



WHAT IT IS

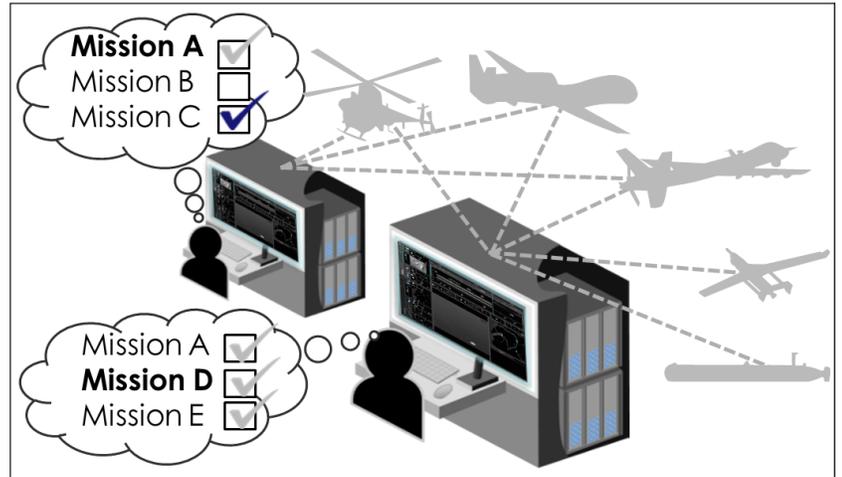
An advanced Human Machine Interface for supervisory control to manage multiple unmanned vehicles (UxVs) with a minimal number of operators in support of a range of Navy operational missions.

HOW IT WORKS

HMI concepts are implemented as modular software working through a service oriented architecture with UxV controller software and Navy mission planning software to allow it to be usable across multiple UxV platforms. Control of UxVs will be handed off to different operators based on mission phase. Prototype HMI designs are being developed to support information requirements of operators for each mission phase. Required automation to support concepts are being identified with limited development. Automation requirements to be delivered to PMA-281 & PMS-425 for future development.

WHAT IT WILL ACHIEVE

The effort will deliver a new concept of employment for UxVs supporting operational missions with prototype software implementations for human machine interfaces (HMIs). Software will be delivered to the Submarine community for integration into the BYG-1 Combat system and to the NAVAIR Common Control System (CCS).



CONTROL STATION HUMAN MACHINE INTERFACE (CaSHMI)

Unmanned Aerial Systems Interface, Selection & Training Technologies - CaSHMI is developing Human-Machine Interface concepts for mission management in the use of multiple Unmanned Vehicles (UxVs). The CaSHMI focus is on Human Machine Interfaces (HMIs) where different operators will be engaged with unmanned vehicles at different times. As a result, operators will be supervisory controllers.

WHAT ARE WE TRYING TO DO?

- Enable Mission-level Task Management for Unmanned Vehicle systems (UxVs)
- Develop Flexible (Executive) Supervisory Control UxV operator interfaces
- Coherent & Scalable UxV HMI Concepts
- Enable Reduced Manning for missions using UxVs

HOW IS IT DONE TODAY?

- Multi-operator teams control single unmanned vehicles
- Sequential approach to multi-vehicle control

WHAT ARE CURRENT LIMITATIONS?

- "Remote-piloting" paradigm; manpower intensive; stove-piped vehicle control systems and disparate HMIs
- Single vehicle flight control HMI metaphor does not scale for multi-UxV mission management & emerging autonomy

WHAT IS NEW ABOUT OUR APPROACH?

- Parallel management of UxVs using Integrated Mission-management vs. vehicle-control concept of employment — vehicles as service providers
- Human interfaces request specific task engagement vice sequential attention and operator vigilance
- Alignment with expected automation and technology capabilities
- Design for intermittent warfighter engagement; Human capacity limitations and strengths

WHY DO WE THINK WE CAN SUCCEED?

- Alignment with CCS Build III and AN/BYG-1 for transition to acquisition programs
- Leveraging multiple, on-going, research efforts on supervisory control and autonomy

WHAT DIFFERENCE DO WE THINK IT WILL MAKE?

- Enable one operator management of 2+ UxVs for a single mission
- Task management for dynamic mission events
- Common controls across Navy platforms



RESEARCH CHALLENGES AND OPPORTUNITIES

- Define an “Supervisory Control” concept of employment for UxVs that supports the PMA-281 Common Control System architecture.
- Identify the core information requirements, platform common and platform specific, leading to successful operation of multiple cross-domain UxVs with an initial focus on UASs.
- Apply human factors and cognitive engineering principles to develop display design options that address identified information requirements.
- Develop a suite of measures of effectiveness to assess advanced supervisory control of UxVs including operator state and task performance.