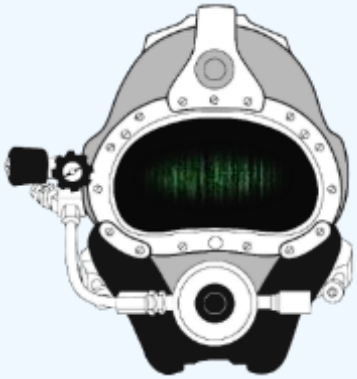
Unclassified

Navy – NASA Collaboration

Joint Technology Development

FLC Midwest/Southeast Regional Meeting 2018



20 September 2018

Naval Surface Warfare Center-PCD
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NASA-Johnson Space Center
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The Aerospace Corporation

Trevor Graff/Chief Scientist
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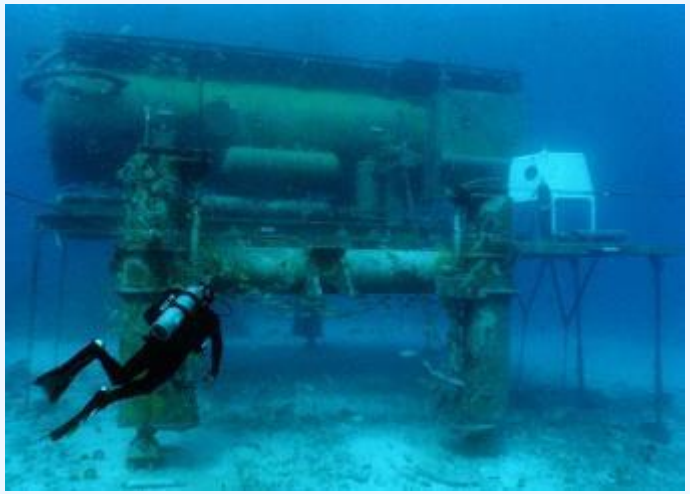
NASA - Johnson Space Center
Neutral Buoyancy Laboratory

NEEMO (NASA Extreme Environment Mission Operations)

- Aquarius habitat undersea research station
  - Florida International University (FIU)
  - Key Largo in the Florida Keys National Marine Sanctuary
- NASA analog missions



NEEMO-7 Mission
(Navy – NASA Collaboration)

U.S. Navy EX14 UBA System

Aquarius Habitat / October 2004

Divers Augmented Vision Display (DAVD)

Sponsors:

- Naval Sea Systems Command (NAVSEA 00C)
- Office of Naval Research (ONR)

Technical Developer:

- Naval Surface Warfare Center-Panama City Division

DAVD system:

- Binocular see-through head-up display (HUD) inside a Kirby Morgan 37 dive helmet and Interspiro Divator MK II Full Face Mask

DAVD capabilities:

- Topside dive supervisor can relay visual mission data to the HUD via an Ethernet cable
- Divers view real-time sector sonar, text messages, videos, photographs, instructions, and augmented reality images

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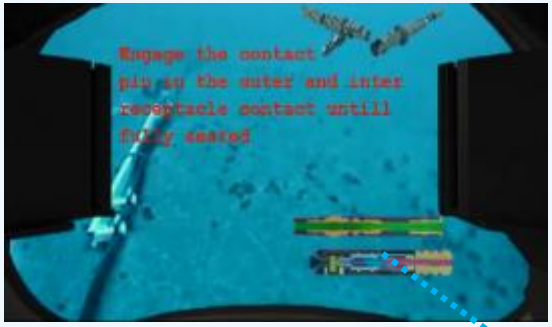
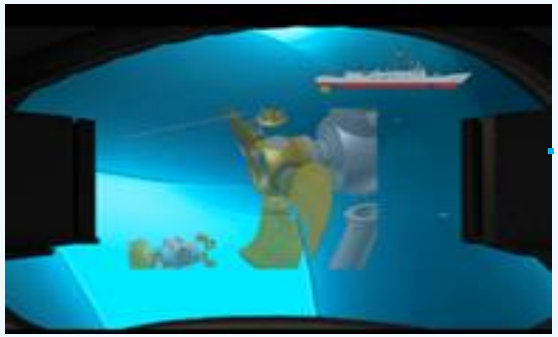
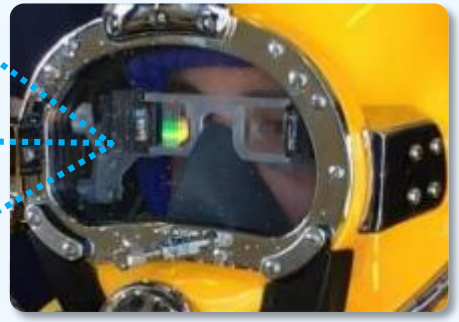
Divers Augmented Vision Display (DAVD)







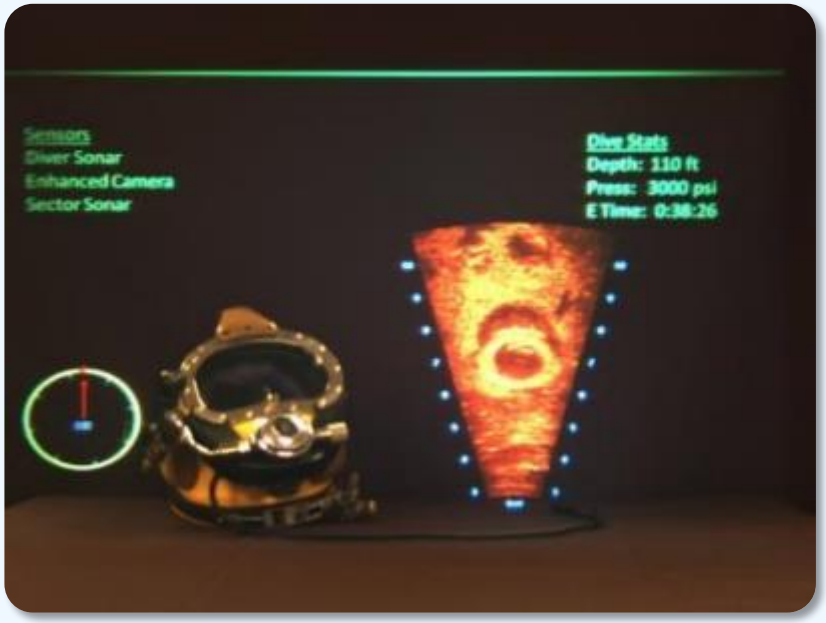
DAVD at NEEMO-22 (June 2017)

Objective

- Evaluate the Divers Augmented Vision Display (DAVD) for potential use in NEEMO training and an EVA spacesuit. EVA Office and astronauts evaluated a lab version topside for potential incorporation on future missions and spacesuit designs.

Key Take-Aways

- DAVD provides a capability to Navy divers that would be advantageous to EVA astronauts.
- There is a promising collaboration between the Navy and NASA to develop an augmented head-up display capability for an EVA spacesuit.

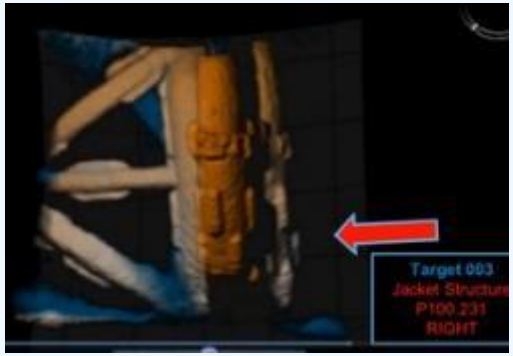


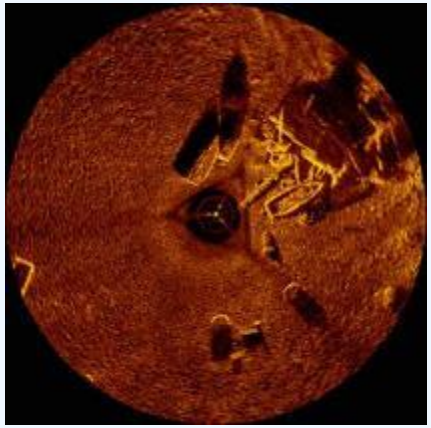
DAVD at NEEMO-23 (June 2019)

Objectives

- Integrate the DAVD system into the NASA Stainless Steel Dive Helmet.
- Navigation with Navy sector-scan sonar for self-navigation and situational awareness.
- Use the DAVD for real-time data update, augmented cue input, and procedure viewing.
- Consideration for a potential Augmented Vision Head-Up Display for future EVA spacesuit development

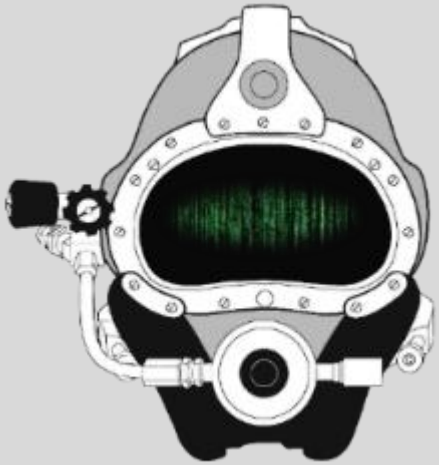
"***...this would be invaluable for EVA."*** – Shuttle/ISS 7-EVA experienced astronaut





Future Navy - NASA Collaboration

Augmented Vision Projection HUD



Next-GEN Navy Dive Helmet

EVA Spacesuit

Atmospheric Dive Suit

Interagency Partnership Agreement

xEMU Next-GEN Spacesuit

Questions?

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