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159667

Resources, Community, and  
Economic Development Division

B-278016

December 19, 1997

The Honorable John J. Duncan, Jr.  
Chairman  
The Honorable William O. Lipinski  
Ranking Democratic Member  
Subcommittee on Aviation  
Committee on Transportation and Infrastructure  
House of Representatives

Subject: Aviation Safety: Installation of Smoke Detection and Fire  
Suppression Systems in U.S. Transport Aircraft

The Federal Aviation Administration (FAA) is planning to issue new regulations to upgrade the fire safety standards for cargo or baggage compartments in certain passenger and cargo aircraft. These regulations would require that approximately 3,700 existing aircraft be retrofitted to include fire suppression and/or smoke detection systems in their cargo or baggage compartments and that all new aircraft entering service include such systems. At your request, we reviewed the actions under way at FAA and within the aviation industry to effect these changes within the 3-year time frame proposed by FAA. We addressed the following questions:

- What is the status of FAA's and the airline industry's efforts to equip aircraft cargo compartments with new smoke detection and fire suppression systems?
- What factors may affect the timetable for equipping the entire fleet with this new equipment?

On December 11, 1997, we briefed your staffs on the results of our review and agreed to provide you with this report summarizing our findings. Our responses to the specific questions you raised are provided in brief below. Additional information regarding these questions is contained in the briefing slides in enclosure I.

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FAA and the aviation industry have taken the initial steps needed to begin installing smoke detection and fire suppression systems in aircraft cargo and baggage compartments. FAA has accelerated its rulemaking procedures for installing these systems with the goal of publishing the final rule by January 1, 1998. The rule includes a plan to monitor and report, on a quarterly basis, the status of retrofitting affected aircraft. In addition, FAA has certified smoke detection and fire suppression systems for DC-9 and 737 aircraft, and our discussions with affected aircraft manufacturers revealed that most plan to develop, test, and certify systems; issue technical installation instructions; and offer modification kits to airlines. Our survey of 15 major, national, and regional airlines<sup>1</sup> indicates that most of those surveyed believe that the retrofit of affected aircraft can be accomplished in 3 years, the compliance period suggested in FAA's proposed rule.<sup>2</sup>

In our discussions with smoke detection and fire suppression suppliers, we found that current suppliers of smoke detection equipment have developed more sensitive and reliable equipment to meet FAA's requirement of smoke detection within 1 minute and that emerging detection and suppression technologies may reduce modification costs and speed installation of the systems.

We identified factors that could affect FAA's proposed 3-year timetable. We found that detection and suppression suppliers' capacity to provide equipment to meet the retrofit program requirements and the use and availability of halon<sup>3</sup> are not likely to affect the timetable. However, a lack of standardization in the application of FAA's test criteria for certifying smoke detection and fire suppression systems and repair stations' capacity, if installation cannot be accomplished during annual scheduled maintenance, could slow industrywide installation. In addition, we are concerned that (1) not all airlines have fully developed plans to retrofit affected aircraft; (2) any delays in publication of FAA's final rule could delay industry's efforts to retrofit aircraft; and (3) FAA's proposed compliance reporting may not provide sufficient information for effective congressional oversight.

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<sup>1</sup>See pages 22 and 23 in enc. I.

<sup>2</sup>The 3-year compliance period begins when the rule is issued.

<sup>3</sup>Halon gas is the most common extinguishing agent for fire suppression systems.

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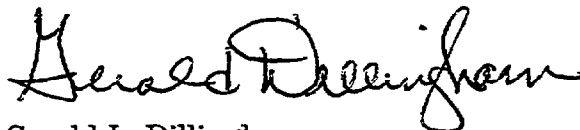
In commenting on a draft of this report, FAA officials, including the Deputy Associate Administrator for Regulation and Certification, noted that they had conducted a series of workshops to increase the level of standardization of FAA's certification efforts in smoke detection testing and planned to revise FAA's advisory circular on smoke detection test procedures. FAA also said that if the airlines begin the installation process promptly and schedule the installations aggressively, the retrofit program could be completed within the time period proposed. FAA agreed that timely publication of the rule is essential and reiterated its plans to publish the rule on January 1, 1998. FAA also said that the level of reporting specified in the proposed rule would provide sufficient information to monitor the industry's progress and that any further reporting requirements might require a supplemental rule and/or approval by the Office of Management and Budget.

We generally agree with FAA's comments but remain concerned that FAA's proposed reporting procedures may not provide sufficient advance notice to the Congress of any serious delays that might develop during the retrofit program.

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To determine the status of FAA's efforts and timetable, we interviewed officials from FAA, airlines, aircraft manufacturers, and the Environmental Protection Agency and reviewed FAA's proposed rule and preliminary regulatory evaluation and the public comments provided in response to the proposed rule. We conducted our review from August 1997 to December 1997 in accordance with generally accepted government auditing standards. Enclosure II presents more details of our scope and methodology.

If you have any questions or need additional information, please call me at (202) 512-3650. Major contributors to this report were Marion Chastain, Christopher Keisling, Richard Scott, and Robert White.



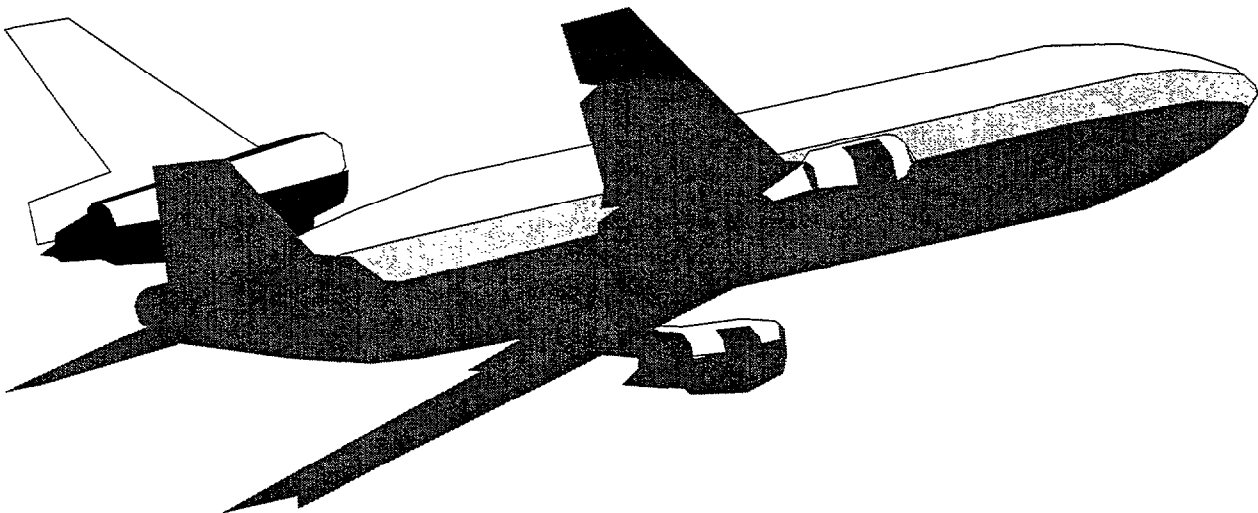
Gerald L. Dillingham  
Associate Director, Transportation  
Issues

Enclosures - 2

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**GAO** Installation of Smoke Detection and Fire  
Suppression Systems in U.S. Transport Aircraft

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Briefing for Congressional Requesters  
December 11, 1997

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GAO Briefing Outline

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- Background
  - Research Questions
  - Status of FAA's and Industry's Efforts
  - Factors That Could Affect Timetable
  - Conclusions and Potential Concerns
  - Appendix
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## GAO Background

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- Fires in the cargo or baggage compartments of transport aircraft in recent years have resulted in accidents and loss of life and prompted FAA's issuance of a proposed rule to require that 3,684 aircraft be modified to include fire suppression and/or smoke detection systems.
  - FAA estimates that the cost of an industrywide retrofit effort is about \$296 million.
  - FAA believes that installation can occur during annual scheduled maintenance for these aircraft.
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GAO Research Questions

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- What is the status of FAA's and the airline industry's efforts to equip aircraft cargo holds with new smoke detection and fire suppression systems?
  - What factors may affect the timetable for equipping the entire fleet with this new equipment?
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GAO Status of FAA's Efforts--Rulemaking

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- Key elements of FAA's proposed rule
    - Require retrofit of 2,994 passenger aircraft to install smoke detection and fire suppression equipment
    - Require retrofit of 690 cargo aircraft to install smoke detection equipment only
    - 3-year compliance period
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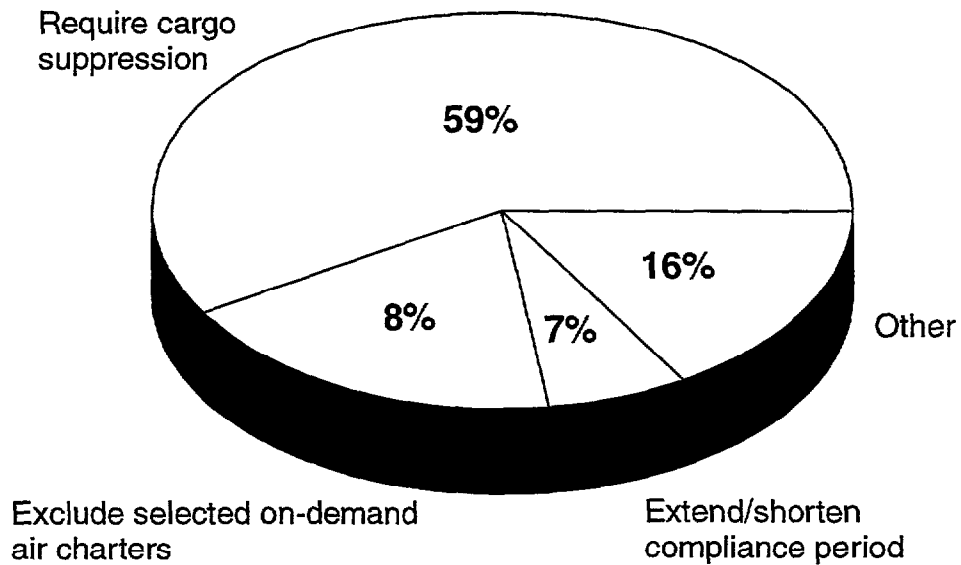


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**GAO** Status of FAA's Efforts--Rulemaking

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**Public comments on proposed rule\***



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\*Total of 92 comments received; percentages indicate the relative number of comments advocating the indicated change.

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**GAO** Status of FAA's Efforts--Rulemaking

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- **FAA has accelerated issuance of final rule.**
    - Law requires FAA to issue final rules within 16 months after end of the comment period.
    - FAA plans to issue smoke detection and fire suppression rule by 1/1/98--in less than 4 months.
  - **FAA plans to monitor operators' compliance.**
    - Number of systems installed/to be installed
    - Publicly report compliance progress
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GAO Status of Industry's Efforts--Alternative Approaches for Installation

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- **Approaches Used to Date**

- Delta developed a system for its 737-200 aircraft and obtained FAA certification.
- AirTran purchased certificated systems from an independent integrator for its DC-9-30 aircraft.

- **Alternative Approach**

- Operators may also buy certificated systems from aircraft manufacturers that provide technical instructions and sell installation kits.
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GAO Status of Industry's Efforts--Aircraft  
Manufacturers' Plans

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- **Most manufacturers plan to issue technical installation instructions and certify systems.**
- Airbus, Boeing, British Aerospace, Dornier, Embraer, and Fokker plan to issue service bulletins\* (about 3,500 aircraft or 95% of the affected fleet).
- CASA, Lockheed, and Shorts have no plans to issue service bulletins (about 180 aircraft).

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\*Service bulletins will provide detailed technical information on installation of certified smoke detection and fire suppression systems.

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GAO Status of Industry's Efforts--Operators'  
Plans for Installation

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- **Most of the responding airlines believe 3-year compliance is feasible.**
  - GAO obtained information from 15 airlines.
  - Only about half indicated they had detailed plans for scheduled installation of smoke detection and fire suppression systems.
  - Plans for installation varied in specificity in terms of schedule and selection of suppliers and integrators.
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**GAO**    **Status of Industry's Efforts--Suppliers'  
Development of New Technologies**

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- **Current suppliers have developed more sensitive and reliable detection equipment to meet FAA's requirement of smoke detection within 1 minute.**
    - Kidde, Autronics, Whittaker, Cerebrus Guinard
  - **Emerging detection/suppression technologies may reduce modification costs/speed installation.**
    - Securaplane testing wireless detection systems
    - Microsafe and CeaseFire developing systems
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**GAO Factors That Could Affect Timetable:  
Certification Process**

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- Interpretation of FAA's test criteria for certifying smoke detection and fire suppression systems may cause testing and certification delays.
  - Definition of a "small smoldering fire"
  - Definition of "start of fire"
  - Identification of ignition source
  - Status of cargo hold contents (empty, full)
  - Measurement of halon concentration\*

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\*Halon gas is the most common extinguishing agent for fire suppression systems; its use is regulated by the Environmental Protection Agency.

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GAO Factors That Could Affect Timetable:  
Industry's Production/Installation Capacity

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- Detection and suppression suppliers assert sufficient capacity to meet industry requirements.
  - Repair stations contacted indicate that capacity is not a limiting factor **if installation can be accomplished during scheduled maintenance.**
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GAO Factors That Could Affect Timetable: Use and Availability of Halon

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- **Use:** EPA's current policy is to manage the release of halon rather than ban its use.
  - No consensus has formed on a viable halon replacement or alternative.
  - **Availability:** EPA estimates implementation of the rule will require 2.5% to 7% of U.S. halon stockpile.
  - Future needs could be met through recycling efforts.
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**GAO** Preliminary Conclusions

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- Smoke detection and fire suppression systems have been certified for DC-9 and 737 aircraft.
  - Detection and suppression suppliers and repair stations contacted report sufficient capacity for production and installation.
  - Availability and use of halon is not a limiting factor.
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**GAO** Potential Concerns

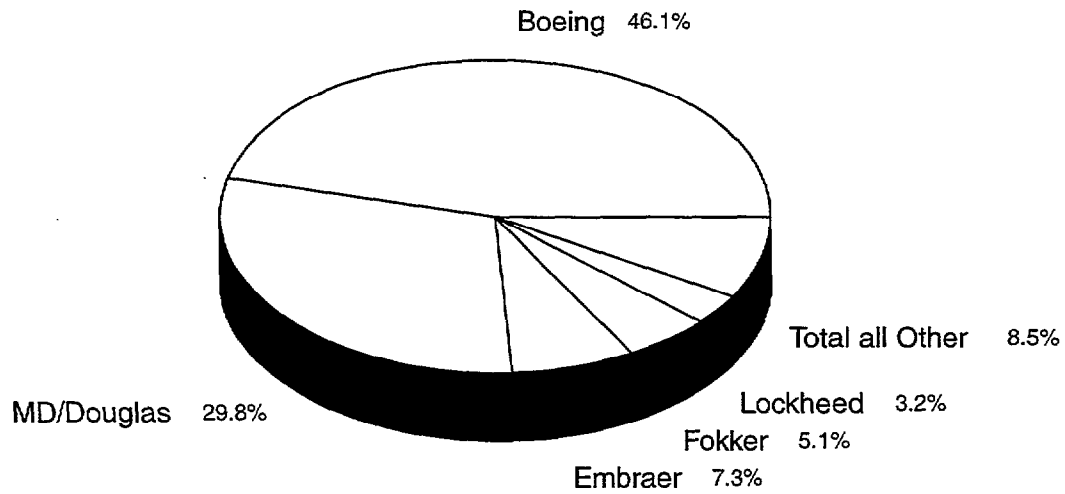
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- FAA's lack of standardization of certification test criteria may slow future certification efforts.
  - Not all airlines have fully developed plans to retrofit affected aircraft.
  - Industry's capacity may be an issue if installation cannot occur during scheduled annual maintenance.
  - Timely publication of final rule is essential.
  - FAA's proposed compliance reporting may require more information for effective congressional oversight.
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**GAO** Appendix: Manufacturers of Affected Passenger Aircraft

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2,994 passenger aircraft affected

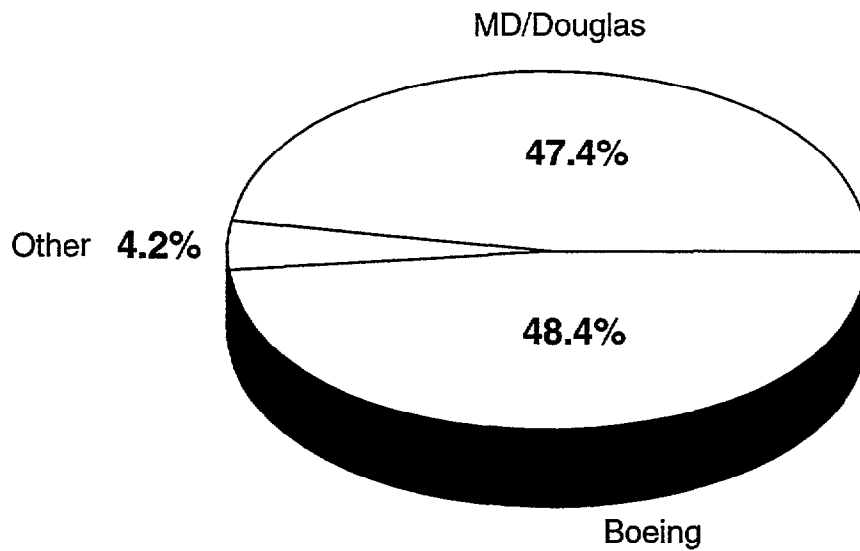
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Source: FAA Preliminary Regulatory Evaluation.

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**GAO** Appendix: Manufacturers of Affected Cargo Aircraft

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690 cargo aircraft affected

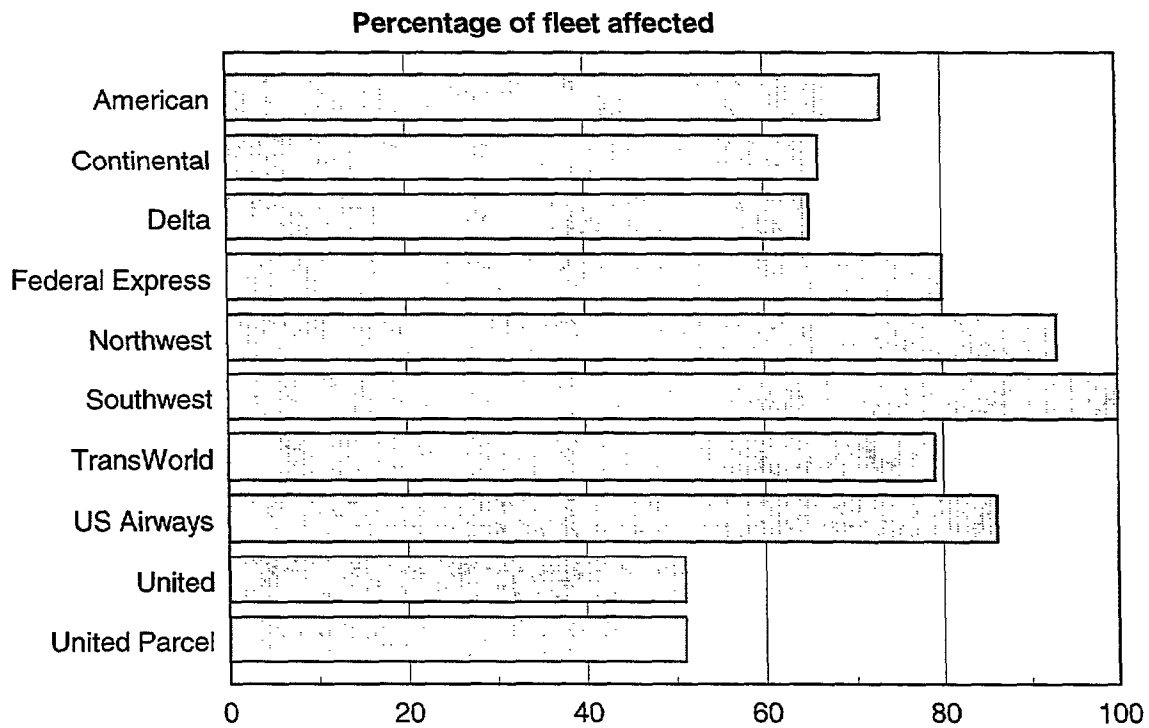
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Source: FAA Preliminary Regulatory Evaluation.

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**GAO** Appendix: Impact of Retrofit Program  
on Selected Major Airlines' Fleets\*

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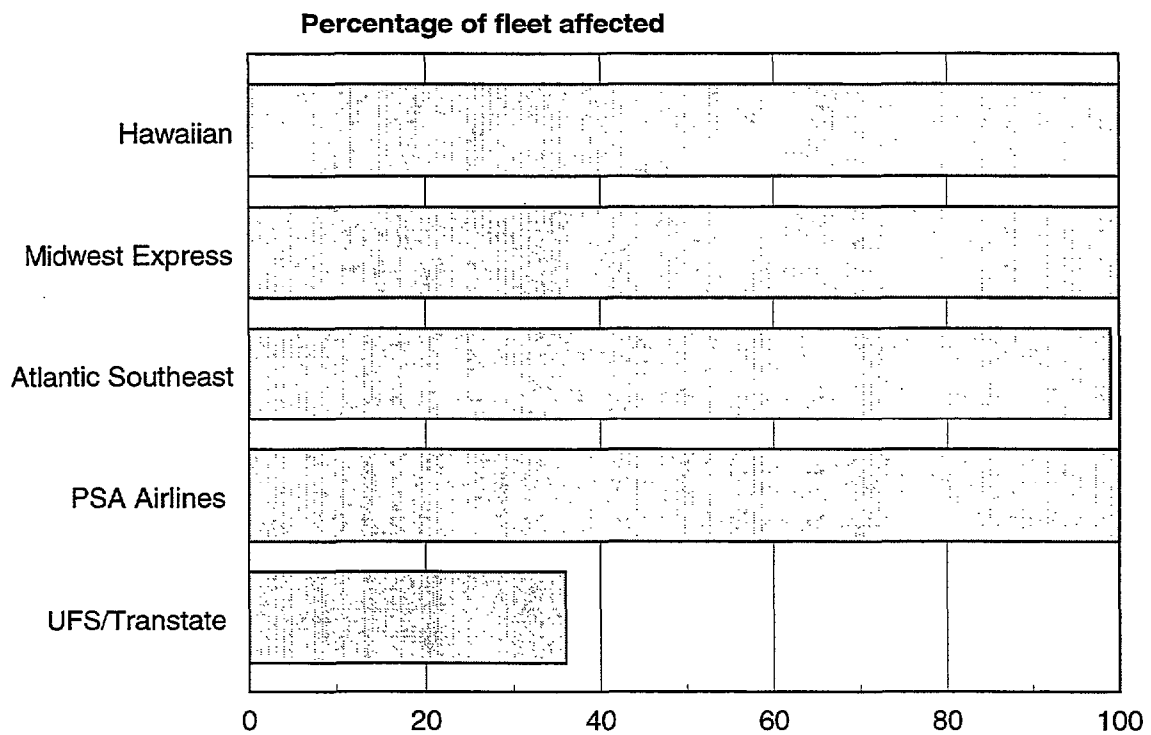
\*A major airline is one whose annual revenues exceed \$1 billion.

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## GAO Appendix: Impact of Retrofit on Selected National and Regional Airlines' Fleets\*

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\*A national airline generates annual revenues between \$100 million and \$1 billion, and a regional airline's annual revenues total less than \$100 million.

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GAO Appendix: Smoke Detection and Fire  
Suppression Suppliers Contacted

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- **Established Suppliers**
    - Walter Kidde (Delta--detector and suppression)
    - Pacific Scientific (AirTran--suppression)
    - Whittaker (FAA-approved Boeing supplier)
    - Autronics (FAA-approved Boeing supplier)
  - **Suppliers of Developmental Systems**
    - SecuraPlane--SouthWest (STC pending)
    - MicroSafe--developmental system
    - CeaseFire--developmental system
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**GAO Appendix: Repair Stations**

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- **Repair Stations capable of installation include**
    - Major airlines (American, Continental, Delta, FedEx, Northwest, TWA, United)
    - National airlines (Aloha, Evergreen)
    - Manufacturers (Boeing, Lockheed)
    - Independent stations (TRAMCO, TIMCO)
  - Regional airlines also operate repair stations that **may have the capability for installation.**
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SCOPE AND METHODOLOGY

To determine the status of FAA's and the industry's efforts and timetable, we obtained information on the rulemaking and certification processes from FAA and discussed completed certification efforts with a representative from FAA's Aircraft Certification Office in Atlanta, Georgia. We also discussed the certification efforts with representatives from the airlines that were involved in the process.

To determine the aircraft manufacturers' plans to provide technical guidance, we met with officials from the Boeing Commercial Airplane Group in Seattle, Washington, and Douglas Products Division of Boeing in Long Beach, California. We also contacted U.S. representatives of internationally based aircraft manufacturers.

To determine the status of airlines' plans for installation of smoke detection and fire suppression systems, we obtained information from selected airlines about their retrofit programs and the extent to which they had planned for installation of the equipment. Affected aircraft operated by these airlines account for almost three-quarters of FAA's estimate of all affected aircraft.

To identify the major factors that could affect the timetable for installation of the equipment, we interviewed industry representatives from the National Transportation Safety Board, the Air Transport Association, and the Regional Airline Association, as well as other aviation industry associations.

To determine the capacity of smoke detection and fire suppression system manufacturers, we visited facilities of current industry suppliers and contacted representatives from suppliers that were developing new technologies.

To determine the capacity of the industry to install the retrofit systems, we discussed installation plans with (1) officials at the selected airlines that intended to retrofit some or all of their aircraft in-house and (2) representatives from two major independent repair stations certified to perform a comprehensive range of aircraft maintenance and modifications.

To determine whether limitations on the use and availability of halon would affect the retrofit program, we discussed those issues with an official from the Environmental Protection Agency and officials from FAA's William J. Hughes Technical Center.

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