Future Maritime Forces: Unmanned, Autonomous, and Lethal

William F. Bundy, Ph.D.

U.S. Naval War College

Vice Admiral Thomas Rowden is leading the U.S. Navy Surface Force towards a transformation into an offense fighting force through the development and realization of the *Distributed Lethality* concept. His vision is to deploy a surface force that has offensive capability in every ship in the Navy. Vice Admiral Rowden's vision is to create and maintain credible combat power as a strategic deterrence to aggression throughout the global maritime domain.

Distributed lethality represents a significant operational concept that will ultimately extend across the U.S. Navy combat force. This of course is an evolving capability based on ships that are in the fleet today and those that are expected to follow through the shipbuilding program over the next 30 years.

At the same time, the Deputy Assistant Secretary the Navy for Unmanned Systems, Frank Kelly, is advancing a program to develop unmanned air, surface and undersea vehicles with the possibility of those vehicles being deployed as semi- and fully-autonomous assets. Unmanned systems have the potential to deliver capabilities that are now delivered by major combatants, aircraft and submarines.

The combination of Distributed Lethality and unmanned systems has the potential for revolutionizing maritime warfare. Imagine if you will the arrival of USS BAINBRIDGE DDG 2001 in the South China Sea to execute a routine maritime patrol in July 2045.

On Patrol in the South China Sea - July 2045

USS BAINBRIDGE DDG 2001 is underway in the South China Sea on maritime security patrol. BAINBRIDGE's mission is sea surveillance and maritime security operations that are designed to maintain free access to the maritime commons. Operating 90 miles south of Fiery Cross Island, a People's Republic of China maritime security base, BAINBRIDGE has deployed three unmanned combat patrol surface vessels, an unmanned aircraft patrol consisting of three armed airships, and two unmanned submarines to extend the surveillance coverage of the ship.

In mission control, operators are monitoring communications and data links from their fullyautonomous ships and aircraft that have been programmed to conduct maritime patrols under mission orders and decision-making control functions that are bounded by prudent navigation, territorial restrictions and rules of engagement. BAINBRIDGE's unmanned patrols have the technology to sense the environment, detect and track aircraft and vessels, and report their operating pictures to BAINBRIDGE via system-to-system networks that create an overall operating picture of the battlespace.

BAINBRIDGE's patrol ships and aircraft have been assigned areas to conduct surveillance and are expected to execute mission orders that direct their actions based on the current security environment. Rather than remotely control BAINBRIDGE's unmanned air and surface patrols, advances in intelligent agent-technology have produced assurances that each of the ships and aircraft will operate within the rules of safe flight and navigation as well as laws that respect territorial limits and exercise freedom of navigation. Intelligent agent-technology combined with sensor and decision-making capabilities enable BAINBRIDGE's patrols to operate in semi-autonomous and fully-autonomous modes of operation.

Developing, testing and employing intelligent control systems in unmanned ships and aircraft will be a major step forward in the acceptance of fully-autonomous fleet elements. In the past, ships and maritime patrols were commanded solely by humans. Those captains and flight leaders were required to exercise initiative and judgment in executing their missions. They were all educated, trained and experienced in their positions as operational leader. They often made subjective decisions based on incomplete information and tensions that involved executing the mission while avoiding risk and possible untoward incidents or collateral damage in combat situations.

The challenge between now and 2045 is to develop technology that will advance artificial intelligence to a point where commanders can be assured that autonomous systems will make "decisions" that conform to safety of flight and navigation and ultimately the laws of armed conflict. This is a vision of course, but a vision that seems within reach for the Navy. Deploying unmanned fully-autonomous ships, aircraft and submarines across the maritime domain would revolutionize maritime warfare.

Advancing Maritime Unmanned Systems

During a recent conference on maritime unmanned systems, experts including scientists, technologists, Navy program managers and war fighters presented arguments for employment of unmanned remotely-controlled, semi-autonomous and fully-autonomous air, surface and undersea vehicles. There was optimism during the conference with a note of caution concerning the limits to which commanders would be assured that "machines" would exercise the necessary behaviors to meet missions beyond simple surveillance and reconnaissance. The idea of unmanned systems with the capability of performing detect-to-engage operations was a point a repeated discussion.

The acceptance of semi-autonomous and fully-autonomous fleet elements is predicated on the reliability, surety and successful testing of sensor to processor to control functions in unmanned ships and aircraft. The persistent question was would unmanned systems adhere to

safe navigation, safety of flight and the laws of armed conflict while executing "assigned" maritime missions ordered by operators and commanders.

The Department of Defense has published guidance on the design, development, construction and intended operation of unmanned systems. That guidance requires system controls and functions that enable commanders and operators to maintain control of unmanned systems through the range of military operations.

Our question for discussion is: Can innovative thinkers in our defense or federal laboratories, industry research and development centers, and/or warfare centers create unmanned systems that can operate as part of the fleet and deliver on the vision of autonomous operations?

This is an urgent question and necessary quest because our competitors are catching up with us on the evolution of unmanned systems. Just recently, an article published in the *National Interest* magazine reported on Russian efforts to advance underwater spy drones. Dave Majumdar reported:

Russia is developing a family of unmanned surface and underwater vehicles, a high-ranking official in that country's navy said this week. While the U.S. Navy has been developing naval drones for more than a decade, this is the first indication that Moscow is working on similar capabilities. "Work will be continued in 2016 to develop unmanned boats that can be based both on ships and on the shore," Vice Adm. Alexander Fedotenkov, deputy commander-in-chief of the Russian Navy told the TASS news agency on Jan. 21. (Russia vs. America: The Race for Underwater Spy Drones, Dave Majumdar, the National Interest, Jan 21, 2016)

Our U.S. Navy fleet evolution and structure question points to the need to continue and possibly accelerate research and development on unmanned systems less we allow near-peer competitors to close the gap and take away our existing advantage.