Toward a US Air Force Arctic Strategy

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If you don't know where you are going, you'll end up someplace else.

—Lawrence P. Berra (1925–2015)

The US Air Force is no newcomer to the Arctic. It has a long history of aerial operations in the "High North" from fighting the "thousand mile war" in the Aleutians during World War II to expanding its Arctic operations throughout the Cold War and beyond.[1] Today, it maintains a significant Arctic presence with missions, bases, personnel, and aircraft in Alaska and at Thule Air Base, Greenland, 750 miles north of the Arctic Circle. It conducts the Arctic Survival School at Eielson AFB, Alaska, has maintained a radar early-warning system in the High North for more than 60 years, and has flying units (active, guard, and reserve) stationed at Eielson and Elmendorf Air Force bases. The Air Force also operates satellites over the top of the world and launches them into polar orbit.

During World War II the Army Air Corps used the experience of seasoned Arctic flyers to establish several air bases in Greenland as way stations for ferry flights to England and to conduct search and rescue (SAR) missions for downed flyers. To thwart the German U-boat menace, it also performed sea surveillance missions in the North Atlantic from these same locations. Seeing the necessity for a permanent base in the High North, Thule Air Base was constructed in the 1950s in near secrecy; an engineering project that rivaled the construction of the Panama Canal in its size and complexity.[2]

SAC bombers dispersed to remote runways in Greenland during the Cold War, using "floating shelf" ice islands as part of a "live aboard" concept during times of nuclear tension.[3] By 1957 the Distant Early Warning (DEW) Line of more than 30 radar stations was manned from Point Barrow, Alaska to the east coast of Greenland to provide early-warning of Russian bomber and missile attacks.[4] The Air Force even had a specialized research organization, the Arctic, Desert, and Tropic Information Center (ATDIC) at Maxwell AFB, Alabama from 1952 well into the 1960s. ATDIC personnel conducted "mukluks-on-the-tundra" Arctic research, contracted numerous Arctic studies, and published their findings in widely-read newsletters, monographs, and survival manuals.[5]

Despite its long Arctic history and ample time to create one, the Air Force has no formal Arctic strategy. In May 2013 the White House released its rather generic *National Strategy for the Arctic*, concurrent with publication of the Coast Guard's *Arctic Strategy*. The Department of Defense (DOD) published its *Arctic Strategy* later that year and the second iteration of the Navy's *Arctic Roadmap* came out in 2014.[6] However, no Air Force Arctic strategy emerged in their wake.

In February 2017, the DOD released a "Report to Congress on Strategy to Protect US National Security Interests in the Arctic Region."[7] Rather than a periodic update of its previous efforts, this document was mandated by an amendment from a senator from Alaska in the 2016 National Defense Authorization Act.[8] Its 2013 *Arctic Strategy* lacked a sense of urgency, and this latest iteration is mostly a rehash of the former.[9] The DOD viewed its role in the Arctic in 2013 as "support-only:" part of a "whole of government" approach to the region.[10] This reflects its general reluctance to engage in near-term Arctic planning, proposing instead "innovative, low cost, small footprint" solutions to its two objectives—"Ensure security, support safety and promote defense cooperation" and "Prepare for a wide range of challenges and contingencies"—and waiting on solutions until "Combatant Commander's operational requirements" are defined.[11] This is not exactly "if we ignore it, it will go away," but more "we'll wait until we're asked." The 2013 *Strategy* also observed that future projections of Arctic activity may be inaccurate; cautioned that there may be fiscal constraints to new Arctic support initiatives; and felt that being "too aggressive" in addressing future security risks may create "conditions of mistrust."[12] The 2016 version also is littered with caveats: "Arctic operations are inherently difficult and dangerous;" "DOD has few niche capabilities;" "DOD will reevaluate capabilities . . . as conditions change;" and "Some may require an expeditionary approach."[13]

A Sense of Urgency

The cautionary tone in DOD's 2016 *Strategy* continues the thought that there is no great urgency to improve its Arctic posture; a position similar to that in its 2013 iteration. However, recent events in the High North, spurred by receding sea ice, portray just the opposite. Last year Russia resubmitted its territorial claims to the United Nations (UN), claiming that the continental shelf along Russia's northern border extends all the way to the North Pole, well beyond the 200-mile economic exclusion zone outlined in the Law of the Sea Convention.[14] Canada, Norway and Denmark also have seabed claims pending in the UN, increasing the possibility of multiple territorial disputes. What's at stake? The 2008 US Geologic Survey (USGS) estimate of High North energy resources suggested that 13 percent of the world's undiscovered oil and 30 percent of the world's undiscovered natural gas lies in the Arctic.[15]

China has also asserted its rights in the Arctic, although she has no territory there. In March 2010 Rear Adm Yin Zhin was quoted in the *New China Daily* stating, "China must play an indispensable role in Arctic exploration as we have one-fifth of the world's population."[16] Perhaps to make her point, China's first icebreaker (a second is in service, and a third is in construction) transited the Northern Sea Route (NSR) in 2012, and the China Ocean Shipping Group completed its third year of container shipping along the NSR in 2016.[17] It is now eyeing the Northwest Passage

for future commercial use, sparking renewed debate about whether the Passage is international water or under Canadian sovereignty. Perhaps to emphasize China's intent to fully participate in Arctic affairs, five Chinese naval vessels passed near the Aleutian Islands in September 2015—a first.[18]

Russia has aggressively improved its own military infrastructure along the NSR since 2014, when a revised *Military Doctrine* declared that Russia's military must protect its national interests in the Arctic.[19] A State Department report in September 2016 noted that the Russian Federation's refurbished Northern Fleet now commands 42 of Russia's 72 submarines and 38 surface combatants, including its largest aircraft carrier.[20] The more troubling issue, from an American Arctic point of view, has been the reopening of several air bases in eastern Siberia opposite Alaska, including the old Soviet bomber base at Mys Shmidta, and an air defense buildup investment (some $4.3 billion by 2020) across the region.[21] In all, Moscow has opened 10 Arctic search and rescue stations, 16 deep water ports, 10 new airfields (for a total of 14), and 10 air defense radar stations to protect its interests along the NSR.[22] While all of these improvements are touted as self-defense, such a huge increase in military capability to the north cannot be ignored. Given the short distances between some of these air bases and the Alaskan coastline, the warning time for any overflight can be measured in minutes. Thus, changes that were thought to occur in "the mid-term" are here now, but the DOD's "near term" planning is inadequate to meet them.

A Lack of "Air-mindedness"

The Air Force's three-plus year silence may be the result of a lack of any service specificity (i.e. air-mindedness) in the DOD's *Strategy* that would prompt the USAF to create a "strategy" of its own. Given the tyranny of time and distance in the Arctic, the current lack of air-mindedness is not only wrong, but dangerous: the only way to quickly get to any crisis above the Arctic Circle is by air. The application of airpower to any situation in the High North provides the quickest response, but there appears to be no DOD-led impetus to do so. Case in point: the term "Air Force" is never used in either the 2013 or the 2016 DOD document; the "Air National Guard" mentioned but once.[23] Instead, the generic word "air" finds its way into the text many times.

The lack of air-mindedness also is reflected in the supporting Arctic strategies of both the Navy and the Coast Guard, as well as that of the Government Accountability Office (GAO). A June 2015 GAO report observed that ". . . since the Arctic is primarily a maritime domain, the Coast Guard plays a significant role in Arctic Policy implementation and enforcement."[24] The GAO also acknowledges the Navy's continuing role in support of other federal agencies and international partners, but it fails to identify one for the Air Force or to even mention the Air Force by name. Thus, an area that is impassable for surface vessels at least part of the year does not have an alternate solution when a maritime one is unworkable due to time, ice, distance, or all three.

The Navy's 2014–2030 *Arctic Roadmap* is rich with objectives, ideas, and goals for the High North, but they aren't objectives, ideas, and goals for the air domain. The

Navy follows the DOD's long lead-time strategy, using near-term (present–2020), mid-term (2020–2030), and far-term (beyond 2030) descriptors. It also echoes the DOD's 2013 assessment that ". . . with the low potential for armed conflict in the region in the foreseeable future, the existing defense infrastructure (e.g. bases, ports, and airfields) is adequate to meet near-to-mid-term US national security needs."[25] Post–2030, the Navy believes it will have the "necessary training, and personnel" to respond to Arctic contingencies and emergencies.[26] After reading the Navy Roadmap, one observer pointed out that even in the out-years, the Navy plans to operate only in open waters and is not planning for any major fleet enhancements (e.g. double hulls, organic ice breakers, major shore infrastructure) based on a perceived lack of any substantive threat.[27]

Even though aviation and space are mentioned several times in the Navy Roadmap, it doesn't acknowledge the need for Air Force support except for intelligence, surveillance, and reconnaissance interoperability. Interestingly, several references to the Air Force and Air Force-related milestones in the Roadmap's previous iteration (October 2009) are absent in the new one. Does this mean that they have been satisfied or just ignored? Perhaps the answer lies in a precursor document to the latest Roadmap, the "Fleet Arctic Operations Game, September 13–16, 2011 Game Report." It refers to Air Force assets at Elmendorf AFB as "sister service Air transport."[28]

In its Arctic *Strategy*, the Coast Guard discusses aviation only in general terms, focusing instead on its maritime needs (read: a glaring lack of icebreakers in sufficient numbers) in the High North. It should be noted that the Coast Guard has taken possession of previously Air Force-owned C-27 aircraft, but it is unclear if any of them will see duty in the Arctic when they enter Coast Guard service later in this decade. Aviation requirements in general—and those in partnership with the Air Force in particular—are missing from the Coast Guard's Arctic planning just as they are from the Navy's. Instead, a report prepared for the Coast Guard in 2010 laments the difficulties in basing aircraft in the High North, even in the summer season. It observed that "No suitable facilities currently exist on the North Slope or near the Bering Strait" that are sufficient for extended aircraft servicing and maintenance. Its "force mix evaluation" only includes surface vessels and helicopters. No fixed wing aircraft appear in the accompanying table, but aircraft are mentioned in its "Concluding Remarks" almost as an afterthought.[29]

The overall effect of this benign neglect *en masse* reduces Air Force motivation to produce an Arctic strategy because there is no clearly stated need to do so by the national command authority, the DOD, or our sister services. There is one other possible reason for the lack of an Air Force Arctic strategy: there is no war in the Arctic. Although the USAF has been at war for the last quarter-century, it hasn't fired a shot in anger in the High North since World War II. The Air Force's warfighting focus is elsewhere because, well, there's no war in the High North.

However, in response to the growing Russian militarization of the Arctic, many observers now maintain that territorial disputes will inevitably spill over into the Arctic, and the region will become another arena of conflict.[30] For example, to enter or exit the NSR or the Northwest Passage from the Pacific side of the globe requires transit of the Bering Strait; a natural maritime chokepoint dividing US and Russian territory that may be a flash point in the future, they argue.

Figure 1. The Northwest Passage(s) and the Northern Sea Route. (Reprinted from "Arctic Ocean," in Central Intelligence Agency, The World Factbook, accessed 3 September 2013, https://www.cia.gov/library/publications/the-world-factbook/geos/xq.html.)

The most pressing issue, however, is a coordinated response to a human or environmental crisis in the High North, not a clash of arms. Although Royal Dutch Shell has withdrawn its oil exploration plans in the Chukchi Sea, plans for drilling efforts in the region by others continue in hopes of tapping possibly the world's last large deposits. Fishing, eco-tourism, and commercial tourism (cruise ships) grow each year on both sides of the Northwest Passage, but this human activity does not come without risks to both persons and the environment. The consequences of one bad decision may require immediate response to mitigate loss of life and damage to a delicate ecosystem.

A major cruise ship successfully transited the Northwest Passage without incident in 2016, and more transits are scheduled for this summer.[31] While there have been a few other successful passages in this decade, the waterways of the Northwest Passage are less than ice-free, navigational aids are sorely lacking, and nautical charts of the region are highly suspect. Experts point to poor navigational aids as a major contributor to Northwest Passage safety concerns. One report cautions that at its current rate, completely charting Canadian Arctic waters will take three centuries.[32]

In 1996 eight nations with territory or clearly defined interests in the region—the United States, Canada, Russia, Finland, Norway, Denmark, Iceland, and Sweden—formed the Arctic Council ". . . to provide a means for promoting cooperation, coordination and interaction among the Arctic States, with the involvement of the Arctic Indigenous communities and other Arctic inhabitants on common Arctic issues."[33]

The Arctic Council is unique in that it only addresses nonsecurity issues faced by the Arctic states and the region's indigenous peoples. Observers have characterized it as ". . . populated more by scientists and scholars than politicians."[34]

The United States is a signatory to the Arctic Council's "Nuuk Agreement on Search and Rescue," which requires each party to establish and maintain an "adequate and effective search and rescue capability" within its designated area (fig. 2). Further, the Nuuk Agreement binds member nations to coordinate its SAR efforts with other members in case of a plane crash, cruise ship sinking, oil spill, or other disaster across the High North.[35] The United States is responsible for SAR operations in Alaska and the western approaches to the Northwest Passage; the eastern approaches to the NSR paralleling Russia's Kamchatka Peninsula; and the Beaufort, Chukchi, and Arctic Seas extending to the North Pole.

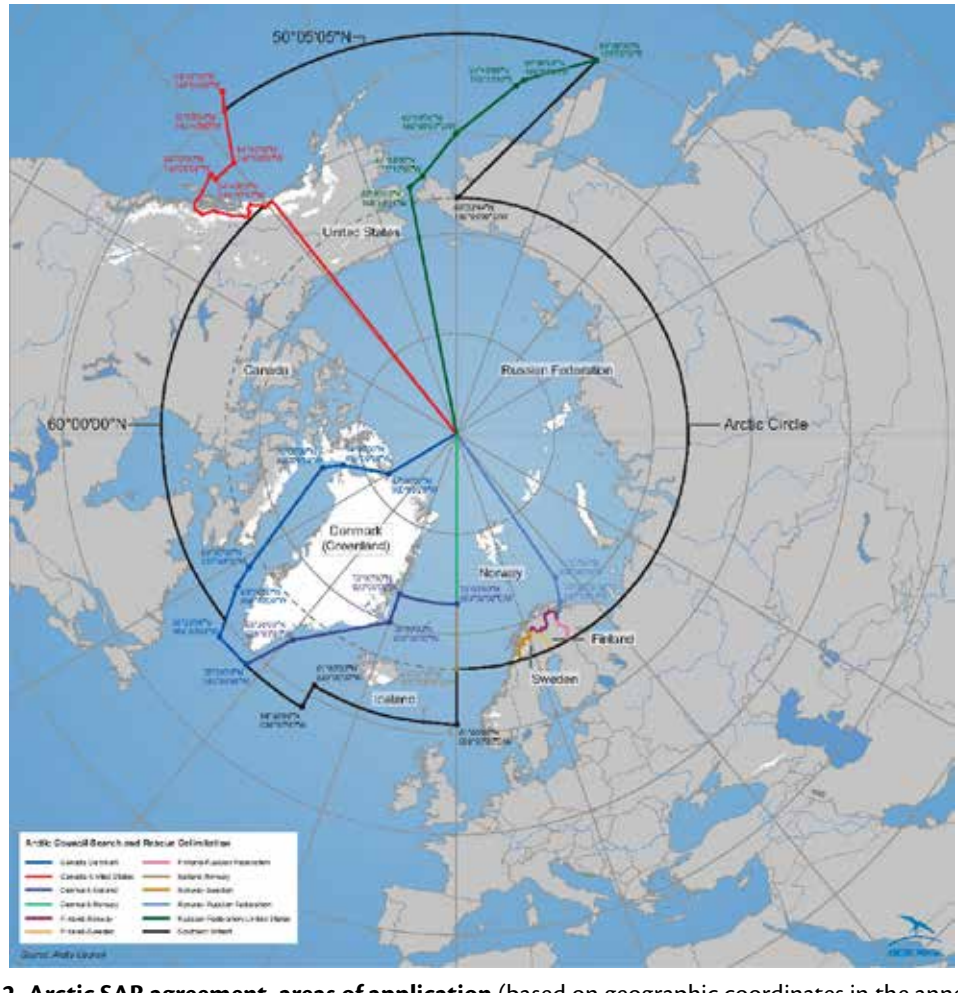

Figure 2. Arctic SAR agreement, areas of application (based on geographic coordinates in the annex to the Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic, 12 May 2011, http://www.ifrc.org/docs/idrl/N813EN.pdf.

A key point in the Nuuk Agreement is that any party may request the assistance of other party/parties if necessary, ensuring that "assistance be provided to any person in distress."[36] Given the current physical disposition of Canadian SAR forces—some actually closer to the northern coast of South America than to Alert, Nunavut—it is highly likely that the United States will be asked to provide assistance in any emergency. An article highlighting Canadian SAR woes calculates flight time from Winnipeg to Resolute Bay in the heart of the Northwest Passage via a Canadian C-130H at more than five hours; helicopters to the same area from Comox would take more than 11 hours.[37] In contrast, US bases in Alaska and Greenland are much closer and would be a logical alternative to help in times of need.

Increasing maritime traffic in the High North has prompted the shrinking of Arctic ice. The Arctic ice shrinking, combined with the unreliability of High North navigation charts, pose near-term naval problems for anyone who transits the region with only a long-term naval solution. Neither the Navy or the Coast Guard has the current capability to quickly reach any environmental disaster or respond to a SAR event above the Arctic Circle, and neither will have such assets for the foreseeable future, if (in the Navy's case) ever.

Current US strategies see the Coast Guard as the logical service for any rescue in the Arctic. Even though it has several Coast Guard facilities in Alaska, all are located below the Arctic Circle. Coast Guard aircraft are based in Kodiak, about 800 miles south of the most northern point in the United States—Point Barrow. Dutch Harbor, the northernmost major deep water port in Alaska, is 400 nautical miles farther south. The Coast Guard has announced that it had no plans to build any additional shoreside infrastructure in the coming decade, so this force structure is essentially static for the next 10 years.[38] As a frame of reference, sea distances to the heart of the Northwest Passage are portrayed below (fig.3).

What hampers the DOD's Arctic *Strategies* (and those of the Coast Guard and the Navy) and deters the Air Force is not the lack of manpower, equipment, or facilities, but a lack of imagination and inclusion. DOD strategy resides primarily in the maritime domain: the slowest, the most expensive ($1 billion and 10 years construction time per icebreaker), as well as the least flexible method of response to any High North situation.[39] In contrast, the air domain is faster and more agile and primarily, but not exclusively, an Air Force domain. Thus, ignoring the Air Force limits the DOD's Arctic options to only a single choice. It's time to supplement Arctic DOD's proposed "low cost, innovative" programs, with the Air Force's "virtually no additional cost, already in-place" ones.

There is sufficient force structure, manpower, and more than enough Air Force and civilian facilities (e.g. airfields) throughout the state of Alaska (not to mention Thule AB) to respond to any crisis in the High North: be it SAR, environmental disaster, aggression, or support to our Canadian ally to meet any or all three.[40]

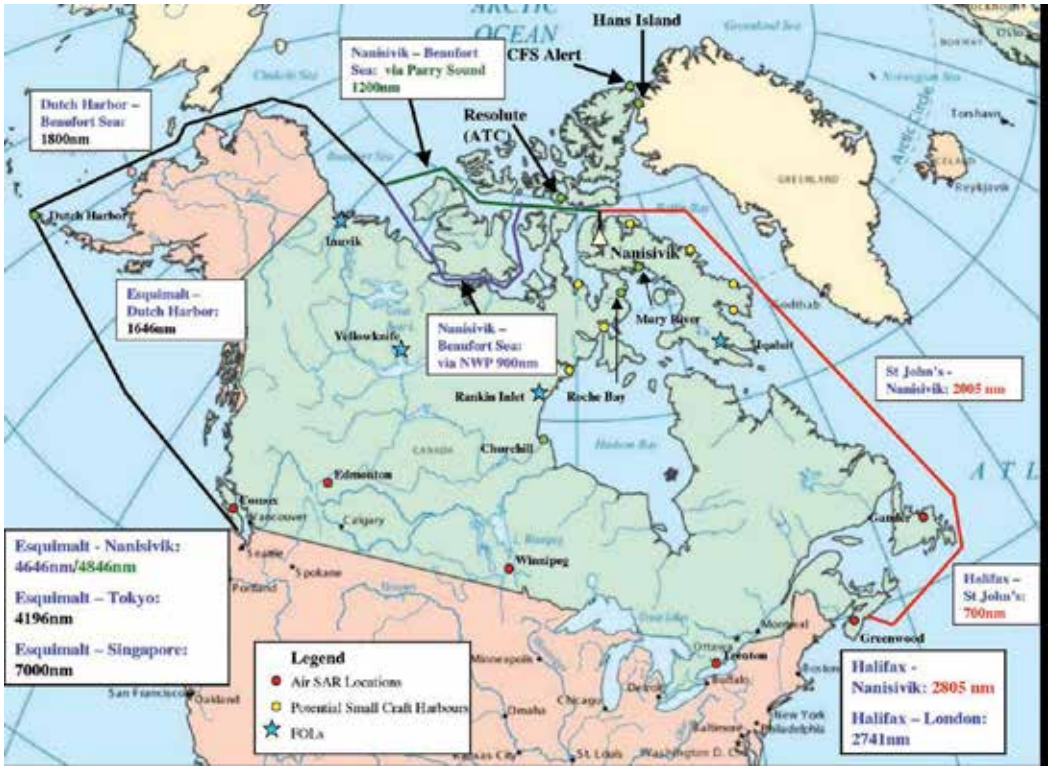

Figure 3. Operational Arctic patrol distances. (Reprinted from Michael Byers and Stewart Webb, "Titanic Blunder: Arctic/Offshore Patrol Ships on Course for Disaster." [Ottawa: Rideau Institute, Canadian Centre for Policy Alternatives, April 2013], http://www.policyalternatives.ca/sites/default/files/uploads/publications/National%20Office/2013/04/Titanic_Blunder.pdf.)

An Air Force Arctic Strategy—What Should It Contain?

An Air Force Arctic strategy should raise awareness—air-mindedness—of the in-place Air Force assets in the Arctic and provide innovative ways to partner them with sister services and other High North nations. It should complement the DOD's Arctic *Strategies*, the *National Strategy for the Arctic Region*, and all presidential directives that set its framework. The overarching goals of an Air Force Arctic strategy should be to highlight USAF Arctic current core competencies, to suggest ways to interface with sister service *Strategies* and *Roadmaps*, and to present future needs to US Northern Command, the DOD advocate for the High North.

Its preface should point out that addressing the effects of climate change is a whole-of-government challenge and that the recommendations of the CNA (Center for Naval Analyses) Military Advisory Board's report, "National Security and the Accelerating Risks of Climate Change," could serve as a benchmark for planning. In particular, its recommendation, "The United States should accelerate and consolidate its

efforts to prepare for increased access and military operations in the Arctic," is a clear call for increased action. Further, CNA advises, "The time to act is now."[41]

An Air Force strategy should succinctly comment on emerging events in the region, including climate change, loss of sea ice, increased commerce in the High North, conflicting claims for the Arctic seabed, and the growing militarization of the region by Russia. In doing so, it will convey the message that these important events in the High North will not pause until some future date when sufficient numbers of icebreakers and new deep water ports may be available; they are happening now. The body of an Air Force Arctic strategy should complement and expand the DOD's Arctic guidance, focusing on its supporting objectives and also should support sister service Arctic *Strategies* and *Roadmaps* by finding lanes in these works that align with Air Force capabilities.

The DOD's first objective, "Promote defense cooperation," should be embraced by the Air Force by expanding its military-to-military contacts with other High North nations, especially members of the Arctic Council, to create an interchange of tactics, techniques, and procedures to assure safe and effective flight operations. Joint exercises, mil-to-mil exchanges, and a flow of information and ideas would have a synergistic effect for all parties.

The strategy should call for a survey (actually, a resurvey) of possible forward operating bases above the Arctic Circle using previous World War II, Cold War DEW Line locations, and existing commercial airfields as points of reference. For example, Wiley Post/Will Rogers Memorial Airport services Point Barrow, and its asphalt runway is 7,100 x 150 feet. To the west are three more airfields with runways of 5,000 feet or more: the aptly-named Lonely Air Station, a military airfield supporting the Point Lonely Short Range Radar Site with a 5,000-foot gravel runway; a private airfield, Ugnu Kuparuk, with a 6,551-foot asphalt runway; and Deadhorse Airport, with 6,500 feet of asphalt runway.[42] To the west on the Chukchi Sea is Ralph Wein Memorial Airport, south of Kotzebue, featuring a 6,300-foot asphalt runway, hangers, and commercial service.[43] Additionally, the use of compacted snow and gravel runways—already proven to be viable landing surfaces under the right conditions—could widen the choice of airfields throughout the region.

These—and others in Canada and Greenland—should be considered as contingency airfields for any rescue operation or oil spill event in the Northwest Passage. Projected use would be during the summer season and in the "shoulder" months in late spring and early fall in the Arctic, as these are times when most human activity will occur.[44]

The Air National Guard already has led the way, partnering its ski-equipped LC-130s of the New York Air National Guard's 109th Airlift Wing with Canadian Forces in 2015 in the annual exercise Operation Nunalivut.[45] Active Air Force units should follow suit by joining with nations of the High North in joint/multilateral exercises. Particular emphasis should be on austere airfield operations, interoperability of airframes and communications, logistics, and SAR techniques.

For their part, the National Guard should add state-to-state partnership programs with these same nations to build on its successful Arctic exercises with Canada with military-to-military ties. It must be mentioned that although it maintains 70 state-to-

state partnerships around the world, no National Guard partnerships with High North nations currently exist.

The second DOD objective, "Prepare for a wide range of challenges and contingencies," can be met with the same military forces and innovative use of facilities outlined above, much in the way defense support to civil authorities opportunities are used to respond to natural disasters. Other Air Force missions that could be expanded to meet this objective include management and oversight of weather forecasting, surveillance platforms, and an upgrade of communications capabilities. In a region with rapidly changing, often unpredictable weather conditions and notoriously uncertain navigational aids, the Air Force should continue to provide a constellation of overhead capabilities through a strong space launch program. It also can enhance weather forecasting capabilities in the region by engaging its WC-130 assets during the non-hurricane season for additional weather research in the Arctic. Other missions that can be accomplished by in-place assets are those that are already daily mission sets: SAR, airspace sovereignty, airlift, and command and control.

The Air Force's Air Education and Training Command should pursue new initiatives in training and education to further Arctic air-mindedness. It should increase class sizes and throughput at its Arctic Survival School (Detachment 1, 66th Training Squadron) at Eielson AFB, ensuring a cadre of trained and competent Air Force personnel for all Arctic missions. This must include all aircrew members assigned to Arctic bases and all personnel whose duties could place them in cold-weather survival situations. In the long term, it should seek additional funding and instructors from across the DOD to transform it into a joint service school.

AETC also should reinstitute the study of the Air Force in the Arctic at its academic roots—Air University (AU). Utilizing the research capabilities of the entire university, it should explore pertinent Arctic issues and offer courses at Air Command and Staff College and Air War College to encourage Air Force thinking concerning strategic and operational issues in the High North. Course development for Arctic-specific issues could reside in a new Arctic Studies Group at AU, similar to those established at the Naval War College and the US Coast Guard Academy.[46]

Final Thoughts

To operate in the High North without an Air Force Arctic strategy and to remain silent on Arctic issues that are clearly within the Air Force's purview allows other services to dictate its roles and missions there. Although the DOD, Navy and the Coast Guard have ignored in-place Air Force assets in their High North planning, these capabilities—in air, space, and in cyberspace—are the *sine qua non* for success. Bidden or unbidden, the point should be made that the Air Force must be a part of the solution. The Air Force must pursue an Arctic strategy of its own and do it sooner rather than later. The result of further inaction (three-plus years since the first DOD Arctic *Strategy*) will be a loss of visibility for the Air Force and a diminished defense capability for this nation in the last frontier on Earth. ✪

Notes

1. For this article, the "High North" is analogous to the "Arctic" and is used alternatively with that term. The "Arctic is most commonly defined by scientists as the region above the Arctic Circle defined by an imaginary line that circles the globe at approximately 66° 34' North latitude." See the National Snow and Ice Data Center website, https://nsidc.org/cryosphere/arctic-meteorology/arctic.html. However, Scandinavian expert and Polish author Ryszard M. Czanry observes that the High North is solely a Norwegian construct; the English translation of a Norwegian word that became commonly used in the mid-1980s. He believes that the term generally refers to the Europe Arctic; the term "Far North" being used for the US and Canadian regions. See Czanry, *The High North: between Geography and Politics* (Cham, Switzerland: Springer International Publishing, 2015), 7 (footnote 1), 9–10. The US Congress appears to have no quibble with the two terms. See House of Representatives, *The United States as an Arctic Nation: Opportunities in the High North*: *A Hearing before the Subcommittee on Europe, Eurasia, and Emerging Threats of the Committee on Foreign Affairs*, 113th Congress, 2nd sess. See https://www.google
.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0ahUKEwid7oSx3abSAhXCeSYKHeHdDnoQFggmMAI&url=https%3A%2F%2Fwww.scribd.com%2Fdocument%2F321744184%2FHOUSE-HEARING-113TH-CONGRESS-THE-UNITED-STATES-AS-AN-ARCTIC-NATION-OPPORTUNITIES-IN-THE-HIGH-NORTH&usg=AFQjCNGqNp_YgL-xCFPGfOecp3dfraCfkA. Interestingly, the "Bard of the Yukon," Canadian-educated (McGill University) poet Robert W. Service, used the term in his collection, "Songs of the High North," published in 1958. See "Songs of the High North." Robert W. Service, http://www.bloomsbury.com/uk/songs-of-the-high-north-9780713650822/.

2. Most of this effort was overseen by Col Bernt Balchen, USAF. Already an Arctic and Antarctic flying legend (the first to pilot an aircraft over the South Pole with Adm Richard E. Byrd), this native Norwegian was recruited into the Army Air Corps in 1942 by its chief of staff, Gen Henry "Hap" Arnold. For the rest of his military career, he was the driving force for Arctic operations and research in the Air Force. The leader of a successful five-month effort to rescue a downed B-17 crew in Greenland in 1942, he built wartime air bases in Greenland and during the Cold War oversaw Thule AB's construction in near secrecy and surveyed sites for the Ballistic Missile Early Warning radar system. See the Arlington National Cemetery website: "Bernt Balchen, Colonel, US Army Air Corps," http://www.arlingtoncemetery.net/bbalchen.htm, and National Museum of the US Air Force: "Saga of B-17 PN9E," http://www.nationalmuseum.af.mil/Visit/MuseumExhibits/FactSheets/Display/tabid/509/Article/196694/saga-of-b-17-pn9e.aspx. On 23 October 1999 the US House of Representatives (with the Senate concurring) passed a resolution honoring the late retired Colonel Balchen for his extraordinary service to the United States on his 100th birthday.

3. Louis Degoes and James T. Neal, "Selected Military Geology Projects in the Arctic, 1950–1970," in J.R. Underwood, Jr. and Peter L. Guth, eds., *Military Geology in War and Peace* (Boulder, CO: Geological Society of North America, 1998), 205, 208–209.

4. Degoes and Neal, "Selected Military Geology Projects," 205.

5. In the winter of 1953, Artic–Desert–Tropic Information Center (ADTIC) personnel spent 90 days in Greenland leading Project Mint Julip, a study of smooth ice to determine if it were feasible to establish a scientific project on the ice and maintain it solely by air. See "History of the Research Studies Institute, 1 January–30 June 1953. Arctic, Desert, Tropic Information Center (ADTIC)," Maxwell AFB, AL, 14. In 1955, ADTIC specialists investigated possible ice landing strips at proposed Distant Early Warning Line sites. See "History of the Aerospace Studies Institute, Twenty-Fifth (Silver) Anniversary Command Edition, Arctic-Desert-Tropic Information Center," Air University. Maxwell AFB, 25 January 1971, 6.

6. The White House, "National Strategy for the Arctic Region," May 2013, https://obamawhitehouse.archives.gov/sites/default/files/docs/nat_arctic_strategy.pdf.

7. Department of Defense, *Report to Congress on Strategy to Protect United States National Security Interests in the Arctic Region*, OUSD (Policy), December 2016, http://www.sullivan.senate.gov/imo/media/doc/2016_ArcticStrategy-Unclass.pdf.

8. Department of Defense, *Report to Congress on Strategy to Protect United States National Security Interests in the Arctic Region*, Section 1068 of the 2016 National Defense Authorization Act, accessed 7 March 2017, https://www.congress.gov/congressional-report/114/house-report/270.

9. Ibid. 11.

10. Department of Defense, *Department of Defense Arctic Strategy* (Washington, DC: DOD), 2013, https://www.defense.gov/Portals/1/Documents/pubs/2013_Arctic_Strategy.pdf. The strategy acknowledges that it is "nested" under a number of documents relating to the Arctic and "complements" DOD's Strategy for Homeland Defense and Defense Support of Civil Authorities.

11. Ibid. 7, 10.

12. Ibid. 12–13.

13. "Report to Congress," 11.

14. Andrew E. Kramer, "Russia Presents Revised Claim of Arctic Territory to the United Nations," *The New York Times*, 9 February 2016, https://www.nytimes.com/2016/02/10/world/europe/russia-to-present-revised-claim-of-arctic-territory-to-the-united-nations.html. For the exact wording of the Law of the Sea art. 56, see http://www.un.org/depts/los/convention_agreements/texts/unclos/part5.htm.

15. USGS appraisal as quoted in "The Geopolitics of Arctic Natural Resources," Policy Department, Directorate-General for External Policies, European Parliament, 2010, 4. See also US Geological Survey, "Circum-Arctic Resource Appraisal (North of the Arctic Circle) Assessment Units GIS Data," 2009, https://energy.usgs.gov/RegionalStudies/Arctic.aspx.

16. Joseph Spears, "A Snow Dragon in the Arctic," 5 March 2010, *Asia Times Online*, 8 February 2011, http://www.atimes.com/atimes/China/MB08Ad01.html. The admiral contends no state holds sovereignty in the Arctic. It is a *res nullius*, or no one's property, in legal terms. Somehow, this contradicts China's claims in the South China Sea.

17. Atle Staalesen, "COSCO Sends Five Vessels through the Northern Sea Route," *The Independent Barents Observer*, 10 October 2016, https://thebarentsobserver.com/en/arctic-industry-and-energy/2016/10/cosco-sends-five-vessels-through-northern-sea-route.

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19. "A Widening Scope: China and the Northwest Passage," *The Arctic Journal*, 22 April 2016, http://arcticjournal.com/opinion/2292/widening-scope.

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40. Two Air Force bases sit well above 60 degrees, well-positioned for launch and recovery of any SAR effort: Eielson AFB, Alaska at 64°39'56" N and Thule Air Base, Greenland (with its 10,000-foot runway), 750 miles north of the Arctic Circle at 74°31'52" N. South of Eielson is Joint Base Elmendorf-Richardson (JBER) with another 10,000-foot runway as well as the 11th Rescue Coordination Center. At the outer edge of the Aleutian Island chain sits Eareckson Air Force Station (formerly Shemya AFB), a contractor-maintained alternate/emergency landing field/refueling location and the site of an Air Force Cobra Dane radar installation. Eareckson's 10,000-foot runway and several hangars constitute a far-western basing resource for any SAR operation. The number and variety of Air Force aircraft available at Eielson and JBER would greatly expand SAR response options. Eielson is home to the 354th Fighter Wing (F-16s) and the Alaska Air National Guard's 168th Air Refueling Wing. JBER hosts the Air National Guard's 176th Wing (C-17s and C-130s as well as HC-130 and HH-60G SAR aircraft). It also hosts the Air Force's 3rd Wing, with C-17s, C-12s, the E-3 Airborne Warning and Control System aircraft, fighters, and two air and space operations centers.

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42. Last year, C-17s delivered elements of an Army stryker brigade combat team to Deadhorse as part of Operation Arctic Pegasus.

43. All airfield descriptions noted above can be found at https://www.airnav.com. Last November, C-17s delivered elements of an Army Stryker brigade combat team to Deadhorse as part of Operation Arctic Pegasus.

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