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Report of Aviation Committee

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(Continued)
REPORT OF COMMITTEE ON AVIATION

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H. V. Williamson, Cardox, Division of Chemetron Corp.

J. H. Yankle, Fire-X Corp.

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.
This Report is in three Parts. **Part I** is the result of the work of the Sectional Committee on Aircraft Fuel Servicing. **Parts II** and **III** are the results of the work of the Sectional Committee on Aircraft Rescue and Fire Fighting. All three Parts have been processed through their respective Sectional Committee memberships and the members of the Committee on Aviation.

**Part I** contains 16 proposed revisions to the Standard for Aircraft Fuel Servicing. *(NFPA No. 407 — 1973, ANSI Z119.1.)* Item 2 liberalizes situations where fuel servicing can be done with an operating aircraft engine; Item 3 gives better guidance on precautions to be taken when passengers remain on board an aircraft during fuel servicing; Items 4 and 5 specify a minimum capacity of wheeled dry chemical extinguishers to be available for flight line protection in addition to the minimum rating of 80B; Items 7 and 8 distinguish between aircraft fuel servicing tank vehicles and aircraft fuel servicing hydrant vehicles as regards the number of extinguishers required; Item 9 covers under what conditions emergency repairs of aircraft fuel servicing vehicles can be accomplished in a hangar; Items 10, 11, 12, 13, 14, 15 and 16 all concern, essentially, proper designs of warning signs. The other items are largely editorial.

**Part II** offers 14 revisions to the Recommended Practice for Aircraft Rescue and Fire Fighting Services for Airports and Heliports *(NFPA No. 403 — 1973; ANSI Z213.1).* Most of these changes are either editorial in nature or a clarification of the intent of the provisions of the text.

**Part III** proposes 11 revisions, deletions and additions to the Standard for Evaluating Foam Fire Fighting Equipment on Aircraft Rescue and Fire Fighting Equipment. Items 1 through 6 concern the question of compatibility and mixing of foam liquid concentrates and converting equipment from one type of concentrate system to another. Item 7 offers a new Section 450 for testing foam performance in this type service. Items 8 through 11 are to alter the Appendix material with new Section A-600 the most significant.
Vote Statement

The Report of the Committee on Aviation and its two Sectional Committees reporting this year is presented in three Parts.

Part I contains proposed revisions to the NFPA Standard on Aircraft Fuel Servicing (NFPA No. 407 — 1973; ANSI Z119.1) as developed through the Sectional Committee on Aircraft Fuel Servicing.

Of the 14 voting members of the Sectional Committee, 13 have voted affirmatively, 1 negatively. The negative vote is from Mr. Schafran who objects to Items 2 and 9. On the Aviation Committee, of the 16 eligible voting members, 12 have voted affirmatively, 0 negatively, and 4 ballots have not been returned to date of this report.

Part II contains proposed revisions to the Recommended Practice for Aircraft Rescue and Fire Fighting Services at Airports and Heliports (NFPA No. 403 — 1973; ANSI Z213.1) as developed through the Sectional Committee on Aircraft Rescue and Fire Fighting.

Of the 48 voting members of the Sectional Committee, 44 have voted affirmatively, 0 negatively, and 4 ballots have not been returned to the date of this report. On the Aviation Committee, of the 13 eligible voting members, all have voted affirmatively.

Part III contains proposed revisions to the Standard for Evaluating Foam Fire Fighting Equipment on Aircraft Rescue and Fire Fighting Equipment (NFPA No. 412 — 1973) as developed through the Sectional Committee on Aircraft Rescue and Fire Fighting.

Of the 48 voting members of the Sectional Committee, 43 have voted affirmatively, 1 negatively, and 4 ballots have not been returned to the date of this report. On the Aviation Committee, of the 13 eligible voting members, all have voted affirmatively. The negative vote was from Mr. Isaac Opare-Addo of Ghana but was not accompanied by any reasons. It may have been an error in marking the ballot form and an effort is being made to contact him for verification of his ballot or for an explanation of his negative ballot.

An update of these ballot reports will be given at the meeting.
Part I
Proposed 1974 Revisions to the
Standard for
Aircraft Fuel Servicing
Revisions to NFPA No. 407 — 1973
ANSI Z119.1

1. Title: Delete the word “Tank” in the subtitle to the Standard (an
editorial oversight in 1973) so that, as corrected, the title will read:

Standard for
Aircraft Fuel Servicing
Including
Aircraft Fueling Hose, Aircraft Fuel Servicing Vehicles
and Airport Fixed Fueling Systems

to read as follows, keeping the present Section title and redesignating present
Subparagraphs 231.b. and 231.c. as 232 and 233, respectively, with no
change in content:

231. An operating engine on an aircraft may be a potential
source of ignition during fuel servicing under certain conditions.
For this reason, aircraft engines shall be shut down during fuel
servicing.

Exception: In an emergency resulting from the failure of an onboard auxiliary
power unit on a jet aircraft, a jet engine mounted at the rear of the aircraft
or on the wing on the side opposite from the fueling point may be operated to
provide aircraft electrical power during fueling provided that the operation
follows procedures published by the operator to assure safety in the operation.

3. Par. 283. Revise to read:

283. Aircraft Occupancy. If passengers remain on board an air-
craft during fuel servicing, at least one trained cabin attendant shall
be in the aircraft at or near a door at which there is a passenger
loading bridge, integral stairs which are down, or a passenger load-
ing stair or stand. Aircraft operators shall establish specific pro-
cedures covering emergency evacuation under such conditions for each type aircraft they operate. A “NO SMOKING” sign shall be displayed in the cabin(s) and the rule enforced.

4. Par. 287.a.(2). Revise to read:

(2) Where said capacity is in excess of 200 gallons per minute but not over 350 gallons per minute, one approved, wheeled dry chemical extinguisher having a minimum rating of 80B and a minimum capacity of 125 pounds of agent shall be provided.

5. Par. 287.a.(3). Revise to read:

(3) Where said capacity is in excess of 350 gallons per minute, two approved, wheeled dry chemical extinguishers, each having a minimum rating of 80B and a minimum capacity of 125 pounds of agent, shall be provided.

6. Par. 418.f. Redesignate as Paragraph 418.c. to improve the sequence of the requirements in this Paragraph and re-edit as shown below. Redesignate present Paragraphs 418.c., 418.d., and 418.e. as 418.d., 418.e., and 418.f., respectively, with no change in content:

*c. Emergency tank outlet valve shutoff controls shall be placarded “EMERGENCY SHUTOFF” in letters at least two inches high and of a color that contrasts with the background for ready visibility. Method of operation shall be indicated by an arrow or by the word “PUSH” or “PULL”, as appropriate. The word “EMERGENCY” shall not be used to identify any control or device on the vehicle other than these tank outlet emergency shutoff controls.

7. Par. 442. Delete the present last sentence as being impractical to enforce and insert the word “tank” between the word “servicing” and “vehicle,” the revised text to read:

442. There shall be at least two extinguishers mounted on each aircraft fuel servicing tank vehicle. Each extinguisher shall have a rating of not less than 20-B. At least one extinguisher shall be readily accessible from either side of the vehicle.

8. New Par. 443. Insert the following new Paragraph to correct a correlation oversight from a previous edition of the Standard, the new Paragraph to read (renumber present Par. 443 as 444):

443. There shall be at least one extinguisher mounted on each
aircraft fuel servicing hydrant vehicle. Each extinguisher shall have a rating of not less than 20-B.

9. Par. 455. Revise to read:

455. Fuel Servicing Vehicle Maintenance. Maintenance and servicing of aircraft fuel servicing vehicles shall be done outdoors or in a building approved for this purpose.

Exception: If emergency repairs are required on an aircraft fuel servicing vehicle during inclement weather and no such approved building is available, minor repairs necessary to get the vehicle back into service may be done in a hangar, provided that the following requirements are observed:

(a) Approval to perform the work in the hangar shall be secured from the supervisor responsible for the hangar operation. The approval shall be in writing. It shall specify the work to be done, the location assigned for the work, the requirements listed below, and any special requirements deemed necessary.

(b) Not more than one such vehicle shall be permitted in a hangar at one time. Repairs shall be limited to those needed to get the vehicle back in service.

(c) Approval shall be limited to vehicles used for Jet A fuels only.

(d) Welding, cutting or open flames shall be prohibited.

(e) Portable electrical equipment used during the repair of the vehicle shall conform to the requirements of Article 513 of the National Electrical Code (NFPA No. 70 — 1974; ANSI C1 — 1974).

(f) The hangar shall be constructed and protected in accordance with the provisions of the Standard for Aircraft Hangars (NFPA No. 409-1973; ANSI Z214.1).

(g) At least two wheeled dry chemical extinguishers, each having a minimum rating of 80B and a minimum capacity of 125 lbs., shall be located within 50 feet of the vehicle being serviced.

(h) A separation of at least 50 feet shall be maintained between the vehicle being serviced and the nearest part of any aircraft in the hangar.

10. Par. 473.b. Revise to read:

*b. One or more emergency shutoff stations shall be provided. Each station location shall be placarded EMERGENCY FUEL SHUTOFF in letters at least two inches high. Method of operation shall be indicated by an arrow or by the word “PUSH” or “PULL” as appropriate. Any action required to gain access to the shuto
device (e.g., “BREAK GLASS”) shall be clearly shown. Lettering shall be on a background of a contrasting color for ready visibility. Placards shall be weather resistant, shall be at least seven feet above the ground, and located so that they can be readily seen from a distance of at least twenty-five feet.

11. Par. 533.f. Revise to read:

*f. Each emergency shutoff station shall be placarded “EMERGENCY FUEL SHUTOFF” in letters at least two inches high. Method of operation shall be indicated by an arrow or by the word “PUSH” or “PULL”, as appropriate. Any action required to gain access to the shutoff device (e.g., “BREAK GLASS”) shall be clearly shown. Lettering shall be on a background of a contrasting color for ready visibility. Placards shall be weather resistant, shall be at least seven feet above the ground, and located so that they can be readily seen from a distance of at least twenty-five feet. Valves used to shut off a hydrant for maintenance purposes shall not have placards that could cause confusion in an emergency.

12. Sec. 620. Revise to read:

620. Emergency Control Stations.

621. A system to completely shut off the flow of fuel in an emergency shall be provided. The system shall shut off the fuel at the grade level.

622. At least two emergency shutoff stations, adequately separated, shall be provided on the operating area. An additional emergency shutoff station shall be at grade level, near but at least ten feet from the pumps.

623. Each emergency shutoff station shall be placarded “EMERGENCY FUEL SHUTOFF” in letters at least two inches high. Method of operation shall be indicated by an arrow or by the word “PUSH” or “PULL”, as appropriate. Any action required to gain access to the shutoff device (e.g., “BREAK GLASS”) shall be clearly shown. Lettering shall be on a background of a contrasting color for ready visibility. Placards shall be weather resistant. Placards on the operating deck shall be at least seven feet above the deck and located so that they can be readily seen from the fueling area.

624. All heliport personnel shall be trained in the operation of the emergency shutoff controls.

625. The emergency shutoff controls shall be in addition to the normal operating controls for the pumps.
13. New Par. A-418.c. Add the following new text to read:

A-418.c. Emergency shutoff controls should be outlined by a contrasting color panel at least one square foot in area. Placard lettering preferably should be red on a white background or black on a high-visibility yellow background.

14. Par. A-473.b. Add the following new first sentence with no other change to the balance of the text or to the subparagraphs which follow:

“See Paragraph A-418.c. for design of emergency shutoff control placards.”

15. New Par. A-533.f. Add the following new text to read:

A-533.f. See A-418.c. for design of emergency shutoff control placards.

16. New Par. A-623. Add the following new text to read:

A-623. See A-418.c. for design of emergency shutoff control placards.
PART II

Proposed 1974 Revisions to Recommended Practice for Aircraft Rescue and Fire Fighting Services at Airports and Heliports

NFPA No. 403; ANSI Z213.1
Latest Previous Revision: 1973

1. Par. 311.b. Change the word "aircraft" in the fifth line to the word "fuselage".

2. Par. 311.d. Change the word "discharge" in the fourth line and in the eighth line to the word "application".

3. Par. 312.a. Change the word "angle" in the eighth sentence to the words "vantage point".

4. Par. 312.d. Revise to clarify intent to read:
   d. At Index 1, 2 and 3 airports and at airports where special climatic conditions exist (such as in arid deserts or in near-arctic cold), dry chemical may be used to replace water on the basis of 8 pounds (3.6 kilograms) of dry chemical to one gallon (3.785 liters) of water.

5. Par. 312.e. Revise to clarify intent to read:
   e. Extinguishing agents (except water for foam production) should be carried in stock to resupply vehicles in sufficient amounts commensurate with the delivery schedules of suppliers. A minimum of one additional charge for all vehicles should be maintained, and where delivery time for suppliers exceeds 24 hours, supplies should be increased accordingly. This condition will vary at different airports, and no definitive quantities can thus be recommended. Care should be exercised in stocking agents to assure that stocks are rotated on a "first in, first out" basis. Consideration should be given to having on hand additional quantities of extinguishing agents for the purpose of training. Where it is anticipated that runways will be
foamed for aircraft emergency landings, still further foam liquid concentrate should be carried in stock to assure that the supplies reserved for fire fighting are not affected. (See also Section 1100 of NFPA No. 402, Standard Operating Procedures, Aircraft Rescue and Fire Fighting.)

6. Note to Article 400 and Par. 411. Change the word “shall” in the second sentence to the word “should” and place the revised material in the “Note” as the second and third sentences of present Paragraph 411.

7. Par. 412. Delete the third sentence which reads: “At airports served by only one vehicle extreme care should be taken to keep the vehicle in top operating condition and available at all times.” Revise the second sentence in the second Paragraph of the “Note” to this Paragraph to read:

As an example, when using aqueous film-forming foam (AFFF) concentrates for foam production, Table 1C specifies 5,000 gallons (19,000 liters) of water capacity for the fire fighting and tank vehicles in Index 7; two fire fighting vehicles each carrying 2,500 gallons (9,500 liters) would be preferable to two 1,500 gallon (5,700 liter) capacity fire fighting vehicles supplemented by a 2,000 gallon (7,600 liter) capacity tank vehicle.

8. Par. 413. Insert the word “as” after the word “overloaded” in the second sentence.

9. Par. 414. Delete the phrase “(runway or taxiway)” in the first sentence. Change the word “determine” in the second sentence to the words “assure that” and also insert the word “are” after the word “vehicle” in the same sentence.

10. Par. 415. Delete the word “opportunities”.

11. Par. 417. In the first sentence, change the word “facilities” to “devices” (second line) and in the last sentence change the word “controlling” to “maintaining control of”.

12. Par. 421. Add after “Table 1B” the words “and 1C” in the first sentence.

13. Par. 431. Delete the second sentence.

14. Par. 461.d. Delete this subparagraph as being redundant since this recommendation is covered in Paragraph 461 itself.
6. Par. 471. Revise the second sentence to read:

Underground water service mains for aircraft landing areas are also desirable.

10. Par. 474. Revise the Paragraph as shown herein and delete Subparagraph e with no changes in the other Subparagraphs:

474. Aircraft rescue and fire fighting vehicles normally should be garaged at one or more strategic locations (see also Article 100 of NFPA No. 402). The station apparatus section should be heated (where necessary) to assure immediate starting of garaged vehicles and should be located so:

17. Par. 482. Delete the third sentence.

18. Par. 483.b. Revise the last portion of this Paragraph to read: "Indexes 4 through 8" instead of "Indexes 3 through 8".

19. Appendix C, Table C1. Add to the Aircraft Groupings the "Airport Indexes" and show the metric equivalents in the bold face aircraft definitions (Editorial).
Part III

1974 Proposed Revisions to

Standard for

Evaluating Foam Fire Fighting Equipment on
Aircraft Rescue and Fire Fighting Equipment

NFPA No. 412
Latest Edition: 1973

1. Par. 213.a. Delete the last sentence of the existing text which reads: "Mixing foam liquids of different types or different manufacturers should not be done unless it is established that they are completely interchangeable (see Paragraphs 213.b. and c.)" (See Item 5)

2. Par. 213.b. Delete the last sentence of the existing text which reads: "Protein and fluoroprotein foam concentrates are incompatible with AFFF concentrate and should not be mixed, although foams separately generated with these concentrates are compatible and can be applied to a fire in sequence or simultaneously." (See Item 5)

3. Par. 213.c. Delete the next to the last sentence of the existing text which reads: "Mixing foam liquid concentrates of different types or different manufacture should not be done unless it is established that they are completely interchangeable (see Paragraph 213.a. and b.)." (See Item 5)

4. Par. 213.d. Note: (See Item 6).

5. New Par. 214. Add the following new Paragraph to replace the deletions indicated in Items 1, 2 and 3, renumbering present Paragraphs 214, 215, and 216 as 215, 216 and 217:

214. Mixing of protein, fluoroprotein, or AFFF concentrates of different types or different manufacturers shall not be permitted unless it has been specifically established that they are compatible for long-term storage and that such mixing will not reduce the fire extinguishing effectiveness of the equipment in which the agent is to be used.
9. New Paragraph 218. Make the present "Note" following present Paragraphs 218.d., new Paragraph 218 to read as follows:

218. Converting aircraft rescue and fire fighting vehicles utilizing foam from one type of concentrate system to another type of concentrate system should not be accomplished without consultation with the equipment manufacturer and without a thorough flushing of the agent tank and the complete system. Particular attention must be given to assuring that system component materials are suitable for the particular concentrate and that, where necessary, the proportioning equipment is recalibrated and reset.

7. New Section 450. Insert the following new Section:

450. Basic Extinguishing Capability

451. The ultimate test for performance is determining action on a fire. Foam performance is chiefly judged on two criteria: (1) ability for quick knockdown of flames and (2) ability to keep fuel area secure against reignition. In order to obtain meaningful information it is necessary that the foam be applied at low rates per square foot of fuel surface. This will represent the performance to be expected when the system is pushed to its ultimate capability on a large fire. High application rates will overwhelm the fire and obscure any possible shortcomings. Fire tests sufficiently large to challenge the foam equipment are very costly and difficult to conduct without creating undue environmental problems. Therefore, an attempt is made in this Standard to devise a restricted but still significant procedure.

452. A foam vehicle user might utilize the basic test procedure in several ways. For example, it might be desired to establish the minimum rate of foam application at which a fire can be extinguished. By taking this rate and the time for extinguishment, the volume of water required to extinguish one square foot can be calculated and also from this the maximum fire area capability of the vehicle. It should be kept in mind, however, that the most efficient use of water leads to long extinguishing times. In practice a high application rate is sought because it gives the most rapid knockdown of flame, although it will be less efficient. Operation of the turret to achieve complete extinguishment is also wasteful of water. Generally after the fire has been 90 per cent extinguished, it is better to shut down the turret and finish off the extinguishment by foam application from handlines or by the application of one of the complementary agents.

453. A user might desire to compare his system on two different fuels or under several different weather conditions such as high winds, heavy rain, or extreme low temperatures or with obstacles within the fire area.
In this type of testing care must be taken to change only one variable at a time. All other conditions must remain the same.

454. A user might desire to check his foam system against its “as purchased” condition. Here the tests must be conducted under the same conditions as any of the original tests.

8. Par. A-252. Insert following the end of the present fifth sentence the following cross reference: “(See Figures 4, 5 and 6.)”

9. Par. A-253.e. Replace with the following:

   e. 1-Hand Refractometer (American Optical Co. Model 10430 or equivalent.) There are numerous refractometers of this general type available. The scale markings may vary but this is not important because the user must make his own calibration.

10. New Figures 4, 5 and 6. Insert these three new Figures in Appendix A after Paragraph A-253 with the captions for each as shown (renumbering present Figures 4A through 4G as Figures 7A through 7G):

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Figure 4. The index of refraction is measured by placing a few drops of the solution to be tested on the prism of a refractometer and closing the cover plate. This is a typical refractometer suitable for this purpose.
Figure 5. When this type refractometer is held up to a light source a reading is taken where the dark field intersects the numbered scale.

11. New Section A-600. Add the following new Section A-600 to read as follows:

**A-600. FOAM FIRE TEST**

**A-610. Turret or Handline Extinguishing Test**

**A-611.** The exact size of the fire to be used is not critical, however, it should be no less than 100 ft\(^2\) (10 x 10) in area. Large-scale testing has shown that larger area fires do not necessarily require greater application rates or greater quantities of agent (foam) per unit area. The choice of fuel is optional, depending on the data desired. Gasolines are normally the most difficult fuels to extinguish and Jet A (JP-5) the easiest. Jet B (JP-4) is a variable fuel without a specified flash point. Normally the fuel will be contained in a shallow pit or diked area on concrete. Water may be used to level a large pit to ensure a full fuel area but in any event bare ground should be presoaked to prevent loss of fuel. The amount of fuel is partially dependent on the length of preburn to be allowed. With preburn times of one minute, at least one gallon of fuel for each two square feet of area should be used. Local clean air regulations may dictate the length of preburn as this is the period of greatest smoke generation.
Figure 6. This illustrates the field of view looking into the refractometer illustrated in Figures 4 and 5 containing a 6 per cent AFFF Solution. The dark field intersects the scale at 1.7 and this value is recorded as the reading for a 6 per cent concentration.

A-612. Establishing and maintaining the desired rate of foam application will require some work and practice prior to the conduct of the fire test. The object is to sweep the turret or nozzle back and forth over the fire area at an even rate in order to apply the foam at the desired gallons-per-minute (gpm) per square foot. The actual rate is checked by placing one foot square (or other convenient size of known area) shallow pans near the edges of the fire area. After the foam discharge pattern has been swept back and forth over the fire area and pans for a measured period of time, the stream is shut off and the weight of the contents of each pan determined and the application rate calculated. If the rate has been too
high, a faster rate and wider angle of sweep will be necessary and vice versa. Once the proper technique has been worked out, the fire is extinguished in the same manner. The pans can be used during the fire test to verify the application rate. NFPA No. 403 recommends a rate of 0.13 gpm per square foot for AFFF and 0.20 gpm per square foot for protein foam.

A-613. The following calculations are typical of those used in the determination of the basic extinguishing capability of an aircraft rescue and fire fighting vehicle of 1000 gallon water capacity:

- Gross weight of pan with collected foam = 412 oz
- Empty weight of pan = 350 oz
- Net weight of foam sample = 62 oz

Water collected = \( \frac{\text{foam wt, oz}}{133.3} = \frac{62}{133.3} = 0.465 \) gallons

Total water applied = \( \frac{\text{water collected, gal}}{\text{area of pan, ft}^2} = \frac{0.465}{3.5} = 0.133 \) gal/ft\(^2\)

Foam application rate = \( \frac{\text{gallons applied per ft}^2}{\text{time of foam discharge, min}} = \frac{0.133}{1.0} = 0.133 \) gpm/ft\(^2\)

Basic extinguishing capability = \( \frac{1000 \text{ gal}}{0.133 \text{ gal/ft}^2} = 7600 \text{ ft}^2/1000 \text{ gal water} \)

A-620. Burnback Test

A-621. The resistance of the foam blanket on the fuel to burnback after the fire has been extinguished is of importance. In the determination of this property wind plays a big role and repeat results are difficult to obtain on an outdoor test. Another factor, but one easier to control, is the size of the fire area at the start of reignition. In order to standardize this a short section of stovepipe 12-inches in diameter is dropped into the foam blanket like a cookie cutter. The foam is removed from the inside,
the fuel surface ignited and allowed to burn for one minute before the stovepipe is removed. The rate of enlargement of the fire is then observed. A long period of confinement is desired. The delay period after end of foam application and start of reignition may be varied but for comparative tests it must be kept constant.

A-622. Burnback resistance is related to the amount of foam which has been applied to the fire. A burnback test on a fire area which has been extinguished with a minimum application of foam will not afford a high level of protection. When the need for long periods of positive protection arises, additional application of foam after extinguishment must be provided.

A-623. To compare the degree of burnback protection of different agents and depths of foam and to familiarize crew with the degree of protection afforded, repeated tests using varied delays between end of foam application and start of reignition are suggested.