

Federal Aviation Administration

FAR NPRM

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DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
14 CFR Parts 21 and 25
[Docket No. 25774; Notice No. 89-1]
RIN 2120-AB22
Airplane Cabin Fire Protection

AGENCY: Federal Aviation Administration, DOT
ACTION: Notice of Proposed Rulemaking

SUMMARY: This notice proposes amendments of the Federal Aviation Regulations (FAR) which would provide for improved cabin fire protection for transport category airplanes by requiring: (1) Each lavatory to be equipped with a smoke detector system which provides warning to the cockpit or to the passenger cabin crew; (2) each lavatory trash receptacle to be equipped with a fire extinguisher which 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; and (4) a specified number of the hand fire extinguishers in the cabin to contain Halon 1211 or equivalent as the extinguishing agent. These safety protections are currently required for operation of airplanes used in air carrier service, but not for the full range of transport category airplanes such as those used for executive transportation. This notice also proposes to require each transport category airplane manufactured after a specified date to incorporate these improvements. These proposals are needed to respond to investigations of inflight fires and an inspection survey of the U.S. air carrier fleet, and are needed to increase protection against possible inflight fires.

DATES: Comments must be received on or before July 10, 1989.

ADDRESSES: Comments on this proposal may be mailed in triplicate to: Federal Aviation Administration, Office of the Chief Counsel, Attention: Rules Docket (AGC-204), 800 Independence Avenue SW., Washington, DC 20591, or delivered in triplicate to: Room 915G, 800 Independence Avenue SW., Washington, DC 20591. Comments must be marked: Docket No. 25774. Comments may be inspected in Room 915G weekdays, except Federal holidays, between 8:30 a.m. and 5:00 p.m. In addition, the FAA is maintaining an information docket of comments in the Office of the Regional Counsel (ANM-7), FAA, Northwest Mountain Region, 17900 Pacific Highway South, C-68966, Seattle, Washington 98168. Comments in the information docket may be inspected in the Office of the Regional Counsel weekdays, except Federal holidays, between 7:30 a.m. and 4:00 p.m.

FOR FURTHER INFORMATION CONTACT: Gary L. Killion, Manager, Regulations Branch (ANM-114), Transport Standards Staff, Aircraft Certification Division, FAA, Northwest Mountain Region, 17900 Pacific Highway South, C-68966, Seattle, Washington 98168; Telephone (206) 431-2112.

SUPPLEMENTARY INFORMATION:

Comments Invited

Interested persons are invited to participate in the proposed rulemaking by submitting such written data, views, or arguments as they may desire. Comments relating to the environmental, energy, or economic impact that might result from adoption of proposals contained in this notice are invited. Substantive comments should be accompanied by cost estimates. Commenters should identify the regulatory docket or notice number and submit comments, in triplicate, to the Rules Docket address specified above. All comments will be considered by the Administrator before taking action on the proposed rulemaking. The proposals contained in this notice may be changed in light of comments received.

All comments will be available in the Rules Docket, both before and after the closing date for comments, for examination by interested persons. A report summarizing each substantive public contact with FAA personnel concerning this rulemaking will be filed in the docket. Commenters wishing the FAA to acknowledge receipt of their comments must submit with those comments a self-addressed, stamped postcard on which the following statement is made: "Comments to Docket No. 25774." The postcard will be date/time stamped and returned to the commenter.

Availability of NPRM

Any person may obtain a copy of this NPRM by submitting a request to the Federal Aviation Administration, Office of Public Affairs, Attention: Public Information Center, APA-430, 800 Independence Avenue, SW., Washington, DC 20591, or by calling (202) 267-3484. Communications must identify the notice number of this NPRM. Persons interested in being placed on a mailing list for future NPRM's should also request a copy of Advisory Circular No. 11-2A, Notice of Proposed Rulemaking Distribution System, which describes the application procedure.

Background

This notice is 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 74-06-09 (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, Section 25.853 of the 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, 74-21-09 (39 FR 38486; October 10, 1974), 75-02-04 and 74-02-05 (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 these AD actions, an FAA-contracted study was conducted to consider the feasibility of a total cabin integrated 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 widebody 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, available from the National Technical Information Service (NTIS), Springfield, Virginia 22151. While the study did provide useful data concerning fire protection, features of the integrated system, such as fire detectors, were not adopted 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 which 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. Considering the seriousness of inflight cabin fires, an expanded approach to fire protection was considered necessary.

In regard to extinguishment of inflight cabin fires. Section 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. These standards were adopted in 1956 when the largest airplanes in service had passenger capacities of less than 100, and those under development were not expected to exceed 200 passengers. Since that time, the size of commercial transport airplanes has increased dramatically. For example, certain versions of the Boeing 747 have been 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 currently in service have elected to install more than three extinguishers in such airplanes.

The FAA has also conducted cabin fire extinguishers tests using various types of hand extinguishers. These tests demonstrated that for a fire in a large airplane cabin, extinguishers containing Halon 1211 (bromochlorodifluoromethane, CBrClF₂) 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 these 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. A copy may be purchased from NTIS. Halon 1211 extinguishers have their greatest effectiveness of Class B and C fires; however, those with 9 pounds or greater capacity are also rated for Class A fires. (Fire classes are as defined 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 combating flammable fluid fires, such as those that might be caused by terrorist activities. Under the air carrier airworthiness surveillance program, the FAA issued a general notice (GENOT), dated November 29, 1980, to inspectors and air carrier operators encouraging the voluntary installation of at least two Halon 1211 extinguishers in each airplane.

Subsequent to the above action, the FAA adopted Amendment 121-185 (50 FR 12726; March 29, 1985) applicable to airplanes used in air carrier service under the provisions of Part 121 of this Chapter. This amendment requires (1) the installation of a smoke detection system, or equivalent, in each lavatory after October 29, 1986, (2) a built-in fire extinguisher for each lavatory disposal receptacle after April 29, 1987, (3) additional hand fire extinguishers for airplanes with passenger seating capacities of 30 or fewer and 60 or more after October 29, 1985, and (4) at least two of the required hand fire extinguishers to contain Halon 1211, or equivalent, as the fire extinguishing agent after April 29, 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. Mandatory retrofit of such 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, this notice proposes to amend Part 25 of the FAR to require these improvements for airplanes for which application for type certificate is made after the effective date of the amendment. In addition, Part 21 would also be amended 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.

Section 25.851 would be amended to require additional extinguishers for the passenger compartments of airplanes with passenger capacities greater than 200. (Part 25 currently requires the same number of extinguishers for passenger capacities of 61 through 200 as is now required by Part 121.) The maximum capacity presently envisioned is 700. Should large 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 combating cabin fires, particularly surface fires. Some of the required hand fire extinguishers would, therefore, have to contain this agent or equivalent. For an airplane with a passenger capacity that is more than 30, but less than 61, at least one of the two required passenger compartment extinguishers would have to contain Halon 1211, or equivalent. For an airplane with a larger passenger capacity, at least two of the required passenger compartment extinguishers must contain Halon 1211, or equivalent.

Section 25.851 presently requires one hand fire extinguisher conveniently located in the pilot compartment. This extinguisher is in addition to any extinguisher required for a passenger compartment.

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. While Class E compartments are not required to be accessible to crewmembers in flight, the proposed amendment to Section 25.851 would require a readily accessible hand fire extinguisher for any Class E compartment 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.

Due to an apparent editorial error, Section 25.851(b) currently implies that the requirements of that paragraph 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 potential hazards to the occupants are concerned. Accordingly, Section 25.851(b) would be changed to correct this error. In addition, minor changes are proposed in the format of Section 25.851 which are clarifying in nature only.

This notice proposes a new Section 25.854 which would require transport category airplanes to be equipped with smoke detectors and with increased fire extinguishment capabilities for lavatories, which have been shown by experience to be more critical for fire protection than other areas of the cabin.

Smoke detector systems would be required in lavatories. While lavatories have a lower smoke and fire incidence rate than galleys, they are more sensitive from a fire detection standpoint 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 systems, a warning light would be required in the cockpit, or a warning light or

audio warning would be required in the passenger cabin which provides a clear and unmistakable signal, readily detectable for 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 visually detect fires in the cabin 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.

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.

As proposed, 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 additional measures of fire protection 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 quickly detect a fire 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.

As proposed, the cabin fire safety improvements contained in this notice would apply to transport category airplanes in general, including the smaller airplanes designed specifically for executive transportation. Due to their relatively small size, the executive airplanes would not be affected by the proposals to increase the number of hand fire extinguishers in airplanes with passenger capacities greater than 200 and to use Halon-filled extinguishers in airplanes with passenger capacities greater than 30. Such airplanes would, however, have to comply with the proposed lavatory fire protection requirements. Many of these airplanes have small lavatories with very limited occupant space and small trash receptacles. In addition, the lavatories in these airplanes are not frequented by the general public. Comments are especially requested concerning the need for and the appropriateness of the proposed lavatory fire protection requirements for these airplanes.

Regulatory Evaluation

I. Cost Benefit Analysis

The FAA proposes to amend Part 25 of the FAR to require improved inflight cabin fire protective measures for transport category airplanes for which application for type certification is made after the effective date of the amendment. The proposed amendment would require that (1) each lavatory be equipped with a smoke detector system, (2) each lavatory trash receptacle be equipped with an automatic discharge fire extinguisher system, (3) more hand fire extinguishers be provided in the passenger compartment of airplanes with more than 200 seats, on a ratio of one fire extinguisher per additional 100 seats, and (4) that one or two of the required passenger compartment hand fire extinguishers, as specified, contain Halon 1211 or equivalent as the extinguishing agent. In addition, the FAA proposes to amend Part 21 of the FAR to require each transport category airplane manufactured after (a date one year after the effective date of the amendment) to incorporate the improved inflight cabin fire protective measures, regardless of the date of application for type certificate.

These proposals respond to findings resulting from investigations of inflight cabin fires and an FAA survey designed to determine the effectiveness of fire safety requirements in the current U.S. air carrier fleet. These findings clearly indicate that inflight cabin fire protective measures need to be improved. Similar requirements have recently been adopted for airplanes operated in air carrier service under the provisions of Part 121.

The benefits of the smoke detector and fire extinguisher proposal are the prospective reduction in fatalities, injuries, and property damage resulting from fires originating in the lavatories and other areas in the passenger cabin. Estimating these benefits quantitatively is difficult because of the limited number of inflight cabin fire accidents and the necessity for using judgment in determining the effectiveness of the proposals in dealing with accidents that involve cabin fires. There have been few major cabin fire accidents worldwide; however, when such accidents have occurred, the losses have been catastrophic.

Estimating the benefits, as well as the costs, of the proposals is further complicated by the difficulty of accurately predicting the types and numbers of new or significantly modified airplanes that will be certificated under Part 25 in the future. In this analysis, the FAA, therefore, compares benefits to 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 would be certificated under Part 25.

Because each of the fire protection measures proposed in this notice is currently required under Part 121, air carriers operating under the provisions of Part 121 already have to comply regardless of whether or not these proposals are adopted. The majority of all airplanes type certificated under Part 25 will be operated under Part 121; therefore, few costs would be attributable to the proposals contained in this notice. Nevertheless, the FAA is evaluating the costs of these proposals to demonstrate that these measures are cost beneficial.

Benefits

Only those fires believed to have originated in the passenger cabin are relevant to this analysis. Post-crash fires, flight deck fires, belly cargo fires, fires aboard freighter airplanes, and all other fires that did not originate in the passenger cabin were excluded in establishing this base line. Only two major cabin fire accidents which meet this criterion have occurred in worldwide operations in the last 15 years. They were the Varig Boeing 707 fire at Paris, France, in July 1973, and the Air Canada McDonnell Douglas DC-9 fire at Cincinnati, Ohio in June 1983. Two other fires which could be considered significant were the 1979 Pakistani 707 and the 1980 Saudi Lockheed L-1011. Evidence regarding the origin of the Pakistani 707 fire is not clear; therefore, that accident was discounted for conservatism. The Saudi L-1011 fire is not considered in the analysis because it may have originated in the cargo hold rather than the cabin.

The two accidents considered in this analysis suggest an average historical rate of two catastrophic cabin fire accidents during a 15 year period. Although this historical rate reflects worldwide operations, forecast growth in the activity of U.S. carriers during the future 15-year period considered in this analysis is sufficient to make the exposure of future U.S. air carrier operations comparable to the exposure of historic worldwide operations. An estimate of two catastrophic cabin fire accidents per 15 years has, therefore, been adopted for developing the benefits in this analysis.

To determine the benefits which will result from preventing an accident, it is necessary to estimate the average costs expected to be associated with that accident.

In its FAA Aviation Forecast published in 1987, the FAA predicts that the average number of seats in an airplane used in air carrier domestic operations will be 171 in 1996 which is the midpoint in the 15 year study horizon. The load factor is estimated to be 81 percent and, therefore, the average number of passengers per flight is expected to be 103. Allowing for flight deck and cabin crew, the FAA estimates that an average of 106 persons will be carried on a typical transport category airplane. Note that is a conservative estimate since it does not take into account the greater number of passengers per airplane in international operations.

The FAA estimates fatalities from future inflight cabin fire related accidents by applying the average proportional fatalities from the two historic accidents as follows: the Varig Boeing 707

and the Air Canada DC-9 accidents had fatality rates of 100 percent and 50 percent respectively. Thus, the average fatality rate for these accidents was 75 percent. Applying this rate to the average number of persons aboard a transport category airplane yields an estimated 61 fatalities per accident. For the purpose of analysis, the FAA uses a minimum economic value for a human life of \$1,000,000. This is the accepted minimum value used by economists in government policy analysis. Therefore, the estimated fatality loss is \$61,000,000. An airplane with 171 seats is estimated to cost about \$34,000,000, i.e., \$200,000 per seat. If the airplane is destroyed halfway through its life, the loss is estimated to be \$17,000,000. The total loss to society due to an accident is, therefore, \$98,000,000. Discounting this value as a uniform series over the 15-year period of the airplane to allow for the random nature of such accidents at the 10 percent interest rate prescribed by OMB yields an average accident cost of \$49.7 million. This will be the average benefit realized for every accident prevented by the proposed rulemaking. To calculate the benefits per airplane, the present value of an accident times the number of accidents divided by the number of airplanes in 1996 is calculated. The FAA forecasts that there will be 3990 airplanes in the air carrier fleet in 1996. The average benefits per airplane are, therefore, \$24,900 (two accidents times \$49.7 million per accident divided by 3,990 airplanes).

Given the probability of an accident and the cost associated with that accident, it is necessary to consider the probability that an accident will occur in an area of the cabin where each of the protective measures proposed in this notice would be operative, and should such a fire scenario occur, what would be the effectiveness of a particular protective measure in preventing that accident.

Benefits for lavatory Safety Devices

Developing estimates to the benefits attributable to the lavatory smoke detectors and to the automatic fire extinguishers in the lavatory trash receptacles requires that some allocation be made of those potential future accidents which would be expected to originate in a lavatory. These potential accidents need to be allocated further into those where the smoke detector would be the piece of protective equipment relied upon to prevent the accident, and those that would rely upon the automatic fire extinguisher in the trash receptacle.

In both of the catastrophic accidents cited above, the fire appears to have originated in a lavatory. It would, however, be unrealistic to assume that all catastrophic cabin fire accidents would necessarily originate in lavatories in the future. Service Difficulty Reports (SDR), maintained by the FAA's National Safety Data Branch in Oklahoma City, indicate that only 12.1 percent of in-cabin smoke and fire incidents occur in lavatories. The SDR data indicate that the vast majority of these incidents, 64.3 percent, occur in airplane galleys, and the remaining 23.6 percent occur in other areas of the cabin. Although none of the catastrophic cabin fires experienced to date are believed to have originated outside of a lavatory, some allowance must be made for the possibility that a major cabin fire could originate in one of the locations where 87.9 percent of the smoke and fire incidents historically have occurred. A strong indication of the particularly insidious nature of lavatory fires is, however, that both of the catastrophic accidents experienced to date have originated where a relatively small minority of the incidents occur. This reflects the fact that fires in closed lavatory compartments are more likely to go undetected than in other areas of the cabin.

In the judgment of the FAA, which is based on accident and incident data over a prolonged period of time, the vast majority of fatal cabin fire accidents would originate in lavatories, but some future fatal accidents could be expected to originate in galleys or other areas of the cabin. For purposes of this analysis, FAA assumes that over time an average of 80 percent of all random catastrophic cabin fire accidents would originate in lavatories and the remaining 20 percent would originate elsewhere in the cabin.

Of the two previous accidents involving lavatory fires, the Varig Boeing 707 accident was attributed to a fire originating in the trash receptacle. In its accident report the National Transportation Safety Board does not make a precise determination of the fire's origin. The evidence indicates, however, that (1) the fire propagated through the lavatory vanity, (2) initially the direction of airflow vented smoke overboard and permitted the fire to burn undetected, and (3)

smoke became noticeable in the open area of the lavatory when the fire penetrated the lavatory liner. These findings suggest that approximately half of potential accidents involving lavatory fires would occur where the automatically activating trash receptacle fire extinguishers would be the primary means of defense, and the other half of these potential accidents would occur in other areas of the lavatory where the smoke detector would be the significant defensive measure. The automatically activating fire extinguishers can only be effective, however, if the door of the trash receptacle seals properly; otherwise the extinguishant dissipates, and its fire-suppressant capabilities are lost. The inspection survey, discussed previously, reveals that the fire-containment capabilities of a trash receptacle can become compromised by the wear and tear of typical service. In these instances, the lavatory smoke detector would be the principal piece of equipment in preventing a trash receptacle fire incident from becoming a major accident. Further, a review of the SDR data concerning the fire incidents that have occurred in the lavatory indicates that for every incident originating in the trash receptacle, there are slightly more than two incidents that have originated in other areas of the lavatory. Typically, they are electrical in origin; and frequently involving the flush pump motor. For these reasons, FAA considers that the lavatory smoke detector will be the operative piece of equipment in preventing potential lavatory fires more often than will the trash receptacle extinguisher. The FAA has, therefore, assumed that of the 80 percent of all potential fire accidents expected to originate in the lavatory, an average of 45 percent of all potential accidents will involve the smoke detector as the protective equipment relied upon to prevent a major accident from developing, and only 35 percent of all potential accidents will involve the trash receptacle fire extinguisher.

Estimates must also be made concerning the effectiveness of the particular piece of equipment in preventing an accident in those random combinations of circumstances where all existing safeguards have failed and, in the absence of the proposed preventive measures, a major cabin fire accident would occur. The FAA assumes that, given such circumstances where the lavatory smoke detector would be the relevant device, a catastrophic accident could be averted an average of 50 percent of the time. The FAA assumes that the average effectiveness of the trash receptacle will be 75 percent. The FAA expects the automatic fire extinguisher to be relatively more effective than the smoke detector in those circumstances where it is the primary means of protection because of the simplicity of its operation.

The benefits of a smoke detector would, therefore, be \$5,600 per airplane (\$24,900 in accident avoidance benefits per airplane times 45 percent of the total occurrences times 50 percent of effectiveness), and the benefits of the trash receptacle fire extinguisher would be \$6,500 (24,900 in accident avoidance benefits per airplane times 35 percent of the total occurrences time 75 percent of effectiveness).

Benefits of the Halon 1211 Fire Extinguisher in the Cabin

The potential benefits of the Halon 1211 fire extinguisher proposals have been estimated in a manner similar to the lavatory fire prevention proposals. As stated previously, FAA has assumed that over a prolonged period of time, an average of 80 percent of passenger cabin fires would involve the lavatory, and the remaining 20 percent of potential catastrophic cabin fire accidents would involve either the galley or other general areas of the passenger cabin not previously specified. The FAA estimates that the proportion of potential cabin fire accidents where the Halon 1211 fire extinguishers will be the critical preventive measures will be about 8 percent. The relatively higher proportion allocated to the galley area reflects the fact that the majority of all passenger cabin fire incidents; 64.3 percent, occur in airplane galleys. Further, many airplane galleys are less visible because they are not located on the main deck of the cabin. The remaining portion of potential catastrophic accidents represents fire scenarios where the Halon 1211 extinguisher would be the critical protective piece of equipment. Although the Halon 1211 extinguisher is a state-of-the-art hand fire extinguisher which is effective against all classes of fires, its primary advantage over existing extinguishers is that it is especially effective against fires that involve volatile liquids. Because the Halon extinguishers are typically lighter than the extinguishers they would replace, there would also be a fuel savings that would be sufficient to offset the procurement costs. This offset will be discussed in greater detail in the costs section.

Finally, estimates must be made concerning the effectiveness of the Halon 1211 fire extinguishers when given a situation in which all existing safeguards have failed and the proposed protective measure would be the last line of defense. The FAA has estimated an average effectiveness of 50 percent for this proposal.

The benefits of the Halon 1211 fire extinguishers would be \$990 (\$24,900 in accident avoidance benefits per airplane times 8 percent it being the relevant device times 50 percent its effectiveness).

Costs

As noted above, estimating the costs of the proposal to amend Part 25 is complicated by the uncertainty inherent in predicting the number of new airplane designs that will be type certified in the future, when these airplanes will be type certificated, and how many will be produced. As a result, the costs are estimated on a unit basis. They also have been discounted on the basis of a 15 year life and a 10 percent discount rate. In addition, the expected number of lavatories in newly designed airplanes is assumed to be the same as those in a Boeing Model 767. The Model 767 is used as the prototype of future transport category airplanes because it is considered to be the approximate median size of such airplanes.

Cost of Lavatory Smoke Detectors

The FAA estimates that the cost of installing smoke detectors would be \$50 each, including the cost of the unit itself. The FAA assume that each lavatory would be equipped with its own smoke detector. Such detectors would not have to meet all of the requirements of a technical standard order applicable to primary detection systems because they would serve essentially as backup to flight attendants and not as primary detection systems, such as those used in isolated cargo compartments.

Commercially available smoke detectors of the type commonly used in residential buildings, have been demonstrated to function properly when installed in an airplane lavatory and would be considered suitable for compliance with the proposed standards.

The Model 767 has five lavatories. Thus five lavatory smoke detectors would have to be installed in each airplane, on the average, resulting in a cost of \$250 per airplane. Each additional pound of weight in a transport category airplane is assumed to result in an average additional fuel consumption of 15 gallons per year. Based on a fuel price of 70 cents per gallon, each detectors would result in an average additional cost of about \$3 per year since it would weight about one quarter of a pound. Maintenance costs for the smoke detectors would be \$85 per unit per year, based on an average wage rate of \$40 per hour and a ten percent replacement cost factor for the units. Thus, the average total present value cost per airplane for lavatory smoke detector would be \$3,600 (five units times \$50 per unit, plus five units times \$88 per year variable cost times 7.606 the discount factor for a uniform annual series).

Cost of Automatically Activating Fire Extinguishers

The costs of the proposed lavatory trash receptacle fire extinguishers, which would be capable of discharging automatically upon the occurrence of a fire, have been estimated in a manner similar to that used to estimate smoke detector costs. Each automatic extinguisher would cost \$300 including installation. Thus, an airplane with five lavatories would require five automatic extinguishers at a total cost of \$1500.

The proposed automatic extinguishers weigh about one pound. At the previously stated fuel consumption rate of 15 gallons per pound per year, the automatic extinguishers would require 75 additional gallons per airplane per year. At 70 cents per gallon, the present value fuel cost for these extinguishers would come to \$400, using the 7.606 discount factor.

Maintenance of automatic fire extinguishers is relatively simple, involving only periodic weighing of units to determine if they remain charged. Assuming that each extinguisher would be inspected twice a year, that each inspection would take 20 minutes of labor at \$40 per hour, the present value of labor is \$1000. Units would be expected to be replaced at a yearly rate of 5 percent or an expense of \$75 per year having a present value of \$570. The total of all present

value costs associated with the automatic lavatory fire extinguisher system is, therefore, estimated to be \$3,470 per airplane.

Cost of Requiring Two Halon 1211 Fire Hand Extinguishers in the Passenger Cabin

The FAA considers that this proposal would not result in any additional costs. The Halon 1211 extinguishers would merely replace a like number of other types of extinguishers. The Halon 1211 extinguisher costs about \$40, about the same as the average cost of other types of extinguishers. The Halon 1211 extinguishers are slightly more expensive to maintain than other types of extinguishers since they require an additional \$10 per extinguisher to recharge; however, they are about 3 pounds lighter than other types of extinguishers. As a result, the installation of these extinguishers would generate fuel cost savings which would more than offset the additional maintenance costs.

Comparison of Costs and Benefits

As noted previously, lavatory smoke detectors are estimated to have \$5,600 in benefits per airplane. Since the costs of these detectors would be \$3,600 the benefit to cost ratio would be about 1.6 to 1.

The FAA projects the installation of automatic fire extinguishers in lavatory trash receptacles to generate \$6,500 in benefits per airplane, at a cost of \$3,470. The benefit to cost ratio would, therefore, be 1.9 to 1.

The Halon 1211 proposal is not expected to generate any net costs since the savings in fuel costs from the lighter weight of this extinguisher would more than offset any other costs. The benefits are expected to be \$990 per airplane. This proposal would, therefore have a positive benefit to cost ratio.

The proposal to increase the number of available hand fire extinguishers in relation to increased passenger seats on new airplanes would not generate any additional costs because it is consistent with current industry practices. For the same reason, no additional benefits would result.

International Trade Impact Analysis

The proposals would have little or no impact on trade for both U.S. firms doing business in foreign countries and foreign firms doing business in the U.S. Airplanes imported from foreign manufacturers would have to meet U.S. requirements, and thus would gain no competitive advantage. The proposed safety feature would not have to be installed in airplanes exported to foreign countries by U.S. manufacturers if the foreign country does not require them. Foreign manufacturers would, therefore, gain no competitive advantages in this regard.

II. 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."

All of the rules proposed in this notice would affect the manufacturers of commercial transport category airplanes who would produce new airplanes under Part 25. None of these manufacturers are considered as small entities in accordance with FAA criteria which state that a small manufacturer is one with 75 employees or less. Because these proposals do not have "a significant economic impact on a substantial number of small entities," no review is required in this regard by the RFA.

These proposals are not likely to result in an annual effect on the economy of \$100 million or more, or a major increase in costs for consumers, industry, or Federal, State, or local government agencies. Accordingly, it has been determined that this is not a major regulatory action under Executive Order 12291.

A regulatory evaluation of this action, including a Regulatory Flexibility Determination and a Trade Impact Assessment, has been placed in the regulatory docket, and a copy may be

obtained by contacting the person identified under the caption "FOR FURTHER INFORMATION CONTACT."

Federalism Implications

The regulations set forth in this notice would be promulgated pursuant to authority in the Federal Aviation Act of 1958, as amended (49 U.S.C. 1301 et. seq.) which statute is construed to preempt State law regulating the same subject. Thus, in accordance with Executive Order 12612, it is determined that such regulation does not have federalism implications warranting the preparation of a Federalism Assessment.

Conclusion

For the reasons given earlier in the preamble, the FAA has determined that this is not a major regulation as defined in Executive Order 12291. The FAA has determined that this action is significant as defined in Department of Transportation Regulatory Policies and Procedures (44 FR 11034; February 26, 1979). In addition, it is certified under the criteria of the Regulatory Flexibility Act that this regulation, at promulgation, will not have a significant economic impact, positive or negative, on a substantial number of small entities.

List of Subjects

14 CFR Part 21

Air transportation, Aircraft, Aviation safety, Safety.

14 CFR Part 25

Air transportation, Aircraft, Aviation safety, Safety.

The Proposed Amendment

Accordingly, the FAA proposes to amend Parts 21 and 25 of the Federal Aviation Regulations (FAR), 14 CFR Parts 21 and 25, as follows:

Part 21 -- Certification Procedures for Products and Parts

1. The authority citation for Part 21 continues to read as follows:

Authority: 49 U.S.C. 1344, 1348(c), 1352, 1354(a), 1355, 1421 through 1431, 1502, 1651(b)(2); 42 U.S.C. 1857f-10, 4321 et. seq.; E.O. 11514; 49 U.S.C. 106(g) [Revised Pub. L. 97-449, January 12, 1983.]

2. By amending Section 21.183 by adding a new paragraph (f) to read as follows:

Section 21.183 Issue of standard airworthiness certificate for normal, utility, acrobatic, commuter, and transport category aircraft; manned free balloons; and special classes of aircraft.

* * * * *

(f) Cabin safety requirements. Notwithstanding all other provisions of this section, the provisions of Sections 25.851 and 25.854 of this Chapter in effect on (the effective date of the amendment) must be complied with for the issuance of a standard airworthiness certificate for each transport category airplane manufactured after (a date one year after the effective date of the amendment).

Part 25 -- Airworthiness Standards: Transport Category Airplanes

3. 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) (Revised Pub. L. 97-449, January 12, 1983); 49 CFR 1.47(a).

4. By revising Section 25.851(a), the introductory text of paragraph (b), and paragraph (b)(1), to read as follows:

Section 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	Number 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 or more	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 CBrClF_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 system is provided:
- (1) The capacity must be adequate for any fire likely to occur in the compartment where used, considering the volume of the compartment and the ventilation rate; and

* * * * *

5. By adding a new Section 25.854 to read as follows:

Section 25.854 Lavatory fire protection

- (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 audio warning in the passenger cabin which would be readily detected by a flight attendant.
- (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 January 5, 1989.

Melvin C. Beard,

Director, Aircraft Certification Service.

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Other Notice of Proposed Rulemaking Actions:

Not Applicable.

Final Rule Actions:

Final Rule. Docket No. 25774; Issued on 04/04/91.