UAS Integration into the NAS: Unmanned Aircraft System (UAS) Delegation of Separation

Presented by:

Lisa Fern

San Jose State University

NASA Ames Research Center

Coauthor:

Caitlin Kenny, San Jose State University

Next Steps …. Part Task II

- Delegated Separation: the transfer of responsibility for maintaining separation between aircraft or vehicles from the air navigation service provider (i.e. ATC) to the relevant flight operator (i.e. pilot) [JPDO NextGen Integrated Work Plan]

- Three levels [Eurocontrol]:

  1. Limited Delegation
     - ATC in charge of problem and solution identifications. Pilot in charge of implementation of solutions and monitoring

  2. Extended Delegation
     - ATC in charge of identifying problems and delegating to pilot identification and implementation of the solution and monitoring

  3. Full Delegation
     - Pilots are responsible for all tasks related to separation assurance: identification of problems and solutions, implementation and monitoring
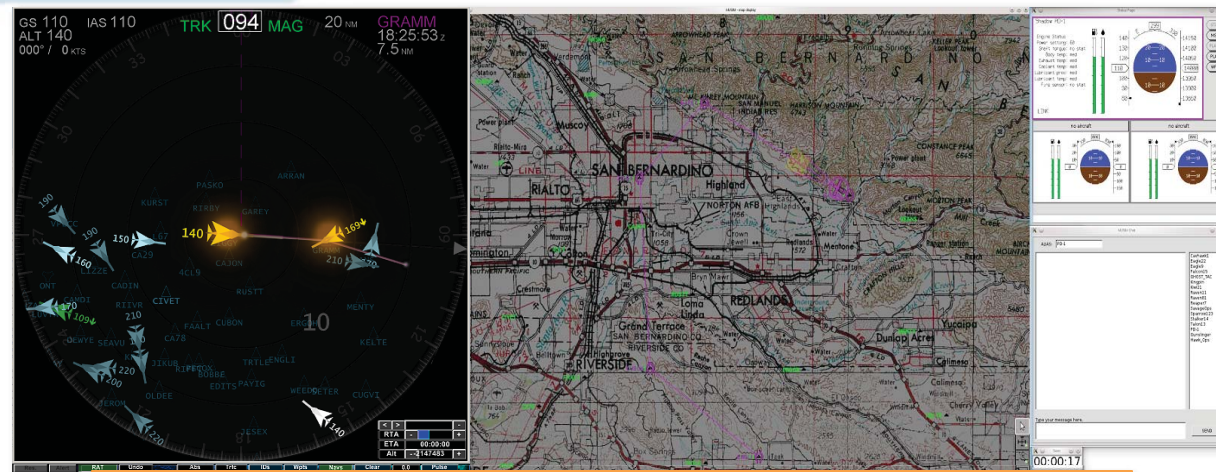
Next Steps …. Part Task II

- Objective: to examine the effects of display type and delegation level on pilot workload and ability to maintain safe separation from other aircraft

- Experimental Design: 2 (display type) X 2 (delegation level) Repeated Measures Factorial

- Two levels of display:
    1. Basic display – traffic only
    2. Advanced display with conflict detection and route assessment tool

- Two levels delegation:
    1. Extended - ATC in charge of identifying problems and delegating to pilot identification and implementation of the solution and monitoring
    2. Full – Pilot responsible for all tasks related to separation assurance: identification of problems and solutions, implementation and monitoring

Method

- Ames Flight Deck Display Research Lab (FDDRL) Simulation Environment
    1. Multiple UAS Simulator (MUSIM)
    2. 3D Cockpit Situation Display (CSD)
    3. Multi-Aircraft Control System (MACS)

- Participants:
    - 12 MUSIM pilots
    - 2 Confederate Air Traffic Controllers (same as first experiment)
    - 2 Pseudo Pilots

- Schedule
    - Currently in shakedown, data collection to start soon ….

Method

UAS GCS: MUSIM with CSD

ATC Station: MACS

Pseudo Pilot Station: MACS

Next Steps …. Part Task II

- Objective Measures:
  - LOS Events
  - Conflicts and Collisions
  - Pilot-ATC Communications
- Subjective Measures
  - Workload
  - SA
  - Post Simulation Subjective Questionnaire (Pilots & ATC)
- Expected Results:
  - Air Traffic Controller
    - Reduced workload with higher delegation levels
    - Reduced radio communications with UAS in higher delegation levels
    - Less ATC interventions with UAS in higher delegation levels
  - UAS Pilot
    - Increased (but manageable) workload with higher delegation levels
    - Increased SA with higher delegation levels