COMMERCIAL AVIATION SAFETY TEAM

Safer Skies Safety Enhancements for Manufacturers

Safety Enhancement: 1   CFIT

Title: Terrain Avoidance Warning System (TAWS)   *Completed*

This SE substantially reduces or eliminates controlled flight into terrain (CFIT) accidents by improving pilot situational awareness. The SE establishes appropriate procedures for the installation and use of TAWS equipment. Procedures include proper flight crew reaction in response to TAWS aural and visual warnings.

☐ **Output 3**   The manufacturers will formulate the standard practice of installing TAWS equipment in all newly manufactured aircraft used under FAR Part 121. This will comply with the TAWS TSO issued by the regulator.

☐ **Output 4**   The manufacturers will implement a retrofit program including certification and installation of TAWS equipment in existing aircraft. The regulator will review/approve any amended type certificates.

☐ **Output 5**   The regulator will develop a comprehensive system to support TAWS including installation, maintenance, training, and use of TAWS equipment for operators. Operators and manufacturers will apply for supplemental/amended type certificates (TC) for approval by the regulator.

Safety Enhancement: 10   CFIT

Title: Institute Proactive Safety Plans: FOQA and ASAP   *Completed*

This SE develops and implements a mutually agreed upon methodology to use de-identified FOQA and ASAP information to identify safety-related issues and corrective actions. This will give operators the tools to identify safety issues and trends, and initiate corrective actions prior to an accident. It will also allow air carriers to share safety information.

☐ **Output 4**   Manufacturers and operators will develop guidance documentation outlining voluntary procedures and protocols for the sharing of trend information or corrective actions amongst the user community. Additionally, a process for sharing "hot topic" items for focus and review will be drafted.

Safety Enhancement: 16   ALAR

Title: Policies for ALAR (Safety Culture)- AFM Database for Inspectors   *Completed*

This SE tasks the FAA to fully implement the airplane flight manuals database for inspectors' use in surveillance. The FAA will populate the database with records pertaining to all aircraft used in all operating parts of Title 14, Code of Federal Regulations, and will also support daily changes in records contained in the database.

☐ **Output 1**   The regulator fully implements the AFM database for inspectors' use with guidance from HBAT 99-16. Manufacturers supply the regulator with all future AFM-revisions and Operator Bulletins for each model affected.

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Safety Enhancement: 21 ALAR

Title: Flight Deck Equipment Upgrade/Installation to Improve   *Completed*
       Altitude Awareness and Checklist Completion

This SE ensures altitude awareness and accomplishment of checklist items. This will be accomplished through the development of guidelines and procedures for a flight deck smart-alerting system design and supporting operational procedures and training based on—
•The installation of automated checklist devices to provide a positive means for checklist completion;
•Research and assessment of existing technology in flight deck smart-alerting system design; and
•The installation of equipment to provide automatic aural altitude alert call-outs on final approach or other such altitude alerting systems.

☐ **Output 1**   The regulator and industry will develop advisory material defining the characteristics of interactive checklists and smart alerting systems for all new type designs along with compatible operational guidance.   This guidance material should address—
•Reduced nuisance alerts,
•Reduced redundant alerts,
•Flight-phase sensitive alerts (e.g., some alerts attenuated on takeoff roll, others on short final approach), and
•Built-in logic prompting the flightcrew to appropriate actions.

 Manufacturers will design and Install on the new type design aircraft.

Operators will develop training syllabi and procedures for use.

☐ **Output 2**   Manufacturers will evaluate/consider during checklist design, the principles contained in the FAA Human Performance Considerations in the Use and Design of Aircraft Checklists, the NASA Contract Report on Design of Flight-Deck Procedures and the NASA Human Factors of Flight-Deck Checklist: The Normal Checklist.

☐ **Output 3**   Manufacturers should provide automatic aural altitude call outs on final approach for all new type design aircraft (including arrival at minimum descent altitude (MDA)/decision height (DH)).

Safer Skies Safety Enhancements for Manufacturers

Safety Enhancement: 24   ALAR

Title: Implementation Plan For Aircraft Design   *Completed*

This SE promotes incorporation of 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 operators will review SAE ARP 5150 "Safety Assessment of Transport Airplanes in Commercial Service" to ensure their continuing airworthiness process(es) incorporates risk management techniques help ensure the original design level of safety is not degraded.

Operators will institute continuing airworthiness processes that adequately monitor and assess fleet performance to verify 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.

Safety Enhancement: 28   Loss of Control

Title: Policies and Procedures-Process to Inform Personnel/Flight Crew   *Completed*

This SE ensures that 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.

☐ **Output 1**   Manufacturers should review their processes for distributing essential operating information and to identify its significance.

Operators should distribute essential operating information identified by the manufacturers to flight crews and maintenance staff in an appropriate and timely manner.

Directors of safety or their equivalent should ensure the establishment of a process to identify, review, analyze, and include essential operating information in training programs and in manuals used by flight crews and maintenance staff.

Safer Skies Safety Enhancements for Manufacturers

Safety Enhancement: 30   Loss of Control

Title: Human Factors and Automation   *Completed*

This SE is designed to reduce loss of control accidents by encouraging Title 14, Code of Federal Regulations part 121 air carriers to adopt consensus policies and procedures relating to mode awareness and energy-state management, as appropriate to their respective operations.

☐ **Output 1**   Air carrier trade associations will create a compilation of industry automation policies and procedures dealing with mode awareness and energy state management. The A4A will request that operators and manufacturers provide copies of their current policies and procedures pertaining to the use of automation for mode awareness and energy state management.

☐ **Output 4**   Airlines for America (A4A) will disseminate a consensus, data-based, improved automation policy/policies to operators and manufacturers. Air carrier trade associations and manufacturers will then encourage operators to review the generic automation policies and implement them as appropriate.

Safety Enhancement: 40   Loss of Control

Title: Flight Envelope Protection in New Airplane Designs   *Completed*

This SE reduces fatal accidents due to loss of control. New airplane designs should include angle of attack/low-speed protection, thrust-asymmetry compensation, and bank-angle protection using hard or soft limits. Fly-by-wire active flight-envelope protection technology does not exist for turboprop airplanes. Turboprop manufacturers should strive to provide the protection benefits of these systems in their new airplane designs.

☐ **Output 1**   CAST requests that the Aerospace Industries Association (AIA) communicate with manufacturers, encouraging them to incorporate angle-of-attack/low speed protection, thrust asymmetry compensation, and bank angle protection into all new airplane designs as defined by published guidance material.
Manufacturers should respond by indicating their intentions regarding incorporation of flight envelope protection into future airplane designs.

Safety Enhancement: 85   Loss of Control

Title: Vertical Situation Displays – All Airplane Designs   *Completed*

This SE reduces loss of control accidents by including vertical situation displays in all new airplane designs and determines the feasibility of installing vertical situation displays on existing airplanes.

☐ **Output 1**   CAST requests that the Aerospace Industries Association (AIA) communicate with manufacturers, encouraging them to incorporate vertical situation displays in their new airplane designs.
Manufacturers shall respond by indicating their intentions regarding incorporation vertical situation displays into new airplane designs.

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Safer Skies Safety Enhancements for Manufacturers

Safety Enhancement: 101   Maintenance

Title: Aircraft Design –Advanced Circuit Protection   *Completed*

This SE provides for the development and installation of advanced circuit protection/arc fault breaker technology in commercial airplanes—new type designs, current production and retrofit.

☐ **Output 1**   The regulator and airframe/circuit breaker manufacturers should continue to support the general development and qualification activities of advanced circuit protection technology for use on commercial airplanes. This support includes development of arc fault circuit breaker technology and technology to determine the location of the fault source on commercial airplanes for maintenance.

☐ **Output 2**   The regulator and airframe manufacturers are tasked to work with circuit breaker manufacturers to develop and certify the advanced circuit protection technology for installation into new type designs where appropriate and feasible.

☐ **Output 3**   Airframe/breaker manufacturers would complete the development process and certification of advanced circuit protection on current production airplanes.

☐ **Output 4**   Airframe/breaker manufacturers will complete the development process and certification of advanced circuit protection where appropriate and feasible on in-service airplanes.

Safer Skies Safety Enhancements for Manufacturers

Safety Enhancement: 120   CFIT

Title: TAWS Improved Functionality _Completed_

This SE increases the potential safety impact of SE–1, "Terrain Avoidance Warning System (TAWS)," by developing procedures to include GPS sensors for TAWS, and to ensure that updates to terrain databases, alerting algorithms, and new options to TAWS are incorporated as soon as possible.

☐ **Output 2**   Manufacturers will install, or provide options to install, GPS sensors in all current production model airplanes and new type designs.

☐ **Output 4**   Manufacturers of TAWS equipment will provide recommendations for the incorporation of TAWS terrain database updates to operators.
Operators will develop and implement procedures for updating TAWS terrain databases on all airplanes in accordance with the manufacturer's recommendations.

☐ **Output 5**   Air carrier trade associations and operators shall establish procedures to review and form a consensus on TAWS manufacturers' recommended updates associated with the underlying TAWS alerting algorithms. Manufacturers, operators, and regulators, shall work together to incorporate those updates considered beneficial to enhancing controlled flight into terrain (CFIT) protection.

☐ **Output 6**   Air carrier trade associations and operators shall establish procedures to review available optional/selectable TAWS features not currently used by the operator and form a consensus on those features that would enhance CFIT protection for their operation.   Manufacturers, operators, and regulators, shall work together to facilitate efficient incorporation of those desired optional/selectable TAWS features.

Safety Enhancement: 127   Cargo

Title: Fire Containment _Underway_

This SE reduces cargo fires through new or revised standards for the construction of standardized and improved cargo containers that include fire-suppression or fire-containment systems.

☐ **Output 3**   Manufacturers will develop standardized fire suppression and/or containment systems in accordance with the standards developed in a revised or new Technical Standard Order (TSO) for cargo containers/ULDs and/or fire containment bags/blankets (see SE 127.2 Output 2).

Safer Skies Safety Enhancements for Manufacturers

Safety Enhancement: 133   Icing

Title: Turboprop Aircraft Ice Detection Systems   *Underway*

This SE reduces accidents caused by in-flight icing encounters by adapting and implementing automatic ice detection and alerting systems on turboprop aircraft that have non-evaporative ice-protection systems and non-powered flight controls, and are operated in commercial passenger and cargo revenue service.

☐ **Output 1**   Manufacturers agree to adapt and implement automatic ice detection and alerting systems on new turboprop type designs.

☐ **Output 3**   Manufacturers will conduct a study to determine the feasibility of installing automatic ice detection and alerting systems on turboprop production aircraft and existing type designs.
JIMDAT will provide manufacturers with an estimation of fatality risk reduction benefits from the CAST fleet-wide assessment to ensure consistency across the processes.

☐ **Output 4**   Manufacturers of affected turboprop airplanes agree to implement ice detection and alerting systems on current existing type designs, as feasible and in accordance with the results of cost-benefit studies from SE 133.2 Output 3.

Safety Enhancement: 134   Icing

Title: Aircraft Design - Avionics   *Completed*

This SE reduces accidents caused by icing encounters by improving situational awareness during low-visibility operations and flight in icing conditions through the development and use of smart pitch guidance systems.

☐ **Output 1**   Manufacturers on new type designs, will develop and install smart pitch guidance systems.