FAA REDAC
Subcommittee on Human Factors
Findings and Recommendations
Summer/Fall 2023

Dr. Phil Smith & Dr. Barbara Holder (Chair)

October 4, 2023

Subcommittee on Human Factors Summer/Fall Meeting

- Meeting was held in a hybrid format on August 29-30, 2023 in Washington D.C.
- Subcommittee appreciated its prior input being reflected in FY25/26 planned portfolios
- Three briefings on Human Factors research needs for Advanced Air Mobility:
  - Mr. John Illson, Supernal, *Human Factors AAM Research Needs*
  - Dr. Mark Nikolic, Joby, *Human Factors Considerations for Scaling AAM*
  - Mr. Adam Hendrickson, FAA*, UAS Detect and Avoid Human Factors*
- 5 Findings and Recommendations
- 2 Actions

Subcommittee on Human Factors Summer/Fall Meeting

- 5 Findings and Recommendations
- 2 Actions
- Winter/Spring Meeting:
  - March 5-6, 2024
  - Location TBD

Finding 1: Urban/Advanced Air Mobility Research Timeline

The Human Factors Subcommittee was pleased to see the FAA has research planned to address Advanced Air Mobility (AAM) human factors needs beginning in 2026.

This project is proposed under the Human Factors Flight Deck NextGen portfolio. For example, research question 8.2 under flight crew displays and interfaces research states: "*What are the anticipated human-machine interface and pilot/crew interaction issues with novel control inceptors that support precise 4-dimensional trajectory navigation accuracy requirements in highly automated rotorcraft and fixed-wing aircraft*?"

The HF subcommittee received two briefings from AAM Original Equipment Manufacturers (OEM) on their research needs. In both cases the timelines for human factors flight standards and aircraft certification guidance is fast approaching as these OEMs are targeting a 2025 Entry into Service date.

Recommendation

The FAA should accelerate the Advanced Air Mobility (AAM) related research projects that were previously submitted as formal requests and are currently planned to begin in mid 2026.

These projects should be funded in 2024 so that the FAA's Flight Standards Organization and Aircraft Certification are better prepared to meet evaluation timelines proposed by the Original Equipment Manufacturer (OEM) applicants.

Finding 2: Competency Based Training and Assessment (CBTA) Timeline

Airbus and EASA have provided guidance to operators on the implementation of CBTA as one means of compliance for recurrent training for operators not utilizing the FAA's Advanced Qualification Program (AQP). Several major non-US airlines have implemented CBTA for recurrent training and are also investigating it for initial training. Boeing recently announced an effort to implement a version of CBTA for non-US operators and is investigating CBTA for its U.S. operators.

The FAA needs to understand how CBTA has been implemented so it can assess its effectiveness in developing, maintaining, and applying required operational knowledge and skills for all work groups during airline operations. This would include an assessment of what CBTA concepts and objectives work well, what is problematic, how current FAA guidance fits, or should be updated, and how to mitigate any new risks.

Recommendation

Research is needed to enable the FAA to assess the effectiveness of CBTA and to take a data-driven strategy to possibly update FAA training program guidance to operators and other training providers that may want to incorporate CBTA concepts. To start, the subcommittee recommends the FAA accelerate the CBTA research proposed under OC 1: Improving Pilot Training, Procedures, and Operations within the Human Factors Flight Deck Core portfolio.

Research should include operators and OEM's that are actively investigating how to implement CBTA and may do so without FAA research and guidance. The research should investigate the effectiveness of CBTA and may include:

- How CBTA defines effective training and evaluation/assessment methods;
- How the CBTA training objectives and training methods are established;
- How the CBTA method effectively builds and maintains the required knowledge and skills;
- The feedback mechanisms CBTA provides to ensure appropriate feedback is included in the training program.

Finding 3: Air Traffic Organization AI/ML Human Factors Research Plan

The FAA has indicated a strong interest in the design, evaluation, and use of future software tools that integrate machine learning (ML) and artificial intelligence (AI) technologies more broadly into FAA software to support air traffic control, traffic flow management, technical operations, and other areas.

The FAA has funded a research project focused on characterizing the state of the art in terms of the integration of human factors into the design and use of ML and symbolic AI as relevant to FAA applications. The FAA is to be commended for pursuing this work.

This project is expected to complete in the fall of 2024 however there is currently no additional research planned to identify how to guide the effective integration of human factors into the design, evaluation, and use of these technologies for use in support air traffic control, traffic flow management and technical operations.

Recommendation

The FAA should continue to conduct research necessary to identify how to address human-AI integration through all development phases.

Human factors should have a leading role in guiding the design, evaluation, and use of AI/ML in support of air traffic control, traffic flow management, technical operations, and other potential technical applications.

Finding 4: Training and Checking Program Changes due to Changing Pilot Entry-Level Experience

Since recent events have shown that the entry skill expectations for part 121 pilots are changing, research is needed to determine how operators are reassessing the foundational assumptions on which their training and qualification programs are built, such as performing entry skills analyses of the changing new-hire workforce and adjusting their training and checking programs based on any identified gaps.

Absent this, airline training programs might allow new-hire pilots to complete their training and begin flying line operations without the necessary knowledge or skills.

Recommendation

The FAA should conduct research to determine the degree to which operators are effectively managing safety threats associated with the lower level of experience for part 121 pilots.

The research should investigate to what extent, and to what degree of effectiveness, operators are:

- Measuring entry skills and knowledge,
- Conducting gap analyses between measured entry skill/knowledge levels and assumed levels for existing training/checking curricula, and,
- Adjusting training/checking curricula appropriately to close identified gaps.

The research should also investigate potential methods to accelerate ways to effectively mitigate gaps in pilot knowledge and skills.

The results of this research could be used to inform updates to required training content and revisions to baseline assumptions about pilot knowledge and skills.

Finding 5: Include Human Factors to the Proposed AVS Research Strategy

The Subcommittee was pleased to receive a briefing on the proposed overall AVS research strategy, including the new proposal for specific “research thrust areas”, and appreciated the opportunity to provide feedback on it from a human factor’s perspective.

One critical observation pertains to the need to add “Human Factors” explicitly as an additional, new research thrust area.

While the briefing indicated that human factors as an overarching need, historically and currently, human factors tends to be a component of conceptual and technical maturation that gets overlooked to the detriment of forward progress.

Recommendation

The subcommittee recommends the AVS Research Strategy be updated to explicitly include “Human Factors” as a “research thrust area”.

The AVS Research Strategy implementation plan should include human factors and identify its alignment with currently funded human factors research and the research that has been proposed for funding for FY24 and FY25.

Because human factors is cross-cutting, the human factors elements embedded within each of the other identified strategic research thrusts should be clearly identified.

The Research Strategy should also describe the role of this new strategy and how it relates to that of the National Aviation Research Plan (NARP) which is required by congressional mandate.