

**NFPA®**

# 414

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**Standard for  
Aircraft Rescue and  
Fire-Fighting Vehicles**

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**2020**



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**NFPA® 414****Standard for****Aircraft Rescue and Fire-Fighting Vehicles****2020 Edition**

This edition of NFPA 414, *Standard for Aircraft Rescue and Fire-Fighting Vehicles*, was prepared by the Technical Committee on Aircraft Rescue and Fire Fighting. It was issued by the Standards Council on April 28, 2019, with an effective date of May 18, 2019, and supersedes all previous editions.

This edition of NFPA 414 was approved as an American National Standard on May 18, 2019.

**Origin and Development of NFPA 414**

In 1960, a tentative edition of this standard was adopted by the Association. The original document was further revised in 1962, 1963, 1964, 1965, 1967, 1968, 1969, 1970, 1975, and 1978.

In 1984, the standard was revised completely to identify three types of vehicles and to make the document easier to use. The text also was rewritten to conform with the *Manual of Style*.

The standard was revised again in 1990, and a chapter was added to provide a test method to verify the design requirements.

Notable revisions to the 1995 edition included the removal of requirements for a separate category of rapid intervention vehicle.

The major change for the 2001 edition was the combination of major fire-fighting vehicles and combined agent vehicles. Additionally, a table concisely provided many requirements that previously were covered by numerous paragraphs.

The 2007 revision included minor changes to the document plus the addition of a new chapter on interior access vehicles.

For the 2012 edition of NFPA 414, the committee went through the entire document and made a multitude of changes to the requirements. Those changes included the addition of an equivalency statement, to provide the AHJ or purchaser some flexibility when it comes to meeting the requirements. There was also a new emphasis placed on Chapter 5, which deals with aircraft interior access vehicles. This was due largely to the increase in need for these vehicles based on the increased size of aircraft as well as some limitations to traditional aircraft rescue and fire-fighting (ARFF) vehicles, whose primary function is fire fighting. These vehicles assist in the evacuation of passengers from aircraft in addition to the use of evacuation slides or if the slides are not appropriate for use and deployment.

Another important item addressed in the 2012 edition was that many ARFF vehicles are operated by a single person and that many of the devices and warnings/alarms are now designed with a single user/operator in mind. Generally speaking, many of the changes or enhancements that were introduced into the 2012 edition revolved around the development and use of larger aircraft, such as the A-380 and the Boeing Dreamliner, as well as the composite materials from which they are manufactured. The capacities for ARFF vehicles have to be increased to address this change in aircraft as well as to ensure that the vehicles are still able to meet prescribed response time standards.

The committee had also addressed the environmental impact some extinguishing agents pose and either limited them or removed them from the document and replaced them with acceptable alternatives. The committee also reviewed the entire document to ensure that it was consistent with the source documents, with commonly accepted practices as they relate to the ARFF industry, and with the *Manual of Style for NFPA Technical Committee Documents*.

The 2017 edition revisions included updates to referenced publications and definitions and a rewrite of Chapter 5, Aircraft Interior Access Vehicles. This rewrite included the addition of language to address cab visibility, cab construction, equipment, AIAV body, docking platform, acceptance

criteria, and testing. Revisions also included extracted language from NFPA 1901 on SCBA mounting and a full extract of NFPA 1901 language for Chapter 6, Electrical System Performance Tests.

The 2020 edition adds new requirements for forward-looking infrared cameras mounted on ARFF vehicles. Clarifications have been made to the definitions and requirements for boom-mounted turrets to align more accurately with industry practices. Extensive changes have been made to prototype vehicle testing procedures, with lists specifying the various testing procedures that need to be conducted based on changes made to existing vehicles. References are updated throughout the document, and minor editorial changes have been made.

The Technical Committee on Aircraft Rescue and Fire Fighting wishes to dedicate this edition of NFPA 414, *Standard on Aircraft Rescue and Fire-Fighting Vehicles*, to the memory of Ralph Colet. Ralph became a principal member of the committee in 1993 and was a tireless advocate for alternative viewpoints throughout his tenure on the committee. Many of the requirements of the standard exist solely because of Ralph's passion and vision. Ralph became ill at a technical committee meeting in Seattle, Washington, in 2017 and passed away shortly after. He will forever be remembered by all of the committee members who knew him.

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**Committee Scope:** This Committee shall have primary responsibility for aircraft rescue and fire-fighting (ARFF) documents used by organizations providing ARFF services for operational procedures; training; foam testing and application; specialized equipment; and planning for aircraft emergencies.

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## NFPA 414

## Standard for

## Aircraft Rescue and Fire-Fighting Vehicles

2020 Edition

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**NOTICE:** An asterisk (\*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced and extracted publications can be found in Chapter 2 and Annex E.

## Chapter 1 Administration

## 1.1 Scope.

**1.1.1\*** This standard specifies the minimum design, performance, and acceptance criteria for aircraft rescue and fire-fighting (ARFF) vehicles intended to transport personnel and equipment to the scene of an aircraft emergency for the purpose of rescuing occupants and conducting rescue and fire-fighting operations.

**1.1.2** Vehicles without wheels, such as track, amphibious, or air-cushion types, are not covered by this standard.

## 1.2 Purpose.

**1.2.1** The purpose of this standard is to specify features and components that, when assembled, produce an efficient and capable fire-fighting vehicle for both on-pavement and off-pavement performance. Off-pavement capability is important to ensure timely and effective response of these vehicles to aircraft accident sites located off paved surfaces.

**1.2.2** It is not the purpose of this standard to serve as a detailed purchase specification. Drafting of complete specifications for bidding purposes is the responsibility of the purchaser.

**1.3 Equivalency.** Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

**1.3.1** Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

**1.3.2** The system, method, or device employed shall be demonstrated to meet the acceptance criteria for the intended purpose to the authority having jurisdiction.

## Chapter 2 Referenced Publications

**2.1 General.** The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

**2.2 NFPA Publications.** National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 412, *Standard for Evaluating Aircraft Rescue and Fire-Fighting Foam Equipment*, 2020 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus*, 2016 edition.

NFPA 1961, *Standard on Fire Hose*, 2020 edition.

NFPA 1964, *Standard for Spray Nozzles*, 2018 edition.

## 2.3 Other Publications.

**2.3.1 ANSI Publications.** American National Standards Institute, Inc., 25 West 43rd Street, 4th Floor, New York, NY 10036.

ANSI S1.4, *Specification for Sound Level Meters*, 1983.

**2.3.2 ASME Publications.** American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

*Boiler and Pressure Vessel Code*, 1992.

**2.3.3 ASTM Publications.** ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM D4956, *Standard Specification for Retroreflective Sheeting for Traffic Control*, 1994.

**2.3.4 FAA Publications.** Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591. [https://www.faa.gov/airports/resources/advisory\\_circulars/](https://www.faa.gov/airports/resources/advisory_circulars/)

FAA Advisory Circular No. 150/5210-19A, *Driver's Enhanced Vision System (DEVS)*.

**2.3.5 NATO Publications.** Global Engineering Documents, An IHS Company, 15 Inverness Way East, Englewood, CO 80112.

NATO Document, *Dynamic Stability Report—Allied Vehicle Testing Publication (AVTP)*, 03-16W.

**2.3.6 SAE Publications.** SAE International, Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.

SAE AIR1375D, *Minimum Safety Requirements for Special Purpose Airline Ground Support Equipment*, 2014.

SAE AIR6133, *Design and Safety Criteria for Passenger Boarding Stairways*, 2013.

SAE J156, *Fusible Links*, 1997.

SAE J551/1, *Performance Levels and Methods of Measurement of Electromagnetic Compatibility of Vehicles, Boats (up to 15 m), and Machines (16.6 Hz to 18 GHz)*, 2010.

SAE J553, *Circuit Breakers*, 1996.

SAE J554, *Electric Fuses (Cartridge Type)*, 1987.

SAE J994, *Standard on Alarm-Backup-Electric Laboratory Performance Testing*, 1993.

SAE J1127, *Low Voltage Battery Cable*, 1995.

SAE J1128, *Low Voltage Primary Cable*, 1995.

SAE J1888, *High Current Time Lag Electric Fuses*, 1990.

SAE J1908, *Electrical Grounding Practice*, 1996.

SAE J2077, *Miniature Blade Type Electrical Fuses*, 1990.

SAE J2174, *Heavy-Duty Wiring Systems for Trailers 2032 mm or More in Width*, 2009.

SAE J2180, *A Tilt Table Procedure for Measuring the Static Roll-over Threshold for Heavy Trucks*, 1993.

SAE J2181, *Steady State Circular Test Procedures for Trucks and Buses*, 1993.

SAE J2202, *Heavy-Duty Wiring Systems for On-Highway Trucks*, 2003.

SAE J2418, *Occupant Restraint System Evaluation — Frontal Impact Component-Level Heavy Trucks*, 2003.

SAE J2420, *COE Frontal Strength Evaluation—Dynamic Loading Heavy Trucks*, 2010.

SAE J2422, *Cab Roof Strength Evaluation—Quasi-Static Loading Heavy Trucks*, 2010.

**2.3.7 UNECE Publications.** UN Economic Commission for Europe, Palais des Nations, CH-1211, Geneva 10 Switzerland.

ECE Regulation number 29, *Uniform Provisions Concerning the Approval of Vehicles with Regard to the Protection of the Occupants of the Cab of a Commercial Vehicle*, 2007.

**2.3.8 U.S. Government Publications.** U.S. Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401-0001.

Federal Motor Carrier Safety Administration: *FMVSS 121 Brake Performance and Stability Testing*.

**2.3.9 Other Publications.**

*Merriam-Webster's Collegiate Dictionary*, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

## 2.4 References for Extracts in Mandatory Sections.

NFPA 402, *Guide for Aircraft Rescue and Fire-Fighting Operations*, 2019 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus*, 2016 edition.

NFPA 1917, *Standard for Automotive Ambulances*, 2019 edition.

## Chapter 3 Definitions

**3.1 General.** The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

### 3.2 NFPA Official Definitions.

**3.2.1\* Approved.** Acceptable to the authority having jurisdiction.

**3.2.2\* Authority Having Jurisdiction.** An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

**3.2.3\* Listed.** Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

**3.2.4 Shall.** Indicates a mandatory requirement.

**3.2.5 Should.** Indicates a recommendation or that which is advised but not required.

**3.2.6 Standard.** An NFPA Standard, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase “standards development process” or “standards development activities,” the term “standards” includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

### 3.3 General Definitions.

**3.3.1 Aggressive Tire Tread.** See 3.3.60.1.

**3.3.2\* Aircraft Rescue and Fire Fighting (ARFF).** The fire-fighting action taken to prevent, control, or extinguish fire involved or adjacent to an aircraft for the purpose of maintaining maximum escape routes for occupants using normal and emergency routes for egress. [402, 2019]