Innovations

Comparing Submarine Powers in Southeast Asia: Insights from Indonesia, Malaysia, Singapore, and Vietnam

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Abstract
The post-Cold War era has witnessed a substantial rise in submarine proliferation, resulting in a notable surge in the count of regional submarine operators. This trend prompts an inquiry into the following: Why are submarines being acquired, what is the acquisition process like, and what implications will these endeavors have? This study undertook a comparative analysis of the submarine procurement cases in Indonesia, Malaysia, Singapore, and Vietnam, examining official statements from government and defense authorities. The findings suggest that Indonesia, Malaysia, and Singapore were likely driven by deterrence and enforcement considerations, while Vietnam's acquisition was primarily motivated by deterrence against China. These insights carry significance as they highlight the potential for mitigating regional submarine-related risks, such as undersea conflict or accidents, by either diminishing threat perceptions among states or exploring effective approaches to maritime domain enforcement.
Keywords: *submarines; Southeast Asia; naval modernization; South China Sea; deterrence; enforcement*

Introduction

The submarine is often considered a weapon employed by weaker entities, serving as a 'force-multiplier' against more potent adversaries (Till 2018). The inherent stealth advantages of submarines disrupt the military dominance traditionally held by major navies, derived from the formidable capabilities of their large vessels in controlling the seas, imposing blockades, seizing overseas territories, supporting land operations, and posing invasion threats. Weaker navies, armed with

submarines, can strategically impact more powerful maritime nations by directly assaulting their commercial shipping. However, engaging in a submarine competition, which involves both qualitative and quantitative aspects, poses significant challenges for smaller navies limited by scale economies. The difficulties extend to the maintenance, operation, and crewing of a limited submarine fleet. Most medium to small countries face obstacles in developing indigenous industrial capabilities for submarine production, making them reliant on external sources. Submarine design and delivery demand exceptional skills, and the commercial viability of such endeavors remains questionable for many smaller nations. Consequently, these nations are likely to be strategically dependent on submarine producers for the foreseeable future. Despite the evident risks, Southeast Asian countries are actively pursuing substantial submarine capabilities. In 2011, Jane's Navy International projected that Southeast Asian nations would obtain a minimum of 13 submarines by the year 2020 (Mazumdar 2011). This prompts three key questions: Why are submarines being acquired, what is the acquisition process like, and what implications will these endeavors have? The subsequent sections will examine these concerns and inquiries through the lens of four Southeast Asian nations: Indonesia, Malaysia, Singapore, and Vietnam. These countries likely offer diverse perspectives on the matter. The concluding section will aim to condense and amalgamate the presented points.

Indonesia

The enduring service of submarines in Indonesia and their significant roles throughout history have deeply influenced the country's naval traditions (AtriandiSupriyanto 2018). These submarines actively participated in major operations that continue to hold a prominent place in national historical narratives. The crucial roles and contributions of Indonesian submarines during these events establish a compelling need to retain them, asserting that their historical significance dictates their importance both in the present and future. Discontinuing the use of submarines would be equivalent to neglecting the pivotal roles they played in Indonesia's history. In comparison to other Southeast Asian navies, Indonesia holds the distinction of being the region's longest-standing submarine operator, accumulating almost six decades of operational experience. In 1959, Indonesia achieved the distinction of being the inaugural Southeast Asian nation to operate submarines by acquiring two Whiskey-class boats from the Soviet Union through Poland, namely the RI Tjakra and Nanggala. Subsequently, ten additional Whiskey-class boats were added until 1962, named RI Trisula, RI Tjandrasa, RI Nagarangsang, RI Nagabanda, RI Wijajadanu, RI Hendrajaja, RI Pasopati, RI Tjudamani, RI Bramasta, and RI Alugoro (Indroyono&Budiman 2008;

AtriandiSupriyanto 2018). The procurement of these vessels was a component of Indonesia's naval modernization initiatives in the 1950s and 1960s, during which the navy actively sought foreign assistance. These submarines were obtained at a time when President Sukarno's administration was engaged in a territorial dispute with the Netherlands over West Irian (West New Guinea) from 1961 to 1963.

Indonesian submarines primarily focused on intelligence gathering due to their stealth capabilities, a role evident in historical events such as the West Irian dispute with the Dutch, the Confrontation against British-backed Malaysia, and the deployment of the International Force in East Timor (INTERFET) (AtriandiSupriyanto 2018). Intelligence played a crucial role in identifying enemy warship operational patterns and supporting covert amphibious infiltrations during hostilities. For instance, in July 1962, six submarines were dispatched to gather intelligence on Dutch shipping traffic (Indonesian Navy Headquarters 2001). During the Confrontation in September 1964, RI Alugoro observed a Royal Navy task force, avoiding a potential conflict (Toh Boon Kwan 2005). KRI Cakra and KRI Nanggala shadowed INTERFET maritime forces during the East Timor landing in September 1999, intensifying protection of maritime lines and prompting a search (Dickens 2001). Submarines were also pivotal in covertly inserting commandos for sabotage missions, as seen in West Irian in 1962. These special commandos conducted acts of sabotage against Dutch forces in West Irian, paving the way for a comprehensive amphibious invasion known as Operation Djajawidjaja, scheduled for August 26, 1962. On August 12, 1962, RI Tjandrasa successfully infiltrated fifteen commandos into West Irian, but three other submarines assigned to the same mission—RI Nagabanda, RI Trisula, and RI Nagarangsang—abandoned their mission immediately upon detection by the Dutch Navy (Indonesian Navy Headquarters 2001). By 1962, Indonesia had deployed a total of 1200 paratroopers and 340 amphibious infiltrators into West Irian (Platje 2001). Additionally, submarines played unconventional roles in naval diplomacy and constabulary missions, as demonstrated by Operation GugusTugas X on October 17, 1965, when RI Nagarangsang and RI Bramasta, along with two Komars and two Jaguar-class torpedo boats, embarked on a covert mission to Karachi. This operation aimed to provide clandestine support to Pakistan and convey Indonesia's dissatisfaction with India in the aftermath of the 1965 Indo-Pakistan War in September (Goldrick&McCaffrie 2014). Throughout the 1970s and 1980s, RI Pasopati engaged in naval exercises and anti-poaching missions with partner navies (Soentoro 2009).

The rise of the New Order government in 1967, led by the anticommunist Army General Suharto, marked a decline in Indonesia's relations with communist nations. Technical assistance and maintenance for Soviet naval equipment were no

longer provided as part of a bilateral agreement, transitioning to a commercial arrangement that Indonesia found financially challenging. Consequently, the operational capability of the Whiskey-class submarines gradually diminished, culminating in the retirement of the last vessel of this class, KRI Pasopati, in January 1990. However, before Pasopati's official retirement, Indonesia had acquired two U-209-class submarines from West Germany in 1981–1982, named KRI Cakra and KRI Nanggala. As of April 2016, these two submarines remained the sole operational submarines in Indonesia. Nevertheless, in 2005, the navy presented its "Green-Water Navy" proposal with a goal of reaching a 274-ship fleet, which later became part of Indonesia's military modernization plan, the "minimum essential force" (MEF), commencing in 2010. The MEF plan, divided into three stages spanning 2010–2014, 2015–2019, and 2020–2024, outlines Indonesia's aspiration to acquire up to twelve submarines by 2024 (Indonesia's Ministry of Defence 2010). Despite initial considerations for the Russian Kilo, German–Turkish enhanced U-209, and French Scorpene, Indonesia ultimately chose the South Korean Type-209 Chang Bogo. On December 20, 2011, Indonesia entered into a contractual agreement with Daewoo Shipbuilding and Marine Engineering (DSME) for the acquisition of three Chang Bogo class submarines at a total cost of USD 1.1 billion. These diesel-powered submarines weigh 1,400 tons, possess a length of 61.3 meters, and are equipped with eight weapon bays for launching torpedoes, mines, cruise missiles, and other armaments. Accommodating a crew of 40 sailors, these submarines also entail a technology transfer component, with the first and second submarines constructed in South Korea, and the third submarine slated for assembly at PT. PAL Indonesia, Surabaya. The completion of the submarines was achieved in 2018 (Menafe et al 2020; Sindo News, 2011). Indonesia has a history of collaboration with Korean naval shipbuilders, having ordered fast attack craft and landing ships in the 1970s and 1980s, as well as a Makassar-class landing platform dock (LPD) in 2000 and the license-built versions in 2007–2011. The contract for the Nagahanda-class, Seoul's largest overseas defense export, includes an "offset" policy, involving the training of 206 Indonesian naval engineers from PT-PAL at the DSME shipyard to construct the third submarine in Indonesia (Malik Ibrahim 2016). Following the overhaul of KRI Cakra and KRI Nanggala in 2004–2006 and 2009–2011, DSME submitted a bid in November 2015 for the maintenance, repair, and overhaul (MRO) of KRI Cakra to ensure its operational capacity until 2024 (RidzwanRahmat 2015).

Indonesia has actively pursued initiatives to foster trust among submarine operators and enhance submarine operational safety, making it a key element in regional maritime security collaboration. A notable instance was the participation of the Indonesian submarine KRI Pasopati in bilateral submarine exercises, known as Exercise Orion, with Australia in March 1975, marking a significant step since

Operation GugusTugas X. In July 2012, Indonesia further advanced its commitment by signing a submarine rescue arrangement with Singapore. This agreement, representing Indonesia's first-ever bilateral submarine rescue cooperation, serves as a symbolic manifestation of the growing trust between Indonesia and Singapore in the traditionally sensitive undersea domain (Koh 2012). In August of that year, KRI Nanggala engaged in a passage exercise with USS Oklahoma City in the Java Sea (Ade Marboen 2012). Indicating enhanced cooperation between the naval forces, the Indonesian submarine fleet and US Submarine Group 7 conducted a Simulated Submarine Casualty Exercise (SMASHEX) in April 2015. Additionally, staff talks were held to establish regular, periodic engagements and operations, incorporating training opportunities to integrate the capabilities of the Indonesian and US submarine forces (Reynolds 2015). While there is keen interest in bilateral submarine exercises, Indonesian submarines are notably absent from multilateral exercises. An illustration of this is the non-participation of Indonesian submarines in the biennial Exercise Pacific Reach series, which aims to enhance regional submarine escape and rescue (SMER) capabilities and foster interoperability in submarine rescue operations among participating navies. Instead, Indonesia has only dispatched naval observers to this exercise since its initiation in 2000, despite Pacific Reach being the sole multilateral submarine exercise in the Asia-Pacific region (AtriandiSupriyanto 2018).

Malaysia

Malaysia shoulders the responsibility of safeguarding vast sovereign maritime territories, encompassing the Strait of Malacca and portions of the South China Sea (Abadi 2021; 2017). This strategic role positions Malaysia as the guardian of crucial maritime sea lanes and pivotal 'choke points' on a global scale. Despite initial perceptions that the Strait of Malacca might be unsuitable for submarine operations due to its perceived shallowness and narrowness, historical evidence reveals that the British effectively utilized submarines in this region during World War II, targeting Japanese naval ships and merchant shipping, although this historical fact remains relatively obscure (Leong 2016). The Japanese strategically utilized the Strait of Malacca as a crucial route for transporting essential supplies to their forces engaged in Burma. Despite the challenging conditions posed by the narrow passage, intermittent shallow areas, and vigilant Japanese anti-submarine patrols, British submarines consistently conducted patrols in the Strait of Malacca. Remarkably, these patrols yielded notable successes, as evidenced by the sinking of over 100 Japanese naval vessels by the British submarines (McCartney 2006). Conversely, German U-Boats and Japanese submarines played an active role in the Indian Ocean, engaging in the disruption of Allied shipping. Penang Island in

Malaya served as a base for these submarines, facilitating resupply and repairs. German U-Boats, in addition to their disruptive activities, were utilized for the transportation of strategic resources, including rubber, tin, and mercury, as well as personnel such as the Indian Nationalist leader Subhas Chandra Bose. The submarines transited through Penang Island to facilitate the movement of materials and individuals between Germany and Japan (White 2009).

Since the 1980s, the Royal Malaysian Navy has been pursuing the acquisition of submarine capabilities, sending a limited number of personnel abroad for submarine qualification training. However, it was only in the year 2000 that a substantial competition for submarines emerged, with Armaris (currently recognized as DCNS) of France and TKMS (ThyssenKrupp Marine System) emerging as the primary contenders (Mhadzir 2018). A relevant context is the involvement of two retired Zwaardvis-class submarines from the Dutch Navy, transported to Lumut at the PSC Naval Dockyard facilities in 2000. This was part of a collaboration between the Dutch company RDM Submarines and PSC Naval Dockyard, intending to sell these submarines to Malaysia. During this period, PSC Naval Dockyard was enjoying success, having secured the contract to construct the six Kedah class Next Generation Patrol Vessels. However, even at that time, the Royal Malaysian Navy (RMN) was hesitant about further engagements with PSC due to doubts about the company's full capabilities. This skepticism was later justified when PSC failed to complete the Kedah class ship. As the attempt to sell the submarines to Malaysia or any other nation fell through, they remained in Lumut and deteriorated to a point where they were deemed suitable only for scrap. The situation worsened with the collapse of RDM Submarines, which had staked its viability on selling the Moray submarine design but failed to attract a buyer. Eventually, recognizing the potential risks associated with the transfer of technology and knowledge from the hulls, the Dutch government opted to cover the costs and had both submarines scrapped in 2006 (Mhadzir 2018).

In June 2002, a contract worth 1.04 billion Euros was signed for the acquisition of two Scorpene class submarines from the French company Armaris and the Spanish company Izar (now Navantia), who jointly build the Scorpene. Subsequently, in July 2003, another contract with Armaris was established to train 150 personnel of the Royal Malaysian Navy (RMN) as submariners. This contract also included the decommissioning of the French Navy submarine Ouessant, an Agosta class submarine, to serve as a training vessel. The initial group of RMN personnel commenced their training in Brest, France, at the end of April 2005. The initial submarine, KD Tunku Abdul Rahman, was launched in France in October 2007 and officially commissioned in January 2009. Subsequently, the second submarine, KD

Tun Abdul Razak, had its launch in Spain in October 2008 and was commissioned in December 2009. The submarines undergo maintenance through Boustead DCNS Naval Corporation (BDNC), established in June 2009 as a collaborative subsidiary by Boustead Heavy Industries Corporation (BHIC) and DCNS. BDNC is responsible for offering support to the two DCNSScorpene class submarines, with BHIC holding a 60% ownership stake, and DCNS holding the remaining 40%. Criticism has been directed towards the perceived limited utility of possessing only two submarines, falling short of an optimal minimum quantity (Leong 2016). However, insights derived from the annals of strategic history underscore that a solitary submarine can wield profound strategic impact in the contemporary landscape of warfare. Leong (2016) scrutinizes the sole two instances post-World War II where submarine operations successfully resulted in the sinking of an adversary's warship. Drawing strategic lessons from these occurrences—specifically, the sinking of INS Khukri by PNS Hangor during the 1971 India–Pakistan War and the sinking of ARA General Belgrano by HMS Conqueror during the 1982 Falklands War—Leong (2016) contends that the Royal Malaysian Navy (RMN), despite its limited submarine fleet, can glean valuable insights from recent conflicts, showcasing that even a singular submarine possesses the potential to exert significant strategic influence.

A strategic decision was made to station these submarines at RMN Kota Kinabalu in TelukSepanggar, East Malaysia. This choice was influenced by the operational impracticality of RMN Lumut for submarine deployment, given that submarines based there would need to navigate through the narrow Straits of Malacca each time they deployed eastwards. The naval base of the Royal Malaysian Navy (RMN) in Kuantan, despite providing access to open seas, was deemed unsuitable for submarine operations due to its small size and proximity to the commercial port. The idea of constructing another base on the East Coast of Peninsular Malaysia was dismissed due to concerns about flooding and increased vulnerability during the monsoon season. Moreover, operating submarines unnoticed in Peninsular Malaysia, being in close proximity to neighboring countries, was considered impractical. In contrast, RMN Kota Kinabalu was viewed as an ideal choice, situated far away from neighboring nations, offering convenient access to open seas. It was designated to become the primary naval headquarters and base in East Malaysia, with plans for the relocation from RMN Labuan, which was being returned to civil authorities.

The inaugural submarine of the Royal Malaysian Navy (RMN), KD Tunku Abdul Rahman, arrived back in Malaysia in September 2009 and commenced operational trials. Subsequent reports in January to February 2010 disclosed that the submarine experienced several defects, temporarily preventing it from diving. In 2014, amid

the MH370 search, Admiral Tan Sri Aziz Jaafar, Chief of the Royal Malaysian Navy (RMN), had to publicly explain why submarines were not considered suitable for underwater searches. This clarification led to the decision not involving RMN submarines in the search. However, this explanation was contradicted when the United Kingdom later announced the commitment of the submarine HMS Tireless to the search efforts. Retired Rear Admiral Rosland Omar, who served as the deputy director of the Royal Malaysian Navy's (RMN) submarine project from 2003 to 2006 and later as the director from 2006 to 2009, expressed dissatisfaction with the RMN submarine project in an article from Asia Pacific Defence Reporter. Rear Admiral Rosland stated that, given his experiences, he would ensure that the contract explicitly covers all aspects, emphasizing that the French side would not undertake anything not explicitly stated in the contract without an amendment. He highlighted that although both submarines were supposed to be available to the RMN for 130 days per annum, this rate was not achieved. Additionally, he identified the lack of timely provision of spares as a significant cause of the problem.

The collaboration between the USA and Malaysia in submarine activities has been on the rise, marked by annual port calls from US Navy (USN) submarines and submarine tenders to RMN Kota Kinabalu, along with yearly staff talks. Australia has also engaged in submarine cooperation, exemplified by the recent 2-day exercise between the submarine HMAS Dechaineux and RMN submarine KD Tunku Abdul Rahman from October 12 to 14, 2015. Initially, in 2006, Malaysia conducted trilateral submarine staff talks with the Royal Australian Navy and the US Navy, but by 2007, this evolved into separate annual bilateral talks between the RMN and both navies. As mentioned earlier, the Royal Australian Navy (RAN) and the US Navy have consistently engaged in cooperative activities. The RMN is actively preparing for increased interoperability with the US submarine force, as highlighted in a September 2015 US Navy release after the RMN and US Navy Submarine Staff Talks 2015 held in Guam. The discussions focused on reviewing and establishing plans for joint trainings and exercises in 2016 and beyond. Another indication of the RMN submarine force moving towards interoperability with their US counterparts is the acquisition of a Ship Interface Template Set (SITS). On January 4, 2016, the Malaysian Ministry of Defence released a tender for the transportation of a fully assembled Ship Interface Template Set (SITS) from the USA to RMN Kota Kinabalu. The SITS includes support structures that are welded onto a vessel's deck, facilitating the swift integration of the US Navy's Submarine Rescue Diving and Recompression System (SRDRS) and Pressurised Rescue Module System (PRMS) on a Vessel of Opportunity. In this context, the SITS would enable the RMN's submarine rescue ship MV Mega Bakti to deploy the US systems, which would only be necessary when rescuing a USN submarine rather than an RMN submarine, for which the MV Mega Bakti already

possesses the integral equipment. The MV Mega Bakti actively participated in the 2016 Pacific Reach submarine rescue exercise held in the Republic of Korea from May 23 to June 3, 2016. Among its exercises, the ship engaged in simulated rescues of personnel from both a Royal Australian Navy (RAN) submarine and a Republic of Korea Navy (ROKN) submarine.

Continuous collaboration has been maintained with the French Navy, and previously, French Navy officers were stationed at the Ministry of Defence in Kuala Lumpur to provide assistance with the RMN submarine project. Following the arrival of the RMN submarines in Malaysia, these officers were relocated to RMN Kota Kinabalu. The most recent interaction between the French Navy and RMN involved a 2-day Combined Anti-Submarine Exercise (Casex) conducted between the submarine KD TunRazak and the French Navy frigate Provence from February 16 to 18, 2016. During the Casex, CaptainBaharudin Wan Md Nor, the RMN Submarine Force Chief of Staff, informed the media that several RMN submarine personnel had accumulated over 10,000 hours underwater in seven years of operations (The Sun 2016, 16 April).

In January 2017, the docking of a Chinese submarine and navy support ship at the Malaysian port of Kota Kinabalu marked a historic event (Abadi 2021; Wall Street Journal 2017). According to a Malaysian navy official, the visiting submarine was identified as the Chang Cheng, and the support vessel was named the Chang Xing Dao (Page & Maxwell, 2017). The visit of a submarine from a major power indicated a notable shift in the defense policy of the smaller nation. As Euan Graham expressed, the occurrence "indicates a higher level of trust on the part of the host country due to the sensitive nature of submarine operations, serving as stealthy war-fighting or reconnaissance platforms" (Page & Maxwell, 2017). Confirming this, The Royal Malaysian Navy reported the second visit by a Chinese submarine, which docked at the Sepanggar naval base in Sabah, Borneo, in September 2017 (South China Morning Post, September 14, 2017). Allowing Chinese submarines to dock twice within a year conveyed Malaysia's indirect message to the US, suggesting an expansion of the area patrolled by Chinese submarines in the South China Sea, challenging the previous boundaries set by the US Navy. This move could be interpreted as a response by the Malaysian Prime Minister at that time, NajibRazak, to the 1MDB (1Malaysia Development Berhad) investigation by the United States[1].

[1] Established by NajibRazak in 2009, 1MDB is a Malaysian state-owned strategic development corporation. After five years of its creation, 1MDB defaulted on a payment to bondholders. In 2015, the Wall Street Journal and Sarawak Report revealed a shocking development: over 700 million USD from 1MDB's funds had been redirected to Najib's personal bank account. This revelation led to a formal investigation and criminal lawsuits by the US Department of Justice in 2016 and 2017, aiming to recover 3.5 billion USD stolen from 1MDB between 2009 and

Concurrently, it marked a substantial advancement for China's strategic submarine force, aligning with its long-envisioned maritime strategy (Howarth, 2006). However, the 1MDB scandal eventually led to Najib's defeat in Malaysia's historic 14th general election in May 2018. The return of the former premier, Mahathir Mohamad, as the new Prime Minister resulted in a shift towards a more critical stance against Beijing. In his initial foreign defense statement, Mahathir declared that Chinese warships would no longer be permitted in the South China Sea. In contrast to Najib and his ministers, Mahathir and other executive leaders expressed greater concern about the presence of Chinese vessels in the country's Exclusive Economic Zone (EEZ) (Straits Times, June 29, 2018). During the joint ASEAN-China summit at the 35th ASEAN 2019 Summit in Bangkok, Thailand, Mahathir reiterated the need to reduce tensions in the South China Sea, emphasizing that China should cease sending warships (Malay Mail 2019, November 4).

Singapore

Singapore is often referred to as a "Little Red Dot," denoting its status as a small city-state highly dependent on continuous access to sea lines of communications (SLOCs) for both its national survival and economic prosperity. Despite its geographical limitations and lack of significant geostrategic depth, Singapore finds itself surrounded by larger neighbors with whom it has experienced contentious relations in the past (Koh 2018). Singapore's pursuit of an underwater capability dates back to the 1980s, during which it initiated a feasibility study, involving a delegation from the Republic of Singapore Navy (RSN) visiting Sweden (Dagbladet 1989). It was not until the early 1990s that favorable financial circumstances allowed substantial progress in submarine acquisition. During this period, the RSN took a practical step by acquiring nearly the entire retired fleet of A12 boats from Sweden. The decision was grounded in prudence for two main reasons. Firstly, being relatively new to underwater operations, the RSN found these second-hand diesel-electric powered submarines (SSKs) to be an appropriate platform for training and integration purposes. Secondly, opting for second-hand submarines rather than new builds minimized the risks associated with establishing such a capability. The A12 boats were chosen as a cost-effective "starter platform" for training and operational purposes, particularly given their good condition and well-maintenance by the Swedish navy.

2015. The charges were part of the Kleptocracy Asset Recovery Initiative, focusing on assets found in the US. The incurred debt from 1MDB and the US DOJ's charges prompted Najib to shift Malaysia's defense policy towards China, the challenger to the US. Just four months after the US DOJ initiated its investigation,Najib visited China and signed multiple loans under the Belt and Road Initiative (BRI) scheme.

The A12 boats, known as the Challenger class, played a pivotal role in establishing the foundation of the RSN's submariners and institutional knowledge. This initial capability emerged during a period when several Southeast Asian navies were undergoing modernization efforts. Despite the challenges posed by the Asian Financial Crisis in 1997–1998, the RSN was able to advance its submarine program due to steady defense funding. This allowed the RSN not only to surpass its regional counterparts but also to contemplate acquiring a more advanced successor submarine. In 2005, as the region was slowly recovering from the financial crisis and reinvigorating naval initiatives, Singapore opted to acquire Swedish A17 submarines. This decision was significantly influenced by the strong defense relations established between Singapore and Sweden, along with the navy's familiarity with the evolving Swedish submarine technology.

The choice of the A17 represented another judicious acquisition of second-hand assets. Being at least a decade younger than the preceding A12, the A17 shared similar hydrodynamic characteristics, featuring the standard teardrop shape and albacore hull, along with the distinctive Swedish X-configuration rudders. Moreover, the A17 boasted more advanced combat systems. These submarines were well-maintained and still possessed a considerable amount of service life. In a more daring move, the RSN decided to cut the A17 into halves and insert an additional section amidships. The supplementary section was designed to accommodate the Stirling AIP, a Swedish advancement. This enhancement increased underwater endurance from a matter of days to a minimum of two weeks before the need for snorkeling to recharge the batteries. It is noteworthy that this modification is not exclusive to Singapore's submarines; the Swedes conducted comparable work on the A17 boats they retained in service, designating it as the Södermanland class. To date, it is the solitary navy in Southeast Asia employing submarines equipped with AIP technology. The introduction of the Archers facilitated the phased decommissioning of certain Challenger SSKs.

The RSN is strengthening its array of capabilities by acquiring new Type-218SG submarines built in Germany, aligning with the strategic plan for the future Singapore Armed Forces (SAF) by 2030 (Ng Eng Hen 2014). Limited details about this previously undisclosed class have been revealed, primarily through official press releases. From available information, including visual evidence, it appears that the Type-218SG is not a completely original submarine design but falls somewhere between the Type-214—a 1400-ton export variant of the Type-212/212A used by the German and Italian navies—and the larger Type-216, optimized as a 3000-ton or more, long-range ocean-going submarine currently offered to the

Australians. The introduction of the Type-218SG would mark another significant achievement in Singapore's submarine program, indicating the navy's capability to operate larger and more advanced vessels equipped with German fuel-cell Air Independent Propulsion (AIP) and potentially unmanned underwater vehicles (UUVs). This decision demonstrates the RSN's strategic and financial prudence, opting for a careful and purposeful approach to capacity-building by initially acquiring second-hand submarines before committing to new-builds. By the year 2020, the plan is to gradually decommission all Challenger-class submarines, leaving the submarine fleet with two Archers and two Type-218SGs (Koh 2018).

Singapore has been able to consistently advance its incremental submarine capacity-building initiative, primarily owing to several advantageous factors. A crucial facilitator is the unwavering commitment to funding, recognizing the substantial expenses associated with procuring, operating, and sustaining an operational submarine fleet, along with the requisite infrastructure. Fortunately, even during the Asian Financial Crisis of 1997–1998, the Singaporean Government maintained a relatively steady level of defense expenditure. In contrast, neighboring Southeast Asian countries adopted a more erratic "feast and famine" approach to defense appropriations, resulting in a postponement of their defense acquisition programs, including submarines (TeoCheeHean 2009). Singapore's defense budget is typically shielded from economic fluctuations and is restricted to a maximum of 6% of the annual gross domestic product. This not only enables the Singapore Armed Forces (SAF) to sustain operational readiness but also supports initiatives for enhancing capabilities, including domestic defense research and development (Ng Eng Hen 2015). Ultimately, another facilitating factor is the growing domestic defense sector. Following the introduction of the A12 submarines, Singapore Technologies Engineering Marine (ST Marine) has fostered a collaborative partnership with the Swedish submarine manufacturer Kockums. This collaboration has involved adapting the submarines to better suit the tropical operational conditions and gaining expertise in system maintenance. In April 2012, ST Marine and Kockums formed a joint venture named Fortis Marine Solutions Pte Ltd with a 51/49 ownership structure. The purpose of this venture was to refurbish and upkeep the Swedish-manufactured SSKs of the RSN. ST Marine's investment in the venture amounted to US$510,000, while Kockums contributed US$490,000 (News Shipping 2012; Singapore Technologies Engineering 2012). Given its limited submarine fleet and the dominance of established international submarine manufacturers, it is not economically viable or commercially practical for Singapore to enter the submarine construction industry for both domestic and international markets. However, Singapore is actively exploring specialized areas within submarine technology. Notably, an in-house developed submarine combat

management system, a collaborative effort between ST Electronics and Atlas Elektronik, is set to be integrated into the Type-218SG (Wong 2015).

It must be noted that Singapore demonstrates a unilateral approach to naval arms control, as reflected in the apparent selection of capabilities by the Republic of Singapore Navy (RSN). While Malaysia has acquired the SM-39 Exocet and Vietnam has obtained Klub-S land-attack cruise missiles, Singapore has refrained from pursuing a similar path (Koh 2018). Specifically, Singapore has not pursued the acquisition of these long-range, stand-off underwater-to-surface guided weapons (USGW), thus abstaining from providing its submarines with a force projection capability. Singapore has actively demonstrated its commitment to enhancing regional submarine collaboration. Since 2001, the Republic of Singapore Navy (RSN) has consistently taken part in the Asia-Pacific Submarine Conference, serving as a forum for navies to foster confidence-building and exchange best practices in submarine operations. Additionally, Singapore has been a regular participant in Pacific Reach, a multinational submarine emergency management and response exercise. The country has shared its suite of submarine rescue capabilities, establishing itself as a "common security goods provider," particularly through bilateral submarine rescue agreements with Indonesia and Vietnam. The most recent agreement, signed in May 2015 with the US Navy, will further refine the RSN's capabilities in this regard. Beyond these confidence-building and responsive measures, Singapore has been a staunch advocate for preventive water-space management measures, notably emphasizing the importance of an institutionalized submarine operational safety framework (Lai Chung Han 2015).

Vietnam

Vietnam, whether in its unified or divided state, directed the majority of its military efforts towards various adversaries throughout the Cold War era, engaging in conflicts with France, the United States, Cambodia, and internal divisions between the North and the South (Hardy 2015). The continuous state of combat operations hindered military planners from actively considering proposals for sophisticated military equipment, such as submarines. However, as Vietnam concluded its involvement in the Cambodian conflict and regional tensions subsided, Soviet submarines started making appearances in Cam Ranh Bay as early as 1979, prompting discussions about the interest of then-unified Vietnam in acquiring submarines. During that period, the presence of a Soviet submarine in Cam Ranh Bay could have been perceived as the Soviets utilizing a naval base in a cooperative Communist ally's territory to enhance their military influence in the region. Yet, by

1985, it became increasingly evident that the Soviets were actively involved in training Vietnamese submariners, a fact underscored by the subsequent arrival of additional Whiskey-class Soviet submarines (Wettern 1985). At the conclusion of the Cold War, Vietnam had not acquired any submarines, even in the presence of potentially advantageous offers from the Soviet Union, primarily due to financial limitations (McCafrie 2014).

Nevertheless, the evolving dynamics of Vietnam's relationship with China in the post-Cold War era had significant implications for its eventual decision to acquire submarines. The territorial conflicts in the South China Sea involving various claimant states, including Vietnam and China, resulted in the militarization of these disputes starting in the 1970s. As the Cold War drew to a close, tensions escalated, leading to overt hostilities between China and Vietnam. These geopolitical developments may have influenced Vietnam's inclination to seek Soviet assistance for submarine training in the mid-1980s. As early as 1974, China and the then-South Vietnam publicly asserted competing claims to the Paracel and Spratly Island chains, eventually leading to armed conflicts and casualties among Vietnamese soldiers (Los Angeles Times 1974). In 1988, heightened tensions arising from China's military buildup in the Spratly Islands culminated in a confrontation that led to the tragic loss of approximately 70 Vietnamese soldiers and sailors (St. Louis Post-Dispatch 1988). As early as the late 1990s, reports suggested that Vietnam had received two mini North Korean Yugo-class submarines. However, there was no public confirmation regarding the terms of the deal or the acquisition itself, and uncertainties existed regarding the operational viability of the two platforms (McCafrie 2014). Ten years following the acquisition of the mini submarines, information regarding a transaction for six Kilo-class hulls from Russia emerged, and it was officially affirmed in December 2009 during a visit to Moscow by Vietnamese Prime Minister Nguyen Tan Dung (Defense Industry Daily 2014). The agreement entailed the procurement of six Project 636MV/Kilo-class submarines, constructed by Russia's Admiralty Shipyard, at an estimated cost of around US$1.8 billion. The delivery schedule stipulated one new hull annually upon the completion of construction (Torode& Chan 2009).

Vietnam has acquired six diesel-electric advanced submarines, specifically the Kilo-class or Project 636.3-MV Varshavyanka-class Fast Attack Submarines (SSK) engineered by the Rubin Central Design Bureau for Marine Engineering (Thayer 2018). These submarines feature enhanced capabilities in terms of range, firepower, reliability, speed, and sea endurance. The Varshavyanka-class submarines have earned the moniker 'black hole' from the US Navy due to their status as one of the most silent diesel-electric submarine classes globally. Their acoustic features

involve enhanced stealth achieved by eliminating flooding ports and applying multilayer anechoic rubber tiles to the hull. Additionally, casings and fins are equipped to absorb sonar sound waves emitted by active sonar, leading to a reduction and distortion of the return signal, along with minimizing sounds emanating from within the submarine. These attributes collectively contribute to a decreased range of detection by passive sonar. The Varshavyanka-class submarines are specifically engineered for multifaceted naval operations, encompassing anti-submarine warfare, anti-shipping, anti-surface ship warfare, patrol missions, general reconnaissance, and the safeguarding of naval bases and coastlines. These submarines demonstrate proficiency in operating within relatively shallow waters.

Defense analysts' perspectives on Vietnam's capacity to establish a robust counter-intervention or area denial naval force, aimed at deterring China within Vietnam's maritime realm, span from skepticism to cautious optimism. Lyle Goldstein, a professor at the US Naval War College, has conducted an examination of Chinese evaluations of Vietnamese military capabilities. Goldstein highlights that Chinese defense strategists closely observe Vietnam's modernization initiatives, expressing substantial respect for Vietnam as a whole, including its Air Force (Perlez 2014). Regarding Vietnam's Varshavyanka-class submarines, Goldstein observes their capability to "deliver lethal blows with either torpedoes or anti-ship cruise missiles." However, he reports that Chinese analysts identify two significant weaknesses in Vietnam's military strategy: a lack of extensive experience in operating complex weapons systems and deficiencies in "surveillance, targeting, and battle management." These weaknesses lead Chinese defense officials to the conclusion that "China could prevail in any armed clash" with Vietnam. Goldstein suggests that Vietnam's most viable strategy against China involves maintaining sufficient forces for deterrence while concurrently engaging in diplomatic efforts to resolve disputes (Thayer 2018). According to Benedictus (2013), the geographical proximity of Vietnam to China's Hainan Province, home to the PLAN Southern Pacific Fleet, raises concerns in Beijing. The presence of vessels harbored in this region could potentially make them vulnerable to submarine attacks in the event of a conflict. Moreover, the prospect of Vietnam acquiring land-attack capabilities within its submarine fleet in the future is considered a significant cause for concern. An interviewed Vietnamese strategic analyst, as documented by Thayer (2014), advocates for a strategy of "mutually assured destruction." This strategy would be relevant only in the scenario of deteriorating relations between China and Vietnam leading to armed conflict. In such a situation, Vietnam would prioritize targeting Chinese-flagged merchant shipping and oil container ships in the southern extremity of the South China Sea. The strategic objective is not to defeat China outright but rather to cause substantial damage and psychological uncertainty. The

intended outcome is to trigger a surge in Lloyd's insurance rates and induce foreign investors to panic and withdraw their investments (Thayer 2018).

Discussion

Situated in the diverse Asia-Pacific region, each nation autonomously considers its distinctive circumstances concerning threat perceptions, developmental priorities for naval forces, and, notably, economic or fiscal capacities. It is evident that these countries, if not all, meticulously devise strategic plans for cultivating subsurface capabilities. Dismissing their submarine acquisition programs as misguided endeavors pursued solely for the sake of prestige would be an oversimplification and may overlook the nuanced and purposeful nature of these initiatives. Vietnam has strategically outlined its objectives in pursuing undersea capabilities. While the acquisition of six Kilo-class submarines may strain Hanoi's resources, especially amidst broader modernization needs, the investment is geared towards addressing the long-term naval imbalance with China, a potential adversary in the South China Sea. The recent procurement reflects Vietnam's financial constraints in the past rather than a lack of inclination. Acquiring six submarines at once underscores Vietnam's commitment to establishing a fully operational subsurface fleet, emphasizing credible deterrence. Similar to Vietnam, Singapore has adopted an incremental approach in developing its undersea capabilities, initially obtaining either low-capability (such as rudimentary Yugo-class midget submarines in Vietnam's case) or second-hand vessels (as seen with Singapore's Sjöormen-class coastal submarines) before progressing to newer, more advanced submarines.

On the other hand, rather than undertaking the refurbishment of their Type-209 submarines in German shipyards, a more costly option considering logistical factors such as transportation distance, the Indonesians opted to send their submarines to South Korea for overhaul. This decision is indicative of Jakarta's strategic choice for South Korean-built SS209 Chang Bogo class submarines, allowing for a more cost-effective solution and leveraging existing institutional connections between the purchaser and the supplier. While the plan to construct the third Chang Bogo in PT-PAL's own yard faces challenges, it underscores the obstacles encountered by smaller navies lacking seamless access to requisite technologies and facing limitations in achieving economies of scale due to their modest procurement endeavors. Possibly due to these considerations, some nations exercise prudence in developing their submarine capabilities. Vietnam, for instance, opted to acquire Kilo-class submarines exclusively manufactured in Russia, relying entirely on this single supplier and forgoing aspirations of indigenization. The prospect of procuring more submarines to facilitate economies of scale and

initiate local construction remains a distant goal. Similarly, Malaysia faces financial constraints that limit its submarine acquisitions, with the acquisition of only two Scorpene-class submarines being feasible, and local submarine production plans are currently unattainable. Nonetheless, this financial reality does not deter countries from exploring specific domains of submarine self-reliance. Singapore, for example, is unlikely to embark on independent submarine construction but demonstrates interest in cultivating a degree of self-sufficiency in specific areas. A notable illustration is Singapore's collaboration with Germany's Atlas Elektronik for the development of submarine combat systems. Certainly, it is evident that Asia-Pacific nations persist in their eagerness to develop and maintain submarine capabilities, notwithstanding the challenges involved in acquisition, operation, and sustainability.

Conclusion

The post-Cold War period witnessed a proliferation of military technology following the dissolution of the Soviet Union, shaping the trajectory of military forces and defense structures. This era not only exposed existing vulnerabilities but also laid the groundwork for potential sources of future conflict. The acquisition of submarines emerged as a distinctive dimension within this evolving landscape, warranting dedicated research. Through a comprehensive examination of case studies from Indonesia, Malaysia, Singapore, and Vietnam, this study systematically assessed the validity of hypotheses related to deterrence and enforcement as underlying rationales for the procurement of submarines, contributing nuanced insights into the diverse motivations guiding these strategic decisions. This research found substantial support for the deterrence hypothesis across all examined case studies, signifying a robust and consistent trend. The post-Cold War era witnessed a notable shift in geopolitical dynamics as the Soviet Union retracted from global engagements, prompting a reciprocal disengagement by the United States. In response to this evolving security landscape, nations sought to bolster their defense capabilities through the acquisition of advanced military hardware and weaponry. The statements articulated by defense officials in each case study underscored a pervasive deterrence-oriented rationale, emphasizing the intent to dissuade potential adversaries from engaging in undesirable military activities. This recurrent emphasis on deterrence emerged as a prevailing regional pattern in the context of submarine proliferation. The evidentiary basis for enforcement as a primary rationale for submarine acquisitions was found to be notably weak, with discernible support only observed in the case of Indonesia. In the Indonesian context, submarines were regarded as essential tools for demonstrating the nation's commitment to effectively patrol its maritime territories and address contested

areas. Conversely, Vietnam, engaged in a prolonged territorial dispute with China, demonstrated a departure from an enforcement-oriented approach. Vietnam's strategic focus shifted towards deterrence, bypassing the intermediate stage of enforcement, and necessitating the acquisition of submarines primarily for the purpose of deterrence rather than the dual objectives of deterrence and enforcement.

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