



FAA REDAC SUBCOMMITTEE ON HUMAN FACTORS SUMMER/FALL 2021

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MEETING SUMMARY

Meeting

- August 17-19, 2021
- Remote, In-person meeting cancelled due to COVID-19
- Reviewed the RE&D accomplishments and expectations for FY21, and research plans through FY23.

Portfolio Review

- Flight Deck/ATC Core/NextGen
- Presented portfolio is limited and does not include the full range of FAA Human Factors research

Updated Aviation Industry Directions and Emerging Issues for Human Factors

- Submitted

MEETING SUMMARY

Briefings

- **Progress update on Human Factors and Systems Safety Activities related to the Aircraft Certification, Safety, and Accountability Legislation, Dr. Kathy Abbott, FAA**
- **Research to improve methods of determining proficiency of operational personnel (F&R response)**
 - Cognitive skill degradation, Dr. Nichola Lubold (and Dr. Barbara Holder), Honeywell
 - Manual flight operations proficiency, Dr. Beth Lyall-Wilson and Capt. Dave McKenney, MITRE
- **Improved ATC learning for Cross-facility decisions (F&R response)**
 - Overview of Regional Decision-Making research, Philip Bassett, CAVAN Solutions
 - TBO Training Roadmap, Elizabeth Lacher, MITRE

Two Findings and Recommendations

- Training Air Traffic Controllers for Increased Automation Use
- Update Alerting System Standards

FINDING 1

Training Air Traffic Controllers for Increased Automation Use

With NextGen, the FAA is moving toward a Trajectory Based Operations (TBO) environment that advances automation for use by ATC and TFM operational personnel. This advance in the capabilities of automation introduces additional training needs (in terms of both content and instructional design strategies) that should be defined and implemented.

Research is needed to improve methods for the effective training and assessment of operational proficiency to account for the steady march of automation into the Air Traffic Control (ATC) and Traffic Flow Manager (TFM) environment.

Current training tends to be developed for individual capabilities, with a “knobology” (user interface) scope, and typically does not address operational use, nor the cognitive skills needed for increased use of automation (e.g., decision support tools).

We acknowledge some current FAA human factors research is starting to be more operationally focused (e.g., on TBO), but this research does not provide adequate guidance on identifying new skills and training requirements, as well as scientifically valid methods to develop, assess, and maintain full-spectrum proficiency of Controllers, Supervisors and Traffic Flow Managers.

RECOMMENDATION 1

Training Air Traffic Controllers for Increased Automation Use

The FAA should conduct research to identify ways to effectively train air traffic personnel to use tools and systems that are increasingly automated. The research should identify the associated cognitive skills and knowledge Air Traffic personnel need to use automation effectively across operational contexts, as well as methods to assess proficiency.

For example, the research should:

- Determine the initial and recurrent training requirements operational personnel will need to account for the implementation of new automation into the Air Traffic Control and Traffic Flow Manager environment.
- Identify ways to determine effective methods to assess the development and maintenance of personnel proficiency.
- Identify the training requirements operational personnel will need to help ensure graceful degradation of operations in off nominal conditions when operational personnel are accustomed to automation support.
- Address knowledge and skills associated with tasks requiring psychomotor, perceptual and cognitive skills as well as the ability to participate effectively as a member of a team.
- Extend learning that only deals with how to accomplish specific tasks while using a tool, to include additional understanding and application of the full capability of the tool in the context of other systems during operation.
- Develop and maintain proficiency in the knowledge and skills necessary when operations transition from an automated environment to a potentially degraded automation environment.

As the operational landscape increases in complexity with TBO, training content will need to keep pace with operational change to ensure the workforce remains proficient across all states of operations to maintain the safety of the system.

FINDING 2

Update Alerting System Standards

The current flight deck designs and regulatory framework for flight deck alerting systems were based primarily on research that was conducted by aircraft manufacturers in the late 1970's and early 1980's.

The last major collaborative efforts in improving and standardizing aircraft alerting systems by U.S. commercial transport aircraft manufacturers were from 40 years ago.

The results of these studies were used as a foundation for the current aircraft certification regulation on Flight Deck Alerting 25.1322 and FAA Advisory Circular 25.1322-1 for the design approval of flight crew-alerting functions.

Technology has advanced significantly, and new capabilities have been implemented in modern alerting systems. Research is needed to ensure the design of advanced alerting systems support human cognitive performance for implementation in modern aircraft. The research should provide a basis to update current alerting system standards and enable a harmonized interpretation of regulations.

RECOMMENDATION 2

Update Alerting Systems Standards: The FAA should conduct research that provides a current scientific and engineering basis to update alerting system standards for design and implementation of modern flight deck alerting systems. The research should focus on human performance considerations to inform the design of modern alerting systems in highly integrated flight decks, and to inform an update to the associated regulations to enable a harmonized interpretation.

For example, the research should address:

- Cognitive performance and alerting such as the effective use of human senses according to the tasks.
- The effectiveness of current alerting methods and systems and identify effective means to mitigate identified human performance issues such as startle, sensory overloading, prioritization of complex information, and swift transfer of control.
- Temporal characteristics of the actions the alerts trigger and improved ways to effectively delineate between categories of alerts such as advisories versus cautions.
- Ways to represent and present alerts to flight crews to effectively guide response to and understanding of the failure. The complexity of the automated systems that also hide their automated processes can be difficult to understand without extensive knowledge of the systems, and they may result in increased reliance on the automated alerting.
- Increased system integration that processes information and outputs it to the flight crew with no transparency into its processing. Flight crews must monitor and assess automated system outputs which creates new tasks and adds workload.