Aircraft Fire Safety

Enhancement of fire safety in commercial transport aircraft is a high priority research activity of the FAA.

Aircraft Fire Safety is comprised of two major programs-fire safety and fire research. The latter is a long-range research program to develop ultra fire–resistant aircraft interior materials. The former is a near-term program that address specific aircraft applications and fire problems and is described here.

Aircraft fire safety entails two distinct fire protection activities–in-flight fire prevention and postcrash fire survivability. The goals of each activity are different because the fire threats and period of protection are dissimilar.

In commercial transport aircraft, the in-flight fire problem is a hidden fire that occurs in an inaccessible location (e.g., cargo compartment) or that is difficult to locate (e.g., lavatory area). The initial design goal is to minimize the likelihood that a fire will begin at any location throughout the aircraft. However, if a fire should occur, the goal is to reliably detect the fire and to extinguish or suppress the fire until the aircraft can be safely landed. Although rare, the consequences of an uncontrollable in-flight fire are great, as attested by the ValuJet accident (May 11, 1996, 110 fatalities).

From the outset, postcrash fires are extremely severe. In most cases, the postcrash fire originates from the ignition of large quantities of spilled jet fuel. The main concern is the spread of the fire into the aircraft and the effect of burning interior materials on passenger evacuation and the creation of untenable conditions. The

primary design goals for enhanced postcrash fire survivability are twofold: (1) additional time for passengers to escape and (2) increased passenger evacuation rate.

In its commitment to fire safety, the FAA operates the most extensive civil aircraft fire test facilities in the world. The centerpiece of this testing capability is a full-scale fire test facility, the U.S. Government's largest. Located at the FAA William J. Hughes Technical Center, Atlantic City International Airport, New Jersey, the laboratory is used by experts to research fire scenarios under realistic simulation conditions. Fuselage test sections are set ablaze by researchers as part of their efforts to understand, retard, and control the effects of an aircraft fire. Five additional facilities are also devoted to fire safety activities, for example, small-scale fire testing of interior materials, fire tests on aircraft components and large-scale specimens, chemical analysis related to the toxicity of combustion products, extinguishment of simulated engine fires, and examining the effects of altitude (pressure, temperature) and air speed on fire behavior.

Through its fire safety program research and testing efforts, the FAA has set a number of fire standards that are followed by the entire aviation industry, including:

- Seat cushion fire-blocking layers
- Low heat and smoke release interior

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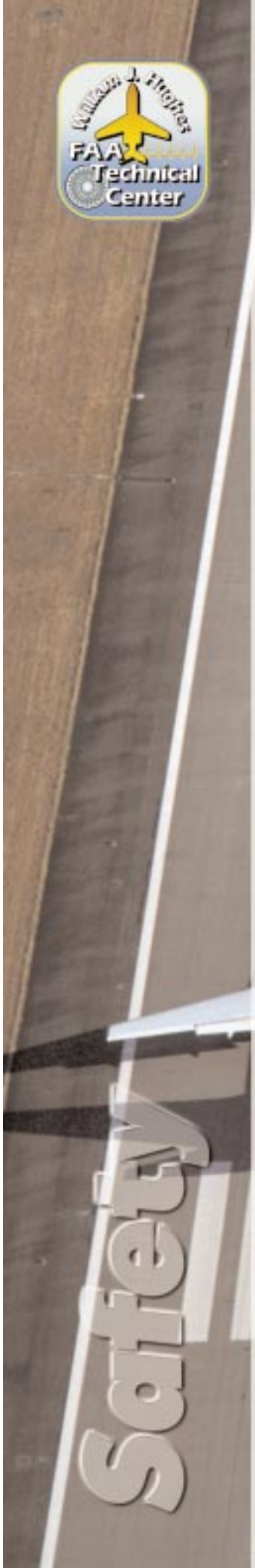

panels (sidewalls, stowage bins, ceilings, and partitions)
- More stringent cargo compartment fire protection requirements, including burnthrough-resistant cargo liners
- Heat-resistant evacuation slides
- Floor proximity lighting
- Flight recorder fire endurance
- Halon 1211 hand-held extinguishers
- Airline blanket ignition resistance
- Guidelines for approving halon replacement agents

Engineers are working on numerous projects that will keep the FAA's Aircraft Fire Safety Program at the forefront well into the next century. These projects fall into three categories: materials fire safety, fire management, and systems.

In the area of materials fire safety, the FAA is developing design guidelines for hardening aircraft fuselages against penetration by an external fuel fire. Burnthrough testing of composite fuselages, as planned for the high-speed civil transport, will also be conducted. The fire performance of current thermal acoustical insulation is being evaluated as well as the need for tougher fire test standards.

New alternatives to fire management and extinguishing are being closely examined. Alternate agents developed by industry to replace halon extinguishers are being tested and replacement guidelines are being developed for cargo holds, engine nacelles, and hand-held extinguishers. Work will soon commence to develop test standards for approval of new cargo fire detectors that are being developed to reduce the high incidence of false alarms. In addition, cargo water spray tests are under way to examine the effectiveness of this promising technology against various cargo fire threats, including exploding aerosol cans. Design criteria for a cabin water spray system will also be developed, building on prior FAA full-scale tests demonstrating water spray effectiveness over a range of postcrash fire scenarios and optimizing water quantities. Future research will address fire safety criteria in large passenger capacity, double-decked aircraft, which aircraft manufacturers are now designing.

Under the area of systems, the FAA will continue to support the National Transportation Safety Board's aircraft fire investigations. This support includes participation on accident investigation teams, analyzing accident materials and fluid chemicals, and conducting full-scale fire tests to recreate and study accident scenarios. Future research will be related to fuel tank explosion prevention and oxygen system safety. The latter will include feasibility of an onboard oxygen generating system/inert gas generating system (OBOGS/OBIGGS) that would fulfill on-demand emergency oxygen requirements while also generating nitrogen for cargo compartment and/or fuel tank inerting.

The FAA will remain steadfast in its commitment to keep aircraft and passengers safe from the ravages of fire, even as new generations of larger aircraft are being introduced to the flying public. Research and development efforts by the FAA's fire safety experts in its world class fire test facilities will continue to result in new systems and procedures to minimize injuries, fatalities, and aircraft damage.

To find out more about the Fire Safety Program, contact:

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