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Issue Brief

Pakistan's Hangor-Class Submarines: Strategic Implications for India

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Summary

Four China-built Hangor-class submarines have been launched to date, while another four are planned to be assembled in Pakistan. These submarines can raise the cost and complexity of Indian maritime reassurance and escalation management during a fast-moving crisis.

Introduction

On 17 December 2025, Pakistan launched *PNS Ghazi*, the fourth Hangor-class submarine being built in China, at the Wuchang Shipbuilding Industry Group's Shuangliu Base in Wuhan. Four China-built Hangor boats have been launched to date (see Table 1) and are said to be in sea trials and in the final stages of handover.[1] Another four submarines are planned to be assembled in Pakistan at the Karachi Shipyard and Engineering Works (KS&EW) under a transfer-of-technology arrangement, reflecting the programme's 4+4 production split.

Table 1. Pakistan's Hangor-class Submarines: Launch Dates

Hangor-Class Submarine	Launch Date
PNS Hangor	26 April 2024
PNS Shushuk	15 March 2025
PNS Mangro	15 August 2025
PNS Ghazi	17 December 2025

Source: Media reports

Hangor is an export variant of China's Yuan-class (Type 039A family) submarine. The programme is intended to modernise Pakistan's undersea arm[2] at a time when: (a) Western supply options have tightened, as several European states restrict or closely control submarine-related technologies due to their 'dual-use' civilian and military applications; and (b) when affordability pressures have further narrowed Islamabad's choices.[3]

[1] **"Pakistan Navy's Fourth Hangor Class Submarine Launched by Chinese Shipyard",** *Dawn*, 17 December 2025.

[2] **"Pakistan's Hangor Submarines Poised to Challenge Indian Naval Supremacy"**, *Times of Islamabad*, 18 November 2025.

[3] Manoj Kewalramani and Anushka Saxena, **"Inside China's 'Low-Cost' Arms Exports Industry, Serving Everyone From Pak to West Africa"**, *NDTV*, 17 June 2025.

Pakistan–China aligned narratives sell the Hangor programme as a regional game-changer. A stated aim of the programme is to transform Pakistan into a submarine-building nation.[4] Pakistan is leaning heavily on the legacy of *PNS Hangor* (S131)—the Pakistan Navy submarine that sank India's INS *Khukri* during the 1971 war. They also amplify claims of 'modern sensors' and 'strong combat capability'. A more sober reading is that Hangor is a downgraded export variant of the Yuan-class, with sensitive technologies likely withheld. In strategic terms, it is best understood as a recapitalisation programme to replace ageing boats and signal resolve. More importantly, Beijing essentially prioritises the sale of low-quality military equipment in the international market and keeps the most advanced and efficient defence systems for itself.[5]

Does the Hangor materially threaten India's maritime dominance *vis-à-vis* Pakistan, or is it a narrative amplified by Beijing and Islamabad? The answer likely lies between the two: representing a real capability gain for Pakistan, embedded within strategic narrative-building designed to inflate perceptions of a shift in the naval balance. Equally important, the Hangor deal signifies a broader shift towards a Chinese-supplied naval architecture, with effects on interoperability, sustainment and life-cycle dependence, and over time, the possibility of the transfer of Chinese naval assets to Pakistan, in a sign of strategic convergence that could threaten India's maritime edge in the North Arabian Sea.

Hangor's Air-Independent Propulsion System

Pakistan and Chinese officials and media frequently describe the Hangor-class submarine as being equipped with an Air-Independent Propulsion (AIP) system, highlighting it as a key feature. AIP is, indeed, a well-established technology on many modern submarines. Its core advantage is that it allows a boat to remain submerged for more extended periods at low speeds without snorkelling to run diesel engines and recharge batteries—thereby improving stealth and persistence, especially in contested littorals. Depending on the type of AIP system and the operational profile, AIP can extend underwater endurance from a few days on batteries alone to roughly the low-to-mid teens in days (approximately 18–20 days) at modest speeds.

Presently, there are four types of AIP systems: (i) closed cycle diesel engines, used by countries such as Germany and Netherlands; (ii) Closed Cycle Steam Turbine

[4] Rear Admiral Monty Khanna (Retd), "**China Accelerates Pakistan's Hangor-Class Submarine Programme**", *Maritime India*, 24 March 2025.

[5] Ibid.

(Module d'Energie Sous-Marine Autonome or MESMA), a French model fitted/retro-fitted engine in submarines of France and Pakistan; (iii) Stirling Engine, used in indigenous productions of countries like Sweden, China, Singapore and Japan; and, (iv) Fuel-cell, which is used in indigenous production of countries like Israel, Germany, Russia and India.[6]

As mentioned above, Pakistan is not new to AIP. It has Agosta-90B/Khalid-class submarines that were retrofitted with the French MESMA AIP system, which uses a closed-cycle steam turbine powered by stored oxygen and fuel. That platform provided Pakistan’s first experience with AIP at sea. However, it is also true that, among the prevalent AIP technologies, MESMA has the lowest efficiency.[7] That is why the Pakistani media claims that the Hangor’s AIP is more advanced, and offers significantly greater submerged endurance and stealth.

China’s own AIP submarines, the Type 039A/Yuan-class, on which Hangor is based, use a Stirling engine system. Stirling engines generate power by burning liquid oxygen with diesel fuel.[8] The Stirling AIP system’s main advantage is that it can use diesel as its primary fuel, which reduces refuelling complexity. However, it is inherently bulkier and is less stealthy than fuel-cell AIP systems, as it typically has higher acoustic and vibration signatures due to moving, reciprocating components, such as pistons, crankshafts and associated linkages. Diving depth can also be a constraint because a Stirling system generates exhaust that must be managed and discharged overboard. At greater depths, higher water pressure makes exhaust venting more difficult and potentially riskier.

Fuel Cells, on the other hand, are emerging as the widely sought-after technology and may well become a flagbearer of AIP technologies in the future. The system operates on the basic principle of combining hydrogen and oxygen molecules to produce electrical energy, with water as its primary byproduct. The wastewater produced can be expelled outboard via the submarine's water dispensation system.

The Hangor may be less stealth-optimal than the best fuel-cell AIP designs. In addition, Western analysts generally assess that China’s AIP has not yet matched the quietness and efficiency of Swedish Stirling systems.[9] If those assessments are

[6] R. Rajiv Menon, Rajagopalan Vijayakumar and Jitendra Kumar Pandey, **“Selection of Optimal Air Independent Propulsion System Using Forced Decision Matrix”**, *Defence Science Journal*, Vol. 70, No. 1, 2020, pp. 103–109.

[7] Ibid.

[8] Ibid.

[9] Sarah Kirchberger, **“China Maritime Report No. 31: China’s Submarine Industrial Base: State-Led Innovation with Chinese Characteristics”**, China Maritime Studies Institute, U.S. Naval War College, September 2023.

correct, it is a disadvantage. Once a submarine is detected and tracked, it loses much of the manoeuvre space and ambiguity that gives it deterrent value. Even so, it would still be far from easy to find compared to a conventional diesel-electric submarine operating without AIP.

The Indian Navy operates an extensive Anti-Submarine Warfare (ASW) ecosystem. It includes the P-8I Poseidon aircraft equipped with sonobuoys, magnetic anomaly detection systems and anti-ship missiles; indigenously built Kamorta-class ASW corvettes designed for littoral operations with dedicated sonar and torpedoes; and shallow-water ASW platforms such as *INS Arnala*, the upcoming *INS Anjadip*, and newly-launched craft including *INS Amini* and *INS Ajay*. These vessels are built around hull-mounted and variable-depth sonars, lightweight torpedoes and anti-submarine rockets. MH-60R Seahawk helicopters add a rapid-response layer to ASW missions.[10]

In November 2025, the Indian Navy commissioned *INS Mahe*, fitted with underwater sensors from DRDO and BEL, lightweight torpedoes from DRDO and BDL, two triple-tube lightweight torpedo launchers from L&T, an ASW rocket launcher from L&T, torpedo decoy launchers from Mahindra, and a mine-laying capability. It also carries Elbit 12.7 mm SRCG guns, produced by Ordnance Factory Tiruchirappalli, and the Elbit 30 mm NSG system, built by GRSE.[11]

AIP is low-maintenance but not maintenance-free. Repairing AIP systems requires sophisticated maintenance facilities and supply chains for diesel/battery/AIP expertise.[12] Pakistan has experience operating and overhauling AIP-equipped submarines (Agosta-class). It possesses domestic shipyard/dockyard capacity,[13] though the degree of self-reliance for deep AIP sustainment and proprietary spares is unclear in open sources. Moreover, reports suggest that China is building a maritime industrial complex in Pakistan. In late December 2025, a Chinese firm (Shandong Xinxu Group) discussed the construction of an Integrated Maritime Industrial Complex (IMIC) at Port Qasim. The key components of the project are: revival of the steel jetty, shipbuilding and shipbreaking facilities, and a port-linked steel mill. However, this project remains at the proposal/feasibility stage.[14] If

[10] Adithya Krishna Menon, "**Indian Navy Commissions First ASW Craft Built by Cochin Shipyard**", *Naval News*, 27 November 2025.

[11] "**Pakistan's Chinese-Built Hangor Submarines Outmatched by India's Cutting-Edge Anti-Submarine Warfare Dominance, Risk Premature Obsolescence**", *Indian Defence News*, 26 July 2025.

[12] Lieutenant Commander Jordan A. Spector, U.S. Navy, "**The Path to a Bigger Submarine Fleet Includes Diesels**", *Proceedings* (U.S. Naval Institute), Vol. 151/10/1,472, October 2025.

[13] "**Pakistan Submarine Capabilities**", Fact Sheet (Submarine Proliferation Resource Collection), Nuclear Threat Initiative (NTI), 4 September 2024.

[14] Kalbe Ali, "**€2bn Maritime Complex Proposed at Port Qasim**", *Dawn*, 19 December 2025.

implemented, such capacity could strengthen Pakistan's broader maritime industrial base over time. However, near-term sustainment for new Chinese-origin platforms would typically continue to rely on Original Equipment Manufacturer (OEM)-linked supply and support while local capability matures.

Is Hangor-Class a Nuclearised Submarine?

After the testing of Babur-3, in 2017, Pakistan's military messaging described it as providing a "credible second-strike capability" for sea-based deterrence and a range of approximately 450 km.[15] However, there is no publicly verifiable official confirmation that the Hangor-class is specifically assigned a nuclear mission or will be able to carry nuclear warheads. Most write-ups that assert Hangor will integrate the Babur-3 submarine-launched cruise missile (SLCM) are based on inference or secondary commentary. Pakistan has not publicly disclosed how/when Babur-3 is integrated onto an operational submarine and deployed on deterrent patrols. Even in the Chinese media, the Yuan/Hangor lineage is described as conventional power submarines that emphasise AIP to extend submerged endurance, rather than as nuclear-propelled submarines.[16] However, claims linking Hangor directly to a nuclear mission hinge on integration, storage, command-and-control and verified deployment patterns. India should monitor these indicators.

The Issue of Chinese-Built Diesel Engines

The biggest issue with the Hangor-class submarines is their engines. It uses a Chinese-built CHD620 high-speed diesel engine, traced back to designs licensed initially from Germany's MTU.[17] The core concern is that the Chinese engines lack the same long, well-documented operational track record as the German originals. This reliability question surfaced clearly in the China–Thailand submarine deal. Under the S26T (Yuan-class export) contract, China proposed replacing the planned MTU engines with CHD620 engines initially after Germany refused to approve the export of the MTU units. The Thai government and the Royal Thai Navy reportedly expressed scepticism about the CHD620's performance, lifespan and reliability,

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[15] Shervin Taheran, "**Pakistan Advances Sea Leg of Triad**", *Arms Control Today* (Arms Control Association), 1 June 2018.

[16] "**Photo of What Seems to be China's New Submarine Revealed in Official Report**", *Global Times*, 19 July 2022.

[17] Pazdin Dalal, "**Germany Refuses to Supply Engines for Pakistan's Chinese Origin Submarines**", *IADN News*, 28 May 2022.

arguing that it lacked a proven service history.[18] Some reports have even claimed that the CHD620 has not been fielded in operational submarine fleets, potentially not even within China's own navy.

To reassure the Thai side, China has cited extensive bench testing (reportedly 6,000+ hours) and offered extended warranty terms, claiming that the CHD620 meets the required performance parameters. A Thai delegation was expected to observe, or may already have observed, engine tests in Wuhan as part of its assessment of the CHD620's viability. At present, however, no publicly confirmed operational navy (excluding possible experimental or prototype use) is known to have adopted the CHD620 for active submarine service. Pakistan, in contrast, has not publicly objected to replacing German engines with Chinese alternatives. But if the Hangor-class relies on an unproven CHD620 variant, the platform could face challenges, particularly in mechanical reliability, maintenance burden and long-term availability.

Implications for India

India should take the Hangor programme seriously, but not treat it as a decisive shift by itself. The programme is an incremental force-accumulation process, not an overnight capability jump. Even if all eight boats are delivered as planned, induction, crew work-up and fleet integration could stretch close to a decade—by which time the Indian Navy's own force levels and enabling capabilities are also likely to have grown. The risk is not that eight submarines will suddenly overturn the maritime balance; it is that they can gradually expand the Pakistan Navy's ability to sustain an underwater presence, complicate crises, and widen the scope for sea-denial activity in the North Arabian Sea, especially if backed by Chinese training pipelines, spare-parts provisioning, ISR cueing and lifecycle assistance. Given the trajectory of China–Pakistan interoperability, such support is likely.[19] For example, Pakistan's Defence Minister Khwaja Asif did acknowledge that Pakistan received operational intelligence support from Chinese satellites during the 6–9 May 2025 crisis.[20]

Contemporary crises rarely remain confined to a single domain. A land-based counter-terror response can quickly spill into the maritime domain. Submarines are

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[18] Sarah Kirchberger, "**China's Undersea Warfare**", testimony before the U.S.-China Economic and Security Review Commission, hearing on "China's Pursuit of Defense Technologies: Implications for U.S. and Multilateral Export Control and Investment Screening Regimes", 13 April 2023.

[19] Sameer P. Lalwani, "**A Threshold Alliance: The China–Pakistan Military Relationship**", Special Report No. 517, United States Institute of Peace, March 2023.

[20] "**'Very normal': Pakistan Confirms China Sharing Intel on India After Operation Sindoor; Says Still on Alert Mode**", *The Times of India*, 27 June 2025.

attractive in such situations precisely because they introduce uncertainty and preserve options. Even a modest rise in Pakistan’s underwater presence can complicate Indian planning by increasing ASW demand, shaping merchant shipping advisories, and creating pressure to demonstrate maritime control without widening escalation. Hence, the issue is not that the Hangor makes Pakistan dominant; instead, it can raise the cost and complexity of Indian maritime reassurance and escalation management during a fast-moving crisis.

Pakistan’s modernisation gain is real. If the Hangor submarines replace older boats and let the Navy send more submarines out on patrol, Pakistan can track Indian ships more frequently in peacetime, keep India guessing during a crisis, and try to block or threaten sea routes near Indian ports and naval bases. But what will matter even more is the level of behind-the-scenes support China provides.

That is why tracking the updates on co-production is vital for India. The key question is not only what these submarines can do at sea, but also what Pakistan builds on land to keep them running: Will Karachi Shipyard (KS&EW) and related dockyards develop the capacity to repair and overhaul submarines properly? Will Pakistan put in place regular routines to update software and combat systems, calibrate sensors and maintain strict safety standards? And will the industrial projects announced on paper turn into real capacity in workshops, tools and trained technicians? These are important questions for which decision-makers must have answers in advance so that the Indian Navy can be prepared.

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