NFPA No.

408T

File: 400 Series
Aviation

Fire Extinguishers (Hand Type)

for

Aircraft Crew and Passenger Compartments

Adopted Tentatively, May, 1954

NOTICE

June, 1954

At the 1954 NFPA Annual Meeting held in Washington, D. C. the recommendations contained herein were tentatively adopted. The text is being reprinted in this form to permit wide circulation to interested persons with the express purpose of soliciting constructive comment and criticism.

At the time of its tentative adoption, several items were specifically referred back to the Committee for further consideration. These are detailed in the Foreword given herein and particular attention is directed to these points.

To receive full Committee consideration, it is requested that all comments be sent to the Association by September 15, 1954. It is planned that the Committee will offer for final adoption a revised text to be acted upon at the 1955 NFPA Annual Meeting to be held in Cincinnati, Ohio, May 16–20.

Price: 15 cents*

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NATIONAL FIRE PROTECTION ASSOCIATION

INTERNATIONAL

Executive Office: 60 Batterymarch St., Boston 10, Mass.

The National Fire Protection Association was organized in 1896 to promote the science and improve the methods of fire protection and prevention, to obtain and circulate information on these subjects and to secure the cooperation of its members in establishing proper safeguards against loss of life and property by fire. Its membership includes over a hundred and eighty national and regional societies and associations (list on outside back cover) and fifteen thousand individuals, corporations, and organizations. Anyone interested may become a member; membership information is available on request.

This pamphlet is one of a large number of publications on fire safety issued by the Association; a complete list is available without charge on request. The standards, prepared by the technical committees of the National Fire Protection Association and adopted in the annual meetings of the Association, are intended to prescribe reasonable measures for minimizing losses of life and property by fire. All interests concerned have opportunity through the National Fire Protection Association to participate in the development of the standards and to secure impartial consideration of matters affecting them.

NFPA standards are purely advisory as far as the Association is concerned, but are widely used by law enforcing authorities in addition to their general use as guides to fire-safety.

Definitions

The official NFPA definitions of shall, should and approved are:

SHALL is intended to indicate requirements.

SHOULD is intended to indicate recommendations, or that which is advised but not required.

APPROVED refers to approval by the authority having jurisdiction.

Units of measurements used here are U. S. standard. 1 U. S. gallon = 0.83 Imperial gallons = 3.785 liters.

Approved Equipment

The National Fire Protection Association does not "approve" individual items of fire protection equipment, materials or services. The standards are prepared, as far as practicable, in terms of required performance, avoiding specifications of materials, devices or methods so phrased as to preclude obtaining the desired results by other means. The suitability of devices and materials for installation under these standards is indicated by the listings of nationally recognized testing laboratories, whose findings are customarily used as a guide to approval by agencies applying these standards. Underwriters' Laboratories, Inc., Underwriters' Laboratories of Canada and the Factory Mutual Laboratories test devices and materials for use in accordance with the appropriate standards, and publish lists which are available on request.

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This Committee was reorganized in 1946 to replace the NFPA Aviation Committee (organized 1928) and the NFPA Committee on Aircraft Fire Fighting (organized 1944). The present Committee is charged with the responsibility "to develop aeronautical fire protection, including the elimination of fire hazards in aircraft design and operation, the installation of fire protective equipment in aircraft, the control of fire hazards in aircraft maintenance and storage, fire protection for airports and aircraft rescue and fire fighting."

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*Serving in a personal capacity.
†Non-voting member.
**Representation is *organizational*, not personal, and is for coordination purposes only.

SUB-COMMITTEE ON FIRE EXTINGUISHERS (HAND TYPE) FOR AIRCRAFT CREW AND PASSENGER COMPARTMENTS

This Sub-Committee of the NFPA Committee on Aviation and Airport Fire Protection was appointed in 1953 to facilitate handling the development of this Tentative Standard which has been under consideration by the full Committee since 1947. The Association is deeply grateful to these men for their cooperation and work in the interest of fire safety in aviation.

Robert C. Byrus, *Chairman,*
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FOREWORD

NFPA Committee activity in this field was initiated by a request from the Civil Aeronautics Administration on October 28, 1947 for comments on a proposed Safety Regulation Release covering fire protection of fuselage, baggage and passenger compartments on aircraft covered by CAR Amendment 04–1 (Nov. 1, 1946). The first publication covering the subject was NFPA Aviation Bulletin No. 19, dated November 1947. There were revisions of this Bulletin in March 1948, January 1949 and, finally, in December 1953. The recommendations contained herein were drafted by the Sub-Committee at a Committee meeting in January 1954 and were subsequently submitted to the full Committee for letter ballot. Of the 60 eligible voters of the full Committee, 45 voted affirmatively (one with editorial suggestions), 7 negatively and 8 did not vote.

At the 1954 Annual Meeting of the Association some editorial changes in the draft submitted and published in the 1954 NFPA Advance Reports (pages 85–90) and in Pamphlet No. 408-P were authorized and Paragraph 43. a. was changed so as not to require, as previously, that the cutting tool recommended therein be located in the passenger compartment.

The following six items have been referred back to the Committee for full consideration prior to the preparation of a revised text:

1. Placement of the cutting tool and the nature of this tool covered in Paragraph 43. a.

2. Whether placards pointing to or indicating placement of concealed extinguishers is acceptable in lieu of the extinguisher itself being "easily visible" as specified in Paragraph 42. b.

3. Whether spare carbon dioxide cartridges should be carried as specified in Paragraph 43. b.

4. Whether carbon dioxide or dry chemical extinguishers should be recommended for galleys as specified in Paragraph 42. b. (5).

5. Whether methyl bromide extinguishers covered in Paragraph 35, should be prohibited because of the toxic properties of the agent.

6. Whether winterization of carbon dioxide extinguishers should be accomplished with halocarbons rather than nitrogen as specified in Paragraph 32.

It is the intent of these recommendations to supplement existing governmental regulations to give the specific guidance of our non-governmental, technical fire protection Association for all those interested.

Fire Extinguishers (Hand Type) for Aircraft Crew and Passenger Compartments

NFPA No. 408T—1954

I. Purpose

11. These recommendations prescribe minimums for the type, capacity, location and quantity of hand type fire extinguishers for the protection of aircraft compartments occupied by passengers and crew.

II. Definitions

21. Hand type fire extinguishers are fire extinguishing units, manually operated, which are sufficiently portable to permit the entire unit to be transported by hand without excessive effort on the part of the operator. An *approved* hand type fire extinguisher for aircraft use is defined as a fire extinguisher which is approved by the Underwriters' Laboratories, Inc., Factory Mutual Laboratories, Underwriters' Laboratories of Canada, or, in the United States, by the Administrator, Civil Aeronautics Administration.

III. General Considerations

31. Fire extinguishers of current commercial availability for the protection of aircraft fuselage compartments occupied by passengers or crew employ one or more of the following agents: carbon dioxide, carbon tetrachloride, chlorobromomethane, dry chemical, methyl bromide, and anti-freeze water solutions. In selecting the agent for use in aircraft, consideration must be given to: (1) type of fires liable to be encountered; (2) ratio of agent's extinguishing ability to the quantity required; (3) method and facilities for extinguishing agent application; (4) agent's toxicity and corrosive properties; (5) gross weight of the unit; (6) freezing point of the agent; and (7) maintenance requirements.

32. Carbon Dioxide: Carbon dioxide extinguishers are principally suited for fires involving flammable liquids and electrical equipment. They have limited efficiency on fires involving ordinary combustible materials (paper, fabric, etc.). The principal action is to "blanket" the fire (by excluding oxygen from the air).

Best results are achieved by directing the discharge as close to the fire as possible, applying first at edge and bottom of the fire and progressing forward and upward, moving discharge horn slowly from side to side. Continuous discharge after the fire has been extinguished to achieve cooling and prevent reflash is recommended, especially where flammable liquids are involved. Carbon dioxide hand type extinguishers of the capacity recommended herein can normally be used without danger of ill-effects to the occupants. The carbon dioxide vapor cloud will, however, often reduce visibility temporarily in an enclosed space. The agent is non-corrosive and will not injure fabric or food. Carbon dioxide extinguishers will operate satisfactorily at temperatures above minus 40° F. Carbon dioxide extinguishers must be winterized with the addition of nitrogen to operate efficiently at temperatures as low as minus 65° F. The addition of nitrogen as a temperature depressant reduces by about 27 percent the amount of carbon dioxide available for fire extinguishing purposes. The agent does not deteriorate with age and the extinguisher needs to be refilled only after use. Periodic checks should be made by weighing the unit to assure full charge (correct full weight stamped on all approved types).

33. **Dry Chemical:** Dry chemical extinguishers are principally suited for fires involving flammable liquids and electrical equipment. The use of dry chemical extinguishers in compartments occupied by crew members is not recommended because of interference with visibility during discharge and the non-conductive powder residues that may be deposited on flight operational electrical contacts. Dry chemical extinguishers have limited efficiency on fires involving ordinary combustible materials (paper, fabric, etc.). The discharge should be directed at the base of the flames (although not directly into burning flammable liquids) and the nozzle moved rapidly from side to side to sweep the flames from the surface. Discharge should be continued after the fire has been extinguished to prevent possible reflash by coating the hot surfaces and any glowing material present. Dry chemical extinguishers of the capacity recommended herein can be used without danger of suffocation to the occupants. The dust cloud will often reduce visibility temporarily. The agent is non-corrosive, non-toxic, will not injure fabrics, and is non-poisonous on food. Discharge pressure may be secured from a small compressed gas cartridge or stored pressure. No special precautions are required for sub-zero operations although the discharge range will be appreciably reduced at temperatures as low as minus 40° F. when using carbon dioxide as the expelling agent. (If nitrogen is used as the expellent

the extinguisher is effective to at least minus 65° F.) The agent does not deteriorate or cake with age or humidity when sealed in the extinguisher and the unit needs to be refilled only after use. Periodic checks should be made to assure full charge. Only dry chemical specified by the manufacturer of the extinguisher should be used for recharging.

34. **Anti-freeze Water Solution:** Water extinguishers are most suitable for fires involving ordinary combustible materials (paper, fabric, etc.) where the cooling effect is essential and where the fire might smoulder if attacked solely by such agents as carbon dioxide or dry chemical. Water type hand extinguishers (of the kinds currently on the market) are not recommended for flammable liquid or electrical fires. The discharge should be directed at the base of the flames and worked around the burning area. Smouldering embers should be kept under scrutiny after the bulk of the fire is extinguished. There is no danger of toxicity. Water type extinguishers of this type are available which are designed to eliminate any detrimental corrosive effects which would interfere with their proper operation. Aircraft use will require anti-freeze preparations and care will be required in refilling (using manufacturers' specifications). Anti-freeze aircraft type extinguishers are effective in temperatures as low as minus 40° F. The Civil Aeronautics Administration (U. S. A.) have a Technical Standard Order (TSO-C19a)† covering aircraft type anti-freeze extinguishers. The agent does not deteriorate or evaporate with age when properly sealed and needs to be refilled only after use. Some types have an expellent charge in the form of a carbon-dioxide cartridge which must be replaced after each use. Periodic checks should be made to assure full charge by weighing cartridge and examining water content.

35. **Vaporizing Liquid Extinguishers:** Vaporizing liquid types of extinguishing agents, such as carbon tetrachloride, chlorobromomethane and methyl bromide possess characteristics making their installation in the specific application of aircraft passenger and crew compartments less desirable than other available types. Use of vaporizing liquid extinguishers in aircraft passenger and crew compartments must be accompanied by adequate and thorough considerations to personnel protection in accordance with the definite toxicity factors involved.

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†Available from Office of Standardization Coordinator, Civil Aeronautics Administration, Washington 25, D. C.

IV. Selection of Extinguishers

41. Selection of fire extinguishers should be based upon the type(s) and size(s) of fires liable to be encountered, the agent's extinguishing ability to handle any such fires, the efficiency of the unit mechanically (including the ease of operation, the method of application, and the facilities provided for effective discharge), the irritating and toxicity hazards of the agent, the weight of the unit, the freezing dangers and low temperature operating characteristics, and the maintenance requirements (including periodic checks, ease of inspection, etc.). It should be noted that almost all forms of combustion (fires) produce toxic vapors, the most serious practical danger being from carbon monoxide. Enclosed areas should be vented following *complete* extinguishment. Premature ventilation might, however, supply fresh oxygen to a smouldering fire which would cause reignition and extreme care is therefore required.

42. Number, Capacity and Location of Fire Extinguishers: The number, capacity and location of the extinguishers recommended follow:

a. Crew Compartment: Crew compartments shall contain at least one approved carbon dioxide hand extinguisher* to be located so as to be immediately accessible to the pilot's station. Additional portable fire extinguishers, suitable for the type of hazard, shall be provided for protection of other locations such as cargo compartments, the flight engineer's panel, radio equipment, etc. when the extinguisher required above is not readily accessible or is not of the proper type.

b. Passenger Compartments and Galley Compartments:

(*1*) Aircraft accommodating no more than 30 passengers shall contain a minimum of one approved anti-freeze water extinguisher.† This extinguisher shall be readily available and easily visible to passengers and crew. In personal type aircraft where crew and passenger compartments are not segregated and 4 or more seats are provided, one approved anti-freeze water extinguisher† is recommended in addition to the carbon dioxide extinguisher recommended in Paragraph 42. a.

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*The approved carbon dioxide and dry chemical extinguishers recommended herein should have a minimum B-2, C-2 rating (see NFPA Pamphlet No. 10). Such devices are available in a variety of sizes ranging in agent capacities from about 2 pounds (operated by a self closing lever or a pistol grip trigger) to about 6 pounds.

†Technical Standard Order C-19a specifies an anti-freeze extinguisher of a 1⅜ quart size.

(2) Aircraft providing space for over 31 and up to 60 passengers shall contain a minimum of one approved anti-freeze water extinguisher† and one additional extinguisher suitable for the type of hazard. These extinguishers shall be readily available and easily visible to passengers and crew.

(3) Aircraft accommodating 61 or more passengers shall have a minimum of two approved anti-freeze water extinguishers† *and* one additional extinguisher suitable for the type of hazard. The two water extinguishers shall be located remote from each other in the compartment. These extinguishers shall be readily available and easily visible to passengers and crew.

(4) Passenger compartments or lounges, other than lavatories, separate and individually located from other passenger-occupied compartments, shall have a minimum of one additional, approved anti-freeze water type extinguisher, this extinguisher to be readily available and easily visible to passengers and crew. A passenger compartment or lounge shall be considered separately and individually located when it is divided from other occupied portions of the aircraft by a door, curtained opening, stairwell or other arrangement which obscures vision or impairs air circulation, except that a berth in a sleeper plane shall not be considered a separate compartment.

(5) Where a galley is provided, one approved carbon dioxide* or one approved dry chemical extinguisher* shall be provided and this may constitute the "one additional extinguisher" referenced in Paragraphs 42. b. (2) and (3) above.

43. Accessory Equipment:

a. It is also recommended that a cutting tool be provided suitable for ripping cabin wall linings and seat upholstery in event of a concealed or smoldering fire in such areas.

b. Where extinguishers recommended above operate by carbon dioxide cartridges, one extra cartridge for each such unit should be carried aboard the aircraft where recharges of the basic extinguishing agent are also available. (This applies particularly to water type devices.)

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†Technical Standard Order C-19a specifies an anti-freeze extinguisher of a 1⅝ quart size.

*The approved carbon dioxide and dry chemical extinguishers recommended herein should have a minimum B-2, C-2 rating (see NFPA Pamphlet No. 10). Such devices are available in a variety of sizes ranging in agent capacities from about 2 pounds (operated by a self closing lever or a pistol grip trigger) to about 6 pounds.