Subcommittee on Aircraft Safety (SAS) 2016 Fall Meeting Summary

FAA Research, Engineering & Development Advisory Committee

October 6, 2016

Fall 2016 SAS Meeting Objectives

- **Continual input on guidance to the research portfolio – 2019**
- **Begin to explore REDAC/Administrators Big Data questions**
- **Maximize value out of our time with Research and the Aviation Safety Management Teams**

SAS Approach

- **Desire to continue to build upon work of prior SAS meetings**
  - **Keep previously identified Emerging and Future concerns in the forefront to assist in identifying research gaps**
- **Meeting the advisory needs of the AVS Management Team**
- **CSTA and outside industry/FAA expert participation whenever possible**
- **Deep Dives into significant items – as defined by:**
  - **Significant research dollars committed**
  - **REDAC priority items**
  - **Committee concern items (Emerging issues)**

Agenda Development Guide

- Meeting's agenda built with a strong connection to previously identified Emerging and Future, and high level REDAC, issues
- ***Big Data Questions (Full REDAC)***
  - Big Data and Data Analytics Discussion
- ***UAS (Full REDAC)***
  - UAS CONOPS and Maturation Plan Discussion
- ***Real Time System-wide Safety Assurance (Emerging Issue)***
  - NASA and FAA Updates on their activities
  - Committee discussion on gaps
- ***Cert of Advanced Materials and Structural Technologies (Emerging Issue)***
  - Additive Manufacturing Discussion
- ***AVS Leadership team (AVS Needs)***
  - AVS Management Team Strategic Research Discussion

For Consideration During the Meeting

- **What do we want to discuss with the AVS leadership team?**
  - **Are we meeting their needs?**
  - **What help do we need to do a better job?**
- **Are SAS Emerging and Future issues still the right ones?**
  - **Should they be changed or adjusted?**
- **What else do we need to evaluate/deep dive into to better inform us?**
  - **Short term?**
  - **Long term?**

Findings and Recommendations

- **Real Time System-wide Safety Assurance**

  - **Findings**
    - SAS Fall 2014 Emerging Issue (Appendix) and NASA Strategic Thrust
    - Pleased to see joint FAA/NASA Research Transition Team item in place
    - Encouraged by development of distributed capability for local action
    - Definition of “Real Time” - In time to mitigate the hazards

  - **Recommendations**
    - RTT provide SAS and other industry groups updates on progress and solicit input
    - Focus on short term (less than 5 year) deliverables

Findings and Recommendations

- **Additive Manufacturing**

  - **Findings**
    - Progress being made on accelerating research
      - Additive Manufacturing National Team
      - MIDO/ACO Aids to Certification of parts released
    - Roadmap under development although not yet shared

  - **Recommendations**
    - FAA should share draft roadmap and accompanying research plan for industry comment

Findings and Recommendations

- **Fatigue Knowledge Affecting Aviation Safety**

  - **Findings**
    - February 2014 implementation of Flight and Duty Time regulations – 1st revision in decades
    - Evaluations underway suggest improvement although concerns remain about fatigue issues across all sectors, including UAS
    - Research is occurring across broad multi-agency portfolio but has not been shared in organized manner making analysis difficult

  - **Recommendations**
    - FAA review and present a coherent and holistic view of fatigue problem in US aviation
      - Include known knowledge gaps and research being accomplished across government agencies including non-aviation fatigue

General Comments

- **2019 Guidance**
  - SAS Emerging Issues included in 2019 Strategic Guidance Document published by AVS in May, 2016
  - Several SAS Spring 2016 Findings and Recommendations are still considered valid and SAS will continue to discuss with AVS
    - Advanced Engine Materials Research, nondestructive evaluation, Ice Crystal Icing

- **Reviewing draft responses to Findings and Recommendations before publishing would be helpful – Possible FAA process change?**

- **Excellent discussion between FAA Research, Aviation Safety and SAS regarding fulfilling mutual expectations through the REDAC process**
  - Obtaining a more comprehensive view of the research portfolio
  - Understanding from industry what may be coming that requires FAA attention
  - Key topics of FAA concern that SAS can explore

Appendix

Findings and Recommendations Spring 2016

- **Advanced Materials Research**
- **Findings**
  - Fall 2014 SAS identified Emerging Issue of Certification of Advanced Materials and Structural Technologies
  - As new aircraft and engine designs drive towards advanced performance, new material systems and structural concepts will continue to be introduced that are significantly different.
  - FAA needs to stay abreast of industry changes to build its knowledge to make certification decisions and support regulations, standards, guidance materials and training
  - Four specific areas of concern include:
    - Hot corrosion on engine rotor life and incorporation of work into DARWIN
    - Advanced Non Destructive Evaluation (NDE) of critical components
    - Cold dwell fatigue modelling in Titanium
    - Computational Material Science research to understand microstructural changes in critical materials
- **Recommendations**
  - FAA continue to prioritize funds for further development and validation of hot corrosion into DARWIN code
  - Continue the study of innovative NDE techniques and assist in the transition of the most promising methods to manufacturers and overhaul facilities
  - Work collaboratively with industry and AFRL to fully understand texturing in Titanium to prevent cold dwell fatigue
  - Continue to work collaboratively with industry and USAF to develop computational methods into DARWIN code to enhance life prediction

Findings and Recommendations
Spring 2016

- **Ice Crystal Icing (ICI) Engine Test and Analysis Capabilities**
- **Findings**
  - SAS presented a comprehensive review of icing related safety research
  - Both the Engine Harmonization Working Groups (EHWG) and Technical Community Representative Groups (TCRG) identified need for additional ICI engine testing
  - Research in avoidance of ICI is ongoing although it is not practical to expect complete environmental condition avoidance

- **Recommendations**
  - Means must be designed, analyzed, and lab tested, to predict and reduce ice crystal icing susceptibility for engines
  - RE&D funding for A11.D (Research on Ice Crystal and SLD Icing Conditions) be prioritized at a higher level in FY18 and beyond to support engine testing

Fall 2014 - SAS Emerging Issues Reminder

- Real time system-wide safety assurance
- Dependability of increasingly complex systems
- Certification of advanced materials and structural technologies
- High density energy storage, management, and use

Fall 2014 - SAS Future Opportunities- Reminder

- Commercial space integration with the National space system
- General aviation's role in safety systems development
- Effects of breakthrough medical technologies on FAA medical certification standards
- Identification and funding of strategic research and development

Real Time System-wide Safety Assurance (More Detail)

- ***Why?***
  - Ongoing advances in sensor and network technology, computation, communications and integration
  - Ongoing advances in data analysis capability
  - Ongoing developments in accelerated data access
  - Ongoing data protection issues
  - Advances in system-on-system modeling and prognostics including integrated human performance monitoring

- ***Research Needs***

  Continued development of real time, continuous, safety analysis and assurance tools including;
  - Data mining and analysis
  - Automated prognostics
  - Safety risk modeling

  Integration of advanced tools into more highly automated safety assurance systems
  - Development of psychological and physiological measures from the human operator that inform the automation
  - Stronger understanding of how human operators and autonomous systems collaborate to improve safety
  - Autonomic properties of self-protection and self-healing