Federal Aviation Administration

Memorandum

Date: MAY 2 4 2013

To: AVS Services and Offices

From: Peggy Gilligan, Associate Administrator for Aviation Safety, AVS-1

Subject: AVS Strategic Guidance for Development of the FY 2016 RE&D Safety Requirements Portfolio

Thank you for your support in developing the FY 2015 Aviation Safety (AVS) research portfolio. Balancing competing safety requirements against limited resources is a huge challenge. That's why it's more important than ever for the research we do in AVS to lead to measurable safety enhancements that truly benefit the flying public. In fact, clear identification of the desired outcome, the desired future state, is a key value in the new Aviation Safety R&D Prioritization Process 2013. So we're excited about the path we're on, the continuous improvement we're making in our research program, the quality of the requirements, and our use of risk based prioritization and decision making.

Looking toward FY 2016, we've created the attached AVS Strategic Guidance (SG) for Development of the FY 2016 RE&D Safety Requirements 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 2016 and beyond, it's 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 isn't 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 specifics to their line organizations and TCRGs.

To develop the best aviation safety research portfolio possible that balances short and long term safety needs against our ongoing resource constraints, each S/O should review existing research plans, regulations, standards and policy issues, and cross coordination of S/O needs. Then once we get funding to conduct a project, we have to make the absolute most of every opportunity by

seeing the research all the way through implementation and measuring it to make sure it's having the intended impact on safety.

By continuing to communicate, collaborate, work together, and improve the program we have in place, there's not a doubt in my mind that we will make aviation safer tomorrow than it was today through our research efforts. Thank you for your help.

Attachment

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AVS Strategic Guidance for the Development of the FY 2016 AVS 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 2016 AVS Research & Development (R&D) portfolio. This guidance is comprised of the following three AVS approved components:

1. The FY 2016 Strategic Guidance (SG) - Aviation Safety Hazards and Risks for AVS-Wide Consideration
2. Supplemental Research Requirement Instructions
3. FY 2016 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 2016 AVS R&D Prioritization Process Supplement includes process changes adopted for the FY 2016 cycle.

All Technical Community Representative Groups (TCRGs) and Office of Primary Interest (OPI) representatives are reminded to develop and or update their comprehensive research plans on the Safety TCRG R&D Recommendations SharePoint site. 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 R&D portfolio. Questions and comments about the SG, the supplemental instructions, or other issues should be communicated to the OPI representative, the AVS Service or Office (S/O) R&D manager, or the AVS R&D manager.

1. **FY 2016 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 FY16, 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), Destination 2025, 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 (SMS) 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 requirements should be submitted that contribute to the development and implementation of guidance materials, processes, regulations, policy, or standards that serve to reduce high-priority risks, such as those listed below. These events illustrate significant risks to aviation safety in the current NAS, based on their frequency in producing fatalities or complete hull losses. These risks are prominent across the broad spectrum of aviation sectors and have maintained a well-recognized and established presence.

- Loss of Control
- Controlled Flight Into or Toward Terrain (CFIT)
- Structural Component or Aircraft System Failures/Malfunctions

When developing research 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)

- Runway Excursions (both takeoff and landing)

In comparison, the fatality risk for 14 CFR part 91, part 91-subpart K, part 135 on-demand, part 137 and Public Use operations, Figure 2, is elevated for the following events:

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

Trends within aviation sectors should also be carefully considered when developing research requirements, such as the increasing rate of accidents for amateur-built aircraft, power plant failures in the General Aviation (GA) community, and the general decline of CFIT 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 (ASIAS) 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
- 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 Service and Office should refer to this set of safety issues for identifying relevant domain-specific future hazards and risks:[1]

- Aircraft Mixed Fleet Equipage

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

- 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

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

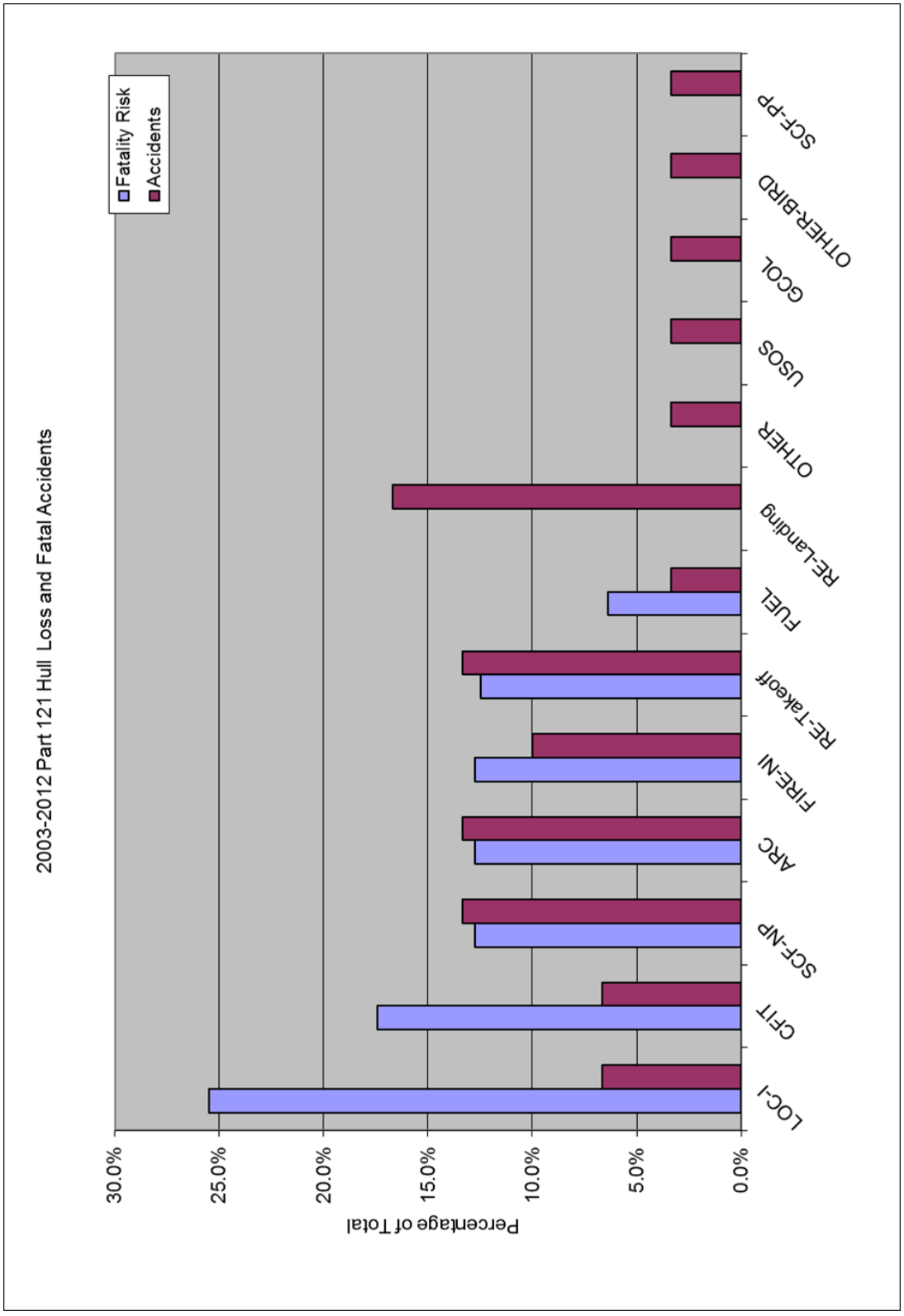

Figure 1

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

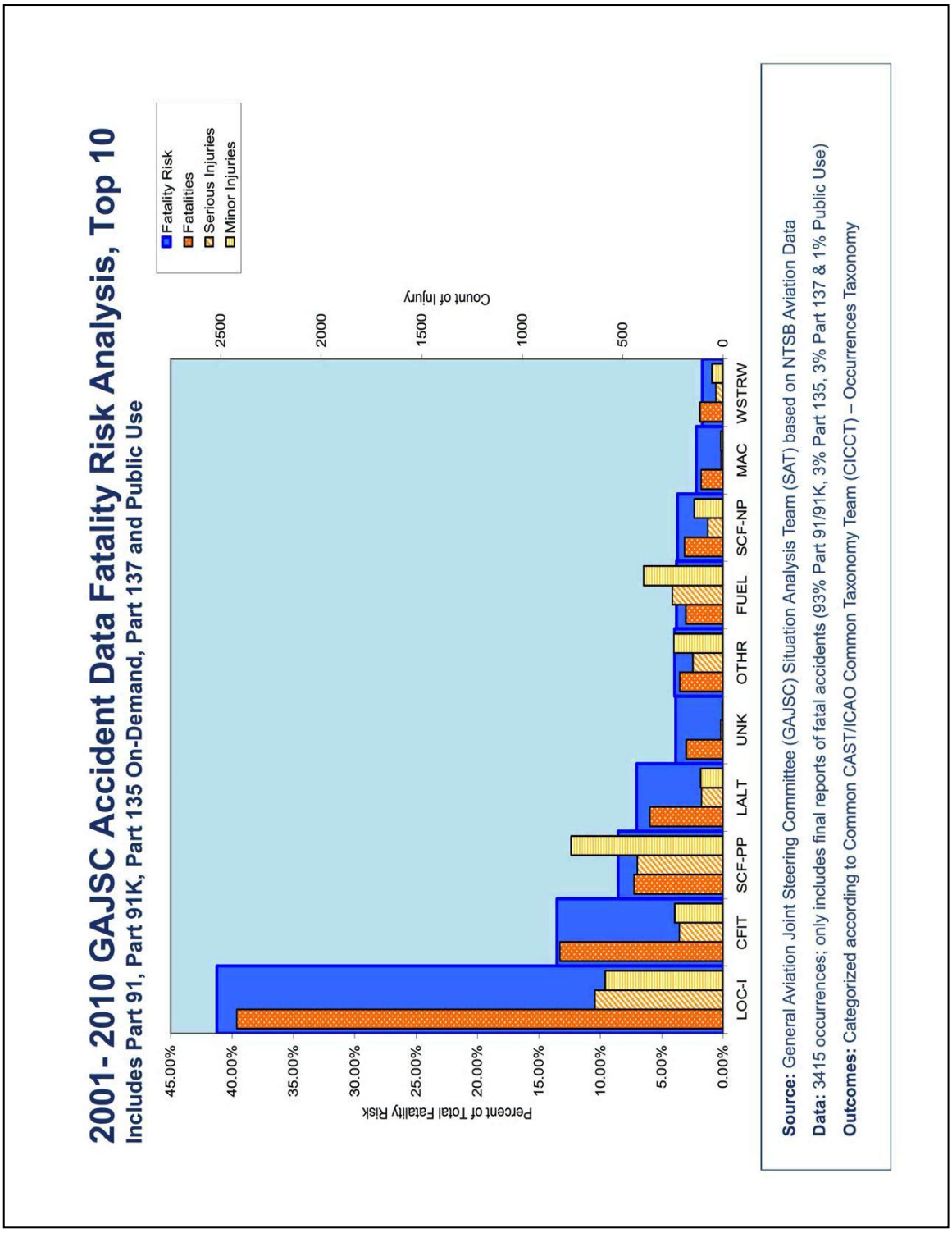
2001- 2010 GAJSC Accident Data Fatality Risk Analysis, Top 10
Includes Part 91, Part 91K, Part 135 On-Demand, Part 137 and Public Use
Fatality Risk
Fatalities
Serious Injuries
Minor Injuries
Count of Injury
2500
2000
1500
1000
500
0
Percent of Total Fatality Risk
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
LOC-I
CFIT
SCF-PP
LALT
UNK
OTHR
FUEL
SCF-NP
MAC
WSTRW
Source: General Aviation Joint Steering Committee (GAJSC) Situation Analysis Team (SAT) based on NTSB Aviation Data
Data: 3415 occurrences; only includes final reports of fatal accidents (93% Part 91/91K, 3% Part 135, 3% Part 137 & 1% Public Use)
Outcomes: Categorized according to Common CAST/ICAO Common Taxonomy Team (CICCT) – Occurrences Taxonomy

Figure 2

2. **Supplemental Research Requirement Instructions**

a. **ALL 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 in which the form cannot be completed, the sponsor shall contact the OPI representative for guidance and assistance.

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 Service or Office. 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 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 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. Requirement linkage information shall be in the associated field in the requirement submittal form.

3. **FY 2016 AVS R&D Prioritization Process Supplement**

a. **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 29 November 2013 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). Performer discussion with the requirement Sponsor Point of Contact and appropriate S/O Division and Directorate R&D representatives is strongly encouraged. Cost estimates should clearly align with the research requirement.

   Incomplete or incorrect cost estimates will impact programming decisions.

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.

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.