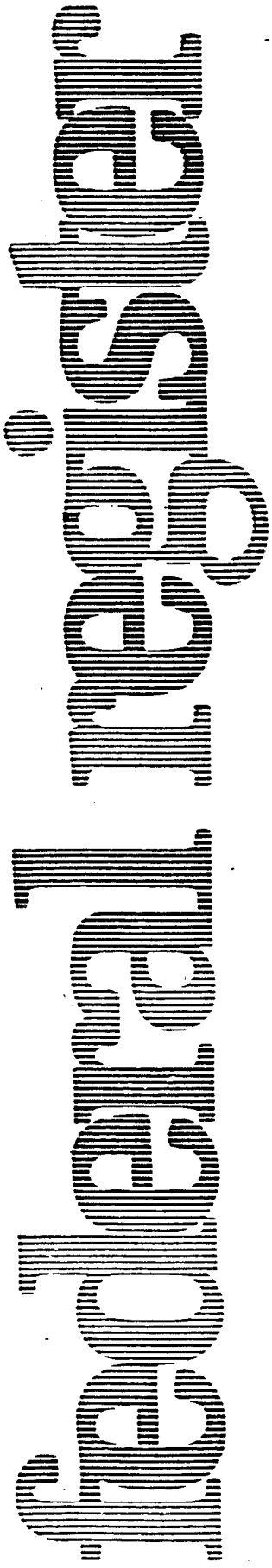

Friday
March 29, 1985

Part IV

Department of Transportation

Federal Aviation Administration

14 CFR Part 121
Airplane Cabin Fire Protection; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 121

[Docket No. 24073; Amdt. 121-185]

Airplane Cabin Fire Protection

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This amendment establishes equipment requirements to improve cabin fire protection for passenger-carrying transport category airplanes operated under Part 121. This amendment requires that each lavatory be equipped with a smoke detector system, or equivalent, which provides warning to the cockpit or to the passenger cabin crew. It requires that each lavatory trash receptacle be equipped with a fire extinguisher which discharges automatically upon occurrence of a fire in the receptacle. It increases the number of hand fire extinguishers required to be installed in the passenger cabins of airplanes with passenger seating capacities greater than 60 and requires that at least 2 of the hand fire extinguishers installed in each airplane have Halon 1211, or equivalent, as the extinguishing agent. This amendment is the result of investigations of in-flight fires and an inspection survey of the U.S. air carrier fleet which indicated the need for an increase in protection against in-flight fires.

EFFECTIVE DATE: April 29, 1985.

FOR FURTHER INFORMATION CONTACT: Henri Branting, Technical Analysis Branch (AWS-120), Aircraft Engineering Division, Office of Airworthiness, Federal Aviation Administration, 800 Independence Avenue, SW., Washington DC 20591; Telephone (202) 426-8362.

SUPPLEMENTARY INFORMATION:

Background

On May 11, 1984, the Federal Aviation Administration (FAA) issued Notice of Proposed Rulemaking (NPRM) No. 84-5 (49 FR 21010) May 17, 1984). The notice proposed to improve in-flight cabin fire protection for passenger-carrying transport category airplanes operated under Part 121. The notice proposed that each lavatory and galley be equipped with a smoke detector and that each lavatory trash receptacle be equipped with an automatic fire extinguisher. In addition, the notice proposed to increase the number of hand fire extinguishers for certain airplanes and to require at least two Halon 1211 extinguishers in each airplane. ("Halon 1211" is a product name for the extinguishing agent bromochlorodifluoromethane.)

The proposals in the notice were the result of investigations of two recent aircraft cabin fires which indicated that additional measures are needed to enhance protection against such fires. One of the fires occurred near Cincinnati, Ohio, on June 2, 1983, and resulted in 23 fatalities. The other occurred 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, discussed below, to correct deficiencies in fire protection and to determine whether or not the corrective actions adequately serve the objectives and provide adequate fire safety. The survey revealed that the fire containment capabilities of trash receptacles may be compromised by the wear and tear typical of service. Considering the seriousness of in-flight cabin fires, an expanded approach to fire protection was considered necessary.

After an in-flight cabin fire several years ago aboard a Varig airliner, which originated in a lavatory area, the following corrective actions were taken. The FAA issued an airworthiness directive (AD 74-09-08, Docket No. 13603), applicable to all transport category airplanes. The AD requires 1,000-hour periodic inspections, and repairs as necessary, of all lavatory trash receptacles to ensure fire containment capability. The AD also requires preflight briefings informing passengers not to smoke in lavatories, the installation of ashtrays near lavatory entrances, and the installation of no-smoking signs on each side of lavatory doors. Subsequent to issuance of the AD's 14 CFR 25.853 was amended to incorporate these requirements for ashtrays and no-smoking signs. Section 121.571 requires that passengers be given preflight briefings regarding smoking. Three additional AD's (AD 74-21-03, AD 75-02-04, and AD 75-02-05; Docket Nos. 73-NW-12, 74-WE-10, and 74-WE-11, respectively) 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. As indicated by the investigations of the Cincinnati and Tampa fires and the subsequent inspection survey, additional measures are necessary to ensure an adequate level of fire safety. These additional measures were proposed in Notice 84-5.

Notice 84-5 proposed regulations which would require, within 1 year after the effective date of the regulations, that transport category airplanes operating under Part 121 be equipped with smoke detectors in galleys and lavatories. The notice explained that galleys have the highest incidence of flame, smoke, and overheat conditions in the passenger cabin and that lavatories are sensitive from a fire detection standpoint because they are often unattended, they are closed from view by a door, and they contain ventilation systems designed to keep odors, and thus sensory smoke warnings, away from the passenger cabin. The galley and lavatory detector systems would be required to provide a warning light in the cockpit or a warning light or audio warning 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. The notice explained that because the smoke detectors are intended to enhance the present ability of the flight attendants to visually detect fires in the cabin and not serve as primary detectors 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) C1b, which are applicable to the type of primary detectors used in isolated cargo compartments. The notice explained that 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.

The proposals would require that each lavatory trash receptacle be equipped with a built-in automatic fire extinguisher which discharges automatically into the receptacle upon occurrence of a fire in the receptacle. This extinguisher could be a small extinguishant-charged bulb with a thermal fuse plug, of the type currently installed in trash receptacles in numerous transport category airplanes.

Notice 84-5 explained that the lavatory smoke detectors and automatic fire extinguishers would be in addition to the fire containment capability currently required for lavatory trash

receptacles because, as indicated by the recent inspection survey, fire containment capability is subject to deterioration in service, and additional measures of fire protection are necessary. Notice 84-5 proposed to require that at least two Halon 1211 hand fire extinguishers be installed in the airplanes. Halon 1211 extinguishers have been demonstrated superior in range, accuracy, and knockdown capability in combatting fires. The notice also proposed to increase the number of hand fire extinguishers required by § 121.309 to be located in the passenger compartments of transport category airplanes. The proposed requirements would be consistent with existing airworthiness regulations for passenger capacities up to 200. For capacities greater than 200, the proposals would require 1 additional extinguisher for each increment, or fractional increment, of 100 passengers.

Public Participation

This amendment is based on Notice 84-5. All interested parties have been given an opportunity to participate in the making of this amendment, and due consideration has been given to all matters presented. Except for the changes discussed below, this amendment and the reasons for the adoption are the same as those stated in Notice 84-5.

Discussion of Comments

One hundred and four comments were received in response to Notice 84-5, representing the views of aircraft and equipment manufacturers, aircraft operators, aircraft crew organizations, fire protection experts, consumer interest groups, foreign airworthiness authorities, and private individuals. About 50 of these comments are from private individuals. The vast majority of the comments support the safety objectives of the notice. In addition to these comments, 372 letters expressing similar support were received from private individuals shortly before publication of the notice. These letters are contained in the docket.

Several commenters contend certain requirements proposed in the notice should not be applicable to the smaller transport category airplanes weighing less than 75,000 pounds or seating less than 50 or 60 passengers, depending on the view of the commenter. Several of these commenters say that for such airplanes smoke detectors are not necessary in lavatories and galleys, and one commenter believes automatic fire extinguishers are not necessary for lavatory trash receptacles. The commenters contend that in the relatively smaller cabins, the galleys and lavatories, and thus the potential ignition sources, are in close proximity to crewmembers, passengers, and firefighting equipment, and that this makes fire detection faster and mitigates the potential fire hazard. One commenter points out that the smaller airplanes generally are used on short routes and that on these airplanes lavatories are used infrequently.

The FAA does not agree that the requirements should not be applicable to the smaller transport category airplanes used in Part 121 operations. As discussed later, the requirement for galley detectors is not adopted. The requirements proposed in Notice 84-5 were prompted by cabin fires occurring in passenger airplanes typically used in Part 121 operations and by the findings of an inspection survey of the air carrier fleet. As a result, these requirements were developed to mitigate cabin fire potential and are directed at airplanes being operated under Part 121. Lavatories in these airplanes, regardless of airplane size and how frequently the lavatories are used, are sensitive from the standpoint of detection and control of a fire because of this relative isolation and ventilation characteristics. Smoke detectors, automatic lavatory trash receptacle extinguishers, and Halon 1211 extinguishers are appropriate fire safety improvements for all passenger airplanes operating under Part 1211, regardless of size.

The majority of commenters support the requirement for smoke detectors in lavatories. One commenter opposed contends it would be better to treat the problem of wear and tear of trash receptacles and ensure fire containment capability than to require the installation of smoke detectors and automatic trash receptacle fire extinguishers.

The FAA does not agree. As explained in the notice, an expanded approach to fire safety is necessary in addition to the effort directed to the wear and tear problem. Several commenters in favor of lavatory smoke detectors point out that in addition to providing early warning and thus additional time to combat a fire, lavatory smoke detectors would benefit safety by tending to deter unauthorized tobacco smoking and intentionally set fires within lavatories.

One commenter believes the intended function of lavatory smoke detectors should be clarified. The commenter points out that the notice intends lavatory smoke detectors as a backup or supplemental fire detection means to sensory detection by passengers or crewmembers, rather than a primary detection means. The commenter contends lavatory detectors, as backup or supplemental equipment, should not be required to be operative for aircraft dispatch and should be covered in the airplane minimum equipment list.

Smoke detectors are intended to enhance detection by cabin occupants of hazardous fire conditions within lavatories. The trash receptacle is the critical ignition hazard potential in a lavatory because of its highly combustible contents which are susceptible to ignition by objects discarded by passengers. Detectors should provide warning commensurate with the ignition hazard early enough in the fire sequence to permit a timely response by a crewmember.

The FAA agrees lavatory smoke detectors may be included in the airplane minimum equipment list. Detectors are not specifically designated as "backup" or "supplemental" equipment items. A smoke detector is significant to cabin fire safety and should whenever practical be operative for flight. Since lavatory smoke detectors do not have an immediate or critical bearing on safety of flight, temporary inoperability of a detector would not warrant interruption of a flight schedule to return the aircraft to a repair station. A lavatory smoke detector should not remain inoperative indefinitely. Detectors should be checked frequently for proper operation and if a detector is found inoperative, it should be repaired or replaced at the first practical opportunity, such as arrival of the aircraft at the first suitable facility. During interim scheduled flights, temporary loss of the detector might be offset by increased monitoring of the affected lavatory, or other compensating measures.

The comments on proposed § 121.308(a) indicate a wide range of views on the way a smoke detector should provide warning. The proposal would require each smoke detector to provide a warning light in the cockpit or a light or aural warning in the passenger cabin readily detectable by a flight attendant, taking into consideration flight attendant positioning throughout the flight. One commenter believes the part of this requirement pertaining to the positioning of flight attendants during flight should be clarified. Several commenters contend there should be warning in both the cockpit and passenger cabin. Others oppose installation of warning devices in the cockpit. Several commenters contend the warning mode of single-station residential-type detectors is intended fo

buildings and may not be suitable for aircraft cabins. Residential detectors must provide an 85 decibel warning 10 feet from the detector station. Commenters say that this might not be heard above the ambient cabin noise and that to overcome this problem, the detectors would require modification to provide remote warning. Several commenters believe the familiar audio warning of a residential smoke detector might unduly alarm passengers and suggest alternate alarms for the passenger cabin such as a silent alarm, public address system chimes, or a coded cabin lighting response. One commenter suggests a central annunciator and control panel wired to smoke detectors located throughout the cabin. One commenter reports several air carriers have already installed residential type smoke detectors in the lavatories of their airplanes on a trial basis and that the detector alarms can be heard throughout adjacent areas of the passenger cabins. The commenter points out that these detectors would satisfy the rule.

A number of different warning means might be used for cabin smoke detectors to serve the purpose delineated in Notice 84–5. The notice explains that the purpose of the detectors is to enhance the present ability of flight attendants to visually detect fires. The rule would require that the means by which each detector provides warning takes into account the positioning of flight attendants during flight. This is to prevent placement of an alarm in an isolated area of the cabin which might result in an undue delay in detection. While a detector need not provide an alarm discernible throughout the entire passenger cabin, it should at least provide an alarm to a passenger seating area, flight attendant station or work area frequently attended by one or more cabin crewmembers during flight. Public address system chimes or a conspicous coded cabin lighting response suggested by commenters might be a means of providing warning. A silent alarm or remote panel annunciation might be satisfactory if these are shown to be adequately monitored during flight. A single-station residential-type detector might be satisfactory for use in a lavatory if it is shown to provide a clearly discernible alarm above ambient cabin noise in an appropriate area of the cabin with the lavatory door closed. The FAA finds no reason to believe the warning mode of a residential-type detector would unduly alarm passengers in a cabin attended by trained crewmembers. If modification of a residential detector is necessary to achieve the necessary warning level, the modification would be considered an essential part of the detector from the standpoint of inclusion in the airplane minimum equipment list. A requirement for a combined passenger cabin and flight-deck warning is not warranted, and the decision to install a flight-deck warning device should be left to the operator.

Notice 84–5 explains that since cabin smoke detectors would not be primary detection systems, the detectors would not necessarily have to meet TSO–C1b, Cargo and Baggage Compartment Smoke Detection Instruments, and that commercially available residential-type detectors might be adequate. This issue regarding the adequacy of residential-type smoke detectors in aircraft cabins drew a wide range of responses from many experts in the field of fire protection. Many commenters contend residential smoke detectors would not serve adequately in aircraft cabins. Commenters contend that residential detectors are not designed and evaluated for use in aircraft and that because the environment of an aircraft cabin is different from that of a building, residential detectors might not have the reliability necessary for their function in an aircraft. Several commenters say residential detectors would require frequent inspections and increased maintenance costs. One commenter says that any kind of detector, including the residential type, should be approved only after proven effective in aircraft cabins.

Commenters cite several reasons that they believe might make residential detectors unreliable for aircraft. They point out that detector location within a lavatory would be critical because ventilation airflow might divert smoke and prevent detection. There might be a different airflow pattern for each type of lavatory and aircraft model. One commenter points out that the small space within a lavatory might not allow adherence to guidelines regarding detector distance from walls and ceiling. Commenters say detectors might be adversely affected by static electricity in and around the aircraft, aircraft RF, structural vibration, exposure to a wide range of temperatures, altitude changes, and changes in the surrounding air mass. Several commenters point out that residential detectors are vulnerable to tampering by passengers and that the removable batteries are subject to pilferage.

Several commenters see no major reason why residential or commercial building-type smoke detectors should not be used in aircraft cabins. One commenter reports that the several air carriers that have installed residential detectors in lavatories on a trial basis have had varied results and that the predominant experience indicates residential detectors are commercially available that have the degree of reliability necessary to serve the intended purpose without uneconomical maintenance costs.

Several commenters point out that both the ionization and optical-type detectors appear likely candidates for aircraft cabins. Other types of detectors suggested by commenters include a carbon monoxide detector, such as the type installed in many general aviation airplanes, a fire detector, and a temperature sensor. Numerous commenters point out that residential detectors are the ionization type and caution that use of this type in aircraft cabins might result in an unacceptable number of nuisance alarms. The commenters point out that an ionization detector is sensitive and might be triggered by substances found in the normal aircraft cabin environment such as aerosol hair sprays and tobacco smoke drawn into a lavatory from the passenger area.

Commenters contend numerous nuisance alarms might in the long run act as a detriment to safety by instilling in the cabin crew an attitude of disrespect and inattention toward the alarm. Several commenters contend cabin smoke detectors should be restricted to the optical type which would have less tendency toward nuisance alarms.

Considering all comments pro and con, the intention in the notice to allow use of residential detectors is appropriate. Commenters favoring the use of residential detectors cite specific cases of the detector's being successfully used in aircraft. Although commenters opposed to residential detectors give reasons why they believe the detectors would be inadequate, there is no indication of technical problems which cannot be accounted for or resolved if a sufficient amount of lead time is allowed in the rule. Many operators apparently may choose residential detectors as a means of satisfying the rule. Since comments indicate a number of technical issues must be resolved for individual detector installations, the rule as adopted allows an additional 6 months in the compliance period, making a total of 18 months, to allow added time for initial qualification screening of detectors, prototype installation testing, and service reliability trials. While all residential detector models available on

the market might not be suitable for aircraft, some might, and operators should have the opportunity to explore the market and evaluate the wide range of detectors available. There is no indication in the comments that there is basis for either blanket exclusion or approval of detectors. Each detector installation must be approved on individual merit. Effects of lavatory size, ventilation airflow, and aircraft RF can be considered during the design evaluation and approval. Simple smoke tests can ascertain whether or not a detector performs its intended function as installed. Static electricity, cabin altitude, and outside air characteristics may be no more adverse in a pressurized aircraft cabin than in many buildings, and problems such as these can be addressed during service trials. Vibration, temperature, unauthorized tampering, and battery pilferage, as affecting continued detector operation, are matters of maintenance. The FAA recognizes, as several commenters points out, that residential detectors might require frequent inspections and increased maintenance. The FAA does not agree that nuisance alarms will be a detriment to safety. The rule as adopted allows the placement of alternative detection devices in alternate locations to minimize the effect of nuisance alarms to the flightcrews, provided these are found equivalent to smoke detectors. To be considered equivalent, an alternative device must provide timely detection comparable to a smoke detector.

Numerous commenters believe cabin smoke detectors should be required to meet a uniform standard. Commenters variously contend the detectors should meet TSO-C1b or standards applicable to commercial building detectors, or that a new standard or TSO should be established specifically for cabin detectors. Several commenters believe a new standard need not be as restrictive or stringent as TSO-C1b. One commenter offers a standard based on the environmental criteria in Radio Technical Commission for Aeronautics Document No. RTCA/DO-160A. Several commenters believe a uniform standard is not necessary. These commenters point out that cabin detectors are not primary devices, as are cargo compartment smoke detectors, and cite the favorable experience several air carriers have had in selecting and utilizing detectors in the absence of a uniform standard. They point out carriers have differing views on the feasibility of various types of detectors. They say whole certain residential detectors have adequate reliability and can satisfy the requirement, this does not necessarily hold true for residential detectors in general and some detectors might pose high maintenance costs in the long run. They believe the choice between inexpensive residential detectors and the more sophisticated types should be left to the carriers based on economic considerations.

A uniform standard should not be established now. Comments indicate different detector types offer different advantages for aircraft cabins. There is no clear indication as to what a uniform standard should be or whether such a standard is necessary for safety. Once the smoke detectors accumulate an adequate service history, their effectiveness, reliability, and maintenance will be brought into perspective and the FAA and industry should be in a position to decide whether or not a uniform standard should be established. The rule should now permit operators the flexibility to develop designs based on economic considerations.

One commenter questions the applicability of flammability requirements to materials used in the construction of commercially available smoke detectors. The commenter believes materials in detectors should be covered by the small parts exclusion of § 25.853(b)(3).

The FAA agrees. Unless some circumstance or design feature unforeseen at this time requires otherwise, materials used in the construction of the relatively small commercially available smoke detectors would not contribute significantly to the propagation of a fire and would be covered by the small parts exclusion of § 25.853(b)(3).

One commenter points out it might be feasible to install a single smoke sensor in the collective outflow ventilation system for several lavatories and provide a single warning annunciation for the lavatories. The commenter suggests that the wording of the rule not exclude this.

The FAA agrees in principle. The objective of the rule is to enable the crew to readily locate the lavatory in which there is a fire. A separate smoke detector and alarm for each lavatory would be one means of achieving this. A single detector serving several lavatories with a common alarm could be considered acceptable if it is shown that under typical operating conditions a person responding to the alarm can be expected to locate the affected lavatory without undue delay. The rule as adopted accommodates this concept.

Although most commenters recognize the value of smoke detectors in lavatories and favor their use, very few favor the use of detectors in galleys, except in lower lobe galleys. Numerous commenters give reasons they believe obviate the need and make smoke detectors in galleys impractical. They point out main deck galleys are located near passengers and are principal work areas for flight attendants. Because of this, galleys are under effective surveillance, and any fire occurring in them will be detected quickly by sight or smell by nearby persons. Commenters say service experience proves this, and they point out that galley fires have never been catastrophic. They say that galleys, by design, have a high fire containment capability and that heat sources such as coffee makers and ovens are metal enclosed. The commenters point out that many galleys, especially smaller ones, are not equipped to handle heated foods and beverages and do not contain equipment likely to cause fire. Commenters point out a number of problems which they say would tend to make smoke detectors ineffective and a nuisance in main deck galleys. They point out that the precise detector location would be very critical in providing a reliable early fire warning. Heat, smoke, and vapors from normal cooking or tobacco smoke from a nearby passenger seating area could trigger a smoke detector and alarm passengers and interrupt crew duties. Atmospheric fog entering an open service door during galley restocking could trigger a detector. One commenter points out that because galley detectors would be exposed to smoke, grease, and oils associated with cooking and not found elsewhere in the cabin, galley detectors would require additional attention and maintenance.

The FAA agrees with the commenters that smoke detectors should not be required for galleys, as proposed in the notice. The comments present a clear distinction between the practicality and benefits of detectors installed in isolated lavatories and those installed in galleys located near passenger areas. Considering the comments, while smoke detectors should be installed in lavatories, they are not warranted for galleys in general. The issue of smoke detectors for isolated lower lobe galleys is discussed below. The rule as adopted does not require smoke detectors in galleys.

Several commenters believe smoke detectors should be required for lower lobe galleys. Commenters say lower lobe galleys, unlike main deck galleys located near passengers, are critical

from the standpoint of fire safety because they contain a number of ignition sources and combustible materials and are not always occupied during flight.

Lower lobe galleys warrant added attention to fire safety because of their unique features. The FAA gives special consideration during the type certification process to ensure that a lower lobe galley has a level of fire protection appropriate for its design configuration. As a result, most lower lobe galleys are equipped with either smoke detectors or heat sensors, depending on galley design. Fire protection of lower lobe galleys is adequately addressed within current regulations and certification procedures, and an additional specific requirement for smoke detectors is not necessary.

Several commenters contend § 121.308(b) should define objective requirements which allow alternate means of trash receptacle fire protection rather than specifically require automatic fire extinguishers. Several commenters believe a fire detection system which alerts the crew in time to extinguish a receptacle fire would be equivalent to an automatic extinguisher.

The automatic extinguisher is intended to provide suppression response during the critical early stages of fire. The rule is objective to the extent it leaves the details of compliance up to the operator, without requiring any particular equipment, although small charged-bulb extinguishers generally are used for this. The rule also requires an early detection capability which would allow the crew to respond to the fire, as suggested by the commenter.

One commenter contends that the primary means of fire protection for a trash receptacle is the fire containment capability required of the receptable and that the automatic fire extinguisher need not be required for aircraft dispatch since it is essentially a backup or supplemental device. The commenter points out that the automatic extinguishers used in the fleet require periodic inspection and maintenance to ensure they remain in a charged condition.

Under the proposals, fire protection consists of fire containment by receptacles, suppression by automatic extinguishers in early stages of fire, rapid detection by smoke detectors, and hand extinguishers. An automatic extinguisher is not specifically designated as a "backup" or "supplemental" device. It is significant to cabin fire protection and should be operative for flight whenever practical. As in the foregoing discussion of smoke detectors, automatic extinguishers may be included in the airplane minimum equipment list. Since automatic extinguishers do not have an immediate or critical bearing on safety of flight, temporary inoperability of an extinguisher would not warrant interruption of a flight schedule to return the aircraft to a repair station. Automatic extinguishers should be checked periodically for proper charge and if an extinguisher is found inoperative, it should be repaired or replaced at the first practical opportunity, such as arrival of the aircraft at the first suitable facility. Interim measures should be taken to compensate for the temporary loss of the extinguisher.

Several commenters contend the 1-year compliance period proposed in § 121.308(b) should be extended. One commenter points out that major transport category airplane manufacturers currently are quoting a delivery wait of nearly 1 year for trash receptacle extinguisher kits. The commenter says a compliance period of 3 years would be necessary to provide lead time to allow operators to procure and install this equipment during regulatory scheduled maintenance checks.

The FAA agrees allowance should be made for the 1-year delivery delay which was not anticipated in the proposal. The rule as adopted allows and added year in the compliance period, making the period a total of 2 years. The installation of automatic extinguishers in receptacles is a relatively simple matter involving little design effort, and the 3 years suggested by the comment would not be necessary.

One commenter points out that a pressurized automatic fire extinguisher located in a trash receptacle should have provisions to prevent it from exploding in a fire since an explosion might damage the fire containment capability of the receptacle.

By virtue of basic design, the type of extinguisher used inside trash receptacles would relieve extinguisher pressure in the event of fire. Extinguishers are typically constructed with fusible discharge plugs designed to release the pressurized extinguishant into the receptacle at a relatively low plug temperature.

One commenter contends § 121.308(b) should be revised to require that the automatic fire extinguisher discharge both in and adjacent to the trash receptacle. The commenter recommends that the extinguisher use a Halon agent. Another commenter, while not recommending any particular agent, does believe a required extinguishing agent should be specified in the regulation.

The FAA does not agree that the rule should require that the extinguisher discharge into areas adjacent to the trash receptacle. The extinguisher required by this rule is intended to counter potential ignition hazards within the receptacle, which are mostly objects discarded by passengers. The space within the receptacle is sealed for fire containment and permits an effective discharge of the extinguisher. The FAA also does not agree that a specific extinguishing agent should be required by the rule since any of several agents might be effective when discharged into the confines of a trash receptacle.

One commenter contends the term "waste" used in § 121.308(b) should be clarified since the term might be misunderstood as including toilet waste tanks as well as trash receptacles. The rule does not need clarification. The term "waste" is used as it is used in Part 25 without apparent confusion. Under current regulations, waste receptacles do not include toilet waste tanks.

One commenter says studies of automatic extinguishers used in commercial building trash receptacles indicate that factors critical to extinguisher effectiveness are trash quantity and receptacle door position. The commenter recommends that design and testing criteria be developed for lavatory receptacles and that the automatic extinguishers be certified by an independent fire safety laboratory. The commenter points out that no automatic receptacle extinguisher has been certified.

The FAA recognizes that overstuffing of receptacles with trash might prevent closure of the receptacle door and reduce the fire safety level of the receptacle. This is one of the conditions the proposals in Notice 84-5 seek to counter. Although an automatic extinguisher would be most effective in a tightly sealed receptacle, it would provide a rapid suppression response in the critical early stages of a fire, regardless of door position and receptacle sealing. This fire protection would be supplemented by rapid detection by a smoke detector and extinguishment by hand extinguishers. The FAA has responsibility for approval of fire exinguishers for installation in aircraft and considers current regulations and certification practices adequate for this. The FAA recognizes the competence of experienced fire safety laboratories and the value of testing and certification of fire extinguishers by these laboratories. Advisory Circular 20-42c states that

FAA accepts certification by certain laboratories as one of the means of ascertaining the acceptability of fire extinguishers for use in aircraft. Although certification of automatic fire extinguishers by an independent laboratory is not required by regulations, the FAA would consider whatever efforts and contributions independent laboratories might wish to make in this area.

Several commenters contend § 121.309(c)(2) regarding hand fire extinguishers for class E cargo compartments introduces a new accessibility requirement for class E compartments which is redundant with current requirements for class B compartments.

The rule does not introduce a new accessibility requirement since it is applicable only to those class E cargo compartments that are accessible to crewmembers during flight. The rule bears no relationship to the accessibility requirements for class B compartments since all class B compartments must be accessible during flight.

Section 121.309(c)(2) requires that at least one hand fire extinguisher be located in each upper and lower lobe galley. Section 121.309(c)(4) requires that a certain number of extinguishers be uniformly distributed in the passenger compartment. One commenter believes the reference to upper lobe galleys includes those galleys on the main deck and that the rule should not require an extinguisher in each main deck galley, but rather in the vicinity of each main deck galley. Several commenters point out that extinguishers installed in galleys should be counted also as those required to be distributed in the passenger compartment.

The rule does not consider an upper lobe galley as one located on the main passenger deck, but rather one located above the main deck. Therefore, it does not specifically require that an extinguisher be installed in each main deck galley although this might be an acceptable location if chosen by the operator. Extinguishers installed in galleys located in the passenger compartment might also count as those required by § 121.309(c)(4), depending on the particular cabin configuration.

One commenter contends § 121.309(c)(4) should not specify the number of required hand fire extinguishers based on aircraft passenger capacity. The commenter says the rule should require that each cabin be evaluated individually to ensure that an appropriate fire extinguisher is located near each potentially high-risk fire area.

The basic structure of the fire extinguisher requirements should not be revised. The rule extends existing fire extinguisher requirements, which are based on passenger capacity, to airplanes with larger seating capacities and does not change the basic concept of the requirements which have been standard practice for certification of numerous airplanes. There is no indication that this practice is inappropriate or in need of revision.

Section 121.309(c)(5) requires that at least two of the required hand fire extinguishers installed in the airplane contain Halon 1211 as the extinguishing agent. One commenter contends the rule should require performance criteria for the extinguishing agent rather than require a specific product.

The FAA disagrees. The value of performance criteria established by fire safety organizations for hand extinguishers is recognized. These criteria are used to rate type and quantity of extinguisher agent for various classes of fires and have played a large part in shaping the accepted practices used in selecting extinguishers for aircraft cabins. Compared to other agents used in aircraft extinguishers, Halon 1211 has demonstrated such unique and superior performance characteristics for the aircraft cabin environment that it can serve conveniently as a comparative standard for selection. A disadvantage of using performance criteria in this case is that it would tend toward added costs for findings of compliance.

Several commenters point out that recent developments have resulted in hand fire extinguishers which have the performance of a Halon 1211 extinguisher but which use a mixture predominately of Halon 1211 together with a lesser amount of some other gas as the propellent. The commenters say that the rule should not limit the agent strictly to Halon 1211 and that it should be revised to allow use of the new type extinguishers.

The FAA agrees. The rule as adopted is revised to allow the use of extinguishers which are equivalent in performance to Halon 1211 extinguishers. To be considered equivalent, an extinguisher must have agent discharge characteristics and extinguishing performance equivalent to a Halon 1211 extinguisher of comparable size.

One commenter contends § 121.309(c)(5), in requiring Halon 1211, appears to contradict Advisory Circular No. 20–42C, Hand Fire Extinguishers for Use in Aircraft, which lists Halon 1301 as an extinguishing agent suitable for aircraft cabins. Several commenters believe the regulation should not exclude Halon 1301 from the aircraft cabin and should allow Halon 1301 as an alternate to Halon 1211. One commenter points out that for a Halon 1211 extinguisher to have a numerical rating for a class A Fire, the extinguisher must weigh at least 9 pounds, which would make it cumbersome for use in an aircraft cabin.

This rule does not contradict the advisory circular. The advisory circular points out the merits of both Halon 1301 and Halon 1211. Unlike Halon 1301, which discharges from the extinguishers as a gas, Halon 1211 discharges mostly as a liquid stream which has been demonstrated to be superior in combating class A fires. The FAA does not consider Halon 1301 a suitable alternate to Halon 1211 for class A fires. The minimum numerical rating for a class A extinguisher is based on extinguishment tests of fires considerably more severe than those expected in an aircraft cabin. Under current regulations, extinguisher agents used in an aircraft cabin must be appropriate for the types of fires expected to occur, but the quantities of agents need not meet a numerical rating.

One commenter recommends that one of the required Halon 1211 fire extinguishers installed in the cabin be fitted with a discharge hose rather than a fixed nozzle. The commenter cites a series of tests of small hand extinguishers which showed that a discharge hose tends to prevent improper extinguisher positioning by a novice user. The commenter also points out that a discharge hose is more effective in reaching underseat fires.

There is not sufficient justification of the recommendation to warrant establishment of a new requirement for discharge hoses. While a discharge hose might be of advantage in certain fire situations, there is no information indicating a rule is warranted which would require retrofit of the numerous Halon 1211 extinguisher installations which have already been made in the fleet on a voluntary basis. The Halon 1211 extinguishers required by this rule are intended for use by crewmembers trained in combatting fires and in the proper use and handling of fire extinguishers. This rule is based, in part, on a series of full-scale extinguishment tests which demonstrated the adequacy of Halon 1211 extinguishers without discharge hoses in combatting severe seat fires.

One commenter contends the proposed requirements specified for the hand fire extinguisher and smoke detector would not provide sufficient

protection against a potential fire in an isolated lower lobe galley. The commenter believes a full face mask with an oxygen bottle should be installed for crewmembers and that the hand fire extinguisher should be a Halon 1211 extinguisher.

For type certification, aircraft with lower lobe galleys are equipped with portable protective breathing equipment for use by crewmembers in combatting fires within the galleys. Hand fire extinguishers installed in lower lobe galleys should not be limited to the Halon 1211 type. Halon 1211 extinguishers have been found to be very effective against certain types of fires which might occur in the passenger cabin. The requirement for lower lobe galley extinguishers should allow selection of extinguishers which are found most suitable for the type of fires likely to occur in the galleys, including Halon 1211 extinguishers, if appropriate.

Several commenters are concerned over the amount of time allowed for compliance with various requirements of § 121.309(c) since no compliance period is specified. The requirement that each hand fire extinguisher for use in a passenger compartment be designed to minimize the hazard of toxic gas concentrations added in § 121.309(c)(1) has been contained for some time in § 25.853(a)(3), is already met by airplanes in service, and is being added for consistency with the existing airworthiness regulations. New § 121.309(c)(2) and revised § 121.309(c)(4), as adopted, allow a 6-month compliance period. Under existing §§ 25.851(a)(5) and 121.309(c)(3), there is no regulatory upper limit to the passenger capacity which could be served by an airplane cabin equipped with three hand fire extinguishers. Section 121.309(c)(4), as amended, requires that at least three hand fire extinguishers be located in the passenger compartment of an airplane with a passenger seating capacity of 61 through 200 and establishes additional hand fire extinguisher requirements for each increment of 100 passenger seats thereafter. This reflects the current general fleetwide practice regarding the installation of fire extinguishers in the larger airplanes, many of which are equipped with an even greater number of extinguishers than specified in the amendment. To the extent that any airplanes are not so equipped, the amendment provides for a 6-month compliance period for hand fire extinguisher installation.

Regulatory Evaluation

Several commenters address the cost estimates used in Notice 84-5 to analyze the smoke detector proposal. They contend the costs of smoke detector installations could be higher than FAA estimates, depending on the type of detector used.

The FAA estimates in the notice were based on a residential-type smoke detector which would satisfy the proposed requirements. The higher costs cited by several commenters reflect the more sophisticated smoke and/or fire detection systems typically used in isolated and unoccupied areas of the aircraft which are more critical from the standpoint of fire detection. Although such systems may be voluntarily installed by operators to comply with the rule, they are not specifically required by the rule. Notice 84-5 explains that lavatory smoke detectors are intended to enhance the present ability of occupants to visually detect fires. As discussed previously, comments indicate that operators will be able to meet this objective using residential detectors and thereby avoid the higher costs of the more sophisticated equipment. One commenter points out that the variations in cost estimates submitted by various operators are due, in part, to the different and somewhat limited experiences of the operators with lavatory smoke detectors. Based upon the comments, the FAA finds that the minimum compliance cost estimates in Notice 84-5 are reasonable.

One commenter contends the FAA costing estimates are not pertinent to the installation of automatic fire extinguishers in lavatory trash receptacles of aircraft with passenger capacities less than 50 or with only one lavatory. The commenter says FAA cost estimates appear to be based only on larger types of aircraft used in long range operations.

The unit cost of each fire extinguisher is independent of the type of aircraft in which the extinguisher is installed. The compliance cost per aircraft is proportional to the number of lavatories aboard the aircraft. Therefore, operators of smaller aircraft will not be disproportionately burdened by this rule in comparison to operators of larger aircraft.

One commenter states that the FAA in its cost-benefit analysis should take into account depreciation and investment tax credits which might be available for the equipment changes and, further, that the analysis should consider that the cost per passenger is small when spread over a very large number of enplanements. Cost-benefit methodology attempts to measure social or economic costs and benefits, reflecting the actual resources utilized and saved as a result of a particular regulatory action. Depreciation and tax credits are accounting concepts which, although relevant for determining the financial condition of a particular business, are not considered in a study of social costs and benefits.

Further, the FAA cost-benefit study estimated the total costs and benefits of the various fire safety measures advanced in this rulemaking. However, the FAA agrees that the cost per enplanement of complying with this rule will be very small.

The Regulatory Evaluation which has been placed in the docket contains a complete cost-benefit analysis of the rule. No comments have been received which indicate that the cost-benefit analysis developed in support of Notice 84-5 is not appropriate. No major changes have been made to the cost-benefit analysis discussed in detail in the notice. Briefly, the FAA estimates that there is an 82 percent probability that the lavatory smoke detector amendment will result in benefits equal to or greater than the $5.9 million total compliance costs and that there is an 86 percent probability that the lavatory trash receptacle fire extinguisher amendment will result in benefits equal to or greater than the $3.7 million compliance costs. The non-adoption of the proposed smoke detector requirement for aircraft galleys eliminates the $3.9 million compliance cost previously estimated to result from that proposal. For reasons discussed earlier, the FAA finds there would be little, if any, benefit derived from installation of smoke detectors in main deck galleys. Deletion of this proposal, however, would not diminish the anticipated benefits of the remaining amendments. The FAA estimates that the amendment requiring two Halon 1211 fire extinguishers in Part 121 aircraft will not result in any net costs to operators because the fuel savings attributable to the lighter weight Halon extinguishers will quickly offset the purchase cost. Finally, the expanded regulation stipulating the number and location of hand fire extinguishers which must be carried aboard Part 121 aircraft reflects current industry practice and is therefore not expected to impose additional costs.

Conclusions

Under the terms of the Regulatory Flexibility Act (the Act), the FAA has reviewed this rulemaking action to determine what impact it may have on small entities. This action is not expected to affect a substantial number

of small entities. Therefore, the FAA certifies that this regulatory action will not result in a significant economic impact on a substantial number of small entities.

This regulatory action is 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. In addition, this regulatory action will have little or no impact on trade opportunities for U.S. firms doing business overseas or for foreign firms doing business in the United States.

Since this regulatory action concerns a matter on which there is substantial public interest, the FAA has determined that this action is significant under Department of Transportation Regulatory Policies and Procedures (44 FR 11034; February 26, 1979).

A regulatory evaluation of this action, including a Regulatory Flexibility Determination and 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."

List of Subjects in 14 CFR Part 121

Aviation safety, Safety, Air carriers, Air transportation, Aircraft, Airplanes, Airworthiness directives and standards, Smoking, Transportation, Common carriers.

Adoption of the Amendment

Accordingly, Part 121 of the Federal Aviation Regulations [14 CFR Part 121] is amended as follows, effective April 29, 1985.

PART 121—CERTIFICATION AND OPERATIONS: DOMESTIC, FLAG, AND SUPPLEMENTAL AIR CARRIERS AND COMMERCIAL OPERATORS OF LARGE AIRCRAFT

1. By adding a new § 121.308 to read as follows:

§ 121.308 Lavatory fire protection.

(a) After October 29, 1986, no person may operate a passenger-carrying transport category airplane unless each lavatory in the airplane is 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, taking into consideration the positioning of flight attendants throughout the passenger compartment during various phases of flight.

(b) After April 29, 1987, no person may operate a passenger-carrying transport category airplane unless each lavatory in the airplane is equipped with a built-in fire extinguisher for each disposal receptacle for towels, paper, or waste located within the lavatory. The built-in fire extinguisher must be designed to discharge automatically into each disposal receptacle upon occurrence of a fire in the receptacle.

2. By amending § 121.309(c) by revising paragraphs (c)(1), (2), and (3); by redesignating present paragraphs (c)(2) and (3) as (c)(3) and (4), respectively; and by adding new paragraphs (c)(2) and (5), as follows:

§ 121.309 Emergency equipment.

* * * * *

(c) * * *

(1) The type and quantity of extinguishing agent must be suitable for the kinds of fires likely to occur in the compartment where the extinguisher is intended to be used and, for passenger compartments, must be designed to minimize the hazard of toxic gas concentrations.

(2) After April 29, 1985, at least one hand fire extinguisher must be provided and conveniently located for use in each class E cargo compartment which is accessible to crewmembers during flight, and at least one must be located in each upper and lower lobe galley.

(3) At least one hand fire extinguisher must be conveniently located on the flight deck for use by the flightcrew.

(4) At least one hand fire extinguisher must be conveniently located in the passenger compartment of each airplane accommodating more than 6 but less than 31 passengers, and at least two hand fire extinguishers must be conveniently located in each airplane accommodating more than 30 passengers. After April 29, 1985, at least 2 hand fire extinguishers must be conveniently located and uniformly distributed in the passenger compartment of airplanes having a passenger seating capacity of 60 or less and for the passenger compartment of each airplane having a passenger seating capacity of more than 60, there must be at least the following number of hand fire extinguishers conveniently located and uniformly distributed throughout the compartment:

Minimum Number of Hand Fire Extinguishers	
Passenger seating capacity:	
61 through 200	3
201 through 300	4
301 through 400	5
401 through 500	6
501 through 600	7
601 or more	8

(5) After April 29, 1986, at least two of the required hand fire extinguishers installed in the airplane must contain Halon 1211 (bromochlorodifluoromethane) or equivalent as the extinguishing agent.

(Secs. 313(a), 314(a), 601 through 610, and 1102 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1355(a), 1421 through 1430, and 1502); 49 U.S.C. 106(g) (Revised, Pub. L. 97-449, January 12, 1983))

Issued in Washington, D.C., on March 26, 1985.

Donald D. Engen,

Administrator.

[FR Doc. 85-7538 Filed 3-28-85; 2:29 pm]

BILLING CODE 4910-13-M