

THE DISRUPTOR

DIRECTOR, UNMANNED SYSTEMS, DASN SHIPS
QUARTERLY NEWSLETTER, WINTER 2021, ISSUE # 1

TRANSFORMATIONAL WARFARE — THE “WHY” OF UNMANNED

A Personal Perspective

Our world has been shaped, and new lines drawn over the centuries, because of great military strategists like Sun Tzu, Mao and Clausewitz. Whether Eastern or Western strategists, what they all had in common was the keen ability to study their threat, learn their weaknesses and visualize their path to victory.

This took great discipline, organization and recognition of the trades necessary to prevail — battles are never won without sacrifices, acts of heroism or the ability to outmaneuver your enemy. Today, we are faced with new threats, and on several fronts.

The freedom that America has come to know, was born from a belief that Life, Liberty and the Pursuit of Happiness are unalienable rights for all Americans. It was this belief that George Washington and his Continental Army embraced, and for which he strategized to win our independence, drawing new

lines on the world map and breathing life into “We the People.”

It is written in our Constitution, specifically Article I, Section 8, that Congress has the responsibility to provide and maintain a navy, as well as build a militia to execute the laws of the union, suppress insurrections and repel invasions. There is no question that China, Russia, Iran and North Korea have all increased their respective military capabilities through technological innovations, which include intercontinental ballistic missiles, nuclear arms and cyber technology, all of which have raised the threat to our great nation.

In order to retain and protect our liberties, we must continue to build the greatest Navy, one that is agile, distributed, lethal and decisive.

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An unmanned aerial vehicle delivers a payload to the Ohio-class ballistic-missile submarine USS Henry M. Jackson (SSBN 730) near the Hawaiian Islands in October 2020. (U.S. Navy)



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Advancements in technology have created the opportunity to provide our military with an operational overmatch by developing and distributing manned/unmanned command and control capabilities. The combination of artificial intelligence and autonomy stands to be the greatest transformation in modern warfare since the gunpowder revolution.

History has shown that whatever nation is victorious at sea is also the nation that has the power to shape the world's map. Sun Tzu, Mao or Clausewitz could never have imagined a world with unmanned mechanical warriors collaborating and operating in every domain from space to the sea floor; a fighting force of 'Gladiators' composed of materials integrated with sensors able to surveil, target, strike and

disseminate our enemy's movements, and designed solely to support our military operators through their command and control.

This is our new world, a new kind of warfare that spans all domains, one that will use unmanned systems as these Gladiators in order to do the more "dull, dirty and dangerous" jobs while freeing up the humans to focus on strategies and tactics necessary to preserve our freedoms. What modern strategist will be written about in our future history remains unknown, but without question, we are intending to shape the world through our lens to ensure freedom of the seas.

Dorothy Engelhardt

a.k.a -...-... / --- ..- / -.. ----
Director of Unmanned Systems, DASN Ships

THE DISRUPTOR

Welcome to the first edition of "The Disruptor." This newsletter is dedicated to sharing the progress of unmanned maritime DOTMLPF-P, to include the supporting enabling technologies such as artificial intelligence/machine learning, autonomy, command and control, energy and lethal and non-lethal sensor development and integration. It is intended to be published every quarter and should be seen as an opportunity for collaboration among government agencies both domestic and international.

You will find the topics we are seeking to share include science and technology (ON THE EDGE), fleet progress (DEVOPS), experimentation (INSIGHTS), progress within DOD (DOD UxS), progress from our

international partners (INTERNATIONAL), current capabilities (ZEIT (X)), enabling technology development (SIGNALS), coming events (FORECAST) and finally for some fun, you will find an embedded message that you will need to decipher within each newsletter.

Please feel free to distribute with widest dissemination, and if interested in contributing or have ideas for improvement, please reach out to me at dorothy.engelhardt@navy.mil or to Rob Holzer at RHolzer@gryphonlc.com.

Design and layout by Peter Atkinson and Whitney Whiteside

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ON THE EDGE

NEW STRATEGY WILL ENSURE COMMON VISION FOR IAS

By Rear Adm. Lorin C. Selby

Greetings, and I'm glad to be here with you for this inaugural newsletter focused on unmanned systems. The idea here is to do the most important job of all involving human beings in this critical arena: to communicate, and hopefully inspire. I'm Lorin Selby, the Chief of Naval Research (CNR), and I'm going to write a regular column here to contribute to that mission. And I look forward to hearing back from you.

When we talk about unmanned systems, there are a lot of unintended and frankly unnecessary obstacles, most of which involve one group not knowing what others are doing. When that happens, we lose the benefit of mutual knowledge, and end up duplicating research and wasting time, research and acquisition dollars.

The Department of the Navy (DoN), writ large, and the Naval Research & Development Establishment (NR&DE), in particular, is working on that — and I am proud to announce here that we are authoring a Science and Technology Strategy for Intelligent Autonomous Systems, or IAS. By stating clearly what our goals and processes are in IAS, we ensure all naval partners involved in research, acquisition or operations of unmanned systems can have a common vision and move forward in sync.

The need for this strategy has been growing as we increase our work with unmanned systems, and as we

gain more confidence in our abilities to incorporate them into the fleet and force. The strategy was chartered by DASN (RDT&E) and myself as CNR, and approved by the Naval R&D Board in August. The draft strategy document was to be delivered to DoN leadership by the end of December. They'll give rudder orders and the strategy will be delivered as of March 31. It will be fully linked to, and in support of, the Chief of Naval Operations' UxS Campaign Plan.

So what will this strategy look like, and what are the objectives? Big picture, this will be an actionable way forward for the DoN in development and use of IAS. Its objectives:

1. Articulate and promote the naval vision for IAS, to achieve coherence.
2. Provide strategic guidance to align NR&DE resource decisions in financial, infrastructure and workforce/education areas.
3. Detail how the NR&DE will accelerate development and fielding of emerging IAS capabilities.

The next question: Who is designing this strategy? The answer: every player we can reach. The Strategy Development Team consists of more than 50 users
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“EVERY ONCE IN A WHILE, A NEW TECHNOLOGY, AN OLD PROBLEM AND A BIG IDEA TURN INTO AN INNOVATION.”

- DEAN KAMEN

ON THE EDGE



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and researchers within the Navy and Marine Corps, with inputs from hundreds of individuals across government, industry and academia. We're not letting current health restrictions stop us from moving forward: We're utilizing online questionnaires, web-based visual collaboration events and virtual workshops.

Bottom line: This will incorporate a lot of invaluable information from a lot of really smart people who know what we need, and have a lot of good ideas on how to get there. When the final strategy is delivered at the end of March, it will be followed by an IAS Strategy Execution Plan — a living document that articulates specific lines of execution that will ensure the Navy and Marine Corps can realize a powerful IAS vision.

It's no secret that our adversaries are on the move when it comes to using autonomous systems to achieve victory on the battlefield and high seas. The leadership of the People's Republic of China, in particular, has made it clear they intend to lead the

world in autonomy in the near future. That cannot be allowed to happen.

The safety of a free and open global commons falls to the United States and our allies. As one recent Brookings Institution study puts it: "Chinese advances in autonomy and AI-enhanced weapons systems could impact the military balance, while particularly exacerbating threats to global security and strategic stability as great power rivalry intensifies."

Words alone won't win wars, but the right words now can ensure inspired, focused and effective development of the unmanned systems our Sailors and Marines need to keep the peace, win the fight and come home safe. And to the men and women across the Navy and Marine Corps — the engineers and scientists, the unmanned systems teams at DASN Ships, ONR and the NR&DE — and so many more with sleeves rolled up working hard on challenging problems each day: thank you, and press on.

Rear Adm. Lorin C. Selby is the Chief of Naval Research



Sea Hunter 1 transferred from the Office of Naval Research to the Navy's Surface Development Squadron One in the first quarter of fiscal year 2020 for continued use in Fleet exercises and payload experimentation. (Office of Naval Research)



DEVOPS

UUV SQUADRON ONE SUPPORTS COLLABORATIVE TACTICAL DEVELOPMENT

By CDR Rob Patchin

It's a typical cool, damp October afternoon on the Keyport, Wash., Test Range as two Sailors muscle a Razorback autonomous undersea vehicle, an 800-pound underwater robot designed to survey the sea floor, aboard a launch-and-recovery sled. The Razorback vehicle is a variant of a commercial vehicle, modified to support host ability from submarine ocean interfaces.

The team from UUV Squadron ONE has just completed another day of payload testing, supporting engineering tests of a future undersea communications capability. Today's testing uncovered a bug in the handoff between different controllers that resulted in an unintended surfacing of the vehicle — sending a government/industry team of developers and programmers back to the drawing board for a quick fix to support testing again tomorrow.

In addition to fielding clandestine unmanned undersea vehicle (UUV) capabilities in an operational environment, the teams at UUV Squadron ONE support tactical development using commercial and prototype unmanned systems. Co-located in Keyport with Naval Undersea Warfare Center Division Keyport, the team maintains a tight feedback loop with stakeholders across the Naval Research and Development Enterprise.

The squadron's tactical development efforts are focused on two main lines of effort. First, we are scoping *existing* vehicle and subsystem behaviors and developing the planning tools, tactics and training to exploit existing capabilities to gain military advantage today.

Because the undersea domain limits communications, vehicle task performance is the result of planning and vehicle behaviors. Factors as mundane as bottom slope or current variations can be the difference between sortie success and failure. Using a mix of prototype and commercial vehicles, the teams wrestle to solve operational problems and develop the tactics, techniques and procedures to enable near-term mission execution.

Second, we support technological risk reduction efforts on *future* systems by providing informed user feedback to teams working on developmental payloads, and by identifying key vehicle and subsystem performance metrics required to enable successful execution of future operational concepts.

Supporting payload testing and development and operations (DEVOPS) initiatives with existing platforms such as the Razorback system, the UUV Squadron team is working to rapidly field innovative new capabilities for fleet employment. Similarly, by conducting routine Large Test Vehicle Operations and validating subsystem requirements to support segmented tasks from future mission concepts, the team is ensuring vehicles are successfully fielded.

UUV Squadron ONE is working with the homeport team at Naval Undersea Warfare Center Division Keyport to enhance collaboration across the unmanned systems community of interest, accelerate fielding of new capabilities and extend the reach of our competitive advantage in the undersea domain.

CDR Rob Patchin is commanding officer of UUV Squadron ONE.



IBP-21 WILL DEMONSTRATE UNMANNED SYSTEMS IN ALL DOMAINS

By Rear Adm. Robert Gaucher

In April 2021, U.S. Pacific Fleet will execute an Integrated Fleet Battle Problem (IBP-21) focused on unmanned systems. Building off advances achieved over the past decade in unmanned aviation, Pacific Fleet is answering the Chief of Naval Operations' (CNO's) drive to put the Navy's Unmanned Campaign Plan into action. Furthermore, by exercising our full range of unmanned capabilities in a Pacific warfighting scenario, IBP-21 directly supports U.S. Indo-Pacific Command's (USINDOPACOM's) warfighting imperative of driving lethality through experimentation.

Earlier this year, the Navy deployed our MQ-4 Triton unmanned aerial vehicles to Guam to support the Seventh Fleet commander. IBP-21 will build on the unmanned experience and success we've had in naval aviation, and add unmanned systems that operate on and under the sea. The overall goal is to integrate our unmanned capabilities across all domains to demonstrate how they solve CNO and Fleet Commander Key Operational Problems.

To get after these problems, IBP-21 will include maneuver in contested space across all domains; targeting and fires; and intelligence, reconnaissance and surveillance. At the execution level, our Fleet operators will execute using manned-unmanned teaming, full and partially autonomous operations, and command and control (C2) methods that range from direct control from a platform at sea to control ashore from an unmanned operations center. Throughout the exercise, our operators will look to shift risk from our manned platforms to our unmanned platforms as they execute the fight.

IBP-21 will test and grade the unmanned capabilities

we have today through the lens of how they contribute at both the operational and tactical level. In some cases, we may find a vehicle and payload work exactly as designed, but don't make the Fleet more lethal. In other cases, we may find that the unmanned system could have filled a key gap, but the technology was not mature enough to deliver. In both cases, the lessons we learn will feed back not only to our engineers, but also to our warfare development centers who are building our unmanned tactics, techniques and procedures.

The Office of Naval Research has been a key partner in working across the technical community to bring a large menu of payloads and vehicles as candidates for IBP-21. The team has focused on pulling in those payloads that will help the Fleet Commander make better decisions by providing intelligence, surveillance and reconnaissance, targeting data, or delivering effects to destroy or degrade our adversaries.

The scenarios in IBP-21 will include some end-to-end events and others where we only test some of the unmanned concept of operations. In some cases, we may choose to launch a vehicle from a third-party host ship, then take control with a warship for the actual execution. In other cases, we may load an unmanned payload on a manned platform, but control it remotely from an unmanned operations center ashore or from another ship at sea. The goal is to pull technology to sea faster and test it in under the conditions that the fleets need.

Although the detailed plan is still in development, the initial pieces are coming together nicely. The forces operating in IBP-21 will report to Commander, Third

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INSIGHTS



An MQ-4C Triton taxis at Andersen Air Base, Guam. (U.S. Navy)

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Fleet, throughout the exercise. USS Michael Monsoor (DDG 1001) will serve as one of the at-sea controlling stations; Surface Development Squadron ONE and UUV Squadron ONE will each help to operate vehicles from the shore at unmanned operations centers; and the air, surface and submarine type commanders will provide ships, submarines and aircraft.

To further naval integration, the Marine Corps Warfighting Lab will leverage IBP-21 to examine how unmanned systems can support their emerging warfighting concepts such as expeditionary advanced basing operations. Throughout IBP-21, our manned operating forces will team with our unmanned systems to operate in a contested environment, reduce risk to our manned platforms and deny/degrade/destroy the adversary operating forces.

In addition to bringing to our unmanned capabilities

on the sea, above the sea and under the sea, IBP-21 will put these systems in the hands of the same Sailors who will employ these systems as they are delivered to the Fleet in the coming years. The experience and feedback gained by putting our unmanned systems to sea in a warfighting scenario will certainly pay great dividends as we move out on developing the tactics, techniques and procedures to operate with unmanned.

Ultimately, IBP-21 aims to drive our unmanned systems more quickly toward warfighting needs today by executing the sets and reps we need to become more lethal while reducing the risk to manned platforms. Triton is deployed today supporting Seventh Fleet, and the Fleet is ready to see unmanned operating in all domains, every day.

Rear Adm. Robert M. Gaucher is director of maritime headquarters at U.S. Pacific Fleet.



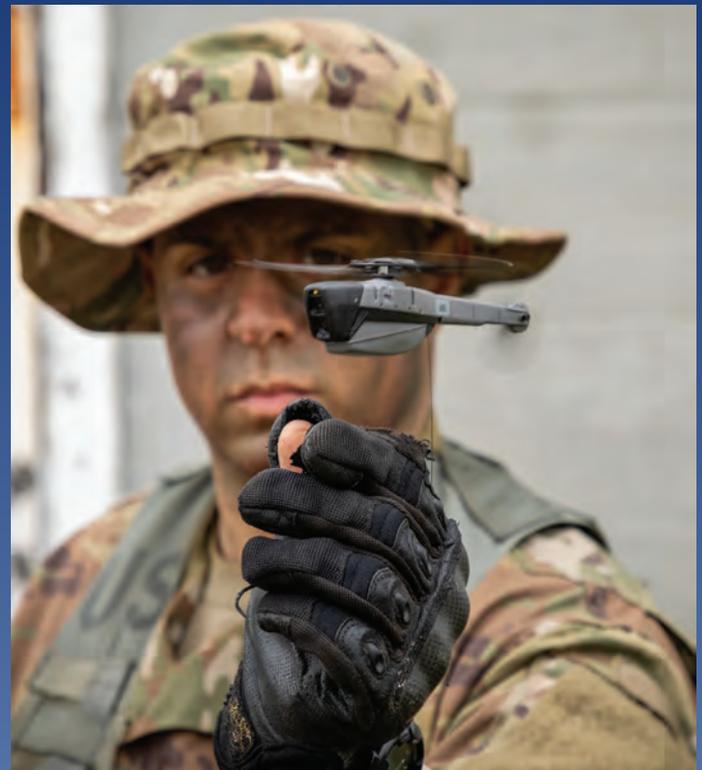
ARMY ROBOTICS AT THE TACTICAL EDGE

By Ted Maciuba

This is an exciting time to be in Robotics Requirements, a part of Army Futures Command at Fort Benning, Ga., where we focus on enabling Army small units at the tactical edge by increasing their situational awareness, lethality, protection, persistence and depth. In September, we publically released the U.S. Army Small Unmanned Aircraft System (SUAS) Strategy, which describes how the Army will integrate current and new SUASs into future organizations to ensure overmatch against highly capable adversaries. It includes a long-term Army Maneuver Robotic Strategy, which will integrate air and ground (and potentially water and cyber) robotics, autonomy and artificial intelligence (AI) to field significantly more combat effective small units.

The Army is fielding thousands of air and ground robots developed by Robotics Requirements including:

- Soldier Borne Sensor — a 1.1-ounce nano-drone that gives the nine-Soldier Infantry squad an organic "quick look" capability for real-time video feeds of larger, complex and restrictive environments.
- Short Range Recon — a 3-pound quadcopter that gives a 40-Soldier Infantry platoon enhanced situational awareness and a standoff capability in urban and complex terrain enabling accurate reconnaissance, detection and acquisition of targets.
- Small Multipurpose Equipment Transport (SMET) — a 4,000-pound unmanned ground vehicle that



A Soldier with a Black Hornet micro UAV. (U.S. Army)

can carry 1,000 pounds of equipment and has three kilowatts of exportable power, increasing small unit self-sufficiency for extended periods in highly contested environments.

Robotics Requirements is also developing requirements for near-term robotic systems including:

- Universal Robotic Controller — an information system capability for dismounted Soldiers and combat vehicle crewmen that controls all robotic systems, air and ground, in the 600-Soldier maneuver battalion.

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DoD UxS

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- Exoskeleton — a wearable system that enables Soldiers to move faster over and within complex terrain, have more endurance, travel further distances and carry heavier loads.
- Long Range Recon — an airborne reconnaissance and surveillance system providing extended day-and-night situational awareness to a 600-Soldier Infantry battalion.
- SMET Modular Mission Payloads — brings additional robotic capabilities at the small unit level such as autonomy, communications and counter-SUAS.

A major issue for all current and near-term small unit robotics is that, apart from the exoskeleton, each requires a Soldier dedicated to control them, usually through a full-motion video controller. This takes Soldiers away from their combat mission, and, with hundreds of robotic systems in each 4,000-Soldier

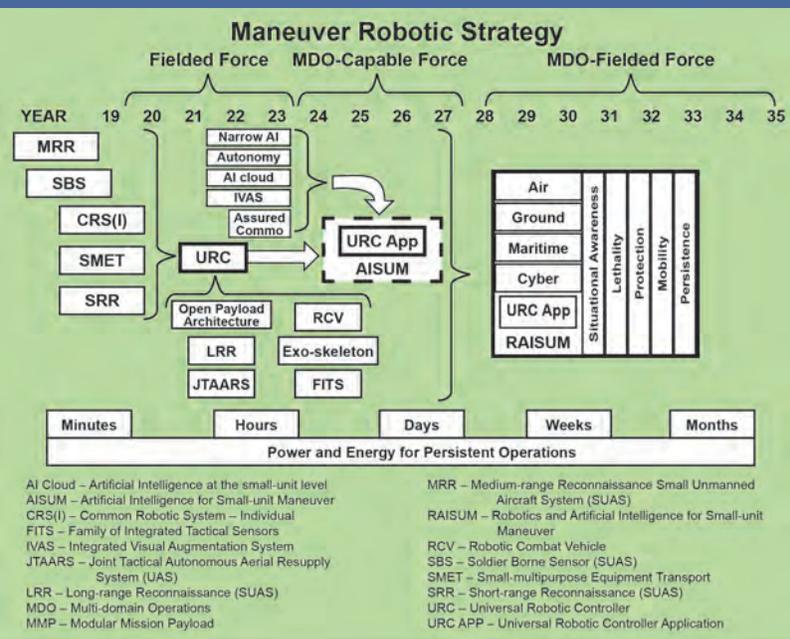
Army Brigade Combat Team, requires a large and robust communications network.

To address this issue, Robotics Requirements is supporting the Close Combat Lethality Task Force and Joint Artificial Intelligence Center, and teaming with other Army agencies, the U.S. Marine Corps and Special Operations Command to develop Artificial Intelligence for Small-Unit Maneuver (AISUM). Potential AISUM capabilities include:

- An AI cloud that controls robotic systems and translates Soldier commands into robotic directions. The AI cloud also consolidates sensor information into a common operating picture with recommended courses of action.
- Narrow AI at the sensor, both robotic and Soldier, that detects, recognizes and identifies militarily interesting information and then reports that information back to the AI cloud.
- Autonomy at the robotic system level that converts the AI cloud's robotic directions into actions.

To develop AISUM capability metrics, we plan to select and demonstrate prototype robotic technologies and AI tools (drawn from the Defense Advanced Research Projects Agency's Squad X; National Advanced Mobility Consortium's Robotic and AI initiative; Army Expeditionary Warrior Experiment; Defense Labs; and other military services) that will show a path toward a dismounted Infantry Platoon that is 10 times more combat effective and able to make better decisions 10 times faster than a current platoon.

Ted Maciuba, P.E., is the deputy director of Army Robotics Requirements, which develops and manages small unit robotics capabilities – to include unmanned ground vehicles, small unmanned aircraft systems, artificial intelligence and exoskeletons.



A graphic depiction of the Army Maneuver Robotic Strategy. (U.S. Army)

INTERNATIONAL



AUTONOMOUS TECHNOLOGY DRIVES ROYAL NAVY TRANSFORMATION

By Admiral Tony Radakin

The U.K. Royal Navy is currently undergoing a major transformation program, much of which involves deepening the already close links we have with the United States. We are increasing our operational advantage in the North Atlantic; delivering a global carrier strike capability with our new Queen Elizabeth-class carriers; transforming our Royal Marines into a Future Commando Force; increasing our forward presence around the world; and using technology and innovation in a much better way. This final pillar underpins much of the entire transformation effort, and an increased focus on autonomy is a core part of that.

To create this technological change, the Royal Navy has created NavyX, an autonomy accelerator that is harnessing the latest developments in autonomy and delivering them to the front line — faster, more efficiently and more effectively than ever before. One of the most striking recent successes for NavyX has been the Mine Warfare and Hydrographic Capability (MHC), delivering a full suite of autonomous mine countermeasures (MCM) and HM capabilities for rapid global and shipborne deployment. As part of this, the Royal Navy has just signed a \$240 million contract to develop the Maritime Mine Counter Measure (MMCM) program.

This exciting new capability uses an autonomous vessel, equipped with a towed sonar and controlled from a mother ship, to locate mines, and a remotely operated underwater mine neutralization system to make them safe. This next-generation mine-hunting capability is designed to replace conventionally crewed mine-hunting vessels, such as the Royal Navy's Hunt- and Sandown-class ships, making mine hunting safer, faster and more effective.



The Royal Navy's NavyX initiative has tested medium-lift drones to deliver small UUVs to target areas. (U.K. Royal Navy)

This is just the latest in a series of initiatives to increase our use of uncrewed systems. In conjunction with MSubs of Plymouth, we are developing a weaponized extra large uncrewed underwater vehicle that is expected to be the largest uncrewed submarine in the world. This has clear potential to support the ongoing drive to develop our operational advantage in the North Atlantic, enhancing the reach and range of our crewed platforms.

Taking people out of systems helps to increase their range and endurance, and prevents us from having to put them in harm's way unnecessarily. This is why we are trialling weaponized uncrewed PAC-24 seaboats for our escort fleet and developing a heavy-lift

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INTERNATIONAL

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maritime drone capable of carrying a wide variety of anti-submarine warfare (ASW) weaponry to target at range.

Similarly, NavyX is working on developing systems that increase or enhance the autonomous systems already in use. We are increasing the use of remotely operated vehicles (ROVs) for explosive ordnance disposal operations, trialling Artificial Intelligence-powered tasking software with REMUS 600 UUVs to carry out route survey work, and using the Malloy TRV-150 medium-lift drone to deliver REMUS 100 UUVs to target areas, increasing the stand-off ranges of crewed platforms.

Underpinning much of this is the fully open architecture, plug-and-play Naval Strike Network (NSN). NSN uses the MAPLE UxV autonomy interface developed by Dstl. This is hosted on the Royal Navy's NELSON Digital Platform and provides multi-environment Command and Control in a Denied or Degraded Environment (C2D2E C2).

One application has been with the Royal Marines developing the technological basis for the Future Commando Force. In trials, the NSN has been used to operate the Android Team Awareness Kit, increasing situational awareness in the field. This is being scaled in support of autonomous applications for the Future Maritime Aviation Force, MCM and ASW battles.

In all this, the Royal Navy remains in close collaboration with the United States. The Chief of Naval Operations, Adm. Michael Gilday, and myself recently reaffirmed our commitment by ratifying a memorandum of understanding to move from interoperability to full interchangeability. In remotely operated, autonomous and uncrewed systems, the key will be alignment of the Royal Navy's MAPLE system with Department of the Navy (DON) progress in the Common Control System (CCS).

This will be accelerated through joint experimentation and technical collaboration, including bilateral and NATO trials programs. U.S./U.K. collaboration received another major upgrade in Dec. 20 with the opening of the London Tech Bridge. Jointly led by the DON's NavalX and the Royal Navy, it seeks to be a portal across the Atlantic for accelerated tech iteration for mutual benefit. These are exciting times for the development of uncrewed systems. These have the potential to change the way in which we deliver operational effect, making it faster, more effective and more lethal to our enemies. Our collaboration with the U.S. is particularly important in this area, and I look forward to seeing this continue.

Admiral Tony Radakin, CB, ADC, is the First Sea Lord and Chief of the Naval Staff of the U.K. Royal Navy.



At left, a MAST-13 unmanned surface vehicle, at right, an uncrewed PAC-24 seaboot. (U.K. Royal Navy)



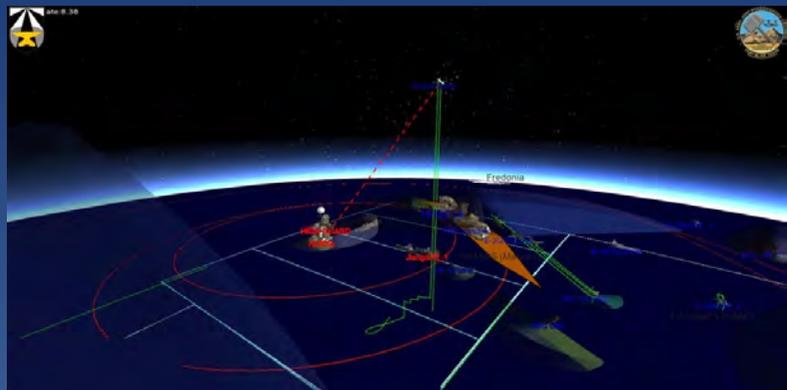
PROJECT OVERMATCH AIMS TO ENSURE FULL POTENTIAL OF DMO

Chief of Naval Operations (CNO) Adm. Michael Gilday directed the establishment of Project Overmatch in October to mature Fleet-driven operational concepts and procedures to fully enable Distributed Maritime Operations (DMO), Expeditionary Advanced Base Operations and Littoral Operations in a Contested Environment.

The ability to establish and sustain sea control is dependent on enhancing DMO through a teamed manned/unmanned force that exploits artificial intelligence and machine learning. Project Overmatch will enable a Navy that swarms the sea, delivering synchronized lethal and non-lethal effects to every domain. The CNO noted that next to the Columbia-class submarine program, there is no higher Navy priority.

The Project Overmatch team, led by Rear Adm. Douglas Small, Commander, Naval Information Warfare Systems Command, is leveraging the significant demonstrated progress in command and control and long-range fires to ensure the full potential of distributed Navy, Marine Corps and Joint Forces. Overmatch will focus on ensuring operationally relevant data is available at the tactical edge, when and where required, to provide an asymmetric advantage to the Joint Force as documented in the recently approved Naval Operational Architecture (NOA).

The Navy concept for DMO describes a NOA as providing accurate, timely and analyzed information to units, task organizations and Fleets. The NOA is the underlying digital foundation enabling future distributed warfighting. The NOA Capability Framework envisions a modular, services-based architecture for DMO to integrate naval, joint and



The Joint Staff's Joint All-Domain Command and Control Campaign Plan Experiment 2 allowed Army, Navy, Air Force and Marine Corps nodes to share near-real-time information to enable sensor-to-shooter linkages and display it on a common operational picture. (Joint Modernization Command)

national capabilities and greatly improve coalition interoperability

Overmatch will develop the networks, infrastructure, data architectures and tools to enable increased battlespace awareness and long-range fires, as well as the ability to seamlessly transition to unmanned operations with the requisite assurances as a force multiplier. The effort will be developed in close coordination with the Joint All-Domain Command and Control (JADC2), and deliberately with the Air Force's Advanced Battle Management System and the Army's Project Convergence.

The Navy will continue to participate with the Air Force and other services in JADC2 experimentation to increase network interoperability. To date, the Navy and its partners have integrated joint fires capabilities in a complex scenario, integrated cloud computing-based command and control systems; enhanced and expanded machine-to-machine data exchanges; and significantly reduced joint kill chain timelines.



ZEIT(X)

MARINE CORPS EYES RPA SQUADRONS FOR FUTURE NAVAL FORCES SUPPORT

By LtCol Noah Spataro

The Marine Corps has been exploring Remotely Piloted Aircraft (RPA) Remote Split Operations (RSO) over the past couple of years while supporting urgent Marine requirements. The commandant's Force Design 2030 capitalizes on the lessons learned from RSO and looks to a more deliberate future of Medium Altitude Long Endurance RPA to support naval forces.

The plan is still in early development but the Marine Corps RPA community is optimistic that the pivot to Great Power Competition in the contact layer, will bring added value to what detached escort and direct-support sensing can provide our maritime forces today.

Marine Unmanned Aerial Vehicle Squadron 1 (VMU-1) successfully transitioned to a new, mixed Contractor Owned Government Operated model after approximately 18 months of Contractor Owned Contractor Operated direct support operations for RSO. During this first chapter, the squadron implemented a Mission Commander crew model resembling that of the old RQ-2 Pioneer and RQ-7 Shadow days.

The Mission Commander served as the planner, tactical mission integrator, flight safety oversight and translated tactical support needs into administrative tasks for the contracted aircrew to perform. At the close out of this initial direct support period, the squadron flew more than 8,600 hours on just two aircraft over 21 months.

The squadron's Mission Commanders supported more than 30 unique named operations and facilitated 281 strikes during this same period.

As Marine VMUs transition to MQ-9 ownership, they will take on growing responsibility for supporting integrated naval operations with Navy and Marine units around the world. In continuation of the existing partnership with the U.S. Air Force RPA training pipeline, the Marine Corps now has RPA crews in the Pilot Exchange Program and is building up the bench of fully trained operators to fully transition to Marine Corps ownership.

Marine Corps Force Design 2030 outcomes project a growth to six RPA squadrons, with the last three squadrons likely leaning to operate with future capabilities. The Marine Corps is closely following numerous developing capabilities that expand on distributed sensing, smart weapons and autonomous behaviors.

Programs like Loyal Wingman, Gremlins, Low Cost Attritable Aircraft Technology, Low-Cost UAV Swarming Technology and Skyborg provide attractive partnership opportunities for integrated joint force capabilities.

The Corps has a proud legacy as warfighting instigators by adapting new technologies that yield a generational leap in warfighting. The time for meaningful change in unmanned aviation is now.

United, the future looks bright for the naval services as a deterrent force in readiness focused on America's partnerships and strategic maritime interests.

U.S. Marine Corps LtCol Noah Spataro is a graduate student at the National Defense University College of Information and Cyberspace.



OVERLORD USV PARTICIPATES IN DAWN BLITZ AFTER TRANSIT TO PACIFIC

By DOD News

A Ghost Fleet Overlord unmanned surface vessel (USV), part of a partnership between the Defense Department's Strategic Capabilities Office (SCO) and the Navy, recently traveled a distance of more than 4,700 nautical miles, almost entirely autonomously. Afterward, it participated in exercise Dawn Blitz where it again spent nearly all of its underway time operating autonomously.

"This is a historic milestone for the program and the Navy. It represents what SCO does best: integrate mature technologies to accelerate service priorities and create new capabilities for our warfighters," said Jay Dryer, director of the SCO.

The Ghost Fleet Overlord program is part of an effort to accelerate the Navy's push to incorporate autonomous vessels within its fleet to expand the reach of manned vessels. Autonomy includes more than just straight-line passage through large areas of the ocean; it also involves such things as collision avoidance and following the rules of the sea.

The Navy's efforts to adopt the unmanned vessel concept involve several classes of ships and an array of missions, such as offensive operations and intelligence, surveillance and reconnaissance, with reduced risk to crew and legacy vessels. The Ghost Fleet Overlord program has demonstrated continued maturity in the autonomous USV concept since it stood up in late 2018.

The most recent display of that maturity involved a USV traveling from the Gulf Coast to the coast of California, moving autonomously approximately 97 percent of the time. While the USV did have a crew on board, remote mission command and control for the

trip was done from a remote location by Sailors with Surface Development Squadron ONE. One of the few times the USV was guided by its onboard crew was when it traversed the Panama Canal.

Optionally manned vessels provide a stepping stone to allow the Navy and its Sailors to more easily become familiar with the concept of autonomous operations than what would be possible with a fully autonomous ship.

After arriving on the U.S. West Coast, the Ghost Fleet Overlord USV participated in December's Dawn Blitz exercise with the Navy and Marine Corps. There, it successfully demonstrated compliance with International Regulations for Preventing Collisions at Sea, station keeping, loiter and transit missions. It was the first time a Ghost Fleet Overlord USV interacted with actual assets in the Navy fleet.

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Following a transit from the Gulf Coast to the coast of California, this Ghost Fleet Overlord program unmanned surface vessel participated in exercise Dawn Blitz, where it also demonstrated its autonomous capabilities. (U.S. Navy)



FORECAST

UPCOMING EVENTS

Feb. 2-3, 2021

NDIA Expeditionary Warfare Conference (virtual)
<https://www.ndia.org/events/2021/2/2/2021-virtual-expeditionary-warfare-conference>

March 23-24

NDIA 2021 Undersea Warfare Virtual Conference
<https://www.ndia.org/events/2021/3/23/2021-usw-virtual-conference>

March 23-25

NDIA National Security AI Conference and Exhibition (virtual)
<https://www.ndia.org/events/2021/3/23/1se1-national-security-ai-conference-and-exhibition>

April 11-15

SPEI Unmanned Systems Technology XXIII
Gaylord Palms Resort & Convention Center, Orlando, Fla.
<https://spie.org/SI/conferencedetails/unmanned-systems-technology?SSO=1>

May 3-6

AUVSI Xponential
Georgia World Congress Center, Atlanta
(In-person and virtual)
<https://www.auvsi.org/our-impact/commercial-uas-exemption-report/auvsi-xponential-2021>

May 25-27

2021 Mine Warfare Association International Mine Warfare Technology Symposium
Embassy Suites Monterey Bay Seaside, Monterey, Calif.
<https://minwara.org/symposium/index.php>

June 21-22

Military Robotics and Autonomous Systems USA
Hilton Arlington, Arlington, Va.
www.roboticsautonomous-usa.com

Due to the COVID-19 pandemic, dates, locations and status of these events are subject to change.

(from previous page)

During its participation in Dawn Blitz, the USV operated autonomously for more than 130 hours and traversed roughly 950 nautical miles, accounting for approximately 98 percent of its underway time. The Ghost Fleet Overlord program has been an accelerant to the Navy's adoption of unmanned surface vessels, enabling it to more rapidly bring such vessels into the fleet.

"Our close partnership with SCO on the Overlord program is accelerating the technology demonstration, CONOPs development and operational command and control of unmanned surface vessels in direct alignment with the Navy's plans," said CAPT Pete Small, Navy Program Manager for USVs.

To help the Navy advance its goal to incorporate

autonomous vessels within the fleet, the SCO's Ghost Fleet Overlord program has taken commercial ocean-going vessels and integrated both commercially available and government-provided equipment on board to create unmanned surface vessels.

Phase II of the Ghost Fleet Overlord program, which focuses on the integration of government-furnished command-and-control systems and payloads and more complex and challenging naval operations experimentation, began in September.

The SCO will transition its two Ghost Fleet Overlord prototypes to the Surface Development Squadron ONE by the end of fiscal year 2021. The Navy is currently acquiring two more Ghost Fleet Overlord prototypes to accompany the two SCO built to continue unmanned systems testing and fleet experimentation.

DISCOVERING THE LOGO



WHAT DO YOU SEE?

The unmanned systems logo is a multistable perceptual phenomena intended to convey a sense of discovery, covering all domains from the satellite constellation to the undersea constellation. It is inspired by a triumphant angelic warrior that conquers the Four Horsemen: conquest, war, famine and death.

The logo's center is a digital knight illustrated as an anime figure signifying the power of computers and information used in gaming and now artificial intelligence and man-machine teaming. The knight's golden wings represent aviation, while the helmet resembles a ship's bow breaking through the sea's waves.

The bow is flanked by profiles of a human face symbolizing manned/unmanned command and control ("man in the loop") with the word "prescience" meaning "foreknowledge" overshadowing the knight, symbolic of how manned/unmanned command and control, coupled with artificial intelligence, provides the Naval Enterprise with continuous battlespace awareness in all domains.

The undersea constellation is represented by the signals emitting from the moorings on the seabed, while the satellites represent the space constellation. Lastly, the knight is illuminated from the center of the Earth, representing our unmanned ground capabilities.

As with rare but true multistable perceptual phenomena, many may interpret the image as a lion's head, which is symbolic of courage, justice and military might.

Lions are seen as the alpha predator, while Lionesses



Logo concept by Dorothy Engelhardt, design and illustration by Whitney Whiteside

are known for their hunting strategies. Chinese culture defines lions as divine beasts that demonstrate strength, stability and superiority, and are often positioned outside their homes to ward off evil.

Now ask yourself: do you see a lion's head, a medieval knight, or both?

Finally, the Latin phrase "*Bonum Malum Vincit*," meaning "Good Conquers Evil," signifies the intent to ensure freedom of the seas for all.