

# Divers Augmented Vision Display (DAVD)

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Military Diver Capabilities  
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**DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited**

## ONR Naval S&T Vision and Strategy



*...develop revolutionary new capabilities...*

*...mature and transition science & technology advances...*

*...invest in breakthrough scientific research and innovative technology...*

## NAVSEA 00C3 Strategic Plan for 2011-2025



*...identify, exploit, and develop technology to advance the state-of-the-art in diving equipment...*

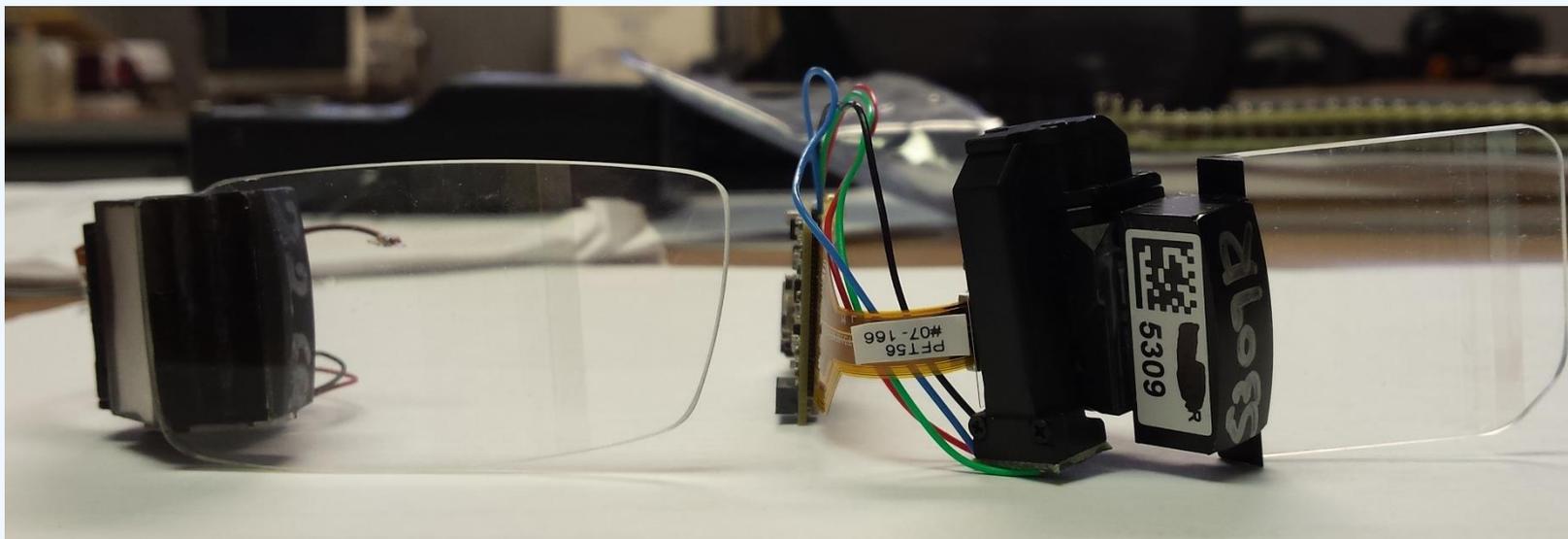
# Divers Augmented Visual Display DAVD

“Underwater Night Vision”

## Description:

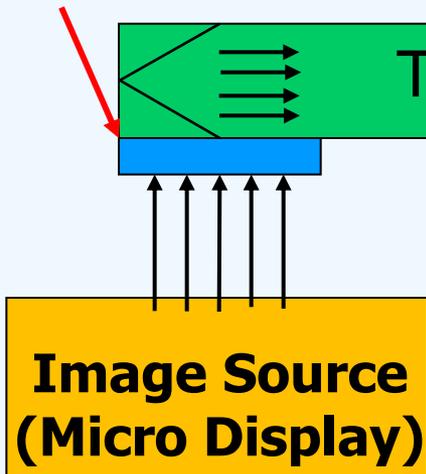
- **Binocular see-through heads up display , HUD to provide critical data, (sonar imaging, graphics, augmented & virtual reality (AR/VR), Navigation) in low /zero visibility conditions.**
- **Diver locating and positional tracking for projected 1<sup>st</sup> and 3rd person perspective to support underwater navigation.**

# Lumus Optical (waveguide light optical elements)



# Waveguide Optics – The Basics

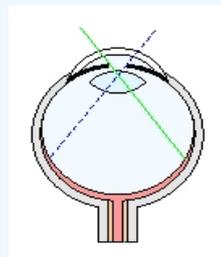
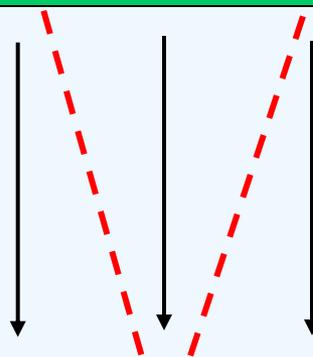
**Optical Coupling  
&  
Magnification**



**Total Internal Reflection (TIR)**



**Waveguide**

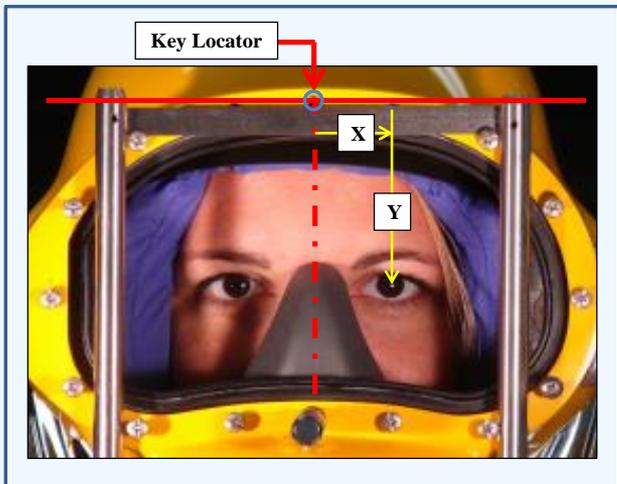


# Laboratory Testing and Measurements



- Focal Distance
- Field-of-View
- Eye Box
- Image Convergence

Cameras used to simulate the Divers eyes



Eye location measurements



# Generation 1 DAVD Prototype System



**Topside Control Box**

**300 FT Umbilical**



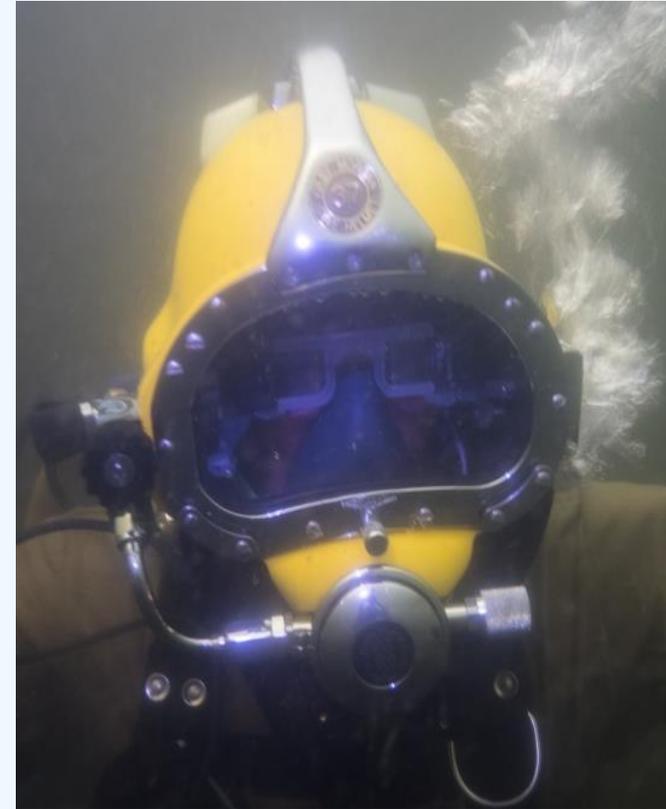
# Design Reference Mission Simulations



# Military Diver Evaluations

## 3 Tasks:

- Navigate to and locate targets
- Identify specific target
- Complete valve lineup

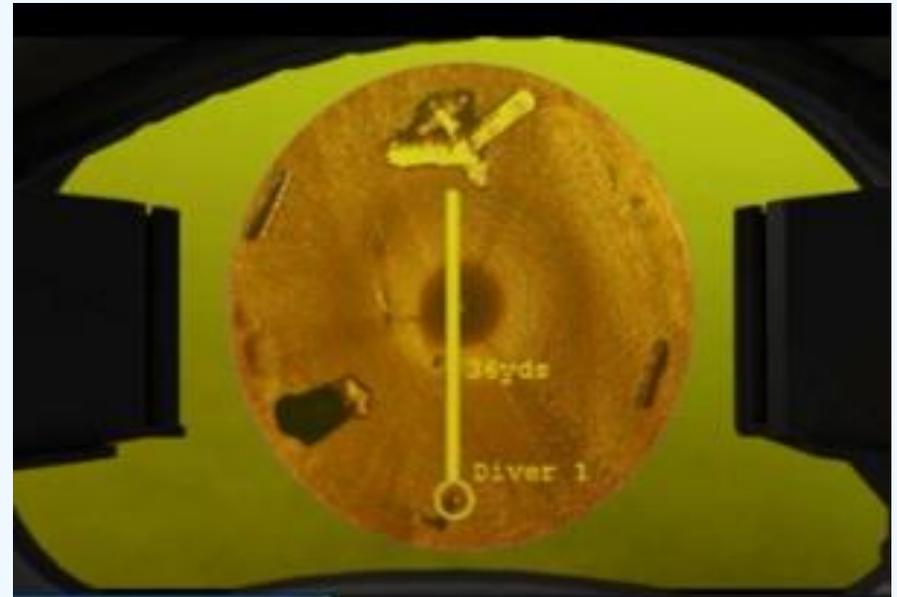


**Naval Diving & Salvage Training Center (NDSTC)  
Panama City, Florida USA (Nov 2017)**

**Mobile Diving & Salvage Unit One (MDSU-1)  
Joint Base, Pearl Harbor, HI (Feb 2018)**

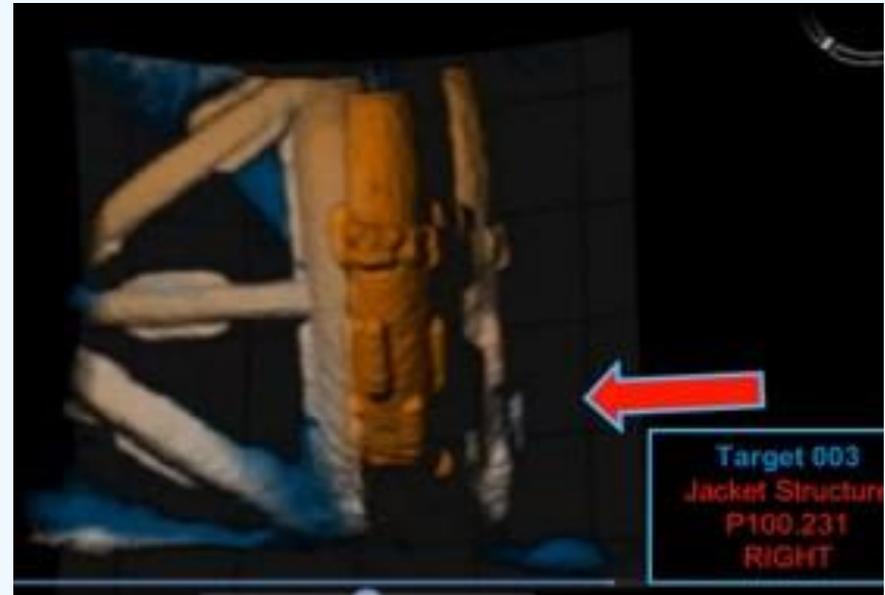
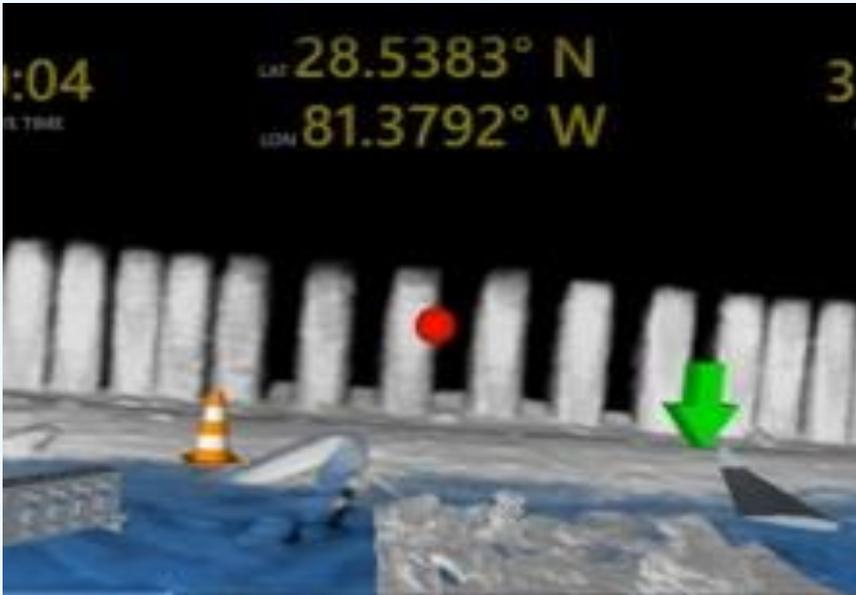
# Phased Development and Procurement Approach

- **Generation 1 DAVD capabilities:**
  - 2D sonar images for navigation
  - Drawings displayed to assist divers
  - "text messaging"
  - Step by step instructions



# Generation 2 DAVD:

- 3 monitor control panel.
- CODA Octopus sonar 3D view as either 1<sup>st</sup> or 3<sup>rd</sup> person (i.e. video game or top down) to HUD and topside.
- Diver location and head tracking and positioning.
- Real time 3D view for diver tracking system.
- Long range 600' umbilical
- Diver CPU platform
- Close-In Visualization System (CIVS).

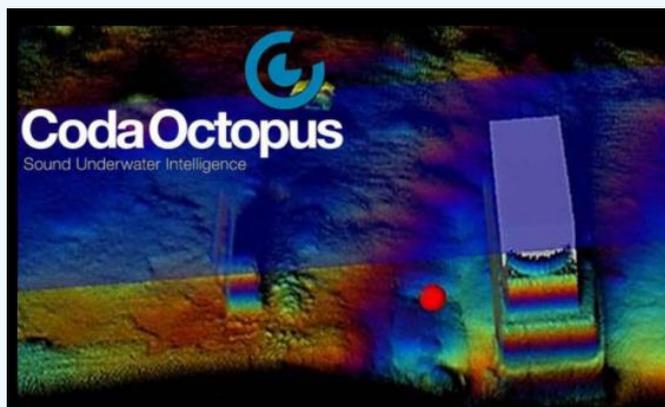


# Technology Transition Phase

## Cooperative Research and Development Agreement (CRADA)



## Exclusive Invention Licensing Agreement



# Questions?

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