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14 CFR Part 25

Airplane Cabin Fire Protection; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

[14 CFR Part 25]

[Docket No. 25774; Amendment No. 25-74]

RIN 2120-AB22

Airplane Cabin Fire Protection

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This amendment provides improved cabin fire protection for transport category airplanes by requiring: (1) Each lavatory in an airplane with a passenger seating capacity of 20 or more to be equipped with a smoke detector system that provides warning to the cockpit or to the passenger cabin crew; (2) each lavatory trash receptacle in an airplane with a seating capacity of 20 or more to be equipped with a fire extinguisher that discharges automatically upon the occurrence of a fire within the receptacle; (3) the number of hand fire extinguishers in the cabins of airplanes with passenger seating capacities greater than 200 to be increased; (4) a specified number of the hand fire extinguishers in the cabin to contain Halon 1211 or equivalent as the extinguishing agent; and (5) one hand fire extinguisher in each galley that is located above or below the passenger compartment. In addition, one hand fire extinguisher would be required for certain all-cargo airplanes. These safety protections against possible inflight fires are currently required for operation of airplanes used in air carrier or commercial service. This amendment adopts these requirements as design standards for transport category airplanes.

EFFECTIVE DATE: May 16, 1991.

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SUPPLEMENTARY INFORMATION:

Background

These amendments are based on Notice of Proposed Rulemaking No. 89-1 (54 FR 1292, January 12, 1989). As discussed in the notice, they are the latest in a series of FAA actions to enhance cabin fire safety in transport category airplanes.

Following an inflight fire which originated in a lavatory area, the FAA issued four Airworthiness Directives (AD) to require specific improvements in cabin fire protection. Airworthiness Directive 74-08-09 (39 FR 12998, April 10, 1974), applicable to all transport category airplanes, requires 1,000 hour periodic inspections and repairs, as necessary, of all lavatory trash receptacles to ensure fire containment capability. It also requires preflight briefings informing passengers not to smoke in lavatories, and the installation of ashtrays near lavatory entrances and no-smoking signs on each side of the lavatory doors. Subsequent to issuance of the AD, § 25.853 of the Federal Aviation Regulations (FAR) was amended to incorporate these requirements for ashtrays and no-smoking signs. Section 121.571 of the FAR was adopted to require that passengers be given briefings regarding smoking. Three additional AD's, 74-21-03 (39 FR 36466, October 10, 1974), 75-02-04 and 75-02-05 (39 FR 13555, January 24, 1975), were issued for specific airplane models, requiring inspection and repair of lavatory electrical components and modification of lavatory trash receptacles to ensure fire containment. Together, the AD actions were intended to eliminate likely ignition sources, end smoking in lavatories, and provide fire-safe trash receptacles in the event that fire occurs in a receptacle despite these precautions.

In addition to the AD actions, an FAA-contracted study was conducted to consider the feasibility of a totally integrated cabin fire management system. This study included analysis of fire-related accident and incident data taken over a 10-year period, a survey of available technology, and analysis of fire detection, monitoring and extinguishing options for all areas of a typical wide-body passenger cabin. The results of this study are contained in DOT Report No. FAA-RD-76-54, Feasibility and Tradeoffs of a Transport Fuselage Fire Management System, dated June 1976, which may be purchased from the National Technical Information Service (NTIS), Springfield, Virginia 22151. While the study did provide useful data concerning fire protection, the FAA did not require adoption of the integrated system at the time because the AD actions were considered to have provided adequate fire protection.

Subsequent to the AD actions, there were two cabin fires that indicated that additional measures were needed to enhance protection against such fires. One of the fires occurred in flight near Cincinnati, Ohio, on June 2, 1983, and resulted in 23 fatalities. The other occurred on the ground at Tampa International Airport in Florida on June 25, 1983, and resulted in evacuation of the airplane with no injuries or loss of life. Following the fires, the FAA conducted an inspection survey of the fire containment capabilities of lavatory trash receptacles in the U.S. air carrier fleet. The survey was conducted to determine the effectiveness of previous FAA actions to correct deficiencies in fire protection and to determine whether or not those corrective actions provide adequate fire safety. The survey revealed that the fire containment capabilities of trash receptacles were compromised by the wear and tear typical of service.

In regard to extinguishment of inflight cabin fires, § 25.851 currently specifies that one conveniently located hand fire extinguisher must be provided for each airplane with a passenger capacity of 7 through 30; two must be provided for each airplane with a passenger capacity of 31 through 60; and three are required for each airplane with a passenger capacity of 61 or more. Those standards were adopted in 1956 when the largest airplanes in service had passenger capacities of fewer than 100, and those under development were not expected to exceed 200 passengers. Since that time, the size of commercial transport category airplanes has increased dramatically. For example, certain versions of the Boeing 747 have been type certificated under part 25 for a maximum of 660 passengers. Service experience has shown that three extinguishers are insufficient for large transport airplanes; and, as a matter of practicality, most operators of the large transport airplanes have installed more than three extinguishers in such airplanes.

The FAA also conducted cabin fire extinguishing tests using various types of hand extinguishers. Those tests demonstrated that for a fire in a large airplane cabin, extinguishers containing Halon 1211 (bromochlorodifluoromethane, $CBrC_1F_2$) are safe from the standpoint of toxicity, and far more effective in range and knockdown capability than other extinguishers currently in service. The results of the tests are contained in DOT Report No. DOT/FAA/CT-82-111, Inflight Aircraft Seat Fire Extinguishing Tests (Cabin Hazard Measurement), dated December 1982. A copy of this report has been placed in the Rules Docket and is available for inspection. It, too, may be purchased from NTIS. Halon 1211 extinguishers have their

greatest effectiveness on Class B and C fires; however, those with 9 pounds or greater capacity are also rated for Class A fires. (Fire Classes A through D are ordinary combustible materials, flammable fluids, electrical equipment and burning metal, respectively. They are defined in more detail in the National Fire Protection Association Standard 10.) Halon 1211 extinguishers are not to be used for Class D (burning metal) fires. Although not rated for Class A fires, such extinguishers with less than 9 pounds capacity have been shown to be effective in extinguishing surface Class A fires. Halon 1211 extinguishers are especially useful for combatting flammable fluid fires, such as those that might be caused by terrorist activities.

In view of the above, the FAA adopted Amendment 121-185 (50 FR 12726, March 29, 1985) applicable to airplanes used in air carrier or commercial service under the provisions of part 121 of this chapter. This amendment requires the following to be installed: (1) A smoke detection system, or equivalent, in each lavatory prior to October 30, 1986; (2) a built-in fire extinguisher for each lavatory disposal receptacle prior to April 30, 1987; (3) additional hand fire extinguishers for airplanes with passenger seating capacities of 30 or fewer and 60 or more prior to October 30, 1985; and (4) at least two of the required hand fire extinguishers to contain Halon 1211, or equivalent, as the fire extinguishing agent prior to April 30, 1986.

Discussion

Although Amendment 121-185 provides improved cabin fire protection for transport category airplanes used in air carrier service, it does not apply to other transport category airplanes, such as those used for executive transportation. As discussed in Notice 89-1, mandatory retrofit of other airplanes to incorporate these improvements is not considered justifiable from an economic standpoint; however, it does appear that such improvements are warranted for future transport category airplanes. Accordingly, Notice 89-1 proposed to amend part 25 of the FAR to require these improvements for airplanes for which application for type certification is made after the effective date of the amendment. In addition, Notice 89-1 also proposed to amend part 21 to require these improvements for all transport category airplanes manufactured after a date one year after the effective date of the amendment, regardless of when the application for type certificate was made. The compliance time of one year is necessary for airplanes not already required to comply under the provisions of part 121 to provide sufficient time in which to make the necessary design changes, procure the required materials and parts, and introduce the modifications into production.

Notice 89-1 also proposed to amend § 25.851 to require additional extinguishers for the passenger compartments of airplanes with passenger capacities greater than 200. These changes would make part 25 consistent with part 121 in that regard. (Both parts 25 and 121 currently require the same number of extinguishers for passenger capacities of 61 through 200.) The maximum capacity presently envisioned is 700. Should larger airplanes be presented for certification in the future, additional standards in the form of special conditions may be warranted. Similarly, additional standards may be warranted for airplanes with nonstandard interior arrangements in which the minimum number of extinguishers does not provide ready access to an extinguisher in each area of the cabin.

As noted above, Halon 1211 has demonstrated superior performance in combatting cabin fires, particularly surface fires. As proposed in Notice 89-1, some of the required hand fire extinguishers would have to contain this agent or an equivalent agent. For an airplane with a passenger capacity that is more than 30, but fewer than 61, at least one of the two required passenger compartment extinguishers would have to contain Halon 1211, or an equivalent agent. For an airplane with a larger passenger capacity, at least two of the required passenger compartment extinguishers would have to contain Halon 1211, or an equivalent agent.

Section 25.851 currently specifies that a readily accessible hand fire extinguisher must be available for use in each Class A or Class B cargo or baggage compartment. Although Class E compartments are not required to be accessible to crewmembers in flight, many are, in fact, accessible. Notice 89-1 proposed to amend § 25.851 to require a readily accessible hand fire extinguisher for any Class E compartment that is accessible in flight. In addition, a hand fire extinguisher would be required for each galley located above or below the passenger compartment because the extinguishers located in the passenger compartment are not readily available at those locations.

If taken literally, § 25.851(b), relating to built-in fire extinguishers, states that the requirements of that paragraph concerning potential hazards to occupants do not apply to fire extinguishment systems which are installed in addition to those required by the minimum standards of part 25. Whether a fire extinguishment system installed in an airplane is required by the regulations or is installed on a voluntary basis is obviously irrelevant insofar as such potential hazards are concerned. As proposed, § 25.851(b) would be changed to correct this error. In addition, minor changes were proposed in the format of § 25.851 which are clarifying in nature only.

Notice 89-1 proposed a new § 25.854 which would require the lavatories of transport category airplanes to be equipped with smoke detectors and have increased fire extinguishment capabilities. While lavatories have a lower smoke and fire incidence rate than galleys, the need for fire detection in lavatories is greater for several reasons. They are more often unattended, they are closed from view by a door, and they contain ventilation systems designed to keep odors, and thus sensory smoke detection, away from the passenger cabin. In addition, galleys are generally occupied only by trained flight attendants. Lavatories, on the other hand, are frequented by the general traveling public, some of whom may not be conscious of the hazards of smoking in the lavatory. As part of the smoke detector system, a warning light would be required in the cockpit, or a warning light or audible warning would be required in the passenger cabin which provides a clear and unmistakable signal, readily detectable by a flight attendant, taking into consideration the positioning of flight attendants throughout the flight. Because the lavatory smoke detectors would serve to enhance the present capability of the crewmembers to detect fires visually in the lavatory and would not serve as primary detection systems, such as those used in isolated cargo compartments, it would be unnecessary for the detectors to meet all of the performance and environmental requirements in Technical Standard Order (TSO) No. C1b, which are now applicable to the type of primary detectors used in isolated cargo compartments. Service experience has shown that nearly all lavatory fires are detected by cabin personnel early enough to allow prompt control and extinguishment. Thus, a commercially available smoke detector, such as the type commonly used in residential buildings, which is demonstrated to serve its intended function as installed,

could be considered adequate under the proposals of Notice 89-1.

As also proposed in Notice 89-1, lavatory trash receptacles would be equipped with automatic fire extinguishers. These could be small extinguishant-charged bulbs with thermal fuse plugs, as are currently used in trash receptacles in a number of transport airplanes.

The lavatory smoke detectors and automatic fire extinguishers would be required in addition to the fire containment capability currently required for lavatory trash receptacles because, as indicated by the inspection survey referenced earlier, fire containment capability is subject to deterioration in service, and measures of fire protection in addition to those taken by AD action may be necessary. The automatic fire extinguishers would counter a fire as quickly as possible at its inception and would be a practicable means of keeping response time to a minimum, which is a key principle of fire protection in general. The smoke detectors would be a necessary complement to the extinguishers to enable crewmembers to detect a fire quickly and determine if additional actions, such as use of hand extinguishers, are necessary to control the fire and prevent rekindling. The requirement for trash receptacle fire containment capability would be retained since containment capability, degraded or not, delays the propagation of fire and provides a needed incremental measure of fire protection.

The cabin fire safety improvements proposed in Notice 89-1 would apply to transport category airplanes in general, including the smaller airplanes designed specifically for executive transportation, regardless of how they are used. It must be noted, however, that the executive airplanes do not typically have passenger capacities great enough for those airplanes to be affected by the proposals to increase the number of hand fire extinguishers in airplanes and to use Halon-filled extinguishers.

Discussion of Comments

Ten commenters representing aircraft manufacturers, operators, airline employees, and individuals responded to Notice 89-1. In addition, the National Transportation Safety Board (NTSB) provided comments. Most commenters generally support the proposed rulemaking; however, some question certain provisions of the proposed new standards.

One commenter is particularly distressed that the FAA proposes to amend Part 25 to require the use of Halon 1211 or equivalent as a fire extinguishing agent in airplanes with more than 30 passengers. The commenter expresses the belief that the use of Halon and other chemicals is depleting the ozone layer of the earth and states, "Let's not destroy the world in order to save a few." The FAA is aware that protection of the atmosphere is an international concern; however, it must be recognized that the FAA does not now have an acceptable option and that the saving in human lives currently outweighs the possible minor impact Halon would have on the ozone layer. It must also be recognized that no additional Halon would be released into the atmosphere as a result of this rulemaking because airplanes operated under the provisions of part 121 are already required to have Halon-filled extinguishers. In that regard, the FAA does not anticipate that there will be future airplanes with passenger capacities greater than 30 that will not be operated under the provisions of part 121 or equivalent foreign standards.

Nevertheless, the FAA is aware that the availability of Halon 1211 and 1301, the primary agents for aircraft cabin fire extinguishers, may be limited in the future. In view of that possibility, and the fact that alternative agents might be more acceptable from an environmental standpoint, the FAA is initiating a study to determine the impact decreased availability of Halon will have on civil aviation and to evaluate the effectiveness of alternate agents. Should other, viable agents be developed, their use in lieu of Halon would be permissible because the proposed rule specified "Halon 1211 or equivalent." Until such time as suitable alternate agents are developed, the reality of airplane cabin fires and their potential consequences cannot be ignored. The continued use of Halon to combat an airplane cabin fire is essential.

In this regard, two other commenters suggest that the FAA define more clearly what is meant by "Halon 1211 or equivalent." Equivalent, as used in this context, means having equal or superior capability to combat the types of fires that would be expected to occur in an airplane cabin while not presenting a hazard to the occupants of the cabin. As with any finding of equivalency in type certification, it is the responsibility of the applicant to show that an alternate agent is equivalent to Halon 1211. The FAA study of alternate agents will, no doubt, be of considerable assistance to applicants in this regard.

Proposed § 25.851(a) (2) and (4) would require at least one hand fire extinguisher in the pilot compartment and in each galley located above or below the passenger compartment. One commenter believes that it may not be clear that those extinguishers are in addition to those required to be evenly distributed in the passenger compartments. Subparagraph (2) specifically refers to "the pilot compartment," and subparagraph (4) specifically refers to "galleys located above or below passenger compartments." Since subparagraph (1) refers to fire extinguishers located in passenger compartments, it does not appear that there could be any doubt that the extinguishers required by subparagraphs (2) and (4) are in addition to those required by subparagraph (1).

As noted above, § 25.851(b) states that the requirements of that paragraph do not apply to fire extinguisher systems which are installed in addition to those required by the minimum standards of part 25. As further noted above, whether a fire extinguishment system is installed on a voluntary basis is irrelevant insofar as potential hazards to the occupants are concerned. A change to correct this error was, therefore, proposed in Notice 89-1. In the meantime, the substance of this proposal was adopted through separate rulemaking as part of Amendment 25-72. One commenter correctly notes, however, that the proposed change would create another error by requiring voluntarily-installed systems to meet the performance requirement of § 25.851(b)(1) as well those of § 25.851(b)(2) pertaining to potential hazards to the occupants. Although the substance of the proposal has already been adopted, the comment is well taken. Section 25.851(b) is, therefore, further changed to clarify that voluntarily-installed systems must comply only with the requirements pertaining to potential hazards to the occupants.

Four commenters, including the NTSB, responded in regard to the applicability of the proposed new standards to the smaller transport category airplanes typically used for executive transportation.

The NTSB fully supports the proposed installation of automatic fire extinguishers in lavatory waste receptacles and lavatory smoke detectors in such airplanes. The NTSB believes that whether these lavatories are used by the general public is not an issue, especially in airplanes where, according to the NTSB, an undetected lavatory fire could spread rapidly to smaller cabins that have executive type furnishings. The NTSB did not provide any information to support this belief.

Three other commenters present views in opposition to those of the NTSB. One states that, to the

commenter's knowledge, there is no record of any accident of this nature in such airplanes. The commenter believes that the lack of adverse service experience is due to three factors. First, the small cabin size, according to the commenter, enables the cabin attendant (if any), the flight crews or the passengers to easily and quickly detect and extinguish any fire. Second, passengers in such airplanes are generally more familiar with aircraft systems and safety features. This would enable them to resolve emergencies involving lavatory fires successfully. Third, the maintenance of such airplanes is usually performed on a single field by a few mechanics and technicians who are very familiar with the airplane. They are thus able to detect any fire-safety problems in the lavatory area and the fire protection devices during each nearly daily visit of the airplane. In view of the above, the commenter does not believe that lavatory smoke detectors and trash receptacle fire extinguishers are warranted for airplanes with fewer than 20 passengers.

Another commenter presents similar views. That commenter notes that each passenger is only steps away from the lavatory, enabling quick detection of a lavatory trash receptacle fire by means of smell and visible smoke sighting. Once the fire is detected, the commenter notes that each passenger is within easy reach of the cabin hand-held fire extinguisher and can quickly act to extinguish any fire that might have occurred. Similarly, according to the commenter, a member of the flightcrew or a cabin attendant (if any) can also utilize the cabin and cockpit fire extinguishers to extinguish a lavatory trash receptacle fire within seconds after it is detected. That commenter also notes the frequent maintenance performed by the same persons who are intimately familiar with the airplane, and the fact that the typical passengers in such airplanes are more familiar with the safety features than those traveling aboard commercial airplanes. In regard to passenger familiarity, the commenter states that most passengers in executive airplanes know the exact location and are familiar with the operation of the fire fighting equipment installed in the airplanes. According to the commenter, the passengers of such airplanes are also often familiar with the crewmembers and can quickly interact with them to quickly resolve any in-flight or ground emergency involving a lavatory fire. This commenter also believes that the lavatory smoke detectors and trash receptacle fire extinguishing systems should be limited to airplanes with 20 or more passenger seats.

Another commenter believes that airplanes with 15 or fewer seats should be excluded from the proposed requirement that the lavatory smoke detector provide warning in the cockpit or in the cabin where it would be readily detected by a flight attendant. In this regard, the commenter states that the relatively small size of these airplanes would allow anyone seated in the passenger cabin and, in some cases, the cockpit to hear a loud smoke alarm alert sounding in any lavatory.

The FAA has carefully weighed the arguments of the commenters. While none of the four commenters have presented studies or other concrete evidence in support of their positions, the FAA is persuaded that the recommendation of the NTSB is not necessary to maintain an adequate level of safety in smaller transport category airplanes. Section 25.854, therefore, applies only to airplanes with passenger capacities of 20 or more.

Almost all of the larger transport category airplanes must meet the new cabin fire safety standards in order to be eligible for operation under part 121; therefore, the primary purpose of the proposed amendment to part 21 was to require airplanes designed for use as executive transports (commonly referred to as business jets) to meet the new cabin fire safety standards. The largest of these, the Canadair CL-600, Gulfstream G-IV and Dassault Falcon 50, have 19 or fewer passenger seats. Since it has been determined that airplanes with 19 or fewer passenger seats need not meet these new standards, the proposed change to part 21 is no longer necessary.

Although it has been determined that airplanes with 19 or fewer passenger seats need not meet the new standards, the FAA plans to review the service experience of airplanes with 20 to 30 passenger seats used by air taxi or commercial operators under the provisions of part 135. If it is determined that a significant improvement in safety could be realized, the FAA will propose an amendment to part 135 that would require lavatory smoke detectors and lavatory trash receptacle fire extinguishers in those airplanes.

The NTSB also believes that the existing regulations for cabin crewmember protective breathing equipment should be required for newly manufactured and in-service turbine transport category airplanes operated under the provisions of part 91. Presumably the NTSB is referring to the existing requirements of part 121 for airplanes used in air carrier service. Amending part 91 to extend this requirement to non-air carrier airplanes would be beyond the scope of Notice 89-1 and cannot be considered in conjunction with this rulemaking. The FAA is, however, reviewing the need for crewmember protective breathing equipment. Any changes in that regard would be proposed in a separate Notice of Proposed Rulemaking.

Another commenter suggests that the numbers of hand fire extinguishers required in the cabin should be changed to be consistent with recommendations contained in National Fire Protection Association (NFPA) Standard 408. Generally, the NFPA recommends one or two additional extinguishers for the various passenger capacity ranges. NFPA does, however, recommend one fewer extinguisher (seven) for an airplane with a passenger capacity of 601 or more. The commenter failed to note that Standard 408 also differs in a number of other respects, such as the permissible types of extinguishing agents, etc. Furthermore, Standard 408 was developed six years ago, and it does not take into account other cabin fire-safety measures that have been adopted since that time. For example, part 121 requires automatic fire extinguishers in lavatory trash receptacles; and, as a result of this rulemaking, part 25 will also require such extinguishers. The number of extinguishers specified in Notice 89-1 and Standard 408 are, therefore, not directly comparable. Taking Standard 408 in its entirety, the FAA determined that it would not provide an acceptable level of safety for transport category airplanes. In the absence of information to the contrary, the FAA considers the numbers proposed in Notice 89-1 to be sufficient.

The commenter also suggests that, when the distances between extinguishers exceed 60 feet, no travel distance to an extinguisher should exceed 30 feet. Presumably the commenter is referring to the distance from one extinguisher to the nearest other extinguisher and to the distance a flight attendant would have to traverse to reach the nearest extinguisher, respectively. The FAA does not concur with that suggestion; the need to locate hand fire extinguishers adjacent to the potential sources of fires, e.g., galleys for example, far outweighs the commenter's concern about distance between extinguishers or the distance that a flight attendant would have to traverse to reach an extinguisher. As noted above, additional standards may be

warranted for airplanes with nonstandard interior arrangements in which the minimum number of extinguishers does not provide ready access to an extinguisher in each area of the cabin. Such additional standards would be developed on an airplane-by-airplane basis in the form of special conditions.

The same commenter suggests that the standards for lavatory smoke detectors should be equal to or better than those of detectors required in cargo compartments. In that regard, the commenter notes instances in which smokers are alleged to have disabled the detectors in order to smoke illicitly in the lavatory. As noted above, the lavatory smoke detector is intended only to enhance the existing capability of crewmembers to detect a fire in the lavatory visually. Unlike those in cargo compartments, it does not serve as the primary detection system; therefore, there is no need for it to meet the performance standards for cargo compartment detectors.

The commenter also suggests that each lavatory should be equipped with a placard clearly indicating that smoking in the lavatory is prohibited and that the internationally understood graphic symbols should be used so that the placard will be understood by persons regardless of their native language. Section 25.853(f) currently requires "No Smoking" placards conspicuously located on each side of the lavatory entry door, and the use of acceptable symbols in lieu of the words "No Smoking" is permitted under the equivalent safety provisions of § 21.21. The commenter failed to show that the present requirement of § 25.853(f) is inadequate to inform the travelling public that smoking in lavatories is prohibited.

Proposed § 25.851(a) specified that eight hand fire extinguishers would be required for airplane passenger capacities of 601 or more. It was noted in the preamble, however, that the maximum capacity presently envisioned is 700 and that additional standards, in the form of special conditions may be warranted if larger airplanes are presented for certification. In order to preclude confusion in that regard, § 25.581(a) specifies that eight extinguishers are required for airplanes with passenger capacities of 601 through 700.

Except as noted above, part 25 is amended as proposed in Notice 89-1.

Regulatory Evaluation

This section summarizes a full regulatory evaluation of the subject rule prepared by the FAA which provides more detailed estimates of the economic consequences of this regulatory action. The full evaluation has been placed in the docket. It quantifies, to the extent practicable, estimated costs to the private sector, consumers, Federal, State, and local governments, as well as anticipated benefits and impacts.

Executive Order 12291 dated February 17, 1981, directs Federal agencies to promulgate new regulations or modify existing regulations only if the potential benefits to society for the regulatory change outweigh the potential costs. The order also requires the preparation of a regulatory impact analysis of all "major" rules except those responding to emergency situations or other narrowly defined exigencies. A "major" rule is one that is likely to result in an annual effect on the economy of $100 million or more, a major increase in consumer costs, a significant adverse effect on competition or that is highly controversial.

The FAA has determined that this final rule is not "major" as defined in the executive order; therefore, a full regulatory analysis, which includes the identification and evaluation of cost-reducing alternatives to the rule, has not been prepared. Instead, the agency has prepared a more concise document termed a regulatory evaluation which analyzes only this rule without identifying alternatives. In addition to a summary of the regulatory evaluation, this section also contains a trade impact assessment, and a regulatory flexibility determination required by the Regulatory Flexibility Act of 1980.

Benefit/Cost Analysis

The subject changes to part 25 are essentially the same as the modifications to part 121 (in 1985) previously discussed. Since the majority of part 25 airplanes are operated under part 121, additional costs attributable to the amendments are not significant. Two categories of part 25 airplanes will be affected: (1) Those with 20–30 passenger seats operated by regional air carriers under part 135, and (2) those with 20 or more passenger seats operated by private persons or entities under part 125. The only requirements of the rule relevant to these airplanes are those pertaining to lavatory fire protection. The requirements for additional fire extinguishers in the cabin or galley and for a specified number of Halon-containing extinguishers in airplanes with 31 or more seats will not affect the two operating types of part 25 airplanes specified above. Since only five larger part 25 airplanes (i.e., those usually purchased by air carriers operating under part 121) were sold to private non-airline users (operating under part 125) during the last 10 years, the FAA assumes that few, if any, of these airplanes will be sold during the period under analysis. Nevertheless, these larger airplanes are manufactured according to the specifications of part 121 operators and will likely already include the relevant fire protection devices. Consequently, there will be no additional costs incurred or benefits accrued with respect to the larger part 25 airplanes.

The benefits attributable to the smoke detector and trash receptacle fire extinguisher amendments are the prospective reductions in fatalities, injuries and property damage resulting from fires originating in the lavatories of the airplane subject 'to these amendments. In consideration of the inherent uncertainty in predicting the types and numbers of new airplanes that will be type certificated under part 25 in the future, this analysis compares benefits with costs on a per-airplane basis. This method results in a relevant presentation of this relationship between benefits and costs while avoiding prediction of the types and numbers of new airplanes that will be certified in the future.

Benefits

To determine the benefits which will result from preventing a catastrophic fire accident, it is necessary to estimate the average losses expected to be associated with that accident. Only those in-flight fires believed to have originated in the lavatory are relevant to this analysis. There have been two major lavatory fire accidents in worldwide operations which meet this criterion in the last 17 years (1973–1990)—the Varig Boeing 707 at Paris, France, in July 1973, and the Air Canada DC-9 fire at Cincinnati, Ohio, in June 1983. Although these accidents involved larger part 25 airplanes, the FAA believes that similar types of accidents are as likely to occur on the smaller part 25 airplanes, given a nearly equivalent number of passengers per lavatory and essentially the same opportunity for lavatory fires to go undetected. The two accidents suggest an average historical rate of two catastrophic lavatory fire accidents during a 17 year period (1973–1990).

There were 6,340 part 25 airplanes with 20 or more passenger seats in worldwide operations per year, on average, during the period; consequently, there were .000315 (2 divided by 6, 340) catastrophic lavatory fires per airplane in 17 years of operation. Therefore, the FAA

postulates that each future part 25 airplane affected by the rule would, in its absence, have a .000315 chance of experiencing a catastrophic lavatory fire during a comparable future 17 year period (1996–2012 in this analysis—this assumes a lead time of 5 years prior to production).

The losses associated with future in-flight lavatory fires are estimated by applying the average relative incidence of fatalities, injuries, and airplane losses of the two historic accidents to the types of airplanes subject to this rule. Given comparable occupancy levels in the two airplanes involved in the specified accidents, the average fatality rate was 75 percent, the serious injury rate was 3.25 percent, and the equipment loss was 100 percent. For airplanes affected by this rule, the FAA predicts an average capacity of 24 passengers and an average load factor of 50 percent. Allowing for two crewmembers, 14 persons are assumed to be on board the typical smaller part 25 airplanes affected by this rule. Thus, absent the rule, 10.5 fatalities (75 percent × 14), .5 serious injuries (3.25 percent × 14), and one destroyed airplane could be expected in each major lavatory fire accident.

In order to provide the public and government officials with a benchmark dollar comparison of the expected safety benefits and estimated costs of rulemaking actions over an extended period of time, the FAA currently uses a value of $1,500,000 to statistically represent a human fatality avoided (in accordance with guidelines issued by the Office of the Secretary of Transportation dated June 22, 1990). An average serious injury avoided is valued at $640,000. Thus, for each accident avoided during the 1996–2012 period of analysis, there are $15,750,000 ($1,500,000 × 10.5) in expected benefits from preventing fatalities and $320,000 ($640,000 × .5) in expected benefits from preventing serious injuries. A part 25 airplane with 24 seats is estimated to cost about $3,500,000; if the airplane is destroyed halfway through its economic life, the loss will be $1,750,000. Therefore, the average expected benefit realizable for each prevented accident is $17,820,000 ($15,750,000 + $320,000 + $1,750,000). Multiplying this benefit per avoided accident by .000315 (the historic accident rate per airplane per 17 years, as discussed above) results in a benefit of $5,620 per airplane. Discounting this value as a uniform series over the 17 year period of analysis (to allow for the random nature of such accidents) at the 10 percent interest rate prescribed by OMB yields a 1990 present value benefit of $1,645 per airplane in 1990 dollars.

The actual benefit realized will depend, among other factors, on the effectiveness of each protection device in preventing an accident. If the fire protection devices prove to be completely effective, this average benefit is expected to be realized. The FAA assumes, however, that neither device will be fail-safe. In certain circumstances, if smoke does not flow upwards, the smoke detector might not be activated; and the waste receptacle extinguisher might be misaligned, thus affecting its operation. Consequently, the FAA assumes that both the smoke detector and waste receptacle extinguisher will be 80 percent effective in preventing a catastrophic fire.

Total realizable benefits are allocated between the lavatory smoke detector and the automatic fire extinguisher in the lavatory trash receptacle according to the proportion of time each protection device can be expected to prevent a major lavatory fire from developing. Based on a review of Service Difficulty Reports (SDRs) and the FAA Accident/Incident Data System, the FAA believes that of all potential fire accidents expected to originate in the lavatory, 55 percent will be prevented by the smoke detector and 45 percent by the trash receptacle fire extinguisher.

Therefore, the benefits of the smoke detector are estimated to be $725 per airplane ($1,645 per airplane times 80 percent effectiveness times 55 percent relevancy factor), and the benefits of the trash receptacle fire extinguisher are estimated to be $595 per airplane ($1,645 per airplane times 80 percent effectiveness times 45 percent relevancy factor).

Costs

The FAA assumes that the typical affected part 25 airplane will be equipped with one lavatory. Because the lavatory smoke detector will serve essentially as a backup to flight attendants and not as a primary detection system such as that used in isolated cargo compartments, it will not have to meet all of the requirements of a technical standard order applicable to a primary detector. A commercially available smoke detector, such as the type commonly used in residential buildings, has been demonstrated to function properly when installed in an airplane lavatory and will be considered suitable. However, the installation of the unit will likely be more costly in an airplane lavatory than in a building. Additional hardware may be necessary and manufacturers may opt to install the units behind lavatory panels. The FAA estimates the costs of the lavatory smoke detector to be $110 per unit; annual variable costs are expected to be $66 per unit, consisting of $45 in maintenance costs, $10 in additional fuel costs, and $11 in replacement costs. The total present value cost for a lavatory smoke detector is estimated to average $395 per airplane in 1990 dollars.

The costs of a lavatory trash receptacle fire extinguisher, capable of discharging automatically upon the occurrence of a fire, can be estimated in a manner similar to that used to estimate smoke detector costs. Each automatic extinguisher costs $230 including installation. Annual variable costs are expected to be $63, including $30 in maintenance costs, $10 in additional fuel costs, and $23 in replacement costs. The total present value cost of the automatic lavatory fire extinguisher system is estimated to average $455 per airplane in 1990 dollars.

Comparison of Costs and Benefits

As summarized above, the benefits and costs of lavatory smoke detectors are projected to be $725 and $395, respectively, per airplane, yielding a benefit-to-cost ratio of 1.8 to 1. Similarly, the benefits and costs of lavatory trash receptacle automatic fire extinguishers are projected to be $590 and $455, respectively, per airplane, yielding a benefit-to-cost ratio of 1.3 to 1. The combined benefits are $1,315 and the combined costs are $850, yielding a benefit-to-cost ratio of 1.5 to 1.

International Trade Impact Analysis

The rule changes will have little or no impact on trade for both American firms doing business in foreign countries and foreign firms doing business in the United States. In the U.S., foreign manufacturers will have to meet U.S. requirements, and thus will gain no competitive advantage. In foreign countries, American manufacturers will not need to install the new safety features if the foreign country does not require them and, therefore, foreign manufacturers will gain no competitive advantage.

Regulatory Flexibility Determination

The Regulatory Flexibility Act of 1980 (RFA) was enacted by Congress to ensure that small entities are not unnecessarily and disproportionately burdened by Government regulations. The RFA requires agencies to review rules which may have "a significant economic impact on a substantial number of small entities."

The subject rule changes will affect commercial transport category airplanes manufacturers producing new airplanes under part 25. None of these manufacturers is considered to be a small entity in accordance with FAA criteria which classifies a small manufacturer as one with 75 or fewer employees. Therefore, these rule changes will not have "a significant economic impact on a substantial number of small entities."

Federalism Implications

The regulations adopted herein will not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government; therefore, in accordance with Executive Order 12612, it is determined that this final rule will not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

Conclusion

Because the regulations adopted herein are not expected to result in significant costs, the FAA has determined that this is not a major rule as defined in Executive Order 12291. In addition, the FAA certifies that this rule does not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act. Since this regulatory document concerns a matter on which there is substantial public interest, the FAA has determined that this document is significant as defined in Department of Transportation Regulatory Policies and Procedures (44 FR 11034; February 26, 1979).

List of Subjects in 14 CFR Part 25

Air transportation, Aircraft, Aviation safety, Safety.

Adoption of the Amendments

Accordingly, the Federal Aviation Regulations (FAR) 14 CFR part 25 are amended as follows:

PART 25—AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES

1. The authority citation for part 25 continues to read as follows:

Authority: 49 U.S.C. 1344, 1354(a), 1355, 1421, 1423, 1424, 1425, 1428, 1429, 1430; 49 U.S.C. 106(g); 49 CFR 1.47(a).

2. By revising § 25.851 to read as follows:

§ 25.851 Fire extinguishers.

(a) *Hand fire extinguishers.* (1) The following minimum number of hand fire extinguishers must be conveniently located and evenly distributed in passenger compartments:

Passenger capacity	No. of extinguishers
7 through 30	1
31 through 60	2
61 through 200	3
201 through 300	4
301 through 400	5
401 through 500	6
501 through 600	7
601 through 700	8

(2) At least one hand fire extinguisher must be conveniently located in the pilot compartment.

(3) At least one readily accessible hand fire extinguisher must be available for use in each Class A or Class B cargo or baggage compartment and in each Class E cargo or baggage compartment that is accessible to crewmembers in flight.

(4) At least one hand fire extinguisher must be located in, or readily accessible for use in, each galley located above or below the passenger compartment.

(5) Each hand fire extinguisher must be approved.

(6) At least one of the required fire extinguishers located in the passenger compartment of an airplane with a passenger capacity of at least 31 and not more than 60, and at least two of the fire extinguishers located in the passenger compartment of an airplane with a passenger capacity of 61 or more must contain Halon 1211 (bromochlorodifluoromethane $CBrC_1F_2$), or equivalent, as the extinguishing agent. The type of extinguishing agent used in any other extinguisher required by this section must be appropriate for the kinds of fires likely to occur where used.

(7) The quantity of extinguishing agent used in each extinguisher required by this section must be appropriate for the kinds of fires likely to occur where used.

(8) Each extinguisher intended for use in a personnel compartment must be designed to minimize the hazard of toxic gas concentration.

(b) Built-in fire extinguishers. If a built-in fire extinguisher is provided—

(1) Each built-in fire extinguishing system must be installed so that—

(i) No extinguishing agent likely to enter personnel compartments will be hazardous to the occupants; and

(ii) No discharge of the extinguisher can cause structural damage.

(2) The capacity of each required built-in fire extinguishing system must be adequate for any fire likely to occur in the compartment where used, considering the volume of the compartment and the ventilation rate.

3. By adding a new § 25.854 to read as follows:

§ 25.854 Lavatory fire protection.

For airplanes with a passenger capacity of 20 or more:

(a) Each lavatory must be equipped with a smoke detector system or equivalent that provides a warning light in the cockpit, or provides a warning light or audible warning in the passenger cabin that would be readily detected by a flight attendant; and

(b) Each lavatory must be equipped with a built-in fire extinguisher for each disposal receptacle for towels, paper, or waste, located within the lavatory. The extinguisher must be designed to discharge automatically into each disposal receptacle upon occurrence of a fire in that receptacle.

Issued in Washington, DC, on April 4, 1991.

James B. Busey,
Administrator.

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