

ELIZABETH M. BARTELS, DAVID A. OCHMANEK, NATHANIEL EDENFIELD, BRIEN ALKIRE, KATHERINE ANANIA, MICHAEL BOHNERT, JAMES BONOMO, JULIA BRACKUP, HANNAH JANE BYRNE, RACHEL COSTELLO, ALYSSA DEMUS, SARAH W. DENTON, JOHN J. DRENNAN, EMILY ELLINGER, DAVID R. FRELINGER, MICHELLE GRISÉ, RUSSELL HANSON, BRUCE MCCLINTOCK, MACE MOESNER IV, STEPHANIE PEZARD, STEPHANIE ANNE PILLION, CLINT REACH, MELISSA SHOSTAK, GABRIELLE TARINI, ABBIE TINGSTAD

Insights from the Plan Blue 21 Game

Examining the Role of Sensing and Partner and Allied Contributions to Competition with Russia in the Arctic



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About This Report

This report describes the design, game play, and insights from the 2021 iteration of the Plan Blue game. The game centered on competition against Russia in the Arctic, with a particular focus on the role of sensing in competition. The game also featured robust participation from regional partners and allies.

The research reported here was commissioned by LeeAnn Borman and Maj Gen David A. Harris of the Office of the Deputy Chief of Staff for Strategy, Integration, and Requirements, Headquarters United States Air Force, and was conducted within the Strategy and Doctrine Program of RAND Project AIR FORCE as part of a fiscal year 2021 project, “U.S. Air Force Plan Blue 21, Global Engagement 21, Title 10 Wargaming Integration.” This research was completed in September 2020, before the February 2022 Russian invasion of Ukraine. It has not been subsequently revised.

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Above all, we would like to thank our game participants. While Human Subjects Protection protocols prevent us from thanking them by name here, without their time and insightful contributions, this research would not have been possible.

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Finally, a game of this size and complexity is not a trivial logistical enterprise, and under changing COVID conditions the complexity only grows. We are indebted to Katrina Doss-Owens, Leanna Shrader, Rachel Uelton, Carmen Richards, and Jason Rogers for their professional expertise and good humor through all the curveballs.

Summary

Issue

The Chief of Staff, United States Air Force, established the Plan Blue series of wargames in 2016 as one means of building familiarity and expertise within the service regarding the demands of challenging future conflicts. The 2021 iteration of the game was focused on competition with Russia in the Arctic. The game was set up in 2030 to explore the intersection of two key trends: (1) changing environmental conditions, and (2) the completion of current Russian investments in increasing military capabilities and infrastructure in the Arctic. The goal of the game was to increase understanding of the sorts of capabilities, posture, alliance command, control, and communication relationships that may be called for in future Arctic operations, focusing on three specific questions:

- What Russian behaviors in the competition space in the Arctic threaten U.S. security interests?
- What roles can sensing play in deterring adversary behavior and supporting U.S., allied, and partner responses to challenges in the region?
- What roles might interagency and international partners and allies play in sensing and response operations?

Approach

The project team developed a bespoke game format that allowed players to explore both steady-state competition and crisis operations. Blue teams representing the United States and its Arctic partners and allies were staffed by representatives from the Department of the Air Force (DAF), joint services, U.S. interagency, and the air forces of key partners and allies. A Red team, representing Russia, was staffed by a team of RAND subject-matter experts (SMEs). The outcomes of operational and strategic interactions between the teams, as well as actions by other actors, were controlled by a RAND White Cell (game umpires). The game was played through twice, once at the O5-O6/GS-15 level in a virtual format in June 2021, and a second time in person at the RAND offices in Arlington, Virginia, with general officers (GOs) and senior executive service (SES) players in August 2021. Insights were drawn through the process of game design, player observations collected during the game, and postgame analysis by the RAND team.

Key Insights and Recommendations

Insights from Plan Blue generally reinforce key findings from Arctic specialists but did so among a community of practitioners with a more general perspective on global competition. Key takeaways are described below.

Competition with Russia

- In game play, Russia had greater, and growing, stakes in the Arctic and lower costs of operating than the United States, its allies, or its partners.
- In the 2030 epoch, Russian activities in the Arctic were driven by (1) potential economic gain, particularly from commercial shipping along the Northern Sea Route (NSR); (2) perceived insecurity due to climate change removing natural defenses of its northern coast; and (3) signaling prestige to domestic audiences. Players noted that this may change in the 2050 time frame as additional warming changes economic opportunities in the region.
- Russian behavior in game play posed challenges to partners and allies but did not threaten vital or important Western national interests in competition unless they threatened the solidarity among partners and allies. Thus, the ability of the allies to rapidly develop and sustain a consensus response to Russian challenges was critical to successfully competing in the Arctic.
- Poor understanding on both sides of the other's interests and sensitivities generated escalation through misperception during the game. Allies and partners with a deep understanding of interests in the region and historical norms of activities may play a key role in interpreting Russian actions.

Sensing as a Deterrent

- The value of sensing in the game was its ability to provide shared situational awareness across the interagency and among partners and allies to coordinate action. Players also saw timely and accurate information about the unfolding situation as key to supporting narrative development and other information operations.
- Information collected through commercial and scientific platforms was particularly valued, because it was easier to share quickly with partners and the general public than information developed through intelligence sources.
- "Naming and shaming" strategies did little to deter Red team players. Blue's actions were too often seen as being "below the level of relevance" to shape Red's decisionmaking.

Operating with Partners and Allies

- Coordinated information-sharing and decisionmaking was critical to maintaining alliance cohesion, but barriers hampered the ability of the United States, its allies, and partners to act at the "speed of relevance." Recommendations that emerged from the game focused on how to build new organizational and technical pathways for information-sharing and practice them regularly to help manage these frictions.

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Chapter 1. Introduction

In 2016 the Chief of Staff, United States Air Force, established the Plan Blue series of wargames as one means of building familiarity and expertise within the service regarding the demands of challenging future conflicts. Plan Blue was modeled on the War Plan Orange series of wargames conducted at the Naval War College prior to World War II.¹ Those games were deemed to have been highly successful in preparing leaders of the U.S. Navy and Marine Corps for the challenges that they faced following Japan's surprise attack on Pearl Harbor. Both sets of games feature

- iterative “plays” of a small number of wartime scenarios
- efforts to develop and test alternative, innovative approaches to projecting power against highly capable adversary states
- direct involvement by flag-level officers from throughout the Department of the Air Force (DAF) and from other services.

Hand-picked Blue teams of general and flag officers have played a Plan Blue game every year since 2016. Since their inception, the Plan Blue games have explored scenarios that depict large-scale war fights against highly capable state adversaries. The main goal of these efforts has been to help DAF leaders to better understand the demands of these potential war fights, to evaluate the capabilities and limitations of programmed forces to meet those demands, and to test new approaches to projecting power.

For Plan Blue 21, the Deputy Chief of Staff for Strategy, Integration, and Requirements, Headquarters United States Air Force, Lieutenant General Samuel Hinote, directed RAND Project AIR FORCE (PAF) to focus the game on threats posed by Russia to the United States itself and to U.S., allied, and partner interests in the Arctic region.

Plan Blue was one of several games that shared this focus and were designed to complement one another. In particular, four characteristics distinguished Plan Blue, and so were prioritized in game design:

- Plan Blue focused on competition and small-scale crises, while other events focused on larger-scale crises and major combat operations.
- Plan Blue took a more general look at the region than other events that focused on the interaction between the Arctic and European operations and the Arctic and U.S. homeland defense in greater detail.

¹ For more information on the Plan Orange series of wargames, see John M. Lillard, *Playing War: Wargaming and U.S. Navy Preparations for World War II*, University of Nebraska Press, 2016.

- Plan Blue had the most robust international participation of the series, and so discussion of international cooperation was prioritized.
- Plan Blue focused on competition with Russia, with fairly minimal consideration of Chinese interest in the Arctic.

Why the Arctic?

Over the past 10–15 years, the United States has once again started to look at the Arctic as a strategic region from a military perspective. This had been the case during the Cold War, as the shortest flight path for Soviet bombers to reach the U.S. homeland was over the North Pole. After the fall of the Soviet Union, the U.S. focus shifted to safety-related (e.g., search and rescue [SAR]), economic, and scientific issues in the Arctic. Subsequently, however, Russia’s efforts to rebuild some of the Soviet-era military capabilities in its own Arctic, as well as an increased Chinese interest in the region, at a time when the United States increasingly perceived itself as being engaged in a strategic competition with these two states, prompted the U.S. military to once again examine what threats to U.S. interests (as well as to U.S. allies) could come from, and through, the Arctic, and what role they might be called to play to address these threats.² A key question in this regard has been whether the U.S. military is ready to operate in this particularly demanding environment and, if not, what it would take to do so.

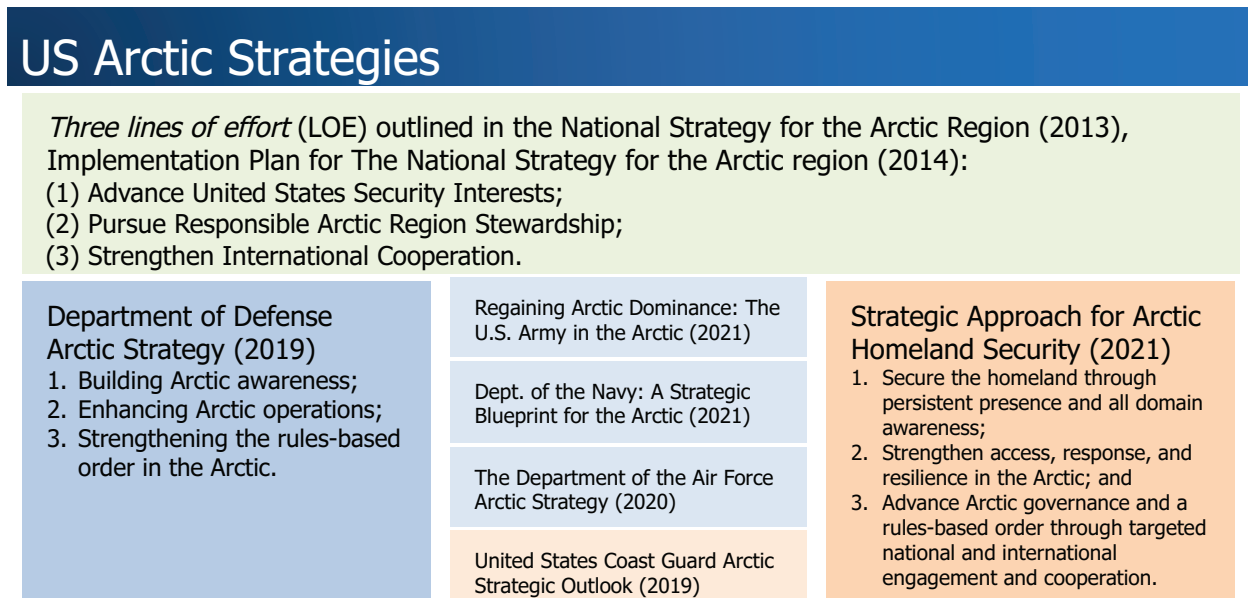
The Department of Defense (DoD) published an Arctic Strategy in 2019, which highlighted three key lines of effort (LOEs): building Arctic awareness, enhancing Arctic operations, and strengthening the rules-based order in the Arctic. Individual Arctic strategies followed for the U.S. Air Force (2020), the U.S. Army (2021), and the U.S. Navy (2021).³ Figure 1.1 illustrates the relationship between key strategic documents and the LOEs highlighted in them at the time of the Plan Blue 2021 game. These documents represent an increased focus on the region; however, commentators have noted inconsistencies between different strategies and gaps in implementation strategy, indicating the potential value of more thinking about the role of the U.S. military in the region. In particular, efforts to ensure stability and deter Russian action in the region pull strategies in conflicting directions between a consistent, predictable presence and flexible, dynamic activities that can surprise potential adversaries.⁴

² Stephanie Pezard, Abbie Tingstad, Kristin Van Abel, and Scott R. Stephenson, *Maintaining Arctic Cooperation with Russia: Planning for Regional Change in the Far North*, RAND Corporation, RR-1731-RC, 2017, pp. 1–2; Stephanie Pezard, *The New Geopolitics of the Arctic: Russia’s and China’s Evolving Role in the Region*, CT-500, Testimony presented before the Standing Committee on Foreign Affairs and International Development of the Canadian House of Commons on November 26, 2018.

³ U.S. Department of the Air Force, *The Department of the Air Force Arctic Strategy*, Government Printing Office, July 2020; U.S. Department of the Army, *Regaining Arctic Dominance: The U.S. Army in the Arctic*, Government Printing Office, January 2021; U.S. Department of the Navy, *Department of the Navy: A Strategic Blueprint for the Arctic*, Government Printing Office, January 2021.

⁴ Katarzyna Zysk, “Predictable Unpredictability? U.S. Arctic Strategy and Ways of Doing Business in the Region,” *War on the Rocks*, March 11, 2021.

Figure 1.1. U.S. Arctic Strategies as of 2021



SOURCES: White House, *National Strategy for the Arctic Region*, Government Printing Office, May 2013; White House, *Implementation Plan for the National Strategy for the Arctic Region*, Government Printing Office, January 2014; Office of the Under Secretary of Defense for Policy, *Report to Congress: Department of Defense Arctic Strategy*, Government Printing Office, June 2019; U.S. Department of the Army, 2021; U.S. Department of the Navy, 2021; U.S. Department of the Air Force, 2020; U.S. Coast Guard, *United States Coast Guard Arctic Strategic Outlook*, Government Printing Office, April 2019; and U.S. Department of Homeland Security, *Strategic Approach for Arctic Homeland Security*, Government Printing Office, January 2021.

Yet because the focus on the Arctic is relatively new—in the sense that it has been largely left aside in U.S. military discussions for the past 30 years—it can be challenging to determine key aspects of these strategies’ implementation given the number of unknowns specific to the region. For instance, access will be largely dependent on sea ice cover, whose extent varies depending on climate models. In addition, the high latitudes and punishing weather make communications difficult and create technical challenges to operating more broadly. Then, too, much remains unknown about the physical environment, from undersea topography to which ice roads might be practicable at a given moment of the year. The questions also extend to U.S. relationships with allies in the Arctic (Canada, Denmark, Norway), as well as with partners (Finland, Sweden) that have been invited to join NATO following the February 2022 invasion of Ukraine by Russia. How to operate with these allies, taking into account their Arctic capabilities and skills (which are, in some cases, superior to those of the United States) while being mindful of the political constraints under which their armed forces might be operating, represents another area that is both essential to Arctic operations and understudied.

Given the overall limited U.S. operational experience in the Arctic and these many unknowns, gaming is a particularly apt way to “play out” various scenarios of crises or conflicts born in or diffused to the Arctic. When placed in a gaming environment with resource constraints, participants make collective decisions about the key challenges raised by the scenario, the military objectives

and concepts of operation to address these challenges, and the capabilities needed to support these concepts of operations. The inclusion of non-U.S. participants can further provide a more realistic understanding of where allies and partners might fit in such operations. The Plan Blue 21 game covered these different elements and allowed participants to experience what it would mean to operate in the Arctic under a set of constraints that is radically different from what they would experience in other regions.

Research Questions and Context

Drawing from sponsor discussions, the current state of Arctic strategy discussions in the U.S. Air Force, and the overarching educational objectives of the Plan Blue series, the Plan Blue project team structured the game around three principal research questions:

- What Russian behaviors in the competition space in the Arctic threaten U.S. security interests?
- What roles can sensing play in deterring adversary behavior and supporting U.S., allied, and partner responses to challenges in the region?
- What roles might interagency and international partners and allies play in sensing and response operations?

In the following sections, we discuss the strategic context that motivated each objective.

Potential for Russia's Arctic Activities to Pose a Threat to U.S. and Partner Interests in the Arctic

The choice to focus on competition with Russia in the Arctic was driven by the popular perception of greater, and potentially more concerning, Russian activity there. Historically, the Arctic has been an area of relative cooperation between the West and Russia, particularly on security issues such as SAR. In the words of one recent analysis, “Pragmatic cooperation has been possible in part because bilateral irritants are diffused by shared and cross-cutting interests.”⁵ While international cooperation continues, climate change has been increasing accessibility to the region over the last ten years and enabling Russia to pursue various activities and develop further capabilities, and infrastructure in the Arctic. Four key trends have become apparent:⁶

⁵ Andrea Kendall-Taylor, Jim Townsend, Lawson W. Brigham, and Nicholas Lokker, *Navigating Relations with Russia in the Arctic: A Roadmap for Stability*, Center for New American Security, November 18, 2021, p. 1.

⁶ For a more detailed discussion of these trends, see Pezard et al., 2017. Mathieu Boulègue, *Russia's Military Posture in the Arctic: Managing Hard Power in a 'Low Tension' Environment*, June 2019; Robert Dalsjö, Christofer Berglund, and Michael Jonsson, *Bursting the Bubble: Russian A2/AD in the Baltic Sea Region: Capabilities, Countermeasures, and Implications*, Swedish Defence Research Agency (FOI), March 2019; Matthew Melino and Heather A. Conley, *The Ice Curtain: Russian's Arctic Military Presence*, Center for Strategic and International Studies, 2020; Katerzyna Zysk, *Russia's Military Build-Up in the Arctic: To What End?*, Center for Naval Analysis, September 2020; Eugene Rumer, Richard Sokolsku, and Paul Stronski, *Russia in the Arctic—A Critical Examination*, Carnegie Endowment for International Peace, March 29, 2021; Kendall-Taylor et al., 2021.

- new and modernized military capabilities, including development of new nuclear-powered icebreakers and testing of new hypersonic cruise missiles and nuclear-powered undersea drones⁷
- investments in Arctic installations and/or infrastructure (illustrated in Figure 1.2)⁸
- increased military activity in the Arctic, including a renewed focus on access and other issues related to key maritime chokepoints, especially power projection into the Barents Sea and the Greenland-Iceland-United Kingdom (GIUK) Gap⁹
- additional anti-access/area denial (A2/AD) deployments to Russian Arctic bases (e.g., new S-400 units).

In addition to the explicitly military activities and investments, researchers also highlight an increase in the types and numbers of Russian “gray zone” activities in the Arctic and near-Arctic, which interfere with military and nonmilitary activities of the United States, allies, and partners in the region.¹⁰

Core to understanding the motivations behind these investments, and how they ought to shape the decisionmaking of the Russia team during game play, the design team analyzed key strategic documents. The most critical of these is *Basic Principles of Russian Federation State Policy in the Arctic to 2035*, in which the Kremlin enumerates its national interests in the Arctic.¹¹ These include

- ensuring Russian sovereignty and territorial integrity
- preserving the Arctic as a “territory of peace, stability, and mutually beneficial partnership” increasing Arctic populations’ quality of life and well-being

⁷ The icebreakers include the Arktika; Sibir; Ural; Yakutia currently being built; building of Chukotka set to start; plans to develop a new Leader-class nuclear icebreaker, capable of year-round navigation on eastern points of NSR by 2027. For more, see Boulègue, 2019, pp. 40–41. Note that for game purposes, we assumed that Russia was able to manage the funding constraints that currently threaten the viability of the Lider-class ships. See also “Russia Test-Fires Tsirkon Hypersonic Missile in Arctic,” *Moscow Times*, November 18, 2021; and Thomas Nilsen, “Russia’s ‘Doomsday Drone’ Prepares for Testing,” *Barents Observer*, May 26, 2020.

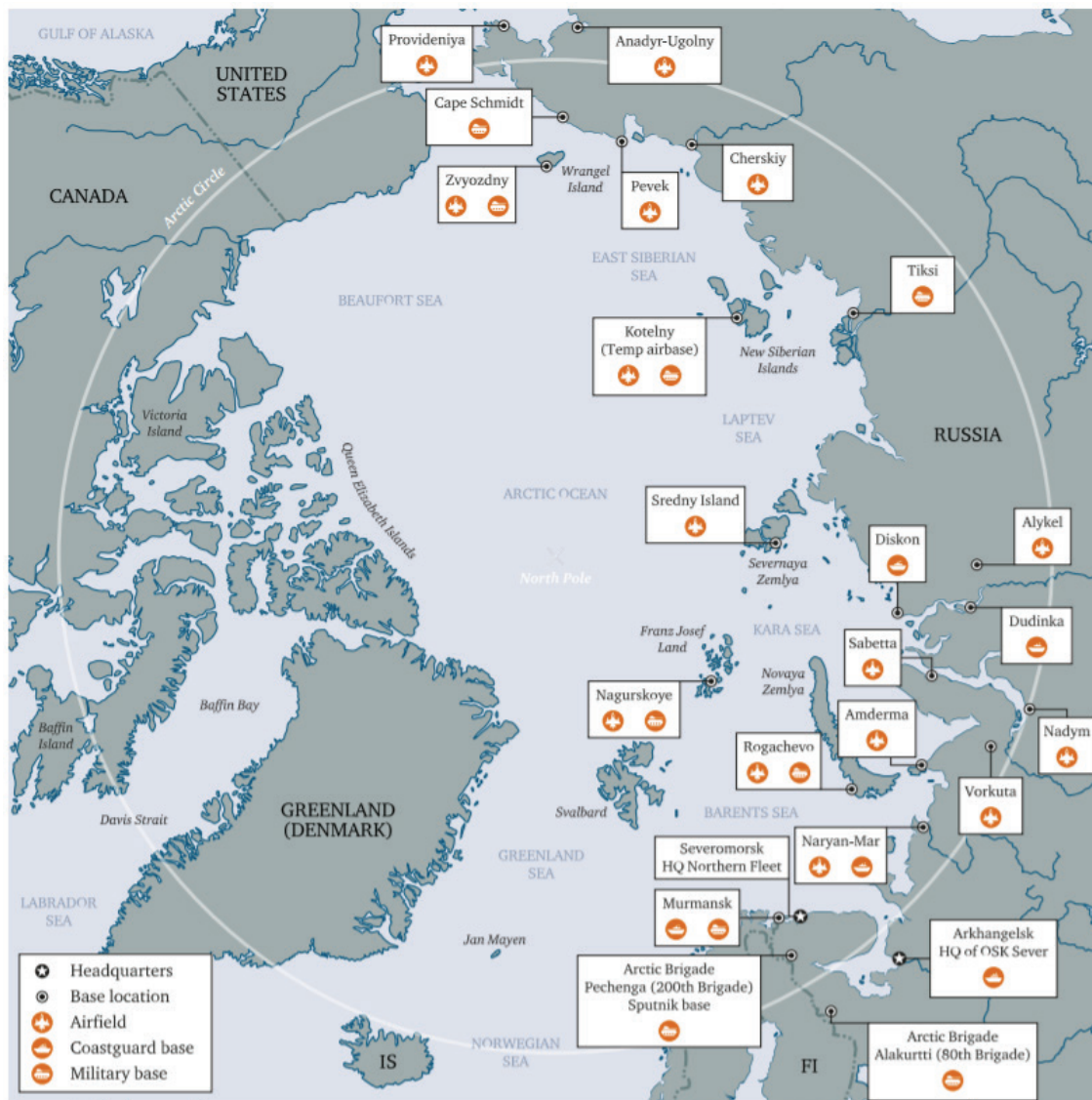
⁸ Aside from expanding presence on the Kola Peninsula, headquarters of the Northern Fleet, major investments include basing infrastructure on major Arctic archipelagos—Alexandra Land Island (Arctic Trefoil/Nagurskoye Airbase), Novaya Zemlya (Rogachevo Airbase), Sredny Island, Kotelny Island (Northern Clover/Temp Airbase, Wrangel Island—and along Russia’s Arctic coast, especially at Tiksi and Cape Schmidt. For more detail, see Heather A. Conley and Matthew Melino, *America’s Arctic Moment: Great Power Competition in the Arctic to 2050*, Center for Strategic and International Studies, March 2020, p. 12; Boulègue, 2019, p. 15; “Russia Completes Equipping of Six Military Bases in Arctic—General Staff Source,” TASS, December 7, 2015.

⁹ See David B. Larter, “The US Navy Returns to an Increasingly Militarized Arctic,” *Defense News*, May 12, 2020; International Institute for Strategic Studies, “The GIUK Gap’s Strategic Significance” *Strategic Comment*, Vol. 25, Comment 29, October 2019.

¹⁰ Kendall-Taylor et al., 2021.

¹¹ The Russian Federation, *Foundations of the Russian Federation State Policy in the Arctic for the Period Up to 2035*, trans. by Anna Davis and Ryan Vest, Russian Maritime Studies Institute, United States Naval War College, March 5, 2020, pp. 3–4.

Figure 1.2. Russian Military Bases in the Arctic Region



SOURCE: Boulègue, 2019, p 15.

- developing the region as a “strategic resource base” and using it to accelerate economic growth
- developing the Northern Sea Route (NSR) into a globally competitive “national transportation passage”
- protecting the environment and preserving the lands and traditions of the region’s indigenous peoples.

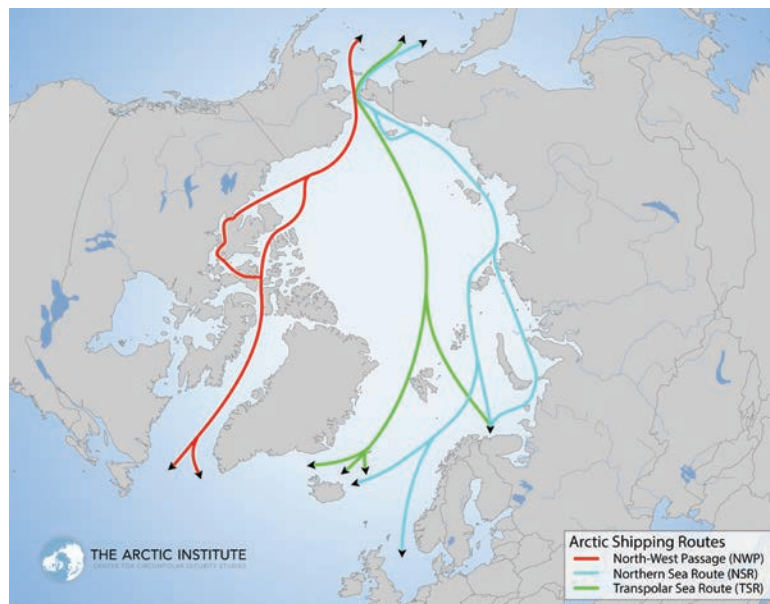
That “ensuring Russian sovereignty and territorial security” is the document’s first principle is particularly important.¹² In the team’s interpretation, climate change and melting of ice are

¹² The Russian Federation, *The Russian Federation’s National Security Strategy*, December 31, 2015, p. 3.

creating new conditions that drive Russia to increase its military presence in order to safeguard a changing external border and projected economic opportunities. In other words, Russia perceives climate change as removing a natural barrier that has long protected them. Through this lens, infrastructure investments are primarily seen as a defensive strategy to compensate for the loss of the previous natural defense. For example, Russian documents express concerns that adversaries might use the high North to launch strategic nuclear and nonnuclear attacks against critical Russian military and nonmilitary targets.¹³ In effect Russia appears to be operating from a defensive mindset, quick to view Western activities as threatening, and this mindset guided the game design.

On the flip side, the Arctic offers economic opportunities to Russia. In the 2030 time frame, one of the most important of these is the increase in seasonal navigability of the NSR relative to other sea lanes,¹⁴ shown in Figure 1.3. That is, uneven sea ice melt creates a finite window in which waters near Russia are more navigable than they are in other regions, which, while

Figure 1.3. Arctic Shipping Routes



SOURCE: Malte Humper, “The Future of the Northern Sea Route—A ‘Golden Waterway’ or a Niche Trade Route,” The Arctic Institute, September 15, 2011.

¹³ This includes the use of bases in Norway and Greenland as vectors to target northern Russian facilities, including Murmansk, St. Petersburg, and Moscow. Historically, much of this discussion has focused on the region as an entry point for U.S. strategic bombers. See E. V. Bei, “Obespechenie voennoi bezopasnosti Rossii v Arktike: Istoriia voprosa,” *Voennaia mysl*, No. 12, 2020, pp. 20–21; and Hans Kristensen “Increasing Nuclear Bomber Operations,” *Strategic Security Blog*, Federation of American Scientists, September 25, 2016.

¹⁴ See Pezard et al., 2017. These results have held in more recent studies, including both modeling and observational analysis. For a recent example, see Zhongfang Liu, Camille Risi, Francis Codron, Xiaogang He, Christopher J. Poulsen, Zhongwang Wei, Dong Chen, Sha Li, and Gabriel J. Brown. “Acceleration of Western Arctic Sea Ice Loss Linked to the Pacific North American Pattern.” *Nature Communications*, Vol. 12, No. 1519, 2021.

contributing to Russia's sense of precariousness, also increases its desire to maximize short-term gains.

The design team further stressed that while official documents and actions serve an actual purpose in and of themselves, there are also important signals to domestic and international audiences about Russia's views of the region. Analysis of the documents and actions focuses on the relative importance of the Arctic to Russian narratives of national power,¹⁵ particularly when compared with the role of the region in the United States' national narrative.

Finally, players were directed by the game design team to assume that relations between Russia and the United States and its allies and partners would continue to deteriorate from the situation on the ground in 2021, though our game did not anticipate the start of the war in Ukraine in 2022 and thus represents a less adversarial relationship than the current reality. During game play we assumed that Russian aggression against Ukraine would continue along the lines that had been common since 2014; and that other objectionable Russian activities, including election interference, promotion of societal divisions in the West, and human rights abuses, would continue during 2021–2030, when game play started. As a result, designers projected that economic sanctions that were in place in 2021 would continue (though again, we did not anticipate the expansion of sanctions that occurred in 2022), and that key fora such as the G-7 or, at the regional level, the Arctic Security Forces Roundtable, would continue to operate without normal participation by Russia.

Of course, Russia's 2022 invasion of Ukraine and the appalling brutality of Russian forces there have created a new geopolitical reality for Euro-Atlantic security. Almost regardless of the eventual outcome of the war in Ukraine, Russia will likely be regarded as a pariah state in Western capitals for as long as Putin remains in power, and the level of economic and other sanctions levied on Russia will be substantially higher than what was assumed in Plan Blue 21. But the fundamental Russian policy goals assumed by the Red team in the game are consistent with Moscow's behavior in the year following the game and the dynamics of the competition as reflected in the game seem valid under the new conditions of 2022.

Sense and Sense-Making as a Deterrent and a Tool for Supporting Competition

One specific hypothesis that Plan Blue 21 sought to explore was the role of sensing as a tool to limit Russian behavior in the Arctic during competition. This concept, sometimes referred to as "deterrence by detection,"¹⁶ argues for the role of persistent and visible intelligence, surveillance, and reconnaissance (ISR) assets in providing real-time situational awareness to prevent *fait accompli* aggression. Fundamentally, the concept is that knowing that it is being

¹⁵ Zysk, 2020.

¹⁶ Thomas G. Mahnken, Travis Sharp, and Grace B. Kim, *Deterrence by Detection: A Key Role for Unmanned Aircraft Systems in Great Power Competition*, Center for Strategic and Budgetary Assessments, April 14, 2020.

observed, an adversary will anticipate a decisive response. Plan Blue 21 was conceived in part as a first test of the utility of this concept in the Arctic, instead of Eastern Europe and the Indo-Pacific, where the strategy was developed.

Additionally, the Air Force was interested in the potential application of sensing concepts developed to support high-end war fights to competition in the Arctic. One such concept is a sensing grid, which is seen as a means for joint and combined forces to find, identify, track, and engage moving enemy forces in the kinds of highly contested environments that would exist in the opening phases of future conflicts with adversary states such as China and Russia. The concept envisages large numbers of relatively inexpensive sensors being employed in relevant areas of the battlespace on a variety of platforms, including in space, on the surface, and in the air. The grid relies on being able to maintain large numbers of these sensors in the battlespace even in the face of intensive enemy attacks on the platforms carrying them; hence the need for low-cost hardware. Digital data developed by each sensor would be shared across the grid in near-real time and processed within the grid itself using automated target recognition algorithms. When data links to rear area operations centers are available, processed data will be shared with those centers, but the grid is designed to function autonomously, guiding weapons to the highest priority targets when such connections are disrupted. In its fullest instantiation to date, the heart of the sensing grid consists of hundreds of autonomous unmanned aerial vehicles (UAVs) equipped with low-cost sensors, data links, and target recognition software.¹⁷

Looking toward 2030 operations in the Arctic, the RAND team eventually assessed that this full vision was not viable, both because of concerns over system performance in the harsh Arctic environment and the greater spatial area that would need to be covered. Instead, Plan Blue 21 game play focused on the role of conventional airborne platforms, such as Global Eye and Wedgetail; space-based sensors, particularly proliferated low-earth-orbit (pLEO) systems from commercial providers; marine sensors, such as unmanned underwater vehicles (UUVs) and submarines; and ground-based systems such as over-the-horizon (OTH) radar. Players were challenged to use these assets in concert with one another to optimize sensing based on their priorities and perceived benefits and risks from engaging with Russian activity in the region.

Role of Interagency and International Partners in Competition in the Arctic

The third objective of Plan Blue 21 highlights the roles of interagency and international partners in the Arctic. As illustrated in Figure 1.1, much of the historical and current Arctic strategy concerns the role of elements other than the military. While Plan Blue focused on the military instrument of power, it was still seen as critical that assets and capabilities from other organizations were included in game play. In particular, the role of Coast Guard assets and personnel in providing both presence in the Arctic and response capabilities such as SAR was

¹⁷ Thomas Hamilton and David Ochmanek, *Operating Low-Cost, Reusable Unmanned Aerial Vehicles in Contested Environments: Preliminary Evaluation of Operational Concepts*, RAND Corporation, RR-4407-AF, 2020.

key. There was also interest in the potential for scientific sensing capabilities to feed into military operations, though this could not be explored in depth during game play.

The game also brought international partners and allies to the table. In part, this was a recognition that many partners have been engaged more consistently in Arctic issues than the United States, giving them a richer strategic sense of the region. For example, Table 1.1 provides a summary of Arctic strategies, which were discussed with players during opening briefings to

Table 1.1. Allied and Partner Arctic Strategies

Country	Strategy Title	Last Updated	Summary
Canada	Arctic and Northern Policy Framework	2019	• Heavily geared toward improving living conditions of indigenous populations • “Ensure that Canada and our northern and Arctic residents are safe, secure and well-defended” • “Restore Canada’s place as an international Arctic leader”
Denmark ^a	Kingdom of Denmark Strategy for the Arctic, 2011–2020	2011	• Aims for a “Peaceful, Secure and Safe Arctic” through respect for international law, maritime safety, enforcement of sovereignty by Danish Armed Forces, cooperation with Arctic partners
Finland	Finland’s Strategy for the Arctic Region	2021	• Prioritizes climate change and sustainable development
Iceland	Iceland’s Policy on Matters Concerning the Arctic Region	2021	• Emphasizes need “to guard security interests on a civil basis, grounded in the National Security Policy, thoroughly monitor security developments in cooperation with the other Nordic nations and our NATO allies, oppose militarisation and purposefully work towards maintaining peace and stability in the area.”
Norway	Norwegian Government’s Arctic Policy: People, Opportunities and Norwegian Interests in the Arctic	2021	• Notes a long tradition of safeguarding Norway’s interests in the North through broad-based international cooperation • Emphasizes respect for the principles of international law, with a focus on the United Nations Convention on the Law of the Sea (UNCLOS) • Discusses increasing Russian investment as well as tensions between Russia and NATO • Highlights new high end military capabilities, as well as the need for joint training with allies and partners
Sweden	Sweden’s Strategy for the Arctic Region 2020	2020	• Calls to “further deepen cooperation with the U.S.” (although not in defense-related areas) • States that it will continue to cooperate with Russia where they have common interests • Emphasizes international law and UNCLOS • Builds ability of military to operate in northern Sweden and beyond

SOURCES: Government of Canada, “Canada’s Arctic and Northern Policy Framework,” webpage, November 2019; Kingdom of Denmark, *Kingdom of Denmark Strategy for the Arctic 2011–2020*, 2011; Finnish Government, *Finland’s Strategy for the Arctic Region*, Institutional Repository for the Government of Finland Valto, June 2021; Althingi, *Parliamentary Resolution 25/151: Iceland’s Policy on Matters Concerning the Arctic Region*, The Ministry for Foreign Affairs of Iceland, October 2021.; Norwegian Ministries, *Norwegian Government’s Arctic Policy: People, Opportunities and Norwegian Interests in the Arctic*, Norwegian Ministry of Foreign Affairs, January 2021; and Government Offices of Sweden, *Sweden’s Strategy for the Arctic Region*, Ministry of Foreign Affairs, November 2020.

^a Jointly published by Denmark, Greenland, and the Faroe Islands.

provide a foundation of knowledge. While these strategies have many points of commonality, analysts highlight that the relative priority of different Russian activities, in different regions between different stakeholders, complicates unity of effort.¹⁸ Players from the countries were also able to bring in other relevant strategies that they felt benefited discussion. Beyond this strategic depth, the game also explored specific operational contributions brought by the partners and allies. These included general military response capabilities, such as advanced fighter forces for defensive air patrols; general capabilities, such as much larger fleets of cold-weather patrol vessels than the United States alone could provide, and sensing-specific assets such as P-8 maritime patrol aircrafts and Global Eye ISR aircrafts.

Beyond the unilateral roles of individual countries, game materials and discussion also touched on the role of different international fora in managing the security of the Arctic. The roles of nonmilitary-focused regional forums, including the Arctic Council, Arctic Coast Guard Forum, Barents-Euro Arctic Council, and Business Index North, were discussed.¹⁹ The Arctic Council, in particular, was presented to players as a key element of Arctic governance, and it has been argued that it has “contributed to regional stability and security, despite being declaratively deprived [of] any security functions.”²⁰ Historically, different actors have preferred different forums for managing the Arctic based both on their specific policies and their broader role in the international organization in question. Beyond a tendency to look to different forums for dispute resolution and rules making, these differences also translate into more tactical differences in interoperations. For example, information-sharing within the North American Aerospace Defense Command (NORAD), NATO, and non-NATO contexts has different restrictions.²¹

While general information about strategies, capabilities, and organizations was provided during game play, the game participants contributed significant insights into partner capabilities. While not all relevant stakeholders were able to attend, the game did include U.S. State Department representation, as well as international representation from Canada, Australia, the

¹⁸ David Auerswald, *All Security Is Local: Arctic Defense Policies and Domain Awareness*, Atlantic Council, March 30, 2022.

¹⁹ On how the Arctic has been a historical forum for cooperation, see Pezard, et al., 2017, pp. 20–27; Andreas Østhagen, “High North, Low Politics—Maritime Cooperation with Russia in the Arctic,” *Arctic Review on Law and Politics*, Vol. 7, No. 1, 2016; Michael Byers, “Crises and International Cooperation: An Arctic Case Study,” *International Relations*, Vol. 31, No. 4, 2017.

²⁰ Piotr Graczyk and Svein Vigeland Rottem, “The Arctic Council: Soft Actions, Hard Effects?” in Gunhild Hoogensen Gjorv, Marc Lanteigne, and Horatio Sam-Aggrey, eds., *Routledge Handbook of Arctic Security*, Routledge, 2020, p. 221. These assumptions are based on the international situation as of mid-2021, when the Plan Blue game took place. At the time of writing, Arctic states had suspended their cooperation with Russia within the Arctic Council in response to Russia’s invasion of Ukraine. See, for instance, Gloria Dickie and Timothy Gardner, “Arctic Council in Upheaval over Russia as Climate Change Transforms Region,” Reuters, March 3, 2022.

²¹ Auerswald, 2022.

UK, Denmark, Norway, Sweden, and Finland. The specific organizations that participated are as follows:

- International
 - Finnish Air Force
 - Royal Air Force (UK) Air Force
 - Royal Australian Air Force
 - Royal Danish Air Force
 - Royal Norwegian Air Force
 - Royal New Zealand Air Force (June game only)
 - Swedish Air Force.
- United States
 - Air Combat Command
 - Air Force Global Strike Command
 - Air Force Materiel Command
 - Air Force Research Laboratory
 - Air Force Special Operations Command (June game only)
 - Headquarters, United States Air Force
 - Office of Secretary of the Air Force, International Affairs
 - Pacific Air Forces (June game only)
 - United States Air Forces Europe
 - United States Northern Command/NORAD
 - Headquarters, United States Space Force
 - Office of the U.S. Coordinator for the Arctic Region, U.S. State Department
 - Army Futures Command.

Players were able to provide not only a greater level of specificity about their equities, but also richer context for the perception of the Arctic, competition with Russia, and sensing capabilities than could have been supplied by game materials alone.

Methodological Approach of Plan Blue 21

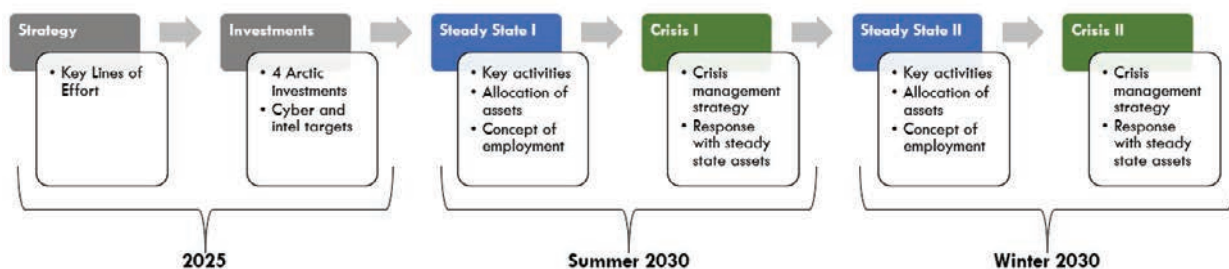
In order to inform Air Force, joint, allied, and partner participants and develop insights into these three areas, the RAND team designed a bespoke game to explore competition in the Arctic in the 2030 epoch. Blue teams, representing the United States and its Arctic partners and allies, were staffed by representatives from the DAF, joint services, U.S. interagency, and the Air Forces of key partners and allies. A Red team, representing Russia, was staffed by a team of RAND subject-matter experts (SMEs). The outcomes of operational and strategic interactions between the teams, as well as actions by other actors, were controlled by a RAND White Cell (game umpires). The game was played through twice, once at the O5-O6/GS-15 level in a virtual format in June 2021 (due to mitigation measures required in the face of the COVID-19 pandemic); and a second time in person at the RAND offices in Arlington, Virginia, with general office (GO)/senior executive service (SES) players in August 2021.

Game play was broken into four phases set between 2025 and 2030:

1. discussion of regional strategy, including desired end states, threat assessment, and LOEs
2. decisions regarding 2025 investments so as to be better prepared for 2030
3. steady-state moves setting baseline activities for six-month periods
4. crisis moves, examining how a single, time-sensitive incident might play out with the resources reasonably available, given the steady-state posture; repetition of steps 3 and 4 to examine both summer and winter operations.

These phases of game play are illustrated in Figure 1.4.

Figure 1.4. Plan Blue 21 Game Process



After the main game, and prior to briefing their key insights to senior leaders, participants discussed the barriers to information-sharing in the real world that would have complicated policy coordination and the execution of agreed courses of action.

Game Process

2025 Strategic Discussion

In order to allow players to gain a better appreciation of current strategy across partners and allies and as a foundation for game play, the first step of the game asked players to review strategies and identify key LOEs for implementation. After providing the players with briefings on the strategic environment and Russian interests in the Arctic, facilitators prompted Blue teams to define their strategic objectives, desired end state, potential adversary threats, and key LOEs to achieve their desired end state. For each prompt, players were free to discuss their thoughts, raise points, and challenge ideas while facilitators recorded responses for review. Facilitators informed players that they would be asked to use their answers, particularly their LOEs, to inform later moves throughout the game. By the end of the phase, each team had to reach a consensus on their top three to five LOEs.

2025 Investments

In order to understand the tools players felt would be needed to implement policy, Phase 2 asked players to prioritize investments in the future force. RAND facilitators presented each Blue team with 15 investment options, of which they were asked to select four. These investment

options represented Arctic-specific infrastructure or assets, which were presented as one-time investments in 2025 that would become available in 2030. The investment options covered the air, maritime, ground, space, and cyber/intelligence domains and featured systems identified by domain SMEs based on strategy documents and ongoing discussions of potential investments, prioritized according to sponsor interest.²² Investments focused on, but were not limited to, assets for sensing in order to gain an understanding of the degree and kind of additional sensing capabilities players prioritized for Arctic competition.

Red investment options were built into the game design and were focused on representing the maturation of existing modernization and infrastructure investments rather than a new strategic choice.

In addition to the baseline investments, facilitators asked both the Blue and Red teams to designate three targets and intended effects for offensive cyber actions. Along with cyber targets, Blue teams also selected two intelligence enterprise support targets. The White Cell adjudicated both cyber and intelligence effects through expert assessment, delineating effects achieved as failed, in-progress, partially successful, or successful. For efforts that were successful or partially successful, teams gained a range of actionable intelligence or ability to exploit the target. In-progress efforts gave teams an initial foothold in the target system but not enough to gain actionable intelligence or exploit the target by summer 2030. Failed attempts meant teams did not gain access to the intended target. Each offensive cyber action and intelligence collection effort also had a chance of detection by the adversary, which was adjudicated based on the sensitivity of the target.

2030 Steady-State Moves

In order to explore (1) core activities prioritized to operationalize Arctic objectives, (2) the role of sensing assets in supporting these activities, and (3) the relative roles and responsibilities of different partners, a major element of Plan Blue play focused on players setting steady-state operational activities. In Phase 3, Steady State, the game moved to the summer and winter of 2030. A scenario, reproduced in Appendix A, provided information about the evolution of key climate, geopolitical, and economic trends in the region between 2025 and 2030.²³ Players

²² For examples of some of these discussions, see Julia Nesheiwat and Andro Mathewson, “Securing the North: Expanding the United States’ Icebreaker Fleet,” *Military Times*, January 26, 2022, David Hodes, “Can LEO Meet the Changing Arctic’s Connectivity Needs?” *Via Satellite*, October 2021; David Pugliese, “Canada Plans New \$1-Billion Radar to Protect North American Cities,” *Ottawa Citizen*, April 25, 2022.

²³ Recent examples include: Benjamin J. Sacks, Scott R. Stephenson, Stephanie Pezard, Abbie Tingstad, and Camilla T. N. Sørensen, *Exploring Gaps in Arctic Governance: Identifying Potential Sources of Conflict and Mitigating Measures*, Santa Monica, Calif.: RAND Corporation, RR-A1007-1, 2021; and Stephanie Pezard, Abbie Tingstad, and Alexandra Hall, *The Future of Arctic Cooperation in a Changing Strategic Environment: Insights from a Scenario-Based Exercise Organised by RAND and Hosted by NUPI*, Santa Monica, Calif.: RAND Corporation, PE-268-RC, 2018.

could then interact with the game map and counters (see Figure 1.5), which presented a baseline allocation of U.S. and partner nation forces to the Arctic over a six-month period. Facilitators tasked players to adjust the baseline allocation of forces by placing counters on the game map according to the key LOEs determined during Strategy Development (Phase 1). Facilitators recorded player discussion and tracked adjustments on the game map, as well as in the virtual adjudication tool, to capture the resulting situational awareness for Blue and Red teams. The mechanics underlying the allocation and steady-state adjustment process, the effects of adjustments, and the virtual adjudication tool are described in greater detail in Appendix B.

Figure 1.5. Plan Blue 21 Game Map



2023 Crisis Response

In the fourth phase of game play, Crisis Response, players were able to see how well their investments and steady-state activities positioned them to respond to a specific time-bound crisis. In these moves, the White Cell briefed the Blue teams on an emerging crisis with information based on the current sensing posture, then tasked the teams to develop crisis response courses of action and prepare to counter Red's response. Crises were selected by the White Cell from a set of 12 possibilities (reproduced in Appendix C), which were distilled from a broader set of over

100 potential Russian competition actions drawn from past gray-zone games.²⁴ Criteria used to generate crises included

- a clear potential for a response that involved military assets, as well as nonmilitary activity, with a particular focus on sensing
- issues involving allied and partner, as well as U.S., interests
- Russian activity that clearly connected to Russian interests and was considered plausible by Russian and Arctic specialists.

Additionally, the overarching scoping of Plan Blue influenced the range of crises considered. Because other games were tasked at looking at the escalation from crisis to major combat operations and the potential for other conflicts to spill over into the Arctic, these topics were not considered for inclusion in Plan Blue.

The selection of which crisis to run in a particular move also weighed several factors:

- promoting robust dialogue between U.S. military, interagency, and international representatives
- potential involvement of multiple types of assets across multiple domains
- considerations of geographic location
- a preference for more stressing scenarios over more limited crises.

Crises were framed as incomplete narratives, specifying a series of events up to a Russian response. Both Blue teams were then asked how they would like to respond, and the Red team was provided an opportunity to refine and expand on their actions. While teams were limited to using the assets acquired during the steady-state phase, they could relocate, repurpose, and modify the composition of task forces to respond. Players could also plan future exercises and operations to execute as the game moved into the next steady-state turn to manage the “long tail” of the crisis. Outside the task forces, facilitators prompted players to consider intelligence collection, information operations, and other nonkinetic means of responding to the crisis, as well as coordinating with other instruments of national power. After both Blue and Red teams presented their responses and counter-responses, the White Cell adjudicated the results and briefed each team as the game returned to the steady-state phase.

Key Limitations

Several trade-offs between game design choices and pragmatic restrictions constrained the design of Plan Blue 21.

Perhaps the most important design limitation was that the game did not simulate barriers to information-sharing. Attempts to model these real-world sources of frictions would have

²⁴ See Anika Binnendijk, *Understanding Russian Black Sea Power Dynamics Through National Security Gaming*, RAND Corporation, RR-3094-OSD, 2020; and Stacie Pettyjohn and Becca Wasser, *Competing in the Gray Zone: Russian Tactics and Western Responses*, RAND Corporation, RR-2791-A, 2019.

required isolating players, particularly international players, in ways that would have dramatically decreased the personal value of participation. In effect, in order to ensure rich cross-talk between players during the game, the game could not replicate the structures that keeps open dialogue from occurring. Thus, the designers opted to assume that there were no information-sharing barriers during game play. This meant, for example, that all Blue players, regardless of country, had access to the same visualization of shared situational awareness generated by all Blue assets—a situation that both game designers and players recognized to be profoundly unrealistic.

In order to mitigate the analytic implausibility of this assumption, the game included a half-day structured discussion designed to capture findings about how players understood the problems caused by existing barriers. During game play, players were prompted to note down when they saw game actions they felt would be constrained by current restrictions on information sharing. During the discussion, players were then encouraged to identify which game events would be implausible, and what types of barriers would have prevented the game event from occurring as described during play.²⁵ In order to ensure consideration of a wide range of potential sources of friction, facilitators asked players to identify budgetary, regulatory, bureaucratic, cultural, political, technical, and strategic blockers that would complicate information sharing and multilateral decisionmaking in the real world, as well as possible means for reducing these barriers.

A second limitation was in the makeup of participants in the game. The Plan Blue series focused mainly on recruiting on military representatives, particularly from the U.S. The ability of joint, interagency, and international stakeholders to participate was affected by a variety of factors including interpersonal connections, availability of personnel, funding, and COVID restrictions on travel. To mitigate these gaps in participation, the RAND team included a range of experts who had worked across absent stakeholder communities, such as the U.S. Navy and Coast Guard and Iceland.

Other key assumptions and scoping conditions that influenced the conduct of Plan Blue were as follows:

- In order to accommodate changing COVID restrictions over the period of performance, Plan Blue 21 needed to be played in both a fully virtual and an in-person format.
- Given the extensive international participation, including non-NATO partners, game play was unclassified. This limited the game to a more general discussion of capabilities.
- Plan Blue 21 opted to have live play representing only Russia. China and other potential adversaries were represented by the White team and were constrained to fairly minor roles in game play.

²⁵ This approach borrows in spirit from activities such as back-casting and pre-mortems, which call on participants to define a desired outcome and then work backward to identify what actions or changes would be necessary to enable that outcome.

These assumptions were made to balance logistical considerations with our research objectives but are potential sources of limitations on findings.

Overview of This Report

The remainder of this report describes how the project team structured and conducted Plan Blue 21 in response to this tasking and conveys insights that emerged from their research and game play.

Chapter 2 provides a summary of game play. The summary highlights key debates from player discussion, as well as consensus decisions, both of which informed the insights the RAND team and players drew from the game.

Chapter 3 offers insights and findings from the game and the research that led up to it that may be relevant to analysts and decisionmakers.

Appendix A replicates the scenario assumptions provided to players about changes in the Arctic between 2021 and 2030.

Appendix B provides a detailed description of the mechanics and visualization tools used to capture deliberations and choices during the Steady-State phase.

Appendix C provides the full set of crises developed to support Plan Blue 21.

Chapter 2. Summary of Game Play

This chapter presents a narrative summary of Plan Blue 21 game play, which is designed to serve as a high-level record of events and an evidence base to support the discussion of key insights in the next chapter. We describe each of the major sections of play. They are

1. strategy, threat analysis, and LOEs
2. 2025 investments and cyber and intelligence activities
3. steady-state activities in the summer and winter of 2030
4. crisis response in the summer and winter of 2030.

Unless otherwise specified, this narrative focuses on the GO iteration of the game that was run in August 2021. Also unless otherwise noted, quotations are from contemporaneous notes documenting player discussion during the game. These quotes are offered to provide a sense of the language players used to communicate their insights.

The Blue teams represented a combined joint task force that allowed for shared situational awareness and operational planning across the U.S. and its regional partners and allies. Each Blue team represented an operational planning team and deliberated independently before being brought together to formulate a consensus position.¹ In many cases, the groups came to similar recommendations, and so unless specifically noted, the discussion below focuses on the consensus position.

Strategy, Threat Analysis, and Lines of Effort

In the first stage of game play, both Red and Blue teams were tasked to develop 2030 LOEs after discussing their collective desired end state for the Arctic and their understanding of threats to that vision.² The goal of this conversation was for players to synthesize their understanding of Arctic strategy to create a common baseline for later stages of play.

¹ In contrast, in the earlier O5/6/GS-15 game, the players were divided into three cells, each of which was given a specific national objective to focus on. This tasking did not project meaningfully different plans in the O5/O6/GS-15 run of the game, so a simpler structure was used in the second run for logistical convenience.

² Prior to the start of game play, players receive briefings on both U.S. and allied and partner strategies in order to provide a baseline understanding of key documents. Facilitators framed discussion around existing strategies (both U.S. and international), but the strategy was not enforced as a hard constraint.

Blue Team

Players shared an overarching desired end state of maintaining “freedom of access and action” that would both enable economic activity and prevent military conflict. The challenge that players faced was in understanding when the Russian buildup of economic and military activity posed a threat to these objectives. On one hand, players highlighted the considerable asymmetry in capabilities available to Red and Blue at the start of play. Perhaps the strongest formulation of this perspective, which came from the Blue team, was that “we don’t have any leverage over Russia in the Arctic. . . . They have all the strength, and we have no options today.” On the other hand, players also emphasized the risks inherent in overreacting to military activity that may not represent a meaningful militarization of the Arctic. Players stressed that increasing peacetime activity could align with, or at least not conflict with, the objectives of Western states. Players also noted the possibility that the Russian buildup in the Arctic could draw resources away from other modernization priorities, such as long-range fires, which pose a greater threat to vital Western national interest. Players worried that overreaction could lead to further tensions with little gain.

Given these two disparate perspectives, the core challenge highlighted by players was the need to accurately characterize Russia’s activities and capabilities in the Arctic and to forge a consensus among the coalition partners on the extent to which they challenged shared Western interests. In part, this problem was seen as a sensing issue: The alliance needs tools to understand if Russia begins building offensive capabilities in the Arctic. Players noted the need not only to see but also to contextualize activity. They also stressed the importance of dialogue with Russia for better understanding Russian goals, as well as of nonmilitary forums such as the Arctic Council and regular interactions between Coast Guards to build up that understanding. At the same time, players struggled with the degree to which Arctic actions could be assessed on their own terms (which might enable short-term cooperation) versus being contextualized in terms of broader Russian competition in the West.

This discussion occasionally referred to specific strategy documents, but was generally not embedded in their particular structures or tied to their details. However, as Table 2.1 illustrates, the LOEs ultimately selected by players align fairly well with those from the 2019 DoD Arctic Strategy, which suggests that player strategy did not radically differ from mainline documents. Both teams stressed the importance of nonmilitary activity in establishing norms and the need to build the coalition’s ability to operate in an integrated manner and thus to bolster limited capabilities. Additionally, both teams stressed the role of sensing, particularly in developing an understanding of events. The similarity in the teams’ approaches continued throughout deliberations, so little effort was needed for the two groups to arrive at a consensus.

Table 2.1. Department of Defense Strategy Compared with Team Lines of Effort

DoD 2019 Arctic Strategy	GO Team 1	GO Team 2
• Building Arctic awareness – enabling domain awareness – improving communications and ISR – increasing in-situation observations and enhancing environmental modeling – supporting Coast Guard homeland security mission • Enhancing Arctic operations – regular exercises and deployments – cold-weather training – refining Arctic posture – supporting resilient infrastructure – working with other federal departments and agencies • Strengthening the rules-based order in the Arctic – cooperating with allies and partners to deter aggression – preserving freedom of the seas	• Strengthen Arctic governance bodies to establish/maintain international norms – sustain relationships with allies and partners and incentivize Russia using communications, diplomacy, information, economic capabilities, and enforcement of international law • Integrate sense and understand – “make sense” among allies and partners (information leads to intelligence to support decisionmaking) – understand Russian battlespace/movement • Strengthen allies and partners Arctic capabilities – expand supply chain and distribution networks throughout Arctic – build capabilities (readiness, training, equipment) – enhance interoperability (e.g., show of force) – build capacity	• All-of-government engagement through common areas of interest (commerce interplay, multilateral, or bilateral, and Arctic Council diplomatic efforts) • Multinational intelligence fusion effort • All-domain awareness and battle management/command and control (BMC2) • Military and law enforcement capability and capacity development • Multinational exercises to demonstrate resolve

These LOEs were generally consistent with those put forward in the June run of the game. Multidomain sensing, improved military capabilities, and better interoperability among partners and allies were common areas of focus. The June game did see somewhat more emphasis on economic LOEs, but this was not a focus of discussions in the majority of game play.

Red Team

As noted in Chapter 1, Russian strategy was understood to be fundamentally defensive in nature. Accordingly, climate change and melting of ice are creating new conditions that are driving Russia to increase its military presence in order to safeguard a changing external border and projected economic opportunities. In phases short of war the Red team articulated concerns that increasing adversary and competitor interest and activities in the Arctic region would be perceived by the Kremlin as potentially threatening to Russian interests. Based on this strategic assessment, the Red team set three objectives and associated tasks, captured in Table 2.2.

Table 2.2. Red Team Objectives and Tasks

Objective	Tasks
Strategic deterrence	Maintain and demonstrate capability to inflict unacceptable damage on critical NATO infrastructure
Defend likely lines of attack targeting the Russian homeland	Establish grouping of forces in the North with capability to detect attack and disrupt NATO air, sea, and command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR)
Management of the NSR	Develop infrastructure and high-readiness air and sea capabilities in order to manage and secure critical sea lines of communication

2025 Investments

The second phase of game play asked players to prioritize long-term investments and cyber and intelligence activities to support their competition LOEs. The goal was to understand what tools players prioritized when presented with a finite menu of investments and activities.

Blue Team

Investments

Given the focus on sensing in the strategy discussion, it is perhaps not surprising that when given the opportunity to select areas for additional investment, much of the focus was on building up a richer understanding of activities in the Arctic. Players focused on broad area surveillance via north-facing OTH radar. Players also invested in building up space-based and terrestrial infrastructure to improve communications that would allow for better integration of existing sensors and improve situational awareness. Table 2.3 shows the menu of investment options provided by the game administrators, with the four selected investments in bold font.

Polar OTH radar was seen as an attractive investment because it could provide both maritime and air situational awareness of activities in and around northern Russia's and because its wide area coverage could provide early warning. Players generally opted to prioritize the facility with greater polar coverage on the grounds that airborne patrols could cover the GIUK gap and the Eastern Pacific.

Both groups saw access to commercial LEO satellite communication (SATCOM) coverage, and the terminals that enable connection of unmanned platforms as key enablers of sensing. Players appreciated the potential resilience of the federated constellation and felt that improved ability to transmit data from the Arctic region was critical to allowing current and future capabilities to operate effectively. Building up cyber infrastructure was also a priority in discussion, again because of the ability of the investment to serve as a key enabler of other systems. Fundamentally, players felt that without these investments in the ability to move data, translating data into understanding at the speed of relevance would not be possible.

Table 2.3. 2025 Investment Options and Player Selections

Domain	Investment Option	Effect
Air	Modernized, manned ISR	U.S. purchase of Wedgetails and Global Eye to supplement airborne warning and control system (AWACS) and Rivet Joint capabilities
	All-weather remotely piloted aircraft	High-altitude, long-endurance (HALE) capabilities with deicing, wing strengthening, and communications and landing control enhancements
Maritime	Additional icebreakers	Purchase of additional heavy icebreakers across the United States and partner nations to increase icebreaking capacity
	Additional unmanned maritime systems	U.S. purchase of additional unmanned air, surface, and subsurface vessels to increase multi-domain sensing capacity
Ground	Multi-Domain Task Force (MDTF) 4 to Alaska	Provides intelligence, space, and cyber assets for target development as well as medium and long-range fires
	OTH radars (U.S.)	Provides detection for surface vessels and large aircraft, with poor localization and only some typing. In arctic region, OTH radars would have some significant, predictable outages
	Polar OTH radars (CA)	Provides detection for surface vessels and large aircraft, with poor localization and only some typing. In arctic region, OTH radars would have some significant, predictable outages
	FPS-117 upgraded to advanced long-range radar (ALRR)	Upgrade Northern Warning System to ALRR to enhance early warning capability
	Winterized bases	Improve capacities to enable winter operations, ranging from snowplows and deicing for aircraft to shelters for mobile radar systems
Space	Increased electro-optical/infrared (EO/IR) revisit rate	Increase the size of SkySat and Dove constellations to provide additional revisits per day with both panchromatic multispectral system and EO sensing
	Commercial moving target indicator (MTI) capability	Leverage commercial synthetic aperture systems (ex. Capella, Radarsat Constellation Mission) for moving target tracking
	Increased satellite communication (SATCOM) capacity	Increase the bandwidth available to militaries on commercial systems
	SATCOM terminals for northern coverage	Install terminals for broadband LEO SATCOM on ISR systems to allow for data exfiltration north of 75 degrees
Cyber	Hardening cyber defenses of infrastructures	Provides enhanced cyber protection to key communications links and networks
	Robust cyber defense team coverage	Provide general cyber defense of key locations and systems, making cyberattacks less likely and less damaging

NOTE: Bold text represents players' selected investments for game play.

Outside of sensing, winterization of bases was seen as important to credibly demonstrating the ability to support a wide range of operations in the region, including bringing firepower to bear in time of conflict. Fundamentally, players saw this investment as a way to be able to better leverage baseline assets. They also saw being able to operate out of more locations as a way of posing multiple dilemmas to the adversary. However, in some cases players felt that exercising at

existing bases would have a similar effect at lower cost. Ultimately for game play purposes this investment fell below the cutline.

Capabilities that players opted not to prioritize tended to provide less persistent, but higher fidelity and more responsive sensing. For example, investments in additional UAVs and manned airborne platforms such as Wedgetail to increase capacity were seen as desirable but given lower priority due to the more limited sensor range and persistence of those systems. Players argued that investments in persistent sensors that might provide earlier indicators and warning could counterbalance more limited response assets, because they would allow for an earlier and more targeted reaction. Broad area surveillance was also perceived to be less escalatory. Naval assets, including icebreakers, were also seen as having too limited a range and too slow a speed to offer a “quick decision capability.” In the case of both UAVs and naval assets, players suggested that in future epochs with more ice melt, and therefore more naval activity, these investments would be more competitive.

The O5/O6/GS-15 game also saw a similar focus on OTH radars and space-based communications capability. However, that Blue team opted to increase cyber defenses, rather than investing in infrastructure, and saw ice breakers as more important than the GO/SES game’s players did.

Cyber and Intelligence Activities

When it came to selecting targets for cyber exploitation and national intelligence collection priorities, both teams focused on key command-and-control and force-generation capabilities. In particular, players were attracted to targets that they felt would help them understand adversary intentions, either directly by accessing senior decisionmaking or indirectly by providing concrete indicators and warnings. In thinking about potential offensive capability, players focused on limiting the ability of the adversary to sense and move in the environment.

Red Team

As with Red’s strategy, investment decisions were designed by team members as part of game construction. They included depictions of both general-purpose modernization investments and investments in specific Arctic capabilities. The goal of the Red team was to depict what the currently planned set of investments might look like once these capabilities matured.

2030 Steady-State Moves

Blue Team

Across both the summer and winter steady-state moves, the Blue team worked to increase Arctic presence generally and sensing capabilities in particular, but struggled to manage limited assets and the risk of escalation. During the first steady-state move, player concern over both the costs and the potential escalatory effects of increased patrols limited their willingness to establish

a more aggressive presence in international waters in order to contest the perception of the Arctic as “Russia’s pond.” In particular, players expressed concern that the use of major airborne sensors and maritime assets, which might have provided higher fidelity sensing off the northern coast of Russia, might be escalatory. As a result, players saw their initial sensing picture as being heavily dependent on the OTH radar- and space-based systems that could provide broad-area, persistent coverage. In the second move, perception of increased Russian aggression removed some of the hesitancy over potential escalation and made players more willing to deploy more capable systems such as UUVs and airborne sensing from European P-8s and Global Eye systems to provide a more detailed look at Red behavior. However, these efforts were still constrained by the availability of assets, particularly under poor weather conditions. The areas of coverage provided by these efforts are shown in Figure 2.1.

Rather than attempting to expand permanent presence, players focused attention on expanding exercises in the region that could provide periodic pulses of increased activity. Blue players sought to operate in multiple locations and across domains in order to demonstrate an ability to pose multiple dilemmas to the Red team. For the summer of 2030, the teams opted to start with Red Flag ALASKA+, envisioned as the first of an annual Rim of the Pacific (RIMPAC)³-style exercise, and a major humanitarian disaster relief and SAR exercise in northern Europe. Winter exercises sought to build on existing programs such as Joint Viking⁴ to demonstrate the ability to conduct combined air and ground activities in winter conditions. Locations of both sets of exercises are shown in Figure 2.1. Supporting operations in the information environment focused on seeking to highlight the operational capabilities displayed by the exercises, while couching the use case for them as not being specific to Russia. Players hoped that this narrative would minimize the Russian perception of Blue activities as threatening.

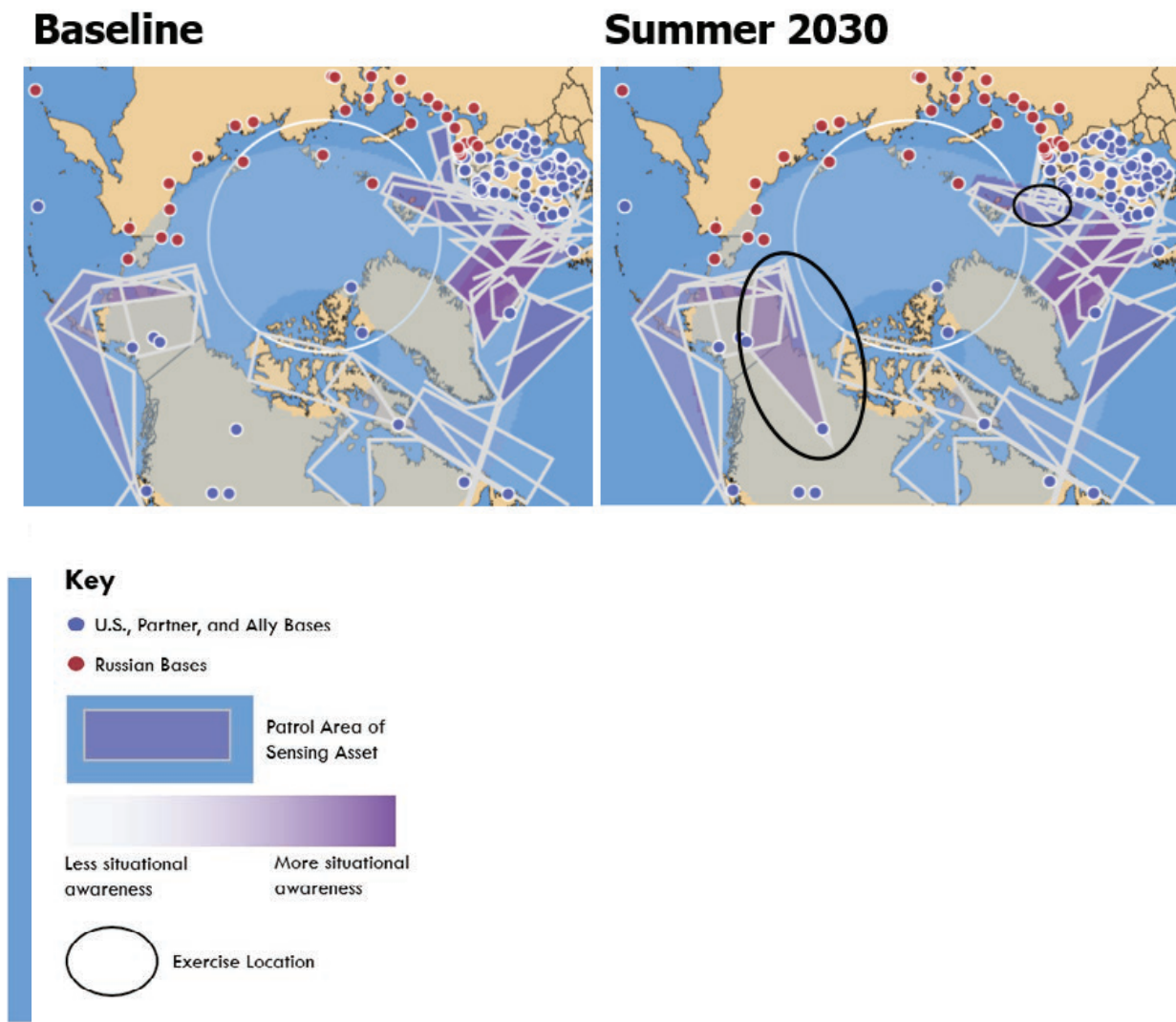
In addition to building interoperability, demonstrating capability, and building logistical capacity, the exercise was seen as an opportunity to observe Russia’s reaction to assets transiting into the exercise. Players also noted that since exercising is already a readiness requirement, these events could be done with less drain on forces than a traditional presence mission would require. During discussion, players began to identify key limitations, based on both environmental hazards and national restrictions, which would require careful coordination to overcome.

These decisions were fairly consistent with Blue play during the June run of the game, which also focused considerable attention on establishing more substantial combined exercises.

³ RIMPAC is a large, multilateral maritime exercise held in the Pacific region biannually, focusing on interoperability.

⁴ Joint Viking is a joint, multilateral winter exercise held in Norway biannually.

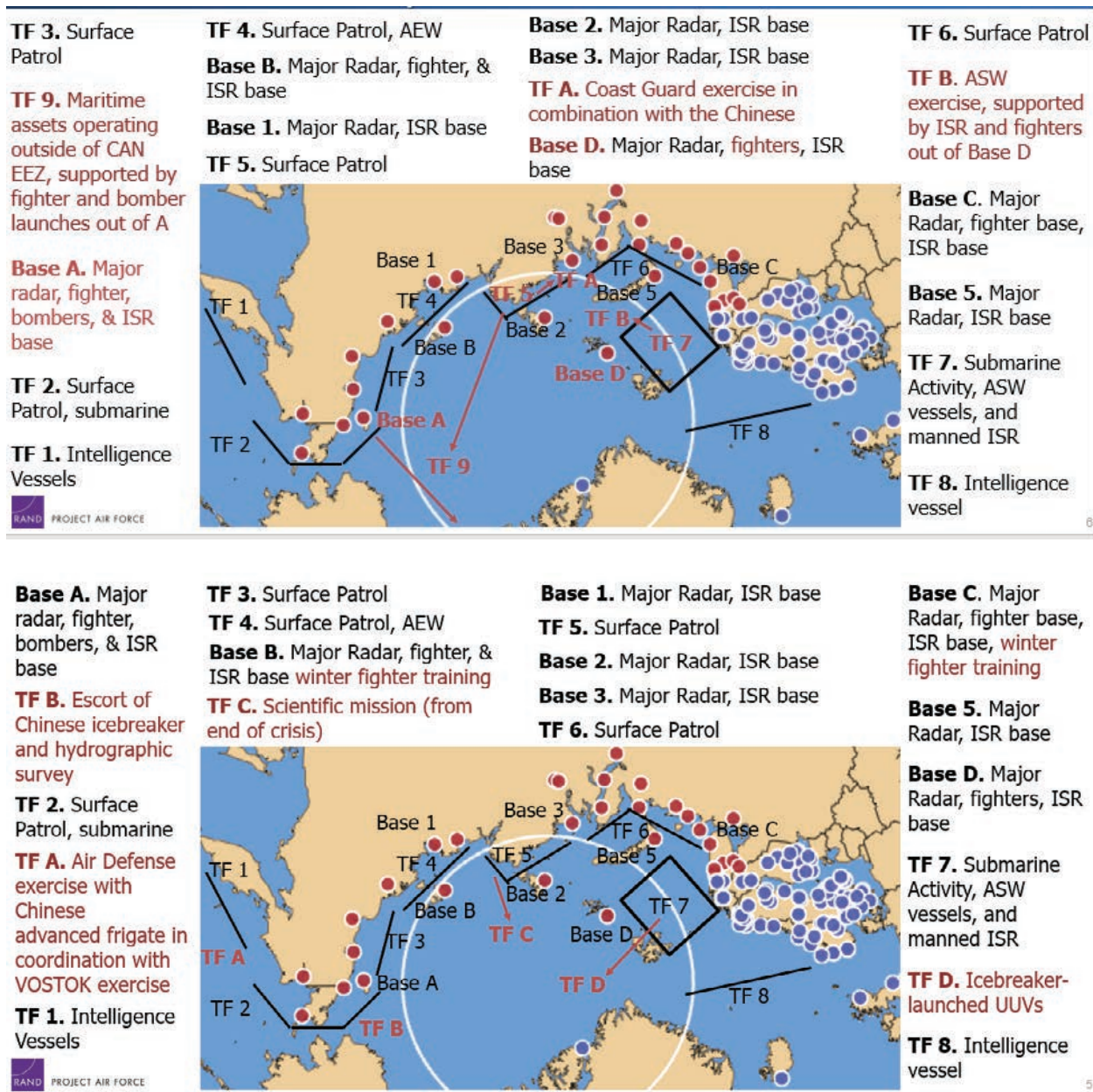
Figure 2.1. Shared Situational Awareness from Blue Sensing Assets



Red Team

The Red team's primary focus in steady-state moves was ensuring the smooth functioning of the NSR, with a secondary goal of putting irritants in place that demonstrated Red's ability to act, which might call into question Blue's ability to sense when and where it wanted to. In the summer move, Red's desire to irritate Blue focused on harassing the new polar OTH radar facility using a large-scale naval task force (TF A in the upper half of Figure 2.2), long-range aviation out of Wrangel Island (Base A), and a cyberattack on the OTH radar's logistics system. Other key activities included anti-submarine warfare (ASW) exercises north of the Kola peninsula, designed to harass U.S. subs (TF B in the upper part of Figure 2.2). Red team activity in the winter focused on increasing activity in disputed areas, following both the Summer 2030 crisis (described in the next section, and label TF C in the bottom half of Figure 2.2) and using patrols in the vicinity of Blue assets operating near Svalbard. Red's goal was partially to

Figure 2.2. Red Team Steady-State Operations for Summer (Top) and Winter (Bottom)



NOTE: Red text highlights changes in the baseline force posture.

monitor Blue activity, but the team also hoped that the visible activity in the area would draw Blue attention and generate confusion. Red coupled these activities with an information campaign designed to position Russia as a key promoter of stability and the rules-based order in the face of a Western return to a more aggressive posture in the region. Russian information operations also targeted perceived fault lines between the partners and allies, such as the United States' and Canada's differing positions on the Northwest passage.

The Red team also sought expanded collaboration with China. In the summer, this manifested as a joint Coast Guard exercise (identified as TF 3 in the upper half of Figure 2.2). As the Red team declined to participate in similar exercises suggested by the Blue team, this move was seen as particularly striking by Blue players. In the winter move, the Red team allowed experimental Chinese icebreakers to transit through Russian waters escorted by Russian icebreakers (noted as TF B in the lower half of Figure 2.2). In addition to the more scientific collaboration, the Red team decided to invite Chinese participation in the Eastern Theater’s strategic VOSTOK exercise⁵ with the goal of having the Chinese contribute high-end air defense assets to the exercise in the Pacific (TF A in the lower half of Figure 2.2). These moves were particularly concerning to Blue players, especially looking toward a future China with additional capabilities in the Arctic.

Throughout Red’s discussion of specific activities, the team kept returning to options to complicate Blue’s sensing and to generate threats. Assets such as UAVs and electronic warfare (EW) capabilities were seen as key enablers to these efforts, but players noted that these efforts would have to be small in scale or risk escalation. For example, Red team players proposed efforts to temporarily blind selected Blue space assets to create windows of opportunity for Russian activities but ultimately decided that the risks involved in targeting commercial systems were not worth the potential gains during peacetime. Instead, information operations became a key way for the team to magnify the results of their actions in the region.

Crisis Response Moves

For both the summer and winter of 2023, the White Cell selected a crisis that was plausible and touched on the interests of the Red and Blue teams in ways that could elicit responses by military assets. Given the focus on crisis short of major conflict (including consideration of conflict overflow from another region), the team generally opted to select more stressing crises that engaged more stakeholders across more domains. The full set of crises developed to support Plan Blue is available for reference in Appendix C.

Summer 2030 Crisis: Managing Economic Activity in Disputed Regions

The first crisis move injected by the control team focused on Russian violations of disputed undersea claims. The vignette postulated that UNCLOS made a recommendation that favored Denmark’s claim over rival Canadian and Russian claims on the Lomonosov Ridge.⁶ Meanwhile,

⁵ This game move preceded the 2022 inclusion of China in the VOSTOK 2022 exercise. See “China to Send Troops to Russia for ‘Vostok’ Exercise,” Reuters, August 17, 2022.

⁶ For background on the dispute, see Cornell Overfield, “An Off-the-Shelf Guide to Extended Continental Shelves and the Arctic,” Lawfare Institute, April 21, 2021.

Russia continued to try to extract economic gains from the disputed area, as indicated by an accident between a Chinese-owned survey vessel, escorted by Russian military vessels, and a Danish frigate that was dispatched to monitor Russian and Chinese operations. Additional details about the crisis can be found in Appendix C.

The Blue team response focused on three major efforts to manage the short-term crisis:

- working to minimize the potential for tension between Canada and Denmark, while also recognizing that Denmark's claims and its direct involvement in the incident would give it greater stakes than the other nations
- addressing immediate tactical requirements of the collision and environmental response unique capabilities held by allies and partners.
- focusing on information operations and specifically on collecting information that could be publicly released to reinforce the narrative of irresponsible and aggressive Russian behavior in order to enhance alliance solidarity and popular support.

However, when it came to options to halt the exploitation of the disputed region by Russia and China, Blue team players found themselves with fewer options. Players did not feel comfortable aggressively enforcing a claim outside of a traditional exclusive economic zone (EEZ). Furthermore, players worried that any substantial Western presence would, perforce, be limited once operations became more difficult in the winter months. As a result, while players did reallocate some assets to provide presence and enhance situational awareness, they recognized that this option was less robust than a likely Russian counter-response.

In line with these concerns, the Red team did not feel that the force the Blue team was able to send meaningfully impeded their ability to respond. The Red team opted not to change their initial play of waiting until the Western vessels had returned to port to send out a new wave of vessels into the disputed area. The Red team also included a substantial information operations element in its strategy, designed to counter the Blue team's narrative of Russian culpability. Players on both teams felt that such a campaign would be effective in sowing doubt among key audiences and complicating Blue's effort to generate a unified response.

The June game ran a different crisis, which focused on Russia allowing commercial fishing vessels to transit through its EEZ. While the themes of commercial activity, freedom of navigation, and incident response were similar to the crisis described above, the fishery crisis took place over a broader geographic area and involved vessels from more states. Discussion during the June game focused to a considerable degree on legal rulings that were not an area of expertise of the players, so a new crisis was selected that was seen as better aligned to the organizational equities of the players at Plan Blue.

Unintentional Escalation

Beyond the steady-state activity outlined above, an additional event that escalated up to the level of a crisis occurred during the winter move. Upon beginning the winter move, the Red team became concerned by continuing Blue attempts to exploit Russian National Command

Authorities communications via cyber intrusions, which the team interpreted as a clear sign of hostility in the context of broader Arctic activity and long-running Russian paranoia around potential Western efforts at regime change. The Red team felt that the persistence of these attempts to exploit high-level targets required a “brush back,” but specifically sought a response that “would not blow up the world.” The Red team thus opted to physically sever the NordBalt undersea cable (see Figure 2.3) between Sweden and Lithuania, along with targeted reductions in Belarussian power exports in order to cause limited “brownouts” in Lithuania. From the Red perspective, this action was nonlethal and would be coupled with diplomatic communications with Washington to make clear the connection between the attack and the cyber incidents.

Figure 2.3. NordBalt Power Cable Location



SOURCE: “Russia Accused of Disrupting New Energy Link Between Sweden and Lithuania,” EURACTIV, May 4, 2015.

While the Red team felt that this option was one of relative restraint, the Blue team perceived the cable-cutting as a dramatic and unwarranted response to cyber exploitation efforts that it considered to be “business as usual.” The fact that the Red team had damaged civilian infrastructure in a way that could have caused fatalities was seen as an escalation from “fair”

military targets. Far from being a deterrent, players felt that the aggressive action needed to be countered by attacking the power grid in Kaliningrad. While the potential crisis was not played out in detail, it was clear to players on both teams that the potential for further escalation was possible, given the misperceptions inherent in the situation.

On the Blue side, players saw the incident in a decidedly mixed light. Several Blue players were particularly worried about the ability to keep the alliance on the same page as it developed a response to the incident. The United States would have to pass along Russian diplomatic messaging about the attack to both NATO and non-NATO states and develop a coordinated response option with states that potentially have very different risk tolerances. However, Blue players were also confident that in changing the theater from the Arctic to the Baltics, the alliance would have both a better developed understanding of potential targets and greater capabilities to bring calibrated military power to bear than they would have had if the incident stayed in the Arctic. In effect, by responding out of the Arctic, the Red team enabled a more capable Blue response, if the partners and allies could coordinate in a timely manner.

Winter 2030 Crisis: Uprising on Svalbard

The winter crisis focused on the islands of Svalbard—Norwegian sovereign territory—with a small Russian minority population. The vignette posited the arrest of several Russian teenagers in association with drug charges, leading to protests and the formation of a small militia in the Russian community. While Norwegian authorities were able to manage the situation on the island, they asked for support to ensure that Russia did not reinforce or resupply the militia.⁷

Blue's response focused on providing military support to the interdiction effort. This included repurposing naval and air assets already in the region to prevent the insertion of Russian forces onto Svalbard. Players felt that while it would be fairly easy to get support for the action, given the Norwegian request, managing the logistics and day-to-day operations of a multinational task force would be challenging. However, given the difficulty of a Russian insertion under winter conditions, the priority was on providing intelligence support to law enforcement efforts. For example, ensuring that potential private military contractors (PMCs) were prevented from entering Svalbard via commercial air was seen as a key LOE that would require the ability to share information cross-nationally and between military and civil organizations. Players also stressed the need for both public and high-level diplomatic communication with Russia to avoid the types of misunderstandings that occurred during the cable-cutting incident.

In response, the Red team felt that Norway's efforts on Svalbard would likely have been sufficiently de-escalatory to allow the regime to save face with the Russian public without

⁷ As with the summer 2030 crisis, the control team chose this one because an event along these lines was seen as both plausible and touching on the interests of the Red and Blue teams in ways that could elicit responses by military assets.

needing to respond directly to the incident. As a result, the Red team was satisfied with a fairly limited effort to monitor Blue's cordon to ensure that there was not a threatening change in operations. However, the Red team saw the situation on the island as one ripe for future exploitation. It thought that with very low levels of support, it would be possible to maintain unrest, thereby tying down partner and ally assets and leaving open the possibility of providing support in summer, when inserting forces would be substantially easier.

The Svalbard crisis was also used in the June game. Blue players also opted to focus on the interdiction mission, though more attention was given to moving assets into position than was needed in the August game, given the favorable position of existing maritime and air patrols. Somewhat less attention was paid to the requirements of supporting civil authorities with information in June than in August. The Red team was slightly more aggressive in June, opting to increase patrols and prepare the northern fleet for a potential response, but the team ultimately opted not to escalate further, resulting in a similar resolution to the crisis in both games.

Summary

This chapter outlined the narrative of game play and how it evolved from the initial discussion of strategy through investments, steady-state posturing, and crisis decisionmaking. The following chapter presents key insights from game design, interpretation of the game's events, and discussion of takeaways with Plan Blue 21 participants.

Chapter 3. Insights and Recommendations for Policymakers

Although there have been several Arctic games and workshops before this, Plan Blue occurred at a time when the DAF was considering serious questions about how to implement the 2019 Arctic strategy. Plan Blue provided an opportunity to tailor a game exactly to the DAF's needs; no game is exactly alike and is designed to serve a specific purpose. In this sense, it gave the DAF their own opportunity to learn what Arctic change means for the DAF and to consider possible next steps for implementation.

Plan Blue was a valuable opportunity for the DAF community to learn about Arctic issues and gain understanding of the problem set it faced. In addition, Plan Blue provided an opportunity for

- confirming known gaps in communications, domain awareness, and information-sharing and considering their practical implications for specific scenarios from an Air Force perspective
- identifying gaps in player baseline knowledge about the region, other countries' military capabilities for operating in the region, intelligence, ability to partner, and other key issues
- understanding how to leverage partners in practical terms (not just that it would be generally useful), including the Joint Expeditionary Force construct and new tactics
- discussing how Arctic missions and needs can vary across the region (e.g., Svalbard versus Alaska)
- considering what domain awareness means in the Arctic and what it should/could look like (e.g., which assets to sense what features, likely intelligence needs)
- articulating limitations for basing, flying, training, partnering, and information-sharing
- identifying knowledge limitations about how well equipment works in the Arctic (implying needs for further research and development and testing).

Plan Blue 21 provided a rich source of insights relevant to the conduct of and preparations for operations in the Arctic region. In developing key takeaways for senior leaders, the game staff and players identified a specific lesson connected to each of the game's research questions. First, in game play, Russia had greater, and growing, stakes in the Arctic and a lower cost of operating than the United States, its allies, and partners. However, Russian activities in the Arctic did not threaten vital or important Western national interests in competition unless they threatened the solidarity among partners and allies. As a result, the ability of the alliance to act in a coordinated manner was seen as the key to successful competition. Second, the value of sensing was in its ability to provide shared situational awareness across the interagency and among partners and allies, particularly to manage crisis escalation. "Naming and shaming" strategies did little to deter Red team players. As a result, sensing was operationally important but was not, in itself, directly useful as a deterrent. Finally, coordinated information sharing and decisionmaking are

critical to maintaining alliance cohesion, but existing barriers hamper the ability of the United States and its allies and partners to act at the speed of relevance. Across all three areas, game findings reinforced broader research. This chapter expands on each of these insights.

The points presented here are derived from our observations of game play in both the field-grade and GO games, as well as from discussions among the players and the research and analysis that preceded game execution. Findings were shared with participants on the last day of game play in order to ensure that the research team received direct feedback from participants and were adjusted to ensure that key insights aligned with player takeaways.

Because game play was deliberately limited to situations short of actual conflict, these findings should not be regarded as applying to all possible scenarios. In particular, players stressed that warfighting requirements may suggest the importance of different capabilities and activities in the high North at steady state than those highlighted by the needs of competition and crisis. However, given the nature of Russian and Western interests in the region, we believe that the game addressed a very significant portion of the “scenario space” relevant to policymakers and force planners.

Insights Regarding Russian Behavior and Potential to Threaten Security Interests in the Arctic During Competition

Russia Has Little Need to Upset the Status Quo to Achieve Its Arctic Objectives and Undermine Alliance Cohesion

Our Red team assessed that that status quo allows Russia to largely satisfy what we believe to be its three principal objectives in the region:

- **Economic development and extraction.** This includes the ability to exploit hydrocarbons and other resources that may become economically viable after 2030 and to reap payments for Russia’s oversight of the northern shipping route, particularly the NSR.
- **Military security.** Moscow is concerned that the receding ice exposes its northern coastline to increased observation and, potentially, threat of attack. These concerns, together with the desire to protect its economic stakes and, perhaps, to challenge Western interests, have prompted substantial investments in military bases and other security-related infrastructure in Russia’s Arctic and near-Arctic regions.
- **Political stability.** Russia’s President Putin has made assertion of the country’s historically dominant role in the Arctic an important theme of his presidency. His perceived need to show strength on issues related to the Arctic may be a factor that influences Russian policies and actions in any future crisis or confrontation.

Nonetheless, Russian intentions vis-à-vis the United States and its partners and allies are far from benign. Under the current regime, Moscow has made clear to the world that it regards the deployment of NATO’s “military infrastructure” closer to Russia’s borders as a threat to its

security.¹ If this assessment is correct, Western policymakers should anticipate that for the foreseeable future, Russian actions in the Arctic, as in other regions, will be propelled by an enduring desire to weaken the ability of the United States, its allies, and partners to act in the region. This can be done both directly, by increasing Russian capabilities while imposing friction on Western operations, and indirectly, by undermining the unity of the alliance to act decisively, coherently, and in defense of common interests.

All of these factors were in play in the Red team's moves during the game, particularly during the crisis moves. For example, the Red team believed that cutting the cable between Sweden and Lithuania would impose costs on the West and bolster Putin's image as someone not to be crossed. Similarly, its invitation to China to exploit oil resources was seen as a way to leverage China's investment capital to both countries' mutual benefit while asserting Russia's claim to a disputed part of the Arctic. And by challenging Norway's sovereignty over affairs on Svalbard, the Red team hoped to show its population that the regime was acting decisively to protect Russians abroad. In every case, the Red team also hoped that its actions would open or exacerbate rifts among the Western Arctic states, based on their differing perceptions of the interests that they had at stake and the severity of Moscow's challenge.

During Competition, Russian Activities in the Arctic Pose a Limited Military Threat

One key insight that came out of game design and was reinforced by game play is that there is a limited number of plausible scenarios in which Russian activities in the Arctic pose a military threat during competition. In the process of developing crises for use in the game, it quickly became clear that a realistic portrayal of possible Russian initiatives and provocations in the Arctic region would be confined to actions that Moscow perceived as running at most a low risk of escalating into even the limited use of arms. In practice, the project team found only a small number of potential crisis situations that would have clear military implications for the Western allies and were deemed plausible given expert assessment of Russian interests and risk tolerance. For example, Russian use of directed microwave radiation to interfere with the construction of new infrastructure in Greenland was seen as plausible but had insufficient military implications. Conversely, crises that depicted a Russian attempt to seize disputed territory in the Arctic with substantial military forces were seen as implausible: The territory in question was simply not sufficiently important to Russian interests to warrant the level of risk involved. This reflects the fundamental reality that Russia today seems to be largely satisfied with the status quo that exists in the Arctic.

¹ The Russian Federation, 2015.

Russia's Greater Freedom of Action in the Arctic Potentially Allows It to Impose Costs on the West

Both the Red and the Blue teams felt that Russia's geography and its decades-long investments in Arctic infrastructure and specialized capabilities, such as icebreakers, conferred advantages in the competition. In both steady-state and crisis, Russian assets on average had to travel less far between home bases and areas of interest, and Russia had more assets available to devote to Arctic missions. Put simply, Russia had more staying power in the Arctic than the United States and more capacity than any of the other Western Arctic states could generate. The disparity was especially pronounced in the winter months, when ice prevents conventional vessels from operating in much of the region and harsh conditions complicate and sometimes preclude operations at airfields in the far North.

This reality might prompt Moscow to adopt tactics designed to drain Western resources. The Red team showed examples of this when it began to explore for hydrocarbon deposits along the Lomonosov Ridge (in the summer crisis described above), prompting selected allies to step up their monitoring and patrol activities there; and when they deployed personnel, ships, long-range attack aircraft, and UAVs outside of Canada's territorial waters to test the capabilities of OTH radar. Responding to these moves by Red took a toll on the readiness of Blue's forces and imposed opportunity costs by reducing Blue's capacity to conduct operations elsewhere. In contrast, the Red team felt that it could sustain these missions without sacrificing other priorities. These dynamics point to a structural opportunity for Russia to execute a strategy of cost imposition on the United States and its allies and partners in the Arctic.

Misaligned Perceptions Between the West and Russia Are a Potential Source of Unintentional Escalation

Both Russia and the Western allies see the Arctic as an area in which they are on the defensive against a potentially aggressive adversary. This sets up a dynamic in which misperceptions create risks of escalation because both sides see their own position as weak and are primed to see the other's actions as threatening.

Game play suggested that the Arctic is ripe for such risks. As early as the initial discussion of strategy, Blue players noted that they lacked an adequate understanding of Russian interests and red lines, and game play illustrated the potential costs of this limited understanding. In the limited set of Red-Blue interactions during Plan Blue, three instances of this stood out:

- Blue believed that bringing its north-facing OTH radar online represented an important but marginal improvement in its monitoring and early-warning capabilities. Red saw it as a qualitatively new capability and an intrusion on its ability to position and operate maritime and air forces within its territorial airspace and waters, and it devoted considerable time during the initial steady-state move to countering (or at least harassing) the capability.

- Likewise, Blue regarded its efforts to penetrate Red’s national-level governmental communications network as being well within the unwritten “rules of the game” for cyber activities.² Red, by contrast, saw this as a highly provocative escalation in the competition that demanded some sort of response.
- Red intended that response—cutting the power and data cable between Sweden and Lithuania—to be a largely symbolic act that could be reversed within a few days at modest expense. Blue, however, saw it as a flagrant and unwarranted violation of Sweden’s and Lithuania’s sovereignty and one that had the potential to endanger lives.

The particulars of these moves are less important than the finding that Western and Russian policymakers are likely to have very different perceptions of each other’s actions and that these differences can give rise to unintended escalatory dynamics. The fact that clear “red lines” have yet to be defined in domains such as cyber operations magnifies the possibilities for unintended escalation. And the fact that Putin apparently feels some need to foster and pander to nationalist elements within the Russian polity may limit his options for defusing some situations during a confrontation with the West. However, Blue team players, particularly those from the United States, noted that their limited familiarity with the operating environment increased the chances of misperception because they did not have the same understanding of what “normal” looked like. Players stressed that a major contribution of partners and allies to the formulation of responses to provocations may be in providing deeper experience with historical activities that can help calibrate responses. Mechanisms for more active multilateral discussions (discussed later in this chapter) were one step to manage this risk, but players noted the difficulty of pulling together all stakeholders, particularly in the face of restrictions on Russia’s ability to participate in many multinational forums due to their aggressive behavior in Ukraine.

Russia’s Satisfaction with the Status Quo May Change After 2030

The research team, players, and senior leaders briefed on Plan Blue noted that these dynamics were, in part, due to the 2030 environment. The changes to the Arctic environment anticipated by 2030 under consensus projections have several important implications.³ First, the European side of the Arctic is expected to experience more sea ice melt. As a result, the NSR is expected to become commercially viable before either the North American side of the Northwest

² Numerous press reports suggest that Russia has been conducting similar cyber operations against U.S. government networks for years. See, for example, Justin Vallejo, “Russian Hackers Stole Thousands of State Department Emails, Reports Claim,” *The Independent*, March 31, 2021; Ellen Nakashima and Craig Timberg, “Russian Government Hackers Are Behind a Broad Espionage Campaign That Has Compromised U.S. Agencies, Including Treasury and Commerce,” *Washington Post*, December 14, 2020.

³ M. Meredith, M. Sommerkorn, S. Cassotta, C. Derksen, A. Ekaykin, A. Hollowed, G. Kofinas, A. Mackintosh, J. Melbourne-Thomas, M. M. C. Muelbert, G. Ottersen, H. Pritchard, and E. A. G. Schuur, “Polar Regions,” in H.-O. Pörtner, D. C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegria, M. Nicolai, A. Okem, J. Petzold, B. Rama, and N. M. Weyer, eds., *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*, 2019.

Passage or the Transpolar Sea Route. If these projections are correct, Russia will enjoy a window of control before these other routes become economically competitive. Red team players argued that in the 2030 time frame, this dynamic would incentivize Russian behavior that promoted economic activity and thus align with the interests of Western states to promote freedom of movement and commerce. However, it is not clear if that alignment would continue once other, potentially more lucrative, Arctic shipping lanes outside of Russia's immediate waters became economically viable. Additionally, current economic sanctions, which are designed to deter Western commercial engagement with Russia, may well erode the potential benefits of the route.

It Is Unclear How Many Successful "Matches" Are Needed to Win the "Game" of Competition

Players identified that part of what made gauging the threat of Russian activities challenging is that no single incident existed in isolation. Rather, the threat was that over time, repeated Russian victories would erode norms and generate serious challenges. Players repeatedly used the metaphor of playing a repeated, or even infinite, game, in which not all rounds needed to be won to secure victory, but some meaningful portion did. To players, the challenge then became identifying which situations had to be won, either because of the specific stakes or because of the general need to remain competitive. Plan Blue 21 players differed considerably in their estimation of how aggressive the United States and its partners and allies needed to be to remain competitive, suggesting the need for further conceptual work to better define theories of victory for competition.

An additional angle to consider is the threat of spillover from a crisis in another region. The potential for activities in the Arctic to trigger a crisis outside of the region was clearly apparent in the cable-cutting crisis, where the sphere of activity moved from the Arctic to the Baltics. The potential for expansion from a regional crisis to the Arctic was not directly considered within Plan Blue but would be equally possible.⁴

Insights into the Roles of Sensing in Deterrence and Crisis Response in the Arctic

In the run-up to the game, both the sponsor and the project team perceived that the ability to monitor and understand what was happening in the Arctic would be important to successful policy formulation and operations for the Blue teams. Compared with other regions in which U.S., allied, and partner forces have conducted sizable military operations over many years and have established mature infrastructures, the Arctic is undercapitalized. For instance, the technical limit for sensors and communications operating from satellites in geostationary orbit

⁴ As originally planned, Arctic implications of conflicts in other areas were a topic for a later game to explore and were thus ruled out of the scope for attention in this game.

(GEO) is approximately 75 degrees north latitude.⁵ Furthermore, while DoD is increasingly reliant on commercial satellites in GEO for SATCOM capacity,⁶ commercial SATCOM providers have historically rarely provided capacity above the 65th parallel because the majority of their users are located at lower latitudes,⁷ though new investments in polar coverage from communications constellations, such as OneWeb and Starlink, mirrored in available investment options, are changing this pattern.⁸

Game play provided some validation for this expectation. Both Blue teams saw a clear need for enhanced sensor coverage and communications infrastructure to support steady-state and crisis operations. As a result, players “spent” their limited resources accordingly in the investment move of purchasing OTH radar coverage and increased LEO space capacity. Those investments were rewarded with improved situational awareness in subsequent moves. As expected, this information and the ability to share it across agencies, alliances, and national boundaries proved important to the formulation of coordinated responses to emerging situations.

Sensing for Intentions Required Analysis and Processing, Exploitation, and Dissemination (PED) Capability as Well as Sensing Capacity

Players stressed that it was insufficient to simply improve the number or performance of sensors. Instead, what players stated that they valued most was information that allowed them to understand Russian intentions in order to better distinguish benign (if irritating) competition activities from activity that posed a potential offensive threat. As a result, players repeatedly stressed the need to invest in processing, exploitation, dissemination, fusion, and analytical capabilities that would allow them to make better use of the data that were collected. While some of the focus of this discussion was on technical solutions to enable information-sharing and automation of analysis, players also focused on the role of SMEs who could contextualize activity within historical patterns and a broader strategic understanding of Russian behavior. In particular, U.S. players stressed that this was a unique contribution of allies and partners, since their proximity to and greater familiarity with both the Arctic environment and Russian decisionmaking might allow for more nuanced analysis.

⁵ The horizon from the 35,767 kilometer altitude of GEO is 81 degrees north, but the practical limit for radio frequency applications is 75 degrees north because of interference from multipath reflections at low grazing angles. See Lina Cashin, Karen L. Jones, and Lori W. Gordon. “Svalbard: Planning for Growing Tensions in the High North,” briefing, Aerospace Corporation, May 24, 2021, slide 3.

⁶ U.S. Government Accountability Office, *Defense Satellite Communications: DOD Needs Additional Information to Improve Procurements*, GAO-15-459, July 2015, p. 2.

⁷ For instance, the coverage footprints for the global network of communication satellites provided by Intelsat are available online, and they illustrate the lack of capacity above 65 degrees north latitude. Intelsat, “Global Satellite Network,” webpage, undated.

⁸ Jason Rainbow, “Arctic Connectivity Competition Is Heating Up,” *SpaceNews*, May 13, 2022.

Information Did Not Change Russian Behavior, but Could Help the Alliance Retain Unity

The Blue team had expected that its ability to gather and promulgate accurate information about the unfolding situation in the Arctic might help to constrain Red aggressiveness. However, Blue narratives laying bare Red provocations in the Arctic had no discernible effects on Red actions or calculations. The Red team seemed confident in its ability to “shout over” Blue’s narratives using trolling and bots on social media as well as other means under its control. The Red team also felt that the costs of a negative narrative were relatively low because the Russian regime did not have the same sensitivity to being seen as “playing by the rules” that other states may have. Events unfolding in Ukraine seem to support the finding that “naming and shaming” is unlikely to deter Russian aggression.

This is not to say that framing accurate and compelling narratives was not important for Blue players. Doing so was crucial to garnering support among the allies and partners themselves and their populations. But the game itself and recent experience suggest that it would be naive to believe that “naming and shaming” can be effective in shaping Russian behavior.⁹

Increasing Testing and Probing May Provide Uneven Value

Game play also suggested that the United States especially, but perhaps also allies and partners, should expect the steady state in the Arctic to be characterized by repeated testing and probing behavior by the Russians. Just as during the Cold War, when the Soviets used bomber flights close to Alaska to test NORAD’s ability to detect and respond to air attacks, the Red team operated at the edges of national territories in order to learn more about the allies’ posture to sense and respond to military activities in the air and at sea. Conducting bomber missions and submarine sorties in sensitive areas provides training for Russian crews and also creates opportunities to evaluate allied defensive measures. From the Red team’s perspective, these activities had the added benefit of potentially requiring Blue to devote resources to respond. And, to the extent that such probes become publicly known, they serve as reminders that Russia is still a military power to be reckoned with.

While Blue players expressed interest in undertaking similar strategies, practice exercises and other activities designed to provoke Red team interest did not appear to generate significant reallocation of resources or become a factor in deliberations. In part, players felt hamstrung by the combined need not to risk unwanted escalation and not to stress the limited forces available to them in the high North. The results, in the memorable words of one frustrated Blue player, was that the Blue team was too often “operating below the level of relevance.”

⁹ The Red Team’s behavior in this area was consistent with Russian actions in the real world. When Western governments have condemned such actions as Russian aggression against Ukraine, the poisoning of Moscow’s political opponents, jailing of dissidents, or Russian-sponsored ransomware attacks on critical infrastructure, the Kremlin’s response has been to label the charges as “fake news” and to continue its practices. Indeed, Putin seems to revel in his growing international reputation for thuggery.

Insights into the Roles of Allies and Partners in Arctic Operations

It is common for senior U.S. policymakers to observe that the nation's security ties with allies and close partners are invaluable strategic assets and key advantages that the United States enjoys over its adversaries. Plan Blue highlighted some of the ways this might be particularly true in the Arctic region.

Western Unity Is Key to Alliance Success

We noted above that undermining Western unity and resolve and, especially, trying to divide Europe and North America, were central goals of Russia's security strategy during competition. The game provided concrete examples of how Moscow might go about pursuing these goals in the Arctic and near-Arctic. The players came away from the game with the strong view that, at least within the realm of competition short of war, it would be difficult to imagine an issue arising of such weight that the resolution of that issue itself would be more important than the maintenance of solidarity among the allies and partners. Said another way, the Blue players saw alliance unity as their collective center of gravity, and they were, in general, willing to compromise on the details of particular issues in order to preserve it.

Players observed that one important complication to maintaining solidarity is that there are likely no consistent rules of thumb to guide when small states prefer to act forcefully to reinforce the status quo versus when the opportunity costs or risks of escalation involved in responding are not worth the potential benefit. Players noted that on the one hand, small states depend on norms as an important "force multiplier" since they do not have conventional militaries with sufficient capability to enforce their preferences by might alone. On the other hand, in some instances the stakes were small enough, or the norm unclear enough, that players counseled a more moderate response. For example, in the first crisis dealing with underseas claims, players pointed out that the legal status of the claim was not at the level of a traditional territorial claim and thus their willingness to respond to Russian provocation was not as great.

The complexity of these considerations points to the value of frequent and robust dialogue among allies and partners in order to enable a shared understanding of the likely priorities of different states in advance of a crisis to enable a faster decision cycle. Players noted that today, lack of familiarity, particularly among states for which the Arctic has not been a traditional area of focus, would likely make developing a coordinated response very slow—potentially weeks or months, rather than the hours and days required to be timely in the event of a crisis. Players stressed that the more familiar they are with the interests and sensitivities of their counterparts, the faster the alliance can align around a commonly acceptable course of action.

Areas of Comparative Advantage Include Both Capabilities and Strategic Insight

In addition to building up a common understanding of interests and red lines to ensure a unified response, players also noted that increased dialogue would allow a better appreciation of

the differential strengths of partners. By virtue of their geographic location, the other Arctic states have been able to focus a substantial share of their attention and resources on developing forces, infrastructure, and training regimens relevant to the demands of the Arctic environment. For example, the overall size of Nordic navies may be smaller than those of the other nations represented at Plan Blue, but much more of their force is rated for cold weather, making it a more flexible force, particularly for winter operations. Other non-Arctic capabilities, such as the Global Eye and Wedgetail aircraft, were also seen as valuable contributors to steady-state posture because of their ability to cover meaningful areas with higher fidelity sensing than space assets were able to provide. Similarly, during crisis moves, specialized capabilities such as cold weather environmental monitoring and cleaning equipment were identified as unique contributions from Nordic states. Experience managing exercises in Greenland and northern Scandinavia was also seen as valuable, given the focus on expanding exercises in Blue team play. For example, practical limitations on operating in Greenland deterred players from proposing such an event in their final plan.

Related to this, the Nordic states have a centuries-long history of relations with their near-neighbor Russia and maintain deep knowledge and analytical expertise regarding Russian politics and policies today. As a result, they can bring a more nuanced perspective to policy debates regarding how the West should approach issues of common interest with respect to Russia. This expertise was identified by participants as an invaluable asset in discerning the intent behind Russian actions.

Recommendations for Enhancing Consultation and Decisionmaking

Below are players' recommendations for improving coordinated information-sharing and decisionmaking for maintaining alliance cohesion and managing crisis escalation.

Recommendations to Improve Information Sharing

- **Create new, informal channels for discussing Arctic security issues.** Players noted that NATO forums are not well suited to managing issues in the Arctic because key players (Sweden, Finland) are not NATO members (at the time of game play) and most NATO members have no direct stake in the Arctic. Players suggested that conducting regular meetings among the Western Arctic nations at multiple levels (e.g., 0-6, general officer/flag officer, ambassadorial) would help in forging personal ties and trust, which would in turn facilitate communication and consensus-building in times of crisis. These channels should not be limited to military entities, but should also include civil agencies with security responsibilities, such as coast guards.¹⁰
- **Expand resources devoted to analyzing publicly available information.** Publicly available information can be a rich source of insights about activities of interest and the

¹⁰ The viability of using the existing forum to serve these purposes was not discussed during the game but was raised by several stakeholders as a potential option for consideration.

intentions of key players. Examples include data regarding shipping activities provided by the Automatic Identification System, commercial space-based sensing of remote locations, and Russian-sponsored activities on Western social media platforms. The allies and partners could pool their resources devoted to collecting and analyzing these data and agree to share products.

- **Create a “Rel Arctic 7” caveat for classified information.** Players highlighted the importance of having classified information that was releasable to all of the key partners and allies in the region. Appoint a senior information security/disclosure official in each country to review relevant reporting with an eye toward releasability.
- **Explore technical options for rapid, secure communication and data-sharing.** Players noted that the structure of current secure networks creates friction for actors seeking to pool and share information that goes beyond the restrictions on the information. Potential solutions such as a dedicated network or alternative technical solutions to managing access at the level of information, rather than network, were highlighted by players.

Recommendations for Increased Engagement

- **Convene regular tabletop exercises and games with allies and partners.** This would socialize players to the importance of getting to collective decisions under time pressure. Exercises that consider a range of competition activities may be particularly useful to complement more traditional warfighting scenarios. Given the importance of civil agencies in competition, stakeholders from these communities should also be invited to participate.
- **Expand field and command-post exercises and training.** Players regarded exercises that offered the opportunity to build interoperability and specialized skills as particularly important. Given the important role that civil capabilities played in crisis response, both due to their specialized capabilities (ex. cold weather SAR, environmental cleanup) and desire to avoid playing into Russian narratives of Western militarization, emphasis could be placed on military operations in support of civil authorities.

Recommendations for Multilateral Consultation and Decisionmaking

- **Understand that decisionmaking must include interagency representation and often a nonmilitary lead.** In competition, civilian organizations will often have the lead, and it is critical that militaries not impose additional barriers to smooth coordination when not required for their supporting role. For example, player discussion noted that objections to Russian rules restricting access to the NSR were best dealt with in diplomatic channels, while environmental clean-up capabilities resided in civilian agencies, including coast guards. Many of these roles and responsibilities are delineated in existing agreements, such as the rules governing Arctic SAR, but may not always be familiar to military forces supporting these efforts. As a result, ensuring that relevant nonmilitary coordination channels are resourced and practiced will be critical to timely responses.¹¹

¹¹ As noted previously, both game staff and players were aware of the limitations of Plan Blue as a forum for discussion due to exactly these gaps in participation.

- **Recognize and prepare for the fact that Russian representatives should sometimes be included in deliberations.** Of course, Russian interests in the Arctic and elsewhere sometimes conflict with those of the West. But Moscow is an important stakeholder in the region, and key allies and partners that live “next door” (Norway, Sweden, Finland, Denmark) are keen to avoid needlessly alienating their powerful neighbor. Accordingly, U.S. representatives to Arctic forums, including military ones, will want to avoid being perceived as reflexively anti-Russia. That said, Russia’s flagrant and repeated violations of international norms and human rights in Ukraine will mean that its representation in international forums will be severely restricted, if not eliminated in many instances, for the foreseeable future.

Most of these initiatives extend beyond the purview of the DAF or DoD. Many call for a parallel or higher-level diplomatic component. The DAF and DoD officials could initiate multi-agency efforts to consider moves in these directions.

Concluding Thoughts and Insights for Senior Leaders

Findings from Plan Blue reinforced insights concerning each of the game’s three major objectives. First, the game suggested that Russia’s interest in the Arctic will grow and will likely remain greater than the West’s. At the same time, without a major increase in investments on the part of the West or the collapse of Russian efforts (a possible outcome of overreach in Ukraine), the West will likely need to adopt limited objectives in the Arctic, particularly in the short term. But then as long as alliance cohesion is maintained and vital or important Western objectives are not threatened during competition, it is unlikely that these limits will materially damage the competitiveness of the United States and its partners and allies. However, the game also highlighted the importance of the connection between the Arctic and other regions, and the potential for crises to move geographically, complicating potential responses. As a result, minimizing the chance of misperceptions by increasing our understanding of Russian priorities, intentions, and red lines may be particularly important.

Second, sensing in the Arctic was most valuable in its ability to provide shared situational awareness. These results suggest that sensing investments that contribute to broad surveillance, such as OTH radars and space-based sensing, are more attractive than higher-fidelity, narrower tools such as unmanned airborne platforms. Open-source capabilities, including commercial and scientific sensors, are particularly attractive because of their ability to enable information-sharing across partners. At the same time, it is critical to set expectations that this type of information is not likely to shape Russian decisionmaking.

Finally, while maintaining a coherent alliance requires the ability to share information in a timely manner, this is currently restricted by technical and policy barriers. Working to ensure that allies and partners have a solid understanding of the priorities of all stakeholders, as well as capabilities and restrictions, is critical to mounting a coordinated response. Since Russia is benefited by actions that split the alliance, coherence will be one of the most important characteristics of successful competition, even if it requires a less aggressive approach to countering Russian behavior in the short term.

Appendix A. Plan Blue 21 Scenario Assumptions Memo

This appendix replicates materials that were provided to players to establish a shared vision of change in the Arctic projected from the context in which the game was played in 2021 to the date of the game setting in 2030.

This memo lays out the key assumptions related to climate, economics, and geopolitical conditions that will shape the scenario past narrative¹ for Plan Blue FY21. In selecting key assumptions, we have followed several guiding principles:

- Projections regarding climate change and its consequences should align with the scientific consensus as reflected in the body of reports by the Intergovernmental Panel on Climate Change (IPCC).²
- Within the bounds of the academic and policy literature, scenario assumptions should be selected to maximize the areas and degree of tension between Russia, and the U.S. and its allies and partners.

The resulting choices do not claim to represent a “most likely future” but rather a plausible vision of 2030 that is of particular interest for exploring potential demands on U.S., allied, and partner military forces, with a particular focus on sensing on managing competition and crisis in the Arctic.³

Climate Change Assumptions

The science of climate change is complex, and offers a range of projections for warming and its impacts. In defining climate change assumptions, we distinguish between two time frames: (1) trends covering the period from now until the 2030 setting of the game, which will directly inform the game environment, and (2) projections about what the further future holds that could affect 2030 decision making.

¹ Harvey A. DeWeerd, *A Contextual Approach to Scenario Construction*, RAND Corporation, 1973.

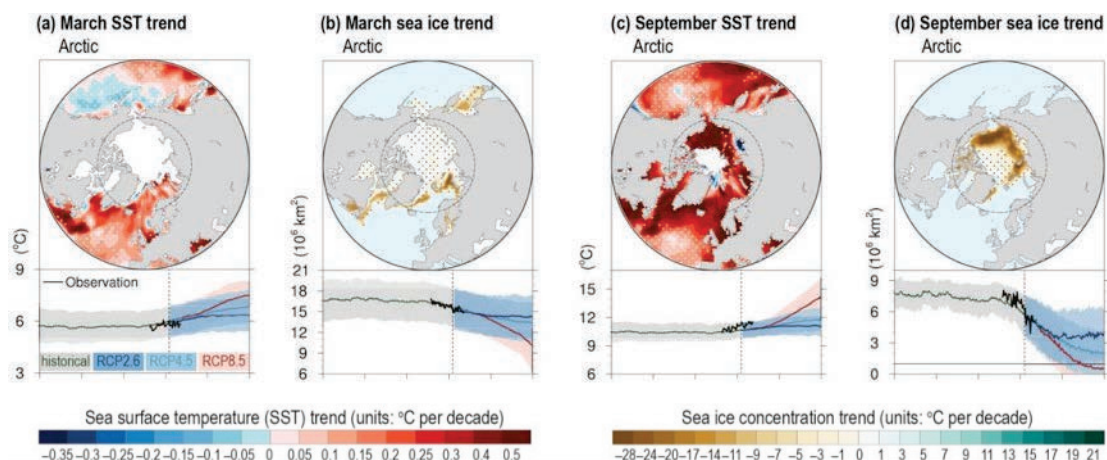
² See Meredith et al., 2019; Intergovernmental Panel on Climate Change, “IPCC, 2019: Summary for Policymakers,” in H.-O. Pörtner, D. C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, and N. M. Weyer, eds., *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*, April 2021.

³ Dirk Notz and Simip Community, “Arctic Sea Ice in CMIP6,” *Geophysical Research Letters*, Vol. 47, No. 10, 2020.

In the 2030 timeframe, expected trends are relatively consistent across projections, regardless of policy actions between 2021 and 2030. The most relevant of these for Plan Blue include

- Melting of sea ice will increase the seasonal navigability of key sea lanes. By the early-to-mid 2030s, we expect further declines in Arctic sea ice, making maritime routes through the Eurasian Arctic and off the coast of Alaska increasingly accessible for a greater portion of the year. We anticipate the Northern Sea Route area having the longest and most consistently open sea lane, with other northern routes, such as the Northwest Passage, will be increasingly navigable by vessels with no or little ice reinforcement. A route across or near the North Pole may emerge during the 2030 decade, and the world could see its first ice-free Arctic summer. However, sea ice extent will continue to vary substantially year-to-year and seasonally. Winter season navigation will remain more challenging, but will be most possible in the Northern Sea route due to more favorable climate conditions and technology/infrastructure needed to support shipping.

Figure A.1. Polar Ice Trends from IPCC



SOURCE: Meredith et al., 2019.

- Melting ice sheets, reduced snow cover, thawing permafrost, and flooding due to melting generate failures in Arctic infrastructure and generation of local hazards, disrupting traditional activities. Specific concerns include
 - Arctic air fields may not be able to support operations by aircraft with high single wheel loading (SWL) factors
 - Unstable roads and buildings due to permafrost melt
 - Difficulty using ice roads for logistics
 - Potential for storms and sea level rise + permafrost to create land instability at some coastal locations, requiring infrastructure in some places to move inland
- Ocean warming is expected to disrupt historical commercial fishing activities, with species on average moving further north. As a result, there is more activity generally, and more illegal fishing activity in particular in the Arctic region, resulting in a higher policing presence.

Conditions in the years beyond 2030 are more sensitive to assumptions about current climate change mitigation activities. For purposes of this game, we assume that all signatories to the Paris Agreement invest in climate change mitigation, but major emitters including China, the U.S., and Russia are unable to sufficiently decarbonize their economies such that a global increase in temperature of up to 2.2 degrees C by 2050 is likely.

Given this assumption, key projections expected to inform the minds of 2030 decisionmakers about the future of the Arctic include the intensification of the key trends listed above. Particular ramifications include:

- Anticipation of more economically accessible hydrocarbons and potentially new markets for blue or green hydrogen, particularly relevant to Russia and Norway
- Easier ability to bring minerals and other raw materials to global markets, for example from Greenland
- Further opening of Northwest Passage shipping route to potentially rival the Northern Sea route if appropriate infrastructure investments are made
- Increasing likelihood of the opening of a Central Arctic Ocean route in the coming decade(s) that will rival the Northern Sea Route and reduce incentives to develop the Northwest Passage for navigation
- Growing commercial fishing opportunities in and around western Canada-eastern Greenland, Alaska, and elsewhere

Geopolitical Assumptions

As a direct result of the emergence of a navigable Northern Sea Route, Russia strongly enforces its right to monitor traffic in this shipping lane based on its proximity to its territory. This enforcement includes attempted vessel boardings and denial of navigation/communications as more vessels with less ice strengthening are able to safely navigate the route. The U.S. and its allies and partners continue to contest this claim.

In addition to the geopolitical assumptions that flow directly from climate change, we have identified several additional factors regarding the relationship between Russia and the U.S. and its allies and partners.

Perhaps most critically, we assume that relations between Russia and the U.S. and its allies and partners will continue to deteriorate. We expect that the current conflict in Ukraine will continue, at least in a frozen state, and that objectionable Russian activities, including election interference, promotion of societal divisions in the West, and human rights abuses will continue in the period from 2021–2030. As a result, we project that economic sanctions will continue, and that key fora such as the G-7 or, at the regional level, the Arctic Security Forces Roundtable, will continue to operate without normal participation by Russia. Arctic states will continue their historical cooperation in nonmilitary-focused regional forums, including the Arctic Council, Arctic Coast Guard Forum, Barents-Euro Arctic Council, and Business Index North.

Second, we assume that while NATO retains close cooperative ties with its European partners, there is no serious effort to expand NATO between 2021 and 2030.

Additionally, we assume that by 2030, a scientific decision on the status of the continental shelf will be reached in favor of Canada and, to a lesser extent, Denmark, over Russia. As a result, we assume legal disputes are ongoing, with Russia on the defensive. Canada may decide to increase its presence in the vicinity of the North Pole.

Greenland is increasingly seeking external investments to further develop fisheries, mining, and tourism. China offers green technologies to help develop these resources, increasing its influence in a growing Arctic economy.

Economic Assumptions

As a result of the climate change and geopolitical assumptions discussed in the earlier sessions, we anticipate several key economic trends in the 2030 time frame:

- Sanctions continue to weaken the Russian economy, and drive closer economic cooperation with China to make up for the decline in European trade. This will also limit Russia's ability to invest in decarbonization strategies and to develop clean hydrogen as an alternative to natural gas production.
- The Northern Sea Route will be increasingly used by commercial shipping, with the expectation of additional northern routes across the pole and in the Western Hemisphere that could offer other options in the future. As a result, Russia sees a time-bound window to take economic advantage of the route.
- Western decarbonization initiatives weaken global demand for hydrocarbons, reducing Russian hydrocarbon exports and state revenues.
- Increases in northern fishing activity as a result of warming global oceans lead to increased Arctic activity, and the expectation of increasing competition for catches by 2050.
- Ease of maritime access also helps to bring more minerals and raw materials to global markets.
- The Barents region, including northeastern Russia, grows as a hub for information technology and green industry, including battery production.
- Growth in the North American Arctic is slower, but is spurred in part due to growth in access to digital infrastructure and technical education.

Appendix B. Plan Blue 21 Steady-State Game Mechanics

This appendix provides details about the game mechanics that underpinned steady-state moves in Plan Blue 21. The first section discusses the mechanics put in place to manage allocation of assets, while the second part describes the custom visualization tool that was developed to show the impact on relative situational awareness of reallocations.

Allocation and Adjustment of Forces

The allocation process of the steady state was designed to emulate the Global Force Management (GFM) allocation process in which combatant commanders request forces to be deployed in their areas of responsibility each fiscal year. Rather than have each team construct its request for forces from scratch, each team was given a baseline allocation of forces for the summer and winter seasons in 2030. The teams were then prompted to adjust the baseline against constraints typically encountered within the GFM allocation process, such as competing global demand for assets. The baseline force was based on past and current deployments to the Arctic as well as projected force structure changes for the United States and partner nations for the Blue team, and for Russia for the Red team. The goal of this constraint was to replicate the existence of global demands without postulating a specific new contingency. Given that we did not project a dramatic realignment of U.S. priorities, it seemed reasonable to assume that requirements for presence missions, countering violent extremist organizations, and low-level contingency operations would persist and prevent a major redistribution of assets to the far North.

The baseline force for both Blue and Red teams contained Arctic-relevant assets across domains from multiple nations. U.S. air assets included fifth-generation fighters based in Alaska for homeland defense and periodic bomber task force (BTF) presence in the region.¹ U.S. airborne sensing included an E-3 Sentry providing an AWACS, also based in Alaska, along with three

¹ Strategic Command (STRATCOM) SMEs contributed to the baseline estimate for the BTF, and Pacific Air Forces (PACAF) SMEs for fifth-generation fighters. The 90th and 525th squadrons, composed of F-22 aircraft, are assigned to Joint Base Elmendorf-Richardson, Alaska, and have aircraft continually assigned to alert missions for homeland defense. The Air Force started to field two F-35 squadrons in Alaska in 2020, and while it is not conducting homeland defense missions as of 2020, it may do so in the future. For more information on fifth-generation fighters conducting homeland defense, see U.S. Government Accountability Office, *Force Structure: F-22 Organization and Utilization Changes Could Improve Aircraft Availability and Pilot Training*, GAO-18-190, July 19, 2018; and Brian Everstine, “Close Encounters of a Familiar Kind,” *Air Force Magazine*, November 1, 2020. BTF units have flown several missions over the Arctic in recent years, and in February 2021, European Command (EUCOM) announced a temporary deployment of a B-1 Lancer squadron and 200 USAF personnel to Norway to support BTF missions. See U.S. European Command Public Affairs, “U.S. Air Force Personnel Arrive for First-Ever Norway Deployment,” U.S. European Command, February 2, 2021.

sorties per month of a HALE UAV.² U.S. maritime assets included manned and unmanned surface vessels (USVs), a surface action group, and a submarine presence conducting patrols in the region, along with numerous icebreakers and cold-weather vessels dedicated to the Arctic.³ U.S. ground forces centered on the U.S. Army's MDTF.⁴

International forces in the baseline were composed of similar elements, such as fighters, UAVs, surface vessels, and submarines. As a general rule, we assumed that the UK and Canada would provide 25 percent of their capacity of relevant assets for operations in the Arctic, while other partners would have 50 percent operating in the Arctic.⁵ Exceptions included the deployment of a UK littoral strike group, similar to a U.S. amphibious ready group, and other surface vessels for exercises. Cyber effects and defense, as well as information operations teams, were also included. A similar unclassified depiction of Russian capabilities was developed, which highlighted both Arctic-specific assets, such as icebreakers, and other relevant capabilities, such as EW. Exemplar space systems, with a focus on emerging commercial capabilities, and generic offensive and defensive units were also included for both teams. A list of assets available to the Blue team, including those outside the baseline, is found in Table B.1; Red team equivalents are shown in Table B.2.

² AWACS presence based on E-3 Sentry assigned to Joint Base Elmendorf-Richardson and ongoing E-3 support for Operation Noble Eagle (homeland defense). See U.S. Department of the Air Force, "E-3 Sentry (AWACS)," fact sheet, undated.

Three sorties of a HALE UAV are based on one collection sortie provided by each of the three combatant commands engaged in the Arctic.

³ The U.S. naval presence was based on past presence and participation in international exercises and patrols, along with adjustments for future ship construction and increased activity in the Arctic. Significant events used to create the baseline include a 2020 UK-U.S. patrol in the Barents Sea, a 2020 U.S.-UK-NO naval exercise in the Barents Sea, the annual Canadian-hosted Operation Nanook, the multinational Dynamic Mongoose exercise hosted each year by Norway and Iceland, and the annual U.S. submarine exercise in the Arctic titled ICEX.

The United States Coast Guard has requested funding for three new heavy icebreakers, followed by three medium icebreakers to replace and/or complement the current fleet of one heavy and one medium icebreaker. According to the Coast Guard, these additional icebreakers are needed to meet increased demand for polar icebreaking year-round in the Arctic. Two heavy icebreakers have been funded as of 2021. For purposes of the game, we categorized icebreakers as either heavy icebreakers or icebreakers. For more information, see Ronald O'Rourke, *Coast Guard Polar Security Cutter (Polar Icebreaker) Program: Background and Issues for Congress*, Congressional Research Service, RL34391, December 30, 2021.

⁴ The U.S. Army strategy for the Arctic, released in January 2021, states that the Army will station an MDTF in Alaska to experiment with delivery of effects in the region, pose an anti-access/aerial denial challenge to adversaries, and test Army modernization priorities and operational concepts in the extreme environment of the Arctic (U.S. Department of the Army, 2021, p. 45).

⁵ This was an estimate of convenience generated to reflect the greater global commitments of the U.K. and Canada. These estimates were assessed as reasonable by RAND SMEs and players in both games.

Table B.1. Exemplar Blue Team Assets

Domain	Type	Selected Assets
Air	Fighter	F-22 (U.S.), F-35 (U.S./UK), Gripen 39 (SE), Typhoon (UK), F/A-18 (CA/FN)
	Bomber	BTF (U.S.)
	Long-range ISR	AWACS (U.S.), Wedgetail (UK), RC-135 (U.S./UK), HALE UAV (U.S.)
	Short-range ISR	Medium-altitude, long-endurance (MALE) UAV (U.S./CA/DK/IS/ UK), RQ-170 (U.S.),
	Maritime patrol	Maritime patrol aircraft (MPA) HALEUAV (U.S./UK)
Ground	Radar	Sentinel A4 (U.S./UK), ground/air task-oriented radar (G/ATOR) (U.S.), TPY-2 (U.S.), lower-tier air and missile defense sensor (LTAMDS)(U.S.), Three-Dimensional Expeditionary Long-Range Radar (3DELRR) (U.S.)
	Mixed	MDTF (U.S.)
Maritime	Surface vessel	Surface vessel (U.S.), cold-weather surface vessels (U.S./CA/DK/FN/IS/NO/SE), small carrier strike group (CSG) (U.S.), amphibious ready group (ARG) (U.S./UK), signals intelligence (SIGINT) vessel (NO/SE)
	Icebreaker	Icebreaker (U.S./FI/NO/SE), heavy icebreaker (U.S./CA/FI)
	Subsurface vessel	Submarines (U.S./CA/NO/SE/UK), large displacement unmanned underwater vehicles (LDUUVs) (U.S.), glider (U.S.)
Cyber	Cyber offense	Cyber Effects Team (U.S.), Information Operations Team (U.S.)
	Cyber defense	Cyber Defense Team (U.S.)

NOTE: CA = Canada; DK = Denmark; FN = Finland; IS = Iceland; NO = Norway; SE = Sweden; U.S. = United States; UK = United Kingdom

Table B.2. Exemplar Red Team Assets

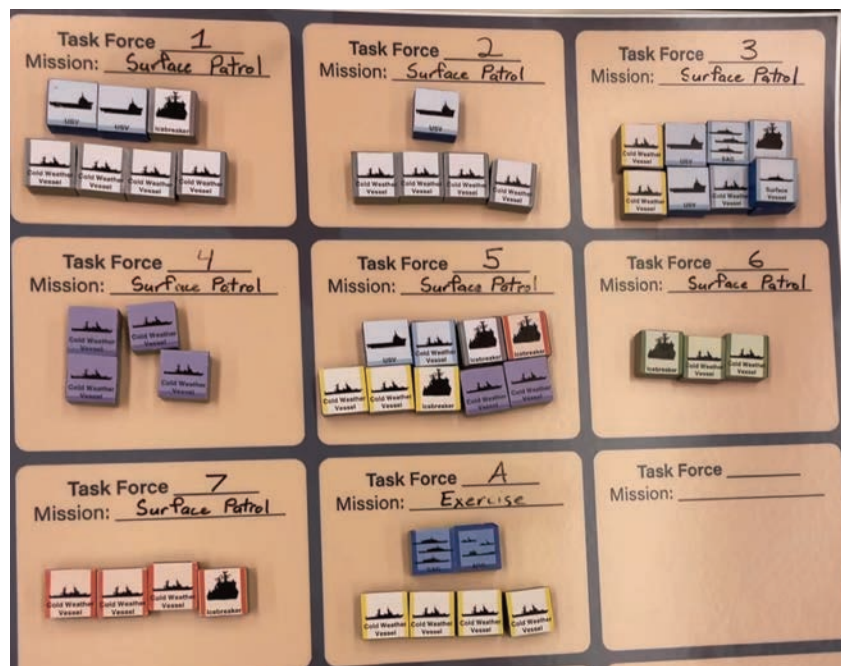
Domain	Type	Selected Assets
Air	Fighter	Su-57, fourth-generation fighters
	Bomber	TU-22M3s
	Long-range ISR	A-50/50U
	Short-range ISR	Forpost, Orlan
	Maritime patrol	Il-38, Tu-142MR/MK
Ground	Radar	Mobile OTH radar, Yenisei radar, SA-22
	EW	Bylina-MM, Murmansk-BN
Maritime	Surface vessel	Coastal ASW surface vessel, hydrographic ships, intelligence vessel
	Icebreaker	Icebreaker, heavy icebreaker
	Subsurface vessel	Klavesin-2R-PM LDUUVs, Submarines
Cyber	Cyber offense	Cyber Effects Team, Information Operations Team
	Cyber defense	Cyber Defense Team

To help players more readily understand and adjust the baseline allocation, assets were organized into task forces with four distinct components: composition, duration, location, and mission. Players could adjust each of these components in order to better align the force with their key LOEs.

Composition, Duration, and Trade Space

Task forces were composed of individual assets—such as cold-weather vessels, icebreakers, fighters, or sensing assets—of multinational or a single nation’s origin. Naval assets, typically operating in groups away from their respective bases, were tracked with task force counters on the game map, and individual counters composing each task force were placed on a designated tracking sheet to the side of the map (see Figure B.1). Air assets, which do not operate away from any base for extended periods, were represented on the game map as individual assets, such as dedicated sensing platforms, or small groupings of identical assets, such as fighters. Air assets were, however, still grouped into task forces for missions and tracked on both paper and electronic slide decks available to players. Deployable ground radars and maneuver units (e.g., the Army’s MDTF) also had individual counters and were depicted on the game map. Any adjustments to task force composition, while tracked on the game map or slides, were also recorded in the virtual adjudication tool (described below).

Figure B.1. Task-Force Tracking Sheet



The duration of a task force's mission represented the number of months/days a task force was available to conduct operations in the region. Duration was tracked on the game map via poker chips placed underneath task force or asset counters, with one chip representing one month of time available for operations. Changes to duration were tracked on the map as well as by the virtual adjudication tool.

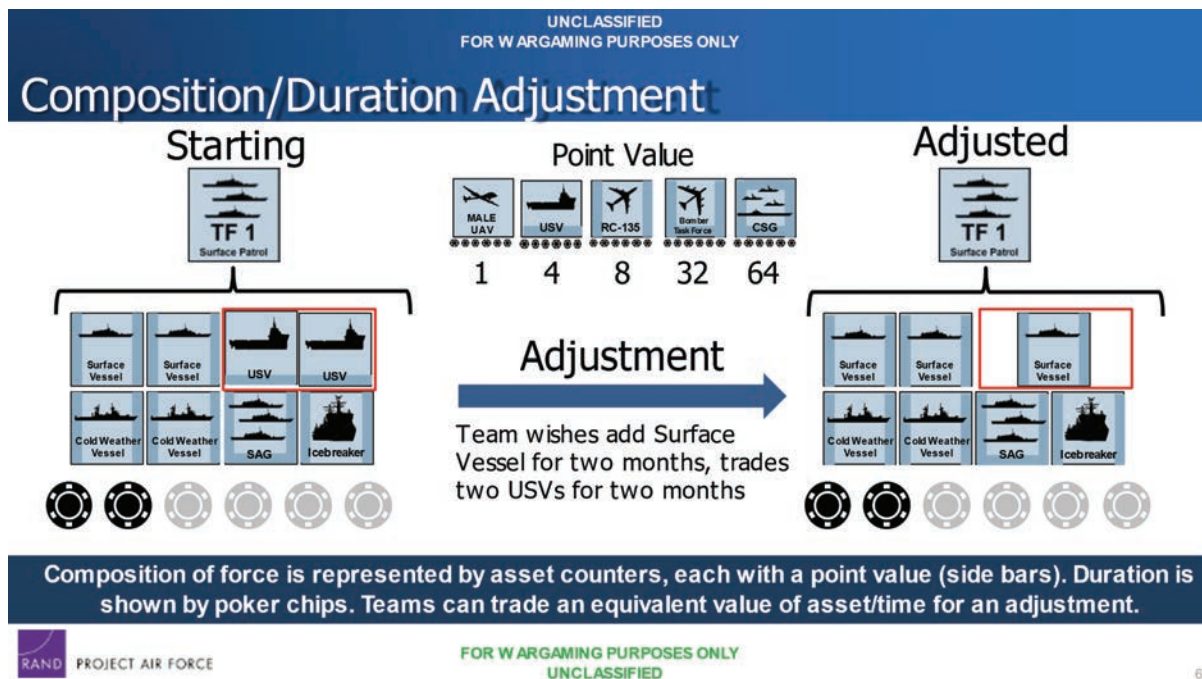
To enable, constrain, and simplify the trade space of allocated assets, each asset was assigned one of five possible point values: 1, 4, 8, 32, 64. The values corresponded to the relative supply and demand of an asset in the joint force as well as their operating cost—that is, they tried to capture the subjective “worth” of an asset to a commander, rather than relying solely on the objectively quantifiable procurement or operating costs. Assets with relatively high supply, low demand, and low operating cost, such as an MQ-1 Predator, had the lowest possible value, while a relatively low-supply, high-demand, and high-operating-cost asset, such as a carrier strike group (CSG), received the highest possible value. This scale alternates between a doubling and quadrupling of value between categories to capture the significant value differences between low-demand unmanned assets such as the MQ-1 Predator, higher-demand sensing assets including the RQ-4 Global Hawk and RC-135 Rivet Joint, assets with more sustained presence such as surface vessels and fighters on alert missions, and aggregated assets such as the BTF or CSG. The scale was intended to capture rough relative values rather than precise trade-offs, particularly between assets operating in different domains. The relative values were shared with RAND SMEs informally to ensure that they aligned with their subjective assessments.⁶

Players could ascertain an asset's value by counting the number of darkened borders on an asset's counter. Assets with a value of 1 had no darkened border, a value of 4 had one darkened border, a value of 8 had two darkened borders, and so on until all darkened borders represented the highest value of 64 points.

Players wishing to adjust the composition of their baseline posture could trade any asset as long as the point value of the assets gained was equal to or less than that of assets traded in. Figure B.2 provides an exemplar allocation adjustment within the notional Task Force 1 (TF 1), which is a surface patrol task force composed of various U.S. Navy assets, represented by the individual asset counters under the TF 1 counter, operating in theater for two months, denoted by the two poker chips beneath the asset counters. In this example, the Blue team wishes to have an additional surface vessel for the same duration. The surface vessel, having two darkened borders denoting a value of eight points, requires the Blue team to trade in assets of at least eight points. In turn, the Blue Team chooses to trade in two USVs, each with one darkened border and

⁶ We recognize that these relative values allow for unrealistic comparisons between assets. For instance, 64 MQ-1s has equal value to 1 CSG under this scale. We did not assign values to assets as a quantitative assessment of an asset's potential effect in theater, but rather to permit players to make simple adjustments to their baseline force. We constrained this trade space to prevent unrealistic adjustments, such as trading 64 MQ-1s for 1 CSG, by setting maximum and minimum capacity limits for forces as described later in this section.

Figure B.2. Example Allocation Adjustment



NOTE: SAG stands for surface action group.

therefore worth four points each or eight total. The trade resulted in the adjusted TF 1 with an additional surface vessel and less two USVs.

To prevent unrealistic trades, such as trading a CSG for more MQ-1 assets than are available for global allocation, each asset had a minimum and maximum presence in theater. In terms of GFM, these figures are similar to the floor and ceiling of a capability established within each combatant command (CCMD). In the absence of precise data on minimum and maximum thresholds for U.S. and partner assets in the Arctic, these figures were based on percentage increases or decreases from the baseline force or total fleet and varied by nation. For instance, U.S. fighter aircraft, AWACS, and maritime vessels could be reduced or increased by no more than 50 percent of the baseline allocation. A 50 percent margin for adjustment ensured that these assets, critical for homeland defense in the Arctic, remained in theater if players wished to trade them while also preventing significant degradation of these critical forces from other theaters. For partner nations in the Arctic, assets could be reduced to as little as 25 percent of the baseline or increased to as much as 100 percent of their respective fleets. Similarly, this rule ensured that Arctic nations with greater focus on the region maintained a minimum force in the Arctic while also allowing them to dedicate all critical forces available to defending their interests.

Exceptions to the minimum and maximum rules were made. For U.S. airborne sensing assets, such as the RC-135 or MQ-4, the maximum and minimum were set at a 100 percent increase and decrease from the baseline, respectively. Given the high demand for ISR assets across theaters, we determined that the Arctic may receive low priority and subsequently no allocation of ISR assets

and that spaced-based and other platforms would fulfill sensing missions instead. In turn, the Arctic could also prove a flashpoint and pull sensing assets from the three CCMDs of the region. The BTF, a strategic force, could also be increased or decreased by up to 100 percent by the same reasoning. Like the logic behind asset point values, the minimum and maximum allocation figures were intended as rough constraints on the trade space rather than precise boundaries.

Location, Mission, and Other Steady-State Moves

In addition to adjusting the composition and duration of assets in theater, players could change the location of a task force or repurpose its mission. Players could draw on scratch game maps, the game map itself, or communicate to the facilitators the new location, and facilitators then assessed whether the adjustment was possible given operating ranges and basing requirements. For example, players could request that a surface patrol move from the Bering Sea to the North Atlantic and draw a specific route through the area. If the location change was not feasible, facilitators would state the limitations and propose alternatives if possible. A change to a mission could be made in the same manner. For example, players could request one or more surface patrols instead of an exercise. Facilitators would note any constraints.

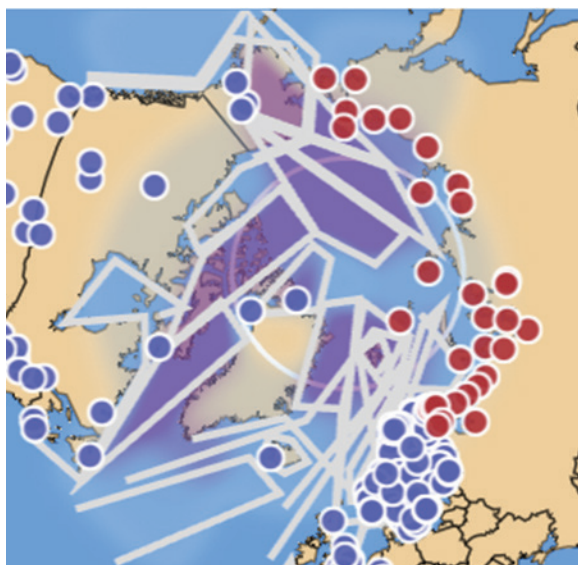
Within the Steady-State phase, players could also direct changes outside of the allocation process. For one, they could reposition nonallocatable assets—that is, Arctic-specific assets that are assumed to be permanently or near-permanently deployed to the Arctic region. These assets, such as icebreakers, cold-weather vessels, and the U.S. Army’s MDTF, could be moved to a new location or repurposed, but they could not be traded. Players could also direct information operations or utilize any cyber access gained during the baseline investment phase. Any other requests, such as activities or dialogue with nations outside of those explicitly represented in the game, would be directed to the White Cell for adjudication.

Game Play Effects and the Virtual Adjudication Tool

Player adjustments to the steady-state posture produced effects in the game across three key tasks: power projection, presence, and sensing. For power projection, a change to a task force’s composition, duration, location, or mission altered Blue’s ability to respond to any crisis or developing situation in the region that would appear in the next phase of game play. A change in presence, closely tied to power projection, could subjectively influence the adversary team’s decisionmaking and either deter or motivate its actions. Sensing adjustments, unlike changes to the former two tasks, produced quantifiable changes to the team’s shared situational awareness in the Arctic, which were captured by the game’s virtual adjudication tool.

The tool, designed for Plan Blue by RAND, allowed facilitators and players to modify and visualize the air, surface, and subsurface sensing network over the Arctic. After receiving the composition, duration, location, and mission of each task force, the tool produced an aggregated map of a team’s activities in the region similar to the example output for Blue in Figure B.3. When working within the tool, the facilitator could move the cursor over any aspect of the map and

Figure B.3. Virtual Adjudication Tool



receive a text box explaining the selected feature. Dots symbolized base locations for Blue and Red, respectively, white lines represented the operating location of a task force, and purple shaded areas denoted the probability of detecting an adversary asset or task force within a given domain.

To account for the long turn steps, quantitative adjudication was designed to provide a gross sense of the contribution of different sensors. Space systems were not included in the tool because they would provide even coverage over the full area over the course of the steady-state turn. The contributions of cyber and national intelligence sources were not included in the visualization because these were seen as providing a different type of information (for example, intentions) than the situational awareness displayed in the tool. Instead, the contributions of these domains were communicated to players in the description of what was known about different adversary systems in different regions. For subsurface, surface, and airborne assets, the contribution of each sensing asset in the visualization was developed based on unclassified approaches to calculating EO/IR,⁷ airborne phenomenology approximated by the radar horizon, including synthetic aperture radar SAR and SIGINT,⁸ and maritime

⁷ Erik Blasch and Bart Kahler, *V-NIIRS fusion modeling for EO/IR Systems*, conference paper, IEEE National Aerospace and Electronics Conference, June 2015.

⁸ For space-based sensors we estimated the radar horizon as the geometric horizon with a spherical earth approximation with average earth radius of 6,371 kilometers using the equations available in Wiley J. Larson and James R. Wertz, eds., *Space Mission Analysis and Design*, 3rd ed., Space Technology Series, Microcosm Press and Kluwer Academic Publishers, 1999, pp. 110–111. We used the same approach and equations for calculating the radar horizon for sensors operating within the earth's atmosphere except that we scaled the average earth radius by a factor of 4/3 to account for radio frequency ducting in the atmosphere as recommended by the International Telecommunication Union, "Effects of Tropospheric Refraction on Radiowave Propagation," Recommendation ITU-R P.834-9, December 2017, p. 2.

sensing,⁹ which accounted for the range, sensor performance, and time on station set by players. Because these approaches are designed to account for more tactical analysis than was used in this context, we felt it more appropriate to describe the resulting coverage as providing players with a relative sense of the contribution to situational awareness provided by the steady-state posture.

By the end of the Steady-State phase, players had the opportunity to adjust their baseline allocations, reposition nonallocatable assets, and direct information or cyber operations to match their key LOEs. This process, initially taking place in summer 2030, was repeated for winter 2030 after the summer crisis response phase.

⁹ Christopher Paul, Michael Nixon, Paul DeLuca, *One Hot Ship: Air-Naval Integration Opportunities in Maritime Interdiction Operations*, RAND Corporation, 2010. Please note that this report is not publicly available.

Appendix C. Crisis Cards Developed to Support Plan Blue 21

This appendix lists the crises that were developed for use during Plan Blue 21. The set of events was generated based on a broader set of over 100 potential Russian competition actions and drawn from past gray-zone games.¹ Criteria used to select crises included

- a clear potential for a response that involved military assets, as well as nonmilitary activity, with a particular focus on sensing
- issues involving allied and partner, as well as U.S., interests
- Russian activity that clearly connected to Russian interests and was considered plausible by Russian and Arctic specialists.

Additionally, the overarching scope of Plan Blue influenced the range of crises considered. Because other games were tasked at looking at the escalation from crisis to major combat operations and the potential for other conflicts to spill over into the Arctic, these topics were not considered for inclusion in Plan Blue.

The selection of which crisis to run weighed several factors:

- promotion of robust dialogue between U.S. military, interagency, and international representatives
- potential involvement of multiple types of assets across multiple domains
- considerations of geographic location, and
- a preference for more stressing scenarios over more limited crises.

Crisis 1: Manufactured by Deep Fake

- According to several European news outlets, NATO military vessels operating in the Barents sea off Russia's Arctic coastline violated Russian territorial integrity by crossing into Russian waters during NATO military exercises despite a peaceful forewarning by Russian naval vessels.
- NATO commanders on the scene assert, and navigation records confirm, that the task force was more than 10 nm outside of Russian waters.
- In a press conference, Russian officials air video footage and still imagery capturing the incident as evidence. Russian decisionmakers call the alleged transgression a "grave threat" to Russian security, citing the incident as proof of NATO's "aggressive posture" toward Russia; this is echoed strongly on Russian state-controlled media outlets, RT and Sputnik.

¹ See Binnendijk, 2020; Pettyjohn and Wasser, 2019.

- In response, Russian officials announce that Russian personnel reserve the right to board any non-Russian vessels operating within Russia's Economic Exclusion Zone (200 miles from coastline).
- Additionally, Russia deploys armed private security contractors to civilian Russian vessels operating in the Barents Sea as well as to Svalbard.
- Western intelligence agencies reveal that evidence suggests the video and still images cited by Russian officials were manufactured deep fakes.
- Cyberattacks have been reported at U.S. & CAN port facilities, in the near vicinity of the Barents sea, disrupting maritime operations and potential U.S., CAN responses

Crisis 2: The Nuuk Syndrome

- Greenland is building a new deep-water port on its eastern coast with U.S. financing for civilian and military purposes. The new port will be open year-round.
- U.S. and local personnel working on the construction site start experiencing violent physical symptoms including debilitating migraines, seizures, nausea, and vertigo. Symptoms last weeks or even months. Family members sometimes experience the same symptoms.
- Western intelligence agencies report suspected GRU² agents near the port construction site and housing areas for construction workers/managers.
- Russia's use of directed microwave radiation against the new port's construction crews and management is suspected but cannot be established with certainty.
- The company charged with building the port finds it difficult to hire personnel, resulting in major delays.
- Russian state-controlled media launch counter-information campaigns offering alternative solutions of the observed symptoms, previous unknown ecologically and biologically damaging minerals, that have been introduced into the environment at the construction site.

Crisis 3: Uprising in Svalbard (Used During the Winter 2030 Move for O5/O6/GS-15 and General Officer Games)

- Norwegian local authorities arrest several Russian teenagers on Svalbard on drug charges. Svalbard has a zero-tolerance policy for drugs.
- The Russian community on Svalbard organizes protests in Longyearbyen, arguing that the teenagers were lured into the drug business by Norwegian drug dealers, who are "overtaking the streets of Longyearbyen and Barentsburg."
- Russia claims that Norway cannot control the rampant drug problem on Svalbard. Shortly after, an armed militia—the People's Protection Patrol—is set up in Barentsburg by the local population, with help from the Consulate of Russia.

² GRU is the common way of referring to the Main Directorate of the General Staff of the Armed Forces of the Russian Federation.

- Norway claims the militia is a violation of the Svalbard treaty, which prohibits militarization of the archipelago. Russia argues that the militia is not a military entity, and that Russians have to protect themselves if Norwegian authorities cannot do the job.
- Meanwhile, Norway receives intelligence that Russia, in addition to stoking separatism, might be about to send private military contractor (PMC) personnel reinforcements to the militia.
- Norway expresses its concerns to other NATO members, requesting urgent consultations regarding a possible multinational response.
- Cyberattacks against law enforcement facilities and infrastructure frustrate their ability to respond to any public disturbances.

Crisis 4: Moscow's Eye Under the Pole

- Russia announces a massive increase in state support for Arctic research, claiming the need to better understand the impacts of climate change.
- Russia increases the size of its current scientific bases, including in Svalbard, and creates large temporary ones on the ice close to the North Pole. Some of these bases appear to be also used for occasional training of special forces groups and other military units.
- At the same time, Russia also starts funding geoengineering techniques designed to expand Arctic ice. On this newly built ice, Russia installs passive hydrophones and magnetic anomaly detectors that force U.S. and allied submarines to adapt their operations.
- The U.S. protests that Russia is “building islands” and “annexing ice,” while Russia argues that it is only setting up Arctic mobile stations akin to the ones the U.S. sometimes sets up (e.g., Ice Camp Sargo set up in 2016 for U.S. Navy Ice X exercise).
- RUS state-controlled media launch documentary style expositions that support the RUS government's historical claims (all fabricated) and RUS's patriotic duty to save this region of the Arctic.
- U.S. and International automated weather stations begin to experience a usually high-number of faults and disruptions, possibly due to cyber-induced interference from RUS.

Crisis 5: Over-the-Horizon Misconceptions

- The U.S. and Canada are testing a north-facing skywave over-the-horizon radar called ROTHr-North providing detection of aircraft and large surface vessels out 1,600 nautical miles from the stations nominally in central Canada. Due to the Earth's tilt, under certain conditions a “second hop” of the skywave system is possible, allowing detection out to 3,200 nautical miles.
- Russian SIGINT stations detect the signals over Russian territory representative of a weak “third hop”. There is a hypothesis that advances in U.S. machine learning and signal processing can provide detection out to 4,800 nautical miles—covering much of Russia.
- Russian decisionmakers call this a “grave threat” to Russian security, citing the incident as proof of NATO's “aggressive posture” towards Russia. In response, Russian officials announce that steps to “limit the effectiveness” of ROTHr-North.

- ROTH-North operators note strange readings that suggest Russian ships and aircraft are taking electronic measures and physical maneuvers near U.S. and Canadian waters and airspace that are causing severely detrimental effects to ROTH-North, radar, and space sensing systems.
- U.S. and Canadian officials take this information public and scientists explain that a useful “triple hop” is not possible, and “double hops” are seasonal with limited functional utility.
- In the meantime:
 - U.S. and other western nations relying on ROTH-North, ground radars, and space for situational awareness are requesting alternative means to provide coverage.
 - NATO is considering measures to use electronic attack and other countermeasures to degrade the performance of Russian sensors in the high north.
- RUS cyber probing attempts are detected at the OTH radar site and occasionally there are unexplained, intermittent power outages.

Crisis 6: UUV Lost at Sea

- A NATO UUV performing maintenance on an undersea cable malfunctions and moves off course. After drifting for several weeks, it drops its sensor payload in the Barents Sea before surfacing in international waters and broadcasting a pickup request. Russian SIGINT platforms detect this message, and a Russian naval vessel is able to collect the UUV before a western ship arrives.
- Upon further study, the repair-centric mission of the UUV is discovered, and the underwater acoustic equipment is ultimately found by Russian submarines. Russian leadership is fearful that this is the start of a western sensing grid capable of tracking ballistic missile submarines near Russian ports.
- Russian leaders take their concerns to the U.N. where several tense sessions with U.S. and NATO ambassadors are unable to assuage Russian concerns. The U.S. and NATO allies maintain that it is a routine repair UUV that went off course while the Russian side, unable to verify the original mission, believes that the UUV was either repairing or emplacing a new detection grid.
- In response, Russian leaders task their submarines and ships to shadow maritime traffic and broadcast fake AIS³ and other signals near known and suspected U.S. and NATO undersea monitoring stations. The intent is to show that such a system would not be effective anyway. U.S. and NATO leaders respond that these actions are provocative and the reduction in maritime domain awareness puts fisheries management and search and rescue abilities at risk.
- Due to Russian actions, visual identification is now necessary to differentiate civilian, military, and fake traffic.

³ AIS stands for automatic identification system.

Crisis 7: Arctic Fisheries Gatekeeping (Used During the Summer 2030 Move for O5/O6/GS-15 Game)

- Continued scientific research on fisheries indicates the movement of valuable fish stocks in the Central Arctic Ocean waters.
- In 2030, Russia and China simultaneously use a provision of the legally binding *Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean* to withdraw from this Agreement.
- Russia hopes to deepen cooperation with China, with the expectation that China will support Russia's claim that the Northern Sea Route should remain under Russian control.
- The U.S. and Canadian federal Arctic waters remain off limit for commercial fishing, and the other signatories to the *Agreement* still pledge to abide by it. Yet other nations with large commercial fishing fleets decide to follow Russia and China's example and begin fishing in Central Arctic Ocean waters.
- Furthermore, Arctic nations start to observe suspicious activity in and near their EEZs, and are concerned by illegal trans-shipment activities and the presence of unexplained visitors to remote indigenous villages.
- The situation quickly becomes a management nightmare. Fishing vessels not common to the Arctic move in to try to exploit rich fisheries. Their lack of knowledge of Arctic conditions and navigation results in a rapid increase in search and rescue incidents.
- Arctic nations begin to more aggressively patrol waters. As naval forces are requested to augment Coast Guard vessels, greater air presence along EEZ boundaries begins to add something not common to the Arctic, congested airspace. Russia begins sending naval vessels and aircraft beyond its EEZ to project authority in the region.
- U.S. and other Arctic nations begin to experience an unusually high number of faults and disruptions at their maritime and aviation traffic monitoring sites, possibly due to cyber-induced interference from RUS.

Crisis 8: Simulated Coordinated Attack on Norwegian Bases

- Russia conducts a large-scale snap military exercise on the Kola Peninsula after several weeks of dangerously close encounters with NATO aircraft in international airspace in the region.
- During the exercises, Norwegian leaders announce that bases close to Russian territory were targeted in a simulated attack by Russian aircraft.
- Two groups of Su-34s took off from Monchegorsk Air Base and in near-unison flew toward their Norwegian targets in an attack formation, turning around just before reaching the border.
- RUS state-controlled media launch documentary-style expositions that support the RUS government's sovereignty (key strategic theme).

- Coordinated RUS MOFA⁴ press release regarding the right to conduct internal military exercises, promoting the need for realism in training, adopting U.S. armed forces adage of “training like you fight”.
- Social Media (Hostile-content) attacks by RUS troll farms aimed against FIN & NOR governments but not their people, in hopes of driving wedges.

Crisis 9: Gone Silent

- Scientific stations around Svalbard report the simultaneous loss of a number of sensors, including metrology and oceanographic data. The loss of this data limits economic activity around the island as uncertainty around weather and currents limits the allies’ ability to safely conduct operations.
- At the same time militaries with UUVs in the region lose contact with their unmanned vessels. The alignment of the timing suggests a shared cause for the sensor outage.
- U.S. government sources claim that the outage is due to a new Russian EW system test. Some intelligence services suggest that the scale and severity of impact was not intentional—that is, that the system performed far better than expected. Russia denies that their systems are responsible.
- The incident occurs during a new round of discussion within the U.S. about how to treat the EMS,⁵ with proponents of treating activity in the EMS as a potential act of war pointing to the severity of the incident and the need for deterrence, and detractors arguing the potential for accidental escalation given lack of clarity about Russia’s role is counterproductive.

Crisis 10: Rogue Russian Missile Creates Environmental Hazard

- The Russian Ministry of Defense announces an upcoming test of a “new model hypersonic missile” and warns ships and aircraft to stay outside of a restricted zone around the test area for a period of 36 hours.
- During the test itself, USG⁶ and commercial satellite imagery providers experience disruption to EO and SAR sensing as their satellites pass over the restricted zone. The disruptions are attributed to laser and EMS jamming.
- During the test, the missile veers badly off course and the self-destruct mechanism onboard (if there was one) fails. The missile crashes into the ocean off the coast of Svalbard/Greenland in Norwegian/Danish territorial waters.
- NATO is conducting a naval exercise nearby and several warships (U.S., UK, Norwegian/Danish) are dispatched from the exercise to search for debris from the missile.

⁴ MOFA stands for Ministry of Foreign Affairs.

⁵ EMS stands for electromagnetic spectrum.

⁶ USG stands for United States government.

- Four days later, one of the NATO surface combatants, working with a Norwegian salvage vessel, retrieves three large pieces of the missile body from shallow waters. Elevated levels of radioactivity are detected in the area of the crash site.
- Russia denies that there was nuclear material on the missile, protests NATO's "interference" in Russia's military development efforts, and demands that its own ships be allowed to enter Norwegian (Danish) waters to retrieve any remaining debris.

Crisis 11: Midair Collision

- In recent months, Russian fighter aircraft have been increasingly aggressive in their intercepts of U.S. surveillance aircraft operating off of Russia's northern coast in international airspace. The Commander of EUCOM⁷ has complained publicly of "dangerous and unprofessional conduct" on the part of Russian interceptor pilots.
- Two days ago, two Russian Su-27 fighters flew alongside an RC-135 flying 25 nm northwest of Franz Joseph Land. The RC-135 crew radioed that the fighters were "buzzing" their aircraft and passing within a few yards above and below the aircraft's fuselage. During one of these passes, one of the fighters struck the RC, lost control, and crashed into the ocean. A spokesman for the Russian Ministry of Defense has accused the crew of the American aircraft of "deliberately provoking" the incident.
- The RC lost control of its rudder and was forced to land at Nagorskoye, a military airfield in Siberia. There were no reports of serious injuries among the crew.
- Russian military authorities have detained the crew and are subjecting them to interrogation. They have refused demands by U.S. embassy personnel to visit the crew. It is assumed that the Russians are removing sensitive intelligence collection gear from the aircraft.
- RUS state-controlled media launch media blitz focusing on the right of all nations to protect their homeland and to enforce standards when the international rule of law regarding national sovereignty is violated.
- Social Media (Hostile-content) attacks by RUS troll farms aimed against U.S. government but not their people regarding this violation of sovereignty incident, in hopes of driving a wedge between the U.S. government and its people.

Crisis 12: Magnetic Instability

- The Earth's magnetic field undergoes a significant shift as part of a standard geomagnetic reversal. During this process, the poles rapidly change position along with occasional multiple weak poles forming. The result is compass navigation becomes nearly impossible, especially near the poles.
 - Note that this is already a problem close to the poles as the magnetic pole moves 10 to 60 kilometers per year.

⁷ EUCOM stands for European Command.

- While SATNAV⁸ has become the primary means of navigation, the rapid shifts in the magnetic field have created difficulty in maintaining accurate positions as well as keeping the multiple national SATNAV systems providing synchronized output. Overall navigation has become more difficult for ships, aircraft, and especially unmanned systems. Operations of unmanned systems are temporarily suspended.
- Compounding this navigational problem are the difficulties in over the horizon sensing as the interaction with the magnetic field and atmosphere results in difficulties including highly unpredictable returns. Sensing range expands and contracts on a weekly and monthly basis and sometimes OTH sensing is effectively not possible.
- There is an increase in ships running aground and entering restricted waters. To help alleviate navigational issues, the U.S. and NATO begin to install a series of fixed unencrypted Link-16 terminals and TACAN⁹ systems providing accurate PNT¹⁰ to support ocean and air navigation including allowing the resumption of unmanned system operations.
- Russian leadership is concerned that these U.S.-NATO systems are a threat to national sovereignty and refuses to allow these systems in Russian territory. Instead they install a similar system operating in the same frequency. The result is neither system works along the EEZ and air defense zone boundaries. Incursions are common on both sides and accidents continue, but in more localized areas.

Crisis 13: Poseidon-Armed Belgorod Surfaces in Canadian Waters

- Russia conducts several tests of new Poseidon nuclear-powered UUVs in the Arctic and announces the successful deployment of 16 such UUVs to the region, along with increased patrols of Poseidon-equipped Belgorod submarines.
- A Russian Belgorod submarine is spotted surfacing near Canadian Arctic waters, potentially even within Canadian territorial waters.
- Alarmed Canadian officials contact their Russian counterparts, but the Russians deny that a Belgorod submarine was even in the vicinity.

Crisis 14: Russian and Chinese Oil Exploration Sparks Dispute with Denmark, Allies (Run Summer 2030 for General Officer Game)

- A decades-long dispute over the status of the Lomonosov Ridge reaches a culminating point in September of 2029 when the UN Commission on the Limits of the Continental Shelf (CLCS) rules in favor of the bulk of Denmark's claim that the ridge represents an extension of Greenland's continental shelf. The CLCS recommends that a demarcation line be drawn roughly halfway between the coasts of Greenland and Russia. Such a line

⁸ SATNAV stands for satellite navigation.

⁹ TACAN stands for tactical air navigation system.

¹⁰ PNT stands for position, navigation, and timing.

would grant Denmark control over the seabed beneath the North Pole. The CLCS further rules partly in favor of Denmark regarding its overlapping claim with Canada.

- Moscow rejects the CLCS's finding as "not based on sound scientific principles or data" and vows to challenge it via both diplomatic and unilateral actions. Fearing a confrontation with Russia, the Danish government invites the government of Canada to participate as a "full partner" in any future hydrocarbon extraction ventures.
- In July 2030 a Chinese-owned vessel, escorted by a Russian icebreaker and a destroyer, begins oil and gas exploration operations in the Danish-claimed region close to the pole. A Danish frigate dispatched to monitor these activities is intercepted by the Russian destroyer and the ships collide, damaging the frigate and injuring three Danish sailors; one critically. The Danish and Canadian foreign ministries issue a formal protest and call for a meeting of the North Atlantic Council to discuss options for a unified response to "this unwarranted Russian-Chinese intrusion."
- Meanwhile, an oceangoing vessel operated by Greenpeace has been on the scene. Using small boats supported by the mothership, Greenpeace activists take video of the Chinese activities and attempt to disrupt them. The Russian destroyer fires warning shots and the small boats retreat.
- On September 27, Greenpeace publishes numerous images, including video, of dying whales covered in oil slick, claiming that the Chinese drilling rig was responsible. Greenpeace claims that the vessel, in direct violation of the Polar Code, repeatedly dumped heavy oil and sludge into the water, endangering wildlife there. The images go viral and spark demonstrations in the United States, Canada, Norway, Denmark, and several other EU countries, calling for economic sanctions against China and other "eco-pirate" states and a moratorium on all efforts to extract hydrocarbons from waters. Moscow and Beijing claim that the images are "deep fakes" and that no spills have occurred in the vicinity of their exploration operations. Two weeks later, all ships in the area withdraw.
- In January 2031, Western intelligence sources receive numerous indicators that the Russians and Chinese are planning to undertake an oil and gas exploration operations over a broader area beginning in the spring. The Danish and Canadian prime ministers confidentially request key allied and partner states bordering the area to develop options to "deter another environmentally irresponsible and geopolitically dangerous incursion into the waters."

Abbreviations

A2/AD	anti-access/aerial denial
ALRR	advanced long-range radar
ASW	anti-submarine warfare
AWACS	airborne warning and control system
BTF	bomber task force
C4ISR	command, control, communications, computers, intelligence, surveillance, and reconnaissance
CCMD	combatant command
CLCS	Commission on the Limits of the Continental Shelf
CSG	carrier strike group
DAF	Department of the Air Force
DoD	Department of Defense
EEZ	exclusive economic zone
EMS	electromagnetic spectrum
EO/IR	electro-optical/infrared
EW	electronic warfare
GEO	geostationary orbit
GFM	Global Force Management
GIUK	Greenland-Iceland-United Kingdom
GO	general officer
HALE	high altitude, long endurance
IPCC	Intergovernmental Panel on Climate Change
ISR	intelligence, surveillance, and reconnaissance
LDUUV	large displacement unmanned underwater vehicle
LEO	low earth orbit
LOE	line of effort
MDTF	Multi-Domain Task Force
NORAD	North American Aerospace Defense Command

NSR	Northern Sea Route
OTH	over-the-horizon
pLEO	Proliferated Low Earth Orbit
PMC	private military contractor
SAG	surface action group
SAR	search and rescue
SATCOM	satellite communication
SATNAV	satellite navigation
SES	senior executive service
SIGINT	signals intelligence
SME	subject-matter expert
TF	task force
UAV	unmanned aerial vehicle
UNCLOS	United Nations Convention on the Law of the Sea
USV	unmanned surface vessel
UUV	unmanned underwater vessel

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Since 2016, Plan Blue wargames have explored scenarios that depict large-scale war fights against state adversaries in order to help U.S. Department of the Air Force (DAF) leaders better understand the demands of these potential war fights, evaluate the capabilities and limitations of programmed forces to meet those demands, and test new approaches to projecting power. The 2021 iteration of the game (Plan Blue 21) was set in the Arctic, in keeping with the Department of Defense's 2019 Arctic strategy, which calls for enhancing capabilities for operations in the region and strengthening the rules-based order there. The purpose of the game was to increase the DAF's understanding of the capabilities, posture, allied command, control, and communication relationships that may be called for to support future Arctic operations.

Focusing on competition with Russia in the year 2030, game play took place in the context of steady-state competition and crisis operations rather than large scale combat, and it explored the intersection of two key trends: (1) changing environmental conditions and (2) the completion of current Russian investments in new military capabilities and infrastructure in the Arctic. Plan Blue 21 was also specifically designed to test the extent to which capabilities for persistent and visible intelligence, surveillance, and reconnaissance can provide real-time situational awareness and potentially contribute to "deterrence by detection." U.S. players in Plan Blue 21 benefitted greatly from the participation of officers from key allied and partner countries that have important interests in and capabilities for operations in the Arctic region.

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