDR data be preserved in the case of "very serious and serious casualties."²⁹ The bridge team had confirmed that 12 hours of data had been saved.

On 03 September 2010, the TSB investigation team attempted to download data from the VDR but no data had been saved. Since the backup procedures had not been followed by the bridge team, the VDR had continued to record data following the grounding, overwriting the data recorded at the time of the grounding.

Analysis

Upon departure from Port Epworth, the *Clipper Adventurer* followed the planned course along a single line of soundings at 13.9 knots. The vessel ran aground on a previously reported shoal not marked on the chart in use. This analysis will consider route selection, navigation practices in Arctic waters, the availability of navigation information, and the management of safety.

Route Selection

When completing the Voyage Planning Form, 2 routes from Port Epworth to [Kugluktuk] were considered (Figure 1). One route (B) would take the vessel south of the Lawford Islands along a single line of soundings and with difficult navigation at its western end. The other route (A), chosen in this occurrence, also followed a single line of soundings.

An alternative route (C) was available using the vessel's reciprocal track northeast back to the main east/west surveyed channel. It was not chosen by the bridge team due to the extra distance of 200 miles. The vessel was scheduled to arrive in Kugluktuk at 0800 on 28 August 2010. This arrival time could have been achieved by either the chosen route (A), 90 nm to Kugluktuk at a speed of 6 knots, or by the longer route (C), 200 nm at a speed of 13 knots. Either route would have allowed the vessel to reach Kugluktuk on schedule.

The *Clipper Adventurer* ran aground on a previously reported but uncharted shoal after the bridge team chose to navigate a route on an inadequately surveyed single line of soundings.

Navigation in Inadequately Surveyed Areas

A bridge management team is expected to navigate with particular caution where navigation may be difficult or hazardous. The *Clipper Adventurer's* bridge team was following a single line of soundings made in a 1965 survey, using less reliable technology than that available today, and was not aware of the NOTSHIP regarding the shoal.

Although the absence of bathymetric contour lines on the chart indicated an incomplete hydrographic survey of the area, the master of the *Clipper Adventurer* was confident in his choice of route and speed, having navigated in polar waters for decades using single lines of soundings without incident. Furthermore, the chart indicated no navigational hazards along the chosen route, the chart dealer had provided all the latest chart corrections, and the existence of a line of soundings indicated that at least one other vessel had successfully transited that route.

In order to reach Kugluktuk on schedule, the *Clipper Adventurer* needed to proceed at a speed of 6 knots. However, the *Clipper Adventurer* was proceeding at full sea speed of 13.9 knots, which significantly exceeded the speed required to meet the scheduled arrival. Additionally, the vessel was not operating with a functional forward looking sonar, nor were one or more of the vessel's inflatables, equipped with portable echo-sounders, dispatched to precede the vessel.

With the forward looking sonar unserviceable, the vessel relied on the echo-sounder to monitor the accuracy of the charted soundings. However, the echo-sounder provided the depth beneath the vessel and not the depth ahead. As a consequence, the vessel struck the shoal at full sea speed, damaging the hull and the propulsion machinery.

Forward Looking Sonar – Status

The unserviceable condition of the forward looking sonar deprived the bridge team of an additional source of valuable information. Forward looking sonars are designed to provide safety critical information regarding underwater obstructions ahead of ships, and provide automatic navigation alerts to bridge teams. As time is critical when an obstruction is detected, it is important to take into account the maximum range of the forward looking sonar when determining the appropriate speed. Based on performance specifications for the unit fitted on the *Clipper Adventurer*, the crew could have been warned approximately 48 seconds in advance given the speed of 13.9 knots. At a speed of 6 knots, the crew could have been warned approximately 2 minutes in advance. Without the valuable information available from a functional forward looking sonar, and given the hazards inherent in navigating inadequately surveyed areas, the vessel's speed of 13.9 knots was probably not prudent.

Canadian Hydrographic Service Chart Corrections

Once a chart has been published, it is subject to amendments and corrections as new information becomes available. Before applying such permanent amendments or corrections, it is CHS Central and Arctic regional practice to conduct a complete hydrographic survey. In this instance, the initial data provided to CHS Central and Arctic by the CCGS *Sir Wilfrid Laurier* did not meet the CHS Central and Arctic regional practice for a permanent chart modification. However, as the information had come from a reliable source, it did meet the International Hydrographic Organization (IHO) criteria for a chart modification in a remote area using IHO-recognized NOTMAR Position Approximate (PA) or Position Doubtful (PD) symbols.

The use of the symbols PA or PD on a chart provides a visual warning of the presence of a possible hazard and seafarers would be expected to navigate with additional caution around this hazard. However, CHS Central and Arctic tries to avoid issuing PAs or PDs on Arctic charts because of the risk that incorrect or incomplete information in poorly surveyed areas could mislead mariners as to the true location of the hazard, or onto another unreported hazard. A similar risk exists with a NOTSHIP as it provides the same information. In addition, a NOTSHIP does not specify that the position of the hazard is approximate or doubtful. The use of the symbols PA or PD on a chart provides a visual warning of the presence of hazards, which are intended to advise mariners to navigate with caution.

Given the data provided by the CCGS *Sir Wilfrid Laurier* regarding the existence of the shoal, CHS Central and Arctic had a mechanism in place to issue a PA chart correction identifying the reported shoal on chart No. 7777. However, since it was not its common practice to do so, no chart correction was issued, depriving the bridge team on the *Clipper Adventurer* of one possible source of critical information.

The practice of CHS Central and Arctic not to issue PA and PD chart corrections increases the risk that mariners may be unaware of known hazards should they not obtain applicable NOTSHIPS.

Retrieval of Notices to Shipping

The completion of a comprehensive voyage plan prompts mariners to source information important to safe navigation. This includes ensuring that the courses have been laid out on the appropriate charts, that the latest corrections have been applied to these charts, that all the appropriate nautical publications have been consulted, and that the relevant navigational warnings have been obtained. In this occurrence, the *Clipper Adventurer's* bridge team laid out the courses and completed the company's Voyage Planning Form. Their voyage plan did not consider local navigational warnings known in Canada as Notices to Shipping (NOTSHIP).

Although the bridge team possessed up-to-date charts and publications from the dealer, these did not include local navigational warnings. In Canada, these can be obtained through numerous methods including Inmarsat-C SafetyNet NAVAREA broadcasts, HF NBDP 8146 MHz broadcasts, the CCG website and by contacting an MCTS Centre. Once the Inmarsat SafetyNet NAVAREA XVIII warning 5/10 ended on 20 August 2010, the information regarding the shoal was available via HF NBDP, the CCG website or by contacting a MCTS Centre. Vessels operating in the Canadian Arctic may have limited access to the Internet due to an unreliable connection because

of satellite geometry. This may limit the mariners' ability to access NOTSHIPS or other valuable navigation information.

The investigation could not determine why the bridge team were not aware of NOTSHIPS, nor why they did not seek them out from the readily available sources while planning and conducting the voyage. The methods for obtaining active written NOTSHIPS or NAVAREA broadcasts are identified in the Radio Aids to Marine Navigation (RAMN). Furthermore, the HF NBDP (8416.5 MHz) SafetyNet broadcast was published in RAMN 2010. The area in which the vessel was operating, NAVAREA XVII–XVIII, was also within range of Inmarsat-C SafetyNET broadcasts[,] and HF NBDP was available as an alternate to Inmarsat-C. Although the vessel was fitted with all of the necessary equipment to receive broadcasts of messages pertaining to navigational warnings for the area, the bridge team was not aware of NOTSHIP A102/07 and NAVAREA XVIII warning 5/10.

NORDREG Vessel Traffic Services in the Arctic

Knowledge of hazards to navigation through reporting mechanisms is crucial to ensure safe navigation. Through the mandatory NORDREG vessel reporting system, the CCG is the initial point of contact for all vessels transiting the Arctic. It has been noted that 5 NOTSHIPS³⁰ issued since June 2006 that refer to navigational hazards (i.e., shoal, rocks, and an islet) remained active for Arctic waters at the start of the 2011 season, but are no longer broadcast through MCTS. These 5 written NOTSHIPS can now only be accessed through the CCG website or by specific request to MCTS.

Obtaining NOTSHIPS through the CCG website can be problematic due to unreliable Internet access north of 60° Latitude. As a result, access to NOTSHIPS may be limited to HF-NBDP and a specific request made to MCTS. The issuing of NOTSHIPS only through these 2 means is a passive method reliant on both a mariner's awareness of how to obtain the information and the vessel being equipped with the appropriate technology to do so. Such an approach may be problematic for vessels entering the Canadian Arctic for the first time and for the bridge teams of foreign flag vessels who may be unfamiliar with Canadian use of the term NOTSHIP.

Furthermore, the NORDREG vessel reporting system requires that vessels must submit a detailed sailing plan report prior to arrival in Canadian Arctic waters. However, when receiving sailing plan reports and providing routing advice to vessels, NORDREG does not proactively advise vessels about active NOTSHIPS for the areas that they will be transiting.

Safety Management

The International Management Code for the Safe Operation of Ships and [f]or Pollution Prevention (ISM Code) has the overall aim of providing an international standard for the safe management and operation of ships engaged in international voyages and for pollution prevention. One of the main objectives set out by the ISM Code is for companies to “establish safeguards against all identified risks.”

Voyage Planning

Although the management company’s Quality, Safety, and Environmental Management System (QSEMS) did not contain specific procedures for operating in the Arctic, it did require key documents to be on board the vessel which identified specific measures to follow when operating in remote and poorly surveyed areas. In addition to the *Sailing Directions – Arctic Canada Vol 1*, one such document referenced was Transport Canada’s (TC) *Guidelines for the Operation of Passenger Vessels in Canadian Arctic Waters*.³¹ This TC document cautions that waters north of 60° are not well-surveyed and soundings in many areas are based on reconnaissance surveys and are not up to international standards. The document also contains a reference to NOTSHIPS, indicating that they are broadcast by MCTS.

Once the seasonal cruise program had been determined for the *Clipper Adventurer*, the management company relied on the experience and competency of the bridge team, expecting it to follow the procedures established by the company’s QSEMS. Before commencing the voyage, the *Clipper Adventurer*’s bridge team laid out the courses and completed the company’s Voyage Planning Form. The vessel was equipped with up-to-date charts, publications were on board including the TC guidelines, and the vessel was fitted with all necessary equipment to receive the broadcast NOTSHIPS. However, the bridge team was not aware of, nor did they seek out[,] NOTSHIPS while planning and conducting the voyage.

This was the *Clipper Adventurer*’s second season in the Canadian Arctic. Throughout the voyage planning process, the master and ship management company were aware that the forward looking sonar was not serviceable. However, the vessel’s management company had not detected irregularities with voyage planning through its ongoing management of the QSEMS. The voyage planning practice on board the *Clipper Adventurer* did not fully comply with the ship management company’s Quality, Safety, and Environmental Protection (QSEP) program, in that local warnings (NOTSHIPS) were not obtained.

Procedures for Arctic Voyages

One of the key functions of an SMS is to proactively manage risk. This includes the identification, assessment, analysis, and the establishment of safeguards against all identified risks. At the time of the occurrence, the ship management QSEMS operations manual did not contain specific provisions to ensure that safety critical equipment, such as the forward looking sonar[,] was serviceable. In addition, procedures and precautionary measures, such as the use of forward looking sonar as a means of determining a prudent speed in inadequately charted areas, were also not identified. Providing specific procedures for these conditions in the company's operations and safety manual would have provided guidance to the bridge team, and should have advised them to take precautionary measures when transiting in Arctic waters. The voyage planning practice on board the *Clipper Adventurer* did not fully comply with the ship management company's Quality, Safety, and Environmental Protection (QSEP) program in that the bridge team did not use the *Bridge Procedures Guide* for a passage plan appraisal. As well, the ship management company's SMS did not provide the vessel's staff with procedural safeguards to mitigate the well-known risks associated with operation in the Arctic such as providing a serviceable forward looking sonar and ensuring that local navigational warnings were obtained.

Refloating Attempts

Before attempting to refloat a grounded vessel, the condition of the vessel must be known, all risks assessed, and appropriate measures put in place to mitigate those risks. It is the master's responsibility to weigh the risks of remaining aground or taking prompt action to refloat the vessel and, in some instances, the resulting decision must be made on the basis of incomplete information.

At the time of the grounding, no salvage vessels were in the area and the CCGS *Amundsen* was approximately 36 hours away from the site. The vessel was firmly aground and severely damaged, while the weather forecast did not indicate that the vessel would be subject to further risk if it remained aground. Upon deciding to refloat the vessel after the grounding, the master did not have sufficient damage stability information to assess whether or not the vessel would be stable once off the shoal. The master's knowledge of damage was limited to which tanks were flooding. The actual condition of the hull, including the hull structure under the machinery space, which had been damaged and significantly deflected, was unknown. Notwithstanding, the master reported to MCTS Iqaluit that he had propulsion, and the main

engines were run during the first attempts to refloat the vessel. During these attempts, the passengers['] shipboard routine continued as normal and, though they were kept informed, they were not re-mustered.

Following the occurrence, a damage stability assessment was conducted by the TSB that determined that the vessel did have sufficient stability had it been refloated before a decision was made to request a salvage operation. Even though there were no adverse consequences in this instance, without readily available SAR resources, and a complete formal assessment of the vessel's seaworthiness, including damage stability, residual hull strength and machinery condition prior to a refloat attempt, such decisions may place a vessel, passengers and crew at risk.

Voyage Data Recorder

The purpose of a Voyage Data Recorder (VDR) is to create and maintain a secure, retrievable record of information indicating the position, movement, physical status, and command and control of a vessel for the period covering the most recent 12 hours of operation. Objective data is [indispensable] to accident investigators seeking to understand the sequence of events and identify operational problems and human factors issues.

The bridge team did not capture VDR data as required by the company's SMS even though they were advised to do so by the designated person ashore following a request by the TSB. The backup procedure was not followed by the bridge team and the VDR continued to record data after the grounding, overwriting the data recorded at the time of the grounding. When bridge recordings are not available to an investigation, this may preclude the identification and communication of safety deficiencies to advance transportation safety.

Findings

Findings as to Causes and Contributing Factors

1. The *Clipper Adventurer* ran aground on an uncharted shoal after the bridge team chose to navigate a route on an inadequately surveyed single line of soundings.
2. Despite having a non-functional forward-looking sonar or using any other means to assess the water depths ahead of the vessel, the *Clipper Adventurer* was proceeding at full sea speed (13.9 knots).
3. The shoal had been previously identified and reported in a Notice to Shipping (NOTSHIP). However, the bridge team was unaware of and did not actively access local NOTSHIPS, nor did NORDREG

specifically advise them of the NOTSHIPs applicable to the vessel's area of navigation.

4. Canadian Hydrographic Service (CHS) Central and Arctic did not issue a chart correction, depriving the bridge team of one source of critical information regarding the existence of a shoal on their planned route.
5. The voyage planning practice on board the *Clipper Adventurer* did not fully comply with the ship management company's Quality, Safety, and Environmental Protection (QSEP) program by not using the *Bridge Procedures Guide* for a passage plan appraisal, which resulted in local warnings (NOTSHIPs) not being obtained.
6. The ship management company's SMS did not provide the vessel's staff with safeguards to mitigate well-known risks, including revision of the voyage plan in conjunction with the management company; assurance that the forward looking sonar unit was operable; use of the zodiacs with portable echo-sounders when necessary; assurance that the vessel transited at lower speed when operating in poorly charted areas; and acquisition of NOTSHIPs local navigation warnings.

Findings as to Risk

1. The practice of CHS Central and Arctic not to issue and apply chart corrections using Position Approximate and Position Doubtful symbols increases the risk that mariners will not be aware of known hazards when they do not obtain the applicable NOTSHIPs.
2. When NOTSHIPs are no longer broadcast, vessels operating in Canadian Arctic waters can only obtain the information on written NOTSHIPs by specific requests to MCTS or by accessing the CCG website, in areas with unreliable Internet connectivity, which may limit the mariners['] awareness of known hazards.
3. When receiving sailing plan reports and providing routing advice to vessels, NORDREG does not proactively advise vessels about active NOTSHIPs for the areas that they will be transiting[,], which may place vessels at increased risk if they have not obtained the information by other means.
4. Unless there is a complete assessment of the seaworthiness of a vessel prior to a refloating attempt, a vessel, its passengers and crew may be placed at risk.
5. When bridge recordings are not available to an investigation, this may preclude the identification and communication of safety deficiencies to advance transportation safety.

Other Findings

1. The term Notice to Shipping is not used outside Canada, whereas the terms Local Warning and Navigational Warning are more widely used and recognized by foreign crews.
2. On 4 September 2008, the passenger vessel *Akademik Ioffe* transited southbound to Port Epworth following the same line of soundings. The bridge team was also not aware of NOTSHIP A102/07.

Safety Action

Identifying Navigational Hazards in the Arctic

I. Communication of Notices to Shipping in the Arctic

On 16 June 2011, the TSB issued Marine Safety Advisory No. 02/11 to the Canadian Coast Guard (CCG) of the Department of Fisheries and Oceans (DFO) advising them of the importance of ensuring that vessels transiting the Arctic are provided with Notices to Shipping relevant to the routes they are intending to follow.

On 03 April 2012, the TSB met with DFO as a follow-up to the MSA [Marine Safety Advisory]. The TSB reiterated its safety concern and requested an update on DFO's intentions regarding NORDREG policies.

During the meeting, the TSB expressed the following concerns. The Canadian Arctic Archipelago is very remote from available Search and Rescue (SAR) and pollution response resources. Consequently, accidents such as the grounding of the *Clipper Adventurer* can have far reaching impacts, including the possible damage or loss of vessels, injuries and loss of life, and damage to the fragile northern environment. The grounding of the *Clipper Adventurer* is not the first occurrence involving passenger vessels in the Arctic where NORDREG had not supplied information regarding this shoal directly to a vessel. On 04 September, 2008, the Russian passenger vessel *Akademik Ioffe* passed close by the same uncharted shoal, unaware of its existence.³² Similar to the *Clipper Adventurer*, the crew of the vessel had not been proactively supplied with information regarding the existing NOTSHIP. In addition, it is reported that the Canadian tugs that came to the aid of the stranded *Clipper Adventurer* were also unaware of the shoal until they were informed by the CCGS *Sir Wilfrid Laurier*.

Until 1988, there were few passenger ships voyaging to the Arctic. In the years 1980–1987, there were only 4 Arctic passenger voyages conducted by one passenger vessel. However, in the past 7 years, there have been a total of 105 distinct voyages conducted by 7 different passenger vessels. During this

time, there has been an average of 9 passenger vessels per year conducting a total of 15 voyages per year. With approximately 105 passengers per voyage, there are at least 1575 passengers in the Arctic every year.

Of the 118 vessels in the Canadian Arctic that conducted 284 voyages in 2011, there were 15 tankers and 7 passenger vessels. Tankers are considered to be of high risk because an accident could have severe environmental consequences. Passenger vessels are also considered high risk since, among other consequences[,] an emergency in the Arctic could leave passengers and crew stranded for an extended period of time in a harsh environment.

It is expected that with the continued melting of polar ice in the future, traffic will increase as vessels (particularly foreign flagged and crewed) increasingly use the Northwest Passage, and new and previously inaccessible areas open up for passenger ships to visit. Given the remoteness of the region, the navigational challenges of the Arctic, and the potential unfamiliarity of foreign crews with Arctic navigation, the Board is concerned that if up-to-date information about hazards to safe navigation does not reach vessels, passengers, crew and the environment are at increased risk.

DFO recently provided a written response to the TSB. Starting with the 2012 Arctic navigation season, the Canadian Coast Guard will utilize the mandatory NORDREG vessel reporting system to proactively provide all vessels with a list of NOTSHIPS that are applicable to Arctic waters north of 60 degrees.

When a vessel first reports to NORDREG, a summary listing of all Arctic NOTSHIPS will be appended to the NORDREG clearance message. The master of the vessel can use this summary listing to determine the details of the appropriate NOTSHIPS along his intended route from a variety of sources, such as via the Internet or the Iqaluit Marine Communications and Traffic Services centre, before entering NORDREG Vessel Traffic Service Zone.

II. Chart Corrections in the Arctic

On 16 June 2011, the TSB issued Marine Safety Information [MSI] N°. 05/11 to the Canadian Hydrographic [Service] (CHS) of the DFO informing them of 5 Arctic NOTSHIPS issued since June 2006 that refer to navigational hazards and that remain active.

In response, CHS indicated the following:

- **NOTSHIP A07/06 – Eastern Arctic – Chart 7569 – 21 June 2006**

CHS is aware of the approximate position of the island and has captured the information in its database. The position and elevation

of the island will be accurately surveyed the next time CHS is able to get to the area.

- **NOTSHIP A96/08 – Eastern Arctic – Chart 7212, 7220 – 6 September 2008**

The charted depth and position of the drying rock has been confirmed. A Notice to Mariners (NOTMAR) will be completed once the tidal adjustment is calculated and applied.

- **NOTSHIP A98/08 – Eastern Arctic – Chart 7212, 7220 – 6 September 2008**

The charted depth and position of the shoal has been confirmed. A NOTMAR will be completed once the tidal adjustment is calculated and applied.

- **NOTSHIP A128/08 – Eastern Arctic – Chart 5300, 7050 – 1 October 2008**

The accuracy of the reported positions of the rocks could not be determined. The area will need to be surveyed before they can be charted or a NOTMAR issued.

- **NOTSHIP A97/09 – Western Arctic – Franklin Strait – 18 September 2009**

CHS is aware of the shoal and has captured the information in its database. It will be accurately surveyed the next time CHS is able to get to the area.

On 03 April 2012, the TSB met with DFO as a follow-up to the MSI. The TSB reiterated their safety concern and requested an update on DFO's intentions regarding CHS policies.

During the meeting, the TSB expressed the following concerns. The shoal had originally been discovered and reported in September 2007 by a CCG vessel with a recognized ability to survey in these waters. Although the bridge team possessed up-to-date charts, the charts did not indicate the existence of the shoal. Although this shoal had not yet been surveyed, International and Canadian hydrographic standards provide a process where reasonably reliable reports of hazards to navigation are incorporated through published chart corrections by NOTMAR prior to an official survey. These chart corrections include the designations *Position Approximate (PA)* and *Position Doubtful (PD)*, which are internationally used and understood. CHS Central and Arctic did not follow these standards and practices of putting these designations on its charts.

DFO recently provided a written response to the TSB, indicating that in order to better respond to increasing demands for products and services, [the]

Canadian Hydrographic [Service] (CHS) is establishing a more rigorous national planning and prioritization process which will bring more consistency among the regions and conformity to the required levels of standards appropriate to Canadian traffic, geographical and weather conditions. In 2013, CHS will establish a procedure to update navigational charts north of 60 degrees when a hazard to navigation is discovered by a credible source, as per international protocols.

Given the importance of timely chart corrections, the Board expects that implementation of this procedure will result in updating navigational charts north of 60 degrees when a hazard to [navigation] is discovered by a credible source, as per international protocols, as soon as possible thereafter. The Board will monitor progress on this important issue.

New Edition of Chart No. 7777

Since the occurrence, several NOTMARs, including NOTMAR LNM/D 08-OCT-2010 concerning the shoal in this occurrence, have been issued to update chart No. 7777. Further, newly acquired survey data will be incorporated by CHS into a new edition of chart No. 7777. As such, CHS will be issuing an electronic navigational chart (ENC) in June 2012 and, subsequently, a paper chart will also be available to mariners.

Voyage Planning for Vessels in the Arctic

Transport Canada prepared a general notice on *Voyage Planning for Vessels Intending to Navigate in Canada's Northern Waters*. This notice was published in the monthly Notices to Mariners (Vol. 36, Monthly Edition N°. 08) on 28 August 2011, and amends the 2011 Annual Notices to Mariners (Notice 7A). The purpose of the notice is to assist mariners, owners, and operators intending on navigating Canada's northern waters with preparing for, and executing, a safe voyage.

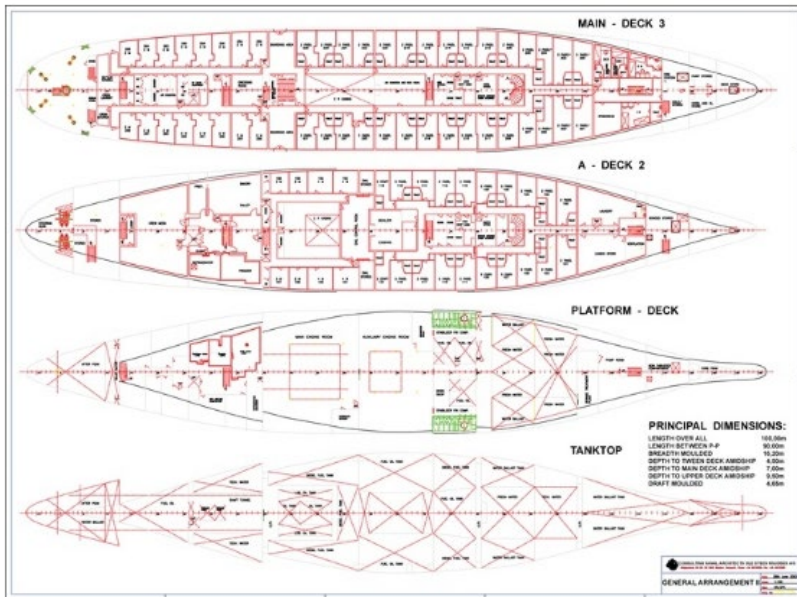
Flag State

The Bahamas Maritime Authority has conducted an investigation surrounding the grounding of the *Clipper Adventurer*. The report has not been released.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 18 April 2012. It was officially released on 26 April 2012.

Appendices

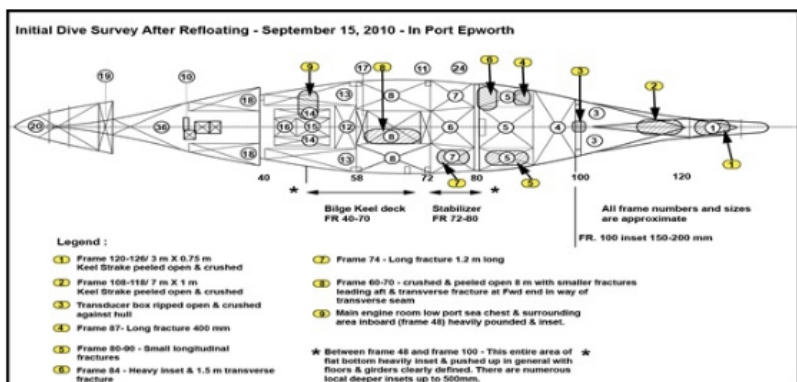
Appendix A – General Arrangement (Source: TSB)



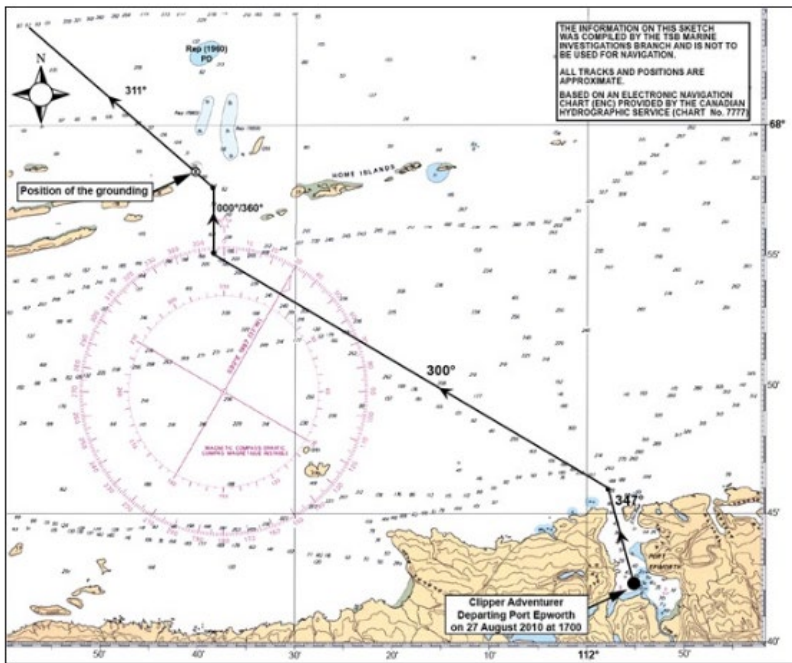
[...]

Appendix C – Damage Schematic (Source: TSB)

Damage assessment after refloating



Appendix D – Chart of the Area of the Grounding (Source: TSB)



Notes

¹ Units of measurement in this report conform to International Maritime Organization standards or, where there is no such standard, are expressed in the International System of units.

² IMO Resolution A.893(21) Annex 25, “Guidelines for Voyage Planning.”

³ IMO, “Polar Shipping Safety,” accessed 19 April 2012,

<http://www.imo.org/OurWork/Safety/SafetyTopics/Pages/PolarShippingSafety.aspx>.

⁴ International Convention for the Safety of Life at Sea (1974 as amended).

⁵ International Chamber of Shipping, *Bridge Procedures Guide*, 4th ed. (2007).

⁶ QSEP Manual 3 indicates that the ICS *Bridge Procedures Guide 4th Ed 2007* is to be on board the *Clipper Adventurer*.

⁷ TP 13670E.

⁸ The voyage planning form is a standard form provided by the ship management company’s Quality, Safety, and Environmental Management System (QSEM).

⁹ Marine Safety Committee of the IMO (MSC).

¹⁰ International Hydrographic Organization (IHO) definition B-417:

“Inadequately surveyed areas may be defined as those where bathymetry is based on older lead-line surveys or other surveys which are either open in nature (e.g., reconnaissance surveys), or are not hydrographic surveys (e.g., seismic surveys). These types of surveys are inadequate for identifying all shoals that may exist between lines of soundings, or may not be ‘shoal-biased’ in their selection of recorded depths.”

¹¹ All times are Mountain Daylight Time (Coordinated Universal Time minus 6 hours), unless otherwise stated.

¹² Speed of the vessel at impact was recorded and confirmed by investigators reviewing the Electronic Chart System (ECS) playback suite.

¹³ The operation began at 1345 and was completed by 1915.

¹⁴ Anchor handling tug supply ship.

¹⁵ *Nunakput, Alex Gordon and Point Barrow.*

¹⁶ International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (1978), as amended.

¹⁷ Issued by Bureau Veritas.

¹⁸ Canadian Hydrographic Service, “Standards for Hydrographic Surveys,” 1st ed., December 2005, accessed 19 April 2012, www.charts.gc.ca/data-gestion/hydrographic/standards-normes-eng.pdf.

¹⁹ SOLAS Chapter V, Regulation 9 – contracting Governments’ obligations for providing hydrographic services.

²⁰ NOTSHIP A101/07, later superseded by A102/07.

²¹ Courtesy of the University of New Brunswick mapping group.

²² IHO Regulation B-611.9, section: “Reports from Ships.”

²³ The primary charting authority for the area should be consulted before a NOTMAR is issued in this case.

²⁴ The notice was broadcast 6 times daily, and was effective from 01 July 2010 until the NOTSHIP was cancelled on 06 September 2010. The broadcast was as follows:

- NAVAREA XVIII 5/10
- CANADA VICTORIA ISLAND
- CORONATION GULF
- CHART CHS 7777
- SHOAL REPORTED 67° 58’25N 112°0’39W.
- LEAST DEPTH 3.3 METERS.

²⁵ Written NOTSHIPs are not available via the Internet for the Maritimes or Newfoundland and Labrador regions.

²⁶ 21 worldwide geographic areas for which various governments are responsible for navigation and weather warnings.

²⁷ Canadian Coast Guard, “Levels of Service,” May 2010, accessed 19 April 2012, http://www.ccgcc.gc.ca/eng/Ccg/wm/Levels_Of_Service_Document.

²⁸ In accordance with International Chamber of Shipping (ICS), *Bridge Procedures Guide*, 4th ed. (2007), the term was changed from route plan to passage plan.

²⁹ The Bahamas Maritime Authority, *BMA Information Bulletin No. 04*, “Incident Reporting Procedures.”

³⁰ Notices to Shipping A07/06, A96/08, A98/08, A128/08, and A97/09.

³¹ Transport Canada, TP 13670 E, March 2005, accessed 19 April 2012, <http://www.tc.gc.ca/media/documents/marinesafety/tp13670e.pdf>.

³² TSB Occurrence M08H0008.

A Matter of Good Fortune: The Grounding of *Clipper Adventurer* in the Northwest Passage

Emma Stewart and Jackie Dawson*

*The uncharted rock on which our ship
ran aground is just one fragment
of an entire world we have yet to perceive.¹*

Because of its hazardous ice conditions, the Canadian Arctic was a latecomer to the burgeoning polar cruise industry: the first cruise was offered in 1984. Since 2006, some regions, especially the Northwest Passage, have witnessed considerable growth in this sector. Despite this growth, cruise operators in Arctic Canada have kept a good human safety profile, although there is a “lengthy record and anecdotal history of groundings and other bumbles.”² In August 1996, for example, *Hanseatic* ran aground in Simpson Strait, perforating two of the ship’s fuel reservoirs, and all 153 passengers had to be evacuated by helicopter.³ The latest of these incidents came in August 2010, when *Clipper Adventurer* grounded on an underwater cliff in Coronation Gulf in the Northwest Passage. Although there was no loss of life or environmental catastrophe, the incident showed the stark reality of the individual, cultural, and environmental risks associated with polar travel, and it should send a warning to decision-makers about the complexities of managing and governing cruise activities in Arctic waters. After an overview of Arctic cruise trends in Canada, we explore briefly what happened to *Clipper Adventurer* during the summer of 2010 and comment on the

* Originally published by the Arctic Institute of North America as “A Matter of Good Fortune? The Grounding of the *Clipper Adventurer* in the Northwest Passage, Arctic Canada,” in *Arctic* 64, no. 2 (June 2011): 263–67.

implications of that incident for the governance of cruise tourism in Arctic Canada, particularly in relation to safety issues.

Cruise Ship Tourism in Arctic Canada

Historically, ice conditions have precluded most commercial shipping in the Arctic. The first tourist voyage through the Northwest Passage by *Explorer* in 1984 aroused sufficient interest in the region to warrant similar transits;⁴ however, only two other crossings were successful during the next four years.⁵ From 1992 to 2005, a more regular pattern of cruise activity emerged: not only were there one to three successful voyages through the Northwest Passage each year, but cruise ships also visited other locations in the Canadian Arctic such as Baffin Island, Hudson Bay, and Ellesmere Island. The trend toward a more sustained Arctic cruise industry in Canada was solidified in 2006, when twenty-two cruises operated in the region – double the number observed during the previous season.⁶ Over the four following years, the number of planned cruises increased by an average of 9.5 percent each year. The 2009 cruise season was the busiest on record, with twenty-six planned cruises. As was observed in 2010, cruise ship activity for the 2011 season is likely to decrease as a consequence of the global economic recession.⁷ In addition, the absence this year of the Inuit-operated cruise vessel *Lyubov Orlova* will eliminate the seven tourist cruises that it normally operates. However, the market of individuals seeking to experience the Canadian Arctic by sea is expected to grow from 2012 onwards, reflecting the dramatic growth in travel to Antarctica.⁸

The patterns of cruise activity reveal a great deal of variability across the Canadian Arctic region. Eastern and southern Baffin Island destinations, such as Cape Dorset, as well as those on the shores of Hudson Bay, such as Churchill, have witnessed a decline in cruise activity in recent years,⁹ but more cruises have moved into the northern, central, and western regions and, most dramatically, through the Northwest Passage. In 2010, the Northwest Passage experienced the highest volume of cruise ship landings (community and shore visits) in the industry’s history, representing a 57 percent increase

TABLE 1. Total community and shore landings by region (after Stewart et al., 2010; Dawson et al., 2011).

Region	Community and shore landings ¹				% change 2006 – 10
	2006	2008	2009	2010	
High Arctic	3	3	2	8	+63%
Northwest Passage	20	23	36	47	+57%
Baffin Bay	47	37	20	25	-68%
Hudson Bay, Newfoundland and Labrador	25	14	14	20	-25%
Total	95	77	72	100	+5%

¹ Data for 2005 and 2007 are not available.

from 2006 (Table 1). It is hardly surprising, therefore, that the majority of incidents involving cruise ships have occurred in this stretch of water.

The Grounding of Clipper Adventurer

In 1975, *Alla Tarasova* was built in the former Yugoslavia as an expedition and research vessel purposely designed for travel to the polar regions, with an A-1 ice-class rating. In 1998, under the ownership of Clipper Cruise Line, the four-thousand-ton vessel was renamed *Clipper Adventurer* after being refitted as an expedition cruise ship with the capacity to accommodate 122 passengers. A sister ship to *Lyubov Orlova*, the vessel is currently owned by International Shipping Partners and sails under charter to various cruise operators such as Quark Expeditions and Adventure Canada. *Clipper Adventurer* regularly visits both polar regions, transiting the Arctic during the Northern Hemisphere summer and the Antarctic during the austral summer. The vessel had just begun to be a regular visitor to the Canadian Arctic with her first voyage through the Northwest Passage in 2009.

In 2010, *Clipper Adventurer* was scheduled to complete four cruises to various locations throughout the region, including the High Arctic, Baffin Island, and the Northwest Passage. During a cruise advertised as “Into the Northwest Passage,” *Clipper Adventurer* was chartered by Adventure Canada and made visits to Pond Inlet, Beechey Island, Gjoa Haven, and Bathurst Inlet before running aground two days before the end of the voyage. On 27 August, while making its way from Port Epworth to Kugluktuk, Nunavut, the vessel ran into a known hazard in Coronation Gulf at 67°58′ North (N), 112°40′ West (W), approximately one hundred kilometres east of Kugluktuk. The seas were calm, sunny conditions prevailed, and good visibility with no wind or swell was reported at the time of the incident. According to local news reports, the ship’s hull suffered serious damage, and watertight compartments were ruptured, although the ship’s interior did not take in water, and no oil spills were reported. Although the ship was listing at about 4.5° to port, all 118 passengers and 69 crew members were safe and unharmed during the incident. As reported by Adventure Canada, efforts by the ship’s crew to dislodge the vessel during high tide on 28 August were unsuccessful. As a consequence, the Canadian Coast Guard (CCG) dispatched the nearest icebreaker, *Amundsen*, to assist the stranded ship. The icebreaker was five hundred kilometres away in the Beaufort Sea but was on the scene by 0900 the following day.

As explained by Church et al., researchers from the University of New Brunswick’s (UNB) Ocean Mapping Group who were on *Amundsen* at the

time of the grounding, Coronation Gulf is transected by a number of island chains known as the Coronation Sills. These geological features “are steep (often vertical) and allow little opportunity for a vessel to avoid [them] if approached without prior knowledge.”¹⁰ As Adventure Canada CEO Matthew Swan reported to the CBC news channel, “we were on a single line track here that indicated we had 68 metres of water directly under us, when we found ourselves on a rock ... It’s a part of the world where you do your best, but there are blank spots on the map.” However, the Canadian Hydrographic Service had reported these escarpment features in 2007, and the CCG had issued a notice to shipping in the same year.¹¹ It is the responsibility of the ship’s officers to update their own charts and note these hazards when they are issued; in the case of *Clipper Adventurer*, this was reportedly not done.

On the northern side of Coronation Gulf, chartered shipping lanes have been established to avoid these navigation hazards, but apart from earlier surveying by *Amundsen* in 2005–06, little is known about the southern region of Coronation Gulf. As a consequence, *Clipper Adventurer* ran aground on a hazard that the crew could easily have avoided if they had been working with updated charts, or if serendipitously the vessel had tracked a course just a few ship lengths to the east or to the west.¹² As the region is poorly charted and also known to possess challenging geological features, travel to rescue the stricken *Clipper Adventurer* was also hazardous for the icebreaker *Amundsen*. However, the researchers onboard *Amundsen* were able to chart a safe course using high-resolution multi-beam sonar from the ship’s barge. The safe corridor allowed *Amundsen* to travel both to *Clipper Adventurer* and then onward to the community of Kugluktuk, from where the passengers were flown to Edmonton, arriving on 30 August.

The surveys completed by UNB researchers were also used by other Coast Guard ships assisting with the recovery of *Clipper Adventurer*. The Resolve Marine Group was awarded the salvage of the cruise ship. The salvage team arrived on the ship on 29 August and, as soon as *Amundsen* had evacuated the passengers, began to assess the damage. The team removed fuel and closed breaches in the hull in preparation to refloat and tow the vessel to Cambridge Bay for repairs. Salvage personnel also flew in from Yellowknife, Northwest Territories.¹³ By the end of September 2010, the Coast Guard had towed the ship out of the region.

Despite the difficulties faced in the 2010 season, *Clipper Adventurer* is scheduled to take passengers on five separate cruises through Arctic Canada in 2011, including tours to Baffin Island, to Newfoundland and Labrador,

and through the Northwest Passage. The vessel will be operating the "Arctic Safari" cruise for the recently reconfigured Inuit-operated cruise company Cruise North Expeditions¹⁴ and, in addition, will be under charter to Adventure Canada. It is anticipated that *Clipper Adventurer* will be the busiest cruise ship in the Canadian Arctic in 2011. During the austral summer, the vessel is also expected to make seven trips to the Antarctic Peninsula.¹⁵

Discussion

The unfortunate grounding of *Clipper Adventurer* gives rise to pressing questions for the cruise industry in the Canadian Arctic. For instance, how can risk be minimized for the increasing number of cruise ships and tourists visiting the Canadian Arctic? What can be learned from the grounding that will help improve future cruise operations in the Arctic, particularly with regard to safety? What voluntary and regulatory mechanisms are required to ensure the Arctic cruise industry meets appropriate safety and environmental protection standards? The anticipated growth in the cruise sector, in combination with increasing debate over sovereignty in Canada's Arctic waterways¹⁶ and the possibility of increased hazards in the Northwest Passage,¹⁷ makes addressing these questions critically important. Although hazardous ice was not a factor in *Clipper's* grounding, incidents may accelerate because ice conditions in this stretch of water will become more unpredictable as the Northwest Passage transitions to an ice-free summer. The prevalence of multi-year ice may be particularly problematic for transiting vessels.¹⁸

It was a matter of good fortune that *Amundsen* was relatively close to *Clipper Adventurer*, and even more fortunate that the icebreaker was carrying the appropriate equipment and operational expertise to map a safe rescue course, which allowed *Amundsen* access to the grounded ship "without risk of succumbing to the same fate."¹⁹ Why the crew of *Clipper Adventurer* was unaware of a charted hazard is currently a matter of speculation, but it is clear that the approach adopted by *Amundsen* minimized the risk associated with the evacuation of passengers from the cruise ship to the icebreaker and onward to Kugluktuk. Without doubt, the CCG greatly increased the efficiency and effectiveness of the rescue under difficult conditions.²⁰ However, it is impossible to guarantee that the Coast Guard will be close enough to provide search and rescue services to stricken cruise ships in the vast and increasingly busy waterways of the Canadian Arctic. Under normal circumstances, the CCG's response time could be ten hours or more, depending on ice, weather, hydrographic, and other conditions.²¹ While six

icebreakers are deployed to the Arctic in summer, and while search and rescue operations take precedence in CCG operations, expecting this small fleet of icebreakers to cover such a vast area of waterways is unrealistic. The fortunate circumstances that permitted the rescue of *Clipper Adventurer* in 2010 may not prevail during future incidents.

Fear of future incidents, along with the desire to exercise sovereignty over the Arctic region, has placed Arctic marine governance at the forefront of northern policy issues in Canada.²² The federal government has already begun to revise reporting and monitoring policies in Arctic waters, including a change in July 2010 to NORDREG (Northern Canada Vessel Traffic Services Zone Regulations), which for the first time made it mandatory for vessels over three hundred tonnes to report to the CCG while operating in Arctic waters. However, according to CCG and Transport Canada representatives, more than 98 percent of vessels operating in Arctic waters were already reporting to the CCG even when it was voluntary. It is therefore questionable whether this policy change will make any appreciable difference beyond reiterating the view that Canada is asserting sovereignty over what it considers to be internal waters. This change has been criticized as being meaningless in practice considering it will capture only the 2 percent of vessels that were not previously reporting. Perhaps more relevant would be significant federal investment in additional icebreakers and other infrastructure for enforcement, search and rescue, environmental disaster prevention, and clean-up and salvage operations. Although the federal government has committed CDN\$800 million to procuring one new polar icebreaker, which is expected to have greater icebreaking capabilities than any other ship operating under the CCG, this ship will simply replace CCGS *Louis S. St-Laurent*, which is expected to be decommissioned in 2017.²³ Thus, at present, there seem to be no plans to make additions to the currently operating Arctic fleet of six Canadian icebreakers. It is also clear from the grounding of *Clipper Adventurer* that significant research investment in charting Arctic waterways is overdue. Some federal funding has been allocated to this initiative, but it is not clear yet whether existing financial commitments will be sufficient.

It is vital, in order to ensure economic, socio-cultural, political, and environmental sustainability in the Arctic region, to identify and evaluate specific policies and regulations that will enhance safety and security in and sovereignty over Canadian Arctic waters. It is also important to evaluate the institutional structures that actually implement and enforce the decisions that are made. Marine shipping is inherently complex, a situation reflected

in the multilayered and multiscale nature of regulatory institutions. In addition to the umbrella framework provided by the International Maritime Organization (IMO), Canada has additional acts, regulations, legislation, and guidelines governing passenger ship operation in Canadian Arctic waterways. An array of federal and territorial organizations support the regulation and operation of passenger vessels in the Canadian Arctic, including the Canadian Coast Guard (search and rescue operations), the Department of National Defence (public safety and emergency preparedness), the Department of Fisheries and Oceans (vessel traffic monitoring services), Environment Canada (distribution of sea ice data), Parks Canada (protected areas), and the Canada Border Services Agency (immigration and passport control), as well as all three northern territorial governments.²⁴ It will be increasingly important to understand and perhaps streamline this complex governance framework as shipping, and particularly cruise shipping, becomes more prevalent in Arctic waters.

There is currently no single or common governing body that manages or supports the Arctic cruise sector in Canada. However, in Greenland and Norway, where cruise tourism has had a much longer history than in Canada, such a body is relatively well developed.²⁵ Throughout Svalbard, Jan Mayen, and Greenland, the cruise sector is overseen by the Association of Arctic Expedition Cruise Operators (AECO). This international organization was founded in 2003 to manage Arctic cruises that are safe, friendly to the environment, and beneficial to Arctic communities.²⁶ Like the International Association of Antarctica Tour Operators (IAATO), which includes many Arctic cruise operators among its members, AECO acts as a representative body offering information, guidelines, and voluntary policies for operating cruise ships in the European Arctic.²⁷ Although Arctic Canada falls outside the regional remit of AECO, the grounding of *Clipper Adventurer* should provide impetus to create a new body or to extend the remit of IAATO or AECO to the Canadian Arctic.

Conclusion

The Northwest Passage is a “honey pot” for cruising in the Canadian Arctic because it combines good wildlife viewing opportunities with the unrivalled chance to witness relics of the historical exploration of the Passage.²⁸ However, it has also been the location of various incidents involving cruise and other vessels (such as the tanker *Nanny*, which ran aground shortly after *Clipper*), and more accidents are likely to occur there in the future.²⁹ John Hughes, the director of the UNB Ocean Mapping Group

onboard *Amundsen*, noted that cruise ships are tending to deviate from safe shipping lanes toward “riskier areas ... where there is more dramatic topography or stunning wildlife.”³⁰ The grounding of *Clipper Adventurer* therefore evoked little surprise, and although we do not wish to sensationalize the possibility of further incidents, neither can we dismiss it. While management cannot handle all eventualities in this remote polar environment, increased attention is clearly needed to streamline the cruise sector’s complex governance structure, maximize benefits to local communities, and minimize risks to human life and to the environment. Good fortune may be running out.

Notes

¹ K. Winter, “An Arctic Accident,” *Maclean’s*, 16 September 2010, www2.macleans.ca/2010/09/16/an-arctic-accident/.

² C.S. Jones, “Arctic Ship Tourism: An Industry in Adolescence,” *The Northern Raven* 13, no. 1 (1999): 31.

³ A.A. Grenier, “The Nature of Nature Tourism,” *Acta Universitatis Lapponiensis* 72 (PhD dissertation, University of Lapland, Rovaniemi, Finland, 2004).

⁴ J. Marsh and S. Staple, “Cruise Tourism in the Canadian Arctic and Its Implications,” in *Polar Tourism: Tourism and the Arctic and Antarctic Regions*, eds. C.M. Hall and M.E. Johnston (Chichester: John Wiley and Sons Ltd., 1995), 63–72; Jones, “Arctic Ship Tourism.”

⁵ Marsh and Staple, “Cruise Tourism in the Canadian Arctic and Its Implications.”

⁶ L. Buhasz, “Northern Underexposure,” *Globe and Mail*, 1 July 2006, <http://www.theglobeandmail.com.proxy1.lib.trentu.ca/life/northern-underexposure/article833485/>.

⁷ E.J. Stewart, A. Tivy, S.E.L. Howell, J. Dawson, and D. Draper, “Cruise Tourism and Sea Ice in Canada’s Hudson Bay Region,” *Arctic* 63, no. 1 (2010): 57–66.

⁸ M. Luck, P.T. Maher, and E.J. Stewart, eds., *Cruise Tourism in the Polar Regions: Promoting Environmental and Social Sustainability?* (London: Earthscan, 2010).

⁹ Stewart et al., “Cruise Tourism and Sea Ice in Canada’s Hudson Bay Region.”

¹⁰ I. Church, D. Cartwright, and J. Hughes Clarke, “The Clipper Adventurer Grounding: CCGS Amundsen Response and Risk Mitigation with Near Real-Time Construction of Safe Shipping Corridors,” Paper presented at the ArcticNet 7th Annual Scientific Meeting (14–17 December 2010, Ottawa, Ontario), 38.

¹¹ CCG (Canadian Coast Guard), “Written Notices to Shipping: Western Arctic,” 2007, www.ccg-gcc.gc.ca/e0004475?todo=notships&series_id=1&area_id=3.

¹² Hydro International, “Arctic Rescue,” 2010, www.hydro-international.com/news/id4176-ArcticRescue.html.

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- ¹³ Marine Log, "Resolve Marine Group Starts Clipper Adventurer Salvage," 2010, www.marinelog.com/DOCS/NEWSMIX/2010sep00033.html.
- ¹⁴ Cruise North Expeditions, "A New Chapter in Arctic Polar Cruising," 2011, www.cruisenorthexpeditions.com/press_release/CNE_AC_NewChapter.pdf.
- ¹⁵ Quark Expeditions, "Clipper Adventurer," 2011, www.quarkexpeditions.com/our-ships/clipper-adventurer.
- ¹⁶ R. Huebert, "Climate Change and Canadian Sovereignty in the Northwest Passage," *Isuma: Canadian Journal of Policy Research* 2, no. 4 (2001): 86–94.
- ¹⁷ E.J. Stewart, S.E.L. Howell, D. Draper, J. Yackel, and A. Tivy, "Sea Ice in Canada's Arctic: Implications for Cruise Tourism," *Arctic* 60, no. 4 (2007): 370–80.
- ¹⁸ Stewart et al., "Sea Ice in Canada's Arctic."
- ¹⁹ Church et al., "The Clipper Adventurer Grounding," 38.
- ²⁰ Church et al., "The Clipper Adventurer Grounding."
- ²¹ CCG, "Levels of Service and Service Standards," 2007, www.ccg-gcc.gc.ca/folios/00022/docs/los-and-ss-v4-2-eng.pdf; CCG, "Service Standards," 2008, www.ccg-gcc.gc.ca/eng/CCG/Ice_Service_Standards.
- ²² Government of Canada, Statement on Canada's Arctic Foreign Policy: Exercising Sovereignty and Promoting Canada's Northern Strategy Abroad, 2010, www.international.gc.ca/polar-polaire/canada_arctic_foreign_policy-la_politique_etrangere_du_canada_pour_arctique.aspx?lang=eng.
- ²³ CCG, "Investment Plan 2010/11 - 2014/15," 2011, www.ccg-gcc.gc.ca/e0012060.
- ²⁴ J. Dawson, E.J. Stewart, T. Pearce, and J. Ford, *Emerging Cruise Tourism Economies in Arctic Canada: Ulukhaktok Case Study* (Ottawa: Indian and Northern Affairs Canada, 2011).
- ²⁵ E.J. Stewart and D. Draper, "Sustainable Cruise Tourism in Arctic Canada: An Integrated Coastal Management Approach," *Tourism in Marine Environments* 3, no. 2 (2006): 77–88; Association of Arctic Expedition Cruise Operators (AECO), Association of Arctic Expedition Cruise Operators, 2011, www.aeco.no.
- ²⁶ AECO, Association of Arctic Expedition Cruise Operators.
- ²⁷ AECO, Association of Arctic Expedition Cruise Operators.
- ²⁸ Stewart et al., "Cruise Tourism and Sea Ice in Canada's Hudson Bay Region."
- ²⁹ Stewart et al., "Sea Ice in Canada's Arctic."
- ³⁰ Hydro International, "Arctic Rescue."



18

Logbook of M/V *Nunavik*'s Commercial Transit of the Northwest Passage, September– October 2014

Tim Keane and Gary Bishop*

September 19, 2014

Longitude: -74.691313 Latitude: 62.140769

The Nunavik sets sail

The *Nunavik*, Fednav's most modern icebreaking ship[,] will soon undertake a historic voyage. It will be the first vessel to carry a cargo of Arctic origins the full length of Canada's Northwest Passage. The ship is loading a cargo of nickel concentrate from Nunavik's Deception Bay destined for northern China. With its Polar Class designation, the *Nunavik* is capable of independent operations in harsh arctic conditions. For those interested, follow the *Nunavik* as it traces a line across the top of the world!

Tim Keane, Senior Manager, Arctic Operations and Projects

19 September – 28 September

September 19, 2014

Longitude: -74.691313 Latitude: 62.140769

Day 1, Getaway Day

Just before 17:00 hours today, with a push from the tug, *Tony Mackay*, the *Nunavik* slipped its lines and set out from Deception Bay. There to see it off was the MV *Arctic*, the flagship of [...] Canada's commercial arctic fleet.

* Originally published on the Fednav website.

At a time when most mariners are thinking about heading south, and arctic foxes are donning their winter whites, Captain Randy Rose and the crew of the *Nunavik* are plotting a course for the high arctic. The ship will spend the next few days first heading east through Hudson Strait, then north through Davis Strait and Baffin Bay before reaching Lancaster Sound, the eastern gateway to the Northwest Passage. Early next week, the ship will enter the fabled passage so much in the news. Later on, the *Nunavik* will likely pass the site where Sir John Franklin's doomed vessel was recently discovered.

Along this first leg of the journey, sea ice is not a major concern, but autumn weather is unpredictable and Captain Rose, ice navigator, Captain Tom Grandy, and the watchkeepers onboard the *Nunavik* will keep a careful watch for glacial ice (bergs, growlers, and bergy bits)[,] an ever-present concern in arctic waters.

September 20, 2014

Longitude: -65.442543 Latitude: 61.320732

Day 2, On the South Baffin Coast

Sunset on day two of the voyage and we are abeam Resolution Island, about 300 miles east of where we began yesterday. Next waypoint will be Davis Strait and the heading will change to north towards Lancaster Sound. The day was spent readying the ship for the open sea and doing drills – donning immersion suits and boarding the ship's lifeboat. The suits are cumbersome and hardly fashionable, but with water temperatures already near zero, style would be the least of concerns.

The first of what will be many icebergs was spotted this morning, well off to port, likely grounded on the south Baffin coast.

Weather was mostly fine today, clear but for a couple of hours of wispy fog. Sunlight refracting through the damp fog produced odd-looking "rainbows" that just about touched down on the portside maindeck.

September 21, 2014

Longitude: -61.244690 Latitude: 65.360764

Day 3, Northward Bound

At the end of day three, we will be sailing past Cape Dyer, about a third of the way up the long coast of Baffin Island.

Overnight last night, the seas were boisterous as the ship changed from an easterly to a more northerly heading and took the swell broadside.

Loaded with dense nickel concentrate, the ship is very stiff and it was an uncomfortable night as it rolled heavily past the entrance of Frobisher Bay.

By morning, the swell was subsiding and pitching gently now more than rolling. We passed a number of large bergs, grounded in the area of Cumberland [S]ound, one appearing like a clipper ship on the starboard side.

We seem to have collected a stowaway somewhere along the passage. A falcon (or hawk?) has been onboard most of the day, using the monkey island as its base, no doubt to the chagrin of the local gulls and turrs.

A crimson sunset bodes well for conditions tomorrow, at least for the area in our wake as we head further north.

September 22, 2014

Longitude: -64.322289 Latitude: 69.391495

Day 4

Day 4 ends with the *Nunavik* about halfway up the Baffin coast. Overnight last night we crossed the Arctic Circle and by midnight tonight, we will be passing Clyde Inlet. Visibility has been good since we left Deception Bay, though the skies are mostly grey – the sun is reluctant to show itself for too long, it seems.

We spotted our first group of whales this morning, though it is hard to say what species they were. Seem to have settled on them being Northern Bottle-nosed whales, based on the blunt heads and shape of their dorsal fins. They seem unperturbed by the vessel, at one stage swimming the length of the ship for a close inspection.

Icebergs have been abundant. We passed a cluster at lunchtime today. The Second Mate had more than a dozen targets plotted on the radar at one stage. Seems the bergs are thinning out as we press north, with only a couple of targets now in range.

We are making good time and if all goes well, around midnight tomorrow, the ship will head west into Lancaster Sound and reach the most northern point on the journey.

September 23, 2014

Longitude: -72.9833 Latitude: 73.1

Day 5, Passing the Sun at 73 Degrees North

At 17:00 today, we are just past 73 degrees north, 73°06" North [N], 72°59" West [W] to be more precise. A brilliant afternoon after a very dull, grey morning.

We are, for the second consecutive day, far from land – nothing on the radar but the odd iceberg. Even the birds seem to have abandoned us as we continue north. The only other traffic recently were two fishing vessels, sensibly heading south, which we passed in the early hours of today.

Given the less-than-scenic views this morning, we took the opportunity to get a look below at the power plant that delivers nearly 30,000 horsepower, enough to ease the ship through 1.5 m [metres] of solid ice. With no ice about, the engine is barely breaking a sweat, operating at about 24 percent of its capacity and still pushing us along at a comfortable 12 knots.

The engine room is impeccably clean – you feel compelled to wipe your feet when you are entering the space! Chief Engineer, Gary Bishop, and all the engine room staff take great pride in keeping everything spotless down below.

The sun finally returned this afternoon, appearing low on the port side. The brilliant conditions provided the opportunity to perform monthly performance tests on the main engine and, for a brief time, the *Nunavik* shuddered under full power, ploughing a deep trough through northern Baffin Bay. By late afternoon, the systems checks are done, and the ship is easing along under bright skies.

Tomorrow promises to be more scenic as we enter Lancaster Sound.

September 24, 2014

Longitude: -91.8 Latitude: 74.3

Day 6, Setting the Table in Lancaster Sound

At day's end, we are at 74 degrees 18 minutes North[,] 91 degrees 48 minutes deep into Lancaster Sound, coming up to Barrow Strait.

It has been a brilliant day, the sun shining brightly since early morning. Unfortunately, there is not a lot of heat left in the sun at this time and this latitude. The winds were brisk too, so the minus four degrees felt much colder still.

We have spent the day off the coast of Devon Island, the largest unpopulated island in the world[,] I am reliably informed. At the time of writing, we are just about abeam Beechey Island which lies off the western end of Devon Island. On the island, lie the remains of two of Franklin's ill-fated crew who perished while the expedition overwintered in nearby waters. The bay adjacent to the island is named for Franklin's two ships, the *Erebus* and the *Terror*.

Winter is fast approaching, the stratified hills well covered now in snow.

We took advantage of the fair weather (fair in the lee of the accommodation at least), to dine al fresco tonight. An elegant table (built by the deck crew) was set by the chief cook and steward – kraft paper instead of linen, held in place (naturally) by duct tape. Plenty of food, good company, and conversation around the BBQ built onboard by the engineering staff. A fitting way to end the day and to mark reaching the “high” point of the trip.

By midnight, we will be passing Resolute Bay and soon after, start the “descent” to lower latitudes as the ship heads west to the Beaufort Sea.

September 25, 2014

Longitude: -102-666667 Latitude: 74.7666667

Day 7, New Ice – 1:43 AM

Last night, just after the sun had set, and exactly where the Canadian Ice Service had indicated, we entered the new ice that is forming in the high arctic.

From a distance, the change in the texture of the sea is apparent. The new ice crystallising on the surface gives the sea a satiny, almost greasy look. It damps the swell and makes the older, heavier pieces stand out even more. The ship’s radar pick[s] up a bit more clutter, but the heavier ice is easy to spot with the naked eye. Despite the quickly shortening days, dusk persists longer at these latitudes. So, for some time after sunset, the watchkeepers need only their eyes to pick up heavier bits and adjust the ship’s course.

Later in the evening the ship’s powerful search lights are trained ahead and the ship remains on hand steering, likely until we reach the Beaufort.

We are just below 75 degrees north now and 102 degrees west, the furthest north and west in the arctic that Fednav has been for years, since the closing of Polaris Mine in 2002.

A new course has been set, conditions are fine along this northerly route and so the ship will press west at this latitude until reaching Prince of Wales Strait, at first light tomorrow likely.

September 25, 2014

Longitude: -106.91667 Latitude: 74.066950

Day 7, Starting the Descent 5:13 PM

The *Nunavik* continues almost due west, at 16:00 hours local time, on a heading of 266. At this latitude, the lines of longitude go by much quicker, we are now at 74 D [degrees] 36 M [minutes] and 106 D 55 M.

A quiet day, no other traffic has been spotted since we passed Resolute Bay, where likely the final cargo ships of the season were completing their

deliveries. The nilas and grease ice of last night, has grown to near grey ice and the seas are just about totally covered.

Either Captain Rose or Ice Navigator, Tom Grandy, is on the bridge at all times as we approach heavier concentrations lying to the west. Speed is being monitored and adjusted so as to reach Prince of Wales [Strait] tomorrow daylight. The strait is amply wide, at about four miles, but better to be negotiated in daylight. Few ships have actually taken this route. The first ship to do so was Henry Larsen's *St. Roch*, also the first Canadian vessel to transit the Northwest Passage. The unofficial statistics show that since 1906 when Roald Amundsen first completed the transit of [the] Northwest Passage, some 334 transits have been accomplished by a host of different craft.

Of those 334 complete transits of the NWP [Northwest Passage], defined by the Canadian Hydrographic Service as being a transit from Baffin Bay to the Beaufort Sea, the majority has been adventurers (96), Canadian Coast Guard vessels (97), passenger ships and pleasure craft (60)[,] and the balance a mix of commercial tugs, research vessels, US Coast Guard ships, and very few commercial cargo vessels.

Sometime tomorrow, the *Nunavik* will be the first commercial ship since the SS *Manhattan* in 1969, to transit Prince of Wales Strait.

September 26, 2014

Longitude: -115.3833333 Latitude: 73.36666667

Day 8, Into the Strait

At 07:30 this morning the ship is just entering Prince of Wales [S]trait at 75.22 N 115.23 W. The sun is still below the horizon and some light flurries are decreasing visibility. Speed has been checked a little.

During the night, speed was likewise reduced while passing close to an area of heavier ice concentration. Currently, the ship's radars confirm the information from the Canadian Ice Service. The charts are used as a guide to plan the route and so far have been accurate, allowing the ship to pick its way along the path of least resistance. Shortly, we should be coming up to an area with thicker ice, the area M on the ice chart. Those conditions may slow things, but are well within the *Nunavik's* capabilities. We are all hoping for the sun to burn through today so as to take in the local scenery.

This will be the closest we have been to land since setting out from Deception Bay.

In about 120 miles, we will exit the strait into Amundsen Gulf. From there, it promises to be clear sailing, in open water, to the Beaufort.

September 26, 2014

Longitude: -115.949173 Latitude: 73.250481

Day 8, The View from Here

Some up-to-the-minute views of where we are at the moment – 09:15 local.

The ice in [this] area is pressed up against the coast of Victoria Island, while the *Nunavik* stays closer to Banks Island.

Captain Rose is very pleased with the last image received, showing only one patch of heavier ice in the strait.

September 26, 2014

Longitude: -118.8 Latitude: 72.433333

Day 8, Boring Is Good

At 17:00 local time today, we are more than half way through Prince of Wales [S]trait, at 72.26 N 118.48 W[.]

Both Captains Rose and Grandy said on different occasions that “boring is good” when it comes to navigating in the Arctic. Of course, boredom is relative. There is nothing boring about being in command of a modern ship in the Arctic. Here, boring refers to not having to spend hours or days beating through difficult ice. The easy life, relatively speaking.

The conditions have been almost ideal, good visibility under grey skies still (a recurring theme on this voyage so far). Barely any serious ice to speak of[,] serious at least for the *Nunavik*. Captain Rose is delighted with the conditions – made to order, really. The winds today pinched the 5/10th concentration to the south side of the strait. The ship is slipping through barely impeded, but for one small section. That small section however is a reminder of the unpredictability of shipping in the arctic. One patch, even a small one strategically placed, would make the route impassable by the vast majority of ships.

Boring can be bad, however, as it leads grown men towards silly endeavours. Silly things like an Arctic Ice Bucket Challenge. So, while the ship [was] very briefly mired in a thick floe, the gauntlet was thrown – boys being boys, a few took the challenge. Some, braver than others, stripped down to basics – one brave soul went two rounds.

The water, drawn from the Arctic Ocean[,] was invigorating to say the least. Salt water freezes only at -1.8°C [Celsius], so the drenching was beyond freezing[,] as was the air temperature at -5°C. No ice cubes required here.

Forgotten in all the revelry, was the issuance of a challenge. So, to all who dare, the challenge goes to other mariners (and hangers-on), in the north and elsewhere.

PS[.] A corrector to yesterday's entry – the *Nunavik* will be the second commercial vessel through the strait. [In] 1986 the *Kalvik*, a Canadian Flag icebreaking anchor-handling tug[,] plied these waters. The vessel later became the *Arctic Kalvik* in the Fednav fleet and sails still today as the *Vladimir Igantiuk*. Apologies.

September 27, 2014

Longitude: -125.28 Latitude: 71.05

Day 9, HURRY UP AND WAIT

The *Nunavik* exited Prince of Wales Strait last evening and west through Amundsen Gulf and now, into the Beaufort Sea, the final leg for some of us onboard. All going well, we supernumeraries will disembark at Tuktoyaktuk tomorrow.

"All going well" are the key words in that sentence. Winds are expected to kick up overnight. Tuk lies within the delta of the Mackenzie River, one of, if not the longest rivers in Canada. The area around the delta is shallow, given the 11 m draft we are carrying, the closest the *Nunavik* will approach is some thirty miles offshore. The delta is also an area where pingos are found. As far as I recall from geography class many, many years ago, pingos are basically frost heaves in the ocean floor. Underwater hills that continue to rise off of the bottom of the Beaufort Sea, a hydrographer's nightmare I expect.

Now that we have entered the Beaufort, the *Nunavik* can (according [to] the Canadian Hydrographic Service) claim to have completed the NWP. Some might say you have to go from Baffin Bay to the Bering Strait, but we here will gladly claim to have now completed the passage.

September 27, 2014

Longitude: -125.28 Latitude: 71.05

Day 9, Change of Plans

Just a very quick update on the day's progress.

The weather forecast being what it is, we've made a last-minute change of plans. Because of the uncertainty of the boat being able to collect us, we looked for an alternate landing spot. Luckily, 60 miles to the north is the community of Sachs Harbour.

With a few calls to an old friend, Terry Camsell of Island Towing, we (well, in fairness, he) made the necessary arrangements and so, in the next ten minutes (at 1500 LT [Local Time]), we will be put ashore on Banks Island. With the further help of Sean Gray from Braden-Burry Expediting, we are all set to disembark. Many, many thanks for Terry and Sean's help!

My experience in the North is that when you have the chance to keep going, you keep going. So, we will leave the *Nunavik* now after a very memorable nine days onboard.

Have to run, but will update again in a few hours when we are safely ashore.

September 28, 2014

Longitude: -125.1475 Latitude: 72.0019444

Day 10, Off the Boat

By late afternoon yesterday, the six non-essential personnel (the chief engineer was less kind, referring to us as deadweight) were safely landed in Sachs Harbour. The tiny community of less than 100 people sits at the southwest tip of Banks Island. The community there grew out of the fur trade, specifically Arctic fox.

Soon after we landed, we boarded a flight to Inuvik, and then later today, south and eastwards to Montreal. As we boarded, the *Nunavik* was sailing into the proverbial sunset.

From here on out, Gary Bishop, Chief Engineer onboard[,] will post updates on the progress of the voyage. Today, the ship will be off the coast of Alaska, ready to turn the corner at Point Barrow and descend the Chukchi and Bering Sea to the Pacific.

Gary Bishop, Chief Engineer, MV NUNAVIK

28 September – 17 October

September 28, 2014

Longitude: -133 Latitude: 71

Day 10, THE NEXT JOURNEY BEGINS

After successfully completing our first challenge of transiting the fabled Northwest Passage and getting our esteemed passengers safely ashore at Sachs Harbour, the second part of our voyage begins.

With 2071 nautical miles behind us, we have 4914 nautical miles ahead to our final destination of Bayuquan, China. We had smooth sailing overnight, allowing good sleep for all, after many nights navigating through patches of ice. We awoke to a beautiful blue northern sky, with the sun rising on the

horizon, casting a warm glow over the cranes of the main deck. We are currently abeam of Tuktoyaktuk (meaning resembling a Caribou, and oddly enough, the site of rock band Metallica's most northerly concert and April's Beluga Jamboree).

At a position of 71 N, and 133 W, we are crossing the Beaufort Sea, skirting the lower edge of the Arctic Ocean's Polar Pack. The seas have come alive later in the morning with a 3 meter sea and a 25 Knot south-easterly wind causing the good ship, *Nunavik*, a gentle roll on a south-easterly swell.

As the initial author of this blog, Tim Keane has returned to dry land and I have been tasked with keeping our followers informed of our voyage and filling his shoes. (Which he actually offered before disembarking Ahhh, no thanks!) Being given the privilege of being Chief Engineer of this amazing vessel, please forgive me if I occasionally digress into technical mumbo jumbo. But, I have been assured that the good Captain will keep me on the straight and narrow.

September 29, 2014

Longitude: -151.65 Latitude: 71.75

Day 11, Another Peaceful Night at Sea

Hearing what I thought was the alarm clock, I instinctively turned over and hit the snooze button, closing my eyes for exactly 60 seconds until I was "gently" awoken again by the same sound ... the foghorn BLASTING!

Climbing from the bed and looking out over the deck I was greeted with the sun rising behind us[,] revealing a grey, foggy day. Ahhh ... I feel at home (i.e., St. John's, Newfoundland). I feel the constant and reassuring hum of the engine working away as the ship glides along the gentle waves – time for breakfast and the daily work meeting.

We are still in the Beaufort Sea, 70 NM [nautical miles] from shore[,] with the closest town being Nuiqsut, Alaska. A small town of 412 people that just celebrated their 40th year since the first group of 14 settled there and is today accessible through the winter by ice roads. Last night we passed 141W, cleared the NORDREG [Northern Canada Vessel Traffic Services Zone Regulations] zone and entered US waters. (NORDREG is the Canadian ship-reporting area in the northern coastal waters.) There has been no sign of wildlife and as the day progresses, the fog has lifted and the sun is trying to break from the clouds, but is not having much luck.

Life on board has gone back to normal, now that the passengers have left, and much quieter as the Captain clearly points out. Routine work now fills our day with normal voyage operations, planned maintenance, and

preparing for our next port-of-call. Today's objective is to submit our orders for parts, food, fuel, and other supplies for the next voyage ... and most importantly our relief crew! We also today, as a crew, congratulate motor man, Volodymyr Vorobyov, and his wife, Nataliya, on the birth of their son, Oleksandr. He is looking forward to being home to see his baby boy. Congratulations!

September 30, 2014

Longitude: -164.4525 Latitude: 70.46666667

Day 12, SPRAY OVER THE BOW

Last evening, with the sun beginning to set, we rounded Point Barrow, [and] the vessel was met with a huge swell generated in the Bering Strait, causing the ship to begin to pitch, and causing large sprays of water over the bow.

As the pitching eased, the crew gathered in the lounge for our first dart tournament. With the Captain supplying prizes, 13 crew members have signed up for a round robin of 81 games to crown the champion. With the help of the weather after the first night of play, I can boast of being in the lead (this will not last long), losing only one game, to the Captain. (I'm not that stupid!)

Just as we were heading for a good night's sleep, the fog set in so that we could be put to sleep by the "gentle" blasts of the foghorn for most of the night.

The sunrise was late this morning due to our fast travels west at this latitude, and tonight begins 10 time changes on board before we get a break again. This morning we entered into the Chukchi Sea and were abeam of Wainwright, Alaska, population 556. Here in 2009, the Blob was discovered (Chukchi Sea Algae), a previously unknown under-ice sea bloom 20 to 60 km [kilometres] long. Very interesting for scientists, since it changes what was previously believed regarding under-ice ecosystems.

Work aboard continues, and we are preparing for suspected rougher weather as we enter into the Bering [Strait] tomorrow.

October 1, 2014

Longitude: -169.151111 Latitude: 66.06694444

Day 13, HI SARAH

We awoke to darkness this morning and did not see daybreak until 09:00 ship time. We have welcomed the calm seas, but a grey, overcast sky remains.

Through the haze, we got our first sight of Russia. The air temperature has risen to a balmy 5°C and sea temperature is no longer below zero. After the Arctic, this feels like summer. A fearsome falcon has perched on our midship light[,] gazing at small birds going to wing in the waters alongside.

Currently in the Bering Strait almost at the narrowest point, less than 55 nautical miles. We crossed from American waters into Russian waters about 1 hour ago. On the Port, we can see Big Diomed Island, Russia, and little Diomed, USA, less than 2.5 nautical miles apart. On the Stbd [starboard] we can see the Russian mainland. I wonder if Sarah Palin is watching?

Early this morning, we passed the Teck Red Dog Mine. This mine is the world's largest producer of zinc[,] accounting for 10 percent of all production and holds the largest known reserve. Fednav works with Red Dog to ship their product to market. We were hoping to see a sister Fednav vessel, but none in sight so far.

There have been 32 games of darts played and somehow I have remained in the lead. I feel payback is coming tonight. Otherwise on board, life continues as normal with work ongoing to de-winterize [the] vessel and prepare for China.

October 2, 2014

Longitude: -177.2680556 Latitude: 61.98361111

Day 14, BON JOVI GET OUT OF MY HEAD

We left the Bering Strait late last night and entered into the Bering Sea. I thought I heard the opening theme for Discovery's Deadliest Catch, "Wanted Dead or Alive[,] " play in the background. I tried to convince the Captain to pull into Dutch [Harbor] and see if we could get in on the 2014 season. No go. Apparently our ship is too big and we have no fishing gear on board. Who knew?

We awoke this morning to a spectacular sunrise over clear calm waters that can only be appreciated from sea, moments like this make sailing worth it. With the good weather, we are able to get outside and start swabbing the deck. Well at least high-pressure washing it.

Wildlife is becoming more abundant, with ducks, seagulls, small birds, whales, and through binoculars, we've seen orcas breaching.

The 94m rusty fishing boat *Vladimir Brodyuk* has shown up on the radar, we actually may see a ship today. Plus, to our port side is an island called Nunivak Island, not the same, but close.

Dart tournament ... no comment. Captain: "Chief got beat 3 games in a row." We also want to say happy birthday to crew member OS [Ordinary Seaman]-Sergiy Nezhynskyi.

October 3, 2014

Longitude: 175.800000° Latitude: 58.133339°

Day 15, WHERE DID FRIDAY GO?

Last night we crossed over the International Date Line. Going to bed on Thursday and waking up on Saturday. (Do I get paid for Friday?) You would think I would be well rested, but that's not the case – it was actually the calm before the storm. Last evening, the swell started and we began rolling, at several times from 23 degrees port to 23 degrees Stbd maximum roll, and causing my favourite Fednav coffee mug to be no more. (Tim, I need a new coffee mug.)

Things have eased up this morning. Sailing now at 13 knots in open water, the massive engine, at 25% load is barely working. With 29540 horse power available and only 31754MT [metric tons] DWT [deadweight tonnage] the ship is truly mighty. The Man B&W 7S70ME-C electronically controlled low-speed diesel engine meets IMO [International Maritime Organization] Tier II emission standards, allowing efficient and emission-friendly operation at any load from as low as 6 percent to 100 percent, making it ideal for both high-load ice breaking and low-load open water operation. Along with lower emissions comes reliability and efficiency due to extended overhaul intervals reducing down time and parts. Truly a modern wonder of ship propulsion! The engine transfers this power through a 6.5m Rolls Royce controllable pitch propeller surrounded by a fixed nozzle, resulting in a max speed of over 18knots full[y] loaded, and incredible thrust when present with ice.

With only 13 games left to play in the dart tournament, the finals should start tomorrow and I'm hanging on to 4th place. Today is drill day and we get to go play with fire hoses and life boats. I wonder if after all the seriousness of the drill is over, can I hose down the Captain when he is not looking?

Of course I will tell him it was Tim's idea.

October 4, 2014

Longitude: 165.335556° Latitude: 56.350278°

Day 16, DRILLS, DRILLS, AND MORE DRILLS

After doing deep-water ballast exchange, we deviated to the west from the planned course due [to] a large weather pattern approaching. We are now

closer to land, sailing south between the Russian Kamchatka Peninsula and Bering Island, named after Commander Vitus Bering.

In 1741, sailing the SS *St. Peter*, he shipwrecked on this desolate, treeless, foggy island ... wait a minute, did we take a wrong turn and end up off Burnt Island, Newfoundland? Sounds very familiar!

Wind gusts have now reached 35 knots, with spray over the bow, causing the Captain to pull all personnel off the main deck.

Yesterday, we had fire drills in the engine room with a mock boiler fire, which was expertly dealt with by a very well-trained and organized crew. Boat drills followed as we practiced operating the lifeboat and leaving the Captain to go down with his ship. Actually I could never allow this to happen as I would be instantly killed by his lovely wife.

The final playoffs for the darts start at 18:00 and we are down to 4 people after Captain eliminated me last night. (Must be payback for trying to hose him down. I must stop giving away my plans on the internet!) So we have Captain Randy Rose, 2nd Mate, Maksym Naberezhnyi, 3rd Mate, Yurii Zaiats, and one representative from the engine room, the Motor man, Volodymyr Vororbyov, remaining.

October 5, 2014

Longitude: 160.534722° Latitude: 52.533333°

Day 17, STORMY WATERS

Unable to completely avoid Typhoon Phanfone, we rode out yesterday evening and last night battling 8m swells on our beam and winds in excess of 65 knots. Sailing south into the North Pacific Ocean, it was a sleepless night.

The morning brought some relief as seas eased to 5m and winds dropped to 35 knots. The Typhoon had hit Japan with reported damage and loss of life. The weather maps show a second larger Typhoon, Vongfong, bearing down on the region in the next few days. With the experience and expertise of our good Captain, and the quality of our amazing vessel, we have no worries of safely reaching our destination.

When storms cross the International Date Line they maintain their original name but change designation from a hurricane to a typhoon. Phanfone started as a tropical storm off Guam September 29, thus was never designated a hurricane.

The darts finals were cancelled, as you might expect. Stay tuned for further results in coming days. We also today, as a crew, congratulate AB2 [Aviation Boatswain's Mate Petty Officer 2nd Class] Ruslan Siskovych and

his wife, Tatyana, on the birth of their daughter, Anastasia. He is looking forward to being home to see his baby girl. Congratulations!

October 6, 2014

Longitude: 154.883333° Latitude: 48.550006°

Day 18, ALL CLEAR TO LAND

#3 Hatch Helicopter landing pad has finally seen action ... about 100 seagulls have landed. Tim, should we collect fare in US dollars or Russian Rubels?

Yesterday afternoon we got a reprieve from the effects of Typhoon Phanfone, just in time to have relatively calm seas for the championship dart games to commence. With all four competitors eyeing to have their name added to the newly minted Trophy, let the games began. First up, the Captain vs. the 3rd mate. With John Fogerty's "Up Around The Bend" playing, the first dart was thrown. In a devastating defeat, the 3rd mate moves in to the final game.

The next Game sees the 2nd Mate vs. the Motor Man. All hope was lost for the engine room as the 2nd Mate triumphs. After a short rest and some good music, the Captain vs. Motor Man for 3rd place ends decisively with a quick defeat by the Captain to redeem himself, and Queen[']s "Another One Bites the Dust". The room falls silent as the 2nd mate vs. the 3rd Mate (the Favourite) begins and then GNR's [Guns N' Roses] "Welcome to the [Jungle]" breaks the silence. In a major upset, we crown the 2nd Mate as the first *Nunavik* Darts champion with Queen's "We Are The Champions" playing as the Captain presents him with the Trophy. (Made expertly by our fitter, Serhiy Malakhov.)

At 0530, the heavy rolling started once more as Typhoon Phanfone's force can still be felt in the region. Along with four other vessels, we are sailing south along the Kuril Islands to reduce the effects of the westerly swell. By mid-afternoon we will be passing the Kuril-Kamchatka trench with depths over 8000m.

October 7, 2014

Longitude: 149.100000° Latitude: 44.650000°

Day 19, FULL MOON ARISEN

Last night, a full moon lit the ocean sky[,] making spray from an 8m swell glisten and come alive. The heavy seas and 60 knots of wind caused the good ship *Nunavik* to roll heavy[,] with maximum list reaching 35 degrees, enough to shiver my timbers. The decks were awash with bright white foam,

reaching as high as the rescue boat deck 11.6m above the water line. Good thing we had batten[ed] down the hatches. As you can imagine, not much sleep was had and a little *mal de mer*. As the sun started to rise, the seas calmed to a long 2m swell. As midday came, the sun shone bright and lifted a sailor's spirit, slowly erasing last night's feeling of being caught between the devil and the deep blue sea, from our minds. (If only it were that easy!)

The warm Pacific breeze can now be felt as we give a wide [berth] overtaking the MV *Cold River*, a handysize bulk carrier. We can also see the MV *Cosco*, a Shanghai container vessel a few miles to our port side. Later tonight, we will pass the Northern Japanese Island of Hokkaido, home to Sapporo, the host of the 1972 Winter Olympics[,] the first held in Asia, and the first time Canada did not send a men's hockey team. It was also the year that Canada defeated the Soviets in the Summit Series, making Paul Henderson a household name.

The 2nd mate is busy making final preparations for tomorrow's transit of the Tsugaru Kaikyo Strait, famous for very strong currents. With any luck, we will be sheltered on the west side of Japan and avoid the full effects of the next Typhoon Vongfong. Appropriately, the Captain and I have started watching the HBO miniseries *The Pacific*.

October 8, 2014

Longitude: 142.566889° Latitude: 41.616681°

Day 20, I'M THE KING OF THE WORLD

Come on, you knew it was coming! How could we make this full passage without the most famous line from *Titanic*? And we have a picture to boot!

Last evening's sunset was spectacular, and today we have air temperature 18°C, water temperature of 15°C, sun shining, waters calm, and a good night's rest, life is good! Storm? What storm? I don't remember a storm

The engine team gets a reprieve from the bowels of the ship to do some maintenance on the winches located forward on the bow. With warm Pacific air, sunshine, views of whales, and no engine noise, I think the job may take a lot longer than I had expected! And boys being boys, they will play it up whenever a camera is in sight. I may have to make someone walk the plank

The bridge team keeps busy with collision avoidance as we now have 25 ships within a 25-mile radius and getting thicker the closer we get to the approaches of the [Tsugaru] Kaikyo strait. Quite a difference than seeing just one ship in eight days when crossing the Northwest Passage.

The Captain and Chief Officer were able to get out today and make a good inspection of the ship for weather-related damage; all good with only a few minor repairs needed. An added bonus, the ship is very clean from getting a good washing in all the waves.

October 10, 2014

Longitude: 136.616667° Latitude: 40.701114°

Day 21, BARK AT THE MOON

Last night, we finally saw the lights of civilization. As we passed through the [Tsugaru] Kaikyo strait, Japan came into view under a beautiful, clear night sky with a full moon casting its reflection unto the water. (The Captain started into a rendition of Ozzy Osbourne's "Bark at the Moon." Who knew he could sing?!)

With a head current of over 5 knots, we had to let the massive engine stretch its legs for a short time to maintain the ship's speed through the narrowest part. Travelling on a heading of 226 degrees, we are currently in the middle of the Japanese Sea, cruising easily at 13 knots, with a wind on our stbd quarter helping us along.

Russia to the North, North Korea to the west, South Korea to the Southwest, and Japan to the East, this [...] 1 million sq [square] km sea traditionally protected Japan from land invasions from the West.

The temperature outside is 19°C and seawater is 20°C, with a bright, sunny sky. If I only had taken a pair of water [skis], this would have been the perfect day to try them out. I feel if this weather continues, we may be able to convince the Captain to have another BBQ. (Hint. Hint.)

October 11, 2014

Longitude: 131.033333° Latitude: 35.933333°

Day 22, NEWFOUNDLANDERS EVERYWHERE!

We awoke to another beautiful sunny day in the Sea of Japan. As midday approached, the temperature climbed to 21°C.

Currently, we have 6 vessels in our relative vicinity, 1.5m of wave height and 23 knots of wind in an East-Northeast direction. With the wind up our stern, we were not able to find a suitable location for our BBQ, but we will keep trying!

We will be conducting several drills today, in preparation for arrival. Included is a security drill, during which there will be a fake bomb hidden on the vessel. A bomb threat call is to come in and the alarm will be sounded. Four teams will be sent to search their assigned areas and each will be tested

on how well they search and secure their zones and locating the bomb. When it is found, the ship's security officer will be notified and calls will be made to authorities for assistance. Depending on location and what we find, several different scenarios will be played out. Crew on board a ship must "know the ropes" and be trained in all aspects of security and lifesaving services that we find on land.

Still on a Southwest heading, at 23:00, we will begin passing through the [Korea Strait] and expecting lots of small fishing boats in the area. On our Stbd beam will be the city of Ulsan, Korea, home to the world's largest shipyard operated by Hyundai Heavy Industry. Interesting enough, Dan, my next-door neighbour from Paradise, Newfoundland, is currently working at the shipyard, building topside modules for the Newfoundland Hebron offshore oil project. Look out world, we're *everywhere*.

October 12, 2014

Longitude: 125.250000° Latitude: 33.783333°

Day 23, LOVE LAND

At noon today, we passed between the southern tip of South Korea and Cheju Do (island). This semi-tropical paradise was voted one of the New 7 Wonders of the world. At its centre is UNESCO [United Nations Educational, Scientific and Cultural Organization] Hallasan Volcano which is famous for many hikers. The long stretches of beach and beautiful resorts are a favourite for honeymoons, including one aptly named "Jeju Love Land." You will have to Google this one yourself ...

As we turn north toward China, we have luckily avoided the major impact of Typhoon Vongfong by about 300Nm, leaving us with only a 2.5m swell. Within a 70-mile radius, there are now over 100 ships, including a new, 317300-DWT crude oil tanker, named MV *Al KOUT*, completing its sea trials.

With the strong wind still at our stern we eased along at 13 knots effortlessly, having to slow the engine down several times to maintain our speed. With only 48 hours to go before arriving at our destination, we are starting to feel the "channels." Things seem very quiet on board; crew members are working inside, cleaning and polishing the accommodations for arrival. The guys off-shift are beginning to pack their bags and prepare for the next crew.

After 8 weeks on board and halfway around the world, the Captain and I are anxious to get home to our families. A grey, overcast, drizzly day ended perfectly with another spectacular sunset.

October 13, 2014

Longitude: 124.054842° Latitude: 35.950000°

Day 24, THAT'S NICE

Another hard night to sleep and day to follow.

Storm force winds of 40-50 knots from the North have built waves 6-8 metres high and with the vessel northbound to Bayuquan, China, we are heading directly into it. The Captain has reduced the vessel['s] speed to 3.5 knots to lower the effects of the ship['s] heavy pitching and slamming into the waves, which is compounded with the bow shape of an icebreaker.

Due to the huge seas head-on, impressive plumes of water and mist break over the bow and water is being taken on both sides of the main deck and sweeping back 120m to the accommodation block.

The height and frequency of the wave is increased due to the shallow waters of the Yellow Sea. Aptly named due to the golden yellow surface of the water created by sands particles from the Gobi [D]esert sand storms. But today's weather has turned this golden yellow into dark blue with white wave tops and spray. The effect of all this motion on the body has taken the good out of most crew.

With my flight booked out of China on the 16th, I try to encourage the Captain to go faster, but his reply, in Mrs. Brown's words, "That's nice," leaves me with little hope.... The forecast shows that the sea should reduce late in the evening and if we can then get back to speed our new ETA [estimated time of arrival] will be on the 15th, just in time.

October 14, 2014

Longitude: 121.383333° Latitude: 38.433333°

Day 25, PATIENCE

As we make the approaches to Dalian and the Laotiesha Shuidao traffic zone, the Captain remarks it feels like being on the Grand Banks of Newfoundland in the 1980s. Fishing boats of every size and shape dot the water no more than 500 feet apart. The mate on watch carefully weaves in and out around the various fishing trawlers, buoys, and nets, making sure not to cause any trouble. Dalian, where 6.7 million people live, is China's fifth largest port city and was voted China's most liveable city and one of the best tourist cities.

Maybe someday I will have time to come visit, but for now, all work and no play. Almost there – only one extra day after 25, and with all the weather that we had to endure – not so bad. All we need is just a little patience.

Hmmm, must find "Patience" by Guns N' Roses and play through the ship[']s speakers ... Hehe.

We will arrive at the Bayuquan pilot station tomorrow morning at 06:00. From there, we have received the green light to proceed to the dock for unloading. The Plan is to be at the dock for only 40 hours and with 14 crew paying off, new crew arriving, some minor repairs, stores arriving, surveys to complete, and one last Blog entry to write, it will be a very busy port call indeed!

October 15, 2014

Longitude: 121.931175° Latitude: 40.324286°

Day 26, THE BITTER END

We, as one big Fednav team, have come to the end of our historic voyage across the Northwest Passage.

Thanks to everyone for following us and making this trip a memory that we will never forget. It's a bittersweet end for me, as this is my last voyage after 22 years at sea. I will transition now to an office job as a superintendent and become one of you landlubbers.

I want to thank everyone at Fednav for giving me this privilege as Chief Engineer to take new delivery of the *Nunavik* in Japan, travel through the Panama Canal to Deception Bay, and then later back to China through the NWP to, in essence, circumnavigate the big island of North America. Writing the blog has been a great way for me to fully appreciate what we have done and to be sure a good record has been kept. I hope you all enjoyed my Newfoundland humour and either laughed with me or at me, it's all the same.

I'd like to thank Ariel Regev for keeping the blog updated and Philippe Gauthier for the French translation. I [a]lso want to thank my amazing wife, Nicole Bishop, for always supporting my life at sea. Good friends, Mike Hennabury, John Drover, Pamela Sooley, and Brian Searwar, kept feeding me facts along the way. But most importantly, I have to thank our Captain and good friend, Randy Rose. His excellent leadership, amazing relationship with all crew, vast knowledge of ice conditions, safety-first attitude, 25 years' experience in the Arctic, and ability to take a good joke against him, has made this the trip of a lifetime.

Live your dreams!

October 17, 2014

ARRIVAL AT DESTINATION

The MV *Nunavik* recently completed its historic voyage through the Northwest Passage.

We wish to thank: Captain Randy Rose and his crew for their safe and efficient navigation; Tim Keane and Gary Bishop for eloquently sharing this adventure with us; valued customer, Canadian Royalties; our Fednav Arctic team in Montreal; and our faithful readers.

This project has been a memorable one for us all, thank you for following our journey.

Your friends at Fednav



19

Social Media, Arctic Tourism, and *Crystal Serenity*, 2016

Mathieu Landriault*

The increase of maritime traffic in the Arctic region in the twenty-first century brought forth a diverse array of issues. Shipping and resource issues attracted the bulk of attention, from the media, national governments, and international forums. Concerns over possible oil spills, commercial bulk shipping, and potential usage of the Northwest Passage (NWP) were frequently mentioned in typical threat assessments of Canada's security and sovereignty in the Arctic region.

However, a warmer Arctic would also mean more maritime traffic for reasons other than resource exploration/extraction and shipping goods. The melting of glaciers has made the region a novel destination for tourists attracted by pristine natural landscapes and a breathtaking flora and fauna, a phenomenon known as last-chance tourism.¹ In this regard, the melting Arctic can be compared to other world destinations that are threatened to disappear because of the forces unleashed by climate change and global warming. As suggested by Lemelin et al., the Arctic is faced with the same predicament as the Great Barrier Reef, Mount Kilimanjaro, or the Everglades.² Likewise, Polar regions have been usually analyzed together in the academic literature, as they faced similar challenges, opportunities, and dilemmas.³

These dilemmas connect with some of the more pressing questions asked during the 1969 *Manhattan* transit and the prime minister's annual Arctic tours. It also comes at a time of transition in Arctic governance. First, touristic

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operators are relatively new players in the Arctic region, emerging from this new era of governance focusing not so much on state actors but rather on private or non-state actors. Second, heightened public awareness of the consequences of global warming produced a surge in tourists motivated to visit soon-to-be vanished attractions before it is too late. Hence, the connection with media coverage is a direct one: the more the populace is made aware of the imminent danger of the global melt and its impacts on the Arctic environment (and especially on specific species, such as the polar bear), the more it is likely to attract last-chance tourists.

Finally, the media landscape has been in transition as well. Traditional media have, for the most part, been struggling, losing their audiences at the expense of new, online media. Consumers have been migrating to online platforms to stay informed as well as to express their opinions and react to current events. As a result, traditional media have been scrambling to choose a strategy to remain profitable amid high costs and a multiplication of new news providers recycling content and/or making it free to their readership. This emerging trend and its impacts on Arctic coverage must be scrutinized in order to decipher if new media represents a break from or continuity with traditional media coverage. But first, it is imperative to figure out the patterns and dilemmas raised by Arctic tourism.

Arctic Tourism: Trends and Dilemmas

Arctic tourism has only recently begun to produce great public and academic interest. It must be stressed that the relatively low number of touristic expeditions offered in Canada's Arctic can explain the initial disinterest. Academic and public attentions have been overwhelmingly devoted to one main type of tourism: cruises. As Stewart and Dawson highlighted, although the first cruise in the Canadian Arctic dates back to 1984, we had to wait until 2006 to observe considerable growth in this sector, with twenty-two cruises during the whole year.⁴

A surge of tourism was noted from 2006 to 2010 in both Polar regions and all Arctic countries, with subsequent years experiencing important drops. Factors coming both from the supply (lack of ice-strengthened vessels capable of navigating Canadian Arctic waters) and demand (recession) sectors explained this boom-and-bust cycle. Tight Canadian regulations and a lack of infrastructure (especially ports) also provided explanations for this lack of interest on the part of cruise operators, rendering the prospect for future expansion bleak.⁵ The great interest in the 2006–10 era receded in the

years that followed; this boom-and-bust model mirrored the pattern observed for Arctic tourism.⁶

As with any type of human activity, tourism has the potential of generating both positive and negative repercussions. The bulk of academic attention was directed towards assessing whether Arctic tourism engendered more harm than good as far as economic, environmental, and social impacts were concerned. For example, many cruises framed the trips they offered as a chance to become more familiar with the impact of climate change by having a first-person account of the ravages caused by global warming. The thought process hints that such a trip could raise awareness and lead individuals to become activists once they returned to their communities. Eijgelaar et al. found that such a purported awareness effect was minimal for cruises visiting Antarctica. These tourists fell into the category of “polar mass market tourists,” being more interested in comfortable sightseeing and accommodations.⁷ In total, 77 percent of tourists surveyed by Eijgelaar and his colleagues did not change their opinions on climate change as a result of their trips.⁸

The lack of social impact must be put in relation with the high environmental costs associated with such cruises, given that “polar cruises produce some of the highest per capita CO₂ [carbon dioxide] emissions in tourism.”⁹ Researchers also discovered that only 7 percent of respondents said that they had (or planned to) offset their emissions. Similar results were found by other researchers when calculating social awareness impacts and greenhouse gas emissions for the polar bear sightseeing industry in Churchill, Manitoba; carbon cost was high for marginal awareness payoffs.¹⁰ Cruises also produced other types of environmental consequences, including the air pollution, sewer, wastewater, and solid waste disposals produced by these large vessels. Crews and guests are additional elements included in the environmental harm column.¹¹

Of course, not all expeditions are of the same nature and yield the same output. For example, the Students on Ice (SOI) program has for its main objective to educate young people on the social and environmental realities of Polar regions, leading to participants with greater awareness.¹² Adventurers must also be distinguished from cruises. These types of tourists typically boast a smaller ecological footprint¹³ and share with local inhabitants a keen interest in their relationship to nature.¹⁴

On the other hand, the economic impact of Arctic tourism on local communities has proven more difficult to decipher. We know, however, that it generates revenues and ensures jobs. According to Snyder, tourism

accounts for thirteen thousand full-time jobs for Indigenous people living in Northern Canada.¹⁵ About five hundred people across Nunavut are directly working in the tourism industry, with an additional three thousand people actively working in the arts and crafts sector, which represents an integral part of tourism in the territory.¹⁶ However, this economic sector comes with its downsides. As described by Snyder,

The host community bears virtually all the costs of constructing, operating and maintaining the port facilities and other infrastructure needed to serve the ships and their passengers. Another economic disadvantage is that locally owned businesses must compete fiercely with the cruise ship for tourist expenditures.¹⁷

Studies on the economic impact of Arctic cruises for local communities are rare, with typical economic assessments focusing rather on industry trends, the number and destination of cruises, and the growth potential for operators.¹⁸

Respect for local cultural heritages also constituted an area of concern in the academic literature. In this regard, touristic endeavours were evaluated on their respect for local inhabitants and their cultural practices and beliefs, especially with regards to the Indigenous people living in the North.¹⁹ Impact on local communities was perceived as particularly salient to assess since tourism activity in the Canadian Arctic generates a situation where tourists are more numerous than a region's local inhabitants. The necessity of relying on a community-based approach to deal with this issue is usually underlined in order to manage the costs and maximize the benefits of the increased development of the tourism sector.²⁰ According to Stonehouse and Snyder, this can translate into mutual benefits:

Cultural groups that want to participate in polar tourism, whether Inuit, Saami or Alaskan Native, determine what aspects of their cultural resources will be shared, how they can authentically be represented, and where and when tourism may occur. Strengthening is manifest in the resurgence of traditional languages and customs, initiatives taken in passing favourable legislation, protection of heritage sites and the wide acceptance of culture and heritage tourism by native communities.²¹

Lastly, safety issues were high on the policy agenda. The Arctic region brings forth a difficult environment that only elevates the risk of ships running aground and/or hitting floating ice, with an elevated risk of vessels sinking. This scenario brings forth questions about the capabilities of the

Canadian government to lead search-and-rescue missions in a distant and vast territory, making this issue a wicked policy problem.²² Precedents of ships running aground are listed as indications of potential risks that operators are facing.²³ The grounding of *Clipper Adventurer*, in August 2011, is one such incident that raised concerns about search-and-rescue capabilities in Canada.²⁴

These different areas of academic investigation led our analysis to four possible issue frames concerning Arctic tourism: the economic benefits frame, the environmental impact frame, the local culture frame, and the safety hazard frame. However, one more frame needs to be added, this time related directly to the case at hand, the 2016 and 2017 *Crystal Serenity* cruises in the Canadian Arctic: the luxury frame.

The Crystal Serenity Cruises

Cruises and tourist expeditions typically only capture the attention of the public when something goes wrong or an incident happens (think *Clipper Adventurer* in 2010, e.g.). However, *Crystal Serenity* caught the public's imagination without the occurrence of unfortunate/accidental events. The operator, Crystal Cruises, organized the first voyage for *Crystal Serenity* during the summer of 2016, after two years of planning and organization. Consultations with local inhabitants and precautions to reduce harm to the environment and fauna were also undertaken by the company through initiatives such as the use of distillate fuel instead of heavy fuel²⁵ and avoiding marine protected areas.²⁶

Crystal Serenity had more than one thousand passengers and six hundred crew on board. The vessel departed from Seward, Alaska, on 16 August 2016 and reached New York City on 16 September. The thirty-two-day voyage took tourists through the NWP and the Canadian Arctic, with the help of an icebreaker to open the way. The cruise ship also stood out for its luxury branding, with the price point for tickets starting at \$22,000.²⁷

The gigantic and luxurious nature of *Crystal Serenity* embodies our final possible issue frame. As such, the cruise shared similarities with the 1969 *Manhattan* transit. In both cases, Canadians were presented with a first, whether a tanker or a massive ice-strengthened cruise ship. Furthermore, both vessels were impressive in size in comparison with similar vessels that operated in the Arctic region. Finally, in both instances, the economic gains were weighted against possible environmental harms to assess whether the voyages were worthwhile for Canadian Northern inhabitants and the environment.

The novelty element around the cruise ship is only truly captured through a dissecting of the fundamental dynamics of tourism in the Canadian Arctic. Indeed, *Crystal Serenity* introduced the era of mass tourism to the Canadian Arctic, which was dominated up to that point by smaller cruises making multiple expeditions a day.²⁸ However, the cruise ship was also representative of a persistent trend, in which more cruises began transiting through the NWP from 2006 to 2010. In this regard, *Crystal Serenity* was not an exception but rather a continuation of an already well-established pattern.²⁹

Nonetheless, the expedition prompted calls to update Canadian legislation in order to ensure that touristic activities were held in a responsible and sustainable fashion. Such changes were requested at both the federal and territorial levels.³⁰ Capitalizing on the success of the 2016 voyage, Crystal Cruises decided to go forward with a second edition in 2017. The company decided to halt the Arctic expedition after the 2017 edition until 2019, when smaller vessels would be scheduled to replace *Crystal Serenity*.³¹

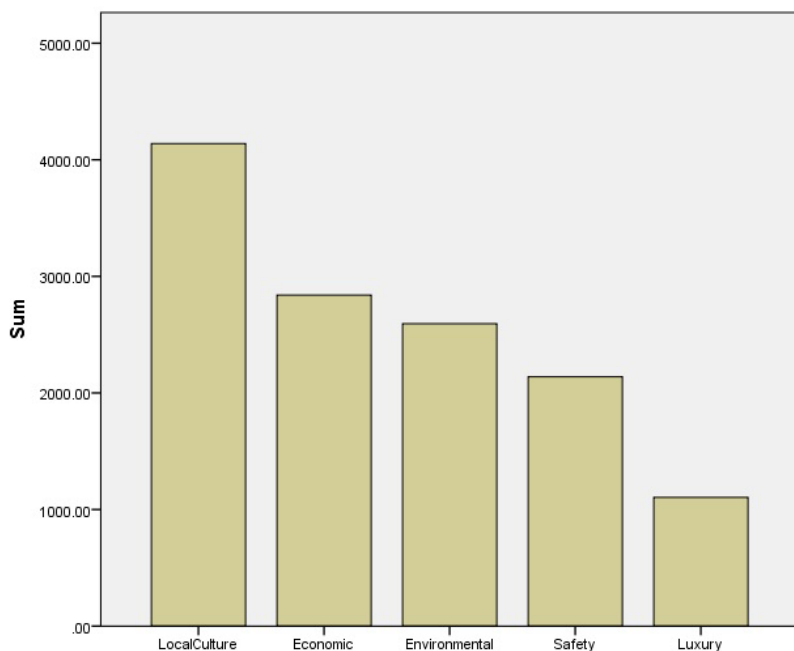
The Traditional Media and the Crystal Serenity Transits

The main objective of this chapter is to describe social media coverage of the two transits. However, a first look at traditional media perceptions of the voyages is imperative in order to analyze if traditional and social media offer a different interpretation of the events.

The time period covered ranges from two weeks before the transits to two weeks after the arrival to port.³² Pre-travel hype and post-factum analysis could then be added to the coverage of the transit itself. Multiple media sources were included in the analysis: televised reports on Radio-Canada's *Le Téléjournal*, CBC's *The National*, and CTV's *CTV News*, as well as twelve newspapers, composed the sample.³³ The term "Crystal Serenity" has been used as keywords in order to limit the results produced by the search as to focus on the most relevant documents.

In total, thirty-four journalistic reports described the *Crystal Serenity* voyage. The media coverage was far from being sustained during the whole time period, as close to 75 percent of reports were published either at the start of the trip (early August) or at the time that tourists disembarked on the tiny hamlet of Cambridge Bay (late August). Media attention was tenuous in mid-August and in September. Media coverage in traditional outlets paid little attention to the luxury frame, rather emphasizing the disruption (or absence of) to local communities (see Figure 18.1).

Figure 18.1. Number of words per frame when describing the *Crystal Serenity* transits in Canadian traditional media



The local culture frame monopolized journalistic focus. Media attention centred on the travellers' interests in local culture, traditions, and lifestyles, as well as the possible disruption the voyage could produce in local communities visited. The collaboration and coordination between the company and the local communities were noted by reporters. The economic angle was mostly positive, as it showcased an economic boon for local artisans and guides, provided by the arrival of wealthy tourists. In both cases, reporters relied heavily on interviews with locals instead of experts or academics to document these dimensions. For example, Vicki Aitoak's point of view was showcased in numerous reports, as she was the head of the Cambridge Bay welcoming committee. Very few Northerners interviewed raised fundamental or one-sided criticisms of the cruise ship; balanced and pragmatic opinions prevailed.

As for the other frames, the safety angle received a balanced treatment, as both risks and possible hazards were described while retaining an emphasis on the high level of preparation of the crew. The precautionary approach adopted by the company helped alleviate safety concerns, even though the perils of conducting a possible rescue operation for two thousand

people were raised by journalists. The environmental frame was overwhelmingly negative. While a minority of media reported the precautions taken by *Crystal Serenity* (especially the use of low-sulphur diesel and the disposal of garbage), a majority of them underlined the damaging environmental impact on the Arctic environment and the planet.

As Michael Byers explained in *The Globe and Mail*,

larger ships such as the *Serenity* could accelerate the area's destruction [...] It's the nature of the exercise, which is to take a large cruise ship with a very large carbon footprint to the Northwest Passage to take advantage of the melting caused by climate change.³⁴

The company was also solicited by the media to share its point of view. For example, Crystal Cruises' spokesperson defended the limited ecological footprint resulting from the expedition and the lengthy collaboration exercise (three years) with local communities.³⁵ Naturally, the operator framed the tour in a positive fashion, hinting at an ecological awareness effect. As Crystal Cruises' Vice-President John Stoll stated:

I think the interest is overwhelming. I think that anytime you present something that's new, something that people haven't done, when you can take a luxury audience, introduce them to expedition, it's rare. And the more that we can expose them to this part of the world, the more we think we're doing the job that we need to do. There shouldn't be limits. We shouldn't not expose our guests to some of the most remote places in the world. They want to see it.³⁶

Nonetheless, the company was not able to voice its opinion widely in the Canadian media. Indeed, the company's representatives were only interviewed in four of the thirty-four media reports analyzed.

The luxury frame was not a popular one, as it was absent from 60 percent of all reports. When it was present, it usually occupied a minor portion of the article or clip, making it one of the top two frames in only five reports out of thirty-four. However, it is interesting to note how the terms used to describe travellers were not flattering, to say the least. The *Crystal Serenity* vacationers were called "jaded tourist[s]," "filthy rich tourist[s]," and "the world's worst people" (all three on CBC, citing the magazine *Slate*), travelling on a "rich palace" and representing either a "horde" or an "invasion of tourists" (Postmedia Network newspapers) in small communities. The *Crystal Serenity* occupants were described as "peppering locals" with questions and "flooding" towns with sightseers.

Journalistic narratives combined frames to highlight debates or areas of tension arising from mass tourism (see Table 18.1). Many articles solely listed different interrogations on the transit without articulating them together. These reports typically enumerated concerns and opportunities with very little effort to present them as trade-offs.

Table 18.1. Frequencies of the top two frames in terms of words per article

Top two frames/report	Number of occurrences
Economic and local culture	10
Economic and environmental	9
Environmental and safety	5
Safety and luxury	3
Environmental and safety	1
Environmental and local culture	1
Local culture and safety	1
Economic and safety	1
Local culture and luxury	1

Other journalists explicitly pitted one frame against another. For example, prospects of economic gains were most often weighted against the disruption of local communities and harm to the environment. On both accounts, the economic advantages for local communities were deemed significant, whereas media outlets were adamant in stressing the efforts undertaken by Crystal Cruises to minimize social and environmental damages.

Finally, the event acted as a catalyst for initiating discussions concerning other related Arctic issues. Climate change (both in its scientific and human dimensions), Canadian sovereignty, the Canada–U.S. relationship in the Arctic, and Arctic socio-economic development were issues all addressed while referring (albeit briefly) to *Crystal Serenity*.³⁷ The most common observation was a familiar one for seasoned Arctic observers: the voyage would open an era of increased accessibility to the region, this time with mass tourism and luxury cruises. For example, readers of the *Ottawa Citizen* were informed that “the arrival of the *Crystal Serenity* ushers in an era of mass tourism made possible by increasingly ice-free summers.”³⁸ A similar observation was made in a majority of media reports, even though the peak of Arctic tourism happened to be years prior, between 2006 and 2010. As such, the popularity attached to this frame reminds the careful reader of similar observations made during the transit of *Manhattan* or from 2000 to 2005: the

Arctic rush metaphor was still alive and well during the *Crystal Serenity* voyages, especially the 2016 edition.³⁹

Real-life developments and new information running in opposition to this recurrent narrative did not receive significant attention from the news media. As described earlier, Crystal Cruises decided to suspend its Arctic cruise in order to build two smaller cruise ships for future expeditions, thus undermining the “mass tourism is coming” image. No major Canadian dailies reported the company’s move, leaving the story to be covered by specialized blogs and local (Northern) newspapers.

Additionally, the coverage of the *Crystal Serenity* voyages provides valuable insights into the changing nature of the media landscape. Indeed, it highlighted the important concentration of media ownership and the accompanying consequences on media coverage of remote areas. Newspapers owned by Postmedia Network (*Calgary Herald*, *Edmonton Journal*, *Leader Post*, *Montreal Gazette*, *National Post*, *Ottawa Citizen*, *The Province*, *Vancouver Sun*) published the same three articles (two on 2 August 2016 and one on 30 August 2016), accounting for 65 percent of all reports. This resulted in high content homogeneity and impacted the diversity of perspectives and opinions.

From Traditional to New Media: Academic Challenges

Newspapers provide a relatively well-structured media, amenable to academic scrutiny as the organization of the information is stable and databases render accessible decades of content, ranging from local to national coverage. On the other hand, the instantaneity of social media and its rather ephemeral nature render this scientific endeavour more perilous and uncertain; the scarcity of academic articles focusing on social media in Canada is illustrative of this hesitation. However, its popularity in the Canadian populace is undeniable, forcibly prompting us to adapt our analytical methods to figure out this emerging tool of communication.

The number of Canadian users of Twitter has tripled in less than a decade, rising from about 6 percent in 2009 to 20 percent by 2017.⁴⁰ Of course, the nature of the use of social media is quite different from one user to the next. However, strong evidence suggests that Canadians utilize different social media for different purposes. For example, Facebook has been adopted by many to share personal information, with close friends or family members. On the other hand, Twitter, one of the most popular micro-blog platforms worldwide, has for its main purpose the information sharing of current events to networks larger than family and friends.⁴¹

Users capitalize on the interactivity and the customization provided by the platform, turning their Twitter accounts into people-based newsfeeds.⁴² By 2013, the internet was the second media source for Canadians to follow news and current affairs.⁴³

Social media introduced novel elements, changing the media/audience relationship by turning the once-passive audience into active participants. It is unclear, however, whether the traditional power relations once typical of the media landscape evolved or were ultimately transformed by this empowerment. Studies have shown that multiple influential actors in the communication and public relations business have made the transition by incorporating social media tactics and practices into their general communication strategy.⁴⁴ In the case of corporations, social media allows them to diffuse unfiltered messages about their corporate actions and purposes.⁴⁵

Twitter is not a perfectly levelled playing field; traditional power holders in Canada (such as traditional media and politicians) retain their power on the platform,⁴⁶ making Twitter's role more reactive than proactive. Indeed, trends and proclamations in traditional media tend to be repeated on Twitter.⁴⁷ In other national contexts, non-governmental organizations and politicians were also found to use Twitter to further their interests, although the impact they have is variable.⁴⁸ It should be added that even actors with similar partisan and ideological inclinations do not adopt similar or even cohesive strategies in their social media use.

Furthermore, Dubois and Gaffney also observed that bloggers and commentators emerged as influential people, even when they were not considered traditional power holders.⁴⁹ Civil society groups, such as grassroots movements, and political advocacy groups can gain notoriety by providing additional information to users, complementing traditional media.⁵⁰

The jury is still out on assessing the impact that Twitter has on political dynamics in Canada and abroad. For one, it was found that the social media platform does not act as a catalyst for meaningful conversation.⁵¹ Furthermore, Grudz and Roy concluded that Twitter creates limited pockets of open cross-ideological interactions as people tend to interact with people sharing similar opinions, creating an echo chamber effect. Moreover, the interactions between users from different ideological worldviews often lead to confrontation, furthering political polarization.⁵²

These various findings were reached by studying tweet content published with a specific hashtag, as hashtags are currently known as the

best way to organize the voluminous content published every day on Twitter.⁵³ These hashtags were quite general, dealing mostly with national affairs (#cndpoli) and/or highly salient political phenomena (#elxn41 for the 2011 federal elections). It will be interesting to see if these findings are applicable to more specific subject matters. For the purpose of this chapter, the hashtag #CrystalSerenity will be utilized to detail social media coverage of the cruise ship's 2016 and 2017 voyages.

A Cruise Ship, in 140 Characters

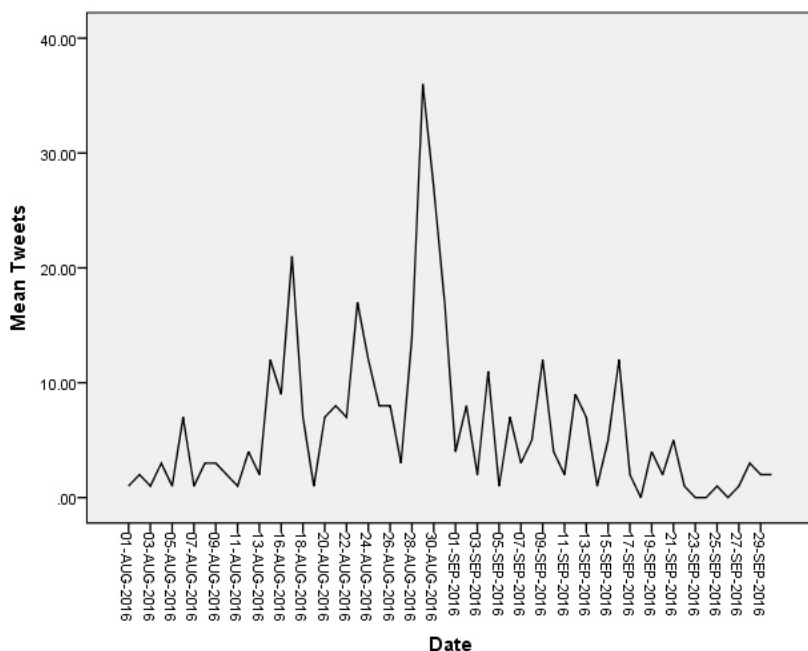
The same timeline used for traditional media (1 August 2016–30 September 2016; 1 August 2017–30 September 2017) was applied for analyzing Twitter. Only tweets written in French or English were retained, whereas tweets that were off topic but nevertheless used the #CrystalSerenity hashtag were removed from the sample.⁵⁴

In total, 404 tweets were written using the said hashtag. The same pattern could be observed when comparing both years. The 2016 voyage caught public attention (362 tweets), whereas the 2017 edition escaped the public's radar (42 tweets); the "precedent" component clearly had an impact, generating a buzz for the first edition. The overwhelming attention in 2016 can be explained by international interest rather than a purely Canada-driven one. If 62 percent of tweets in 2017 were from Canadians, this proportion dropped to 44 percent for the 2016 trip; American and European users were active in 2016 while being for the most part passive in 2017.

On the other hand, coverage proved to be more constant on Twitter when compared with traditional media outlets. In 2016, tweets were written every day from 1 August to 17 September, with the exception of a single day (14 August). However, similar interest peaks can be noted, as tweet activity experienced a slight increase in mid-August before significantly peaking at the end of August. Much like traditional media, this latter peak occurred at the time that the cruise ship was to dock in Northern Canadian communities, first in Ulukhaktok (27 August) and Cambridge Bay (29 August). Here, social media trends mirrored traditional media, with many tweets sharing reports recorded by CBC reporter Chris Brown.

The influence of traditional institutions such as the traditional media and non-governmental organizations should be stressed. Only fourteen tweets broke the ten-retweets barrier, all of which came from handles with social capital, whether as a traditional media outlet (e.g., the CBC or *Nunatsiaq News*), a non-governmental organization (Ocean Conservancy), or a special-

Figure 18.2. Frequencies of tweets per day in August and September 2016 under the #CrystalSerenity hashtag



ized news feed (Sea Trade Insider). These organizations constituted 42 percent of the sample, thus representing a sizable portion of the platform's coverage of the voyages.

The content of the tweets presented some analytical limitations. In most instances, authors did not take positions or deploy any of the frames described previously. However, users would retweet or share content created by other external sources. In fact, 30 percent of tweets displayed this practice. Therefore, the frame analysis was also extended to the resources shared by users.

Overall, there were approximately three times more tweets or shared links describing the voyages as positive compared to tweets presenting the cruise as negative.⁵⁵ This can be partially explained by the fact that cruisers participated in this effort, diffusing positive messages about their experience as well as nature and people they encountered during the voyages. Many such positive reviews originated from accounts specializing in cruises, and especially luxury ones; these handles were considered to have very high levels of popularity, as their numbers of followers were in the tens of thousands.

Comparing Canadians with other users allows us to better focus on Canada’s social media landscape. Differences between Canadian and non-Canadian users were significant in some regards, whereas other aspects produced similarities. Indeed, twice as many dominantly negative tweets came from non-Canadians, meaning that the majority of critiques emanated from beyond Canadian borders.

Table 18.2. Perceptions, practices, and statuses of Twitter users who were active on #CrystalSerenity, by national status

		Tweets by Canadian users (184 in total)	Tweets by non- Canadian users ⁵⁶ (220 in total)
Type of user	Individual	117 (64%)	116 (53%)
	Organization	67 (36%)	104 (47%)
Popularity	Low (under 1,000 followers)	73 (40%)	61 (28%)
	Intermediate (1,000–3,000 followers)	73 (40%)	67 (31%)
	High (3,000–5,000 followers)	5 (2%)	35 (16%)
	Very high (over 5,000 followers)	33 (18%)	56 (25%)
Dominant perception of voyages	Positive	86 (47%)	99 (45%)
	Negative	20 (11%)	49 (22%)
	Neutral	78 (42%)	72 (33%)
Link to other media	Yes	48 (26%)	74 (34%)
	No	136 (74%)	146 (66%)

Non-Canadians also had the potential to influence others, as their followers were typically more numerous than those of Canadian accounts. Differences in diffusion potential were linked to the type of user. Organizations, whether research institute or non-governmental organizations, have an established network of support, people dedicated to communications, and relevant expertise on the subject matter. Thus, they

have the means to mobilize members or sympathizers to their viewpoint and share the organization's point of view. On the other hand, Canadian users were typically individuals, with a smaller following; they were more likely than non-Canadians to remain neutral and less likely to share links to other media. A greater number of individuals commenting could mean that they would add novel frames or highlight different frames than traditional media, participating in a democratization of the messages transmitted through social media platforms like Twitter.

Similar framing was performed for the perceived historical nature of the trips. A dominant frame consisted of stating that the cruises had inaugurated an era of mass tourism into the Arctic region. Considerations for respecting local communities, their culture, and their customs also ranked first in social media topics. In fact, the local culture (eighty-nine tweets), environmental (eighty-one), and safety (seventy-three) frames were all widely disseminated on the social media platform. While user opinions were predominantly positive about the respect of local cultures and communities, they were more critical about the environmental impacts engendered by the trips. On the other hand, they were more ambivalent regarding safety concerns. For example, many users highlighted the inherent dangers and numerous hazards of navigating through the Canadian Arctic. However, an equal number of people enumerated the precautions taken by the company and expressed a reassuring opinion about safety concerns.

The low occurrence of the economic frame represents the most significant contrast between traditional and social media; very little attention was devoted in social media to highlighting or assessing the potential economic benefits for Northern communities. A direct consequence of this was to underplay a frame widely perceived as positive, especially by Canadian users, even though some stops (like the one in Nome, Alaska) generated little economic benefit. The economic benefits of the Cambridge Bay stop were the main focus of interest, whereas little attention was paid to the other Canadian stops (in Ulukhaktok or Pond Inlet).

On the other hand, opinions on environmental issues were overwhelmingly negative, underlining the negative impacts on climate change and the damages made to the pristine environment, especially the fauna, of the Arctic region.

Figure 18.3. Frequencies of specific frames mentioned in tweets or retweeted links under #CrystalSerenity

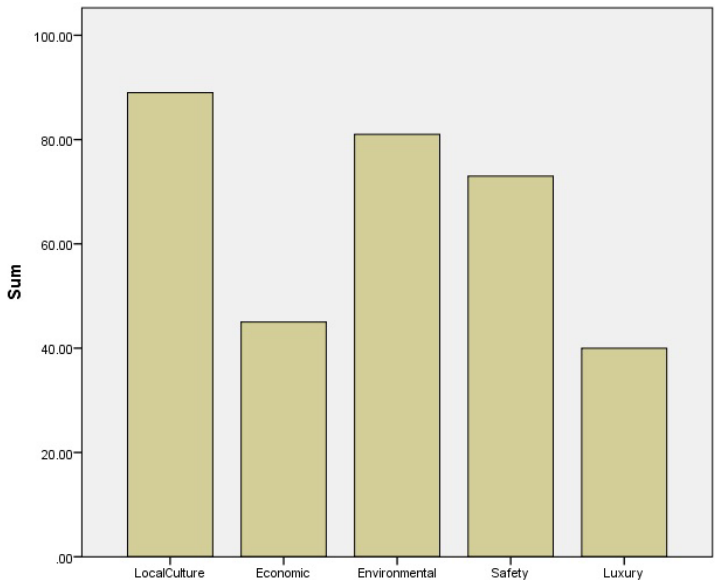


Table 18.3. Dominant perception of tweets on each frame during the two *Crystal Serenity* transits

	Tweets from Canadian users		Tweets from non-Canadian users		Total
	Dominantly positive	Dominantly negative	Dominantly positive	Dominantly negative	
Local culture frame	38	7	26	13	84
Environmental frame	5	17	1	42	65
Safety frame	9	12	17	14	52
Economic frame	20	1	14	6	41
Luxury frame	4	10	9	9	32
Total	76	47	67	84	274

Nonetheless, most of the media coverage focused on people rather than the environment. An environment-only perspective was criticized both by civil society (especially groups representing Inuit people)⁵⁷ and scholars,⁵⁸ rendering Northerners invisible. The local culture and economic frames represent popular frames, combining for a more significant presence than coverage solely focusing on the Arctic environment.

Crisis Averted

The *Crystal Serenity* cruise shared many similarities with the 1969 *Manhattan* transit: each were a ground-breaking, historical precedent, testing a new economic venture with a vessel of unprecedented size for the region. In both cases, both companies prepared for months to confront the safety risks posed by the harsh Arctic environment. The *Manhattan* transits generated considerable coverage over an extended time period, with the second transit generating substantial public attention; *Crystal Serenity* experienced a different fate, with the second voyage barely registering on the media radar.

A few key differences between the two expeditions can explain these different outcomes. Of course, the sovereignty issue caused passionate uproars in Canada during the 1969 transit, whereas sovereignty was a non-factor for the cruise ship. Moreover, the reactive posture of the federal government and the lengthy legislative process ensured that the tanker's transit would remain at the top of the political agenda during the winter and spring of 1970. The nature of the 1969 trip also differed substantially from the *Crystal Serenity* trip. The environmental risk posed by *Manhattan* was clearer and more straightforward for the Canadian public; the very nature of the tanker made it so that the risk of an oil spill was front and centre in the public imagery. On the other hand, the cruise ship did not pose such a risk but generated possible positive impacts (economically) for Northerners, something that *Manhattan* could not do.

A quick glance at the nature of the media coverage (e.g., Table 18.3) explains why the *Crystal Serenity* transits did not translate into a national crisis in Canada and why attention subsided significantly (to the point of being a non-story in most media, social or traditional) by the second trip. Positive frames clearly outweighed negative ones in Canada, whereas the same trend could not be observed for non-Canadian users.

Precautions implemented by the cruise line clearly rebutted the majority of criticisms on three important fronts: respect for local culture/communities, economic benefits, and risks to safety. The local culture and economic benefits angles provided positive coverage for the cruise ship, whereas the safety precautions undertaken assured readers that safety risks were taken seriously. Only the environmental and luxury frames were left with negative perceptions, with the former being more prevalent. It is interesting to note that the precautionary measures related to safety and consultation/cooperation with local communities were acknowledged

profusely, whereas concerns related to the environment were usually not presented to the audience.

In fact, an oft-repeated analytical observation was that Crystal Cruises had deep pockets and could, therefore, ensure that all precautions had been taken to guarantee a transit respectful of local communities, safety concerns, and avoidance of (some) environmental damages to the Arctic ecosystem. However, the leading apprehension was that other operators might feel tempted to enter the Arctic cruise market; these companies might not cater to customers seeking luxury cruises and might not possess the means (or the will) to implement this precautionary outlook. According to Michael Byers, although the *Crystal Serenity* is well-managed and should have an uneventful trip, it will be followed by many other large ships, some from companies with dubious safety records. Not all of the risks associated with these ships can be addressed under the 46-year-old Arctic waters law.⁵⁹

It represents an arduous endeavour to sensationalize *Crystal Serenity* as a significant threat when the trips were described as “well-managed” and most observers expected an “uneventful trip.” It is difficult in this context to dramatize or single out the cruise ship. *Crystal Serenity*, after all, did not represent a direct threat; subsequently, low-budget cruises could potentially represent a more dangerous phenomenon.

Both traditional and social media offered a positive coverage of the events. Frames differed to a certain extent, with the economic story downplayed to the detriment of the safety angle in social media. The economic frame required somewhat more depth on the part of Twitter users, as the focus had to be on the testimonies of local Northerners about the economic benefits generated by the excursions. Other than retweeting external sources (especially from traditional media, which many did not – see Table 18.2), it was difficult for users to tackle this aspect on their own. The safety angle, on the other hand, was more conducive for observations or analysis; the risks and precautions taken by the company were obvious and highly conjectural.

The transits were again a clear illustration of media coverage on Arctic issues in the age of governance. A handful of articles and tweets evoked Canadian Arctic sovereignty, but they represented exceptions rather than the norm. Environmental concerns, safety risks, and economic development necessarily led to more complex and nuanced debates and assessments than black-or-white statements on possession and ownership, even in the echo chamber of social media.

Notes

¹ Eke Eijgelaar, Carla Thaper, and Paul Peeters, "Antarctic Cruise Tourism: The Paradoxes of Ambassadorship," *Last Chance Tourism* and Greenhouse Gas Emissions," *Journal of Sustainable Tourism* 18, no. 3 (2010): 337–54; Jackie Dawson, Emma Stewart, Harvey Lemelin, and Daniel Scott, "The Carbon Cost of Polar Bear Viewing Tourism in Churchill, Canada," *Journal of Sustainable Tourism* 18, no. 3 (2010): 319–36; Harvey Lemelin, Jackie Dawson, Emma Stewart, Patrick Maher, and Michael Lueck, "Last-Chance Tourism: The Boom, Doom, and Gloom of Visiting Vanishing Destinations," *Current Issues in Tourism* 13, no. 5 (2010): 477–93.

² Lemelin et al., "Last-Chance Tourism," 477.

³ John Snyder and Bernard Stonehouse, eds., *Prospects for Polar Tourism* (Wallingford: CAB International Press, 2007); Michael Lück, Patrick Maher, and Emma Stewart, *Cruise Tourism in Polar Regions – Promoting Environmental and Social Sustainability?* (London: Earthscan Publications, 2010); Bernard Stonehouse and John Snyder, *Polar Tourism – An Environmental Perspective* (Bristol: Channel View Publications, 2010).

⁴ Emma Stewart and Jackie Dawson, "A Matter of Good Fortune? The Grounding of the Clipper Adventurer in the Northwest Passage, Arctic Canada," *Arctic* 64, no. 2 (2011): 263.

⁵ Frédéric Lasserre and Pierre-Louis Têtu, "The Cruise Tourism Industry in the Canadian Arctic: Analysis of Activities and Perceptions of Cruise Ship Operators," *Polar Record* 51, no. 1 (2015): 24–38.

⁶ Mathieu Landriault, "La sécurité arctique 2000–2010: une décennie turbulente?" (PhD dissertation, University of Ottawa, 2013), <http://www.ruor.uottawa.ca/handle/10393/24353>; Mathieu Landriault, "Interest and Public Perceptions on Canadian Arctic Sovereignty: Evidence from Editorials, 2000–2014," *International Journal of Canadian Studies* 54 (2016): 5–25.

⁷ Eijgelaar et al., "Antarctic Cruise Tourism," 347.

⁸ Eijgelaar et al., "Antarctic Cruise Tourism," 345.

⁹ Eijgelaar et al., "Antarctic Cruise Tourism," 340.

¹⁰ Dawson et al., "The Carbon Cost of Polar Bear Viewing Tourism in Churchill."

¹¹ Stonehouse and Snyder, *Polar Tourism*, 110–13.

¹² Geoff Green, "Students on Ice: Learning in the Greatest Classrooms on Earth," in *Cruise Tourism in Polar Regions*, eds. Michael Lück, Patrick T. Maher, and Emma J. Stewart (London: Earthscan Publications, 2010), 93–105.

¹³ Mark Orams, "Polar Yacht Cruising," in *Cruise Tourism in Polar Regions*, eds. Michael Lück, Patrick T. Maher, and Emma J. Stewart (London: Earthscan Publications, 2010), 13–22.

¹⁴ Bryan Grimwood, "Advancing Tourism's Moral Morphology: Relational Metaphors for Just and Sustainable Arctic Tourism," *Tourist Studies* 15, no. 1 (2015): 3–26.

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- ¹⁵ John Snyder, "Polar Tourism Markets," in *Prospects for Polar Tourism*, eds. John Snyder and Bernard Stonehouse (Wallingford: CAB International Press, 2007), 103.
- ¹⁶ Mike Robbins, "Development of Tourism in Arctic Canada," in *Prospects for Polar Tourism*, eds. John Snyder and Bernard Stonehouse (Wallingford: CAB International Press, 2007), 84–101.
- ¹⁷ John Snyder, "The Economic Role of Arctic Tourism," in *Prospects for Polar Tourism*, eds. John Snyder and Bernard Stonehouse (Wallingford: CAB International Press, 2007), 56.
- ¹⁸ Stonehouse and Snyder, *Polar Tourism*; Lasserre and Têtu, "The Cruise Tourism Industry in the Canadian Arctic."
- ¹⁹ Grimwood, "Advancing Tourism's Moral Morphology."
- ²⁰ Eva Kajàn, "An Integrated Methodological Framework: Engaging Local Communities in Arctic Tourism Development and Community-Based Adaptation," *Current Issues in Tourism* 16, no. 3 (2013): 286–301.
- ²¹ Stonehouse and Snyder, *Polar Tourism*, 128–29.
- ²² Rebecca Pincus, "Large-Scale Disaster Response in the Arctic: Are We Ready?," *Arctic Yearbook* (2015): 234–46.
- ²³ Ross Klein, "Cruises and Bruises: Safety, Security and Social Issues on Polar Cruises," in *Cruise Tourism in Polar Regions*, eds. Michael Lück, Patrick T. Maher, and Emma J. Stewart (London: Earthscan Publications, 2010), 57–74.
- ²⁴ Stewart and Dawson, "A Matter of Good Fortune?"
- ²⁵ Bryan Comer, Naya Olmer, and Xiaoli Mao, "Heavy Fuel Oil Use in Arctic Shipping in 2015," Working Paper 21, The International Council on Clean Transportation, 2016, https://www.theicct.org/sites/default/files/publications/HFO%20Arctic%20Shipping_working-paper_vF_21102016.pdf.
- ²⁶ Lauren McWhinnie, William Halliday, Stephen Insley, Casey Hilliard, and Rosaline Canessa, "Vessel Traffic in the Canadian Arctic: Management Solutions for Minimizing Impacts on Whales in a Changing Northern Region," *Ocean and Coastal Management*, no. 160 (2018): 1–17.
- ²⁷ Katie Orlinsky and Eva Holland, "Apocalypse Tourism? Cruising the Melting Arctic Ocean," *Bloomberg Businessweek*, 8 September 2016, <https://www.bloomberg.com/features/2016-crystal-serenity-northwest-passage-cruise/>.
- ²⁸ Lasserre and Têtu, "The Cruise Tourism Industry in the Canadian Arctic," 30.
- ²⁹ Stewart and Dawson, "A Matter of Good Fortune?," 263–64.
- ³⁰ Jackie Dawson, Margaret Johnston, and Emma Stewart, "The Unintended Consequences of Regulatory Complexity: The Case of Cruise Tourism in Arctic Canada," *Marine Policy*, no. 76 (2017): 75; Government of Nunavut, "Responsible Cruise Tourism Development in Nunavut," Northern Public Affairs, October 2016, <http://www.northernpublicaffairs.ca/index/responsible-cruise-tourism-development-in-nunavut/>; World Wildlife Fund, "Canada Should Modernize Grey Water Discharge Rules for the Arctic, WWF-Canada Says," 9 December

2016, <http://www.wwf.ca/?23481/Canada-should-modernize-grey-water-discharge-rules-for-the-Arctic-WWF-Canada-says>.

³¹ Annie Zak, "Northwest Passage Cruise from Alaska Won't Return Next Year, Anchorage Daily News," 22 September 2017, <https://www.adn.com/business-economy/2017/09/21/northwest-passage-cruise-from-alaska-wont-return-next-year/>.

³² In the case of the 2016 and 2017 voyages, this meant analyzing the period spanning from 1 August to 30 September of each year.

³³ The newspapers were the *Calgary Herald*, *Chronicle Herald*, *Edmonton Journal*, *Leader Post*, *Montreal Gazette*, *National Post*, *Ottawa Citizen*, and *Vancouver Sun*, as well as *The Globe and Mail*, *The Province*, *La Presse*, and *Le Devoir*.

³⁴ Byers quoted in Alex Migdal, "Ship Sets a Clean Path through Arctic Channel," *The Globe and Mail*, 20 August 2016, A6.

³⁵ Migdal, "Ship Sets a Clean Path through Arctic Channel," A6; Bob Weber, "Northern Tourism – New Rules Considered for Arctic Cruises," *Chronicle-Herald*, 19 September 2016, A6.

³⁶ Stoll quoted in CBC Television/News, "Massive Cruise Ship Brings New Era of Arctic Tourism to Cambridge Bay," *The National*, 12 September 2016.

³⁷ *Crystal Serenity* can be credited for shining a light on the region, which had the indirect effect of raising awareness on the impact of melting ice and high food prices.

³⁸ Tristan Hopper, "Ship Puts Nunavut Hamlet on the Map," *Ottawa Citizen*, 30 August 2016, 1.

³⁹ Landriault, "La sécurité arctique 2000–2010"; Landriault, "Interest and Public Perceptions on Canadian Arctic Sovereignty."

⁴⁰ Tamara Small, "What the Hashtag? A Content Analysis of Canadian Politics on Twitter," *Information, Communication and Society* 14, no. 6 (2011): 875; Statista, "Number of Twitter Users in Canada from 2012 to 2021," 15 June 2018, <https://www.statista.com/statistics/303875/number-of-twitter-users-canada/>.

⁴¹ Anatoliy Grudz and Jeffrey Roy, "Investigating Political Polarization on Twitter: A Canadian Perspective," *Policy and Internet* 6, no. 1 (2014): 28–45.

⁴² Small, "What the Hashtag?"

⁴³ Statistics Canada, "Spotlight on Canadians: Results from the General Social Survey," 15 February 2016, <https://www150.statcan.gc.ca/n1/pub/89-652-x/89-652-x2016001-eng.htm>.

⁴⁴ See Timothy Bajkiewicz, Jeffrey Kraus, and Soo Yeon Hong, "The Impact of Newsroom Changes and the Rise of Social Media on the Practice of Media Relations," *Public Relations Review* 37 (2011): 329–31; Richard Waters and Jia Jamal, "Tweet, Tweet, Tweet: A Content Analysis of Nonprofit Organizations' Twitter Updates," *Public Relations Review* 37 (2011): 321–24; Elizabeth Dubois and Devin Gaffney, "The Multiple Facets of Influence: Identifying Political Influentials and Opinion Leaders on Twitter," *American Behavioral Scientist* 58, no. 10 (2014): 1260–77; Kenneth Lachlan, Patric Spence, Xialing Lin, Kristy Najarian, and Maria Del Greco, "Social Media and Crisis Management: CERC, Search Strategies, and Twitter Content," *Computers in Human Behaviour* 54 (2016): 647–52.

⁴⁵ Bajkiewicz et al., "The Impact of Newsroom Changes and the Rise of Social Media on the Practice of Media Relations"; Marcia DiStasio and Denise Sevick Bortree, "Multi-Method Analysis of Transparency in Social Media Practices: Survey, Interviews, and Content Analysis," *Public Relations Review* 38 (2012): 511–14.

⁴⁶ Dubois and Gaffney, "The Multiple Facets of Influence."

⁴⁷ Dhiraj Murthy, "Twitter and Elections: Are Tweets Predictive, Reactive, or a Form of Buzz?," *Information, Communication and Society* 18, no. 7 (2015): 816–31.

⁴⁸ Waters and Jamal, "Tweet, Tweet, Tweet"; Ana Adi, Kristofer Erickson, and Darren Lilleker, "Elite Tweets: Analyzing the Twitter Communication Patterns of Labour Party Peers in the House of Lords," *Policy and Internet* 6, no. 1 (2014): 1–27.

⁴⁹ Dubois and Gaffney, "The Multiple Facets of Influence."

⁵⁰ Itai Himelboim, Derek Hansen, and Anna Bowser, "Playing in the Same Twitter Network – Political Information Seeking in the 2010 US Gubernatorial Elections," *Information, Communication and Society* 16, no. 9 (2013): 1373–96.

⁵¹ Small, "What the Hashtag?"; Waters and Jamal, "Tweet, Tweet, Tweet"; Grudz and Roy, "Investigating Political Polarization on Twitter."

⁵² Grudz and Roy, "Investigating Political Polarization on Twitter."

⁵³ Of course, not all Twitter users include hashtags in all of their publications. However, Canadian users seem to make good use of this classification tool: about 70 percent of Canadian users incorporate hashtags in their publications on the platform.

⁵⁴ Messages that included the hashtag but were off topic were discarded. For example, quite a few New Age enthusiasts praised the curative virtues of crystals using the #CrystalSerenity hashtag; these tweets were removed from the sample. Moreover, tweets that consisted only of photos or hashtags and were exempt from text were also discarded from the analysis.

⁵⁵ Many tweets were considered neutral as they could not be coded as sharing either positive or negative sentiments towards the cruise ship. Numerous tweets, for example, only briefed their network on the location of *Crystal Serenity* at a given time.

⁵⁶ National status was determined by browsing the Twitter handles of users. Users who did not share their location were included in the non-Canadian category.

⁵⁷ See Emily Blake, "National Geographic Polar Bear Apology Proves Colonialist Attitudes Towards Inuit Remain, Say Northerners," CBC News, 17 August 2018, <http://www.rcinet.ca/eye-on-the-arctic/2018/08/17/inuit-nunavut-national-geographic-polar-bear-apology-indigenous-canada-colonialism-conservation-sealegacy/>.

⁵⁸ See, for example, Elizabeth Arnold, "Doom and Gloom: The Role of the Media in Public Disengagement on Climate Change," Shorenstein Center on Media, Politics and Public Policy, Harvard Kennedy School, 2018, <https://shorensteincenter.org/wp-content/uploads/2018/05/Media-and-Climate-Change-Elizabeth-Arnold.pdf?x78124>.

⁵⁹ Michael Byers, "PM Should Move Now to Safeguard Northwest Passage," *The Globe and Mail*, 12 August 2016, A11.

20

Polar Prince and the Canada C3 Expedition, 2017

Canada C3 (Coast to Coast to Coast) Team*

Canada C3's epic 150-day expedition navigated over twelve thousand nautical miles, travelling from Toronto to Victoria via the Northwest Passage. That is twenty-three thousand kilometres at sea, exploring Canada from coast to coast to coast, over five months. The expedition was divided into fifteen legs ranging from seven to twelve days, each leg bringing a new group of participants on board to connect with communities and Canadians. Sharing experiences, stories, and adventures, every day included growth and celebration of Canada's past, present, and future.

Leg 1: Toronto to Montreal (31 May–10 June)

We launched from Canada's biggest city, sailing down Lake Ontario and the St. Lawrence River. Populous multicultural communities line this historic seaway, as well as forts, archaeological sites, parks, and traditional Anishinaabe and Mohawk lands. We celebrated World Environment Day in Kingston and World Oceans Day in Cornwall with the first group of Canada C3 participants.

Leg 2: Montreal to Baie-Comeau (10–20 June)

We started this leg in Montreal to join in the celebration of the 375th anniversary of the second-largest French-speaking city in the world. We then continued sailing down the backbone of Quebec, where we explored some of the oldest cities in North America. We then climbed into the Saguenay Fjord, scanning the surface of the St. Lawrence River looking for whales and shipwrecks, and visited divers in the coastal communities of the St. Lawrence Valley!

* <https://canadac3.ca/en/expedition/the-legs/>.

Leg 3: Baie-Comeau to Charlottetown (20–30 June)

From Baie-Comeau, we travelled down the St. Lawrence River to the shore of the Gaspé Peninsula, where we visited Petite-Vallée, a small village that has had a big impact on maintaining and promoting the music and culture of Francophones across the country. Then we crossed over to the “Côte Nord” or “north coast” of the St. Lawrence to explore the Mingan Archipelago with its mysteriously shaped and unique monoliths. Our tour continued through areas of the country settled by the Acadian people after they were expelled from the Maritimes in the 1700s, visiting Havre St. Pierre, Anticosti Island, and the Magdalen Islands. We celebrated Multiculturalism Day in the Baie des Chaleurs at Petit Rocher and then travelled on to Charlottetown, Prince Edward Island (P.E.I.), where we welcomed Prime Minister Justin Trudeau aboard the ship.

Leg 4: Charlottetown to St. John’s (30 June–11 July)

We celebrated Canada Day in the birthplace of Confederation. Then, we stopped in Canso at the Stan Rogers Folk Festival for a rousing rendition of the Northwest Passage. A slight detour took us southwest to visit Halifax, one of the economic centres of the Maritimes and home to the largest naval base in the country. Then, we headed back towards Cape Breton Island before crossing the Cabot Strait towards “the Rock,” where the birds, cliffs, and hundreds-of-millions-of-years-old fossils awaited.

Leg 5: St. John’s to Nain (11–22 July)

We experienced the wonder of sailing through the Narrows into St. John’s, the city of colourful stories unlike anywhere else in Canada. As we travelled north along Iceberg Alley, our vessel explored the eastern edge of our nation, even touching one of the four corners of the Earth, according to the Flat Earth Society (Brimstone Head on Fogo Island). We travelled in the path of the Vikings as we approached the UNESCO (United Nations Educational, Scientific and Cultural Organization) World Heritage Site, L’Anse aux Meadows, from the ocean, before heading north along the Labrador Coast, where we connected with the remote Inuit communities of Nunatsiavut.

Leg 6: Nain to Iqaluit (22–29 July)

Starting from vibrant Nain, the largest community in Nunatsiavut, the expedition sailed north. A sombre day of recollection was spent in the abandoned community of Hebron, where members were forced to relocate in 1959. The reconstruction of the site is an important part of the reconciliation journey. Participants felt the power and spirituality of the

Torngat Mountains National Park, meaning “place of spirits,” where the natural stone amphitheatre of Ramah Bay played scene to the park’s first-ever concert. We stopped to appreciate the rich landscape and hidden archaeological sites, before setting sail across the Hudson Strait to Iqaluit.

Natan Obed’s Travel Log, written in Nachvak Fiord, 26 July 2017[†]

I am fortunate to be traveling through Nunatsiavut as a participant in leg six of the ambitious Canada C3 project. We are sailing north from Nain through some of the most beautiful parts of the world, destined for Iqaluit, Nunavut by way of Torngat Mountains National Park. I share this journey with approximately sixty other Canadians on board the ship *Polar Prince*, plus many other Nunatsiavut Inuit along the way who have provided incredible hospitality to the interested and open Canadians who have predictably been amazed by this land, by Inuit strength and resiliency, and by the work left to do on our path to reconciliation.

I am from Nain, Nunatsiavut, and much of my family comes from much further north, in the Nutak and Hebron area. I’ve been lucky to have been to my family homeland before with my good friend Richard Pamak by speedboat, and in official capacities related to my duties as a trustee of the Nunatsiavut Group of Companies. I’ve always wished for more time here, but I have cherished the brief moments in this special, spiritual, and beautiful part of the world that I proudly call my homeland.

I have played many roles on this journey, but my role as ambassador for Inuit has been most important. We have a cross section of Canadians on this ship, and most are not familiar with Inuit and want to learn more about Inuit history, present, and future. I enjoy the opportunities to tell Canadians about Inuit, but hardly ever have I had the spectacular Inuit Nunangat backdrops to tell our story in, or other strong, proud Inuit to tell the story with in the moment of telling.

Elders John Jararuse and Sophie Keelan have shared with the group the history of Inuit in Nunatsiavut, specifically in the Hebron and Torngat

[†] https://canadac3.ca/en/?post_type=news-or-media&p=16106. Natan Obed is the president of Inuit Tapiriit Kanatami, the national representational organization for Canada’s sixty thousand Inuit. He is originally from Nain, the northernmost community in Labrador’s Nunatsiavut region, and now lives in Ottawa. For ten years, he lived in Iqaluit, Nunavut, and worked as the director of social and cultural development for Nunavut Tunngavik Inc., the organization that represents the rights of Nunavut Inuit. He has devoted his career to working with Inuit representational organizations to improve the well-being of Inuit in Canada. <https://canadac3.ca/en/expedition/the-people/natan-obed/>.

Mountains areas. They also proudly tell the group of their associations with younger generations, so that participants see an unbroken chain of Inuit society caring for and living in our homeland.

Artists like Sylvia Cloutier, Madeleine Allakariallak, [and] Twin Flames (Jaaji and Chelsey June) have proudly shared throatsinging, ajaaja's, drum dances, and Inuktitut contemporary music with enthralled audiences, most recently at Ramah Bay in a natural amphitheater steps from the beautiful sandy beach.

Also, we have had Inuit who are Parks Canada's employees, Students on Ice employees, Nunatsiavut Group of Companies employees, and Nunatsiavut Government employees and their family members who have shown Canada C3 what Inuit self-determination looks like. We are capable, we can do anything, and we are resilient. I have a special appreciation for Gary Baikie and Caitlyn "Baby Girl" Baikie who have been superstars in the eyes of the C3 participants. I enjoy facilitating learning moments, providing information that leads to respect, and the immediate connections to Nunatsiavut being formed. I am having a blast seeing and sharing time with my friends and relatives, and becoming fast friends with many people on this ship, with a special mention to my Cabin 38 brother Shaun Majumder.

As Canada C3 sails through Inuit Nunangat over the coming months, I am confident many more Canadians will come to better understand Canadian Inuit, and we, as we always do, will share our story with pride and love.

Leg 7: Iqaluit to Qikiqtarjuaq

We experienced and celebrated the diversity and burgeoning culture of Canada's newest capital city, Iqaluit, which was formerly a seasonal fishing area for local Inuit, hence the name meaning "place of fishes." We discovered the Arctic Archipelago as we sailed by many islands and points with a history of Distant Early Warning systems, whaling, and Arctic exploration. Participants heard the cry of murre and fulmars, as thousands of breeding pairs make a home on the cliff walls facing the sea. As we arrived in Auyuittuq National Park, a zig-zag skyline of craggy granite peaks and glittering glaciers awaited us, overlooking tundra valleys and steep-walled fjords whose winding waterways hold narwhal and ringed seals. Auyuittuq is Inuktitut for the "place that never melts," and the spectacular Coronation Glacier has a glimpse of the power that the ice caps still hold in shaping the land.

Leg 8: Qikiqtarjuaq to Pond Inlet

We travelled north along the eastern coast of Baffin Island, the fifth-largest island in the world, and visited Qikiqtarjuaq, one of the more traditional communities in Nunavut. It still relies on its excellent traditional clothing industry. The next community to the north is Clyde River, home to Nunavut's Inuit Cultural Learning Centre, where we learned how traditional Inuit knowledge (Inuit Qaujimajatuqangit or IQ) is still a vital part of survival in the North. Then, we continued our journey to Sam Ford Fjord, known for its awe-inspiring stark granite cliffs, which rise steeply to heights up to 1,500 miles (4,900 feet). How high is that? It takes daredevil cliff divers eleven seconds to free fall when they jump from its peak.

Leg 9: Pond Inlet to Cambridge Bay

After a closing ceremony, we left the welcoming community of Pond Inlet to search for narwhals down Milne Inlet, where signs of hunting camps can be found on the shore, both recent and thousands of years old. The luscious summer tundra flanks the jagged, glacier-rimmed peaks of Sirmilik National Park, teeming with migratory shore birds. We then set course for the Northwest Passage, exploring well-preserved Hudson's Bay Company (HBC) and Royal Canadian Mounted Police (RCMP) outposts, before making it to the gateway of northern expeditions: Resolute Bay. The community of Gjoa Haven, named by Norwegian explorer Amundsen, shared stories of many other important connections with Norway. We then finally reached Cambridge Bay.

By Journey Participant Joshua Riker-Fox[‡]

Day 1

Last night's flight from Calgary to Ottawa landed around 12:30am, and Mel McCann picked me up. We had a quick catch up, sleep and she took me back to the airport for a 9:15am departure. Flying from Ottawa to Iqaluit to Pond Inlet, it's slowly become more evident who the 20 participants will be within the crowd of many passengers. Now, waiting

[‡] https://canadac3.ca/en/?post_type=news-or-media&p=18086. Growing up in rural Alberta, Joshua Riker-Fox's passion for the outdoors, sport, and learning was instilled early on. He loves the pursuit of excellence as an athlete, student, and coach. He is an Olympic modern pentathlon athlete and holds a Master of Business Administration (MBA) in sport marketing from the University of Calgary. <https://canadac3.ca/en/expedition/the-people/joshua-riker-fox/>.

to board for our final destination, Pond Inlet, our plane will land and refuel one hour into the flight (Iglulik), then continue.

I love small and remote communities so this is a big factor in my excitement. Iqaluit has a population of 6,500 but is in its own way, thriving. The airport is new and it feels like there is a lot of activity in the small community. I really love the mixture of language on landing here; French, English and Inuktitut. I sat beside Omar Sachedina, CTV correspondent. Very conscientious personality and it's easy to appreciate why he's successful in media. W5 has a team of three, including Omar, which is filming several pieces in a sort of part-participant, part-media role.

One, if not my only, concern leading into my departure is that I hadn't decompressed mentally or emotionally to fully appreciate and grow from this experience. I feel in the next 12 days, there will be a considerable amount of time devoted to difficult discussions and introspection. It's been impressed on us that this isn't a cruise. The expedition's objectives and activities are oriented around four themes; environment, diversity and inclusion, youth, and reconciliation. We know these are important topics as we prepare Canada for its next 150 years. It's easy to lament about this surface-level, but really complex and intimidating when you delve below the safe barrier. It will be interesting to see what each of us has to offer.

Day 2

Monday started early with breakfast at 6:30am, after limited sleep the two previous evenings. It's a rainy and brisk day[,], in stark contrast to yesterday's surprising +16c [Celsius] temperature. The 20 of us have varying levels of knowledge about what lies ahead, so there is an ongoing conversation speculating about plans. In particular, today is fairly hectic as we've hardly had a chance to even introduce ourselves to everyone on board. We total 57 individuals with respect to the Canada C3 team (who are incredible [and] of which many are doing the full 150 days) and the ship's crew (who are equally incredible). After breakfast, we left our boat on the zodiacs to visit another ship in the harbour. Zodiacs are mid-size rubber motorized boats that allow us to get off our big boat (a reborn coast guard vessel named the Polar Prince) and be mobile. The other ship we boarded is a retro-fitted cruise ship running the Students on Ice (SOI) program. Canada C3 is also a Students on Ice foundation project, so it became evident quickly that the two operations are tightly connected with staff and leadership overlap. Geoff Green established both

expeditions, and is the highly respected and admired person managing each operation (a multi-tasking gentleman overseeing or managing nearly 400 people and two boats now). SOI has about 200 high school students from 17 nations aboard, primarily Canadians, who spend two weeks in Canada's arctic. This is a gifted group of kids, who are very likely going to be leaders in the conservation field in the future.

In the inlet with us were five other boats. This surprised me as we are in a very remote area, with limited services and a small population. One is Ocean Expedition (the SOI program mentioned earlier). The Canadian Navy is also here (for a government announcement and relationship building with the Inuit community). There is a large fishing boat, which appears to be a Nunavut-owned boat, and there are two private boats. One is a catamaran and one a sailing ship (Polish flag). I never would have expected private boats to anchor in remote northern communities.

Following our time on the SOI ship, the zodiacs brought us into the Pond Inlet community (pop. [population] 1600) for a Federal and Territorial announcement regarding the Lancaster Sound Conservation area, which was unknown to me or most of us. This is a huge expanse of water between Baffin Island and Devon Island. Essentially this body of water between can no longer be used for exploration, seismic work or drilling. This required Shell to relinquish permits it had for the area. From what I understand, the fight to protect this area is over 50 years in the making. I doubt Pond Inlet has had such an influx of people recently, if ever; C3, SOI, media, the navy, and federal and territorial politicians. The ceremony included traditional Inuit musical performances, which were incredible. I still have one song in my head today and I wish I knew what the lyrics meant because it was powerful (I will try to share later). Two throat-singers also performed, which is a unique form of [singing]. The art was diminished when the Anglican and Catholic churches came to Nunavut (around 1920), but is re-surging somewhat now as Inuit youth are taking ownership. These churches viewed throat singing as a form of shamanism. Incredibly, many members of the community are practising Christians in one of the two churches. I found this surprising and would have thought that the contradiction of joining a faith that was largely responsible for their colonization and residential schools would prevent subscription. In fact, the Anglican and Catholic churches competed against each other for parishioners here and all across Nunavut. It is a complex relationship and I'm thankful to our Inuit team-members who continually educate. The explorers arrived first, then whalers, then the

Hudson Bay outposts were installed. The whalers brought missionaries, who eventually asserted sovereignty over the land. In time, RCMP detachments were established as well.

A couple of us managed to visit a small museum briefly prior to returning to SOI for a session, a visit on the HMCS Montreal navy ship and dinner. The session I joined had two Inuit elders sharing stories of their community. I can't capture the essence of these stories, but take a moment to imagine the harshness and isolation of this area and this culture's passion for storytelling. The result is a vivid description that extends back to a time before European contact, where survival relied on hunting, shelter and a community's ability to read the land. It's remarkable. We are all somewhat familiar with Canada's northern culture, but to spend time immersed in the community, is sometimes beyond words.

Day 3

After really limited sleep on Day 1 and 2, the participants enjoyed a full night of rest while the Polar Prince drove east toward Canada Point and Tay Bay. 13 C3 staff manage our daily operation; Scott being the group's leader. There is a robust comms [communications] team capturing every moment as well. Today was magical in that the previous 48 hours was a rush with a disjointed team. There was a lot of pressure on the C3 staff to meet deadlines in conditions where so many variables are at play. But now we've settled and profound moments emerge without warning; today I woke up to a massive glacier beside our boat. Clear, pure, solid yet vulnerable at the same time.

Unexpectedly I found myself in a conversation with Tom Smith and Jena Merkosak. Jena is an Inuit around 24, who has deep knowledge of her people and land, but also carries millennial ambition and sense. Tom Smith is the type of person you'd want to see a movie of his life. In the 1960s he was stationed in the first RCMP detachment in Arctic Canada. His recount is incredible and I'm hopeful to pull more stories out of him. He is proud to share there were no arrests while he was the Mountie. A tragic reality of the first RCMP detachments in northern Canada is that they were simultaneously deploying Mounties and displaced Inuit in newly-created communities, simply to assert sovereignty on land that did not belong to the Crown or to Canada. Often, this meant that eastern/southern Baffin Island and northern Quebec Inuit, who traditionally hunted caribou[,] were moved to areas with few caribou and forced to adapt to survive. Tom is a wonderful human, late-70s, and a

great story teller, passionate about his time here and one who was accepted by the Inuit. Following his RCMP career, he was a judge in BC [British Columbia] for over 30 years. One of the most fantastic stories he shared yesterday was that in Pond Inlet, on Monday during the Conservation ceremony, he connected with a person he first met in 1963 – Koko. Imagine, 52 years later since the last time they spoke. They both had tears when they hugged.

As we continued north through the night, our day started in Tay Bay, which is on the west side of Bylot Island. The zodiacs took us onto the land where Jaypootie led a hike. He shared so much with us, at one point finding a polar bear's sleeping area (prophetic...). While on land, we have a 'bear guard' throughout which means 2–3 individuals cover a perimeter while carrying shot guns. Understandably we can't venture alone, though we all wish we could.

The glacier was an incredible sight to wake up to, but the day had more to offer. Mid-afternoon as we progressed through Sirmilik National Park, with Bylot Island on our right (east), the Polar Prince stopped abruptly. You could feel electricity in the air as everyone congregated on the front (bow) of the ship, where a polar bear was napping on a chunk of ice. She had the same mannerisms as my cat; disinterest in us demonstrated by a few big yawns. She eventually stretched a bit, pointed her butt at us and left, skipping from ice floe to ice floe. If that is the only wildlife I see while here, I will be fulfilled. Passing the latter section of Bylot Island, brought us through its Migratory Bird Sanctuary. A beautiful view, with teeming life swooping up and down. This is a critical habitat for the thick-billed murre, which is kind of like a chubby flying puffin.

Tonight we continue toward Devon Island.

Day 4

This morning began in Devon Island, in Dundas Bay. It's a beautiful isolated space, where the mountain ranges are a different form than what we saw previous. Devon Island is also where the USA Army does its Mars testing. Jena, CTV and the C3 comms team went into the Bay. It is uninhabited now, but three old houses remain. This is where Jena's grandmother was born and we are so remote now that this is not an area Jena would have ever visited before. At one point, the RCMP had a detachment here and there was some habitation, but now apart from a handful of researchers on the boat, no one spends time here any longer.

The Legacy Room – There is a dedicated space onboard for discussion around First Nation topics. As the trip progressed from its June start, the room has collected gifts from participants of the first 8 legs. The room is established in partnership with The Gord [Downie] & [Chanie] Wenjack Fund. Yesterday and today we spent time learning about the Indian Residential School system. This is a complex and difficult subject, and it's truly unbelievable how unaware we are because this is something we just don't talk about. I feel relatively informed, but admit I still only know what is on the surface. I'm thankful I had positive and early immersion in some aspects of the culture. I still remember my dad saying many times when I was young that 'our ancestors are responsible for a lot of harm on First Nations.' This topic is popular in the media now due to the Truth and Reconciliation Commission and the National Inquiry into the Murdered and Missing [sic] Indigenous Women and Girls. Past reports did not meaningfully move the dial. A quick recap; residential schools officially began operating in the 1830s, with the last one closing in 1996 in Saskatchewan. There are about 142 recognized residential schools, but another 120 or more unrecognized. 150,000 youth are thought to have gone through the schools[,] for which about 80,000 still survive. The mortality rate is reported at 24%. The gravity of the physical, emotional and sexual abuse is horrific. Parents were compelled to release their kids because the threat to all other aspects of their life was too severe to resist. Years later, many of those parents live with PTSD [post-traumatic stress disorder] and extreme guilt. This is termed inter-generational impact and to be candid, is why so many of the social challenges we see today persist.

Further along Devon Island, we entered [Croker] Bay and toured the bay in the zodiacs and on foot. We stood on a beautiful glacier. Our day finished with an incredible dinner in the helicopter hanger. Words can't describe the setting. This trip is a privilege, which is not lost upon me each morning when I open my eyes.

Tonight we drive toward Resolute.

Day 5

Today we are sailing east, with Devon Island still on our right (north side). The small Prince Leopold Island is immediately to our left (south), and it is an important migratory bird location. There are three Pauls on board; Paul 1 is a PhD in the water and DNA field, Paul 2 is a PhD in birds (actually ecology, but he's called the Bird Paul), and Paul 3 is our fantastic cook. I believe Paul 2 said there are over 200,000 migratory birds that use Prince Leopold Island.

There was a concern that we'd skip some intended destinations due to ice conditions. We actually thought we may have an ice-breaker lead us through some parts of the Barrow [Strait]. This would have been cool! But alas, conditions have improved, so no ice-breaker and we are sticking to Plan A. We stopped in Radstock Bay. While there we saw two musk oxen but from a distance, so they still seem like mystical creatures to me. I hope to get a better view, but they are rare and shy. I saw a seal very briefly and some people saw a [narwhal], but I wasn't so lucky. A proposition was offered to do a polar dip and many took the opportunity to risk their lives... Joking, we had a patrol on a paddle board, and a doctor. The water is 2c. Very refreshing and saltier than I expected.

Beechey Island is where the graves of three men from the Franklin Expedition are laid, plus two men who were part of a search vessel in the early 1850s. There is not a lot to see here beyond remnants, but it's still remarkable to consider the voyage that was made in 1845 (Franklin made previous voyages including one [in] 1826). 129 people, including John Franklin[,] aboard the British expedition died. Their ships were the HMS Erebus and HMS Terror. In 2014, after years of searching by the Brits, Americans and Canadians[,] the first ship was located. A Canadian search team as part of a Parks Canada-led mission found the wreck of the HMS Erebus. The HMS Terror was later located in 2016 by the Arctic Research Foundation. Two main thoughts/feelings emerged from the visit. The first is that it's extraordinary to see the remnants and graves, including Northumberland House, which was built by a search party in hope Franklin's team would eventually return to find it, but it's also sad to see how many stupid humans visited Beechey Island since 1845. Those stupid humans took artifacts, left artifacts, or otherwise defaced an amazing historical site. The second thought is how ignorant I was in overlooking that to Inuit, this site is not pleasing to visit. After Jena and Jaypootie shared how that expedition represented an era of dominance from outside power. I'm not sure I felt sorrow or pride in visiting this site, as it was just an interesting, remote area with historical relevance. But to the Inuit it is a soiled piece of their territory and one they know is often portrayed with valour to the rest of Canada.

This afternoon we rendezvoused with the Coast Guard vessel Henry Larsen. This ship patrols the northern arctic to protect our water and land. There is limited engagement with other vessels, but they said that if Canada did not have a presence, many other nations would infringe our waters. They welcomed us aboard for an evening event. Along with Zach,

Jena, Aviaq, Marta and Val, the Chief Engineer gave us an extraordinary tour. This ship is 99m [metres] in length and complex beyond explanation. The engineer wanted to explain many aspects of the operation, but settled on just describing several machines as 'magic.' What patience! He then shared that his 14 year career with the Coast Guard was preceded by 14 years in shipping around the world. This man was attacked by pirates!! He was a great Newfie with an ability to tell a story. Tonight our two ships are parallel parked beside each other (I'm sure there is a technical term for that). Our captains could definitely park a ½ ton truck in Montreal during rush hour.

Day 6

Another spectacular day has passed, and as per the trend, one of learning. The days are going by quickly and blending together.

I will start with a (mostly) funny story. Going back three days to our venture in Tay Bay, Tom and David Gray shared this story. David, by the way, is an [Arctic] Biologist and Research Associate with the Canadian Museum of Nature. He's also my roommate (lucky guy!). Just as we arrived on board, David was switched into my room (or me into his more likely..) so the CTV crew could be together (so cliquey eh .. joking; they have real work to do preparing and editing hours of footage). David is a super cool scientist, he wrote the guiding literature for the entire C3 expedition, cheekily titled 'Gray's C3 Coastal Anatomy[.]' He leads many of our adventures and I ask him at least 15 questions a day, which may be starting to annoy him. He's such a nice, nerdy person, and I'm really enjoying that he's stuck with me in cabin 37. Back to the story; The Wollaston Islands sit just west of Bylot Island and we progressed through this straight while leaving Pond Inlet. I shared a bit about Franklin's failed mission to navigate the Northwest Passage yesterday in the mid-1840s. After they disappeared, American, Canadian, French and British vessels searched for his ships, the HMS Erebus and HMS Terror. The search parties repeated their efforts from Beechey Island, by leaving supplies elsewhere in Lancaster Sound with the hope that Franklin would find them. You can imagine the darkness and despair these men faced. A question was asked if Franklin's ship ever found these stockpiles, to which David said 'it's not really known, but for sure the Inuit did as they were spotted in years following sporting British attire in Nunavut.'

Today was a gap day as we are ahead of schedule. Tom Zagon presented this morning on the remnants of the HMS Erebus and Terror. He is a specialist on ice, and part of the project that ultimately located

both ships. Dr. David calls him the Ice Man (probably not finding it as funny as I do). The ships are largely intact, especially the HMS Terror. It appears it sunk straight down in Terror Bay. What an intriguing presentation through a different lens.

Following this, we took the zodiacs into Sophia Inlet and Griffith Bay. We saw a couple seals and went for a very peaceful walk around an incredible waterfall. This is such remote space; there are no tracks and no real reason for someone to visit this spot beyond science. There are muskox here, but no luck in seeing any today. Upon returning from the trip, we had the option to kayak or paddle board in the bay. Our ship is anchored through the day and now we are leaving toward Resolute. The kayak in Griffith Bay was unreal. I am pinching myself. It is Kajarnaq ('beauty in the moment surrounded by the scenery' in [Inuktitut] language). The group is also growing closer and more open. It is nice to be a part of such an amazing and diverse team. Every person here, is someone you want to hear their stories.

Our day ended with a presentation from Leslie Reid. Leslie's father flew planes over Nunavut, post-World War 2, capturing aerial imagery of the land. This was the seminal collection of Canada's north for mapping. As a child, Leslie was immersed in her dad's work. The sad chapter in the story is that the government made a strategic decision to populate Resolute (Qausuittuq) in 1953, termed the High Arctic Relocation. With one sole objective in mind[,] to assert sovereignty during the escalation of the Cold War, seven families from Inukjuak, Northern Quebec, Pond Inlet and Baffin Island were forcibly moved to Resolute Bay and Grise Fiord (on Ellesmere Island). 1955, more Inuit families were moved. The Royal Commission on Aboriginal Peoples described this as "one of the worst human rights violations in the history of Canada." These people were not equipped to live on a desolate island with no support and limited wildlife, and one that was not conducive to their hunting and survival skills. Resolute's Inuk (Inuit people) sometime say 'we are human flagpoles.'

Day 7

This morning we awoke in Resolute Bay. Resolute Bay has a population of around 200–300 so it's very small and very isolated. Interestingly, in the 1970s it was Canada's busiest airport. This was during the exploration boom. There is a busy transient population here for exploration, resource and defense purposes, but they are fairly isolated and I don't think they interact with the community regularly.

Today was a big day and I have a lot on my mind to try to share in as few words to keep you engaged.

Our start was on the shore of Resolute Bay, where Allie and Susan Salluviniq welcomed us. Susan is Resolute's mayor and Allie is one of the original individuals stranded here. To explain; in 1953 and 1955 the Canadian government forcibly moved families from three Inuuk communities, establishing Resolute Bay. I shared this yesterday, so I'll try to keep brief. This was a project by the government to artificially build a 'community' so it appeared these northern islands were rightfully Canadian. The families were lied to; told they could return home, told there was a lot of food available, told there was housing and they'd be supported. When they arrived there was nothing – absolutely nothing, and they suffered through their first winter scavenging for driftwood to build shelter and hunting in difficult land. Susan's words 'We Inuit are survivors' hit us in the heart. These people anticipated hunting, but to survive they needed to fish, which was a skill they did not have. Allie shared that when they were dropped off the ship, 'Even the dogs cried.' The government solved the fishing challenge by coercing Inuuk from Baffin Island to go to Resolute, again under false pretenses. On the shore, there is a monument that Allie resurrected of giant stones in the place they landed. Amazingly, the Canadian government had [servicemen] living a short distance down the road in proper housing, but the Inuuk were not allowed to interact or be in their space. Over time, these families built their roots and now there is a very warm community and about 20 years ago the government apologized. Allie says he loves this space and it's home now. I filmed his words and hope to share with you!

My brain is busy with reflection. We awoke in Resolute Bay, to one boat – an opulent yacht (Archimedes) sharing this peaceful space with us. Nothing else is in the bay. The contrast of a once-displaced, underprivileged community against a boat representing conspicuous consumption left some of us feeling a bit off. It seems insensitive; immeasurable wealth vs unavoidable poverty. Perhaps an ambivalence to the symbolism, perhaps I'm overthinking. I'm kinda wealthy (relatively speaking, along with our whole ship), so I shouldn't judge.

We visited the Polar Continental Shelf Program. This federal facility can house up to 237 scientists and support staff at any moment. Very fascinating operation that oversees logistics (in varying degrees) for research, resource exploration and defense operations. The building and its operation has [*sic*] grown substantially over the last 60 years. It is clean,

modern, has a gym, cooks and is technology-forward, in contrast to its neighbours 3km [kilometres] down the road. I really enjoyed seeing this facility. David Gray ran into a mechanic who he started working with over 30 years ago!

The flame dims a bit on these immersive experiences after a few days and everyone settles in. Every day is absolutely incredible and I'm so thankful, but one eventually reflects deeper about what one is doing. It took until today to see a couple others share similar feelings. There's a point where 'I am so lucky to be here,' turns into 'I feel a bit guilty.' Sometimes you get lucky so I can rationalize it that way, however this project and the millions of dollars behind [it] have a specific purpose that should improve our knowledge and compassion as a country. I hope it will, but it will be so difficult to move the dial. Where does that leave us? We arrive, observe, interact, and depart. We risk being just tourists, which hints a bit of the elitist mindset that brought Canada here. The intent of this expedition is 100% driven by clear objectives and led by an incredible team, and it aspires to very high goals. A[t] times today I wondered 'What if it's not enough?'

Our Resolute visit was at risk earlier this week due to ice floes and I'm so happy it worked out. The people of Resolute Bay are warm and affectionate, and they are certainly resolute. At the community ceremony, a young boy named Elijah sat down beside me, introduced himself with a big smile and chatted away. Filled my heart.

Tonight we drive to Leopold Island, which we passed from afar two days ago. It is a migratory bird sanctuary with 200,000 birds and 100,000 nests. It stands 300m above the shore line, in a circular shape like cork. We've reached the highest northerly point and begin our journey south. My feet hit the floor from my top bunk, every morning with eagerness for what's next.

Day 8

Sunday has been a calm day. We anchored at Prince Leopold Island and zodiaced into the Bay. I did finish last night, 2am, standing alone on the top of the ship as it progressed south through calm waters and with an incredible sky. Impressively, we have wifi at times here, which I find amazing. The signal strength depends on the angle we have relative to the equator, which has varied between 1.5 and 4.5 degrees.

Correction from yesterday; the island has about 200,000 thick-billed murres and an additional 120,000 birds of two other breeds. The[y] live on this ridiculously tall ridge (265m I believe). The baby murres, once

mature enough and around this time of year, dive off the side into the water. They can't fly yet, so they float for a few weeks toward less icy water until they get those skills in order. Brave buggers. Sometimes dad pushes them. Daddy murre accompanies them on their trip. Generally they mate for life so mom and dad murre find each other and return [to] the exact same spot each year. Bird Paul shared a story of a bird that his colleague tagged in 1982 and then 30 years later while tagging again on the side of this ridge, grabbed the same bird again. The bird PhDs are crazy because they belay down the face of the ridge in climbing gear and use a retro-fitted golf ball grabber with a metal loop on it to capture the birds.

Our intention was to land at Port Leopold and explore the island, but this was cancelled so that we could reach the Bellot [Strait] at the right moment. This is necessary as it is a narrow passage and is most ideally travelled when the current is neither travelling in or against your direction (slack water). The Captain's goal is to arrive at the [Strait] at 4am, so that he can select the exact moment to enter this very narrow space. It should take about two hours to pass through, and then we'll travel on the immediate west side of Boothia Peninsula. Boothia is the most northerly land mass of Canada's mainland.

Right now we are heading south sitting between Somerset Island and Brodeur Peninsula. Captain Stephan Guy pensively shared this is 'special and truly what sailing the Northwest Passage means.' He is an incredible person. Spending any brief moment of time with him and you immediately appreciate his level of intelligence and the fact that his brain is continually calculating many variables. We passed a Russian passenger boat, which brought up a lot of conversation. There are two recent Canadian citizens on the C3, from the Ukraine[,] so for them it struck a chord. For Stephan, he blew the horn and the Russians responded which he really appreciated[,] likening it to an international handshake. A moment later we discussed access to territorial waters and he said these ships can access our water as they wish. He feels this is a major concern for the future as accessibility increases and we haven't established firm laws to protect our space yet. And he said, the Russians and Norwegians would absolutely not allow us to enter their water unannounced. Include the Inuit's position and concerns on tourism and the dilution of culture, and the precarious situation we will inevitably face becomes more concerning.

We had a few other tasks this afternoon and then Jason led a workout in the helicopter hangar. It was well attended by half the group. That is a neat bucket list item; burpees while the chunks of floating ice pass by in the Canadian Arctic! Tomorrow, we are up around 6am to watch our entry into Bellot [Strait]!

I'm getting the feeling I am going to miss this beautiful space.

Day 9

This is a little delayed as our internet was down. What a luxury to have any internet in the middle of the Arctic! We are back online now, in Gjoa Haven.

Driving through Bellot [Strait] was really beautiful. It is about 250m wide, and has approximately the same depth. Somerset Island is on the right (north) and Boothia Peninsula on our left (south) through this narrow passage. Captain Stephan is happy that it went smoothly as the margin for error is quite small. As we exited the [strait], there was a second Russian passenger ship, like we saw yesterday. There is a Russian-Canadian crew member on-board; stereotypically old, crusty and doesn't talk a lot. He did say, with a deadpan tone, 'They are probably spies.' Comforting..

We turned south to head down Franklin [Strait], with Boothia Island on our left (east) side. The water is incredible – either very clear or filled with large ice floes. The drive along Boothia can take 10–20 hours depending on conditions. Boothia is a most northerly chunk of mainland Canada. Somehow we ended up [singing] Stan Roger's 'The Northwest Passage' on deck. We did not do the song justice, but it was a powerful moment as the lyrics resonate so much while you are in the water.

Not long on our journey south, and two French sailboats appear in the distance, appearing stuck in between ice. There is a lot of ice in this area which the ship drives around mostly and over, when necessary. I can't imagine sailing up here! That seems risky. Both boats had families with young kids running around on deck in their snow-suits. They were able to follow us through the water as the Polar Prince cleared a path; such a Canadian moment.

As it was a day of mostly travel and no stops, we enjoyed the view, the wildlife and the stories shared amongst a group that is integrated now. It's a great mix of interesting folks. It was Omar Sachedina's birthday so we also sang him a very off-key happy birthday. Most participants deliver a short presentation at some point and it was my day. I linked on C3's themes (youth) with activities I am involved with at home. The day

ended with Jim (C3 team), Bird Paul, Anique and Scott (C3 leader) playing guitar and singing. A super Monday night.

Day 11

Today we spent our time in Gjoa Haven. This is a hamlet of about 1000. The temperature is surprisingly warm – 15c. The morning involved a tour and a visit to their historical centre, which was informative and modern. It is also the main destination for the traditional Inuk goods of this area; in particular carvings. Inuk art has become famous around the world for its distinct style.

Next we visited the school, spending time with the community. A few of us spoke; Scott, Bird Paul, Charlene, myself and Anique and Jena played two songs. I mentioned the Arctic Winter Games briefly when I spoke, and Scott thought it would be funny to have someone challenge me in a traditional Inuk sport. Scott did not mention this to me prior! Otherwise I may have stretched it. A really nice kid was brave enough to come up and ‘leg wrestled.’ Harvey, my competitor, taught me how it works. We did five rounds and he easily beat me the first four. He told me try harder, to which I replied ‘I was trying my hardest.’ I won the last round, maybe because I tired him out! That was the highlight of my day. We all know sport can be a great connector. Seeing ‘Team Nunavut’ jackets upon arrival this morning reminded me that sport’s reach extends to all corners. These kids were extremely welcoming. I really enjoyed our time.

The toughest part of the day is seeing the deep challenges the community faces. Many of the youth are overweight or obese, because they cannot or choose not, to eat healthy. Due to the climate, vegetables are uncommon and ready-made meals a norm. Healthy food is subsidized, but is still difficult to get onto the plate for some reason. It is also tough to see such a beautiful place not well-loved. As in previous communities, there is a lot of garbage. I say this based on my value system, and it’s probably not fair for me to draw judgement as I do not understand their challenges and culture.

A highlight of the day was Dr David Gray’s presentation of a sled to the Historical Society. He brought the sled here, which had sat in storage in Ottawa for [...] many years. The sled is significant because it was used to March 1948, by the HBC post manager at Fort Ross (east end of Bellot [Strait]) to travel to Gjoa Haven (about 475km distance). Lorenz Learmonth was closing down the station but weather deteriorated so he

wasn't able to fly out with everyone else and he had to walk the full distance, with this komatik (Inuk for sled).

Tomorrow we spend our day in Gjoa Haven again and then overnight toward Cambridge Bay.

Day 12

I got a run in today, which was super nice. I ran around the bay area, which is quite rough, but has nice views. Our main component of the day is an event bringing together the Inuk community, the Norwegian embassy (Ottawa), the Fram museum (Oslo) and Canada C3. The evening included traditional food, dance, music and a lot of education on the role Amundsen played in [...] discovering the Northwest Passage. Amundsen was Norwegian and successfully navigated in 1905. Unlike Franklin, he absorbed the Inuit knowledge[,] spending two years to prepare on Gjoa Haven for his expedition. Gjoa Haven has a population of about 1000 people and they take pride in Amundsen's adoption of their ways. He truly admired the Inuk people and his diaries capture that affection. They weren't able to understand each other often with regard to language, but otherwise there was a true relationship of teacher and student. At this ceremony, the Fram Museum, which houses many artifacts from the expedition in Oslo, gifted several diary reproductions of Amundsen's.

The music was fantastic. Anique played as she most often does, but also a member of the ships' crew (Jim from Newfoundland) made a special appearance to play the accordion. You would not have guessed but square dancing is really popular in Inuk culture! A group of really cute kids led a dance, and then randomly pulled in strangers to join them. Somehow of 300 or more people in the audience, I was pulled in. Pretty funny. My final parting highlight was tracking down a piece of Inuk art I wanted. The artist is considered a 'young up-and-comer.' Inuk carvings are a big part of the artistic culture in the Arctic and the work is increasingly popular for collectors in the south. With the help of the young friends made in Gjoa Haven and our little crew of C3 friends, we went to Louis' (the artist) house. His mom had to get him out of bed, and he happily sold me a beautiful polar bear he finished that day.

As our zodiacs pulled away toward the Polar Prince, I felt a lot of happiness for our time here and sadness to wave goodbye to these kids. They are such welcoming, warm people and their smiles will carry in my memory for years to come.

Day 13

It's incredible to come to realize that today is our last full day. Most of our day is spent sailing toward Cambridge Bay, though we will stop in Jenny Lind Island. This morning we spent time reflecting on the trip. These moments are always emotional. There is no way to get around it! It sure makes me appreciate the time it takes to get to know someone and how the first impressions we make have so far to evolve. A ship with this many leaders, in such a variety of contexts, brings so much to each participant. It's a vacuum in time, a bubble or a wormhole that we each fell into.

Our day largely involved prep to wind down our footprint on the ship and prepare for Leg 10's arrival. But there was still a lot of fun and adventure included. Jenny Lind Island was a 'wet landing' meaning wear boots because you're getting wet! The bear guard was assembled as per usual and we were allowed to wander inside that zone. I shared some quality conversation with team members, and then ventured alone. The peacefulness and serenity are vividly in my mind today. It's a very moggy place, and sadly there were many dead birds scattered around. Bird Paul concluded it is likely due to avian cholera. On my solo walk, I found a polar bear scull. It laid perfectly flat looking towards the water and I didn't touch it. About 20m away, I thought I found its lower jaw, which had one large pointer tooth remaining. I reunited the two parts and let it be.

From our first landing, a problem I'm sure I didn't face alone is the need to pee, and the corresponding lack of trees necessary to do so. By lack, I mean zero trees as we are north of the treeline. I found rocks when necessary, but didn't think that was a great lasting impression to give everyone. On the open expanse yesterday, I took the PhD's advice to just go and hope everyone understood what I was doing. In this ~5km x 5km area, I hope I didn't offend anyone. It's Day 12, oh well.

Our last team dinner marked the end of the journey. Many laughs, many stories and a few tears filled the evening. A remarkable energy grows within a group that is motivated and isolated – key ingredients. This journey is a privilege beyond words. Thank you Canada C3, Geoff Green, our amazing team led by Scott MacDougall and Susan Finlay, the Polar Prince crew and Captain Stephan Guy, to the many welcoming Inuit communities that took us in, and to Aline Lafreniere. And of course, to the 19 participants who somehow also were met with this stroke of luck to join Leg 9, Pond Inlet to Cambridge Bay.

Day 14

Transition day as we leave the Polar Prince this morning and Leg 10 participants move in. This has been a serious immersion in the 'ship life.' Cambridge Bay is a hamlet of about 1700 people, similar to Pond Inlet where we started. Oddly the weather on the book-ends of the trip were the same; cold, wet and windy. The days in between beautiful though. My first stop was the RBC [Royal Bank of Canada]! But alas, it was not open. I was really looking forward to visiting branch staff. One of my pentathlon colleagues from Ontario, Dawn Watson, linked me up with two of her friends that teach in Cambridge Bay and they were nice enough to come visit during our short stay. Paula and Chris also gifted Valerii and me with caribou meat. As is always the case in the North, folks share. We took in a short tour at the High School, which has a Discovery Centre; a very impressive museum and collection of Inuk history. And then, it was time to go...

Leg 10: Cambridge Bay to Kugluktuk

We took education underwater with an epic live dive in the Arctic Ocean just off Cambridge Bay. We connected with the scientists who run the research at CHARS (the Canadian High Arctic Research Station). We showcased the work of the Nunavut Literacy Council, which has been one of the lucky winners of the Arctic Inspiration Prize. Finally, we explored one of the best traditional Copper Inuit quarries for soft potstone, a kind of soapstone, at Tree River.

Leg 11: Kugluktuk to Tuktoyaktuk

We joined the community of Kugluktuk on their annual pilgrimage along the Coppermine River to the Kugluk Falls for a Labour Day dip in the river, jumping off cliffs and picking berries on the way. The Canada C3 expedition then made its way to the Northwest Territories, leaving Nunavut for Inuvialuit, as migratory birds start making their way south after summering in the Arctic. This area has many extraordinary phenomena, like the ever-burning coal veins of the Smoking Hills and the huge dome shape of icy pingos emerging from the flat surrounding tundra. We explored the remnants of journeys long past and made our way to Tuktoyaktuk, which is located at the mouth of the mighty Mackenzie River, one of the longest in the world.

By Leg 11 Journey Participant John Crump[§]

The *Polar Prince* was tucked neatly into the deep harbour at Liston Island, like a car in a parking slot. Her ice-breaking nose nudged the lowest of the gravel benches that rise in tiers from the sea. These undulating levels are evidence that the land continues to lift long after it was pressed down by [the] three-kilometre thick ice sheet during the glacial period that ended about 8,000 years ago.

The ground is covered in shards of crenelated, pockmarked rock on a dozen or more benches that we followed up to a high point marked by a cairn. Just behind this marker, which contained a note from a tug boat captain weathered in by a storm in 1986, lay a silent city of lichen crusted tent rings.

Dorset people used this place, perhaps as many as 2,000 years ago. Coming from the west, they occupied the Arctic from around 500 BCE to 1200 CE and then they vanished. They were displaced by the ancestors of the modern Inuit and left little behind to tell about themselves. In one ring, we found a core for making the thin stone blades for which the Dorset are known. In other places lay scatterings of ancient weathered bones, some broken lengthwise to release their marrow.

Two or three large stone rectangles characteristic of longhouses suggest this was an important gathering and perhaps ritual place. These ancient sites, now on a high ridge, were at one time along the shoreline. It was [as] if they had been lying there, silent and windswept, for centuries, waiting for us.

Our Inuit companions – Roger Hitkolok, whose family was once marooned on the island, Hovak Johnston from Kugluktuk and Jimmy Evalik from Cambridge Bay – are connected to these ancient people by the land which continues to rise, a millimeter or so a year, beneath our feet. This is their world. We are just visitors.

[§] https://canadac3.ca/en/?post_type=news-or-media&p=19837. John Crump is a senior science writer at GRID-Arendal, a Norwegian foundation supporting United Nations (UN) Environment. He works with colleagues to develop innovative ways to communicate new knowledge to policymakers and the public. He is a member of GRID-Arendal's Polar team, which provides strategic advice and information to UN Environment on rapid changes taking place at the poles and the implications this has for the rest of the planet. He also collaborates with people in the Arctic, South Pacific, Nepal, Indonesia, Europe, and other places on climate change and other environmental challenges. <https://canadac3.ca/en/expedition/the-people/john-crump/>.

Their ancient connections make me reconsider my own roots. My father's side of the family has records going back to the 1500s in Shropshire, England. My mother's side was uprooted from Ireland during the Great Famine and came ashore in New Brunswick in 1847. I know this history, but I don't know the songs of my ancestors and the lands from which they sprang. I have a connection. It is part of me but very distant.

My connection to this land is even more tenuous, I think, as we sail through the flat waters of Amundsen Gulf. The names rise from the pages where I first encountered them – Bernard Harbour with its weathered RCMP post defying the scouring winds to topple it, the sod outline of the headquarters of the Canadian Arctic Expedition of 1915, Stefansson, Amundsen – all the transposed names of book learning. It's just surface knowledge when we encounter the deep, ancient reality of this part of the Arctic.

Our home is Canada, those of us who descend from immigrants who came here for a variety of reasons. But we are still trying to root ourselves. Our efforts to reconcile our colonial past with a non-colonial future, just in its first stages, may give us the rootedness we need as a people.

...

Our four zodiacs cruised into Paulatuk through the morning fog. Hugging a symmetrical cove, the village emerged slowly as we approached across a flat, slate grey sea.

The day before we had been on the water in the brilliant sunshine at Pearce Point Harbour, the green sea [...] flowing along the side of our translucent kayaks. A great arch of layered seabed soared above us as we pointed the nose of our light craft through, passing from shadow to sunlight.

We spent a gentle day visiting Paulatuk, a village of slightly more than 300 on the Arctic coastline of Canada's Northwest Territories near the western entrance of the Northwest Passage. We learned a lot about the Inuvialuit who live in this quiet place on the edge of Tukturnogait National Park. While we enjoyed the tranquility and visited with students at the local school, a distress call went out that two people were missing on the nearby Hornaday River. The river is within Tukturnogait, one of Canada's remotest national parks (so far this year, it has had four visitors from outside the territory).

Several members of the Canada C3 team leapt into action, including Jimmy Evalik and Roger Hitkolok, from Cambridge Bay and [Kugluktuk]

respectively, who were travelling with us. Shortly after the local distress call came in, C3 received a call asking for help from Canadian Forces Base Trenton, a search and rescue coordination centre several thousand kilometres away near the shore of Lake Ontario. Trenton is responsible for a vast area, including the Arctic. The caller was informed that C3 “was on it,” in the words of expedition leader Geoff Green.

The searchers found a woman shivering on the bank of the river and they brought her back to the village. Her husband wasn’t found.

We talked about this loss in subdued tones that evening as we sailed away from Paulatuk. The Arctic can be an unforgiving place, even to those who live there. The loss of one man affected everyone in the tight-knit community.**

Leg 12: Tuktoyaktuk to Prince Rupert

Participants had to pack warm clothing for this leg — it was a long sea voyage around Alaska! Before making our way into the United States, we stopped on Herschel Island in the Yukon. The island is the site of an abandoned community. Both the island and the historical site are slowly being eroded into the sea. The expedition stopped in some of the most remote communities of the United States, like the small village of Point Hope (Tikigaq). We also travelled through the Bering Strait and its picturesque land bridge, the Aleutian Islands with their volcanoes and sea life, as well as the Yukon River, the gateway to the Klondike Gold Rush.

Leg 13: Prince Rupert to Bella Bella

The magnificent fourteen-mile harbour of Prince Rupert is one of the deepest natural, ice-free harbours in the world and offers a great starting point for a trip to the western coast of Canada. In the few days we spent in Haida Gwaii, we marvelled at the superb old-growth rainforests and appreciated the beauty of Haida culture. In the sea between the islands and the mainland, we found the Hecate Strait reefs, nine-thousand-year-old glass sponges, as we made our way to the Great Bear Rainforest, where we met grizzly bears, bald eagles, and the rare and elusive white-furred spirit bear.

Leg 14: Bella Bella to Campbell River

The scenic backdrop of Bella Bella in the middle of the B.C. coast began the penultimate leg of the Canada C3 expedition. We sailed by numerous fishing towns and ancient canneries, witnessing the changing economy of the region

** https://canadac3.ca/en/?post_type=news-or-media&p=20374.

firsthand. We then visited Koeye camp, where the Indigenous youth connect with their Elders, culture, and lands. A visit to the Hakai Institute research station showcased remote coastal science, and we tried out some experiments ourselves. We made our way to Vancouver Island, starting from the northern community of Port Hardy and lastly making time for God's Pocket Marine Park, some of the most beautiful underwater sceneries in Canada.

Leg 15: Campbell River to Victoria

As we made our way through the magnificent landscape of the Strait of Georgia and the Gulf Islands, we met with diverse communities living and thriving here: from artist and musician havens, to coastal First Nations and fishing towns built by newcomers. Participants experienced the strong tidal currents of the Yuculta Rapids as we journeyed to the rich and multicultural Vancouver, also known as "the city of reconciliation." Our final journey will bring the ship to Victoria, where we will celebrate the completion of a successful coast-to-coast-to-coast adventure and launch Canada C3's lasting legacy.



21

Practice Voyage and Exploration of the Northwest Passage by R/V *Xuelong* in the Arctic

Zhu Bing, Yuan Dongfang, and Xia Yinyue*

Introduction

With the warming climate and economic globalization, the value of developing and using Arctic passages is becoming increasingly obvious. In recent years, the Northeast Passage has been operating commercially, but the commercial use of the Northwest Passage is still in the initial stage of research. Although scholars have analyzed and researched the sea ice distribution characteristics of the Northwest Passage,¹ the opening of the passage,² the risks of the natural environment,³ and the related risk studies⁴ in recent years, to realize the regular use of the Northwest Passage by Chinese ships, we still need continuous navigation practice and exploration research⁵ to fully evaluate its economics and navigation safety.

During China's eighth Arctic scientific expedition, the polar scientific research vessel *Xuelong* crossed the Arctic Central Passage and the Northwest Passage for the first time, realizing the first circumnavigation of the Arctic by Chinese ships and accumulating valuable experience for Chinese ships navigating in Arctic waters. *Xuelong's* completion of the first Northwest Passage transit by a Chinese ship opens up a new maritime channel from the North American Economic Circle (Atlantic coast) to the Northeast Asian Economic Circle, accruing rich navigational experience for

* Excerpts from Zhu Bing, Yuan Dongfang, and Xia Yinyue, "Practice Voyage and Exploration of the Northwest Passage by R/V *Xuelong* in the Arctic," *Chinese Journal of Polar Research* 34, no. 1 (2022): 101–13 [translated from Chinese].

Figure 1. Northwest Passage route



the future use of the Northwest Passage by Chinese ships and promoting China’s navigation of the Arctic.⁶

Xuelong: “Snow Dragon”

Length 167 metres, beam 22.6 metres, summer full-load draft 9.0 metres, full-load displacement 21,025 tons/tonnes, single propeller and single rudder, controllable-pitch propeller (CPP), main engine power 13,200 kilowatts, generator power 3 x 1,140 kilowatts, economic speed 15 knots. The maximum speed is 17.9 knots, the endurance is 20,000 nautical miles, ice class B1* (equivalent to International Classification Societies (ICS) Ice Class PC6), can break 1.2-metre thick ice (including 20 centimetres of snow) continuously at 1.5 knots, and is the first polar research icebreaker in China. To present, *Xuelong* has carried out twenty-three Chinese Antarctic scientific expeditions and nine Chinese Arctic scientific expeditions.

Navigation Regulations and Information

Water Access Policy

Canada claims its northern Arctic archipelagic waters as “historic internal waters” and excludes foreign vessels from the right of innocent passage in these waters. It has enacted such laws as the Arctic Waters Pollution Prevention Act (AWPPA), the Arctic Shipping Safety and Pollution Prevention Regulations (ASSPPR), and the Northern Canada Vessel Traffic Services Zone Regulations (NORDREG). In the name of reducing maritime navigation safety accidents and protecting the marine environment in the Arctic ice-covered waters, NORDREG has strengthened its jurisdiction over the Northwest Passage by imposing strict navigational access and

environmental standards on foreign vessels.⁷ In the Northern Canada Vessel Traffic Services Zone Regulations, a navigational safety control zone was established for waters under Canadian jurisdiction, requiring mandatory application and reporting for vessels entering the zone. At present, Canada has not established a standardized application process for navigation in the Northwest Passage. Ships wishing to cross the Northwest Passage must first familiarize themselves with the relevant Canadian regulations; make appropriate preparations in terms of ship navigation performance in ice areas, marine pollution prevention measures, provision of ice area pilots, and reasonable route planning; and communicate with the Canadian maritime administration in advance and make effective applications.

Based on requirements to conduct marine scientific investigations in Arctic waters, *Xuelong* submitted an application for passage. [*The original contains Table 2 with a list of main applications for consent to conduct marine scientific research and the reports that were submitted.*]

... For Chinese ships planning to navigate in Arctic waters and through the Northwest Passage, they should actively respond to international regulations and Canada's local navigation policy; meet the relevant requirements in ship construction, fire-fighting and life-saving, navigation safety, ship manning, crew training, environmental protection, etc.; and do a good job in navigation safety and pollution prevention in polar waters. China and Canada need to improve understanding and build mutual trust in their cooperation in the maritime field, broaden cooperation in other areas of the route, and reduce the restrictions on the navigation of Chinese ships in the Northwest Passage in order to achieve the goal of waterway navigation.

Voyage Practice and Exploration

Process Overview

Xuelong began its transit of the Northwest Passage at 14:10 Beijing time on 30 August 2017 and completed it at 17:40 on 6 September 2017, passing through Davis Strait, Baffin Bay, Lancaster Sound, Barrow Strait, Peel Sound, Franklin Strait, Larsen Sound, Victoria Strait, Queen Maud Gulf, Dease Strait, Coronation Gulf, Dolphin and Union Strait, Amundsen Gulf, and the Beaufort Sea, for a total of 2,293 nautical miles and 171.5 hours (including mileage and time off the east coast of Baffin Island) (Figure 3).

Figure 3. The sailing track of *Xuelong*



Sea Ice Risk Assessment

During the voyage, the ice conditions were indexed according to the Canadian Arctic Ice Regime Shipping System (AIRSS) standard for real-time ice conditions ahead of the route.

The calculation was carried out to assess the possibility of ships crossing the ice area, to make route adjustments when appropriate, and to report the observed sea ice conditions to the Canadian traffic management. The ice

conditions in Larsen Sound are severe for the entire southern route.⁸ [See original for details.]

Sailing Points Analysis

The Canadian ice pilot boarded *Xuelong* in Nuuk Harbor, Greenland, and then met with the captain to determine the navigation plan for the Northwest Passage. The ice conditions in Viscount Melville Sound on the centreline were very severe, as seen on the comprehensive ice map (Figure 5) from 22–28 August 2017. Therefore, based on the ice level and icebreaking capability of *Xuelong*, the original southern route was taken instead. The pilot provided waypoints for the entire centreline [the original includes Table 7 with a list of waypoints]. While on board, the pilot was responsible for receiving local meteorological and sea ice information, calculating ice indices, and assisting the captain in drafting reports based on each report format.

This time, *Xuelong* sailed along the south route of the Northwest Passage from east to west; that is, after leaving Greenland, it sailed to Lancaster Sound, passed through the straits and waterways of the south route, sailed out of Amundsen Gulf, entered the Beaufort Sea, and finally arrived at the Bering Strait, completing the navigation of the Northwest Passage.

Figure 4. Northwest Passage southern route ice map (Source: Canadian Ice Service)

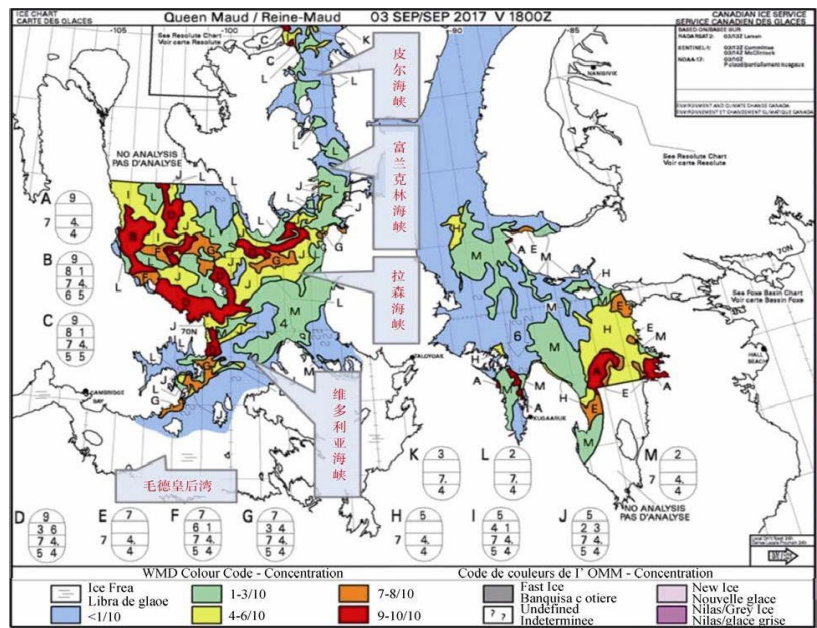
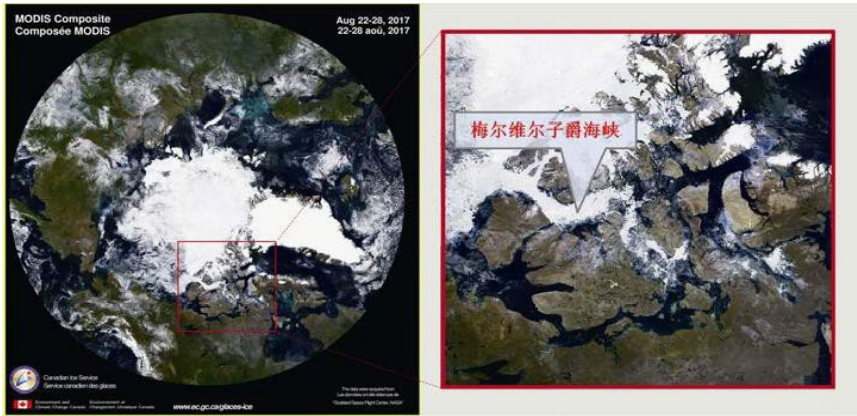


Figure 5. Ice chart of the middle line of the Northwest Passage (Source: Canadian Ice Service)



The width of Lancaster Channel is more than forty nautical miles, the water surface is open and ice free, and the channel depth is 200–800 metres. Barrow Channel is also open, and the channel depth is 150–200 metres. When turning south through Barrow Channel into Peel Channel, a large area of coastal ice floes ten to fifteen nautical miles wide on the east side of the entrance to Peel Channel forms a dense ice floe area, and it is necessary to go west into Peel Channel to pass through, and then continue south. The ship has to go westward into Peel Channel and then continue southward.

The width of the channel in Peel Sound and Franklin Strait to the south is narrowed, but it is also more than ten nautical miles, and the depth of the channel is more than two hundred metres. There is a small amount of ice floes on the sea surface. As long as the watch is strengthened and the correct avoidance is made, these ice floes will not have a big impact on navigation.

In the southern part of Franklin Strait and Larsen Sound, the channel depth is fifty to two hundred metres, representing the densest ice floe on the entire southern route (Figure 4). Depending on the results of ice index calculations, we need to determine the measures to be taken, such as going straight ahead, detouring, stalling and waiting for the ice conditions to improve, or applying for assistance from icebreakers. In the Arctic region, large ice floes are often accompanied by dense fog, so effective fog navigation measures must be taken at this time to strengthen the watch, slow down navigation, and stop navigation if necessary. Before transiting the shipping lanes, we should make good preparations for night sailing and take all necessary measures to ensure the safety and security of the vessels. It is

necessary to have a strong searchlight to avoid ice floes by sweeping the surface of the sea during night navigation in the ice area where visibility is still available.

From the southern part of Victoria Strait to the exit of Amundsen Gulf, ice floes no longer accumulate on the route, so the focus should shift from safe navigation in the ice zone to safe navigation in the ensuing narrow waterways, shallow waters, and island reefs.

Along the five- to six-nautical-mile channel, the water depth is basically fifty to one hundred metres. There are a few shoals along the recommended route, which must be considered for direct passage or bypassing, depending on the draft of the ship.

Edinburgh Channel in Coronation Gulf is the narrowest area of the Northwest Passage (only one nautical mile wide) (Figure 6), especially at night, which requires deceleration and slow passage. Coronation Gulf and the Dolphin and Union Strait (Figure 7) are complex waters with many islands and shoals, and the narrowest are between the shoals in the Edinburgh Channel (Figure 7).

The course is only two nautical miles, with a minimum depth of thirteen metres.⁹ The surface looks normal, but the underwater situation is complex, and the course must be strictly followed without deviation. By Amundsen Gulf, the channel gradually opens up to a depth of two hundred metres. There will be fog from time to time, so please navigate with caution.

Xuelong sailed from Amundsen Gulf into the Beaufort Sea, safely and successfully completing the second leg of the Northwest Passage. The ice pilot also completed his pilotage duties. At the end of the pilotage service, *Xuelong* provided Transport Canada with the ice pilot's certificate of service on board. Afterwards, the pilot left the ship and disembarked in Nome, Alaska.

Figure 6. R/V *Xuelong* passed through the narrow Edinburgh Channel

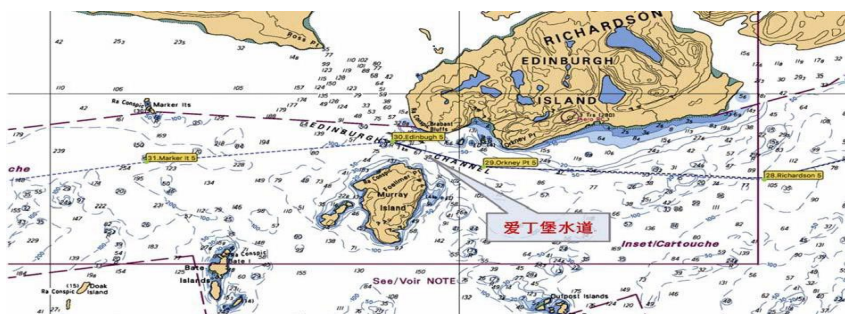
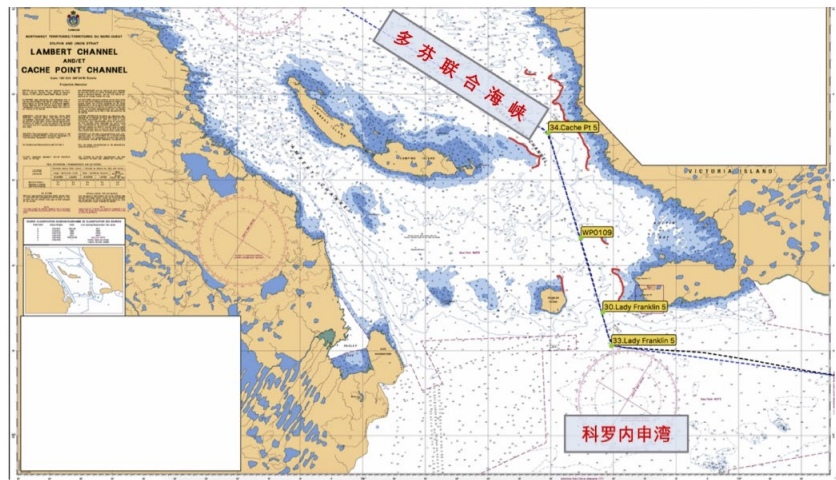


Figure 7. R/V *Xuelong* passed through Dolphin and Union Strait



Key Lessons Learned and Navigation Recommendations

The crossing of the Northwest Passage (especially the second leg) is more complicated than the other passages, but there are fewer vessels in the passage, and *Xuelong* did not encounter any passing vessels that it needed to avoid during the crossing. Through the practice and exploration of the first Arctic crossing of *Xuelong*, the following main experiences and navigation suggestions were obtained:

1. Understand the Canadian policy on access to the Northwest Passage, submit an application and obtain a permit, and hire a qualified local Canadian ice pilot as required.
2. Determine or improve the icebreaking class of the ship in due course and obtain the ice class certificate (or “Arctic Pollution Prevention Equivalence Statement” certificate) issued by the classification society.
3. Carry out seaworthiness checks for polar navigation, and equip relevant emergency equipment and materials.
4. Crews with experience in ice and reef navigation and effective training.
5. Develop emergency procedures in case of sudden failure of the main engine and rudder in dangerous navigation waters, and conduct drills.
6. Do a good job of anti-pollution work in the Arctic waters, and prohibit the discharge of oil and domestic sewage.
7. Route planning according to the requirements of the ship’s ice level and navigation safety control area entry. Ships with strong

icebreaking ability should choose the northern line or the middle line; the northern line and the middle-line channel is wide and deep (except for a shallow shoal in the middle section of the Prince of Wales Strait in the middle line, which has a channel width of 3.5 nautical miles from the shore and a water depth of thirty to one hundred metres), but the ice floes are dense; ships with weak icebreaking ability and a draft of less than ten metres should choose the southern line for navigation, but the southern-line channel is long and winding, and the navigable channel is narrow, has complex water depth conditions, and there is incomplete hydrological information.

8. To give full play to the role of the ice pilot, using its route, channel information, ice maps, weather information, and other resources to assess the safety of passage; more complex ice index calculations and various reports can also assist the pilot to help complete the draft.
9. In areas of dense ice, poor visibility, and night navigation, crew should optimize their selection of routes, travel at a safe speed, and augment the lookout to facilitate cautious operation. Through radar, GPS (Global Positioning System), charts, water depth, and other means of timely and accurate positioning, calculate the wind flow pressure difference to prevent yawing. When sailing at night, use searchlights to scan the sea surface and avoid ice floes. When passing through dense ice floes, narrow waterways, and shallows, slow down the navigation.¹⁰
10. Although there are few merchant ships in the Northwest Passage, Canadian patrol aircraft and Coast Guard vessels are often encountered and can be the first to assist if a ship needs rescue.

Conclusion

This analysis of the main points of the passage of the ship through the Northwest Passage, through the navigation practice of *Xuelong*, especially discusses the Canadian policy on the passage of the Northwest Passage, the employment of Canadian ice zone pilots, and the reasonable planning of the route according to the ice class of the ship, combined with the requirements of the navigation safety control zone entry in the Arctic archipelagic waters. In particular, we discuss the Canadian policy on the Northwest Passage, the hiring of Canadian ice zone pilots, the rational planning of the route according to the ice class of the ship, the entry requirements of the navigation safety control zone in the Arctic archipelagic waters, the correct navigation method, and the assessment of the voyage risk and the formulation of the

emergency plan under the special conditions such as an island reef area, narrow waterway, ice area, fog and night in the ice area, etc., and provide experience and reference for other ships to cross the Northwest Passage safely and smoothly.

Notes

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- ¹ 苏洁, 徐栋, 赵进平, 等. 北极加速变暖条件下西北航道的海冰分布变化特征[J]. 极地研究, 2010, 22(2): 104–24. Su Jie, Xu Dong, Zhao Jinping, et al., “Characteristics of Sea Ice Distribution in the Northwest Passage Under Accelerated Arctic Warming,” *Polar Research* 22, no. 2 (2010): 104–24.
 - ² 李春花, 李明, 赵杰臣, 等. 近年北极东北和西北航道开通状况分析[J]. 海洋学报(中文版), 2014, 36(10): 33–47. Li Chunhua, Li Ming, Zhao Jiechen, et al., “Analysis of the Opening Status of the Northeast and Northwest Arctic Seaway in Recent Years,” *Journal of Oceanography* (Chinese Edition) 36, no. 10 (2014): 33–47.
 - ³ 葛珊珊, 张韧, 杨孟倩. 气候变化背景下西北航道自然环境危险性评估[J]. 海洋通报, 2017, 36(2): 121–27, 134. Ge Shanshan, Zhang Ren, Yang Mengqian, “Assessment of Natural Environmental Hazards of the Northwest Passage in the Context of Climate Change,” *Marine Bulletin* 36, no. 2 (2017): 121–27, 134.
 - ⁴ 席永涛, 付姗姗, 陈伟炯, 等. 北极水域船舶航行风险管理研究现状分析[J]. 交通信息与安全, 2020, 38(3): 67–76. Xi Yongtao, Fu Shanshan, Chen Weijiong, et al., “Analysis of the Current Situation of Ship Navigation Risk Management in Arctic Waters,” *Transportation Information and Safety* 38, no. 3 (2020): 67–76.
 - ⁵ 张侠, 杨惠根, 王洛. 我国北极航道开拓的战略选择初探[J]. 极地研究, 2016, 28(2): 267–76. Zhang Man, Yang Huigen, and Wang Luo, “A Preliminary Study on the Strategic Choice of China’s Arctic Waterway Development,” *Polar Research* 28, no. 2 (2016): 267–76.
 - ⁶ 徐韧. 中国第八次北极科学考察报告[M]. 北京: 海洋出版社, 2019. Xu Ren, *Report on the Eighth Chinese Arctic Scientific Expedition* (Beijing: Ocean Press, 2019).
 - ⁷ 邹磊磊, 付玉. 从有效管理向强化主权诉求的又一范例——论析加拿大西北航道主权诉求的有利因素及制约因素[J]. 太平洋学报, 2014, 22(2): 1–7. Zou Leilei and Fu Yu, “Another Example of the Transition from Effective Management to Enhanced Sovereignty Claims: An Analysis of the Factors that Facilitate and Constrain the Sovereignty Claims of Canada’s Northwest Passage,” *Pacific Journal* 22, no. 2 (2014): 1–7.
 - ⁸ Li et al., “Analysis of the Opening Status of the Northeast and Northwest Arctic Seaway.”
 - ⁹ Arctic Council, *Arctic Marine Shipping Assessment 2009 Report* (2009), <https://oarchive.arctic-council.org/handle/11374/54>.
 - ¹⁰ 顾维国, 张秋荣, 胡志武. 北冰洋冰区航行的船舶操纵[J]. 航海技术, 2011(1): 10–14. Gu Weiguo, Zhang Qiurong, and Hu Zhiwu, “Ship Maneuvering in the Arctic Ocean Ice Zone,” *Marine Technology* 1 (2011): 10–14.

22

The Grounding of *Akademik Ioffe* in Nunavut, August 2018

Transportation Safety Board of Canada*

Executive Summary

On 24 August 2018, the passenger vessel *Akademik Ioffe* ran aground 78 nautical miles north-northwest of Kugaaruk, Nunavut. The *Akademik Ioffe* was sailing through narrows in a remote area of the Canadian Arctic that was not surveyed to modern or adequate hydrographic standards, and where none of the vessel crew had ever been. The vessel ran aground at a speed of 7.6 knots before the bridge team could take evasive action; team members were not closely monitoring the echo sounders, and the steady decrease of the under-keel water depth went unnoticed for more than 4 minutes, because the echo sounders' low water depth alarms had been turned off.

In his assessment of the occurrence voyage plan, the master relied on a Canadian chart that contained incomplete bathymetric data.¹ Because the chart indicated spot soundings that showed localized sufficient water depths, and because the chart did not show any shoals or other navigational hazards, the bridge team of the *Akademik Ioffe* considered that the narrows were safe to transit, and consequently did not implement any additional precautions. Following the grounding, the Canadian Coast Guard vessels *Pierre Radisson* and *Amundsen* were tasked to assist, and 5 aircraft were dispatched by the Canadian Armed Forces. The vessel self-refloated later that night and, on 25 August 2018, its passengers were evacuated and transferred to the sister passenger vessel *Akademik Sergey Vavilov*. The *Akademik Ioffe* sustained serious damage to its hull: 2 ballast water tanks and 2 fuel oil bunker tanks

* Marine Investigation Report M18C0225, Grounding – Passenger vessel *Akademik Ioffe*, Latitude 69°43.043' N, Longitude 091°20.951' W, Astronomical Society Islands, Nunavut, 24 August 2018.

were breached and took on water. An estimated 80.51 L [litres] of the vessel's fuel oil was released in the environment. No injuries were reported.

The investigation determined that if a vessel's crew conducts passage planning and assessment based on incomplete and unreliable navigational data, and without taking mitigating measures, there is an increased risk to the safety of the vessel and its complement. Also, if bridge navigation equipment is not optimally operated and automatic safety features such as alarms are turned off, there is a risk that a bridge team will miss critical information, especially in situations where the prevailing navigating conditions create a high workload for bridge team members. Moreover, if the bridge team composition is inadequate during periods of high workload, such as when transiting confined waters, there is a risk that critical navigational parameters, such as the under-keel water depth, will not be properly monitored, compromising vessel safety.

The TSB [Transportation Safety Board] investigation into this occurrence revealed safety deficiencies that led the Board to issue a safety recommendation.

Risk Mitigation Measures for Vessels Transiting Canadian Arctic Waters

Transport Canada regulates navigation of domestic and foreign vessels within Canada's territorial waters, including the coastal waters surrounding the Canadian Arctic Archipelago. Fisheries and Oceans Canada, through the Canadian Hydrographic Service, is responsible for meeting Canada's international obligation to provide hydrographic services; the Canadian Coast Guard is responsible for the provision of marine search and rescue resources, traffic monitoring, icebreaker assistance and diffusion of navigation safety information, among other services. Both Transport Canada and the Fisheries and Oceans Canada, combined, have the regulatory mandate to implement various risk mitigation measures to reduce the likelihood and consequences of a passenger vessel running aground in Arctic waters.

This investigation determined that voyage planning in the Canadian Arctic has unique risks that require additional mitigation measures in order to ensure the safety of passenger vessels, and to protect the vulnerable Arctic environment. Until the coastal waters surrounding the Canadian Arctic Archipelago are surveyed to modern or adequate hydrographic standards, and if alternate mitigation measures are not put in place, there is a persistent

risk that vessels will make unforeseen contact with the sea bottom. The Board therefore recommends that

the Department of Transport, in collaboration with the Department of Fisheries and Oceans, develops and implements mandatory risk mitigation measures for all passenger vessels operating in Canadian Arctic coastal waters.

TSB Recommendation M21-01

1.0 Factual Information

1.1 Particulars of the Vessel

Table 1. Particulars of the Vessel

Name of the vessel	Akademik Ioffe
IMO [International Maritime Organization] number / Official number	8507731 / 870072
Port of registry	Kaliningrad
Flag	Russian Federation
Type	Passenger
Call sign	UAUN
Classification	Russian Maritime Register of Shipping - KM(*) L1 [1] A2 passenger ship
Gross tonnage	6450
Length overall	117.1 m [metres]
Breadth	18.2 m

Depth to main deck	10.0 m
Maximum loaded draught / deadweight	5.9 m / 1738 tonnes
Draught at time of occurrence	5.75 m Forward / 5.9 m Aft
Built	1989, Hollming Oy, Rauma, Finland (hull No. 266)
Propulsion	2 medium-speed, 4-stroke diesel engines driving 2 controllable pitch propellers (total maximum continuous rating [MCR] 5152 kW [kilowatts]).
Bow thruster	1 tunnel thruster, power 700 kW
Stern thruster	1 azimuthing thruster, power 600 kW
Crew / Expedition staff	37 / 24
Passengers	102
Registered owner / technical manager	P.P. Shirshov Institute of Oceanology of [the] Russian Academy of Sciences (IO RAS), Moscow, Russian Federation
Charterer	One Ocean Expeditions Inc., Edmonton, Alberta, Canada, under a charter contract with Terragelida Ship Management Limited, Cyprus ²

1.2 Description of the Vessel

The *Akademik Ioffe* was built as an ice-strengthened³ passenger-carrying research and survey vessel for ocean acoustic science, marine geology, bathymetry, geophysics, physical and chemical oceanography, as well as optical and meteorological research work. The machinery space is located aft and the accommodations extend from amidships to forward (Figure 1).

Figure 1. The *Akademik Ioffe* (Source: TSB)



The vessel is fitted with 2 totally enclosed 66-person motor lifeboats that also serve as rescue boats, 204 lifejackets, 12 lifebuoys, 4 inflatable life rafts, 14 immersion suits, and 170 thermal protective aids. The *Akademik Ioffe* has a sister vessel, the *Akademik Sergey Vavilov*, and each vessel is certified to carry a maximum complement of 170 persons.

The vessel is propelled by 2 diesel engines which, via gearboxes and clutches, drive 2 controllable pitch propellers at 220 revolutions per minute and 2 shaft generators. The vessel is equipped with bow and stern thrusters that can be powered using various configurations between the shaft generators and the 2 auxiliary diesel generators.

The vessel's navigation bridge is equipped with 2 class-approved navigation echo sounders⁴ with shallow water, bottom lost, and power failure aural/visual alarms. The echo sounders' alarms can be manually turned off by the operator. One electronic chart display and information system is installed on each of the port and starboard bridge consoles. A public address (PA) system is fitted on board. [...]

The vessel's Global Maritime Distress and Safety System (GMDSS) console is located in a separate radio room, abaft the bridge deck.

The vessel has 16 fuel oil bunker tanks, 13 of which are structural double-bottom tanks. The *Akademik Ioffe* carries 2 grades of marine fuels in these tanks: marine gas oil (MGO) and intermediate fuel oil (IFO).⁵

For conducting onshore and offshore passenger activities, the vessel carries inflatable personal floatation devices (PFDs), multiple kayaks, and inflatable boats fitted with outboard gasoline motors.

1.3 Time Chartering

[...] At the time of the occurrence, the *Akademik Ioffe* was chartered by a private Canadian company, One Ocean Expeditions. This particular company specialized in various types of expedition cruises in remote areas worldwide, including the Canadian Arctic. One Ocean Expeditions was a member of the Norway-based Association of Arctic Expedition Cruise Operators, which obligates all members to operate in accordance with national and international maritime laws and regulations.⁶

The vessel owner, the P.P. Shirshov Institute of Oceanology of [the] Russian Academy of Sciences (IO RAS), was responsible for the proper crewing of the vessel⁷ and for managing, maintaining, and providing all applicable insurances.⁸ The owner was also responsible for ensuring the vessel's seaworthiness and regulatory compliance. One Ocean Expeditions had exclusive control of the vessel's itineraries, which could vary so long as the itineraries were within the vessel's capabilities.

The task and the authority to evaluate the vessel's capabilities rested with the vessel's master, as he was the individual responsible for the safety of the vessel, its crew, and its passengers.

The *International Convention for the Safety of Life at Sea, 1974* (SOLAS) stipulates that

[t]he owner, the charterer, the company operating the ship as defined in regulation IX/1, or any other person shall not prevent or restrict the master of the ship from taking or executing any decision which, in the master's professional judgement, is necessary for safety of life at sea and protection of the marine environment.⁹

The crew had to provide vessel passengers and expedition staff with all safety drills, including musters at lifeboat stations. During those drills, the crew was responsible for loading and launching the vessel's lifeboats.

In addition to paying for the vessel's bunkers, stores, provisions, and port fees, One Ocean Expeditions was also responsible for providing the necessary expedition staff,¹⁰ who had access to the vessel's transmission facilities¹¹ and PA system. One Ocean Expeditions could not require that the

vessel be operated in a manner that could endanger the vessel, its crew, or passengers, nor could One Ocean Expeditions breach the vessel's trading and operational limits.

One Ocean Expeditions offered expedition cruises in the Canadian Arctic on board the *Akademik Ioffe* at a daily rate of approximately USD 1000 per passenger.

1.4 History of the Voyage

On 23 August 2018, the *Akademik Ioffe* arrived in Pelly Bay and anchored off Kugaaruk, Nunavut, completing an expedition cruise in the Canadian Arctic. As scheduled, all passengers and expedition staff were disembarked and brought ashore by vessel crew using the vessel's inflatable boats. By 1830,¹² another group of passengers and expedition staff, which had arrived in Kugaaruk by airplane, had been gradually transferred on board the *Akademik Ioffe* using the same inflatable boats, during which the passengers were given basic verbal instructions on actions to take should a passenger or boat operator fall overboard. The master and the joining expedition leader conferred; as they both agreed, the master postponed the passengers' mandatory safety briefing and mustering at the lifeboat stations until the next morning. Following dinner, the ship's doctor gave the passengers a briefing about seasickness, shipboard hazards, doorways, ladders and staircases, and basic sanitation.

At 2045, the *Akademik Ioffe* raised its anchor and departed from Kugaaruk on a new expedition cruise to Cambridge Bay, Nunavut, with 102 passengers, 24 expedition staff, and 37 crew members on board. A stopover at the Hecla and Fury Islands was scheduled for the next morning, to allow the passengers an onshore visit.

The morning of 24 August, the expedition leader evaluated the weather conditions forecasted for the Hecla and Fury Islands and surrounding area. Concerned that the prevailing winds and sea conditions (ice, waves) could negatively impact the passengers' on- and offshore experiences, at 0633, the expedition leader discussed the situation with the master to determine whether to maintain or alter the planned itinerary.

At 0640, the expedition leader changed the voyage's itinerary, and asked the master to assess the feasibility of diverting the vessel to the Astronomical Society Islands, as this new destination would offer shelter and more comfort for the passengers.

The master assessed the intended passage and concurred with the expedition leader on the feasibility and safety of altering the passage plan. By 0738, a new passage plan¹³ had been developed and was sent to the

Canadian Coast Guard (CCG) Northern Canada Vessel Traffic Services (NORDREG) for approval; the *Akademik Ioffe* altered course to 307°G on a northwesterly route toward the Astronomical Society Islands (Appendix A, waypoint E). At 0743, the crew shut down the starboard main engine because the vessel had reached ice-free waters.

At 0801, Transport Canada (TC), via NORDREG, acknowledged the new itinerary and approved the requested deviation (Appendix A, waypoint F). At 0847, following breakfast, the general alarm was sounded to initiate the mandatory mustering and safety briefing for passengers and expedition staff. During this mustering, the passengers were instructed on how to properly don their lifejackets, to dress warmly, and to carry only critical items such as medication with them. The passengers were also shown one of the lifeboats from the outside, while it was in its stowed position (Appendix A, waypoint G). At 1000, the delivery of the first of 2 shore excursion safety briefings¹⁴ was initiated by the expedition staff to half of the passengers.¹⁵

At 1027, the *Akademik Ioffe* changed course to 221°G to enter the narrows between the Ross Peninsula and the Astronomical Society Islands (Appendix A, waypoint H). As the vessel was making way using its port main engine, a minimal speed of about 8 knots¹⁶ was necessary to maintain steerage due to the 20–30 knot winds and a quartering swell. The sea conditions rendered the autopilot ineffective, and so the officer of the watch (OOW) ordered the helmsman to hand steer the vessel.

At 1109:25, the water depth under the vessel's keel was 100 m. At that time, the bridge team consisted of the OOW and the helmsman; the master was at the aft area of the bridge, sitting at the work desk beside the chart table, performing administrative duties. The second engineer was keeping watch in the engine room. The speed was 7.6 knots and the course was 218°G; the water depth gradually reduced and, at 1111:55, reached 50 m. At 1112:54, the OOW realized that the under-keel water depth was 14 m and decreasing. At 1113:29, the vessel contacted a rocky shoal, in the Gulf of Boothia and at the entrance of Lord Mayor Bay, in position 69°43.043' N [North], 091°20.951' W [West] (Figures 3 and 4). A loud crushing noise was heard and vibrations were felt by everybody through the entire vessel; the vessel rapidly came to a stop and heeled to starboard. The deceleration caused the passengers who were standing to lose their balance, while dishes and crockery from the galley and dining room shattered on the deck. At that time, the first shore excursion safety briefing had just been completed and the expedition staff was about to begin the second briefing for the remaining half of the passengers.

Figure 3. Times, under-keel depths, and distances prior to the grounding of the *Akademik Ioffe* (Source: TSB)

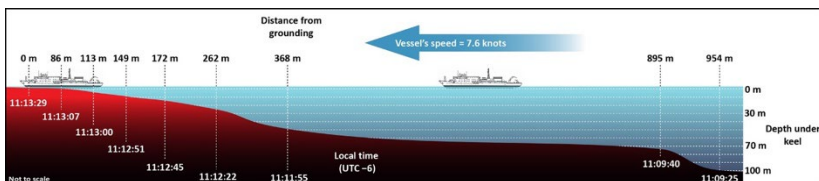
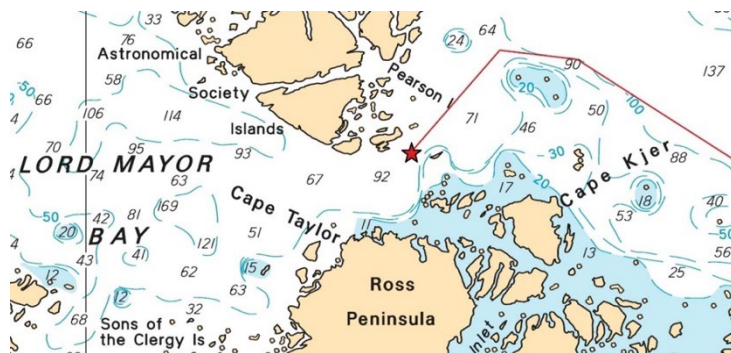


Figure 4. Track and position of grounding of the *Akademik Ioffe* (Source: Canadian Hydrographic Service, with TSB annotations)



At 1115, using the PA system and speaking Russian, the master ordered the crew to prepare the lifeboats for a potential abandonment of the *Akademik Ioffe*. Two minutes later, the master declined the recommendation from a crew member to activate the vessel's general alarm and muster the passengers at the lifeboat stations. At 1120, the expedition leader broadcast a message, in English, over the PA system to inform passengers that the crew was assessing the situation and to wait for further instructions.

At 1130, as passengers had been questioning the ongoing situation, the expedition leader requested the master's permission to broadcast more information over the PA system. Permission was granted and the expedition leader announced in English that the *Akademik Ioffe* had grounded, that the hull had not been breached, and that the master would use the vessel's thrusters to free the vessel. The expedition leader also asked passengers to await further information. One minute later, the master tried refloating the vessel using both main engines and the stern azimuthing thruster, further dragging the hull against the rocky shoal.

1.5 Post-Grounding Search and Rescue Response

At 1213, the *Akademik Ioffe*'s radio officer broadcast a distress message through the GMDSS's digital selective calling (DSC) function.¹⁷ The DSC message was received by the CCG's Marine Communications and Traffic Services (MCTS) in Iqaluit, Nunavut, and by the Joint Rescue Coordination Centres (JRCC) in Halifax, Nova Scotia; Stavanger, Norway; and Portsmouth, United States of America.

At 1219, the JRCC in Trenton, Ontario, responsible for coordinating search and rescue (SAR) operations in the region where the grounding occurred,¹⁸ was informed of the situation and initiated its response 4 minutes later.¹⁹ The CCG vessels *Pierre Radisson* and *Amundsen* were tasked at 1225 and 1232 respectively to immediately deploy to the last position reported by the *Akademik Ioffe*; the estimated time of arrival (ETA) for the *Pierre Radisson* was 36 hours and the ETA for the *Amundsen* was 22 hours. The Canadian Hydrographic Service (CHS) provided the CCG vessels with the positions of all potential shoals in the vicinity of the grounding location (Appendix B).

At 1235, MCTS Iqaluit contacted the *Akademik Ioffe* to acknowledge receipt of its DSC distress message. The master then confirmed that the vessel was taking on water in some ballast water and fuel oil tanks, that shipboard pumps were running, discharging the ruptured tanks' contents to the sea and keeping up with the rate of water ingress, and that the vessel was sitting upright on the rocky shoal.

At 1255, 2 CC-130H Hercules aircraft²⁰ were tasked to deploy from the Canadian Armed Forces (CAF) airbases in Trenton and Winnipeg, Manitoba, to the site of the grounding. At 1256, JRCC Trenton asked MCTS Iqaluit to broadcast a Mayday relay.²¹ At 1300, the vessel *Polar Prince* reported being 670 nautical miles (NM) away from the *Akademik Ioffe*, with an ETA of 96 hours. At 1318, JRCC Trenton tasked the *Akademik Ioffe*'s sister vessel, the *Akademik Sergey Vavilov*, to deploy immediately after having retrieved its passengers from an onshore excursion. At 1330, another CC-130H Hercules aircraft²² was tasked from the Greenwood, Nova Scotia, airbase. At 1345, 2 CH-149 Cormorant helicopters²³ were also tasked from the Greenwood and Gander, Newfoundland and Labrador, airbases.

At 1412, Canada's major aeronautical disaster (MAJAID)²⁴ contingency plan was initiated. At 1438, One Ocean Expeditions informed JRCC Trenton that the master of the *Akademik Ioffe* was trying to refloat the vessel; this information raised concerns among JRCC staff. At 1449, Canada's major maritime disaster (MAJMAR)²⁵ contingency plan was initiated by JRCC Trenton. By 1507, the *Akademik Sergey Vavilov* had completed boarding its

passengers and departed toward the occurrence site, with an ETA of 12 hours. At 1513, the master of the *Akademik Ioffe* informed JRCC that the vessel was stable, that 3 tanks were punctured, that he did not want to evacuate the passengers at that time, and that he wanted to refloat the vessel.

At 1530, the Mayday relay broadcast by MCTS Iqaluit was downgraded to a PAN PAN.²⁶ At 1850, the master of the *Akademik Ioffe* confirmed with JRCC Trenton that his plan was to not order the abandonment of the vessel to the lifeboats, but instead to wait and transfer all passengers and expedition staff to the *Akademik Sergey Vavilov* once it arrived. At 2021, a CC-130H Hercules aircraft arrived overhead of the *Akademik Ioffe* and stood by, circling around it. The aircraft was relieved by another CC-130H Hercules at 2210.

At 2333, the *Akademik Ioffe* was refloated using a combination of its propulsion and the flooding tide. The vessel immediately proceeded away from the rocky shoal and anchored 2.4 NM northeast of it. On 25 August at 0050, JRCC Trenton released the CC-130H Hercules aircraft from the scene. At 0517, the *Akademik Sergey Vavilov* arrived and anchored 1.2 NM off the *Akademik Ioffe*.

The master of the *Akademik Ioffe* did not wait for a CCG vessel to arrive before evacuating the vessel. Although not enough lifesaving appliances were available on the *Akademik Sergey Vavilov* for the combined complements of both vessels, the JRCC and TC agreed to the evacuation plan.

At 0632, the evacuation of all passengers and expedition staff from the *Akademik Ioffe* to the *Akademik Sergey Vavilov* began using the inflatable boats from both vessels. At 0741, the CCG vessel *Amundsen* deployed its Bell 429 helicopter²⁷ to oversee the evacuation; the *Amundsen* arrived on site at 0758. By 0810, all 126 passengers and expedition staff from the *Akademik Ioffe* had been transferred to the *Akademik Sergey Vavilov*, bringing the *Akademik Sergey Vavilov's* total complement to 270 persons on board; the transfer of the luggage and extra stores was completed at 0909. The 37 crew members remained on board the *Akademik Ioffe*.

At 0912, the *Akademik Sergey Vavilov* departed the occurrence site for Kugaaruk with the passengers from the *Akademik Ioffe* on board, after having been granted an exemption from TC to sail with 100 persons more than the vessel's lifesaving equipment capacity.

At 1500, the CCG vessel *Pierre Radisson* arrived on scene and relieved the *Amundsen*, which departed immediately to resume its normal operations. The *Akademik Sergey Vavilov* arrived in Pelly Bay and anchored off Kugaaruk at 1824; throughout that evening and the following morning, passengers and

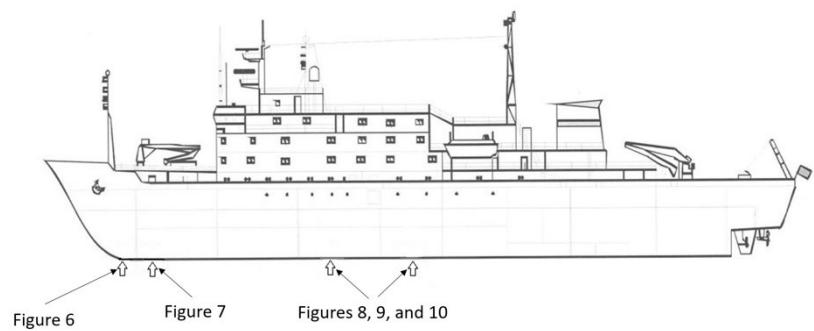
expedition staff were disembarked and brought ashore using the vessel’s inflatable boats.

A commercial diving company was retained to deploy to the *Akademik Ioffe*; on 02 September, the initial underwater surveys and damage assessments were completed. The CCG vessel *Pierre Radisson* was released and departed the scene on 05 September. On 11 September, the divers completed their underwater temporary repairs to the *Akademik Ioffe*’s hull. TC cleared the vessel to sail and, on 14 September, the vessel departed from the Astronomical Society Islands for the shipyard in Les Méchins, Québec, where it arrived on 25 September to be dry docked.

1.6 Damage to Vessel

Following the grounding of the *Akademik Ioffe* and the subsequent attempts to refloat it, the vessel sustained extensive structural and hull damage in way of the double-bottom ballast water and fuel oil bunker tanks, from the bow to amidships (Table 2). Two fuel oil bunker tanks (No. 41 port and No. 41 centre) and 2 ballast water tanks (No. 21 centre and No. 51 port) were breached and took on seawater, flooding to their maximum capacity. Details of the damage and location of hull breaches are also provided in Figure 5.

Figure 5. Location of hull breaches, indicated by arrows (Source: TSB)



On 28 September and 03 October 2018, the TSB visited the shipyard in Les Méchins to document the hull damage sustained by the *Akademik Ioffe* [See Figures 6, 7, 8, 9, and 10 in the original report).

1.7 Damage to the Environment

Prior to the grounding, the vessel’s port and centre fuel oil bunker tanks No. 41 contained 0 m³ and 16 m³ of IFO respectively. Following the

grounding, these 2 tanks were flooded with seawater to their maximum capacity of 158 m³ and 168 m³ respectively. The master reported to JRCC Trenton, CCG, and TC that 489 m³ of IFO and 150 m³ of MGO remained on board.

On 30 August 2018 at 1100, an aircraft from TC's National Aerial Surveillance Program observed an oil slick on the surface of the sea in the Gulf of Boothia, 0.5 NM from the *Akademik Ioffe*. The volume of oil was estimated at 80.51 L, covering 0.99 km² [square kilometres], and was determined to be unrecoverable.

On 30 September, at 0919, in Les Méchins, while shipyard personnel were emptying the graving dock after docking the *Akademik Ioffe*, a mixture of seawater and IFO escaped from tanks No. 41 and contaminated the waters around the vessel. Shipyard personnel contained the oil spill to the inside of the graving dock and later recovered the fuel oil.

1.8 Environmental Conditions

At the time of the occurrence, the air temperature was 1.9°C [Celsius], the skies were overcast with a visibility of 5 NM, the wind was from the north at 21 knots,²⁸ and the swell was from the north with waves of 1.5 m in height. The *Akademik Ioffe* was sailing in ice-free waters of a temperature of 1.02°C and was taking the swell on its starboard quarter. The tide was flooding; the high tide occurred at 1549 (1.5 m), was low at 2023 (0.9 m), and was high again at 0326 (2.8 m) on 25 August 2018.

[...]

1.16 Charting in the Canadian Arctic

1.16.1. Role and Mandate of the Canadian Hydrographic Service

According to the *Oceans Act*,²⁹ the Minister of Fisheries, Oceans and the Canadian Coast Guard is responsible for the Government of Canada's policies and programs regarding oceans. Among other responsibilities, the Minister provides hydrographic services to promote safe marine navigation and facilitate maritime trade and commerce. Through the Canadian Hydrographic Service (CHS), the Minister may conduct hydrographic and oceanographic surveys of Canadian and other waters, and prepare and publish data, reports, statistics, charts, maps, plans, and other documents.

According to the regulations³⁰ enacted under the authority of both the *Canada Shipping Act, 2001*, and the *Arctic Waters Pollution Prevention Act*, vessels must carry up-to-date charts and other nautical publications necessary for their intended voyage, made by or under the authority of the CHS.

The CHS is also responsible for ensuring that Canada fulfills certain international obligations. The SOLAS Convention requires contracting states such as Canada to provide hydrographic services adequate for the needs of safe navigation as well as adequate, up-to-date charts and publications for all ships.³¹ The CHS is also responsible for producing charts or publicizing the coordinates for Canada's maritime boundaries, as required under the United Nations Convention on the Law of the Sea. Finally, the CHS works with the IMO to establish ECDIS carriage requirements.

The CHS delivers its services by performing targeted hydrographic surveys, which provide data to map the seafloor, and communicating this information to mariners via electronic and paper navigational charts. These authoritative products are maintained and updated with new information on a continual basis via NOTMAR. The CHS also operates a network of tide gauges, which provide real-time measurements of sea or lake levels, and inform tide tables.

1.16.2 Data Quality and Survey Standards

The CHS does not have vessels dedicated to data collection in the Canadian Arctic and relies primarily on CCG vessels and other vessels of opportunity³² to deploy its survey launches. This means that the CHS collects data in areas where the CCG is already operating; for example, while CCG icebreakers are on standby for ice escorts. The CHS also partners with other federal departments, territorial governments, and academic organizations for data collection, such as the Royal Canadian Navy, Natural Resources Canada, Parks Canada, and ArcticNet.³³ The CHS conducts surveys in the Canadian Arctic mainly based on opportunity and is therefore often challenged to address the higher risk areas first.³⁴

The remoteness, harsh meteorological conditions, seasonal and permanent sea ice coverages, and the historically low marine traffic in Canadian Arctic waters are factors that impact the quality of hydrographic data collected, some of which are decades old. In 2014, only about 1% of Canada's Arctic waters were surveyed to modern standards.³⁵ By April 2019, 14% of Canada's Arctic waters had been surveyed to modern or adequate standards.

In the CHS's *Sailing Directions ARC 400*, mariners are warned that "[i]n some areas, spot soundings through the ice or reconnaissance track soundings are the only survey data available."³⁶

Spot soundings through the ice are single depth measurements taken at 2000 m intervals, commonly referred to as through-ice bathymetry. Depth measurements are taken through the ice with a fixed grid-spaced single

beam sounding: a transducer is physically placed on the ice and a single depth and position reading is recorded. The hydrographer is transported between the grid-spaced sites by helicopter. The shape of the seafloor between the recording sites is unknown and can only be inferred.

Reconnaissance track sounding is another technique used to record depth measurements, where a vessel of opportunity records the water depths and vessel positions along its sailing path or track (the technique may be digital or analog). Typically, the track is a single pass with no offsetting or reciprocal lines and in which case, the level of accuracy is uncertain and no information is collected about depths on either side of the vessel's track.

The CHS's *Sailing Directions ARC 402* issue the following cautions for the area of the occurrence:

- The depths in Prince Regent Inlet and Gulf of Boothia are based on reconnaissance surveys and ships' track soundings. Much of this area is not surveyed to modern standards. A spot sounding survey through the ice, with a grid spacing of about 1 mile, was made in 1984 and some additional inshore depths were obtained. Soundings on charts of Bellot Strait and approaches are based on controlled and uncontrolled surveys made from 1957 to 1959. Committee Bay was surveyed from 1984 to 1992; these were reconnaissance surveys with 2 km between soundings;
- The magnetic compass is unusable in Prince Regent Inlet and Gulf of Boothia and erratic in Committee Bay.³⁷

Additionally, *Sailing Directions ARC 402* describe the Astronomical Society Islands as being

[...] rocky, rounded, bare and uniform in height; they are higher on their west sides where they rise to over 213 m [...]. From air photos there appears to be deep water close to the shores of Astronomical Society Islands and in the channels between them.³⁸

The area where the *Akademik Ioffe* ran aground is a very remote portion of the Canadian Arctic, normally covered in ice for much of the year, and has a short navigation season; mariners consider the navigational aids and references for this region (except for main shipping corridors) to be somewhat unreliable. Mariners are cautioned to continuously run an echo sounder in these waters and to use the largest scale chart available.^{39,40}

The CHS navigation chart 7502, which was used on board the *Akademik Ioffe* (in paper and electronic format) at the time of the occurrence[,] includes a note to mariners that the information used to establish water depths was of a reconnaissance nature and collected from CHS spot sounding surveys from

1984 to 1992, at a spacing of 2000 m, as well as track soundings from other agencies. Another inset on this chart elaborates on the 2 above-described types of reconnaissance data used for the portrayal of the seafloor.⁴¹

Following the occurrence, the CHS issued, via the CCG's NAVWARN A111/18, a warning indicating the location and depth of the rocky shoal on which the *Akademik Ioffe* had run aground. The CCG later published a formal NOTMAR on 12 October 2018 correcting navigation chart 7502, which cancelled the NAVWARN A111/18.

In October 2018, a study was released by the CHS as part of a project for satellite-derived bathymetry using empirical, photogrammetric, and classification modelling. The Canadian Space Agency funded this project, which was designed to investigate the potential of remote sensing and improve the chart production process of the CHS. This satellite-derived bathymetry would allow the CHS to identify new shoals and rocks, and to extract isobaths. This method of chart production is still at a developmental stage.⁴²

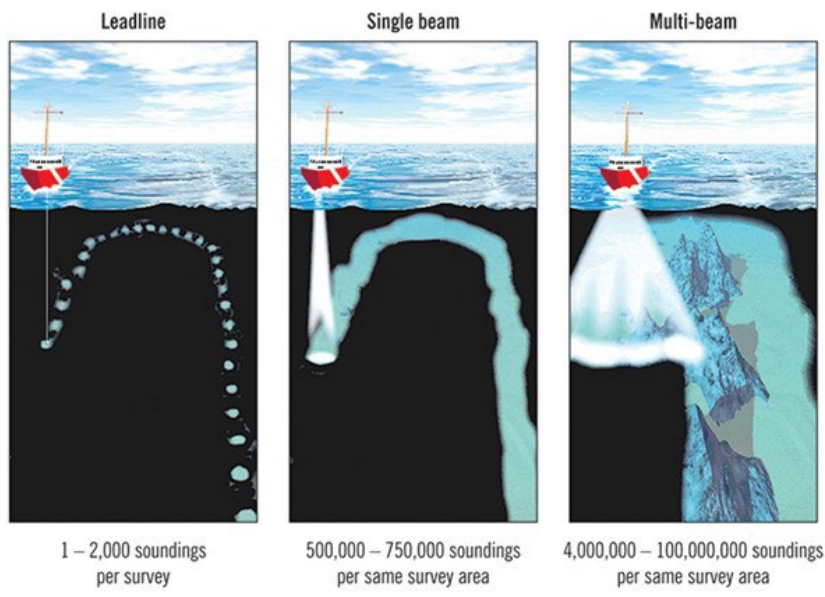
1.16.3. 2014 Fall Report of the Commissioner of the Environment and Sustainable Development, Office of the Auditor General of Canada

In 2014, the Office of the Auditor General of Canada published a report from its Commissioner of the Environment and Sustainable Development. Chapter 3 of the report addressed marine navigation in the Canadian Arctic, where the Commissioner reported that although it was not reasonable to expect the entire Canadian Arctic to be surveyed to modern standards, it was expected that reliable information for the higher risk areas, where vessel traffic was most prevalent such as approaches to northern communities, be available.

The report gave a description of the factors affecting hydrographic data collection quality:

The quality and accuracy of nautical charts depend on the data used to produce them. Modern charts are compiled from hydrographic surveys conducted on vessels equipped with sonar technology that measures water depths, while satellite navigation systems, such as the global positioning systems, determine the precise geographic positions of the vessels' soundings. Data collected through post-1970s technology, including single-beam sonar technology, is referred to as "surveyed to adequate standards." Data collected through multi-beam sonar technology that became commercially available in the 1990s is referred to as "surveyed to modern standards" [Figure 12].⁴³

Figure 12. Technological evolution of seafloor mapping in the Arctic (Source: Office of the Auditor General of Canada, adapted from the Canadian Hydrographic Service)



Chapter 3 noted that the CHS conducted an assessment of the paper navigation charts covering the Canadian Arctic. The assessment was based on factors such as chart age (10% of charts for the Arctic date from 1970 or earlier), the reference system used to establish data positions, and whether more recent information not included in the charts was available. The assessment found less than 25% of the paper charts in the Canadian Arctic to be “good.”⁴⁴

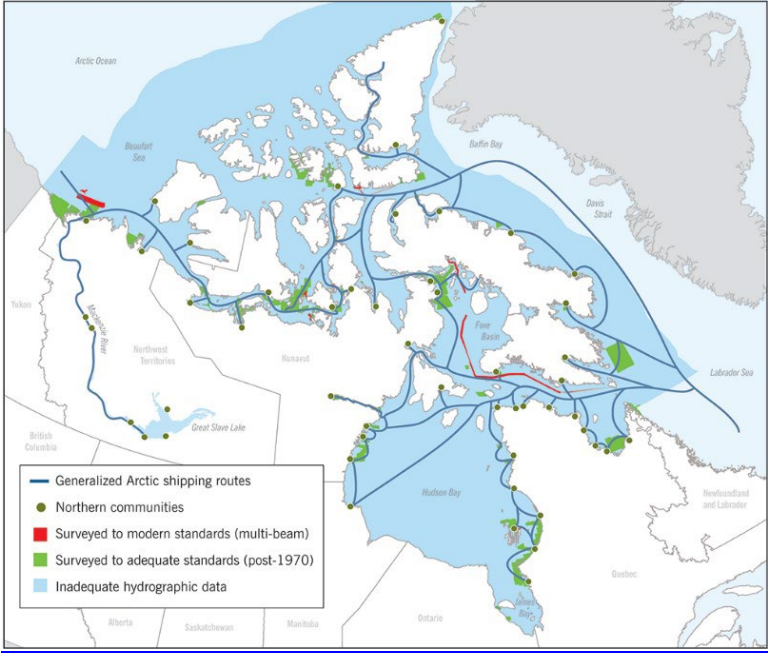
The report also noted that

[...] large areas of Canadian Arctic waters, including many of the main traffic corridors, have either non-existent or inadequate hydrograph[ic] data coverage. The CHS estimates that about one percent of Canadian Arctic waters are surveyed to modern standards [Figure 13].⁴⁵

Moreover, the report noted that

[t]he charts based on data collected through hydrographic surveys that do not meet adequate or modern standards generally have a high likelihood of undetected hazards and uncertainty in position of the data.⁴⁶

Figure 13. Canadian Arctic shipping routes and their survey standards
(Source: Office of the Auditor General of Canada, adapted from the Canadian Coast Guard)



Chapter 3 of the Commissioner’s report also stated that [w]hile demands for charting in the Arctic are growing, the CHS’s resources to do hydrographic work in the Arctic have recently declined. This is an additional challenge on top of a lack of dedicated vessels for conducting surveys, the size and remoteness of the Arctic waters, and the short season in which to carry out the work.⁴⁷

The Commissioner recommended that the CHS identify and prioritize the areas of the Arctic region that need to be surveyed and charted. The report also recommended that the CHS develop a long-term implementation plan with cost estimates, timelines, and options that could include collaboration with partners, alternative service delivery, and the use of modern technologies. The CHS agreed with both recommendations.⁴⁸

1.16.4. Present and Future Developments in Charting the Canadian Arctic

Prior to 2016, CHS data acquisition and charting strategies in the Canadian Arctic focused hydrographic resources mostly where vessels traditionally transit, called low impact shipping corridors (LISC). However,

this occurrence happened outside of these corridors. Since 2016, the CHS has received additional funding to fulfill its mandate. This funding allows it to arrange time periods during which CCG vessels are dedicated to hydrographic surveying in the Canadian Arctic, and to contract commercial hydrographic survey providers to work on high-priority locations. The CHS reported that by June 2019, the coverage in LISCs to adequate or modern hydrographic surveying standards was around 31%.

Additionally, the CHS plans to chart Canadian Arctic waters to modern hydrographic standards using a federal program that funds the incremental installation of modern hydrographic sonars, or multi-beam echo sounders, on CCG ice-breaking vessels. This program aims to collect modern hydrographic data while the CCG vessels transit the Canadian Arctic for other purposes (scientific research, sealift of supplies to remote communities, escorts of merchant vessels through ice-infested waters, and SAR standby posture), thereby gradually increasing the amount of data available to the CHS with each vessel pass.

At the time of the occurrence, 4 CCG ice-breaking vessels were equipped with multi-beam echo sounders and 2 more vessels were scheduled to be fitted with this equipment by 2020. The CHS emphasizes the importance of this technology to its strategy by noting that more than 50% of all modern hydrographic data collected for Canadian Arctic waters is a direct result of opportunistic multi-beam echo sounder data collected by the CCG vessel *Amundsen* alone since the vessel was fitted with this hydrographic data collection technology in 2003.

The use of remote sensing tools, such as satellite imagery for direct hydrographic observations, is a developing technology that is not fully integrated into the CHS's standard operations. Since 2017, the CHS has been involved in discussions with the IHO [International Hydrographic Organization] and hydrographic organizations from other states about implementing remote sensing tools in hydrography. In 2018, the CHS published its first chart using satellite data as source data, and shared its experience using satellite imagery with its IHO partners during the IHO's October 2018 Council. The IHO continues to assess the technology as it develops and to provide advice and guidance to its member states, including Canada.

The CHS intends to integrate remote sensing and satellite-derived bathymetry, among other technologies, to its strategy to achieve modern standard hydrography for Canadian Arctic waters. Other states' hydrographic organizations have successfully used remote sensing and

satellite-derived bathymetry technologies in water depths up to 20 m, although the technologies' effectiveness can be reduced by poor weather conditions, water turbidity, erosion, and sedimentation.

The CHS warns that although satellite imagery can positively identify the location of potential hazards to navigation, this does not imply or guarantee that hazards do not exist if they were not identified. For instance, the CHS points out that this lack of reliability is particularly relevant in the context of this occurrence; all 4 vessels involved⁴⁹ were provided with information derived from satellite imagery (Appendix B), but all 4 vessels are of a small displacement, with operational draughts ranging from 5 m to 7 m. The turbidity of the seawater, the presence of ice, and unfavourable weather conditions may prevent the satellite imagery from detecting a shoal that could present a hazard to navigation for larger vessels operating at deeper draughts.

Since 2014, the CHS has published 42 new electronic navigational charts (ENCs) and produced 70 new edition ENCs for Canadian Arctic waters. The CHS currently does not have a timetable to collect hydrographic data for all Canadian Arctic waters that would comply with modern international standards of hydrography.

[...]

1.22 National Search and Rescue System in Canada

1.22.1. Major Aeronautical Disaster and Major Maritime Disaster Contingency Plans

The CAMSAR Manual describes a major aeronautical disaster (MAJAID) as an aeronautical incident occurring in a remote area of Canada that, because of the number of people involved, requires augmentation of established SAR facilities. The Canadian Joint Operations Command Search and Rescue (CJOC SAR) staff is responsible for preparing the response to a MAJAID within Canada's SAR area of responsibility. During a distress case with a potential or confirmed MAJAID situation, on behalf of CJOC SAR, the response will be initiated and coordinated by the JRCC responsible for the SRR where the distress occurs.⁵⁰

During a declared MAJAID situation, the responsible JRCC launches its primary SAR resources, recalls off-duty personnel to base, and prepares all serviceable aircraft for imminent launch; if necessary, the JRCC also requests additional SAR resources from the other 2 SRRs. During the implementation of the MAJAID contingency plan and regardless of the SRR in which the incident occurred, JRCC Trenton prepares an aircraft that will deploy a

MAJAID sustenance kit to the site of occurrence, consisting of containers carrying food, water, tents, stoves, heaters, survival kits, first aid supplies, and other supplies for 320 survivors.⁵¹

The CAMSAR Manual describes a major maritime disaster (MAJMAR) as a maritime distress incident or other distress incident occurring on the waters of the SRR for which the JRCC or maritime rescue sub-centre is responsible, and of such scale that the federal SAR system alone can no longer coordinate, control, and respond to all aspects of the SAR for survivors and the preservation of life. In a typical MAJMAR, the number of persons in distress is unusually large, and support from other entities operating outside of the Canadian SAR system, such as other federal agencies or civilian resources, is required. The CAMSAR Manual cites, as examples of potential MAJMAR situations, the mass evacuation of an offshore oil rig or the evacuation of a large passenger vessel's complement. The activation protocol of the MAJMAR contingency plan is similar to the activation protocol for the MAJAID contingency plan.⁵² Any SAR aircraft deploying on a MAJMAR response will also carry extra inflatable life rafts that can be launched from above the vessel in distress.

1.22.2 Search and Rescue Response to the Akademik Ioffe's Grounding

The *Akademik Ioffe* broadcast the distress message reporting its grounding at 1213 on 24 August 2018, a Friday, when all Canadian aeronautical SAR assets were operating on a Tier 1 SAR readiness posture. The CCG vessels *Pierre Radisson* and *Amundsen* were already sailing the Canadian Arctic on their annual sealift support mission, and were assigned as primary SAR units, following a 30-minute readiness posture.⁵³ They were tasked at 1225 and 1232 respectively. The *Amundsen* went underway immediately after being tasked while the *Pierre Radisson* went underway at 1420. The *Pierre Radisson* was stood down from the SAR case at 1043 on 25 August, but continued to the occurrence site to provide support to the CCG's Environmental Response program. The *Amundsen* was released from the SAR case at 1458 on 25 August when the *Pierre Radisson* arrived on site.

Two hours following the initiation of its SAR response, as JRCC staff became concerned that the *Akademik Ioffe* was attempting to refloat itself and might have to be abandoned by its complement, the MAJAID contingency plan was activated. The MAJMAR contingency plan was activated 37 minutes later. Because all aeronautical SAR assets were stationed at their respective airbases in Winnipeg, Trenton, Gander, and Greenwood, multi-hour flights were forecasted and extra relief flight crews and SAR specialists were paged from their homes.

CC-130H Hercules aircraft search and rescue units (SRUs) 332-424, 333-435, and 343-413 have a maximum range of 7222 km, and the first two flew directly from their respective airbases to the occurrence site without stopping to refuel. CH-149 Cormorant helicopter SRUs 905-103 and 910-413 have a maximum range of 1018 km, and each helicopter had to refuel at different airfields along its route.

SRU 332-424 was tasked at 1255, took off at 1359 from Trenton, and arrived on scene at the site of grounding at 2021, 6 hours and 22 minutes after having departed its airbase. SRU 332-424 left the scene at 2210 and then proceeded to Rankin Inlet where it landed at 2351 for refuelling and crew resting. It took off at 1403 on 25 August and landed at 1841 in Trenton.

SRU 333-435 was tasked at 1255 on 24 August, took off at 1740 from Winnipeg, and arrived on scene at 2210, 4 hours and 30 minutes after having departed its airbase. On 25 August, at 0050, JRCC Trenton stood the aircraft down; it proceeded to Rankin Inlet for refuelling, and landed there at 0230. It took off from Rankin Inlet at 0335 to resume SAR duties, and was released from the *Akademik Ioffe's* SAR case when it landed in Winnipeg at 0705.

At 1330 on 24 August, SRU 343-413 was tasked to transport relief aircrews to the Canadian Arctic; it took off from Greenwood at 1743. The aircraft landed in Gander at 2131, took off again at 2256, and landed in Iqaluit at 0248 on 25 August. It took off at 0504 from Iqaluit toward Greenwood, and was released from the SAR case when it landed at 0848 in Greenwood.

SRU 905-103 was tasked at 1345 on 24 August and took off at 1520 from Gander. It landed in Goose Bay, Newfoundland and Labrador, at 1815 for refuelling and took off again at 1902; it landed once more in Kuujuaq, Quebec, at 2215 for refuelling, then departed at 2259 and landed in Iqaluit at 0143 on 25 August. The SRU 905-103 returned to base on 28 August.

SRU 910-413 was tasked at 1345 on 24 August and took off at 1555 from Greenwood. It landed in Sept-Îles, Quebec, at 1827 for refuelling and took off again at 1956. The aircraft landed in Kuujuaq at 2323 for refuelling and took off again at 0008 on 25 August, landing in Iqaluit at 0258. The SRU 910-413 was released from the SAR case at 0955. The SRU 910-413 returned to base on 28 August.

JRCC Trenton declared the SAR response to the *Akademik Ioffe's* occurrence closed on 29 August at 1313 (1913 UTC).

1.23 Other Occurrences

On 29 August 1996, the passenger vessel *Hanseatic* ran aground in Simpson Strait while on passage from Gjoa Haven, Nunavut, to Resolute Bay, Nunavut.

From 2000 to 2018, 74 occurrences involving vessel grounding or bottom contact in the Canadian Arctic were reported to the TSB, including this occurrence. Six of these occurrences involved passenger vessels. Four of the occurrences involving passenger vessels took place in the Mackenzie River, Northwest Territories; the other 2 occurrences, involving the *Clipper Adventurer* (2010) and the *Akademik Ioffe* (2018), were the only occurrences within this period where passenger vessels ran aground within the Canadian Arctic Archipelago.

Additionally, on 23 August 2019, the charter yacht *Hanse Explorer* ran aground in Admiralty Inlet (Baffin Island) off the Peter Richards Islands, Nunavut, with 26 people on board.

Finally, several occurrences with similarities to this one have been noted in both non-Arctic Canadian and foreign waters.

A full list of previous occurrences and their summaries is available in Appendix C.

2.0 Analysis

This analysis will discuss the factors leading to the *Akademik Ioffe's* grounding, as well as the vessel's voyage planning and risk assessment, navigational watchkeeping and bridge resource management (BRM) practices, and passenger safety management practices. This analysis will also examine issues regarding charting Canadian Arctic waters, approval of Arctic voyage routing, and search and rescue resources in the Canadian Arctic.

2.1 Factors Leading to the Vessel's Grounding

Due to the prevailing environmental conditions at the Hecla and Fury Islands, the *Akademik Ioffe* deviated from its original voyage plan toward Lord Mayor Bay, west of the Astronomical Society Islands. The master was required to submit a deviation report to Transport Canada (TC), via Northern Canadian Vessel Traffic Services (NORDREG), which acknowledged and approved the requested deviation based on the area's existing ice conditions, per its mandate.

In his assessment of the new voyage plan, the master relied on a Canadian chart but was not aware that the chart contained outdated and partial bathymetric data despite the chart indicating such. He also relied on Russian sailing directions to determine water depths along the intended route, which did not provide any specific warning about the area of the occurrence. In preparing a new voyage plan based on the Canadian chart and Russian

sailing directions, the master concluded that the shallowest water depth the vessel might encounter was 50 m. Consequently, the master did not implement any additional precautions.

Because of the quarterly swell and winds, the bridge team, consisting of an officer of the watch (OOW) and a helmsman, had to navigate the *Akademik Ioffe* at a speed of about 8 knots for steerage. The autopilot was ineffective in those environmental conditions, and so the helmsman had to hand steer the vessel. While steering the vessel, the helmsman was no longer acting as a lookout. The OOW was therefore the sole person acting as lookout while also monitoring the bridge navigation equipment. As the vessel entered the narrows between the Ross Peninsula and the Astronomical Society Islands, extra watchkeeper(s) to assist the bridge team were not assigned nor requested, as required by the vessel's safety management system's (SMS) standard operating procedures (SOPs).

While transiting the narrows, the OOW was multitasking, the helmsman was busy steering the vessel, and no other crew were tasked with monitoring the echo sounders and keeping lookout. As a consequence, they did not notice the under-keel water depth steadily decrease. The master, on the bridge carrying out administrative duties, also did not notice the decrease, as the under-keel low water depth aural and visual alarms for both echo sounders were turned off. By the time the OOW noticed the decreasing water depth on the echo sounder display, it was too late for the bridge team to take evasive action, and the vessel, which had been travelling at 7.6 knots, ran aground on an uncharted rocky shoal.

The master attempted to free the vessel from the rocky shoal using the vessel's propulsion, which aggravated damage to the hull. Subsequently, the vessel broadcast a distress call 60 minutes following the grounding.

Because of the occurrence site's remote location, the first air search and rescue unit (SRU) arrived overhead more than 8 hours following the distress call. Because the vessel was stable and refloated with the evening tide, passengers were evacuated the next morning, once the *Akademik Sergey Vavilov* arrived 18 hours after the grounding. Approximately 2 hours and 31 minutes later, the Canadian Coast Guard[s] (CCG) *Amundsen* arrived.

[...]

3.0 Findings

3.1 Findings as to Causes and Contributing Factors

These are conditions, acts or safety deficiencies that were found to have caused or contributed to this occurrence.

1. Due to the prevailing environmental conditions at the Hecla and Fury Islands, the *Akademik Ioffe* deviated from its original voyage plan toward Lord Mayor Bay, west of the Astronomical Society Islands.
2. In his assessment of the new voyage plan, the master relied on a Canadian chart but was not aware that the chart contained outdated and partial bathymetric data despite the chart indicating such.
3. In preparing a new voyage plan based on the Canadian chart and Russian sailing directions, the master concluded that the shallowest water depth the vessel might encounter was 50 m. Consequently, the master did not implement any additional precautions.
4. While transiting the narrows, the officer of the watch was multitasking, the helmsman was busy steering the vessel, and no other crew were tasked with monitoring the echo sounders and keeping lookout. As a consequence, they did not notice the under-keel water depth steadily decrease.
5. The under-keel low water depth aural and visual alarms for both echo sounders were turned off.
6. By the time the officer of the watch noticed the decreasing water depth on the echo sounder display, it was too late for the bridge team to take evasive action, and the vessel, which had been travelling at 7.6 knots, ran aground on an uncharted rocky shoal.
7. The master attempted to free the vessel from the rocky shoal using the vessel's propulsion, which aggravated damage to the hull.

3.2 Findings as to Risk

These are conditions, unsafe acts or safety deficiencies that were found not to be a factor in this occurrence but could have adverse consequences in future occurrences.

1. If a vessel's crew conducts passage planning and assessment based on incomplete and unreliable navigational data without taking mitigating measures, there is an increased risk to the safety of the vessel and its complement.
2. If bridge navigation equipment is not optimally operated and automatic safety features such as alarms are turned off, there is a risk that a bridge team will miss critical information, especially in situations where the prevailing navigating conditions create a high workload for bridge team members.
3. If the bridge team composition is inadequate during periods of high workload, such as when transiting confined waters, there is a risk that

critical navigational parameters, such as the under-keel water depth, will not be properly monitored, compromising vessel safety.

4. If passengers are not familiarized with shipboard lifesaving appliances upon their embarkation and before the vessel proceeds to sea, there is a risk they will not be able to respond appropriately to an emergency situation, should the need arise early in the voyage.
5. If passenger safety briefings and familiarizations are planned and delivered by uncertified staff rather than qualified crew members, there is risk that lapses in this critical familiarization will occur and impede passenger readiness in an emergency.
6. If critical safety tools such as emergency procedures and decision support systems are not optimized for use by the crew in an emergency or simultaneous emergencies, there is a risk that their response will be uncoordinated.
7. If proper post-occurrence contingency actions are not taken in an emergency situation, there is a risk of adverse consequences affecting the seaworthiness of the vessel or the safety of its passengers and crew.
8. If passengers are not given concise information and clear instructions during a shipboard emergency, there is a risk that passengers will become confused and react in an uncoordinated manner, delaying an orderly evacuation and compromising their safety.
9. If the coastal waters surrounding the Canadian Arctic Archipelago are not surveyed to modern international hydrographic standards and the existing government-issued navigation charts are based on incomplete bathymetric data, there is a risk that mariners will not have adequate information to safely navigate in these waters.
10. Until the coastal waters surrounding the Canadian Arctic Archipelago are adequately charted, and if alternate mitigation measures are not put in place, there is a persistent risk that vessels will make unforeseen contact with the sea bottom.
11. If the mandate of a vessel traffic coordinating and controlling organization does not include warning vessels to use extreme caution as they sail into poorly surveyed waters, there is a risk that crews will miss critical warnings from the official navigational publications, compromising the safety of their vessels and complements.
12. Given the increasing volume of vessel traffic in the Canadian Arctic, if search and rescue resources are not able to provide assistance to a marine occurrence in a timely manner, there is an increased risk of

adverse consequences to vessels, their complements, and the environment.

3.3 Other Findings

These items could enhance safety, resolve an issue of controversy, or provide a data point for future safety studies.

1. The master of the *Akademik Ioffe* did not wait for a Canadian Coast Guard vessel to arrive before evacuating the vessel. Although not enough lifesaving appliances were available on the *Akademik Sergey Vavilov* for the combined complements of both vessels, the Joint Rescue Coordination Centre and Transport Canada agreed to the evacuation plan.
2. At 0912, the *Akademik Sergey Vavilov* departed the occurrence site for Kugaaruk with the passengers from the *Akademik Ioffe* on board, after having been granted an exemption from Transport Canada to sail with 100 persons more than the vessel's lifesaving equipment capacity.
3. The 4 certified bridge watch officers on board the *Akademik Ioffe* had completed and signed the P.P. Shirshov Institute of Oceanology of [the] Russian Academy of Sciences' familiarization checklist for shipboard bridge equipment. The equipment familiarization checklist on board the *Akademik Ioffe* included the use of the echo sounders but did not include the electronic chart display and information systems.
4. An Arctic Pollution Prevention Certificate was issued to the vessel, although it was not required. The certificate stated that the vessel was carrying the most recent editions of the Canadian *Sailing Directions*, the Canadian Notices to Mariners, and the *Ice Navigation in Canadian Waters*, despite the fact that the most recent editions of these publications were not on board the vessel at the time the certificate was issued.
5. The *Akademik Ioffe* initiated its expedition cruise from a Canadian location (Kugaaruk, Nunavut) not listed in the letter of compliance for its coasting trade licence.
6. The minimum and maximum operating draughts prescribed in the Arctic Pollution Prevention Certificate differed from those stated on the vessel's Polar Ship Certificate.
7. The *Akademik Ioffe*'s shipboard post-grounding checklist required the master to attempt refloating the vessel after mustering the entire complement, but before carrying out a damage assessment that included the integrity of the hull and its appendages.

8. It is within Transport Canada's mandate to assess a vessel's ice navigation capabilities against existing ice conditions. The Northern Canada Vessel Traffic Services serves as a communication intermediary between the vessel and Transport Canada for the information exchange; Northern Canada Vessel Traffic Services does not have the mandate, expertise, or regulatory authority to assess the safety of a vessel's intended passage for hazards.
9. Although they were included in the *Akademik Ioffe's* safety management system, procedures for responding to a grounding or flooding or for evacuating the crew, expedition staff, and passengers were not included in the decision support system.
10. Contrary to the *International Convention for the Safety of Life at Sea, 1974* requirements, the lifeboat mustering and ship safety briefing were carried out more than 12 hours after the vessel's departure to sea from its anchorage off Kugaaruk.
11. The investigation determined that the passenger safety checklist had not been updated to reflect the 2015 amendment to the *International Convention for the Safety of Life at Sea, 1974*, which requires specific tasks to be conducted prior to or immediately upon vessel departure.
12. The first Port State Control inspection, conducted by Transport Canada in Louisbourg, Nova Scotia, did not identify any of the 12 deficiencies noted during the post-occurrence Port State Control inspection 37 days later while the *Akademik Ioffe* was at anchorage off the Astronomical Society Islands.
13. Although some passenger vessels carry forward-looking sonar systems to mitigate the risks associated with navigating in poorly surveyed waters and areas where navigation charts are unreliable, these systems are not mandatory under the *International Convention for the Safety of Life at Sea, 1974*, flag state, or coastal state requirements, for vessels operating in polar waters.

4.0 Safety Action

4.1 Safety Action Taken

4.1.1 Transport Canada

Following the occurrence, Transport Canada issued a Letter of Warning to the Authorized Representative (AR) of the *Akademik Ioffe*, requiring that all deficiencies be addressed and a corrective action plan issued. It was also communicated that any future non-compliance would result in greater

enforcement actions. Transport Canada then received a letter from the AR of the *Akademik Ioffe*, indicating that all deficiencies had been corrected.

4.1.2 Canadian Hydrographic Service

Following the occurrence, the Canadian Hydrographic Service amended navigation chart 7502: *Northwest Territories – Gulf of Boothia and/et Committee Bay*, via a Notice to Mariners (12 October 2018) to include the rocky shoal on which the *Akademik Ioffe* ran aground, at position 69°43.00' N, 091°21.00' W. The amended chart indicates “rep 2018”⁵⁴ and a depth of 5.2 m.

4.1.3 Russian Federation

Following the occurrence, the Russian Federal Authority for Transport Oversight (Rostransnadzor) carried out a safety investigation and produced a marine casualty investigation report. The report identified poor and unreliable charting in the area the *Akademik Ioffe* sailed as the cause of the grounding. The report recommended that mariners increase watchkeeping with more bridge watch personnel and more lookouts when sailing in confined waters, use a forward-looking sonar system, maintain minimal safety speed to keep steerage of the vessel, and use anchors as a dip line to navigate unknown waters. Finally, Rostransnadzor recommended to the P.P. Shirshov Institute of Oceanology of [the] Russian Academy of Sciences that the *Akademik Ioffe*'s crew be made aware of the investigation's conclusions, and that it establish procedures to prevent a recurrence.

4.1.4 P.P. Shirshov Institute of Oceanology of [the] Russian Academy of Sciences

Following the occurrence, the P.P. Shirshov Institute of Oceanology of [the] Russian Academy of Sciences corrected the *Akademik Ioffe*'s bridge watch crew bridge equipment familiarization checklist to include familiarization with the electronic chart display and information system (ECDIS).

Appendices

Appendix A – Chart of area of occurrence with vessel track

Figure A1. Track of the *Akademik Ioffe*, from departure off Kugaaruk, Nunavut, to position of grounding (Source: Canadian Hydrographic Service chart 7502 and Google Earth, with TSB annotations)

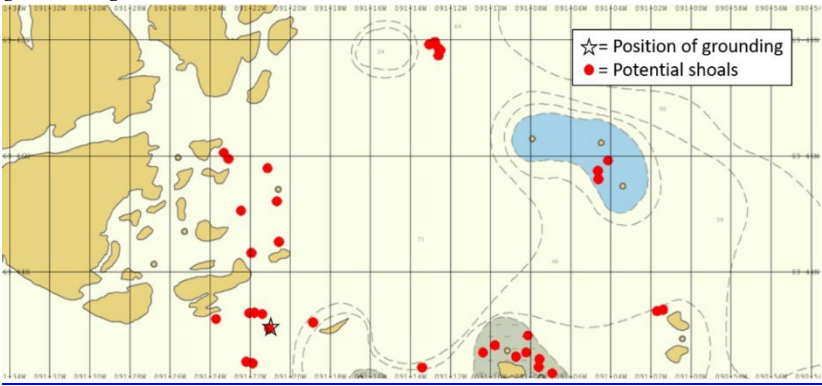


Waypoint	Date and time (Mountain Daylight Time - UTC-6)	Description of event
A	23 August 2018 2045	Departure from the anchorage in Pelly Bay off Kugaaruk
B	24 August 2018 0000	Change of course for the narrows at the entrance of Pelly Bay
C	24 August 2018 0252	Change of course to 352°G to navigate around the Harrison Islands
D	24 August 2018 0440	Change of course to 336°G to navigate around the Harrison Islands
E	24 August 2018 0738	Deviation Report (DR) sent to Northern Canada Vessel Traffic Services (NORDREG)
F	24 August 2018 0801	NORDREG acknowledges receipt of DR; TC accepts the new passage plan
G	24 August 2018 0847	Musters and safety briefings initiated
H	24 August 2018 1027	Change of course to 221°G to enter the narrows between the Ross Peninsula and the Astronomical Society Islands
Star	24 August 2018 1113	Vessel runs aground on uncharted rocky shoal

Appendix B – Satellite-derived imagery showing potential shoals in the vicinity of the Astronomical Society Islands

In response to the grounding of the *Akademik Ioffe*, and to support anticipated vessel movements in the vicinity of the grounding location during the search and rescue response, the Canadian Hydrographic Service (CHS) analyzed several satellite imagery sources to identify the position of potential shoals. The CHS could not evaluate the depth of these shoals. To provide this preliminary data, the CHS used PlanetScope imagery from 22 August 2018 and Sentinel-2 imagery from 22 September 2017 and 18 August 2018.

Figure B1. Position of potential shoals and position of the *Akademik Ioffe*'s grounding (Source: TSB)



Appendix C – Previous occurrences

Occurrences in Canadian Arctic waters

M96H0016 (*Hanseatic*) – On 29 August 1996, the *Hanseatic* ran aground in Simpson Strait while on passage from Gjoa Haven, Nunavut, to Resolute Bay, Nunavut. The weather was fine and clear and the vessel was being navigated visually, by reference to shore ranges, and by radar. The passage plan was disrupted when it was assumed that a buoy, which had been left in the strait from the previous navigation season, was marking a shoal. The buoy had been moved out of position by ice.

The Board determined that the *Hanseatic* grounded because the bridge team did not strictly adhere to the plan that had been prepared for navigating the vessel through the strait. Relying on a navigation buoy left in the strait from the previous navigation season contributed to the grounding.

M08H0011 (*Akademik Ioffe*) – On 04 September 2008, the *Akademik Ioffe* nearly touched bottom when it sailed close to an uncharted shoal in the Coronation Gulf, Nunavut. The vessel crew was able to take evasive action as the vessel's echo sounders read a water depth that abruptly diminished to 16 m. At the time, the vessel was sailing along a line of spot soundings that showed a water depth of 29 m, according to Canadian Hydrographic Service (CHS) navigation chart 7777.⁵⁵

M09L0147 (*Zelada Desgagnés*) – On 31 August 2009, the Canada-flagged general cargo vessel *Zelada Desgagnés* made contact with the bottom while exiting the Povungnituk River off Puvirnituk, Quebec. Some ballast water tanks were breached and minor pollution was reported.

M09H0007 (*Amundsen*) – On 18 October 2009, the Canadian Coast Guard (CCG) vessel *Amundsen* grounded in Prince of Wales Strait, Northwest Territories. The vessel was successfully refloated at high tide.

M10H0006 (*Clipper Adventurer*) – On 27 August 2010 at approximately 1832, the Bahamas-flagged passenger vessel *Clipper Adventurer* ran aground in the Coronation Gulf on the same uncharted shoal that had been previously reported by the *Akademik Ioffe* in September 2008. No injuries were reported. Two days following the occurrence, the vessel's 128 passengers were transferred to the CCG vessel *Amundsen* and taken to Kugluktuk, Nunavut.

The *Clipper Adventurer* was refloated on 14 September 2010; the hull had sustained extensive damage and 13 of the vessel's double bottom tanks and compartments, including 4 fuel oil tanks, were breached. The TSB's investigation determined that the CHS's practice of not issuing and applying chart corrections using Position Approximate (PA) and Position Doubtful (PD) symbols increases the risk that mariners will not be aware of known hazards when they do not obtain the applicable Notices to Shipping (NOTSHIPS).

The investigation also established that when receiving sailing plan reports and providing routing advice to vessels, Northern Canada Vessel Traffic Services (NORDREG) does not proactively advise vessels about active NOTSHIPS for the areas they will transit, which may place vessels at increased risk if they have not obtained the information by other means. The investigation also concluded that unless a vessel is assessed for seaworthiness prior to a refloating attempt, the safety of the vessel, its passengers, and crew may be at risk.

Finally, the investigation established that at the time of the occurrence, the *Clipper Adventurer* was fitted with a forward-looking sonar system; however, it was unserviceable. With this system unserviceable, the vessel

bridge team relied on the SOLAS-required echo sounder to monitor the accuracy of the charted soundings. However, because the echo sounder provided the depth beneath the vessel and not the depth ahead, the vessel struck the shoal at full sea speed.

M10H0007 (*Nanny*) – On 01 September 2010, the Canada-flagged oil products/chemical tanker *Nanny* ran aground in Simpson [Strait], Nunavut. No pollution or injuries were reported.

M12H0008 (*Atlantic Teak*) – On 05 August 2012, the Canada-flagged tug *Atlantic Teak* was towing the cargo barge *Atlantic Sea Lion* when both ran aground in Chesterfield Inlet, Nunavut. The tug and barge were later refloated and proceeded to Baker Lake, Nunavut. No pollution or injuries were reported.

M12H0011 (*Dorsch*) – On 24 October 2012, the Canada-flagged oil products/chemical tanker *Dorsch* ran aground in Baker Lake, Nunavut, and was later refloated after its ballast water was pumped out. No damage, pollution, or injuries were reported.

M12H0012 (*Nanny*) – On 25 October 2012, the Canada-flagged oil products/chemical tanker *Nanny* ran aground on a shoal in Chesterfield Narrows, Nunavut. On 27 October, the vessel came off the shoal during strong northwesterly winds. No pollution or injuries were reported. The forward section of the vessel's hull was indented and breached, and the bow thruster, stern thruster, and both bilge keels sustained damage.

M13H0002 (*Island Tugger*) – On 27 July 2013, the Canada-flagged tug *Island Tugger* ran aground off Tuktoyaktuk Island in Kugmallit Bay, Northwest Territories. No damage, pollution, or injuries were reported.

M14C0219 (*Nanny*) – On 14 October 2014, the Canada-flagged oil products/chemical tanker *Nanny* made bottom contact west of Deer Island in the Chesterfield Inlet, Nunavut. No pollution or injuries were reported. Structural damage occurred and the hull's shell plating was breached in 2 places. The investigation identified several shortcomings with the way the vessel's on-board safety management system was implemented, and determined that a lack of continued proficiency in bridge resource management principles among bridge watch officers may impair bridge team situational awareness and effectiveness.

M18C0275 (*Fathom Wave*) – On 27 September 2018, the Canada-flagged tug *Fathom Wave* struck the bottom and began taking on water off Cambridge Bay, Nunavut. The crew made temporary repairs and the vessel resumed its operations.

M19C0276 (*Hanse Explorer*) – On 23 August 2019, the Antigua and Barbuda-flagged charter yacht *Hanse Explorer* ran aground in Admiralty Inlet (Baffin Island) off the Peter Richards Islands, Nunavut, with 26 people on board. No pollution or injuries were reported. The vessel sustained minor damage to the hull's antifouling coating. At the time of the occurrence, the vessel was using the local CHS-issued electronic navigational chart (ENC); during its approach to Levasseur Inlet at a speed of 9 knots, the under-keel water depth abruptly diminished from 44 m to 0 m and the vessel ran aground.

Occurrences in Canadian Non-Arctic Waters

M12L0045 (*Coriolis II*) – On 16 May 2012, the Canada-flagged research vessel *Coriolis II* ran aground off Pointe-des-Monts, Quebec, while conducting geophysical surveying. The vessel sustained damage to its hull, rudder, and port propeller.⁵⁶ Although the *Coriolis II* did not run aground in the same geographical area as the *Akademik Ioffe*, a similar misuse of electronic-format navigation charts was identified in both occurrences. The investigation determined that the crew did not use the CHS-issued navigation chart in its paper format because of its fixed scale of 1:200 000; instead crew used the corresponding ENC in conjunction with the vessel's electronic chart system (ECS) to manually increase the scale and better distinguish the bathymetric curves of the chart. This technique gave crew a false sense of safety in relation to the vessel draught against the water depth shown on the chart.

M15A0056 (*Ann Harvey*) – On 01 April 2015, the CCG vessel *Ann Harvey* was conducting buoy tending operations when it struck an uncharted shoal off Burgeo, Newfoundland and Labrador. The vessel's hull was breached and the propulsion motor room flooded. The vessel was towed to a dry dock for repairs.⁵⁷ Although the *Ann Harvey* did not touch bottom in the same geographical area as the *Akademik Ioffe*, a similar unreliability with CHS-issued navigation charts was identified in both occurrences. The investigation determined that the hydrographic data used by the CHS for charting the area of the occurrence were based on a lead line survey carried out in 1872, and that, like most of Canada's Arctic waters, several other areas around Newfoundland and Labrador were not surveyed to modern standards. The CHS-issued digital navigational chart format (raster) did not show the shoal, despite the fact that a 3.7 m deep shoal had been reported in 1993 in the local *Sailing Directions*, after the *Ann Harvey* made bottom contact with it.

M16C0005 (MSC Monica) – On 22 January 2016, the Panama-flagged container vessel *MSC Monica* ran aground off Deschaillons-sur-Saint-Laurent, Quebec. The vessel was refloated the following day, with the assistance of 3 tugs. The vessel sustained minor damage to its hull and major damage to its 4 propeller blades. Although the *MSC Monica* did not run aground in the same geographical area as the *Akademik Ioffe*, similar contributing human factors and issues with bridge resource management were identified in both occurrences. The investigation pointed out the issue of the power distance principle as a factor that played a role in the occurrence, and that if bridge team members do not share a complete understanding of an emerging problem and continuously exchange information to resolve it, there is a risk that the bridge team's response will be premature, uncoordinated, and ineffective.

Occurrences in Foreign Waters

The *Akademik Ioffe* was also involved in an allision in polar waters outside Canada, which emphasizes the increased probability of risks to safety for passenger-carrying vessels conducting expedition cruises in remote areas. On 26 February 2013, the *Akademik Ioffe* struck an iceberg in the Palmer Archipelago in Antarctica. No pollution or injuries were reported. The vessel proceeded to Ushuaia, Argentina, and arrived on 03 March for inspection, which revealed that the vessel's hull had sustained damage. The vessel sailed to Bremerhaven, Germany, where it was dry-docked for repairs on 08 April.⁵⁸

Notes

¹ Chart 7502, published by Fisheries and Oceans Canada, Canadian Hydrographic Service, *Northwest Territories – Gulf of Boothia and/et Committee Bay*, edition for 31 July 1998, contains the following note for reconnaissance data: "The portrayal of the seafloor on this chart is based on two types of reconnaissance data: 1) Single depth measurements taken at 2 kilometre intervals. The shape of the seafloor between the depths is unknown. 2) Depths from ships' tracks. In this case the accuracy is uncertain and no information about depths on either side of the track is available."

² Time charter agreement between Terragelida Ship Management Limited (Cyprus) and One Ocean Expeditions Inc. (Canada), *Charter Contract for the Tourist Cruise Operation 2017-2018 For m/v "Akademik Ioffe"*. Signed by both parties on 1 June 2017.

³ Canadian Ice Class Type B (per the *Arctic Waters Pollution Prevention Act*, R.S.C., 1985, c. A-12) and L1 icebreaking passenger ship (per the recognized organization – RO, the Russian Maritime Register of Shipping). For reference,

the *Akademik Ioffe*'s ice class notation is equivalent to the 1A ice class notation from other major classification societies.

⁴ One Furuno Electric model FE-700 echo sounder and one Japan Marina model F-3000 echo sounder.

⁵ At the time of the occurrence, the marine intermediate fuel oil (IFO) on board the *Akademik Ioffe* consisted of 493 m³ of RMA 30 with a density of 932.8 kg [kilograms]/m³ at 15°C, and a kinematic viscosity of 28 cSt [centistokes] (mm²/s) [millimetres squared per second] at 50°C. There were also 150 m³ of marine gas oil (MGO) and 30 450 kg of various lubricating and hydraulic oils on board.

⁶ Association of Arctic Expedition Cruise Operators, *Operational Guidelines*, accessed 19 February 2021, <https://www.aeco.no/guidelines-2/operational-guidelines/>.

⁷ The *Akademik Ioffe*'s crew consisted of 37 seafarers to ensure the proper manning of the vessel's navigation, deck, engine, hotel, and catering departments.

⁸ Protection and indemnity (P&I), hull, and machinery insurances.

⁹ International Maritime Organization, *International Convention for the Safety of Life at Sea, 1974* (SOLAS), Chapter V: Safety of Navigation, Regulation 34-1: Master's Discretion (London, U.K.: IMO Publishing, 2014).

¹⁰ One Ocean Expeditions directly employed 24 non-marine-certified personnel on board the vessel, referred to as the expedition staff, who were responsible for guiding and entertaining the passengers during sailing and shore expeditions. The expedition leader was in charge of the expedition staff, was One Ocean Expeditions' on-board representative, and was responsible for all communications between the vessel and [...] One Ocean Expeditions' shore office.

¹¹ Also known as the vessel's radio room, where all satellite communications equipment is located.

¹² Unless otherwise specified, all times are Mountain Daylight Time (Coordinated Universal Time minus 6 hours).

¹³ Pursuant to section 5 of Transport Canada's SOR/2010-127, *Northern Canada Vessel Traffic Services Zone Regulations*, a formal deviation report (DR) must be pre-approved when a vessel's intended voyage changes from the initial sailing plan report (SP).

¹⁴ The shore excursion safety briefing consisted of instructions and precautions on boarding and disembarking both the vessel and the inflatable boats, donning of PFDs, polar bear encounters, shore excursions, and person overboard contingency. The passengers were also given an update on the *Akademik Ioffe*'s sail plan.

¹⁵ The passengers undertaking this first briefing were accommodated in the vessel's portside cabins.

¹⁶ All vessel speeds in this report are speed over the ground (SOG).

¹⁷ The DSC function of a vessel's GMDSS transmits digital distress alerts via high frequencies (HF), in this occurrence frequency 16804.5 kHz [kilohertz], and an electronic text message (telex) through the Inmarsat C satellite connection.

The *Akademik Ioffe*'s radio officer sent the following information when he activated the DSC function: the vessel's Mobile Maritime Service Identification (MMSI) number and call sign, the nature of the distress (grounding), the vessel's position, and the time of transmission using the coordinated universal time (UTC).

¹⁸ The 3 JRCCs in Canada (Victoria, Trenton, Halifax) are jointly operated by the Royal Canadian Air Force and the CCG; each centre covers different areas of the country for SAR response coordination.

¹⁹ JRCC Trenton SAR case No. T2018-01907.

²⁰ Search and rescue units (SRUs) 332-424 and 333-435.

²¹ A Mayday relay is an international distress message repeated by a radio station (a vessel or land-based station) other than the radio station in distress, in order to further broadcast the critical information to all surrounding available assets.

²² SRU 343-413.

²³ SRUs 910-413 and 905-103.

²⁴ The Department of National Defence's major aeronautical disaster, or MAJAID, contingency plan is the response plan for an aircraft accident occurring in a sparsely settled area of Canada which, because of the size of the accident, requires augmentation of established (SAR) resources. The MAJAID contingency plan includes survival kits for the emergency sheltering, sustenance, and medical treatment of the casualties. "Info Brief on Canadian Armed Forces Search and Rescue (SAR) in Canada," accessed 22 February 2021, <https://www.icao.int/NACC/Documents/Meetings/2018/SAR/SARMeeting-P02.pdf>.

²⁵ Similar to MAJAID, but covers a marine accident involving a vessel carrying numerous passengers.

²⁶ An international distress message for an on-board non-life-threatening emergency.

²⁷ SRU 439 GCQB.

²⁸ The prevailing air temperature and wind speed correspond to a wind chill of -5°C, according to the United States' National Oceanic and Atmospheric Administration. National Weather Service, National Oceanic and Atmospheric Administration, "Understanding Wind Chill," accessed 22 February 2021, <https://www.weather.gov/safety/cold-wind-chill-chart>.

²⁹ Government of Canada, *Oceans Act* (S.C. 1996, c. 31, last amended 27 May 2019), Part III: Powers, Duties and Functions of the Minister, Sections 40 and 42.

³⁰ Transport Canada, SOR/95-149 (last amended 1 July 2007), *Charts and Nautical Publications Regulations, 1995*, Section 4: Carriage of Charts, Documents and Publications.

³¹ International Hydrographic Organization, accessed 5 July 2019, https://www.iho.int/srv1/index.php?option=com_content&view=article&id=298&Itemid=297&lang=en.

³² Vessels of opportunity include foreign international science vessels, CCG and Department of National Defence vessels, and assets from the Canadian Department of Natural Resources.

³³ ArcticNet is a Canadian scientific network that studies the impacts of climate change in the coastal Canadian Arctic. The network is hosted at Laval University in Québec, Quebec. At ArcticNet, accessed 26 February 2021, <http://www.arcticnet.ulaval.ca/vision-and-mission>.

³⁴ Fisheries and Oceans Canada, “Arctic Charting,” accessed 26 February 2021, <http://www.charts.gc.ca/arctic-arctique/index-eng.asp>.

³⁵ Office of the Auditor General of Canada, *2014 Fall Report of the Commissioner of the Environment and Sustainable Development*, Chapter 3: Marine Navigation in the Canadian Arctic, subchapter 3.17: Hydrographic Surveys.

³⁶ Fisheries and Oceans Canada, Canadian Hydrographic Service, *Sailing Directions, ARC 400E: General Information, Northern Canada – First Edition 2009* (corrected to Monthly Edition No. 02/2013), Chapter 1: Navigational Information, paragraph 107.

³⁷ Fisheries and Oceans Canada, Canadian Hydrographic Service, *Sailing Directions, ARC 402E: Eastern Arctic – First Edition 2014* (corrected to Monthly Edition No. 11/2018).

³⁸ Fisheries and Oceans Canada, Canadian Hydrographic Service, *Sailing Directions, ARC 402E: Eastern Arctic – First Edition 2014* (corrected to Monthly Edition No. 11/2018).

³⁹ Fisheries and Oceans Canada, Canadian Hydrographic Service, *Sailing Directions, ARC 400E: General Information – Northern Canada, First Edition 2009* (corrected to Monthly Edition No. 02/2013).

⁴⁰ Transport Canada, TP 13670E - *Guidelines for Passenger Vessels Operating in the Canadian Arctic*, Chapter 3: *Regulatory Roles and Responsibilities by Federal Government*, Section 3.4 *Canadian Hydrographic Services*, First Edition November 2017.

⁴¹ Fisheries and Oceans Canada, Canadian Hydrographic Service, Chart 7502, *Northwest Territories – Gulf of Boothia and/et Committee Bay*, edition for 31 July 1998.

⁴² R. Chénier, M-A. Faucher, R. Ahola, Y. Shelat, and M. Sagram, “Bathymetric Photogrammetry to Update CHS Charts: Comparing Conventional 3D Manual and Automatic Approaches,” *ISPRS International Journal of Geo-Information* 7, no. 10 (2 October 2018): 395.

⁴³ Office of the Auditor General of Canada, *2014 Fall Report of the Commissioner of the Environment and Sustainable Development*, Chapter 3: Marine Navigation in the Canadian Arctic, Exhibit 3.3: Hydrographic survey methods have improved over time.

⁴⁴ Office of the Auditor General of Canada, *2014 Fall Report of the Commissioner of the Environment and Sustainable Development*, Chapter 3: Marine Navigation in the Canadian Arctic, Section 3.18: Nautical Charts.

⁴⁵ Office of the Auditor General of Canada, *2014 Fall Report of the Commissioner of the Environment and Sustainable Development*, Chapter 3: Marine Navigation in the Canadian Arctic, Section 3.17: Hydrographic Surveys.

⁴⁶ Office of the Auditor General of Canada, *2014 Fall Report of the Commissioner of the Environment and Sustainable Development*, Chapter 3: Marine Navigation in the Canadian Arctic, Section 3.18: Nautical Charts.

⁴⁷ Office of the Auditor General of Canada, *2014 Fall Report of the Commissioner of the Environment and Sustainable Development*, Chapter 3: Marine Navigation in the Canadian Arctic, Section 3.22: Capacity to Survey and Chart Canadian Arctic Waters Is Limited. Audit work for this chapter was completed on 18 July 2014.

⁴⁸ Office of the Auditor General of Canada, *2014 Fall Report of the Commissioner of the Environment and Sustainable Development*, Chapter 3: Marine Navigation in the Canadian Arctic, Section 3.23: Recommendation.

⁴⁹ CCG vessels *Pierre Radisson* and *Amundsen*, and passenger vessels *Akademik Ioffe* and *Akademik Sergey Vavilov*.

⁵⁰ Department of National Defence and Canadian Coast Guard, CAMSAR: *Canadian Aeronautical and Maritime Search and Rescue Manual*, Combined Edition – Volumes I, II, and III (English), subsection 5.02, *Major Aeronautical Disaster Contingency Plans*.

⁵¹ Department of National Defence and Canadian Coast Guard, CAMSAR: *Canadian Aeronautical and Maritime Search and Rescue Manual*, Combined Edition – Volumes I, II, and III (English), subsection 5.02, *Major Aeronautical Disaster Contingency Plans*.

⁵² Department of National Defence and Canadian Coast Guard, CAMSAR: *Canadian Aeronautical and Maritime Search and Rescue Manual*, Combined Edition – Volumes I, II, and III (English), subsection 5.03, *Major Maritime Disaster Contingency Plans*.

⁵³ Department of National Defence and Canadian Coast Guard, CAMSAR: *Canadian Aeronautical and Maritime Search and Rescue Manual*, Combined Edition, Volume I, Chapter 2: System Components, subsection 2.11.1.

⁵⁴ “Rep 2018” indicates that the shoal was included in the chart on the basis of a report made in 2018.

⁵⁵ Fisheries and Oceans Canada, Canadian Hydrographic Service, Chart 7777, *Coronation Gulf Western Portion*, since re-edited 15 May 2015 and adequately updated.

⁵⁶ TSB Marine Safety Information Letter No. 06/12.

⁵⁷ TSB Marine Safety Information Letters No. 07/15 and 08/15.

⁵⁸ Occurrence data compiled by IHS Global Limited, accessed 16 August 2019, <https://maritime.ihs.com/EntitlementPortal/Home/Index>.

23

The Interconnected Northwest Atlantic: U.S. Coast Guard Cutter *Healy*, 2021

Jake Kritzer and Shayla Fitzsimmons*

In the fall of 2021, the U.S. Coast Guard cutter (USCGC) *Healy* completed a historic scientific expedition in the Northwest Passage and Baffin Bay, before continuing around Atlantic Canada and into the Gulf of Maine. Inspired by and connecting with *Healy*'s voyage, the Northeastern Regional Association of Coastal Ocean Observing Systems (NERACOOS) and Canadian Integrated Ocean Observing System Atlantic (CIOOS Atlantic) hosted "We're All in the Same Boat," a virtual engagement program focused on challenges and interconnectedness across the Northwest Atlantic region. As we close out 2022, with *Healy* recently returned from another historic voyage to the North Pole, we reflect on the insights and ideas that emerged during the program to help chart new directions in 2023 and beyond. Part I examines the changing ocean and its ecosystems, Part II highlights interwoven human interactions and policy priorities, and Part III considers directions we might travel on the sea ahead.

Part I: A Historic Voyage

On 25 August 2021, USCGC *Healy* departed Seward, Alaska, for its first transit through the Northwest Passage in nearly twenty years, in cooperation

* Originally published by the Polar Institute at the Wilson Center as Polar Points Blog Posts in 2022 and reprinted with the Polar Institute's permission. Written by Jake Kritzer, Executive Director, Northeastern Regional Association of Coastal Ocean Observing Systems (NERACOOS), and Shayla Fitzsimmons, Executive Director, Canadian Integrated Ocean Observing System (CIOOS) Atlantic Regional Association.

with Canada. A team of scientists from the U.S. carried out a diverse research program during the journey. Larry Mayer of the University of New Hampshire and Chief Scientist for the Northwest Passage expedition was responsible for organizing and communicating the varied research that took place, including his own work conducting bathymetric surveys of the Passage. Improving seafloor maps in this poorly studied area through these surveys will be critical as vessel traffic, fishing, energy development, and other activities increase in the Arctic in response to the ongoing reduction of sea ice cover.

After exiting the Passage and a crew change in Nuuk, Greenland, *Healy* began a three-week expedition in Baffin Bay. Bob Pickart of the Woods Hole Oceanographic Institution took over as Chief Scientist overseeing another varied set of research projects, with scientists from Canada and Norway joining those from the U.S. His own research in Baffin Bay focused on basal melting of coastal glaciers and ice sheets, which is the influence of warm subsurface currents on the coastal ice margin at depth. This process exacerbates melting from above due to atmospheric and ocean surface warming, compounding the downstream oceanographic effects of warming on mid-latitude waters.

Healy is the U.S. Coast Guard's largest vessel and the most technologically sophisticated icebreaker in the U.S. fleet. Equipped with a number of sensors, flow-through systems, and other equipment, ship time is in high demand by the scientific community. Assembling research teams, like those that worked during the Northwest Passage and Baffin Bay cruises, is a process managed by Dave Forcucci with USCG Icebreaker Science Operations and guided by the Arctic Icebreaker Coordinating Committee of the University-National Oceanographic Laboratory System. The scientific work of *Healy* continues even after the research teams disembark through a suite of oceanographic and meteorological variables measured underway. Shawn Smith at Florida State University oversees the integration of these observations from *Healy* and thirty-two other vessels participating in the Shipboard Automated Meteorological and Oceanographic System (SAMOS). SAMOS manages a data assembly centre that makes data available to interested users. Observations underway began when *Healy* departed from its home port of Seattle, Washington, and continued after *Healy* left the Northwest Atlantic, passed through the Panama Canal, and steamed back up to Seattle – a historic circumnavigation of North America.

Changing Ocean Ecosystems

In an area that is as vast, remote, and sparsely populated as Nunavut and the Canadian Arctic, community science that draws upon the ecological knowledge of resident people can be a powerful complement to traditional scientific tools. Christina Macdonald with the Arctic Eider Society explained how this idea inspired SIKU, the Indigenous Knowledge Social Network, which ingests user reports on environmental conditions – including wildlife, ice cover, ship traffic, and more – and makes that information accessible through a portfolio of electronic tools and data products. Across Baffin Bay, Lorenz Meire with the Greenland Climate Research Centre also addressed the fate of changing ice cover along the Greenland coast as it influences coastal and ocean environments, specifically the dynamics of glaciers and the role of fjords as gateways of interactions between land and sea. Glacial melt enhances the upwelling of nutrients to surface waters, which fuels planktonic production, a function that is lost as glaciers recede. The influence of ice on the ocean continues beyond the coast, including through the fate of icebergs as they move south along the Labrador Current, as discussed by Kristin Schild at the University of Maine. The melting of icebergs during advection to warmer latitudes affects surface temperatures, salinity, circulation, and water levels, while also creating an obstacle for navigation. Further, changes in ice sheets, glaciers, and icebergs not only affect surface waters and pelagic habitats but are also driving significant changes on the seafloor. Mark Patterson of Northeastern University, but on sabbatical at Université Laval during the program, described how warmer temperatures, deeper light penetration, and increased atmospheric interactions could be paving the way for a dramatic expansion of kelp beds into high latitudes. These habitats are home to complex ecological communities and commercially important species, so this ecosystem shift could have profound implications for biodiversity and fisheries in the Arctic region.

Arctic influences on the ocean extend south to the subpolar Northwest Atlantic and interact with other changing processes in the waters south of Greenland and offshore from Newfoundland and Labrador. In particular, Jaime Palter at the University of Rhode Island explained how an extension of the Gulf Stream tail toward the Grand Banks is restricting the flow of the Labrador Current to the southwest. This restriction might also be related to climate-driven changes in the Atlantic Meridional Overturning Circulation (AMOC), although AMOC could be shifting toward interior pathways and having less influence offshore. Within these evolving current

systems, a diverse and productive pelagic ecosystem is in flux. Maxime Geoffroy with Memorial University surveyed important ecological trends, including a shift toward smaller zooplankton species and the northward expansion of the ranges of cod, herring, capelin, sand lance, and other fishes. However, range expansion will be hindered by persistent features of the Arctic region that are not affected by climate change. One such feature is day length, which is especially important to the life history of lanternfish, the most abundant fish in the Labrador Sea. Jamie Tam at the Bedford Institute of Oceanography noted that subpolar ocean ecosystems in the Northwest Atlantic have not only been reshaped by climate change but also by other anthropogenic impacts, especially the overfishing that led to the collapse of cod in the early 1990s. To keep pace with these changes, ecosystem modelling that considers the effects of multiple environmental drivers is advancing and being incorporated into stock assessments and other tools that support natural resource management.

The expansion of the Gulf Stream not only affects the influence of the Labrador Current on mid-latitude areas, but it also directly influences the Scotian Shelf and Gulf of Maine. Gordon Zhang at the Woods Hole Oceanographic Institution illustrated the increasing frequency of warm core rings that carry salty and low-nutrient water into these shelf systems and contribute to the long-term warming trend underway. These changes are affecting the biological and ecosystem productivity of the Gulf of Maine, especially through the deprivation of nutrient-rich Arctic waters. Changes in productivity manifest in different and complex ways, including two highlighted by Michelle Staudinger with the U.S. Geological Survey: the timing of key events in the life histories of different species, known as phenology, and the overall species composition of ecosystems. Many life-history events are taking place earlier in the year as waters warm, which can create phenological mismatches with key oceanographic events and favours ecological generalists that are more adaptive to uncertainty and evolving conditions. Among the many species experiencing these transitions, considerable attention is being paid to the plight of endangered marine mammals, especially North Atlantic right whales (NARW). Jen Miksis-Olds at the University of New Hampshire highlighted the urgency of expanding the coverage of acoustic monitoring systems for detection, status determination, and long-term predictions of the NARW population. Acoustic systems can also reveal broader soundscapes in the ocean, which can enhance understanding of phenology and other aspects of the ecosystem, such as auditory cues used for navigation by different species.

Part II: Evolving Human Interactions

Indigenous people in the Arctic region grapple daily with the uncertainties brought on by a changing climate, which motivates involvement in community-based science initiatives like SIKU. In fact, Inuit communities have gone beyond science based on human observations in developing SmartICE, a program that Andrew Arreak characterized as using technological tools to directly serve people's well-being, livelihoods, and social values through the improved monitoring of ice cover. Despite the challenges associated with changing ice cover, it is also opening new opportunities for Inuit communities. Chris Flanagan of Baffin Fisheries outlined assets such as investment, species diversity, and technology that will enable Inuit fishing businesses to capitalize on increased access to Arctic fishery resources. Although the largest fishing enterprises in Northern Canada are currently Inuit-owned, the opening of the Arctic could bring waves of new, well-financed interests to the region, many of which are likely to compete with existing users for space and resources. Indeed, a complex and rapidly changing geopolitical landscape will shape the future of the Arctic, creating a convergence of the security, shipping, tourism, energy, and other interests of many nations. Encouragingly, there is potential for this looming transition to be less disruptive if governments, industries, and local communities can collectively attend to the seven Cs that Michael Sfraga at the Wilson Center highlighted as being critical determinants of the future of the Arctic: Climate, Commodities, Commerce, Connectivity, Communities, Cooperation, and Competition.

Fisheries are an important social and economic driver in subpolar waters like they are in the Arctic. Fishing is the oldest commercial enterprise in the region, yet Fred Kingston described how the Northwest Atlantic Fisheries Organization (NAFO) is working to modernize management by adopting ecosystem-based practices. These include the protection of vulnerable deep-sea corals for their habitat value and unique genetic resources, as well as navigating interactions between fisheries and energy development. This broader focus by NAFO mirrors other initiatives to support the Blue Economy of the region in a more holistic way. Robert Greenwood helped lead the recent Blue Economy consultation in Newfoundland and Labrador for Memorial University, a milestone convening that addressed data sharing and integration, diversifying the regional economic portfolio, infrastructure improvements, and other issues. Importantly, Indigenous knowledge partnerships are emphasized in this initiative, fostered by a new Vice-President (Indigenous) at Memorial University. A prosperous and equitable

Blue Economy must address interactions among communities and industries, as well as geographic connections at larger scales. To illustrate the influence of large-scale connectivity on institutions and policies, John Farrell reviewed ways that the Arctic is tied with subpolar areas and how these ties shape the work of the U.S. Arctic Research Commission. For example, shipping and tourism companies travel to Arctic destinations from bases in the Northeastern U.S. and Canadian Maritimes, with the subpolar region serving as a vital point of connection. Another manifestation of these linkages is the New England Arctic Network, which recognizes and responds to connections between the Arctic and the Northeastern U.S. by promoting research, dialogue, and capacity building.

The Labrador Current, Gulf Stream, AMOC, and other oceanographic features have profound effects on ocean ecosystems of the Northwest Atlantic, but there are also important interactions between freshwater systems and the ocean. Indigenous people have long recognized and depended on these connections, especially the once-plentiful sea-run fish populations around the Gulf of Maine and Scotian Shelf. Denise and Paul Pouliot showcased the commitments of the Cowasuck Band of the Pennacook-Abenaki People and other members of the Wabanaki Confederacy in the U.S. and Canada to the stewardship of rivers, estuaries, and fish runs. These Tribes and First Nations work to remove barriers to migration, improve habitat and water quality, and restore fish stocks and ecosystems. Ariel Smith illustrated how conservation organizations complement the environmental stewardship of Indigenous people with examples from the work of Coastal Action. Two priority issues being addressed in the region include the mortality of marine species due to lost fishing gear, or “ghost gear,” and efforts to understand the volume, composition, and effects of plastic pollution in the marine environment. Of course, climate change is a pervasive factor shaping the region, one that is an especially significant threat to low-lying coastal communities. This is why the Cape Cod Commission prioritizes understanding and adapting to a wide range of climate-driven risks, as highlighted by Erin Perry, including flooding, saltwater intrusion, and erosion. These stressors could cost billions of dollars to communities on Cape Cod and many other places if monitoring and adaptation lag.

Policy Priorities

Melanie Zimmerman with the U.S. Department of State and U.S. Embassy and Consulates in Canada reiterated the commitment made by U.S. Secretary of State Blinken to partner with Canada on keeping the Arctic

peaceful and ensuring that benefits of economic development accrue to people living in the region. The Arctic Council is the premier forum for moving toward these goals through broader international cooperation on reducing greenhouse gas emissions from new activity in the Arctic, and on services provided by the armed forces and coast guards of different nations, especially to conduct the search-and-rescue operations needed to keep people and vessels safe. Lyra Carr at the U.S. Consulate in Halifax expanded on the shared interests of the U.S. and Canada, particularly those reflected in the *Roadmap for a Renewed U.S.–Canada Partnership* signed by President Biden and Prime Minister Trudeau, which aims to promote the economic recovery of the two neighbours and allies in the wake of the COVID-19 pandemic and other challenges. President Biden has also emphasized the economic importance of the ocean for his Build Back Better agenda, which motivates U.S. commitment to the United Nations Decade of Ocean Science for Sustainable Development.

Angus King, U.S. Senator representing the State of Maine, reflected on the origins and evolution of the U.S. Integrated Ocean Observing System (IOOS) Program, particularly its roots in the Northeast. A longtime proponent of recognizing and reinforcing the vital linkages between the Northeastern U.S. and the Arctic, Senator King acknowledged the importance of both *Healy's* voyage and the robust, large-scale ocean observing systems managed by NERACOOS and CIOOS Atlantic, especially in the face of environmental change. Nicole LeBoeuf at the National Oceanic and Atmospheric Administration's (NOAA) National Ocean Service expanded on those themes, recognizing the vulnerable communities throughout the region that are best served by international collaboration as a vehicle for sharing resources, information, and experience. The pace of change underway from the Northeastern U.S. to the Arctic further compels a strong and coordinated international response, to which NOAA is firmly committed. This spirit of international cooperation to meet pressing challenges facing ocean-dependent communities is being spread across the globe and brought to life through the United Nations Decade of Ocean Science for Sustainable Development, under the leadership of Vladimir Ryabinin. The Decade aims to bridge local to global initiatives through communities of practice that can mobilize ideas, energy, and resources, with particular focus on engaging and empowering Indigenous communities. Public-private partnerships will also be an important vehicle for achieving the vision of the Decade.

Oceanographic agencies in Canada and the U.S. take on leadership roles in implementing these national and international strategies needed to meet the challenges presented by a changing ocean. Keith Lennon with the Department of Fisheries and Oceans (DFO) Oceans Science Branch drew upon issues facing Canada's Atlantic provinces, many of which confront the U.S. as well, to underscore the need to move away from reactive approaches and toward a more proactive mindset. Working across domains and disciplines is essential to this shift in order to promote the shared indicators, data centres, and communication systems that will enable stakeholders to identify and begin working toward collaborative solutions sooner and more effectively. Indeed, information is the foundation of the New Blue Economy, a concept articulated by Carl Gouldman with the NOAA Integrated Ocean Observing System, given its value for scientific understanding and prediction, policy development, and economic and community planning. Creating a firm information base requires the right convergence of people, technology, and modelling capability to shape the future of our ocean. Forums such as the webinar series can be important venues for fostering that convergence.

Part III: The Sea Ahead

The scope of the virtual engagement program was broad and aimed to illuminate a variety of scientific, social, economic, and policy issues facing the Northwest Atlantic region at multiple scales. The diverse perspectives shared during the program pointed to a number of worthwhile directions in which we might travel to meet these challenges. Here, we highlight four emergent themes from the program identified by the organizers, attention to which can shape more effective responses to complex changes along coasts and in the ocean. The first two themes relate to the scale and resolution of new initiatives, highlighting the need for perspectives that provide breadth and depth, while being attentive to both the commonalities and uniqueness of issues faced across this vast region. Addressing these multi-dimensional, and sometimes conflicting, themes will be enabled by continuing to build and evolve modern information systems. Moving in all of these directions, the ocean-dependent community of the Northwest Atlantic should seize the Decade as an unprecedented vehicle for convening, knowledge sharing, resources, and scaling.

Expand Collaborations with Breadth and Depth

Programs such as this that span large geographic scales and a wide variety of issues are important in identifying shared challenges and emphasizing linkages across geographies and sectors. These challenges and linkages might be overlooked when the focus is narrower and more in-depth, which can mean missing important drivers and opportunities for knowledge transfer, the collaborative development of solutions, and creating economies of scale. Breadth of focus helps to articulate the context in which specific challenges are faced, and programs like this should be replicated periodically to keep the big picture fresh.

At the same time, the complexities and unique properties inherent within any given community, industry, or ecosystem necessitate deeper dives to most effectively diagnose and address challenges. Moving toward improved understanding and solutions will require targeted partnerships, projects, and policies that drill into the relevant social, economic, ecological, and governance intricacies. Therefore, programs such as this should serve as a springboard from which to launch more targeted initiatives that are nested within and mindful of the broader national and international context.

Embrace Commonality and Uniqueness

The program sought to identify shared challenges facing communities, industries, and governments from the Arctic to the Gulf of Maine. Many challenges are linked to climate change, such as ecological shifts in habitat and species composition. Among other impacts, these shifts have important implications for fisheries, so strategies for adaptation by fishing fleets, scientists, and fishery managers are a common need. However, the nature of change will vary along latitudinal gradients. In particular, there will be generally northward shifts in the range of many species as waters warm, which means Arctic fisheries could benefit from more species to harvest, while lower-latitude fisheries could experience net loss. Amidst these ecological changes, fisheries in the region are also navigating new interactions with energy development. However, there is a greater focus on offshore wind in the south as opposed to oil and gas further north. Different energy sources present different types of infrastructure and impacts, as do different fishing fleets, potentially calling for unique management approaches tailored to the particular combination of uses in any given area.

Similar challenges with important local differences can also be found along the coast. Inuit communities in remote Arctic areas and Wabanaki communities in more developed temperate areas are both closely tracking

ongoing changes in the landscapes that have been their ancestral home for millennia. For the Inuit, the dynamics of ice sheets shape the ways people live, hunt, and travel, in the past and today. For the Wabanaki, rivers were once central arteries of commerce and convening, and today, they provide spiritual and cultural connections to the natural world and their past. Ice sheets and rivers both influence oceanography and marine ecosystems, and they are both in flux due to climate change and other impacts. However, the nature of these influences and capacity to shape these systems at the local level are rather different. Still, Indigenous peoples across the Northwest Atlantic can benefit from the exchange of ideas and experiences in how to understand and adapt to changes in the foundational natural assets of their homelands, whether river, ice sheets, or other coastal features.

Build Modern Information Systems That Are Streamlined, Shared, and Scaled

The program underscored the many ways that human and natural systems are interconnected across coastal and ocean areas of the Northwest Atlantic, while helping to prompt new conversations about ways to span sectoral and disciplinary divides. For example, a topic of energetic discussion among the panelists sharing perspectives on the state of marine ecosystems in the Arctic region during the opening webinar was ways in which the local ecological knowledge captured by SIKU can inform conventional research endeavours. Drawing upon community science, private sector data and platforms, and other non-traditional sources not only has the potential to advance scientific understanding but also to channel that understanding more directly into solving problems faced by communities and industries in a changing ocean. Indeed, the growing importance of a firm information base and common understanding among different users underlies the concept of the New Blue Economy and was underscored by policymakers during the program. The program was organized by partner organizations – NERACOOS and CIOOS Atlantic – that focus on ocean observing, so the lessons learned about the essential attributes of effective information systems was of particular interest. Speaker perspectives and panel discussions illustrated that modern information systems will increasingly need to be streamlined, shared, and scaled.

Changes underway in both ocean ecosystems and human uses are increasing the types and resolution of data needed for all levels of decision-making, from individuals to international policy bodies. It is no longer the case that temperature is seen as the dominant driver of species composition

and resultant food web dynamics, with salinity, dissolved oxygen, pH, nutrient levels, soundscapes, and other physical and chemical properties rising as issues of concern. Similarly, monitoring commercially exploited fish stocks and other megafauna is no longer sufficient to understand biological systems as changes unfold in planktonic and even microbial communities. Furthermore, there is increasing need for the collection of physical, chemical, and biological data at finer spatial and temporal scales, given the pace and uncertainty of ecosystem change, as well as the fine-tuning of management measures. At the same time, socio-economic data are also becoming more important to understand and manage the complex interplay between human and natural systems. These multifaceted demands mean that data collection needs to be as streamlined as possible, eliminating redundancy wherever it is not intentional (e.g., to ensure continuity of the most critical data streams) and collecting multiple types of data from any given platform wherever resources and logistics allow. Coordination is becoming more important than ever, and every dollar spent collecting data that are already being collected elsewhere misses an opportunity to develop the new data streams needed to make headway on vital challenges.

Maximizing the utility of data collection systems will also require that data be shared to the widest extent possible, recognizing that decision-making improves with a stronger information base. Working with common understanding will also help to reduce, although not eliminate, conflicts among competing interests while cultivating the development of new approaches to shared challenges. After all, clear problem identification is an essential first step in solution co-development. However, expanding the reach of data must also be mindful of and protect confidentiality and important sensitivities where appropriate. The private sector can be a valuable source of funding, platforms, and data, but those contributions will only be sustained if legitimate proprietary concerns are addressed. Indigenous data sovereignty is another important consideration in light of the exploitation and marginalization suffered by Indigenous peoples. Although bringing data and data products from Indigenous communities into science and policy processes can amplify their efforts, goals, and concerns, doing so without the right consultation and collaboration can perpetuate historical injustices.

Some data needs will be unique to the issues and attributes of particular locations, such as the importance of ice cover to Inuit people and river flow to Abenaki people discussed earlier, and therefore should be developed and tailored locally. But other issues are shared across the ocean-dependent

community from the Arctic to the Gulf of Maine, and beyond, calling for information systems that are *scaled*. The oceanographic and ecological attributes of the major current systems that connect the region are a shared interest, one that is most effectively addressed by observing systems that span international boundaries. Satellite remote sensing is an important tool in this regard, as are long-distance scientific voyages like that of *Healy* and the ships of opportunity that feed data to SAMOS. Scaling can also improve understanding of processes operating at smaller scales when they are replicated across the wider region. For example, tracking, predicting, and responding to sea-level rise and coastal inundation is a common concern in coastal regions the world over. Monitoring these changes takes place locally, but sharing experiences with technologies, emergency protocols, data management and delivery, and long-term planning across the region can improve local understanding and response. This type of scaling can be achieved through workshops, communities of practice, shared platforms, and other tools that promote interaction and exchange.

“Carpe Decennium” – Seize the Decade

Meeting the challenges facing the Northwest Atlantic will require new ways of thinking and new resources applied at an international scale. The importance of information systems and other prominent themes raised during the program are at the heart of what the Decade aims to achieve, so the ocean-dependent community of the Northwest Atlantic should engage in and embrace opportunities emerging through the Decade in the years to come. A number of pertinent workshops, webinars, and virtual laboratories, including this program, have been held over the first year of the Decade. These aim to cultivate new partnerships and programs needed to meet the ten challenges being confronted by the Decade to reach the seven outcomes that define “the ocean we want.” Funding is a particularly pressing need, given that funding for sustained international collaborations is limited relative to funding for work at the national scale. As scientists, community leaders, industry members, and policymakers work to collaborate more on shared issues of concern from the Arctic to the Gulf of Maine, we should also look to opportunities for engagement at the global scale as a means of access to ideas, partners, and resources. After all, the Northwest Atlantic is part of the global ocean, so ultimately our region affects and is affected by changes taking place across its extent.

Summary and Conclusions

The historic 2021 voyage of USCGC *Healy* provided a unique focal point for considering the complex and interconnected oceanographic, ecological, social, economic, and policy systems along its route through the Northwest Atlantic Ocean. Despite the constraints imposed by the coronavirus pandemic, a virtual engaged program proved to be an effective vehicle for convening a diverse group of thirty-one expert speakers with more than two hundred audience members from across the region. Indeed, it is unlikely that an in-person forum with this scope would have brought together Inuit leaders from Arctic Canada and municipal leaders from Cape Cod. As we build from the connections made among communities, institutions, and individuals during the program to address the issues identified, deeper and sustained person-to-person interactions alongside additional virtual engagement will enable continued collaboration and scaling. As the steward of ocean observing systems in the Northeastern U.S. and Atlantic Canada, respectively, NERACOOS and CIOOS Atlantic will continue efforts to expand and integrate data and modelling systems across our domains and connect with those in the Arctic. In parallel, ocean users across the Northwest Atlantic should work to create communities of practice, learning networks, integrated data and modelling systems, training and capacity-building programs, and other tools for the collaboration and scaling needed to meet the challenges before us.



24

HMCS *Harry DeWolf* Transits the Arctic, 2021

Commander Corey Gleason*

On 6 September 1958, Vice-Admiral Harry DeWolf, CBE, DSO, DSC, CD, RCN, wrote a letter that ordered HMCS *Labrador*, the Royal Canadian Navy's (RCN) "first" Arctic Patrol Vessel, to be paid off and transferred to the Department of Transport. In his order, he noted that the ship did not deliver on the operational role of an escort in war and that the paying off of the ship would permit the crewing of additional escorts.

Well, the Harry DeWolf class is no escort. The year 2021 is the year that ended the RCN's limited capacity to operate in the Arctic. When once the RCN could operate for weeks in the North, it can now be there for months, or any time there is a necessity to operate in Canada's northern waterways.

This article will share from the captain's chair some highlights of HMCS *Harry DeWolf*'s first major journey with a focus on the North. The journey begins in Halifax, Nova Scotia (N.S.), and ends in Esquimalt, British Columbia (B.C.), via the Northwest Passage by way of the route of the Franklin Expedition and Roald Amundsen on *Gjoa*.

HMCS *Harry DeWolf* (HDW) deployed under the banner of Operation *Nanook* (*Op Nanook*) from 3 August to 15 September 2021. *Op Nanook* is the signature Arctic operation of the Canadian Armed Forces. The name derives from a military operation nomenclature that dates back to 1946,

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Commander Corey Gleason was the first commanding officer of HMCS *Harry DeWolf*. Appointed in 2015, Commander Gleason worked alongside industry and government to bring this class into service. He turned over command on 22 January 2022 and is now with Sea Training Patrol Vessel (Atlantic Group), supporting future patrol vessel captains at sea.

formally referred to as “U.S. Naval Exercise Nanook,” a proposed U.S./Canada joint Arctic exercise in which Canada’s senior naval leadership refused to participate at the time despite the significant international interest. Today, *Op Nanook* is delivering Arctic training, developing partnerships, and improving the readiness of its air-land-sea participants. The introduction of the Arctic and Offshore Patrol Ships, the Harry DeWolf class, is signalling the RCN’s readiness to operate in the North and improve its interoperability with domestic and international partners.

The days leading up to the departure were no different than those of HMCS *Labrador* when it set off on a similar voyage in the North, or any RCN ship, for that matter. Last-minute storing, training, personnel changes, equipment repairs, and, of course, a global pandemic complicated our departure. Everyone who was scheduled to sail with the ship, including the captain, had to chip in to get everything onboard and secured for sea.

On the day of the departure, there was a warm send off by Fleet Commander Commodore Rich Feltham, Commander Maritime Forces Atlantic Rear-Admiral Brian Santarpia, Member of Parliament Andy Fillmore, Lieutenant-Governor of Nova Scotia the Honourable Arthur J. LeBlanc, and local media. The ship moved away from the jetty, then turned at rest to pipe the side and salute the lieutenant-governor on our departure.

The transit north between Halifax and Iqaluit consisted of radar trials, typical training with sea trainers, and some task group-related activities with HMCS *Goose Bay*, USCGC *Richard Snyder*, and USCGC *Escanaba*. The weather was challenging and visibility quite poor. Upon arrival in Iqaluit, Nunavut, HDW proceeded to anchor, disembarked all sea training staff, and embarked four members of the Royal Canadian Mounted Police (RCMP) and three members of Defence Research and Development Canada (DRDC). The RCMP detachment embarked for the purpose of identifying and establishing future interoperability needs to meet their own Arctic mandates. The DRDC team embarked for the purpose of operating the Towed Reelable Active Passive Sonar (TRAPS) system, which was installed in a sea container that was embarked and secured to the quarterdeck to be employed during *Op Nanook*.

HDW jumped quickly from *Op Nanook* to Operation *Tatigiit* (NA-TA). This was a scenario-based operation that kicked off in dense fog on 12

August 2021 in the vicinity of Clyde River, Nunavut, and concluded in the same area and visibility on 13 August. *NA-TA* entailed a maritime response to a mass rescue operation involving units from the U.S. Coast Guard (USCG), Canadian Coast Guard (CCG), and HDW. As part of this, a vessel, *MV Northern Ranger*, was employed to act as the stricken vessel. The USCG and CCG concentrated on a search in restricted visibility for eight personnel in the frigid waters, whereas HDW focused on the stricken vessel. HDW sent casualty clearing teams, damage assessment teams, and a command component to organize an emergency response and stabilize the vessel. RCMP members embarked the stricken vessel to investigate and collect evidence in order to understand how the event happened. These personnel transfers were made possible by HDW's small boats, which are fitted with a full communications, radar, and navigation suite that includes an automatic identification system (AIS), which makes operating in restricted visibility a challenge but with much fewer risks.

The exercise wrapped up quickly, with many lessons learned. With the exercise came the realization of how much work we collectively have ahead to be an effective force enabler that can work seamlessly in a real-world situation. HDW then transited the Davis Strait for Nuuk, Greenland. The ship made a one-day stop for fuel and light provisioning before the next exercise began.

Before discussing our next exercise – Operation *Nunakput (NA-NU)* – I want to mention a special event that occurred. HDW crossed the Arctic Circle for the first time on 18 August 2021 at 0725:55 Greenwich Mean Time. In the tradition of acknowledging the milestone, HDW held a Crossing the Line ceremony. HDW kicked the day off with a Crossing of the Line breakfast, which consisted of some harmless food colouring added to eggs, bacon, sausage, and oatmeal. Sailors were invited to the flight deck where they were addressed by Queen Neptune, “shaved” with cake icing so they would be cleanly shaven before Queen Neptune, given a “pill” (cookie) to cure the tadpoles of disease, and kissed the head of a fish. They were then escorted across the flight deck under the salt-water spray from the ship's foam cannons on the gun deck and dipped into a kiddie pool. It culminated in sailors being acknowledged to be clean by Queen Neptune. HDW had 100 percent turnout for the ceremony, and the ship's company enjoyed seeing their captain go through all that they did. The air temperature was approximately 1° but sunny, and the whole event lasted approximately sixty minutes.

And now back to *Op NA-NU*. This commenced on 16 August as HDW departed Nuuk, and it was a pretty full dance card in the hamlets where the ship operated with Canadian Rangers and the Canadian Army Land Task Forces (LTF). We conducted training on the ship and illustrated our joint capabilities with boats and landing craft loaded with all-terrain vehicles. Our briefings with the Canadian Armed Forces (CAF) elements were important, as we learned to exploit our joint capabilities with an Arctic and Offshore Patrol Vessel (AOPV). HDW embarked twenty LTF soldiers from Grise Fjord and transferred them to Arctic Bay, demonstrating how their annual patrols can be expanded and enhanced with an AOPV as part of their patrol plans. HDW demonstrated throughout this operation that with its capabilities, personnel can now patrol extreme reaches of bays, the feet of glaciers, and beaches accessible only by boat. This force-enabling function will enhance Canada's reach in these austere regions.

In working with the Government of Nunavut and through face-to-face meetings to establish an affiliation program¹ with the different regions, it was decided that HDW would be affiliated with the largest of the six Inuit regions: Qikiqtaaluk. The Qikiqtani Region has thirteen hamlets that are spread as far north as Resolute Bay and Grise Fjord, and as far south as Hudson Bay, spanning all of Baffin Island and parts of Melville Peninsula, Somerset Island, and Prince of Wales Island. To commemorate this affiliation, a ceremony was conducted in Iqaluit in 2018, where then-President P.J. Akeagok of the Qikiqtani Inuit Association (QIA) (now Premier of Nunavut) and HDW were officially affiliated. Since the ceremony in 2018, the commanding officer had been collaborating by mail, email, and through teleconferences, but this was the first time that the ship and company were available in person to begin to develop friendships that I hope will last for many years.

Activities with the communities commenced upon arrival in Pond Inlet, Nunavut, on 20 August and carried on with subsequent visits to Grise Fjord (23 August), Arctic Bay (25 August), Cambridge Bay (2 September), and Kugluktuk (6 September). These activities allowed HDW to engage with over six hundred residents through formal visits with senior town administrators, breaking bread together (through community BBQs), town hall discussions, and providing tours of HDW. Between Pond Inlet and Arctic Bay, HDW embarked Peter Mansbridge and a film crew. This provided an opportunity to showcase the AOPV capabilities

and the positive impact the RCN will have in affiliated communities. I hope some of our efforts may be captured in the Arctic documentary still in production.²

The first deployment of the Towed Reelable Active Passive Sonar system from HDW began on our departure from Grise Fjord. The tests were to determine the efficacy of this system to be deployed from this class of ship. I was pleased to inform DRDC staff that we made history with this sovereignty patrol between Ellesmere Island and Devon Island – this was the farthest north an RCN towed array had been employed in northern waters.³

The visits to the hamlets and historic sites provided opportunities to showcase new capabilities, such as beach landings, that could be used in humanitarian and disaster relief operations anywhere in the world. For example, once at anchor, the crew conducted beach landing operations that included beach reconnaissance with swimmers to identify an appropriate beach operation point. The ship disembarked its seventeen-tonne landing craft with all-terrain vehicles to the shore position. The ship's crew went ashore to support activities, which included the movement of equipment, stores, and food for an outdoor cook-out, thus illustrating that rations for a large group of personnel could be transported to shore. The ship's company moved groups over land-sea-land for ship tours, thus proving the ability to move the elderly and children safely to the ship via landing craft and fitted ladders if ever needed.

While we were in Grise Fjord, a story was shared with the ship's company by a gentleman named Larry Audlaluk. Larry is now in his seventies and told the story of how as a young boy he was moved in the 1950s with some of his family from the northern part of Quebec to the shores off Grise Fjord on the side of a grainy barren hill by the water. Other members of his family were moved to Resolute Bay and left on a barren land in a similar manner. His story is complicated and painful to hear but is one that must be told and heard by every Canadian. I cannot do it justice in this short article, and his own book would be better suited to tell it.⁴ His family's story has been illustrated. In Grise Fjord, you will see a carved statue sitting in the hills above the hamlet. It is a young woman with her daughter facing west towards Resolute Bay. In Resolute Bay, you will find a similar statue facing east – it is a man and his dog. The two statues tell a story of families torn apart by people who believed they knew what was

best for other peoples' lives. It is a tragic story and one that I share with everyone who will listen. When I tell the story in person, it is so gut-wrenching for me I end up in tears. This is a small price to pay to remind Canadians of the mistakes we have made.

HDW visited the Nanisivik Naval Fuelling Facility (NNF), located on the banks of the Strathcona Sound on Baffin Island, in Nunavut. NNF has the ability to store 7,500 cubic metres of diesel fuel oil in two twenty-two-metre-diameter double-walled tanks. On site one, there is a storage facility and a site office that can accommodate up to six personnel. The berth is not a traditional jetty – it has a unique jetty structure unlike any traditional ship-shore connector. (It is made up of three large cylinders partially secured to the shore by recessing them into the shoreline.) Having made a series of approaches on the jetty with the ship, I found it to be an easy approach.

The closest hamlet to NNF is Arctic Bay, located approximately forty kilometres southwest over a mountainous region via a dirt road. The road once served as a service road for an iron ore mining company but was also used for the annual Arctic Marathon, which one day I hope the RCN will rebrand as the RCN Arctic Marathon. Participants could fly to Arctic Bay via commercial air during an AOPV's summer patrol, which could support the event. During our visit to Arctic Bay, we experienced a very warm welcome, a great deal of interest to visit the ship, and tremendous interaction on the shore with community members, in particular the youth of the community who received school supplies and backpacks collected and delivered by the HDW crew in their first week of school.

With the eastern patrol complete, HDW proceeded to the central Arctic. I was excited about this leg of the journey because the crew was about to explore parts of the world that are rarely visited. During our passage from Arctic Bay via Admiralty Inlet and Lancaster Sound, HDW encountered stiff winds and following seas. We encountered light 3/10th ice (meaning that 3/10th of the surface was covered with ice) with no significant floes right up until Beechey Island. We entered Devon Island Bay, an area that provided suitable anchorage and shelter to the Franklin Expedition and other ships that would follow in search for HMS *Terror* and *Erebus*, including HDW.

On arrival, we flew our drone over land in search of wildlife and found polar bears far away from our intended beach landing area. We prepared to place boats in the water for our reconnaissance and follow-on personnel

and conducted our routine mission briefs. We proceeded to Gascoyne Inlet with our landing craft and a work party to conduct a site survey, run up generators, and get a sense of what maintenance will be required once DRDC can return to continue its work in the North. My mission while at anchor was twofold: conduct an over-the-horizon operation with my landing craft from Beechey Island to Gascoyne Inlet via Lancaster Sound, and take advantage of a professional development opportunity like no other on the shores of Beechey Island.

Before proceeding ashore, I gathered the crew in HDW's hangar and discussed the Franklin Expedition and the significance of Beechey Island. Three of Franklin's crew are interred on the island. Their graves were discovered in 1851 by the crew of British and American search vessels who were looking for any sign of Franklin's "lost" expedition. I talked about the importance of their work and how sailors like ourselves took risks and sometimes made the ultimate sacrifice, not in a traditional war, but in doing all they could to see their mission through to fruition. I asked the crew, once they were on the beach and amongst the grave markers, to pause and reflect on the hardship those crews must have faced, as I did many years ago when I first visited this site. I asked them to take some time while on the beach to pay their respects. My imagination of life on Beechey is in stark contrast to Roald Amundsen's depiction, described in Pierre Berton's book *The Arctic Grail*, as "splendidly equipped ships, with the British colours flying, officers in dazzling uniforms or boatswains with their pipes and blue-clad sailors hurrying ashore." For me, while standing on the beach in a bitter cold wind, I imagined determined sailors from HMS *Erebus* and *Terror*, some despairing, hungry, cold, and perhaps with little appetite for fanfare, for tradition or uniforms, simply wanting to stay fed and warm.

At the end of both missions, we regrouped in the hangar for a BBQ. The discussions differed – some were somber, some excited due to polar bear sightings – and the Away Team who had departed the ship for Gascoyne via Lancaster shared their own observations. Each sailor had a unique story or observation, and I am sure these will be shared in years to come. It was a special day for all of us.

Once all boats were onboard and the ship was ready to redeploy, HDW got underway for Peel Sound. We didn't know it, but we were bound for ice encounters. The ice was reported to be light, with a decent lead (a lead is a crack in the ice or path between ice floes that is the path of least

resistance) to the northwest of Somerset Island. During our transit southeast through Barrow Strait and under a colourful sunset, I saw no evidence of a lead, and HDW found itself quickly in 4/10th ice regimes that would gradually increase day after day to 10/10th ice as we proceeded south in Larsen Sound for Victoria Strait.

As you can imagine, ice is a concern in the North. The AOPVs have been designed and appraised by Lloyd's Register based on the new International Association of Classification Societies (IACS) Polar Class (PC) Rules. The categories are as follows:

- A. Ships that are designed to operate in at least medium first-year ice which may include old inclusions. This corresponds to vessels built to the IACS Polar ice classes PC 1 to 5, icebreaking ships.
- B. Ships that are designed to operate in at least thin first-year ice which may include old inclusions. PC 6 and 7 or equivalent, ice-strengthened ships.
- C. Ships that are designed to operate in open water or in ice conditions less severe than those in categories A and B. This corresponds to ships of any Baltic ice class or with no ice strengthening at all.

The AOPVs have been classified as PC 4. They have icebreaking capabilities such as an icebreaker stem, ice-strengthened propellers, and ice knives, and the hull itself is an icebreaking form. These features, together with the propulsion plant, are what enable the ship to conduct icebreaking.

Ice in the Canadian Arctic is a mixture of first-year and multi-year ice. Multi-year ice is extremely dense, dangerous even for icebreaking ships proceeding too fast. During the summer thaw, multi-year ice breaks away and mixes in with first-year ice. When the winter begins, that multi-year freezes in with first-year ice, resulting in old inclusions which present challenges in the next navigable season. Depending on the summer melt, much of the Canadian Arctic can remain inaccessible for that navigable season.

The Harry DeWolf class is able to operate during the whole of the navigable season, which means that 2021 marked the first time this has been possible since HMCS *Labrador* operated in Canada's northern waterways. I am often asked "in what thickness of ice can an AOPV operate?" Thickness is of course a concern; however, temperature and wind build up ice ridges, and ice pressure is created between floes, which contributes to the risk index assessments equally.⁵ Without focusing on

the science of sea-ice composition, ice ridging, and pressure regions, a ship can be hampered in an ice regime, extremely cold temperatures, and inconsistent density, pressure, and thickness.

To get back to HDW's travels, the ship took Franklin's route west of King William Island, where ice tends to be extensive. The RCN could not operate in ice before the AOPVs – their introduction has made it possible to operate in 10/10th ice (100 percent ice). We proved this ability during cold weather Arctic trials in February/March 2021. Ship-handling in 10/10th ice is a force-enabling function. Now, this passage will be a matter of routine operation during *Op Nanook*. The ship encountered old ice from McClure Strait and M'Clintock Channel clogging Larsen Sound and Victoria Strait. Civilian shipping required escort by CCG ships, and HDW routinely encountered and communicated with the CCG in the central and western Arctic.

Once out of Victoria Strait, it was clear sailing through Queen Maud Gulf to Cambridge Bay, where the ship was to conduct its first major Arctic provisioning operation, as well as a planned fuel stop in Kugluktuk. Cambridge Bay is a beautiful open bay in which to anchor, protected by the environments and home to the Canadian High Arctic Research Station (CHARS). CHARS lies almost due south of Resolute Bay and shares similar infrastructure, such as a long runway, warehousing, federal facilities, and accommodations that can support crew changes, land task forces, and government departments with an Arctic mandate. This visit was hampered by the fact that COVID paperwork had not been received by the hamlet officials, so the ship crew was not allowed to engage with the community in the same way we had elsewhere. As an interesting aside, two beluga whales followed the ship into the bay, and the people of the hamlet were pleased and thanked us over the radio for the whales.

When we think about the Arctic, we think of rough terrain, sparse vegetation, and harsh weather conditions. Few would believe that coral could be found just feet off the shore in some places. CHARS illustrated this with submersible remote-controlled devices equipped with cameras, so we could see the fragile floral beauty under the water. It was extraordinary to discover and also concerning given what little we know about the biodiversity beneath the sea and another domain we must work to protect while we travel in northern waterways.

We spent four days at anchor off the coast of Kugluktuk, sharing our anchorage with CCGS *Sir Wilfrid Laurier* and a few commercial vessels

awaiting escort. Kugluktuk has a wonderful cultural centre which provides a snapshot of years of culture and tradition. The crew took the opportunity to purchase souvenirs to share with their families and friends. The Kitikmeot (western Arctic) Region is a special area, and I am confident the AOPV selected to be affiliated with this region will be well received by the residents of each community.

HDW carried on its journey, passing Point Barrow, Alaska, and proceeded south to Dutch Harbor for its first fuel stop since Nuuk and first port visit in fifty-one days at sea. Dutch Harbor was an excellent port to visit after such an amazing journey through Canada's Arctic Archipelago. It represents the frontier into the U.S. Arctic and the first fuel stop when leaving (or entering) the Arctic. The transit in and out was interrupted by pods of whales of different species – the ship stopped regularly for whales during its southbound transit. Through poor weather, the ship made good time, arriving in Prince Rupert to embark Commander Maritime Forces Pacific (MARPAF) Rear-Admiral Angus Topshee. We signalled our salutations to the town with ship's whistles, as we were greeted by people with cameras, flying unmanned aerial vehicles and small boats coming in for a closer look.

We carried on to Vancouver. The ship proceeded alongside Burrard Pier in the north end of Vancouver, where RCMP motor vessel *St. Roch* was built and launched. It was a fitting tribute to Vancouver and its contribution to building the first Canadian vessel to traverse the Northwest Passage. HMCS *Labrador* was the first RCN vessel and HDW the second. The interest in the ship was impressive, and the crew felt like celebrities.

The ship conducted a Canadian Leaders at Sea engagement, led by Commander Fleet Pacific Commodore Dave Mazur, which involved a transit from Vancouver to Victoria's Ogden Point, where local dignitaries and guests visited the ship. The next morning, HDW moved to Esquimalt Harbour for fuel, ammunition, and a short work period. This leg of HDW's journey ended with a brief rest, relaxation, and maintenance period in Esquimalt, designed to introduce the ship to the West Coast fleet of sailors, trainers, logisticians, maintenance personnel, and industry.⁶

I began this article with the paying off of HMCS *Labrador*, the first Arctic Patrol Vessel. Times have changed since 1958, but some things remain the same. Specifically, global and domestic affairs demand, as they did in 1958, that Canada and its allies invest in ships that respond with the

right capability to support the mission they are being asked to do. The work done by HDW in the North illustrated that its capabilities are applicable anywhere in the world. This very Canadian ship fits into a scalable RCN and will operate on the lower spectrum of warfare, filling the operational space of maritime security and disaster relief operations, while the frigates and Canadian Surface Combatants are free to operate exclusively in the higher spectrum of warfare.

Notes

¹ Ships are affiliated with regions of the country or cities. Ships and their affiliated cities or regions share charities, participate in community engagements, and share the activities of the ship with schools, clubs, and local governments. HMCS *Harry DeWolf* is affiliated with the Qikiqtani, one of the six Arctic regions recognized by the Inuit.

² Peter Mansbridge's podcast, "The Bridge," was produced onboard the ship while here, and I encourage you to take the time to listen as he describes his personal observations and conducts an interview with Coxswain (Coxn) Chief Petty Officer 1st Class Ginette Seguin.

³ The CBC-contracted film crew recorded some footage during the TRAPS deployment.

⁴ Larry Audlaluk, *What I Remember, What I Know: The Life of a High Arctic Exile* (Iqaluit: Inhabit Media, 2020).

⁵ Temperature affects fractal ice strength. When two large ice floes interact, they will break up and create ridges that push ice down into the water and up, creating a mountain with a deep keel like an iceberg, or at the very least create pressure that could prevent a ship from moving freely.

⁶ Thales, for example, is establishing on the West Coast under in-service support contracts for the AOPVs and the Joint Support Ships (AJISS) [Arctic and Offshore Patrol Ship/Joint Support Ship In-Service Support].



Further Reading

- Alexeeva, Olga, and Frédéric Lasserre. "China and the Arctic." In *Arctic Yearbook 2012*, eds. Lassi Heininen, Heather Exner-Pirot, and Joel Plouffe, 81–91. Akureyri: Northern Research Forum, 2012.
- Alexeeva, Olga, and Frédéric Lasserre. "La Russie, la Chine et la route de la soie polaire." *Diplomatie* n°102 (2020): 53–56.
- Amundsen, Roald, and Godfred Hansen. *The North West Passage: Being the Record of a Voyage of Exploration of the Ship "Gjoa" 1903-1907*. New York: E.P. Dutton, 1908.
- Appleton, Thomas E. *Usque ad mare: A History of the Canadian Coast Guard and Marine Services*. Ottawa: Department of Transport, 1969.
- Arctic Climate Impact Assessment (ACIA). *Impacts of a Warming Arctic: ACIA Overview Report*. Cambridge: Cambridge University Press, 2004.
- Arctic Marine Shipping Assessment (AMSA) *Report* 2009.
- Babin, Julie, Frédéric Lasserre, and Pauline Pic. "Arctic Shipping and Polar Seaways." In *Encyclopedia of Water: Science, Technology, and Society*, ed. Patricia Maurice, 1539–50. Hoboken: Wiley, 2019.
- Baker, H. Charles. "Northwest Passage: Voyage of the Manhattan." *Ocean Industry* 4, no. 8 (August 1969).
- Bankes, Nigel D. "Forty Years of Canadian Sovereignty Assertion in the Arctic, 1947-87." *Arctic* 40, no. 4 (December 1987): 292–99.
- Bankes, Nigel, and Maria Madalena das Neves. "The United Nations Convention on the Law of the Sea and the Arctic Ocean." In *The Palgrave Handbook of Arctic Policy and Politics*, eds. Ken Coates and Carin Holroyd, 375–91. Cham: Palgrave Macmillan, 2020.
- Barnes, Justin, Heather Exner-Pirot, Lassi Heininen, and P. Whitney Lackenbauer, eds. *China's Arctic Engagement: Following the Polar Silk Road to Greenland and Russia*. Peterborough: North American and Arctic Defence and Security Network (NAADSN), 2021.
- Bartenstein, Kristin. "The 'Arctic Exception' in the Law of the Sea Convention: A Contribution to Safer Navigation in the Northwest Passage?" *Ocean Development & International Law* 42, no. 1–2 (2011): 22–52.
- Bartenstein, Kristin. "Between the Polar Code and Article 234: The Balance in Canada's Arctic Shipping Safety and Pollution Prevention Regulations." *Ocean Development & International Law* 50, no. 4 (2019): 335–62.

- Bartenstein, Kristin. "The 'Common Arctic': Legal Analysis of Arctic and Non-Arctic Political Discourses." *Arctic Yearbook* 264 (2015): 281.
- Bartenstein, Kristin. "Navigating the Arctic: The Canadian NORDREG, the International Polar Code and Regional Cooperation." *German Yearbook of International Law* 54, no. 77 (2011).
- Bartenstein, Kristin, and Aldo Chircop. "Polar Shipping Law." In *Research Handbook on Polar Law*, eds. Karen Scott and David VanderZwaag, 371–90. Cheltenham: Edward Elgar, 2020.
- Bartenstein, Kristin, Roman Dremluga, and Natalia Prisekina. "Regulation of Arctic Shipping in Canada and Russia." *Arctic Review* 13 (2022): 338–60.
- Bartenstein, Kristin, and Suzanne Lalonde. "Shipping in the Canadian and Russian Arctic." In *Arctic Shipping: Climate Change, Commercial Traffic and Port Development*, eds. Frédéric Lasserre and Olivier Faury, 137–56. Routledge Studies in Transport Analysis. New York: Routledge, 2019.
- Bercuson, David J. "Continental Defense and Arctic Security, 1945-50: Solving the Canadian Dilemma." In *The Cold War and Defense*, ed. K. Neilson and R.G. Haycock, 153–70. New York: Praeger, 1990.
- Berger, Thomas. *Northern Frontier, Northern Homeland: The Report of the Mackenzie Valley Pipeline Inquiry*. Ottawa: Supply and Services Canada, 1977.
- Berton, Pierre. *The Arctic Grail: The Quest for the North West Passage and the North Pole, 1818–1909*. Doubleday Canada, 1988.
- Beveridge, Leah. "Inuit Nunangat and the Northwest Passage: An Exploration of Inuit and Arctic Shipping Conceptualizations of and Relationships with Arctic Marine Spaces in Canada." In *Governance of Arctic Shipping*, eds. Aldo Chircop, Floris Goerlandt, Claudio Aporta, and Ronald Pelot, 137–49. Cham: Springer, 2020.
- Beveridge, Leah, Mélanie Fournier, Frédéric Lasserre, Linyan Huang, and Pierre-Louis Têtu. "Interest of Asian Shipping Companies in Navigating the Arctic." *Polar Science* 10, no. 3 (2016): 404–14.
- Bocking, Stephen, and Daniel Heidt, eds. *Cold Science: Environmental Knowledge in the North American Arctic During the Cold War*. New York: Routledge, 2019.
- Bone, Robert. *The Geography of the Canadian North: Issues and Challenges*. Toronto: Oxford, 1992.

- Bourbonnais, Pascale, and Frédéric Lasserre. "Winter Shipping in the Canadian Arctic: Toward Year-Round Traffic?" *Polar Geography* 38, no. 1 (2015): 70–88.
- Bown, Stephen R. *The Last Viking: The Life of Roald Amundsen*. Boston: Da Capo Press, 2012.
- Briggs, Philip J. "The Polar Sea Voyage and the Northwest Passage Dispute." *Armed Forces & Society* 16, no. 3 (1990): 437–52.
- Broadhead, Lee-Anne. "Canadian Sovereignty Versus Northern Security: The Case for Updating Our Mental Map of the Arctic." *International Journal* 65, no. 4 (2010): 913–30.
- Byers, Michael. *International Law and the Arctic*. Cambridge: Cambridge University Press, 2013.
- Byers, Michael. "Negotiate the Northwest Passage, Before It's Too Late." In *North of 60: Toward a Renewed Canadian Arctic Agenda*, eds. John Higginbotham and Jennifer Spence, 77–81. Waterloo: Centre for International Governance Innovation, 2016.
- Byers, Michael. "Time to Negotiate the Northwest Passage with the United States." *Policy Options* 32, no. 9 (2011): 68–71.
- Byers, Michael. "Unfrozen Sea: Sailing the Northwest Passage." *Policy Options* 28, no. 5 (2007): 30.
- Byers, Michael. *Who Owns the Arctic?: Understanding Sovereignty Disputes in the North*. Vancouver: Douglas & McIntyre, 2009.
- Byers, Michael, and Nicole Covey. "Arctic SAR and the 'Security Dilemma.'" *International Journal* 74, no. 4 (2019): 499–517.
- Byers, Michael, and Suzanne Lalonde. "Who Controls the Northwest Passage?" *Vanderbilt Journal of Transnational Law* 42 (2009): 1133–210.
- Byers, Michael, and Emma Lodge. "China and the Northwest Passage." *Chinese Journal of International Law* 18, no. 1 (2019): 57–90.
- Cavell, Janice. "Arctic Exploration in Canadian Print Culture, 1890–1930." *Papers of the Bibliographical Society of Canada* 44, no. 2 (2006): 7–43.
- Cavell, Janice, ed. *Documents on Canadian External Relations: The Arctic, 1874–1949*. Ottawa: Global Affairs Canada, 2016.
- Cavell, Janice. "'A Little More Latitude': Explorers, Politicians, and Canadian Arctic Policy During the Laurier Era." *Polar Record* 47, no. 4 (2010): 289–309.

- Cavell, Janice. "Sector Claims and Counter-Claims: Joseph Elzéar Bernier, the Canadian Government, and Arctic Sovereignty, 1898–1934." *Polar Record* 50, no. 3 (2014): 293–310.
- Cavell, Janice, and Jeff Noakes. *Acts of Occupation: Canada and Arctic Sovereignty, 1918–25*. Vancouver: UBC Press, 2010.
- Charron, Andrea. "Canada, the United States and Arctic Security." In *Canada's Arctic Agenda: Into the Vortex*, eds. John Higginbotham and Jennifer Spence, 92–101. Waterloo: Centre for International Governance Innovation, 2019.
- Charron, Andrea. "Canada, the United States, and the Northwest Passage: Sovereignty to the Side." *Polar Geography* 29, no. 2 (2005): 139–55.
- Charron, Andrea. "Contesting the Northwest Passage: Four Far-North Narratives." In *Border Flows: A Century of the Canadian-American Water Relationship*, eds. Lynne Heasley and Daniel Macfarlane, 87–110. Calgary: University of Calgary Press, 2016.
- Charron, Andrea. "The Northwest Passage: Is Canada's Sovereignty Floating Away?" *International Journal* 60, no. 3 (2005): 831–48.
- Charron, Andrea. "The Northwest Passage Shipping Channel: Sovereignty First and Foremost and Sovereignty to the Side." *Journal of Military and Strategic Studies* 7, no. 4 (2005): 1–26.
- Charron, Andrea. "The Recasting of the Arctic Sovereignty Theme: Assessing Harper's Arctic Foreign Policy." In *Harper's World: The Politicization of Canadian Foreign Policy, 2006–2015*, ed. Peter McKenna, 211–23. Toronto: University of Toronto Press, 2022.
- Chen, Jin-Lei, Shi-Chang Kang, Jun-Ming Guo, Min Xu, and Zhi-Min Zhang. "Variation of Sea Ice and Perspectives of the Northwest Passage in the Arctic Ocean." *Advances in Climate Change Research* 12, no. 4 (2021): 447–55.
- Chircop, Aldo. "Climate Change and the Prospects of Increased Navigation in the Canadian Arctic." *WMU Journal of Maritime Affairs* 6, no. 2 (2007): 193–205.
- Chircop, Aldo. "The Growth of International Shipping in the Arctic: Is a Regulatory Review Timely?" *The International Journal of Marine and Coastal Law* 24, no. 2 (2009): 355–80.
- Chircop, Aldo. "The Polar Code and the Arctic Marine Environment: Assessing the Regulation of the Environmental Risks of Shipping." *International Journal of Marine and Coastal Law* 35, no. 3 (2020): 533–69.

- Chircop, Aldo. "Sustainable Arctic Shipping: Are Current International Rules for Polar Shipping Sufficient?" *The Journal of Ocean Technology* 11, no. 3 (2016): 39–51.
- Chircop, Aldo, Ivan Bunik, Moira L. McConnell, and Kristoffer Svendsen. "Course Convergence? Comparative Perspectives on the Governance of Navigation and Shipping in Canadian and Russian Arctic Waters." *Ocean Yearbook Online* 28, no. 1 (2014): 291–327.
- Chircop, Aldo, and Miriam Czarski. "Polar Code Implementation in the Arctic Five: Has Harmonisation of National Legislation Recommended by AMSA Been Achieved?" *The Polar Journal* 10, no. 2 (2020): 1–19.
- Chircop, Aldo, Floris Goerlandt, Claudio Aporta, and Ronald Pelot, eds. *Governance of Arctic Shipping: Rethinking Risk, Human Impacts and Regulation*. Cham: Springer Nature, 2020.
- Chircop, Aldo, Peter Pamel, and Miriam Czarski. "Canada's Implementation of the Polar Code." *Journal of International Maritime Law* 24, no. 6 (2018): 428–50.
- Clancy, Peter, and P. Whitney Lackenbauer, eds. *Shaping Inuit Policy: The Minutes of the Eskimo Affairs Committee, 1952–62*. Documents on Canadian Arctic Sovereignty and Security (DCASS) No. 13. Calgary and Waterloo: Centre for Military, Security and Strategic Studies/Arctic Institute of North America (AINA)/Centre on Foreign Policy and Federalism (CFPF), 2019.
- Clark, Karin. *Breaking Ice with Finesse: Oil and Gas Exploration in the Canadian Arctic*. Calgary: AINA, 1997.
- Coates, Ken, and Kimi Hara, eds. *East Asia-Arctic Relations: Boundary, Security, and International Politics*. Waterloo: Centre for International Governance Innovation, 2014.
- Coates, Ken, P. Whitney Lackenbauer, William Morrison, and Greg Poelzer. *Arctic Front: Defending Canada in the Far North*. Toronto: Thomas Allen, 2008.
- Coen, Ross. *Breaking Ice for Arctic Oil: The Epic Voyage of the SS Manhattan Through the Northwest Passage*. Fairbanks: University of Alaska Press, 2012.
- Cohen, Maxwell. "The Arctic and the National Interest." *International Journal* 26, no. 1 (1970–71): 52–81.
- Conant, Melvin. *The Long Polar Watch: Canada and the Defence of North America*. New York: Harper, 1962.

- Cook, Alison, Jackie Dawson, Stephen Howell, Jean Holloway, and Mike Brady. "Sea Ice Choke Points Reduce the Length of the Shipping Season in the Northwest Passage." *Communications Earth & Environment* 5, no. 1 (2024): 362.
- Cooke, Alan. *The Exploration of Northern Canada, 500-1920: A Chronology*. Toronto: Arctic History Press, 1978.
- Copland, Luke, Jackie Dawson, Adrienne Tivy, Frances Delaney, and Alison Cook. "Changes in Shipping Navigability in the Canadian Arctic Between 1972 and 2016." *Facets* 6, no. 1 (2021): 1069–87.
- Corley, Nora. *A Bibliography of Expeditions to the Canadian Arctic 1576 to 1966, with Special Emphasis on the Classics of Canadian Exploration*. Ottawa: AINA, 1973.
- Cotter, Jamie. "Developing a Coherent Plan to Deal with Canada's Conundrum in the Northwest Passage." *Journal of Military and Strategic Studies* 11, no. 3 (2009): 1–51.
- Dawson, Jackie, Natalie Carter, Nicolien van Luijk, Colleen Parker, Melissa Weber, Alison Cook, Kayla Grey, and Jennifer Provencher. "Infusing Inuit and Local Knowledge into the Low Impact Shipping Corridors: An Adaptation to Increased Shipping Activity and Climate Change in Arctic Canada." *Environmental Science & Policy* 105 (2020): 19–36.
- Dawson, Jackie, Margaret Johnston, and Emma Stewart. "Governance of Arctic Expedition Cruise Ships in a Time of Rapid Environmental and Economic Change." *Ocean & Coastal Management* 89 (2014): 88–99.
- Dawson, Jackie, Larissa Pizzolato, Stephen E.L. Howell, Luke Copland, and Margaret E. Johnston. "Temporal and Spatial Patterns of Ship Traffic in the Canadian Arctic from 1990 to 2015." *Arctic* 71, no. 1 (2018): 15–26.
- Dawson, Jackie, Emma J. Stewart, Margaret E. Johnston, and Christopher J. Lemieux. "Identifying and Evaluating Adaptation Strategies for Cruise Tourism in Arctic Canada." *Journal of Sustainable Tourism* 24, no. 10 (2016): 1425–41.
- Day, Alan. *Historical Dictionary of the Discovery and Exploration of the Northwest Passage*. Lanham: Scarecrow Press, 2006.
- Day, Alan. *Search for the Northwest Passage: An Annotated Bibliography*. New York: Garland, 1986.
- Dean, Ryan, and P. Whitney Lackenbauer. "China's Arctic Gambit? Contemplating Possible Strategies." *NAADS Policy Brief* (April

2020). <https://www.naadsn.ca/wp-content/uploads/2020/04/20-apr-23-China-Arctic-Gambit-RD-PWL.pdf>

Dean, Ryan, P. Whitney Lackenbauer, and Adam Lajeunesse. *Canadian Arctic Defence Policy: A Synthesis of Key Documents, 1970-2013*. DCASS No. 1. Calgary and Waterloo: Centre for Military and Strategic Studies/CFPF, 2014.

Delaney, Jason. "'He Was Writing the Book': Lieutenant Commander James P. Croal: The Royal Canadian Navy's Cold War Arctic Specialist." *Northern Mariner* 25, no. 4 (2015): 399–412.

Delaney, Jason, and Michael Whitby. "The Very Image of a Man of the Arctic: Commodore OCS Robertson." *Canadian Naval Review* 4, no. 4 (2009): 25–29.

Delgado, James. *Across the Top of the World: The Quest for the Northwest Passage*. Vancouver: Douglas & McIntyre, 2009.

Delgado, James P. *Arctic Workhorse: The RCMP Schooner St. Roch*. TouchWood Editions, 2003.

Depledge, Duncan, and P. Whitney Lackenbauer, eds. *On Thin Ice? Perspectives on Arctic Security*. Peterborough: NAADSN, 2021.

Dorion-Robitaille, Yolande. *Captain J.-E. Bernier's Contribution to Canadian Sovereignty in the Arctic*. Ottawa: Canadian Museum of Civilization, 1978.

Dorough, Dalee Sambo, Bridget Larocque, Kaviq Kaluraq, and Daniel Taukie. In *Voices from the Arctic: Diverse Views on Canadian Arctic Security*, ed. P. Whitney Lackenbauer. Peterborough: NAADSN, 2020.

Dosman, Edgar, ed. *The Arctic in Question*. Toronto: Oxford University Press, 1976.

Dosman, Edgar. *The National Interest: The Politics of Northern Development 1968-75*. Toronto: McClelland and Stewart, 1975.

Dosman, Edgar. "The Northern Sovereignty Crisis." *The Arctic in Question*, ed. Edgar Dosman. Toronto, 1976.

Dosman, Edgar, ed. *Sovereignty and Security in the Arctic*. London: Routledge, 1989.

Elliot-Meisel, Elizabeth. "Politics, Pride, and Precedent: The United States and Canada in the Northwest Passage." *Ocean Development & International Law* 40, no. 2 (2009): 204–32.

Elliot-Meisel, Elizabeth. *Reconsidering the Northwest Passage: Arctic Sovereignty and Continental Security in U.S.-Canada Relations*. Peterborough: NAADSN, 2024.

- Elliot-Meisel, Elizabeth. "Still Unresolved After Fifty Years: The Northwest Passage in Canadian-American Relations, 1946-1998." *American Review of Canadian Studies* 29, no. 3 (1999): 407-30.
- Elliot-Meisel, Elizabeth. "Understanding the Canada-United States Arctic Relationship." In *International Law and Politics of the Arctic Ocean: Essays in Honor of Donat Pharand*, eds. Suzanne Lalonde and Ted L. McDorman, 201-15. Leiden: Brill Nijhoff, 2015.
- Eyre, Kenneth. *Custos Borealis: The Military in the Canadian North*. Edited with an afterword by P. Whitney Lackenbauer. Peterborough: NAADSN, 2020.
- Eyre, Kenneth. "Forty Years of Military Activity in the Canadian North, 1947-87." *Arctic* 40, no. 4 (December 1987): 292-99.
- Farish, Matthew. *The Contours of America's Cold War*. Minneapolis: University of Minnesota Press, 2010.
- Farish, Matthew, and P. Whitney Lackenbauer. "High Modernism in the Arctic: Planning Frobisher Bay and Inuvik." *Journal of Historical Geography* 35, no. 3 (2009): 517-44.
- Ford, James, and Dylan Clark. "Preparing for the Impacts of Climate Change Along Canada's Arctic Coast: The Importance of Search and Rescue." *Marine Policy* 108 (2019): 1-4.
- Ford, Violet. "The Inuit and Issues of Arctic Sovereignty." In *Northern Exposure: Peoples, Powers and Prospects in Canada's North*, eds. Frances Abele, Thomas J. Courchene, F. Leslie Seidle, and France St-Hilaire. Ottawa: Institute for Research on Public Policy, 2009.
- Fortier, Y.O., A.H. McNair, and R. Thorsteinsson. "Geology and Petroleum Possibilities in Canadian Arctic Islands." *Bulletin of the American Association of Petroleum Geologists* 38, no. 10 (1954): 2075-109.
- Funston, Bernard. *Emergency Preparedness in Canada's North*. Toronto: Walter and Duncan Gordon Foundation, 2014.
- Gabrys, Marcin. "The Legend of the *Gedania* Voyage Through the Northwest Passage." *International Journal of Canadian Studies* 60 (2022): 1-20.
- Gagnon, Melanie, and Iqaluit Elders. *Inuit Recollections on the Military Presence in Iqaluit*. Iqaluit: Nunavut Arctic College, 2002.
- Gavrilov, Viatcheslav, David VanderZwaag, and Susan Rolston. "Responding to a Changing Arctic Ocean: Canadian and Russian Experiences and Challenges." *Arctic Review* 13 (2022): 213-18.

- Geddert, Jeremy Seth. "Right of (Northwest) Passage: Toward a Responsible Canadian Arctic Sovereignty." *Canadian Journal of Political Science* 52, no. 3 (2019): 595–612.
- Genest, Philippe, and Frédéric Lasserre. "Souveraineté, Sécurité, Identité: éléments-clés du discours du gouvernement canadien sur l'Arctique." *Canadian Foreign Policy Journal* 21, no. 1 (2015): 64–84.
- Grant, Shelagh D. *Polar Imperative: A History of Arctic Sovereignty in North America*. Vancouver: Douglas & McIntyre, 2010.
- Grant, Shelagh. *Sovereignty or Security?: Government Policy in the Canadian North, 1936-1950*. Vancouver: UBC Press, 1988.
- Greaves, Wilfrid, and P. Whitney Lackenbauer, eds. *Breaking Through: Understanding Sovereignty and Security in the Circumpolar Arctic*. Toronto: University of Toronto Press, 2021.
- Greenwood, Nigel. "Canada's Pacific Gateway to the Arctic." *The Northern Mariner* 31, no. 4 (2021): 431–48.
- Griffiths, Franklyn, ed. *Arctic Alternatives: Civility or Militarism in the Circumpolar North?* Toronto: Science for Peace/Samuel Stevens, 1992.
- Griffiths, Franklyn. "Canadian Arctic Sovereignty: Time to Take Yes for an Answer on the Northwest Passage." In *Northern Exposure: Peoples, Powers and Prospects in Canada's North*, eds. Frances Abele, Thomas Courchene, Leslie Seidle, and France St-Hilaire, 1–30. Ottawa: Institute for Research on Public Policy, 2009.
- Griffiths, Franklyn, ed. *Politics of the Northwest Passage*. Montreal and Kingston: McGill-Queen's University Press, 1987.
- Griffiths, Franklyn, Rob Huebert, and P. Whitney Lackenbauer. *Canada and the Changing Arctic: Sovereignty, Security, and Stewardship*. Waterloo: Wilfrid Laurier University Press, 2011.
- Guillaume, Anne. "Passage du Nord-Ouest et Navigation en 2016." *La Météorologie* 95 (2016): 2–3.
- Guy, Emmanuel, and Frédéric Lasserre. "Commercial Shipping in the Arctic: New Perspectives, Challenges and Regulations." *Polar Record* 52, no. 3 (2016): 294–304.
- Halliday, William, Jackie Dawson, David Yurkowski, Thomas Doniol-Valcroze, Steven Ferguson, Carina Gjerdrum, Nigel Hussey, et al. "Vessel Risks to Marine Wildlife in the Tallurutiup Imanga National Marine Conservation Area and the Eastern Entrance to the Northwest Passage." *Environmental Science & Policy* 127 (2022): 181–95.

- Hamilton, Vesey, Allen Young, Captain Creak, Admiral Field, and Captain Amundsen. "To the North Magnetic Pole and Through the North-West Passage: Discussion." *Geographical Journal* 29, no. 5 (1907): 513–18.
- Handeland, Ingrid. "Navigational Rights for Warships in the Northwest and Northeast Passages." *Arctic Review on Law and Politics* 13 (2022): 143–59.
- Head, Ivan. "Canadian Claims to Territorial Sovereignty in the Arctic Regions." *McGill Law Journal* 9 (1963): 200–26.
- Headland, Robert. "Ten Decades of Transits of the Northwest Passage." *Polar Geography* 33, no. 1–2 (2010): 1–13.
- Headland, Robert, and John Splettstoesser. "First Circumnavigation of the Arctic by Tourist Vessel." *Polar Geography* 23, no. 3 (1999): 246–49.
- Heidt, Daniel, and P. Whitney Lackenbauer. *The Joint Arctic Weather Stations: Science and Sovereignty in the High Arctic, 1946-1972*. Calgary: University of Calgary Press, 2022.
- Helfferich, Merritt R. "The Cruise of the *Manhattan*." *Alaska Geographic* 1, no. 1 (1972).
- Henke, Martin, Tyler Miesse, Andre de Souza de Lima, Celso Ferreira, Thomas Ravens, and Ralph Pundt. "Evolving Arctic Maritime Hazards: Declining Sea Ice and Rising Waves in the Northwest Passage." *Proceedings of the National Academy of Sciences* 121, no. 29 (2024): e2400355121.
- Honderich, John. *Arctic Imperative: Is Canada Losing the North?* Toronto: University of Toronto Press, 1987.
- Howell, Stephen, David Babb, Jack Landy, and Mike Brady. "Multi-Year Sea Ice Conditions in the Northwest Passage: 1968–2020." *Atmosphere-Ocean* 61, no. 4 (2023): 202–16.
- Howell, Stephen, David Babb, Jack Landy, Isolde Glissenaar, Kaitlin McNeil, Benoit Montpetit, and Mike Brady. "Sea Ice Transport and Replenishment Across and Within the Canadian Arctic Archipelago, 2016–2022." *The Cryosphere* 18, no. 5 (2024): 2321–33.
- Huebert, Rob. "Canada-United States Environmental Arctic Policies: Sharing a Northern Continent." In *Bilateral Ecopolitics: Continuity and Change in Canadian-American Environmental Relations*, 133–50. London: Ashgate, 2017.
- Huebert, Rob. "Canadian Arctic Maritime Security: The Return to Canada's Third Ocean." *Canadian Military Journal* 8, no. 2 (2007): 9–16.

- Huebert, Rob. "The Melting Ice and the Transforming Arctic Ocean." *Ocean Yearbook Online* 31, no. 1 (2017): 55–79.
- Huebert, Rob. "Melting Relations: The Evolving Canadian-American Arctic Partnership—Disputes, Challenges, and Opportunities." *Polar Geography* 29, no. 2 (2005): 126–38.
- Huebert, Rob. "A Northern Foreign Policy: The Politics of Ad Hocery." In *Diplomatic Departures: The Conservative Era in Canadian Foreign Policy, 1984–93*, eds. N. Michaud and K.R. Nossal, 84–112. Vancouver: UBC Press, 2001.
- Huebert, Rob. "Polar Vision or Tunnel Vision: The Making of Canadian Arctic Waters Policy." *The Calgary Papers in Military and Strategic Studies* 4 (2011): 309–44.
- Huebert, Rob. "The Shipping News Part II: How Canada's Arctic Sovereignty Is on Thinning Ice." *International Journal* 58, no. 3 (2003): 295–308.
- Huebert, Rob. "Steel, Ice and Decision-Making: The Voyage of the Polar Sea and Its Aftermath." Unpublished Ph.D. dissertation, Dalhousie University, 1994.
- Huebert, Rob. "Submarines, Oil Tankers, and Icebreakers: Trying to Understand Canadian Arctic Sovereignty and Security." *International Journal* 66, no. 4 (2011): 809–24.
- Huebert, Rob, ed. *Thawing Ice--Cold War: Canada's Security, Sovereignty, and Environmental Concerns in the Arctic*. Bison Paper 12. Winnipeg: University of Manitoba, Centre for Defence and Security Studies, 2009.
- Huebert, Rob, and P. Whitney Lackenbauer. "Premier Partners: Canada, the United States, and Arctic Security." In *Governing the North American Arctic*, eds. Dawn Alexandra, Nigel Bowles, and Halbert Jones, 122–42. London: Palgrave Macmillan, 2016.
- Jessup, David Eric. "J.-E. Bernier and the Assertion of Canadian Sovereignty in the Arctic." *American Review of Canadian Studies* 38, no. 4 (2008): 409–27.
- Jockel, Joseph. *No Boundaries Upstairs: Canada, the United States, and the Origins of North American Air Defence, 1945–1958*. Vancouver: UBC Press, 1987.
- Johnston, Douglas. "The Northwest Passage Revisited." *Ocean Development & International Law* 33, no. 2 (2002): 145–64.

- Jones, Gordon. "Economic Development – Oil and Gas." In *A Century of Canada's Arctic Islands, 1880-1980*, ed. Morris Zaslow. Ottawa: Royal Society of Canada, 1981.
- Keating, Bern. *The Northwest Passage: From the Mathew to the Manhattan, 1497 to 1969*. Chicago: Rand McNally, 1970.
- Keith, Robert, and David Fischer. "Assessing the Development Decision-Making Process: A Case Study of Canadian Frontier Petroleum Development." *American Journal of Economics and Sociology* 36, no. 2 (1977): 147–64.
- Kenney, Gerard. *Dangerous Passage: Issues in the Arctic*. Toronto: Dundurn, 2006.
- Kenney, Gerard. *Ships of Wood and Men of Iron: A Norwegian-Canadian Saga of Exploration in the High Arctic*. Toronto: Dundurn, 2005.
- Kerber, Jenny. "Tracing One Warm Line: Climate Stories and Silences in Northwest Passage Tourism." *Journal of Canadian Studies* 56, no. 2 (2022): 271–303.
- Kessel, Alan. "Canadian Arctic Sovereignty: Myths and Realities." In *Governing the North American Arctic*, eds. Dawn Alexandra, Nigel Bowles, and Halbert Jones, 242–46. London: Palgrave Macmillan, 2016.
- Kikkert, Peter. "The Disappointing Arctic: Will More Shipping Dreams Be Shattered on the Ice?" *Journal of Maritime Law and Commerce* 43, no. 4 (2012): 539–52.
- Kikkert, Peter. "In Search of Polar Sovereignty, 1900-1959." In *Breaking Through: Understanding Sovereignty and Security in the Circumpolar Arctic*, eds. Wilfrid Greaves and P. Whitney Lackenbauer, 25–43. Toronto: University of Toronto Press, 2021.
- Kikkert, Peter. "1946: The Year Canada Chose Its Path in the Arctic." In *Canadian Arctic Sovereignty and Security: Historical Perspectives*, ed. P. Whitney Lackenbauer, 69–110. Calgary: Centre for Military and Strategic Studies, 2011.
- Kikkert, Peter. "Promoting National Interests and Fostering Cooperation: Canada and the Development of a Polar Code." *Journal of Maritime Law and Commerce* 43, no. 3 (2012): 319–34.
- Kikkert, Peter, and P. Whitney Lackenbauer. "Bolstering Community-Based Marine Capabilities in the Canadian Arctic." *Canadian Naval Review* 15, no. 2 (2019): 11–16. <http://www.navalreview.ca/wp-content/uploads/public/vol15num2/vol15num2art2.pdf>

- Kikkert, Peter, and P. Whitney Lackenbauer. "Canada's Arctic and Northern Policy Framework: A Roadmap for the Future?" In *Redefining Arctic Security: Arctic Yearbook 2019*, eds. Lassi Heininen, Heather Exner-Pirot, and Justin Barnes, 332–39. Akureyri: Northern Research Forum, 2019.
- Kikkert, Peter, and P. Whitney Lackenbauer. "'A Great Investment in Our Communities': Strengthening Nunavut's Whole-of-Society Search and Rescue Capabilities." *Arctic* 74, no. 3 (2021): 258–75.
- Kikkert, Peter, and P. Whitney Lackenbauer, eds. *Legal Appraisals of Canada's Arctic Sovereignty: Key Documents, 1905–56*. DCASS No. 2. Calgary and Waterloo: Centre for Military and Strategic Studies/CFPF, 2014.
- Kikkert, Peter, and P. Whitney Lackenbauer. "The Militarization of the Arctic to 1990." In *The Palgrave Handbook of Arctic Policy and Politics*, eds. Ken Coates and Carin Holroyd, 487–505. Cham: Palgrave Macmillan, 2020.
- Kikkert, Peter, and P. Whitney Lackenbauer. "Search and Rescue, Climate Change, and the Expansion of the Coast Guard Auxiliary in Inuit Nunangat/the Canadian Arctic." *Canadian Journal of Emergency Management* 1, no. 2 (2021): 26–63.
- Kikkert, Peter, and P. Whitney Lackenbauer. "Setting an Arctic Course: Task Force 80 and Canadian Control in the Arctic, 1948." *Northern Mariner* 21, no. 4 (2011): 327–58.
- Kikkert, Peter, and P. Whitney Lackenbauer. "Strengthening Search and Rescue in Nunavut: Approaches and Options." *NAADSN Policy Primer* (January 2021).
- Kikkert, Peter, Adam Lajeunesse, and P. Whitney Lackenbauer. "Lester Pearson, the United States, and Arctic Sovereignty: A Case of Un-Pearsonian Diplomacy?" In *Mike's World: Lester Pearson and Canadian External Relations, 1963–68*, eds. Asa McKercher and Galen Perras, 149–68. Vancouver: UBC Press, 2017.
- Kirkey, Christopher. "The Arctic Waters Pollution Prevention Initiatives: Canada's Response to an American Challenge." *International Journal of Canadian Studies* 13 (1996): 41–59.
- Kirkey, Christopher. "Smoothing Troubled Waters: The 1988 Canada–United States Arctic Co-operation Agreement." *International Journal* 50 (1995): 401–26.
- Kirton, John, and Don Munton. "The Manhattan Voyages and Their Aftermath." In *Politics of the Northwest Passage*, ed. Franklyn Griffiths,

- 67–97. Montreal and Kingston: McGill-Queen's University Press, 1987.
- Kirton, John, and Don Munton. "Protecting the Canadian Arctic: The *Manhattan Voyages, 1969-1970*." In *Canadian Foreign Policy: Selected Cases*, eds. John Kirton and Don Munton, 206–21. Toronto: Prentice-Hall, 1992.
- Kløver, Geir, Susan Barr, et al., eds. *Roald Amundsen's Diaries: The Northwest Passage 1903-1905*. Oslo: Fram Museum, 2017.
- Krafft, Mahealani. "The Northwest Passage: Analysis of the Legal Status and Implications of Its Potential Use." *Journal of Maritime Law & Commerce* 40 (2009): 537.
- Kraska, James. "The Law of the Sea Convention and the Northwest Passage." *International Journal of Marine and Coastal Law* 22, no. 2 (2007): 257–81.
- Kravitz, Meredith, and Vanessa Gastaldo. *Emergency Management in the Arctic: The Context Explained*. Toronto: Walter and Duncan Gordon Foundation, 2013.
- Lackenbauer, P. Whitney. "Agency in High [Arctic] Modernization." In *Many Norths: Spatial Practice in a Shifting Territory*, eds. Lola Sheppard and Mason White, 331–40. New York: Actar Publishers, 2017.
- Lackenbauer, P. Whitney. "Arctic Defence and Security: Transitioning to the Trudeau Government." In *Whole of Government Through an Arctic Lens*, eds. P. Whitney Lackenbauer and Heather Nicol, 308–40. Antigonish: Mulroney Institute of Government, 2017.
- Lackenbauer, P. Whitney. "Canada's Emerging Arctic and Northern Policy Framework: Confirming a Longstanding Northern Strategy." In *Breaking the Ice Curtain? Russia, Canada, and Arctic Security in a Changing Circumpolar World*, eds. P. Whitney Lackenbauer and Suzanne Lalonde, 13–42. Calgary: Canadian Global Affairs Institute (CGAI), 2019.
- Lackenbauer, P. Whitney, ed. *Canada's Northern Strategies: From Trudeau to Trudeau, 1970-2025*. DCASS No. 17, rev. ed. Calgary: Centre for Military, Security and Strategic Studies, 2025.
- Lackenbauer, P. Whitney, ed. *Canadian Arctic Defence and Foreign Policy: Recent Developments*. Peterborough: NAADSN, 2025.
- Lackenbauer, P. Whitney, ed. *Canadian Arctic Sovereignty and Security: Historical Perspectives*. Calgary: Centre for Military and Strategic Studies, 2011.

- Lackenbauer, P. Whitney. "Canadian Security and Safety in the Arctic: Probable Challenges, Practical Responsibilities." *Canadian Naval Review* 10, no. 2 (2014): 10–15.
- Lackenbauer, P. Whitney. "Conceptualizing Canadian Arctic Security in the Twenty-First Century." In *Lines in the Snow: Thoughts on the Past and Future of Northern Canadian Policy Issues*, eds. Clive Tesar and P. Whitney Lackenbauer, 104–14. Ottawa: Canadian Arctic Resources Committee, 2021.
- Lackenbauer, P. Whitney. "Defence, Development, and Inuit: St-Laurent's Modern Approach to the North." In *St. Laurent's Canada*, ed. Patrice Dutil, 193–221. Vancouver: UBC Press, 2020.
- Lackenbauer, P. Whitney. "The Military as Nation Builder: The Case of the Canadian North." *Journal of Military and Strategic Studies* 15, no. 1 (2013): 1–32.
- Lackenbauer, P. Whitney, ed. *Northern Nationalisms, Arctic Mythologies, and the Weight of History: Selected Writings by Shelagh Grant*. Peterborough: Frost Research Centre Press, 2023.
- Lackenbauer, P. Whitney. "Polar Race or Polar Saga? Canada and the Circumpolar World." In *Arctic Security in an Age of Climate Change*, ed. James Kraska, 218–43. Cambridge: Cambridge University Press, 2011.
- Lackenbauer, P. Whitney. "Toward a Comprehensive Approach to Canadian Security and Safety in the Arctic." In *Breaking Through: Understanding Sovereignty and Security in the Circumpolar Arctic*, eds. Wilfrid Greaves and P. Whitney Lackenbauer, 137–67. Toronto: University of Toronto Press, 2021.
- Lackenbauer, P. Whitney, and Ryan Dean, eds. *Canada's Northern Strategy Under Prime Minister Stephen Harper: Key Speeches and Documents on Sovereignty, Security, and Governance, 2006-15*. DCASS No. 6. Calgary and Waterloo: Centre for Military, Security and Strategic Studies/AINA/CFPF, 2016.
- Lackenbauer, P. Whitney, Ryan Dean, and Rob Huebert, eds. *(Re)Conceptualizing Arctic Security: Selected Articles from the Journal of Military and Security Studies*. Calgary: Centre for Military, Security and Strategic Studies, 2017.
- Lackenbauer, P. Whitney, and Elizabeth Elliot-Meisel, eds. "A Highly-Coveted Consultant": *Captain T.C. Pullen's Contributions to Arctic Knowledge, Volume 2: Consulting*. DCASS No. 20. Calgary: Centre for Military, Security and Strategic Studies/AINA, 2022.

- Lackenbauer, P. Whitney, and Elizabeth Elliot-Meisel, eds. *"One of the Great Polar Navigators": Captain T.C. Pullen's Personal Records of Arctic Voyages, Part 1: Government Roles*. DCASS No. 12. Calgary and Waterloo: Centre for Military, Security and Strategic Studies/AINA/CFPF, 2017.
- Lackenbauer, P. Whitney, and Matthew Farish, eds. *The Distant Early Warning (DEW) Line Coordinating Committee: Minutes and Progress Reports, 1955-63*. DCASS No. 15. Calgary and Waterloo: Centre for Military, Security and Strategic Studies/AINA/CFPF, 2019.
- Lackenbauer, P. Whitney, Matthew Farish, and Jennifer Arthur-Lackenbauer. *The Distant Early Warning (DEW) Line: A Bibliography and Documentary Resource List*. Calgary: AINA, 2005.
- Lackenbauer, P. Whitney, and Shelagh Grant, eds. *"The Adventurous Voyage": St. Roch and the Northwest Passage, 1940-42 and 1944*. Arctic Operational History Series No. 7. Antigonish: Mulroney Institute of Government, 2019.
- Lackenbauer, P. Whitney, and Daniel Heidt, eds. *The Advisory Committee on Northern Development: Context and Meeting Minutes, 1948-71*. DCASS No. 4. Calgary: Centre for Military and Strategic Studies, 2015.
- Lackenbauer, P. Whitney, and Rob Huebert. *Debating Arctic Security: Selected Writings by Rob Huebert and P. Whitney Lackenbauer, 2010-2021*. Peterborough: NAADSN, 2022.
- Lackenbauer, P. Whitney, and Rob Huebert. "Premier Partners: Canada, the United States and Arctic Security." *Canadian Foreign Policy Journal* 20, no. 3 (2014): 320-33.
- Lackenbauer, P. Whitney, and Peter Kikkert. "Archipelagic Analogues? Indonesian Baselines, Canadian Arctic Sovereignty, and the Framing of Mental Maps, 1957-62." *International Journal of Canadian Studies* 50 (2014): 227-52.
- Lackenbauer, P. Whitney, and Peter Kikkert. "Building on 'Shifting Sands': The Canadian Armed Forces, Sovereignty and the Arctic, 1968-1972." In *Canadian Arctic Sovereignty and Security*, ed. P. Whitney Lackenbauer, 283-308. Calgary: Centre for Military and Strategic Studies, 2010.
- Lackenbauer, P. Whitney, and Peter Kikkert, eds. *The Canadian Forces and Arctic Sovereignty: Debating Roles, Interests, and Requirements, 1968-1974*, rev. ed. Peterborough: NAADSN, 2024.

- Lackenbauer, P. Whitney, and Peter Kikkert. "The Dog in the Manger—and Letting Sleeping Dogs Lie: The United States, Canada and the Sector Principle, 1924–1955." In *In the Arctic Ocean: Essays in Honour of Donat Pharand*, eds. Suzanne Lalonde and Ted McDorman, 216–39. Leiden: Brill Nijhoff, 2015.
- Lackenbauer, P. Whitney, and Peter Kikkert. "A 'Profound Change of Direction'? Co-Developing Canada's 'New' Arctic and Northern Policy Framework." In *Arctic Fever: Political, Economic & Environmental Aspects of New Regional Agendas*, ed. Anastasia Likhacheva, 241–73. Cham: Palgrave Macmillan, 2022.
- Lackenbauer, P. Whitney, and Peter Kikkert. "Sovereignty and Security: Canadian Diplomacy, the United States, and the Arctic, 1943–1968." In *In the National Interest: Canadian Foreign Policy and the Department of Foreign Affairs and International Trade, 1909–2009*, eds. Greg Donaghy and Michael Carroll, 101–20. Calgary: University of Calgary Press, 2011.
- Lackenbauer, P. Whitney, and Adam Lajeunesse, eds. *Defining Ice: Lieutenant E.B. Stolee's Accounts of the Canadian Arctic Voyages of CCGS John A. Macdonald, 1969/70*. Arctic Operational History Series No. 8. Antigonish: Mulroney Institute of Government, 2019.
- Lackenbauer, P. Whitney, Adam Lajeunesse, and Ryan Dean. "Why China Is Not a Peer Competitor in the Arctic." *Journal of Indo-Pacific Affairs* 5, no. 5 (2022): 80–97.
- Lackenbauer, P. Whitney, Adam Lajeunesse, and Lieutenant (N) Jason Delaney, eds. *HMCS Labrador: An Operational History*. Arctic Operational History Series No. 1. Antigonish: Mulroney Institute of Government, 2017.
- Lackenbauer, P. Whitney, Adam Lajeunesse, James Manicom, and Frédéric Lasserre. *China's Arctic Ambitions and What They Mean for Canada*. Calgary: University of Calgary Press, 2018.
- Lackenbauer, P. Whitney, and Suzanne Lalonde. "Arctic Sovereignty." In *Lines in the Snow: Thoughts on the Past and Future of Northern Canadian Policy Issues*, eds. Clive Tesar and P. Whitney Lackenbauer, 202–20. Ottawa: Canadian Arctic Resources Committee, 2021.
- Lackenbauer, P. Whitney, and Suzanne Lalonde. "Canada, Sovereignty, and 'Disputed' Arctic Boundaries: Myths, Misconceptions, and Legal Realities." In *The Networked North: Borders and Borderlands in the Canadian Arctic Region*, eds. Heather Nicol and P. Whitney

- Lackenbauer, 95–113. Victoria and Waterloo: Borders in Globalization/CFPF, 2017.
- Lackenbauer, P. Whitney, Suzanne Lalonde, and Elizabeth Riddell-Dixon. *Canada and the Maritime Arctic: Boundaries, Shelves, and Waters*. Peterborough: NAADSN, 2020.
- Lackenbauer, P. Whitney, and Heather Nicol, eds. *Whole of Government Through an Arctic Lens*. Antigonish: Mulroney Institute of Government, 2017.
- Lajeunesse, Adam. "Claiming the Frozen Seas: The Evolution of Canadian Policy in Arctic Waters." In *Canadian Arctic Sovereignty and Security: Historical Perspectives*, ed. P. Whitney Lackenbauer, 233–58. Calgary: Centre for Military and Strategic Studies, 2011.
- Lajeunesse, Adam, ed. *Documents on Canadian Arctic Maritime Security, 1950–1988*. DCASS No. 13. Calgary and Waterloo: Centre for Military, Security and Strategic Studies/AINA/CFPF, 2018.
- Lajeunesse, Adam. "The Gentlemen's Agreement: Sovereignty, Defence, and Canadian-American Diplomacy in the Arctic." In *Breaking Through: Understanding Sovereignty and Security in the Circumpolar Arctic*, eds. Wilfrid Greaves and P. Whitney Lackenbauer, 45–61. Toronto: University of Toronto Press, 2021.
- Lajeunesse, Adam. *Lock, Stock, and Icebergs: A History of Canada's Arctic Maritime Sovereignty*. Vancouver: UBC Press, 2016.
- Lajeunesse, Adam. "A New Mediterranean: Arctic Shipping Prospects for the 21st Century." *Journal of Maritime Law and Commerce* 43, no. 4 (2012): 521–38.
- Lajeunesse, Adam. "The Northwest Passage in Canadian Policy: An Approach for the 21st Century." *International Journal* 63, no. 4 (2008): 1037–52.
- Lajeunesse, Adam. "Sovereignty, Security and the Canadian Nuclear Submarine Program." *Canadian Military Journal* 8, no. 4 (2007–08): 74–82.
- Lajeunesse, Adam. "A Very Practical Requirement: Under-Ice Operations in the Canadian Arctic, 1960–1986." *Cold War History* 13, no. 4 (2013): 507–24.
- Lajeunesse, Adam, and Rob Huebert, eds. *From the Polar Sea to Straight Baselines: Arctic Policy in the Mulroney Era*. DCASS No. 11. Calgary and Waterloo: Centre for Military, Security and Strategic Studies/AINA/CFPF, 2017.

- Lajeunesse, Adam, and Rob Huebert. "Preparing for the Next Arctic Sovereignty Crisis: The Northwest Passage in the Age of Donald Trump." *International Journal* 74, no. 2 (2019): 225–39.
- Lajeunesse, Adam, and P. Whitney Lackenbauer, eds. *Canadian Arctic Operations, 1941–2015: Lessons Learned, Lost, and Relearned*. Fredericton: Gregg Centre for the Study of War and Society, 2017.
- Lajeunesse, Adam, and P. Whitney Lackenbauer. "Chinese Mining Interests and the Arctic." In *Governing the North American Arctic*, eds. Dawn Alexandra, Nigel Bowles, and Halbert Jones, 74–100. London: Palgrave Macmillan, 2016.
- Lajeunesse, Adam, and P. Whitney Lackenbauer. "On Uncertain Ice: The Future of Arctic Shipping and the Northwest Passage." Calgary: Canadian Defence & Foreign Affairs Institute Policy Papers, December 2014. <https://www.policyschool.ca/wp-content/uploads/2016/03/uncertain-ice-lackenbauer-lajeunesse.pdf>
- Lajeunesse, Adam, and P. Whitney Lackenbauer. "Opening an Arctic Escape Route: The Bellot Strait Expedition." *The Northern Mariner* 31, no. 1 (2021): 1–29.
- Lajeunesse, Adam, and P. Whitney Lackenbauer. "Shipping Along the Northwest Passage: A Historical Overview." In *Shipping in Inuit Nunangat: Governance Challenges and Approaches in Canadian Arctic Waters*, eds. Kristin Bartenstein and Aldo Chircop, 58–77. Leiden: Brill Nijhoff, 2023.
- Lalonde, Suzanne. "The Arctic Exception and the IMO's PSSA Mechanism: Assessing their Value as Sources of Protection for the Northwest Passage." *International Journal of Marine and Coastal Law* 28, no. 3 (2013): 401–32.
- Lalonde, Suzanne. "Arctic Waters: Cooperation or Conflict?" *Behind the Headlines* 65, no. 4 (2008): 8–14.
- Lalonde, Suzanne. "Canadian Arctic Maritime Sovereignty During the Trudeau Years." In *Canada's Arctic Agenda: Into the Vortex*, eds. John Higginbotham and Jennifer Spence, 74–83. Waterloo: Centre for International Governance Innovation, 2019.
- Lalonde, Suzanne. "La frontière maritime dans l'archipel arctique : un garde-fou essentiel pour le Canada." *Annuaire Français de Droit International* 53 (2007): 609–39.
- Lalonde, Suzanne. "The IMO's PSSA Mechanism and the Debate Over the Northwest Passage." In *Polar Oceans Governance in an Era of*

- Environmental Change*, eds. Tim Stephens and David VanderZwaag, 166–85. Cheltenham: Edward Elgar, 2014.
- Lalonde, Suzanne. “The Northwest Passage and the Northern Sea Route: Sovereignty and Responsibilities.” In *Global Challenges in the Arctic Region: Sovereignty, Environment and Geopolitical Balance*, eds. Elena Conde and Sara Iglesias Sánchez, 42–74. London: Routledge, 2017.
- Lalonde, Suzanne. “Le passage Nord-Ouest: zone canadienne ou internationale?” *Le Multilatéral* 1, no. 2 (2007): 1–13.
- Lalonde, Suzanne, and Frédéric Lasserre. “The Position of the United States on the Northwest Passage: Is the Fear of a Precedent Warranted?” *Ocean Development & International Law* 44, no. 1 (2013): 28–72.
- Lalonde, Suzanne, and Ted McDorman, eds. *International Law and Politics of the Arctic Ocean: Essays in Honor of Donat Pharand*. Leiden: Brill Nijhoff, 2015.
- Lamson, Cynthia. “Shipping in the Northwest Passage: A Pandora’s Box.” *Endeavour* 10, no. 4 (1986): 167–76.
- Landriault, Mathieu. *Media, Security and Sovereignty in the Canadian Arctic: From the Manhattan to the Crystal Serenity*. New York: Routledge, 2019.
- Landriault, Mathieu. “Public Opinion on Canadian Arctic Sovereignty and Security.” *Arctic* 69, no. 2 (2016): 160–68.
- Landriault, Mathieu. *La Sécurité Arctique 2000-2010: Une décennie turbulente?* Peterborough: NAADSN, 2020.
- Larsen, Henry. “The Conquest of the North West Passage: The Arctic Voyages of the St. Roch, 1940-44.” *The Geographical Journal* 110, no. 1–3 (1947): 1–16.
- Lasserre, Frédéric. “Arctic Shipping Routes: From the Panama Myth to Reality.” *International Journal* 66, no. 4 (2011): 793–808.
- Lasserre, Frédéric. “Bateaux, plateaux, arsenaux: quels enjeux géopolitiques dans un Arctique en mutation?” *VertigO – la revue électronique en sciences de l’environnement*. Hors-série 33 (2021).
- Lasserre, Frédéric. “Canadian Arctic Marine Transportation Issues, Opportunities and Challenges.” University of Calgary School of Public Policy *Reports* 15 (2022). https://www.policyschool.ca/wp-content/uploads/2022/02/NC28_Marine-Transportation_Lasserre.pdf

- Lasserre, Frédéric. "Case Studies of Shipping Along Arctic Routes. Analysis and Profitability Perspectives for the Container Sector." *Transportation Research Part A: Policy and Practice* 66 (2014): 144–61.
- Lasserre, Frédéric. "China and the Arctic: Threat or Cooperation Potential for Canada?" Toronto: Canadian International Council, 2010.
- Lasserre, Frédéric. "High North Shipping: Myths and Realities." In *Security Prospects in the High North: Geostrategic Thaw or Freeze*, eds. Sven Holtsmark and Brook A. Smith, 179–200. Rome: NATO Defence College, 2009.
- Lasserre, Frédéric. "Navigation arctique : renforcement du trafic de destination." *L'Année arctique 2020. Revue annuelle* n°2 (2020): 23–33.
- Lasserre, Frédéric, ed. *Passages et Mers Arctiques*. Québec: Presses de l'Université du Québec, 2010.
- Lasserre, Frédéric. "Le retour du mythe des passages arctiques: quel trafic maritime dans l'Arctique au XXI^e siècle?" *Nordiques* 37 (2019): 9–24.
- Lasserre, Frédéric, Leah Beveridge, Mélanie Fournier, Pierre-Louis Têtu, and Linyan Huang. "Polar Seaways? Maritime Transport in the Arctic: An Analysis of Shipowners' Intentions II." *Journal of Transport Geography* 57 (2016): 105–14.
- Lasserre, Frédéric, Anne Choquet, and Camille Escudé-Joffres. *Géopolitique des pôles : vers une appropriation des espaces polaires?* Paris: Le Cavalier Bleu, 2021.
- Lasserre, Frédéric, and Alexandra Cyr. "Geopolitics and Shipping Development in the Arctic." *Ocean Yearbook Online* 36, no. 1 (2022): 416–39.
- Lasserre, Frédéric, and Olivier Faury, eds. *Arctic Shipping: Climate Change, Commercial Traffic and Port Development*. New York: Routledge, 2020.
- Lasserre, Frédéric, and Sébastien Pelletier. "Polar Super Seaways? Maritime Transport in the Arctic: An Analysis of Shipowners' Intentions." *Journal of Transport Geography* 19, no. 6 (2011): 1465–73.
- Lasserre, Frédéric, and Pierre-Louis Têtu. "The Cruise Tourism Industry in the Canadian Arctic: Analysis of Activities and Perceptions of Cruise Ship Operators." *Polar Record* 51, no. 1 (2013): 24–38.
- Lasserre, Frédéric, and Pierre-Louis Têtu. "The Geopolitics of Transportation in the Melting Arctic." In *A Research Agenda for*

- Environmental Geopolitics*, ed. Shannon O'Lear, 105–20. Cheltenham: Edward Elgar, 2020.
- Lehane, Brendan. *The Northwest Passage*. Alexandria: Time-Life Books, 1981.
- Liu, Xing-he, Long Ma, Jia-yue Wang, Ye Wang, and Li-na Wang. "Navigable Windows of the Northwest Passage." *Polar Science* 13 (2017): 91–99.
- MacDonald, Adam. "Arctic Maritime Security Becoming an 'Arctic-Capable' Navy: Not Just the Arctic and Offshore Patrol Ship." *Canadian Military Journal* 22, no. 2 (2022): 7–16.
- MacDonald, Adam. "China Looking North: Compromising Canada's Arctic Sovereignty and Security?" *Canadian Military Journal* 18, no. 1 (2017): 4–15.
- MacDonald, Edwin. *Polar Operations*. Annapolis: U.S. Naval Institute, 1969.
- Macdonald, R. Bruce. *Sisters of the Ice: The True Story of How St. Roch and North Star of Herschel Island Protected Canadian Arctic Sovereignty*. Madeira Park, B.C.: Harbour Publishing, 2021.
- MacDonald, Robert St. J., ed. *The Arctic Frontier*. Toronto: University of Toronto Press, 1966.
- Maginley, Charles. *The Canadian Coast Guard, 1962-2002*. St. Catharines: Vanwell, 2003.
- Maginley, Charles, and Bernard Collin. *The Ships of Canada's Marine Services*. St. Catharines: Vanwell, 2001.
- Manicom, James, and P. Whitney Lackenbauer. "The Chinese Pole." *Policy Options* 34, no. 4 (2013): 12–15.
- Masterson, D.M. "The Arctic Islands Adventure and Panarctic Oils Ltd." *Cold Regions Science and Technology* 85 (2013): 1–14.
- Mayne, Richard. "'An Unusual Voyage in Far Northern Waters': The Royal Canadian Navy's First Postwar Forays into the Arctic, 1946-1950." *Canadian Military History* 22, no. 4 (2013): 4.
- McCannon, John. "Exploring and Mapping the Arctic: Histories of Discovery and Knowledge." In *The Routledge Handbook of the Polar Regions*, eds. Mark Nuttall, Torben Christensen, and Martin Siegert, 19–33. London: Routledge, 2018.
- McDorman, Ted. "Canada, the United States and International Law of the Sea in the Arctic Ocean." In *Polar Oceans Governance in an Era of Environmental Change*, eds. Tim Stephens and David VanderZwaag,

- 253–68. New Horizons in Environmental and Energy Law Series. Cheltenham: Edward Elgar, 2014.
- McDorman, Ted. “Canada-United States Bilateral Ocean Law Relations in the Arctic.” *Southwestern Journal of International Law* 15 (2008): 283–300.
- McDorman, Ted. “The Northwest Passage: International Law, Politics and Cooperation.” In *Changes in the Arctic Environment and the Law of the Sea*, eds. Myron H. Nordquist, Tomas H. Heidar, and John Norton Moore, 227–50. Leiden: Martinus Nijhoff, 2010.
- McDorman, Ted. *Salt Water Neighbors: International Ocean Law Relations Between the United States and Canada*. Oxford: Oxford University Press, 2009.
- McGoogan, Ken. *Searching for Franklin: New Answers to the Great Arctic Mystery*. Vancouver: Douglas & McIntyre, 2023.
- McMahon, Kevin. *Arctic Twilight: Reflections on the Destiny of Canada’s Northern Land and People*. Toronto: Lorimer, 1988.
- McRae, Donald. “Arctic Sovereignty: Loss by Dereliction?” *Northern Perspectives* 22, no. 4 (1994–95): 4–9.
- McRae, Donald. “Arctic Sovereignty? What Is at Stake?” *Behind the Headlines* 64, no. 1 (2007): 1–23.
- McRae, Donald. “Rethinking the Arctic: A New Agenda for Canada and the United States.” In *Canada Among Nations, 2009-2010: As Others See Us*, eds. Fen Osler Hampson and Paul Heinbecker, 245–54. Montreal and Kingston: McGill-Queen’s University Press, 2010.
- Meren, David, and Bora Plumptre. “Rights of Passage: The Intersecting of Environmentalism, Arctic Sovereignty, and the Law of the Sea, 1968-82.” *Journal of Canadian Studies* 47, no. 1 (2013): 167–96.
- Millard, Bryan, and P. Whitney Lackenbauer. “Trojan Dragons? Normalizing China’s Presence in the Arctic.” Ottawa: CGAI, 2021. https://www.cgai.ca/trojan_dragons_normalizing_chinas_presence_in_the_arctic
- Morenus, Richard. *DEW Line: Distant Early Warning, The Miracle of America’s First Line of Defense*. New York: Rand McNally, 1957.
- Mudryk, Lawrence, Jackie Dawson, Stephen Howell, Chris Derksen, Thomas Zagon, and Mike Brady. “Impact of 1, 2 and 4 °C of Global Warming on Ship Navigation in the Canadian Arctic.” *Nature Climate Change* 11, no. 8 (2021): 673–79.

- Nagel, Tyler. "Northwest Passages: Framing by Local, National and Public Media in Canada's Arctic." *Journalism Practice* 14, no. 10 (2020): 1244–63.
- Nalder, Eric. *Tankers Full of Trouble: The Perilous Journey of Alaskan Crude*. New York: Grove Press, 1994.
- Nickels, Scot, ed. *Nilliajut: Inuit Perspectives on Security, Patriotism and Sovereignty*. Inuit Tapiriit Kanatami, 2013.
- Nicol, Heather. "Discourses of Power: Sovereignty and the Canadian Arctic." In *A Northern Nation: Canada's Arctic Policies and Strategies*, eds. Klaus Dodds and Mark Nuttall. Edmonton: University of Alberta/Canadian Circumpolar Institute Press, 2014.
- Nicol, Heather, and P. Whitney Lackenbauer, eds. *The Networked North: Borders and Borderlands in the Canadian Arctic Region*. Victoria: Borders in Globalization, 2017.
- Nicol, Heather, and Barry Scott Zellen. "Emerging Trends in Arctic North America's Maritime Security Agenda: From Ice to Water." In *Cold Waters: Tangible and Symbolic Seascapes of the North*, eds. Markku Lehtimäki, Arja Rosenholm, Elena Trubina, and Nina Tynkkynen, 127–43. Cham: Springer, 2022.
- Nossal, Kim Richard. "Polar Icebreakers: The Politics of Inertia." In *Politics of the Northwest Passage*, ed. Franklyn Griffiths, 216–38. Montreal and Kingston: McGill-Queen's University Press, 1987.
- O'Connell, Barbara. "Icebreaking in the Arctic: Then and Now." *Journal of Ocean Technology* 6, no. 3 (2011): 88–100.
- Østreng, Willy, Karl Magnus Eger, Brit Fløistad, Arnfinn Jørgensen-Dahl, Lars Lothe, Morten Mejlænder-Larsen, Tor Wergeland, et al. "The Northeast, Northwest and Transpolar Passages in Comparison." In *Shipping in Arctic Waters: A Comparison of the Northeast, Northwest and Trans Polar Passages*, eds. Willy Østreng, Karl Magnus Eger, Brit Fløistad, Arnfinn Jørgensen-Dahl, Lars Lothe, Morten Mejlænder-Larsen, and Tor Wergeland, 299–353. Cham: Springer Science, 2013.
- Owen, J. Victor. "No Smooth Sailing: The Once and Future Northwest Passage." *Mercator's World* 7, no. 1 (2002): 30–38.
- Page, Robert. *Northern Development: The Canadian Dilemma*. Toronto: McClelland and Stewart, 1986.
- Panikkar, Bindu, Benjamin Lemmond, Brent Else, and Maribeth Murray. "Ice Over Troubled Waters: Navigating the Northwest Passage Using Inuit Knowledge and Scientific Information." *Climate Research* 75, no. 1 (2018): 81–94.

- Pashkevich, Albina, Jackie Dawson, and Emma J. Stewart. "Governance of Expedition Cruise Ship Tourism in the Arctic: A Comparison of the Canadian and Russian Arctic." *Tourism in Marine Environments* 10, no. 3–4 (2015): 225–40.
- Pelletier, Sebastien, and Frédéric Lasserre. "Arctic Shipping: Future Polar Express Seaways: Shipowners' Opinion." *Journal of Maritime Law and Commerce* 43, no. 4 (2012): 553–64.
- Perreault, François. "The Role(s) of China in the Arctic: Regional Governance and Foreseeable Challenges." In *Global Challenges in the Arctic Region: Sovereignty, Environment and Geopolitical Balance*, eds. Elena Conde and Sara Iglesias Sánchez, 430–51. London: Routledge, 2017.
- Pharand, Donat. "The Arctic Waters and the Northwest Passage: A Final Revisit." *Ocean Development & International Law* 38, no. 1–2 (2007): 3–69.
- Pharand, Donat. *Canada's Arctic Waters in International Law*. Cambridge: Cambridge University Press, 1988.
- Pharand, Donat. "Canada's Sovereignty Over the Newly Enclosed Arctic Waters." *Canadian Yearbook of International Law/Annuaire canadien de droit international* 25 (1988): 325–43.
- Pharand, Donat. *The Law of the Sea of the Arctic with Special Reference to Canada*. Ottawa: University of Ottawa Press, 1973.
- Pharand, Donat. "The Northwest Passage in International Law." *Canadian Yearbook of International Law/Annuaire canadien de droit international* 17 (1980): 99–133.
- Pharand, Donat, and Leonard Legault. *The Northwest Passage: Arctic Straits*. Leiden: Martinus Nijhoff, 1984.
- Pic, Pauline, Julie Babin, Frédéric Lasserre, Linyan Huang, and Kristin Bartenstein. "The Polar Code and Canada's Regulations on Arctic Navigation: Shipping Companies' Perceptions of the New Legal Environment." *The Polar Journal* 11, no. 1 (2021): 95–117.
- Pizzolato, Larissa, Stephen Howell, Jackie Dawson, Frédéric Laliberté, and Luke Copland. "The Influence of Declining Sea Ice on Shipping Activity in the Canadian Arctic." *Geophysical Research Letters* 43, no. 23 (2016): 12, 146–12, 154.
- Pizzolato, Larissa, Stephen Howell, Chris Derksen, Jackie Dawson, and Luke Copland. "Changing Sea Ice Conditions and Marine Transportation Activity in Canadian Arctic Waters Between 1990 and 2012." *Climatic Change* 123, no. 2 (2014): 161–73.

- Potter, Russell. *Finding Franklin: The Untold Story of a 165-Year Search*. Montreal and Kingston: McGill-Queen's University Press, 2016.
- Pullen, Thomas. "Expanded Arctic Shipping: Canadian Challenge." *Sentinel* 7, no. 2 (1971).
- Pullen, Thomas. "S.S. *Manhattan's* Northwest Passage Voyage—Observations by Canada's Representative." *The Empire Club of Canada Addresses*. Toronto: Empire Club, 12 February 1970. 260–72.
- Pullen, Thomas. "What Price Canadian Sovereignty?" *U.S. Naval Institute Proceedings* 113, no. 9 (1987): 66–72.
- Pullen, Thomas, and Charles Swithinbank. "Transits of the Northwest Passage, 1906–90." *Polar Record* 27, no. 163 (1991): 365–67.
- Raffan, James, ed. *Canada C3: Connecting Canadians Coast to Coast to Coast*. Ottawa: Students on Ice Foundation, 2018.
- Raffan, James. *Circling the Midnight Sun*. Toronto: Harper Collins, 2014.
- Reid, Robert. "The Canadian Claim to Sovereignty Over the Waters of the Arctic." *Canadian Yearbook of International Law/Annuaire canadien de droit international* 12 (1975): 111–36.
- Rothwell, Donald R. "The Canadian-US Northwest Passage Dispute: A Reassessment." *Cornell International Law Journal* 26 (1993): 331–72.
- Rothwell, Donald R. *The Polar Regions and the Development of International Law*. Cambridge: Cambridge University Press, 1996.
- Rowley, Graham. "Captain TC Pullen, RCN: Polar Navigator." *The Northern Mariner* 2, no. 2 (1992): 29–49.
- Shapovalova, Daria, Sian Prior, Jamie Snook, Dorothée Cambou, Claudio Aporta, Magdalena Muir, and Reetta Toivanen. "Perils of an Open Arctic." *One Earth* 4, no. 12 (2021): 1652–55.
- Sheehan, Rebecca, Dimitrios Dalaklis, Anastasia Christodoulou, Megan Drewniak, Peter Raneri, and Angelos Dalaklis. "The Northwest Passage in the Arctic: A Brief Assessment of the Relevant Marine Transportation System and Current Availability of Search and Rescue Services." *Logistics* 5, no. 23 (2021): 1–15.
- Shen, Xin-Yi, Yu Zhang, Chang-Sheng Chen, Song Hu, Dan-Ya Xu, Wei-Zeng Shao, Liang Chang, and Gui-Ping Feng. "Arctic Sea Ice Variation in the Northwest Passage in 1979–2017 and Its Response to Surface Thermodynamics Factors." *Advances in Climate Change Research* 12, no. 4 (2021): 563–80.
- Simon, Mary. "Climate Change, Sovereignty, and Partnership with Inuit." In *Northern Exposure: Peoples, Powers and Prospects in Canada's*

- North*, eds. Frances Abele, Thomas J. Courchene, F. Leslie Seidle, and France St-Hilaire. Ottawa: Institute for Research on Public Policy, 2009.
- Simon, Mary. "Inuit and the Canadian Arctic: Sovereignty Begins at Home." *Journal of Canadian Studies* 43, no. 2 (2009): 250–60.
- Smith, Gordon W. *A Historical and Legal Study of Sovereignty in the Canadian North, 1870-1942: Terrestrial Sovereignty*, ed. P. Whitney Lackenbauer. Calgary: University of Calgary Press, 2014.
- Smith, Gordon W. "Sovereignty in the North: The Canadian Aspect of an International Problem." In *The Arctic Frontier*, ed. R. St. J. MacDonald, 194–255. Toronto: University of Toronto Press, 1966.
- Smith, Gordon W., edited by P. Whitney Lackenbauer. "'This was not the time for this type of 1890 imperialism': Cryolite, Control, and Canada-US Relations over Greenland, 1940." *The Northern Mariner* 31, no. 3 (2021): 241–84.
- Smith, William D. *Northwest Passage*. New York: American Heritage Press, 1970.
- Splettstoesser, John, and Beezie Drake Splettstoesser. "The First Transit of the Northwest Passage by Russian Icebreaker." *Polar Record* 29, no. 169 (1993): 148.
- Stewart, Emma, Jackie Dawson, Stephen Howell, Margaret Johnston, Tristan Pearce, and Harvey Lemelin. "Local-Level Responses to Sea Ice Change and Cruise Tourism in Arctic Canada's Northwest Passage." *Polar Geography* 36, no. 1–2 (2013): 142–62.
- Stewart, Emma, Stephen Howell, Diane Draper, John Yackel, and Adrienne Tivy. "Sea Ice in Canada's Arctic: Implications for Cruise Tourism." *Arctic* 60, no. 4 (2007): 370–80.
- Stoddart, Mark, and Jillian Smith. "The Endangered Arctic, the Arctic as Resource Frontier: Canadian News Media Narratives of Climate Change and the North." *Canadian Review of Sociology* 53, no. 3 (2016): 316–36.
- Strohmeyer, John. *Extreme Conditions: Big Oil and the Transformation of Alaska*. Anchorage: Cascade Press, 1997.
- Swithinbank, Charles. *Forty Years on Ice: A Lifetime of Exploration and Research in the Polar Regions*. Sussex: The Book Guild, 1998.
- Swithinbank, Charles. "Second Arctic Voyage of SS *Manhattan*, 1970." *Polar Record* 15, no. 96 (1970): 355–56.

- Tesar, Clive, and P. Whitney Lackenbauer, eds. *Lines in the Snow: Thoughts on the Past and Future of Northern Canadian Policy Issues*. Yellowknife: Canadian Arctic Resources Committee, 2021.
- Tolppanen, Bradley P. "The Royal Canadian Mounted Police Schooner *St. Roch* and Superintendent Henry A. Larsen: A Selected and Annotated Bibliography." *BC Studies* 177 (2013): 147–70.
- Toomey, Patrick, and John Splettstoesser. "The World Becomes the Largest Passenger Ship to Transit the Northwest Passage." *Polar Record* 49, no. 3 (2013): 319–20.
- Tracy, Nicholas. "The Navy and the Arctic." In *Two-Edged Sword: The Navy as an Instrument of Canadian Foreign Policy*, 287–98. Montreal and Kingston: McGill-Queen's University Press, 2012.
- Tynan, Thomas. "Canadian-American Relations in the Arctic: The Effect of Environmental Influences upon Territorial Claims." *The Review of Politics* 41, no. 3 (1979): 402–27.
- Van Luijk, Nicolien, Jackie Dawson, Natalie Carter, Gloria Song, Colleen Parker, Kayla Gray, and Jennifer Provencher. "At the Front Lines of Increased Shipping and Climate Change: Inuit Perspectives on Canadian Arctic Sovereignty and Security." In *Arctic Yearbook 2021*, eds. Lassi Heininen, Heather Exner-Pirot, and Justin Barnes, 108–24. Akureyri: Northern Research Forum, 2021.
- VanderZwaag, David. "Canada and the Governance of the Northwest Passage: Rough Waters, Cooperative Currents, Sea of Challenges." In *Navigating Straits: Challenges for International Law*, eds. David Caron and Nilufer Oral, 87–121. Leiden: Brill Nijhoff, 2014.
- Vondrak, Richard. "Amundsen's Difficult Search for the Elusive North Magnetic Pole During His Voyage to the North West Passage." *Terrae Incognitae* 50, no. 2 (2018): 146–74.
- Walter and Duncan Gordon Foundation (WDGF). *Are We Ready? Emergency Preparedness in Nunavut: Regional Roundtable Report*. Toronto: WDGF, 2014.
- Walter and Duncan Gordon Foundation. *Rethinking the Top of the World: Arctic Security Public Opinion Survey*. Toronto: WDGF-Munk School for Global Affairs Arctic Security Program, 2011.
- Wang, Chuya, Minghu Ding, Yuande Yang, Ting Wei, and Tingfeng Dou. "Risk Assessment of Ship Navigation in the Northwest Passage: Historical and Projection." *Sustainability* 14, no. 9 (2022): 5591.
- Wang, Erik. "Canadian Sovereignty in the Arctic." *Canadian Yearbook of International Law* 1976: 307–12.

- Wang, Erik, edited by P. Whitney Lackenbauer. "The Role of Canadian Armed Forces in Defending Sovereignty, 30 April 1969." *Journal of Military and Strategic Studies* 11, no. 3 (2009): 1–23.
- Waterman, Jonathan. *Arctic Crossing: A Journey Through the Northwest Passage and Inuit Culture*. Random House Canada, 2001.
- Watt-Cloutier, Sheila. *The Right to Be Cold: One Woman's Story of Protecting Her Culture, the Arctic and the Whole Planet*. Toronto: Allen Lane, 2015.
- Waylett, D.C. "Natural Gas in the Arctic Islands: Discovered Reserves and Future Potential." *Journal of Petroleum Geology* 1, no. 3 (1979): 21–34.
- Williams, Glyn, and Sophia Costley. *Arctic Labyrinth: The Quest for the Northwest Passage*. Toronto: Penguin Canada, 2010.
- Wonders, William, ed. *Canada's Changing North*. Toronto: McClelland and Stewart, 1971.
- Wonders, William, ed. *Canada's Changing North*, rev. ed. Toronto: McClelland and Stewart, 2003.
- Wright, Christopher. *Arctic Cargo: A History of Marine Transportation in Canada's North*. Digby: self-published, 2016.
- Wright, Shelley. "Inuit Perspectives on Governance in the Canadian Arctic." In *Polar Oceans Governance in an Era of Environmental Change*, eds. Tim Stephens and David VanderZwaag, 166–89. Cheltenham: Edward Elgar, 2014.
- Wright, Shelley. *Our Ice Is Vanishing/Sikuvut Nunguliqtuq: A History of Inuit, Newcomers, and Climate Change*. Montreal and Kingston: McGill-Queen's University Press, 2014.
- Yergin, Daniel. *The Prize: The Epic Quest for Oil, Money, and Power*. New York: Simon & Schuster, 1991.
- Zaslow, Morris, ed. *A Century of Canada's Arctic Islands 1880-1890*. Ottawa: The Royal Society of Canada, 1981.
- Zaslow, Morris. *The Northward Expansion of Canada, 1914-1967*. Toronto: McClelland and Stewart, 1988.
- Zaslow, Morris. *The Opening of the Canadian North 1870-1914*. Toronto: McClelland and Stewart, 1971.
- Zhu, Shengda, Adolf Ng, Mawuli Afenyo, Roozbeh Panahi, and Michael Bell. "Socio-Economic Impacts of Shipping Along the Northwest Passage: The Cost to Locals." *Marine Policy* 153 (2023): 105647.

NORTHWEST PASSAGES

Navigating the Canadian Arctic from *Gjoa to Harry DeWolf*

Ship transits through the Northwest Passage have always been the source of, or stage for, decades of navigational, political, and security challenges. This volume brings together some of the most compelling histories of key transits of the Northwest Passage from 1903-2021, bringing to life abstract concepts such as sovereignty and security. While future threats and challenges remain opaque, the case studies in this book share a wealth of experience and lessons learned on the risks and rewards of operating in Canada's Arctic.

P. Whitney Lackenbauer is a Professor in the School for the Study of Canada and Canada Research Chair (Tier 1) in the Study of the Canadian North at Trent University.

Adam Lajeunesse is an Associate Professor and Coordinator of the Public Policy and Governance Program at St Francis Xavier University.



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