REDAC Subcommittee on Aircraft Safety (SAS)

Findings and Recommendations from Fall 2020 Meeting

<u>General Observations</u>: During the REDAC SAS meeting, FAA presented a series of updates and a review of the R&D program accomplishments. It was observed that many of the R&D efforts have the potential to support on-going developments in industry, especially many of the new entrants to aviation. Given the international scope of aviation today, it will be important for the FAA to collaborate with other regulators to find a common set of requirements and how those requirements can be used as a means of compliance to the regulations. This will allow companies to develop aircraft and systems that will be accepted worldwide. In addition, it will be important for the FAA to build on the R&D efforts to collaborate closely with industry to establish a solid regulatory framework for this new technology. This is critical for innovation and bring new entrants into the aviation eco-system.

Finding – FAA's R&D Efforts During COVID-19 Pandemic: the REDAC SAS received briefings on the FAA's R&D program developments. It was clear that tremendous progress has been made during the past six months, in spite of the challenges of COVID-19. Industry representatives on the SAS were impressed at that progress and commend the FAA for its efforts during this pandemic. While significant progress has been achieved during these unprecedented times in our nation's history, from a long-term perspective, to meet the needs of the industry, a continued focus on the R&D program will be imperative. The committee was also briefed on the COVID-related suspension of all FAA human-subjects research. The potential for budgetary and programmatic disruption is of concern to the committee. In addition to the COVID-19 situation, both industry and the FAA have had the additional burden of dealing with the outcomes of the Boeing 737MAX re-certification effort. As further lessons are learned from the investigation and subsequent recommended improvements to the regulatory and compliance framework, the potential exists to put new priorities on the R&D program.

Recommendation #1 – As the FAA continues its R&D work program, the REDAC SAS further encourages the continued focus on those funded programs. The REDAC SAS requests regular updates to any R&D programs that may be negatively impacted by the COVID-19 crisis, including re-planning of milestones and areas.

Recommendation #2 – As progress is made on the recertification of the 737MAX, at the appropriated time the REDAC SAS requests a briefing on what lessons have been learned and the impact they are having on the FAA's R&D portfolio and any changes to its priorities.

FINDING – Fatigue Risk Management R&D Portfolio: At the Fall 2020 REDAC SAS meeting, the committee received an update on the FAA's research efforts focusing on aircrew fatigue. This followed a similar briefing during the Spring 2020 meeting. The Subcommittee continues to be

impressed with the dedication of the researchers briefing their fatigue research, and notes efforts to bring together fatigue-related research from different policyholders, funding programs, and research organizations within the FAA. Notably, the overdue addition of rotary-wing aviation operations to the fatigue working group is recognized.

The SAS recognizes that efforts are ongoing to provide a) a fatigue research program that provides a method of surveillance for early indicators of fatigue hazards across aviation operations in U.S., and b) a structured research program to assess the effectiveness of FRMP/FRMS in Part 121 passenger-carrying operations. Dr. Nesthus briefed two proposed studies into the fatigue issue, one dealing with short haul flying and the other on circadian shift during long haul operations. Dr. Nesthus also stated that due to funding constraints, emphasis would be placed on accomplishing the short haul study initially due to the level of risk and the current gaps in existing research. The committee agrees with this reasoning and that the short haul study should be done first.

However, despite the FAA's apparent support for the Fatigue Management Working Group (FMWG) and for increased fatigue research, the SAS made two observations: 1) There still does not appear to be any planned research aimed at reviewing the existing FRMP/FRMS program to assess its performance in long-haul commercial aviation operations. Such research could take the form of surveys, event reports, accident reviews, data analysis, etc. 2) SAS committee received budgetary information showing that several fatigue research requirements, including the two studies mentioned above, are unfunded in FY22. The researchers indicate that these studies may be suspended due to lack of continued funding. The FAA's method of annually reprioritizing research, including multi-year human subjects research, for the purpose of determining funding, is contrary to the conduct of good science, and in human use circles, is considered unethical (due to the needless exposure of human subjects to research risk). The Committee hopes that funding reforms in the FAA will correct this problem.

Recommendation #1: The Subcommittee would like to see additional information on the FAA's fatigue-related projects to enable a better understanding of funded research objectives and deliverables. The SAS is requesting an update at the Spring 2021 meeting on the progress and continued funding of this research.

Recommendation #2: The Subcommittee also requests further clarification of the funding profiles and prioritization of fatigue-related research in the FAA. Additionally, the Subcommittee recommends for the FAA to restore full multi-year funding for the two research projects discussed above, which follow up on the effectiveness and utility of the FRMS/FRMP and allow the FAA to identify shortfalls and potential enhancements to the current flight time/duty time regulations.

FINDING – Aircrew Stress Biomarker Research: The SAS REDAC received an update on aircrew stress biomarker research at the FAA's Civil Aerospace Medical Institute (CAMI). The

committee is impressed with this world-leading research effort. Objective markers for degraded aircrew performance and health are urgently needed to replace current subjective reporting methods that fail to reliably aid accident investigators in assessing human factors in accident causation. This ground-breaking research into gene expression and genetic-based biological indicators at CAMI is unique in the federal government and aims to deliver tools that can identify pre-accident aircrew stress states (e.g., fatigue, hypoxia, disorientation) that will revolutionize aircraft accident investigation. Additionally, these techniques, when validated, can serve as fitness-for-work assessments, giving safety and management personnel tools for real-time risk assessment decision-making.

Recommendation: The Subcommittee requests that the FAA consider the potential short- and long-term benefits of objective genetic-based biomarkers for aircrew stress and impaired performance and evaluate possible stable funding strategies to support this important and unique forward-looking research program.

FINDING - Ice Crystal Icing: The subcommittee appreciates the FAA research in Ice Crystal Icing on High Altitude Icing on Turbine Engine Damage and Power Loss. The project is currently funded through the 2020 fiscal year but Task 4 (develop and test a large-scale model rotating rig to investigate engine geometric scaling effects) is not funded beyond GFY20. Task 5 (supporting information for developing guidance materials for means of compliance) will continue in FY2021 using FY2019 and FY2020 funding.) Further in-depth research can aid current rulemaking work to address this issue appropriately.

Current funding was used for several flight campaigns however, the data analysis portion requires additional funding for consultants. Additionally, as many projects are put on hold during the COVID-19 pandemic, funding should be available for ongoing work including additional testing for modeling and testing for ICI accretion behind the fan.

Recommendation: The FAA should consider further funding for ice crystal icing research for Fiscal years 2021 and 2022 and beyond as this problem has not been adequately addressed in certification and rulemaking. The FAA should consider additional research in the following fields:

- Aerosol testing to determine how the water droplet adheres to the pollutant.
- New engine entrants and components (e.g. wide chord fans, composites, etc.)