Findings, Recommendations, and Actions from the Summer/Fall Human Factors Subcommittee Meeting

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Findings and Recommendations

Information Management

After reviewing the 2017 portfolio projects, tasks, and their status and outcomes the subcommittee supports the ongoing flight deck research being conducted and scheduled. However, the subcommittee identified several important gaps in the planned Human Factors research which the subcommittee deems high priority areas of research that should be reprioritized for FY18 and funded in subsequent years.

Finding 1:

One gap in the Human Factors NextGen portfolio concerns Information Management. An important example of this is the impact of information overload on pilot workload and its consequences for distraction. Standards are needed to define what information may be pushed to or pulled by the pilot and when. Increasing information management demands for pilots, controllers, dispatchers, and traffic managers in NextGen operations will create human factors risks and vulnerabilities such as high workload, distraction, longer task time, and increase errors.

Recommendation:

The FAA should review its HF portfolio for 2018, 2019 to include information management as a research focus area and ask planned projects as appropriate to address information management issues in their current project tasking. The 2020 research portfolio should include information management as a specific research focus area well above the "Mendoza line".

Consequences if not funded:

Modern flight decks and the control stations for controllers, dispatchers, and traffic managers are rich information landscapes that demand user's process and manage information by acquiring, filtering, interpreting, and integrating relevant information, into a coherent understanding. If the information sources are difficult to monitor and verify or if appropriate information is not shared among collaborators in the same format in a timely fashion, several human factors issues may result. Users may over rely and trust automated systems because they don't have the capacity to interpret and verify outputs. Performing information management tasks such as organizing, filtering, and prioritizing information may distract from primary tasks (such as flight path management). Communication may break down and result in both errors and inefficiencies because collaborators don't have the same information or don't interpret the information similarly because it is in different forms or formats. Primary tasks may take longer because additional information management tasks add task time but not direct value. If this research priority is not addressed, the significant changes in the information environment related to NextGen and beyond will likely increase existing human performance issues and

introduce new ones that could reduce safety and efficiency thereby negating the expected benefits of NextGen.

Pilot Training

After reviewing the 2017 portfolio projects, tasks, and their status and outcomes the subcommittee supports the ongoing flight deck research being conducted and scheduled. However, the subcommittee identified several important gaps in the planned Human Factors research which the subcommittee deems high priority areas of research that should be reprioritized for FY18 and funded in subsequent years.

Finding 2:

A major gap in the Human Factors portfolio related to Pilot Training. There are a number of important areas related to training for NextGen that include human factors issues that are not being investigated nor are they currently planned. These areas include distance learning, training methods, training effectiveness assessment, instructor/evaluator training, and situations with no checklist.

Recommendation:

The FAA AVS should review and reprioritize the overall safety portfolio for 2018, 2019 to include research on pilot training issues to improve safety. The 2020 research portfolio should include training as a specific research focus area. For example, concerns about distance learning and training methodologies are already in the requirements but have not been funded and are high priority issues to the subcommittee. Training methods, such as competency based training and other methods need to be assessed and updated to meet current and future needs. What skills and knowledge do pilots need and how do we train instructors to ensure they are developed in pilots? We expect skills and knowledge to transfer, but how do we measure the effectiveness of training? Because we cannot train for everything how do we build resilience into the human component of the system, controllers and pilots, and into the system itself so that the humans are equipped to effectively manage the unexpected?

Consequences if not funded:

Distance learning is already being used extensively by operators to replace other proven training methodologies without research being conducted to determine empirically if the distance learning method is effective. Safety and training data suggest that pilot knowledge and skills required for current and NextGen requirements is increasing and current training methodologies used to develop knowledge and skills may not be as effective to meet NextGen system needs. The FAA currently provides guidance that allows for 100% of some knowledge based training to be done via distance learning using methods which some studies found to be only 10-20% effective. Research is needed to define realistic guidance on what types of distance learning delivery methods are effective for different types of knowledge and skills, how to assess effectiveness of distance learning after training completion, and the proper mix of distance learning with classroom and other methodologies. ICAO is supporting competency-based training and the U.S. has not funded the research to understand competency-based training and other proposed training methodologies. The FAA is participating in the ICAO working group with little or no

research to back up their position. The working group work is scheduled to be completed by 2020, so the research needs to be started now.

Research to Reality

Finding 3:

Next Gen applications such as, Trajectory-Based Operations and Dynamic RNP aim to enable both greater flexibility and efficiency. For such programs to realize the expected benefits, human factors principles and findings need to be included into the design of flight crew and air traffic displays, procedures, and other details of the complex operations. While significant human factors work has been conducted that relate to these applications and supporting technologies, such as Data Comm, a continual emphasis on the correct application of past research and human factors principles is needed as decisions are made on national and international procedures and guidance. While some of the relevant work had a specific program emphasis in the past (e.g., Data Comm), the total of the work that needs to be applied to ensure realization of expected benefits is broad and cross-cutting. This includes several 'lessons learned' that need to be considered to prevent situations that have resulted in rejection of new technologies by pilots and air traffic controllers. The application of this body of knowledge is the final step in the research process and required for the realization of the benefits of the research.

Recommendation:

A vehicle or standardized processes is needed within ANG-C1 to enable the continual transfer of the results of both Core and Next Gen human factors research and the correct application of these results and human factors principles into the decision-making bodies of the standards and procedures of Next Gen operations. These include RTCA working groups, ICAO panels and ICAO working groups which develop and refine international standards and guidance materials and work toward global harmonization of such procedures.   Such a vehicle would promote and ensure effective continual involvement of human factors in all aspects of Next Gen operations from concept development through post- implementation. Post-implementation testing would assess effectiveness and identify whether refinements are needed to realize projected benefits.

UAS in the NAS

Finding 4:

At the last meeting of the REDAC HF sub-committee, there were several presentations related to the FAA research plans for including UAS in the NAS. While significant progress is being made and some plans are yet in development, the sub-committee was disappointed that research in the areas of communication latency and message clarity between the various components, (ground station, ATC, Visual Observers and UAVs) and the human factors aspects of the communication latency was not seen as significant. Little or no research appears to be planned in this area. Understanding the latency requirements for UAS operating in the NAS is necessary in order to create acceptable standards. While there is some work being done looking at communication latency, the importance of the human aspects

of that latency seems to be missing. Without sufficient research in this area, introduction of the UAS in the NAS has a high risk of not having sufficient communication speed and bandwidth to operate safely.

Recommendation:

Ensure that sufficient research is planned and conducted on the human factors aspects of communication latency in the overall UAS research plan.

Consequences if not funded:

If research related to the human aspects of latency and communication is not conducted, the introduction of UAS into the NAS may result in lower safety margins as well as inefficient infrastructure design.