

Developing and testing two interfaces for Supplemental Data Service Provider (SDSP) tools to support UAS Traffic Management (UTM)

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AIAA Aviation, June 12-16th, 2023

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Background & Objective

- Future of airspace operations and technologies
- Uncrewed Aircraft Systems Traffic Management (UTM) concept – *enable safe and efficient UAS operations*
- NASA's System-Wide Safety (SWS) project is addressing and identifying potential risks of sUAS operations
- SWS to provide a suite of data-driven tools and services to enable *risk and hazard prediction and mitigation*
- Supplemental Data Service Providers (SDSPs) provide the means through which risks and hazards can be run and displayed on a graphical user interface
- Need to investigate interface requirements to display and organize these services and report how operators might use these tools



Usability study

- **Objective:** Do candidate interfaces provide enough information for users to understand their capabilities and functions to complete various risk and hazard assessment tasks successfully in simulated scenarios?
- **Method:**
 - 16 Participants (HF SMEs & pilots with range of sUAS experience)
 - Interfaces: Supplemental Data Service Provider– Consolidated Dashboard (SDSP-CD) and the Human Automation Teaming Interface System (HATIS)
 - 5 Services: Battery, Proximity to Threat, Population, GPS, RFI
 - 4 Scenarios developed
 - Multiple measures collected – this focuses on performance on a simple task set, SUS ratings & open-ended feedback
 - Descriptive analyses

Graphical User Interfaces

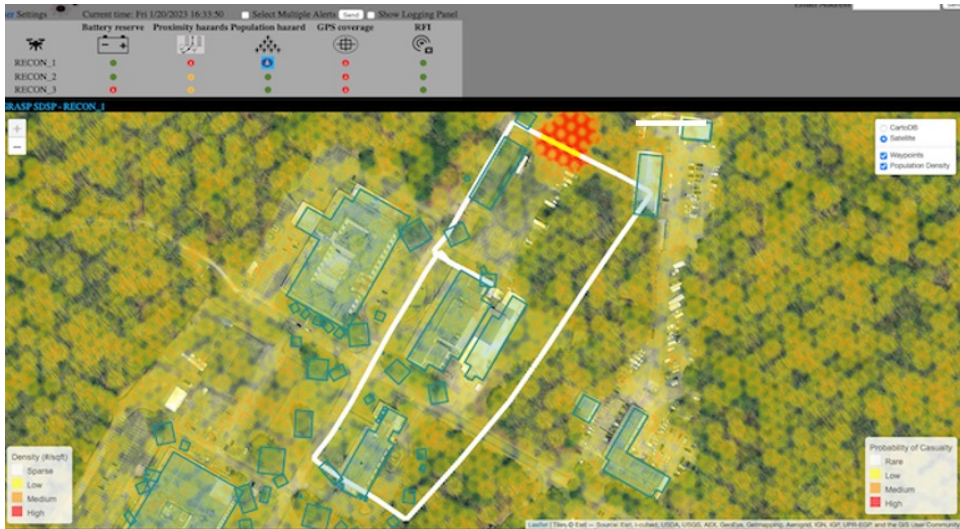


Image of SDSP-CD display interface with Population hazard alert selected for the UAS with the callsign “RECON_1”. Population density and probability of casualty heat map shown. (NASA image)

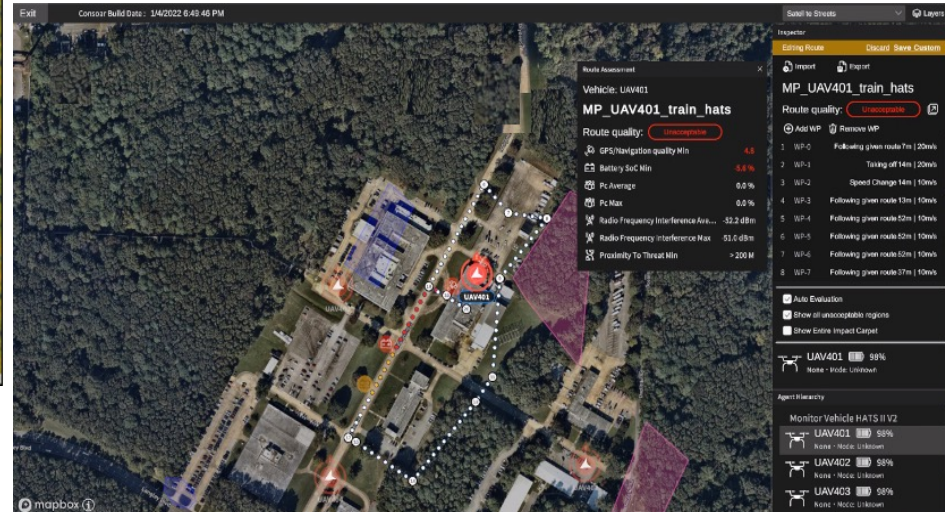
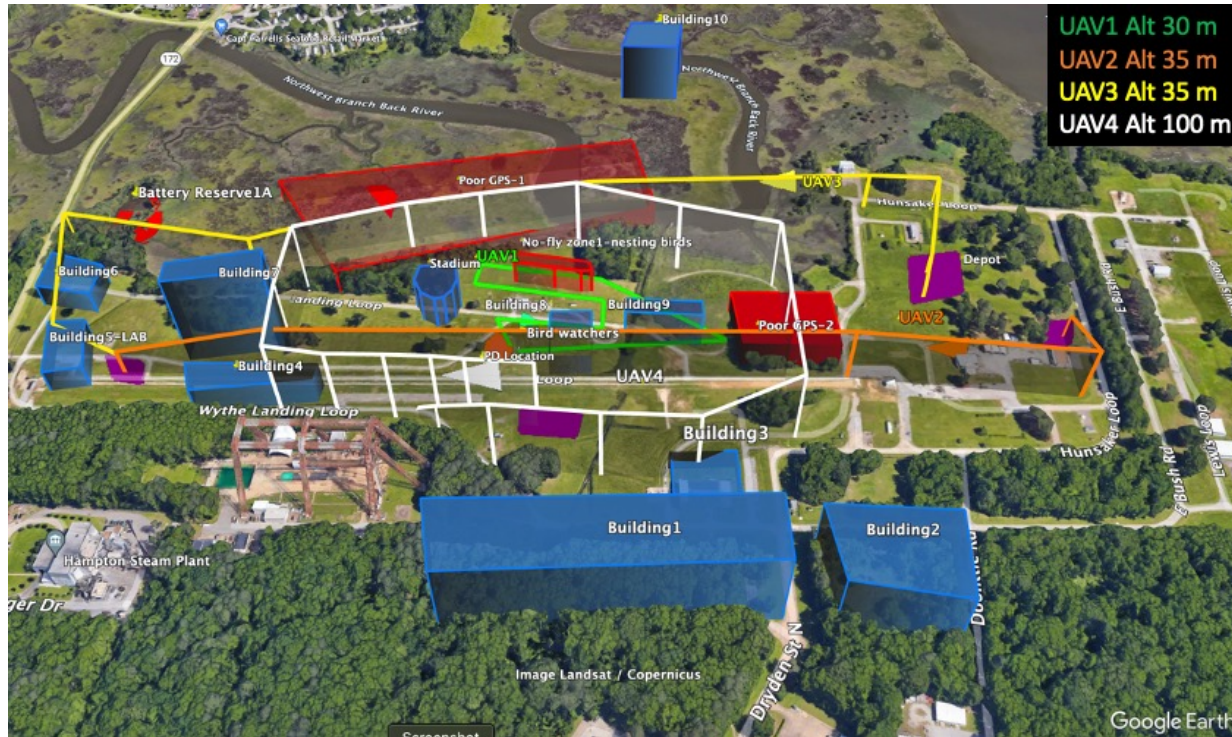


Image of HATIS display interface with route assessment selected for a UAS with the callsign “UAV401”. (NASA image)

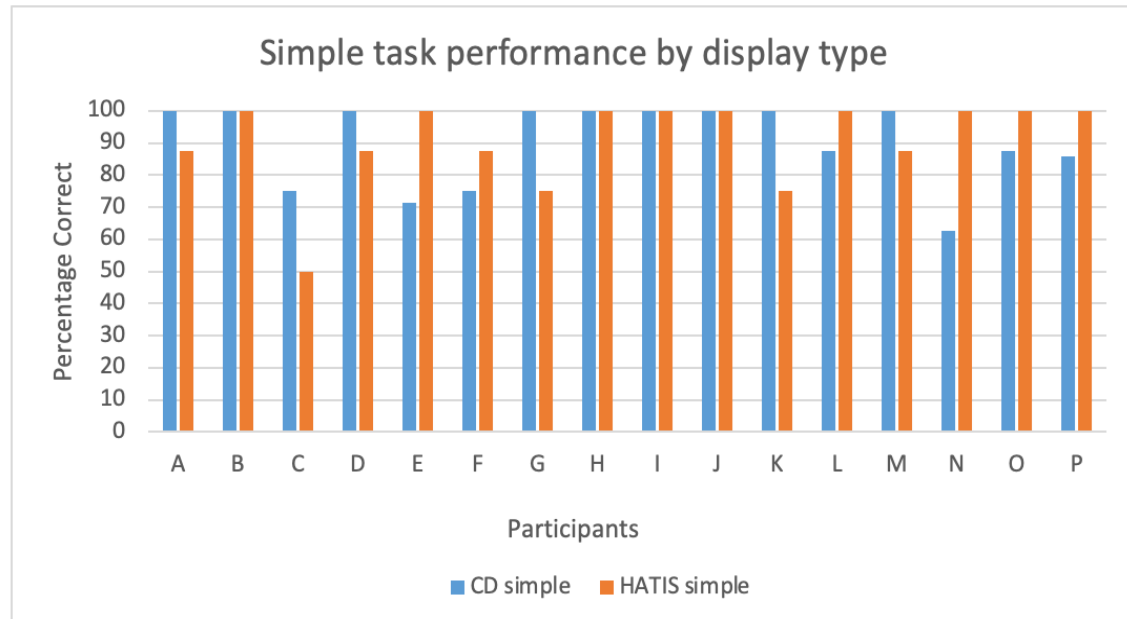
Example scenario: Wildlife Management



Wildlife Management Scenario. (Maps Data: Google, Image ©2023 Landsat / Copernicus)

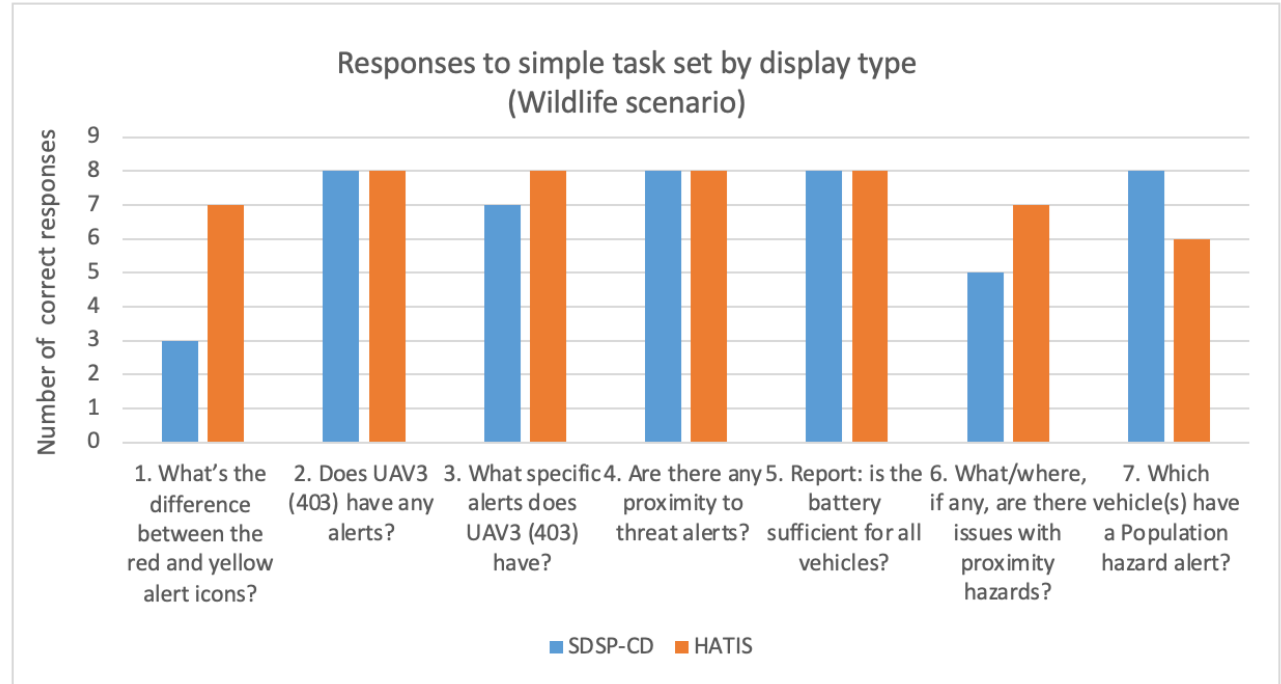
Findings: Participant performance by display type

- Participants generally able to identify risks and hazards
- As a group, the mean percentage correct using HATIS = 93%, SDSP-CD = 91%



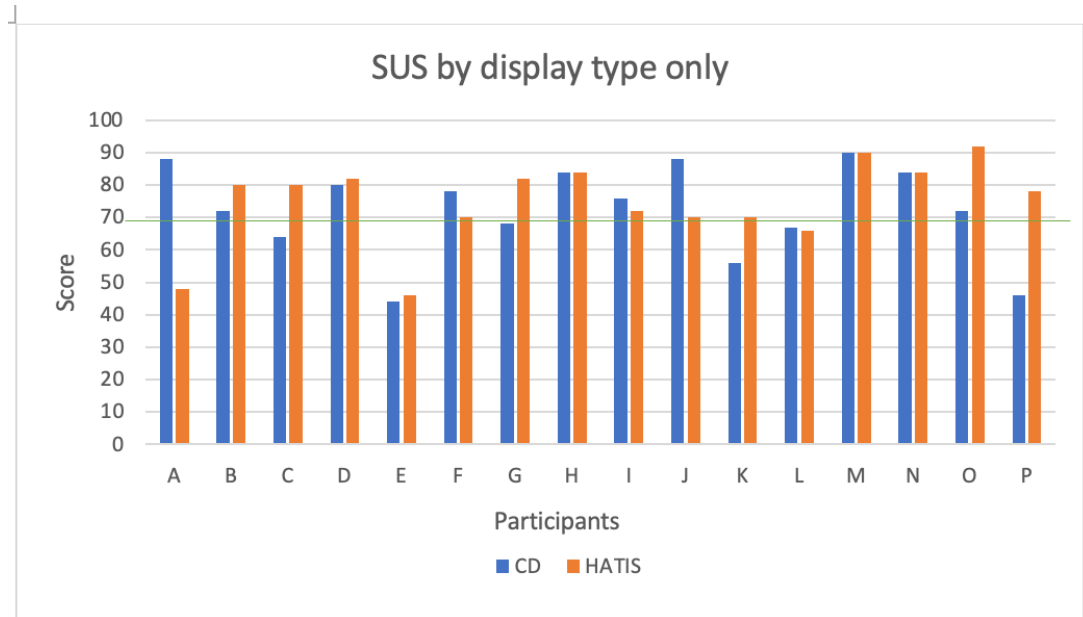
Findings: Simple task question set & feedback

- Q1 – HATIS route evaluation, SDSP-CD risk evaluation to operator, alert color meanings?
- Q3 – SDSP-CD masking of alerts on dashboard?
- Q6 – HATIS waypoints info?
- Q7 – SDSP-CD at-a-glance dashboard view & heat maps?



Findings: SUS results

- Rated as “good” user interface
- Most rated both displays similarly and positively
- Open-ended responses support the SUS ratings – useful for flight planning
- Liked: flight path route editing capability, ability to view all flights and information in one view, heat maps



Conclusion

- Discussion
 - Considerations: one view, consistent/meaningful icons and alerts, well-defined modes, enable quick access to info., minimize potential user confusion, prevent masked data, level of guidance for re-planning
 - Displays *if* risk is present, *where* the risk is, *but not what* to do or *where* to go
- Limitations: system lag (distance), service unavailability, task discrepancies
- Summary: to inform development of sUAS preflight planning tools for operators, well-regarded and “good” usability of SDSP-CD and HATIS interfaces to support sUAS preflight planning

References

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Thank you!



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