

NASA SBIR/STTR Technologies

H4.02-8749 - Projection/Reflection Heads-up Display



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Identification and Significance of Innovation

To address the NASA need for an extravehicular activity (EVA) information display device, Physical Optics Corporation (POC) proposes to advance development of a new Projection/Reflection Heads-up Display (Pro/Ref-HUD) based on innovative integration of liquid crystal display (LCD) screen projectors, partially see-through optical reflectors and unique ergonomic designs. This approach enables the displayed image to meet NASA EVA requirements and is completely decoupled from the user's head. The Pro/Ref-HUD offers full-color, high-resolution collimated images, with large fields of view, highly suited to the space and weight constraints inside an astronaut's suit. In Phase I, POC successfully demonstrated the feasibility of the Pro/Ref-HUD system by designing, building, and testing a TRL-4 prototype. In this Phase II, POC proposes to develop a fully functional prototype to demonstrate sunlight readability and SXGA resolution to TRL-6.

Estimated TRL at beginning and end of contract: (Begin: 4 End: 6)

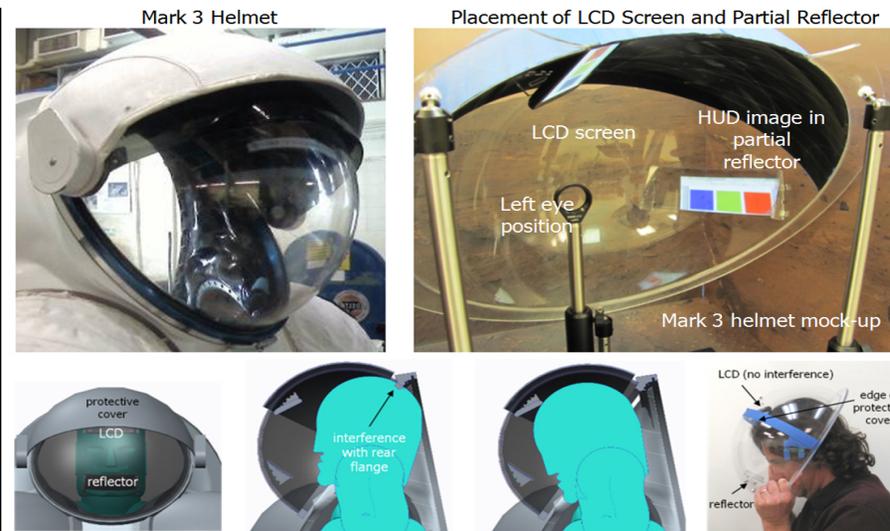
Technical Objectives and Work Plan

Technical Objectives

- Objective 1. Refinement of the Pro/Ref-HUD design by analytical computer modeling and optical ray-tracing.
- Objective 2. Demonstration of the individual projection and reflection components.
- Objective 3. Demonstration of the integrated Pro/Ref-HUD system inside the Mark 3 helmet.
- Objective 4. Exploration of the commercial scenarios for the Pro/Ref-HUD optics technology.

Work Plan

1. Develop System-Level Design for the Proposed Pro/Ref-HUD System
2. Design Projection and Reflection Optics by Computer Modeling
3. Design, Fabricate, and Test the Pro/Ref-HUD Reflector Optics
4. Design, Fabricate, and Test the Pro/Ref-HUD Image Projection Subsystem
5. Design, Fabricate, and Test Mechanical Fixtures for the Mark 3 Spacesuit Bubble
6. Demonstrate the Integrated Pro/Ref-HUD
7. Explore Commercial Potential
8. Prepare and Submit Reports



NASA Applications

The Pro/Ref-HUD technology will provide new capabilities for astronauts during EVA with a see-through display system that allows them to monitor the conditions around them while being provided visual instructions and direction in a hands-free format. Applications include space walks on the International Space Station (ISS) where navigating the structure can be completed with maps, and repairs completed with heads-up manuals.

Non-NASA Applications

Military applications of the Pro/Ref-HUD system will include HUDs for pilots of high-altitude supersonic aircraft. The Pro/Ref-HUD can be used by the Air Force or the Navy and others aboard the current Apache helicopter and the CH-53K heavy lift helicopter under development, offering numerous benefits. Additionally, applications include commercial vehicle HUDs.

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NON-PROPRIETARY DATA