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AIRCRAFT HAND FIRE EXTINGUISHERS 1970

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Official NFPA Definitions

Adopted Jan. 23, 1964: Revised Dec. 9, 1969. Where variances to these definitions are found, efforts to eliminate such conflicts are in process.

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This material has been developed in the interest of safety to life and property under the published procedures of the National Fire Protection Association. These procedures are designed to assure the appointment of technically competent Committees having balanced representation from those vitally interested and active in the areas with which the Committees are concerned. These procedures provide that all Committee recommendations shall be published prior to action on them by the Association itself and that following this publication these recommendations shall be presented for adoption to the Annual Meeting of the Association where anyone in attendance, member or not, may present his views. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accepts any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

Standard on

Aircraft Hand Fire Extinguishers

NFPA No. 408 — 1970

1970 Edition of NFPA No. 408

This standard was officially adopted on May 20, 1970 at the NFPA Annual Meeting held in Toronto, Ont. It revises and replaces the 1965 edition following action by the sponsoring Sectional Committee on Aircraft Maintenance and Servicing (under whose jurisdiction this standard rests) and the NFPA Committee on Aviation. The principal change in the 1970 edition, as compared with the 1965 text, is the permissive substitution of extinguishers utilizing halogenated extinguishing agents (classified by the Underwriters' Laboratories as falling into UL toxicity Group 5 or 6) for carbon dioxide extinguishers under certain conditions. This change appears in Note 2 to Paragraph 311. Other minor editorial and reference changes and deletions were made as necessary.

The earlier (1965) edition of this Standard had been approved as a USA Standard in 1967 and was identified as USAS Z112.3–1967. This 1970 edition is currently being submitted to the American National Standards Institute for approval.

Origin and Development of No. 408

Work on this standard started in 1947 after requests had been received by the National Fire Protection Association for recommendations on aircraft hand fire extinguishers. During the intervening years, prior to the adoption of the first draft of this text in 1955 by the Association, a number of proposals were prepared and circulated for comment and criticism. In 1956 a revision was adopted incorporating an Appendix on air crew training. Revisions were made in 1964, and 1965, and the current edition contains the latest recommendations of the Association.

It is the intent of this standard to supplement existing governmental regulations, as they may affect aircraft operators, in the provision for and selection of aircraft hand fire extinguishers. Where specific governmental regulations are not applicable, it is hoped that this standard will be a useful guide to those interested.

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SCOPE: To promote fire safety during the operation, maintenance, servicing and storage of aircraft and in the operation of airports and associated functions. The Committee is a policy-making Steering Committee of the NFPA Sectional Committees organized to handle specific technical problems in the aviation field. Reports prepared by the Sectional Committees are circulated for letter ballot to the members of this Committee and the results reported to the Annual Meeting of the Association.

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SCOPE: To develop fire safety recommendations to safeguard aircraft maintenance, storage and servicing operations, including all types of maintenance work (routine to major overhaul but excluding new construction and aircraft fuel servicing). This Sectional Committee reports to the Association through the Aviation Committee.

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Standard on

Aircraft Hand Fire Extinguishers

NFPA No. 408 — 1970

100. Scope

110. This Standard covers the type, capacity, location and quantity of aircraft hand fire extinguishers and accessory equipment provided essentially for the protection of aircraft compartments occupied by passengers and crew. Recommendations are also given for the daily inspection and periodic maintenance of aircraft hand fire extinguishers and a suggested air crew training outline is given in the Appendix.

200. Definitions

210. Aircraft hand 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 aircraft hand fire extinguisher is defined as a fire extinguisher which is approved by the Underwriters' Laboratories, Inc., Factory Mutual Research Corp., Underwriters' Laboratories of Canada, or other nationally recognized fire testing laboratories. The Federal Aviation Agency in the U. S. A. accepts water-based extinguishers on certification by the manufacturer that the device meets FAA Technical Standard Order C-19.

220. For the purposes of this Standard, fires can be divided into three basic types:

(a) Class A fires, defined as fires in ordinary combustible materials such as wood, cloth, paper, etc.

(b) Class B fires defined as fires in flammable petroleum products or other flammable liquids, greases, etc.

(c) Class C fires, defined as fires involving energized electrical equipment where the electrical nonconductivity of the extinguishing media is of importance. In most cases where electrical equipment is de-energized, extinguishers suitable for use on Class A or B fires may be employed effectively.

300. Basis for Recommendations

310. General

311. Aircraft hand fire extinguishers shall be of an approved type employing carbon dioxide or water (water solution) as ex-

tinguishing media.

NOTE 1. Dry chemical extinguishers are *not* recommended because fine electrical contacts aboard the aircraft serving essential circuits might be rendered inoperative due to the nonconductivity of dry chemical residues., the corrosive effect of *some* dry chemical formulations on metals commonly exposed in aircraft, the reduction of visibility liable to be encountered when the agent is discharged in the confined space of an aircraft cabin, and the difficulty of removing dry chemical residues following extinguishment.

NOTE 2. Extinguishers utilizing halogenated extinguishing agents classified by the Underwriters' Laboratories, Inc. as falling in UL Toxicity Group 5 or 6 *may* be substituted for the carbon dioxide extinguishers recommended herein if it can be shown that there is sufficient free-air volume within the aircraft cabin space to avoid producing serious irritating effects on the occupants. The irritating effects may be calculated by establishing the discharge of the total quantity of extinguishing agents (of all such extinguishers carried) within the smallest occupied space within the aircraft under full-load aircraft conditions and with no mechanical ventilation equipment in operation. In aircraft in which all occupants are provided with oxygen masks or respiratory equipment, this factor may be taken into consideration. Halogenated extinguishing agents with *lower* numerical UL toxicity ratings should *not* be used because of the greater toxicity of the agents and the possibility of producing greater quantities of harmful or irritating decomposition products when the agents are applied to a fire. (See also the "Warning" in Paragraph 411.)

312. The number, capacity and location of extinguishers shall be as specified in Section 400.

320. Carbon Dioxide Extinguishers

321. Carbon dioxide extinguishers are principally suited for fires involving flammable liquids (Class B) and electrical equipment (Class C). They are of limited value for extinguishment of incipient fires involving ordinary combustible materials (Class A) such as paper, fabric, etc. Their principal action is to "blanket" the fire by excluding oxygen.

322. In using extinguishers of this type, best results are obtained by directing the discharge close to the fire, applying first at edge and bottom of the fire and progressing forward and upward, moving discharge horn slowly from side to side. On electrical fires, to eliminate the primary source of trouble and to reduce the hazard of rekindling, the power to the appliance or wiring should be disconnected first wherever possible. Where electrical circuits cannot be disconnected, intermittent discharge of the extinguisher after the fire is initially extinguished may be necessary in event of reignitions.

323. Carbon dioxide hand type extinguishers *of the capacity recommended herein* can normally be used without danger of ill effects to the occupants. (See Note to Paragraph 421.a.) The carbon dioxide

vapor cloud will, however, often reduce visibility temporarily in an enclosed space. The agent is noncorrosive and will not injure fabric or food.

324. Where temperatures below minus 40° F. are encountered, carbon dioxide extinguishers should be winterized in an approved manner to assure maximum operational efficiency.

325. 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).

NOTE: Full information on the maintenance of these extinguishers is contained in the NFPA Recommended Good Practice for the Maintenance and Use of Portable Fire Extinguishers (No. 10A).

330. Water (Water Solution) Extinguishers

331. Water (water solution) extinguishers are most suitable for fires involving ordinary combustible material (Class A) such as paper, fabric, etc., where the quenching and cooling effects of water or a solution containing water are of first importance. Water extinguishers are not recommended for use on fires involving flammable liquids or energized electrical equipment or wiring.

332. In using extinguishers of this type, best results are obtained by directing the discharge at the base of the flames and working around the burning area. Smoldering embers should be kept under scrutiny after the bulk of the fire is extinguished.

333. There is no danger of toxicity. Water (water solution) extinguishers of approved types are designed to eliminate any detrimental corrosive effects which would interfere with their proper operation.

334. A proper degree of anti-freeze protection should be provided where necessary to assure efficient operation. Anti-freeze protection should be accomplished only in accordance with the manufacturer's instructions and with the approval of the testing agency (see Section 210 and Paragraph 442).

335. Discharge pressure may be secured from a small compressed gas cartridge or stored pressure. The agent does not deteriorate or evaporate with age when properly sealed and needs to be refilled only after use. Periodic checks should be made to assure full charge.

NOTE: Full information on the maintenance of these extinguishers is contained in the NFPA Recommended Good Practice for the Maintenance and Use of Portable Fire Extinguishers (No. 10A).

336. Normally, additional water is available from buffet and washroom facilities which may be used for soaking smoldering materials and for supplementary fire control purposes involving ordinary combustible materials.

400. Recommendations

410. General

411. Selection of fire extinguishers shall be based upon the facts discussed in Section 300.

WARNING: 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 supply fresh oxygen to a smoldering fire which might cause reignition and extreme care is therefore required.

420. Number, Capacity and Location of Fire Extinguishers:

The number, capacity and location of the extinguishers shall be as follows:

421. Crew Compartment:

(a) Crew compartments shall contain at least one approved carbon dioxide hand extinguisher with a minimum rating of 2B:C* to be located so as to be immediately accessible to the cockpit crew and its location made obvious by either its location or placarding.

422. Passenger and Buffet Compartments:

(a) In passenger compartments, the extinguishers specified in the following Subparagraphs *shall* be easily accessible at all times and *should* be clearly visible to the crew and passengers; however, if the extinguishers are not clearly visible to the crew and passengers, their location *shall* be indicated by a clearly legible placard or sign easily visible to the crew and passengers.

It is recommended that signs indicating location of extinguishers have letters at least 3/8 inch in height mounted on a contrasting background.

(b) Aircraft accommodating no more than 30 passengers shall contain a minimum of one approved water extinguisher.† In per-

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*Extinguishers are rated in accordance with the NFPA Standard on Installation of Portable Fire Extinguishers (No. 10, ANSI Z112.1). Carbon dioxide extinguishers having a 2B:C rating are available in sizes containing from 2 to 5 pounds of agent. Each extinguisher should be checked to determine its exact rating. Larger sizes should *not* be used in crew compartments unless the volume of the free air space and the natural venilation available indicates that any carbon dioxide concentration which might result from the operation of such larger capacity devices presents no problem to the crew due to oxygen deficiency in the space or obstruction of vision.

†See footnote page 408–9.

sonal type aircraft where crew and passenger compartments are not segregated and 4 or more seats are provided, one approved water extinguisher† is recommended in addition to the carbon dioxide extinguisher recommended in Paragraph 421.a.

(c) Aircraft providing space for 31 through 60 passengers shall contain a minimum of one approved water extinguisher† and one additional extinguisher which may be a carbon dioxide unit* having a minimum 2B:C rating.

(d) Aircraft accommodating 61 or more passengers shall have a minimum of two approved water extinguishers† and one additional extinguisher which may be a carbon dioxide unit* having a minimum 2B:C rating. The two water extinguishers shall be located remote from each other in the compartment.

(e) Passenger compartments or lounges, other than lavatories, separate and individually located from other passenger-occupied compartments shall have a minimum of one approved water extinguisher.† 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.

(f) Where cooking facilities are provided in a buffet or galley, one approved carbon dioxide extinguisher* having a minimum rating of 2B:C shall be provided and this may be the "additional extinguisher" referenced in Paragraphs 422.c. and d. above.

423. Baggage and Cargo Compartments:

(a) Baggage or cargo compartments of passenger-carrying aircraft accessible to crew members in flight may be provided with one approved water extinguisher† where desired. Normally, the water extinguishers provided in the passenger compartment will be available and accessible for use in such accessible baggage or cargo compartments and an extra extinguisher specifically for such compartments is not mandatory.

(b) No hand fire extinguishers are required for baggage or cargo compartments of passenger-carrying aircraft which are not accessible to crew members in flight.

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†A minimum one quart (nominal) size is recommended. The Underwriters' Laboratories, Inc., lists a special loaded-stream water solution extinguisher for aircraft use. FAA Technical Standard Order C-19 describes extinguishers of this design and the FAA authorizes the use of extinguishers meeting this TSO on certification by the manufacturer.

*See first footnote, page 408–8.

(c) Crew compartments of all-cargo type aircraft shall be provided with extinguishers as specified in Paragraph 421. Protection of cargo compartments of all-cargo type aircraft requires individual study as to the desirability and practicality of providing hand fire extinguishers. It is not considered practical to attempt to carry sufficient hand fire extinguishers to deal with a major cargo fire. The accessibility of the cargo, the internal air circulation, the facilities for depressurization, the insulation of the cargo compartment, the nature of the cargo, and the provision of fixed fire extinguishing equipment and the availability of fire detection equipment in such spaces influence the need for and type of hand fire extinguishers which might be required.

430. Daily Inspections of Aircraft Hand Fire Extinguishers

431. The daily inspections shall include: (1) a check that aircraft hand fire extinguishers are in their proper location, (2) that seal wires are in place, and (3) that pressure gage indicates proper pressurization on stored-pressure type equipment.

440. Other Maintenance Procedures for Aircraft Hand Fire Extinguishers

441. Aircraft hand fire extinguishers shall be maintained in accordance with the provisions of the NFPA Recommended Good Practice for the Maintenance and Use of Portable Fire Extinguishers (No. 10A) in so far as applicable.

442. Water extinguishers that are protected from freezing by corrosive additives (such as calcium chloride or alkali metal salt solutions) shall be discharged every six months to determine that they operate properly unless the manufacturer certifies that no corrosion hazard exists and this is substantiated by the tests of a nationally recognized fire testing laboratory.

450. Air Crew Training on Aircraft Hand Fire Extinguishers

451. Initially, before assignment, and annually thereafter, air crews shall receive training in the use of aircraft hand fire extinguishers. A suggested training outline is given in the Appendix.

460. Accessory Equipment

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

462. 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 to water type devices.)

Appendix
Suggested Air Crew Training Outline On Use of Aircraft Hand Fire Extinguishers

A-10. In compliance with Paragraph 451, aircraft crew members should be given opportunities to use the aircraft hand fire extinguishers provided so that they might become proficient in the use of these devices and be able to judge in actual fire situations the best type or types of extinguishers which might be used with maximum efficiency. A recurrent training program should be established.

A-20. Aircraft hand fire extinguishers recommended herein include those employing carbon dioxide** or water (water solution). Aircraft crews should be given training using the types of appliances actually provided on the aircraft they operate and serve.

A-30. The following outline to provide aircraft crews with the desired familiarity with aircraft hand fire extinguishers may be helpful.

WARNING: Instructors should practice these test fires beforehand and know what to anticipate. Be sure to light gasoline fires from the upwind side and prearrange method of ignition of fires to assure safety.

A-31. Training with carbon dioxide** extinguishers designed for Class B fires should be as follows:

(a) Materials needed:

1. Gasoline (in safety can).

2. One metal pan or tub about 18 inches in diameter and 4 inches high.

3. A supply of shredded paper.

4. One 15-pound carbon dioxide or dry chemical extinguisher and a 2½-gallon water extinguisher *for emergency use.*

5. One or more of the aircraft carbon dioxide** and water extinguishers to be used for the tests.

(b) Test fire suggestions:

1. In a safe location outdoors, spill some gasoline along the ground in a narrow strip (4 or 5 inches wide) for a distance of about 5 feet. Light one end and have trainees extinguish with the aircraft carbon dioxide extinguisher** in the manner described in Paragraph 322.

2. In a safe location outdoors, pour some gasoline in a metal pan or tub about 18 inches in diameter and 4 inches high. (The gasoline may be floated on water to conserve the fuel. Leave at least one-inch "freeboard.") Ignite the gasoline and have trainees

**Alternately, training with halogenated agent fire extinguishers shall follow the guide for carbon dioxide units.