From MRAP to MADIS: Legacy of Innovation Endures at NIWC Atlantic

NORTH CHARLESTON, S.C. (January 13, 2026) Naval Information Warfare Center (NIWC) Atlantic's Expeditionary Warfare (ExW) Department personnel work on integrating Marine Air Defense Integrated System (MADIS) software, components and weapons onto Joint Light Tactical Vehicles (JLTVs) at the command's Vehicle Integration Facility on Jan. 13, 2026. The engineers and computer scientists are part of the ExW Department's Counter Threat Platforms team that for over a year now has been helping to field the drone-defeating MADIS capability to Marines at the 3rd Littoral Anti-Air Battalion and the Marine Corps Communication-Electronics School. (U.S. Navy photo by Joe Bullinger/Released)

By Steve Ghiringhelli, NIWC Atlantic Public Affairs, March 10, 2026

As one of the Navy's top labs in systems integration, NIWC Atlantic engineering and ingrained innovation culture continue to deliver information warfare-dominant platforms that make the Naval and Joint Force more connected, resilient and lethal.

CHARLESTON, S.C. – Throughout 2025, Naval Information Warfare Center (NIWC) Atlantic helped deliver the drone-defeating Marine Air Defense Integrated System (MADIS) to the Marine Corps, shepherding a critical breakthrough in air defense technology that significantly improves warfighter survivability and lethality.

The MADIS system, which is mounted on two Joint Light Tactical Vehicles (JLTVs), detects aerial threats and defeats them with a 30mm cannon, Stinger missiles and electronic warfare capabilities.

"As one of the Navy's top labs in systems integration, NIWC Atlantic collaborates with industry partners to adopt the latest software and engineering innovations and quickly turn them into information-dominant platforms," said Erick Fry, NIWC Atlantic acting executive director. "In the case of MADIS, our Expeditionary Warfare (ExW) Department very rapidly delivered a capability to U.S. Marines that defeats low-altitude threats and makes the Naval and Joint Force more connected, resilient and lethal."

The effort began in 2022, when ExW Department engineers used commercial off-the-shelf (COTS) components and leveraged the command's On Demand Manufacturing Lab to outfit JLTVs with the necessary weapons, sensors, radar and other equipment to complete MADIS Increment 1.0 in less than one year's time. The capability then matured through rigorous tests and trials before fielding to Marines at the 3rd Littoral Anti-Air Battalion and the Marine Corps Communication-Electronics School in late 2024 and throughout 2025.

Fry said MADIS is one of many examples at NIWC Atlantic that builds upon the command's historic successes in working with the Marine Corps and industry partners to rapidly innovate, prototype and integrate command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) components onto warfighting platforms like the JLTV.

"NIWC Atlantic engineers modernize and streamline the complex work of systems integration each time they iterate," Fry said. "I couldn't be prouder of their accomplishments and continued advances on the innovation front."

'Speed of MRAP'

A triumph still remembered today for its rapid warfighter response is NIWC Atlantic's C4ISR integration of thousands of Mine Resistant Ambush Protected (MRAP) vehicles for Marines in Iraq and Afghanistan, an effort that began in 2008 and ended up blasting through slow bureaucratic processes to save countless lives.

Last November, Secretary of War Peter Hegseth invoked the MRAP effort during a speech he delivered at the National War College announcing sweeping reforms in how the Department of War (DOW) will procure warfighting capabilities. With the current backdrop of a complex and ever-evolving threat environment, the Secretary stressed an urgency to move at "the speed of MRAP."

"Our objective is simple—transform the entire acquisition system to operate on a wartime footing," he told the crowd.

For a warfare center like NIWC Atlantic, rapidly integrating commercial products and information technologies onto mission-ready platforms is job No. 1.

But speed and government are not often synonymous.

Nevertheless, NIWC Atlantic has long been a driver for disrupting the status quo to gain greater flexibilities to navigate the complex world of military acquisitions. From MRAP to MADIS, NIWC Atlantic has rapidly delivered capabilities to provide warfighters speed, connectivity, lethality and survivability, despite the roadblocks.

For example, when the JLTV first entered the U.S. military, the ExW Department overcame strict size, weight and power limitations to integrate components like sensors, jammers, advanced radio systems, battle-management software and communications equipment onto four distinct JLTV variants. Eventually, the department would field more than 5,000 of the high-tech vehicles to the Marine Corps and another 17,000 JLTVs to the Army, Navy and Air Force.

Today, the JLTV and its advanced onboard suite of C4ISR services is considered by many a cornerstone platform of Marine Corps modernization in protected and expeditionary vehicles.

More recently, the ExW Department began integrating the new Amphibious Combat Vehicle (ACV), the Marine Corps' next-generation, amphibious transport that will replace the older Assault Amphibious Vehicles.

"NIWC Atlantic is committed to delivering cutting-edge capabilities to the warfighter with speed and precision," said ExW Department Head Ashlee Landreth. "By applying lessons learned from MRAP and embracing modularity, rapid prototyping, rigorous testing and warfighter feedback, we are accelerating the development and fielding of next-generation technologies that give the Naval and Joint Force a decisive edge on the battlefield."

Engineers who have worked at the command for decades say teams have refined and baked lessons learned into the systems-integration process, something that intricately includes COTS solutions, to build the systems for the platforms that Marines take to war.

For example, NIWC Atlantic's signature Networking on the Move (NOTM) technology was designed in 2012 in response to an urgent Marine Corps request by U.S. Central Command to expand the capability to vehicles beyond the MRAP. Once the JLTV emerged, the Marine Corps asked ExW Department to develop a transferrable variant for it.

So the team engineered a way for NOTM to be integrated onto three separate JLTVs, operating as one system, providing Marines a sophisticated communications hub to transmit and receive vital information across the battlespace in seconds, allowing infantry troops to fight at high speeds while still maintaining critical command and control functions.

More recently, the ExW Department also integrated long-term power supplies and a completely redesigned, state-of-the-art communications system onto the Ground/Air Task-Oriented Radar (G/ATOR), a 360-degree, 3D surveillance, air-defense and air-control radar system that has replaced five legacy systems for the Marine Corps.

The department also outfitted the JLTV with the Navy-Marine Expeditionary Ship Interdiction System, or NMESIS, which is a cutting-edge, land-based, anti-ship missile capability tailored for the complex littoral environment.

Jenny Bennett, who leads the ExW Department's platform integration team that was responsible for fielding the JLTV, said every integration has to be meticulously managed through workflow processes that ensure the end-user, the warfighter, always gets into the identical JLTV variant—same look, same

feel, same function. “We baseline every truck before turning it over to our MADIS, NOTM or NMESIS teams,” she said.

Modularity & Speed

As a result of MRAP lessons learned, the ExW Department eventually broke with tradition and began procuring technical data packages (TDPs) from industry. Owning the TDPs that are tied to a COTS solution ensured government could find alternative, competitive sources in the marketplace during times of supply chain instability.

Peter Ward, ExW Department deputy, who was a young systems engineer just joining NIWC Atlantic 20 years ago, said the department continued to innovate. It bought and standardized data and focused heavily on incorporating a more vendor-neutral, “modular open systems approach,” or MOSA.

“We have focused on modularity for a long time,” Ward said. “No matter which commercial solution is available, the MOSA framework specifically enables a collaborative environment for working with vendors and filling specific operational needs.”

With TDPs and other sensitive data, Ward said MOSA concepts help ensure proprietary data does not later keep engineers from achieving interoperability.

Recently, MOSA also enabled ExW Department engineers to tailor COTS software to build a secure, hardware-agnostic platform called the Common Hosting Environment (CHE). Using next generation technologies, CHE is the first container-hosting environment that can run apps for Marines in the field.

Perhaps just as important as the unseen innovations in software, agile processes and engineering insights, the physical infrastructures stood up at NIWC Atlantic since the MRAP buildup is paying enormous dividends now 20 years later.

In 2007, NIWC Atlantic first stood up Poseidon Park for radio frequency testing of vehicle-mounted antennas. Instead of shipping vehicles hundreds of miles away on rail, JLTVs, ACVs and other vehicles drive onto an automated vehicle turntable to be tested and validated under an overhead gantry through range checks, antenna cosite analysis and verifications of survivability.

In 2011, the command unveiled the nearby Small Autonomous Unmanned Systems Research (SAUSR) Range to support drone swarming technologies, resilient communications, C4ISR test and evaluation, and other science and technology research.

Last year, the SAUSR Range expanded its footprint and mission set to unveil a new laser range focused on advancing naval communications through the research and development of free-space optics.

In addition to the two outdoor capabilities, NIWC Atlantic began building indoor systems integration labs, or SILs, enabling engineers to test and integrate new commercial solutions within physically constructed replicas of real-world platforms, such as one resembling the inside of a JLTV and another one the Marine Corps' new advanced reconnaissance vehicle.

"The systems integration process becomes a lot more agile and iterative when you are working in these controlled environments," said Jeff Sims, who leads the Expeditionary Platform Integration Division at ExW Department. "SILs enhance continuous improvements and the rapid adaptation of solutions."

SILs have also institutionalized rapid prototyping practices, bringing together diverse vendors, industry partners and subject matter experts to optimize the integration of the

latest innovations, from GPS technologies, radios, ruggedized laptops, sensors and cameras to data-fusing AI, advanced networking, driver-vision systems and electronic warfare.

“The cool thing is how the SIL speeds us up, gives us more flexibility and gets us across the finish line through modeling and simulation,” Ward said. “Instead of requiring that everyone come together all at the same time to integrate, whenever a program discovers a new commercial product offering, we can just go in with all the other equipment, see how it configures, design it, integrate a new system and get it out the door.”

Platforms successfully integrated inside of a SIL are then dispatched for environmental and operational testing at Poseidon Park, SAUSR Range and other labs on base. Before final warfighter acceptance, a field user evaluation is typically coordinated with Marine units.

“All of these developments have helped us field equipment faster, because it’s not only about researching and finding products off the shelf,” Ward said. “When you procure them, you need to integrate them and modify them, so they work together and do no harm to one another, and then test them. Without these labs and ranges on site, where we can physically drive the vehicles to see which ones perform best, it would take forever.”

At NIWC Atlantic, innovations in automation, engineering, modularity, systems integration and software-defined communications have made the command good stewards of their many MRAP lessons-learned. Rather than be cloistered in labs, teams are external-facing, working closely with pioneers in industry, constantly experimenting with the integration of systems, walking lockstep with their Marine sponsors and very appreciative of the multifaceted stakeholder relationships a Navy lab like NIWC Atlantic must continually foster and

support in order to continue delivering worldclass information warfare solutions to the Fleet.

“We know the Marine Corps requires information warfighting capabilities to create and exploit information advantages on all points of the competition continuum,” Landreth said. “This is why NIWC Atlantic—from MRAP to MADIS and beyond—plays such a critical role in the success of the modern-day Marine.”

About NIWC Atlantic

As a part of Naval Information Warfare Systems Command, NIWC Atlantic provides systems engineering and acquisition to deliver information warfare capabilities to the naval, joint and national warfighter through the acquisition, development, integration, production, test, deployment, and sustainment of interoperable command, control, communications, computer, intelligence, surveillance, and reconnaissance, cyber and information technology capabilities.