NASA’s Unmanned Aircraft Systems (UAS) Integration in the National Airspace System (NAS) Project (UAS-NAS) and the UAS Executive Committee (EXCOM) Science and Research Panel (SARP) invite you to attend the 2nd Workshop on Human-Automation Interaction Considerations for UAS Integration. A follow on to the workshop hosted by the National Academies of Science, Engineering and Medicine, this two-day workshop aims to tackle two critical issues for UAS integration in the NAS being addressed by NASA and the SARP: control of multiple UAS by a single, or multiple, operators (multi-UAS), and automatic collision avoidance (auto-CA). Attendees will be asked to generate real human-automation architecture and human machine interface solutions for these problems during interactive breakout sessions. Attendance is limited to select government and academia invitees only. This presentation is outlines the objectives of the workshop.
2nd Workshop of Human-Automation Interaction Considerations for UAS Integration

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Welcome !!

• Thanks for coming.....

• Introductions
Objectives

• Follow-on to Workshop 1
  – Ellen Bass
  – January, 2018
    • Washington, D.C.
    • National Academies
  – General Issues
Issues

• Calibrated Trust and Transparency
• Common understanding and shared perception
• Human-Agent communications/Interaction
• Collaboration
• Shared Mental Models
• Joint Decision making
• Roles and Responsibilities
• Communication
Objectives # 2

• Specific Use Cases –

• Teamed with SARP (Ted)

• Multiple UAS Control
  – M to N

• Auto Collision Avoidance
Specific Objectives

• HSI Architecture(s)

• Issues

• Feasibility
Primitive Building Blocks
(if you want to use...)

- Human Operator
- Intelligent / Cognitive Agent
- Automated Tools
- Communication Only
- Supervisory Relationship
- Cooperative Relationship
- Co-location (e.g., onboard an airplane, in ground station)

Both imply bi-directional information flow, usually using automated tools
FLYSKY12 is en route from SFO to BOS. There is one POB and a dispatcher flight following.

- Onboard automation detects fuel imbalance and alerts POB and dispatcher.
- POB requests automation diagnose fuel imbalance. Automation reports to POB a leak in left tank.
- POB requests that agent manage fuel. Agent opens the cross feed and turns off the pumps in the right side to draw fuel from the left.
- POB contacts dispatch about need to divert.
- Dispatcher requests divert planning from dispatch automation.
- Dispatcher uplinks flight plan to POB. POB inspects the flight plan and agrees.
- POB requests agent coordinate divert with ATC. Agent reports divert is approved. POB tells agent to execute.
Top-Level Actor Relationships

- WObj: Airline Flight
  - Onboard Pilot
  - Onboard Agent
  - Worker / Tools
  - WO: Aircraft

- WObj: Ground Operations
  - Ground Operator
  - Ground Agent
  - Worker / Tools

- WObj: ATC Operations
  - ATC
  - Worker / Tools
Top-Level System Work

WProc: Airline Operations

WOBJ: Airline Flight

Onboard Pilot

Onboard Agent

WOBJ: Ground Operations

Ground Operator

Worker: Tools

WOBJ: ATC Operations

Atc Operator

Worker: Tools

WO: Aircraft

WPOut: Fly aircraft

WPOut: Telemetry data
Voice comm

WPOut: Alerts (e.g., weather)
Mitigations (e.g., reroutes)
Voice comm

WPOut: Telemetry data
Voice comm

WPOut: Direct traffic (e.g., clearances)
Provide information (e.g., traffic)
Voice comm
Summary

• Thanks!

• Have Fun!

• Be Creative!