SUBCOMMITTEE ON AIRCRAFT SAFETY

Findings and Recommendations

Fall 2015 Meeting

The Aviation Safety Committee of the REDAC met on September 9, 10, 2015 at the FAA technical Center in Atlantic City, NJ for its fall meeting. Below are the Findings and Recommendations from the committee which should be used to consider improvements in current research programs, controls and to also inform the 2018 Research Plan as it develops. Thank you to the committee members for their engaged participation and dedicated time. Also a strong thank you to all at the FAA that made the meeting a success through their support by providing research details, tours and immediate responses to committee questions.

Title: Improved Program Management Tools for Research

Finding: The SAS committee is spending considerable time and energy trying to understand the big picture of the FAA's research programs as they relate to aviation safety. In 2015 there are over 70 research requirements with a total budget expenditure for the safety portfolio on the order of $90 million. This size of investment in research warrants a clear picture into the programs including overall research objectives, sponsor outcomes, financial commitments over multiple years, research exit criteria, etc. Good progress has been made in producing individual research program quad charts describing specific targeted contract research efforts. However, visibility to the comprehensive research picture is still lacking and confused by the presentation of the material in individual Budget Line Item (BLI) format and related to contracted dollars only versus total dollar efforts. Program documentation is also apparently produced for the use of SAS committee only, which, while appreciated, seems counter to good program management techniques. Lacking clear line of sight to the higher program level makes providing SAS committee input into overall research programs fragmented and incomplete at best.

Recommendation: FAA should create a comprehensive program management tool set for safety research that clearly identifies the higher level research objectives, by topic, (icing, fire safety, structural technologies, etc.) as well as provides connectivity to the comprehensive set of specific targeted research objectives in each area. This tool set needs to clearly demonstrate how individual research supports the overall objectives. The tools should be designed so they primarily add FAA management value as well as support the SAS Committee objectives.

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Title: Enhanced International Collaboration on Safety Research

Finding: The subcommittee received an overview presentation on the Association of European Research Establishments in Aeronautics (EREA) Future Sky Safety program. We were pleased to see that the FAA Aviation Safety organization will be engaged in the activity by being part of the Advisory Board.

The program's four themes are addressing issues, which align with many of the FAA's aviation safety priorities.

Recommendation: Given that Aviation Safety issues span international borders, the FAA should consider taking a leadership role in deepening US-European collaboration on Aviation Safety research by initially focusing on one or two specific areas of common interest. One potential is big data analytics associated with aviation safety data exploration. Both the FAA and NASA have significant on-going investments in this area, which aligns nicely with the Future Sky Safety project on Emergence Detection and Big Data, which is intended for a start in 2017. Through joint efforts we are likely to be able to magnify the safety impact of research investments of all parties.

Title: Immediate Needs for Additive Manufacturing Certification Support

Finding: There has been continued progress accelerating the development of a FAA Additive Manufacturing Roadmap and the identification of focused Additive Manufacturing research. In parallel, industry is continuing to accelerate efforts to incorporate additive manufacturing technologies as full-scale production processes. The subcommittee was presented with an update on Additive Manufacturing research activities ongoing at the Air Force Research Laboratory and the identified design, manufacturing and inspection challenges associated with this technology. In July 2015 the Air Force issued an Airworthiness Bulletin to its Program Offices highlighting the process steps to be followed to insert Additive Manufacturing technologies. This near term action is seen as a positive step to assure implementation is consistent with strategic planning with respect to qualification of new materials and processes. The subcommittee also received a briefing from the FAA Fatigue and Damage Tolerance Chief Scientific and Technical Advisor (CSTA) on recent progress including collaboration with the Air Force Research Laboratory on the qualification and certification of parts produced via Additive Manufacturing processes. The subcommittee finds that a near term strategy is required to help the certification directorates assess type designs or type design changes which incorporate parts produced utilizing additive / advanced manufacturing methods.

Recommendation: The subcommittee recommends that the FAA develop guidelines describing the considerations, which should be assessed relative to the incorporation of parts produced by Additive Manufacturing. Target for implementation of these guidelines should be immediate (on the order of 3 months). The subcommittee further recommends that the FAA assess the need for additional research to supplement the initial guidelines for the potential longer-term codification of Additive Manufacturing guidance.

Title: Research to Mitigate the Impact of Cockpit Laser Strikes

Finding: The potentially negative effects of laser beams striking the human eye and interfering with flight operations are well documented by previous research conducted by the FAA, among others. The frequency of reported laser strikes has increased more than 10 fold since 2006; that year, FAA reported 384 such events. In 2014, the agency reported 3,894 laser strikes and, unfortunately, the number of reported strikes this year has spiked about 35% higher than last year with more than 2,625 reported as of June 2015. Whereas low-powered handheld lasers were previously in common use, more powerful lasers that pose a greater threat to the pilot are becoming available to potential offenders. While considerable research has been conducted within the military, much of this work is classified, focused on specific threats, and therefore will not provide a complete solution for the civilian sector. To date the FAA's approach to mitigate the impact of a laser illumination event is to document and characterize these events, and educate flight crews on how to recognize an event and then respond in a manner to help identify and prosecute offenders. Despite these efforts and others, the number of laser strikes is expected to continue to rise and there has yet to be identified a robust, reliable countermeasure that will protect pilots' vision and preserve flight safety. Currently, there is no funding in the FAA R&D portfolio of activities to investigate and/or develop potential technical solutions to mitigate the impact of a laser strike. Achieving a workable, technical solution to this problem, rather than relying primarily on law enforcement and education campaigns to mitigate the risk, would represent a significant safety accomplishment that would benefit the traveling public and cockpit flight crews.

Recommendation: The SAS Committee recommends that the FAA include within its R&D portfolio the resources to conduct research aimed at identifying a technical, onboard solution to prevent or greatly reduce the potential for a laser strike against aircraft and mitigate its impact. The extensive R&D conducted within the DoD should be leveraged to the maximum extent possible considering security and intelligence concerns. As envisioned, the solution would:

- Require no action by the flight crew that would disrupt or unduly complicate normal operations
- Be effective against a high percentage of laser strikes, regardless of frequency (i.e., color) and power of the source
- Be capable of being used on any aircraft used in FAR Part 121 or Part 135 service
- Not impair pilots' visual acuity or ability to correctly interpret colors of messages, warnings, etc., on cockpit displays at any time, or otherwise degrade performance, while operating the aircraft