

Department of the Navy SBIR/STTR Transition Program

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NAVAIR

Topic # N121-041

Variable Accommodation Head Mounted Display
Holochip Corporation

WHO

SYSCOM: NAVAIR

Sponsoring Program: Naval Aviation Training Systems Program Office (PMA 205)

Transition Target:

TPOC:
(407)380-8031

Other transition opportunities: The primary application is in high fidelity helicopter simulators and Level D FAA simulators. Potential transition targets include the chin windows for the CH-47F TFPS and CH-53 trainer; additionally, chin, cargo hatch window and out the window (OTW) visual systems for fixed, rotary wing and vertical/short takeoff and landing (V/STOL) aircraft simulator platforms, and other simulation and virtual reality (VR) and augmented reality (AR) platforms.

Notes: Top: Holochip's Variable Collimation Display (VCD). Bottom: Holochip's Variable Accommodation Head Worn Display (VAHWD).



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WHAT

Operational Need and Improvement: Rotary wing platforms require a complex set of flight regimes using low-altitude close-proximity visual cues while in hover, launch and recovery, search and rescue, cargo management, and search-and-rescue missions. Current aircraft simulator visual displays provide monoscopic visual cues using either real image or fixed collimated displays. Each technology has its own advantages and disadvantages. However, no optimal solution exists today for low altitude operations that provide binocular disparity, and correct vergence-and-accommodation at low altitudes.

Specifications Required: A display system that delivers all visual cues with a sufficiently large viewing angle that matches real-world depth perception while retaining general spatial orientation; low-altitude weather and night vision goggle (NVG) presentation, chin window and cargo hatch viewing of low-altitude, landing zones with changes in depth perception that are correct with dynamic changes in own-aircraft altitude and full correlation with the forward field-of-view imagery.

Technology Developed: Two Solutions: Head-Worn and Head-Up Displays enabled with natural accommodation depth cues.

1. Variable Collimation Display (VCD)

A wide-area collimated (WAC) display system with variable collimation provides accurate accommodation and vergence visual depth cues for image distances ranging from 3 to 60 m from pilot's eyes.

2. Variable Accommodation Head Worn Display (VAHWD).

A head-worn display (HWD) enabled with Holochip's focus-tunable lens stimulates natural focusing of the eye. The user experiences correct focus and vergence. Discomfort associated with Vergence-Accommodation Conflict is eliminated.

Applicable to VR/AR simulation and training environments

Warfighter Value: The VCD provides accurate accommodation cues based on the aircraft's distance to the ground. This innovative display technology improves visual cues provided to pilots and low-level (< 30 ft) operations, improving safety and training. The VCD may also contribute to enhancements on other display applications currently limited by a lack of accurate depth cues.

The VAHWD provides accurate accommodation-vergence depth cues needed for Navy training VR and AR applications in which vergence-accommodation conflicts remain a major problem.

WHEN

Contract Number: N68335-18-C-0056 **Ending on:** December 22, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Variable Accommodation Head-Worn Display (VAHWD): Complete prototype; Demo in lab	Med	Simulation results achieve requirements	4	September 2019
VAHWD: Human factors studies	Med	Demonstration of visual cues	6	December 2019
Variable Collimation Display (VCD): Complete prototype; Demo in lab	Low	Demonstration of VCD technology at lab	6	September 2019
VCD: System integration; Evaluations with pilots	Med	Demonstration of VCD with an image generation (IG) or relevant computer graphics environment	7	December 2019

HOW

Projected Business Model: Holochip is interested in partnering, joint venture or licensing agreements with Navy training system original equipment manufacturers (OEMs) and prime contractors. We seek opportunities to work with the developers of flight simulators to integrate and demonstrate our low-cost optical display technology into various training platforms.

Company Objectives: Holochip is a developer and supplier of Natural Depth Cue Displays for defense, industrial and consumer electronics. Our technologies enable next-generation flight training simulator displays with correct depth cues, enabling the natural focusing response of the user's eyes, for improved spatial awareness. The VCD and VAHMD are part of our suite of VR/AR, light field and WAC true focus display solutions for Navy and commercial customers.

Potential Commercial Applications: The initial commercial applications include chin window, cargo hatch, refueling and out-the-window (OTW) visual systems for fixed, rotary wing and vertical/short takeoff and landing (V/STOL) aircraft simulators and other simulation and virtual reality platforms.

Contact: Robert Batchko, President
rgb@holochip.com 650-906-1064