NFPA No.

408

# AIRCRAFT HAND FIRE EXTINGUISHERS 1973


$1.00

*Copyright © 1973*

NATIONAL FIRE PROTECTION ASSOCIATION
International
470 Atlantic Avenue, Boston, MA 02210

5M-6-73-FP
Printed in U.S.A.

## 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.

SHALL is intended to indicate requirements.

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

APPROVED means acceptable to the authority having jurisdiction. The National Fire Protection Association does not approve, inspect or certify any installations, procedures, equipment or materials nor does it approve or evaluate testing laboratories. In determining the acceptability of installations or procedures, equipment or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure or use. The authority having jurisdiction may also refer to the listings or labeling practices of nationally recognized testing laboratories,* i.e., laboratories qualified and equipped to conduct the necessary tests, in a position to determine compliance with appropriate standards for the current production of listed items, and the satisfactory performance of such equipment or materials in actual usage.

*Among the laboratories nationally recognized by the authorities having jurisdiction in the United States and Canada are the Underwriters' Laboratories, Inc., the Factory Mutual Research Corporation, the American Gas Association Laboratories, the Underwriters' Laboratories of Canada, the Canadian Standards Association Testing Laboratories, and the Canadian Gas Association Approvals Division.

LISTED: Equipment or materials included in a list published by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials, and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.

LABELED: Equipment or materials to which has been attached a label, symbol or other identifying mark of a nationally recognized testing laboratory that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling is indicated compliance with nationally recognized standards or tests to determine suitable usage in a specified manner.

AUTHORITY HAVING JURISDICTION: The organization, office or individual responsible for "approving" equipment, an installation, or a procedure.

## Statement on NFPA Procedures

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.


## Copyright and Republishing Rights

This publication is copyrighted © by the National Fire Protection Association. Permission is granted to republish in full the material herein in laws, ordinances, regulations, administrative orders or similar documents issued by public authorities since the text is tentative at this time. All others desiring permission to reproduce this material in whole or in part shall consult the National Fire Protection Association.

# Standard on

# Aircraft Hand Fire Extinguishers

NFPA No. 408— 1973

ANSI Z112.3

## 1973 Edition of NFPA No. 408

This Standard was officially adopted on May 15, 1973 at the NFPA Annual Meeting held in St. Louis, Mo. It revises and replaces the 1970 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.

This edition, as revised in 1973, is a complete revision of the last previous issue (1970), largely to separate the *mandatory* provisions from the *recommendations*. This will be apparent to users of this Standard as now the "shall" requirements are in the main body of the text and the "should" recommendations are in Appendices A and B.

The earlier (1970) edition of this Standard was approved as an American National Standard in 1971 and was identified as ANSI Z112.3–1971. This 1973 edition has been submitted to the American National Standards Institute for approval. If and when approved, the cover of the pamphlet edition of this Standard will reflect the action by the American National Standards Institute.

## 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, 1965, and 1970, 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.

## Committee on Aviation

**Jerome Lederer,†** *Chairman,*
Flight Safety Foundation, 1800 North Kent St., Arlington VA 22209

**Harvey L. Hansberry,** *Vice-Chairman,*
U.S. Dept. of Transportation, Federal Aviation Administration, NAFEC, Atlantic City, NJ 08405

**George H. Tryon†,** *Secretary,*
National Fire Protection Association, 470 Atlantic Ave., Boston, MA 02210

**J. C. Abbott,** British Overseas Airways Corp.

**H. J. Badger,** The Boeing Co.

**J. J. Brenneman,** Chairman, NFPA Sectional Committee on Aircraft Rescue and Fire Fighting

**William L. Collier,** International Federation of Air Line Pilots Assns.

**F. P. DeGiovanni,** Vice-Chairman, NFPA Sectional Committee on Aircraft Hangars & Airport Facilities

**D. G. Dumper,** American Airlines

**P. M. Fitzgerald,** Chairman, NFPA Sectional Committee on Aircraft Hangars and Airport Facilities and rep. Factory Mutual Research Corp.

**W. Harris,** Australian Dept. of Civil Aviation

**B. V. Hewes,** Vice-Chairman, NFPA Sectional Committee on Aircraft Rescue and Fire Fighting and rep. Air Line Pilots Assn.

**Lt. Col. G. A. Hope,** Canadian Forces Headquarters

**R. L. Jackson,** American Petroleum Institute

**John E. Lodge,** Civil Aviation Authority (United Kingdom)

**A. J. Mercurio,** Factory Insurance Association

**J. A. O'Donnell,** Chairman, NFPA Sectional Committee on Aircraft Fuel Servicing

**H. B. Peterson,** U. S. Naval Research Laboratory

**Capt. Reuben P. Prichard, Jr.,** National Aeronautics & Space Administration

**Victor B. Robinson, Jr.,** U.S. Dept. of the Air Force

**John H. Sellers,** Chairman, NFPA Sectional Committee on Aircraft Maintenance and Servicing and rep. American Insurance Association

**John T. Stephan,** American Assn. of Airport Executives

**Kenneth A. Zuber,** Vice Chairman, NFPA Sectional Committee on Aircraft Maintenance & Servicing and rep. Compressed Gas Association

### Alternates.

**Wm. L. Hanbury,** National Aeronautics & Space Administration (Alternate to Capt. Reuben P. Prichard, Jr.)

**D. A. Heine,** Air Line Pilots Association (Alternate to B. V. Hewes)

**Thomas A. Raffety,** American Assn. of Airport Executives (Alternate to John T. Stephan)

**Richard Southers,** American Petroleum Institute (Alternate to R. L. Jackson)

### Nonvoting Members

**J. G. W. Brown,** British European Airways

**Stanley J. Green,** General Aviation Manufacturers Association

**V. Kidd,** Ministry of Defence, Air Force Dept. (United Kingdom)

**C. Hayden LeRoy,** National Transportation Safety Board

**Gene I. Martin,** Aerospace Industries Association of America, Inc.

**C. M. Middlesworth,** Federal Aviation Administration, National Aviation Facilities Experimental Center

**John A. Pope,** National Business Aircraft Assn., Inc.

**A. F. Robertson,** National Bureau of Standards.

**Dr. R. R. Shaw,** International Air Transport Association

**Edwin L. Thomas,** Air Transport Association

**Chief of the Aerodromes,** A.G.A., International Civil Aviation Organization

†Nonvoting.

## Sectional Committee on Aircraft Maintenance and Servicing

**John H. Sellers,** *Chairman,*
Insurance Company of North America, 1600 Arch St., Philadelphia, PA 19101
(rep. American Insurance Association)

**Kenneth A. Zuber,** *Vice Chairman,*
Walter Kidde & Co., Inc., Belleville, NJ 07109 (rep. Compressed Gas Assn., Inc.)

**J. C. Abbott,** British Overseas Airways Corp.
**K. J. Brewer,** Canadian Forces Headquarters
**Robert Donovan,** United Air Lines
**P. M. Fitzgerald,** Factory Mutual Research Corp.
**Harold W. Gray,** National Assn. of Fire Equipment Distributors, Inc.
**Harvey L. Hansberry,** (ex-officio), U.S. Dept. of Transportation, Federal Aviation Administration
**R. L. Jackson,** American Petroleum Institute
**Herb Leppke,** Air Line Pilots Assn.
**Donald Maddock,** Fire Equipment Manufacturers Assn.
**R. S. Moore,** Grumman Aerospace Corp.
**J. L. O'Donnell,** Eastern Air Lines
**Eugene Schafran,** Airport Operators Council International
**Howard Warzyn,** Trans World Airlines

**Alternates.**

**Edwin A. Olsen,** Compressed Gas Assn., Inc. (Alternate to Kenneth A. Zuber)
**Henry Matarazzo,** Fire Equipment Manufacturers Assn. (Alternate to Donald Maddock)
**Richard Southers,** American Petroleum institute (Alternate to R. L. Jackson)

**Nonvoting Members**

**Jerome Lederer** (ex-officio), Flight Safety Foundation
**C. M. Middlesworth,** U.S. Dept. of Transportation, Federal Aviation Administration NAFEC

*This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.*

### Table of Contents

**Standard on**

# Aircraft Hand Fire Extinguishers

**NFPA No. 408 — 1973**

**ANSI Z112.3**

## 100. Scope.

**110.** This Standard covers the type, capacity, location and quantity of aircraft hand fire extinguishers provided for the protection of aircraft compartments occupied by passengers and crew. Requirements are also given for daily checks and periodic maintenance of aircraft hand fire extinguishers. A suggested air crew training outline is given in Appendix B.

## 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 listed by the Underwriters' Laboratories, Inc., Factory Mutual Research Corp., Underwriters' Laboratories of Canada, or other nationally recognized fire testing laboratories. The Federal Aviation Administration in the U. S. A. accepts water-based extinguishers on certification by the manufacturer that the device meets FAA Technical Standard Order C-19b. and Aeronautical Standard AS-245.a.

**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 or combustible 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 Requirements

### 310. General

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

312. 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 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 shall 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 intended for continuous use, this factor may be taken into consideration. Halogenated extinguishing agents with *lower* numerical UL toxicity ratings shall *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.

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

323. Carbon dioxide extinguishers shall be weighed at least once a year to assure full charge (correct full weight marked on all approved types).

*See Appendix A.

### 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. A proper degree of antifreeze protection shall be provided where necessary to assure efficient operation. Antifreeze protection shall be accomplished only in accordance with the manufacturer's instructions and with the approval of the testing agency (see Section 210 and Paragraph 442).

333. Extinguishers shall be checked at least once a year to assure full charge. On cartridge-type extinguishers, the cartridge shall be weighed and the contents visually checked. On stored-pressure-type extinguishers, the pressure gage or indicator disc shall be checked.

## 400. Requirements

### 410. General

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

### 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. Extinguishers with higher ratings shall *not* be used in crew compartments unless the volume of the free air space and the ventilation available indicates that any carbon dioxide concen-

*See Appendix A.

**Where carbon dioxide extinguishers are specified in Section 400, halogenated extinguishing agent hand extinguishers meeting the provisions of Paragraph 312 may be substituted.

†Extinguishers are rated in accordance with the NFPA Standard on Installation of Portable Fire Extinguishers (No. 10, ANSI Z112.1).

tration 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.

**422. Passenger and Buffet Compartments:**

(a) In passenger compartments, the extinguishers specified in the following Subparagraphs shall be easily accessible at all times and their locations known to the crew or operator.

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

(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.** Aircraft hand fire extinguishers are not required for baggage and cargo compartments.

---

*See Appendix A.

**Where carbon dioxide extinguishers are specified in Section 400, halogenated extinguishing agent hand extinguishers meeting the provisions of Paragraph 312 may be substituted.

††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-19b. describes extinguishers of this design and the FAA authorizes the use of extinguishers meeting this TSO on certification by the manufacturer.

### 430. Daily Checks of Aircraft Hand Fire Extinguishers

**431.** For aircraft in service, daily checks shall include: (1) that aircraft hand fire extinguishers are in their proper location, (2) that seal wires are in place, and (3) that pressure gages, where provided, indicate 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.***

***460. Accessory Equipment.** Accessory equipment to facilitate effective use of aircraft hand fire extinguishers is not required.

*See Appendix A.

***A suggested training outline is given in Appendix B.

## Appendix A

## Supplementary Information

**A.311.** 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.

**A.321.** In using carbon dioxide extinguishers 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. 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 noncorrosive and will not injure fabric or food. The agent does not deteriorate with age and the extinguisher needs to be refilled only after use.

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).

**A.331.** In using water (water solution) extinguishers, 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. 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. 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. 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.

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).

**A-421.** (a). Carbon dioxide extinguishers having a 2B: C rating† are available in sizes containing from 2 to 5 pounds of agent.

**A-422.**(b). In personal 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.

**A-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 that are not accessible to crew members in flight.

(c) 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 that might be required.

**A-460. Accessory Equipment**

**A-461.** It is 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.

**A-462.** Where water extinguishers (water solution) are operated 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.

†Extinguishers are rated in accordance with the NFPA Standard on Installation of Portable Fire Extinguishers (No. 10, ANSI Z112.1).

## Appendix B

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

**B-10.** In compliance with Paragraph 451, aircraft crew members shall 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.

**B-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.

**B-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.

**B-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 A.321.

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.