Underwater ambitions: submarines and anti-submarine capabilities in Southeast Asia

The rapid proliferation of submarines in Southeast Asia has resulted in heightened interest in anti-submarine warfare platforms and equipment. Ridzwan Rahmat examines key developments

In July 2014 at its Sattahip Naval Base, the Royal Thai Navy (RTN) officially launched a submarine squadron in preparation for an anticipated purchase of a submarine capability. Bolstered by political support from the country’s military government, Thailand has renewed its quest to acquire submarines; as IHS Jane’s reported in March 2015, it is understood to have been considering a number of designs including China’s Type 041 Yuan class, Russia’s Project 636 Kilo class, Germany’s Type 209/1400 and the smaller Type 210 (the latter being aimed at navies looking to acquire their first submarine), and South Korea’s HDS-500RTN.

While the specifications of the HDS-500RTN have not been revealed, IHS Jane’s understands that it is a mini-submarine, which would support RTN operations in relatively shallow waters such as the Gulf of Thailand.

Should the acquisition of a submarine capability proceed, Thailand will become Southeast Asia’s latest submarine-operating navy, joining a number of counterparts in the region - namely the Republic of Singapore Navy (RSN), the Royal Malaysian Navy (RMN), the People’s Army of Vietnam (PAVN) Navy, and the Indonesian Navy (Tentera Nasional Indonesia-Angkatan Laut, or TNI-AL).
Indonesia’s Cakra Type 209/1300-class conventional submarine KRI Nanggala. Along with sister ship KRI Cakra, Nanggala has been operating with the TNI-AL since the early 1980s. (TNI-AL)

These acquisitions highlight a proliferation of such assets in the region. Prior to the commissioning of the RSN’s first Challenger (ex-Sjöormen)-class patrol submarine RSS Conqueror in July 2000, the TNI-AL was the sole post-Second World War submarine operator in the region, with a squadron of Whiskey-class boats operating in the 1960s and 1970s, and then with a fleet of two Type 209/1300 (Cakra)-class diesel-electric submarines (SSKs) - KRI Cakra (401) and KRI Nanggala (402) - since the early 1980s.

The first of Malaysia’s French-built Scorpène submarines, KD Tunku Abdul Rahman, commissioned in January 2009. (DCNS)
Driving factors

However, before examining Southeast Asia’s ASW-related procurements, it is important first to understand the context behind the spate of submarine acquisitions.

With perhaps the exception of Vietnam, which has engaged in skirmishes at sea with China over conflicting South China Sea territorial claims, submarine procurement by Southeast Asian operators has been driven primarily by the need to modernise force structures and by issues relating to the region’s overall strategic balance, rather than by a requirement for underwater warfare capabilities in response to a specific threat.

As reported by *IHS Jane’s* in March 2011, Thailand’s then deputy prime minister, Suthep Thaugsuban, said that the acquisition of submarines is "necessary for the RTN because countries in the immediate region - who could pose a threat - all have submarines. If we don't [acquire] submarines it will be difficult to protect our sovereignty and we will be at a disadvantage".

The ex-deputy prime minister was responding to concerns raised by opposition politicians with regards to the planned acquisition expenditure of USD220 million on a submarine programme. Concerns about such expenditure were based, in part, on Thailand not being a claimant to any South China Sea territories, and not having outstanding maritime border disputes with any neighbours.

The same position seems to have been taken by Malaysia. Although the country does have claims to South China Sea territories, the RMN seems to have taken the decision to acquire submarines as a force development exercise. Prior to procuring its Scorpène-class vessels, the RMN was already operating a well-
balanced mix of surface combatants that arguably could fulfil the mission of protecting Malaysia’s maritime interests.

The country’s decision to acquire submarines in the early 2000s can be seen as a move to counter-balance the RSN’s acquisition of subsurface capabilities. Strategic rivalry between the two countries has endured since Singapore’s independence in 1965. However, the RMN’s decision to base both submarines at the Kota Kinabalu Naval Base in Sabah, in close proximity to the South China Sea, can be interpreted as a move by the navy to deter Chinese assertiveness in staking its rights to territories claimed by both countries.

Indonesia has also explicitly indicated that much of its underwater fighting capability will be used to deter naval risks emanating from neighbouring Malaysia. In particular, the TNI-AL has said that the country’s current and projected submarine capabilities will be primarily deployed to protect interests in disputed maritime regions in the Celebes Sea known as the Ambalat and East Ambalat blocks. In May 2009, an RMN Jerong-class patrol vessel, KD Yu (3508), and the TNI-AL Kapitan Pattimura (Parchim I)-class frigate KRI Untung Suropati (872) narrowly avoided a skirmish after the former was accused of intruding into Indonesian territorial waters. Tensions in these energy-rich maritime areas have remained since.

**Airborne ASW**

However, while surface-based submarine prosecution capabilities may not be new in the region, the proliferation of submarines has coincided with an increased interest in dedicated airborne ASW platforms among Southeast Asian navies and air forces.

In February 2014 at the Singapore Airshow, aerospace company PT Dirgantara Indonesia told *IHS Jane’s* that the Royal Brunei Air Force (RBAF) is set to acquire three ASW-capable CN235-220 aircraft to meet its maritime patrol requirement, following a successful demonstration by the company in 2013 of the platform’s ability to prosecute submarine targets.

Brunei has overlapping territorial claims with China in the South China Sea. Colonel Shahril Anwar bin Ma’awiah, head of the Directorate of Force Capability Development at Brunei’s Ministry of Defence, told *IHS Jane’s* in 2013 that the acquisition of a fixed-wing maritime patrol aircraft (MPA) would be a priority. However, by the time of writing, neither the RBAF nor PT Dirgantara had responded to *IHS Jane’s* questions regarding whether a contract for the three aircraft had materialised.

Malaysia, as another South China Sea territory claimant, has also since 2012 been seeking to procure six ASW helicopters. The RMN has said that it will push for this acquisition as a matter of priority. However, it is not certain whether an acquisition programme would be approved, given the country's tight budgetary constraints.
Indonesia’s navy demonstrating submarine special operations capabilities during the 69th TNI Day Parade in Surabaya, 2014. (IHS/Ridzwan Rahmat)

Also anticipating delivery of new ASW helicopters is the TNI-AL. The service announced in November 2014 that it will be acquiring 11 AS565 Panther ASW helicopters from Airbus Helicopters. The aircraft will be fitted with the L-3 Helicopter Long-Range Active Sonar (HELRAS) dipping sonar and a torpedo launching system. Once in service, the helicopters are slated for the TNI-AL’s SIGMA 10514-class guided-missile corvettes and the three recently commissioned Bung Tomo-class corvettes.

In addition to the Panthers, the service is also reportedly interested in acquiring the Kaman SH-2G Super Seasprite helicopter, although as yet there has been no confirmation of any deal.

Another Southeast Asian naval service which has looked to the sky for its ASW requirements is the PAVN Navy. In April 2013, *IHS Jane’s* reported that Vietnam is expected to bolster its capability by requesting from the US government the sale of up to six surplus Lockheed Martin P-3 Orion MPAs. The platforms would in principle come without weapons, although these could always be supplied subsequently. Should the deal materialise, the P-3s will complement the navy’s current fleet of fixed-wing aircraft, including the three Viking DHC-6 Twin Otters deployed for maritime surveillance.
Singapore's Sikorsky S-70B helicopter. With six of the ASW helicopters already in service, in 2014 Singapore announced the acquisition of two more. (IHS/Patrick Allen)

Despite operating a modern fleet of ASW-capable surface ships, the RSN too has decided to go airborne for submarine prosecution. As reported by IHS Jane’s, Singapore’s MINDEF announced in March 2014 that it will be acquiring two more Sikorsky S-70B Seahawk ASW helicopters in addition to the six already in service. The earlier batch of helicopters was acquired in 2005 and was integrated with the RSN’s Formidable-class frigates in 2010.

The RSN’s helicopters are equipped with the AN/APS-143 maritime surveillance and tracking radar, the HELRAS dipping sonar, and the Raytheon AAS-44 multipurpose infrared and laser designation system. The platforms are also armed with the Whitehead Alenia Sistemi Subacquei (WASS) A.244/S lightweight torpedo as an offensive capability against hostile submarines.

Non-airborne ASW

An alternative to the airborne ASW approach, and one which has emerged in recent years, is unmanned systems including unmanned surface vessels (USVs) and autonomous underwater vehicles (AUVs).

In February 2014, Singapore state-affiliated company ST Electronics told IHS Jane’s it had begun testing its unmanned modular platform, known as the Venus USV, for ASW operations. The platform had been integrated with a launch-and-recovery system for dipping sonars and was slated for a live demonstration, simulating a submarine-hunting operation.

The company declined to identify potential buyers, but indicated that the ASW-capable Venus has received interest from Asia-Pacific states.
Another approach taken by companies recognising the budgetary constraints faced by Southeast Asian navies is to provide containerised ASW mission modules that can be embarked in non-dedicated ASW vessels.

During the OPV Asia Pacific 2014 conference in Singapore, German naval systems company Atlas Elektronik showcased its product known as the TAS M module, which consists of a standard, 20 ft, air-conditioned container with a built-in operator console and a winch system for launch-and-recovery of towed array units. The company told IHS Jane’s that the product is targeted at operators in the region that lack purpose-built ASW vessels, but have alternative platforms, such as offshore patrol vessels (OPVs), which can be converted into submarine hunters.

"Navies can opt to buy just one or two units of this containerised module, and then decide which vessel they would like to have converted into a submarine hunter. [The module] is completely interchangeable," said Jens Wachsmann, Atlas Elektronik’s East Asia sales director. Atlas Elektronik said the module has generated interest from several regional navies.

In addition, several Southeast Asian navies have already made provisions for future platforms to be armed with submarine-prosecuting capabilities.

The L-3 HELRAS dipping sonar. The Indonesian navy will be joining the Republic of Singapore Navy as an operator of the ASW system. (L-3 Communications)
**Competition or co-operation**

While the region has seen investment in both submarines and in capabilities to offset their influence, this growing underwater focus has also led to calls for the development of concepts and capabilities that can promote better waterspace management in the region, especially given the relatively small size of water bodies such as the South China Sea and the busy nature of maritime channels such as the straits of Malacca and Singapore.

Retired Royal Australian Navy (RAN) commodore and noted maritime security analyst Dr Sam Bateman has warned that increasingly crowded waters in Southeast Asia could mean a higher risk of submarine collisions. Speaking at an RSIS seminar in August 2014, Bateman referred to a 2009 collision involving the UK Royal Navy’s lead Vanguard-class nuclear-powered ballistic missile submarine (SSBN) HMS Vanguard and the French Navy’s Le Triomphant-class SSBN Le Triomphant in the more open waters of the Atlantic Ocean.

Adding to the proliferation of submarines by Southeast Asian navies is the possible presence of underwater platforms belonging to extra-regional operators such as China’s People’s Liberation Army Navy (PLAN) and the US Navy (USN). For example, the PLAN, in its quest to secure the country’s SLOCs, said in January 2015 that it will deploy a broad range of naval vessels into the Indian Ocean region in the future, with submarines already having operated there. Transit routes for such vessels will include Southeast Asian waters such as the Malacca or Lombok straits.

To reduce the risk of collision, analysts including retired RAN commodore Jack McCaffrie (the latter writing in a chapter in an edited collection titled *Naval Modernisation in South-East Asia: Nature, Causes and Consequences*) have suggested that Southeast Asian navies should develop a waterspace management framework similar to the regime adopted by North Atlantic Treaty Organization (NATO) navies. Via a series of communications and separation protocols, submarines could be segregated into operating envelopes to ensure sufficient distance between them.

However, proposing such a regime for the region is likely to meet with several difficulties, due largely to geopolitical factors and interoperability issues.

The geopolitical environment in Southeast Asia is of course very different from that of Europe, where NATO countries are galvanised for example by more common security concerns.

Overlapping maritime claims persist across the Southeast Asian region. In addition, political wounds relating to previous conflicts - such as between Indonesia and Malaysia and Singapore during the 1960s - may have not fully healed, judging for example by the sensitivities revealed during Indonesia’s naming of its Bung Tomo-class corvette KRI Usman Harun. As IHS Jane’s has reported, the vessel was named after two Indonesian marine commandos convicted of participating in the 1965 bombing of MacDonald House in Orchard Road, Singapore.

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**Conclusion**

The procurement of ASW-related platforms and equipment across Southeast Asia has developed for several different reasons. With the exception of Vietnam and the Philippines, acquisitions have been driven mostly by generic desires to modernise fleets in the wake of increasing defence expenditure bolstered by
wider economic development. While Southeast Asian navies may not have the defence budgets of Western powers, these budgets have been rising all the same.

In the South China Sea region, overlapping territorial claims (involving states including China, the Philippines, and Vietnam) endure. However, while strategic rivalries may exist between states within the Southeast Asian region, these rivalries have not evolved into clear strategic threats. Arguably, thus, for most Southeast Asian navies the procurement of submarines and ASW-related equipment is not being driven by a perceived need to respond to a specific risk, but rather a perceived need to maintain strategic balance. Moreover, while there will be continued demand for ASW platforms and equipment in Southeast Asia, such capabilities may not be as robust as those elsewhere in the Asia-Pacific region, where there exists perhaps a stronger likelihood of underwater conflict.

**UNDERSTANDING THE ASW ENVIRONMENT**

The tropical waters of Southeast Asia present a particularly challenging environment for ASW operations. Characterised by areas of relatively shallow water contrasting with a number of deep trenches falling away at the edge of the continental shelf, in geography terms the region is also home to numerous islands of all sizes that contribute to the development of strong currents and tidal streams. The hydrography - complex and not well-mapped - displays a great variation of bottom types, adding to the difficulties. The oceanography is equally complex.

Together, these factors demand considerable understanding of the region's waters if an ASW operator is to maximise sensor and weapons capability. ASW is a game of 'cat and mouse', where both the hunter and the hunted seek, through exploitation of the environment, to optimise the tactical situation to their advantage.

These complex conditions have similar impact on the performance of both active and passive sonars, governed as they are by the physics of sound propagation through water. Acoustic signals, whether active transmissions or radiated noise, are affected by the structure of the water column, in particular by its density and the aural frequency of the sound (high frequencies suffer greater attenuation). This structure, measured by a bathythermograph, is used to determine the sound speed profile and thus potential sonar range in the conditions.

Surface warming in the heat of a tropical day will create a strong surface duct in which sonar signals can be trapped, whereas homogenous water temperature will allow the sound to insonify the entire water column. Understanding how such phenomena can be used tactically is the key to success. In the tropical and subtropical areas, cyclical daily warming of the sea surface - sometimes referred to as the 'afternoon effect' - has a profound impact on the performance of hull-mounted sonars fitted on surface ships. Heating of the water at the surface creates an isothermal layer over the more persistent water conditions. In effect, this creates a mirror at about 30 m, below which a hull-mounted sonar on a surface ship will not penetrate. A strong surface duct allows the submariner to close the surface ship with less chance of detection - so long as he stays below the layer. The surface ship therefore seeks to deploy a variable depth sonar below the layer to overcome this sonic barrier.

Warm, shallow water conditions coupled with the attendant complexity of the environment present poor sonar propagation characteristics. Where the structure causes the sound to be refracted downward, ranges at the surface may be less than those at depth.

In shallow waters (defined as <200 m in depth) the environment is highly dynamic, far more complex and variable in its composition, and influenced by the other geographical features, including the effect of freshwater outflows (as seen in the Bay of Bengal). In addition to the influences of the water column, there
may be acoustic interaction with the seabed, with mud and sand absorbing the energy, and with rocky bottoms causing reflection. Deeper water usually provides a more predictable outcome.

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**CHINESE SUBMARINES IN SOUTHEAST ASIA**

In September 2014, a PLAN submarine, reported to be the Type 039 Song-class diesel-electric boat **Great Wall**, visited the Sri Lankan capital Colombo. During a January 2015 press conference, Chinese Ministry of National Defense spokesperson Senior Colonel Yang Yujun said the PLAN will send different kinds of naval vessels into the Indian Ocean region.

"The Chinese military has sent various kinds of naval ships to the Gulf of Aden and the waters off the Somali coast to conduct escort missions since 2008 - and in the process, we have notified relevant countries of the escort missions of the PLA naval ships, including the PLA naval submarines," said Senior Col Yang.

China will continue to use various elements of its naval forces to protect what it sees as critical SLOCs in the Indo-Pacific region. The transit of PLAN submarines into the Indian Ocean will involve Southeast Asian waters including the Lombok, Malacca, and Singapore straits. However, while such transits may add to the underwater crowd in the region, the presence of Chinese submarines transiting into the Indian Ocean is unlikely to threaten the strategic order therein.

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**AN UNDERWATER RE-BALANCE TO SOUTHEAST ASIA?**

The United States has recently indicated its concern over increasingly potent Chinese underwater capabilities. In a statement to the US Senate Armed Services Committee in March 2014, head of US Pacific Command, Admiral Samuel J Locklear III, described the PLAN’s advancement in submarine capabilities as significant. The admiral also warned that the PLAN’s Type 094 Jin-class nuclear-powered ballistic missile submarine would likely be deploying long-range nuclear missiles for the first time by the end of 2014.

To underscore the US military’s commitment to ASW as part of its re-balance towards the Asia-Pacific region, the Pentagon in 2012 outlined some of the equipment that the United States will be deploying there.

Such equipment includes new Virginia-class nuclear-powered attack submarines. Also to be included in the re-balancing strategy are submarine-prosecuting P-8A Poseidon multimission maritime aircraft and MH-60 Seahawk multimission helicopters.

In addition, the USN has also recently dispatched its third Littoral Combat Ship (LCS), **USS Fort Worth** (LCS 3), to Singapore on a 16-month rotational tour, following the deployment of sister ship **USS Freedom** (LCS 1). In July 2014, at the 'Rim of the Pacific' (‘RIMPAC’) international naval exercise, Commander Joseph Gagliano, the commanding officer of lead Independence variant LCS **USS Independence** (LCS 2), told *IHS*
Jane’s that the modular nature of *Fort Worth* means that the vessel can also embark ASW mission packages during its deployment in Southeast Asia. As reported by *IHS Jane’s*, this mission package may include the General Dynamics Robotic Systems 11 m 'Fleet'-class ASW unmanned surface vehicle, first delivered to the USN in May 2008.

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