

# NRL Conducts Successful Terrestrial Microwave Power Beaming Demonstration



A demonstration using the MIT Haystack Ultrawideband Satellite Imaging Radar transmitter for higher average power. *NAVAL RESEARCH LABORATORY*

WASHINGTON – A team of researchers from the U.S. Naval Research Laboratory recently demonstrated the feasibility of terrestrial microwave power beaming by transmitting 1.6 kilowatts of power over 1 kilometer, the most significant power beaming demonstration in nearly 50 years, NRL said April 20.

Microwave power beaming is the efficient, point-to-point transfer of electrical energy across free space by a directive microwave beam. The project, Safe and COntinuous Power bEaming – Microwave (SCOPE-M), was funded by the Office of the Undersecretary of Defense for Research and Engineering's Operational Energy Capability Improvement Fund and led by project principal investigator Christopher Rodenbeck, Head of the Advanced Concepts Group at NRL.

Within 12 months, NRL established the practicality of

terrestrial microwave power beaming and beamed 1 kilowatt of electrical power over a distance of 1 kilometer using a 10 gigahertz microwave beam. SCOPE-M demonstrated power beaming at two locations, one at the U.S. Army Research Field at Blossom Point, Maryland, and the other at The Haystack Ultrawideband Satellite Imaging Radar transmitter at the Massachusetts Institute of Technology.

"The reason for setting those targets is to push this technology farther than has been demonstrated before," said Paul Jaffe, power beaming and space solar lead.

"You don't want to use too high a frequency as it can start losing power to the atmosphere," Rodenbeck said. "10 GHz is a great choice because the component technology out there is cheap and mature. Even in heavy rainfall, loss of power is less than five percent.

"In Maryland, the team exceeded their target by 60% by beaming 1.6 kW just over 1 kilometer," he said. "At the Massachusetts site, the team did not have the same peak power, but the average power was much higher, thereby delivering more energy. Jaffe said these demonstrations pave the way for power beaming on Earth, in space and from space to Earth using power densities within safety limits set by international standards bodies.

"As engineers, we develop systems that will not exceed those safety limits," Jaffe said. "That means it's safe for birds, animals, and people."

Jaffe went on to say that during past experiments with laser power beaming using much higher power densities, the engineers were able to successfully implement interlock systems so if something approached the beam it would turn off.

"We did not have to do that with SCOPE-M because the power

density was sufficiently low that it was intrinsically safe," Jaffe said.

Brian Tierney, SCOPE-M electronics engineer, said the Department of Defense is interested in wireless power beaming, particularly wireless power beaming from space, and that a similar rectenna (rectifying antenna) array as used for SCOPE-M could be used in space. A rectenna is a special type of receiving antenna for converting electromagnetic energy into direct current electricity in wireless power transmission systems.

"Although SCOPE-M was a terrestrial power beaming link, it was a good proof of concept for a space power beaming link," Tierney said. "The main benefit of space to Earth power beaming for the DoD is to mitigate the reliance on the fuel supply for troops, which can be vulnerable to attack."

Besides being a DoD priority, Rodenbeck said power beaming is the ultimate green technology. Unlike other sources of clean energy, which provides intermittent and sporadic electrical power, power beamed from space to Earth can provide power continuously, 24 hours a day, seven days a week, 365 days a year.

"That is something no other form of clean energy can do today," Rodenbeck said. "From the standpoint of technology readiness level, I feel we are very close to demonstrating a system we can truly deploy and use in a DoD application."

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# Navy Proposes Decommissioning 6th Fleet's Command Ship in 2026



The Egyptian navy frigate ENS Alexandria (F911) and the U.S. Navy amphibious command ship USS Mount Whitney (LCC 20) operate in the Red Sea in support of the newly established Combined Task Force 153, April 20. *U.S. ARMY / Cpl. DeAndre Dawkins*

ARLINGTON, Va. — The U.S. Navy has proposed in its 2023 budget to decommission the amphibious command ship USS Mount Whitney (LCC 20) during fiscal 2026.

The Mount Whitney has served as the flagship of the U.S. 6th Fleet since 2005, when it replaced the USS LaSalle (AGF 3).

The Navy is proposing the retirement of the Mount Whitney because its retirement “is mitigated by staff operating ashore,” the service said in its 2023 budget highlights book,

citing a savings of \$179.7 million over the Future Years Defense Plan.

The 6th Fleet staff normally is stationed ashore in Naples, Italy. The Mount Whitney is homeported in nearby Gaeta.

The Mount Whitney is a Blue Ridge-class amphibious command ship. It was commissioned on Jan. 16, 1971, and served until 2005 as the flagship of the U.S. 2nd Fleet. It underwent conversion to a Military Sealift Command ship and is operated by a hybrid Navy/Civilian Mariner crew but remains a commissioned ship under the command of a Navy captain. If retired in 2026, the ship will have served 55 years.

Currently, the Mount Whitney is deployed to the Red Sea and Gulf of Aden where it serves as the flagship of commander, Task Force 153, a new task force of the Combined Maritime Forces, an international coalition operating under commander, U.S. 5th Fleet/Naval Forces Central Command.

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**NSWC Dahlgren Engineers  
Develop Modernized Low-Cost  
Semi-Active Laser Seeker**





From left to right, Naval Surface Warfare Center Dahlgren Division engineers Ryan Littleton and Michael St. Vincent perform seeker calibration on the semi-active laser seeker they helped develop. The new SAL seeker is smaller and lower in cost than previous seekers and will be compatible with the future generations of guided munitions systems. *U.S. NAVY*

DAHLGREN, Va. – Engineers at NSWC Dahlgren Division have developed a new, lower-in-cost, semi-active laser (SAL) seeker, the division said April 25.

SAL seekers are a key enabling technology for guided munitions that allow warfighters to target stationary and moving targets in areas where GPS is unavailable. SAL seekers function in tandem with an operator that directs a pulsing, infrared laser at targets. The seeker, typically in the nose of laser-guided munitions, detects the laser energy reflecting off the target and guides the munition to the operator's mark with high precision. This partnership assures that the correct target is engaged.

The seeker developed by engineers at Dahlgren Division is

smaller, three to five times cheaper than comparable laser seekers and is based on modern electronics designs not only to ensure relevance, but also to improve performance and implement the next generation of signal processing and countermeasures. As precision weapons requirements continue to expand, the design is ready to support integration with imager systems. The upgraded terminal seekers will be instrumental in the development of future guided munition systems.

“In response to the shift in force design, warfighting function and the trends going forward, we’re technologically pivoting to stay ahead of the game,” said program manager for the Enhanced Expeditionary Engagement Capability program Luke Steelman.

Traditional SAL seeker systems use a gimbaled detector element to track the laser spot as it moves relative to the weapon. Engineers at Dahlgren were able to develop a new combination of fixed optics and software algorithms to replicate the capability without the need for those expensive and sensitive moving parts. This has not only led to a smaller and more cost-effective product, but also one that is instrumental in ensuring compatibility with the next generation of system currently under development.

What’s more, the new seeker design also includes an integrated height-of-burst sensor that is able to measure proximity to the ground and signal the weapon’s fuze to create a very precise airburst function without the need of an additional sensor on the guided munition, further saving space and reducing cost.

Dahlgren has produced more than 50 prototypes, 30 of which have been live-fire tested on multiple weapon systems – including the 81-mm Advanced Capability Extended Range Mortar – and successfully guided systems to stationary and moving targets.

Michael St. Vincent, project lead engineer, said that direct feedback from warfighters was critical to the successful development process.

“We would get feedback from warfighters – what kind of targets they are targeting, what they are like, and also what requirements they need to meet,” said St. Vincent. “If they needed more range or more field of view . . . we would do simulations and make some changes and new iterations that moved closer to what they want.”

Dahlgren has long had a hand in terminal seeker technology, but in recent years the focus of the warfighting function has moved to exceedingly longer-range engagements. These long-range engagements keep warfighters and targeting assets far away from adversaries, but often preclude the use of laser-guided munitions.

Despite increasing engagement distances, Steelman says that laser-guided munitions that use the SAL seeker will always be a mainstay in warfighters’ toolboxes for one reason: target assurance.

“If the operator is putting a dot on a target, he is telling me ‘this is your target, not the one to the left, not the one to the right, that one,’” St. Vincent noted. “Laser guidance will always provide that 99.99-percent assurance that a specific truck or boat is your target.”

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## USS Donald Cook Returns to



# Mayport after Surge Deployment



The Arleigh Burke-class guided-missile destroyer USS Donald Cook (DDG 75) arrives at Naval Station Norfolk, April 13. *U.S. NAVY / Mass Communication Specialist Mass Communication Specialist 1st Class Jacob Milham*

JACKSONVILLE, Fla. – The Arleigh Burke-class guided-missile destroyer USS Donald Cook (DDG 75) returned to Naval Station Mayport following a three-month deployment, April 24, the U.S. 2<sup>nd</sup> Fleet said in an April 25 release.

Donald Cook departed Naval Station Mayport in January on a short-notice deployment to operate with NATO Allies and partners in the Eastern Atlantic, North Sea and Baltic Sea.

The crew spent more than 70 days at sea and conducted three port visits in support of maritime security partnerships in

Copenhagen, Denmark; Rostock, Germany; and the Isle of Portland, England.

“Visiting other countries as a representative of the United States is surreal,” said Fire Controlman (Aegis) 2nd Class Brady Itkin. “People told us how nice Americans are everywhere we went, and we were shown amazing hospitality by the civilians of other NATO countries. There’s no better feeling than making a positive impact on other people’s perspective of America.”

The ship received warfare excellence awards in communications, engineering and ship safety while underway.

“The crew put in a lot of hard work over the past year,” said Ensign Benjamin Steen, electronic warfare officer aboard Donald Cook. “This recognition is definitely a testament to all of our efforts.”

While deployed, Donald Cook participated in NATO Exercise Dynamic Guard 2022 in the North Sea. Dynamic Guard, hosted by Norway, is a biannual, multinational electronic warfare exercise series designed to provide tactical training for the NATO Response Force and NATO national units. For the first time in three years, two U.S. vessels participated to further enhance the ongoing cooperation, strength and interoperability between NATO Allies.

“The crew demonstrated their tenacity by executing multinational exercises and national tasking on short notice during this surge deployment,” said Cmdr. Matt Curnen, commanding officer of Donald Cook. “Our operations over the past few months have demonstrated our proficiency and capability as well as reaffirming our commitment to the NATO Alliance. I could not be more proud of the resiliency and professionalism the crew displayed during this deployment.”

Donald Cook is scheduled to start a major maintenance availability, its first since returning from their former homeport of Rota, Spain, in June.

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## Future APL 69 Conducts Builder's and Acceptance Trials



The Navy's newest berthing barge, APL 69, recently conducted builder's and acceptance trials in Pascagoula, Mississippi. This is a file photo of APL 67. *U.S. NAVY*  
WASHINGTON – The Navy's newest berthing barge, Auxiliary

Personnel Lighter (APL) 69, recently conducted builder's and acceptance trials in Pascagoula, Mississippi, Team Ships Public Affairs said in a release.

Builder's trials consist of a series of in-port tests and demonstrations that allow the shipbuilder, VT Halter Marine, and the Navy to assess the craft's systems to ensure installation in accordance with the original equipment manufacturer's guidelines and that the craft design and configuration meet the contract requirements.

Acceptance trials consist of integrated testing to demonstrate the capability of the platform and installed systems across all mission areas to effectively meet its requirements. These tests and demonstrations are witnessed by the Navy's Board of Inspection and Survey and are used to validate the quality of construction and compliance with specifications prior to delivery to the Navy.

"These vessels improve quality of life for our Sailors during ship maintenance availabilities and inter-deployment training cycles," said Capt. Eric Felder, program manager for U.S. Navy and Foreign Military Sales Boats and Craft, Program Executive Office Ships. "We look forward to delivering more of these vessels to the fleet to provide the necessary berthing, messing, administrative, and leisure facilities to crews while their ships are undergoing maintenance."

APLs are 82-meter-long barges that can berth up to 609 people – 72 officers and 537 enlisted personnel. Mess seating is available for 224 enlisted personnel, 28 chief petty officers and 28 officers in 20-minute intervals, allowing food service for 1,176 personnel with three meals a day.

APLs are used to house duty crews while ships are in maintenance availabilities and can be towed to new bases or shipyards to support changing fleet requirements. Additionally, they offer the potential use for humanitarian

missions and other temporary assignments. APLs are equipped with offices, classrooms, washrooms, laundry facilities, a medical treatment facility, a barber shop and a fitness center.

VT Halter Marine is currently in production of two additional APLs.

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## **Navy Awards Raytheon Up to \$1.68B for Zumwalt DDG Engineering Services**



Guided-missile destroyer USS Zumwalt (DDG 1000), right, and amphibious assault ship USS Tripoli (LHA 7) sail behind

amphibious transport dock USS Anchorage (LPD 23) in the Pacific Ocean, April 10. *U.S. NAVY / Mass Communication Specialist 2nd Class Malcolm Kelley*

TUCSON, Ariz. – The U.S. Navy awarded Raytheon Missiles & Defense an activation, sustainment and modernization contract for \$483 million with options, if exercised, totaling \$1.68 billion across five years, the company said April 20.

Under this contract, Raytheon Missiles & Defense will provide the U.S. Navy services and professionals to complete the activation and fleet introduction of the three Zumwalt-class destroyers, while continuing to develop technology and warfare capabilities.

“This contract underscores our role as a systems integrator, which goes beyond offering customers weapons and radars,” said Wes Kremer, president of Raytheon Missiles & Defense. “Our team provides Zumwalt destroyers extensive support, from engineering and cyber protection to software development and upgrades.”

Additional services will include design, integration, test and evaluation, system upgrade and replacement, logistics product development, configuration management and training systems.

The Zumwalt-class destroyers recently achieved initial operational capability in December 2021, with the inaugural fleet employment of USS Zumwalt scheduled for later this year.

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## **Navy Proposes to Cut Five**



# EA-18G Growler Electronic Attack Squadrons



Sailors assigned to the “Lancers” of Electronic Attack Squadron (VAQ) 131 recover an EA-18G Growler during night operations in 2020. Under Navy plans, the squadron is one of several that would be deactivated. *U.S. NAVY / Mass Communication Specialist Seaman Benjamin Ringers*

ARLINGTON, Va. – The U.S. Navy is proposing to deactivate five electronic attack squadrons, or VAQs, that operate the Boeing EA-18G Growler electronic attack jet, roughly a third of the Defense Department’s tactical jet electronic attack force.

As laid out in the recently released Department of the Navy’s fiscal 2023 budget highlights book, the Navy proposes to deactivate its entire expeditionary VAQ force, which deploys to overseas bases to provide electronic attack capabilities to the joint force. The five expeditionary VAQ squadrons are separate from the Navy’s VAQ squadrons that deploy on aircraft

carriers.

The Navy is the only provider of expeditionary electronic attack jets to the joint force. The Air Force retired its last EF-111A Raven jets in 1998 and the Marine Corps retired its last EA-6B Prowler tactical jets in 2019. The expeditionary VAQ squadrons have deployed to Southwest Asia, Japan and Italy over the years in support of U.S. and coalition forces. Last month, one squadron, VAQ-134, was deployed to the European Command as part of the build-up of forces in support NATO's eastern flank after the Russian invasion of Ukraine.

The budget book says the five squadrons include a total of 25 EA-18Gs which would be placed in storage at the Aerospace Maintenance and Regeneration Group at Davis-Montham Air Force Base in Tucson, Arizona, half in fiscal 2024 and half in fiscal 2025. The cuts also would free up approximately 1,020 officer and enlisted personnel. The Navy estimates the savings over the Future Years Defense Plan would be 807.8 million.

The Navy's five expeditionary VAQ squadrons are all based at Naval Air Station Whidbey Island, Washington: VAQs 131, 132, 134, 135, and 138. The Navy's only reserve VAQ squadron, VAQ-209, also has been used in an expeditionary role.

The carrier-deployable VAQ squadrons are VAQs 130, 133, 136, 137, 139, 140, 141, and 142, with another, VAQ-144, set for establishment in October. All are based at Whidbey Island, except for VAQ-141, which is based at Marine Corps Air Station Iwakuni, Japan, as part of the forward-deployed Carrier Air Wing Five for USS Ronald Reagan.

The expeditionary VAQ squadrons are considered high-demand/high-value assets by the Joint Chiefs of Staff. The assessments of the various regional combatant commanders may be instrumental in reversing or mitigating the Navy's proposal.

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# Navy's LCS Decommissioning Proposals Would Bring Major Changes for Retained Ships



The Independence-variant littoral combat ship USS Jackson (LCS 6) pierside in Guam during routine operations in 2021. Under new Navy plans, it would be operated by a single crew in 2023 and decommissioned in 2024. *U.S. NAVY / Mass Communication Specialist 3rd Class Andrew Langholf*

ARLINGTON, Va. – The U.S. Navy's 2023 budget proposal – including the Future Years Defense Plan – would result in profound changes to the missions, organization, force structure, training and crews of the Navy's littoral combat ships in addition to the force reduction by decommissioning of many of the ships.

The LCS remaining in service would see a second order of effects that would further show a force dramatically changed from the original vision for the ships. The surface warfare mission and the mine countermeasures mission will be divided by coast instead of mixed on both.

The Freedom-class LCS would be most the most affected by the proposed budget. Including earlier decisions, the Navy would, because of fiscal constraints, decommission LCS 3, 5, 7, 9, 11, 13, 15, 17, and 19 across the FYDP. (LCS 1 was decommissioned in 2021.) Six Freedom-class ships (LCS 21, 23, 25, 27, 29, and 31) would be retained, having been or will be completed with the combining gear improvement installed.

The Independence-class LCS will not be unscathed. The Navy proposes to reduce LCS 6 and 8 to single crews (from dual Blue-Gold crews) in 2023, and then decommission the two ships in 2024. (LCS 2 was decommissioned in 2021, and LCS 4 is scheduled to be decommissioned in 2022.) A total of 15 Independence-class ships would be retained in the fleet.

All LCS assigned the surface warfare mission would be assigned single crews only. Such crews would see their manpower increased by approximately 25 Sailors each to help sustain readiness levels that a second off-hull provided.

Since the antisubmarine warfare mission package is being divested, all LCSs marked for the ASW mission will be shifted to the surface warfare or mine countermeasures mission. Because of the substantial reduction in the number of LCS planned, the ASW mission in small surface combatants will reside solely in the future Constellation-class guided-missile frigate (FFG 62), which the Navy says is a “foundational mission set for the FFG 62 program, which is a more suitable platform and Variable Depth Sonar [VDS] capability will be added to the fleet through the FFG 62 class.”

The Navy is proposing the East Coast littoral combat ships –

which are of the Freedom class – be assigned only the surface warfare mission and the West Coast LCS – planned to be only Independence-class ships – be assigned only the mine countermeasure mission. As a result, there would be changes in the LCS command and support organization structure.

Accordingly, the LCS antisubmarine warfare divisions on both coasts would be disestablished in 2023 with the divestiture of the ASW mission. MCM Division 22 on the East Coast and SUW Division 11 on the West Coast also would be disestablished in 2023.

With the overall reduction in LCS ships and their crews, and a force of just 21 LCS planned (15 MCM ships and 6 SUW ships), the training infrastructure required for training would be reduced. The proposal calls for the disestablishment of LCS Training Facility Atlantic, consolidating all LCS training at LCS Training Facility Pacific.

All of these proposals will receive the scrutiny of the congressional armed services and appropriations committees.

If the total LCS changes were to be approved, the Navy estimates the savings to be \$391.4 million for fiscal 2023, totaling \$2.46 billion over the FYDP.

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## **USS Hershel ‘Woody’ Williams Completes Gulf of Guinea Maritime Security Patrol**





The Expeditionary Sea Base USS Hershel "Woody" Williams (ESB 4) sails the Adriatic Sea, Feb. 19. Hershel "Woody" Williams is on a scheduled deployment in the U.S. 6th Fleet area of operations in support of U.S. national interests and security in Europe and Africa. *U.S. NAVY / Mass Communication Specialist 1st Class Fred Gray IV*

NAVAL STATION ROTA, Spain – The Expeditionary Sea Base USS Hershel "Woody" Williams (ESB 4) arrived at Naval Station Rota, Spain, following a successful maritime security patrol in the Gulf of Guinea on April 18, 2022, said U.S. 6th Fleet Public Affairs.

From March to April, Hershel "Woody" Williams completed maritime security operations with African partners from Sierra Leone, Cabo Verde and Senegal as well as members of the U.S. Navy, Coast Guard and Marine Corps.

"The men and women that made this possible are a testament to our shared values and commitment to ensuring the safety,



security, and freedom of navigation on the waters surrounding the African continent,” said Capt. Michael Concannon, commanding officer, USS Hershel “Woody” Williams.

In March, the joint U.S. and African maritime team interdicted an illegal, unregulated, and unreported fishing vessel operating in Sierra Leone’s economic exclusive zone.

In April, as part of the African Maritime Law Enforcement Partnership, the joint team, led by Cabo Verde, worked in coordination with the Maritime Analysis and Operations Centre – Narcotics, INTERPOL and Cabo Verde’s national Maritime Operations Center to conduct a compliant boarding of a Brazilian-flagged fishing vessel, which led to the seizure of approximately 6,000 kilograms of suspected cocaine with an estimated street value of more than \$350 million.

“I couldn’t be more proud of the professionalism and integration of the U.S. tri-maritime services, partner nations and other supporting organizations during our maritime security operations,” Concannon said. “These maritime security events show the world that our African partners are poised and ready to strike against illicit activity.”

Hershel “Woody” Williams is the first warship permanently assigned to the U.S. Africa Command area of responsibility. The U.S. shares a common interest with African partner nations in ensuring security, safety and freedom of navigation on the waters surrounding the continent, because these waters are critical for Africa’s prosperity and access to global markets.

The ESB ship class is a highly flexible platform that may be used across a broad range of military operations. Acting as a mobile sea base, they are part of the critical access infrastructure that supports the deployment of forces and supplies to support missions assigned.

For over 70 years, U.S. 6th Fleet forces have forged strategic

relationships with our allies and partners and solidified a foundation of shared values, experiences and vision aimed at preserving security and stability.

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## Navy Proposes Elimination of Snakehead LDUUV program



Cheryl Mierzwa, Naval Undersea Warfare Center Division Newport's technical program manager for the Snakehead Large Displacement Unmanned Undersea Vehicle, christens the underwater vehicle at the Narragansett Bay Test Facility in Newport, Rhode Island, on Feb. 2. *U.S. NAVY*

ARLINGTON, Va. – Even as the U.S. Navy was christening the first prototype of the Snakehead large-diameter unmanned underwater vehicle (LDUUV) in February, planning was underway to cancel the program.

The Navy is proposing in its 2023 budget to eliminate the Snakehead program, according to the Navy Department's recently released Fiscal 2023 budget highlights book.

The Snakehead is intended to be a major advance in UUVs and designed to be the largest UUV to be deployed on the interfaces of the Navy's attack submarines. It is designed to be autonomous, modular and reconfigurable, equipped with a government-owned architecture. It features innovative hull materials and certified lithium-ion batteries. It is designed to be deployed from a modernized dry-deck shelter.

According to the budget highlights book, the major problem in the program was "Misalignment of Snakehead LDUUV design and procurement efforts with submarine hosting interfaces result[ing] in limited availability of host platforms to conduct Snakehead operations."

The book also said that "cost and schedule delays associated with LDUUV development and Virginia Class SSN [attack submarine] integration prohibited further investment."

The only alternative launch and recover interface for the Snakehead is the Modernized Dry Deck Shelter. The U.S. Special Operations Command in conjunction with the Navy is modernizing three Dry Deck Shelters between 2022 and 2026. They are scheduled to become available for use in 2022, 2023, and 2026, respectively.

Under Phase One of the Snakehead program, only one vehicle was built.

The Navy estimates the cancellation of Phase Two of the program and future Snakehead procurement will save the Navy \$185.9 million in fiscal 2023, resulting in a total savings of \$516.8 million over the Future Years Defense Plan.

The Snakehead Phase One prototype was christened on Feb. 2 at the Narragansett Bay Test Facility in Newport, Rhode Island,

by a team from the Naval Undersea Warfare Center Division Newport and the Program Executive Office for Unmanned and Small Combatants.