

DATE 7/29/80

ADVISORY CIRCULAR



DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Washington, D.C.

Subject: HAND FIRE EXTINGUISHERS FOR USE IN AIRCRAFT

1. PURPOSE. This advisory circular (AC) provides methods acceptable to the Administrator for showing compliance with the hand fire extinguisher requirements in Parts 25, 29, 91, 121, 127, and 135 of the Federal Aviation Regulations (FAR), and provides related general information.

2. FOCUS. Changes made to some of the FAR requirements for hand fire extinguishers used in aircraft are of utmost concern to both aircraft owners/operators and aviation maintenance agencies. Recent advancement in fire fighting technology and the development of fire extinguishing agents have made it necessary to update the AC information.

3. CANCELLATION. AC 20-42, Hand Fire Extinguishers in Transport Category Airplanes and Rotorcraft, dated 9/1/65 is canceled.

4. RELATED FAR SECTIONS.

- a. FAR 21.305.
- b. FAR 25.851; FAR 25.853 (e) and (f).
- c. FAR 29.851; FAR 29.853 (e) and (f).
- d. FAR 91.193 (c).
- e. FAR 121.309 (c).
- f. FAR 127.107 (c).
- g. FAR 135.155.

5. APPROVED HAND FIRE EXTINGUISHERS. Hand fire extinguishers are acceptable under Sections 25.851(a)(1), 29.851(a)(1), 121.309(c), 127.107(c) and 135.155 if they have been approved in accordance with FAR 21, Section 21.305. In accordance with Section 21.305(d) of the FAR the FAA accepts hand fire extinguishers approved by Underwriters Laboratories, Factory Mutual Laboratories, or U.S. Coast Guard under CFR 46 for use in aircraft.

6. DISCUSSION.

a. Types of Fires. To properly select an appropriate extinguisher for use in an aircraft it is recommended that consideration be given to the following classes of fires (as defined in the National Fire Protection Association (NFPA) Standards #10) that are likely to occur:

(1) Class A - Fires in ordinary combustible materials, such as wood, cloth, paper, rubber, and many plastics for which the quenching and cooling effects of quantities of water, or of solutions containing a large percentage of water, are of prime importance.

(2) Class B - Fires in flammable liquids, oils, greases, tars, oil base paints, lacquers, and flammable gases, for which extinguishing agents having a blanket effect are essential.

(3) Class C - Fires which involve energized electrical equipment and where the electrical nonconductivity of the extinguishing media is of importance.

(4) Class D - Fires which involve combustible metals and require extinguishing agents of the dry powder types, following special techniques and manufacturer's recommendations for use.

b. Extinguishing Agents Appropriate for Types of Fires. The following extinguishing agents are recommended as appropriate for use on the types of fires as specified below and defined in paragraph 6a.

- (1) Carbon Dioxide - Class B or C.
- (2) Water - Class A.
- (3) Vaporizing Liquid - Class B or C.
- (4) Dry Chemicals - Class B or C.
- (5) Halogenated Hydrocarbons - Class A-B-C.
- (6) Dry Powder - Class D.

c. Location Mounting of Hand Fire Extinguishers in Passenger Compartments. It is acceptable to install fire extinguishers in passenger compartments according to the following criteria:

(1) In general, locate hand fire extinguishers adjacent to the hazardous area (i.e., galleys, accessible baggage or cargo compartments, electrical equipment racks, etc.) they are intended to protect.

(2) If no clearly defined hazardous area exists, locate the hand fire extinguishers as follows:

(a) When one extinguisher is used, locate it at the flight attendants station or, where no flight attendant is required, locate the extinguisher at the passenger entrance door.

(b) When two or more extinguishers are used, locate one at each end of the passenger compartment and space the remainder uniformly within the cabin area.

(3) Mount hand fire extinguishers so that they are readily available. If they are not visible in their mounted position, a placard (with letters at least 3/8 inch high) may be used to indicate their location.

(a) Due to the mass weight of hand fire extinguishers, mounting brackets should be properly secured to aircraft structure capable of withstanding the inertia forces shown in Sections 23.561, 25.561, 27.561, 29.561 of the Federal Aviation Regulations.

(b) The weight of the hand fire extinguisher and its mounting bracket should be added to the aircraft empty weight and a new empty weight center of gravity computed.

d. Location and Mounting of Hand Fire Extinguishers in Small Single Engine and Multiengine Aircraft.

(1) Locate hand fire extinguishers so that they are easily accessible to the flight crew and the passengers.

(2) Hand fire extinguishers should not be allowed to lie loose on shelves or seats. Fire extinguishers and mounting brackets should be properly mounted to airframe structure capable of withstanding the inertia forces listed in paragraph (c) (3)(a) above.

e. Extinguishing Agent Toxicity.

(1) Hand fire extinguishers having a toxicity rating of five or higher are acceptable for use in occupied areas. Hand fire extinguishers using an extinguishing agent that has a rating in toxicity group four or lower are not recommended for use in confined areas unless adequate ventilation of the area (within 4 to 5 minutes) can be effected. Commonly used extinguishing agents are rated in toxicity groups (by the Underwriters' Laboratories) as follows:

(a) Bromotrifluoromethane (Halon 1301)	Group 6
(b) Carbon Dioxide	Group 5
(c) Bromochlorodifluoromethane (Halon 1211)	Group 5
(d) Dibromodifluoromethane	Group 4
(e) Bromochloromethane	Group 3
(f) Carbon Tetrachloride	Group 3

(2) Dry chemical extinguishing agents are considered nontoxic from a physiological point of view. However, as with any finely divided material, they may produce mild irritating effects especially when used in an enclosed area.

7. GENERAL INFORMATION.

a. Corrosion by Extinguishing Agents. Carbon dioxide is not corrosive and will not damage electrical equipment. Water itself is not corrosive, but may be rendered corrosive by the addition of antifreeze solutions. Various dry chemical agents are corrosive to most sensitive electronic components and instruments.

b. Winterized Hand Fire Extinguishers. Hand fire extinguishers may be winterized down to a -65°F (-54°C). Extinguishers containing plain water only can be protected to temperatures as low -40°F (-40°C) by the addition of an antifreeze stipulated on the extinguisher nameplate. Some extinguishers that use nitrogen as an expellant gas rather than carbon dioxide are approved or listed for temperatures as low as -65°F (-54°C).

c. Disadvantages of Dry Chemical Extinguishing Agents. When dry chemical fire extinguishers are discharged in crew compartments or confined areas, serious impairment to visibility will occur. Certain dry chemical agents also have a corrosive effect on electrical components.

d. Factory Sealed ("Disposable Type") Fire Extinguishers. Disposable type fire extinguishers should be maintained and inspected in accordance with the nameplate instructions.

(1) Nonrefillable disposable fire extinguishers have plastic discharge heads installed. Care should be exercised in the location of this type fire extinguisher to eliminate damage.

(2) Nonrefillable disposable fire extinguishers are exempt from the periodic hydrostatic test requirements.

(3) These type fire extinguishers are normally charged with a dry chemical extinguishing agent and have the same fogging effect and chemical reaction as standard dry chemical fire extinguishers.

e. Advantage of Using Halogenated Agent Extinguishers.

(1) Halon 1211 is similar to CO₂ in that it is suitable for use in cold weather and leaves no residue.

(2) Halon 1211 is twice as effective as a CO₂ extinguisher having equal weight of agent.

(3) Halon 1211 is a liquefied gas which leaves the nozzle in a stream that is about 85 percent liquid and 15 percent gas. This gives the agent a range of 20 to 25 feet.

(4) Because it is a gas, at normal temperatures, Halon 1211 leaves no chemical residue behind to contaminate or corrode aircraft parts or surfaces.

f. Precautions.

(1) Tests indicate that high levels of human exposure to Halon vapors can result in dizziness, impaired coordination, and reduced mental sharpness. Inhalation of air containing a four to five percent concentration of Halon 1211 for one minute is the maximum that can be safely tolerated by human subjects. (The discharge of a 2 1/2 pound Halon 1211 extinguisher in a 120 cubic foot aircraft cabin results in a concentration of less than one fourth of one percent.)

(2) Fire extinguishers containing bromotrifluoromethane (Halon 1301) and bromochlorodifluoromethane (Halon 1211) contain extinguishing agents whose vapor has a low toxicity. However, their decomposition products can be hazardous.

(3) Carbon dioxide fire extinguishers contain an extinguishing agent which will not support life when used in sufficient concentration to extinguish a fire. Prolonged occupancy of unventilated spaces can result in loss of consciousness due to oxygen deficiency.


g. Helpful Hints:

(1) Best results in fire fighting are generally obtained by attacking the near edge of the fire and progressing toward the back of the fire by moving the nozzle rapidly with a side-to-side sweeping motion.

(2) The effective discharge time of most hand held fire extinguishers ranges from 8 to 25 seconds depending on the capacity of the extinguisher. Due to this relatively short effective time span, the proper selection and use of the fire extinguisher must be made without delay.

(3) Care must be taken not to direct the initial discharge directly at the burning surface at close range (less than 5 to 8 feet) because the high velocity stream may cause splashing and/or scattering of the burning material.

(4) Ventilate the area as soon as possible (within 4 to 5 minutes) to reduce the gaseous combustion and the gases produced by thermal decomposition.


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