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AUKUS: U.S. Navy Nuclear-Powered Forward Presence Key to Australian Nuclear Submarine and China Deterrence

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KEY TAKEAWAYS

The Australia–U.K.–U.S. (AUKUS) partnership to deliver an Australian nuclear submarine could provide invaluable deterrence against China.

But, if not managed well, AUKUS could just as easily become a diplomatic and engineering fiasco, further setting back U.S. and allied interests.

The United States should meet certain short-term, mid-term, and long-term objectives to ensure that AUKUS fulfills its mission.

President Joseph Biden announced a new Australia–U.K.–U.S. (AUKUS) partnership on September 15, 2021.[1] The goal of the agreement is to develop an Australian nuclear submarine program. AUKUS was received with fanfare by some allies, with ridicule from China, and anger—notably from France, which lost its lucrative submarine deal with Australia. However, the real measure of AUKUS will be providing, sustaining, and posturing naval nuclear assets in Australia to kickstart a program that will last a decade.

AUKUS is a big deal, and if it is not carefully managed, it could just as easily become a diplomatic and engineering fiasco further setting back U.S. and allied interests. As the AUKUS project shifts into its 18-month planning phase, there are myriad potential complications with its central element—the

production of a nuclear submarine—that must be addressed. While such technical and often mundane concerns over nuclear maintenance, nuclear-parts quality control, and infrastructure rarely get press coverage, they are critical to AUKUS's success. As this program evolves, there are three key areas that should remain foremost in the U.S., U.K., and Australian leaders' plans: (1) developing and deploying capabilities that deter China's increasingly aggressive maritime behavior, (2) tangibly advancing the Australian submarine program while avoiding the delays and cost overruns that doomed the French project, and (3) maintaining vigilance to ensure sustained Australian commitment of resources to the effort.

A Complicated Endeavor

To produce a nuclear attack submarine is perhaps the most challenging manufacturing task in the world. The engineering tolerances, specifications, and requirements are daunting. While there is a need for urgency, the allies would be well-served to follow prudent engineering practices to deliver an Australian nuclear submarine in the next decade.

Even before its current 2016 defense white paper,[2] Australia's government has been steadfast on the need for submarines in defending its maritime interests. Australia's current *Collins*-class submarine prioritized defending shipping lanes against attack.[3] To do so, the submarines would have to operate over long distances while patrolling the expanses of the Indian and Pacific Oceans, requiring great range, speed, and submerged endurance.

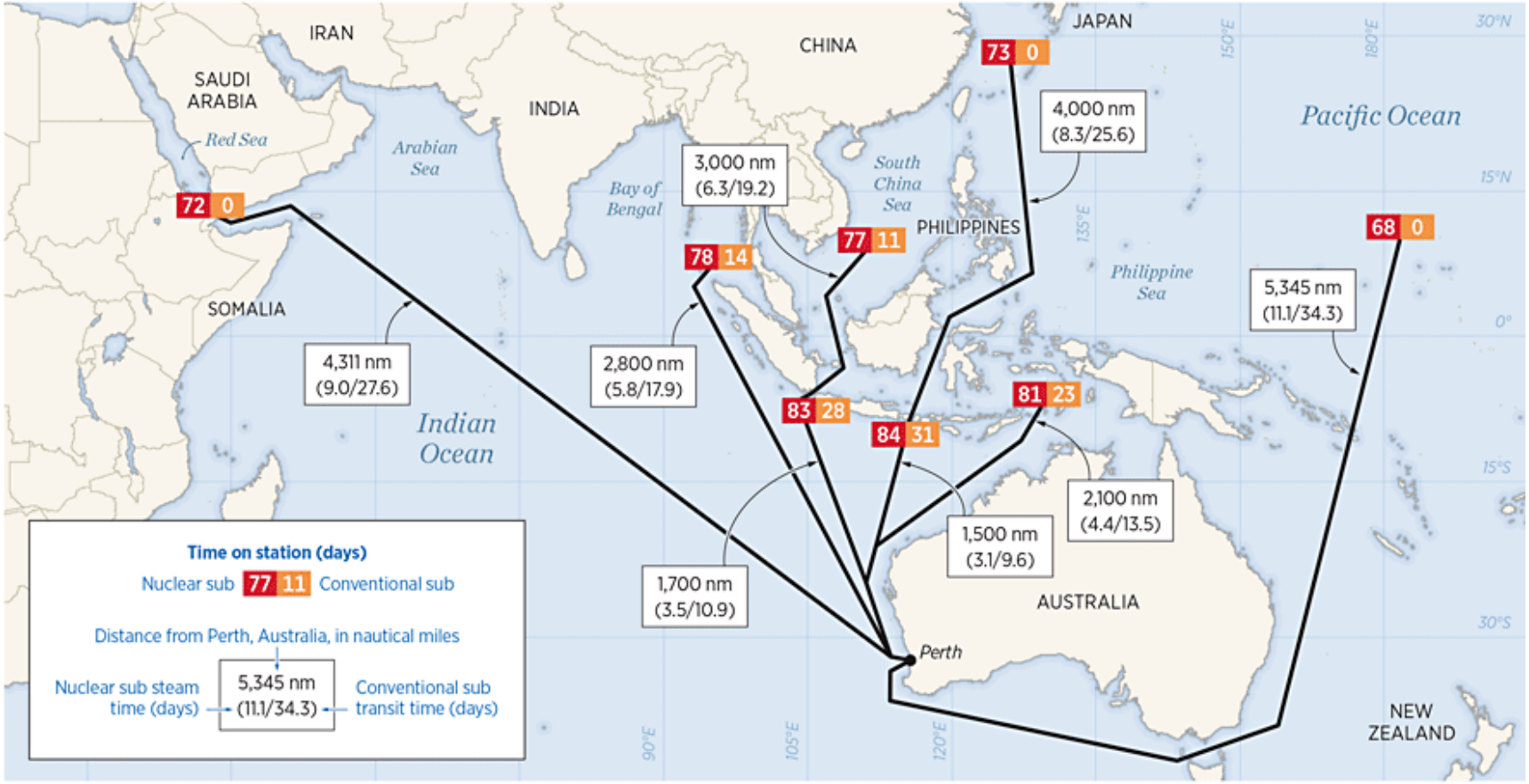
A nuclear submarine fleet can meet these requirements. Nuclear submarines can sustain speeds in excess of 20 knots indefinitely, with endurance limited only by how much food is onboard. A conventionally powered submarine needs to come shallow in order to recharge batteries after a sprint away from attack, exposing it to detection and renewed attack, whereas nuclear-powered submarines have better ability to evade an enemy at high speeds for long periods of time underwater. Nuclear power also provides greater electrical capacity to run advanced sonar and tactical systems while affording space for a larger arsenal of weapons. The 3,400-ton *Collins*-class submarine can carry around 20 torpedoes or 44 mines, while a 7,900-ton U.S. *Virginia*-class nuclear submarine matches this and adds 12 vertical launch tubes for cruise missiles.[4]

For these reasons, Australia had considered nuclear power early in the design of the *Collins* class in 1982. However, unwillingness by the United States and U.K. to share the technology—and a French alternative submarine that would have required reliance on overseas maintenance—precluded

MAP 1

The Benefits of a Nuclear Submarine Fleet in Australia

An Australian submarine fleet would need to defend shipping lanes from the Persian Gulf to the North Pacific Ocean. Nuclear submarines can travel at faster speeds (about 20 knots, on average) compared to convential submarines (6.5 knots) and stay on station for significantly longer periods of time.



NOTE: Calculations for times on station are based on 6.5 knots and 50 days of endurance for conventional subs, and 20 knots and 90 days of endurance for nuclear subs.
SOURCE: "Figure 3: Comparison of Submarine Time on Station at Critical ChokePoints," in Center for Strategic and Budgetary Assessments, "Gateway to the Indo-Pacific: Australian Defense Strategy and the Future of the Australia-U.S. Alliance," 2013, p. 33, https://csbaonline.org/uploads/documents/Gateway_to_IndoPacific1.pdf (accessed September 28, 2021).

Australia's pursuit of a nuclear submarine option.[5] In 2016, Australia awarded France's Naval Group a $38.5 billion contract for a modified 4,000-ton *Shortfin Barracuda*-class submarine called *Attack*. A key stipulation was that construction and sustainment be conducted in Australia—a requirement that precluded a French nuclear variant.[6]

An Australian parliamentary audit found the French *Attack* program to be at high risk of failure, with sunk design costs, months-long delays, and cost overruns—the first submarine was going to be delivered at double the original cost ($80 billion Australian dollars).[7] Progress was so slow that the chief of Australia's navy, Vice Admiral Mike Noonan, admitted that the first *Attack* submarine would not arrive until 2035—three years later than originally planned.[8] Then things got worse: Because of the *Attack* program's delays, Australia's six *Collins*-class submarines now require service life extensions at a total cost of $6.4 billion Australian dollars.[9] Australian frustrations apparently reached a tipping point during the G7 summit in June 2021: After talks with French President Emmanuel Macron, U.S. President Biden, and U.K. Prime Minister Boris Johnson, Australian Prime Minister Scott Morrison gave way to an idea that would become AUKUS.

Challenges Ahead

First building, then operating, and then maintaining an Australian nuclear submarine will be a multigenerational endeavor. The AUKUS announcement was really an agreement to develop a long-term plan. Australia's first task over the next 18 months is to chart a course that is achievable, timely, and based on sound engineering. This is good, as demand at U.S. shipyards to concurrently produce two *Virginia*-class submarines and one next-generation *Columbia*-class submarine is straining shipyard capacity.

Cost. Nuclear submarines are wickedly complex machines with multi-billion-dollar price tags to match. Australia's 2020 defense budget at $39.5 billion is likely inadequate for the task, requiring significant and sustained increases well into the future.

Timeframe. The current U.K. *Astute*-class nuclear submarine ran 53 percent over budget and almost five years late, while the U.S. *Virginia*-class nuclear submarine fared better, with only a four-month delay, and was largely on budget due in part to predictable multi-year block purchases.[10] Moreover, in the U.S. nuclear submarine experience, it typically takes 15 years to design and build the first in class of a new submarine.[11] Unlike the U.S. and the U.K., Australia would have to build a nuclear submarine enterprise (construction, training, operating, and maintenance) from the ground up.

Safety. As Australia creates a naval nuclear submarine program, it will be committing itself to sustaining the highest engineering standards of nuclear-power safety and operation. For the U.S. Navy, the April 1963 loss of the nuclear submarine *Thresher* led to implementation of the Submarine Safety Program (SUBSAFE), an extraordinary quality-assurance and design-standards regime that ensures a high degree of survivability. The Navy lost 16 submarines outside of combat prior to SUBSAFE's 1963 inception and only one since.[12]

Nuclear Maintenance. Since a 1982 executive order, the Naval Reactors (NR) program has been charged with overseeing all aspects of the U.S. Naval nuclear program. Given the unique challenges of developing nuclear power for use on Navy warships, NR's roots date to a unique 1949 merger between the Department of the Navy and the Department of Energy. Today, NR is charged with certifying the design of nuclear submarines and ensuring adequate radiological controls, as well as training and assignment of personnel to every phase of the nuclear submarine life cycle.[13] The father of the U.S. Navy's nuclear fleet, Admiral Hyman Rickover, realized early that nuclear submarining required a unique service culture of technical competency, integrity, and precision, the standards of which are upheld today by NR. The Royal Australian Navy is no stranger to submarining, having acquired E-class submarines when its navy was established in 1914. That said, the stringent operational and rigorous training requirements of naval nuclear power due to the added engineering complexities will require the Australian submarine force to adapt its submarine service culture accordingly.

Leveraging U.S., U.K. Technology

To get an Australian nuclear submarine to sea by the early 2030s, Australia will have to leverage existing U.S. or U.K. designs, training regimens, and infrastructure. One option to do so would be to build on the U.K.'s recently announced three-year contract awarded to BAE Systems and Rolls-Royce to design a new nuclear attack submarine, which just might meet Australian requirements.[14]

Another potential option is to continue to use existing U.S. *Virginia*-class or U.K. *Astute*-class designs currently in production. Sustaining *Astute* production beyond the final three boats to be built (as of this writing) as Australian nuclear submarines could be feasible. This assumes that the demand for more nuclear-component production can be met without affecting next-generation U.K. submarine design and production. The *Astute*, roughly the same length but with several thousand tons more displacement

than the *Attack*, might also be interoperable with Australian infrastructure (such as piers and dry docks) built for the cancelled *Attack* program. However, taking this route would at best delay domestic production, which has been a past Australian political sticking point. After the 2016 decision to pursue a French submarine, then-Australian Prime Minister Malcolm Turnbull championed the potential for 2,800 new jobs: "Australian built, Australian jobs, Australian steel. Here, right where we stand."[15]

India's Experience

India's nuclear submarine program is instructive in how to add naval presence in the Indo–Pacific while laying the foundations of an indigenous program. Since 1987, the Indian navy has leased a nuclear submarine from Russia. In 2016, after decades of leased nuclear submarine experience, the Indian navy delivered its first indigenously built nuclear submarine—the INS *Arihant* strategic strike submarine—at a cost of $13 billion and 12 years of construction. In turn, the Indian navy has begun to develop a nuclear attack submarine, under Project 76. But due to delays, India has since had to seek a $3 billion deal with Russia to modernize its currently leased Russian nuclear attack submarine, while leasing a second to escort deployed aircraft carriers.[16]

Unlike India's experience with Russia, AUKUS has an ace up its sleeve: the U.S.–U.K. Mutual Defense Agreement. This agreement, originally penned in 1958, provides for technical exchange in the development of nuclear submarines. Should Australia be brought into the agreement, it could benefit from American and British operational and design expertise and transfer of naval nuclear fuel. Given the deteriorating geostrategic environment in Asia, time is in short supply.

Admiral Philip Davidson, Commander of the U.S. Indo–Pacific Command, testified in March 2021 that China is making necessary investments to start a war against Taiwan within six years. Driving this timeline is a host of domestic pressures that challenge the legitimacy of the Chinese Communist Party (CCP) that will come to a head by 2029, when China begins an unavoidable population decline, accompanied by a likely decline in the growth rate of gross domestic product from today's 6.9 percent to 3 percent by 2030.[17] Coincidently, the CCP is urgently seeking to field a fully modern military by 2027—a budget priority in the CCP's 2021–2025 five-year plan. These developments should inform AUKUS timelines, preferably toward earliest in-country delivery of added naval forces to Australia.

Deployment Options

While leasing may not be a preferred Australian option for AUKUS, forward-deploying the U.S. Navy's nuclear submarines and submarine tenders—with their machine shops and technical experts for nuclear maintenance—might.

These tenders and their workshops have the capacity to conduct nuclear maintenance, and could serve as floating nuclear apprenticeship schools with embedded Australian crew members. Likewise, increasing the frequency of nuclear submarine visits or basing in Australia provides for rapidly increased forward presence and platforms for training of Australian nuclear submariners. Another option is to phase in Australian crews aboard U.S. or U.K. nuclear submarines that would gradually be turned over to the Australian navy. Of course, this does not obviate the need to train nuclear shipyard workers and maintainers who will build and sustain an Australian nuclear submarine enterprise.

Achieving this objective in rapid order with minimum risk requires increased U.S. nuclear expertise and support machinery in Australia. Regarding any sustained U.S. presence in Australia, it will be important to heed the lessons of Marine Rotational Force–Darwin, a U.S. Marine Corps task force based in Australia. That task force was announced in November 2011 as an effort to rebalance U.S. military presence to the Asia-Pacific, ostensibly to deter Chinese aggression. The effort stalled fairly quickly out the gates. Especially important was drawn-out cost-sharing negotiations and the troubling lease of the port of Darwin to Chinese company Landbridge.[18] By all accounts, the alliance has learned from the Darwin experience and moved on.

Recommendations for the U.S.

In the near term (next two years), Australia's priority should be to deter Chinese adventurism while demonstrably delivering on the promises of U.S. security partnerships—principally AUKUS. In the mid-term (next five years), it will be critical to the eventual success of AUKUS that visible progress is made in Australia in building a nuclear submarine and its support structures, which would also support a U.S. Naval forward presence when tensions with China are likely to be highest. The final goal in the long term (10 years and beyond) should be establishing a viable Australian nuclear submarine program. To accomplish this, the U.S. should do the following.

The Chief of Naval Operations should:

- **Shift the homeport of a submarine tender to Australia.** To provide an early opportunity for Australian sailors and maintainers to begin learning what it takes to support nuclear-powered submarines, the U.S. Navy could move one of its two submarine tenders to Australia. Doing so would sustain deployed submarine nuclear maintenance while accelerating the training of Australian personnel.

- **Open the U.S. Navy's nuclear training facilities to the Australian navy.** Offering seats at the Navy's nuclear training facilities for Australian personnel will create a fresh cadre of nuclear submariners ready to go to sea. Consideration should also be given to training Australia's future nuclear-power instructors and to supporting Australia's eventual creation of its own nuclear-power training pipeline.

- **Increase nuclear submarine port visits and expand nuclear maintenance at Australian ports where nuclear facilities are to be located.** At first this would likely entail only minor adjustments to submarine deployment plans, but the United States should also consider long-term potential of basing in Australia.

The Secretaries of Energy and the Navy should:

- **Direct NR to establish field offices in Australia at facilities that are key to Australia's nuclear submarine program.** The NR program is responsible for the U.S. Naval nuclear program and has maintained an impeccable track record. It should be a major partner in Australia's efforts to develop a nuclear program. NR should establish field offices in Australia to assist with future nuclear submarine manufacture, maintenance, and training, while inviting the Australian government to create a parallel institution.

The Director of National Intelligence should:

- **Establish a mechanism in consultation with the U.K. for sharing naval nuclear propulsion information with Australia.** Currently the United States, the U.K., and Australia are members of the Five Eyes intelligence sharing agreement, which provides a solid basis of trust for the secure handling of sensitive information.[19] Since the three

allies' national leaders have made the strategic decision to support AUKUS, creating a new AUKUS classification standard not unlike Five Eyes should receive high priority and accomplished rapidly given its importance to the wider effort.

The Secretary of State should:

- **Expand existing U.S.–U.K. nuclear agreements to a new trilateral agreement with Australia.** In 1958, the United States and U.K. entered into cooperation on the uses of atomic energy for mutual defense. Through several amendments, the agreement continues to successfully govern the sharing of nuclear technologies, nuclear fuel, and resources.[20] It should form the basis of a new trilateral agreement that includes Australia. Broader technical exchange in artificial intelligence and quantum technologies mentioned in the September 15, 2021, White House statement should be covered in separate agreements so as to not delay progress on the nuclear submarine.

House and Senate leaders should:

- **Establish a joint congressional coordinating working group on AUKUS.** The Navy will need Congress's sustained support as it works through a decade-long project to assist in building an Australian nuclear submarine program. This will be particularly important for the forward-basing of U.S. Navy personnel and platforms. Establishing an Australian nuclear submarine program will enhance the alliance for generations to come.

Conclusion

Having a close ally, such as Australia, that contributes nuclear submarines to the maritime competition with China is invaluable. Success will depend on the three AUKUS allies quickly establishing an irreversible pathway to an Australian nuclear submarine. If the project falls into the cost-and-delay trap that characterized the French program, it will meet the same end and risk further eroding the ability of the United States and its allies to deter China.

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