AIR TRANSPORT ASSOCIATION

January 30, 2009

Selection Committee
National Aeronautic Association, Suite 2021
Reagan National Airport, Hangar 7
Washington, DC 20001-6015

Ladies and Gentlemen:

It is an honor and privilege for the Air Transport Association of America, Inc. to nominate the Commercial Aviation Safety Team ("CAST") to receive the prestigious Robert J. Collier Trophy – 2008 "for the greatest achievement in aeronautics…in America, with respect to improving the performance, efficiency, and safety of air…vehicles, the value of which has been thoroughly demonstrated by actual use during the preceding year." This special recognition is long overdue for the thousands of individuals who have worked diligently, since 1997, to produce the safest commercial aviation system in the world. At the same time, the capacity and complexity of the air transportation system have steadily increased. By 2016 as many as one billion air travelers are forecast every year.

CAST formed in the late 1990s in response to a government and industry challenge in the *1997 White House Commission on Aviation Safety and Security Report* to reduce the commercial aviation accident rate 80 percent over the next 10 years. The National Civil Aviation Review Commission also recognized the need for government/industry collaboration on a focused, consensus-based safety agenda.

Comprising industry and government safety experts, CAST quickly became a unique partnership, and adopted the Gore Commission's goal, originally deemed by many as virtually unattainable. Since then, the team has worked relentlessly to analyze data from approximately 500 accidents and thousands of safety incidents worldwide. From the distillation of lessons learned, the team devised critical safety enhancements that greatly reduce accident risk and ultimately save lives. As a result of this premiere program, admired and emulated around the world, ***2008 topped the previous year as the safest year in commercial aviation history and the CAST team proudly reports the risk in fatal commercial accidents has been reduced by 83 percent!***

One of the first enhancements adopted by CAST was voluntary implementation of Enhanced Ground Proximity Warning Systems (EGPWS) on commercial airliners. CAST's studies showed that Controlled Flight Into Terrain, or CFIT, accidents were the leading cause of death in airline accidents for decades. Following CAST Joint Safety Analysis Team and Joint Safety Implementation Team studies, a commitment by CAST members launched the incorporation of EGPWS technology on all aircraft well in advance of an FAA requirement to do so. Guided by GPS technology, EGPWS gives pilots a computerized map that shows oncoming obstacles in red. It prevents pilots from inadvertently flying into terrain or water such as mountains, hills, trees and the ocean by issuing an aural alert. Proactive safety enhancements like this allow pilots to detect and correct problems before an accident results. Good mitigations like EGPWS can fully eliminate major accident categories.

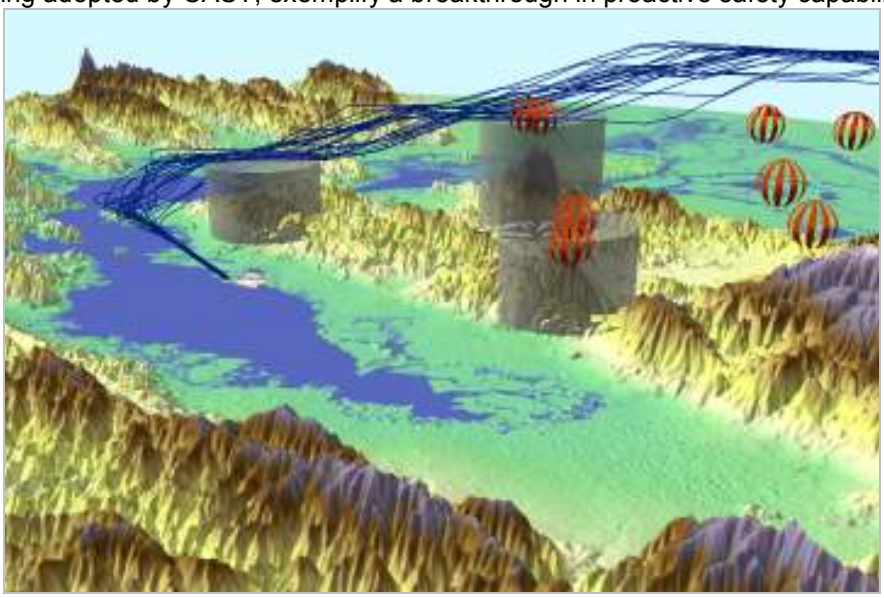
U.S. airlines voluntarily stepped up and committed to embracing the CAST safety agenda even while struggling with the greatest crisis in airline history following the terrorist attacks of September 11, 2001. Despite the significant cost of implementing the full slate of enhancements, airlines appreciated the $620 million per year return on investment that these proactive safety investments would deliver. CAST clearly demonstrated that appropriately constructed, risk-based safety management is good business, saving the industry money while it saves lives.

To date, CAST has completed 47 of the 70 most promising safety enhancements directed toward mitigating the leading causes of commercial aviation accidents in the United States. A summary of all safety enhancements that CAST members have voluntarily committed to implement is attached in Appendix 1. ***Adoption of these enhancements resulted in the 83 percent risk reduction cited above. Today, fatal accidents have been reduced to a probability of only one in 22.8 million flights, an absolutely remarkable achievement.***

CAST follows a disciplined, proactive, data-driven approach to develop safety enhancements. Initially it concentrated on the leading categories of accidents, identifying more than 800 accident precursors and addressing them with an optimal resource-effective package of actions. The sheer volume of flights expected in

the near future requires greater emphasis on acquiring, sharing and analyzing aviation safety data in a collaborative environment. This becomes especially important as historical accident causes are effectively eliminated. The evolving aviation environment will likely introduce new threats that must be identified and addressed before they lead to accidents. From 2006 to 2007 CAST chose not to rest on its remarkable achievements, but instead redirected its efforts to pursue ever-higher safety levels for commercial aviation. The charter was expanded to include a focus on identifying and prioritizing emerging aviation safety issues and threats, prioritizing them, and adopting mitigating actions to prevent accidents.

CAST is now transitioning to a fully incident-based risk methodology that uses *precursors* to focus on risk prediction by identifying "atypicalities" and trends. Unprecedented mitigation strategies will generate corrective actions before new types of accidents can emerge. Based on a decade of trust and confidence working together, industry and government CAST members now share sensitive safety information in a protected environment. Digital and text mining tools have been developed that enabled a first-ever fusion of flight crew safety reports, aircraft digital flight data recorder parameters, high-definition terrain databases, weather data and radar track data. The final product generated awareness and causal understanding of emerging safety threats that were never before possible. A recent Terrain Avoidance Warning System (TAWS) study, shown below, depicting undesired terrain alerts on arrival to Oakland airport's runway 11, and related safety solutions being adopted by CAST, exemplify a breakthrough in proactive safety capability.



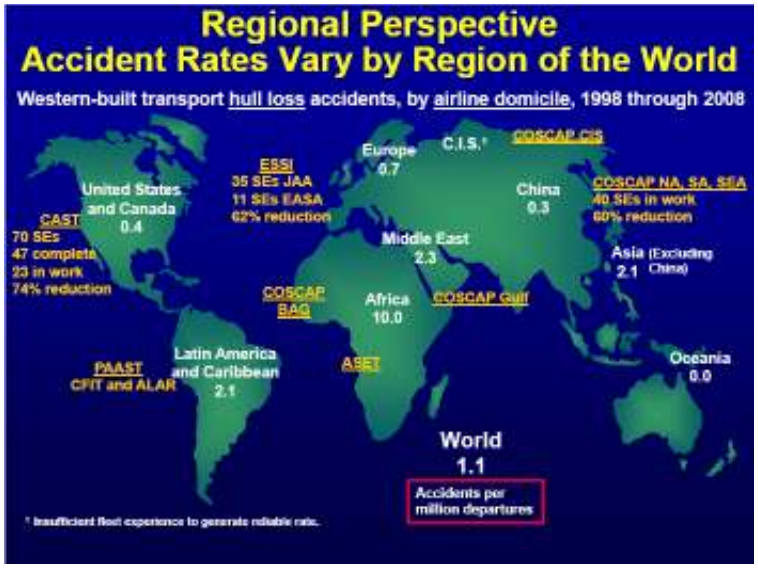
As CAST embarks on its second decade, the team is exploring bold new avenues of effectively sharing critical safety information to maintain the reduction in threats that often led to past fatal accidents. The Aviation Safety Information Analysis and Sharing program (ASIAS), launched in 2007, greatly expands the information-sharing partnership among manufacturers, operators and analysts. Meanwhile, CAST refocused its efforts to build on the success to date, continuing its proactive approach to safety by moving deeper into risk prediction and mitigation strategies. ***Using voluntarily provided aviation industry data, CAST is identifying emerging threats before they result in accidents.*** CAST continues to export its methodology to an eager international audience and is the model for establishing similar safety programs serving general aviation and rotorcraft.

CAST includes safety experts from the FAA, NASA and the Defense Department. Industry representatives include the Aerospace Industries Association (AIA), Air Line Pilots Association (ALPA), Allied Pilots Association (APA), Air Transport Association (ATA), Flight Safety Foundation (FSF), National Air Traffic Controllers Association (NATCA), National Air Carriers Association (NACA) and Regional Airline Association (RAA). Large aircraft manufacturers take part in CAST as well as engine manufacturers. A complete listing of the CAST member and observer organizations is contained in Appendix 2. All of these organizations share in CAST's success and deserve the recognition represented by the Collier Trophy.

Even though CAST has focused primarily on the U.S. aviation system, throughout its history CAST has reached out internationally to help improve aviation safety around the world. This is evidenced by the large number of international organizations who have been members and observers of CAST, including the European Aviation Safety Agency (EASA), Joint Aviation Authorities (JAA), International Civil Aviation Organization (ICAO), and Transport Canada Civil Aviation (TCCA). Other international participants include the International Federation of Air Line Pilots' Association (IFALPA), Air Transport Association of Canada (ATAC), Association of Asia Pacific Airlines (AAPA), and International Air Transport Association (IATA). CAST's impact and leadership

can be seen by the resulting formation and actions of many cooperative regional safety alliances, modeled after CAST and working to incorporate CAST results (see figure below), and by the international acceptance of its principles in the newly released ICAO global safety roadmap.

In addition to being a beacon for commercial aviation-related safety professionals throughout the world, CAST has served as a model for the helicopter community as well. Using CAST and the CAST process as a model of success, government and industry leaders chartered the International Helicopter Safety Team (IHST) in January 2006 to reduce the worldwide military and civil helicopter accident rate by 80 percent by 2016. Members include helicopter operators, airframe manufacturers, and regulators such as the FAA, Transport Canada, ICAO, and EASA.



In conclusion, the year 2008 marked the 11th anniversary of CAST, and signified an historic achievement in aviation richly deserving of the Collier Trophy. Undaunted by skeptics, CAST's member organizations boldly stepped forward more than 10 years ago and launched an effort that has left its mark forever on the national aviation system. CAST has changed the world view of aviation safety and heralded a new era of proactive safety management. Throughout a period that witnessed the toughest challenges ever to face the aviation community, this government/industry team has maintained a steadfast commitment to envisioning the most effective improvements that can be made to the aviation system, and voluntarily deploying them. Without a doubt, hundreds, if not thousands, of lives have been saved over the past decade, and *will* be…far into the future.

CAST is clearly the preeminent aviation safety organization in the United States. The international outreach activities of CAST will continue the compelling task of improving global aviation safety over the next decade. CAST clearly demonstrates how dedicated safety practitioners transcend organizational boundaries to improve the treasured national asset of commercial aviation and save lives. For this sustained superior achievement, CAST should receive the 2008 Collier Trophy.

On behalf of the CAST Executive Committee, whose organizations are depicted below,

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AIR TRANSPORT ASSOCIATION BOEING alpa NASA FEDERAL AVIATION ADMINISTRATION AIA

Nomination for Robert J. Collier Trophy

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Air Transport Association
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National Air Carrier Association
Boeing Commercial Aircraft
General Electric Corporation
Pratt & Whitney
Rolls Royce
Regional Airline Association
Flight Safety Foundation
Department of Defense
Federal Aviation Administration (Aircraft Certification, Flight Standards, System Safety, Air Traffic Operations, and Research)
National Air and Space Administration
European Aviation Safety Administration
European Commercial Aviation Safety Team
Transport Canada.

Observers
International Air Transport Association,
Association of Asia Pacific Airlines
Air Transport Association of Canada
Association of Professional Flight Attendants
National Transportation Safety Board
International Civil Aviation Organization
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Proposed Citation

2009
THE COMMERCIAL AVIATION SAFETY TEAM
"For achieving an unprecedented safety level in U.S. commercial airline operations by reducing risk of a fatal accident by 83 percent, a probability of one in approximately 23 million flights."

Safer Skies/CAST

70 Selected Safety Enhancements
48 completed / 22 underway
Updated January 26, 2009

* ***Completed = All CAST actions have been completed***
* ***Ongoing = All CAST actions have not been completed***

Safety Enhancement 1: Controlled Flight Into Terrain
Terrain Avoidance Warning System (TAWS) ***(completed)***

This safety enhancement substantially reduces or eliminates CFIT accidents by improving pilot situational awareness by establishing appropriate procedures for the installation and use of Terrain Awareness and Warning System (TAWS) equipment. Procedures include proper flight crew reaction in regard to TAWS aural and visual warnings.

Action: The FAA issued a final rule in March 2000 that requires all new commercial aircraft to be equipped with TAWS equipment by March 2003 and the entire commercial fleet equipped by March 2005.

Safety Enhancement 2: Controlled Flight Into Terrain
Standard Operating Procedures (SOP's) ***(completed)***

This safety enhancement ensures that all operators establish flight crew Standard Operating Procedures (SOP's) that fit that operator's particular operation, institute SOP training, and encourage operators to use SOP's in all normal operations.

Action: Industry and the FAA worked together to develop an SOP template that was published in new guidance, *Standard Operating Procedures for Flight Deck Crew Members* (AC 120-71).

Safety Enhancement 3: Controlled Flight Into Terrain
Precision Approach Implementation: Vertical Angles ***(completed)***

This safety enhancement develops criteria to support the inclusion of vertical angles on all existing instrument approach procedures allowing for a stabilized vertical descent to the runway end at all certificated airports within the United States.

Action: FAA's Aviation Systems Standards (AVN) developed a plan to include vertical angles on instrument approach procedures. Certificated airports (Part 139) were prioritized into high-, medium-, and low-risk categories and were completed first. Eighty four percent of certificated airports currently have vertical angles included in their published instrument approach procedures.

Safety Enhancement 4: Controlled Flight Into Terrain
Precision Approach Implementation: VGSI at runway ends used by air carriers ***(completed)***

This safety enhancement develops and implements a plan to install Visual Glide Slope Indicators (VGSI) at each runway end of runways used by air carriers.

Action: New precision-like instrument approach procedures to all runway ends required VGSI lighting at all runway ends used by air carriers. FAA's Air Traffic System Requirements (ARS) developed a plan and installation has begun.

Safety Enhancement 5: Controlled Flight Into Terrain
Precision Approach Implementation: Distant Measuring Equipment (DME) *(completed)*

This safety enhancement establishes a plan to ensure installation of DME at airports where significant numbers of older air carrier aircraft are expected to operate or where particularly vulnerable instrument approach procedures are located, allowing for a stabilized vertical descent to the runway end.

Action: Additional DME installation is required in order for older generation commercial aircraft to use the new precision-like instrument approach procedures. FAA's ARS developed a plan to install DME's at locations where older generation commercial aircraft operate.

Safety Enhancement 6: Controlled Flight Into Terrain
Precision Approach Implementation: (RNAV) 3D Instrument Approach Procedures *(completed)*

This safety enhancement develops criteria in FAA Order 8260.48 for approach charts that include 3D RNAV minima and charting specifications for publication of approach charts, which include 3D RNAV minima. This will allow for a stabilized vertical descent to the runway end.

Action: AVN has developed a plan that will rename GPS procedures at Part 139 airports as RNAV procedures and include vertical guidance. The plan is available at http://avn.faa.gov/content/ifp/cast.pdf and has been implemented at all NTSB risk airports and about 80% of all Part 139 airports. Estimated date for all Part 139 airports is September 2009.

Safety Enhancement 7: Controlled Flight Into Terrain
Precision Approach Implementation: RNAV Required Navigation Performance (RNP) instrument approach procedures *(completed)*

This safety enhancement adds Required Navigational Performance (RNP) criteria and guidance to FAA Order 8260.48, allowing for reduced landing minima. There are only a few air carriers that currently use RNP, and only on their newest airplanes. Authorization is granted by special operation specifications. This enhancement would allow all air carriers to use RNP for equipped aircraft.

Action: FAA AVN implemented a comprehensive instrument approach procedure production plan that enables industry to take advantage of new aircraft and space based navigation technology, especially as it relates to RNAV/RNP procedures.

Safety Enhancement 8: Controlled Flight Into Terrain

Precision Approach Implementation: x-LS (ILS, MLS, GLS) ***(completed)***

This safety enhancement defines the parameters for future installation of the xLS (laterally and vertically guided approach path) to runway ends not served by Instrument Landing System (ILS).

Action**:** Advanced precision approach procedures have been incorporated into the ICAO Road Map and into the Joint Planning Office (JPDO) Next Generation Agile Air Traffic System design.

Safety Enhancement 9: Controlled Flight Into Terrain

Minimum Safe Altitude Warning (MSAW) ***(completed)***

This safety enhancement ensures that ground-based radars and their associated by-products provide the necessary levels of terrain avoidance protection to aircraft operating domestically within the United States and that air traffic controller MSAW training is adequate and appropriate to operate.

Action: All current MSAW data was verified for accuracy. All MSAW systems were checked and a plan for re-check every 540 days was developed. ATC controllers were provided with initial and recurrent training on the use of MSAW.

Safety Enhancement 10: Controlled Flight Into Terrain

Institute proactive safety plans: Flight Operations Quality Assurance (FOQA) and Aviation Safety Action Programs (ASAP) ***(completed)***

This safety enhancement develops and implements a mutually agreed upon methodology to use de-identified Flight Operations and Quality Assurance (FOQA), and Aviation Safety Action Partnership (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.

Action: These are voluntary programs. FAA ASAP guidance was issued in January 2000 and revised in November 2002. There are currently 51 carriers participating in ASAP programs. The FOQA rule was issued in October 2001. There are currently 15 carriers participating in the FOQA programs.

Safety Enhancement 11: Controlled Flight Into Terrain

Training - CFIT prevention in Crew Resource Management (CRM) Training ***(completed)***

This safety enhancement reduces CFIT accidents by promoting comprehensive SOPs as a key element of every Part 121 air carrier's CRM training program. Under a related project, a template for comprehensive SOPs is being developed, including SOPs that specifically address CFIT accident prevention.

Action: *Crew Resource Management Training* (AC 120-51) was revised to stress the use of CFIT prevention using SOP's in CRM training. The new AC *Standard Operating Procedures for Flight Deck Crew Members* (AC 120-71) was also referenced.

Safety Enhancement 12: Controlled Flight Into Terrain Training – CFIT Prevention Training *(completed)*

This safety enhancement substantially reduces or eliminates the CFIT accident rate by adding CFIT prevention training and procedures to all Part 121 air carrier training curriculums that emphasize pilot situational awareness and escape procedures for flight crews to use in the event of a terrain warning indication.

Action: The CFIT Education and Training Aid was posted on the FAA's website and distributed to every FAA's principal inspector for U.S. Part 121 air carriers. It was also sent to every Regional Technical Branch requesting a review to determine if their carriers were conducting CFIT training and, if they were not requesting them, to voluntarily initiate a CFIT training program. It was determined that all U.S. air carriers were conducting CFIT Training

Safety Enhancement 13: Controlled Flight Into Terrain Training – ATC CFIT Training *(completed)*

This safety enhancement reinforces current safety alert procedures and good air traffic operating practices by providing initial and recurrent ATC CFIT training for all controllers.

Action: Through the use of Air Traffic Bulletins (ATBs), Air Traffic Controllers now receive required initial and annual recurrent ATC CFIT training.

Safety Enhancement 14: Approach and Landing Policies for Approach and Landing Reduction (ALAR) – Safety Culture *(completed)*

This safety enhancement develops a strategy to that makes CEOs and other key officers of Part 121 air carriers more visible and more effective in promoting a safety culture targeted to preventing approach and landing accidents.

Action: The following safety culture guidance materials are endorsed by CAST: Operator's *Aviation Safety Handbook*, SAE-G18 committee document, and the FAA Audit Tool. *Handbook Bulletin Air Transportation – 14 CFR Part 121 and 135 air carrier safety departments, programs, and safety directors* (HBAT 99-19) was also endorsed by CAST and distributed to all certificate holders. CAST member organizations requested and received a safety commitment statement from air carrier CEO's. Directors of safety (DOS's), working through senior management, were requested to implement the guidance contained in HBAT 99-19. Results were reported to CAST member organizations.

Safety Enhancement 15: Approach and Landing Policies for ALAR – Safety Culture *(completed)*

This safety enhancement tasks the Director of Safety to ensure the establishment of a process to identify, review, analyze and include appropriate safety information in training programs and in manuals used by flight crews and maintenance staff.

Action: *Handbook Bulletin Air Transportation – Policy Company Operating Manuals and Company Training Program Revisions for Compliance with Current Airplane or Rotorcraft Flight Manual Revisions* (HBAT 99-07) was endorsed by CAST. The DOS, through senior management, were asked to apply the principals of HBAT 99-07 to training programs and manuals used by flight crews and maintenance staff.

Safety Enhancement 16: Approach and Landing
Policies for ALAR – Safety Culture ***(completed)***

This safety enhancement tasks the FAA to fully implement the AFM database for inspectors' use in surveillance by populating the database with records pertaining to all aircraft used in all operating Parts of the CFR, and to support daily changes in records contained in the database.

Action: *Handbook Bulletin for Air Transportation – Airplane Flight Manual Revisions and Aircraft Manufactures Operations Bulletins* (HBAT 99-16) was issued as guidance for aircraft manufactures. Flight manual and operations bulletin revisions are forwarded to a centralized location to populate a database for use by FAA field inspectors conducting surveillance of their assigned air carriers.

Safety Enhancement 17: Approach and Landing
Maintenance Procedures ***(completed)***

This safety enhancement reduces approach and landing accidents by re-emphasizing current maintenance rules, policies, and procedures developed by the commercial airline operators and the FAA. This re-emphasis specifically directs that approved maintenance programs related to the servicing of components incorporate all of the Original Equipment Manufacture (OEM) safety related components and procedures.

Action: *Flight Standards Information Bulletin for Airworthiness – Cold Weather Servicing of Aircraft Nose Landing Gear Struts* (FSAW 97-10) was issued as guidance for FAA field inspectors regarding adequate procedures to ensure aircraft nose landing gear struts are serviced in accordance with the manufacturers recommended methods for cold weather operations.

Safety Enhancement 18: Approach and Landing
Maintenance Procedures ***(completed)***

This safety enhancement reduced approach and landing accidents by re-emphasizing current maintenance rules, policies, and procedures developed by the commercial airline operators and the FAA. This re-emphasis specifically directs that both the operators and regulators increase oversight of sub-contract activity.

Action: *Handbook Bulletin for Airworthiness – Air Carrier Operations Specifications to Make Arrangements with Other Organizations to Perform Substantial Maintenance and Aircraft and*

Maintenance Provider Contracts (HBAW 96-05C and 98-01) were issued to FAA field inspectors to specifically address FAA surveillance oversight activity of air carriers sub-contractor activities and evaluation of contractual relationships between air carriers and maintenance providers

Safety Enhancement 19: Approach and Landing
Maintenance Procedures ***(completed)***

This safety enhancement reduces approach and landing accidents by re-emphasizing current maintenance rules, policies, and procedures developed by the commercial airline operators and the FAA. This re-emphasis directs operators to strictly adhere to MEL policy and procedures.

Action: *Joint Handbook Bulletins for Air Transportation and Airworthiness* (HBAT 98-18 and HBAW 98-09) were issued to provide guidance to FAA aviation safety inspectors regarding the requirement for air carriers to include instructions concerning the
MEL conditions and limitations.

Safety Enhancement 20: Approach and Landing
Maintenance Procedures ***(completed)***

This safety enhancement tasks the Directors of Safety to determine 1) that the maintenance deficiencies described in safety enhancements 17-19 have been remedied and 2) that quality control procedures have been implemented to ensure that those deficiencies are continually addressed.

Action: The Director's of Safety were asked to conduct an internal audit of their carrier to ensure that maintenance procedures adequately address the specified bulletins in SE 17, 18, and 19. Audit outcomes are to be reported to his/her respective CAST member.

Safety Enhancement 21: Approach and Landing
Flight Deck Equipment Upgrade/Installation to Improve Altitude Awareness and Checklist Completion for New Type Design Aircraft ***(completed)***

This safety enhancement ensures altitude awareness and accomplishment of checklist items. This will be accomplished through the development of guidelines and procedures for flight deck smart alerting system design and supporting operational procedures and training based upon:

- 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.
- The installation of equipment to provide automatic aural altitude alert call-outs on final approach or other such altitude alerting systems.

Action: Aircraft Manufactures, Airlines, and Operators, in collaboration with the FAA's Aircraft Certification Service (AIR), have agreed to: (1) the implementation of interactive electronic checklist and smart alerting systems for New Type Design Aircraft, and (2) evaluate/consider, during checklist design, the principles contained in FAA Report "*Human Performance Considerations in the Use and Design of Aircraft Checklist"*, the NASA Contract Report *"On the Design of Flight-Deck*

Procedures", and the NASA Contract Report *"Human Factors of Flight-Deck Checklist: The Normal Checklist"* for New Type Design Aircraft. Additionally, a Notice of Availability was issued by AIR defining the standards for manufactures to use in designing Automatic Aural Altitude call-outs on final approach, including arrival at Minimum Decent Altitude (MDA) and Decision Height (DH), for all New Type Designs.

Safety Enhancement 23: Approach and Landing
Flight Crew Training (ALAR) ***(completed)***

This safety enhancement ensures that Part 121 air carriers implement syllabi that train and evaluate aircrews on stabilized approaches, unusual attitudes, and upset recoveries. Specific topics related to stabilized approaches should include: crew resource management, go around criteria, approaches with system malfunctions, non-normal conditions, emphasis on basic airmanship, approach briefings, approach and missed approach procedures.

Action: AFS-200 issued FSAT 01-12 stating the importance of ALAR type flight crew training and introduced a training guide developed by ATA and the ALAR JSIT (Joint Safety Implementation Team) with instructions to all Part 121 POI's to convey the contents of FSAT 01-12 to their assigned Air Carrier. AFS-1 then directed a review to ascertain the number of Air Carriers that implemented the recommended ALAR training. The review revealed that all Air Carriers were in fact training in the 8 topic areas described in FSAT 01-12 with the exception of 8 Carriers who were training in 7 of the ALAR topics and one Carrier was training in 6 of the topic areas. ATA, RAA, and NACA, contacted their members of the 8 Air Carriers and requested they voluntarily implement ALAR training in all of the ALAR topics recommended in FSAT 01-12.

Safety Enhancement 24R2: Approach and Landing
Aircraft Design – Continuing Airworthiness ***(completed)***

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

Action: The information developed by the KSI team was produced as a "White Paper" and will be considered as part of SE-172. Additionally, manufactures and operators reviewed their processes to ensure they are consistent with SAE ARP 5150.

Safety Enhancement 25: Approach and Landing
Aircraft Design – Critical System Maintenance ***(Deleted) Incorporated into RR SE172)***

This safety enhancement is for the FAA to issue guidance on acceptable procedures to ensure that maintenance activities involving flight critical system components do not reduce or compromise the designed level of safety and is in accordance with FAA approved data.

Safety Enhancement 26: Loss of Control

Policies and Procedures – Standard Operating Procedures (SOP's) ***(completed)***

This safety enhancement ensures that all airline operators publish and enforce clear, concise, and accurate flight crew SOPs. These SOPs should include expected procedures during pre/post flight and all phases of flight i.e., checklists, simulator training, PF/PNF duties, transfer of control, automation operation, rushed and/or unstabilized approaches, rejected landings and missed approaches, in-flight pilot icing reporting, and flight crew coordination. Operator instructors and check airman should ensure these SOPs are trained and enforced in their aircrew proficiency and standardization programs.

Action: The Federal Aviation Administration published AC 120-71A "***Standard Operating Procedures for Flight Deck Crewmembers***" on 02/27/03. This AC is available at http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf .

Safety Enhancement 27: Loss of Control

Policies and Procedures – Risk Assessment and Management ***(completed)***

This safety enhancement identifies or develops and implements methods for operators, regulators, and manufacturers to prioritize safety related decisions. The project 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.

Action: The Airline Transport Association (ATA) Human Factors Committee published guidance material. Also, in 2003 the Global Aviation Information Network (GAIN) Working Group B (Analytical Methods and Tools) published a guide to existing analytical methods and tools that can help the airline community turn data into safety information. "Guide To Methods & Tools For Airline Flight Safety Analysis" is available at http://204.108.6.79/products/guide_analytical.cfm .

Safety Enhancement 28: Loss of Control

Policies and Procedures – Policies ***(completed)***

This safety enhancement 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.

Action: Aerospace Industries Association (AIA) communicated with aircraft manufactures the importance of timely discrimination of essential safety information and procedures to aircraft operators. As guidance, AIA also distributed *Handbook Bulletin Air Transportation, Flight Standards Policy company operating Manuals and Company training Programs for Compliance with Current Airplane or Rotorcraft Revisions* (HBAT 99-07)

Safety Enhancement 29: Loss of Control

Policies and Procedures – Policies ***(completed)***

This safety enhancement is to ensure that air carriers have a process to enhance pilot proficiency.

Action: ALPA (Air Line Pilots Association), in collaboration with other Pilot Associations, developed a program to continuously improve Pilot performance and proficiency utilizing information from other

programs such as FOQA (Flight Operation Quality Assurance), AQP (Advanced Qualification Program) and ASAP (Aviation Safety Action Program). The program is non-punitive, voluntary, and managed by the individual airlines. ATA (Air Transport Association), in collaboration with other Airline Groups (Aligned Carriers) voluntarily implemented the program.

Safety Enhancement 30: Loss of Control
Training – Human Factors and Automation ***(completed))***

This safety enhancement is to reduce loss of control accidents by encouraging Part 121 air carriers to adopt consensus policies and procedures relating to mode awareness and energy state management, as appropriate to their respective operations.

Action: Recommendations were developed emphasizing seven broad topics that air carriers should consider incorporating into their automation policies. The seven topics provide a basic exemplar, based on current practices that are known to be effective and incident analysis by an expert panel. Copies of the report, Safety Enhancement 30, Revision 5, August, 2008, ***"Mode Awareness and Energy State Management Aspects of Flight Deck Automation"***, may be obtained from the CAST web site at www.CAST-Safety.org .

Safety Enhancement 31: Loss of Control
Training – Advanced Maneuvers ***(completed)***

Advanced Maneuvers Training (AMT) refers to training to prevent and recover from hazardous flight conditions outside of the normal flight envelope. Examples include in-flight upsets, stalls, ground proximity and wind shear escape maneuvers, and inappropriate energy state management conditions.

This safety enhancement collects and provides advanced maneuver training material and to encourage Part 121 operators to use these materials to implement advanced maneuver ground and flight training using appropriate flight training equipment. Emphasis should be given to stall onset recognition and recovery, unusual attitudes, upset recoveries, effects of icing, energy awareness and management, and causal factors that can lead to loss of control.

Additionally, research should be conducted to determine how existing flight simulation devices may be used effectively in AMT.

Action: Airplane manufacturers, airlines, pilot associations, flight training organizations, and government and regulatory agencies have developed a training resource called, "Airplane Upset Recovery Training Aid." The training package also includes a supporting video. This information is available at http://www.faa.gov/other_visit/aviation_industry/airline_operators/training/ .

Safety Enhancement 32: Loss of Control
Autoflight Features in New Airplane Designs ***(completed)***

This safety enhancement reduces fatal accidents due to loss of control by recommending and supporting the development of regulations and guidance material that ensure or encourage autoflight (autopilot and autothrust) systems in new airplane designs to accomplish the following:

- Minimize the probability of creating a thrust asymmetry that could lead to loss of control;
- Yield control to significant manual flight control forces (e.g., force disconnects);
- Annunciate to the flight crew if aircraft response differs significantly from what the autopilot has been commanded to do;
- Ensure autopilot internal monitor logic does not inappropriately disconnect the autopilot when it is properly attempting to correct for deviations from the commands it receives; and
- Include low speed protection.

Action: Based upon the recommendations of the Flight Guidance Harmonization Working Group (FGSHWG) ARAC Report, CFR 25.1329 was revised and Advisory Circular AC 25.1329-1B, "*APPROVAL OF FLIGHT GUIDANCE SYSTEMS*", was published to incorporate the requirements of this safety enhancement.

Safety Enhancement 34: Loss of Control

Display and Alerting Features in New Airplane Designs ***(completed)***

This safety enhancement reduces fatal accidents due to loss of control, display and alerting systems in new airplane designs should include:

- Graphic speed trend information;
- A pitch limit indication;
- Bank angle limits to buffet;
- Barber poles and amber bands on primary airspeed indications;
- Detection and annunciation of conflicting attitude, airspeed and altitude data information;
- Detection and removal of invalid attitude, airspeed and altitude data information (i.e. from an internal fault);
- Detection and removal of misleading attitude, airspeed and altitude data information (i.e. from an external sensor fault) to the extent feasible;
- Information to perform effective manual recovery from unusual attitudes using chevrons, sky pointers, and/or permanent ground-sky horizon on all attitude indications;
- Salient annunciation of autoflight mode changes and engagement status changes (e.g., blinking/colored/boxed mode information);
- Effective sideslip information and alerting of excessive sideslip (e.g., split trapezoid on attitude indicator);
- Clear annunciation of engine limit exceedances and significant thrust loss.

Action: AC 25-11A, *Electronic Flight Deck Displays* was revised to include recommendations developed by the Task Avionics Working Group (ASHWG) ARAC. This AC provides guidance for showing compliance with certain requirements of Title 14, Code of Federal Regulations (CFR), part 25, as well as general guidance for the design, installation, integration, and approval of electronic flight deck displays, components, and systems installed in transport category airplanes. AC 25-11A is available at www.faa.gov under Regulations & Policies, Advisory Circulars (AC).

Safety Enhancement 39: Loss of Control

Criteria for Flight in Icing Conditions for New Airplane Designs ***(ongoing)***

This safety enhancement reduces loss of control fatal accidents by recommending amended icing certification criteria for new airplane designs not equipped with evaporative (i.e. hot wing) systems. The criteria would include performance and handling quality requirements for:

- Residual ice;
- Intercycle ice;
- Delayed anti-icing/de-icing system activation; and
- De-icing/anti-icing system malfunction.

Safety Enhancement 40: Loss of Control

Flight Envelope Protection in New Airplane Designs ***(completed)***

This safety enhancement 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. Turbo-prop manufacturers should strive, to the fullest extent, to provide the protection benefits of these systems in their new airplane designs.

Action: Aerospace Industries Association communicated with Airbus Industries, Boeing, Embraer, and Bombardier Aerospace encouraging them to incorporate angle-of attack/low speed protection, thrust asymmetry compensation, and bank angle protection into all new fly-by-wire aircraft designs. All four manufactures have agreed to incorporate flight envelope protection into future airplane designs.

Safety Enhancement 46: Runway Incursions

Air Traffic Control Training ***(completed)***

This safety enhancement updates controller training programs and course curriculums designed to improve the level of knowledge, skill and proficiency that supports and enhances system efficiency, thereby increasing safety by fostering a higher level of situational awareness.

Action: The FAA Air Traffic Organization (ATO) developed a computer based course, "***ATC Memory Guide***" that is mandatory for all ATCT controllers. Additionally, the ATO reviewed course requirements for tower controllers, revised the material and made mandatory the following training, Wake Turbulence, Course Number 57030, Rev. 10/2003, Preventing Runway Incursions, Course Number 57061, Rev. 10/2003, Situational Awareness (Tower), Course Number 57062, Rev. 10/2003, Reducing Runway Incursions Tower Communications, Course Number 57063, Rev. 10/2003, Runway Separation Minima, Course Number 57093, Rev. 10/2003.

Safety Enhancement 47: Runway Incursions

Air Traffic Control Training ***(completed)***

This safety enhancement increases teamwork in the tower cab environment. All tower controllers should receive a course similar to CRM for pilots.

Action: The FAA Air Traffic Organization (ATO) developed a new CRM Training program for controllers that includes CRM Workshop training to be completed first at 35 OEP airports and then to all Tower Controllers. Additionally, ATO has begun CRM training for all new controllers, has distributed a CRM DVD to all controllers, has established refresher training in CRM and begun distribution of CRM newsletters.

Safety Enhancement 49: Runway Incursions

Standard Operating Procedures – Runway Incursion Prevention ***(completed)***

This safety enhancement reduces the risk of runway incursions and surface incidents by recommending that all FAR Part 121 operators and Part 135 operators establish, document, train and follow SOPs for ground operations.

Action: In coordination with industry, the FAA developed and published Advisory Circular 120-74A, "***Flight Crew Procedures During Taxi Operations***", to provide Standard Operating Procedures for ground operations by air carriers. The FAA also issued Flight Standards Handbook Bulletin for Air Transportation (HBAT) 04-04, "***Incorporating Standard Operating Procedures During Taxi Operations in Training Programs, the Use of SOPs During Taxi Operations, and Special Emphasis Inspection Items for Runway Incursion Surveillance***"

Safety Enhancement 50: Runway Incursions

Standard Operating Procedures – Runway Incursion Prevention ***(completed)***

This safety enhancement reduces the risk of runway incursions by
establishing and disseminating recommended practices for general aviation (GA) ground operations.

Action: *Part 91 Pilot and Flight Crew Procedures during Taxi Operations and Part 135 Single-Pilot Operations* (AC 91-73) was drafted and published as guidance for general aviation ground operations.

Safety Enhancement 51: Runway Incursions

Standard Operating Procedures – Runway Incursion Prevention ***(completed)***

This safety enhancement reduces the frequency and severity of runway incursions by the developing and implementing recommended best practices for mechanics and others who tow or otherwise move aircraft within the airport movement area.

Action: FAA prepared and distributed a CD (FAA Taxi 101) as guidance for mechanics and others who tow or move aircraft within airport movement areas.

Safety Enhancement 52: Runway Incursions

Standard Operating Procedures – Runway Incursion Prevention ***(completed)***

This safety enhancement helps prevent runway incursions/surface incidents by developing and implementing recommended best practices for vehicle operations in the aircraft movement area and driver training.

Action: On February 10, 2004, 14 CFR 139, "Certification of Airports", was adopted and Section 139.303 now requires specific training for vehicle operators.

Safety Enhancement 53: Runway Incursions

Situational Awareness Technologies for Air Traffic Control ***(ongoing)***

This safety enhancement develops and implements technology tools including data link that will provide and/or enhance airport surface situational awareness to air traffic controllers. Examples of these technology tools include, but are not limited to, Airport Movement Area Safety System (AMASS), Airport Surface Detection Equipment (ASDE-X), Automated Dependent Surveillance – Broadcast (ADS-B), Next Generation Air-Ground Communications System (NEXCOM), Surface Movement Advisor (SMA), and Airport Target Identification System (ATIDS). The strategies for accomplishing this project include:

- New technology tools will be developed by the FAA to enable enhanced surveillance, information, communication and conflict detection for ATC operations.
- FAA and airport operators will provide airport surface surveillance equipment with conflict alerting capability at air traffic control towers.
- Digital data link capability will be developed and implemented to enable automatic transmission of ATC instructions/information (between the ground & aircraft).
- Situational Awareness Displays developed in support of the above listed strategies will incorporate industry best practices for computer-human interface (CHI) design to enhance and support ATC decision-making.

Safety Enhancement 55: Runway Incursions

Air Traffic Control Procedures ***(completed)***

This safety enhancement substantially reduces runway incursions and improves aviation safety through the use of nationally standardized procedures that focus on situational awareness in the control tower.

Action: The Office of Runway Safety incorporated this Safety Enhancement into their 2002 – 2003 Runway Safety Blueprint (Objective 3.2). Objective 3.2 of the Runway Safety Blueprint was closed in December of 2002, thus, closing Safety Enhancement 55 as well. The national situational awareness requirements are outlines in FAA Order 7210.3S (Facility Operation and Administration).

Safety Enhancement 59: Runway Incursions

Air Traffic Control Procedures ***(completed)***

This safety enhancement creates a shared responsibility to ensure clear understanding of specific control instructions through the use of mandatory readbacks of any instructions or clearances to enter a specific runway, hold short of a specific runway, or "taxi into position and hold" instructions. It is

currently the sole responsibility of the controller to seek and receive acknowledgement for these instructions.

Action: *Advisory Circulars (AC's) 120-74A and 91-73A* were published ensuring readback of all ATC instructions or clearances in the three specific areas. Further, the Runway Safety Program Office issued related material recommending the readback of all ATC instructions or clearances. Finally, the readback requirements will be published in the February 2005 issue of the AIM (Airman's Information Manual)

Safety Enhancement 60: Runway Incursions
Pilot Training ***(completed)***

This safety enhancement substantially reduces or eliminates the risk of Runway Incursions (RI) by the incorporation of RI training into flight crew qualification, approved training, and other pilot training programs. This training will increase the pilot's ability to recognize and avoid situations leading to runway incursions.

Action: The Runway Safety Program Office established and published a reference library of runway safety materials to be shared with industry. The number of runway surface movement tasks was increased on all required Pilot Certification Practical Test, first by Policy Memo and Flight Standards Information Bulletin (FSIB) and then by revision to all required Written Test and the Practical Test Standards. Advisory Circulars (AC's) AC 91-73: Part 91, Pilot Procedures During Taxi Operations and Part 135 Single Pilot Operations and AC 120-74: Part 121, 125, and 135 Flight Crew Procedures During Taxi Operations were published issuing guidance for airport surface operations and use of Standard Operations Procedures (SOP's). AC 120-35: Line Operational Situations: Line Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation was revised to include taxi operations in air carrier LOFT training scenarios. AC 120 51: Crew Resource Management Training was revised providing guidance for clear delineation of captain command oversight training and first officer monitoring responsibilities during airport surface movements.

Safety Enhancement 78: Turbulence
Cabin Injury Reduction During Turbulence ***(completed)***

This safety enhancement reduces turbulence injuries to flight attendants (FA's) and passengers through improved situational awareness, turbulence encounter management procedures (before, during and after encounter), and enhanced communication methodologies standardized across all Part 121 air carriers.

Action: FAA published Advisory Circular AC120-88A, "*PREVENTING INJURIES CAUSED BY TURBULENCE."*

Safety Enhancement 84: Uncontained Engine Failures
Uncontained Engine Failures (UEF) ***(completed)***

This safety enhancement eliminates UEF by mandatory inspections of the disks of turbine engines during shop visits.

Action: The aviation industry is using improved methods and technology to detect potential defects in aircraft engines. Working in partnership, government and industry are using enhanced inspections for certain high-energy rotating engine components. The initiative is based on an extensive analysis conducted by the FAA and industry on the historical causes of engine-related accidents. The FAA issued 23 Airworthiness Directives (ADs) requiring that operators inspect fan, high-pressure turbine and priority low-pressure turbine engine components.

Safety Enhancement 85: Loss of Control

Vertical Situation Displays (VSD) – New Airplane Designs ***(completed)***

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

Action: Aerospace Industries Association communicated with Airbus Industries, Boeing, Embraer, and Bombardier Aerospace encouraging them to incorporate vertical situation displays into all new aircraft designs. All four manufactures have agreed to incorporate vertical situation displays into future airplane designs.

Safety enhancement 101:…Remaining Risk
Aircraft Design –Advanced Circuit Protection *(ongoing)*

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

Safety Enhancement 120: Controlled Flight Into Terrain

TWAS Improvement Functionality ***(ongoing)***

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

Safety Enhancement 121:…Remaining Risk

Cargo – Cargo Loading Training and SOPs ***(ongoing)***

This safety enhancement reduces cargo-related accidents and incidents by publishing and enforcing clear, concise and accurate standard operating procedures, and training the rationale behind those procedures; ensuring company training programs are approved and monitored; and ensuring adequacy of contractor training.

Safety Enhancement 125:…Remaining Risk

Cargo – Hazardous Materials – Hazmat Processing ***(ongoing)***

This safety enhancement reduces cargo-related accidents and incidents by preventing undeclared hazardous materials from entering the shipping system by developing and implementing a system to identify and process undeclared hazardous material..

Safety Enhancement 127:…Remaining Risk

Cargo – Fire Containment *(ongoing)*

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

Safety Enhancement 129:…Remaining Risk

Cargo – Regulation and Policy – Compliance, Enforcement and Restricted Operations *(Completed)*

This safety enhancement reduces the risk of cargo fires by enhancing the regulatory legal processes for compliance and enforcement to allow for more timely imposition of restrictions on operations when necessary to ensure continued operational safety and that also promotes disclosure of safety concerns by enhancing legal protections for airline/operator employees, contractors, and their employees.

Action: FAA Order 2150.3B now contains timeliness goals for completion of an investigation, preparation of the enforcement investigative report, and the processing of legal enforcement actions, to provide for more timely completion of the enforcement process.

The FAA is without authority to grant immunity from criminal prosecution, however, FAA Order 2150.3B now contains policies and procedures for the grant of immunity from FAA enforcement actions to persons who provide information on violations to the regulations.

Safety Enhancement 130:…Remaining Risk

Cargo – Regulation and Policy – Oversight *(Completed)*

This safety enhancement reduces cargo-related accidents and incidents by requiring regulators to provide adequate oversight, by developing/enhancing and implementing a system that ensures appropriate inspector coverage for all airlines, with particular emphasis on sub-contracting and leasing operations , and that includes the assigning of highly-experienced inspectors (appropriate for the operation) to those operators that require the most comprehensive oversight.

Action: The FAA has implemented the Air Transportation Oversight System (ATOS) which is a risk based, System Safety process for surveillance of all air carriers that hold operations specifications issued in accordance with 14 CFR parts 119 and 121. ATOS is designed to identify safety trends in order to spot and correct problems at their root cause before an accident occurs and it includes elements specifically targeting outsourced training and air carrier oversight. FAA inspectors now look at an airline as a whole, to see how the many elements of its operations -- from aircraft to pilots to maintenance facilities to contract maintenance and training, to flight dispatch to cabin safety-- interact to meet federal standards and implement industry best practices for safety. By collecting and analyzing data on the many airline systems, FAA inspectors are better able to target areas for improvement.

ATOS has enabled the FAA to create a targeted, more effective surveillance plan for all air carriers, including those that carry cargo. The FAA also uses risk management processes to target resources in accordance with risk-based priorities. Information on the ATOS System is available at http://www.faa.gov/safety/

The FAA has also instituted a new Safety Inspector compensation and assignment system that ensures that all Principal Inspectors assigned to a Certificate Management Team (CMT) are highly experienced and fully qualified inspectors.

Safety Enhancement 131:…Remaining Risk

Cargo – Safety Culture *(ongoing)*

This safety enhancement reduces cargo-related accidents and incidents by encouraging a safety culture that includes: (1) development of an accident/incident cost analysis tool, (2) a self-audit process, (3) risk management programs, (4) revised standards for the Director of Safety (DOS), and (5) development of incident reporting and quality assurance.

Safety Enhancement 133:…Remaining Risk

Icing – Turboprop Aircraft Ice Detection Systems *(ongoing)*

This safety enhancement reduces accidents caused by in flight icing encounters by adapting and implementing systems that automatically detect ice, measure the rate of ice accretion, and provide annunciation to the flightcrew, on all turboprop aircraft that have non-evaporative ice protection systems and non-powered flight controls on all aircraft operated in commercial passenger and cargo revenue service.

Safety Enhancement 134:…Remaining Risk

Icing - Aircraft Design – Avionics *(ongoing)*

This safety enhancement 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.

Safety Enhancement 136:…Remaining Risk

Icing – Training – Engine Surge Recovery *(ongoing)*

This safety enhancement reduces the risk of accidents resulting from an engine surge caused by ice ingestion by including the Engine Failure Recognition and Response (EFRR) training materials in air carrier training programs.

Safety Enhancement 159 :…Remaining Risk

Midair – Airspace Design *(ongoing)*

This safety enhancement prevents midair collisions by: designing B/C/D airspace to be more easily identifiable; improving the usability of VFR charts; and ensuring adequate and timely coordination of airspace design changes with all airspace users.

Safety Enhancement 165 :…Remaining Risk

Midair – TCAS Policies and Procedures *(ongoing)*

This safety enhancement prevents midair collisions by requiring flightcrews to follow TCAS Resolution Advisories (RA's) even in the presence of contravening ATC instructions; establishing procedures for TCAS range setting; and recommending that TCAS-capable simulators and flight-training devices be used for training TCAS responses and maneuvers.

Safety Enhancement 169 – :…Remaining Risk

Maintenance - Policy & Procedures – Work Cards / Shift Change / Responsibilities / Manuals (***ongoing***)

This safety enhancement reduces the number of accidents related to improper or incomplete maintenance by ensuring that: (1) work cards or other written instructions are used at the start of each task, with written and oral status reports at every shift change; (2) procedures are written to include clear responsibility and authority for work assignments; and (3) necessary manuals (operational & maintenance) are complete, accurate, available and appropriately used.

Safety Enhancement 170R2 – :…Remaining Risk

Maintenance - Aircraft Design – OEM Continuous Monitoring of Service History (***ongoing***)

This safety enhancement reduces the number of accidents due to improper maintenance by ensuring that maintenance task difficulty data is collected and reported to the OEM and that proper maintenance is being performed to ensure that aircraft systems continue to function as designed.

Safety Enhancement 172 – :…Remaining Risk

Maintenance - Gap Analysis of Existing Airplane Maintenance Process & Follow on Action **Plan** History (***ongoing***)

This safety enhancement will reduce the number of accidents due to improper maintenance by identifying and correcting gaps within and between maintenance processes that could inhibit the intended design level of safety from being sustained throughout the life of the airplane.

Safety Enhancement 175 – :…Remaining Risk

Maintenance - Policy & Procedures – Flight Critical Configurations Changes Made During Maintenance History (***ongoing***)

This safety enhancement will reduce accidents due to loss of pitot static systems by providing visible tagging any time ports of the pitot static system are covered during maintenance or servicing and by

enhancing preflight walk-around procedures to include specific verification that pitot static ports are uncovered.

Safety Enhancement 176 – :…Wrong Runway Departures
Runway Safety Action Team Evaluations (***completed***)

This safety enhancement will reduce Wrong Runway Departures by having each Runway Safety Action Teams (RSAT) include the *Wrong Runway Departure Study* and its *Part 139 Airport Threat Assessment* in the in the identification of contributing factors and threats that exist in airport environments that have led to wrong runway departures.

Action: All RSAT teams have received and incorporated both documents into their airport environments evaluation process.

Safety Enhancement 178 – :…Wrong Runway Departures
Enhanced Surface Marking and Lighting (***completed***)

This safety enhancement will reduce Wrong Runway Departures by having each Runway Safety Action Team (RSAT) review existing sign and marking plans at all high threat airports, as identified in the Wrong Runway Departure Report, to identify potential hazards, develop mitigation plans and incorporate necessary changes.

Action: For the short term, 20 of the busiest U.S. airports were scheduled for Runway Safety Action Team visits based on a combination of a history of runway incursions, incidents of aircraft turning onto the wrong runway and the risk of wrong-runway incidents. These teams identified more than 100 short term fixes that including new or improved signage, improved markings, driver training and other actions. A second tier of 22 airports have been identified for evaluation.

Safety Enhancement 179 – :…Wrong Runway Departures
Scenario Based Training for Pilots (***ongoing***)

This safety enhancement will reduce Wrong Runway Departures by substantially reducing or eliminating the risk of wrong runway operations by the incorporation of wrong runway operations training into flight crew qualification, approved training, and other pilot training programs. This training will increase the pilot's ability to recognize and avoid situations leading to wrong runway departures.

Safety Enhancement 180 – :…Wrong Runway Departures
Scenario-Based Training for Tower Controllers (***ongoing***)

This safety enhancement will reduce Wrong Runway Departures by providing scenario-based training for controllers highlighting the contributing factors that have led to wrong runway departures. The training would focus on operations in complex airports, airport geometry, communications, taxi/departure clearances, understanding and managing fatigue and time pressures, Taxi Into Position and Hold (TIPH), and situational awareness as described in the Wrong Runway Departures report.

Safety Enhancement 181 – :…Wrong Runway Departures
Taxiway and Runway Configuration (***ongoing***)

This safety enhancement will reduce Wrong Runway Departures by addressing hazards identified in the Wrong Runway Departure Report relating to airport construction and runway/taxiway location. FAA advisory material will be updated to include risk analysis to address confusing taxiway and runway geometry and airports geometry will be assessed during the Airport Layout Plan Review to identify potential hazards, develop mitigation plans and incorporate necessary changes.

Safety Enhancement 182 – :…Wrong Runway Departures
Air Traffic Control Clearance Procedure Review (***ongoing***)

This safety enhancement will reduce Wrong Runway Departures by evaluating policy and procedures for the issuance of early takeoff clearances that require the crossing of multiple runways before reaching the departure runway. In addition, the FAA "*Taxi Into Position and Hold*" (TIPH) policy will be reviewed for appropriate limits or prohibition depending on airport characteristics.

Safety Enhancement 183 – :…Wrong Runway Departures
Cockpit Moving Map Display and Runway Awareness System (***ongoing***)

This safety enhancement will reduce Wrong Runway Departures and runway incursions by encouraging the installation of own-ship moving map display and/or runway awareness systems and by encouraging the FAA to expedite the development of standards for integration of class II EFBs with the airplane systems.

APPENDIX 2
CAST Member Logos