



U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Class B and F Cargo Compartments

Date: 02/03/16

AC No: 25.857-1

Initiated By: ANM-112

1 **PURPOSE.**

This advisory circular (AC) provides guidance concerning compliance with the airworthiness standards for transport category airplanes pertaining to Class B and Class F cargo compartments.

2 **APPLICABILITY.**

- 2.1 The guidance in this AC is applicable to transport category airplanes for which a new, amended, or supplemental type certificate is requested. This guidance is for airplane manufacturers, modifiers, foreign regulatory authorities, and Federal Aviation Administration (FAA) transport airplane type-certification engineers and their designees.
- 2.2 The material in this AC is neither mandatory nor regulatory in nature and does not constitute a regulation. It describes acceptable means, but not the only means, for demonstrating compliance with the applicable regulations. The FAA will consider other means of demonstrating compliance that an applicant may elect to present. While these guidelines are not mandatory, they are derived from extensive FAA and industry experience in determining compliance with the relevant regulations. If, however, we become aware of circumstances that convince us that following this AC would not result in compliance with the applicable regulations, we will not be bound by the terms of this AC, and we may require additional substantiation or design changes as a basis for finding compliance.
- 2.3 This material does not change or create any additional regulatory requirements, nor does it authorize changes in, or permit deviations from, existing regulatory requirements.

3 RELATED DOCUMENTS.

3.1 Sections of Title 14, Code of Federal Regulations (14 CFR) Part 25.

- § 25.851, *Fire extinguishers.*
- § 25.855, *Cargo or baggage compartments.*
- § 25.857, *Cargo compartment classification.*
- § 25.858, *Cargo or baggage compartment smoke or fire detection systems.*

3.2 FAA ACs.

The following ACs were current at the time of publication of this AC. You should use the latest version for guidance. You can view and download the latest version at:

http://www.faa.gov/regulations_policies/advisory_circulars/.

- AC 20-42D, *Hand Fire Extinguishers for use in Aircraft*, issued January 14, 2011.
- AC 25-9A, *Smoke Detection, Penetration, and Evacuation Tests and Related Flight Manual Emergency Procedures*, issued January 6, 1994.
- AC 25-17A, *Transport Airplane Cabin Interiors Crashworthiness Handbook*, issued May 18, 2009.
- AC 25-18, *Transport Category Airplanes Modified for Cargo Service*, issued January 6, 1994.
- AC 25-22, *Certification of Transport Airplane Mechanical Systems*, issued March 14, 2000.
- AC 25.851-1, *Built-in Fire Extinguisher/Fire Suppression Systems in Class C and Class F Cargo Compartments*, issued February 3, 2016.

3.3 FAA Orders.

- Order 8110.4C, *Type Certification*, effective December 20, 2011.
- Order 8110.115, *Certification Project Initiation and Certification Project Notification*, effective September 5, 2014.
- Order 8150.4, *Certification of Cargo Containers with Self-Contained Temperature Control (Active ULDs)*, effective August 29, 2007.

3.4 Technical Standard Orders (TSOs).

- TSO-C90d, *Cargo Pallets, Nets and Containers (Unit Load Devices)*, dated September 30, 2011.
- TSO-C203, *Fire Containment Covers (FCC)*, dated July 1, 2014.

4 **BACKGROUND.**

Paragraphs (b) and (f) of § 25.857 provide standards for certification of two classes of cargo compartments, Class B and Class F. A Class B cargo compartment is configured in a manner that allows a crewmember to extinguish any fire likely to occur in the compartment using a hand fire extinguisher. While the person combating the fire must have access to the compartment, it must not be necessary for that person to physically enter the compartment to extinguish the fire. A Class F cargo compartment is similar to a Class C (as defined in § 25.857(c)) compartment in that there are means to extinguish or suppress the fire without requiring a person to enter the compartment. Both Class B and Class F cargo compartments have smoke or fire detection systems to alert the crew to the presence of the fire.

Note: The terms “extinguishing system,” “suppression system,” and “extinguishing/suppression system” are used interchangeably in this AC. Systems that are located in remote (e.g., inaccessible or distant) areas are not required to extinguish a fire in its entirety, because the crew would not be able to confirm that the fire is extinguished. These systems are intended, instead, to suppress a fire until it can be completely extinguished by ground personnel following a safe landing.

5 **COMPARTMENT CLASSIFICATION REGULATIONS.**

In order to establish appropriate requirements for fire protection, a system for classification of cargo or baggage compartments was developed and adopted for transport category airplanes. Classes A, B, and C were initially established; Classes D, E, and F were added later. Class D has since been eliminated from the regulations. The classification is based on the means by which a fire can be detected and the means available to control a fire. All cargo compartments must be properly classified in accordance with § 25.857 and meet the requirements of §§ 25.851, 25.855, 25.857, and 25.858 pertaining to the particular class involved.

- 5.1 A Class A compartment (see § 25.857(a)) is located so close to the station of a crewmember that the crewmember would easily discover the presence of a fire. In addition, each part of the compartment must be easily accessible so that the crewmember could quickly extinguish a fire with a portable fire extinguisher. A Class A compartment is not required to have a liner.
- 5.2 A Class B compartment (see § 25.857(b)) is accessible in flight but more remote from the crewmember’s station than a Class A compartment and must, therefore, incorporate a smoke or fire detection system to give warning at the pilot or flight engineer station. Because a fire would not be detected and extinguished as quickly as in a Class A compartment, a Class B compartment must have a liner that meets the requirements of § 25.855(b). In flight, a crewmember must have sufficient access to a Class B compartment to effectively fight a fire in any part of the compartment with a hand fire extinguisher when standing at the compartment’s one designated access point, without stepping into the compartment. Therefore, Class B cargo compartments are limited to the main deck. There must be means to ensure that, while the access provisions are

being used, no hazardous quantity of smoke, flames, or extinguishing agent will enter areas occupied by the crew or passengers.

- 5.3 A Class C compartment (see § 25.857(c)) differs from a Class B compartment in that it is not required to be accessible in flight and must, therefore, have a built-in fire extinguishing or suppression system that is controllable from the flight deck. A Class C compartment must have a liner and a smoke or fire detection system that meets the requirements of §§ 25.855(b) and 25.857(c)(1). There must also be means to exclude hazardous quantities of extinguishing agent and products of combustion from occupied areas (see § 25.857(c)(3)).
- 5.4 A Class D compartment was one in which a fire would be completely contained without endangering the safety of the airplane or the occupants. A Class D compartment was not accessible to a crewmember in flight, and instead of providing smoke or fire detection and extinguishment, Class D compartments were designed to control a fire by severely restricting the supply of available oxygen. Due to several uncontrollable fires in Class D compartments, they were eliminated by Amendment 25-93, effective March 19, 1998. As explained in Amendment 25-93, Class D cargo compartment standards pre-dating Amendment 25-93 are inadequate. Therefore, the FAA does not approve new Class D cargo compartments even in airplanes with a certification basis pre-dating Amendment 25-93.
- 5.5 A Class E compartment (see § 25.857(e)) is found only on an all-cargo airplane. Typically, a Class E compartment is the entire cabin of an all-cargo airplane; however, other compartments (e.g., lower-deck, inaccessible cargo compartments) of such airplanes may be classified as Class E compartments. Shutting off the ventilating airflow to or within the compartment controls a fire in a Class E compartment. A Class E compartment must have a liner and a smoke or fire detection system installed in accordance with § 25.857(e)(2). It is not required to have a built-in fire suppression system.
- 5.6 A Class F compartment (see § 25.857(f)) must be located on the main deck of the airplane. Class F compartments must have means to control or extinguish a fire without requiring a crewmember to enter the compartment. Class F compartments that include a built-in fire extinguishing/suppression system or require the use of fire containment covers (FCCs) or fire resistant containers (FRCs) meeting the criteria identified for these components in paragraph 6.3.3 of this AC may meet these requirements.
- 5.6.1 We introduced the Class F cargo compartment as a practicable and safe alternative to the previous practice of providing large Class B cargo compartments. Class B compartments are limited to the main deck for accessibility reasons. Likewise, Class F cargo compartments must be limited to the main deck for accessibility. All lower-deck cargo compartments in airplanes carrying passengers must comply with the Class C cargo compartment requirements of § 25.857(c).
- 5.6.2 The Class F compartment must have a smoke or fire detection system installed in accordance with § 25.857(f)(1). Unless there are other means of containing the fire and

protecting critical systems and structure, a Class F compartment must have a liner meeting the requirements of part III of appendix F to part 25 or other approved equivalent methods (see § 25.855(b)). For example, the FAA would accept a Class F cargo compartment requiring the use of FCCs, FRCs, or other means meeting the liner requirements in part 25, appendix F, part III (flame penetration resistant means) as equivalent to installation of a fixed liner.

6 **FIRE PROTECTION FEATURES.**

The airplane design must provide fire protection features based on the class of the cargo compartment. The applicant must show that the fire protection features meet the standards established by the original type certification basis for the airplane or later part 25 standards. These features may include liners, control of ventilation, fire/smoke detection systems, hand fire extinguishers, and built-in fire suppression systems.

6.1 **Liners.**

6.1.1 The primary purpose of a liner is to prevent a fire that originates in a cargo compartment from spreading to other parts of the airplane before it can be brought under control. For Class B compartments, it is assumed that the fire will be quickly extinguished, so the liner must meet part 25, appendix F, part I requirements. For Class F cargo compartments, the fire might have grown larger prior to being suppressed, so better protection is needed to prevent damage to surrounding systems and structure. Therefore, a Class F ceiling and sidewall liner must meet the requirements of part 25, appendix F, part III, while the floor panels must comply with part 25, appendix F, part I. However, the liner does not need to serve as the compartment seal, although it is frequently used to perform the secondary functions of containing discharged extinguishing agent and controlling the flow of oxygen into the compartment. If other means, such as compartment walls, are not capable of performing those functions, the liner must be sufficiently airtight to perform them.

6.1.2 The liner must be separate from the airplane structure except for points of attachment.

6.1.3 As detailed in appendix F to part 25, the liner must have sufficient fire integrity (i.e., resistance to flame and temperature penetration). The purpose of this requirement is to prevent flames from burning through the liner before the fire can be brought under control and the heat from the fire is sufficiently dissipated. As stated in part III of appendix F, in addition to the basic liner material, the term “liner” includes any design feature, such as a joint or fastener that would affect the capability of the liner to safely contain a fire.

6.2 **Access – Class B.**

Class B compartments must provide sufficient accessibility to enable a crewmember to reach any part of the compartment by hand or with the contents of a hand fire extinguisher without physically entering the compartment. This requirement, by its nature, tends to limit the size and shape of the compartment. Additionally, the access provisions should be sufficiently large to enable the crewmember to determine visually

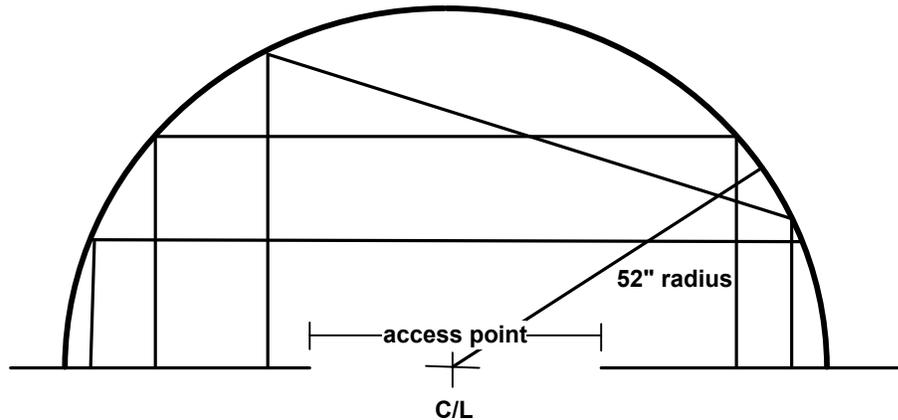
that a fire has been extinguished. Access is also a function of how the compartment is configured rather than just dimension and volume. In determining access, the FAA would not accept a design that requires a crewmember to pull baggage or cargo onto the floor of the passenger compartment to gain access to the source of the fire, because that action may introduce a safety hazard.

- 6.2.1 The requirement for Class B compartments in § 25.857(b)(1), "...to extinguish a fire occurring in any part of the compartment," means that the crewmember should be able to open the door or hatch and, while standing in the opening, effectively fight a fire anywhere in the compartment where cargo or baggage can be located. The extension of the crewmember's reach through the use of a fire extinguisher is limited such that the combination of reach and the extinguisher should not be more than 52 inches.
- 6.2.2 The FAA tasked an Aviation Rulemaking Advisory Committee, which established the Cargo Standards Harmonization Working Group (CSHWG), to develop new or revised requirements for Class B cargo compartments in transport category airplanes. The CSHWG recommendations included an estimate of a Class B cargo compartment that would meet the FAA's intent that a crewmember be able to reach any part of the compartment. One recommendation was that the outline of any compartment, viewed from above, should fit within a vertical cylinder of radius 52 inches (132 cm) measured from the centerline of the access door or hatch (see figure 1 of this AC). This dimension assumes that a 95th percentile male can reach a one-foot square box located anywhere within the compartment. Access by a smaller crewmember to reach the same area within the compartment could require that the crewmember move laterally within the access door or hatch opening, while not physically entering the compartment. However, the FAA's position is that the use of a 95th percentile male is not realistic in that many flight attendants are female and have a smaller reach.¹ For example, a 50th percentile female has a reach of 28.96 inches (~29 inches), and the FAA holds that this is a more realistic value to use. In addition, when determining a distance that a crewmember can effectively fight a fire within a Class B cargo compartment, consideration should be given to the distance that the fire extinguisher stream can be accurately directed. However, the published "range" of hand fire extinguishers can be many feet and will vary depending on bottle pressure and mass of the fire extinguishing agent. Using accepted values for extinguisher range from recognized authorities (e.g., the U.S. Underwriters Laboratories) would result in very large Class B cargo compartments that are beyond the ability for crewmembers to effectively fight a fire. A realistic value that a hand fire extinguisher can be accurately directed is no more than two feet. Therefore, in consideration of realistic effective reach to extinguish a fire, harmonization with the guidance provided by other regulatory authorities, the recommendations of the CSHWG, and service history of airplanes with small Class B cargo compartments, a fire

¹ Harrison, Catherine R., Robinette, Kathleen M., "CAESAR: Summary Statistics for the Adult Population (Ages 18-65) of the United States of America," AFRL-HE-WP-TR-2002-0170, United States Air Force Research Laboratory, June 2002.

in a small cargo compartment may be effectively fought if the contents of cargo and baggage are within an arc not exceeding a 52-inch radius.

Figure 1. Examples of Possible Cargo Compartment Shapes within 52” Reach from Access Point Centerline.



- 6.2.3 Should an applicant request FAA certification of an airplane with a Class B cargo compartment that exceeds the design guidance in this AC, the FAA will expect the applicant to perform full-scale fire extinguishing tests. These tests will be used to demonstrate compliance to the regulations and to establish the quantity of fire extinguishing agent that must be provided to ensure an acceptable level of safety.
- 6.3 **Fire Protection – Class F.**
To obtain certification of a Class F compartment, a design must include a means to extinguish or control a fire (“fire protection”) without a crewmember entering the compartment.
- 6.3.1 One means of providing fire protection could be to design the compartment to Class C requirements except not include all the features of a built-in fire extinguishing/suppression system. One suppression method might be for a crewmember to attach a hand fire extinguisher containing an appropriate flooding agent to a plumbing and nozzle distribution system within the compartment that would provide acceptable suppression capability throughout the volume of the compartment. The source for such a system could be a single or multiple hand fire extinguishers, which interface with the distribution system through a suitable interface nozzle. This system would not require the crew member to enter the compartment. Further, it reduces the complexity and costs associated with a built-in suppression system and could be suitable for smaller compartments. For certification purposes, the extinguishing agent concentration should be measured in flight, following airplane flight manual (AFM) procedures, and the length of protection time afforded by the system recorded. This time of protection should be used to establish AFM limitations for cargo or baggage

compartment fire protection times. The operator could then use these times for route planning. For Halon 1301 fire extinguishing agent, a minimum 5-percent concentration by volume at all points in the compartment is considered adequate for initial knockdown of a fire (i.e., flames are no longer visible from the source of the fire), and a 3-percent concentration by volume at all points in the compartment is considered the minimum for controlling a fire after it is knocked down² (i.e., the removal of flames from the fire source). The use of this option requires the use of a liner, if needed, as noted in § 25.855(c). Full-scale or high-fidelity model fire extinguishing testing may be necessary.

6.3.2 Another means of providing fire protection in a Class F compartment would be to provide a built-in fire extinguishing/suppression system similar to a Class C cargo compartment. Further guidance on this type of design installation can be found in AC 25.851-1. However, in general, a Class F cargo compartment that uses a built-in fire extinguishing/suppression system should meet the same requirements as a Class C cargo compartment. For example, an applicant for a Class F cargo compartment with a built-in fire extinguishing/suppression system must ensure that:

6.3.2.1 No discharge of the extinguisher can cause structural damage;

6.3.2.2 The capacity of each required built-in extinguishing/suppression system is adequate for any fire likely to occur in the compartment where used, considering the volume of the compartment and the ventilation rate;

6.3.2.3 There are means to exclude hazardous quantities of smoke, flames, or extinguishing agent from any compartment occupied by the crew or passengers; and

6.3.2.4 There are means to control ventilation and drafts within the compartment so that the extinguishing agent used can control any fire that may start within the compartment.

Note: Flight tests are conducted to ensure compliance with the provisions in §§ 25.855(h), 25.857(f), 25.858, and 25.1301(a).

6.3.3 Another means of providing fire protection in a Class F compartment involves the use of FRCs or FCCs shown to be capable of containing a fire. Some FCCs that will pass the oil burner test requirements in part 25, appendix F, part III have already been developed and are typically constructed of woven fiberglass-based materials.

6.3.3.1 Using FCCs or FRCs shown to be capable of containing a fire may meet the requirements of § 25.857 at Amendment 25-142 for Class F cargo compartment fire protection in lieu of a built-in fire suppression system.

² Gassmann, J., Hill, R., "Fire Extinguishing Methods for New Passenger/Cargo Aircraft," Federal Aviation Administration, Final Report FAA-RD-71-68, November 1971.

- 6.3.3.2 If FCCs, FRCs, or other means are proposed as a method to suppress a fire for a Class F compartment, at a minimum they should meet TSO-C203 requirements, which include the requirements in part 25, appendix F, part I, paragraphs (a)(1)(ii) and (a)(2)(ii). FCCs should be self-extinguishing when tested vertically per appendix F, part I, paragraph (b)(4). No flame penetration should occur during application of the specified flame source when the specimen is subjected to the 45-degree test per appendix F, part I, paragraph (b)(6). If the flame penetration test in appendix F, part III is used as a substitute, the specimen should meet the flame penetration requirements of appendix F, part III, paragraph (a)(3) with no flame penetration within 5 minutes after application of the flame source, and the peak temperature measured at 4 inches (100 mm) above the upper surface of the horizontal test sample should not exceed 400 °F (204 °C). However, based on full-scale qualification testing, some alternative materials not fully in compliance with appendix F, part III might also be acceptable for FCC side and top portions, as long as they are successfully tested and meet the intent of the rule. For example, material that may not meet the peak temperature limit of 400 °F measured 4 inches above the upper surface, but successfully demonstrates that there is no external flaming above the upper surface of the horizontal test sample, may be acceptable to the FAA. Also, SAE International published SAE Aerospace Standard AS6453, which specifies the requirements, minimum design and performance criteria, and testing methods of FCCs for carriage of cargo with pallet and net on the main deck of transport category airplanes. Applicants who propose to use FCCs in a Class F cargo compartment should follow the guidance in the TSO-C203 and SAE standard as recommended within the TSO.
- 6.3.3.3 The applicant should contact the responsible aircraft certification office (ACO) for concurrence on any proposed approach when FCC or FRC qualification is envisaged. Full-scale or high fidelity model fire testing may be necessary to ensure that the FCC, FRC, or other means can contain a fire for the longest flight time (diversion) required in service.
- 6.3.3.4 If FCCs are used as the sole means of compliance, they should be used with a pallet that demonstrates adequate fire performance so that the cargo is surrounded by fire protection equivalent to that of the FCC. If no pallet is used, the FCC should completely surround all cargo, including underneath the cargo, except for obviously nonflammable items, such as metal stock, machinery, and nonflammable fluids without flammable packaging. These FCCs would need to meet, at a minimum, part III of appendix F to part 25. Because the fire is controlled or extinguished within the isolated compartment, but is separated from the actual cargo compartment boundaries, the cargo compartment liner requirements of § 25.855(c) would not apply. However, the effects of the heat generated by the contained/covered fire should be evaluated to ensure that adjacent

systems and structure are not adversely affected. For certification purposes, test data with the actual design configuration and possible fire sources would have to be provided. The temperature and heat load time history measurements at various locations above, around, and below the FCC are needed to ensure the continued safe function of adjacent systems and structure. The time history data should be used to establish the length of protection time afforded by the system and subsequent AFM limitations for cargo or baggage compartment fire protection times. The operator would then use these times for route planning purposes.

- 6.3.3.5 FCCs (when used in conjunction with a pallet) should meet, at a minimum, the flammability requirements as described above in paragraph 6.3.3.2 of this AC.
- 6.3.3.6 The pallet used in conjunction with an FCC should meet, at a minimum, the flammability requirements of part 25, appendix F, part I, paragraphs (a)(1)(ii) and (a)(2)(iii), i.e., be self-extinguishing when tested vertically in accordance with part I, paragraph (b)(4), and have no flame penetration during application of the specified flame source when subjected to the 45-degree angle test defined in part I, paragraph (b)(6).
- 6.3.3.7 The net used in conjunction with an FCC should meet, at a minimum, the requirements of TSO-C90 and flammability requirements of part 25 appendix F, part I, paragraph (a)(1)(ii), i.e., be self-extinguishing when tested vertically in accordance with part I paragraph (b)(4).
- 6.3.3.8 If a design uses FCCs or FRCs for fire protection, compliance with the smoke or fire detection requirements in § 25.858 may present unique challenges. Crew awareness is a critical factor to ensure adequate fire protection on airplanes. Applicants for FAA approval should consider the use of infrared (IR) cameras or other means to ensure adequate detection of a fire within the cargo compartment where FCCs and FRCs are used. Full-scale or high-fidelity fire testing may be necessary to ensure that the smoke or fire detection system can provide adequate detection.
- 6.3.3.9 If an applicant's proposed design for a Class F cargo compartment relies on fire containment (e.g., fire hardened containers/pallets, FRCs and/or FCCs placed over palletized loads or non-fire hardened containers), then the applicant should be prepared to demonstrate the continued effectiveness of those means after incorrect usage or cargo loading errors.
- 6.3.3.10 If an applicant's proposed design for a Class F cargo compartment requires FCCs or FRCs or other means to afford fire protection, then the applicant should incorporate means to prevent the carriage of cargo in standard containers or pallets. Instructions for loading cargo should warn that all cargo must be placed within the approved design (i.e., FCCs, FRCs, or other approved methods of providing fire protection). In

addition, to ensure only approved designs are used to carry cargo, applicants may incorporate within the approved design such features as, but not be limited to:

- Physical features at the container/pallet-to-cargo compartment floor interface (e.g., a unique locking mechanism); or
- Operational procedures, such as requiring airplane crew verification of cargo loading before every flight; or
- A suitable detection system (e.g., radio-frequency identification tags on approved FCCs, FRCs or other approved methods) that would warn the crew and prevent a non-approved cargo configuration from being loaded.

6.4 **Extinguishing Agent.**

6.4.1 In order to effectively extinguish or control a fire in a Class B or Class F cargo or baggage compartment, sufficient fire extinguishing agent must be allocated. The FAA requirements for hand fire extinguishers and fire extinguishing agents are included in § 25.851(a). General guidance on this topic is included in AC 20-42. The FAA's requirements for built-in fire extinguishing/suppression systems and fire extinguishing agent are included in § 25.851(b). AC 25.851-1 contains guidance for built-in fire extinguishing/suppression systems. Both AC 20-42 and AC 25.851-1 include guidance on halon and non-halon fire extinguishing agents in hand fire extinguishers and built-in fire extinguishing/suppression systems. However, the FAA has not issued substantive guidance addressing installation issues associated with non-halon fire extinguishing agent applications. Instead of such guidance, the FAA will expect that each non-halon agent has successfully passed the minimum performance standard³ for that application (e.g., lavatory trash receptacle fire extinguisher, hand fire extinguisher, engine/auxiliary power unit fire extinguishing system, or cargo compartment fire extinguishing/suppression system). Meeting these standards is one way to ensure the performance of the proposed non-halon agent provides protection equivalent to that provided by halon and that the applicant has addressed installation issues associated with the specific application. Depending on the properties of the agent, the means to deliver the agent, and the means to determine the concentration of the agent, full-scale or high-fidelity fire testing may be necessary to ensure that the non-halon fire extinguishing/fire suppression system provides adequate performance. AC 20-42 provides an acceptable means to implement the requirement in § 25.851(a) for at least one hand fire extinguisher to be located in the pilot compartment, at least one readily accessible hand fire extinguisher to be available for use in each Class A or Class B cargo/baggage compartment and in each accessible Class E or Class F cargo/baggage compartment, and for one or more hand fire extinguishers to be located in the passenger compartment of airplanes with a passenger seating capacity of 7 or more.

³ Reports available at the FAA William J. Hughes Technical Center Fire Safety Branch website: <http://www.fire.tc.faa.gov>.

6.5 **Fire Control.**

To “control a fire” (§ 25.857(f)(2)) means that the fire does not grow to a state where damage to the airplane or harm to the passengers or crew occurs during the length of time of protection that the fire protection system is demonstrated to afford during certification testing. This in turn means that critical airplane systems and structure adjacent to the cargo compartment are not adversely affected, and the temperature and air contaminants in areas occupied by passengers and crew do not reach hazardous levels.

- 6.5.1 The applicant should provide adequate protection from the effects of a fire for all cockpit voice and flight data recorders and wiring, windows, primary flight controls (unless it can be shown that a fire cannot cause jamming or loss of control), and other systems, structure, and equipment within or adjacent to the compartment that are required for safe flight and landing.
- 6.5.2 An applicant must demonstrate for Class B and Class F cargo compartments that hazardous quantities of smoke, flames, extinguishing agent, or noxious gasses do not enter any compartment occupied by passengers or crewmembers. AC 25-9 provides guidance concerning smoke penetration testing.
- 6.5.3 If an airplane has a Class B or Class F cargo compartment, portable protective breathing equipment must be provided for the appropriate crewmembers in accordance with § 25.1439. If the airplane is operated under part 121, the protective breathing equipment must meet the more stringent standards of § 121.337.
- 6.5.4 Additional protective breathing equipment or breathing gas supply, and additional fire extinguishers, may be required to ensure that the fire can be controlled for the time the airplane is expected to be in the air after onset of a fire. As required in § 25.851(a), 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. Depending on the proposed fire extinguishing agent and quantity of the agent provided, full-scale or high-fidelity fire extinguishing testing may be necessary to ensure an adequate level of protection.

6.6 **Reclassification.**

As explained in paragraph 5.4 of this AC, the Class D cargo compartment has been eliminated from the regulations due to limited effectiveness in providing fire protection. The Class F compartment is not intended to be a Class D compartment with smoke or fire detection. It is not acceptable to simply reclassify a compartment as Class F and use the same fire protection methodology as was used for Class D compartments. Means for controlling ventilation in Class D cargo compartments were shown to be ineffective in controlling a fire in many cases. This was evidenced by a number of accidents and incidents involving fires in Class D cargo compartments as discussed in Docket No. 28937, Notice of Proposed Rulemaking No. 97-10 (62 FR 32412, June 13, 1997), and Amendment 25-93 (63 FR 8032, February 17, 1998).

7 PROCEDURES AND LIMITATIONS.

- 7.1 To ensure that the contents of Class B and F compartments are accessible to crewmembers seeking to combat a fire, the cargo or baggage loading limitations and any operational limitations or procedures provided are expected to be identified with placards in the compartment. The loading and operational limitations must also be addressed in the appropriate weight and balance or loading document.
- 7.2 Any operational limitations or procedures necessary to ensure the effectiveness of the fire protection system for Class B and Class F cargo and baggage compartments should be clearly defined in the AFM. This should include such items as any changes to the ventilation system to prevent the entrance of smoke or gasses into occupied areas, use of hand fire extinguishers, use of protective breathing equipment, use of protective clothing, and use of the FCCs and FRCs in Class F cargo compartments. For example, the use of FCCs and FRCs in Class B cargo compartments do not afford a single crewmember immediate access to the source of the fire, which is critical in extinguishing the fire. The purpose of FCCs and FRCs is to control the fire within the cargo container without exposing the airplane to damage from a fire. The opening of an FCC or FRC to fight a fire would negate the benefits of their design. Therefore, the FAA may restrict use of FCCs and FRCs to certain classes of cargo compartments. The applicant and the ACO should work closely with the FAA Flight Standards organization (Aircraft Evaluation Group) to ensure that additional training necessary for crewmembers assigned to combat fires is adequately addressed.
- 7.3 Any time limit for a cargo or baggage compartment fire protection system, or other conditions or procedures related to combating a fire in a compartment, should be clearly defined in the AFM.

8 AFM CONSIDERATIONS.

- 8.1 Any crewmember designated to combat a fire in a Class B compartment will need special training. Fires occurring in luggage are difficult to extinguish completely and rekindling may occur. Crewmembers designated to combat fires in Class B compartments should be trained to check periodically to ensure that a fire has not grown back to hazardous proportions. The applicant and the ACO should work with the appropriate organizations, including the operators, to ensure that training in the use of protective breathing equipment, fire extinguishers, protective gloves and clothing is provided.
- 8.2 AFMs should contain instructions to land at the nearest suitable airport following smoke or fire detection, unless it can be positively determined that the fire is extinguished.
- 8.3 In the unusual event that occupancy of a Class B or F compartment during flight is approved by the FAA, that approval may require limitations in the AFM.

- 8.4 Any loading restrictions associated with access to cargo or baggage or special containers, including the use of FCCs and FRCs in Class F cargo compartments, should be clearly identified in the AFM. This would include, but not be limited to, placement of luggage in a Class B compartment or identification of special containers or covers associated with fire protection in a Class F compartment. If FCCs or FRCs are used in conjunction with a Class F cargo compartment, they should be easy to install and sufficiently durable to withstand in-service conditions.

If you have any suggestions for improvements or changes to this AC, you may use the Advisory Circular Feedback form at the end of this AC.



Jeffrey E. Duven
Manager, Transport Airplane Directorate
Aircraft Certification Service

Advisory Circular Feedback

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by (1) emailing this form to 9-AWA-AVS-AIR500-Coord@faa.gov or (2) faxing it to the attention of the Aircraft Certification Service Directives Management Officer at (202) 267-3983.

Subject:

Date:

Please check all appropriate line items:

An error (procedural or typographical) has been noted in paragraph _____ on page _____.

Recommend paragraph _____ on page _____ be changed as follows:

In a future change to this AC, please cover the following subject:
(Briefly describe what you want added.)

Other comments:

I would like to discuss the above. Please contact me.

Submitted by:

Date: