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NAVY SBIR TRANSITION PROGRAM

SPOTLIGHT

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Holochip awarded Best Paper by AIAA for Navy SBIR-funded flight simulator display system with accurate visual depth cues

In July 2025, Holochip Corporation, a small business focused on advanced 3D visualization, extended reality (XR), and spatial computing technologies, was awarded the 2024 AIAA Modeling and Simulation Best Paper by the American Institute of Aeronautics and Astronautics (AIAA).

Presented at the 2024 AIAA Aviation Forum, Holochip's paper, "Advancements in Flight Simulation Visual Systems: An In-Depth Analysis of Variable Collimation Display Technology," detailed the company's Navy SBIR project aimed at significantly improving the efficacy of the Navy's rotorcraft flight simulator visual systems.

Holochip's variable collimation display (VCD) is a glasses-free display technology that provides accurate visual depth cues in downlook displays for Navy pilots training in rotary wing aircraft simulators. Rotary wing aircraft pilots must rely on close proximity visual cues to judge distance to the ground and other points in the environment during hovering, take-off and landing, search and rescue, cargo loading/unloading, and other operations in confined spaces.

Current Navy rotary flight simulators typically use wide-angle collimated (WAC) and real image displays. WAC displays provide immersive visual experience out-the-window with correct depth cues for points in the far distance but fail to recreate accurate depth cues at close range. Conversely, real image displays create fixation points at close range (approximately 3 meters) but fail at providing accurate depth cues at greater distances. Holochip's VCD system corrects this issue by providing accurate visual depth cues from approximately 3 meters to visual infinity (>9 meters), allowing pilots' eyes to focus naturally and correctly, without requiring special glasses or headsets, thereby improving their ability to judge distances accurately. The VCD is designed as a drop-in replacement for chin window displays in most standard rotorcraft simulators, integrating with existing image generators using the Common Image Generator Interface (CIGI) standard.

Image provided by Holochip

Holochip's H50 AR headset

In May 2023, the Navy evaluated the VCD by integrating it into the right chin window of a CH-47 Transportable Flight Proficiency Simulator (TFPS) at Naval Air Station Patuxent River, Maryland. Over two days of use by Navy test pilots, both error and standard deviation in the pilots' altitude estimations decreased by 57%,

demonstrating clear performance improvements when using the VCD.

The VCD is one of several innovative solutions Holochip is developing for the Navy. According to CEO Robert Batchko, the company plans to deliver prototypes for two additional SBIR-funded projects by the end of 2025.

One is the H50 goggle-style AR headset, a ruggedized cybersecure headset that provides a wide field of view, ergonomic comfort and AI-enabled gesture recognition for hands-free operation.

Initially developed for NAVAIR aviation maintenance applications, the H50 is also being adapted for Environmental Protection Agency disaster response software applications, enabling response teams to generate and share large 3D maps of interior and exterior structures, coordinate with command and control, and access critical software tools and data in the field.

Many other integrated visual augmented soldier (IVAS) applications can use the technology as well. Batchko anticipates the H50 goggles will fill a gap in the commercial market as Microsoft's popular HoloLens product line phases out.

The second prototype, the Holoview, is a Navy SBIR-funded project currently in Phase I. Although prototypes are typically the culmination of a Phase II contract, Holochip invested internal R&D funds to build a fully integrated system during Phase I.

"We're really excited about this program because it's so aligned with Holochip's mission and the technical requirements make it so unique," said Batchko. "It's an autostereoscopic XR system, meaning it's capable of providing a high-fidelity extended reality (or mixed reality) experience but without a headset. This was a core requirement of the program—nothing on the head, no glasses, no head worn display—you just stand in front of a wide screen and it's like a window into a virtual world. Further, the display's headbox must be much larger than that of current solutions, having sufficient width and height to match the typical head motion envelopes of fixed wing and rotary flight simulators."

"Delivery of a prototype is rarely required in Phase I, but the value of going beyond the topic description and letting your SBIR team evaluate your solution 'hands-on' cannot be overstated," added Holochip's VP of Engineering, Sam Robinson.

Holochip is developing the Holoview for NAVAIR with air-to-air refueling as the initial demonstration application. Like the H50 goggles, the company expects Holoview technology to find applications in a broad range of markets. "This is something we're very passionate about and it ties together perfectly with the arc of all the other technology we've developed for the Navy over the last 14 years," explained Batchko.

The common thread in Holochip's Navy technology programs is the focus on enhancing situational awareness and the visualization of complex information while reducing cognitive load for the user, said Batchko. The company's solutions are built on core technologies in optics, 3D computer graphics, computer vision and spatial computing, as well as

hardware engineering and artificial intelligence and machine learning (AI/ML), capabilities developed in part through SBIR projects since Holochip's first award from DARPA in 2008.

"The Navy has been one of our major customers in the SBIR community," said Batchko. "Under SBIR contracts we've developed expertise and functionality that we're bringing into our solutions to fill capability gaps for the Navy."

Working with the Navy and other federal agencies through the SBIR program has been both challenging and rewarding for Holochip. "The program is a lot of work. It's highly competitive and not for everybody. For a small team it's very demanding," explained Robinson. Devoting company resources to identify solicitation topics, write competitive proposals, continue working through funding gaps between SBIR contracts, and then market the firm and the technology to targeted customers is a process that requires resilience and toughness, in his view. "It's really a culture, and it takes a lot of time for a small business to train everybody to support the SBIR effort."

The Navy provides resources to help small businesses successfully navigate the SBIR process and transition their solutions to the warfighter. Holochip has participated in the Navy SBIR Transition Program (Navy STP) during several of its Navy Phase II contracts, including the Phase II for the VCD technology.

"Those programs have been very effective in introducing us to other DoN and military customers, networking with other companies, getting publicity, getting us into conferences and helping us demonstrate our technologies," said Batchko. "I would go back and do the STP again anytime."

Recently, Holochip also connected with the Department of the Navy SBIR Experimentation Cell (DoN-SEC), which helps connect DoN SBIR-funded Phase II projects with the defense experimentation community. The company has already tested its SBIR-funded solutions at the Naval Postgraduate School's Joint Interagency Field Experimentation (JIFX) 2025 events and looks forward to working with the DoN-SEC to expand those efforts in the future.

"In 2026 we plan to roll out the H50 with the DoN-SEC to different field events and get it into the hands of prospective customers," Batchko said.

"At the end of the day, the goal of the SBIR program can pay off for the companies. It's a tough road and more work is needed to level the playing field for small businesses of all sizes, but the opportunity to fill critical technology gaps and launch products out of the SBIR program is very real."

Headquartered in Torrance, California, Holochip develops custom XR and holographic display solutions for industries including defense, medical, simulation and training, entertainment, automotive, aviation, maritime and space. The company's team has expertise in advanced computer graphics, XR hardware and software, game engine integration, light field display, optics, robotics, and computer vision. For more information, visit www.holochip.com.

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