

Barbara Holder Ph.D. November 14, 2018

HUMAN FACTORS SUBCOMMITTEE 2018 SUMMER/FALL MEETING



Human Factors Subcommittee Summer/Fall Meeting

Last Meeting:

• Summer/Fall meeting at the JMA offices in Washington D.C., August 28-29, 2018

Next Meeting:

 Winter/Spring meeting, at Boeing, Seal Beach, California, March 12-13, 2019

Two new members were present:

- Captain Jon Tovani, Delta Airlines
- Captain Richard Louden, Alaska Airlines



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Presentations

FAA's Strategic Research Agenda

- Shelly Yak, FAA Director of William J. Hughes Technical Center, REDAC Co-Chair
- The subcommittee believes the Landscape will become an effective method for identifying, planning, and prioritizing key research drivers across domains within and outside the FAA (See F&R 1)

Runway Friction Research

• Paul Giesman, Transport Standards (AIR-671)





Deep Dives

Flight Deck Core

• Advanced Vision Systems, Terry King, Flight Standards

NextGen Research Program

• Terminal Sequencing and Spacing, Randy Bone, MITRE

NextGen Enterprise ATC

• Established on RNP, Lauren Thomas, Evans Incorporated



Human Factors Subcommittee Summer/Fall 2018

- Briefed on HF Core and NextGen programs, however these were not presented in sufficient technical detail to provide guidance
- Discussed the current state of the budget and implications for critical priorities
- Important/urgent research needs and gaps in the portfolio were identified and most are currently unfunded (see Action 3)
- Discussed how ongoing research aligns with HF emerging issues and requested briefings on how the FAA will address alignment
- The prioritization scheme used to fund research remains unclear even after multiple requests for transparency
- Several prior actions were addressed:
 - Industry partnerships
 - Remote towers
 - Mixed environment



Human Factors Subcommittee Summer/Fall 2018 Updated: Human Factors Emerging Issues List

Urgent near term issues to be addressed within 5 years:

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- Human Factors issues associated with implementation of UAS in the NAS
- Increasing complexity of the airspace, transition to trajectory based operations (TBO) and performance based navigation
- Information management, managing distraction, overload
- Training and qualification methods and technologies
- Increased automation and autonomy that enables operations with a reduced crew

Important longer term issues to be addressed in the next 5-10 years:

- Development and deployment of new and novel interfaces
- Cybersecurity and safe integration of new technologies
- Data collection and analysis to enable big data analytics, data fusion, real-time assessments



Task 1: Identify high-value applied research areas deemed essential to support the rulemakings, standards, and procedures necessary to safely achieve the operational capabilities articulated in the plan.

Feedback:

- Identify safety implications of sUAS colliding/interfering with other aircraft
- New collision hazards and potential for damage to other vehicles
- Detect and avoid sensing requirements
- Artificial intelligence and machine learning
- Unmanned large commercial passenger/cargo transport and dispatch requirements
- Ensure various scenarios surrounding the introduction of UAS is understood
- Issues regarding "levels of autonomy"
- HF definition is too narrow, there is always a human in the system



Task 2: Identify areas where planned activities and/or needs reflected in the plan are already being addressed within the stakeholder community or do not impact UAS integration objectives.

Feedback:

- There appears to be several high activity areas missing from the plan e.g. Urban Air Mobility vehicles that could be easily tracked
- Flight path management and hazard avoidance
- Some of the needs seem overly broad, with unclear purpose or scope e.g. airspace density/capacity studies
- Several tasks assigned to the NSF Center for UAS seem to be better addressed by the industry stakeholders & applicants:
 - Detect and Avoid
 - Flight Intent
 - Swarm control of multiple UASs



Task 3: Opportunities to leverage relevant on-going or planned industry-led research.

Feedback:

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- Progression in operational capabilities provided in plan seems to incorporate major concepts under consideration by industry:
 - Detect and Avoid
 - Traffic management
- Autonomous vehicle research and development in adjacent industries
- Work in other parts of the world
- Other regulatory inputs, e.g. ICAO



Task 4: Adjustments to research timelines in the plan, which are necessary to keep pace with industry-led technology advancements

Feedback:

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- Expand plan beyond 5 years and consider parallel development
- Large carrier cargo/passenger operations are currently not supported by key enabling technical capabilities
- Airspace design and procedures to "integrate" unmanned rotorcraft
- Identify research most critical to enabling necessary updates to industry standards, regulations, and critical priorities
- Some research topics seem overly open-ended and could become enduring study areas rather than focused efforts with tangible progress
- UAS research needs to be flexible/agile to address gaps that arise because of on-going research.



Finding 1:

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- The sub-committee appreciated the framework presented by Shelley Yak on the FAAs' Research and Development Landscape
- This new perspective promises to be a valuable tool for informing the FAA's R&D portfolio and planning
- The subcommittee has three recommendations regarding its further development and use
- These recommendations are structured around content, process, and communicating the plan's status and impact



Recommendation for *Content***:**

- Continue to mature the landscape framework
- Identify partnerships for cross cutting HF areas and identify what research is being done, where, and any gaps
- Identify lead, leverage, and watch areas for Human Factors research areas and provide links to partnerships
- Illustrate the budget for the entire portfolio and identify high priority areas and how they link to funded programs



Recommendation for *Process***:**

- Create a means by which the Landscape can inform the R&D portfolio, including prioritization of projects
- Describe how the Landscape will address cross cutting issues like Human Factors and Safety that impact multiple areas/domains identified in the Landscape



Recommendation for *Communication***:**

- Provide the HF subcommittee evidence the Landscape is influencing the HF portfolio plan and prioritization of projects
- Provide examples of how the landscape is being used to influence the overall R&D portfolio, especially as related to partnering and leveraging R&D from other stakeholders

Consequences:

- Lack of strategic direction for the R&D portfolio, prioritization, and opportunity to leverage research from other parts of industry
- Inability to identify significant partnerships
- Inability to maximize collaboration
- Duplication of effort and funding
- Research gaps



Finding 2:

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- Modern Flight Decks enable an extensive amount of information to be displayed to the flight crew
- New information automation systems and applications distance the pilot from the processing of information such as:
 - Advanced radar, Advanced Vision Systems, CPDLC, ACARS, Electronic Flight Bags, including operator and vender "Apps"
- These applications/systems provide useful information to the flight crew, however there is little guidance to operators for managing information and for approvers to accurately assess its impact on workload.
- This issue was identified and recommended for funding several years ago, but remains unfunded and is an continuing gap in the current HF R&D portfolio



Recommendation to fund research:

- Fund research on Information Management
- Document current practices, identify actual/potential threats, and identify mitigation strategies
- Research should include but should not be limited to the following:
 - Managing information across systems such as: CPDLC, ACARS, Radar, EFB, aircraft systems, external (non-aircraft) applications, Etc.,
 - Identify strategies for mitigating information overload and distraction
 - Methods for understanding the accuracy, integrity, (i.e., trustworthiness), and timeliness of information
 - Effective information management for operational, tactical, and strategic decision making

Recommendation to provide guidance to operators:

 Leverage research as well as the experience of operators who are already working to address these issues to develop guidance for flight deck information management practices, challenges/threats, procedures, and training.



Recommendation provide guidance to approvers:

- Develop guidance to aid the operational approval process for:
 - Evaluating and approving information automation applications/systems (e.g., non-certified applications) and their use with information applications installed in the certified flight deck/avionics systems.
 - Guidance should include how information will be displayed, gathered, and used on the flight deck, and its fit into the flight crew workflow, and mitigation of conflicting information from different sources.



Consequences:

- Perpetuate ongoing human factors/safety issues
- Operators will continue to develop their own unique strategies for managing information and distractions on the flight deck
- The FAA may perpetuate inadequate workload assessment methods
- The FAA may permit the implementation of information integration where the integrity or completeness of presented information may be misunderstood or is used inappropriately by the flight crew



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