

AUKUS Cooperation in the Form of Australian Nuclear Submarine Technology for Stability in Indo-Pacific Region

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Abstract: Australia's future submarine operation missions are guided by the 2009 Australian White Paper with the specification being able to carry out covert patrols at very long distances with long operating times. Submarines that meet these specifications are nuclear-powered submarines, especially the Astute Class Nuclear Submarine with high technology. The submarine specifications are 97 m long and will displace 7,400 tons of seawater when stored. The submarine can fully circumnavigate the globe without ever surfacing and, armed with tomahawk cruise missiles, can target military facilities on land from thousands of miles away. This new payload will significantly increase the Australian navy's conventional strike power. The Smart Submarine Astute can pinpoint accuracy to strike targets up to 1,200 km from the coast. According to the AUKUS Alliance (Australia-UK-US), nuclear submarines are an effort for world stabilization and security, especially in the Indo-Pacific Region. Considering the Natural, Energy and Food Wealth of the Indo-Pacific Region is the spearhead of the survival of the global community. The assembly of super-advanced nuclear submarines will not be ready until around 2040, so this cooperation will last quite a while.

Keywords: AUKUS, Nuclear Submarine, Indo-pacific, Stability, Cooperation

I. INTRODUCTION

Efforts to meet Australia's Future Submarine mission requirements, as outlined in the 2009 White Paper, include strengthening of 12 submarines capable of conducting extended covert patrols (long-range) based on a strategic approach in the operational area. Submarines must be able to operate at low speeds up high. The solution to the mission is a Nuclear Submarine. Although the nuclear submarine lease option has its backers in Australia, nuclear propulsion is political, controversial and explicitly outlined in the 2009 defence White Paper [1-2].

The most significant benefit of a nuclear-powered submarine is staying submerged and staying hidden for longer [27]. Conventionally powered ships do not have the same range without making themselves detectable by coming to the surface [28]. Nuclear powered submarines can carry enough fuel to operate for up to 30 years and only need to return to port for maintenance and supplies. (US Navy) [2 and 30].

Many challenges will be faced in the Australian nuclear submarine procurement project [31]. Australian Prime

Minister Scott Morrison, US President Joe Biden and UK Prime Minister Boris Johnson released one page's statement launching "enhanced trilateral security partnership" called AUKUS which aims to promote "deeper integration of the industrial base, and supply chain." By President Joe Biden, the future of each of our countries and the people of the world will depend on a free, open, surviving and thriving Indo-Pacific in the world. [7].

AUKUS' role is to support Australia in acquiring nuclear-powered submarines, starting with an 18-month feasibility study and a nuclear fuel supply chain study or acquisition plan outlined [32]. Although all three partners are committed to "the highest standards of protection, transparency, verification, and accounting measures to ensure the non-proliferation, safety and security of nuclear materials and technology [33], many complex and profound questions arise not only for the three partners but for state governments, the international community, and global regimes that regulate the use of nuclear energy for national defence. [8].

The unknowns of this project are similar to Project Rumsfeld in that they are intricate and intertwined. However, it is known that most Australian submarines are located in Adelaide (state of South Australia). Australian conventional powered submarines have been built there for decades, producing a skilled and specialized workforce [34]. A company called Barrow-in-Furness in Cumbria, northwest England appears to be in a prime position to have built a version of the Type 26 frigate for Australia at its new shipyard in Adelaide [35]. The first nuclear submarine will be built in Adelaide in 2040 [36]. The submarine building is a huge undertaking, and most programs are notoriously late and over budget. AUKUS has a primary mission in the security of the Indo-Pacific region [9]. This is because it is in big contact with the South China Sea conflict, which indirectly intersects with the North Natuna Island (Indonesia). Therefore, it is necessary to know the role of AUKUS in maintaining security and stability in the Indo-Pacific Region. Basic research is needed to find out the latest developments and information related to the mastery of Australian nuclear submarine technology and the hegemony of the development of the AUKUS trilateral alliance.

II. RESEARCH METHOD

The research method used in this study is a qualitative literature review study by utilizing various sources of information that can be accounted for because it is sourced from information that can be measured in truth, and information is a new issue [38]. A limited search was conducted using the terms “Australian Nuclear Submarine”, “Nuclear Submarine Cooperation between Australia, UK, and US”, “AUKUS Defense Strategy in the Indo-Pacific region”, “Map of Operations that can be carried out by nuclear submarines in the indo-pacific region and their comparison with conventional submarines”. Further exploration was carried out regarding theories that support arguments and statements with limited searches related to themes in English with a range of 2011 and 2021 [39]. The search results included research, reviews and opinion pieces by the authorities and a good scientific background [40].

III. RESULT AND DISCUSSIONS

3.1. Military Technology Development

Military Technology is a collection of weapons from simply sharpened stone projectiles in the Paleolithic to weapons of mass destruction in the modern world. Various weapons, equipment, structures and vehicles were used specifically for the purpose of warfare. This includes the knowledge needed to build the technology general defence equipment used in battle, then repair and replenish it [14].

Military technology as a special case, arguing that the sharp increase in the offensive and defensive capabilities of technology together with the accompanying tactical and organizational innovations resulted in the “Military Revolution” (note the plural), which in turn has greatly increased consequences and, which is of particular concern in here, the spread of country formation globally [15]. The development of military technology in each country is growing rapidly starting from the Middle Ages to the 2000s, this can be seen from the development of military technology from the beginning of civilization from 8000 BC to 2000 as shown in Fig 1.

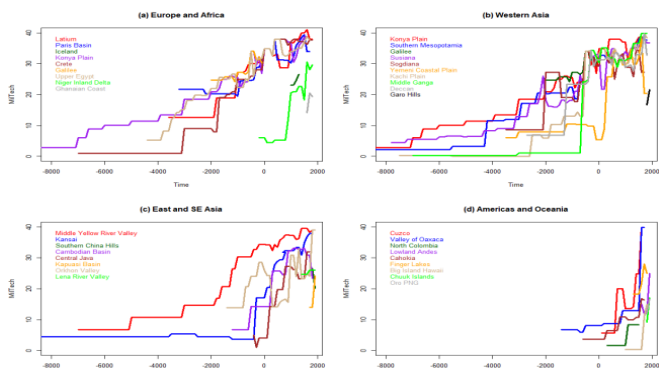


Fig. 1 Development of Military Technology is divided by major regions of the world Europe Africa; (B) West Asia; (C) East and Southeast Asia; (D) America and Oceania [14].

3.2. Naval Military Technology

Naval Military Technology is a defence institution of a country that generally operates in the marine area, so the defence technology that is usually used is Radar, Warships, Missiles, and Submarines. Interests as institutions greater than those of the Army or Air Force. At the same time, the navy’s relevance is questioned due to technological and political changes. Long-range aviation and nuclear weapons challenged the navy’s relevance during the Cold War and responded by carrying out nuclear missions for its aircraft carriers and submarines. Royal Navy on 16 February 2021, the Royal Navy introduced components of the British Carrier Strike Group consisting of a wide range of ships and aircraft, including the aircraft carrier Queen Elizabeth with Merlin helicopters and F-35B fighters. The Fleet Auxiliary fast fleet of Tide class tankers, Type 23 also called Duke class frigates, Type 45 also called Daring class guided-missile destroyers and Astute-class nuclear-powered submarines (SSN). The picture of the British Navy technology is shown in Fig 2.

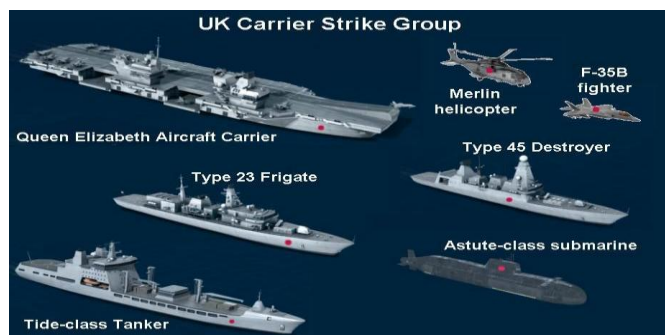


Fig. 2 Royal Navy (UK) Alutsista Technology

3.3. Nuclear Submarine

Nuclear submarines are one of the most complex technologies that humans have created today. Australia’s ambitious decision to switch from a fleet of diesel-electric (conventional) submarines to a fleet of nuclear-powered submarines (SSN) is a significant advance in naval capability that will come with many challenges. Without adequate crews and proper maintenance, a submarine is an expensive metal tube and, at worst, an aqueous tomb [19]. Providing solutions for nuclear manpower, sustainability and technical capability to achieve a successful capability transition is a key challenge that the Royal Australian Navy (RAN) will face over the next decade.

Nuclear Submarines do not need to be crewed simultaneously because operating requires high capabilities with the rule of thirds: deployment rotation, maintenance and deployment work. The size of the future submarine workforce will be based on several factors, including crew size and requirements for shore posts to allow rest, training, and professional development [20]. To see a comparison of Australia’s Collins-class diesel-electric submarines with nuclear submarines in development from the United States Navy (USN) and the Royal Navy (RN) [20], see table 1.

TABLE I. Comparison of Collins Class Diesel-Electric Submarines (Australia) against Virginia (US) and Astute (UK) Class Nuclear Subs [20]

Submarine Class	Water Transfer when submerged	Length (m)	Beam (m)	Crew Size (Size comparison with Collins class in %)
Virginia Class (USN)	7,900 ton	115	10	134 (319.05 % bigger)
Astute Class (RN)	7,400-7,800 ton	97	11.3	110 (261.90% bigger)
Collins Class (RAN)*	3,350 ton	78	8	42

*The Collins Class (Royal Australian Navy) is the Australian Conventional Submarine Class

There is a significant difference in ship size and crew size between Conventional Submarines and Nuclear Submarines. Given that Australia will be developing its SSN with the US and UK, the theoretically based assumption is that size and capability will be similar to Virginia or Astute classes. Based on the Astute crew, the crew size for replacement of the SSN Collins needs to be increased by around 260% per vessel which leaves RAN a significant task in terms of adding to the Australian submarine workforce.

3.4. Indo-Pacific Geopolitics

Indo-Pacific Geopolitical Theory For the first time, the term Indo-Pacific was introduced by Japanese Prime Minister Shinzo Abe at the first Quadrilateral Security Dialogue (QSD) forum in 2007. It has become a term that has become a hot topic of conversation lately. The US in the QSD which was held on 12 November 2017, in Manila raised the Indo-Pacific as a new term that not only replaces Asia-Pacific in terms of designation and geographical coverage but also expands actors, powers to the regional security architecture [16].

The 'Indo-Pacific' debate highlights parties such as the United States, Australia, Japan, India and China, among other players, jointly producing these regional constructs amid ongoing geopolitical anxieties about the shape and trajectory of Asia's future regional order. The 'Indo-Pacific' is designed primarily to allow the US and its regional allies to 'naturally' strengthen and expand their existing network of regional alliances to protect and counter the perceived China-centric regional order in Asia. Together with India, Australia and Japan, the US emphasized that in addition to improvements in the regional security sector, the Indo-Pacific in it also leads to the creation of a more open climate of cooperation. Marking the initial stage towards geopolitical transformation in the region, the term Indo, in this case, is like a golden ticket for India to signify a new era of expanding India's role in the governance landscape of the Asia-Pacific region [17].

3.5. AUKUS Geopolitics

The recent development of AUKUS (a trilateral partnership of Australia, the UK and the US) brings a new chapter, where procuring eight nuclear-powered submarines for Australia will mean something in Indo-Pacific trust-

building, especially when we look at it from a Chinese perspective. There is not much to predict at AUKUS, as the follow-ups and arguments circulating are all based on predictions [21]. So far, the research team believes that AUKUS and Quad will be complementary instruments for the US' new axis to Asia, and will also expect more from the Indo-Pacific Cooperation strategy. The newly adopted 2021 European Union. Preventive diplomacy will be a favourite discourse in the Quad 2.0 era, and what is important is how the central actor of the Indo-Pacific, namely ASEAN, can take advantage of the ASEAN-led mechanism. The ASEAN Regional Forum (ARF) is an attempt to promote preventive diplomacy and respond to rising multilateralism that will undermine the integrity of the ASEAN-led on their political consensus [22]. The AUKUS submarine project is shown in Fig 3.



Fig. 3 AUKUS Nuclear Submarine Project for Australia [22]

The recent development of AUKUS (a trilateral partnership of Australia, the UK and the US) brings a new chapter, where procuring eight nuclear-powered submarines for Australia will mean something in Indo-Pacific trust-building, especially when we look at it from a Chinese perspective. There's not much to predict at AUKUS, as the follow-ups and arguments in circulation are all based on predictions. So far, the authors argue that AUKUS and the Quad will be complementary instruments for the US' new axis to Asia, and we would also expect more from the newly adopted EU 2021 Indo-Pacific Cooperation strategy [26].

The nuclear submarine procurement/project will impact China's Anti-Area/Area Defense (A2/AD) strategy, with which the Chinese navy's operational, theatrical and technical operations are located. As shown in Fig 4, China's strategy and tactics will respond to increasing submarine activity as expected from the procurement of AUKUS and intervention by western powers in maintaining the freedom of navigation and rules-based order agenda in the South China Sea and to also deter China from expanding into the Indian Ocean Region (IOR), will therefore be China's next target -to secure their interest in expanding into Africa and the Middle East. For ASEAN, of course, this will have an impact on the principle of non-proliferation and self-restraint of power projection as regulated in the 1976 Treaty of Amity and Cooperation (TAC), Zone of Peace and Neutrality (ZOPFAN), and Southeast Asian Nuclear Weapon Free Zone

(ZOPFAN). SEANWFZ) [22].

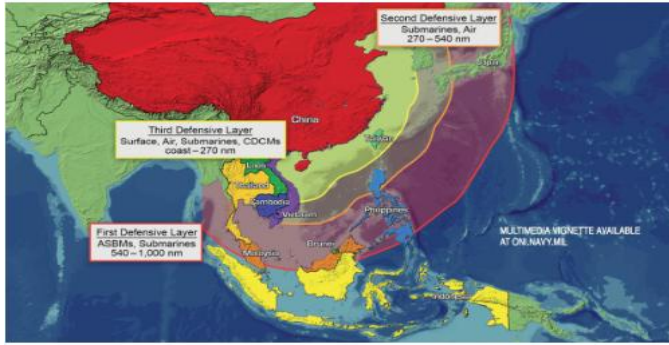


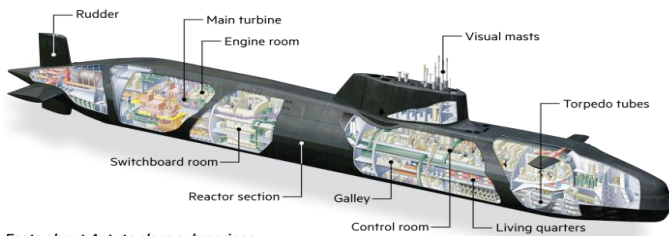
Fig. 4 China's Defence Strategy Map to prevent submarine activity [22].

3.6. AUKUS Cooperation in the field of Nuclear Submarines

The Royal Navy, in cooperation with AUKUS operates three nuclear-powered submarine systems: the Vanguard-class ballistic missile submarines and the Astute and Trafalgar class attack submarines [3]. Morrison suggested that the next generation of nuclear-powered submarines would use reactors that would not need refuelling over the life of the ship [4].

Nuclear-powered submarines are “the most complex machine man-made, even more so than the space shuttle”, according to a defence expert. The submarine had a nuclear reactor in the back, high explosives front and centre, a hotel, where people lived, and they all sank for months at a time [5]. The Astute Class Nuclear Submarine is shown in Fig 5.

Astute class nuclear submarine



Facts about Astute class submarines

97m in length and will displace 7,400 tonnes of sea water when fully stored
 Can circumnavigate the world without ever surfacing
 When armed with Tomahawk cruise missiles, Astute class submarines can strike targets up to 1,200km from the coast with pinpoint accuracy

Source: BAE Systems © FT

Fig. 5 Astute Class of Nuclear Submarine Structure

Facts about the Astute-class nuclear submarines are outlined below: They are 97 m long and will displace 7,400 tonnes of seawater when stored. Fully capable of circumnavigating the globe without ever surfacing and armed with Tomahawk cruise missiles, the Tomahawks turned surface naval vessels into strategic assets that could target military facilities on land from thousands of miles [5, 20, and 22]. This new payload will significantly increase the Australian navy's conventional strike power. The Smart Submarine Astute can pinpoint accuracy to strike targets up to 1,200 km from the coast. The British Astute submarine, built by BAE Systems, or the Virginia-class equivalent of the US navy, was built by General Dynamics Electric Boat and

America's Newport News Shipbuilding [6].

This new payload will significantly increase the Australian navy's conventional strike power. The Smart Submarine Astute can strike targets up to 1,200 km from the coast with pinpoint accuracy [23]. According to the AUKUS Alliance (Australia-UK-US), the use of nuclear submarines is an effort for the sake of stabilization and world security, especially in the Indo-Pacific region [24]. Considering the Natural, Energy and Food Wealth of the Indo-Pacific Region is the spearhead of the survival of the global community [25]. It is generally estimated that the submarines will not be ready until around 2040, which effectively indicates that this deal will be a long-term commitment.

3.7. Security Stability of Indo-Pacific

The Indo-Pacific is estimated to stretch from the western part of the Indian Ocean to the eastern part of the Pacific, also including north and southeast Asia and Australia. Australia's role in the indo-pacific region plays an important role in security stability, and its benefits have been enthusiastically promoted by Western Australian foreign ministers from both major parties (Stephen Smith and Julie Bishop) [10]. The Indo-Pacific map is shown in Fig 6.

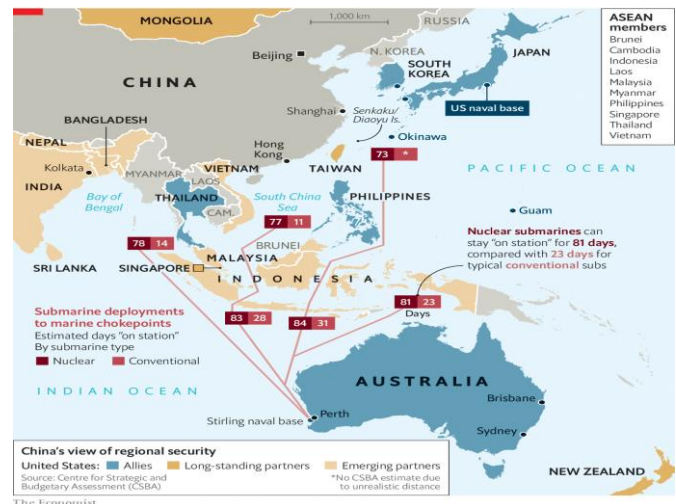


Fig. 6 Indo-Pacific Map and Comparison of Nuclear and Conventional Submarine Capability [11]

Based on Fig 6. It is known that the comparison of nuclear submarine operations against conventional submarines is characterized by a nuclear submarine operating time of up to 81 days from Perth-Southeast Asia. The nuclear submarine has properties that are very difficult to identify by radar because it is equipped with advanced technology and can dive to a high enough depth. So that the use of submarines for missions/spy operations is ideal for nuclear submarines [12]. Based on Fig 6, it can be seen that nuclear submarines can easily pass through Indonesia to Singapore, Thailand, Malaysia, the Philippines, Taiwan, India, Japan to the Chinese border. Major geopolitics between the US and China, the Indo-Pacific offers another way of responding to China's rise.

This may not be called a defence strategy, but the idea that a growing India might provide another important counterweight to China's growing influence is clearly of interest to many major strategists in the US and Australia [13]. Apart from that, the conflict between Australia and France has opened a new chapter because the submarine project that should have been agreed upon between the two sides has been revoked. This is because Australia decided to follow up the AUKUS cooperation regarding the nuclear submarine project in Australia, which was planned to be built in Adelaide. As a result, the French Embassy living in Australia departed back to their country. Therefore, more treatment is needed so that the cooperation between France and Australia can return properly [37].

IV. CONCLUSIONS

AUKUS is a trilateral security institution formed to encourage the integration of industrial bases, supply chains, security and ensure the security of EEZ boundaries according to the UNCLOS 1982, especially in the Indo-Pacific Region. One of the three countries' trilateral controversial cooperation is the cooperation in the construction of nuclear submarines in Australia. Many parties are sceptical, and there is a big challenge in the development of advanced technology because Australia is one of the countries that have signed the non-proliferation agreement on nuclear weapons. This also harmed the French side because the previous submarine project worked on by the French had to be cancelled, resulting in conflict and polemic between France and Australia. Apart from that, the manufacture of nuclear submarines will not be ready until around 2040, so this agreement will be a long term commitment, but if this can be realized, then nuclear submarine operations, especially in North Natuna Island and in general in the Indo-Pacific region will increase significantly.

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