Federal Aviation Administration

Memorandum

Date: JUN 15 2015

To: AVS Services and Offices

From: Margaret Gilligan, Associate Administrator for Aviation Safety

Subject: AVS Strategic Guidance for Development of the Fiscal Year (FY) 2018 Research & Development (R&D) Portfolio

Thank you for your support in developing the FY 2017 Aviation Safety (AVS) research portfolio. Balancing competing safety requirements against limited resources is a huge challenge. That's why it is extremely important that research we do in AVS leads to measurable safety enhancements that truly benefit the flying public. In fact, clear identification of the desired outcome, is a key value in the AVS R&D Prioritization Process. I am excited about the path we are on, the continuous improvement we are making in our research program, the quality of the requirements, and our use of risk-based prioritization and decision making.

Looking forward to 2018, we created the attached AVS Strategic Guidance (SG) for development of the FY 2018 R&D Portfolio. As you know, AVS has adopted Safety Management System processes and risk-based decision making. This year's SG supports these approaches with the inclusion of aviation safety hazard and risk data, as well as guidance on emerging risks. Sponsors should supplement the SG data with the additional data and analysis needed to fully identify and assess desired sponsor outcomes.

Although the SG emphasizes areas that are important to the AVS mission in FY 2018 and beyond, it is not intended to exclude or restrict proposed research requirements. Rather, this guidance is intended to emphasize areas of aviation safety risk that AVS Services and Offices (S/O) and their Technical Community Representative Groups (TCRGs) should consider when developing research requirement proposals. The SG is not intended to be a checklist used to evaluate the proposed requirements either—requirements are evaluated against the criteria in the AVS Prioritization Process. Each S/O may decide to provide additional direction to their divisions and directorates who can then provide the specifics to their line organizations and TCRGs.

Each S/O should review existing research plans, regulations, standards and policy issues, and cross coordination of S/O needs. This will allow us to develop the best aviation safety research portfolio possible that balances short and long term safety needs against our ongoing resource constraints. Once we get funding to conduct a project, we have to see the research all the way through implementation and measure it to make sure it is having the intended impact on safety.

By continuing to communicate, collaborate, work together, and improve the program we have in place, our research efforts will make aviation safer tomorrow than it is today. Thank you for your help.

Attachment

AVS Strategic Guidance for the Development of the Fiscal Year (FY) 2018 AVS Research & Development (R&D) Portfolio

Introduction:

This document supplements the 2013 Aviation Safety R&D Prioritization Process (the Process) and provides guidance for the development of the FY 2018 AVS R&D portfolio. This guidance is comprised of the following three AVS approved components:

1. The FY 2018 Strategic Guidance (SG) - Aviation Safety Hazards and Risks for AVS-Wide Consideration;
2. Supplemental Research Requirement Instructions; and,
3. FY 2018 AVS R&D Prioritization Process Supplement.

These components should be applied to all steps of the AVS prioritization process and at all levels of the AVS organization. The SG emphasizes areas of particular importance to aircraft safety, including the health and safety of aircraft passengers and crewmembers. The Supplemental Research Requirement Instructions are aimed at improving the content provided in the research requirement submittals. The FY 2018 AVS R&D Prioritization Process Supplement includes process changes adopted for the FY 2018 cycle.

The Strategic Guidance identifies some hazards, risks, and safety issues based upon samples of data that may drive AVS research needs. While this data covers a variety of operations, it is only a subset of the extensive aviation safety data that impact FAA, and specifically AVS responsibilities. This Strategic Guidance provides notional direction only. It is the responsibility of each AVS Service or Office (S/O) to determine research needs within their areas of responsibility that support the AVS mission.

All Technical Community Representative Groups (TCRGs) and Office of Primary Interest (OPI) representatives are reminded to develop and or update their research project plans. Research plans provide a longer-range and organized focus on critical research requirements, thus enabling AVS to identify and coordinate longer-range resource needs; increasing the likelihood that necessary resources will be available.

Communication is critical to the successful development of the annual AVS R&D portfolio. Questions and comments about the SG, the supplemental instructions, or other issues should be communicated to the OPI representative, the AVS S/O R&D Program Manager, or the AVS R&D Manager.

1. **FY 2018 R&D Strategic Guidance**

Aviation Safety Hazards and Risks for AVS-Wide Consideration

To facilitate the adoption of a risk-based approach by AVS offices contemplating research proposal submittal(s) for FY18, AVP analyzed data sources to identify high priority hazards and risks facing the National Airspace System (NAS). Consideration of these hazards and risks during research requirement development will stimulate multi-disciplinary and coordinated efforts across AVS offices and TCRGs, and the development of research requirements that address these hazards and risks. Thus, AVS

will be in a position to meet safety goals and responsibilities spanning the lifecycle of certification and continued operational safety.

AVS is responsible for responding to today's hazards and risks, as well as preparing for potential risks associated with changes related to the Next Generation Air Transportation System (NextGen), current FAA Strategic Initiatives, and other foreseeable (and unknown) economic and industry trends. Ensuring that regulations and guidance materials maintain relevancy will require the continued implementation of a comprehensive approach, with reactive, proactive, and predictive components integrated into an agency-wide Safety Management System framework. Aviation Safety R&D is one of the critical tools supporting development of effective means for continued safety improvement.

Risks to Aviation Safety in the Current NAS

Aviation safety data provides a rich historical basis from which to determine the most significant high-priority risks to safety in the current NAS. Mitigating these risks will have the most direct and predictable effect on the reduction of future accidents and associated fatalities.

In accordance with the mission of AVS, research requirement proposals should be submitted that contribute to the development and implementation of FAA guidance materials, processes, regulations, policy, or standards that serve to reduce high-priority risks.

When developing research requirement proposals, AVS Sponsors should consider differences in accident statistics between aviation sectors. For example, the fatality risk for Title 14, Code of Federal Regulations (14 CFR) Part 121 operations, as shown in Figure 1 (See Attachment (1) for acronym key), is elevated for the following events:

- Structural Component or Aircraft System Failures/Malfunctions – ***non-power plant***;
- Abnormal Runway Contact (during landing or takeoff);
- Fire (not related to impact); and,
- Runway Excursions (both takeoff and landing).

In comparison, the fatality risk for 14 CFR Part 91Subpart K fractional ownership operations, Part 135 on-demand operations, Part 137 agricultural operations, and U.S. Government public use operations, Figure 2, is elevated for the following events:

- Structural Component or Aircraft System Failures/Malfunctions – ***power plant***; and,
- Low Altitude Operations.

Trends within aviation sectors should also be carefully considered when developing research requirement proposals, such as the rate of accidents for amateur-built aircraft, power plant failures in the general aviation community, and the general decline of controlled flight into terrain accidents. Each AVS office and TCRG unit is encouraged to carefully consider these differences and trends and all other related data and activities that may influence research needs and priorities.

Emerging Risks to Aviation Safety

Historical accident data highlights hazards that have risen to the level of producing severe and negative outcomes, though it is not comprehensive for forecasting future significant risks to the aviation community. Moving beyond this reactive historical data to include proactive and predictive approaches involves identifying current or emerging hazards with a high likelihood or potential to result in significant safety risks. Proactive and predictive approaches enable AVS to progress forward in the research cycle to prevent accidents and manage safety with the changing composition of hazards.

Proactive activities that identify trends and emerging risks are currently being carried out within the Aviation Safety Information Analysis and Sharing framework; these efforts have shed light on current risks likely to increase in significance in the coming years, such as:

- Loss of Separation;
  - Mid-Air Collisions
  - RNAV Arrival and Departure Procedures
- Breakdown in Pilot-Controller Communication; and,
- Airplane State Awareness.

The results of systems-level modeling of safety outcomes to predict and forecast risk are being developed and validated. This modeling incorporates planned changes associated with NextGen, as well as unplanned changes associated with market trends and fluctuations. In the interim, by reviewing government and industry reports that rely on historical data, statistical trends, and the input of subject matter experts, a short set of near-term, high-priority safety issues emerge that transcend specific implementation plans, technologies and operational frameworks (as listed below). Each AVS S/O should refer to this set of safety issues for identifying relevant domain-specific future hazards and risks:[1]

- Aircraft Mixed Fleet Equipage;
- Assurance of Functional Integrity for Critical Systems;
- Certification Methods for Complex Systems (for example, software);
- Changing Roles for Air Traffic and Flight Deck Personnel;
- Human-Automation Interaction;
- Information and Systems Security;
- Interoperability and System Incompatibilities;
- System Safety Assessment Methods and Tools; and,
- New types of user technologies, such as unmanned aircraft systems and commercial space vehicles.

Each safety issue encompasses multiple hazards and potential risks. For example, research in the area of System Safety Assessment Methods and Tools that addresses increased component and system complexity may also include methods to identify common-cause failures and the introduction of new failure modes. Multiple approaches

[1] This list is not comprehensive; Issues are organized in alphabetical order – placement does not suggest priority.

across AVS offices and TCRGs that will mitigate anticipated risks are encouraged for developing responses to these issues.

Key Technology Areas

There are key technology areas where the FAA has provided research leadership. There are certain areas where FAA is performing research that cannot be duplicated anywhere else in the world. FAA must maintain this critical research in areas that make up the backbone of its long term FAA R&D program. In such cases, FAA has a strategic need to maintain in-house capability and competency to perform research.

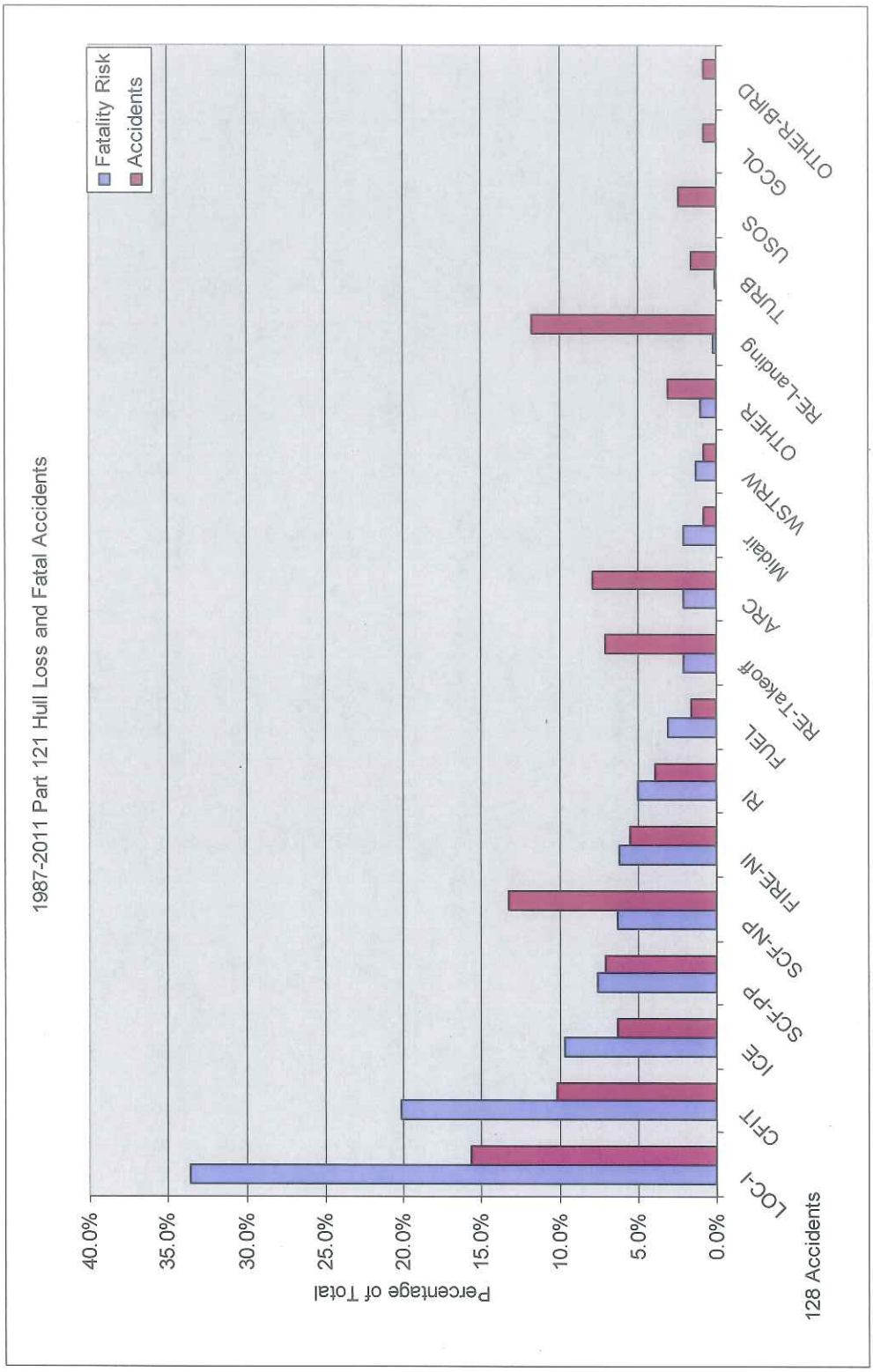

Figure 1

Source: Commercial Aviation Safety Team (CAST) – Domestic U.S. Part 121 Operations

Outcomes: Categorized according to Common CAST/ICAO Common Taxonomy Team (CICCT) – Occurrences Taxonomy

Fatality Risk: Sum of equivalent full planeloads perished per event

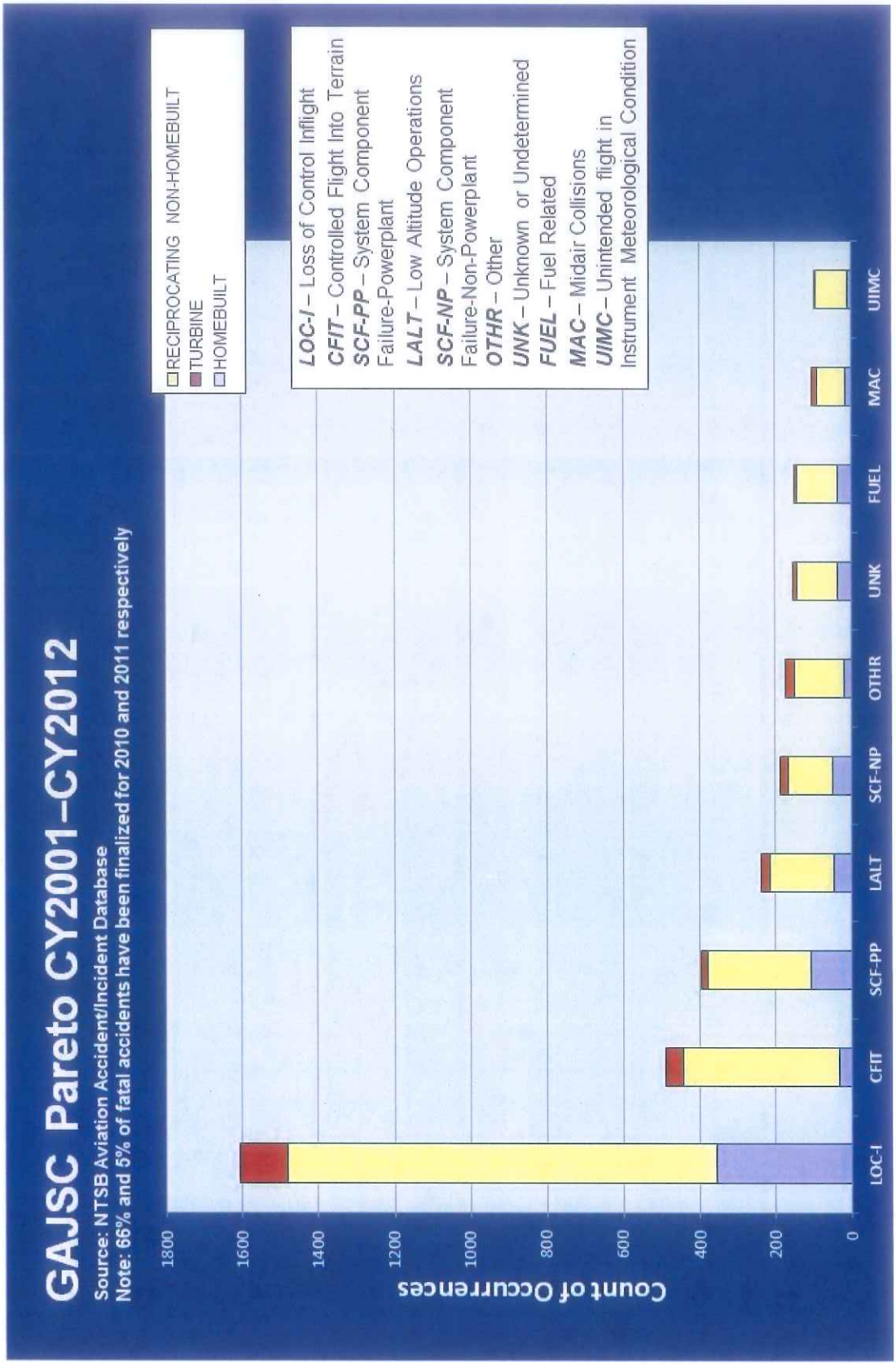
GAJSC Pareto CY2001–CY2012
Source: NTSB Aviation Accident/Incident Database
Note: 66% and 5% of fatal accidents have been finalized for 2010 and 2011 respectively
RECIPROCATING NON-HOMEBUILT
TURBINE
HOMEBUILT
LOC-I – Loss of Control Inflight
CFIT – Controlled Flight Into Terrain
SCF-PP – System Component Failure-Powerplant
LALT – Low Altitude Operations
SCF-NP – System Component Failure-Non-Powerplant
OTHR – Other
UNK – Unknown or Undetermined
FUEL – Fuel Related
MAC – Midair Collisions
UIMC – Unintended flight in Instrument Meteorological Condition
Count of Occurrences
1800
1600
1400
1200
1000
800
600
400
200
0
LOC-I
CFIT
SCF-PP
LALT
SCF-NP
OTHR
UNK
FUEL
MAC
UIMC

Figure 2

2. **Supplemental Research Requirement Instructions**

a. **All REQUIRED fields on the requirements submittal form on the AVS RE&D management system SharePoint site must be completed for each requirement.** Requirements with incomplete forms will not be evaluated by the AVS RED group. If the sponsor feels there are circumstances where the form cannot be completed, the sponsor shall contact the OPI representative and/or RED Group member for guidance and assistance **before your office's deadline or before the AVS research proposal submission deadline of September 25, 2015.**

b. **Sponsoring Office Manager's Approval:** Per Section 4.5 of the Process, each requirement write-up shall be endorsed and dated by the Sponsoring Office Manager, as delegated by the AVS S/O. This approval confirms the requirement has been reviewed and approved by the sponsoring Directorate or Division manager.

Sponsoring Office Management Approval indicates the Sponsor Point of Contact (POC) and the Sponsoring Office's Manager listed on the requirement are fully accountable for the requirement throughout the requirement life-cycle.

The Sponsor POC field should identify only ONE sponsor and the Sponsoring Office Management Approval field should identify ONE directorate or division manager in the direct management chain for the individual identified as the Sponsor POC. Multiple sponsorships and Sponsoring Office Management Approvals may create ambiguity regarding ownership and accountability for the requirement and outcome.

If multiple AVS S/O's need research in a similar area, each S/O should submit its own requirement (identifying the linkage between the AVS requirements), specifying the unique sponsor outcome for each requirement. The Sponsor POC and Sponsoring Office's Manager identified in each requirement MUST have authority over the respective implementation plans identified in each requirement (i.e., AIR personnel and organizations should not be identified as sponsors for topics that specify an AFS outcome and implementation plan). Due to the similarity, each requirement should specify a link to the other in the Linked AVS Requirements field provided on the AVS RE&D Research Requirement Input Form.

When an S/O has an interest in a requirement of another S/O, but no responsibility for an outcome or implementation, the sponsor of the requirement should specify the interested organizations in the Other Related Office(s) field in the AVS RE&D Research Requirement Input Form.

In the unlikely event there is a requirement that cannot conform to these instructions; the sponsors should contact the associated S/O R&D Program Managers and the AVS R&D Manager for consultation and guidance.

c. **Linked AVS Requirements:** As applicable, requirements with linkages to other AVS RE&D requirements, shall list the specific linking requirement control account numbers and titles, along with a short description of the linking relationship and how the requirements are being coordinated. For assistance with the linkage field, the sponsor shall contact the OPI representative. The linked requirements should cross reference each other.

d. **Research Connection to Strategic Guidance:** During the April 28, 2014 AVSMT, AVS-1 asked that the research requirements show connection to the Strategic Guidance. To meet this request, a "Strategic Guidance Connection" field has been added to the requirement template. The requirement write-up must indicate whether there is a connection to the SG, and if so must clearly identify the connection. The requirement write-up should refer to the data illustrated in Figures 1 and 2, and/or reference additional data sources. Completing these fields will meet the AVS-1 request and will not affect requirement ranking, as these fields are not explicitly part of the ranking criteria. However, **data on safety hazards and mitigations from the sources referenced in these fields should be used in the justifications for the evidence and impact for each of the ranking criteria.** This will strengthen the justifications that are used to determine the ranking. As stated in part (a) above, all required fields must be completed for evaluation by the AVS RED Group.

e. **Use plain language.** Please keep in mind that the audience reviewing will be the AVS RED Group, without intimate knowledge of the activity. Please reference the link below for additional guidance on the use of plain language.

https://my.faa.gov/tools_resources/branding_writing/plain_language.html

3. **AVS R&D Prioritization Process Supplement**

Development of Cost Estimates: In accordance with Section 5.1 of the 2013 Aviation Safety R&D Prioritization Process, the AVS RED Group will distribute an abbreviated list of prioritized requirements that have a reasonable likelihood of being funded within the Aircraft Safety budget target. Performing organizations will submit cost estimates for these requirements **not later than December 4, 2015** in accordance with Section 5.2 of the Process. The performing organization responsible for executing the research will develop the cost estimate(s) in coordination with their sponsor(s). Only tasks outlined in the requirement write-up should be programmed for funding. A template for developing FY18 cost estimates is available on the AVS RE&D Management System KSN.[2] Each AVS RED Group member must ensure that the tasking identified in the cost estimate aligns with the sponsors' research objectives within the requirement. Incomplete or incorrect cost estimates will impact programming decisions.

[2] Link to RE&D Cost Estimate:
https://avssp.faa.gov/avs/aviationsafetyresearch/_layouts/xlviewer.aspx?id=/avs/aviationsafetyresearch/AVS%20RD%20Process/FY16%20Cost%20Estimate%20Template.xlsx&Source=https%3A%2F%2Favssp%2Efaa%2Egov%2Favs%2Faviationsafetyresearch%2FAVS%2520RD%2520Process%2FForms%2FAllItems%2Easpx&DefaultItemOpen=1&DefaultItemOpen=1

Attachment (1)

ACRONYMS and KEY TERMS:

ARC: Any landing or takeoff involving abnormal runway or landing surface contact.

CFIT: Controlled Flight Into or Toward Terrain. In-flight collision or near collision with terrain, water, or obstacle without indication of loss of control.

Fire-NI: Fire/Smoke (Non-Impact). Fire or smoke in or on the aircraft, in flight or on the ground, which is not the result of impact.

Fuel: Fuel related. One or more powerplants experienced reduced or no power output due to fuel exhaustion, fuel starvation/mismanagement, fuel contamination/wrong fuel, or carburetor and/or induction icing.

GCOL: Ground Collision. Collision while taxiing to or from a runway in use.

ICE: Icing. Accumulation of snow, ice, freezing rain, or frost on aircraft surfaces that adversely affects aircraft control or performance.

LALT: Low Altitude Operations.

LOC-G: Loss of Control – Ground. Loss of aircraft control while the aircraft is on the ground.

LOC-I: Loss of Control – In Flight. Loss of aircraft control while or deviation from intended flight-path in-flight.

MAC: Midair/Near Midair Collision. Airprox, ACAS alerts, loss of separation, as well as near collisions or collisions between aircraft in flight.

Other: Any occurrence not covered under another category.

Other-Bird: Occurrences involving collisions / near collisions with bird(s) / wildlife

Ramp: Ground Handling. Occurrences during (or as a result of) ground handling operations.

RE-Landing: Runway Excursion Landing. A veer off or overrun off the runway surface.

RE-Takeoff: Runway Excursion Takeoff. A veer off or overrun off the runway surface.

RI: Runway Incursion: – vehicle, aircraft or person. Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft.

RNAV: Area Navigation. A method of navigation that permits aircraft operation on any desired flight path within the coverage of navigation aids

SCF-NP: System/Component Failure or Malfunction (Non-Powerplant). Failure or malfunction of an aircraft system or component – other than the powerplant.

SCF-PP: System/Component Failure or Malfunction (Powerplant). Failure or malfunction of an aircraft system or component – related to the powerplant.

TURB: Turbulence Encounter. In-flight turbulence encounter.

UNK: Unknown or Undetermined. Insufficient information exists to categorize the occurrence.

USOS: Undershoot/Overshoot. A touchdown off the runway/helipad/helideck surface.

WSTRW: Windshear or Thunderstorm. Flight into windshear or thunderstorm.