

First Augmented Reality Maintenance Systems Operational on Five Ships



Naval Surface Warfare Center, Port Hueneme Division (NSWC PHD) Fire Controlman Petty Officer 1st Class Donald Tran demonstrates the Augmented Reality Maintenance System aboard USS Spruance (DDG 111) during a recent Combat Systems Assessment Team event at NSWC PHD. The technology could reduce the number of onboard technical assistance visits by connecting sailors and subject matter experts through augmented reality and audio.

By [Brian Varela](#), May 14, 2025

Sailors are a ship's first line of defense against system failures. But when the issue requires a subject matter expert (SME), repairs have often had to wait until a technician could travel to the ship.

Enter ARMS, short for the Augmented Reality Maintenance System. ARMS enables sailors and Naval Surface Warfare Center, Port Hueneme Division (NSWC PHD) SMEs to instantly address system failures and eliminate the need for costly travel – and it's now installed aboard five Navy ships.

NSWC PHD's Augmented Reality Maintenance System (ARMS) team recently outfitted five ships in less than a week with the unique and fully operational remote viewing instruments.

The group installed the technology on USS Curtis Wilbur (DDG 54), USS Lenah Sutcliffe Higbee (DDG 123), USS Gridley (DDG 101), USS Fitzgerald (DDG 62) and USS Nimitz (CVN 68) with support from Naval Air Systems Command (NAVAIR) and Naval Information Warfare Systems Command (NAVWAR). NSWC PHD electronics engineer Matthew Cole and computer scientist Nick Bernstein led the effort between March 22 and 26.

"Sailors are by trade operators and maintainers of their warships," NSWC PHD Commanding Officer Capt. Tony Holmes said. "It's never a matter of if, but when, systems aboard a ship will require some sort of troubleshooting and/or corrective maintenance to keep them operating. If outside help is required to resolve an issue, and that issue can be resolved by over-the-shoulder assistance via ARMS, that is a good thing."

This remote assistance not only empowers sailors to fix problems quickly and keep their systems operating, he explained, it also saves time and money by averting the need for an SME to fly out to the ship for onboard technical assistance.

"The biggest win in this case is that the sailor fixed the problem, not the external SME," Holmes added. "ARMS capability goes to the heart of enabling sailor self-sufficiency, and keeping our warships in the fight."

Prior to the recent installations, Bernstein – who is also the ARMS engineering lead – led a small NSWC PHD ARMS team to conduct short technical demonstration installations aboard three ships. The group used AR hardware with the same NAVAIR-developed ARMS software, Bernstein said.

For the March installations, Bernstein and Cole worked with the internal and external ARMS team to equip the aircraft carrier and four guided-missile destroyers with the latest hardware and software to be used on their deployments.

“These are the first operational, useable ARMS installs,” Bernstein said.

Augmented reality

ARMS is a remote viewing capability used to connect deployed sailors with subject matter experts (SMEs) at warfare centers, in Regional Maintenance Centers and other shoreside locations. Sailors wear a simplified AR headset that allows the SMEs to observe and troubleshoot any shipboard systems in real time by seeing and hearing from the sailor’s point of view. While wearing the headgear, the sailors can pull up technical manual excerpts, maintenance requirement cards, 3D images, design models or schematics to restore a system while the remote SMEs talk them through the process.

The team aims to use the technology to reduce the number of visits command personnel make to ships to provide them with technical assistance. ARMS can also reduce the length of time NSWC PHD personnel spend aboard by diagnosing issues in advance.

As a result, the fleet will receive faster support without waiting for technicians to arrive aboard.

“Now, we can send the right expert with the right tools out to the ship, thereby saving time and money,” Cole said.

Installation and test

The five-day installation in March marked the end of one Interim Authority to Test (IATT) and the beginning of another. The Navy conducts IATTs as a first step to check within a specified time period that a new system works and to gather feedback for upgrades.

The first IATT was scheduled to expire in March. However, NAVWAR Commander Rear Adm. Seiko Okano requested the original seven-month time frame to perform an operational ARMS capability be narrowed down to one month so the AR equipment could be installed aboard the five ships before they deployed from Naval Base San Diego, Bernstein said.

The vessels were ported simultaneously for a one-week period in San Diego, so the group had to work fast. The ARMS installation team – which included NSWC PHD and Naval Information Warfare Center Pacific SMEs – installed each system in less than a day while also training sailors.

During the current IATT, the team will monitor ARMS usage and solicit feedback to improve its capabilities and handling ahead of the full Authority to Operate.

Gear changes

Throughout the first IATT, ARMS utilized an AR/mixed reality headset that had been used commercially for remote collaboration and training. After the product was discontinued in October, the ARMS system switched to AR smart glasses to retain the hands-free goal of ARMS.

The ARMS team is also looking at other potential headsets,

including a 3D-printed alternative the command's Engineering Development Lab is developing, Cole said.

Since he first got involved with the program in fiscal year 2022, Bernstein has watched ARMS grow as it reached numerous milestones. He said he's excited to see ARMS maturing as it's fielded for operation aboard future ships.

"It's incredibly rewarding seeing this project transition to the fleet and stand on its own to support sailors and SMEs," Bernstein said.