Project Smenos: Squadron of Optionally Manned Corvettes

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As the U.S. Navy continues to feel pressure from constrained budgets and the rise of near-peer competitors, solutions must be found to increase fleet capacity while maintaining the capability edge. Project Smenos, named after the Greek word for 'swarm,' developed a design and examined the technical feasibility of a corvette-sized combatant to fill this gap. By leveraging autonomous systems and a distributed mission system paradigm, the smaller vessel provides significant capability.

Smenos' primary mission is ASW, with ISR, MIW and ASuW as secondary missions. The vessels were designed to operate independently or in squadrons, surface action groups or strike groups. DDG-51's Flight IIA ASW capability provided the benchmark for the systems fielded on Smenos. Additional capabilities included expanded offensive ASW capability and UxV launch and recovery to improve the fleet's ASW and undersea ISR.

To facilitate this robust capability on a small ship, two key concepts were foundational to the design. First, the ships included an autonomous control structure that provided automation of the HM&E systems as well as a large portion of the navigation and steering systems. Given the state of automation technology, these systems were deemed to be feasible for naval use when combined with the presence of a small cadre of onboard personnel. Rather than execute their duties as traditional watchstanders, the automation systems would allow the personnel to act more in a duty capacity, able to respond to unexpected or complex situations. In addition to those systems, however, the control structure provides the backbone for further automation of the ship as the risk-reward balance changes with different mission scenarios. This Risk-Driven Manning concept allows operators and fleet commanders to adjust the crew size and capability to fit the mission needs. For instance, the unmanned Smenos could traverse a minefield, eliminating unnecessary risk to sailors while a manned vessel of the same squadron could conduct helicopter operations or torpedo engagements. Due to the combined manned and autonomous structures, this control structure also provides an excellent transition platform for the U.S. Navy to move from the completely manned platforms of today to the unmanned platforms envisioned for the future.

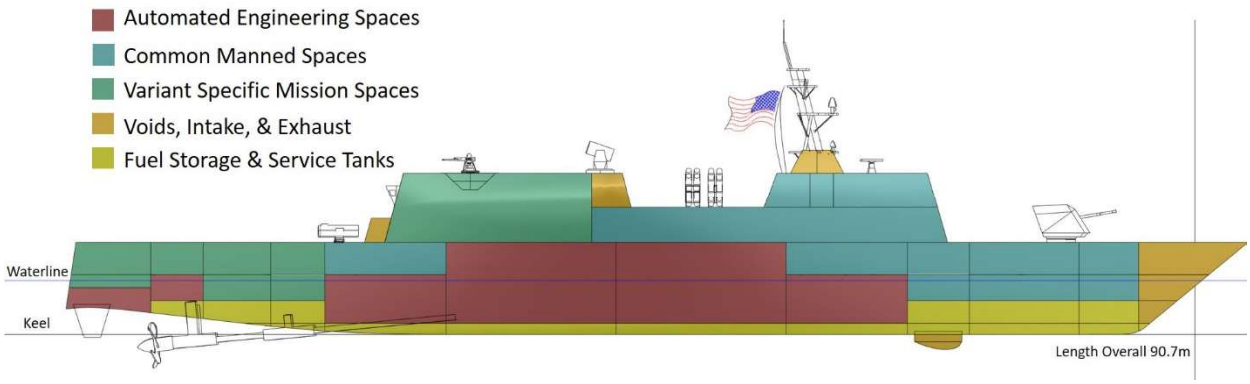

Figure 1: Common, Automated, and Distributed System Arrangement Zones

The second novel cornerstone of the design is the distribution of mission capability amongst the squadron vessels. Smenos corvettes are designed to include three different variants which each provide a unique and valuable contribution to the group. Although all variants were designed with the exact same hull structure, engineering plant, C4I and self-defense systems, the internals of aft and superstructure mission bays were different. The first variant included a hangar and associated maintenance area in the superstructure to host a MH-60R or similarly-sized ASW helicopter. This allowed the squadron to leverage air assets for logistics support as well as in the detection, identification, and prosecution of undersea threats. The second variant provided UxV host capabilities via a launch & recovery stern bay as well as telescoping davits to side launch an 11-meter boat from either side of the superstructure. Finally, the last variant was equipped with a 16-cell VLS to provide ASROC capabilities and provided the additional stores to extend the operational endurance of the squadron. All variants included a flight deck and hull-mounted sonar. Variable depth sonars are included on the first and third variants.

To develop Smenos, the project team leveraged tenets of set-based design to explore a large design space. This was essential to fully understand the implications of driving for a much smaller ship than currently exists in the fleet. The design process generated 2550 unique permutations that reduced to 19 design options through the analytical hierarchy process, feasibility criteria, and sensitivity analysis. We selected the final design that was closest to the utopia point which offered the greatest performance for the smallest increase in cost and risk. We validated the final concept design through technical analyses in the areas of stability, resistance, seakeeping, strength, general arrangements and cost. The result was a corvette which was technically feasible and surpassed the sponsor's cost target, ensuring the design was programmatically palatable given the current budget environment.

Smenos bridges the gap between existing surface combatants both in terms of size and in its hybrid configuration of autonomous and manned control structures. The vessel fills essential capacity shortfalls in the U.S. fleet and provides an immediately relevant ASW platform using currently available ASW mission systems. Finally, this platform provides a useful stepping stone for bringing the prototype unmanned platforms under development to fruition by incorporating the automated systems alongside manned systems in a way that provides for technology development and risk reduction.

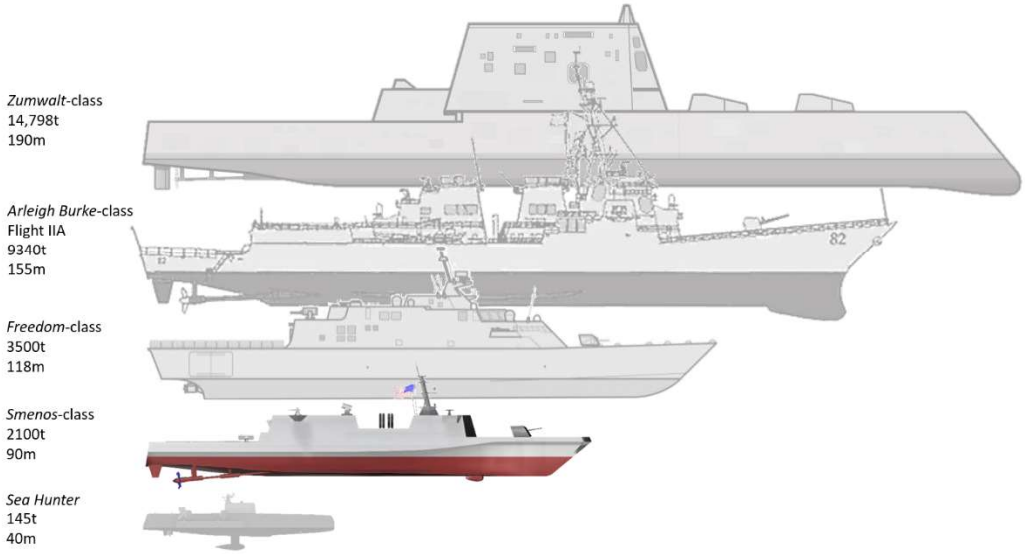

Figure 2: Bridging the Gap