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14. ABSTRACT

As the Navy moves to decommission both of it's submarine tenders aggressive investment is required to develop and build the next generation of highly capable expeditionary tenders, AS (X). Submarine tenders offer expeditionary capabilities that maximize the nation's Undersea Warfare system in combat and provide significant opportunities to maintain the edge in peacetime great power competition. A failure to invest in AS (X) exposes a critical vulnerability to would-be adversaries and would cripple the future of the fleet.

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The Navy Needs New Submarine Tenders

Protecting Expeditionary Capabilities is the Key to Undersea Dominance

Supporting Fleet Operations

The United States Navy operates the most capable submarine force in the world. The current force consists of over 65 fast attack, ballistic missiles, and guided missile submarines. These undersea assets provide continuous covert intelligence, surveillance, and reconnaissance (ISR) worldwide, and forward-deployed units provide an immediate in-theater response for any unfolding military conflict. The Los Angeles-class fast attack and Ohio-class ballistic and guided-missile submarines are aging platforms facing imminent decommission and obsolescence. The Virginia-class fast attack now makes up most of the fleet, and the first Columbia-class units are under construction. The next-generation fast attack platform, SSN (X), is still in the design and planning phases, but the Navy plans to begin construction shortly.

It's imperative that the Navy critically assesses the maintenance and repair facilities required to sustain the fleet at the highest state of readiness in this era of great power competition, which includes the condition and replacement plan for the fleet's submarine tenders. Domestic repair facilities on the east and west coast of the country routinely fall short, even in peacetime, to meet the operational demands of the fleet. Submarine tenders relieve some of the burden on domestic shipyards in peacetime, and new, modern, expeditionary submarine tenders are essential to support the Navy's undersea warfare system in combat operations.

The Navy currently operates two Emory S. Land class submarine tenders that provide food, water, electricity, parts, ordnance, maintenance, and repair functions to the five units permanently homeported in Guam and all forward deployed ships operating in the 7th Fleet Area of Responsibility. These tenders, commissioned in the late 1970s, have proven value and capability but are rapidly approaching the end of their planned service life. The Navy intends to

decommission both of its tenders by 2030 but plans for a replacement next-generation submarine tender are woefully behind the curve. Any gap in operational capability between the present fleet of tenders and their replacements provides a window of opportunity to would-be adversaries by eliminating the critical capabilities of expeditionary weapons reload, maintenance, and repair from the nation's undersea warfare system, resulting in lost operational time and a net decrease in combat effectiveness.

In early 2022 the contract to develop the next generation "AS (X)" submarine tender was awarded to L3HARRIS Industries[i]. In an ideal world, AS (X) would integrate the United States Navy's core defensive weapons, acoustic masking technologies, and communications platforms in a fuel-efficient high-speed hull form. AS (X) must be capable of sustained independent operations at sea or at anchor with sufficiently large food and water stores, fuel inventories, torpedo and missile magazines, and waste disposal systems to support expeditionary reloads of our combat units with little or no existing infrastructure. Synchronized development that meets the current needs of the Virginia-class platform and the future requirements of SSN (X) units would facilitate joint operations, enable multi-mission capabilities, and enhance forward power projection. AS (X) would provide an agile support network for sustained combat operations and peacetime humanitarian mission sets. Finally, AS (X) creates opportunities to strengthen international relationships with allies and partners, mainly Australia and the United Kingdom, through the 2021 AUKUS security pact. Submarine tenders are an integral component supporting the nation's undersea warfare system, and a failure to invest in next-generation platforms will have dire consequences for the fleet.

Twenty-first Century Naval Logistics and Supply

Between 2000 and May of 2023, approximately 75 USNS (United States Naval Ship) units were commissioned and put into active service. The cost and size of those ships vary, and the capabilities provided include dry cargo/ammunition logistics, fast combat support, expeditionary fast transport, rescue and salvage, and expeditionary mobile basing, among others. Ships that were not wholesale replaced, like the hospital ship USNS Comfort, underwent an extensive modernization project that overhauled their medical facilities, communications, and information technology capabilities, and their electrical and mechanical systems at the cost of approximately $250 million.

Similar overhaul and modernization projects have sustained the USS Emory. S Land and USS Frank Cable, allowing the Navy to realize the fleet benefits of several service life extensions. However, these efforts will eventually prove to be a stop-gap measure. Retiring these current tenders before their replacement units go into service will expose a critical vulnerability to the Navy's system of submarine operations.

The surface fleet remembers the lessons of World War II in the Pacific and the challenges that theater geography imposed on supply and logistics. The U.S. Navy has worked to build and develop not only the most capable warships but the most capable naval surface combat *system* comprised of the high-tech platforms, weapons, sensors, and the logistics and supply functions required to sustain their operations in a combat environment. For example, the Lewis and Clark-class dry cargo/ammunition ship (T-AKE) and John Lewis-class oilers (T-AO 205) are purpose-built to integrate with the Navy's 21st-century aircraft carriers, amphibious assault ships, cruisers, and destroyers. As next-generation surface combatants are designed and built, they will

undoubtedly be optimized for backward compatibility with their critical USNS support ships. The Navy's surface warfare system is built for interoperability, flexibility, and defense in depth.

The submarine fleet has not fared so well, perhaps due to the nature of the modern nuclear submarine as a lone wolf, conducting independent operations frequently without communication, much less logistics support, for months at a time. This peacetime operational attitude will translate poorly to large-scale conflict. The present state of the nation's submarine warfare *system* is little more than an investment in the best parts. A modern nuclear submarine is a technical marvel, with capabilities and technologies that WWII diesel-boat forefathers couldn't have imagined. Even newer technologies are making inroads into the fleet with updated support for special-force delivery platforms and an increasing role for unmanned underwater vehicles (UUV). These underwater drones will comprise a vital component of the Navy's future undersea fleet, providing enhanced capabilities for intelligence gathering, special operations, and, potentially, even combat missions. But these are all parts of a larger system - and each of the parts, be it a drone, a submarine, or its crew, requires some level of transportation, resupply, or maintenance that a new class of submarine tenders can optimally provide.

The United States' submarine warfare system is brittle. Maintenance and construction delays have become the standard, with only a handful of shipyards capable of providing the services required to build and maintain the fleet. Virginia-class ships are even being sidelined as critical parts wear out faster than expected with no spares on hand.[ii] Failure to modernize the Navy's submarine tenders will exacerbate these problems, potentially with dire consequences. Aggressive investment and thoughtful design for the nation's next-generation submarine tenders would not just maintain the status quo but drastically improve the entirety of the Navy's submarine warfare system. Deliberate steps to integrate the needs of the present and future

classes of submarines and submarine tenders while ensuring compatibility with innovative unmanned platforms will increase operational flexibility and ensure undersea dominance into the next generation of global competition and conflict.

New Challenges for National and Theater Strategies

U.S. Strategic and INDOPACOM Theater Strategic lines of effort focus on countering the threat of great power competition from the People's Republic of China (PRC). The PRC has invested heavily in the modernization and expansion of its armed forces in the last two decades and presently operates one of the largest navies in the world. Nearly all of the western Pacific region, including Guam, is within range of modern PRC intermediate-range ballistic missiles like the DF-21 and DF-26.

In contrast, America has failed to invest sufficiently in regional defenses. The U.S. Army's Theater High Altitude Air Defense (THAAD) system provides ballistic missile defense (BMD) for Guam, South Korea, and Japan. Some experts believe hypersonic missiles could defeat THAAD based on speed and maneuverability alone, and given the limited quantity and capacity of THAAD batteries, a multi-missile attack of any kind could overwhelm the system by over-saturation.[iii] THAAD does not provide for layered defenses, and it is unwise to base the survivability of forward submarine operating bases on the protection of a single system. One option the Department of Defense is considering is to add layers of protection is investing nearly a billion dollars in next-generation interceptors and Aegis Ashore systems for Guam[iv], or to permanently station surface assets fitted with the Aegis Ballistic Missile Defense system in or near Guam on permanent guard duty. Both these options are costly in terms of dollars or opportunity costs imposed by not utilizing our surface combatants to their full potential. Strategic

assumptions in full-scale war must account for the worst-case scenario where Guam is no longer a safe haven for forward basing, maintenance, and logistics for submarines, or any U.S. forces for that matter. Modern expeditionary submarine tenders are one step toward mitigating the potential loss of Guam in conflict.

Investment in AS (X) will directly contribute to accomplishing both strategic challenges outlined in the 2022 Biden-Harris National Security Strategy. Primarily, submarine tenders will support a "free, open, secure, and prosperous."[v] post-Cold war global landscape despite competition between major powers. Secondly, submarine tenders are well suited to execute peacetime mission sets to counter the myriad of natural disasters, environmental challenges, and humanitarian issues encountered in the Indo-Pacific region. Submarine tenders are an implicit requirement to implement the Indo-Pacific Strategy of the United States and serve to reassert the nation's position as a regional power and, thus, its responsibility to maintain a peacetime military presence in the region for diplomatic and maritime security concerns[vi].

USINDOPACOM's mission - to prevent conflict through integrated deterrence and to fight and win if required - is a direct extension of U.S. national strategy. USINDOPACOM has identified a critical capability to synchronize operations, align force posture, and develop advanced capabilities[vii]. Furthermore, USINDOPACOM recognizes that strategic efficacy hinges on "significant investment to defend the homeland, protect the joint force, operate in contested space, and provide all-domain battlespace awareness."[viii]

The submarine force's continuous clandestine operations allow agile responses to developing circumstances for peacetime intelligence, surveillance, and reconnaissance missions and a near-instantaneous escalation to kinetic fires if required by the combatant commander. However, unnoticed vulnerabilities could cripple the force in wartime. Modern U.S. nuclear

submarines are, for the most part, entirely self-sufficient. They produce their own electricity, water, and oxygen with a reactor that never requires fuel. Complex onboard systems clean atmospheric contaminates and manage waste. Food stores are generally assumed to be the limiting factor for a U.S. Navy submarine, and even then, it is capable of independent un-supported peacetime operations for months at a time. In wartime, however, additional factors must be considered, including repair and replacement of sensitive or damage-prone equipment, medical necessities to maintain crew fitness, and in a worst-case scenario, major refit from battle damage.

The most limiting factor in wartime, though, will be torpedo and missile inventories. It is reasonable to assume that a fast attack submarine could empty its inventory of missiles and torpedoes in a matter of days or weeks while operating in the target-rich environment in or near the South China Sea. This would leave the submarine crippled with no offensive or defensive capability and no choice but to steam a minimum of approximately 2,000 nautical miles back to Guam or 5,600 nautical miles back to Pearl Harbor, reload, and transit back into the theater. At a 20-knot speed of advance, between eight and 25 days of lost operational time would result from the transit to and from a reload point. When planners factor in the present force composition, the planned decommissioning of aging boats, and production delays for new Virginia-class hulls, increased transit time inevitably results in decreased combat effectiveness. There will not be enough submarines or weapons in the theater simultaneously to oppose our adversaries 350 ship navies without the ability to conduct expeditionary reloads.

In contrast, a forward-deployed submarine tender operating in concert with allies and partners could establish a base of operations in the Philippines, Singapore, Indonesia, or Australia. This could shorten the transit to as little as 300 nautical miles or less each way and cut

the net off-station time to as little as 36 hours. Permanent air defenses and sea control would not be required as the tender could leverage its mobility to maneuver around the theater as a strike group component. The capability to turn *any* atoll, bay, or anchorage into a multi-purpose submarine depot would create an asymmetric advantage for friendly forces and present extreme challenges to our enemies. The Navy showcased its expeditionary reload capability as recently as 2022 when the USS Frank Cable and USS Springfield executed a weapons handling exercise in Australia[ix]. The Navy must deliberately safeguard this capability and ensure continuity to limit the perceived opportunities of would-be adversaries.

Supporting Allies and Partners

In peacetime, a submarine tender is an ideal platform to execute humanitarian assistance and disaster relief. Submarine tenders can deliver electrical generation capacity, medical facilities, water purification plants, and large food stores throughout the region to assist during natural disasters or humanitarian crises. AS (X) could leverage vertical replenishment via an embarked helicopter or drone to transfer goods, materials, and personnel. These acts of goodwill would go a long way in reinforcing the diplomatic relationships and familiarity between regional partners, ensuring that their ports remain open for American forces in wartime.

In September 2021, Australia, The United Kingdom, and The United States announced the trilateral security pact known as AUKUS. The AUKUS partnership centers on providing conventionally armed nuclear submarines to Australia and developing joint advanced military capabilities. AUKUS includes plans for significant improvement to Australia's naval infrastructure and intentions to construct a new submarine base on the continent's east coast to house its soon-to-be-acquired nuclear submarines. Australia has agreed to purchase its first

nuclear-powered submarines from the United States, requesting at least three Virginia-class units by the early 2030s. By 2040 Australia intends to establish its own domestic industrial base capable of manufacturing and maintaining units of their own new design.[x]

AS (X) has the potential to streamline the introduction of nuclear submarines to the Australian force. First, the United States could incorporate portions of the project's development and design costs into the AUKUS program's budget and develop a cost-sharing model with the U.K. and Australia. A cost-sharing model would reduce per-unit construction costs while further increasing the compatibility and interoperability of all member nation's submarine warfare systems.

Alternatively, AUKUS member nations could arrange for The Australian National Naval Shipbuilding Enterprise to assume the responsibility for the bulk of AS (X) construction. Engaging with Australia to build AS (X) would help achieve the stated goals of the National Naval Shipbuilding Enterprise- to build a competitive industrial base, develop a skilled workforce, and secure more domestic jobs- ensuring long-term economic sustainability.[xi] Transferring AS (X) construction responsibilities to Australia would alleviate some of the burdens on an already strained American industrial base, which, as many critics have noted, has failed to meet the original goal of delivering two new Virginia class submarines per year since the program's inception.[xii] It remains unclear how the United States will improve Virginia class production from its present 1.2 ships per year while also providing a minimum of three units to Australia[xiii], and commencing construction of the new Columbia class ballistic missile submarines. Coordinating AS (X) construction with Australia would be in both nations' interests and presents a viable option to engage with a key Pacific ally in the diplomatic, economic, and military domains.

Ulithi Atoll: A case study in Expeditionary Logistics

Ulithi Atoll is a small, primarily uninhabited chain of islands and reefs located approximately 400 miles southwest of Guam. The sandy islands offer little protection for terrestrial operations, but the reefs and shallow waters create a 200-square-mile safe anchorage for ships.

In 1944 a small detachment of Japanese forces occupied the area but failed to recognize its strategic value and abandoned the atoll when challenged. Ulithi became the premier U.S. base of operations supporting the war effort in the western Pacific. Over 600 ships were anchored in Ulithi between patrols and engagements. The impressive might of American industry was fully on display at Ulithi, a floating metropolis of "repair ships, submarine tenders, salvage ships, floating drydocks, ammunition ships, and seaplane tenders."[xiv]. While the concentration of ships created a clear target for Japanese attacks, the same concentration provided defensive functions for the atoll and was generally successful in its defense. As a forward staging base, Ulithi also offered an ideal resupply base for Army and Marine Corps units supporting the nation's island-hopping campaign.

World War II in the Pacific is most often remembered as the revolution from the battleship era to carrier warfare, a triumph in the development and implementation of naval aviation. Other aspects of the war, like the incredible efforts to mass-produce ships or the submarine force's stunning success, deserve praise. However, the unsung hero of the war was the innovation of expeditionary logistics strategies and capabilities, such as those at Ulithi Atoll, without which the war effort would have stopped dead in its tracks.

Repairing and maintaining modern warships is ostensibly more complex in 2023 than in 1944. A modern submarine comprises thousands of individual parts and components, and no matter how reliable or durable those components are, the probability of critical component failure is high. The ship's success depends on each system's integrated operation, and thus success in maintenance and operations hinges on maintaining an extensive stock of pre-positioned spare and replacement parts. Increased complexity and opportunities for equipment failure, coupled with the vast operational environment in the Pacific, present significant challenges to our nation's undersea warfare system. The tyranny of distance will again, just as in 1944, become an adversary of its own in combat. Modernized submarine tenders, with capabilities matched to the warships they service, will mitigate some of the challenges presented by complexity and distance and provide advantageous expeditionary capability in the era of great power competition.

Unreasonable Expense versus Intelligent Investment

Modern warships are undeniably expensive. Initial estimates for one submarine tender replacement design, the Common Hull Auxiliary Multi-Mission Platform (CHAMP), exceeded $1 billion per hull and were deemed unreasonably expensive to pursue[xv]. The Navy abandoned the CHAMP project due to the high overhead and failure of similar "multi-mission" platforms like the Littoral Combat Ship. New scoping studies by L3HARRIS industries should yield an optimized submarine tender design at a more affordable price.

L3HARRIS still needs to provide cost estimates for AS (X), but it is not unreasonable to assume a similar price tag to other 21st-century logistics and supply ships of approximately $700 million. For reference, the Lewis and Clark-class dry cargo/ammunition ship (T-AKE) tallied an

average unit cost of $660 million, and the John Lewis-class oiler (T-AO 205) rang up at approximately $740 million per hull. While expensive, investment in these logistics and supply platforms provides an enabling function to maximize the utility and lethality of the warships they serve, which cost roughly two to six times more to replace. The 2023 National Defense Budget allocates $7.3 billion for two new Virginia-class submarines and $6.1 billion for the Pacific Deterrence Initiative[xvi]. But despite this rampant spending, the plan for new submarine tenders has yet to advance beyond a development contract. The Navy must work to carve out funding specifically for these next-generation submarine tenders and bring a crucial and long-neglected part of the nation's warfighting capabilities into the 21st century.

Plans for permanent intermediate maintenance infrastructure in locations such as Guam will certainly advance the nation's undersea warfighting system, especially under the protection of robust defensive systems like ship and shore-based Aegis Ballistic Missile Defense platforms. But static sites are not enough. A capable submarine tender enables agile, defensible, innovative submarine warfare strategies. While satellite technology precludes anything from remaining truly secret, simple mobility and agility, complicate enemy efforts to target and destroy critical capabilities. Without in-theater local support capability, time and distance could render a $3 billion submarine useless for nearly a month unless the Navy commits to developing effective expeditionary submarine maintenance, repair, and logistics support capability while operating "under the guns."

Modernized submarine tenders stand to significantly improve the functionality of the entire U.S. undersea warfare system in peacetime and war. They will provide the required maintenance and repair functions to maintain an ever-increasing pace of fleet operations in a highly complex and dynamic theater. Modernized tenders have the capability to influence

regional partners and allies who look toward the United States as a partner of choice in the diplomatic, economic, and military domains. In peace, modernized submarine tenders will improve international relationships and can aid in any crisis. In war, modernized submarine tenders will prove crucial in maintaining the U.S. fleet as the preeminent power to ensure undersea dominance. While critics balk at the cost of developing and constructing new tenders, the prices for failing to do so would cripple the future of the fleet.

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