Commercial Aviation Safety Team

A Unique Government–Industry Partnership

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In January 1997 the Air Transport Association of America (ATA), Boeing, and the Air Line Pilots Association (ALPA) founded the Industry Safety Strategy Team (ISST). The team was formed in recognition of the need to better coordinate the various efforts of the airline industry to achieve increased levels of commercial aviation safety.

Sharing of Aviation Safety Responsibilities

Safe Airplane + Safe Operation + Safe Infrastructure = Safe Air Travel

Manufacturers are responsible for:

- Safe airplane design
- Development of safety-enhancing technologies
- Flight and maintenance operations, recommendations, documents, training, and support
- Maintenance planning
- Safety-related analysis
- Safety initiatives

Operators are responsible for:

- Operations policy and procedures
- Airplane/pilot publications
- Approved maintenance program
- Maintenance policy and procedures
- Maintenance publications
- Safety program
- Training

Government (including air traffic service providers) is responsible for:

- Aviation law
- Operations specifications
- Rules and regulations
- Inspection policy, procedures, and training
- Airline policy and procedures requirements
- Safety, health, environmental law, and regulations
- Navigation facilities/operations
- Airport facilities
- Departure, en route, arrival, and approach policy and procedures
- Air traffic control services
- Safety-related analysis

Context and Initial Efforts

The founders of the ISST acknowledged the complexity of the U.S. aviation safety environment, with its multiple actors and many, sometimes competing, influences and spheres of activity. Safety responsibilities are shared among three principal entities—manufacturers, operators, and the government (see box this page); the public and the media also have some influence over the process, and certainly are stakeholders to whom the industry must be accountable. In the United States, cooperation among these entities has resulted in a system that experiences about 2 million safe flights for every major commercial accident. Nonetheless, it was believed that enhanced linkages were needed among the safety efforts of the three major sectors. The ISST founders also recognized a strategic need to develop a data-driven agenda, focused on eliminating those causal factors that habitually lead to commercial aviation accidents, and whose elimination or mitigation would yield the greatest savings in both lives and aircraft.

While acknowledging the critical role of government, primarily the Federal Aviation Administration, in sharing responsibility for aviation safety, the ISST founders decided to begin by working only with the private sector. Initial efforts were focused on increasing participation in the group, clearly defining the problems to be addressed, and developing a strategic safety agenda. The membership was quickly expanded to include the airplane manufacturers Airbus Industrie and McDonnell Douglas (since bought by Boeing); engine manufacturers General Electric and Pratt & Whitney; and the Aerospace Industries Association (AIA), representing all its industry members.

Since the introduction of jet transports in the 1950s, there have been tremendous improvements in the safety of air travel. Yet the accident rate, while low, has been stable for the last 10 years at approximately 1.4 hull loss accidents per million flights worldwide.[1] Moreover, Boeing projects that the number of large commercial jet transports in service

[1] A hull loss accident is one that causes an aircraft to be removed from service permanently.

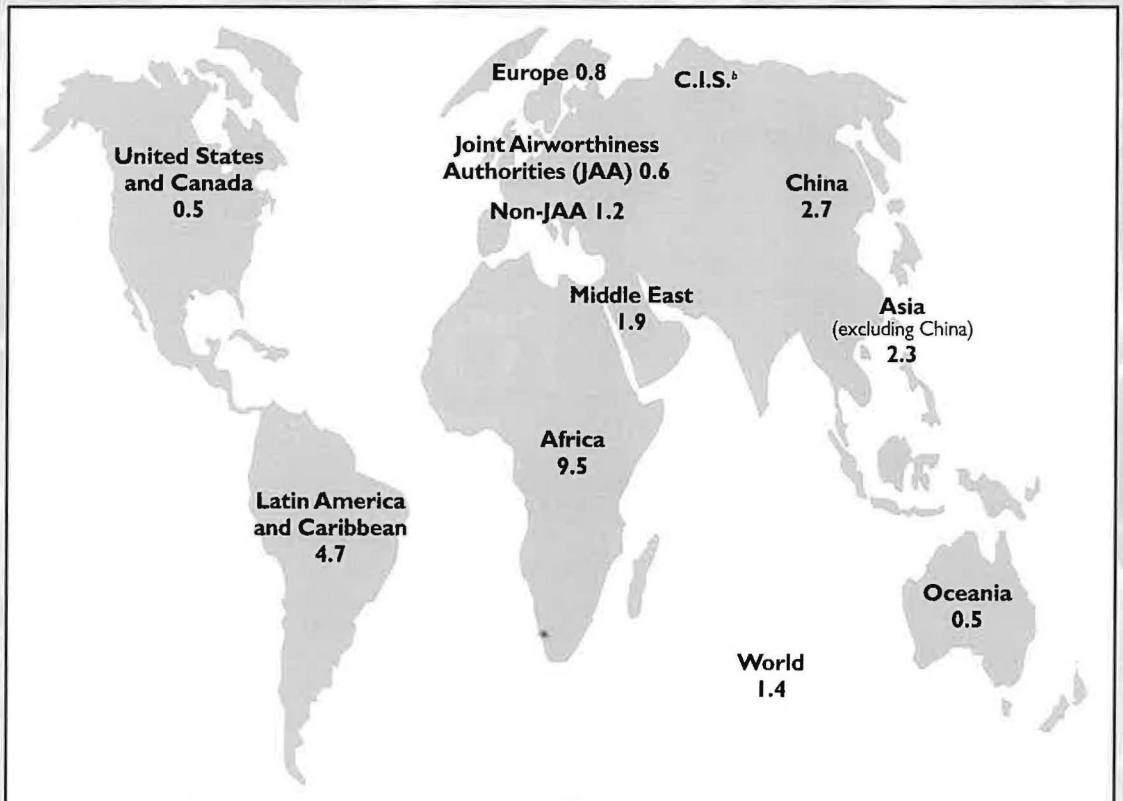
will nearly double by 2016, from about 12,595 in 1997 to more than 25,000. With the associated projected growth in air traffic, the data indicate nearly a hull loss accident per week on a worldwide basis by 2016. The ISST viewed this trend as unacceptable and decided that to improve the overall accident rate, a new, cohesive, and focused approach would be necessary.

While agreeing to give initial priority to reducing the U.S. accident rate, the ISST acknowledged the need to expand the effort worldwide, especially in light of regional differences in accident rates. Figure 1 shows the disparity in accident rates by world region. The hull loss accident rates shown are derived from historical data and represent hull losses in the designated region, regardless of country of registry. These data highlight the significance of regional differences, primarily in infrastructure. While safety can and should be improved in every region, there is apparently more room for improvement in some regions than in others; thus regional information must be considered in pursuing incremental safety enhancements. It should be noted that even in regions with higher accident rates, there are many airlines whose safety records are among the best in the world. The low accident rates achieved in some regions are cause for optimism about the possibility of improving aviation safety worldwide, provided lessons learned by one region or airline can be transferred to another.

Examination of the data on worldwide and U.S. airline fatal accidents and fatalities for 1987–1996 by type of accident reveals primarily similarities, but also some differences. Although the principal cause of fatalities worldwide was controlled flight into terrain (CFIT)—pilots inadvertently flying fully functioning airplanes into the ground, usually during nighttime or cloudy conditions—loss of control in flight was the biggest problem in the United States. Other areas in which U.S. data stray from the world norm are ice/snow accidents and runway incursions. There were five fatal accidents related to ice/snow worldwide; of these, three involved U.S. operators. More disconcerting is that all four fatal runway incursion accidents worldwide involved U.S. operators at U.S. airports.

The worldwide data are helpful in determining whether a particular region is above or below average risk with regard to a given accident type. The low overall rate of U.S. accidents leads to two inferences:

◆ A key element of aviation safety is a mature infrastructure with multiple redundancies. In the United States, for example, complete radar coverage, combined with minimum safe altitude warning approach radars and mandatory installation of ground proximity warning systems, has contributed to the lower number of CFIT accidents.



[a]Accidents per million departures, western-built transports, 1988 through 1997.
[b]Insufficient fleet experience to generate reliable rate.

FIGURE 1 Hull loss accident rates worldwide.[a]

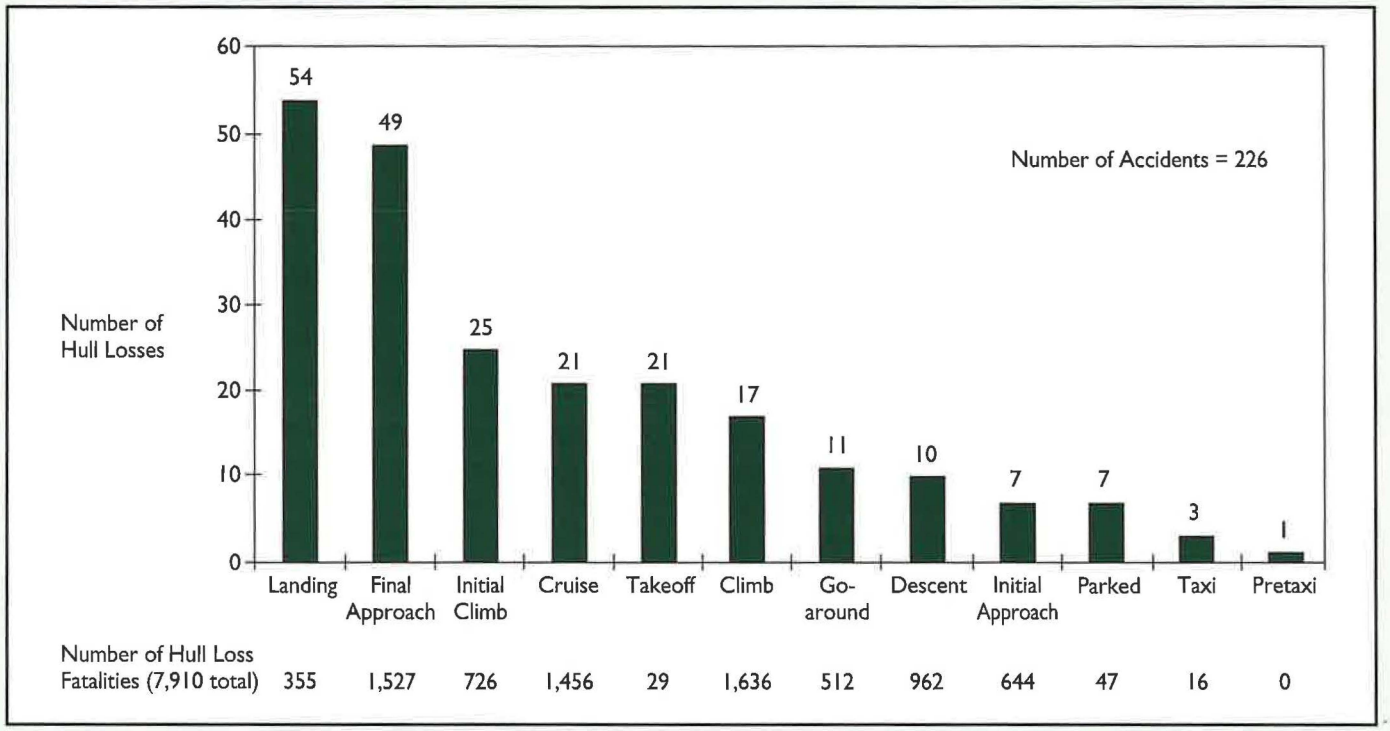


FIGURE 2 Worldwide airline hull loss accidents by phase of flight (1988–1997).

◆ To further reduce risks in the United States, it will be necessary to learn from accident and incident trends in other parts of the world, where these multiple redundancies do not yet exist.

Another way to examine the accident data is by categorizing the number of hull loss accidents occurring during particular phases of flight, such as takeoff, cruise, approach, and landing (see Figure 2). As the figure indicates, the approach and landing phases of flight are the most hazardous.

Many ideas for enhancing safety are focused on technological improvements to airplanes. While such improvements are important, their impact will not be significant unless they can be implemented on the existing fleet. A large portion of the airplanes that will be operating in 2007 have already been built, and most of the rest have been designed (see Figure 3). Although technological advances in airplanes, avionics, and air traffic infrastructure and design have helped decrease the accident rate, they cannot provide significant reductions in the accident rate, especially in the near term.

Commercial Aviation Safety Agenda

During its first year, the ISST focused on evaluating fatal accidents and their causes and on developing a strategic safety agenda. Those efforts culminated in the adoption and publication of a Commercial Aviation Safety Agenda in December 1997 (see box page 8).

For many years, the various segments of the aviation industry had been developing safety agendas and implementing safety plans. The ISST analysis resulted for the first time in a coordinated effort to identify intervention strategies that would have the greatest potential for preventing future accidents. The agenda is intended to be an evolutionary document—changed not on a prescribed schedule, but as new issues are identified and new priorities emerge.

The intervention strategies identified in the Commercial Aviation Safety Agenda are generally quite broad. They are based on an initial strategic review, not a rigorous analysis of accidents and incidents and the more formal development of intervention strategies that would follow such an analysis. The agenda does, however, provide the first strategic roadmap for increased commercial aviation safety.

FAA Safer Skies Agenda

In 1995 the FAA developed an Aviation Safety Plan, incorporating a goal of zero accidents. In 1996 the White House Commission on Aviation Safety and Security (the Gore Commission) was convened as a result of the Boeing 747 accident off Long Island to recommend safety and security improvements. The commission established the national goal of an 80-percent reduction in the fatal accident rate in the United States by 2007. To this end, the commission encouraged expanded cooperative efforts to enhance aviation safety.

The National Civil Aviation Review Commission (NCARC), commissioned by the U.S. Congress in

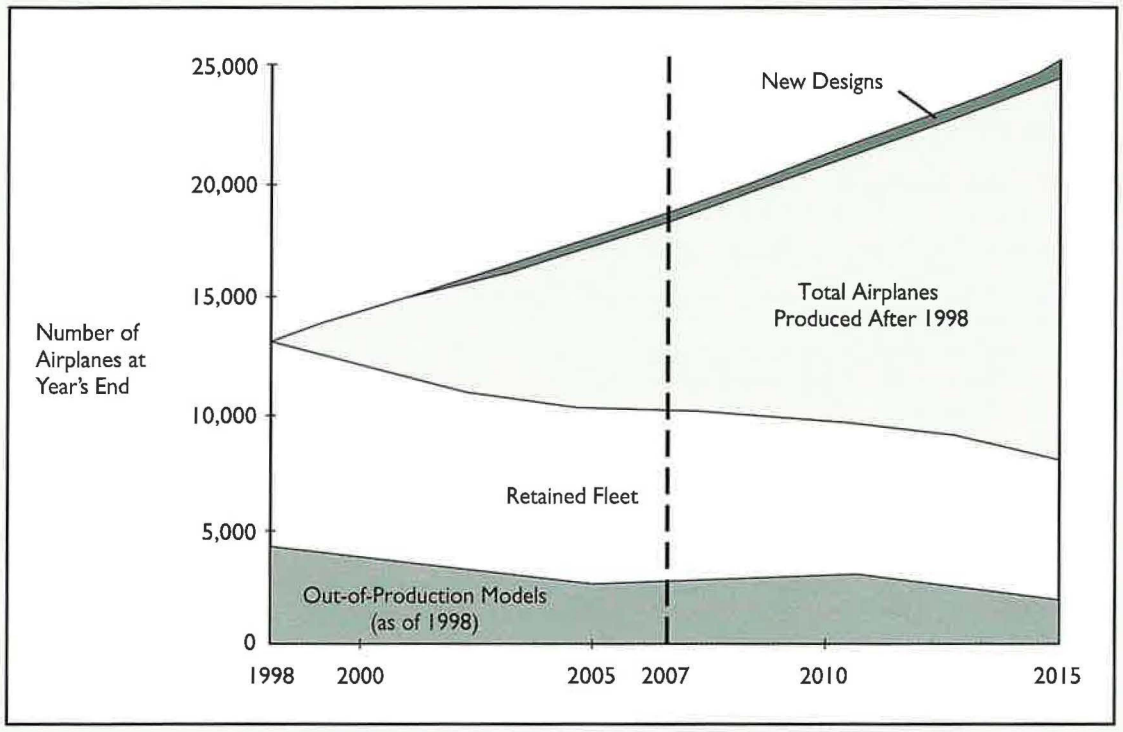


FIGURE 3 Projections for new airplane designs.

1997 to advise the FAA on means of improving aviation safety, followed up with its own strong recommendation that the FAA and industry work together to develop a comprehensive, data-driven, and integrated strategic safety plan to implement the many existing safety recommendations. The NCARC also recommended that performance measures and milestones be developed for assessing progress in meeting the safety goal, and advocated periodic review of priorities and monitoring of progress made in achieving the overall safety goal.

As a result, the FAA developed a Safer Skies Agenda (see Figure 4), which was announced in April 1998. This agenda addresses three main areas—commercial aviation, cabin safety, and general aviation—while recognizing the importance of

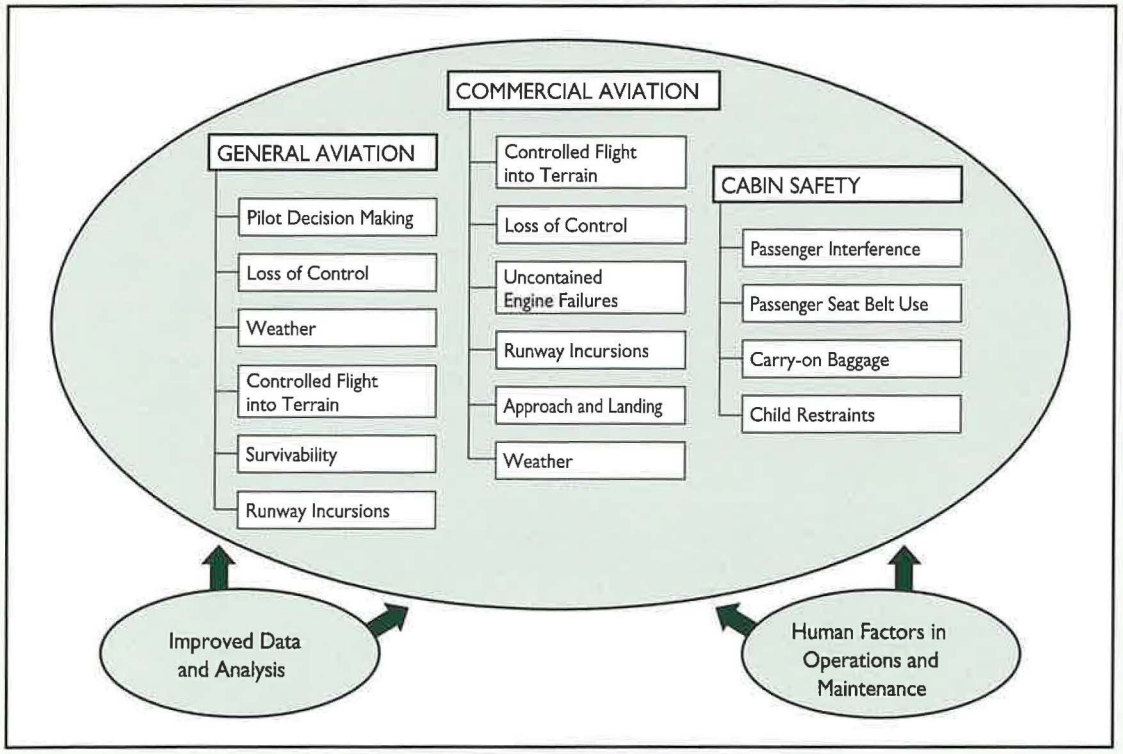


FIGURE 4 FAA Safer Skies Agenda.

Commercial Aviation Safety Agenda

Flight Safety

- Reduce controlled-flight-into-terrain (CFIT) mishaps through one or more of:
  - CFIT training.
  - Installation of enhanced ground proximity warning systems.
  - Improved navigation accuracy through use of the Global Positioning System.
- Reduce loss-of-control accidents by improving flight crew skills through the application of new tools and training processes.
- Improve operational training and procedures, focusing on human factors errors, including:
  - Application of crew resource management techniques.
  - Development of and compliance with standard operating procedures.
  - Elimination of inappropriate crew response to non-normal situations.
  - Flight crew–automated cockpit interface.
  - Improved situational awareness.
  - Improved simulator fidelity.
- Reduce approach and landing mishaps by:
  - Application of stabilized approach procedures.
  - Emphasis on the "go-around" option.
- Reduce weather- and turbulence-related accidents and incidents through the development and implementation of training programs and systems for:
  - Wind shear detection.
  - Ice detection/deicing/anti-icing (ground and flight).
  - Wake turbulence detection and separation standards.
  - Clear air turbulence detection.
- Reduce runway/taxiway incursion accidents and incidents through:
  - Application of the joint industry–government airport runway incursion action plan.
  - Installation of the Airport Surface Detection System-3 and Airport Movement Area Safety System.

Cabin Safety

- Enhance cabin and passenger safety through the continued installation of fire-resistant/retardant materials.
- Reduce passenger and flight attendant turbulence-related injuries through the development and implementation of:
  - Increased compliance with or modification of existing seat belt policies.
  - Operational turbulence policies and awareness programs.
  - Turbulence avoidance programs.
  - Training programs.
- Improve safety for children aged 2 and under by developing an improved child seat restraint specification.

Engineering, Maintenance, and Materiel Safety

- Reduce uncontained engine failures by developing:
  - Improved nondestructive inspection techniques.
  - Rotor integrity programs.
  - Damage mitigation programs.
- Reduce maintenance human errors through the implementation of:
  - Maintenance error reduction programs, such as maintenance resource management, Maintenance Error Detection Aid, and Aurora and Airbus Crew Resource Management.
  - Maintenance staggering procedures.
  - Standardized maintenance procedures, recordkeeping, and documentation.

Safety Data

- Protect voluntarily provided safety information to enable sharing and analysis among industry and government groups.
- Focus on accident and incident prevention through data collection and analysis in the following areas/programs:
  - Accident and incident databases.
  - Aging aircraft databases and aging systems surveys.
  - Flight Operations Quality Assurance.
  - Confidential reporting systems (e.g., Aviation Safety Action Programs, FAA/National Aeronautics and Space Administration Aviation Safety Reporting System, Air Transport Association Aviation Safety Exchange System, and Airbus Confidential Reporting System).

improved data collection and analysis and the impact of human factors on all aspects of aviation. It may be noted that the specific elements of the Safer Skies Agenda in commercial and cabin safety closely match those of the Commercial Aviation Safety Agenda.

This similarity is no coincidence. As noted earlier, the founders of the ISST had acknowledged the importance of government (primarily the FAA) in the aviation safety process, but had chosen to work initially within the private sector. By the end of 1997 the initial objectives had been achieved, and efforts were undertaken to expand the group to include government. In early 1998, as the FAA was developing the Safer Skies Agenda, FAA and ISST representatives began meeting to discuss how to merge their safety efforts. During this period, ISST changed its name to the Commercial Aviation Safety Strategy Team (CASST).

The effort to include government in the process was not limited to the FAA. As a result of the Gore Commission report, the National Aeronautics and Space Administration had established an Aviation Safety Program (AvSP) to provide research support for the national safety goal of reducing the accident rate by 80 percent in 10 years. To this end, the AvSP, developed with industry and other government agency input, addresses a wide variety of safety issues.

Evolution to Commercial Aviation Safety Team

Mid-1998 saw CASST and government working together to design and implement a concept for the aviation safety process that would include full representation by all sectors of aviation, as well as initial efforts to reach out to international partners. The first decision was to shift away from the concept of industry (ISST/CASST) and government as separate, cooperating parties, and create a new entity that would include all partners. The result was the Commercial Aviation Safety Team (CAST).

CAST includes equal partners from both industry and government. Industry is currently represented by AIA, Airbus, ALPA, the Allied Pilots Association, ATA, Boeing, Pratt & Whitney (also representing General Electric), the Regional Airline Association, and the Flight Safety Foundation. Government membership includes the U.S. Department of Defense, the FAA, NASA, and the Joint Airworthiness Authorities of Europe. CAST members also determined that it would be in the best interest of the overall safety effort to include the International Civil Aviation Organization, the International Air Transport Association, and the National Air Traffic Controllers Association in the team's activities; these organizations currently serve as observers.

In fall 1998, CAST developed a formal charter with goals and a strategic plan. The team also elected its first cochairs, one each from industry and government. CAST's stated goal is to reduce the fatal accident rate of U.S. Part 121 air carriers[2] by 80 percent by 2007, while working with airlines, appropriate regulatory/government authorities, and other international organizations to reduce worldwide fatal accident rates among commercial jet transports.

Before CAST was formed, the various groups were using accident data to determine their highest-priority safety focus areas. They used the data to develop an understanding of those actions or interventions with the best potential to prevent future accidents. CAST has consolidated and formalized this process by developing a structure for the analysis of accidents and incidents and the identification of promising interventions. The process includes collaborating to determine key safety areas through the analysis of past accident and incident data, chartering joint teams of experts to develop methods for fully understanding the chain of events leading to accidents, identifying high-leverage interventions to address these areas, and focusing on the implementation of these interventions.

Figure 5 shows the membership and composition of CAST, including its Joint Safety Analysis Teams (JSATs) and Joint Safety Implementation Teams (JSITs), which are key to the analysis efforts and development of intervention strategies. JSATs and JSITs are chartered by CAST to study and evaluate a particular area of concern; each is chaired jointly by at least one industry and one government representative. Their membership is based on the recommendations of the CAST members and cochairs. JSATs conduct detailed accident/incident analyses, develop problem statements, and identify and evaluate potential intervention strategies. JSITs then take over and develop the intervention strategies; their efforts include assessing the feasibility of interventions and developing implementation plans. CAST approves all analyses and intervention plans. Each JSIT works through CAST to serve as the focal point for monitoring the implementation of adopted strategies with responsible organizations; to develop,

[2] Part 121 air carriers are operators of aircraft with 10 or more passenger seats or 7,500 pounds of payload capacity, which are regulated by Part 121 of the Federal Aviation Regulations.

monitor, and track performance measures; and determine progress in meeting major milestones, as well as the effectiveness of interventions.

The first JSAT was formed to analyze CFIT accidents. Its report was finalized in late 1998 and then presented to the first JSIT. That JSIT is still working on the development of potential intervention strategies for reducing CFIT accidents. Although focused on long-term solutions, the team has already developed a list of near-term, implementable interventions that should be announced in the near future, and that expand on interventions included in the initial Commercial Aviation Safety Agenda. Additional JSATs have been chartered by CAST to analyze approach and landing accidents and incidents, as well as runway incursion events. Once those JSATs have completed their work, JSITs will be formed to develop the associated intervention strategies. Ultimately, only the broad application of those interventions will effect the safety improvements that are the goal of CAST.

Conclusion

CAST will continue to review available accident and incident data—including those from modern on-board data sources as they become increasingly available—to assess and reassess the threats to commercial aviation safety. The Commercial Aviation Safety Agenda will remain the team's strategic blueprint, modified as necessary as the CAST process continues to evolve. Industry and government remain committed to working together and expanding the CAST efforts to include the international aviation community.

For more information visit the Air Transport Association website at www.air-transport.org.

FIGURE 5
Membership and composition of Commercial Aviation Safety Team.