

A Remote Vehicle Operations Center's Role In Collecting Human Factors Data

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Introduction and Background

- Research is needed to develop a prototype remote vehicle operations center to explore current and future AAM³ operations.
- Our research is intended to provide data that informs evolving operational concepts, aviation regulations, and standards.
- The design of the operations center is focused on enabling a crew of human operators to remotely manage multiple highly automated small UAS⁴ in BVLOS⁵ conditions.



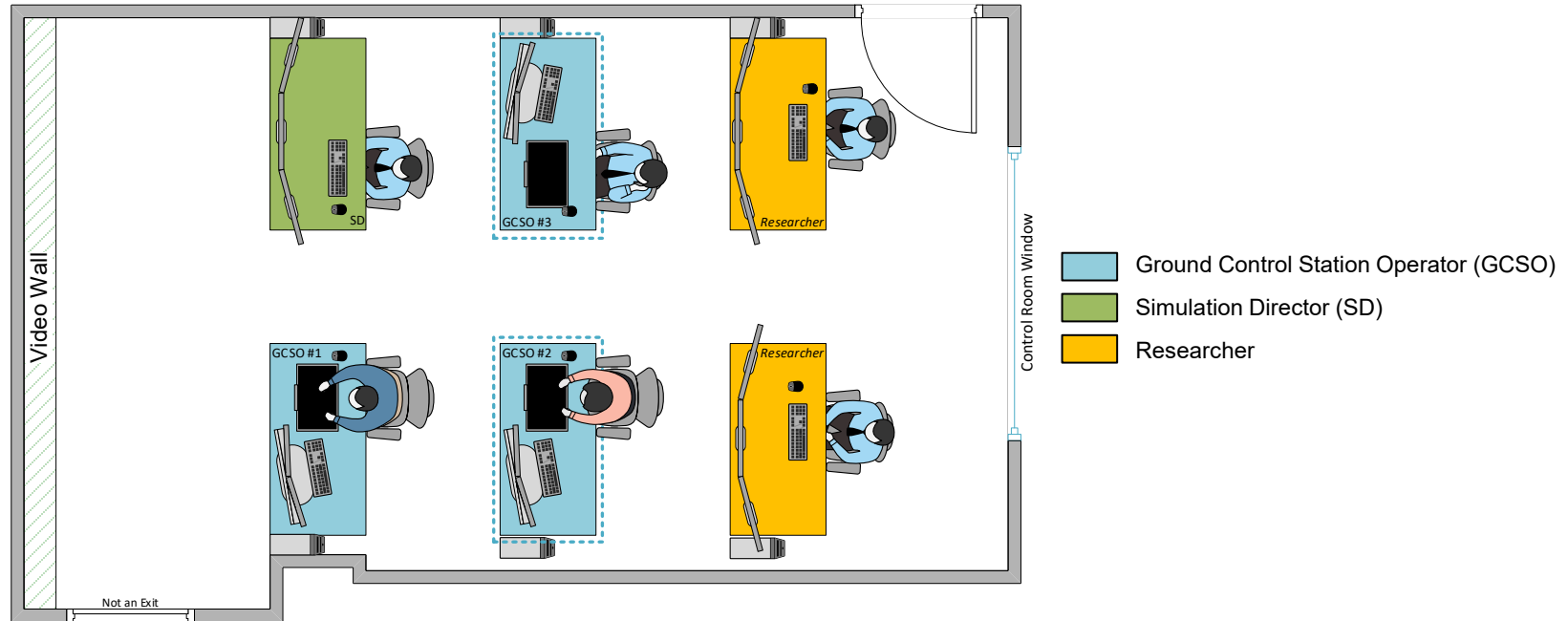
Description of the ROAM UAS Operations Center

- Twofold purpose:
 - To conduct human-in-the-loop experiments that explore different roles and responsibilities of remote operators managing multiple increasingly autonomous vehicles, with the goal of exploring human-autonomy teaming concepts that enable m:N operations.
 - To enable multi-vehicle small UAS flight operations from a remote location in BVLOS conditions.
- Use cases tested within the facility focus on small UAS operations and passenger-carrying operations.

ROAM Design Philosophy

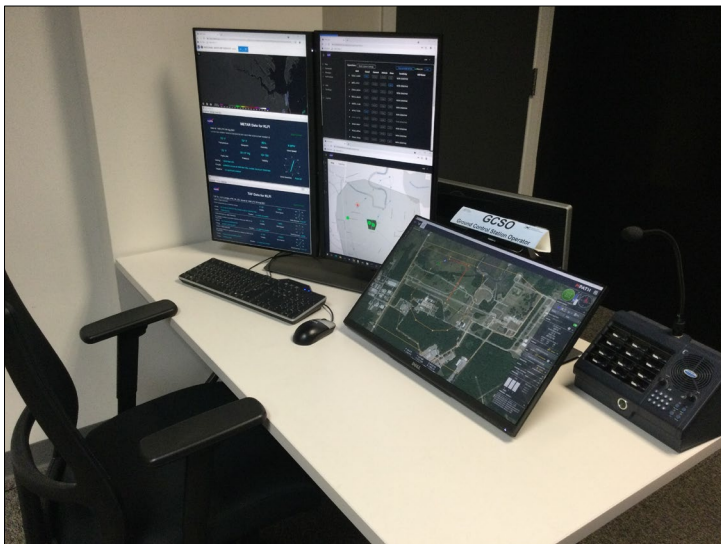
- Overarching design goals:
 - Relocate existing field operators to the remote vehicle operations center
 - Produce a shared situation awareness environment
 - Provide the ability to pursue advanced vehicle operations and control
- Envisioned to provide:
 - A user training environment
 - Flight operations planning and briefing environment
 - A research facility for conducting simulated and live operations of small UAS vehicles

ROAM's First Instantiation

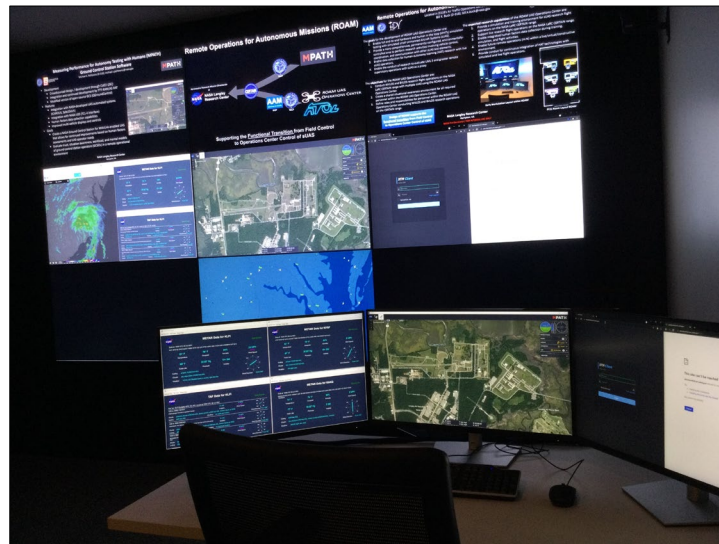


ROAM UAS Operations Center Generalized Layout, 2021

ROAM's First Instantiation (cont.)



Ground Control Station Operator Workstation



Simulation Director Workstation with Video Wall

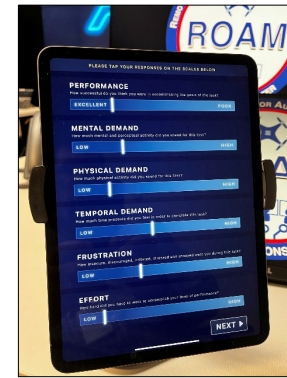
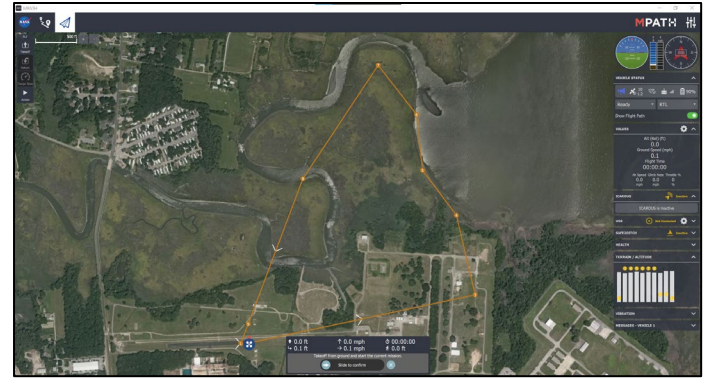
ROAM's First Instantiation (cont.)



ROAM Forward Video Wall as used in Simulation

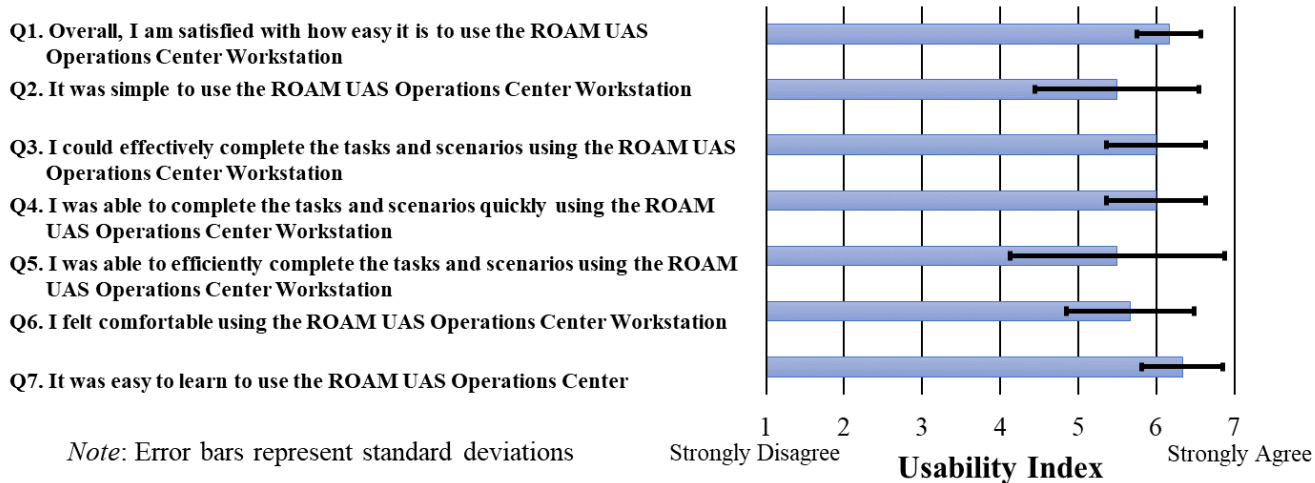
Capabilities Supporting Human Factors Research

- MPATH⁶ Ground Control Station Software
- Tobii Pro Nano Eye Tracker
 - Mounted to the primary display for the operator
- Custom NASA application to collect questionnaire data from operators

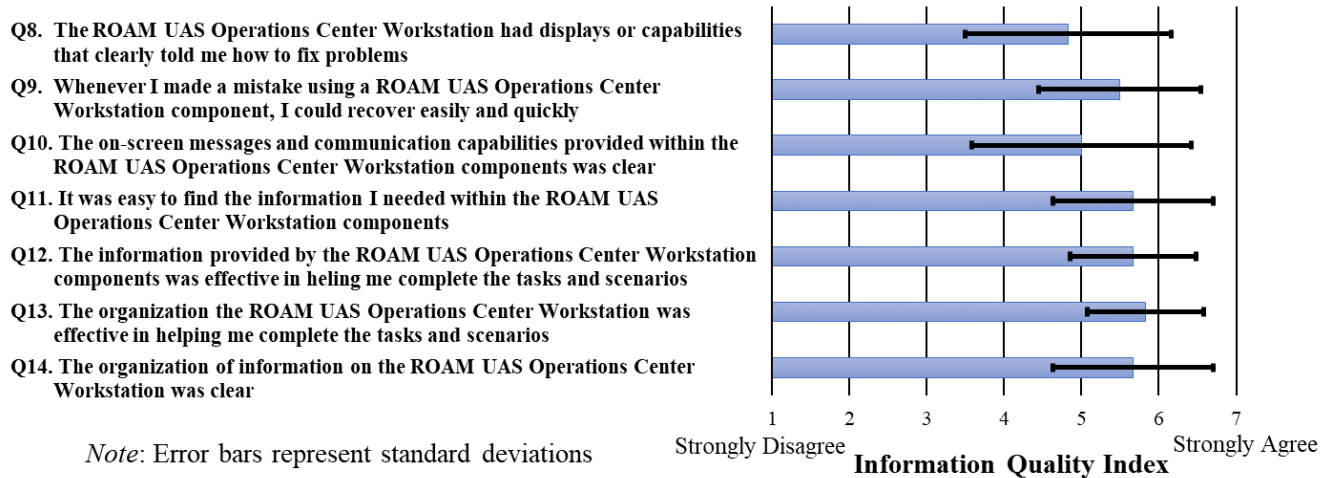


Initial Usability Results

- Data was collected from participants with a modified version of the Post-Study System Usability Questionnaire (PSSUQ)
- Focused on Usability and Information Quality

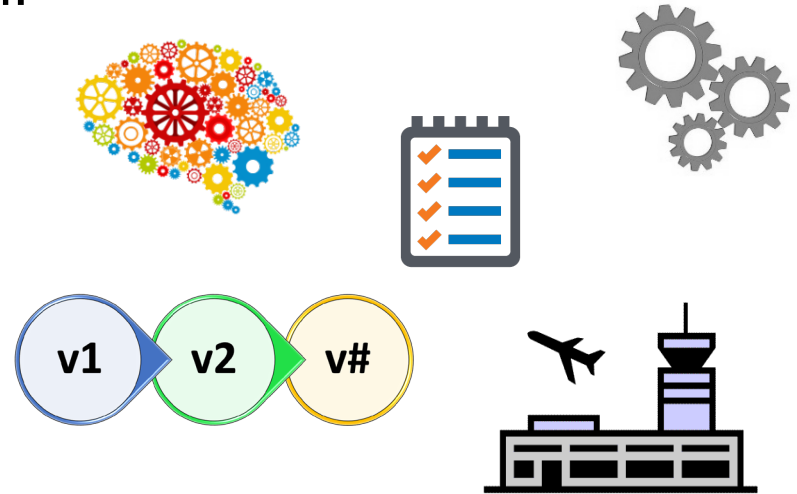


Initial Usability Results (cont.)



Extensibility for UAM⁷ Research

- A remote vehicle operations center like ROAM can conduct research into several areas of AAM:
 - Technology Performance Studies
 - Procedure Development
 - Human Factors Analyses
 - Integrated Simulation Studies
 - Future Evolutions



Concluding Remarks

- Usability ratings for ROAM are generally high, reflecting a positive start for the facility.
- Based on initial findings, significant changes have already been implemented into the ongoing design of ROAM.
- The ROAM UAS Operations Center can support both the collection of human factors data and multiple needs of researchers answering questions of today and tomorrow on AAM.



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