An Arctic Promised Land: Greenlandic Independence and Security

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The Arctic is exempt neither from the global process of decolonization, nor the geopolitical effects of climate change. In the case of Greenland (Kalaallit Nunaat), the desire on the part of the Greenlandic people for full political autonomy from Denmark is driving a secessionist process that stands on the threshold of conclusion. This movement has deep roots in a growing sense of Greenlandic cultural identity and confidence in the population and is strongly represented in the current political discourse. Despite its physical extent, Greenland has a small population. Independence would transform it into a microstate, sharing many of the economic and other problems common to such polities, but in a strategic location. However, the political drive toward independence is gathering momentum. The time is at hand for definitive policy decisions to be made regarding the security aspects of Greenlandic nationhood. Practical policy questions will have to be addressed, both for the protection of sovereign rights and as a new states party actor in the security of the Arctic region. Absent sound security policy, independence will be compromised—or worse, may lead to open conflict. To better inform these choices, this article considers five principal defense policy options open to a newly independent Greenlandic state, including indicative costs. The analysis explores themes of more general policy application, including microstate independence and sovereignty, neutrality, and non-alignment, aspects of climate change, and the influence of microstates on regional stability.

Keywords: Security Policy, Defense Policy, Geopolitics, Greenland, Arctic Region, Independence, Conflict, Sovereignty, Microstates, Climate Change, Regional Stability.

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Una tierra ártica prometida: independencia y seguridad de Groenlandia

El Ártico no está exento ni del proceso global de descolonización ni de los efectos geopolíticos del cambio climático. En el caso de Groenlandia (Kalaallit Nunaat), el deseo del pueblo groenlandés de una autonomía política plena de Dinamarca está impulsando un proceso secesionista que se encuentra en el umbral de la conclusión. Este movimiento tiene profundas raíces en un creciente sentido de identidad cultural groenlandesa y de confianza en la población y está fuertemente representado en el discurso político actual. A pesar de su extensión física, Groenlandia tiene una población pequeña. La independencia lo transformaría en un microestado, compartiendo muchos de los problemas económicos y de otro tipo comunes a tales organizaciones políticas, pero en una ubicación estratégica. Sin embargo, el impulso político hacia la independencia está cobrando impulso. Ha llegado el momento de que se tomen decisiones políticas definitivas con respecto a los aspectos de seguridad de la nacionalidad groenlandesa. Deberán abordarse cuestiones de política práctica, tanto para la protección de los derechos soberanos como como nuevo actor de los Estados parte en la seguridad de la región ártica. Sin una política de seguridad sólida, la independencia se verá comprometida o, lo que es peor, puede conducir a un conflicto abierto. Para informar mejor estas opciones, este artículo considera cinco opciones principales de política de defensa abiertas a un estado groenlandés recién independizado, incluidos los costos indicativos. El análisis explora temas de aplicación de políticas más generales, incluida la independencia y soberanía de los microestados, la neutralidad y la no alineación, los aspectos del cambio climático y la influencia de los microestados en la estabilidad regional.

Palabras clave: Política de seguridad, Política de defensa, Geopolítica, Groenlandia, Región Ártica, Independencia, Conflicto, Soberanía, Cambio climático, Estabilidad regional.

北極應許之地：格陵蘭的獨立與安全

北極既不受全球非殖民化進程的影響，也不受氣候變化的地緣政治影響。就格陵蘭（Kalaallit Nunaat）而言，格陵蘭人民對丹麥完全政治自治的渴望正在推動一個即將結束的分
離主義進程。這一運動深深植根於人們對格陵蘭文化認同感和信心日益增強的意識，並在當前的政治話語中得到了強有力的體現。格陵蘭島雖然地域遼闊，但人口很少。獨立會將其轉變為一個微觀國家，共享此類政體共有的許多經濟和其他問題，但處於戰略位置。然而，爭取獨立的政治動力正在積聚。現在是就格陵蘭國家的安全方面做出明確政策決定的時候了。無論是為了保護主權權利還是作為北極地區安全的新締約國，都必須解決實際的政策問題。如果沒有健全的安全政策，獨立性就會受到損害——或者更糟的是，可能會導致公開衝突。為了更好地告知這些選擇，本文考慮了對新獨立的格陵蘭國家開放的五種主要國防政策選擇，包括指示性成本。該分析探討了更普遍的政策應用主題，包括微觀國家的獨立和主權、中立和不結盟、氣候變化的各個方面以及微觀國家對區域穩定的影響。

關鍵詞：安全政策、國防政策、地緣政治、格陵蘭、北極地區、獨立、衝突、主權、氣候變化、區域穩定。

This article is concerned with military security in the Arctic region and the policy options surrounding it. The knowledge gap it addresses is in two parts: first, how Greenland as a nascent Arctic state could properly discharge the responsibility of defending itself and its population. Second, the prospective effects of Greenlandic independence on Arctic geopolitical stability. It is not directed at any specific stakeholder group and has no comment to make regarding the moral rights to self-determination of a population—indigenous or otherwise—that identifies itself as a distinct community. Nor does it address any aspect of perceived or actual historical wrongdoing by any state party. Inevitably defense issues, and how they are to be addressed, will form a part of the governmental considerations of any new nation state, including the likely response by other nations.

Despite the formal cessation of the Cold War, the balance of geopolitical forces that exercise sovereignty over the Arctic remains extant. In effect, the Arctic is a mediterranean ocean across which Russia confronts four NATO nations. Due to its geographical location, Greenland forms a key element in that balance—a wedge in one of the power blocs—which makes it an excellent case, pertinent to Policy Studies Yearbook readers, for studying the intersection of several recent and current policy issues well beyond defense and security concerns. Climate change has brought the prospect of increased availability of Arctic natural resources, and with it, concerns that these might provide focal points for conflict (Ash 2016).

1 For a discussion of the historic strategic tensions in the Arctic, see Huebert (2019).
To date, these fears have proven groundless and the latest assessment by the U.S. National Intelligence Council (U.S. NIC 2021, 8) anticipates a regional increase in competition, largely economic in nature, with a modest increase in the risk of miscalculation by 2040. What has not abated is the sensitivity in Russia concerning the nuclear second-strike capability of its Northern Fleet submarines based on the Kola Peninsula (Boulègue 2019, 6-8). In a future major armed conflict, air, maritime, and land assets would contest control of critical circum-Arctic regions. If the situation escalated, nuclear missiles from both sides would cross the Arctic on ballistic trajectories. Consequently, close attention is paid to any increment or reduction in regional military capability (see e.g., Poulin 2016), and the continued presence, or future absence of Greenland as a sovereign polity from the balance of power would influence the political symmetry that underpins current stability.

Shi (2019 and citations therein) identifies four principal incentives behind the demand for Greenlandic independence. First, a long-term growth in the confidence of Greenlandic people with respect to the management of domestic and foreign affairs. Citing Beukel, Jensen, and Rytter (2010 30), Shi notes the Second World War (WWII) as a turning point in this regard, as it brought contact with external actors other than Danes. Second, increased prosperity in a more diversified and efficient economy. Third, a long-term dissatisfaction with Denmark at an emotional level, relating to the colonial past. And finally, the sense of identity among indigenous Greenlandic people and a related growing national identity. However, the desire for independence is nuanced. While a poll in 2016 indicated a 64-percent majority among the Greenlandic people for full autonomy (Skydsbjerg and Turnowsky 2016), a 2017 survey revealed a 78-percent opposition if it entailed a fall in living standards (Bjerregaard 2017).

The political process leading toward independence has been protracted. A 1953 change to the Danish constitution incorporated Greenland into Denmark as a province, conferring parliamentary representation (constituteproject.org 2021). Home rule was granted in 1979 with defense, together with foreign affairs, currency, and the legal system remaining under the jurisdiction of Denmark. Following a 2008 referendum (Göcke 2009), a 2009 self-rule law granted the Greenlandic government (Naalakkersuisut) extensive rights, including autonomy with respect to the legal system, law enforcement, the Coast Guard, and foreign affairs in matters relating exclusively to Greenland and those responsibilities transferred under the Act. The powers granted to Naalakkersuisut did not limit the Danish authorities’ constitutional responsibility and powers in foreign and security policy. However, the Act authorized Greenland to declare full independence, subject to approval by a referendum of the Greenlandic people.

Despite reservations among the Greenlandic population, the drive toward

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independence has momentum, and the question of how the Greenland government would exercise sovereign authority with respect to defense is now becoming urgent. Greenland, together with the Faroe Islands, is assuming greater authority in foreign affairs and defense, having recently signed terms of reference with Denmark for the creation of a special contact committee to discuss matters of national and common interests (Danilov 2021). This agreement comes against the backdrop of a cabinet reshuffle in the Greenland government, in which the premier took personal charge of foreign affairs, relieving the foreign minister of those responsibilities (McGwin 2021). The action follows publication of a news article in which the minister was reported as questioning whether non-Inuit individuals should be permitted to participate in a vote on Greenland’s independence (McGwin 2021). While the minister regarded the article as misinterpreting his comments (McGwin 2021), the premier’s response underlines the sensitivity and currency of the independence question. At the same time, a general increase in international tension is reflected in perceptions of the Arctic as a potential future battlespace. As Faroe Islands’ Prime Minister Bárður á Steig Nielsen observed: “The North Atlantic and the Arctic are increasingly in the spotlight of security policy, and therefore the active participation of the Faroe Islands and Greenland is also of growing importance” (cited in Danilov 2021).

The Defense of a New Arctic State: Key Questions

The problem of defending an independent Greenland has many conflicting elements. These may be summed up under four general headings: strategic geography, limited revenue, practical military necessity, and the prospective reaction of other states to a newly independent nation (see Figure 1). These will be examined in greater detail shortly, but in elementary terms, the cost of becoming independent entails the protection of an island whose size renders conventional defense very expensive, but whose position confers military advantage to leading powers currently in political dispute, and potentially in future military conflict. While Greenland has an areal extent of 2,166,086km$^2$ the population numbers only some 56,000 (Statistics Greenland 2020). Quite apart from the many other funding demands that will be made against whatever revenue streams are available, the island stands at the frontline of climate change, and there may be significant costs in preserving extant civil infrastructure. Creating a sustainable Greenlandic economy that can support adequate public services is a task fraught with problems. Factors including the island’s geography, small population, demographics, education standards, and related language issues frustrate efforts to diversify and attract investment (Andersen 2015; Einarsdóttir 2006; Tomala 2014). Thus, an autonomous Greenlandic government will need to consider the question: What are the defense options for a newly independent Greenland?
The aim of this article is to explore that problem from an academically independent perspective. It does this by considering five principal defense options that may not be mutually exclusive, but in some cases are impractical for a variety of reasons. While exposing the comparative strengths and weaknesses of the options, this research is not intended as a policy proposal. Rather, it is a document for informing the creation of policy. Indeed, it may be that, on reflection, the options for a comprehensive defense policy are all so undesirable that full independence *per se* is judged by the Greenlandic people as impractical. At the same time, other nations presently contemplating full independence may consider the case of Greenland and the issues entailed in exercising sovereignty and defense useful in their own policy deliberations.

**Greenland as a Scene of Historic Conflict**

It is erroneous to consider Greenland as a remote Arctic island previously untouched by conflict. Records of violent clashes between the Norse and Inuit can be traced to the fourteenth century (Birket-Smith 1928, 12; Arneborg 2015, 268). WWII saw violence at the interstate level when Germany attempted to operate weather stations on Greenland’s east coast (Schuster 1991). Although Denmark had capitulated, residents on the island, both Danish and Inuit, established a light raiding force using dog sledges to confront the German incursion (Howarth 1957). It was the smallest army to fight in WWII (Schuster 1991). Following a skirmish between the Greenlandic force and German personnel in 1943, one member of the
patrol travelled 600 miles to warn allied forces (Schuster 1991). The United States sent aircraft to attack the weather station and the Germans withdrew (Schuster 1991). During the Cold War, Denmark established a sledge-based reconnaissance unit under Operation Resolut (Jensen, Bisgaard, and Heinrich 2013). The legacy of that organization exists today in the form of the Sirius Patrol (Jensen, Bisgaard, and Heinrich 2013); a unit of the Danish Special Operations Command that monitors the littoral to the north-east of the island—part of the largest national park in the world. The Cold War also witnessed the creation by the United States of two facilities in the north of the island: a major airfield capable of accommodating heavy bombers, and a radar station, part of the Ballistic Missile Early Warning System (BMEWS), an integrated network of sensors designed to detect a nuclear attack by the Soviet Union. Relevant also to this study are the waters adjacent to Greenland. During WWII, the Denmark Strait was accessed from the north by German warships en route to intercept allied convoys in the Atlantic. In early 1941, the battleships Scharnhorst and Gneisnau transited the Denmark Strait as part of a mission that resulted in the capture or destruction of 22 merchant vessels (Knowles 2020). In May 1941, the battleship Bismark, accompanied by the heavy cruiser Prinz Eugen sailed south through the Strait, also intent on convoy interception (Bennett 1975, 136-149). Encountering British forces, they sank HMS Hood in an exchange of fire. British retaliation soon followed and Bismark, pursued into the Atlantic, was destroyed (Bennett 1975). During the Cold War the Denmark Strait formed part of the Greenland-Iceland-UK (GIUK) ‘Gap’ and was planted with SOSUS fixed underwater acoustic sensors to detect Soviet submarines (Østreng 1977; Rhode 2019).

The Military Significance of Greenland

The military significance of Greenland resides primarily in its location in the Arctic. Due to its massive size and flanking position to the west of both Svalbard and Iceland, Greenland forms half of the maritime choke points at the Denmark Strait in the south, and the Fram Strait to the north. Thus, it provides an opportunity to exert control over access between the Atlantic and the Greenland Sea, and from the Greenland Sea to the central Arctic Ocean. The importance of the Denmark Strait in particular was recognized during the Cold War, as it formed part of the maritime geography by which NATO hoped to preclude Soviet Russian access to the North Atlantic. In addition to the SOSUS acoustic arrays for detecting submarines, the GIUK gap would have been sown with mines. With the an-
ticipated increase in shipping traffic as the Arctic climate changes, this significance is likely to increase.

The geography of Greenland has military significance in two other respects. First, its position, almost equidistant between the United States and Russia, makes it an ideal location for early warning radar installations—hence its use for BMems and former air defense radars directed at the detection and tracking of lower altitude threats. With the introduction of hypersonic missiles by Russia, the value of Greenland as a site for warning sensors is also likely to increase (Breum 2019). Second, its location and geography offer a staging point for aircraft and ships—either for projection of U.S. or NATO power into the Arctic, or potentially, from which a non-NATO entity could direct military activity into the Arctic, North Atlantic, or indeed, against Canada or America.

Related to Greenland’s military value is its strategic hard ore potential. In particular, the deposits of Uranium (see Thrane, Kalvig, and Keulen 2014, and citations therein) and rare earths (Andersen 2015; Tomala 2014).

**Defense and Sovereignty**

The relationship between sovereignty and defense is a complex one. In this article, full independence is considered as the *de facto* capacity by a Greenlandic government to exercise all sovereign rights in respect to state activities. This includes ultimate control and responsibility for the constitution, foreign relations, and defense. While this study is not primarily an examination of sovereignty as a theoretical political subject, it is recognized that it is not a simple phenomenon to define. While Philpott’s (2001) definition, “supreme authority within a territory,” represents a useful starting point, Krasner (1999) is probably more accurate in recognizing that the term ‘sovereignty’ has different meanings in different contexts. Krasner notes what has come to be recognized as Westphalian sovereignty—the right to act without interference from other polities—as one of the meanings commonly ascribed to sovereignty.

Defense is one of the principal responsibilities of a sovereign (Smith 1776). While the method by which a sovereign entity undertakes the defense of the nation is its own business, an effective defense forms part of the ability to exercise other sovereign authority, including the sole right to enforce laws over a nation’s citizens, control its natural resources, environment, and economy, and the means to exclude non-citizens from its territory, territorial waters, and airspace. At the same time, defense is a demonstration of sovereignty in itself—a function of government that acts as an underpinning to a nation’s diplomatic standing. Thus, an inadequate defense risks not only loss of exclusive control over its citizenry and territory, but an affront to its stature as a state party.

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6 According to Adam Smith (1776), the first duty.
State parties that are internationally recognized as such have two basic methods by which they undertake national defense: first, they can fund the recruitment, training, and equipping of their own armed forces. Second, as internationally recognized polities, they can enter into defense agreements with other nations. Such agreements might take many forms, from simple treaties under which intelligence is shared, through joint training exercises, to mutual defense pacts and, in some cases, the delegation of military defense in its entirety to another nation. In practice, many nations adopt aspects of both the self-defense and treaty approaches.

Cost: How Much Defense Can an Independent Greenland Afford?

Having outlined the key issues underlying any choice the government of a newly independent Greenland may wish to make (Figure 1) and explained both the history of conflict on the island and the manner in which defense relates to sovereignty, it is necessary to introduce the problem of cost. It is not inappropriate to ask: How independent can Greenland afford to be?

Defense economics is a complex subject. However, despite the many variables involved in making procurement judgements, it remains essential to provide at least an indication of what Greenland could not afford. The first point to make is that legally, Greenland could proceed to full independence without revenue streams to replace the annual grant currently made by the Danish government. The loss of that income would certainly inflict serious shortfalls in the amenities available to the Greenlandic people but, ultimately, the choice is more political than economic. As Wilson (2017) notes with reference to Chapter 8 of the 2009 Self-Government Act, it requires the agreement of both the Greenlandic and Danish governments to conclude full independence, and the endorsement of a referendum in Greenland. She makes special reference to section (4) of that chapter: “Independence for Greenland shall imply that Greenland assumes sovereignty over the Greenland territory” (Wilson 2017). Wilson emphasizes that this part of the agreement is an acknowledgement by both sides that independence presupposes Greenland’s willingness and ability to take sovereign responsibility for the territory. This is significant because it places sovereignty and the capacity to exercise that authority at the center of the independence debate.

Second, for the purpose of this analysis, Greenland will be regarded as a microstate, having a population of less than a million persons. As such, it shares the problems of most other microstates in terms of its capacity to generate revenue. Aspects of defense spending and indicative costs are introduced as the analysis now

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8 This classification is not in any respect intended as pejorative. As Gubb (2000, and citations therein) indicates, attempts to classify nation states by size, either of land area, population, or GDP, have not proven straightforward. Several commentators appear to agree that ‘microstate’ may be used to refer to a nation state of less than one million persons without misleading complexity (Gubb 2000).
considers the various defense options from which a Greenlandic government may wish to choose. Example costs for specific security capabilities appear in Table 3.

**Option 1: The ‘Do Nothing’ Approach: The Demilitarised Arctic State Model**

The guarantees of protection of their sovereignty embodied in the UN Charter are, at least in the present state of the world, sadly illusory so far as small states are concerned. (Diggines 1985)

Rasmussen (2019) notes a tendency for Greenlandic politicians to play down or ‘de-securitize’ defense issues, and this has been attributed to a desire to prioritize independence as a political goal, rather than facing an objective consideration of the defense issues that such a state of sovereignty would entail. Given the island’s strategic geography and the challenging defense problem it constitutes, a government that could not defend a newly independent Greenland would expose its population to unreasonable risk. Should it be confronted with any one of many potential security emergencies, it might also find itself rapidly bleeding political credibility.

Of course, there are nations that have no military forces as such. These may be territories that have been demilitarized by a victorious power following a conflict, or that are simply unable to afford defense forces, in which case a more powerful state provides military security. Costa Rica is an example, having formally disbanded its military in 1948 (see Adams 2018). Yet its police are legally empowered to protect territorial integrity (Adams 2018, 5), it operates a Special Forces unit, the Unidad Especial de Intervencion, an air unit and a coastguard (Adams 2018; Kassebaum 1990). Macias (2018/2019) notes no fewer than 36 states that have no regular military force. She bases her report on the CIA World Factbook, and some of the entries in the list are open to question.9 While it is striking that such a high percentage of the world’s nation states and dependencies—15 percent—should have no military organization and resources of their own, they represent only 0.2 percent of the global population. Moreover, having no military is not the same as being undefended. In fact, defense agreements with militarily stronger entities, whether formalized as treaties or otherwise, have mutual benefit. A pertinent example is that of Iceland. A NATO member with no armed forces per se, its strategic position is such that other nations provide defense support, partic-

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9 For example, while the UK certainly defends the Falkland Islands, the CIA make no mention of the Falkland Islands Defence Force, a local volunteer unit funded by the Falkland Islands Government (Bound 2012, 145-153; Tossini 2021). Another curious inclusion is Svalbard, which is part of Norway and not a dependency. Norway received sovereignty of Svalbard by the Treaty of 1920, under the terms of which, the archipelago may not be militarised. However, that does not mean that it may not be defended should it be subject to invasion or any other foreign military action.
ularly deployments of interceptor aircraft for air defense. The advantage to NATO is access to strategic geography and its denial to a potential adversary. At the same time, Iceland’s NATO membership—or rather, the threat to leave the alliance—has enabled it to exert political pressure to change maritime law to protect the fisheries on which it depends (Jónsson 1982).

A policy of pacifism in its strictest interpretation is difficult to identify among modern nation states. Some states, for example, Japan, have had a constitutional disbarment from choosing warfare as a political option: a situation imposed by the Allied powers at the end of WWII. Yet Japan today has modern and capable armed forces. Perhaps the clearest example of the fate of polities that practice pacifism in a true sense is that of Moriori, inhabitants of the Chatham Islands, who were almost annihilated in 1835 by invading Māori, who killed, enslaved, and cannibalized them (Brett 2015; Miah 2020; Waitangi Tribunal 2001/2016).

**Option 2: Neutrality**

We have always been a peaceful nation, and our role in the world community should be to spread the message of peace. We must not participate in wars.

(Ane Hansen, reported in Turnowsky, 2017)

Neutrality and demilitarization are distinct political positions. The first implies a deliberate policy of non-involvement in a dispute between other nations. It does not of itself imply that a nation has no military capability, while the latter certainly does. Political neutrality guarantees neither peace nor freedom from invasion. History is littered with examples of states that claimed neutrality in order to avoid war and were simply engulfed or taken over by the belligerents. A claim to political neutrality did not prevent Britain and the United States from occupying Iceland during WWII, enabling allied aircraft to provide support to convoys en route to Europe, and preventing Germany from gaining a foothold. Considering more recent examples, the United States has intervened militarily in a number of nations which, as Chomsky (1992) notes, pose neither a significant military threat nor a source of important economic resources, including Grenada, Guatemala, Laos, and Nicaragua.

10 See for example Allied Air Command Public Affairs Office (2020), Einarsdóttir (2021), and Van- diver (2020).
11 See Article 9 of the Constitution of Japan of 1946 (see also Prime Minister of Japan and his Cabinet n.d.).
12 Following the imposition of a defensive British military presence in May 1940, Canadian reinforce- ments arrived in Iceland in June (Walling 2012, 29-30). The Icelandic government attempted to persuade the United States to declare Iceland part of the Western hemisphere, and therefore subject to the protection of the Monroe doctrine (Fairchild 1990). They were persuaded to invite the United States to garrison the island, relieving the British personnel in spring 1942 (Walling 2012, 29-30).
History suggests that effective neutrality appears to have a number of elements. First, a strong defense, or at least a defense that is too militarily inconvenient for major belligerent powers to expend effort in defeating. Second, the vested political or economic interests of the major belligerents. Thus Switzerland—a former supplier of mercenary soldiers from the fifteenth to the seventeenth centuries to other nations in the form of the Landsknechts—has extensive armed forces, including hard-skinned vehicles and combat aircraft, and a mountainous geography lending itself to defense (ArmedForces.eu 2019; McPhee 1983/1984). Switzerland also extended its political neutrality to accommodating the finances of Nazi Germany, providing the sole source of much needed foreign exchange toward the end of WWII (McComas 2016). Had the outcome of the war not favored the Allies, such economic convenience would probably not have prevented its invasion—German plans for events following the defeat of the Allies included Operation Tannenbaum, an invasion of Switzerland with some territories to be allocated to fascist Italy (Weinberg 1999).

Sweden declared an official policy of non-belligerency during WWII and provided assistance to both Germany and the Allies (Rai 2017; Wahlbäck 1998). Nonetheless, fearing an Allied invasion of Norway, Hitler had his military consider a preventive strike against Sweden (Wahlbäck 1998). During the Cold War, secret preparations were made to receive NATO aid in the event of a Soviet attack, but there were concerns that such support would arrive too late to influence a ground war (Åselius 2005). Substantial defense forces were developed, including the procurement of combat aircraft, although these forces were allowed to diminish following the collapse of the Soviet Union (Åselius 2005). More recently, the Swedish government has agreed a defense pact with Denmark, Estonia, Finland, Iceland, Latvia, Lithuania, the Netherlands, Norway, and the UK, under which it will contribute to the Joint Expeditionary Force (JEF) (JEF 2021). The JEF is designed to be able to respond to aggression including sub-threshold incidents (JEF 2021), and its establishment indicates a renewed concern with recent Russian behavior on the international stage.

Since Greenland is unlikely to be able to afford a strong self-defense—or indeed even a defense against most conventional threats—neutrality does not appear to be a viable strategy. This leads naturally to consideration of the next option.

Option 3: Self-Defense

In the following discussion, it has been assumed as a starting point that the government of a newly independent Greenland will not wish to spend much more

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13 “Sub-threshold activity does not seek decisive conflict, but is a way that adversaries alter the balance of advantage in order to achieve their objectives without the material, financial and social cost of armed conflict. It is orchestrated by hostile state and non-state adversaries to undermine security, the integrity of democracies, public safety, reputation or economic prosperity” (JEF 2021).
than the average indicated by the global military burden—2.4 percent of GDP\textsuperscript{14} (Da Silva et al. 2021). This suggests an annual budget of approximately USD 71.6m (2019 figures). With many calls on its income, the government may wish to spend substantially less, but the figure serves as a tool for analysis. In this context, it is worth noting that Iceland, a state that formally eschews a military of its own, has pledged to adhere to the minimum baseline defense budget of 2 percent of GDP enjoined by NATO.\textsuperscript{15} Iceland’s defense budget for 2019 was USD 17.7m, of which the largest proportion was allocated to the Coast Guard and Keflavik Airport (see Ćirić 2019, and citations therein).

Greenland is potentially vulnerable to air and sea attack against its key economic assets. There are two deep water ports, one at Thule and the other at Nuuk. An air defense capability, at least to protect the ports, would be desirable. In the case of Thule, it may be expected that the United States would provide the appropriate protection for both the port and the other military facilities located there. To safeguard Nuuk, a specimen cost for a single air defense missile battery is some $US 800m - 950m\textsuperscript{16} and, while such a cost might be spread over a number of years, such an asset would appear to be simply unaffordable.

Similarly, if a potential enemy wished to ruin the Greenlandic economy, or bring crushing political pressure on the government, it might do so by mining port approaches, thereby crippling the movement of heavy freight. Such an attack might be conducted in a relatively covert fashion, by using a vessel of opportunity to sow the mines, a form of attack exemplified by actions taken by Iraq during the second Gulf War (O’Flaherty 2019). Defense against such an attack would entail the deployment of a mine sweeping or mine hunting capability.\textsuperscript{17} Mine sweeping aims to clear weapons by severing the tethers of buoyant mines, or safely triggering bottom-laid mines by mimicking the acoustic or magnetic signatures of ships. Sweeping platforms include surface vessels, drones, and helicopter-towed buoyant sledges. Some mines have sophisticated triggers that react to combinations of acoustic and magnetic stimuli, rendering them resistant to basic sweeping techniques. Others may lie buried in the seabed and require sonar detection before a demolition charge can be set to destroy them. A specimen cost for a mine-hunting sonar may be gleaned from the Type 2093, developed for the British Sandown class

\textsuperscript{14} This figure might have been assessed in many ways, and merely represents a point of departure. For comparative information on island nations defence spending, see SIPRI fact sheet in Da Silva and others (2021).

\textsuperscript{15} For the history and other aspects of the 2-percent guideline, see Dowdy (2017) and NATO (2014/2018). In addition to committing capabilities, NATO membership requires a contribution for alliance budgets and programmes (NATO 2021).

\textsuperscript{16} This is a specimen cost for a single MIM-104 Patriot missile battery, derived from two reports of sales to Poland and Sweden (i24 2017; Trevithick 2018). In the case of the Polish transaction, the missiles were of Israeli manufacture, and 10 percent of the cost of the American versions (i24 2017).

\textsuperscript{17} For a comprehensive account of mine technology and countermeasures see Friedman (1989, 444-6, 478) and Hartmann and Truver (1991).
minehunter at a reported (1989) cost of £83m.\textsuperscript{18} This suggests a notional unit price of USD 22.1m (2019), which would not include operating platform, maintenance, or training. Friedman (1989) notes the development of relatively cheap improvised systems provided by the United States to Vietnam. However, these were simple noise-making and magnetic field-generating systems designed by personnel who knew the type of mines they were attempting to defeat.

**Military and Security Capabilities Exercised by Small Nations**

> “The Danish defense today is not the actual defense of Greenland. Should there arise a real threat to our country from hostile powers, it is defended by the United States. It is the reality all know but nobody discusses.”

(Breum 2018, cited in Rasmussen 2019)

The basis for a capability-based national defense plan is an estimate of the threat (Singer 1958). The population of any state, including those with a relatively small GDP, will expect its government to protect them against terrorist attacks. An anti-terrorist capability implies the availability of some form of armed unit within the *Kalaallit Nunaanni Polititit* trained in the tactical application of firearms in terrorist situations. A state fails in its duty if it cannot address an incident such as the 2019 attack on mosques in Christchurch, New Zealand, in which a gunman killed 51 people (Battersby and Ball 2019). In addition to dealing with the gunman, an improvised explosive device (IED) also had to be disarmed and suspected IEDs dealt with (Ashford, Heron, and Kaldas 2020, 12).

A government will wish also to be able to exert sovereign control over its Exclusive Economic Zone (EEZ). In the case of Greenland, those waters represent not only the asset of a sovereign entity whose authority and status would be affronted by Illegal, Unreported, and Unregulated (IUU) fishing, but also a valuable revenue stream. That implies at least some maritime intervention vessels, since fisheries laws cannot be enforced without boarding for the inspection of fishing gear and documentation. Remote sensing measures, by satellite tracking or drones, may assist in covering the large areas involved, but cannot on their own provide sufficient information. Moreover, the technology is expensive. A specimen cost for an Israeli drone in which the Canadian government showed interest, that was capable of monitoring large areas of the high north, was $CDN 36.16m (Baerson 2021).

These are measures against sub-state level threats. However, both terrorism and access to fishing grounds unauthorized by a coastal state may be state supported activities. Regarding the latter, it should not be forgotten that nations on occasion send military vessels to support fishing vessels flagged to their jurisdiction operating in the waters of other coastal states. In the past this has resulted

\textsuperscript{18} This included development and the delivery if two preprototypes and 10 production units (Friedman 1989, 470).
in violent confrontations, including clashes between NATO allies. In the so-called Turbot War of 1994-6, Spain sent patrol vessels to protect its fishing vessels, which Canada claimed were fishing illegally. The Canadian prime minister authorized Canadian forces to fire if the Spanish vessels uncovered their guns (Gough 2009, 70). Britain sent military vessels to protect fishing vessels in disputed waters adjacent to Iceland on no less than three occasions: the so-called Cod Wars. Icelandic patrol vessels towed trawl cutting gear to impede fishing operations and were in collision with Royal Navy vessels (Ingimundarson 2003).

One devastating—and relatively deniable—form of attack would be to use cyber warfare against state government and economic institutions. A recent case involved a ransomware attack on the government of Nunavut (George 2020). The Nunavut government elected not to pay, and the incident took over five months to resolve (George 2020). A cyber defense capability would appear to be fundamental for any nation state.

In addition to these elementary constabulary functions, governments of small states often find benefit in sending government personnel in support of UN and NATO operations. In addition to the political recognition such commitments garner among the community of nations, there are other benefits including: the sharing of professional skills and up-to-date practice; the establishment of desk-level contacts; and the exchange of intelligence information. For UN operations, the cost of the equipment owned and brought by a state to an operation (Contingent Owned Equipment) and some other expenses are reimbursed by the UN (United Nations Peacekeeping, undated). Once again, Iceland is an example of an Arctic nation that has been one nation sending government personnel to NATO operations, despite having no established military per se (Icelandic Government 2018).

Cyber Defense

Consideration of cyber defense follows naturally from discussion of the elementary protection a population will expect from a polity, but the nature and threat posed by the problem merits a separate section. Much of the cyber threat is criminal activity directed against private individuals and organizations. Greenland is increasingly dependent on digital infrastructure and, to a great extent, the first-line protection of critical economic infrastructure may be undertaken by the various private sector companies and organizations of which it is comprised, particularly banking and telecommunications vendors. For example, the Bank of Greenland (2021, 67) reports a capability to restore customer-oriented temporary service following an IT outage within one day. However, an autonomous Greenland government will have to protect itself and legislative plans are already being drawn up for that purpose (Turnowsky 2019).

In the military security context, cyber assaults may be launched by nation states, including third parties acting on a state’s behalf in order to provide deni-
ability, or by terrorists or criminals whose motives include avarice, revenge, or hubris. Assaults may be designed to steal data and/or overwhelm or otherwise incapacitate computer systems. A classic example of a cyber attack launched against an Arctic government entity was the ransomware attack that paralyzed Nunavut government activity recently (George 2020).

Key functions of any cyber defense system include provisions for continuity of service, data protection, and the denial of external control. This implies not only the possession of a functional strategy, but the availability of a 24/7 incident response capability and secure data replication. An example of the latter may be found in the Estonian ‘data embassy’ project—data repositories set up in friendly nations, designed to ensure the digital continuity of the state, even if its territorial sovereignty is compromised (Areng 2014, 8). Other benefits accrue from establishing a center of excellence for coordinating cyber security, or at least collaborating with other nations in sharing expertise in this subject.

The relative vulnerability of Greenland to cyber assault is a mixture deriving largely from its geographic circumstances. The underwater cable connections are relatively vulnerable, and their general positions are open-source information (TeleGeography 2021). With appropriate underwater equipment, finding and cutting them would not be particularly challenging for a determined adversary who wished to make a political point, or support a military operation. Although Huawei Marine Systems, which was jointly involved in laying the cables, is reported to have sold its underwater cable business to another Chinese company (Savov 2019), it is conceivable that software vulnerabilities remain in the system. A certain resilience exists in the Greenland telecommunications system in the form of the number of VHF radiotelephones owned by Greenlanders.19

One further point that needs to be made is that if an independent Greenland wishes to become a member of NATO, then it will be required to align with coalition standards for cyber defense, including policy and a coordinating agency. As with every other aspect of defense activity, the establishment of such facilities requires expertise, for which Greenland may have to recruit outside its own borders, and investment, which will place an additional burden on scarce resources.

**Option 4: Alliance**

The coalition parties stand firm, our country as an independent state must be a member of NATO.

(The Coalition Agreement of 2018 between Siumut, Atassut, Partii Naleraq and Nunatta Qitornai, para 341. Translation in Rasmussen 2019, 10)

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19 It is difficult to obtain precise subscriber numbers. One open source (Watkins 2021) suggests that ‘many’ Greenlanders own a radio/telephone.
Should Greenland wish to join NATO, there will be certain reciprocal expectations in addition to the cyber defense arrangements alluded to above. These include minimal funding levels, and overall defense policy alignment with the precepts of the alliance. There may also be other contributions that Greenland could make. For example, by providing a venue for training in cold weather survival, land warfare, aircraft operation including the use of ice runways, and a location for tactical development.

In choosing an alliance with a larger state as part of its defense strategy, a smaller nation is choosing, at least to some extent, to share any future conflict that stronger power engages in. Thus, if the stronger power or alliance places military resources such as fixed installations, troops, aircraft, or vehicles on the territory of the small state, an enemy of the protector force may attack those resources, potentially inflicting collateral casualties on the population and harm to domestic infrastructure.

There may also be political consequences. The protector polity may insist on judicial oversight over its own troops, thereby visibly diminishing the sovereignty of the small nation. Consider, for example, the 1951 defense agreement drawn up between Denmark and the United States. In Article VIII, the issue of jurisdiction is made explicit:

\[
\text{The Government of the United States of America shall have the right to exercise exclusive jurisdiction over those defense areas in Greenland for which it is responsible under Article II (3), and over any offenses which may be committed in Greenland by the aforesaid military or civilian personnel or by members of their families, as well as over other persons within such defense areas except Danish nationals, it being understood, however, that the Government of the United States of America may turn over to the Danish authorities in Greenland for trial any person committing an offense within such defense areas. (Defense of Greenland 1951)}
\]

Such arrangements may lead to discontent in the host nation when the behavior of visiting military personnel falls short of expected standards. Ultimately, however, a small nation is likely to have to choose from whom it accepts a military safeguard and, indeed, may have simultaneous defense agreements with more than one nation or alliance. Thus, a Greenlandic government might elect to join the JEF in addition to NATO, to provide an assurance that it could avail itself of a response to a sub-threshold threat.

A final point in relation to the establishment of defense alliances relates to procedural limitations. To take the example of NATO, its enlargement is gov-

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20 Defense of Greenland: Agreement Between the United States and the Kingdom of Denmark, April 27, 1951.
erned by a set of rules, as noted in its 'Study on NATO Enlargement' (NATO 1995, chap. 1 para. 6): “States which have ethnic disputes or external territorial disputes, including irredentist claims, or internal jurisdictional disputes must settle those disputes by peaceful means in accordance with OSCE principles. Resolution of such disputes would be a factor in determining whether to invite a state to join the Alliance.” Thus, if Russia, consistent with its view concerning NATO and the Arctic (Barbin 2021) chose to foment discord in a newly independent Greenland, such dissent might obstruct the nation's entry into the alliance.

**Option 5: Post-Independence Alliance with Denmark**

Related to the option of alliance, one strategy not often discussed would be to form a post-independence alliance with Denmark. This approach could provide significant benefits to all parties, alleviating many of the issues confronting a nascent Arctic state, smoothing the transition to the exercise of full sovereignty, and providing a secure foundation for NATO membership—if that is what Greenlanders choose. As Greenland transitioned to full independence, Danish forces would continue to play a role as alliance guests, the conditions of their presence and authority to act defined by a defense agreement between Nuuk and Copenhagen. Greenland would achieve autonomy, without as material a burden on its stretched resources, and there would not be a significant hiatus in defense capability and potential insecurity.

Under a defense agreement with Denmark, the essentials of the sovereignty role would be retained by Greenland, with counterterrorism, fisheries protection, and most search and rescue responsibilities falling under the operational control of Nuuk. The operational control of Danish forces would be exercised by local Danish commanders in accordance with overall procedures agreed in advance with the Greenlandic government. The presence and role of the Danish forces would form part of Denmark’s contribution to NATO.

Danish forces would continue to provide defense capabilities, in a location in which they already possess experience. Although these capabilities would have to be the subject of a defense agreement, potential examples include:

1. Home guard training, for an organization broadly similar to the Canadian Rangers, to enable it to undertake sovereignty patrols, early warning, and search and rescue duties.

2. A special forces contingent, able to advise a Greenlandic counter-terrorist unit in cases of state-sponsored terrorism and provide key point defense during heightened periods of tension.

3. Air assets for the protection of Greenlandic airspace, NATO operations, and exercises. These might include combat aircraft such as fighters, reconnaissance aircraft, maritime patrol aircraft, helicopters, drones, and associ-
ated ground support personnel and equipment. Involvement in search and rescue operations would be at the invitation of the Greenland government.

4. Naval assets for defense against maritime threats to Greenland and for NATO operations and exercises. This would not include fisheries protection. Involvement in search and rescue operations would be at the invitation of the Greenland government.

Greenlandic Independence and the Prospective Outcomes for Other Arctic States

Irrespective of the desire of an independent Greenlandic government to live at peace, that peace is contingent on the behavior of other nations. The present political trend is for Arctic nations to follow the rule-based order, and the concerns regarding inter-state conflict arising in the region as a result of climate change have yet to be borne out. Yet there remains the possibility that conflict may spread to the Arctic from superpower engagement elsewhere. Moreover, the very process of Greenland becoming independent brings potential political instability to the Arctic. The problem has three key parts (see Figure 1): first, the island of Greenland is almost equidistant between Russia and the United States. It is thus either a buffer or a potential base of operations for one of the belligerents in any future conflict. Second, its geography is critical in the creation of two maritime choke points in such a confrontation. Third, the country is vast, but with a relatively modest GDP. It could not afford armed forces of any scale of its own. A newly independent Greenland represents an opportunity or threat to Arctic superpowers, or indeed, an opportunity for a near-Arctic state, as China regards itself.

The United States has certainly demonstrated a strong wish to influence aspects of Greenlandic affairs—including an offer to purchase the island. While the offer may have caused reactions varying from humor to offence, there are historical precedents. Three of these cases concern Arctic territories. First, the sale of Rupert’s Land by the Hudson’s Bay Company to Canada in 1870 secured a vast area that drains into Hudson’s Bay, including areas to the north of the Arctic Circle (Hudson’s Bay Company 2016; Smith 2006). The second case was the 1947 sale of the Jäniskoski-Niskakoski area by Finland to the Soviet Union, which formed part of its war reparations (Finlex n.d.; Katajala 2010, 107). The area was of interest to the Soviet Union due to its potential for hydroelectric power (Katajala 2010). However, the third, and perhaps the most relevant case of an Arctic territorial sale was that of Alaska by Russia to the United States in 1867 (Bolkhovitinov 1996; Mitchell 1976). It had become evident to Russia that it could not defend the territory against potential incursions from either the British Empire or an expanding United States (Bolkhovitinov 1996).

In this history of Arctic territory purchase and occupation, two related factors are predominant in the behavior of state parties: cost and practical mili-
tary necessity. If a nation cannot afford to defend a territory, or is unable to do so, it may elect to sell it, as Russia did with Alaska. However, if the acquisition of a territory by a hostile party threatens a nation or alliance, it may well respond with the exercise of force in denying the use of the area to the enemy. Thus, the Allied powers occupied Iceland and the Faeroes during WWII (Walling 2012; Fairchild 1990; Miller 2003). The United States would, of course, prefer to retain its facilities at Thule\textsuperscript{21} and while, at some expense and inconvenience, these might be repositioned in north-east Canada, it would likely react negatively to the idea of a polity with interests inimical to its own, such as Russia or China, being allowed to position its own military resources in Greenland. Such facilities might range from a capability for collecting intelligence (anything from a ship in harbor to a building housing a company communications station), to a staging base for special forces, or in the worst case, a depot vessel berthed in a deep-water harbor capable of supporting visiting submarines. One of the problems associated with the governance of a newly independent Greenland is that facilities such as runways, docks, and buildings associated with major economic investment, provide potential military assets in time of war. The United States is unlikely to be content with a Chinese or Russian investment in Greenland that provides either nation with a prospective base from which it can conduct operations against either its facilities in Thule (if the government of Greenland consents to their continuance), or indeed in such close proximity to the continental United States. In this regard, it is worth noting the actions of the Danish government to block the acquisition of the abandoned Grønnedal naval base by the Hong Kong-based General Nice Company in 2016, and its funding for Greenland’s airports in 2018 in reaction to bids by the China Communications Construction Company to build them (Dams, Van Schaik and Stoetman 2020, 34).

In terms of opportunity, Russia has made no secret of its view that NATO has no place in the Arctic (Barbin 2021). An independent Greenland that withdrew support for NATO operations would drive a physical wedge between the coalition territories that confront its authority across the Arctic. Beyond the cost and inconvenience of relocating the ballistic missile detection radar at Thule, any diminishment of NATO’s capacity to close the Denmark Strait to submarines would strengthen Russia’s position.

China also has been open in the pursuit of its ambitions to exert influence in the Arctic.\textsuperscript{22} China now has observer status on the Arctic Council, and has spentlavishly on polar research, commissioning two icebreakers and establishing a sci-

\textsuperscript{21} The radar at Thule forms part of a system that has an important civil function in monitoring the position and trajectories of space debris (Console 2019, 39; Dickson undated). Objects may damage spacecraft with civil functions or re-enter the Earth’s atmosphere without completely burning up before impact. Providing territorial access for the Thule radar facility would be a contribution by the Greenlandic government to the global community.

\textsuperscript{22} For a comprehensive overview, see Dams, Van Schaik, and Stoetman (2020).
cientific station on Svalbard. It has expanded its diplomatic representation, with a large embassy building in Reykjavik, and invested in land purchase and other business ventures in the Arctic. Its wish to use the Northern Sea Route is evident in its dealings with Russia. Augmenting its scientific and political bases in the Arctic with a military base, in particular a port with Arctic access, would provide China with a prospective means of protecting its maritime traffic in the region. An opportunity to position and sustain ballistic missile submarine operations in the Arctic or north Atlantic would bring more targets in the United States into missile range. Additionally, in the case of submarines operating in the Arctic, they could do so from waters that offer the protection of the pack ice.\(^{23}\) Such a move would counter American presence in the Indo-Pacific, enhancing China’s retaliatory capability and splitting U.S. military resources by opening a second front. This would confer not merely an advantage during open conflict, but an enhanced deterrent at a global level.

**Greenlandic Independence and Geopolitical Stability**

Having considered the potential outcomes of Greenlandic independence for Arctic and ‘near’ Arctic nations, a key question that follows is whether such a change would influence geopolitical stability. As Niou and others (1989) note, stability has more than one meaning in international relations. For clarity, this article follows the definition of Bragg (2011, 36) in taking geopolitical stability to constitute “a state of relations among nations that is generally consistent with and conducive to change and progress without having to revert to initiating a war with global or regional proportions.” Since ‘war’ is a complex phenomenon to define,\(^{24}\) this analysis substitutes the concept of ‘armed conflict between nation states.’ By this definition, stability and war are mutually incompatible circumstances, and the problem becomes one of identifying possible conditions in which Greenlandic independence leads states to risk armed conflict in addressing their grievances and ambitions. But if geopolitical instability is synonymous, or at least correlatable, with causes of war, the problem of reliably identifying such causes appears daunting. As Bueno de Mesquita (1981, 2) observes:

> Despite the attention of such intellectual giants as Spinoza, Rousseau, Kant, and Clausewitz, we know little more about international conflict today than was known to Thucydides four hundred years before Christ. Indeed, the failure to identify a generally accepted theory of war leads some observers to conclude that scientific explanations of such conflicts are not possible.

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\(^{23}\) For a comprehensive account of the issues associated with Arctic submarine warfare, see Compton-Hall (1988, 173–185).

\(^{24}\) For example, the Correlates of War project adopts a typology of wars based on factors such as number of battle-related fatalities and time (Sarkees n.d.).
Thus, the lack of a general theory of war causation would appear to be a severe impediment in understanding or predicting such instability. Yet Bueno de Mesquita (1981, 2) has a further contribution to make. His endeavor is “to present systematically derived, lawlike statements about war and other serious disputes and to explore the relationship between history and those statements.” His solution is to devise an expected utility-based approach that assesses the agency and preferences of key actors in the conflict decision process (Churchman 2005, 153-155; Bueno de Mesquita 1997). Feder (2002) reports remarkable predictive capacity in tests of Bueno de Mesquita’s algorithms made in government service.

It is not the purpose of this study to predict future armed conflict in Greenland: merely to identify whether the issues associated with independence are likely to result in a less stable geopolitical situation in the Arctic; in other words, if Greenland undertakes the transition to full independence are nation states more likely to go to war? To be clear, Bueno de Mesquita’s (1981) model considers the specific circumstances of senior and influential decision makers in potentially belligerent nations and the utility of violent conflict as a decision option. Consequently, the potential outcome of the model fluctuates over time with the dynamic interrelation of the key actors. But he is clear also that a critical feature of the analysis is the salience—importance—of the casus belli to each of those actors (Bueno de Mesquita 1997). While the degree of salience may differ with each actor, we may identify themes that have remained of consistently high salience to the collective leaderships of particular nations. We may infer that in the absence of such highly salient factors, stability is more likely.

For the United States, one factor of persistent and high salience is ensuring that a potential belligerent is denied a potential base of operations in close proximity to the continental United States. This priority is satisfied if Greenland hosts no such threat. Referring back to the previous section, China will not wish to surrender any potential monopoly on rare earths and would wish to enjoy the political influence investment in mining would confer. Such an industrial facility could have military potential; that is, it may be ‘dual-use.’ More directly, China may also favor a base from which to project maritime power into the Arctic, and has shown itself adept at acquiring access to strategically important locations, as it has for example in Sri Lanka (Patrick 2017; Singh 2018). Russia would prefer to see NATO’s position in the Arctic fractured and, as in the Ukraine, has shown itself proficient in the use of overt and clandestine military forces in securing its strategic position. Given its modest population size and history, Greenland does not have an extensive pool of expertise from which to recruit its diplomatic corps. This, added to its need to attract investment in order to establish a stable economy, renders it vulnerable to foreign influence—both beneficial and malign. To this may be added the distressing tendency for small nations with poorly developed political and legal systems to be plagued by corruption.

Potential military threats in Greenland are likely to be matters of high sa-
lience to any American polity, and thus a source of instability. At the time of writing, commentators in Russia suggest supporting and exploiting independence as a mechanism for diminishing NATO Arctic presence, both within and beyond Greenland (see Goble 2021). In that regard, a post-independence combination of limited Greenlandic diplomatic representation and economic need may give rise to circumstances that undermine stability. However, membership of NATO or other alliance(s) may redress shortfalls not only in defense capability, but in diplomatic presence also.

Balancing Military Options: A Capability-based Approach

Traditionally, nations have founded defense planning largely on the basis of threat, a concept described formally by Singer (1958) as a combination of the Estimated Intent of a foreign power, and that power’s Estimated Capability. An alternative is to approach the problem of national security on the basis of risk and view the potential for military and terrorist attack among the many hazards, both natural and anthropogenic, that confront a nation. The UK is one of the nations to draw up a national security risk assessment, and considering the limited resources available to a newly independent Greenlandic state, it might be helpful to take such an overview, particularly since, as an Arctic state, there are likely to be expensive infrastructure costs associated with climate change.

It might be tempting to assume that once such a listing is drawn up, risks associated with national defense can be relegated to a lower order of priority as a matter of political expediency. That view is an error and neglects elementary risk management practice. A risk that is unlikely but catastrophic in eventuation is not ignored. Rather, general management practice for such a risk is by sharing—in military terms, forming an alliance. However, alliance is not cheap defense. It may be an agreement of necessity for a small nation, but as noted earlier, it comes with obligations. Of course, the establishment of such an alliance may in itself signal independence from Denmark, not merely because it is the act of a sovereign, but because it may constitute a pivot from the Nordic to the Anglophone world.

Defense planning has developed in recent years toward a capability-based approach (De Spiegeleire 2011; Stojković et al. 2016). Such a process has been adopted by several NATO nations and incorporates consideration of threat and available resources to devise an appropriate national defense strategy (De Spiegeleire 2011). Following such a method, the remaining discussion is intended as a starting point for an intelligent debate regarding the security aspects of Greenlandic full independence. As such, it is not a comprehensive capability-based analysis per se.

Further to the earlier comments regarding Greenland’s military significance, it is possible to devise a set of threat scenarios to form the basis of defense and security planning. For convenience, these have been divided between two ta-
bles. Neither table is designed to be exhaustive. Nor is either table a shopping list. Both describe hazards to the people of Greenland that a fully independent polity is responsible for addressing. Given the enormous areal extent of Greenland and its modest population size, attention is focused on defending people, rather than territory. In Table 1, the example threats are those that affront or challenge the basic sovereignty of a Greenland government. They are the types of events from which any population would expect its government to protect them. It has been assumed that for NATO, or other allied installations, the visiting power will assume responsibility for defending their own military facilities.

Table 1: Threat/Option Analysis for an Independent Greenland: Sovereignty Functions

<table>
<thead>
<tr>
<th>THREAT</th>
<th>EXAMPLE</th>
<th>OPTION</th>
<th>CAPABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCIDENTS AT SEA</td>
<td>Fishing vessel on fire in Greenlandic waters</td>
<td>Self-defense</td>
<td>Fixed and rotary wing aircraft and sea vessels to provide assistance</td>
</tr>
<tr>
<td>IUU FISHING 1</td>
<td>Increased incidence of illegal fishing</td>
<td>Self-defense</td>
<td>Sea vessels for on board inspection and arrest. Aircraft/drones for EEZ</td>
</tr>
<tr>
<td></td>
<td>associated with climate driven displacement of stocks</td>
<td></td>
<td>surveillance</td>
</tr>
<tr>
<td>IUU FISHING 2</td>
<td>EEZ confrontation in which another states</td>
<td>Self-defense</td>
<td>Sea vessels/aircraft to confront other state party vessels. Aircraft/drones</td>
</tr>
<tr>
<td></td>
<td>party sends vessels into Greenlandic waters</td>
<td></td>
<td>for EEZ surveillance</td>
</tr>
<tr>
<td></td>
<td>to enforce its option to fish the Greenlandic EEZ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TERRORISM</td>
<td>Terrorist attack on a cruise ship in a</td>
<td>Self-defense /</td>
<td>Armed response unit. Bomb disposal unit. Intelligence collection and</td>
</tr>
<tr>
<td></td>
<td>Greenlandic port</td>
<td>alliance</td>
<td>sharing.</td>
</tr>
<tr>
<td>CYBER ATTACK 1</td>
<td>Ransomware attack against a Greenlandic</td>
<td>Self-defense /</td>
<td>Cyber defense organization, training, and equipment providing immediate</td>
</tr>
<tr>
<td></td>
<td>government</td>
<td>alliance</td>
<td>response plus backup data storage.</td>
</tr>
</tbody>
</table>

Table 2 provides a similar threat/option/capability analysis, but for military threats. A stipulation that formed part of the 2018 Greenlandic government coalition agreement was a need to “engage our young people and adults who would like to work for and can participate in our country’s defense. E.g. in fishing inspection and in The Sirius sledge patrol (sic)” (The Coalition Agreement of 2018 between Siumut, Atassut, Partii Naleraq, para 344. Translation in Rasmussen 2019, 10). This suggests an intention to establish a patrol force similar to the current Sirius unit operated by the Danish Special Operations Command. It is for consideration also that raising a unit similar to the Canadian Rangers would bring multiple benefits. This is a project that has already received attention, although there is a diversity of opinion regarding the form such a volunteer force should
take (Damgaard, Kamp, and Poulsen 2019). The remit of the Canadian Rangers\textsuperscript{26} includes the conduct of reconnaissance, sovereignty, and occasional search and rescue operations. While legally a part of the Canadian Armed Forces Reserves, the unit fulfils an important social function, providing training in Arctic field skills for young people, and offering societal engagement and status to people who might otherwise feel disaffected and disenfranchised from the community. Such a force could fulfil a basic set of sovereignty demonstration, enforcement, and defense roles. In the case of conventional attack scenarios 4 and 5 in Table 2, such a force could augment any NATO assets, patrolling the deep field environment surrounding key points. They would not be expected to engage hostile forces as infantry.

To be effective, in addition to appropriate funding, a defending force must also possess the requisite expertise, and morale.\textsuperscript{27} Expertise in its broadest sense is key if a military unit is to prevail in operations. Such knowledge may exist in many forms. It may be the recent exercise of operational technique, particularly if the skill set is perishable. This pertains to operations in any part of the battlespace—air, sea, land, or cyber. In the case of the Arctic, physical operations occur in a battlespace characterized by remoteness, extreme seasonality, and often violent weather conditions. Simply surviving in such conditions represents a challenge that requires specialist skills. Thus, a patrol force and/or home guard would benefit from training and exercise collaboration with established overseas forces with Arctic operational experience.

\textsuperscript{26} For an overview of the Canadian Rangers see Lackenbauer (2006, 2013) and Vullierme (2018).

\textsuperscript{27} Determination of spirit has many manifestations, for example, in the prosecution of search and rescue operations. For a thorough consideration of morale and military success, see Keegan, Holmes, and Gau (1985, 39-56).
Table 2: Threat/Option Analysis for an Independent Greenland: Military Functions

<table>
<thead>
<tr>
<th>THREAT</th>
<th>EXAMPLE</th>
<th>OPTION</th>
<th>CAPABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYBER ATTACK 2</td>
<td>Non-NATO forces cut one or more undersea telecommunications cables</td>
<td>Alliance</td>
<td>Cable repair would be the responsibility of the owner. Military units including air and sea assets sufficient to intercept ships or submarines inflicting the damage</td>
</tr>
<tr>
<td>CONVENTIONAL ATTACK 1</td>
<td>Non-NATO forces plant sea mines in Greenlandic ports to deny their use to NATO</td>
<td>Alliance</td>
<td>A developed mine-hunting capability</td>
</tr>
<tr>
<td>CONVENTIONAL ATTACK 2</td>
<td>Non-NATO forces seize an area of south-east Greenland and establish shore-based missiles to dominate the Denmark Strait</td>
<td>Alliance</td>
<td>Military units sufficient to overmatch a likely invading force. In the case of a fully developed Anti-Access/Area Denial operation with defended missile batteries established on Greenland, elimination may require a combination of air strike and special forces</td>
</tr>
<tr>
<td>CONVENTIONAL ATTACK 3</td>
<td>Non-NATO forces strike key points with air or sea launched weapons to deny their use to NATO</td>
<td>Alliance</td>
<td>A developed air defense capability. A developed capability to interdict non-NATO maritime launching platforms</td>
</tr>
<tr>
<td>CONVENTIONAL ATTACK 4</td>
<td>Non-NATO forces strike key points with special forces to deny their use to NATO</td>
<td>Alliance/ self-defense</td>
<td>A developed air defense capability plus a developed maritime capability to interdict hostile forces. Ground forces trained in key point defense</td>
</tr>
<tr>
<td>CONVENTIONAL ATTACK 5</td>
<td>Non-NATO forces strike NATO facilities and assets in Greenland</td>
<td>Alliance/ self-defense</td>
<td>A developed air defense capability plus a developed maritime capability to interdict hostile forces</td>
</tr>
</tbody>
</table>

Capabilities and Cost

While cost is not the sole determining factor in devising an effective defense, it is significant, particularly for a small state. Considering the elementary requirements needed to exercise sovereignty exemplified in Table 1, plus the proposal to establish a home guard, Table 3 offers representative costs, calculated on
the basis of analogue units in other parts of the world. Assumptions in deriving costs are described below.

Defense economics is a discipline in itself, and a thorough examination of each of the four capabilities described in Table 3 might consume a paper in its own right. As the purpose here is to indicate what a newly independent Greenland is likely to be able to afford—or more significantly unable to afford—the approach adopted is to evaluate a representative cost for a minimal credible capability, that would be consistent with the exercise of national sovereignty. Perhaps other commentators would urge alternative analogues or calculation methods, but in making an objective estimate of an elementary set of capabilities, the analysis is guided by the precept that a polity that does not behave in a sovereign manner, is unlikely to have its sovereignty respected by other states.

The costs in Table 3 have been simplified to:

\[ C_{\text{tot}} = C_{\text{cap}} + C_{\text{op}} \]

where:

- \( C_{\text{tot}} \) = total annual costs expressed in 2019 USD.
- \( C_{\text{cap}} \) = capital costs including buildings, ships, aircraft, and other vehicles. Single-purchase items are amortized over a ten-year period and financed with sovereign debt with an interest rate drawn from historical levels (3.25 percent), after Lindert and Morton (1989).
- \( C_{\text{op}} \) = operating costs including salaries, maintenance, fuel, and other consumables.

Calculations include currency conversion and inflation, but not insurance. Some aspects of training costs have been included.
Table 3: Representative Annual Costs for Elementary Defense Capabilities

<table>
<thead>
<tr>
<th>CAPABILITY</th>
<th>ASSETS</th>
<th>REPRESENTATIVE ANNUAL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>FISHERIES PATROL / SEARCH AND RESCUE / LAW ENFORCEMENT IN GREENLANDIC TERRITORIAL WATERS AND EEZ</td>
<td>Coastguard. 4 offshore patrol vessels, 2 aircraft, associated personnel, ground vehicles, and headquarters. A contracted helicopter service supplying 4 aircraft.</td>
<td>USD 39.78m</td>
</tr>
<tr>
<td>COUNTER TERRORISM</td>
<td>Counter terrorism organization of 15 constabulary personnel, to provide armed response, bomb disposal, and intelligence liaison officers.</td>
<td>USD 0.74m</td>
</tr>
<tr>
<td>CYBER</td>
<td>Cyber defense organization, including two firewalled servers in secure locations, four personnel to provide a Computer Emergency Response Team, plus advice and education on computer security.</td>
<td>USD 0.40m</td>
</tr>
<tr>
<td>TERRESTRIAL SOVEREIGNTY PATROL / SEARCH AND RESCUE / EARLY WARNING</td>
<td>Home guard organization of some 20 local teams with an overall establishment of 735, including 21 officers. A headquarters facility. Communications and basic field equipment for each team. Uniform, a weapon, annual ammunition allowance, and a stipend for each volunteer. One annual training exercise.</td>
<td>USD 6.02m</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>USD 46.94m</td>
</tr>
</tbody>
</table>

A Greenlandic Coastguard

A Greenlandic coastguard would be essential to exercise the maritime functions of government, including search and rescue, enforcement of law including fisheries law, and response to marine environmental incidents. It should be borne in mind that in becoming fully independent, Greenland would be expected to assume many of the international treaty obligations currently exercised by Denmark. This would include UNCLOS, and the terms of the Arctic Search and Rescue Treaty. The annex to that treaty gives the coordinates delineating the areas for which each Arctic nation has responsibility. In the case of the Greenlandic sector, the area extends from 58°30’00” north, around both sides of the island to the North Pole. It is difficult to see how such an enormous area could be searched

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28 A listing of primary international relationships pertinent to Greenlandic independence may be found in Taagholt and Hansen (2001, 92-3).
29 Formally, the Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic concluded at Nuuk on May 12, 2011.
and intervention enacted effectively without fixed and rotary wing aircraft, plus appropriate vessels. Appendix III to the Search and Rescue Treaty also identifies two rescue coordination centers in Greenland, a Maritime Rescue Coordination Center at Grønnedal and a Rescue Coordination Center at Søndrestrøm/Kangerlussuaq. In this case, the costing assumes a minimum of four patrol vessels to allow for both maintenance cycles and coverage of the large sea areas involved. An airborne patrol would be required for surveillance and search. Future consideration may be given to the use of drones, but an allowance for this technology has not been included. However, a helicopter unit is necessary if loss of life and environmental impacts are to be minimized.

Addressing first the capital costs, Kelleher (2002) provides a detailed analysis of fisheries protection economics. It must be remembered that these vessels must be seaworthy in severe weather conditions, including operation in ice infested waters (DNV classification 1A). A new military ship for Offshore Patrol Vessel (OPV) duties was purchased for USD 25m in 2000 (Kelleher 2002, 12). Darling (2019) reports a €66m 2016 contract for an OPV for the Irish Navy. A 28-year-old vessel of similar type was auctioned for less than USD 75,000 (Kelleher 2002, 12). However, even if suitable vessels were available for purchase, the likely maintenance costs and serviceability of the craft would have to be considered. Vessel hire is an option. The Falklands Island government uses such an arrangement for fisheries protection, with personnel of the Falklands Islands Defence Force providing gun crews. However, such a contract is for a limited period and tends to be directed at fisheries protection only. The fuller range of duties falling to a coastguard requires a 24/7/365 availability. A compromise option would be the purchase and conversion of ocean-going trawlers of suitable hull and machinery classification for polar waters. A vessel of this type was offered recently at DKK 22m (USD 3.52m). Kelleher (2002, 12) suggests some USD 1.5m to convert the vessel.

Two further points should be made. First, the cost of a patrol vessel might vary between USD 1—a notional fee for a secondhand ship provided under a political agreement by a willing ally—to USD 78.3m (2019 values) for a new vessel. A secondhand vessel, suitably refurbished, represents a reasonable investment for a service life of approximately a decade, and might be purchased using sovereign debt. Second, for Greenland to exercise full sovereign authority over its own waters, it cannot depend on a fleet of secondhand trawlers fitted with machine guns. If it is involved in a fisheries dispute with another sovereign nation that sends war vessels of its own, it needs to be represented by vessels with a gun of at least 20mm caliber. This is not to enable them to engage in naval battles, but to reduce the likelihood that Greenlandic government vessels will be rammed or treated with contempt.

A Greenlandic Police Commando Unit

A useful analogue for this would be Iceland’s Sérsveit Ríkislögreglustjórans, also known as the Vikingasveitin. Modelled on the Norwegian Emergency Re-
sponse Unit, it is a police commando force of only 55 men (Gray 2019). Its duties include counterterrorism and anti-hijack operations, VIP security and key point defense in wartime (Gray 2019). Its specialists include Explosive Ordnance Disposal operatives and personnel trained in diving and boat operations (Gray 2019). While the Greenlandic police have experience in addressing incidents involving firearms, given the widespread ownership of such weapons in the community, this analysis includes an augmentation of capability, albeit with an establishment of 15, relative to the population size.

A Greenlandic Cyber Defense Organization

As a minimum, it is assumed that while many of the government departments may deposit their data in the cloud as a reasonable compromise between security and cost, for the most sensitive data, including aspects of foreign policy and defense, storage and backup will be hosted at locations to which the Greenlandic government has exclusive access. This suggests a dedicated server hosting a firewalled network and associated equipment. There would need to be a second secure server, similarly equipped and located, to provide continuity should the first system be compromised. These facilities should of course be environmentally controlled and provide physical security, which would probably rule out a “data embassy” overseas. Two other elements are required: a Computer Emergency Response Team (CERT), and appropriate policy and law to assert governance over sensitive data. The CERT need only comprise three or four people with appropriate training, experience and security clearance. CERT team members provide a 24/7 response to cyber attacks, restoring service. They may also conduct proactive monitoring, advice, and education on computer security issues. They are not employed to design and build networks, provide routine monitoring, create policy, or audit. One proposal is to source a stand-alone facility from current telecommunications vendors.

A Greenlandic Home Guard

There are several examples of relatively small states with successful citizen armies, including Israel and Switzerland. However, these nations have larger populations and GDPs than Greenland. Moreover, they are not Arctic states. Perhaps the most realistic model for a Greenlandic citizen volunteer patrol is the Canadian Rangers. This force of 5,000 personnel is a sub-component of the Canadian Armed Forces Reserve (Vullierme 2018). Largely centered on their communities, they provide a surveillance (‘eyes and ears’) role for the government (Lackenbauer 2006). As scouts, their activities constitute an expression of sovereignty as representatives

30 The term used to refer to this prospective organization has been chosen with care for readers from the Nordic nations. A general comparison in function may be found with the Danish Home Guard (Fridberg and Larsen 2017). Applying the nomenclature ‘militia’ is inaccurate, as there is no intention for personnel to fight as soldiers. Similarly, the term ‘ranger’ would be misleading, as it would normally refer to a person charged with the care of a forest.
of the polity. In that role, they are experts in cold weather and wilderness survival, retaining and transferring indigenous knowledge (Lackenbauer 2006). Canadian Rangers are able to conduct ground search and rescue, medical evacuation and emergency rescue (Lackenbauer 2006). They are not expected to provide aid to the civil power per se (Lackenbauer 2006). The equipment with which they are provided is basic: a rifle and yearly ammunition allowance, a uniform, some camping equipment and tools, and fuel for their own vehicles and boats. Lackenbauer (2013, 203) notes an annual program cost for the Canadian Rangers of $CDN 6.5m. The Greenlandic population is largely urbanized, inhabiting towns to the south and west of the island, a Greenlandic home guard might be based on a Headquarters unit at Nuuk, plus 20 patrols to cover the remainder of the country. This suggests an overall force size of approximately 735. To maintain training standards, annual exercises would be needed, these can easily cost between $CDN 150,000-500,000.

The question of a replacement for the Sirius Patrol is complex. One of the tasks of the unit is the demonstration of sovereignty. No serious objections appear to have been raised at the national level against the 1933 judgement of the Permanent Court of International Justice, awarding the whole of Greenland to Denmark (PCIJ 1933). Moreover, as Cavell (2008, and citations therein) notes: “It would be highly unreasonable for international law to apply the criteria for effective occupation as stringently in the polar regions as it does in the temperate zones.” Nonetheless, it would be imprudent for a Greenlandic government to act in such a fashion as to evidence an animus derelinquendi—an intent to abandon. As Socarras (1984-5) notes, similar behavior by the British in respect to fishing grounds in the south Atlantic led to the Argentinians inferring that Britain had lost interest in the territory and, in turn, promoted the invasion of the Falkland Islands. To date, although eligible, Greenlanders have shown little interest in applying for service with the Sirius Patrol. Interviewees for the present study suggested that adopting responsibility for the patrol might be an iterative process requiring over a decade to complete. For completeness, the financial analysis includes an allowance for an element of a Greenlandic home guard to perform this role, noting that patrol members would almost certainly require the incentive of pay. The patrol would be distinct from a Greenlandic home guard in other respects. They would require certain constabulary powers to enforce the law in the remote areas they monitor. Their weapons would also probably require hunting (expanding) ammunition as protection against polar bears.

The Price of Sovereignty

At an indicative total annual cost of some USD 46.94m, even without the annual block grant, a minimal defense organization with the structure suggested would appear to be affordable. This assumes that a Greenlandic government can

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31 Values calculated in 2019 USD, using 2019 values for GDP (Statista 2021) and Danish block grant (Statistics Greenland 2020).
obtain NATO membership, avail itself of sovereign debt, and chooses 2 percent of GDP allowance for the defense budget in alignment with alliance expectations. Estimates for the cost of individual capabilities have been provided in Table 3 to enable readers to consider alternatives for themselves. However, the analysis is not intended as a component in an independence transition financial plan. Rather, it is designed to foster intelligent debate on a critical aspect of nationhood.

Conclusions

The problem of how a fully independent Greenland might be defended is one that requires prompt and serious consideration. The Greenland government is acquiring greater authority with respect to foreign affairs, and the political process leading to independence stands on the threshold of completion. Simultaneously, other nations are showing greater interest in Greenland for political or economic reasons. This article has considered the problem: What are the defense options for a newly independent Greenland? A nation that gives no thought to defense, and in particular the relationship between sovereignty and defense, is unlikely to remain an independent territory for long. The same may be said for the option of demilitarization—true pacifism as a national policy has a sorry history, which is why although some states may have no military per se, none are without some constabulary force and many choose alliance as a guarantee against external aggression.

In considering other options, Greenland is caught at the confluence of four related issues: its strategic geography, the reaction of more powerful states to its independence, its modest GDP, and the need to defend a vast battlespace with a population relatively lacking in military skills. These factors place critical limitations on choices for a newly independent Greenlandic government when considering defense and security policy. Constabulary forces able to confront terrorist attacks or to police fisheries; in short, to exercise the elementary functions of a sovereign state, may be possible. Indeed, a patrol force to exercise sovereignty, reconnaissance, and search and rescue duties across Greenland’s vast territory would be desirable, and perhaps exercise a valuable social focus for the nation’s communities. However, it is difficult to see how as a microstate Greenland could afford, or recruit, all of the appropriately skilled staff from its population to create a capable air defense system, protect its ports against the laying of sea mines, or resist an assault by special forces intent on seizing territory for tactical advantage during a superpower conflict. The option of self-defense against significant conventional threats would appear unavailable.

Similarly, the option of neutrality is impractical since to be effective, such a policy tends to require a robust self-defense and collusion with stronger states, and while a minimal defense capability consistent with sovereignty would appear to be affordable, that is not the same as a fully capable self-defense. This leaves the option of alliance, and in this respect, a newly independent Greenland cannot ig-
nore its own geographical significance in the international order. NATO membership would provide continuity in the balance of Arctic political forces and should address some of the most difficult conventional defense issues. However, it does not come without cost, both financial and political. Membership of the NATO alliance may bring the expectation that it will devote 2 percent of GDP to defense investment, even if that funding is spent on the maintenance of civil projects with potential military utility, such as airports, radar installations, and docks. At the same time, choosing political friends entails the choice of adversaries. In the event of an interstate conflict in the Arctic, Greenland would become part of the contested battlespace. Moreover, in seeking economic opportunities, a Greenlandic government would have to be mindful of NATO, and particularly U.S. security sensitivities. Offering too generous a set of facilities to foreign states for economic development may compromise Greenland’s alliance status if the recipient of those facilities is a nation with aims inimical to those of its protector nation or alliance.

In common with other microstates, there is no simple policy option for an autonomous defense of Greenland that is without disadvantage, and this article makes no policy recommendation in that regard. Indeed, given the above discussion, the Greenlandic people may conclude that their best security option is to simply retain their current level of independence as an autonomous territory within the Kingdom of Denmark. The consideration of representative costs included in the analysis suggests that the elementary functions of state sovereignty could be afforded even if the annual block grant from Denmark was not replaced from other sources. Whether that degree of political autonomy is sufficient, and the costs desirable, are matters for the Greenlandic people to decide. Ultimately, Greenlandic independence has the potential to disrupt the peaceful balance of political forces in the Arctic. And that instability is likely to have tragic consequences for Greenland itself, a land that has already known the violent hand of war.

About the Author

Dr. John Ash has extensive operational and scientific experience in the Arctic and subarctic. As a Royal Air Force Fighter Control Officer, he was stationed in the Shetland Islands, and later, serving as an oceanographer and submariner in the Royal Navy, was involved in data collection in the Arctic Ocean to support the study of climate change. Selected to lead a team of Russian researchers at Cambridge University examining radionuclide pollution in the Northern Seas, he was later assigned to undertake the initial design work for the Navy Department’s Environmental Management System. He has held a British Safety Council Fellowship at the Judge Institute of Management Studies (now the Judge Business School) at the University of Cambridge, where the focus of his research concerned the management of dynamic risk problems in operational environments. Dr. Ash has lectured on the application of risk management at the Royal Air Force College,
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