Commercial Aviation Safety Team

CAST Safety Portfolio Background for Air Carrier Maintenance

April 2017

REVISION LOG

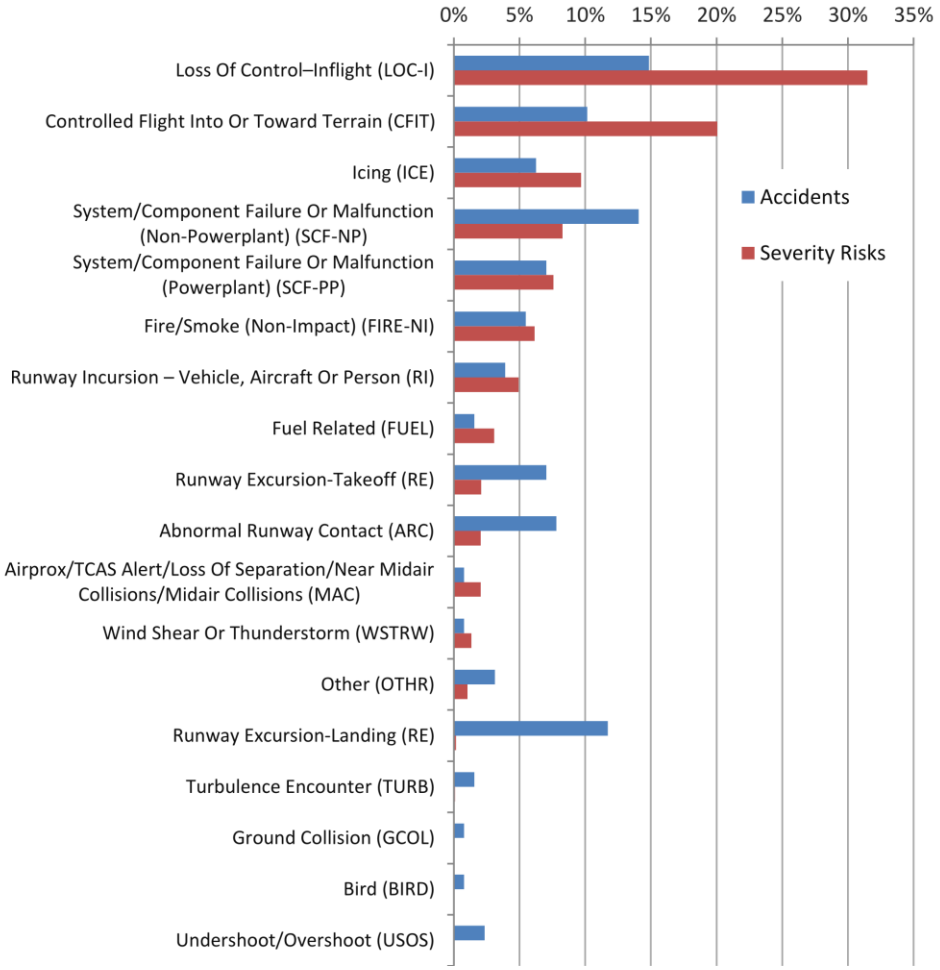
Date	Updates
02/04/2016	SE 127 OP4 completed and closed.
06/02/2016	SE 193 OP1 completed and closed.
08/04/2016	No changes. SE decisions at the August 2016 CAST meeting do not affect this portfolio.
10/06/2016	SE 172 completed and closed. SE 229 OP2 added to portfolio.
12/01/2016	SE 126 completed and closed.
02/02/2017	SE 193 completed and closed.
04/06/2017	No changes. SE decisions at the April 2017 CAST meeting do not affect this portfolio.

1. Introduction

CAST Overview

The Commercial Aviation Safety Team (CAST) is a Government and industry collaboration of major organizations sharing the common aviation safety mission to reduce the commercial aviation accident rate.

CAST uses an integrated, data-driven strategy to reduce the U.S. commercial aviation fatality risk[1] and promote new Government and industry safety initiatives throughout the world. CAST prioritizes its efforts based on historical accident risk. The following bar chart displays 1987–2011 U.S. Hull Loss and Fatal Accidents and the percent of the total for each associated contributing factor.[2]



[1] Fatality risk is the fatal accident rate computed in terms of equivalent fully fatal airplane loads. It does not include ramp or security-related fatalities. It does include cargo operations. An accident that is fatal to 50 percent of the people on board equates to a 0.50 fatality risk.

[2] CAST/International Civil Aviation Organization Common Taxonomy Team Aviation Occurrence Category definitions: http://www.intlaviationstandards.org/Documents/CICTTOccurrenceCategoryDefinitions.pdf.

As of April 2017, CAST has adopted 101 voluntary safety enhancements (SE), 78 completed and 23 underway. During the CAST studies, some potential mitigations were discussed that were not mature enough to add to the CAST Plan. These research and development (R&D) SEs do not directly reduce accident risk, but were adopted for further research or studies that CAST hopes will lead to opportunities for additional risk reduction. In the future, as the research is conducted, aspects of these R&D SEs may be added to the CAST Plan.

CAST seeks to have industry and Government voluntarily implement the SEs, which can be as effective as rulemaking, but take less time. Safety experts report the fatality risk for commercial aviation in the United States has been reduced by 83 percent from 1998 to 2008 by implementing the voluntary SEs described in this CAST portfolio.

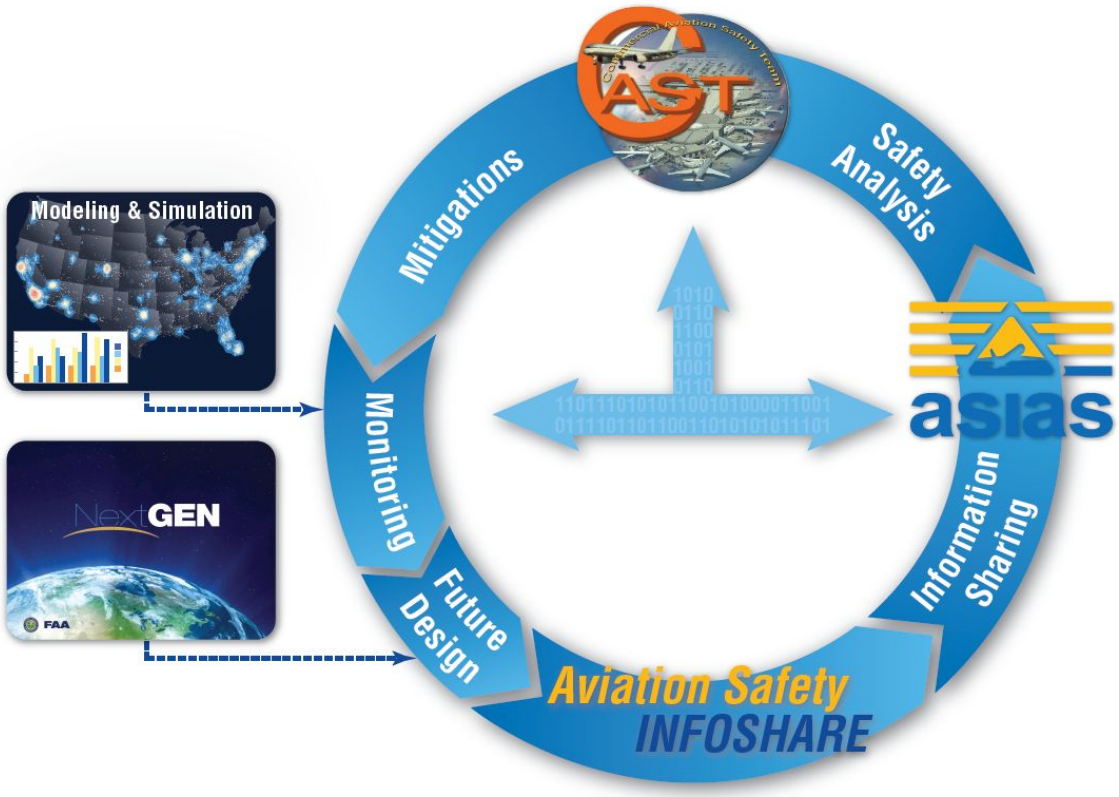
Current CAST goals include—

- Reducing the U.S. commercial aviation fatality risk by at least 50 percent from 2010 to 2025.
- Continuing to work with our international partners to reduce fatality risk in worldwide commercial aviation.

ASIAS Overview

The Federal Aviation Administration (FAA) created Aviation Safety Information Analysis and Sharing (ASIAS) as a means to provide a national resource for data analysis to discover common, systemic safety problems spanning multiple aspects of the global air transportation system. ASIAS uses safety data collected from the public sector and internal FAA databases, and proprietary data from industry stakeholders (air carriers and manufacturers) to assess identified safety issues and monitor multiple data sources for potential high-risk safety vulnerabilities. Proprietary ASIAS data is governed by policies that protect the interests of the supplier(s) while allowing the broader aviation community to benefit from aggregate data analysis. Data from the public sector is available online at http://www.asias.faa.gov. Analysts are available to assist with public data pulls by emailing ASIAS@faa.gov.

CAST, ASIAS, AND INFOSHARE—A SYSTEM-WIDE SAFETY MANAGEMENT SYSTEM



Aviation Safety InfoShare (InfoShare) is a semiannual event where air carriers and others come together in an open environment to voluntarily share safety findings and potential issues. InfoShare is a vital part of the aviation safety community. By participating in InfoShare, air carriers can fulfill the Title 14, Code of Federal Regulations (14 CFR) § 13.401[3] requirement for disclosing Flight Operational Quality Assurance (FOQA) data.

CAST, ASIAS, and InfoShare together are part of the global Safety Management System (SMS) process. ASIAS uses all available data to study systemic issues raised at InfoShare and better understand the underlying contributing factors. When appropriate, ASIAS shares its directed studies with CAST for potential mitigation. CAST develops voluntary SEs to mitigate potential fatality risk threats. CAST also monitors implementation and effectiveness of its safety plan to ensure it is adopted in a manner consistent with the agreed-to plan and CAST goals. The ultimate goal is to generate corrective actions before new types of accidents emerge.

Air carriers are encouraged to voluntarily implement the CAST SEs discussed in this portfolio.

[3] Flight Operational Quality Assurance Program: Prohibition against use of data for enforcement purposes.

PORTFOLIO LAYOUT

This portfolio describes 29 of the 101 CAST voluntary SEs, and 1 of the 21 R&D SEs. This portfolio will be updated after each CAST meeting (typically every 2 months) to reflect the status of SEs in the CAST Plan. The summaries in this portfolio are intended to explain each SE as it pertains to air carrier maintenance. A complete listing of all CAST SEs, in their original formatting and language, is available at the website: http://www.skybrary.aero/index.php/Portal:CAST_SE_Plan.

Each SE may involve several actions (or outputs) needed from multiple sources, such as regulators, manufacturers, or air carriers, for successful implementation. This portfolio focuses on all SEs with air carrier maintenance actions and outputs.

Seven SEs in this portfolio are considered "underway." Specific outputs, or actions, of these SEs may already be complete; however, the SE as a whole is not.

Twenty-three SEs in this portfolio are considered "completed." Because CAST SEs are voluntary, the classification "completed" does not mean every air carrier implemented the SE as specified.

Air carriers are encouraged to determine whether the SEs have been implemented. If the SEs have not been implemented, air carriers are encouraged to review the SEs and evaluate whether implementing them would improve their safety margin.

The following is a list of the CAST voluntary SEs and R&D SEs included in this portfolio.

Topic	*Completed*	*Underway*	*Category*
SE 1: Terrain Avoidance Warning System (TAWS)	X		Airworthiness
SE 10: Airline Proactive Safety Programs (FOQA & ASAP) **Output 1** **Outputs 2–5**	X		Operations
SEs 14–16: Policies for ALAR (Safety Culture)	X		Operations
SEs 17–20: Maintenance Procedures	X		Airworthiness
SE 21: Flight Deck Equipment Upgrades/Installation To Improve Altitude Awareness and Checklist Completion	X		Operations
SE 24: Aircraft Design	X		Airworthiness
SE 27: Risk Assessment and Management	X		Operations
SE 28: Policies	X		Operations
SE 51: SOPs for Tow Tug Operators	X		Operations
SE 84: Disk Inspection Initiative	X		Airworthiness
SE 120: TAWS Improved Functionality	X		Airworthiness
SE 126: Mitigations for Hazardous Material Fires	X		Research
SE 127: Cargo Fire Management		X	Airworthiness

Topic	*Completed*	*Underway*	*Category*
SE 131: Safety Culture		X	Operations
SE 165: TCAS Policies and Procedures	X		Airworthiness
SE 169: Work Cards/Shift Change/Responsibilities/ Manuals	X		Airworthiness
SE 170: OEM Continuous Monitoring of Service History	X		Airworthiness
SE 172: Gap Analysis of Existing Airplane Maintenance Process & Follow on Action Plan	X		Airworthiness
SE 175: Flight Critical Configurations Changes Made During Maintenance	X		
Output 1			Airworthiness
Output 2			Operations
SE 178: Airport Enhanced Surface Markings & Lighting	X		Operations
SE 183: Cockpit Moving Map Display and Runway Awareness System		X	Airworthiness
SE 193: Non-Standard, Non-Revenue Flights	X		Operations
SE 212: Equipment and Procedures To Improve Route Entry for RNAV Departures		X	Operations
SE 218: Overrun Awareness and Alerting Systems		X	Operations
SE 229: Takeoff Configuration Warning System Maintenance and Operational Awareness		X	Airworthiness

Section 2 of this portfolio includes a list and summary of the airworthiness CAST voluntary SEs, with associated air carrier maintenance actions where air carrier maintenance is an implementer; influences the actions, or should be aware of the actions.

Section 3 of this portfolio includes a list and summary of the operations CAST voluntary SEs, with associated air carrier maintenance actions where air carrier maintenance is an implementer; influences the actions, or should be aware of the actions.

Section 4 of this portfolio includes a list and summary of the R&D SEs, with associated air carrier maintenance awareness items.

Section 5 of this portfolio includes a checklist for air carriers to use to determine if they have implemented the 29 voluntary SEs with air carrier maintenance actions. In this section, the SEs are categorized by safety topic.

FEEDBACK

If you have questions or suggested changes on the utility of the information, please email your feedback to ASIAS@faa.gov.

2. Safety Enhancements—Airworthiness

SE 127: Cargo Fire Management (Underway)

Implementer

This SE is underway. Aspects of this SE are being worked on and will be altered from this draft version once they are complete.

This SE is designed to reduce cargo fires through new or revised standards for the construction of standardized and improved cargo containers including fire-suppression or fire-containment systems.

This SE calls for the development of improved fire containment/suppression systems in Class B or E cargo areas. These systems could include: 1) improved containers/unit load devices (ULD) capable of internally containing or suppressing a fire; 2) fire containment bags/blankets, which would be used to cover palletized cargo or cargo containers; or 3) fire suppression systems external to the pallets/ULDs. These improved containment/suppression systems should be implemented when available.

Output 4

SAE International published Aerospace Specification AS6453 on August 6, 2013. Portions of the SAE standard were adopted by reference in FAA TSO–C203, effective July 1, 2014.

Cargo operators should use fire containment covers conforming with TSO–C203 on palletized cargo.

Completed and closed February 4, 2016.

Output 8

Product development and testing activities are underway for ULDs made of more fire-resistant materials, as well as ULDs with internal fire suppression systems. If the testing shows such products to be viable, standards for these types of ULDs will be developed. Cargo operators should install and use these new ULDs if they become available.

SE 183: Cockpit Moving Map Display and Runway Awareness System (Underway)

Implementer

This SE is underway. Aspects of this SE are being worked on and will be altered from this draft version once they are complete.

This SE is designed to reduce wrong runway departures and runway incursions by encouraging the installation of ownship moving map display and/or runway awareness systems.

Output 1

Air carriers should review the latest version of Advisory Circular (AC) 120–76, Guidelines for the Certification, Airworthiness, and Operational Use of Electronic Flight Bags, and other applicable ACs that enable use of moving map display in conjunction with company implementation of electronic flight bags (EFB).

Air carriers should evaluate all available runway awareness systems for forward fit and retroactive implementation. Air carriers should consult with original equipment manufacturers (OEM) and third party suppliers for detailed costs and technical capabilities of any system that provides airport position and/or aural warnings and alerts for airport runways.

Air carriers should install and implement moving map displays and/or runway awareness systems and activate the software to provide crews with knowledge of airplane position during taxi operations.

SE 229: Takeoff Configuration Warning System Maintenance and Operational Assurance (Underway)

Implementer

This SE is underway. Aspects of this SE are being worked on and will be altered from this draft version once they are complete.

This SE is designed to mitigate the risk of flightcrews attempting to take off with flaps in an improper setting by ensuring air carrier maintenance programs include appropriate actions and procedures to ensure proper operation of the takeoff configuration warning system (TCWS).

Output 2

Air carriers should review their maintenance programs related to the TCWS to ensure acceptable in-service reliability:

- Ensure maintenance programs meet the latest manufacturer recommendations for maintenance intervals and procedures on TCWS.
- Review maintenance programs to ensure any circuit breakers bulled during maintenance or troubleshooting that could affect availability of the TCWS are re-engaged before release for flight.
- Review Minimum Equipment Lists (MEL) to ensure the procedures do not allow flightcrews to disable the TCWS by pulling circuit breakers.

SE 1: Terrain Avoidance Warning System (TAWS) (Completed)

Implementer

This SE is designed to reduce or eliminate controlled flight into terrain (CFIT) accidents by improving pilot situational awareness. It also establishes appropriate procedures for the installation and use of TAWS equipment. Procedures include proper flightcrew reaction in response to TAWS aural and visual warnings.

Output 5

Air carriers should use a comprehensive system to support TAWS. The system should include information on installation, maintenance, training, and use of TAWS equipment.

Although SE 1 was originally written to be a voluntary safety enhancement, 14 CFR §§ 91.223 and 121.354 have required TAWS since 2005 for all turbine-powered airplanes in part 121 air carrier service. Air carriers are encouraged to implement CAST SE 120 for additional TAWS functionality.

AC 20–138D, Airworthiness Approval of Positioning and Navigation Systems, Change 2, issued April 7, 2016, initiated by the FAA Aircraft Certification Service (AIR), Systems and Equipment Standards Branch (AIR–130) is available for guidance: https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_20-138D_Chg_2.pdf.

SEs 17–20: Maintenance Procedures (Completed)

Implementer

The purpose of these SEs is to reduce approach and landing accidents by re-emphasizing current maintenance rules, policies, and procedures developed by commercial air carriers and the FAA. The re-emphasis should specifically direct—

1. Approved maintenance programs related to the servicing of components incorporate all OEM safety-related components and procedures;
2. Oversight of subcontractor activity is increased by both the air carriers and regulators; and
3. MEL policies and procedures are strictly adhered to.

The re-emphasis could be acted on almost immediately.

Output 4

Air carrier directors of safety should—

- Determine if quality control procedures have been implemented to ensure those deficiencies are continually addressed.
- Ensure an internal audit is conducted to determine whether rules relating to maintenance deficiencies in the specified bulletins, listed above, are being met through adequate maintenance procedures.
- Establish system safety procedures to ensure continuing conformance with the bulletins listed above.
- Determine whether the maintenance deficiencies described in the following bulletins and policy letters have been remedied:
    - Flight Standards Information Bulletin for Airworthiness 97–10 dated March 3, 1997: http://www.skybrary.aero/bookshelf/books/1561.pdf.

- Handbook Bulletin Airworthiness (HBAW) 96–05C dated December 15, 1997: http://www.skybrary.aero/bookshelf/books/1562.pdf.
- HBAW 98–01 dated February 3, 1998: http://www.skybrary.aero/bookshelf/books/1563.pdf.
- HBAW 98–09 dated April 28, 1998: http://www.skybrary.aero/bookshelf/books/1564.pdf.
- Handbook Bulletin Air Transportation (HBAT) 98–18 dated April 28, 1998: http://www.skybrary.aero/bookshelf/books/1564.pdf.
- MMEL Policy Letter 87 Revision 10 dated August 10, 2010: http://fsims.faa.gov/PICDetail.aspx?docId=237672117617D63C86257784006C2EED.
- National Transportation Safety Board (NTSB) Safety Recommendation A–96–166: http://www.ntsb.gov/investigations/AccidentReports/_layouts/ntsb.recsearch/Recommendation.aspx?Rec=A-96-166.
- NTSB Safety Recommendation A–97–74 and A–97–57: http://www.ntsb.gov/investigations/AccidentReports/_layouts/ntsb.recsearch/Recommendation.aspx?Rec=A-97-074.

SE 24: Aircraft Design (Completed)

Implementer

This SE is designed to incorporate fault-tolerant design principles for flight-critical system components and facilitates critical-point, flight-realistic condition, and certification testing/analysis. Changes to flight-critical system components will be considered a major change unless the applicant can show the change is minor and monitors the continued airworthiness (in-service failures) of these systems using a risk-assessment focused methodology.

Output 3

Manufacturers and air carriers should review SAE Aerospace Standards Aerospace Recommended Practice (ARP) 5150, Safety Assessment of Transport Airplanes in Commercial Service, to ensure their continuing airworthiness processes incorporate risk management techniques to help ensure the original design level of safety is not degraded.

Air carriers should adequately monitor and assess fleet performance to verify that the level of safety intended by the product's original basis of certification remains unchanged by application of safety risk management processes to identify and prioritize safety critical threats/trends and mitigating corrective action.

SE 84: Disk Inspection Initiative (Completed)

Implementer

This SE is designed to eliminate uncontained engine failures (UEF) by mandatory inspections of the disks of turbine engines during shop visits.

Output 1

Air carriers should develop and implement enhanced disk inspection to detect cracks and help prevent UEFs of high-energy rotating parts.

Guidance on disk inspections can be found in U.S. Department of Transportation (DOT)/FAA/AR–04/28, Turbine Engine Fan Disk Crack Detection Test, issued September 2004: http://www.tc.faa.gov/its/worldpac/techrpt/ar04-28.pdf.

SE 120: TAWS Improved Functionality (Completed)

Implementer

This SE is designed to increase the potential safety effect of SE 1, Terrain Avoidance Warning System (TAWS), by developing procedures to include Global Positioning System (GPS) sensors for TAWS, and to ensure updates to terrain databases, alerting algorithms, and new options to TAWS are incorporated as soon as possible.

Output 3

Air carriers should install GPS capability on all airplanes with multi-sensor RNAV Flight Management Systems (FMS), Electronic Flight Instruments, and Electronic Map Displays. Note: These airplanes may have distance measuring equipment (DME)/DME or triple Inertial Navigation System positioning capability rather than GPS.

As a minimum, air carriers should modify TAWS to GPS TAWS. In addition, all air carriers should enable GPS to the TAWS box at any applicable maintenance opportunities. To minimize CFIT risk, air carriers not installing GPS at this time should implement Standard Operating Procedures (SOP) that advise flightcrews of the possible increased risk of operating into areas with limited ground based navigation aids (NAVAID) and that help verify the aircraft's actual position relative to displayed ground track when appropriate.

Air carriers that fly standard airplanes, equipped with non-GPS TAWS, into regions with minimal navigation aids, should modify standard TAWS to GPS TAWS or conduct a risk assessment to develop and implement effective risk mitigation (such as no dual DME, or poor ground-based NAVAID reliability).

Output 4

Air carriers should develop and implement procedures to ensure TAWS terrain databases are updated in accordance with the manufacturer's recommendations on all airplanes.

SE 165: TCAS Policies and Procedures (Completed)

Implementer

This SE is designed to prevent midair collisions by requiring flightcrew to follow Traffic Collision Avoidance System (TCAS) resolution advisories (RA), even in the presence of contravening Air Traffic Control (ATC) instructions. It also establishes procedures for TCAS range setting, and recommends TCAS-capable simulators and flight-training devices be used for training TCAS responses and maneuvers.

Output 6

TCAS DO–185, Version 7.1 includes TCAS reversal logic as well as a change from "Adjust Vertical Speed Adjust" to "Level off-Level off."

Air carriers should consider the benefits associated with TCAS DO–185, Version 7.1. If air carriers are conducting maintenance on their TCAS units, they should consider upgrading to TCAS DO–185, Version 7.1.

For more information on TCAS DO–185, Version 7.1, see Introduction to TCAS II Version 7.1: http://www.skybrary.aero/bookshelf/books/1927.pdf.

SE 169: Work Cards/Shift Change/Responsibilities/Manuals (Completed)

Implementer

This SE is designed to reduce accidents related to improper or incomplete maintenance by ensuring—

- Work cards or other written instructions are used at the start of each task, with written and oral status reports at every shift change;
- Procedures are written to include clear responsibility and authority for work assignments; and
- Necessary manuals (operational and maintenance) are complete, accurate, available, and appropriately used.

Output 2

Air carriers should audit their compliance with AC 120–16F, Air Carrier Maintenance Programs, and implement changes where needed, including both procedural content and procedural use. AC 120–16F, issued November 15, 2012, is available for guidance: http://www.faa.gov/documentLibrary/media/Advisory_Circular/AC%20120-16F.pdf.

Successful implementation of procedural enhancements may additionally require changes to associated company policies and philosophy, and a sound organizational commitment to safety culture. See SE 17, Maintenance Procedures.

Air carriers should review their guidance material in an appropriate and timely manner to establish their level of alignment with the material.

SE 170: OEM Continuous Monitoring of Service History (Completed)

Implementer

This SE is designed to reduce accidents caused by improper maintenance. It is designed to ensure maintenance task difficulty data is collected and reported to the OEM and proper maintenance is being performed to ensure aircraft systems continue to function as designed.

Output 2

Air carriers and maintenance organizations should develop processes to follow the intent of and incorporate best practices into their reporting processes for maintenance task difficulties.

(See ATA[4] Spec 119, Continuous Monitoring of Maintenance Instructions, January 2014, http://www.skybrary.aero/bookshelf/books/2866.pdf)

SE 172: Gap Analysis of Existing Airplane Maintenance Process & Follow-on Action Plan (Completed)

Influencer

This SE is designed to identify and correct gaps within and between the maintenance processes that could otherwise inhibit the intended design level of safety from being sustained throughout the airplane life.

Output 1

The Flight Standards Service Aircraft Maintenance Division (AFS–300) should convene a task force that will perform a gap analysis between the certified level of design system reliability and maintaining this reliability with current maintenance and oversight practices and processes.

Output 2

AFS–300, AIR, and the International Air Transport Association (IATA) should coordinate with current rulemaking and guidance material update schedules to implement mitigations to close gaps as identified in "Scoping Study - Gap Analysis of Existing Airplane Maintenance Processes."

SE 175: Flight Critical Configurations Changes Made During Maintenance (Completed)

Implementer

This SE is designed to reduce accidents, caused by loss of pitot static systems, by providing visible tagging any time ports of the pitot static system are covered during maintenance or servicing. This SE is also designed to enhance preflight walk-around procedures to include specific verification that pitot static ports are uncovered.

Output 1

OEMs and air carriers should review, and amend, procedures to ensure multiple levels of alerting, including visible tagging, are used anytime the pitot static system is covered. Such levels should include visible tagging, or similar readily-visible alerting, a work card, and logbook entry.

[4] Airlines for America, formerly known as Air Transport Association of America (ATA). The specifications are still known as "ATA specs."

Air carrier directors of safety, in conjunction with directors of maintenance, should ensure appropriate procedures are covered in maintenance information, including work cards.

Air carriers should include adherence to the process within the internal audit process of their SMS (or equivalent).

3. Safety Enhancements—Operations

SE 212: Equipment and Procedures To Improve Route Entry for RNAV Departures (Underway)

Implementer

This SE is underway. Aspects of this SE are being worked on and will be altered from this draft version once they are complete.

This SE is designed to reduce the frequency of crew errors during initial FMS programming of departure routes. Air carriers should take steps to address issues concerning pre-departure clearances (PDC) and pre-departure route changes.

Output 3

Air carriers are encouraged to deploy the capability to autoload pre-departure route clearances, with crew acknowledgement, into the FMS.

SE 218: Overrun Awareness and Alerting Systems (Underway)

Implementer

This SE is underway. Aspects of this SE are being worked on and will be altered from this draft version once they are complete.

This SE is designed to reduce landing overrun accidents through the development by manufacturers and the implementation by manufacturers and operators of onboard technologies to reduce or prevent landing overruns on new and existing airplanes and airplane designs, as applicable and as feasible.

Output 3

Air carrier industry associations should communicate with their air carrier members, explaining the analysis undertaken by CAST regarding REs and the potential benefits of onboard technologies that reduce or prevent landing overruns.

Air carriers should study the feasibility of incorporating these technologies into their specific fleets (both existing airplanes and new purchases) and operations. Studies should take into account current and potential future availability of systems from manufacturers. Air carriers should consider results from manufacturer-developed onboard technology that reduces or prevents landing overruns on new, current production, and out-of-production transport category airplane programs.

Air carriers should implement systems based on results of their feasibility assessments, where applicable, and report to their air carrier industry associations whether they intend to incorporate systems in their fleet.

SE 10: Airline Proactive Safety Programs (FOQA & ASAP) (Completed)

Implementer

This SE is designed for air carriers to develop and implement a mutually agreed upon methodology to use deidentified FOQA and ASAP information for proactively identifying safety-related issues and corrective actions.

Output 1

AFS and the Office of the Chief Counsel worked with industry groups to draft and issue a notice of proposed rulemaking (NPRM) preventing use of data collected under FOQA and ASAP programs in certificate actions against the airlines or their employees. This NPRM resulted in 14 CFR § 13.401 on May 9, 2002.

Employee groups should work with operators (A4A, RAA) to draft contractual language to prevent the use of FOQA or ASAP information as a basis for disciplinary actions.

Operators (A4A, RAA) worked with employee groups to develop legislative language to exempt FOQA and ASAP information from FOIA disclosure and prevent misuse of FOQA and ASAP information. This legislative language resulted in Title 49, United States Code (U.S.C.) § 44735, Limitation on disclosure of safety information.

SEs 14–16: Policies for ALAR (Safety Culture) (Completed)

Implementer

The purpose of these SEs is to develop a strategy to promote a safety culture at each air carrier specifically targeting approach and landing accident reduction (ALAR). It is designed to ensure essential safety information generated by airplane manufacturers and the FAA is included in company operating manuals and in training programs for pilots and other appropriate employee groups.

Teams within each air carrier should jointly develop manuals and training programs striving for the highest safety goals. They should further ensure the content of those manuals are rigorously followed in training programs and in day-to-day operations. It is recognized that rulemaking may be necessary to clarify existing requirements specifying the content and use of company operating manuals.

Output 1

Air carrier chief executive officers (CEO) and other key officers should be made more visible and more effective in promoting safety culture.

Safety culture guidance material can be found in the following documents:

- Operator's Flight Safety Handbook: http://flightsafety.org/files/OFSH_english.pdf,
- FAA Audit Tool, or
- Other similar guidance, endorsed by CAST.

SE 21: Flight Deck Equipment Upgrades/Installation To Improve Altitude Awareness and Checklist Completion (Completed)

Implementer

This SE is designed to ensure altitude awareness and accomplishment of checklist items. Air carriers should develop guidelines and procedures for a flightdeck smart-alerting system. Air carriers should incorporate procedures and operational training based on—

1. The installation of automated checklist devices to provide a positive means for checklist completion (described in Human Performance Considerations in the Use and Design of Aircraft Checklists, issued January 1995: http://www.skybrary.aero/bookshelf/books/1566.pdf.
2. Research and assessment of existing technology in flightdeck smart-alerting system design; and
3. The installation of equipment to provide automatic aural altitude alert call-outs on final approach or other such altitude alerting systems.

Outputs 1 and 3

Air carriers should develop training syllabuses and procedures for interactive checklists and smart alerting system use.

(AC 25.1322–1, Flightcrew Alerting, is available for guidance: http://www.faa.gov/documentLibrary/media/Advisory_Circular/AC%2025.1322-1.pdf)

SE 27: Risk Assessment and Management (Completed)

Implementer

This SE is designed to identify, or develop and implement, methods for air carriers to prioritize safety-related decisions. This SE will improve methods of risk assessment for operational issues related to service bulletins, aircraft accident/incident analysis, flight-critical safety information, and recurring intermittent failures related to dispatch.

Output 3

Air carrier directors of safety or their equivalents should ensure all appropriate managers implement and use risk assessment tools to prioritize safety related decisions.
Guidance materials on risk assessment and risk management tools to prioritize safety related decisions for operational issues are in Guide to Methods and Tools for Airline Flight Safety Analysis, second edition, issued June 2003: http://www.skybrary.aero/bookshelf/books/237.pdf.

Air carrier directors of safety or their equivalents, working through senior management, should apply the principles contained in AC 120–92B, Safety Management Systems for Aviation Service Providers, to training programs and manuals used by operations and maintenance staff.

AC 120–92B, is available for guidance:
https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_120-92B.pdf.

SE 28: Policies (Completed)

Implementer

This SE is designed to ensure essential safety information and operational procedures generated by airplane manufacturers are included in operating manuals and training programs for pilots, and other appropriate employee groups. Air carriers should develop a means to improve the performance of those flightcrew members who meet the minimum criteria, but have shown a limited proficiency.

Output 1

Air carriers should develop reliable processes to ensure flight operations and maintenance personnel are made aware of and incorporate essential operating information in a timely manner.

- Air carriers should distribute essential operating information identified by the manufacturers to flightcrews and maintenance staff in an appropriate and timely manner.
- Air carrier directors of safety or their equivalents should ensure the establishment of a process to identify, review, analyze and include essential operating information in training programs and in manuals used by flightcrews and maintenance staff.
- Air carriers should revise the company flight manual(s) in a timely manner as essential operating information is amended or added.

SE 51: SOPs for Tow Tug Operators (Completed)

Implementer

This SE is designed for the development and use of recommended "best practices" for ground operations by mechanics and others who tow or otherwise move aircraft within the airport movement area, and will improve aviation safety by reducing the frequency and severity of runway incursions.

Output 1

AFS developed a template for "best practices" to prevent runway incursions and other surface incidents. Air carriers should train mechanics and others who tow or otherwise move aircraft within the airport movement area on the recommended best practices.

SE 131: Safety Culture (Completed)

Implementer

This SE is designed to reduce cargo-related accidents and incidents by encouraging a safety culture, which includes the following outputs.

Output 2

Air carriers should implement a self-audit process as part of the SMS program to further enhance safety.

Information on SMS is available for guidance:
http://www.faa.gov/about/initiatives/sms/explained/.

Output 3

Air carriers should implement an operational risk management program.

(See SE 27, Risk Assessment and Management).

Output 5

Air carriers should implement a safety reporting system and develop a quality assurance program appropriate for their operations.

SE 175: Flight Critical Configurations Changes Made During Maintenance (Completed)

Implementer

This SE is designed to reduce accidents, caused by loss of pitot static systems, by providing visible tagging any time ports of the pitot static system are covered during maintenance or servicing. This SE is designed to enhance preflight walk-around procedures to include specific verification that pitot static ports are uncovered.

Output 2

OEMs and air carriers should confirm pilots performing pre-flight walk-around procedures ensure pitot/static ports are uncovered.

Air carrier directors of safety, in conjunction with its director of operations, should ensure the appropriate pre-flight walk-around procedures are covered in Flight Operations Manual.

Air carriers should include adherence to the process within the internal audit process of their SMS (or equivalent).

SE 178: Airport Enhanced Surface Markings & Lighting (Completed)

Influencer

This SE is designed to develop and install airport visual aids that provide clear guidance (taxi route, runway entrance, runway exit and construction area avoidance) for flightcrews and other persons operating aircraft and vehicles on the movement area.

Output 1

FAA Runway Safety Action Teams conducted a study to determine the resources required to mitigate the threats (runway/taxiway markings and construction signage) present in the airport environment that contribute to runway incursions and surface incidents. As a result, AC 15/5340–1L was published.

(See AC 150/5340–1L Standards for Airport Markings, September 27, 2013, http://www.faa.gov/documentLibrary/media/Advisory_Circular/150_5340_1l.pdf)

Output 2

Airports should establish existing standards for holding position markings, signs, and lights or improved to improve visual awareness and all-weather conspicuity.

Output 3

All part 129 and 139 airports should develop a standardized design for construction signage, markings and lights, which will improve visual awareness and all-weather conspicuity.

SE 193: Non-Standard, Non-Revenue Flights (Completed)

Implementer

This SE is designed to reduce accidents and incidents because of loss of airplane state awareness (ASA) during high-risk maneuvers in functional check flights, as well as in other non-standard, non-revenue flight operations.

Output 1

AFS published InFO 16006, identifying risks and summarizing recommendations while conducting non-revenue flights.

(See InFO 16006, Non-Revenue Flight Procedures, https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/info/all_infos/media/2016/InFO16006.pdf, and the Flight Safety Foundation Functional Check Flight Compendium, http://flightsafety.org/current-safety-initiatives/functional-check-flights.)

Completed and closed June 2, 2016.

Output 2

Air carriers should implement the guidance developed from Output 1 to create operational risk assessment guidelines and training standards that mitigate risk associated with non-standard, non-revenue flights.

Air carriers should incorporate these practices into their SOP, policies, training, and SMS.

Completed and closed February 2, 2017, based on air carrier industry association member implementation surveys.

SE 10: Airline Proactive Safety Programs (FOQA & ASAP) (Completed)

Awareness

This SE is designed for air carriers to develop and implement a mutually agreed upon methodology to use deidentified FOQA and ASAP information for the purpose of proactively identifying safety-related issues and corrective actions.

Output 2

A FOQA Steering Committee and ASAP Policy Sub-Committee comprised of government and industry representatives, endorsed by the FAA, provided guidance to operators regarding the implementation of FOQA and ASAP programs (mentoring). Each steering committee was responsible for the development and establishment of standards for FOQA and ASAP programs. In addition, each steering committee documented standards for FOQA and ASAP programs.

The FAA convened a group to draft and coordinate ASAP AC 120–66B and FOQA AC 120–82. A redraft of the ASAP AC is in production.

(See AC 120–66B, Aviation Safety Action Program (ASAP), November 15, 2002, http://www.faa.gov/documentLibrary/media/Advisory_Circular/AC120-66B.pdf)

(See AC 120–82, Flight Operational Quality Assurance, April 12, 2004, http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/list/AC%20120-82/$FILE/AC120-82.pdf)

Output 3

The FAA convened a group of the referenced organizations to draft HBAT guidance regarding approval of FOQA and ASAP programs. FAA AFS–1 was the lead organization for HBAT development.

Output 4

Operators and manufacturers developed a process to identify and communicate "Hot Topic" items of focus or review that could be monitored for a specific period.

Currently the sharing of trend information and corrective actions from FOQA and ASAP programs is undertaken by ASIAS.

Output 5

Flight Safety Foundation (FSF) promoted and advertised FOQA overview documentation.

A4A and RAA, through the FOQA Task Force, drafted and coordinated documentation outlining suggested methods and procedures regarding key components of analysis and trend identification programs and suggested items to monitor in FOQA and ASAP programs.

The FAA and National Aeronautics and Space Administration (NASA) publish results of studies reviewing existing FOQA and ASAP programs and the analysis tools those existing programs employ.

NASA undertook studies to develop analytical tools and methods that both large and small operators could apply to FOQA and ASAP information.

Operations

4. Safety Enhancements—Research

SE 126: Mitigations for Hazardous Material Fires (Completed)

Awareness

This SE is designed to reduce the occurrence of accidents and incidents from fires involving high-consequence hazardous materials, develop systems to contain or suppress such fires as a final line of defense for personnel, equipment and cargo. The system should be usable for both ground (for example, cargo loading/unloading, and ramp movement) and flight operations.

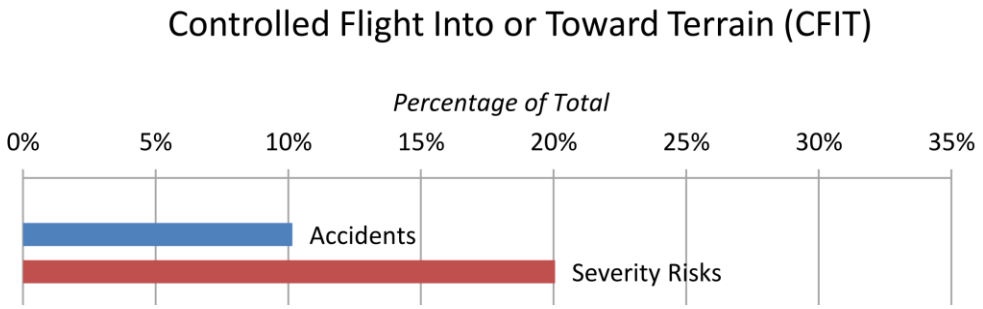
A JIMDAT working group completed initial research, and CAST has adopted four additional SEs as a result:

- SE 223: Cargo – Hazardous Material Fires – Prevention and Mitigation
- SE 224: Cargo – Hazardous Material Fires – Enhanced Fire Detection Systems (Research)
- SE 225: Cargo – Hazardous Material Fires – Containment and Suppression (Research)
- SE 226: Cargo – Hazardous Material Fires – Enhanced Protection of Occupants and Aircraft

SE 126 completed and closed December 1, 2016.

5. Air Carrier Action Safety Enhancement Check-List

Controlled Flight into Terrain (CFIT)



SE 1: Terrain Avoidance Warning System (TAWS)

Output 5

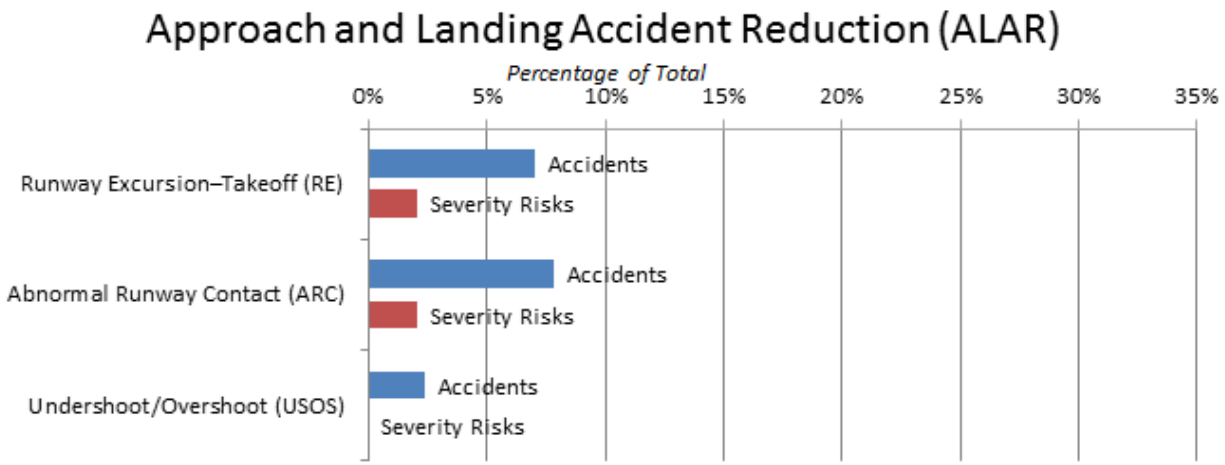
- ☐ Is your air carrier using a comprehensive system to support TAWS that includes information on installation, maintenance, training, and the use of TAWS equipment?

SE 10: Airline Proactive Safety Programs (FOQA & ASAP)

Output 1

- ☐ Has your air carrier's employee group worked with operators (A4A, RAA) to draft contractual language to prevent the use of FOQA or ASAP information as a basis for disciplinary actions?

Approach and Landing Accident Reduction (ALAR)



SEs 14–16: Policies for ALAR (Safety Culture)

Output 1

- ☐ Are your air carrier's key officers visible and effective in promoting safety culture?

SEs 17–20: Maintenance Procedures

Output 4

- ☐ Has your air carrier's director of safety determined that the maintenance deficiencies, described in the bulletins and policy letters listed in this document, have been remedied?
- ☐ Has your air carrier's director of safety determined that quality control procedures have been implemented to ensure that those deficiencies are continually addressed?
- ☐ Has your air carrier's director of safety ensured an internal audit has been conducted to determine that rules relating to the maintenance deficiencies described in the specified bulletins are being met through adequate maintenance procedures?
- ☐ Has your air carrier's director of safety established system safety procedures to ensure continuing conformance with the bulletins?

SE 21: Flight Deck Equipment Upgrades/Installation to Improve Altitude Awareness and Checklist Completion

Outputs 1 and 3

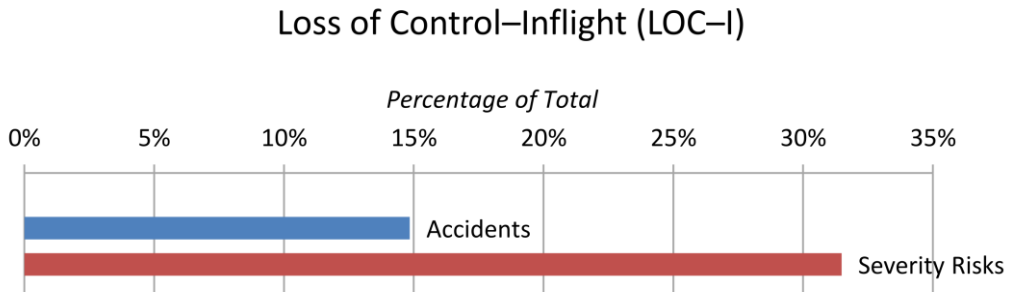
- ☐ Has your air carrier developed training syllabuses and procedures for interactive checklists and smart alerting system use?

SE 24: Aircraft Design

Output 3

- ☐ Has your air carrier reviewed SAE ARP 5150, Safety Assessment of Transport Airplanes in Commercial Service, to ensure your continuing airworthiness processes incorporate risk management techniques that help ensure that the original design level of safety is not degraded?

Loss of Control (LOC)



SE 27: Risk Assessment and Management

Output 3

- ☐ Has your air carrier established a risk management program that—

  a) Prioritizes safety related decisions?

  b) Implements risk management methods in operations and maintenance departments?

SE 28: Policies

Output 1

- ☐ Has your air carrier distributed essential operating information identified by the manufacturers to flightcrews and maintenance staff?

- ☐ Has your air carrier's director of safety or equivalent ensured the establishment of a process to identify, review, analyze and include essential operating information in training programs and in manuals used by flightcrews and maintenance staff?

- ☐ Has your air carrier revised the company flight manual(s) as essential operating information is amended or added?

SE 193: Non-Standard, Non-Revenue Flights

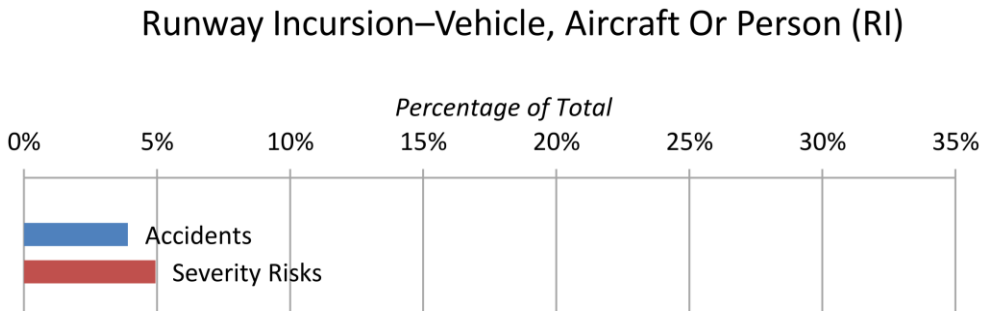
Output 1

- ☐ Has your air carrier reviewed the regulator guidance material providing best practices on the conduct of non-standard, non-revenue flights?

Output 2

- ☐ Has your air carrier revised its SOP and policies, as applicable, regarding conduct of non-standard, non-revenue flight operations to reflect the guidance?

Runway Incursion



SE 51: SOPs for Tow Tug Operators

Output 1

- ☐ Has your air carrier trained its mechanics and others who tow or otherwise move aircraft within the airport movement area on the recommended "best practices" developed to prevent runway incursions and other surface incidents?

Cargo

SE 127: Cargo Fire Management

Output 4

- ☐ Has your cargo air carrier incorporated the new fire suppression and/or containment systems developed by manufacturers?

Output 8

- ☐ If they are available, does your cargo air carrier have the new ULD installed?

SE 131: Safety Culture

Output 2

- ☐ Has your air carrier implemented a self-audit process to further enhance safety?

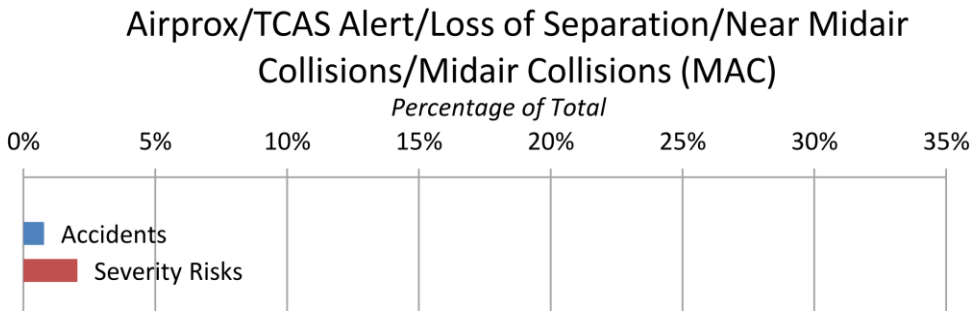
Output 3

- ☐ Has your air carrier implemented an operational risk management program?

Output 5

- ☐ Has a safety reporting system been implemented? Has a quality assurance program appropriate for your operations been developed?

MIDAIR



SE 165: TCAS POLICIES AND PROCEDURES

Output 6

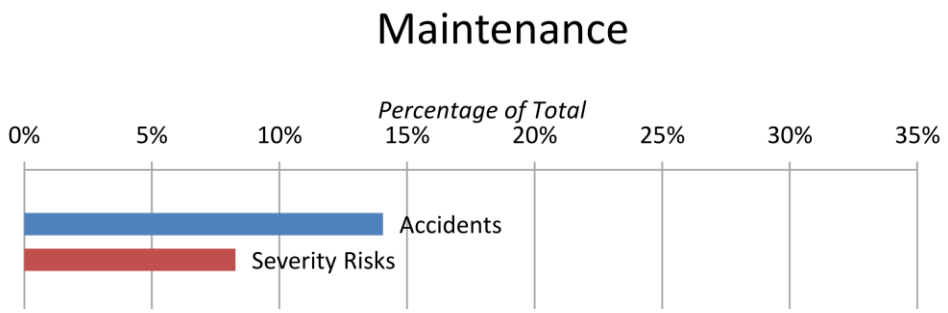
- ☐ Has your air carrier considered the benefits associated with TCAS DO–185, Version 7.1?
- ☐ If your air carrier is conducting maintenance on its TCAS units, has your air carrier consider upgrading to TCAS DO–185, Version 7.1?

SE 212: EQUIPMENT AND PROCEDURES TO IMPROVE ROUTE ENTRY FOR RNAV DEPARTURES

Output 3

- ☐ Has your air carrier deployed the capability to autoload pre-departure route clearances, with crew acknowledgement, into the FMS?

MAINTENANCE



SE 169: WORK CARDS/SHIFT CHANGE/RESPONSIBILITIES/MANUALS

Output 2

- ☐ Has your air carrier audited your compliance with AC 120–16F?

SE 170: OEM Continuous Monitoring of Service History

Output 2

- ☐ Has your air carrier developed processes to follow the intent of the guidance material?
- ☐ Has your air carrier incorporated the best practices into your reporting processes for maintenance task difficulties?

SE 175: Flight Critical Configurations Changes Made During Maintenance

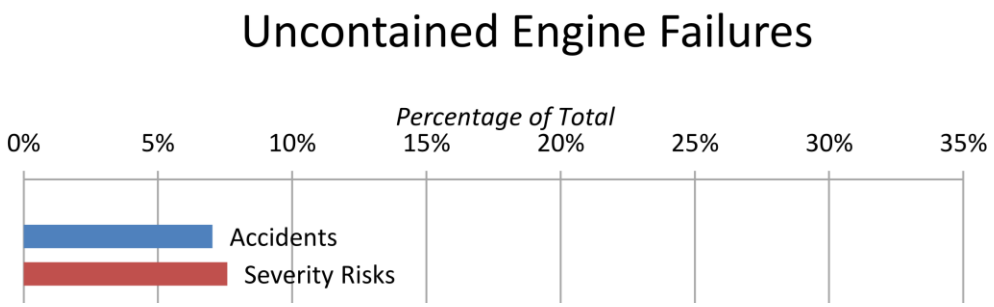
Output 1

- ☐ Has your air carrier reviewed, and amended, procedures as appropriate to ensure that multiple levels of alerting, including visible tagging, are used anytime the pitot static system is covered?
- ☐ Has your air carrier ensured that maintenance procedures include multiple levels of protection to ensure timely removal of covering?
- ☐ Has your air carrier's director of safety, in conjunction with its director of maintenance, ensured the appropriate procedures are covered in maintenance information, including work cards?
- ☐ Does your air carrier include adherence to the process within the internal audit process of its SMS?

Output 2

- ☐ Has your air carrier ensured that preflight walk around procedures ensure that pitot/static ports are uncovered?

Uncontained Engine Failures

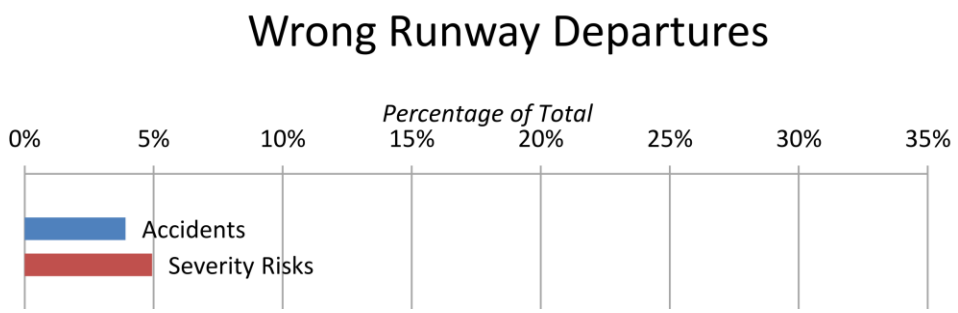


SE 84: Disk Inspection Initiative

Output 1

- ☐ Has your air carrier developed and implemented enhanced disk inspection to detect cracks and help prevent UEF of high energy rotating parts?

Wrong Runway Departures

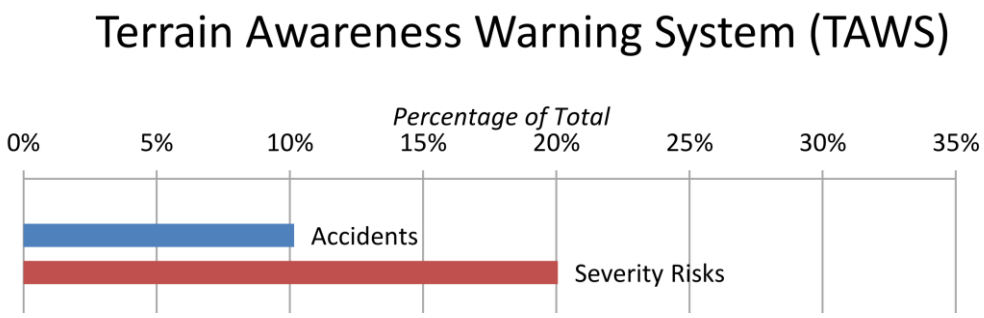


SE 183: Cockpit Moving Map Display and Runway Awareness System

Output 1

- ☐ Has your air carrier installed ownship moving map display and/or runway awareness systems?

Terrain Awareness Warning System



SE 120: TAWS Improved Functionality

Output 3

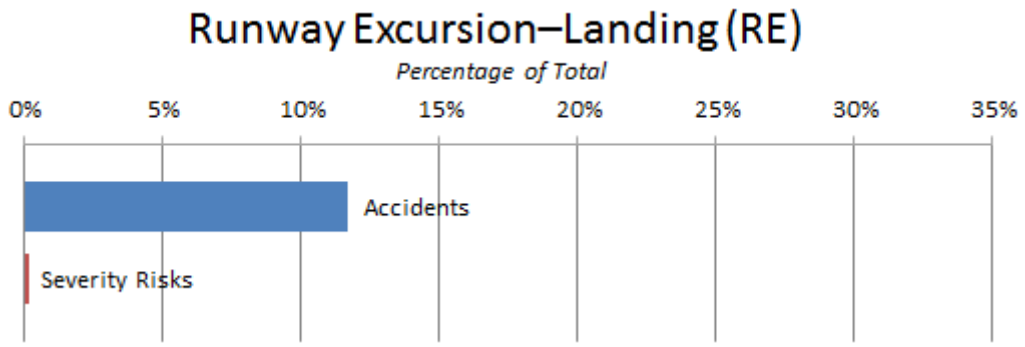
- ☐ Has your air carrier installed GPS capability on all airplanes with multi sensor RNAV FMS, electronic flight instruments and electronic map displays?

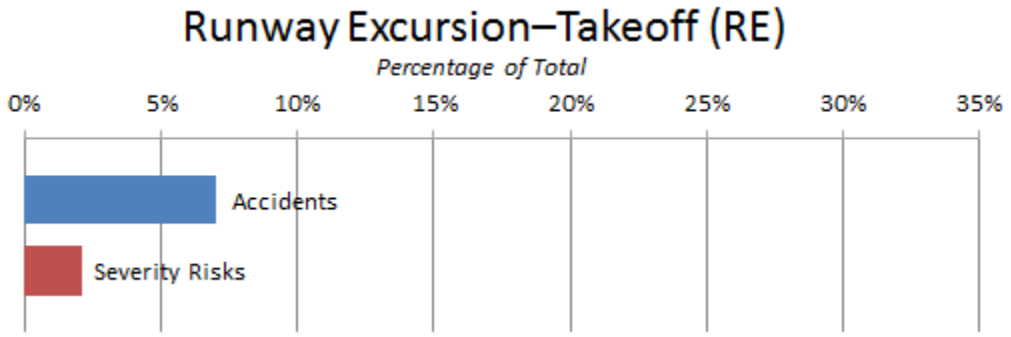
- ☐ If your air carrier flies standard airplanes equipped with non-GPS TAWS into regions with minimal NAVAID, have you modified standard TAWS to GPS TAWS, or conducted a risk assessment to develop and implement effective risk mitigation?

Output 4

- ☐ Has your air carrier developed and implemented procedures to ensure that TAWS terrain databases are updated in accordance with the manufacturer's recommendations on all airplanes?

RUNWAY EXCURSION





SE 218: OVERRUN AWARENESS AND ALERTING SYSTEMS

Output 3

- ☐ Has your air carrier incorporated into its specific fleet (both existing airplanes and new purchases) and operations onboard technologies that reduce or prevent landing overruns?

- ☐ Has your air carrier implemented systems based on results of its feasibility assessments, where applicable?

- ☐ Has your air carrier reported to industry associations whether it intends to incorporate systems in its fleet?

TAKEOFF MISCONFIGURATION

SE 229: TAKEOFF CONFIGURATION WARNING SYSTEM MAINTENANCE AND OPERATIONAL ASSURANCE

Output 2

- ☐ Has your air carrier reviewed its maintenance programs related to TCWS to ensure they meet the latest manufacturer recommendations for maintenance intervals and procedures?

- ☐ Has your air carrier reviewed its maintenance procedures to ensure circuit breakers pulled during maintenance or troubleshooting that could affect TCWS availability are re-engaged before releasing the aircraft for flight?

- ☐ Has your air carrier reviewed its MEL procedures to ensure approved procedures do not allow the TCWS to be disabled by pulling circuit breakers, including circuit breakers for integrated/related systems?

- ☐ Does your air carrier periodically review its maintenance programs related to the TCWS to ensure acceptable in-service reliability?