



Knocking at the Door: South Korea's Potential Participation in AUKUS Pillar Two

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Introduction

On September 15, 2021, Australia, the United Kingdom, and the United States announced the formation of AUKUS, “an enhanced trilateral security partnership” intended to “strengthen the ability of each [country] to support our security and defense interests, building on our longstanding and ongoing bilateral ties.”¹ The primary initiative under the new AUKUS partnership made global news: the United States and the United Kingdom would support Australia’s acquisition of nuclear-powered submarines for the Royal Australian Navy. The joint development program to provide this capability would “focus on interoperability, commonality, and mutual benefit,” leveraging existing US and UK capabilities and expertise to “bring an Australian capability into service at the earliest achievable date.”

The statement indicated the three countries would take 18 months to generate detailed plans for the initiative. As planned, on March 13, 2023, the three countries announced plans for the SSN-AUKUS, a trilaterally developed nuclear-powered submarine based on a UK design and including US technologies that Australia and the United Kingdom would jointly build and incorporate into their respective navies. The plans anticipated delivery of the SSN-AUKUS for deployment by the late 2030s. Meanwhile, the United States would sell Australia between three and five Virginia-class nuclear-powered submarines throughout the decade to replace its current fleet of diesel-electric submarines as part of an array of efforts to “systematically grow Australia’s sovereign SSN capability and support capacity.”²

Implicitly recognizing the nuclear proliferation concerns that this initiative would generate, the joint leaders statement in September 2021 reaffirmed Australia’s commitment to “all of its obligations as a non-nuclear weapons state” and all three countries’ sustained “leadership on global nonproliferation.”³ The joint leaders statement in March 2023 restated the three countries’

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commitment to, leadership in, and respect for the global nonproliferation regime while additionally maintaining that the consortium is engaging the International Atomic Energy Agency (IAEA) “to develop a non-proliferation approach that sets the strongest precedent for the acquisition of a nuclear-powered submarine capability.”⁴

A less widely recognized component of the initial AUKUS statement was the announcement of intentions for the three countries to “embark on further trilateral collaboration under AUKUS to enhance our joint capabilities and interoperability,” including other undersea capabilities, cyber capabilities, artificial intelligence (AI), and quantum technologies.⁵ The announcement continued:

We will promote deeper information and technology sharing. We will foster deeper integration of security and defense-related science, technology, industrial bases, and supply chains. And in particular, we will significantly deepen cooperation on a range of security and defense capabilities.⁶

The following spring, the three countries issued an update on AUKUS that noted progress on “advanced capabilities” collaboration, including the announcement of four additional areas: hypersonic and counter-hypersonic capabilities, electronic warfare, innovation, and information sharing.⁷ Concurrently, providing nuclear-powered submarines to Australia has become known as Pillar One of the AUKUS partnership, with Pillar Two referring to other initiatives for advanced capabilities collaboration. Pillar Two activities take place under the auspices of working groups (or workstreams) established by the governments to coordinate efforts in each of these areas.⁸

Notably, the White House’s fact sheet on AUKUS in April 2022 stated, “As we mature trilateral lines of effort within these and other critical defense and security capabilities, *we will seek to engage allies and close partners as appropriate.*”⁹ Thus, at the outset, the AUKUS partnership explicitly included a door within Pillar Two through which other countries may be brought into collaborative development of advanced capabilities, either within existing initiatives or through new areas specific to a given partnership.¹⁰

A number of countries have expressed interest, for various reasons, in joining AUKUS Pillar Two activities. This paper focuses on South Korea, or the Republic of Korea (ROK), and its interests and capacities for collaborating under AUKUS Pillar Two on advanced capabilities development. The following section briefly reviews South Korea’s range of reactions to the overall emergence of the AUKUS partnership. The paper then delves more deeply into the interests of,

opportunities for, and limitations facing South Korea in collaborating with each of the eight Pillar Two areas. The paper concludes with a brief discussion of how South Korean engagement with AUKUS in some form may impact the country's conceptions of its core interests, the US-ROK alliance, and other security relationships in the Indo-Pacific region overall.

South Korean Reactions to AUKUS

The announcement of the AUKUS partnership touched on many elements of South Korea's security concerns and circumstances. Accordingly, the news elicited a range of reactions among subject matter experts and policy advocates, often tracking with the existing spectrum of viewpoints in South Korea on key security issues but, in some respects, fostering new perspectives.

South Korea has had a longstanding interest in acquiring nuclear-powered submarines of its own. Debate within South Korea over this possibility addresses a range of issues, including basic costs, the feasibility of developing the requisite nuclear infrastructure, and the need to fit this initiative within the US-ROK alliance. Many observers have considered the idea fanciful, at best symbolic, and at worst a drain on resources better directed to other defense needs. Probably the most important issue has been the efficacy of nuclear-powered submarines in achieving South Korea's core security interests, which spotlights more fundamental debates over defining these core security interests. While advocates of South Korea's acquisition of nuclear-powered submarines tout their utility in tracking and countering North Korea's growing submarine capabilities, including its aspirations for the capability to launch nuclear missiles from submarines, comprehensive analyses suggest that nuclear-powered submarines would be more efficacious if South Korea adopts a posture less focused on proximate and littoral defense against North Korean threats and more focused on integrating with the United States and other regional partners in supporting a "blue water" maritime posture toward regional threats.¹¹

The desire for nuclear-powered submarines in South Korea also has roots in the country's longstanding interests in developing nuclear technologies more broadly, including nuclear weapons. South Korea has a well-developed civilian nuclear power infrastructure, which it operates under its obligations toward the Nuclear Nonproliferation Treaty (NPT), IAEA agreements to safeguard its nuclear facilities, and the terms of the bilateral US-ROK Agreement for Peaceful Nuclear Cooperation (commonly known as the "123 Agreement") that limits South Korea's nuclear fuel cycle activities.¹² The United States has long resisted the extensive expansion of South Korea's nuclear fuel cycle capacities out of

concern for the effect it might have on global nonproliferation efforts generally and on restraining North Korea's nuclear activities specifically and out of awareness of the historic and ongoing interest of some South Korean circles in indigenous nuclear weapons development, either latently or overtly.¹³

Such nuclear interests reflect endemic concerns in South Korea, which periodically surge in response to fluctuations in US nuclear weapons policies and North Korea's nuclear development, over the sufficiency of the US nuclear umbrella and its security guarantee to South Korea.¹⁴ Most recently, in the context of North Korean efforts to develop nuclear ballistic missiles capable of threatening the US mainland, the United States and South Korea established the Nuclear Consultative Group (NCG), aiming to deepen the two countries' consultations on nuclear and strategic planning and "to enable joint execution and planning for ROK conventional support to U.S. nuclear operations in a contingency and improve combined exercises and training activities on the application of nuclear deterrence on the Korean Peninsula."¹⁵

Against this backdrop, the announcement that the United States would support Australia's acquisition of nuclear-powered submarines while continuing to resist South Korea's interests in nuclear-powered submarines elicited predictably complicated and, to a degree, contradictory reactions. Positive responses tended to focus on South Korea's benefits from the contributions AUKUS would make to bolstering regional security postures and other emerging multilateral security groups, such as the Quad, in the context of China's rising power and aggressive activities. Some saw AUKUS as heralding South Korea's need and opportunity to bolster its support of US security actions to secure maritime sea lanes in the Western Pacific that are critical for South Korea's own welfare.¹⁶ Some also saw Australia's success at securing nuclear-powered submarines from the United States as a result of its readiness to align with the United States' strong China-oriented security posture, displaying a pathway that South Korea could and should follow by moving away from concentrating primarily on North Korea and more actively supporting the US Indo-Pacific security posture.¹⁷ A variant of this view held that a stronger commitment to the US Indo-Pacific strategy by South Korea would also strengthen US and regional support against North Korean threats.¹⁸ Lastly, some pointed to South Korea's submarine production capacity as a vital asset for AUKUS collaboration. Beyond being the world's second-largest commercial shipbuilder, in 2018, South Korea became the eighth country in the world to build a 3,000-ton submarine with its own technology, and it is assertively seeking to expand submarine exports to other countries.¹⁹

More negative responses to the creation of AUKUS in South Korea focused on the potential detrimental impacts on specific security interests. From one perspective, the United States providing nuclear-powered submarines to Australia signified its antipathy to such a deal with South Korea, rather than showing South Korea a pathway to follow.²⁰ Some observers expressed a more deep-seated concern that “passing over” South Korea’s nuclear-powered submarine interests in favor of Australia expressed a lesser regard by the United States for South Korea as an ally, reinforcing concerns over the US extended deterrence commitment independent of debates over the efficacy of nuclear-powered submarines for South Korea’s security needs.²¹

Any ambivalence in initial South Korean reactions to AUKUS Pillar One has gradually become overlaid by percolating South Korean interests in the possibility of joining AUKUS Pillar Two. Observers in South Korea on both sides of debates regarding nuclear-powered submarines have found common ground on the potential benefits of South Korea engaging with Pillar Two. These perceived benefits flow from both the specific opportunities for collaboration on advanced technology projects and the general opportunity to find functional roles in multilateral collaboration.

Accordingly, some saw South Korean engagement with Pillar Two’s advanced technology development as a means to strengthen US perceptions of South Korea as a trusted and responsible partner, paving the way to US support for South Korea’s own nuclear-powered submarine development program.²² Alternatively, others focused on Pillar Two engagement as a practical means for South Korea to help improve the security environment in the Indo-Pacific region, whereas to follow Australia in obtaining US support for acquiring nuclear-powered submarines would be inappropriate due to the exclusion of China.²³ In one view, Pillar Two engagement would enable South Korea to enhance its security and deepen contributions to the US-led regional security posture more quickly and directly, while reducing the risk of collateral damage to the South Korea-China relationship that a nuclear-power submarine project would likely generate.²⁴

More skeptical observers raised concerns about the objectives and process of Pillar Two engagement. Some feared that Pillar Two cooperation would embed South Korea more firmly in an Indo-Pacific security posture and the benefits of doing so would not outweigh the potential damage of Chinese retaliation.²⁵ Others cautioned that the benefits of Pillar Two cooperation would be unlikely to materialize easily and quickly, as some may hope, due to South Korea’s limited access to classified information necessary for certain types of sensitive weapons technologies on which Pillar Two projects focus.²⁶ China’s reaction to South Korea’s decision to allow US deployment of the THAAD missile-defense system informs these concerns, albeit in a contradictory fashion.²⁷

As noted, the April 2022 AUKUS statement expanding the range of Pillar Two activities promised to “engage allies and close partners” as these activities progressed.²⁸ Two years later, in a joint statement between defense ministers covering AUKUS developments, the partners reiterated their “intent to engage others in Pillar II projects as our work progresses” and announced that they would begin consultations with prospective partners on joining individual Pillar Two projects. The statement laid out the criteria for additional participants, including a set of domestic capacities and “impact on promoting peace and stability in the Indo-Pacific region,” identifying Japan as a country under consideration for cooperation on Pillar Two advanced capability projects.²⁹

Given the complex issues related to South Korea’s potential participation in AUKUS, the announcement of Japan’s active consideration as an additional partner generated predictably multifaceted responses in South Korea. Many observers perceived Japan’s possible involvement in Pillar Two engagement as strengthening South Korean prospects as well. While the outreach to Japan touched raw nerves for some given unresolved historical issues, it also bolstered the appeal of AUKUS for those valuing greater multilateral engagement for South Korea and greater trilateral cooperation among the United States, Japan, and South Korea.³⁰

The ROK Ministry of Foreign Affairs (MOFA) responded to the announcement by stating the South Korean government was also open to collaborating with AUKUS and there would be further discussions toward that end.³¹ Shortly thereafter, at the foreign and defense ministerial meeting (2+2) between South Korea and Australia, the two countries agreed to expand cooperation in the areas of comprehensive security, cybersecurity, and maritime security and discussed positively the prospect of South Korea’s participation in AUKUS Pillar Two activities, with both defense ministers remarking on the close technical cooperation and shared values that the two countries already enjoy.³²

A public opening of AUKUS Pillar Two to South Korea was not long in coming. In a statement marking the third anniversary of the AUKUS consortium in September 2024, the partners noted progress in consultations with Japan to focus initially on the interoperability of maritime autonomous systems and announced that consultations were underway “with Canada, New Zealand, and the Republic of Korea to identify possibilities for collaboration on advanced capabilities under AUKUS Pillar II.”³³ Since the first announcement of the creation of AUKUS, South Korea has been restively but hopefully knocking on its door—the September 2024 statement indicated that that door was now opening.

The opening to South Korea does not mean that tangible projects on Pillar Two advanced technology development will emerge quickly. Given the steady and measured progress of AUKUS activities overall, including careful preparation for outreach to new partners, all parties involved seem poised to explore and build new partnerships slowly and thoughtfully. All parties seem to recognize that successful collaboration will require understanding and balancing security and technological considerations. Opening consultations are likely to focus on identifying the most promising areas of initial cooperation, which will leverage the strongest innate capabilities of the widened circle of partners, pose the fewest obstacles to technical information exchange, and offer the clearest potential contribution to individual and collective security objectives. The following section provides an initial consideration of where opportunities with South Korea are most likely to emerge.

AUKUS Pillar Two Elements: Potential South Korean Contributions

AUKUS Pillar Two covers a range of initiatives to develop and field “advanced capabilities” among the three main contributing countries, separate from the provision of nuclear-powered submarines to the Australian Royal Navy. The eight advanced capability areas enumerated in April 2022 are undersea capabilities, quantum technologies, artificial intelligence and autonomy, advanced cyber, hypersonic and counter-hypersonic capabilities, electronic warfare, innovation, and information sharing.³⁴

Of these eight areas, six focus on development in specific technological areas, while the other two address more functional areas.³⁵ Given the variety of challenges facing progress across these diverse areas, collaborative work in each area may proceed in different ways and at different tempos. Accordingly, announced accomplishments in Pillar Two initiatives have been uneven.

Nevertheless, Pillar Two activities carry distinctly more potential to impact deployed military capabilities in the near term. Pillar One’s initiative—developing nuclear-powered submarine capabilities for Australia and the United Kingdom—will not show deployed results until the 2030s, at the earliest. In contrast, AUKUS Pillar Two may produce more immediate capability improvements that are directly relevant to near-term strategic security in the Indo-Pacific region. Senior officials in the US Department of Defense (DOD) have indicated that Pillar Two initiatives would focus on technology developments supporting regional war-fighting requirements.³⁶ Some analysts have termed these initiatives potentially “*game-changing*,” securing the future military and economic advantage of the AUKUS nations and recasting the nature of [the strategic competition with China] for global influence.”³⁷

Given the Indo-Pacific focus of Pillar Two initiatives, it is not surprising Indo-Pacific countries that have the strongest security relationships with the United States would appear as prominent candidates. The Australian Strategic Policy Institute (ASPI) reviewed 23 critical technologies deemed integral to the advanced capability areas for AUKUS Pillar Two, observing the value of expanding partnerships in the context of competition with China:

China is leading in high-impact research in 19 of these 23 technologies and has a commanding lead in hypersonics, electronic warfare and in key undersea capabilities. But in other key technologies such as autonomous systems operation technology, advanced robotics, adversarial AI-reverse engineering and protective cyber, the collective strength of the AUKUS countries shifts this picture, and they take the global lead. A slightly larger grouping of countries would change the picture even further.³⁸

Nevertheless, the successful expansion of AUKUS partnerships in advanced technology development must surmount both technological and political hurdles. Understanding the opportunities as well as the constraints begins with a baseline appreciation of a candidate country's existing capacity and developmental potential in any given area—that is, what a candidate country has both to *bring* and to *gain* from collaborating on advanced technology development.

The following subsections provide an initial understanding of South Korea's potential engagement in the existing AUKUS Pillar Two areas of joint development, utilizing data on South Korea's relative stature in technology development from the ASPI's *Critical Technology Tracker*. The tracker provides an overview of the measurable achievements, relative rankings, and progress trajectories of countries on numerous advanced technologies. This database is optimal for the present study for two reasons. First, the tracker has collated data on specific capacities applicable to Pillar Two's six technology development categories. Second, the tracker has calculated the risk of China's monopolization in these categories, which enables evaluation of how much a South Korean contribution could support AUKUS partners' efforts to balance China's capabilities.³⁹

Undersea Capabilities

Within AUKUS, undersea capabilities encompass technologies that operate underwater other than manned submarines, focusing on the development of autonomous unmanned underwater vehicles (UUVs). UUVs may have applications for many roles, including intelligence, surveillance, and

reconnaissance (ISR) and anti-submarine warfare. The United States, the United Kingdom, and Australia have all been developing and deploying UUV capabilities.⁴⁰ Hence, AUKUS collaboration in this area is a natural value-added enabler for these partners.

Efforts in this area were initiated by the AUKUS Undersea Robotics Autonomous Systems (AURAS) project.⁴¹ Subsequently, the partners have announced a number of activities in this area, including the AUKUS Maritime Autonomy Experimentation and Exercise Series, entailing “integrated trilateral experiments and exercises aimed at enhancing capability development, improving interoperability, and increasing the sophistication and scale of autonomous systems in the maritime domain.” AURAS was designed to enable defense industry participation as well as enhance maritime data sharing and provide “real-time maritime domain awareness” to the partners.⁴² Another related activity is the Undersea Vehicle Launch and Recovery project, aiming to integrate the ability to launch and recover UUVs from torpedo tubes on current classes of submarines and the SSN-AUKUS for strike missions and ISR.⁴³ The partners have also collaborated on related exercises hosted by Australia’s new Undersea Support Vessel to demonstrate and improve capabilities relating to the protection of underwater infrastructure, including mine countermeasure operations, using both autonomous and semi-autonomous undersea systems.⁴⁴

South Korea has a strong capacity for collaboration in the development of UUVs and related underwater advanced technologies. Beyond South Korea’s prodigious shipbuilding capacity, including significant submarine development, production, and export, South Korea also already has advanced autonomous systems capacity, ranking fifth in the world for autonomous systems operations technology and advanced robotics. This foundation suggests South Korea could be a strong contributing partner in this area of AUKUS advanced capabilities development, which is particularly valuable given China’s dominant position in many of these technology categories.⁴⁵

South Korea also would have a strong interest in such capabilities. Because of the broad range of applications for UUV technologies, South Korea would be able to both participate in joint operations supporting regional security postures and deepen its ISR and littoral defense capabilities against more proximate North Korean threats, particularly in response to North Korea’s manned submarine and UUV development ambitions. Hence, undersea capabilities appear to be an area where the potential mutual benefits of South Korean engagement with AUKUS Pillar Two activities would be strong and lasting.

Quantum Technologies

Utilizing the principles of quantum physics, quantum technologies have a variety of potential applications to create, enhance, or support military capabilities. The DOD Defense Science Board (DSB) points to three applications that hold the most promise for applying quantum technologies for defense purposes: quantum sensing capabilities, information processing and security with quantum computers, and quantum communications systems.⁴⁶

Within the quantum technologies working group, the AUKUS partners created the Quantum Arrangement (AQuA) initiative to coordinate US, UK, and Australian research and development (R&D) on applicable quantum technologies. Initial AQuA activities were planned to focus on integrating quantum technologies for positioning, navigating, and timing through trials and experimentation through 2025.⁴⁷ Subsequently, these activities were accelerated with the aim of creating resilience for environments in which Global Positioning System (GPS) systems are degraded and enhancing stealth in the undersea domain in support of other undersea activities, including the SSN-AUKUS.⁴⁸

South Korea would likely benefit broadly from collaboration on quantum technology development projects. Applications for maritime positioning and navigation are mainly applicable at a broader regional level, but quantum technology enhancement of undersea activities would support the broad range of South Korea's peninsula and regional security interests.

However, South Korea's capacity for contribution and partnership in quantum computing is more limited. While South Korea is the fourth-ranked country for certain sensing, timing, and navigation technologies, it is not a leading state across a range of quantum technology categories, including the communications and sensing areas that are of most focus under AUKUS.⁴⁹ Therefore, relative to other Pillar Two activities, quantum computing appears to be a less auspicious category of potential collaboration for South Korea.

Artificial Intelligence and Autonomy

The term "artificial intelligence" encompasses an array of computing technologies. The definition used within the US government denotes "a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments."⁵⁰ Most basically, AI systems differ from other forms of computer software through their capacity to utilize dramatic quantities of data at speed to generate original response to queries and commands and their ability to incorporate new data and prior outcomes to improve performance over time—in short, to learn.

Potential applications of AI in defense organizations and for war-fighting functions are numerous. It is useful to note that AI systems are not themselves weapons—rather, AI is a technology that enables and enhances other instruments of military power. Even as new AI application possibilities continue to emerge, some prospects are clear, particularly at tactical levels:⁵¹

- Military logistics and transport, especially improving efficiency in the allocation of military resources.
- Pre-identification of maintenance problems in complex equipment, including combat vehicles, aircraft, and warships.
- Difficult control problems, such as flight and navigation, especially autonomous vehicles in air and maritime domains.
- Target selection, tactical maneuvering, and other aspects of battle management.
- Software vulnerability discovery tools to autonomously protect networks, computers, programs, and data while also contributing to offensive cyber operations.
- Battlefield medical care, including diagnosis and optimized treatment in mass casualty situations, and integration with robotic systems to support remote surgery and evacuation activities.⁵²

At the operational level, many applications involve scaling up tactical capabilities, but AI also has applications for broader warfare planning. For example, AI can support both manned and unmanned ISR activities, from the surveillance front end to the intelligence production back end. Machine learning, combined with image recognition, has clear application to target identification, including previously unrecognized target types, in part through incorporating reports, documents, news feeds, and other forms of unstructured information. AI and machine learning are well-suited for sifting and assessing multiple streams of incoming intelligence collection, particularly given increasing requirements for broad-scope analysis incorporating open and classified sources. At the strategic level, current projects would build AI into multi-domain command and control (MDC2) capabilities. This may include fully integrated ISR capabilities, precision targeting of strategic assets, AI-guided cyber offensive and defensive operations, and AI incorporation into nuclear command and control.⁵³

All three AUKUS partners have been focused on AI development. The US DOD is working to accelerate AI adoption across the department and military, scale up the utilization of AI solutions demonstrated to be effective, and create capacity to surge relevant services when needed.⁵⁴ The United Kingdom and Australia are undertaking similar efforts to incorporate AI capabilities across their defense postures.⁵⁵ Accordingly, the AI element has been prominent in AUKUS Pillar Two activities. Early work in this area sought to accelerate AI adoption with a focus on improving the resilience of autonomous and AI-enabled systems in contested environments.⁵⁶ More recently, the AUKUS partners have stated that the Resilient and Autonomous Artificial Intelligence Technologies (RAAIT) initiative has resulted in “delivering” AI systems for force protection, precision targeting, and ISR functions, with a companion effort yielding planned AI deployments to enhance maritime surveillance in support of anti-submarine warfare efforts.⁵⁷

Given the wide scope of possible applications, South Korea's potential contributions to AUKUS Pillar Two's AI and autonomy initiatives are especially opportune. According to the ASPI data, South Korea is already a world leader in multiple categories of key AI technology and autonomous system capabilities. Specifically, South Korea ranks third in high-performance computing, fourth in AI algorithms and hardware accelerators, fifth in natural language processing and in machine learning, and sixth in adversarial AI and in advanced integrated circuit design and fabrication. In all of these categories, South Korea ranks either ahead of or just behind the United Kingdom and significantly ahead of Australia.⁵⁸ Hence, in AI development—an area of advanced technology within which cumulative efforts are particularly productive—South Korea can already bring to the table capacities comparable to the other AUKUS partners.

South Korea would be highly motivated to participate in this area of AUKUS Pillar Two advanced technology collaboration. Not only would such collaboration bring significant dividends to South Korea's existing capacities, but the defense and military applications that are the focus of AUKUS activities could bring substantial enhancements relevant to South Korea's core security interests. Considering North Korea, AI applications in the areas of multi-domain ISR, anti-submarine warfare, target identification, battle management, and software security would help South Korea generate more stabilizing deterrence responses to the mushrooming North Korean threat perception. More broadly, given the benefits that flow from AI integration in many military applications, such as ISR, South Korea's clear existing capacity to contribute to AUKUS development of deployable AI systems would pave the way for fulsome South Korean integration into a region-wide deterrence posture.

Advanced Cyber

While US policymakers have been focused on cybersecurity as a dimension of national security for some time now, the nature of the capabilities and the strategies for utilizing them have continued to evolve. The DOD's involvement in national cybersecurity has grown broad, incorporating military and intelligence activities under the conjoined operations of the US Cyber Command and the National Security Agency, as well as elements in all military services, combatant commands, and other DOD offices. DOD operations are diverse, encompassing ongoing engagements within the cyber domain itself and extensive planning for cyber operations in any emerging physical conflict. Most recently, the foundational premises of US cyberstrategy have been evolving from a Cold War-era deterrence-oriented motif toward a more cyber-intrinsic conception of persistent engagement, with both defensive and offensive dimensions.⁵⁹ Importantly, engagement with allies and partners to bolster collective cybersecurity has become an increasingly important element of US cyber strategy.⁶⁰ Military cybersecurity has also become an increasingly central focus for the other two AUKUS partners, who have also developed cybersecurity strategies.⁶¹

Collaborative work in the AUKUS Pillar Two Advanced Cyber area appears to have begun with broad attention to communications and operations systems and then incorporated a focus on working with the industry to improve the cybersecurity of critical suppliers to the naval supply chain.⁶² Other efforts may be developing behind these representations, and it would not be surprising for the AUKUS partners to proceed particularly cautiously in building collaboration on cyber capability development. This is because the security of technical and operational information is uniquely vital to successful cyber operations, both defensively and offensively.⁶³ Collaboration with any partners intrinsically creates new potential vulnerabilities for that information, including partnerships among governments that already maintain an especially high level of intelligence collaboration. AUKUS partners, even as they perceive the necessity of collaboration to achieve collective cybersecurity goals, have not failed to recognize this concern.⁶⁴

South Korea has an enduring interest in improving all facets of national cybersecurity for reasons it shares with the AUKUS partners and due to intensive ongoing North Korean cyber aggression.⁶⁵ Accordingly, South Korea already has a growing US partnership in response to these concerns, including the 2023 establishment of the US-ROK Strategic Cybersecurity Cooperation Framework, mapping out an array of specific initiatives to enhance cybersecurity tools,

information sharing, joint exercises, personnel training, private sector engagement, and capacity building.⁶⁶ Resonant of the direction of DOD cybersecurity posturing, South Korea issued an updated National Cybersecurity Strategy in February 2024, auguring a transition to a more offensively oriented posture, including a focus on the development of emerging technologies.⁶⁷

South Korea has cyber capacities that would enable the country to benefit from significant collaboration with the AUKUS partners and contribute to that collaboration. According to the ASPI data, South Korea ranks fourth in the world in advanced communications systems, which is the initial focus within the AUKUS Pillar Two Advanced Cyber area and an area of particular risk of Chinese technological monopolization. The data also shows that South Korea has appreciable capabilities in protective cybersecurity technologies and reverse engineering of adversarial AI systems—the two elements identified as most central to the AUKUS cyber area of advanced technology research.⁶⁸ Notably, the data suggests that South Korea's contribution to the existing AUKUS partner capacities offers the greatest boost relative to China's capabilities in any of the six Pillar Two-focused technology categories (see Table 1, Appendix).

Given existing cyber defense weaknesses that have resulted in periodic exposures of defense and security information, South Korea will certainly benefit from greater cooperation on cyber defenses, whether directly with the United States or through an AUKUS collaboration. The dilemma is that those same weaknesses pose obstacles to greater collaboration due to the risks involved in sharing details of technological capacities and operational practices to support objectives for cybersecurity improvement. Resolving this dilemma is mainly a matter of time and trust—time to develop secure platforms and processes for effective cybersecurity collaboration and trust among all parties that, in an environment characterized by deception, the collaborative objectives are the top priority.

Hypersonic and Counter-Hypersonic Capabilities

Hypersonic capabilities refer to maneuverable missiles that fly at speeds above Mach 5 (3836 miles per hour, five times the speed of sound). Maneuverability enables these missiles to fly at a low altitude with variable courses, as opposed to the predictable ballistic trajectories of conventional missiles, making them harder to detect with existing early warning systems and harder to defeat with existing missile defenses. Counter-hypersonic capabilities refer to systems intended to overcome these limits and counter such weapons, which can entail developing new types of technologies. DOD

has developed a number of programs to develop hypersonic and counter-hypersonic defensive capabilities, and both the United Kingdom and Australia have also undergone efforts to develop hypersonic capability prior to the establishment of AUKUS Pillar Two collaboration in this area.⁶⁹

Details on AUKUS hypersonic technology collaboration efforts are limited. The April 2022 statement that introduced this area only expressed the intention to “accelerate development of advanced hypersonic and counter-hypersonic capabilities.”⁷⁰ Subsequent updates providing additional details on other Pillar Two activities have not mentioned hypersonic technology development collaborations.⁷¹ Australia has stated that its facility for hypersonic R&D, which opened in 2022, would enable Australia and its international partners “to develop and characterize sovereign hypersonic technologies and generate ‘true’ hypersonic flight conditions at large scale in a classified laboratory.”⁷² More recently, joint US-Australia R&D of hypersonic technology, and potentially joint production, is reportedly progressing.⁷³

South Korea has a definitive interest in this area of AUKUS collaboration. Like the AUKUS partners, South Korea has preexisting hypersonic and counter-hypersonic R&D efforts underway. South Korea’s Agency for Defense Development (ADD) has a hypersonic cruise missile program with the goal of fielding the capability in the late 2020s.⁷⁴ South Korea also has a clear interest in developing a capability to counter North Korea’s hypersonic missiles.⁷⁵ Now that engagements with AUKUS partners to explore Pillar Two collaboration prospects are underway, South Korea has reportedly proposed hypersonic technologies as a potentially fruitful area.⁷⁶

However, the ASPI data suggest that South Korea’s potential contribution in this area may be less beneficial than in other areas. In the principal elements contributing to hypersonic and counter-hypersonic capabilities development, South Korea maintains a negligible portion of global capacity, and its potential contribution to existing AUKUS capacities barely dents China’s dominant position.⁷⁷ On the other hand, given the relative opacity of current AUKUS efforts in the hypersonic technology area, more specific considerations than overall capacity may influence prospects for South Korea joining AUKUS partners on advanced technology collaboration on particular elements.

Electronic Warfare

Electronic warfare (EW) has a deeper pedigree than other areas of Pillar Two advanced technology development. EW mainly entails actions to undermine an

adversary's military use of the electromagnetic spectrum (EMS) while ensuring one's own use. Activities can include achieving and defending against detecting, locating, identifying, intercepting, jamming, disrupting, cloaking, and analyzing EMS signals, which can contribute to intelligence gathering and support military operations across the war-fighting domains.⁷⁸ EW capabilities have existed since World War II, and all the AUKUS partners have ongoing EW development and operations distributed across various military services and organizations.

As with hypersonic technologies, the April 2022 statement only conveyed for EW the intention to “share understanding of tools, techniques, and technology.”⁷⁹ Similarly, further updates to EW collaborations have been sparse. In 2024, AUKUS sponsored an “Electronic Warfare Challenge,” encouraging private sector development of novel EW capabilities, with winners announced in September.⁸⁰ Solicitation of these contributions would serve a general objective to identify and develop new technologies and perhaps to germinate other specific collaborative activities within the EW area.

Specific information on South Korea's EW capabilities and operations is slim, but the ASPI data indicates that South Korea's EW technology capacity is the world's fourth largest, offering a distinct potential contribution to the overall AUKUS capacity.⁸¹ Intriguingly, some analysis suggests that EW advanced technology development may be particularly apropos as an AUKUS Pillar Two activity because all three partners are set to operate the US Air Force E-7 Wedgetail, an airborne command-and-control and EW platform.⁸² South Korea is the only other country in the Indo-Pacific region that is also procuring this platform.⁸³ If collaborative development of EW capabilities for this platform is an AUKUS objective, South Korea is a natural fit. Taken together, these factors suggest that, compared to other potential new AUKUS Pillar Two partners, a collaboration with South Korea offers unique opportunities to contribute to new EW technology development and bolster collective EW capabilities.

Innovation

As a functional area of defense collaboration, the developmental objectives of innovation are harder to specify than in the more tangible technological Pillar Two project areas. Innovation, despite being a focal topic of strategic studies, is notoriously difficult to define.⁸⁴ For military technology, innovation colloquially means the development of new capabilities and incorporation into military operations resulting in improved outcomes in the field. The 2022 US National Defense Strategy emphasizes the importance of “maintaining an enduring competitive edge over the PRC.”⁸⁵ This is an objective often considered to

depend on superior innovation capacities. But for collaboration among national partners, strong innovative capacities can introduce new challenges, including synchronizing technological innovation trajectories and managing disparate adoption capacities.⁸⁶

The initial AUKUS representation of the innovation project area implicitly recognizes these challenges by directing initial efforts toward building familiarity with mutual capacities: “Our work on innovation aims to accelerate our respective defense innovation enterprises and *learn from one another*, including ways to more rapidly integrate commercial technologies to solve warfighting needs.”⁸⁷ This could include fostering greater engagement among the three partners’ governmental agencies with innovation mandates, such as the US DOD’s Defense Innovation Unit (DIU) and Defense Advanced Research Projects Agency (DARPA), and their UK and Australian counterparts.⁸⁸ But early public activities suggest a clear interest in collectively tapping into the private sector’s innovation capacities, represented by the institutionalization of the AUKUS Innovation Challenges, “in which companies from across all three innovation ecosystems will be able to compete for prizes on a common innovation challenge topic.”⁸⁹ This outlook reflects an underlying reality that, relative to Cold War-era circumstances, Western militaries today are adopting rather than directing technology development.

South Korea displays a parallel interest and capacity to integrate commercial technologies into defense capabilities—exemplified by efforts on AI and autonomous drones, discussed earlier. In terms of overall innovation capacity, one assessment ranks South Korea sixth in the world, behind the United States (third) and the United Kingdom (fifth) but ahead of Australia (twenty-third), Japan (thirteenth), and China (eleventh).⁹⁰ Unlike the technology capacities in the ASPI data, innovation capacities are not cumulative, but South Korea’s strong position as a source of global innovation suggests potentially positive synergies are available through its incorporation into AUKUS defense technology innovation cooperation.

Information Sharing

Information sharing is another functional area of defense collaboration whose developmental objectives are harder to specify. Initially, AUKUS set out to “expand and accelerate sharing of sensitive information, including as a first priority enabling workstreams that underpin our work on agreed areas of advanced capabilities.”⁹¹ In other words, this functional area is an enabler for other Pillar Two elements.

The challenge is distinct. The AUKUS partners have a long history of information sharing on security and defense matters, including intelligence sharing through the Five Eyes (FVEY) network. Yet, despite this intimacy, effective information sharing has been an enduring challenge. Pillar Two advanced capability activities engage particularly protected areas, such as nuclear technology and cyber capabilities, and the partners have acknowledged that many of these activities will remain classified.⁹² The challenge of creating new avenues for information sharing among the partners in these areas likely presents an endemic resistance to the fluid collaboration necessary for the success of these activities. Some analysts have proposed specific remedies for these challenges, such as creating a new category of classified information, “Releasable to AUKUS Nations” (REL-AUKUS), to eliminate the need for piecemeal dissemination authorization and establishing a specialized AUKUS visa to facilitate the movement of expertise among the partners.⁹³ Ultimately, the success of promoting information sharing in AUKUS will come down to building trust in both information infrastructure security and intergovernmental relations.

South Korea has established important information-sharing conduits with key partners, including dedicated channels for sensitive information exchange within the US-ROK alliance and the General Security of Military Information Agreement (GSOMIA) established with Japan in 2016.⁹⁴ This existing foundation of information-sharing capacity makes South Korea a more credible potential partner, not only in the information-sharing area but across all AUKUS Pillar Two activities. However, the challenges facing the existing AUKUS partners are likely magnified with the inclusion of the new candidates, South Korea and Japan, that are outside the existing Five Eyes intelligence sharing network.⁹⁵ And, as with the existing partners, the viability of South Korean inclusion in AUKUS Pillar Two collaboration will surely hinge on developing trust. This is a principal reason why the development of advanced technology cooperation with South Korea under AUKUS is likely to emerge slowly and in a piecemeal fashion, allowing the incremental development of institutional and intergovernmental trust necessary to open other doors down the line.

Conclusion

The findings and analysis of the preceding section indicate that South Korea, through joining selective AUKUS Pillar Two activities, has much *to gain from* and *to bring to* advanced technology development collaboration. Some specific areas, such as undersea capabilities and AI, have potentially strong mutual benefits for South Korea and the AUKUS partners. Other areas appear

to offer relatively fewer compelling prospects. South Korea's inclusion in some elements of the functional information-sharing area is likely a prerequisite to fulsome engagement in other areas. Table 1 in the Appendix provides the ASPI data underlying some of these findings.

South Korea's motivations for seeking involvement in AUKUS Pillar Two activities are evident. The technological, economic, and military benefits could be significant, including the addition of key capabilities directly applicable to responding to North Korean threats. At the same time, such partnerships would enable South Korea to become a valuable contributor to a broader multilateral regional security posture, increasing the country's integration with key allies and partners while enhancing its regional status and influence. Not least among the potential benefits is the likely strengthening of the US-ROK alliance that would result from more extensive joint capabilities development and information sharing under AUKUS auspices. Concurrently, some observers suggest that increasing South Korea's inclusion in more multilateral security mechanisms could bolster the country's security autonomy and self-determination, which somewhat ironically could also strengthen the US-ROK alliance.⁹⁶

More contentiously, some observers also see South Korea's inclusion in Pillar Two advanced capability development projects, and many of the inclusiveness benefits that could accrue from that, as a means to gradually persuade the United States and other regional partners to support some form of a Pillar One program enabling South Korea to acquire nuclear-powered submarines.⁹⁷ Yet, as noted, that ambition rekindles an awareness of longstanding interests within some South Korean circles in expanding nuclear technology capabilities and perhaps developing a latent nuclear weapons capacity. From current US and regional partner perspectives, such aspirations are antithetical to South Korea's deeper integration into a multilateral regional defense posture. Conversely, these allies and partners are likely to hope that South Korea's greater regional security inclusion, and in particular the strengthening of the US-ROK alliance that is likely to flow from South Korea's participation in AUKUS, would in turn provide long-term amelioration of South Korean concerns regarding allied abandonment that motivate calls for more independent South Korean conventional forces and strategic deterrent capabilities.

These considerations spotlight how the creation of AUKUS, and the subsequent initial opening of the door to include South Korea and select countries in certain Pillar Two collaborative projects, have had the unintended consequence of kindling more fundamental discussions in South Korea over the country's core security interests and how best to pursue them. The definitive concern over North Korean threats has oriented South Korean security priorities for

decades and is in some respects graver now more than ever. Yet, many South Korean analysts increasingly acknowledge the threat that growing Chinese power and assertiveness pose to the country's security interests, not only mediated through US concerns projected through the US-ROK alliance. Cutting across this antinomy, some analysts suggest that greater South Korean inclusion in regional multilateral security mechanisms beyond the bilateral US alliance can bolster South Korea's responses to both these security concerns. AUKUS, and the crack in the door for South Korea's participation in it, propels these debates.

Appendix - Table 1

AUKUS Advanced Technology Capabilities with South Korea								
Undersea Capabilities								
Technology	United States	UK + Australia	South Korea	AUKUS Total	AUKUS + S. South	China	SK Additional v. China	Technology monopoly/risk
Coatings	7.3%	2.9%	3.2%	10.2%	13.4%	58.5%	5.5%	8/10 & 7.96 high
Autonomous underwater vehicles*	9.5%	4.8%	2.3%	14.3%	16.6%	56.9%	4.0%	10/10 & 6.00 high
Sonar and acoustic sensors*	11.0%	5.2%	3.0%	16.2%	19.2%	44.9%	6.7%	8/10 & 4.08 high
Air-independent propulsion (focused on compact energy generation)*	11.1%	3.2%	3.7%	14.3%	18.0%	41.6%	8.9%	5/10 & 3.75 medium
Autonomous systems operation technology	21.0%	8.6%	3.5%	29.6%	33.1%	26.2%	13.4%	3/10 % 1.25 low
Advanced robotics	24.6%	8.4%	3.8%	33.0%	36.8%	27.9%	13.6%	4/10 & 1.13 low

Quantum Technologies								
Technology	United States	UK + Australia	South Korea	AUKUS Total	AUKUS + S. South	China	SK Additional v. China	Technology monopoly risk
Quantum computing	33.9%	8.9%	1.0%	42.8%	43.8%	15.0%	6.7%	8/10 & 2.26 medium
Post-quantum cryptography	13.3%	7.5%	1.0%	20.8%	21.8%	31.0%	3.2%	4/10 & 2.33 low
Quantum communications	16.7%	9.7%	1.0%	26.4%	27.4%	31.5%	3.2%q	5/10 & 1.89 low
Quantum sensor	23.7%	6.7%	1.0%	30.4%	31.4%	23.3%	4.3%	2/10 % 1.02 low
Artificial Intelligence and Autonomy								
Technology	United States	UK + Australia	South Korea	AUKUS Total	AUKUS + S. South	China	SK Additional v. China	Technology monopoly risk
Drones, swarming and collaborative robots	10.3%	6.6%	1.0%	16.9%	17.9%	36.1%	2.8%	5/10 & 3.50 medium
Artificial intelligence (AI) algorithms and hardware accelerators	13.3%	6.0%	4.2%	19.3%	23.5%	36.6%	11.5%	7/10 & 2.76 medium

Artificial Intelligence and Autonomy (cont.)									
Technology	United States	UK + Australia	South Korea	AUKUS Total	AUKUS + S. South	China	SK Additional v. China	Technology monopoly risk	
Advanced data analytics	154%	7.6%	1.0%	23.0%	24.0%	31.2%	3.2%	8/10 & 2.02 medium	
Machine learning (incl. neural networks and deep learning)	17.9%	6.6%	3.3%	24.5%	27.8%	33.2%	9.9%	7/10 & 1.85 low	
Advanced integrated circuit design and fabrication	24.2%	4.2%	3.5%	28.4%	31.9%	21.2%	16.5%	4/10 & 1.14 low	
Natural language processing	25.7%	7.2%	3.4%	32.9%	36.3%	23.6%	14.4%	5/10 & 1.09 low	
Advanced Cyber									
Technology	United States	UK + Australia	South Korea	AUKUS Total	AUKUS + S. South	China	SK Additional v. China	Technology monopoly risk	
Advanced communications (incl. 5G and 6G)	9.5%	7.0%	4.9%	16.5%	21.4%	29.7%	16.5%	8/10 & 3.12 high	
Protective cybersecurity technologies	16.8%	11.0%	2.7%	27.8%	30.5%	22.3%	12.1%	5/10 & 1.33 low	
Adversarial AI - reverse engineering*	25.1%	8.6%	3.5%	33.7%	37.2%	30.9%	11.3%	7/10 & 1.23 low	

Hypersonic and Counter-hypersonic Capabilities								
Technology	United States	UK + Australia	South Korea	AUKUS Total	AUKUS + S. South	China	SK Additional v. China	Technology monopoly risk
Hypersonic detection, tracking and characterization*	14.1%	4.6%	0.5%	18.7%	19.2%	73.3%	0.7%	9/10 & 3.25 high
Advanced aircraft engines (incl. hypersonics)	11.7%	5.5%	1.0%	17.2%	18.2%	48.5%	2.1%	7/10 & 4.15 medium
Electronic warfare								
Technology	United States	UK + Australia	South Korea	AUKUS Total	AUKUS + S. South	China	SK Additional v. China	Technology monopoly risk
Electronic warfare*	14.3%	5.6%	3.5%	19.9%	23.4%	46.5%	7.5%	9/10 & 3.25 high
Photonic sensors	12.5%	3.5%	3.6%	16.0%	19.6%	42.7%	8.5%	8/10 & 3.41 high
Directed energy technologies	19.1%	7.2%	5.9%	26.3%	32.2%	39.1%	15.1%	7/10 & 2.05 medium

Note: South Korea values of 1.0% or less are estimates drawn from available data in the dataset.

Note: UK_Australia advanced communications value is an estimate drawn from available data in the dataset.

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- ⁵⁷ US Department of Defense, “AUKUS Defense Ministers Meeting Joint Statement,” December 1, 2023, <https://www.defense.gov/News/Releases/Release/Article/3604511/aukus-defense-ministers-meeting-joint-statement/>.
- ⁵⁸ Gaida, Wong Leung, Robin, and Cave, “Critical Technology Tracker”; “AUKUS Relevant Technologies: Top 10 Country Snapshot,” Australian Strategic Policy Institute, <https://techtracker.aspi.org.au/our-report/>. In only one prominent AI category spotlighted in the ASPI data—advanced data analytics—is South Korea’s ranking below both the United Kingdom and Australia. Also worth noting: in all these categories, South Korea ranks well ahead of Japan. Lastly, in all these categories, the United States and China hold the top two rankings, with China ahead in all but natural language processing.

- ⁵⁹ The current benchmark articulation of the latter perspective is Michael P. Fischerkeller, Emily O. Goldman, and Richard J. Harknett, *Cyber Persistence Theory: Redefining National Security in Cyberspace* (New York: Oxford University Press, 2022). See also Catherine A. Theohary, “Defense Primer: Cyberspace Operations,” Congressional Research Service, December 14, 2023.
- ⁶⁰ US Department of Defense, “Unclassified Summary of the 2023 Cyber Strategy,” September 2023, https://media.defense.gov/2023/Sep/12/2003299076/-1/-1/1/2023_DOD_Cyber_Strategy_Summary.pdf.
- ⁶¹ UK Government, “National Cyber Strategy 2022,” December 15, 2022, <https://www.gov.uk/government/publications/national-cyber-strategy-2022/national-cyber-security-strategy-2022>; Australian Government, “2023-2030 Australian Cyber Security Strategy,” November 22, 2023, <https://www.homeaffairs.gov.au/about-us/our-portfolios/cyber-security/strategy/2023-2030-australian-cyber-security-strategy>.
- ⁶² Note the evolution in two statements separated by 20 months: The White House, “Fact Sheet: Implementation of the Australia – United Kingdom – United States Partnership (AUKUS)”;
- US Department of Defense, “AUKUS Defense Ministers Meeting Joint Statement,” December 1, 2023, <https://www.defense.gov/News/Releases/Release/Article/3604511/aukus-defense-ministers-meeting-joint-statement/>.
- ⁶³ For a thorough articulation, see Erik Gartzke and Jon R. Lindsay, “Weaving Tangled Webs: Offense, Defense, and Deception in Cyberspace,” *Security Studies* 24, no. 2 (June 2015), <https://www.tandfonline.com/doi/full/10.1080/09636412.2015.1038188>.
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- ⁶⁵ For recent discoveries in a long series, see Jack Kim, “North Korea hacking teams hack South Korea defence contractors,” *Reuters*, April 22, 2024, <https://www.reuters.com/technology/cybersecurity/north-korea-hacking-teams-hack-south-korea-defence-contractors-police-2024-04-23/>, and Mariko Oi, “North Korea hacked South Korea chip equipment makers,” *BBC*, March 4, 2024, <https://www.bbc.com/news/business-68476035>.
- ⁶⁶ Office of the President, “Strategic Cybersecurity Cooperation Framework Between the Republic of Korea and the United States of America,” April 2023. For a recent assessment, see Sebastian Garcia, “Facing the North Korean Cyber Threat: United States-South Korea Coordination in Cyberspace,” *Asia Dispatch*, Wilson Center, August 29, 2024, <https://www.wilsoncenter.org/blog-post/facing-north-korean-cyber-threat-united-states-south-korea-coordination-cyberspace>.
- ⁶⁷ Natasha Wood, “South Korea’s 2024 Cyber Strategy: A Primer,” *Center for Strategic and International Studies*, August 2, 2024, <https://www.csis.org/blogs/strategic-technologies-blog/south-koreas-2024-cyber-strategy-primer>.
- ⁶⁸ Gaida, Wong Leung, Robin, and Cave, “Critical Technology Tracker: The Global Race for Future Power”; and “AUKUS Relevant Technologies: Top 10 Country Snapshot,” *Australian Strategic Policy Institute*, <https://techtracker.aspi.org.au/our-report/>.

- ⁶⁹ More information on technology characteristics and global development programs is available at Kelley M. Saylor, “Hypersonic Weapons: Background and Issues for Congress,” Congressional Research Service, August 14, 2024, <https://crsreports.congress.gov/product/pdf/R/R45811/41>.
- ⁷⁰ The White House, “Fact Sheet: Implementation of the Australia – United Kingdom – United States Partnership (AUKUS).”
- ⁷¹ For example, US Department of Defense, “AUKUS Defense Ministers Meeting Joint Statement,” December 1, 2023, <https://www.defense.gov/News/Releases/Release/Article/3604511/aukus-defense-ministers-meeting-joint-statement/>.
- ⁷² Statement by then-Australian Minister for Defence Peter Dutton, quoted in Mikayla Easley, “AUKUS Partners Aim to Catch China in Hypersonics Race,” National Defense, February 17, 2023, <https://www.nationaldefensemagazine.org/articles/2023/2/17/aukus-partners-aim-to-catch-china-in-hypersonics-race>.
- ⁷³ Kirsty Needham, “Australia, US Look to Joint Production of Hypersonic Missile,” Reuters, August 16, 2024, <https://www.reuters.com/world/australia-us-look-joint-production-hypersonic-missile-us-lawmaker-says-2024-08-16/>.
- ⁷⁴ Hyuk-cheol Kwon, “우리도 극초음속미사일 개발하고 있었다... ‘북한보다 기술 앞서’ [We were also working on hypersonic missiles... technologically ahead of North Korea],” *Hankyoreh*, January 6, 2022, <https://www.hani.co.kr/arti/politics/defense/1026272.html>.
- ⁷⁵ Dong-seok Kim, “韓 방공망, 北 저고도-극초음속 미사일 못 막는다 [South Korea’s air defenses can’t stop North Korea’s low-altitude, hypersonic missiles],” *Maeil Shinmun*, January 28, 2024, <https://www.imaeil.com/page/view/2024012820095644716>.
- ⁷⁶ Seong Hyeon Choi, “South Korea Brings Hypersonic Tech to the AUKUS Table,” *South China Morning Post*, May 5, 2024, <https://www.scmp.com/news/china/diplomacy/article/3261304/south-korea-brings-hypersonic-tech-aukus-table-sign-seoul-moving-closer-us-and-its-other-allies>.
- ⁷⁷ For example, in “hypersonic detection, tracking, and characterization,” China commands 73.3 percent of global capacity; South Korea with less than 0.5 percent is not in the top ten of countries. “AUKUS Relevant Technologies: Top 10 Country Snapshot,” Australian Strategic Policy Institute, <https://techtracker.aspi.org.au/our-report/>.
- ⁷⁸ For more information on electronic warfare, see “Defense Primer: Electronic Warfare,” Congressional Research Service, Updated November 14, 2022, <https://crsreports.congress.gov/product/pdf/IF/IF11118>. Directed energy weapons, such as lasers and high-powered microwaves, generally are considered distinct from EW capabilities.
- ⁷⁹ The White House, “Fact Sheet: Implementation of the Australia – United Kingdom – United States Partnership (AUKUS).”
- ⁸⁰ Defense Innovation Unit, “First Trilateral AUKUS Pillar II Prize Competition Completed,” September 25, 2024, <https://www.diu.mil/latest/first-trilateral-aukus-pillar-ii-prize-competition-completed>.

- ⁸¹ Relatedly, South Korea ranks third in directed energy technologies, behind only China and the US, with a high value-added to AUKUS relative to China. See “AUKUS Relevant Technologies: Top 10 Country Snapshot,” Australian Strategic Policy Institute, <https://techtracker.aspi.org.au/our-report/>; and the Appendix, Table 1.
- ⁸² “AUKUS Pillar 2 (Advanced Capabilities): Background and Issues for Congress.”
- ⁸³ The only other country is Turkey. See “E-7A AEW&C,” Boeing, <https://www.boeing.com/defense/e-7-airborne-early-warning-and-control/>.
- ⁸⁴ For a recent review and evaluation of the extensive literature on military innovation, see Michael C. Horowitz and Shira Pindyck, “What is a Military Innovation and Why It Matters,” *Journal of Strategic Studies* 46, no. 1 (2023), <https://doi.org/10.1080/01402390.2022.2038572>.
- ⁸⁵ US Department of Defense, “National Defense Strategy of the United States of America,” October 2022, <https://media.defense.gov/2022/Oct/27/2003103845/-1/-1/1/2022-NATIONAL-DEFENSE-STRATEGY-NPR-MDR.PDF>.
- ⁸⁶ For an investigation of innovation collaboration challenges in the Asia-Pacific context, see Joanthony De Hoyos, “The Revolution of Military Affairs: US-Japan Innovation Alliance to Ensure Future Interoperability” (Master’s Thesis, Naval Postgraduate School, March 22, 2024).
- ⁸⁷ The White House, “Fact Sheet: Implementation of the Australia – United Kingdom – United States Partnership (AUKUS).” Emphasis added.
- ⁸⁸ “AUKUS Pillar 2 (Advanced Capabilities): Background and Issues for Congress.”
- ⁸⁹ US Department of Defense, “AUKUS Defense Ministers Meeting Joint Statement,” December 1, 2023, <https://www.defense.gov/News/Releases/Release/Article/3604511/aukus-defense-ministers-meeting-joint-statement/>. As discussed in the prior sub-section, the first round focused on electronic warfare.
- ⁹⁰ “Global Innovation Index 2024 - GII 2024 Results,” Global Innovation Index 2024, accessed October 4, 2024, <https://www.wipo.int/gii-ranking/en/rank>.
- ⁹¹ The White House, “Fact Sheet: Implementation of the Australia – United Kingdom – United States Partnership (AUKUS).”
- ⁹² US Department of Defense, “AUKUS Defense Ministers Meeting Joint Statement,” December 1, 2023, <https://www.defense.gov/News/Releases/Release/Article/3604511/aukus-defense-ministers-meeting-joint-statement/>.
- ⁹³ John Christianson, Sean Monaghan, and Di Cooke, “AUKUS Pillar Two: Advancing the Capabilities of the United States, United Kingdom, and Australia,” Center for Strategic and International Studies, July 10, 2023, <https://www.csis.org/analysis/aukus-pillar-two-advancing-capabilities-united-states-united-kingdom-and-australia>. Italics original.

⁹⁴ Sangbo Park, "Implications of the General Security of Military Information Agreement for South Korea," Stimson Center, December 16, 2016, <https://www.stimson.org/2016/implications-general-security-military-information-agreement-south-korea/>. This assessment notes that South Korea had signed a GSOMIA agreement with 32 countries and NATO, compared with six such agreements by Japan.

⁹⁵ The Five Eyes (FVEY) countries—the United States, the United Kingdom, Australia, Canada, and New Zealand—have maintained a separate technology cooperation forum since 1969. See US Department of Defense, "DOD Represented at Five Eyes Technology Principals Meeting," September 20, 2023, <https://www.defense.gov/News/Releases/Release/Article/3532136/dod-represented-at-five-eyes-technology-principals-meeting/>.

⁹⁶ Author interviews in Seoul, Korea, September 8-13, 2024.

⁹⁷ Author interviews in Seoul, Korea, September 8-13, 2024.