A New Mediterranean? Arctic Shipping Prospects for the 21st Century

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In 1921, Vilhjalmur Stefansson famously predicted that the Arctic would soon become a region of great strategic and commercial importance. Crisscrossed by the air and sea traffic of many nations, the region was to be the Mediterranean of the modern age. While Stefansson’s prediction was certainly premature, recent economic and environmental developments suggest that a sea change may finally be taking place. The well documented melting of the region’s sea-ice and the rush of tourist, oil and resource companies into the area have together created the potential for a radical increase in maritime activity, with all the consequences and opportunities that will go with it. Yet despite these changes, the more modern prophecies of an Arctic Mediterranean remain premature. Rather than a flood of international shipping seeking a shortcut through the Arctic, the next ten to twenty years will likely see an explosion of destination traffic. This new traffic will be led by the tourism, oil, and mining industries which have all shown a new and sustained interest in the Canadian Arctic. And, given the investment which has already taken place, it is likely that this traffic will increase exponentially in the near future.

This increased activity carries with it both risks and opportunities for Canada. If the country is to be prepared for, and benefit from, future traffic it will have to invest strategically in many of the areas which it has deferred for decades. These investments will have to range from improved hydrographic mapping, search and rescue resources, navigational aids and ice-breaking and forecasting services to surveillance and law enforcement capabilities. Changes in policy and regulation will also have to be designed to

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ensure the maritime space is managed in an environmentally sustainable and politically acceptable manner.

If managed correctly Arctic shipping can proceed safely and be a catalyst for economic growth. Just as importantly, from a policy perspective, this traffic need not be the assault on Canadian sovereignty which some commentators have feared. Rather, by developing the region’s waterways and working with growing business interests, Canada will have a distinct opportunity to solidify its title by winning the acceptance of its jurisdiction which is demanded by international law in cases of proscribed sovereignty.

As the ice recedes in the Canadian North, the prospect of a navigable Northwest Passage has been increasing fears and hopes – depending on one’s perspective – that the region will soon become a commercially viable shipping route. From Japan to the American eastern seaboard, the Arctic route is 8,000 kilometres shorter than the Panama Canal and would seem to offer shipping companies dramatic savings if it could be transited safely. The question of when it will become safe enough to be used seems tied to the rate of ice melt, which has been steadily stripping the Arctic of its barriers. On average, the Arctic has been losing 74,000 km² of ice each year – adding up to a loss of over two million km² since the late 1970s. Various studies have even predicted a seasonally ice-free passage as soon as 2015.

Yet to assume that this melt will translate into a viable commercial sea-route within the short or even medium term (5-20 years) would be unrealistic. Despite the loss of sea ice, shipping conditions in the Northwest Passage will remain extremely hazardous for the foreseeable future and will likely leave the route an unattractive alternative to existing shipping lanes. While there has been a general downward trend in both ice cover and thickness, the process has been anything but reliable or consistent. While certain Arctic channels may be open for an expanded period each year, those openings are sporadic and largely unpredictable. Winds and currents across the region shift the ice constantly, often into channels which had been clear the week or even the day before. Accordingly, a shipping season of a certain number of weeks will not necessarily mean consecutive weeks.

Of equal importance is the geographic variability which will often see shippers facing easier conditions in certain sections of the passage and very

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difficult conditions in others. Certain regions have also experienced far less ice-loss over the past decades than others. For instance, the northern parts of the Queen Elizabeth Islands, the western areas of Viscount-Melville Sound and the McClintock Channel have seen far less melt than the average. It is important to note that the latter two sit astride two of the three most important potential shipping routes. The third route, the Prince of Wales Strait, remains hazardous. Indeed, studies by Professors Howell and Yackel have shown very little change in ease of navigation there as well.

An alternative to passing through the Viscount-Melville Sound or McClintock Channel would be to run through either Peel Sound or the Bellot Strait. The latter route could potentially avoid the multi-year ice in Peel Sound, but its narrowness makes it impracticable for use by larger vessels. Regardless, a choke point remains in the vicinity of Victoria Strait which acts as a trap for multi-year ice. While Howell and Yackel have showed slightly safer conditions from 1991 to 2002 compared to 1969 to 1990, they attributed this improvement to the anomalous warm year of 1998 that removed most of the multi-year ice in the region. From 2000 to 2005, when conditions began to recover from the 1998 warming, the ice became mobile, flowing southward into Victoria Strait as the surrounding first-year ice broke up earlier.

Ironically, the melting of first-year ice across the region has been allowing winds and ocean currents to drive more old ice from the Arctic Ocean into the narrow channels of the Archipelago. Some of the more important areas (from a shipping perspective) have actually exhibited an increase in hazardous ice levels. This shift is largely the result of an ocean current pattern called the Beaufort Gyre, which regularly shifts multi-year ice from

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1G.W. Moore, for example, has found that from 1969-2004 the western Beaufort Sea has experienced sea ice decreases while the eastern Beaufort has experienced increases; R. Galley et al., “Spatial and Temporal Variability of Sea Ice in the Southern Beaufort Sea and Amundsen Gulf: 1980-2004.” Journal of Geophysical Research 11:5, (May, 2008).
5Ibid; Indeed, more old-ice was seen to have accumulated in the important Victoria Strait in the warm summer of 1998 than in the heavy ice summer of 2001; Wilson, K.J. et al. “Shipping in the Canadian Arctic, Canadian Ice Service and the Institute of Ocean Sciences, (2004).
further north into the western channels of the Archipelago. As such, many observers believe that even as overall ice cover recedes, conditions will remain extremely dangerous.

Even as far forward as 2040, many climate models still predict high concentrations of multi-year ice within the Arctic Archipelago. While some predictions have been made of an ice-free summer later in the century — which would eliminate multi-year ice entirely — this scenario remains a questionable hypothetical. However, as long as significant amounts of sea ice remain within the Arctic Ocean it will likely continue to enter the shipping lanes of the Canadian Arctic and threaten transiting vessels.

For international shippers and underwriters these uncertain and dangerous conditions create a challenge. In most cases international shipping relies on a system of just in time delivery with tight schedules and little room for uncertainty. The Arctic does not lend itself to such timetables, as unpredictable ice and weather will prevent captains from maintaining a consistent speed and course in even favourable conditions. Delays while a vessel waits for icebreaker support or for conditions to improve would also render any savings on distance and time far less attractive.

An icebreaking tanker or cargo ship could transit the region on a more certain schedule; however such ships are considerably more expensive to build than standard ice-strengthened vessels and the additional capital costs would have to be amortized over a far longer period of time. Standard ice-strengthened tankers on the other hand would only be able to operate in the Canadian North for the summer and perhaps spring months. During these windows of opportunity ships would also face serious limitations in size and draft. The most travelled routes through the Archipelago have been Peel Sound and McClintock Channel. Both of these routes restrict the draft of a ship to ten metres, meaning that the economies-of-scale provided by larger vessels could not be realized. The largest vessel capable of transiting these straits would be a small Handysize ship of from 15-30,000 tons. The deep-draft routes through the Prince of Wales or M'Clure Straits could handle even the 25 metre draft of an ultra large crude or cargo carrier but these are

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Ibid, 376.
Wilson, K.J. et al.
In 2004 the Arctic Climate Impact Assessment (ACIA) predicted a largely ice-free Arctic Ocean in late summer in 100 years. More recent estimates moved this up to 30-50 years from: Claes Lykke Ragner, “The Northern Sea Route,” Nordin Association’s Yearbook, (2008).
the areas with the most extreme ice conditions and, even in the summer, are limited to Arctic Class 3 vessels.\textsuperscript{16}

In addition to the obvious physical difficulties, the dangers posed by ice will also result in extremely high insurance premiums. In the Canadian Arctic prices remain an unknown quantity, however they have been estimated at 150\% to 300\% more than blue water traffic.\textsuperscript{17} Yet, these premiums vary considerably between different underwriters and this lack of consistency presents a serious problem when contemplating regular transits.

Since there has never been a regular commercial voyage through the Northwest Passage a comparison with the Russian Northern Sea Route (NSR) would be useful. Despite the more developed nature of the NSR – in terms of icebreaker support and navigational and port infrastructure – it is still extremely expensive to procure the necessary insurance. There are no consistent rates for the NSR and some insurers simply will not provide the necessary coverage.\textsuperscript{18} However, a premium of $125,000 for a GL (or AWPPA Class B) ice-strengthened bulk carrier represents an educated industry estimate.\textsuperscript{19}

In Canada, insurance estimates published in the mid-1990s by the Canadian Hull Advisory Committee demonstrate the high cost of this uncertainty. To transit the Perry Channel with a 35,000 ton Lloyds ice class I (AWPPA class B) vessel the insurance rate would be approximately $0.55/ton per day. Assuming a five day voyage, the insurance cost would come to $96,250.\textsuperscript{20} A heavy class ‘A’ vessel would get slightly better rates, however nothing lower than a class ‘B’ would even be insurable.\textsuperscript{21} Should the voyage last longer because of unpredictable weather or ice conditions, the insurance costs could skyrocket, making accurate expense planning impossible.

In his article “Pathetic Fallacy: That Canada’s Sovereignty is on Thinning Ice,” Franklyn Griffiths tabulates some of these cost estimates for a tramp


\textsuperscript{19}Haylon Schøyen and Svein Brâthen. \textit{Bulk Shipping via the Northern Sea Route versus the Suez Canal: Who Will Gain from a Shorter Transport Route?} 12th World Conference on Transport Research, 2010. pp. 17.

\textsuperscript{20}Inflation would make this $137,540 in 2009 dollars.

cargo vessel and concludes that the dangers and liabilities of an Arctic transit would greatly exceed the minimal savings the route has to offer. In a more recent cost simulation for container shipping, Saran Somanathan et al. have estimated that a route from Japan to New York would actually prove slightly more expensive via the Northwest Passage, on the order of $625/container (TEU) versus $541/TEU for the Panama Canal route. A port further north, such as St. John's was found to be slightly more efficient, yet the authors again conclude that any slight price advantage would still be grossly overshadowed by the operational risks.

A recent survey conducted by Frédéric Lasserre of Laval University confirms the resistance which these factors have generated in the industry. In 2008, Lasserre contacted firms representing 62% of the world's shipping and found that few of them had any interest in shipping through the Northwest Passage. Most of those that did were already involved in the annual sea lift of bulk supplies to northern communities. Lasserre got similar results from a second, more extensive survey, in 2009 which showed only six out of 46 container shippers would even consider an Arctic route.

While conditions, costs and a lack of interest seem to indicate that the Canadian Arctic will not soon become Stefansson's new Mediterranean, a dramatic increase in shipping still seems inevitable. Yet, rather than through-traffic, the coming decades will see an explosion of destinational traffic; namely vessels travelling to and from points in the Arctic rather than sailing through it. Traffic will be tourist, resource and supply based and the vessels involved will likely be owned or chartered (and occasionally self-insured) by major resource or tourist companies rather than international shippers.

In this sense the Northwest Passage will come to closely resemble the NSR. At its height in 1987 that route carried almost seven million tons of cargo, yet very little of this ever made a complete transit. What the Russians found the passage useful for was shipping out coal, timber and other raw materials while moving in industrial equipment and supplies. During the Cold War, there were political motivations which kept the passage closed to international shipping, yet even after the collapse of the USSR and the official opening of the NSR, the composition and nature of maritime traffic has not materially changed. This is the type of shipping that the Canadian Arctic is most likely to see develop.

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22Griffiths, "Shipping News."
25Ragner.
The oil industry will likely lead this move as many of the industry majors have already begun a new round of Arctic exploration, collectively spending billions on exploration leases in the Beaufort and Chukchi Seas. The global recession and the Macondo blowout in the Gulf of Mexico have certainly slowed this activity, however recent months have seen a cautious movement back towards Arctic offshore drilling. The U.S. presidential panel reviewing that country’s offshore options has reported back and recommended an overhaul of some of the industry’s approaches, yet there was no thought of stopping exploration entirely. Canada’s National Energy Board has launched its own review of offshore oil drilling in the Arctic and though it has not yet issued its final report, it seems unlikely that it will reverse the movement towards Arctic development. The interests and investment in the region are simply too great to be reversed or delayed for too long.

How this oil and gas will eventually be shipped out of the Arctic to market remains to be seen. Most likely it will be brought south along the proposed Mackenzie Valley Pipeline route, however tanker transportation remains a viable alternative. Regardless, large scale development will necessitate a great deal of shipping to transport heavy machinery, drilling rigs and ships and the myriad of supplies needed for such complex operations. Since oil platforms will be in operation year round, there will also likely emerge a regular year-round supply capability.

The region’s oil and gas potential certainly garners the majority of the headlines, however there has also been a strong resurgence of interest in mining. This year, ArcelorMittal and Nunavut Iron Ore have jointly announced plans to takeover Baffinland and its rich Mary River iron ore deposits for $590 million. Once in operation, which is predicted to be in 2015, Mary River is expected to use a dedicated fleet of cape-sized ore carriers and, potentially, some very large bulk carriers (VLBCs) to ship 18 million tonnes of ore per year (for 21 years) from a port near Igloolik into the

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In the summer of 2007 Imperial Oil and Exxon turned heads with a nearly $600 million bid that won them a 205,321 hectare exploration lease on the Canadian side of the Beaufort Sea. In February 2008 Shell and Conoco Phillips bid nearly $2.7 billion in a blockbuster competition for drilling rights in the Chukchi Sea -- a record for any Alaskan oil or gas lease. British Petroleum also spent nearly $1.2 billion in a June 2008 auction for oil and gas exploration leases covering roughly 611,000 hectares of the Beaufort seabed north of Tuktoyaktuk. In the same auction two other leases were won by a trio of companies led by MGM Energy and including ConocoPhillips, Canada Resources, and Phillips Petroleum Canada. These companies spent $4.3 million for 237,820 hectares of offshore exploration rights. In addition to the initial investment, the five exploration leases come with work commitments totalling more than $300 million. Shell, despite ongoing difficulties with Alaskan conservation and native groups, expects to start a three year drilling program as soon as it receives government permission. It is understood that Repsol of Spain, Norsk Hydro of Norway and Conoco-Phillips of the U.S. are also ready to follow suit if the drilling proves successful.
Foxe Basin.\(^{27}\) In Nunavut, new bulk exports are also expected to include magnetite from Roche Bay and lead, zinc and copper concentrate from Izok Lake, shipped out from Gray’s Bay or Bathurst Inlet.

The level of capital now being invested speaks volumes. AcelorMittal’s nearly $600 million dollars suggests that Mary River will certainly be developed. The billions laid out by the oil majors suggest the same is true of the region’s hydrocarbons. Shell alone, for example, has already spent $3.1 billion on lease sales and exploration in the Chukchi Sea.\(^{28}\) Development is thus more a matter of time than anything else.\(^{29}\)

In addition to resource development, the Canadian Arctic will certainly see increased shipping from both tourism and community re-supply. Economic development will naturally increase the region’s population, which is already growing at a healthy rate, and that population will need to be supplied. At present the annual dry cargo requirements of the North (including the Mackenzie River communities) are 372,500 m\(^3\) with an additional 262,500 m\(^3\) in petroleum products. This translates into twenty to twenty two seasonal vessel trips in the Eastern Arctic and fourteen to fifteen seasonal tug-barge trips in the Western Arctic.\(^{30}\) By 2020 the Canadian Arctic Shipping Assessment estimates that requirements will increase to 570,250 m\(^3\) in dry cargo and 431,600 m\(^3\) in oil and lubricants.\(^{31}\)

Cruise tourism has also increased dramatically in the past decade. By 2008 there were 2,400 passengers traveling through the region on 26 trips and these numbers are only expected to increase.\(^{32}\) These vessels rarely make a full transit but will often spend more time loitering in the region and tend to visit less frequented areas. Destination shipping thus seems certain to increase dramatically in a number of sectors over the coming years. The spring-summer shipping season will certainly become increasingly busy while the winter will see limited but steady year-round traffic.

Preparing for this dramatic shift will require significant investments in transit infrastructure, new regulations, hardware and a great deal of study and policy development. Most importantly, Canada must prepare for this


\(^{29}\)While there was a similar level of investment in the Arctic during the 1970s and 1980s much of this was funded by generous government programs and tax incentives.

\(^{30}\)The Mariport Group Ltd, Canadian Arctic Shipping Assessment, (June, 2007), pp. 5 & 95-96.

\(^{31}\)Ibid.

increased shipping aggressively and proactively, rather than continuing with the far more reactive approach which has characterized its policy over the past century. Because of the long lead times required to build much of what is required and to conduct some of the research that will be needed, Canada cannot afford to wait until this shipping boom has become a reality before addressing the issue. Prevarication would likely prove costly, economically, politically and perhaps environmentally.

Canada must soon determine what sections of the Northwest Passage will be open to shipping and what sections will be closed, for either safety or environmental reasons. For instance, in 2009 the Harper government began working with Inuit leaders to create a maritime park in Lancaster Sound, an ecologically and culturally important area which is home to beluga whales, walrus and seals and which serves as a migration route for 85% of the world's narwhal. Since Lancaster Sound is also an important passage through the Archipelago, appropriate shipping lanes must be determined and speed and staggering requirements set in order to minimize shipping's footprint in this vital ecosystem.

Lancaster Sound is the most obvious example of a sensitive marine environment since it is the only area currently being considered for special protection. At some point other such areas across the Northwest Passage and in the Beaufort Sea will have to be considered and integrated into a system of ecological preserves around which shipping can be routed or more heavily regulated. Extensive research will be required to gain a better understanding of the region's ecology and, considering the slow pace at which Arctic research is conducted, it should begin soon.

The region's ice reporting system will also require revamping in the near future. In the Arctic the most important element of vessel safety and pollution control is the avoidance of dangerous ice conditions. Transport Canada currently relies on a system called the Zone-Date System (ZDS) which is based on historic ice conditions to provide entrance dates to various control zones across the Arctic. In 1996 the system was updated to include the Arctic Ice Regime Shipping System (AIRSS) which allows for increased flexibility to CAC class icebreaker ships with an ice-navigator able to make on the spot evaluations of ice conditions.

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Christopher Debiccki, "Protecting Lancaster Sound," Nunatsiaq Online, available, (July 29, 2010) http://www.nunatsiaqonline.ca/stories/article/908789_protecting_lancaster_sound/. This is what the International Maritime Organization (IMO) would consider a particularly sensitive sea area (PSSA). Under IMO rules this body of water can be subject to increased regulation, from vessel re-routing to special restrictions. While Canada does not require IMO approval to regulate internal waters, it would remain prudent to adhere as closely as possible to international regulations.
In general the system has worked well with accident rates falling dramatically over the past three decades. The system is, however, predicated on relatively consistent ice conditions and does a poor job taking year to year variation into consideration. The Canadian Hydraulics Centre has been investigating the efficiency of the ZDS and an examination of several years of data has shown that the system often allows vessels into potentially dangerous areas while also restricting some ships from entering regions where the ice conditions are favourable. The AIRSS system was designed to overcome some of these problems, yet it does not apply to ships without an ice-pilot and only to CAC class icebreaking vessels.

Ship speed was also found to be a significant omission from the AIRSS system. Since speed is an important element in determining how safely a ship can transit any given control zone, it should be included in the regulations. A ship transiting a region of ‘open water’ infested with bergy bits or traces of old ice could still receive a high ice numeral (the calculation within the AIRSS system which determines whether or not a vessel can transit a zone) yet remain at high risk if it impacts old-ice at high speeds.

Simply put, the system, while good, is still far from ideal. It should be expanded to include factors currently overlooked such as speed, visibility and the experience of the ice-navigator. In their 2008 study of the issue, Ivan Kubat and Garry Timco recommended a hybrid system which would use the ZDS as the basis of entry yet would require vessels to use the AIRSS system at all times to improve ship safety while navigating through the zones and to avoid any false sense of security that strict adherence to the ZDS may create.

Increased emphasis in this system is thus placed on the ability and experience of the ship’s ice-navigator. Experience gathered from ice-covered waters around Canada has shown that the presence of an ice-navigator is the most effective and economical way to achieve safe and efficient transit. Currently, Canada does not always require an ice-navigator to be aboard a vessel. While this may be sufficient with current traffic levels, in dealing

34Brad Judson, “Trends in Canadian Arctic Shipping Traffic-Myths and Rumors,” ISOPE-2010, (June, 2010).
37Supra Note 35, pp. 6.
39Section 26 (1) of the Canadian Arctic Shipping Pollution Prevention Regulations requires any tanker transiting Canadian Arctic waters to carry an Ice Navigator at all times and vessels other than tankers to carry one if they intend to transit zones that would otherwise be closed to their vessel by virtue of the ZDS.
with greater ship numbers it would be prudent to expand the requirement, for instance, to vessels of a certain tonnage, carrying certain cargos or within the more hazardous shipping control zones. Vessels transiting the NEP already have to adhere to this requirement. However, rather than assigning an ice-navigator, as is the Russian practice, it would be more efficient to strive for international qualification standards for the profession. Currently, most ice navigation training programs are ad hoc and there are no uniform international training standards. Leading a circumpolar effort to harmonize these skills would be in every Arctic country’s best interest.

Accurate and timely ice information is as essential to safe operations as a well trained crew. In Canada, the Canadian Ice Service is responsible for disseminating ice charts to vessels travelling Arctic waters and opinions of the service’s efficiency vary. In a 2007 survey of Arctic captains a general desire was expressed for better information. A recurring theme was that navigators and captains wanted an integration of satellite imagery with meteorological and oceanographic data and better resolution on the images they were given. Many also expressed a desire to have more access to the raw data and not simply a chart processed by someone ashore. It was also opined that information regarding ice strength and decay as well as the location of growlers, old ice and leads was generally insufficient. A more extensive system involving increased ground truthing and field data will therefore likely be needed. More information on specific freeze-up dates for various ports and more raw satellite data should also be provided.

At present, the Canadian Ice Service has only one aircraft available for radar ice reconnaissance and, due to budget constraints, this aircraft is limited to 200 hrs flying to cover the entire Canadian Arctic. As a result, ice charts are predominantly based on RADARSAT imagery and secondarily on the direct visual sightings from the Ice Observers on the widely separated icebreakers. This often leads to delays in information as RADARSAT’s orbital paths and downloading of data may be several days apart for given areas of interest. With an increase in vessel traffic real time raw data transmission will be important. Accurate ice information from around the passage will have to be kept very current and the personnel and infrastructure to process and disseminate this information will have to keep up with demand.

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42Supra Note 38, pp. 9.
43Ibid.
In terms of hardware, Canada is also far behind what will be required. The Russian example is again useful. In 2008 there was 1.5-2 million tons of cargo moved along the NSR. To assist this traffic, Russia deploys a fleet of seven nuclear powered icebreakers and several strong diesel powered craft. Even with this fleet, Russian companies Lukoil and Norilsk Nickel are already predicting a capability gap and building their own icebreakers. Canada, in contrast, has only two heavy icebreakers remaining. An expanded and modern fleet will certainly be required in the coming decades. Canada is only now in the planning stages of replacing the CCGS St. Laurent and the rest of the fleet is aging rapidly. As these expensive vessels require long lead times of from eight to ten years, they cannot be put off until they are required. The planned Offshore Patrol Craft will be valuable additions to search and rescue (SAR) and law enforcement, however, they will not provide the capabilities needed to escort and rescue vessels trapped in the ice.

Surveillance of the region has always been a concern and an expensive proposition and more activity will of course necessitate a more robust surveillance capability. For this task, Canada has traditionally relied upon its small fleet of CP-140 Aurora patrol aircraft. More such craft could be acquired, though a shift to unmanned aerial vehicles would seem a prudent step towards improving situational awareness. While most UAVs lack the staying power and range of an aircraft they have evolved rapidly over the past decade. The widely used Predator drone, for example, has managed a flight of 40 hours and a range of 3,700km. Prototype solar powered craft have also demonstrated the ability to remain aloft for days or even weeks at a time. While solar powered UAVs would be inoperable during the winter months they would be highly effective in the summer shipping season. While an Aurora has superior speed and range there would be obvious advantages in capital outlay, fuel consumption, and crew costs to supplementing the fleet with drones.

To ensure safe shipping, Canada will also have to invest in more sea route infrastructure such as radio and radar beacons, lighted marks, radar

*Ragner.

*Canada, Senate, The Standing Committee on Fisheries and Oceans, Controlling Canada’s Arctic Waters: Role of the Canadian Coast Guard, (March, 2010) pp. 50.


*The US Navy has recently awarded a contract for seven QinetiQ’s solar powered Zephyr UAVs for $45 million; Defence Update, “QuinetiQ’s Zephyr...Soars to New Record,” (August 24, 2010) available http://www.defence-update.net/wordpress/20100824_zephyr_solar_powered_uav.html.

*An Aurora unit cost is $25 million vs. a $4.5 million predator which can remain in the North and be flown by a smaller team permanently stationed in the South.
reflector and various buoys to mark off safe passages. The NSR, as an example, deploys radio beacons in 47 locations, seventeen of which are manned stations. A further 200 radar reflectors are also dotted along the coast. The reflectors are installed because the low surrounding islands make radar navigation difficult. In total, the NSR boasts some 250 lighted marks and 200 unlit marks. In the summer, some 1,000 floating marks are also added. The Canadian Coast Guard maintains a number of seasonal fixed and floating aids, however this infrastructure will have to be considerably increased and maintained (even at a reduced level) year round.

An essential element in ensuring safe navigation will also be the acceleration of the government’s hydrographic mapping efforts. At present, roughly 10% of the total Arctic maritime area is surveyed to modern standards. The result has been relatively frequent groundings. The 2010 groundings of the Nanny, a tanker carrying nine million litres of fuel in the Simpson Strait, and the Clipper Adventure, a cruise ship in Coronation Gulf, are only the most recent examples.

Facilities for waste disposal and collection of oil spills will also see increased demand from regular shipping. Storage and processing facilities for this waste should be planned for a least two facilities on either end of the passage. One will certainly be needed in the Beaufort when oil development takes place and one at Nanisivik would serve Eastern cruise vessels and the mining interests which will become increasingly important in the Baffin Island/Foxe Basin area.

When oil spills or dangerous discharges do take place, there will be a need for a rapid clean-up effort and Canada must enhance its hardware stockpiles, infrastructure and general preparedness in this area. Currently, crew aboard commercial oil tankers and Coast Guard icebreakers carry oil-spill response equipment and are trained in its use. In addition, an inventory of response equipment, such as booms and skimmers, is maintained at ten community depots strategically located throughout the North. Yet, these preparations are

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"From 1998 to 2008, groundings made up fully 27% of all maritime accidents in the Canadian Arctic; Supra Note, 34.
"For example, the 2004 U.S. Commission on Oceans Policy reported that, while at sea, the average cruise-ship passenger generates about eight gallons of sewage per day and an average cruise ship can generate a total of 532,000 to 798,000 litres of sewage and 3.8 million litres of wastewater from sinks, showers and laundries each week, as well as large amounts of garbage. The average cruise ship will also produce more than 95,000 litres of oily bilge water from engines and machinery a week; Arctic Council, Arctic Marine Shipping Assessment Report 2009, (2009), pp. 137."
designed to cope with the limited activity in the Arctic today and will have to be expanded.

Pollution response is an area in which the Canadian government should be actively seeking partners, both in industry and across the circumpolar world. Currently, there are agreements in place with the U.S. and Denmark, however these are limited regional agreements which should be expanded. The Canada-US Joint Marine Pollution Contingency Plan, for instance, covers only the Beaufort and lacks a specific commitment of resources that either state could or would employ. Since the equipment and infrastructure for an adequate reaction to a sizable accident is expensive and the Arctic is a remote area, a more comprehensive and geographically broad agreement should be negotiated between Canada, the U.S. and Denmark. The objective of this would be to build common stockpiles of emergency response equipment and shared infrastructure as the most cost effective way of protecting the entire North American Arctic. Joint training and an alignment of doctrine, plans and procedure between the national coast guards and industry should also be developed to parallel shipping increases. In a similar vein, the Coast Guard and relevant personnel should increase their contacts with the Russian and Norwegian governments as well as industry leaders such as Statoil and the Russian state companies to determine best practices and the most effective means of dealing with oil and pollution in ice-covered waters.

Similar arrangements would also provide for a more cost effective way of covering the Beaufort Sea or Baffin Bay areas with regards to SAR operations, an area where all three states are under-prepared. Canada and the U.S. in particular share a long history of cooperation in maritime SAR and, as much of the future activity will take place in the Beaufort, a formal sharing of responsibilities would work well and reduce the burden on both states.

In addition to the obvious physical dangers, Arctic shipping has always appeared to present political danger as well. The status of the Northwest Passage remains in dispute; Canada claims it as historic internal waters while the U.S. and many other governments hold it to be an international strait. In the past, fears have arisen that regular shipping might be enough to solidify the position of the Northwest Passage as an international strait. This concern is based upon the precedent set by the 1949 Corfu Channel Case, which determined that one vital element in establishing a passage was regular usage. In the Canadian context, the voyages of the Polar Sea (1985)

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5Canada & The United States, Canada-U.S., 2003, Joint Marine Pollution Contingency Plan.
6The need for such cooperation was already highlighted and agreed to at the 2008 Ilulissat summit in Greenland.
8International Court of Justice, Corfu Channel Case: United Kingdom v. Albania (April 9, 1949).
and the *Northwind* and *Manhattan* (1969) are held up as the sort of dangerous transits which might create this precedent.

Yet, the nature of destinational shipping would make regular repetitions of such challenges highly unlikely. While counties, such as the U.S, will continue to openly disagree with Canada over the status of the Arctic waters, businesses will likely prove far less intransigent. While American policy is based upon concern for global freedom of the seas and the negative precedent that recognition of the Canadian claim could bring, oil and resource companies will be far more concerned with the smooth and efficient running of their operations. The operation of the NSR has consistently proven this point. What foreign shipping that has taken place in and out of the Russian Arctic has been done under the laws and control of the Russian government. Vessels have refrained from challenging the legitimacy of the Russian baselines which enclose the key Arctic straits or the right of the Russian government to collect icebreaking and other fees for the use of the passage. It has simply not been in the interest of any company to do so.

In the Canadian Arctic the situation would certainly be similar. In order to transport tourists, oil or supplies safely and efficiently through the Northwest Passage the companies involved would inevitably require the assistance of the Canadian government. Government services, from icebreaking support, SAR, ice and weather reporting services, and perhaps even access to Canadian ports, repair and refueling facilities would be necessary and sought after. A refusal to recognize Canadian sovereignty or jurisdiction would simply invite Ottawa to deny access to any of these vital services. Equally damaging would simply be a Canadian refusal to grant further exploration leases or development permits in the area.

Recognizing Canadian sovereignty would not entail any additional cost or difficulty and it therefore seems unlikely that any industry would find it productive to challenge the government’s position. There remains the possibility that Washington may pressure American companies into ignoring certain Canadian regulations so as to make a political point. However, American governments have traditionally been as adverse to Arctic disputes as their counterparts in Ottawa. Doing anything to hinder the region’s major oil developments would also seem to go against American national energy and security interests. Applying such pressure is also quite unnecessary. Washington has historically had little real interest in maintaining the Canadian Arctic straits as international *per se*. The real concern has always been the legal precedent. Instead, it would make more sense for the U.S. to be content with allowing private firms to recognize Canadian sovereignty while passively maintaining its traditional position on the law of the seas.
What little traffic that has taken place in the Canadian Arctic seems to substantiate this assumption. The private vessels that have used the Northwest Passage over the past few decades have overwhelmingly chosen to register when entering the region and have complied with Canadian laws and regulations. Even the most dramatic challenge to Canadian sovereignty, the 1969 voyage of the Humble Oil supertanker Manhattan, was ironically a display of how the Canadian government could leverage its Arctic capabilities and assets to force recognition of its jurisdiction. It was actually the accompanying American icebreaker, the Northwind which explicitly refused to request permission to enter Canadian waters.

The Manhattan requested Canadian support for its passage, an implicit form of recognition, and in 1970 when Ottawa made it clear that future transits would have to be on Canadian terms and with regard to Canadian sovereignty, Humble Oil chose to comply. The company complied because it needed Canadian icebreaker support and because it was far more convenient than a political battle with Ottawa from which it had little to gain and much to lose. As such, in 1970 Humble complied with Canada's anti-pollution regulations and even ceded ultimate control of the voyage to the captain of the accompanying Canadian icebreaker.\(^5\)

It therefore seems likely that the Canadian government would be able to ensure that such local traffic took place with respect for Canadian sovereignty and shipping regulations. The result would certainly be a strengthening of the Canadian legal position. The acceptance of Canadian control by those primarily affected is one of the fundamental prerequisites to establishing a claim to historic internal waters. Donat Pharand writes: "if there is clear evidence of acquiescence, the title will be deemed to have materialized even if the usage has not been of such long standing."\(^6\) Indeed, even if the companies involved were not asked to explicitly recognize Canadian sovereignty, but merely to comply with pollution control regulations and Canadian law, the result would be the same.

If the government sought to avoid the potentially awkward situation of demanding explicit acceptance of Canadian sovereignty, a solution might be the application of a transit fee for access to the Northwest Passage. The Russian government charges such a fee for icebreaking services in the NSR (even if icebreaking is not required), however this is a hefty amount and serves to discourage use. A small, almost token fee would not discourage or inconvenience shipping yet, since there are no transit fees to pass through an

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international strait, would serve to establish a precedent of Canadian control and user recognition of that control. While the United States may persist in viewing the Northwest Passage as international, the use of those waters by U.S. government vessels will be substantially less than the usage by various resource and cruise companies which could be brought to accept Canadian sovereignty – either explicitly or implicitly.

The Russian claim to sovereignty in the Arctic is generally more accepted than the Canadian equivalent largely because it has this history of acquiescence and control. In order to use the NSR, Russia demands mandatory notification and authorization fees, liability, discharge and safety standards, reporting design, mandatory manning and construction standards and reserves the right to inspect, stop or detain offending vessels. Canada also has most of these regulations in place, however in Russia there is an extensive history of their application. This history of acceptance by foreign vessels is precisely what Canada requires to cement its claims should the issue ever reach the International Court. Since destination shipping will require Canadian cooperation and assistance, asserting national jurisdiction will be far easier than it would be over international traffic. Fortunately, it appears this is the pattern that Arctic shipping will take in the foreseeable future. Canada must be ready to ensure that this growth in activity is well managed, safe and takes place with respect for its jurisdiction. A great deal of investment and effort will be required to bring this about and those investments must be made in advance of, rather than in reaction to, the coming flood.