Federal Aviation Administration (FAA)

Research, Engineering, and Development Advisory Committee (REDAC)
Subcommittee on Aircraft Safety (SAS)

William J. Hughes Technical Center
Atlantic City International Airport
Atlantic City, NJ 08405

March 24-25, 2015

Meeting Minutes
Day 1 – March 24, 2015

Welcome/Opening Comments/Agenda Review

Ken Hylander called the meeting to order at 8:44AM and welcomed the SAS members, FAA participants, and all others in attendance or on the phone. Ken initiated an introduction of those present in the room and on the phone. Eric Neiderman added his welcome to the group.

Ken commented that this meeting presented an opportunity to maintain continuity from the last meeting (Fall 2014) by striking a balance between the emerging issues identified by the SAS and the individual requirements proposed for FY17.

Eric distributed a one page document that identified the two key questions for this meeting:

• What are the recommendations and impacts for the FY17 aviation safety portfolio?
• What are the long-term considerations?
  o Do we have the right building blocks?

Dennis Filler, Director, William J. Hughes Technical Center, agreed with the need to maintain continuity with the last meeting. He addressed the importance of integrating SAS output across the entire FAA RE&D appropriation portfolio. This is especially important in a system-of-systems context.

Letter designations represent location of presentation material in the binders distributed at the meeting.
B  Budget Update
Presenter: Mike Gallivan (FAA)

Mike presented REDAC Aircraft Safety Subcommittee R&D Budget Status. Mike’s presentation included information about the enacted FY15 RE&D budget and the FY16 RE&D budget request. He added that sequestration is still the law. The FAA presented the FY16 budget to Congress on time (2-2-15) and we expect Congressional mark-ups by this summer.

The out-year budget targets from FY17 through FY21 are set but expected to change. Mike added that the target is broken into three components: personnel compensation and benefits (PC&B), travel, and contracts. He concluded by mentioned that the FAA has started work on its proposed reauthorization bill. The current authorization runs through FY15.

Mark Orr (FAA) explained that the FY17 Aircraft Safety portfolio being presented at this meeting used the total FY17 Target figures shown as a starting point. The projected PC&B and travel are deducted from the target yielding an amount available for contracts. The AVS process programs budget to the prioritized requirements based on the cost estimates submitted by the performers until the expected contract dollars are used up. This becomes the Mendoza line.

C  Strategic Input from Fall 2014
Presenter: Ken Hylander (SAS – Chair)

Ken presented Subcommittee for Aviation Safety – Going Forward. Ken referred back to the special tasking from the FAA in the fall of 2014 to focus on emerging issues and future safety themes. On slide 4 (SAS Meeting Summary), he presented the list of emerging issues and future issues for consideration. He added that there were no specific Finding & Recommendations.

On slide 11 (Follow Up Meeting with AVS Leadership), Ken presented his thoughts about the integration of SAS emerging issues with AVS research portfolio and AVS feedback. Ken stated that in his discussions with Peggy Gilligan, she acknowledged there is value in considering the emerging issues while recognizing the real-time horizon needs within AVS.

The balance of the presentation spoke to methods of connecting the SAS emerging issues to the AVS research requirements embedded in the Budget Line Items (BLIs) that build the R&D budget portfolio. Mark Orr’s presentation will expand on this topic.

D  Budget Line Item Mapping
Presenter: Eric Neiderman (SAS – DFO)

Eric presented FY17 Aviation Safety Portfolio Budget Line Item Mapping. The BLI maps on slides 5 through 8 show the relationship between the Technical Community Representative Group (TCRGs) that identify AVS research needs, the expression of those needs as research requirements, and the capability groupings (BLIs) that plan and conduct the research. The BLIs are made of people, laboratories, partnerships, and fiscal resources.
Eric made reference to the nickname for this mapping, the Rosetta Stone, and the idea that it could be useful concept when mapping SAS emerging issues to AVS research needs to future research capabilities.

E  Improving Aviation Safety FY17 BLI Portfolio
Presenter: Mark Orr (FAA).

Mark presented *FY17 Aviation Safety Portfolio – BLI View*. Mark’s presentation included two separate sections: mapping FY17 requirements to SAS emerging issues; and a complete list of the proposed AVS requirements for FY17.

The results of the AVS R&D team effort to map FY17 requirements supporting SAS issues to BLIs is shown on slide 4. Slides 5 through 15 provide greater detail of this mapping, including research milestones (shown in red) and implementation milestones (shown in blue). Unfunded requirements are shown on slides 9 through 11.

The SAS discussed the best way to review and interpret this information, is it the right tool, or how best to extract value from this mapping. The SAS reached consensus that the emerging issues need better definition and that the FAA should consider the use of research roadmaps with both strategic and operational features.

The second section, the proposed FY17 requirements, was distributed to SAS in advance of the meeting. SAS members provided commentary on this information via emails prior to the meeting. Pages 3 and 4 of the Agenda identify SAS member comments and FAA approach for reviewing these comments and providing a response.

Kathy Abbott (FAA - on phone) discussed the status of an open Finding and Recommendation: SAS Fall_2013-3 *Alignment of Human Factors Research*. She explained that there is an ongoing coordination process across other research programs and that the HF TCRG is distributed across Flight Standards and actually embedded in the unmanned aircraft system (UAS) program.

At the conclusion of the review of FY17 requirements, SAS members toured the NextGen Integration and Evaluation Capability (NIEC) and Network Operations Center.

F  Fatigue Structures and Materials
Presenter: Mike Gorelik (FAA)

Mike presented *Emerging Technologies and Risk Mitigation – Additive Manufacturing*. Mike discussed the emerging technology considerations of additive manufacturing (AM) related to aviation safety. This includes business drivers, technology transition, and the evolution of criticality of AM parts. Slide 19 identified the top five challenges. He also informed the SAS

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2 See Appendix III for associated Finding and Recommendation.

3 This information (*FY17 Portfolio HF Connected Requirements*) was provided to the SAS during discussions about open F&R SAS Spring_2013-24: Flight Deck/Maintenance/System Integration Human Factors and NextGen Human Factors.
that the FAA is forming an AM Steering Group with an initial focus on developing an Agency AM roadmap.⁴

A second section of Mike’s presentation focused on the state-of-the-industry: original equipment manufacturers (OEMs) and government agencies (Air Force, NASA, NIST).

Ken Hylander assigned homework to individual SAS members on three topics: research roadmaps, embedded experts for human factors research⁵, and an additive manufacturing roadmap. There was also a request from the SAS to provide the proposed research requirements and Quad Charts earlier in the process for SAS review.⁶

Meeting adjourned at 5:25 PM.

Day 2 – March 25, 2015

Ken Hylander convened the meeting at 8:30 AM and began with a review of the homework assignments. The result of these discussions and subsequent dialogue yielded a set of Findings and Recommendations that the SAS will forward as part of their report to the full REDAC committee.

The SAS members received a copy of the AVS Strategic Guidance for Development of the FY 2017 Research, Engineering, and Development (RE&D) Safety Requirements Portfolio.

G COE Overview
Presenter: Pat Watts (FAA)

Pat presented FAA Air Transportation Center of Excellence. The presentation covered the legislative authority, selection criteria, and geographic distribution of Centers of Excellence (COE). The universities cost match, dollar for dollar, all research grant awards. This long-term collaborative commitment between the FAA and the COEs provides a valuable benefit to aviation research. Pat also discussed the status of current COEs and the pending COE for UAS.

H UAS R&D Overview
Presenters: Chris Swider (FAA on phone) and Claude Jones (FAA)

Chris presented REDAC SAS Spring 2015 Review - Unmanned Aircraft Systems (UAS) Research Planning. Chris framed his presentation around the following elements: a) resource changes, b) integrated plans, c) research priorities, and d) partnerships.

a) The FY15 Appropriation from Congress included $2M to accelerate key research areas and $4M towards research at the pending UAS COE.

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⁴ See Appendix III for associated Finding & Recommendation.
⁵ This is related to an open Finding and Recommendation SAS Fall_2014-3 Alignment of Human Factors Research.
⁶ See Action Item 5 in Appendix IV.
b) FAA-wide coordinated planning is underway. The goal is a working level integration plan that supports near- and mid-term needs.

c) Efforts are underway to get useful research results from the UAS test sites. Sensor fusion research is focused on standards development supporting RTCA SC-228 developments. Emerging priorities include the impact of the small UAS Notice of Proposed Rulemaking. FAA/ATO developed a multi-year UAS-L2 integration timeline.

d) Internal partners include – ATO, ANG, ARP, and AEE. External partners include MITRE, MIT Lincoln Labs, DoD, NASA, and DHS. Partnerships also extend the six UAS test sites, academia, industry, and international (through Action Plan 24). Slides 26 through 30 expand on the nature of these research partnership linkages.

Claude Jones presented *UAS R&D Update*. Claude focused on FY15 research activities and the research requirements for FY16. He provided greater detail on multi-sensor surveillance data fusion strategies and UAS system safety criteria.

This presentation addressed an open REDAC Observation to the Administrator from October 2, 2013, and an open Finding and Recommendation, SAS Spring 2014-2, on the UAS Roadmap and UAS R&D Strategy, respectively. In subsequent discussions, the SAS closed out the F&R and elected to establish an Action Item 7 for the next SAS meeting to provide a UAS presentation with a focus on Pathfinder implications. REDAC has the action to address the open Observation.

### I Unleaded AvGas

Presenter: Dave Atwood (FAA)

Dave presented *NextGen Alternative Fuels for General Aviation - REDAC Subcommittee on Aviation Safety (SAS) - Spring 2015 Meeting*. Dave framed his presentation around a visual on slide 2 that described a Path to Unleaded Avgas. In 2010, a general aviation coalition asked the FAA to take a leadership role to form a public-private partnership. The result was the Piston Aviation Fuels Initiative (PAFI) with a mission to “facilitate development and deployment of an unleaded AVGAS with the least impact on the existing piston-engine aircraft fleet.” He discussed the PAFI process in great detail and the status of testing to date at the William J. Hughes Technical Center.

The tour of the fuels lab was cancelled due to time constraints.

### J High Performance Computing, Big Data, ASIAS

Presenter: Charles (Cliff) Johnson (FAA)

Cliff presented: *High Performance Computing, Big Data, & ASIAS - An Overview of NextGen Shared Services (NSS) within the NextGen Prototyping Network (NPN)*. Cliff explained the generic nature of big data and its relationship to safety assurance with the aviation industry. More specifically, he described the role that the William J. Hughes Technical Center

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7 See Appendix IV for list of open and new Action Items.
can fill by providing high performance computing, secure storage and data access mechanisms, and analytical tools. Slides through 18 through 28 addressed specific resources and activities now active at the FAA Technical Center.

The SAS commented on slide 26 Big Data & ASIAS – Rotorcraft Research, as a good example of solving a current problem with a long-term beneficial approach. The SAS also observed that this work seems to meet several emerging issues identified previously by the SAS. Though not yet real-time, this provides a backbone or an essential step-one to addressing emerging issues.

Wrap Up

The SAS then revisited open F&R SAS Spring_2013-24: Flight Deck/Maintenance/System Integration Human Factors and NextGen Human Factors. Michele Yeh (FAA) presented information, FY17 Portfolio HF Connected Requirements, which showed the distribution of AVS sponsors across numerous TCRGs and requirements. The SAS agreed to close the F&R and prepare a new Finding.

John Lapointe addressed open Action Item #7. The SAS accepted the new information but deferred closing this Action Item until Joe Del Balzo, author of the Action Item and previous SAS Chair, had an opportunity to review the material.

The SAS also decided to keep Action Item #8 open but asked John Cavolowsky to address this matter at the next SAS meeting.

Randy Bass (FAA) addressed open F&R SAS Spring_2014-1: Weather and Decision-making. He presented REDAC Subcommittee on Aircraft Safety (SAS) Open Recommendation - Understanding Probabilistic Weather Information. This presentation was prepared for the FAA 2014 SAS meeting. The SAS concurred that this presentation successfully closed out the F&R.

The SAS briefly discussed significant lessons-learned from the meeting. They agreed that the ability to review and comment on the requirement Quad charts prior to the meeting is beneficial.

Next SAS meeting is scheduled for September 9 and 10, 2015, at the William J. Hughes Technical Center.

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8 See Appendices III and IV for new Findings and Recommendations and status of old and new Action Items.
Appendices

Appendix I: Agenda
Appendix II: Attendance
Appendix III: Findings and Recommendations
Appendix IV: Action Items
### Appendix I:

**AGENDA**

**FEDERAL AVIATION ADMINISTRATION**

REDAC Subcommittee on Aircraft Safety (SAS)

William J. Hughes Technical Center

March 24-25

Director’s Conference Room

Dial in Access: (609) 916-1975, passcode 257511

**Tuesday, March 24, 2015**

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<th>Speaker</th>
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<td>8:30 – 8:50</td>
<td>Welcome/Opening comments</td>
<td>Kenneth Hylander (Chair)</td>
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<td></td>
<td>• Introductions (all)</td>
<td>Eric Neiderman (SAS DFO)</td>
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<td></td>
<td>• Opening remarks/comments (Chair &amp; DFO)</td>
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<tr>
<td>8:50 – 9:00</td>
<td>Welcome</td>
<td>Dennis Filler (REDAC DFO &amp; WJHTC Director)</td>
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<tr>
<td>9:00 – 9:15</td>
<td>Budget Update</td>
<td>Mike Gallivan</td>
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<td>9:15 – 9:45</td>
<td>Strategic Input from Fall 2014</td>
<td>Kenneth Hylander</td>
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<td>9:45 – 10:15</td>
<td>Budget Line Item (BLI) Mapping</td>
<td>Eric Neiderman</td>
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<td>10:15 – 10:30</td>
<td>Break</td>
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<tr>
<td>10:30 – 11:15</td>
<td>Improving Aviation Safety FY17 Budget Line Item (BLI) Portfolio</td>
<td>Mark Orr</td>
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<td>11:15 – 12:15</td>
<td>Review of FY17 Quad Charts – Session 1</td>
<td>All</td>
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<td>See Page 2 for Review Topics</td>
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<td>12:15 – 1:15</td>
<td>Lunch</td>
<td>Cafeteria</td>
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<td>1:15 – 2:15</td>
<td>Review of FY17 Quad Charts – Session 2</td>
<td>All</td>
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<td>See Page 3 for Review Topics</td>
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<tr>
<td>2:15 – 3:15</td>
<td>NextGen Integration and Evaluation Capability (NIEC) &amp; Network Operations Center Tour</td>
<td>Hilda DiMeo</td>
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<td>3:15 – 3:30</td>
<td>Break</td>
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<td>3:30 – 4:30</td>
<td>Fatigue Structures &amp; Materials</td>
<td>Mike Gorelik</td>
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<td>4:30 – 5:30</td>
<td>Discussion/Summary/Homework/Actions</td>
<td>Kenneth Hylander/ Eric Neiderman</td>
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<td>6:30</td>
<td>Group Dinner: <em>Touch of Italy</em>, 6629 Black Horse Pike, Egg Harbor Township, NJ 08234</td>
<td>(609) 646-1855</td>
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<tr>
<td>Time</td>
<td>SAS Member Comment</td>
<td>Who is Needed?</td>
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<td>11:15-12:15</td>
<td>KH: System Safety Management (A11G.HF.10, A11H.SSM.9, A11H.SSM.11, A11H.SSM.13) - Large budget driver and strong (I think) connection to the Real Time System Safety SAS emerging issue. We should explore this further.</td>
<td>A11.HF.10 Dr. Bill Johnson (CSTA) Dr. Don Arendt (Sponsor POC) A11H.SSM.9 Mark Liptak (Sponsor POC) Cliff Johnson (Research Provider) A11H.SSM.11 &amp; A11H.SSM.13 Dr. Julia Pounds (Sponsor POC) Vasu Kolli and Huasheng Li (Research Providers) Dan Brock Danko Kramar Frank Wondolowski (RED Group Members)</td>
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<td>KH: Rotorcraft FDM Data Gathering and Analysis for ASIAS (A11H.SSM.9) - not sure I understand how this is research related. I have no debate that this work should be done but don’t we know how to do this already through the many FDM and ASIAS efforts in place in industry? Seems more like an operating budget requirement vs. research requirement unless I am missing something.</td>
<td>Mark Liptak (Sponsor POC) Cliff Johnson (Research Provider) Danko Kramar (RED Group Member)</td>
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<td>KH: Onboard Network Systems (A11D.SDS.1, A11D.SDS.4) - Seems to fit nicely with the SAS emerging issue of “Dependability of Increasingly Complex Systems” item.</td>
<td>Barbara Lingberg (Sponsor POC) Alanna Randazzo (Research Provider) Michelle Yeh (RED Group Member)</td>
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<td></td>
<td>KH: Fire Safety - Large budget driver and NOT something that we identified as a SAS priority or emerging issue. Did we miss something last Fall?</td>
<td>A11A.FCS.1 Steve Edgar (Sponsor POC) Gus Sarkos (Research Provider) Michelle Yeh (RED Group Member)</td>
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</table>
## Spring 2015 SAS Minutes

### DS/Boeing:

*the only question we have ahead of the actual meeting is in reference to the Flutter Suppression R&D. We would like to know where this subject stands in FAA priorities, and what particular research is planned to be accomplished in the next three years.*

- Ian Won (Sponsor POC)
- David Westlund (Research Provider)
- Michelle Yeh (Red Group)

### Tasking and timeline

### Review of FY17 Quad Charts – Session 2

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Participants</th>
<th>Notes</th>
</tr>
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</table>
| 1:15-2:15 | **KH:** Advanced Materials and Structural Safety – See my first comment about overlapping research and I’d like to understand the AVS Composite Plan that is referenced in many of the Quad charts. | Larry Ilcewicz/Rusty Jones (AVS Composites Plan)  
A11E.MI.1  
/A11E.SIM.5  
Ian Won (Sponsor POC)  
Curtis Davies (Research Provider)  
Dan Brock  
Michelle Yeh (RED Group Members) | Composites plan  
one pager  
Discuss research overlap-industry |
|        | **CK:** There seems to be areas of overlap that could be explored to accelerate and/or streamline research. The mapping above might help identify these areas of overlap. For example:  
- Vision systems for helicopters A11H.TAS.5 versus Advanced Vision Systems A11G.HF.4  
- Mitigating Ice Crystal Threat A11K.WX.3 versus Research on Ice Crystal and SLD A11D.AI.1 | A11H.TAS.5  
Mike Webb (Sponsor POC)  
Cliff Johnson and Dr. Andrew Cheng (Research Providers)  
A11G.HF.4  
Terry King (Sponsor POC)  
A11K.WX.3 & A11D.AI.1  
John Fisher (Sponsor POC)  
Dan Brock  
Michelle Yeh (RED Group Members) | Discuss research, point out differences |
|        | **Director’s Conference Room**                                         |                                                                            |                                            |
### Spring 2015 SAS Minutes

**Dial in Access:** (609) 916-1975, passcode 257511

#### Wednesday, March 25, 2015

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<th>Time</th>
<th>Activity</th>
<th>Presenter(s)</th>
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<tr>
<td>8:30 – 9:00</td>
<td>Review of Homework Assignments from Previous Day – Findings and Recommendations Discussions</td>
<td>All</td>
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<tr>
<td>9:00 – 9:15</td>
<td>Opening Remarks – FAA Aircraft Safety R&amp;D Action Items &amp; Recommendations</td>
<td>Eric Neiderman</td>
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<td>9:15 – 9:45</td>
<td>COE Overview</td>
<td>Pat Watts</td>
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<td>9:45 – 10:00</td>
<td>Break</td>
<td>All</td>
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<tr>
<td>10:00 – 11:30</td>
<td>UAS R&amp;D Portfolio</td>
<td>Claude Jones, Sabrina Saunders-Hodge</td>
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<td>11:30 – 12:30</td>
<td>Lunch</td>
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<tr>
<td>12:30 – 1:30</td>
<td>Unleaded AvGas (NextGen BLI)</td>
<td>Dave Atwood</td>
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<td>1:30 – 1:45</td>
<td>Travel to Building 292 for Tour</td>
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<tr>
<td>1:45 – 2:45</td>
<td>Unleaded AvGas Tour</td>
<td>Dave Atwood</td>
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<td>2:45 – 3:00</td>
<td>Break</td>
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<td>3:00 – 4:00</td>
<td>High Performance Computing, Big Data, ASIAS</td>
<td>Charles (Cliff) Johnson</td>
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<td>4:00 – 5:00</td>
<td>Wrap up</td>
<td>All</td>
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<td>SAS Fall Actions &amp; Recommendation Review</td>
<td>Kenneth Hylander/Eric Neiderman</td>
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<td>SAS Feedback/Future Planning</td>
<td>Kenneth Hylander</td>
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SAS Spring 2015

Tuesday & Wednesday

8:00 am  |  Eastern Daylight Time

Join WebEx meeting

Meeting number: 397 881 708

Meeting password: spring

Add this meeting to your calendar.

Can't join the meeting? Contact support.

IMPORTANT NOTICE: Please note that this WebEx service allows audio and other information sent during the session to be recorded, which may be discoverable in a legal matter. By joining this session, you automatically consent to such recordings. If you do not consent to being recorded, discuss your concerns with the host or do not join the session.
## Appendix II

### Attendance

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<td>Mike Gallivan</td>
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<td>Kerin Olsen</td>
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Appendix III

Findings & Recommendations

Previous

SAS Spring_2013_24: Flight Deck/Maintenance/System Integration Human Factors and NextGen Human Factors
Recommendation: The Subcommittee recommends that, for funding and functional purposes, AFS and AVS explore the possibility of closely aligning human factors research requirements with the other research areas they support, even though those issues fall outside of the traditional human factors portfolio. For instance, research on artificial vision and the complexity of instrument approaches both support increasing airspace capacity, which is a NextGen issue. Additionally, the Subcommittee recommends that more support and priority be given to human factors research that supports significant new or revised regulation.

FAA Response: Michele Yeh (FAA) presented information, FY17 Portfolio HF Connected Requirements, which showed the distribution of AVS sponsors across numerous TCRGs and requirements. The SAS agreed to close the F&R and prepare a new Finding. CLOSED

SAS Fall_2013_3: Alignment of Human Factors Research
Recommendation: The Subcommittee recommends that, for funding and functional purposes, FAA explore the possibility of closely aligning human factors research requirements with the other research areas they support, even though those issues might fall outside the traditional human factors portfolio.

FAA Response: Kathy Abbott (FAA) discussed the alignment of human factors research. Kathy explained that there is an on-going coordination process across other research programs and that the HF TCRG is distributed across Flight Standards and actually embedded in the unmanned aircraft system (UAS) program. CLOSED

SAS Spring_2014-1: Weather and Decision-making
Recommendation: There is a significant body of knowledge about how people deal with probabilistic information for decision making in situations involving risk. It is recommended that the Weather program get sufficient understanding, using such information where appropriate, to help them design weather forecast displays, decisions support tools, and associated training that make use of probabilistic weather information.

FAA Response: Randy Bass (FAA) addressed weather and decision-making with a presentation to the SAS: Understanding Probabilistic Weather Information. This presentation was prepared for delivery at the FAA 2014 SAS meeting but was postponed to Spring 2015. The SAS concurred that this presentation successfully closed out the F&R. CLOSED

SAS Spring_2014-2: UAS R&D Strategy
Recommendation: The FAA should develop a holistic implementation plan to include a detailed R&D strategy which would address the research needs from both the regulator and airspace operator perspectives.

The SAS requested further details on the UAS R&D plan reflecting deliverable validation milestones against the published FAA Integrated UAS Roadmap.

**FAA Response:** Chris Swider (FAA) presented *REDAC SAS Spring 2015 Review - Unmanned Aircraft Systems (UAS) Research Planning*. Chris framed his presentation around the following elements: a) resource changes, b) integrated plans, c) research priorities, and d) partnerships. Claude Jones presented *UAS R&D Update*. Claude focused on FY15 research activities and the research requirements for FY16. The SAS agreed to close out the F&R and elected to establish an Action Item\(^9\) for the next SAS meeting to provide a UAS presentation with a focus on Pathfinder implications. **CLOSED**

**New**

**Finding:** The subcommittee was fully briefed on the UAS safety research plan. We are encouraged by the progress made in the past year regarding organization and networking of different stakeholders. We encourage the continuation of this integrated research planning. There appears to be a focus on real problems and growing consideration of evolving issues.

**Recommendation:** **SAS Spring_2015-1: UAS Portfolio Flexibility**

We recommend building flexibility into the FY17 UAS budget that can address emerging issues that may not be understood currently. We also recognize the focus on Beyond Line of Sight (BLOS) operations but recommend consideration of other emerging "long term" issues such as complete autonomous operations. We also recommend that UAS NAS integration R&D focus on sense and avoid technology vs aircraft robustness in case of impending collision.

**Finding:** There has been visible progress in terms of developing a process to prioritize research based on priorities and need. Review of the 2017 strategic guidance, quad charts, and list of emerging issues highlighted a need to provide greater linkage between the proposed and funded research and the FAA’s strategic plan. The strategic plan should not be a static document; it will require regular updates to address the changing needs of the FAA and the NAS and to ensure that the research is appropriately targeted.

**Recommendation:** **SAS Spring_2015-2: Research Roadmap Development**

SAS understands and recognizes the ongoing need for research focused on operational safety of the current fleet. Notwithstanding, focused research must be conducted to address emerging issues. The FAA should develop and implement a process to produce 5 to 10 year research roadmaps to guide sponsors in the development of research requirements and to assist in prioritizing and focusing research on strategically significant elements. The roadmaps should define the FAA’s vision for the future, quantify success measures to the greatest extent possible,\(^9\)

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\(^9\) See Appendix III for list of open and new Action Items.
and identify the research areas necessary to support the roadmap vision. It is further recommended that the FAA make available and use the roadmaps as the basis for its comprehensive strategic research plan, research needs, program initiatives, and intended outcomes for aviation safety.

**Finding:** There have been significant developments in additive manufacturing technologies and capabilities that are expected to rapidly proliferate in aviation applications due to many potential benefits including reduction in material cost, fewer part details, and enabling of more complex designs. However, additive manufacturing technologies have a number of technical risk factors that could have significant impact on design, production, and maintenance. The FAA must be prepared to address these factors in order to ensure appropriate airworthiness and certification standards and methods of compliance. The subcommittee received a briefing from the FAA fatigue and damage tolerance Chief Scientific and Technical Advisor (CSTA) on the establishment of an FAA Additive Manufacturing Steering Group to address these issues. The SAS strongly supports the high level of coordination with other government and industry initiatives and development of a detailed roadmap identifying near-term and strategic areas that focus FAA’s activities on the safe implementation of these technologies. Current planning is to develop the additive manufacturing roadmap over the next 18-24 months. This roadmap will inform regulatory, policy, and R&D program needs. The subcommittee also noted and strongly endorsed the addition of additive manufacturing materials into the Metallic Materials Properties Development and Standardization (MMPDS) process and handbook (under research requirement A11E.SIM.4) to provide standardized and acceptable design and compliance data and tools.

**Recommendation:** SAS Spring_2015-3: Additive Manufacturing Research Acceleration

There is significant activity across all major aviation industry sectors in the application of additive manufacturing technologies affecting current production systems and new product designs. The subcommittee recommends that the FAA accelerate the development of the additive manufacturing roadmap over the next 12 months in order to inform FAA’s existing regulatory, policy, and R&D program needs. In addition, the subcommittee recommends that the FY17 and FY18 R&D portfolio includes consideration of proactive research necessary to ensure an understanding of key properties/characteristics of additive manufacturing to identify hazards and mitigations necessary to establish the appropriate standards and methods of compliance necessary to enable safe implementation of these technologies.

**Observation:** The Subcommittee continues to emphasize the importance of human factors research in all aspects of aviation safety. The Subcommittee also recognizes the importance of the factors issues that AVS has identified for funding and further research. Human factors research covers a broad spectrum of regulations and guidance. Unfortunately, this significance and importance has not always been consistently recognized. As a result of this observation, the Subcommittee previously recommended that AVS closely align human factors research requirements with the other research areas they supported, even though those issues fell outside of the traditional human factors portfolio.

The committee is pleased to hear that FAA human factors specialists are closely involved (rather than just consulting) with many research efforts throughout the portfolio. The committee also
sees value in human factors specialists’ involvement during the requirements phase of research
efforts and is pleased to be advised that this is happening.

Observation: Based on the feedback received from multiple REDAC subcommittees, it is
evident that crosscutting capabilities should be engaged at earlier stages of setting requirements
and concept development. As operational concepts are explored, experts from all research
disciplines should work jointly to establish operational requirements and objectives. Earlier
coupling across multiple disciplines may result in reduced development time and costs.
Appendix IV

Action Items

Carry-over Action Items:

**Spring 2014 Action Item 7:** Eric Neiderman will provide an explanation of SDSS core capability at the next SAS meeting. REMAIN OPEN (Prepare background slides for Joe Del Balzo review and include in DSS Deep-dive presentation at Fall 2015 meeting)

**Spring 2014 Action Item 8:** Eric Neiderman will provide information regarding the NASA Ames tool to track safety cases. REMAIN OPEN (John Cavolowsky will address this issue at next SAS meeting.)

New Action Items:

**Action Item 1:** Provide FY17 BLI to requirements mapping (Rosetta Stone) showing full funding for BLIs. (CLOSED)  
10

**Action Item 2:** Provide deep-dive presentations on SSM and DSS requirements as they relate to SAS emerging issues. (Action - John Lapointe see Carry-over Action Item #7 above)

**Action Item 3:** Provide UAS presentation with focus on Pathfinder implications. (Action - Chris Swider)

**Action Item 4:** Provide human factor presentation on operator fatigue issues. (Action – Mark Orr)  
11

**Action Item 5:** Provide requirements list with Mendoza Line and items below in advance of future Spring meetings. (Action – Mark Orr)  
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10 Action Completed on April 8, 2015.
11 Mark Orr will prepare AFS plan and forward to SAS.
12 Mark will provide AVS approved FY17 list to SAS this May.