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ARCTIC PACIFIC SECURITY DIALOGUE 2026

Workshop Report

13 – 14 April | Anchorage, Alaska | Hotel Captain Cook



Table of Contents

Executive Summary.....	2
Strategic Themes & Key Insights	2
Environmental Volatility: “Ice-free” Doesn’t Mean a Free Ride	2
Public- Private Integration: Commercial Demand as a Vector for Resilience	2
Coalition Sovereignty: Countering Adversary Lawfare and Capability Gaps	2
Day 1 Presentations	4
Panel: Arctic Sea State 2050	4
Key takeaways:	4
Keynotes: Research, Transportation and Operation in the Arctic.....	4
Key Takeaways:.....	4
Panel: Arctic Maritime Legal Considerations	5
Key Takeaways:.....	5
Day 2 Presentations	6
Panel: Innovation for the Arctic-Pacific	6
Key Takeaways:.....	6
Panel: Economics of Arctic Maritime Security	6
Key Takeaways:.....	7
Keynote: Arctic Policy from the Pacific.....	7
Key Takeaways:.....	7
Workshop: Arctic Sea State 2050	8
Workshop Results	9
Key Takeaways from the ASPD Workshop	12
Conclusion	12
References	14
Appendix	15
Prioritized Maritime Challenges by Theme	15
Table 1: Primary Challenges	15
Table 2: Secondary Challenges	16
Table 3: Tertiary Challenges	17

Executive Summary

The inaugural Arctic Pacific Security Dialogue convened defense, government, industry, and academic leaders from the Arctic and Indo-Pacific regions to address the strategic future of Arctic maritime security. Grounded on the Arctic Waterways Security Strategy in the Maritime Action Plan, the program assessed U.S. and allied operational readiness to project power and secure an increasingly accessible Arctic Ocean. Panelists evaluated near- and long-term regional challenges through the strategic lenses of international law, innovation, economics, research, and transportation. Together, panelists and participants mapped realistic scenarios Arctic-Pacific maritime activity through 2050, identifying the critical operational capabilities and policy bridges required to transition from present-day posture to future-state requirements.

Strategic Themes & Key Insights

Environmental Volatility: “Ice-free” Doesn’t Mean a Free Ride

- **Proliferation of Transition Hazards:** The reduction of multi-year ice will not yield a benign maritime environment; the future Arctic Ocean will be characterized by highly unpredictable, mobile, and hazardous first-year (“young”) ice.
- **Degradation of Infrastructure and Sea State Stability:** Increased open water fetch will generate higher wave energy, threatening transiting vessels with heavier seas while accelerating coastal erosion that directly compromises shore-side logistics and basing infrastructure.
- **Escalated Risk Profiles:** Rather than mitigating operational hazards, emerging environmental conditions will likely increase the tactical risks and commercial insurance premiums associated with Arctic maritime operations

Public- Private Integration: Commercial Demand as a Vector for Resilience

- **Commercial Foundations of Regional Presence:** Dual-use and commercial maritime frameworks are inherently more sustainable and resilient over long horizons than purely military-driven presence models.
- **Shared Incentive Frameworks:** Establishing collaborative mechanisms, such as an Arctic Port League or a joint infrastructure fund, is critical to aligning the incentives government, industry, academia, and Arctic communities require to accelerate capital investment and technological innovation.

Coalition Sovereignty: Countering Adversary Lawfare and Capability Gaps

- **Indo-Pacific Alliance Integration:** Non-Arctic allies, specifically Japan and the Republic of Korea, represent vital partners who are postured and willing to integrate capabilities to bolster regional stability and reinforce shared commitments to international law.

- **Contested Norms and Lawfare:** Strategic competitors are actively utilizing gray-zone lawfare tactics to challenge maritime boundaries, manipulate international law, and erode the sovereign legitimacy of the United States and its partners.
- **Infrastructure Deficits as Strategic Vulnerabilities:** Persistent gaps in U.S. and allied cold-weather maritime infrastructure directly limit operational response options, hampering our ability to counter adversarial maneuvers and guarantee Freedom of Navigation.

Day 1 Presentations

Panel: Arctic Sea State 2050

This panel focused on environmental intelligence as a tool to analyze the potential navigability of new transportation pathways through the Arctic. The conversation was particularly focused on what the Arctic may look like in 2050 in terms of sea ice, ocean currents and infrastructure.

Key takeaways:

- Persistent presence and comprehensive domain awareness require granular environmental intelligence. Variables such as temperature, precipitation and sea-ice presence, impact wave energy and big weather events, which directly threaten both ashore and afloat infrastructure. Further, ice thickness -rather than mere spatial extent - is the primary determinant for forecasting fleet navigability and operational constraints.
- While macro-level sea-ice modeling is a mature field, a critical operational gap remains in the high-resolution modeling of near-shore (littoral) ice dynamics. Investment in these targeted analytics is required to accurately forecast localized hazards.
- Anticipating the compound effects of sea-ice reduction on coastal infrastructure and fleet maneuverability is a foundational requirement for force protection, resilient logistics, and long-term Arctic campaign planning.

Keynotes: Research, Transportation and Operation in the Arctic

This series of presentations explored the role of United States Arctic leadership through research, transportation and infrastructure. The conversation highlighted the interconnectedness of sectors in the Arctic: military, scientific, commercial and social.

Key Takeaways:

- The United States must reclaim its vanguard role in Arctic scientific research. Just as legacy U.S. Navy requirements drove historical Arctic exploration, future joint force priorities must direct targeted research to enhance environmental intelligence and underwrite persistent domain awareness.
- The Arctic maritime domain is a highly volatile operational environment. Capital investments, infrastructure planning, and acquisition strategies must be correspondingly agile to pace rapidly shifting environmental and threat conditions.
- Alaska serves as the critical geographical and operational node bridging the Arctic and Indo-Pacific theaters. However, actualizing this role requires transitioning from episodic operations to a persistent posture built on sustained infrastructure capitalization and joint coordination.
- The Port of Anchorage is not merely a regional commercial lifeline; it is a vital strategic logistics hub. Its throughput capacity is inextricably linked to the

sustainment of joint air and maritime operations projecting power across both the Arctic and the broader Pacific.

- Operational presence dictates regional influence and sovereign control. While presence can be directly driven by military demand, integrating commercial maritime activity offers a highly resilient, self-sustaining foundation that can augment and underwrite defense logistics.
- High-bandwidth data is poised to become the first reliable, year-round "cargo" traversing trans-polar routes via subsea cable networks. Securing this critical infrastructure will dictate a strategic requirement for continuous, resilient, and hardened power generation systems in austere operational environments.

Panel: Arctic Maritime Legal Considerations

This panel considered lawfare in the Arctic, with a focus on strategies used by Russia and China. The conversation emphasized the need for international cooperation in the Arctic as well as updated legal framework and diplomatic efforts to protect Arctic interests.

Key Takeaways:

- “Lawfare” is the targeted, strategic application of legal regimes to degrade an adversary’s legitimacy, constrain their operational maneuverability, and erode their national will, frequently achieving strategic objectives below the threshold of armed conflict.
- Because the People's Republic of China (PRC) lacks sovereign Arctic territory, it cannot directly replicate its aggressive South China Sea territorial strategies. Instead, it exploits UNCLOS provisions and bilateral partnerships, applying its civil-military fusion doctrine to leverage ostensibly civilian scientific and commercial activities for strategic and military advantage in the region.
- Russia is a sophisticated practitioner of lawfare, actively maneuvering to exert unilateral control over the Northern Sea Route (NSR). By drawing excessive straight baselines around offshore archipelagos, declaring and declaring international straits as internal waters, and imposing restrictive domestic regulations on foreign vessels, Russia directly contravenes established interpretations of UNCLOS.
- Deepening bilateral cooperation between Moscow and Beijing – exemplified by joint development agreements along the NSR – compounds the threat to freedom of navigation and attempts to rewrite both established and customary international maritime law.
- A critical legal and policy void exists regarding the protection of subsea data cables. Because this critical infrastructure is predominantly owned and operated by private commercial entities, it presents a soft target for gray-zone sabotage and exploitation by strategic competitors and non-state actors.
- Detering competitor lawfare requires a coordinated interagency and coalition response. Defending lawful maritime access dictates proactive diplomatic

engagement, aggressive strategic communications (counter-information operations), and sustained, assertive U.S. leadership within governance bodies such as the International Maritime Organization and the Arctic Council.

Day 1 concluded with an opportunity for participants to travel to the Alaska Chadux Network to learn about maritime monitoring in the State of Alaska. Participants also had the chance to attend a Commonwealth North Event that featured federal and state officials speaking about Arctic research and development. This gave participants the chance to engage with other members of the Alaskan and Arctic community involved in the future of the Arctic-Pacific region.

Day 2 Presentations

Panel: Innovation for the Arctic-Pacific

This panel discussed the role of innovation in conflict zones, highlighting examples like Ukraine's use of drones and Iran's missile attacks. From that foundation, the conversation explored innovation happening in the Arctic-Pacific region.

Key Takeaways:

- Systems deployed to austere Arctic environments must be inherently ruggedized, rapidly deployable, and designed for organic maintenance. Localized units must be equipped to sustain operations at the tactical edge without relying on continuous, vulnerable logistical lifelines.
- Strategic investment must be aggressively directed toward critical technology frontiers to close existing operational gaps. Imperatives include AI-enabled physical infrastructure, advanced baseload power generation (e.g., Small Modular Reactors [SMRs] and geothermal systems), and multimodal through-ice and subsea communications to ensure resilient Command and Control (C2).
- Rapidly fielding relevant technology requires compressing the traditional acquisition cycle. Aligning the distinct equities of the warfighter, the researcher, and the commercial entrepreneur is essential to bridge the "valley of death" and deliver capabilities to the theater.

Panel: Economics of Arctic Maritime Security

This panel focused on the frameworks in place to facilitate maritime security in the Arctic region, including agreements on search and rescue (SAR) and oil spill response, as well as the IMO's Polar Code. The conversation highlighted the unpredictability of Arctic waterways and the need for further research and ice-breaking infrastructure in the region in order to support business and other operations.

Key Takeaways:

- The Canadian High Arctic Research Station serves as a critical allied asset, generating high-latitude environmental intelligence that directly underwrites the operational readiness and domain awareness of Joint Task Force North.
- The Arctic Council and the International Maritime Organization remain the foundational governance bodies for establishing, defending, and enforcing regulatory frameworks and international norms for regional maritime operations.
- The projected escalation in regional maritime traffic dictates a proportional expansion of Search and Rescue (SAR) and mass-casualty incident response capabilities to mitigate compounding operational and strategic risks.
- A severe deficit in hydrographic data and modern bathymetric charting represents a critical navigational hazard and domain awareness gap, directly restricting safe surface and subsurface maneuverability.
- Emerging Arctic transit routes and strategic chokepoints constitute highly contested operational environments, presenting both critical vulnerabilities for allied logistics and opportunities to exert sea control and deterrence against strategic competitors.
- Sustaining expanded maritime transit and coalition power projection necessitates urgent, targeted investment in deep-water port infrastructure across both the North Atlantic and the North American Arctic.

Keynote: Arctic Policy from the Pacific

This series of presentations explored the role of Pacific nations in and around the Arctic. The conversation discussed Japan and Korea's approach to the Arctic, and to bilateral and multilateral cooperation more broadly.

Key Takeaways:

- Japan's foundational Arctic policy is centered on defending and sustaining a free and open maritime order based on established international law and recognized norms of behavior.
- The Republic of Korea's regional strategy recognizes that environmental, security, and governance shifts in the Arctic directly reverberate to impact global supply chains and the stability of the international maritime commons.
- Commercial and strategic planners are increasingly projecting expanded maritime transport and cargo transit via northern pathways to connect European and Asian markets.
- Trilateral coordination between the United States, Japan, and the ROK is a vital strategic imperative for securing Arctic-Pacific transit lanes and deterring maritime coercion across the North Pacific.

- Japan maintains a leading role in regional science and technology through sustained integration with the International Arctic Research Center (IARC) in Alaska and dedicated bilateral initiatives such as the Takahashi Project.
- The ROK and Japan possess world-class shipbuilding capabilities and advanced industrial capacity, which are critical to constructing the specialized ice-capable fleets required for safe, persistent regional operations.
- Deepening multilateral scientific cooperation and coordinating legal and diplomatic postures are essential to preserving the Arctic as a peaceful, stable, and collaborative domain.

Workshop: Arctic Sea State 2050

The Arctic-Pacific Security Dialogue included a workshop and discussion portion, where attendees divided into smaller groups to consider challenges that the Arctic maritime environment may face in 2050. Using the *Arctic Sea State 2050* panel as a foundation for discussion, the workshop posed one question to participants: *What Arctic maritime challenges will emerge by the year 2050?*

Workshop facilitators started by asking participants to write 5-10 challenges on sticky notes (one challenge statement per sticky note). Next, participants were asked to consider the perceived importance of each challenge and rank each sticky note as “primary,” “secondary,” or “tertiary.” Once all challenges were ranked, the topics were sorted into six predetermined themes: (1) Diplomacy, (2) Economics, (3) Environment, (4) Security, (5) Technology, and (6) Other (workshop participants perceived the “Other” category as the intersecting challenges that could be applied to multiple themes at once). Figure 1 illustrates this process.

The bull’s-eye ranking facilitated the identification of participants’ perceived priorities when it comes to future challenges in the Arctic Sea State, while the thematic categorization provided insight into the lenses that participants applied when considering these challenges.

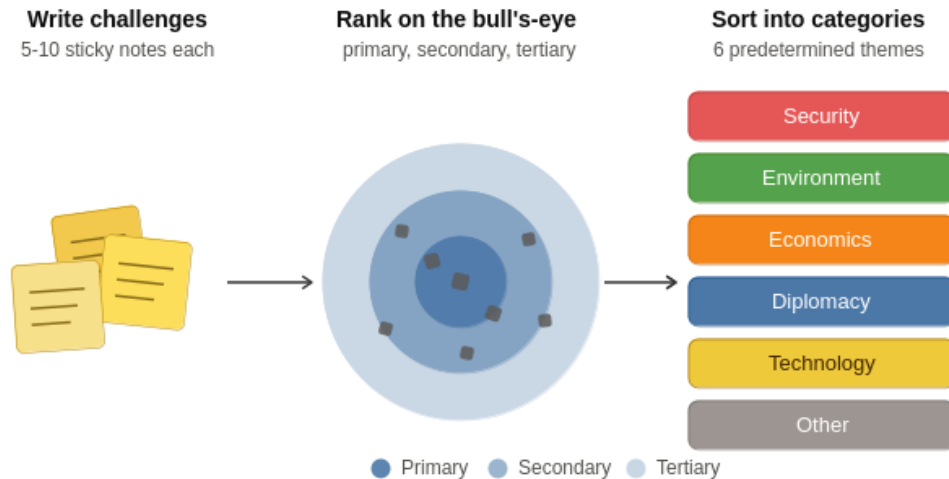


Figure 1 - A graphic representation of the APSD workshop process, from identifying challenges, ranking the challenges using the bull's eye activity, and thematically categorizing each challenge.

Workshop Results

In total, the workshop participants posed 110 unique maritime challenges expected to shape the Arctic operating environment in 2050. Figure 2 on the following page summarizes the distribution of these challenges across six thematic categories. Security accounted for the greatest number of identified challenges (n=25), followed closely by Environment and Other (n=23), Economics (n=20), Diplomacy (n=18), and Technology (n=14). Tables 1-3 in the Appendix list each challenge identified by the workshop participants, and their corresponding themes.

Beyond the raw data, Figure 3 on the following page depicts the proportional composition of each theme within each ring of the bull's eye, illustrating where participants concentrated their highest-priority concerns.

Primary Ring:

Security and Environment each make up the largest share of the primary ring (20% each), reflecting broad agreement that these were top-tier concerns. Among the Security theme, the challenge of Search and Rescue (SAR) dominated the Primary ring, specifically related to future SAR capacity as maritime traffic increases, and the increasing complexities of SAR operations as a result of the changing environment. Within the Environment theme, participants prioritized challenges surrounding pollution to the

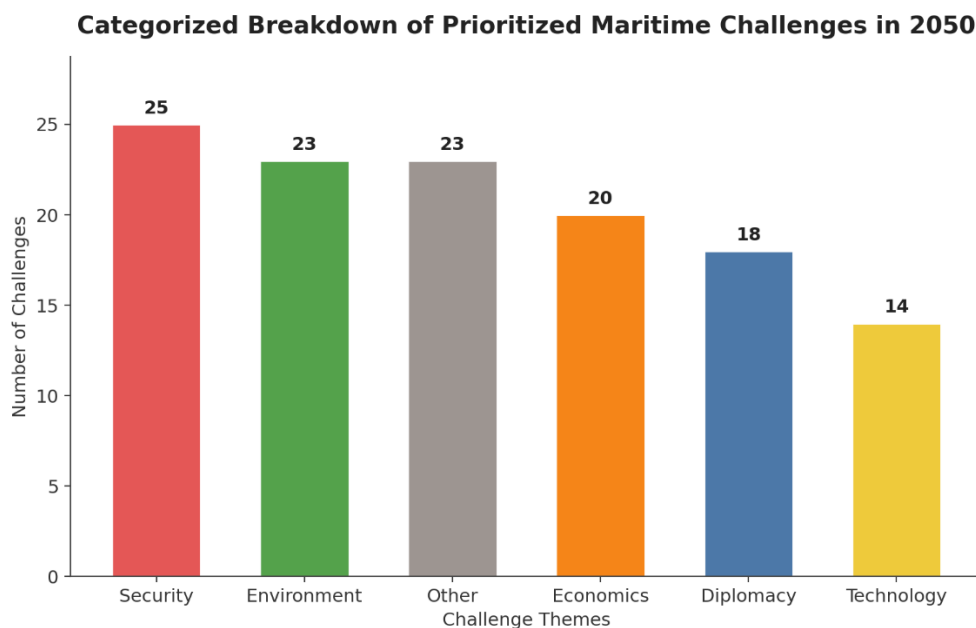


Figure 2 - A bar chart illustrating the volume of challenges identified by the workshop participants, and their categorized breakdown into themes.

marine environment, including hazmat incident response, as well as the operational risks associated with ice accretion¹. The theme of Diplomacy made up the second largest portion of the Primary ring and was dominated by challenges related to Freedom of Navigation, specifically related to Russian encroachment in the region, and the associated requirement for increased intergovernmental cooperation. Participants additionally prioritized the funds necessary to pay for specialized icebreakers and the complexities of resource development. Technology made up the smallest share of the Primary ring (11%), specifically focused on the lack of weather sensors as a primary technological challenge facing the future of maritime activity in the Arctic region.

Secondary Ring:

Turning to the Secondary ring, Environment made up the largest share (24%, the largest single share of any theme in any ring), driven by a different set of concerns than those raised in the Primary ring. Participants here prioritized the consequences of a changing Arctic on a more local level, raising challenges such as the survival and adaptation of Alaska's coastal villages, the broader disaster-response burden on local communities, and the long-term erosion of coastlines. The Other category made up the second-largest share (21%), reflecting a mix of fisheries enforcement, increased Arctic fishing activity, population growth, and the risks associated with a potential increase in

¹ Ice accretion is the hazardous process where freezing spray, waves, or atmospheric precipitation accumulate on a vessel's hull and superstructure. It occurs when air temperatures drop below -2°C and sea surface temperatures fall below +5°C (Mintu & Molyneux, 2022).

bergy bits and growlers² due to sea ice decline. Security's Secondary-ring concerns shifted toward regulatory and coverage gaps, including Coast Guard coverage, Russian restrictions on freedom of navigation in the Northern Sea Route, and the adequacy of Sea Lines of Communication (SLOCs). Technology's Secondary-ring share was dominated by mapping and forecasting infrastructure, such as bathymetric and oceanographic mapping, ice prediction for route planning, and icebreaker fleet build-out. Diplomacy made up the smallest share of the Secondary ring (7%), limited to lawfare and the challenges associated with international cooperation.

Tertiary Ring:

Diplomacy made up the largest share of the tertiary ring, more than doubling its Primary-ring share (18%). Where Primary-ring diplomatic concerns centered on acute Freedom-of-Navigation disputes with Russia, Tertiary-ring diplomatic concerns were longer-horizon and structural: UNCLOS 234 questions, Polar Code and IMO mandates, and broader global competition. The Other category made up the second-largest share (22%), covering access-related challenges, such as access to subsistence resources, as well as potential issues associated with the Northwest Passage's shallow-water limitations. The Economic theme followed (17%), reflecting commercial infrastructure concerns like roads, insurance, and modernized port services. Security and Environment tied for the smallest share of the Tertiary ring (13% each): where challenges related to Security included concerns regarding shadow fleet and SSBN encounters, and Environmental challenges focused on ocean currents. Lastly, the Technology theme made up the smallest share of the Tertiary ring (9%), covering the challenges associated with connectivity and modeling in the Arctic.

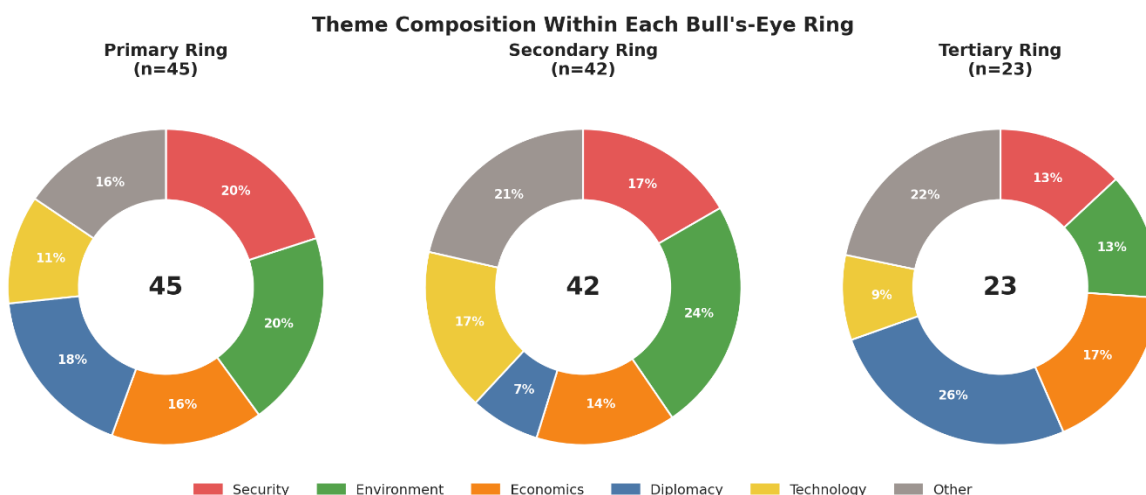


Figure 3 - Three pie charts illustrating the proportion of each theme within each of the bull's eye rings (primary, secondary, and tertiary).

² Bergy bits and growlers are the smallest classifications of floating glacial ice. They pose extreme navigational hazards because, unlike large icebergs, they ride low in the water and are easily obscured by waves or marine radar clutter (NOAA, 2024).

Key Takeaways from the ASPD Workshop

Taken together, the workshop discussions and prioritization exercise revealed several cross-cutting themes that extend beyond individual challenge areas. These key takeaways highlight the strategic issues participants viewed as most likely to shape the future Arctic operating environment.

- 1. Search and Rescue (SAR) constitutes the most immediate operational capability gap.** The compounding risks of escalating vessel traffic, highly unpredictable environmental hazards, and severely constrained expeditionary response capabilities establish mass-casualty and SAR readiness as the most urgent priority for future regional operations.
- 2. Physical and digital infrastructure will dictate future Arctic presence.** Deep-water ports, ice-capable fleets, secure C5ISR networks, and robust logistics pipelines are not merely commercial assets; they are the absolute foundational prerequisites for projecting power, maintaining domain awareness, and sustaining national security operations.
- 3. Arctic governance and maritime access will become increasingly contested.** The Joint Force and its allies must anticipate and counter escalating challenges to Freedom of Navigation (FON), including adversary lawfare, the manipulation of established international law, and threats to lawful maritime access, driven directly by Russian and PRC strategic expansion.
- 4. Environmental intelligence must be operationalized as a key strategic capability.** High-fidelity meteorological forecasting, comprehensive hydrographic surveying, and real-time sea-ice monitoring are critical mission enablers required for safe surface maneuverability, operational planning, and persistent maritime domain awareness.
- 5. Arctic security demands a synchronized coalition and interagency approach.** The operational environment dictates that environmental volatility, economic competition, technological innovation, and military security are inextricably linked, requiring seamlessly integrated strategies across defense, diplomatic, and commercial sectors.

Conclusion

The inaugural Arctic-Pacific Security Dialogue underscored that the Arctic is no longer an isolated region, but a critical theater of global strategic competition. As environmental shifts accelerate maritime access, the United States and its coalition partners must transition from episodic engagement to persistent, integrated operational readiness focused on Arctic capabilities. Defending U.S. sovereignty and interests in this increasingly congested domain demands urgent investments in resilient infrastructure, advanced environmental intelligence, and expeditionary capabilities, all synchronized to deter gray-zone coercion and guarantee lawful maritime access across the Arctic and Pacific theaters.

Translating these strategic imperatives into fielded capabilities requires continuous interagency and multinational coordination. To that end, the specialized operational data and capability prioritization metrics collected during the second half of the Dialogue's second day will drive the next phase of regional planning. This information will be further analyzed and serve as the foundational framework for discussions in a coming workshop session at the 2026 Anchorage Security and Defense Dialogue, also held in Anchorage, Alaska, ensuring the Joint Force and our partners maintain the momentum required to secure the Arctic-Pacific.

References

- Gagnon, R., Cumming, D., Ritch, R., Browne, R., Johnston, M., Frederking, R., McKenna, R., & Ralph, F. (2008). Overview accompaniment for papers on the bergy bit impact trials. *Cold Regions Science and Technology*, 52(1), 1–6.
<https://doi.org/10.1016/j.coldregions.2007.04.015>
- Mintu, S., & Molyneux, D. (2022). Ice accretion for ships and offshore structures. Part 1—State of the art review. *Ocean Engineering*, 258, 111501.
<https://doi.org/10.1016/j.oceaneng.2022.111501>

Appendix

Prioritized Maritime Challenges by Theme

The following three tables list every ranked challenge, grouped by bull's-eye tier and shaded by theme.

Security	Environment	Economics	Diplomacy	Technology	Other
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Table 1: Primary Challenges (n=45)

Challenge	Theme
Strategic Competition	Security
SAR	Security
Conflict	Security
Russia/China Military Cooperation in Arctic	Security
SAR capacity	Security
more treacherous SAR	Security
increased maritime traffic and need for SAR operations	Security
SAR capacity national interagency + interoperability	Security
Joint Russian Chinese activity	Security
Increase in ice accretion	Environment
less predictable "shoulder season" weather	Environment
disaster due to climate change	Environment
Pollution from shipping	Environment
future fish migration	Environment
accurate forecast, weather / freezing spray	Environment
environmental disasters	Environment
avoiding Pollution and hazmat incident response	Environment
coastal erosion of communities	Environment
Ecosystem shifts (e.g. fisheries)	Economics
How to make Arctic shipping "boring" like long-haul aviation	Economics
Infrastructure	Economics
Congestion of Ships	Economics
Development of a deepwater port in the Arctic	Economics
Logistics/infrastructure build out	Economics
Transportation sector	Economics
Paying for specialized icebreakers to facilitate	Diplomacy
Russian encroachment on Freedom of Navigation (FON)	Diplomacy
Chinese research vessels	Diplomacy
New resource development	Diplomacy
Cooperation between competing states	Diplomacy

sovereignty and freedom of passage	Diplomacy
defense of sovereignty	Diplomacy
Increased intergovernmental cooperation	Diplomacy
SAR (technological capabilities)	Technology
Transpolar subsea data trade lane	Technology
Maritime domain awareness	Technology
weather forecast lack of sensors	Technology
Infrastructure	Technology
Increasing maritime traffic	Other
Maritime domain awareness intensifies	Other
Arctic shipbuilding expertise and skilled labor	Other
Safeguarding access to both big ships and subsistence vessels	Other
Fisheries management	Other
Chinese influences and presence in the region	Other
Northern Sea Route	Other

Table 2: Secondary Challenges (n=42)

Challenge	Theme
Lack of policing or regulations (e.g. Polar Code)	Security
Isolated Community Emergency readiness	Security
Increased Hybrid Threats	Security
Coast Guard coverage	Security
Russian restriction of FON in NSR	Security
SLOCs	Security
FON operations	Security
Continual migrations of bio stocks	Environment
Coastal/shoreline mapping/erosion	Environment
Survival/Adaptation of AK coastal villages	Environment
Environmental disaster response	Environment
coastal erosion	Environment
Increased seas from winds	Environment
over-extraction of resources	Environment
environmental protection	Environment
dramatic climate change impact to local communities	Environment
endangered wildlife	Environment
P&I Clubs increased oversight into Arctic shipping	Economics
Sustainable commercial base for AK maritime port system	Economics
Tolls on the NSR/NWP	Economics
Shipyards availability and building infrastructure	Economics
Land based infrastructure needs development (railway to Nome)	Economics

Deep seabed mining	Economics
Less commitment to cooperation and international agreements	Diplomacy
lawfare and competing legal claims leading to tension/conflict	Diplomacy
Geopolitical risks	Diplomacy
keeping up with bathymetric mapping demand	Technology
Oceanography Mapping	Technology
Ice prediction allowing for custom route planning	Technology
Unknown weather modeling	Technology
Navigation Aids/charts	Technology
bathymetric charting	Technology
icebreakers and ice vessel build out	Technology
Increased traffic (fishing)	Other
Population growth	Other
increased shipping impacts	Other
Increase in vessel damage as a result of bergy bits and growlers	Other
increased in Arctic fishing	Other
fisheries enforcement	Other
Icebreakers	Other
Russia	Other
Access	Other

Table 3: Tertiary Challenges (n=23)

Challenge	Theme
Risks posed by shadow fleet	Security
SSBN encounters	Security
shared marine domain awareness (with Arctic allies)	Security
Slowing of Arctic Ocean currents	Environment
Pollution	Environment
natural disasters	Environment
Roads	Economics
Insurance	Economics
Lack of modernized Ports/services for Arctic ships	Economics
Tourism infrastructure	Economics
Nationalizing shipping routes	Diplomacy
Escalation in geopolitical tension	Diplomacy
communication between commercial and security vessels	Diplomacy
UNCLOS 234 challenges	Diplomacy
Polar Code/IMO mandates	Diplomacy
global competition	Diplomacy
Connectivity in the Arctic, especially CAO	Technology
Models	Technology

Increased traffic (commerce)	Other
Continued disruption of subsistence hunting by commercial traffic	Other
Potential for the Northwest Passage to be too shallow for economic use (dredging / ship size)	Other
Port infrastructure	Other
Challenges with the Northwest Passage	Other