

Breakout Session: Next-Gen Aviation

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1. Role of autonomy and automation in aviation (including verification)
2. Control and coordination of mixed air traffic
3. Impact of human-autonomy interactions
4. Other issues
 1. Passenger flow
 2. Security and privacy
 3. Big data
 4. Cloud computing
 5. Green aviation challenges

1- Role of autonomy and automation in aviation

- Which decisions are automated ?
- Where does the decision making reside ?
- How are the components verified ?
- How is the system verified ?

2- Control and coordination of mixed air traffic

- Including commercial, general aviation as well as UAVs
 - Legacy, current and future aircraft models
- Levels of control
 - Device
 - Physical system (aircraft)
 - Operational system (sector)
 - Global (US airspace)
- Autonomy as you go “down” the levels of control

3- Impact of human-autonomy interactions

- Human-agent interactions
- Agent-agent interactions with human intervention

- Passenger flow
- Security and privacy
- What can we learn from big data collected in next gen ?
- Cloud computing
- 2050 green aviation challenges
- ???

Automation and Autonomy

Automation can improve existing state and enable new/disruptive technologies.

Existing issues: Airplanes are already automated; addiction to automation; legal aspects of autonomy; controller interface to pilot; cargo aircraft are likely; human factors (ability to handle off-nominal conditions).

V&V is a challenge (compositional verification for adaptive systems is a hard problem)

- Operational concept of the FAA (closely spaced operations); alerting mechanism is needed; alerting protocol correctness; academic driven problems; What happens when the operational context/assumptions changes; what happens to the protocol correctness verification;

Model of the awareness of the human and how does it deviate from air traffic situation. Can we improve safety?

New roles for automation

Automation within and outside aircraft in the presence of traffic delays, safety, economy issues, bottlenecks with information flows.

Asiana and Air France incidents (mutually respecting each other); Automation, procedures, information sharing are needed.

Automation is not the problem, it is the solution; problems come because of automation; Assurance of existing automation;

Compositionality for the sake of provability of safety, with scalability bigger than number 3.

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- Sub-systems composition; hybrid automata background (continuous part is non-linear then you are in trouble! More than 3-4 subsystems); what is missing to bridge? Autonomy and NextGen viewpoint is identify and fix various entities involved;

Other research areas

- **Passenger convenience and passenger airport security**
 - New applications
 - Security and privacy viewpoint, and interactions with autonomous systems within and outside aircraft.
- **Formation flight of commercial airliners**
- **Mid-air refueling of commercial airplanes**
- Iceland volcano related problems
- **Small aircraft transportation system**
- Green aviation: which hubs, routes, and sectors are causing disruptions/uncertainties; information/data for operational purposes; Airline business models related to green aviation and aviation performance in general
- RFID at the product level/personal baggage item level
- Impact of extreme natural disasters (solar flares) on aviation technologies must be studied
- UAV and aerial robots have testbeds. Limited to civilian sector. Govt. can help by facilitating such testbeds.
- Trust a pilot; how to transfer this to automation