March 2, 2026

Testimony of RADM Mike Brookes

Intelligence Director – Navy

Commander, Office of Naval Intelligence

Director, National Maritime Intelligence-Integration Office

Submitted to the

U.S.-China Economic and Security Review Commission

Hearing on

Part of Your World: U.S.-China Competition Under the Sea

China views undersea warfare (USW) as an enabler for the full spectrum of naval operations, supporting defense (i.e., near-seas control, SSBN protection, and counter-surveillance) and offense (i.e., sea-lane interdiction, deterrence, and strikes on high-value targets). This focus aligns with the PLA Navy's "Near Seas Defense, Far Seas Protection" strategy and reflects Beijing's view of the undersea domain as central to great-power competition and the broader U.S.–China contest.

China frames future USW as "systems confrontation," prioritizing networked, multi-domain ASW over platform-on-platform fights. The PLA is integrating air, surface, seabed, and undersea sensors and platforms into an ASW system-of-systems to control key maritime areas and compel adversary submarines to withdraw. At the same time, PLA academics highlight persistent vulnerabilities—especially high detection risk from U.S. layered surveillance during port departures—driving continued investment in quieting, operational security, seabed systems, and unmanned vehicles.

USW Modernization Efforts

Current Force Structure: China currently operates one of the world's largest submarine fleets with over 60 submarines. This includes six nuclear-powered attack submarines (SSN) providing the offensive backbone, at least two nuclear-powered guided missile submarines (SSGN) for precision strike, six nuclear-powered ballistic missile submarines (SSBN) ensuring nuclear deterrence, and more than 50 diesel-electric submarines (SS/SSP), including modern Yuan- and Song-class vessels with air-independent propulsion (AIP).

The force is evolving through successive generational improvements. Yuan-class diesel-electric submarines incorporate AIP technology extending submerged endurance. Shang-class SSNs and SSGN's represent China's most capable nuclear-powered attack submarines, while Jin-class SSBNs provide sea-based nuclear deterrent armed with submarine-launched ballistic missiles capable of striking targets at long range.

China has dramatically increased its domestic submarine production capacity through major infrastructure investments at three primary shipyards, accelerating production from less than one nuclear submarine per year to significantly higher rates. These expansions include the construction of expansive facilities that have tripled construction hall capacity, enabling higher production rates for conventional submarines, while upgraded infrastructure now accommodates the construction of larger diameter, advanced submarines across all three facilities. These investments, initiated as early as 2010, have more than doubled China's submarine production capacity and position the PLA Navy for sustained force expansion through the 2030s and beyond.

Force in Transition: The PLA Navy is executing a significant strategic shift from diesel-electric to all-nuclear construction, representing a fundamental departure from historical construction patterns. This transition includes development of the Type 041 Zhou-class SSN—a small-scale, low-power nuclear submarine approximately the size of conventional submarines but with greater endurance, potentially filling regional patrol and presence missions more economically than full-size SSNs and SSGNs.

Advanced Platforms: The Shang III SSGN represents the PLA Navy's most capable operational attack submarine. Equipped with ducted propulsors for reduced acoustic signature and a 24-cell vertical launch system capable of launching anti-ship and land-attack cruise missiles, at least six of eight expected units have launched since 2022. These platforms significantly enhance the PLA Navy's long-range precision strike capability.

The Jin-class SSBN equipped with JL-3 submarine-launched ballistic missiles can target portions of the U.S. from within the first island chain, enabling operations from protected bastion areas rather than requiring vulnerable transits through detection zones to reach distant patrol areas with broader targeting options.

Type 095 SSGN and Type 096 SSBN represent next-generation platforms expected to enter service during the late 2020s through 2030s. These submarines will incorporate substantial advancements in nuclear reactor design, sensor performance, weapons integration, and noise quieting technologies. The Type 096 SSBN equipped with JL-4 SLBMs will be able to target large portions of the U.S. from protected waters, fundamentally enhancing strategic deterrence credibility.

Unmanned Undersea Systems: China has invested in unmanned undersea vehicles for more than two decades—including autonomous underwater and remotely operated vehicles—fusing both military-civil technologies to expand the PLA Navy's capabilities for attack, ISR, and communications. Underwater gliders collect oceanographic data that improves sonar performance; systems like the "Dolphin" glider with passive acoustic vector sensors suggest ASW applications. China has also revealed extra-large UUV concepts able to perform missions ranging from reconnaissance and mine placement to one-way attacks.

Beijing is pursuing large AUVs such as the HSU001 (likely ISR-configurable) and AJX002 (potential mining role), and envisions autonomous UUVs for long-range mine countermeasures beyond the first island chain to compensate for limited manned MCM reach. Development concepts (e.g., "UUV300") emphasize modular payloads—sensors, mines, torpedoes, missiles, and deployable small UUVs—and networked operations, with UUVs operating independently or in swarms alongside manned platforms to control key undersea areas and potentially target submarines as they depart port.

Seabed Systems: China continues research into undersea and seabed warfare to gain advantages and complicate adversary undersea operations. China is focused on developing capabilities across all levels of the water column, including integrated sensor networks, undersea weapon systems, and unmanned vehicles that can operate autonomously.

Increasing Undersea Domain Awareness: China is building layered undersea surveillance networks to erode U.S. undersea advantages and counter U.S. undersea assets. Central to this effort is a seabed sensor architecture, including the "Blue Ocean Information Network," that integrates fixed and floating platforms, satellite-linked buoys, mobile UUVs, and underwater sonar arrays into a comprehensive detection system. These systems gather hydrographic data—water temperature, salinity, currents—to optimize sonar performance and enable persistent surveillance of submarines transiting critical waterways like the South China Sea.

Anti-Submarine Warfare Improvements: China is investing heavily to strengthen PLA Navy anti-submarine warfare for "high-end naval war," fielding modern ASW ships with towed-array sonar, embarked helicopters, and quieter electric propulsion. It is also expanding undersea domain awareness with small-waterplane-area twin hull catamarans optimized for reconnaissance and surveillance, improving detection, identification, and tracking through persistent monitoring of key waters, close-in reconnaissance, and support to wartime naval operations.

Future Projections

Projected Force Growth: By 2027, China's submarine force is projected to reach roughly 70 submarines, adding up to six SSGNs, three smaller class SSNs, and two SSBNs while retiring older Chinese and Russian built submarines. By 2035, continued expansion could yield up to 80 submarines, with about half nuclear-powered—a major shift in force composition—and projections for the early 2040s include around 20-30 new class SSGNs and SSBNs.

These platforms will be designed from the keel up for blue-water operations and persistent presence beyond the first island chain, representing an evolution in PLA Navy undersea operational capabilities. China will likely field a more survivable and numerous ballistic missile submarine force equipped with longer-range, more accurate SLBMs, enabling patrols in bastions closer to home waters while holding the U.S. homeland at risk.

Broader deployment of long-range, potentially hypersonic anti-ship and land-attack missiles from undersea platforms is anticipated, along with more sophisticated torpedoes and unmanned vehicles for ISR, mine warfare, and strike missions. Substantial investments in seabed sensors, undersea cables, and unmanned systems will enhance China's situational awareness while creating vulnerabilities for the U.S. and allies in crisis or conflict.

The Indo-Pacific will remain the PLA Navy's primary focus, but by 2040 routine submarine deployments to the Indian Ocean, Arctic approaches, and possibly the Atlantic are likely.

Deep-Sea Mining and Dual-Use Concerns

China has made deep-sea mineral mining a national strategic priority to secure seabed resources, strengthen control of critical mineral supply chains, and reduce reliance on foreign sources. General Secretary Xi Jinping has championed this effort, directing expanded ocean and polar surveys (2013) and calling for mastery of deep-sea access, survey, and development technologies (2016)—spurring major investments in mining technology and specialized vessels.

Critical Minerals and Strategic Dependencies: Deep-sea mining targets polymetallic nodules and manganese crusts containing critical minerals including cobalt, nickel, copper, and rare earth elements. These minerals are essential for advanced battery technologies for electric vehicles and energy storage, electronics manufacturing and semiconductors, defense applications including precision-guided munitions and advanced sensors.

China already dominates terrestrial critical mineral supply chains through mining operations, processing capacity, and downstream manufacturing. Extending this dominance to seabed resources would further entrench strategic advantages while potentially creating dependencies for nations relying on these minerals for energy transition and defense manufacturing.

International Seabed Authority Engagement: China holds the most exploration contracts from the International Seabed Authority (ISA), with state-owned companies China Minmetals Corporation (CMC), China Ocean Mineral Resource Research and Development Association (COMRA), and Beijing Pioneer Hi-Tech Development Corporation holding five of the ISA's 22 mining exploration permits for polymetallic nodules and manganese crusts.

China maintains membership on the ISA Council until 2028, providing significant influence over development of international seabed mining regulations. China also serves as a major financial contributor to the ISA, providing considerable influence in decision-making processes and standard-setting activities. In 2019, China established a joint China-ISA research and training center at China's National Deep-Sea Center specifically for developing nations to explore and exploit seabed resources, regularly hosting ISA events and extending influence over emerging deep-sea mining capabilities among developing nations.

Bilateral Arrangements and Strategic Partnerships: Beyond ISA engagement, China is working to build strategic partnerships with Pacific Island countries to expand access to seabed mineral resources. Beijing has established arrangements with nations including the Cook Islands and Kiribati to conduct mining within their exclusive economic zones (EEZs), where ISA permits are not required. This approach circumvents international regulatory frameworks while advancing its Belt and Road Initiative objectives. These bilateral agreements enable China to accelerate development timelines, minimize international oversight of mining operations, and strengthen political influence with strategically positioned Pacific nations. Simultaneously, operations within these EEZs serve as proving grounds for mining technologies prior to wider commercial deployment.

Technological Development and Testing: Chinese companies are actively advancing mining technology development, conducting testing with research vessels and autonomous underwater vehicles. Firms are planning to test collection vehicle maneuverability in water depths beyond 4,000 meters—the depth required for commercial mining operations in most target areas. Development efforts concentrate on remotely operated vehicles for mineral extraction, seafloor mapping and resource assessment systems, vertical transport systems to bring minerals from the seabed to surface vessels, and processing systems for at-sea or near-shore mineral processing.

Dual-Use Concerns and Military Applications: China's deep-sea mining activities may serve dual-use purposes beyond commercial extraction. Seafloor mapping and exploration data could support submarine warfare applications. Bathymetric intelligence enables submarine navigation, concealment, and positioning of seabed sensors or weapons. Acoustic propagation data from mining surveys can optimize sonar performance and identify tactical advantages. Comprehensive mapping may identify optimal submarine transit routes through contested waters, while seabed composition data informs placement of sensors, cables, and pre-positioned weapons platforms.

This convergence of commercial deep-sea mining with potential military intelligence collection represents a strategic concern. China's expanding presence on the seabed and in deep ocean environments provides opportunities to enhance undersea warfare capabilities while ostensibly pursuing economic objectives. The integration of China's civil-military fusion strategy with deep-sea mining operations suggests technological developments and data gathered through commercial activities will likely inform and enhance PLA Navy capabilities in the undersea domain.

Future Outlook

China’s undersea ambitions are well-resourced and strategically aligned, posing military, economic, and technological challenges to U.S. interests. PLA Navy submarine modernization, rising threats to undersea infrastructure, and the push for deep-sea resources are part of a broader effort to expand China’s power and influence.

- **Military Challenge**: By 2040, the PLA Navy’s undersea forces may credibly challenge U.S. regional maritime dominance, complicating crisis response, power projection, and allied defense. Advances in submarines, sensors, seabed systems, and unmanned vehicles will create layered defenses that raise the cost—and in some scenarios the feasibility—of U.S. operations in the western Pacific.
- **Infrastructure Vulnerability**: China’s investments in UUVs, seabed systems, and deep-sea capabilities could threaten undersea cables, sensor networks, and other critical infrastructure that the U.S. and allies rely on for communications, commerce, and military operations.
- **Economic Competition**: China’s push for deep-sea minerals—backed by influence at the ISA and bilateral deals that sidestep global rules—could extend its control of critical mineral supply chains from land to sea, affecting its energy transition, advanced manufacturing, and defense industrial resilience.

The undersea domain is increasingly contested. China is pursuing a unified approach that links strategy, naval modernization, seabed infrastructure, and resource extraction into a single, connected effort. U.S. undersea advantages cannot be assumed to endure without sustained investment, innovation, and strategic focus.