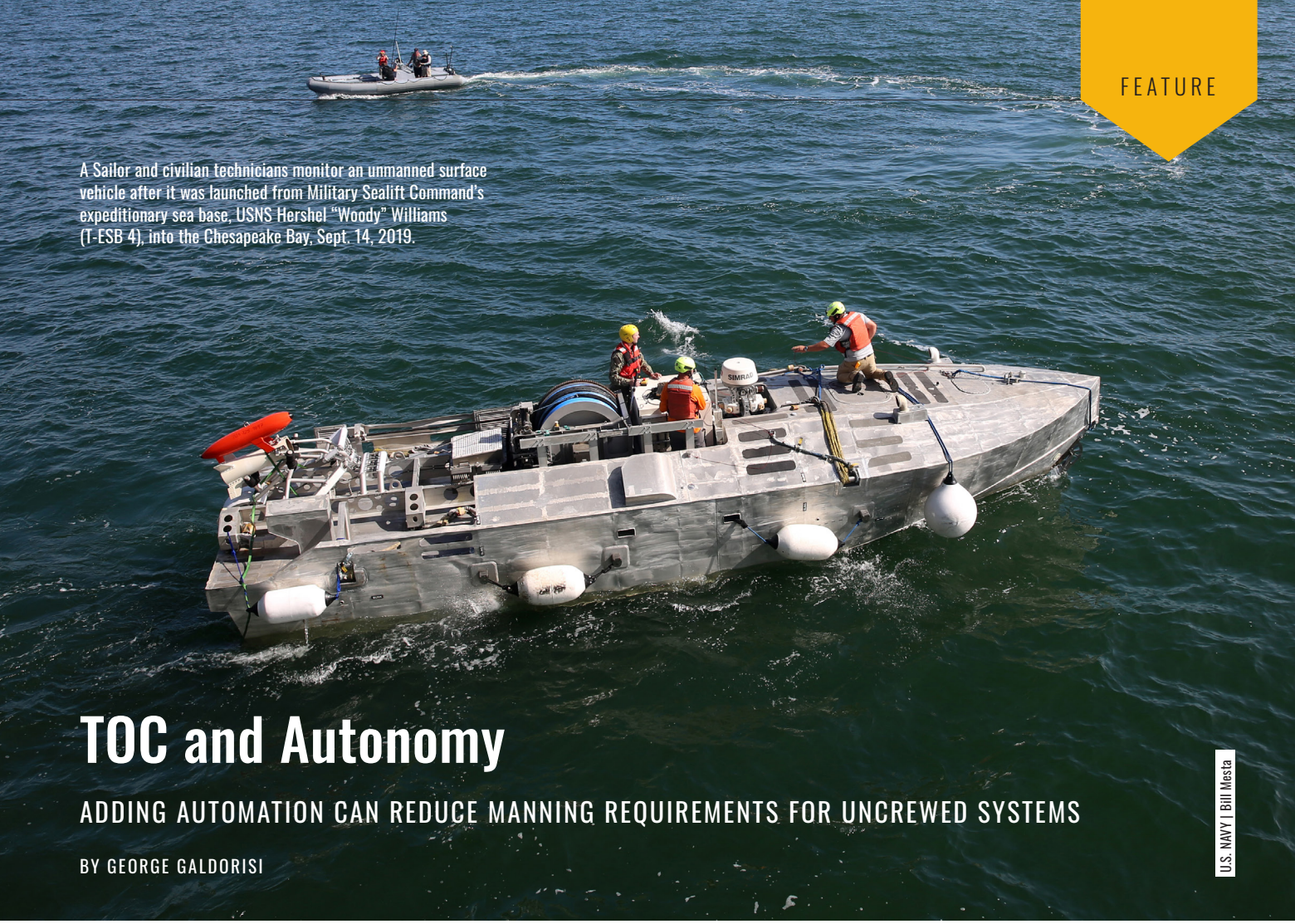

A Sailor and civilian technicians monitor an unmanned surface vehicle after it was launched from Military Sealift Command's expeditionary sea base, USNS Hershel "Woody" Williams (T-ESB 4), into the Chesapeake Bay, Sept. 14, 2019.

U.S. NAVY | Bill Mesta

# TOC and Autonomy

## ADDING AUTOMATION CAN REDUCE MANNING REQUIREMENTS FOR UNCREWED SYSTEMS

BY GEORGE GALDORISI

By any measure, one of the most exciting advances in military technology is uncrewed systems. While these technological innovations were developing on a deliberate path over the past decade-plus, recent conflicts have accelerated that progress.

Widely reported in the international media, Russia's use of armed unmanned air vehicles to attack targets in Ukraine; Ukraine's use of armed unmanned surface vessels to attack Russian ships; the Houthi's use of both armed unmanned surface vessels and armed unmanned air vehicles against shipping in the Red Sea; Hamas and Hezbollah forces unleashing scores of armed unmanned air vehicles against Israel of other clashes in just the last few years; all have made it clear that uncrewed platforms have gained purchase in military organizations worldwide.

The U.S. Navy has fostered the design, experimentation and fielding of uncrewed systems for some time. Many trace this development to the 28th CNO Strategic Studies Group which spent one year examining this issue. Its report spurred increased interest in — and emphasis on — uncrewed systems Navy-wide. Since then, the Navy has placed increasing emphasis on making uncrewed systems an integral part of the fleet.

One of the most pressing challenges for the Navy is, ironically, to reduce the prohibitively burdensome manpower footprint currently necessary to operate unmanned systems. Military manpower makes up the largest part of the total ownership cost of systems across Navy. What this means is that the Navy must "bake in" more autonomy for its uncrewed systems in all domains.

### The U.S. Navy's Commitment

The U.S. Navy is not the only military service in any nation keen on leveraging uncrewed systems. This emerging technology, and especially unmanned maritime systems, are becoming more valued. Like their uncrewed air and ground counterparts, these


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Military and industry representatives view a Large Diameter Unmanned Underwater Vehicle (LDUUV), Global Autonomous Reconnaissance Craft (GARC), and an M18 Unmanned Surface Vehicle (USV) on display as part of Integrated Battle Problem 24.1 at U.S. 3rd Fleet in San Diego, March 14, 2024.

maritime systems are valued because of their ability to reduce the risk to human life in high threat areas, to deliver persistent surveillance over areas of interest and to provide options to warfighters that derive from the inherent advantages of uncrewed technologies.

Like all uncrewed systems, unmanned surface vehicles are critical assets in all scenarios across the spectrum of conflict and are especially useful against high-end adversaries. Uncrewed surface vessels enable warfighters to gain access to areas where the risk to manned platforms is unacceptably high due to a plethora of enemy systems designed to deny access. These uncrewed surface vessels can provide greater range and persistence on station, leading to enhanced situational awareness of an objective area.

The U.S. Navy has a rich history of unmanned systems development. Over the past decade-plus, the importance of unmanned systems to the U.S. Navy's future has been highlighted in a series of documents, ranging from the revised "A Cooperative Strategy for 21st Century Seapower" to "A Design for Maintaining Maritime Superiority," to a Chief of Naval Operations' "The Future Navy" white paper. The Navy's UNMANNED Campaign Framework was issued to guide the development of uncrewed systems in all domains.

More recently, previous speeches and interviews alluding to the number of unmanned surface vehicles the Navy intends to field culminating in the issuance of the Chief of Naval Operations' NAVPLAN and Force Design 2045, which both call for a hybrid fleet of manned ships and uncrewed surface vessels.

The U.S. Navy's commitment to uncrewed systems is unlikely to wane as, increasingly, these platforms continue to prove their utility in performing the dull, dirty and dangerous work that the Navy previously assigned to manned platforms. Indeed, in remarks at several recent military-industry events, CNO Lisa Franchetti has emphasized the Navy's commitment to a future hybrid fleet consisting of 350 crewed ships and 150 uncrewed vessels.

## Reducing Manning

Military manpower costs are the fastest growing accounts, even as the total number of military men and women decrease. According to an Office of Management and Budget report, military personnel expenditures have risen from $74 billion dollars to $159 billion dollars over a 10-year period, an increase of almost 115%.

Lessons learned throughout the development process of most uncrewed systems demonstrate that unmanned systems can actually increase manning requirements. Indeed, the Air Force has estimated the MQ-1B Predator requires a crew of about 168 personnel, while the MQ-9 Reaper requires a crew of 180 and the RQ-4 Global Hawk relies on 300 people to operate it. As General Philip Breedlove, then-vice chief of staff of the Air Force, said, "The number one manning problem in our Air Force is manning our unmanned platforms."

The Navy must deal with the same issue for its uncrewed systems. An article in the Armed Forces Journal summed up the dilemma in a sentence, saying, "The military's growing body of experience shows that autonomous systems don't actually solve any given problem, but merely change its nature. It's called the autonomy

paradox: The very systems designed to reduce the need for human operators require more manpower to support them." As one recent example, the Navy's MQ-4C Triton requires a squadron of 350 personnel to conduct operations with two Tritons, with only one aircraft in the air at a time.

Compounding the total ownership cost (TOC) issue based on the manning required to operate and maintain uncrewed systems, the data overload challenge generated by the proliferation of unmanned systems and their sensors has created its own set of manning issues. A former vice chairman of the Joint Chiefs of Staff complained that a single Air Force Predator can collect enough video in one day to occupy 19 analysts, saying, "Today an analyst sits there and stares at Death TV for hours on end, trying to find the single target or see something move. It's just a waste of manpower." The data overload challenge is so serious it's widely estimated the U.S. Navy will soon face a "tipping point," after which the Navy will no longer be able to process the amount of data it is compiling.

## Increasing Autonomy

With the prospect of rising costs of military manpower, and the increased Department of Defense emphasis on TOC, the Navy recognizes the compelling need to move beyond the "many operators, many-joysticks, one-vehicle" paradigm that has existed during the past decades for most unmanned systems. The Navy is accelerating efforts to increase the autonomy of uncrewed systems as a primary means of reducing manning and achieving acceptable TOC.

The Navy has conducted several exercises, experiments and demonstrations that have featured commercial-off-the-shelf uncrewed surface vessels that have operated autonomously. For example, in a demonstration conducted in the waters surrounding the Philippine Islands, a Martac T38 Devil Ray USV navigated a mission course. The Devil Ray autonomously avoided several boats and obstructions without operator intervention. In one case, the vessel avoided a vessel the operators did not see on camera and only knew the vessel was in "avoid" mode.

In another demonstration, a Devil Ray was programmed to autonomously execute an "evade" maneuver to avoid interception by adversarial vessels while maintaining a designated safe standoff distance. Evade is a fully autonomous behavior. Once the behavioral parameters were designated by an operator, the Devil Ray executed maneuvers independently without the need for operator intervention. Evade is designed to continue to work in communications-denied environments.

This autonomous operation enables Navy and Marine Corps operators to task USVs such as the Devil Ray to operate completely autonomously and conduct missions important to the Navy such as intelligence, surveillance and reconnaissance; maritime domain awareness; intelligence preparation of the battlefield; mine-countermeasures; expeditionary logistics; target of interest monitoring; port and harbor security; high-value unit protection and many others.

To be clear, this is not a platform-specific solution to accelerate the Navy's efforts to make its uncrewed systems more autonomous and drive down TOC, but rather a concept. When operators see uncrewed COTS systems autonomously performing these missions, they will likely press industry to produce even more-capable platforms with greater autonomy to perform these tasks.

There is little doubt the U.S. Navy is committed to making uncrewed systems of various types and capabilities an important part of the Navy fleet in the near-, mid- and especially long-term. During his congressional testimony in support of his nomination for the post of secretary of the Navy, Carlos Del Toro said, "Investments in unmanned naval systems will be key to meeting those threats. It's important to ensure that they're fully integrated with all of our existing platforms."

This aspiration is critically dependent on the ability of the Navy to make increasing the autonomy of its uncrewed systems a high priority. The technology to achieve this goal exists and it is imperative the Navy's research and development community and industry join hands to accomplish this important task. ■

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