NFPA 1143

Standard for Wildland Fire Management

2003 Edition

NFPA, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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NFPA 1143

Standard for

Wildland Fire Management

2003 Edition

This edition of NFPA 1143, *Standard for Wildland Fire Management*, was prepared by the Technical Committee on Forest and Rural Fire Protection and acted on by NFPA at its May Association Technical Meeting held May 18–21, 2003, in Dallas, TX. It was issued by the Standards Council on July 18, 2003, with an effective date of August 7, 2003, and supersedes all previous editions.

This edition of NFPA 1143 was approved as an American National Standard on July 18, 2003.

Origin and Development of NFPA 1143

The first edition of NFPA 295, titled *Community Forest Fire Fighting Equipment,* was adopted by NFPA in 1934. The next edition was issued in 1956 as *Community Equipment and Organization for Fighting Forest, Grass and Brush Fires.* The document was retitled *Recommendations for Forest, Grass and Brush Fire Control* when it was issued in 1965 and retitled again, as *Recommendations for Wildfire Control and Environmental Improvement*, in 1972. In 1973 the document became a standard and was titled *Standard for Wildfire Control by Volunteer Fire Departments* and carried that title in the 1978 edition. The document was titled *Standard for Wildfire Control* with the issuance of the 1985 edition. Subsequent editions were issued in 1991 and 1998.

This edition is a complete rewrite of the document, which has been renumbered and renamed NFPA 1143, *Standard for Wildland Fire Management.* In developing this edition, the Technical Committee recognized the development of the National Fire Plan in the United States and numerous mitigation efforts to solve the ailing forests and endangered communities in or near forested areas. In addition, the Committee incorporated material to help small community and volunteer fire departments prepare for not only fire suppression in forested and wildland areas but also the broader task of wildland fire management, including mitigation, prevention, and community coordination.

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NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

Committee Scope: This Committee shall have primary responsibility for documents on fire protection for rural, suburban, forest, grass, brush, and tundra areas. This Committee shall also have primary responsibility for documents on Class A foam and its utilization for all wildland and structural fire fighting. This excludes fixed fire protection systems.

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Contents

Chapter 1 Administration **1143–** 4
1.1 Scope **1143–** 4
1.2 Purpose **1143–** 4
1.3 Wildland Fire Control Policies **1143–** 4

Chapter 2 Referenced Publications **1143–** 4
2.1 General **1143–** 4
2.2 NFPA Publications **1143–** 4
2.3 Other Publications **1143–** 4

Chapter 3 Definitions **1143–** 4
3.1 General **1143–** 4
3.2 NFPA Official Definitions **1143–** 4
3.3 General Definitions **1143–** 5

Chapter 4 Risk/Hazard Assessment and Mitigation **1143–** 6
4.1 General **1143–** 6
4.2 Values at Risk **1143–** 6
4.3 Risk Assessment **1143–** 6
4.4 Hazard Assessment **1143–** 6
4.5 Mitigation Plan **1143–** 6

Chapter 5 Preparedness **1143–** 7
5.1 Preparedness Planning **1143–** 7
5.2 Financial Planning **1143–** 7
5.3 Safety Requirements **1143–** 7
5.4 Training and Qualifications **1143–** 7

Chapter 6 Incident Management **1143–** 7
6.1 Organizational Structure **1143–** 7
6.2 Command Function **1143–** 7
6.3 Operations **1143–** 8
6.4 Planning Function **1143–** 9
6.5 Logistics Function **1143–** 9
6.6 Finance **1143–**10

Annex A Explanatory Material **1143–**10

Annex B Air Operations for Forest, Brush, and Grass Fires **1143–**19

Annex C Preparedness Planning **1143–**23

Annex D Informational References **1143–**24

Index **1143–**26

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NFPA 1143

Standard for

Wildland Fire Management

2003 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. As an aid to the user, Annex D lists the complete title and edition of the source documents for both mandatory and nonmandatory extracts. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

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

Chapter 1 Administration

1.1 Scope. This standard presents fundamental information to fire protection organizations on the management of wildland fire.

1.2* Purpose. The purpose of this standard is to specify management practices and policies necessary for a fire protection organization to develop a wildland fire management program.

1.3 Wildland Fire Control Policies.

1.3.1 Organization.

1.3.1.1 Where the possibility of wildland fire constitutes a threat to the jurisdiction, the authority having jurisdiction (AHJ) shall be organized to perform activities to protect life and property.

1.3.1.2 The goal shall be to reduce wildland fire loss through the establishment, maintenance, and coordination of policies and programs addressing fire prevention, risk assessment and mitigation, planning, incident management, personnel, infrastructure, training, communications, and safety.

1.3.2 Policy. The AHJ shall develop a policy for managing the organization in all aspects of wildland fire prevention and control.

1.3.2.1 As a minimum, the policy shall be established in accordance with legal mandates, department priorities, planning procedures, incident management, personnel safety and training, and cooperative agreements.

1.3.2.2 Additional policy items shall be included as determined necessary by the AHJ.

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, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications,* 2003 edition.

NFPA 1051, *Standard for Wildland Fire Fighter Professional Qualifications,* 2002 edition.

NFPA 1144, *Standard for Protection of Life and Property from Wildfire,* 2002 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program,* 2002 edition.

NFPA 1521, *Standard for Fire Department Safety Officer,* 2002 edition.

NFPA 1561, *Standard on Emergency Services Incident Management System,* 2002 edition.

NFPA 1977, *Standard on Protective Clothing and Equipment for Wildland Fire Fighting,* 1998 edition.

2.3 Other Publications.

2.3.1 NWCG (National Wildfire Coordinating Group) Publication. National Interagency Fire Center Publications, Great Basin Cache Supply Office, 3833 So. Development Avenue, Boise, ID 83705.

NWCG-NFES No. 1077, *Incident Response Pocket Guide,* January 2002 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 included, common usage of the terms shall apply.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). 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 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* 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.

3.2.5 Shall. Indicates a mandatory requirement.

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

3.2.7 Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

3.3 General Definitions.

3.3.1 Agency. A division of government with a specific function or a nongovernmental organization (e.g., private business) that offers a particular kind of assistance.

3.3.2* Apparatus. A motor-driven vehicle or group of vehicles designed and constructed for the purpose of fighting fires.

3.3.3 Brush. A collective term that refers to a stand of vegetation dominated by shrubs, woody plants, or low-growing trees, usually of a type undesirable for livestock or timber management.

3.3.4 Command. The act of directing and/or controlling resources by virtue of explicit legal, agency, or delegated authority.

3.3.5* Company. A group of members having the following characteristics: (a) Under the direct supervision of an officer or leader (b) Trained and equipped to perform assigned tasks (c) Usually organized and identified as engine companies, ladder companies, rescue companies, squad companies (d) Usually operating with one piece of fire apparatus (e.g., quint, pumper, ladder truck, elevating platform, rescue, squad, or ambulance) (e) Arriving at the incident scene on fire apparatus or assembling at the scene prior to assignment. [**1500:**3.3]

3.3.6 Company Officer. The officer or any other position of comparable responsibility in the department in charge of a fire department company or station.

3.3.7 Control a Fire. To complete a control line around a fire, any spot fire therefrom, or any interior island to be saved; to burn out any unburned area adjacent to the fire side of the control line and to cool down all hot spots that are an immediate threat to the control line.

3.3.8 Crew. An organized group of fire fighters under the leadership of a crew leader or other designated official.

3.3.9 Crew Boss (Leader). A person who is in supervisory charge of usually 10 to 20 fire fighters and who is responsible for their performance, safety, and welfare.

3.3.10 Defensible Space. An area as defined by the AHJ [typically a width of 9.14 m (30 ft) or more] between an improved property and a potential wildfire where combustible materials and vegetation have been removed to reduce the potential for fire on improved property spreading to wildland fuels or to provide a safe working area for fire fighters protecting life and improved property. [**1144:**3.3]

3.3.11 Finance. The incident management section responsible for all incident costs and financial considerations.

3.3.12 Forest Fire. See 3.3.30, Wildland Fire.

3.3.13 Grass Fire. See 3.3.30, Wildland Fire.

3.3.14 Incident. An occurrence, either human-caused or a natural phenomenon, that requires action or support by emergency services personnel to prevent or minimize loss of life or damage to property and/or natural resources.

3.3.15 Incident Commander (IC). The individual responsible for the management of all incident operations at the incident site.

3.3.16* Incident Management System. A system that provides structure and coordination to the management of emergency incident operation in order to provide for the safety and health of fire department members and other persons involved in those activities.

3.3.17 Liaison. The individual responsible for the coordination of activities with assisting agencies.

3.3.18 Logistics. The incident management section responsible for providing facilities, services, and materials for the incident.

3.3.19 Mitigation. Action that moderates the severity of a fire hazard or risk.

3.3.20 Operations. The incident management section responsible for all tactical operations at the incident.

3.3.21 Planning. The incident management section responsible for the collection, evaluation, and dissemination of tactical information related to the incident and for preparation and documentation of incident management plans.

3.3.22 Prescribed Fire. A fire burning within prescription from either planned or unplanned ignitions.

3.3.23 Prevention. Activities, including public education, law enforcement, personal contact, and reduction of fuel hazards, directed at reducing the incidence of fires.

3.3.24 Risk. The chance of fire starting from any cause.

3.3.25 Rural. Any area wherein residences and other developments are scattered and intermingled with forest, range, or farmland and native vegetation or cultivated crops.

3.3.26 Stakeholder. An individual, or representative of same, having an interest in the successful completion of a project. [***101*:**3.3]

3.3.27* Unified Command. A team effort that allows all agencies with jurisdictional responsibility, either geographical or functional, to manage an incident by establishing a common set of objectives and strategies.

3.3.28* Values at Risk. Public and private values that the wildland fire protection system is created and funded to protect.

3.3.29 Wildfire. See 3.3.30, Wildland Fire.

3.3.30* Wildland Fire. An unplanned and uncontrolled fire spreading through vegetative fuels, at times involving structures.

3.3.31 Wildland/Urban Interface. Any area where wildland fuels threaten to ignite combustible homes and structures.

3.3.32* Wildland/Urban Interface Coordinator. The person responsible for the development of the plan(s) for the reduction of the fire risks and hazards associated in the wildland/urban interface.

3.3.33 Wildland/Urban Interface Protection Specialist. The person responsible for the development and/or implementation of a plan to protect people, communities, or individual structures from a wildland fire.

3.3.34 Wildland/Urban Intermix. An area where improved property and wildland fuels meet with no clearly defined boundary.

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Chapter 4 Risk/Hazard Assessment and Mitigation

4.1* General. The AHJ shall develop a written risk and hazard assessment and mitigation plan based on values at risk and consistent with fire fighter and public safety.

4.2 Values at Risk.

4.2.1 The AHJ shall involve the community, landowners, industry, and major stakeholders in the identification of values to be protected within the jurisdiction.

4.2.2 The values shall include, but not be limited to, health, safety, property, and resource values, as well as the social, economic, environmental, and political concerns of the local jurisdiction.

4.3 Risk Assessment.

4.3.1 The AHJ shall evaluate the potential and historical sources of ignition.

4.3.2 The evaluation shall include both natural and human sources including, but not be limited to, the following:

(1) Natural occurrences (e.g., lightning, volcanic eruptions)
(2) Utility and transportation corridors
(3) Industry
(4) Recreation
(5) Arson

4.4* Hazard Assessment.

4.4.1 The AHJ shall determine the difficulty to control wildland fires within or threatening the jurisdiction.

4.4.2 The assessment shall consider, but not be limited to, the following:

(1) Vegetation (fuels)
(2) Topography
(3) Aspect
(4) Fire history
(5) Historical fire weather
(6) Fire danger rating
(7) Potential fire behavior
(8) Fire-fighting capabilities and limitations

4.5* Mitigation Plan.

4.5.1 General.

4.5.1.1 Based on the values, risk assessment, and hazard assessment, the AHJ shall develop a strategic plan identifying the required mitigation activities, responsible party, priorities, and implementation schedule.

4.5.1.2 This plan shall be developed and implemented through coordination and cooperation with the following:

(1) Neighboring fire organizations
(2) Police organizations
(3) Public works agencies
(4) Service/support organizations
(5) Public utilities
(6) Medical/health facilities
(7) Media and the general public
(8) Dispatch/communications centers
(9) Insurance companies
(10) Local government stakeholders
(11) Homeowner organizations
(12) Environmental agencies and organizations
(13) Planners, builders, and developers
(14) Other special interest groups

4.5.1.3 The mitigation activities shall include, but not be limited to, the details outlined in 4.5.2 to 4.5.8.

4.5.2 Ignitions. The AHJ shall identify the prevention activities that reduce the occurrence of human-caused ignition.

4.5.3 Fuels Treatment.

4.5.3.1 The AHJ shall identify activities necessary to mitigate fire behavior characteristics through fuel modification.

4.5.3.2 Fuels treatment shall include, but not be limited to, one or more of the following methods:

(1) Fire
(2) Mechanical
(3) Hand
(4) Biological (e.g., grazing, species modification)
(5) Chemical

4.5.4 Public Education. The AHJ shall appoint a qualified public information officer (PIO) whose duties shall include, but not be limited to, the following:

(1) Scheduling and facilitating public meetings to identify values at risk, wildland fire threats, and potential mitigation strategies
(2) Disseminating information concerning activities and their status through development and distribution of prevention information
(3) Familiarizing press and media representatives with the threat of wildland fire and mitigation strategies

4.5.5 Building Site Design and Construction.

4.5.5.1 Where a wildland fire risk and hazard severity assessment indicates the need for fire-resistive design and construction, that design and construction shall be consistent with NFPA 1144, *Standard for Protection of Life and Property from Wildfire.*

4.5.5.2 The design criteria shall include, but not be limited to, building placement and defensible space.

4.5.6 Fire-Fighting Capability.

4.5.6.1 The AHJ shall evaluate the capabilities and limitation of fire-fighting resources to meet the mitigation standards.

4.5.6.2 When the situation indicates that additional resources are needed, the following shall be considered:

(1) Cooperative agreements
(2) Budget adjustments for additional personnel and/or equipment
(3) Government and private sector grants
(4) Volunteer recruitment
(5) Additional training
(6) Improved tactics
(7) Use of improved techniques

4.5.7 Infrastructure. The AHJ shall evaluate and consider the need for modification or additions to the infrastructure, including the following:

(1) Roads
(2) Water supply
(3) Communications
(4) Utility corridors

4.5.8 Special Considerations. The AHJ shall comply with environmental laws in the planning and implementation of mitigation activities, including those pertaining to threatened and endangered species and historical and cultural resources.

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Chapter 5 Preparedness

5.1* Preparedness Planning.

5.1.1 The AHJ shall develop a written preparedness plan(s) for wildland fire control consistent with fire fighter and public safety.

5.1.2 The plan(s) shall be based on life safety, followed by resource/property values to be protected, as well as the political, social, economic, environmental, and other concerns of the local jurisdictions.

5.1.3 This plan shall be reviewed annually and, as a minimum, include the following:

(1) Identification of specific wildland fire hazards and risks and hazard areas within the jurisdiction and other hazards that negatively affect wildland fire control efforts
(2) Identification of fire protection features such as lakes, rivers, water points, natural firebreaks, and other areas or features that are beneficial to wildland fire control efforts
(3) A list of resources, including personnel, apparatus, and equipment
(4) A list of all cooperating agencies and other mutual aid resources and the procedures for requesting assistance from those agencies and resources
(5) A reference to any and all existing mutual aid agreements, contracts, and other protection agreements applicable to wildland fire control efforts
(6) A list of specific objectives relating to training, safety, response times, and staffing levels
(7) A list of other resources that provide analyses of fire cause, identification of special fire hazards and risks, assessment of wildland/urban interface and intermix fire protection problems, and proposed measures to reduce fire occurrence

5.2 Financial Planning. The financial element of the preparedness plan shall include, as a minimum, the contractual agreements to provide for the following services:

(1) Fuel, oil, and lubricants
(2) Medical services, including injury reports
(3) Catering, food, and drinking water
(4) Personnel hiring and hourly pay
(5) Outside services, including lodging and communications
(6) Equipment maintenance
(7) Specialized fire-fighting equipment
(8) Purchasing agreements and systems
(9) Incident support
(10) Insurance notification systems

5.3* Safety Requirements. The AHJ shall develop safety requirements that include the requirements of 5.3.1 through 5.3.4.

5.3.1 The AHJ shall develop a safety program that includes all aspects of wildland fire incident operation, personnel welfare, and the use of personal protective clothing and equipment. The program shall be established in accordance with jurisdictional policies and procedures and reflect the established guidance provided by NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program.*

5.3.2 The safety officer's function shall be to carry out duties in accordance with established wildland fire incident procedures and to carry out criteria as outlined in NFPA 1521, *Standard for Fire Department Safety Officer.*

5.3.3 Protective safeguards shall be developed for appropriate apparatus and equipment used during wildland fire incidents. Equipment operators shall be properly trained as outlined in NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications.*

5.3.4 The AHJ shall follow the medical examination standards established in NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program.*

5.4* Training and Qualifications. Each organization having wildland fire control responsibility shall develop and conduct a training and qualification program, as outlined in NFPA 1051, *Standard for Wildland Fire Fighter Professional Qualifications.*

Chapter 6 Incident Management

6.1* Organizational Structure. The AHJ shall structure an organization in a manner to provide for wildland fire control.

6.1.1 Each of the following functions shall be addressed regardless of the size and complexity of the incident:

(1) Command
(2) Operations
(3) Planning
(4) Logistics
(5) Finance

6.1.2 On a small incident, one person shall handle all of the functions in 6.1.1.

6.2* Command Function. In the management of wildland fire incidents, the AHJ shall utilize an incident management system as specified in NFPA 1561, *Standard on Emergency Services Incident Management System.*

6.2.1 Unified Command. When wildland fire control efforts involve a multiagency or multijurisdictional incident, the AHJ shall utilize a unified command approach to incident management.

6.2.2 Strategic Considerations. The command function shall develop strategic goals for the control of wildland fire incidents.

6.2.3* Command Staff. The incident commander (IC) shall provide for public information, safety, and liaison functions in which each function shall be filled as needed depending on the size and complexity of the incident.

6.2.3.1 Public Information Plan. The AHJ shall prepare a written public information plan to guide the department and the public information officer in executing the organization's responsibilities to inform the public of the danger of wildland fire.

6.2.3.1.1 Incident Public Information. The plan shall include the following:

(1) A media alert system to inform media of wildland fire events in a timely manner
(2) A method that allows media representatives to approach the fire scene, in a safe manner, to take photographs, to record video, and/or to conduct interviews

6.2.3.1.2 Post-Incident Public Information. The plan shall include the following:

(1) Follow-up contacts with public and press/media to ensure an unimpeded flow of information to the public
(2) A process for allowing the public and residents to return to evacuated areas

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6.2.3.2 Post-Incident Activities.

6.2.3.2.1* Fire Reporting.

(A) The AHJ shall complete and file a fire report for every incident.

(B) Such reports, whether hard copy or electronic, shall be filed within the time frame specified by the state, provincial, or federal authority.

6.2.3.2.2 Reviews and Evaluations.

(A) All reviews and evaluations shall be conducted as constructive critiques to determine the facts related to a specific incident.

(B) As a minimum, evaluations shall cover the following:

(1) Examination of the progress of an ongoing incident and confirmation of effective decisions or corrected deficiencies
(2) Identification of new or improved procedures, techniques, or tactics
(3) Examination of incidents to determine cause(s) and contributing factors and, where applicable, to recommend corrective actions

6.2.4 Safety Function. The AHJ shall develop incident safety requirements that include the requirements of 6.2.4.1 through 6.2.4.4.

6.2.4.1* During wildland fire suppression activities, protective clothing shall include, as a minimum, approved head protection, gloves, protective footwear, and flame-resistant clothing as defined in NFPA 1977, *Standard on Protective Clothing and Equipment for Wildland Fire Fighting*.

6.2.4.2 Protective safeguards shall be developed for apparatus and equipment used during wildland fire incidents. Equipment operators shall be trained in accordance with NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*.

6.2.4.3* All fireline actions shall be in compliance with the NWCG *Incident Response Pocket Guide*, which includes 10 "Standard Fire Orders" and 18 "Watch Out Situations."

6.2.4.4 The AHJ shall conduct a review and a critique of the safety actions following each incident.

6.2.5 Liaison Function. The liaison officer (reporting directly to the IC) shall develop a list of all assisting and cooperating agencies and work with them as a point of contact throughout the duration of the incident.

6.3 Operations. The operations function shall be responsible to the command function for carrying out the strategic and tactical plans of the incident and shall include incident and post-incident planning and actions.

6.3.1 Resource Evaluation. When a wildland fire incident occurs, the IC shall evaluate available resources.

6.3.1.1 Personnel Resources. The IC shall evaluate the number of qualified and equipped people available, their physical condition, their experience and skill levels, and the daytime and evening hours they are available.

6.3.1.2* Equipment.

(A) The IC shall evaluate the types and amount of equipment and apparatus normally available within a specified response time, where the resources are located, how quickly and easily they can be transported to the incident, and the suitability of such equipment for use in wildland fire control considering terrain and other local conditions.

(B) All members of the fire protection organization shall be acquainted with the standards set by the AHJ for the safe operation of equipment.

6.3.1.3* Aviation/Air Operations. At a minimum, all members of the fire protection organization shall be acquainted with basic air operations, including safety considerations. *(See Annex B).*

6.3.2 Size-Up.

6.3.2.1 Upon arrival at a fire incident, the IC shall determine the extent of the fire and its potential for becoming a major event.

6.3.2.2 The IC shall immediately report the fire size-up to the communications center and request additional resources as necessary.

6.3.2.3 The following conditions shall be addressed:

(1) Special or unusual hazards or potential hazards
(2) Type and amount of fuel
(3) Terrain
(4) Present and predicted weather conditions
(5) Fire intensity and behavior
(6) Available resources
(7) Need for specialized personnel and equipment to address special or unusual hazards

6.3.3 Fire Attack and Control.

6.3.3.1* The IC shall deploy personnel and equipment to the incident according to strategic and tactical plans, within the priorities established for the incident, and with consideration for the safety of civilians and fire-fighting personnel.

6.3.3.2 Once the threat to life and property is minimized, the IC shall plan for and execute tasks necessary for the containment, control, and mop-up of the remainder of the fire.

6.3.3.3 The plan of containment and control shall address the following:

(1) Available resources
(2) Fireline location
(3) Method of fireline construction
(4)*Application of water and chemicals from the air and on the ground

6.3.4 Mop-Up and Demobilization.

6.3.4.1 Plans.

6.3.4.1.1 Once the fire is controlled, the IC shall develop plans for the thorough mop-up of the fire scene and for demobilization of personnel and equipment.

6.3.4.1.2 The plan shall ensure that the fire is completely out.

6.3.4.2 During mop-up activities, the IC shall begin an orderly demobilization of resources used on the fire.

6.3.4.3 Reports.

6.3.4.3.1 The IC shall complete all necessary and appropriate documentation for financial and fire-reporting purposes.

6.3.4.3.2 The completed reports shall be properly submitted to the AHJ.

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6.3.5 Post-Incident Review and Evaluations.

6.3.5.1 The AHJ shall conduct a review of actions taken during the incident after completion of the incident.

6.3.5.2 Designated personnel from all operational areas of the fire shall be in attendance to provide for a thorough review of the operation.

6.3.5.3 The AHJ shall review all activities related to the fire incident, including safety practices and provisions; strategy and tactics; the deployment of personnel, equipment, and apparatus; and the overall management of the fire.

6.3.5.4 The AHJ shall take corrective actions in all areas where deficiencies exist or problems occurred.

6.4 Planning Function. The planning function shall be responsible to the IC for the preparation of all plans necessary to carry out the purpose and goals of the fire control organization.

6.4.1 Coordination and Cooperation. The AHJ shall coordinate and cooperate with entities involved in fire suppression activities for the purpose of organizing their capabilities to protect the property and the public from wildland fire.

6.4.1.1 Entities Involved in Fire Suppression. The AHJ shall prepare a written coordination and cooperative agreement plan that includes entities affected by or involved in wildland fire protection and related cooperative procedures. Entities to be considered shall include the following:

(1) Neighboring fire organizations
(2) Police organizations
(3) Public works agencies
(4) Service/support organizations
(5) Public utilities
(6) Medical/health facilities
(7) Media and the general public
(8) Dispatch/communications centers
(9) Mitigation incident command
(10) Financial personnel
(11) Insurance companies
(12) Local government stakeholders
(13) Homeowner organizations
(14) Environmental agencies and organizations
(15) Planners, builders, and developers

6.4.1.2 Cooperative Agreements. The AHJ shall use the following as the basis for establishing new cooperative agreements and for reviewing existing cooperative agreements:

(1) Cooperation in prevention, pre-incident, and suppression operations
(2) Coordination in development and implementation of wildland fire control plans, protection standards, strategies, tactics, and procedures
(3) Identification of parties responsible for implementing various aspects of the agreement
(4) Existence of a command structure *(See 6.4.1.2.1.)*
(5) Communications capability
(6) Minimum qualification requirements of personnel
(7) Existence of an annual operating plan used to define and update specific operating procedures prior to each fire season

6.4.1.2.1 To facilitate a cooperative effort on a wildland fire incident, a command structure shall be established to manage the incident.

(A) An incident command system, as outlined in NFPA 1561, *Standard on Emergency Services Incident Management System*, shall be used.

(B) If the incident involves multiple jurisdictions, a unified command shall be implemented.

(C) Command of the incident shall be delegated from the agency with jurisdiction to the cooperating agency by mutual agreement, as necessary.

6.4.1.2.2 Command radio frequencies shall be designated and limited to command purposes.

6.4.1.2.3 Fire suppression personnel shall meet the minimum requirements as outlined in NFPA 1051, *Standard for Wildland Fire Fighter Professional Qualifications*.

6.4.1.3 Fire Danger Rating. The AHJ shall obtain weather observations and determine the wildland fire danger rating or shall obtain the information daily from the state forester or federal or provincial wildland fire control agency.

6.4.1.4 Incident Planning.

(A) The IC shall cooperate with the AHJ to establish objectives for the overall incident management strategy (consider elements within Wildland Fire Situation Analyses).

(B) The IC shall develop specific tactical actions to implement the strategy.

(C) The plan, written or oral, shall include incident objectives, organization, current and predicted fire weather and behavior, resource assignments, communications, safety, transportation, logistics, incident map, and air operations.

6.4.1.5 Post-Incident Activities.

6.4.1.5.1 All reviews and evaluations shall be conducted as constructive critiques to determine the facts related to a specific incident.

6.4.1.5.2 As a minimum, evaluations shall cover the following:

(1) Examination of the progress of an ongoing incident and confirmation of effective decisions or corrected deficiencies
(2) Identification of new or improved procedures, techniques, or tactics
(3) Examination of incidents to determine cause(s) and contributing factors and, where applicable, to recommend corrective actions

6.5* Logistics Function.

6.5.1 General.

6.5.1.1 The logistics function shall be responsible to the IC for providing support resources that meet the goals and purposes of the wildland fire control effort.

6.5.1.2 Each logistics chief shall assess and determine the need for facilities, communications, support services, supplies, and equipment.

6.5.2* Facilities.

6.5.2.1 The logistics function shall determine the need for and locate appropriate facilities required for the use of the fire control organization.

6.5.2.2 The logistics function shall evaluate the physical facilities and usable space required to meet pre-incident planning objectives.

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6.5.2.3 Where relevant, such plans shall identify locations for apparatus storage, equipment and personnel staging, base camp operations, lodging of personnel, and support services sites.

6.5.3* Communications.

6.5.3.1 The AHJ shall establish a communications function to determine communication needs and required resources, including various radio networks (fixed and portable); landline and cellular telephones; pagers, scanners, and other audible alert equipment; and computer, data, and fax capabilities.

6.5.3.2 The communications function shall also determine radio system needs, including frequency allocation, availability and compatibility of equipment between responding agencies, transmission and security priorities and procedures, and equipment assignment and accountability.

6.5.4* Support Services. The logistics pre-incident plan shall identify necessary support services that facilitate continual operations throughout the incident.

6.5.4.1 Emergency Medical Support.

(A) The logistics function shall determine the required level of emergency medical support and identify available resources.

(B) During incidents, appropriate emergency medical support, including transportation capabilities, shall be made at the incident locations.

6.5.4.2* Food Services Support.

(A) The logistics function shall determine the required level of food services support and identify available resources.

(B) Applicable health standards shall be reviewed and placed in perspective with the size and complexity of anticipated incident activity.

(C) The pre-incident plans shall include identification of providers and probable location sites and include available utilities, tentative operation schedules, and contract prices.

6.5.4.3* Sanitation Services Support. The logistics function shall determine the required level of sanitation services, including resources for ample toilets, with cleaning, inspection, and maintenance schedules; trash and garbage collection and removal to approved sites; and ample replacement of consumable supplies.

6.5.4.4* The logistics function shall determine the requirements for potable water and identify sources and a system of water distribution.

6.5.4.5* The logistics function shall determine the requirements for ground support for personnel, equipment, and supplies.

6.5.4.6 The logistics function shall determine and provide for security for personnel and equipment.

6.5.5 Supplies and Equipment. The logistics function shall provide supplies and equipment as requested to support the incident.

6.5.6 Demobilization. The logistics function shall plan for and carry out demobilization activities in support of and in cooperation with command, operations, planning, and finance.

6.6 Finance. The IC shall be responsible for the finance function for all aspects of financial management in support of the fire protection organization.

6.6.1 Incident.

(A) Pre-incident plans shall be followed to accurately account for all expenditures during the incident.

(B) A methodology for the timely and accurate disbursement of funds shall be followed.

6.6.2 Post-Incident. The AHJ shall prepare and distribute, as required, a summary report that will ensure that all accounts are paid and reimbursable costs are billed.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.2 The current text is designed to help the thousands of small community organizations existing in the rural and forested areas of North America. Many of these communities are exposed to the dangers of large fires involving many acres of natural fuels, such as forest, grass, or brush. To prepare for such emergencies, the responsible fire protection organizations and individuals should be aware of the most recent and useful wildland fire management techniques, equipment, training, and operations.

This standard includes a list of mandatory requirements that must be met if fire fighters are to be safe in the prevention and suppression of wildland fires. Additional information on large equipment, heavy power tools, specialized wildland firefighting equipment, and techniques for landscape management, prescribed fire, smoke management, community and subdivision planning, and other mitigation measures is available in other publications.

Fire organizations should consider the adoption of this standard through a vote by the fire department members and/or by citizens of the protected area where mitigation and suppression efforts would affect private or public properties. Legal counsel should be consulted to explain how the adoption of this standard affects the department and its members.

In many rural and wildland areas, forest, grass, crop, and brush fires are a continual problem. These fires, if not controlled, can endanger human life and cause serious damage to property, natural resources, and the environment. Careful evaluation of wildland fires in the United States and Canada for many years has shown that fire damage can be prevented or minimized if proper mitigation efforts are made well ahead of annual fire seasons and when, in the case of such fires, aggressive suppression actions by trained fire fighters are executed in the early stages of fire development.

A.3.2.1 Approved. 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, 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 an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase "authority having jurisdiction," or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and

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approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.4 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.2 Apparatus. Examples include fire engines, water tenders, and ladder trucks.

A.3.3.5 Company. Companies are often assigned to specific apparatus or stations.

A.3.3.16 Incident Management System. See NFPA 1561, *Standard on Emergency Services Incident Management System.*

A.3.3.27 Unified Command. This should be accomplished without loss of or abdication of authority, responsibility, or accountability.

A.3.3.28 Values at Risk. Such values include timber, watershed, wildlife, unique scenic and recreation areas, range, air quality, structures, and people.

A.3.3.30 Wildland Fire. The terms *wildfire* and *wildland fire* are often used interchangeably by many in and out of the fire protection community. This document prefers the term *wildland fire* as all encompassing when referring to fires in the wildland, wildland/urban interface, and/or wildland/urban intermix areas.

A.3.3.32 Wildland/Urban Interface Coordinator. This person coordinates with local residents, local government, and the responsible fire service agency.

A.4.1 The wildland/urban interface coordinator should be responsible for developing the risk and hazard assessment with community and stakeholder involvement. For specific information regarding hazard and risk assessment in wildland areas, refer to NFPA 1144, *Standard for Protection of Life and Property from Wildfire*, Figure A.4.2, which shows a Wildland Fire Risk and Hazard Severity Assessment Form.

A.4.4 The probability of a wildland fire starting is largely dependent on an ignition source, fuel conditions, and the weather. Accurate determination of fire danger can be made only through specific weather-related observations such as temperature, humidity, wind speed, and fuel moisture. These observations are used by systems such as the National Fire Danger Rating System and the Canadian Forest Fire Danger Rating System.

A.4.5 It is important to identify problems or potential problems accurately. Any wildland fire prevention planning process that does not accurately assess or identify wildland fire prevention problems is doomed to fail. Identification of priority wildland fire prevention programs should look at a number of variables, including the following:

(1) *Risks.* When assessing the risk of a given area, only the risk should be examined. The potential for a fire to spread or burn will be looked at separately; these two items should not be confused. Wherever there are concentrations of people or activity, the potential for a human-caused ignition exists. After assessing the risks within an area, it can be helpful to look at historical fires to validate the risk assessment. Historical fires alone, however, are not an accurate reflection of the risks within a given area. The objective of this effort is to determine the degree of risk within given areas of an administrative unit.
(2) *Hazards.* The objective in examining hazards is to determine the potential of a large fire resulting from an ignition. In other words, the objective is to determine the degree of difficulty in suppressing a fire once it is ignited.
(3) *Values.* Values are defined as natural or developed areas whose loss or destruction by wildland fire would be considered unacceptable. The objective of this process is to rate values based on the need to protect these from wildland fire. Once risks, hazards, and values have been evaluated, it is possible to determine when, where, and how to implement fire prevention programs. By comparing an area's potential to have an ignition (risks) with its potential to burn after ignition (hazards) and the values threatened by a wildland fire, a fire prevention plan can be written. This plan can focus on the highest priority wildland fire prevention problems within an administrative unit. It is not necessary to have an extensive fire prevention effort in an area where a number of risks exist but the hazard is minimal and no real values are threatened. In contrast, it is important to have a comprehensive effort in an area where there are substantial risks, a high hazard, and a threat to high values.

The wildland fire prevention plan should address what needs to be done in each area based on the type of activities and uses. It should clearly define what actions will take place and when and who is responsible. Wildland fire prevention activities generally fall into three broad categories:

(1) *Education.* Education is aimed at changing people's behavior by informing them. People can be informed through printed materials, mass media (radio, television, etc.), one-on-one contacts, or group presentations. Information can also be delivered through signs, displays, fairs, parades, and so forth.
(2) *Engineering.* Engineering is an activity designed to shield an ignition source (e.g., spark arrester) or remove the fuel that would ignite from a spark (e.g., clearance around a home).
(3) *Enforcement.* Enforcement is used to gain compliance with fire codes and ordinances. The wildland fire prevention plan should select the most cost-effective mix of activities to mitigate potential fire problems within each priority area. The wildland fire prevention plan should be evaluated annually. If ignitions are occurring in an area where an active fire prevention program is implemented, perhaps the fire prevention activities should be reviewed. This review could result in a change of activities within the area. If the plan is working, there will be no need to make any changes.

A.5.1 Several models for plans exist. Some state and federal agencies may have standard elements for inclusion in plans. Three models developed by the Technical Committee on Forest and Rural Fire Protection are provided in Annex C.

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A.5.3 Fire fighting requires fast action, sustained effort, and greater energy than most other work. Fire fighting is always potentially hazardous. In the United States, fire fighting has one of the highest accident rates of any occupation. Wildland fire control can be particularly hazardous unless the necessary safety procedures and principles are constantly practiced and obeyed. Most accidents can be prevented by careful procedures and training before emergencies. The safety and welfare of the entire fire-fighting organization are the responsibility of the incident commander. All persons in authority are likewise responsible for the safety of the personnel under their direction.

A.5.4 All personnel should receive frequent training in first aid, fireline safety, fire behavior, and techniques and methods of wildland fire suppression. Periodic hands-on training with hand tools and equipment, as well as crew and fireline organization, should be included. Crew leaders and company officers need specialized training in fire control tactics to ensure their competence when directing fire suppression operations. It is recommended that cooperative training with other wildland fire control organizations be conducted. Federal, state, and provincial forest fire officers have technical training materials and are usually available to assist.

Many states and provinces have established programs through which fire fighters can receive training in structural fire fighting. Special training in wildland fire tactics and techniques can be obtained from state, provincial, or federal wildland fire protection agencies, which frequently conduct special fire schools, seminars, and other forms of instruction. A number of publications dealing with wildland fire control are available from state forester's offices or the National Wildfire Coordinating Group (NWCG). *(See Annex D.)*

A.6.1 To provide fire prevention and control and to protect life and property from wildland fire, a community should establish the following:

(1) An officially designated formal organization headed by a fire chief or fire warden charged with the responsibility of prevention and suppression of wildland fires. The chief would be in charge of the entire departmental operation. The chief should be appointed by the governing body, if one exists, or elected by the membership on the basis of merit and ability. The chief can be a paid professional, a part-time paid employee, or a volunteer.
(2) A well-organized, equipped, and trained fire company or crew who will operate under the authority of the chief, fire warden, or subordinate officer. If attacked quickly, most small wildland fires can be handled by a well-trained squad or company of two to five fire fighters. Large or rapidly spreading fires require more fire fighters, more equipment, expert supervision, and extensive radio and telephone communications.
(3) Three or four small companies or squads of five or six fire fighters, with leaders, can be grouped together under the command of a crew leader or company officer. The leader can be one of several crew leaders commanding similar groups. All personnel under the leader's command, as well as others concerned with incident management, should know who the crew leader is and the scope of the leader's authority. The crews or companies can be assigned to action only on a designated portion of the main fire. This designated portion of the fire is commonly called a *sector* or *division*.

A.6.2 The first responsible authority (ranger, warden, company officer, crew leader, or other officer) who arrives at the emergency is the incident commander (IC) until someone with higher authority specifically assumes command. Whenever a new incident commander assumes command, all officers, crew leaders, and others involved in the incident should be notified immediately. The incident commander is responsible for planning and directing the fire control efforts; assembling crews of fire companies and telling them where and how to work; making the best use of personnel; arranging for communications, rest periods, and relief crews; making the best use of equipment and tools; obtaining supplies; and ensuring that the fire is completely extinguished before the last crews are released from the scene. In other words, the incident commander is responsible for all activities and operations at an emergency incident. The incident commander delegates more and more responsibility to assistants as the needed organizational effort grows, but the incident commander is always the final authority and bears total operational responsibility.

A.6.2.3 When structures are threatened, the incident commander should staff the position of wildland urban/interface protection specialist.

A.6.2.3.2.1 The reporting of fires is an important function of the fire department. Fire reports provide a realistic and factual basis for fire prevention planning, support for funding requests, and aid in organizational development. The reports can be significant documents during investigations and/or in insurance claim adjustment cases. A report must be completed on every fire or false alarm responded to by the fire department. It is important that information be compiled while it is fresh in the reporting officer's mind.

The U.S. Fire Administration (USFA), in conjunction with the National Fire Information Council (NFIC), has developed the National Fire Incident Reporting System (NFIRS), which includes several modules that provide information specific to wildland fire incidents. At the state level, NFIRS provides for the collection of reports on incidents to which local communities responded. NFIRS uses the local databases from individual states to form the national database. The USFA analyzes this database and publishes the analysis.

The basic form, NFIRS-1 *[see Figure A.6.2.3.2.1(a)]*, captures data relevant to fire location (B), incident type (C), dates and times (E1), actions taken (F), resources (G1), estimated dollar losses and values (G2), and completed modules (e.g., NFIRS-8, Wildland Fire).

NFIRS-8 *[see Figure A.6.2.3.2.1(b)]* focuses on wildland fire and provides in-depth information about, among other things, the cause of the fire (D1), human factors contributing to ignition (D2), the weather (H), and National Fire Danger Rating System (NFDRS) fuel model and origin (K).

Although field forms can assist in information gathering, the NFIRS system is a computer-based program developed to reduce recordkeeping time and improve output reporting capability.

Additionally, the National Wildfire Coordinating Group (NWCG) has established standard information content for wildland fire reporting *[see Figure A.6.2.3.2.1(c)]*. This standardized content is now used by all U.S. federal wildland fire control agencies and many states.

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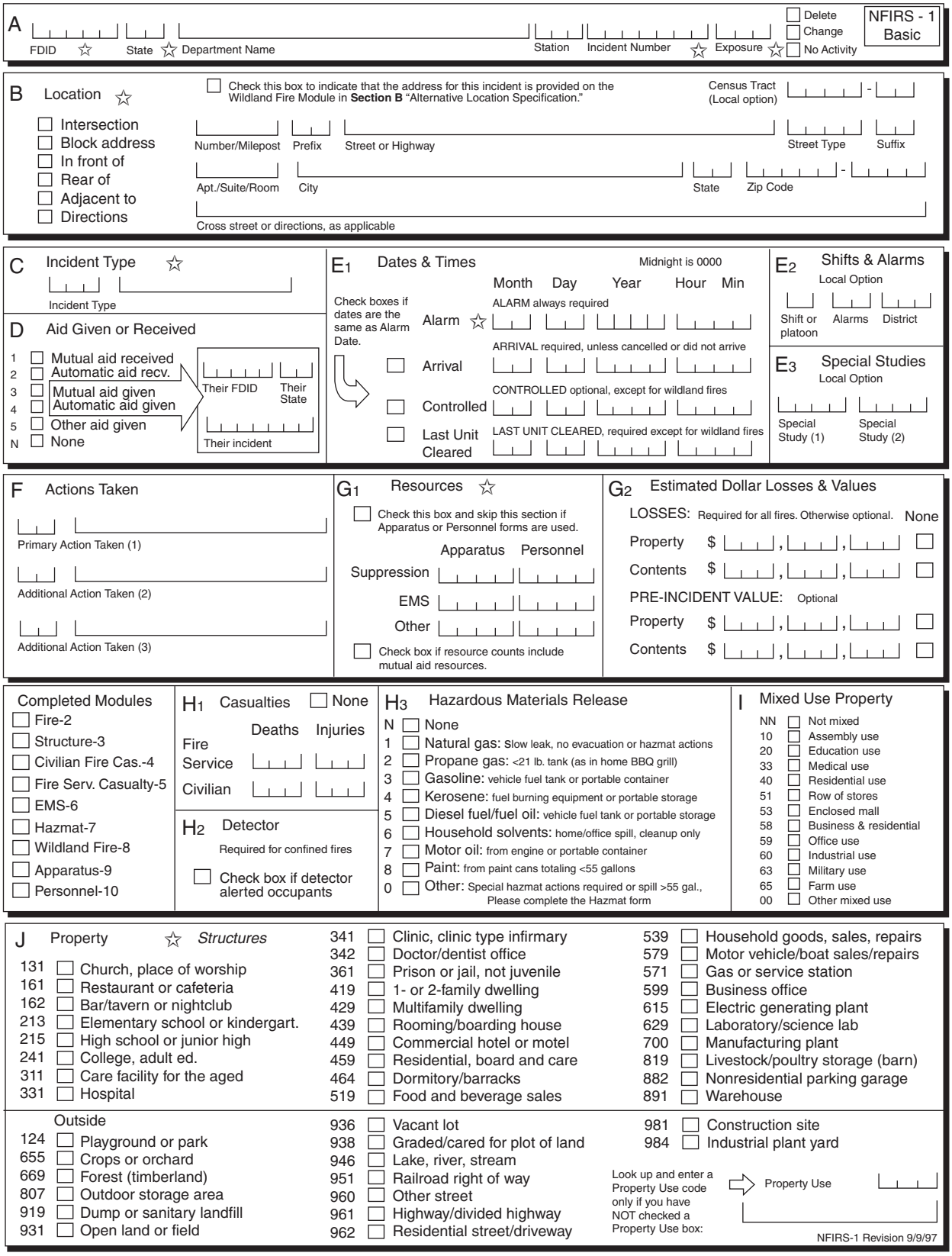

FIGURE A.6.2.3.2.1(a) NFIRS-1, Basic Reporting Form.

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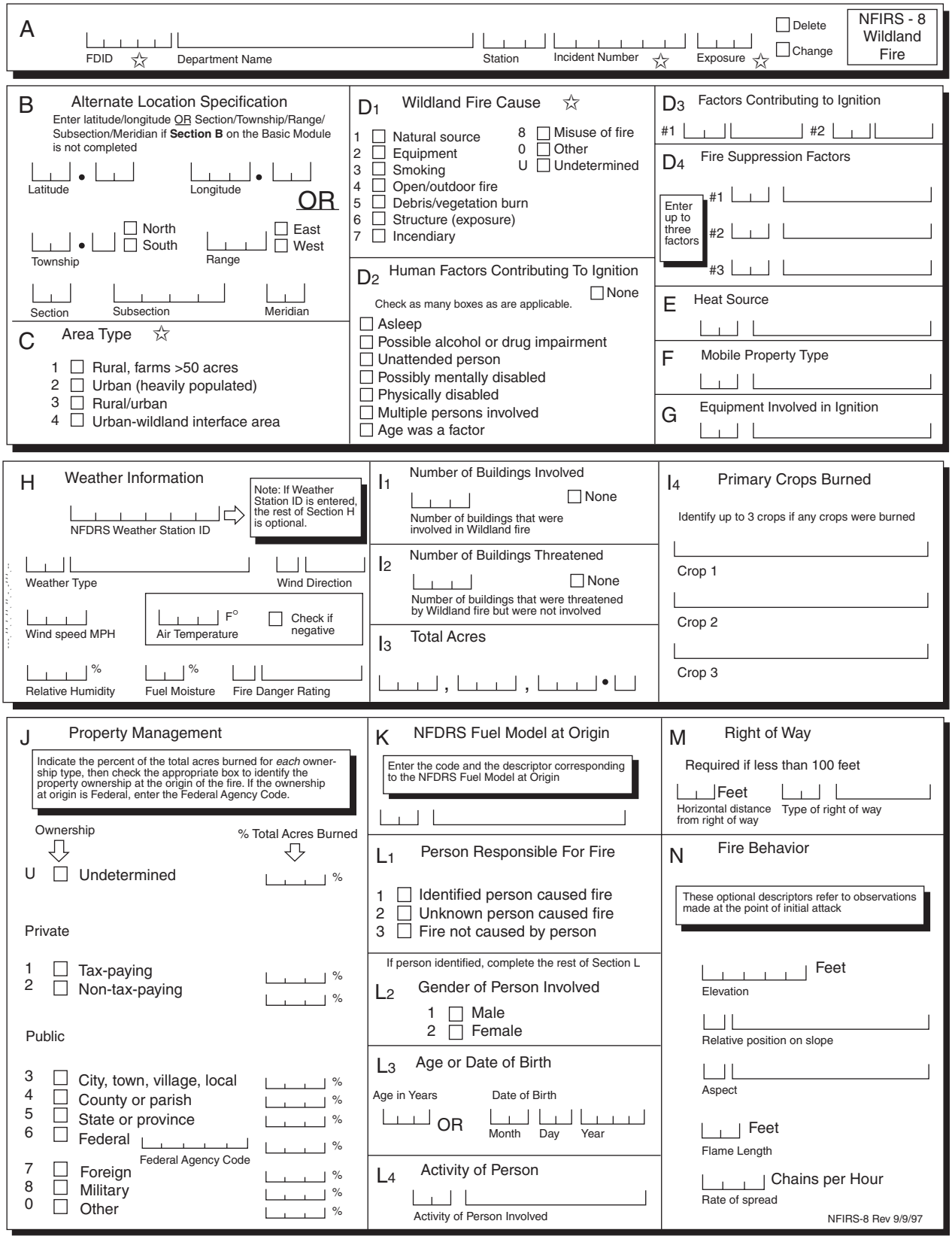

FIGURE A.6.2.3.2.1(b) NFIRS-8, Wildland Fire Reporting Form.

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USDA - Forest Service
INDIVIDUAL FIRE REPORT
(Ref. FSH 5109.14)

Fire Name
Local Fire Number
Location
T/R/S/SS/Mer_____

IDENTIFICATION

1. Region/Forest/District ID and SO fire number __/__/__/__
2. Protecting agency at origin __
3. Ownership at origin/state at origin/county __/__/__
4. Fire management zone __
5. Adjoining forest (entry no longer used) __/__/__/__

OCCURRENCE

6. Point of origin lat=_____ long = __ __ __
7. Time of ignition __/__/__/____
8. Time of discovery __/__/__/____
9. Detection method _
10. Statistical/general/specific cause/class of people _/_/__/_
11. Unplanned ignition designated as prescribed fire _

ACTION

12. Initial suppression strategy _
13. Escaped fire _
14. Time of initial action __/__/__/____
15. Time final suppression strategy attained __/__/__/____
16. Time fire out __/__/__/____
17. Forces used __/_/__ __/_/__ __/_/__
up to time of __/_/__ __/_/__ __/_/__
attainment of __/_/__ __/_/__ __/_/__
initial strategy __/_/__ __/_/__ __/_/__
or escape __/_/__ __/_/__ __/_/__

DESCRIPTION

18. Estimated FFF cost (whole dollars) _____
19. FMZ NVC per acre (whole $) _____
20. FS acres (all forests) _____._
21. Non-FS acres protected by FS _____._
22. Acres outside FS protection _____._
Total acres = .
23. Fire intensity level _
24. Representative weather station _____
25. NFDRS fuel model/cover type _/__
26. Aspect/slope percent _/__
27. Elevation (feet in hundreds) ___

OPTIONS

28. Special code __/_____ __/_____ __/_____
__/_____ /_____ __/_____
__/_____ __/_____ __/_____
__/_____ __/_____ __/_____

REMARKS

Submitted /s/ /a/ Approved /s/ /d/

USDA - Forest Service
INDIVIDUAL FIRE REPORT
(Ref. FSH 5109.14)

Fire Name
Local Fire Number

SUPPLEMENT FOR LARGE FIRE ACRES BURNED

1. Region/forest/district ID and SO fire number __/__/__/____

20. FS Acres (all forests) _____._
21. Non-FS acres protected by FS _____._
22. Acres outside FS protection Total acres = _____._ .

Prot agency	FS unit	Land ownership	Acres
___	__/__	___	_____._
___	__/__	___	_____._
___	__/__	___	_____._
___	__/__	___	_____._
___	__/__	___	_____._
___	__/__	___	_____._
___	__/__	___	_____._
___	__/__	___	_____._
___	__/__	___	_____._
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___	__/__	___	_____._
___	__/__	___	_____._
___	__/__	___	_____._
___	__/__	___	_____._
___	__/__	___	_____._
___	__/__	___	_____._
___	__/__	___	_____._
___	__/__	___	_____._
___	__/__	___	_____._

FIGURE A.6.2.3.2.1(c) Sample NWCG Wildland Fire Reporting Form.

A.6.2.4.1 Hard hats greatly reduce the number of serious injuries and must be worn on the fireline. A safety hard hat with chin strap is preferred, but a standard fire fighter's helmet can be permitted to be worn as an alternative. Lightweight "bump" hats are unacceptable because they do not provide adequate protection in wildland fire control.

Footwear should be leather lace-up boots. It is recommended that boots be without steel toes except for those used by chain saw operators. The boots should have slip-resistant soles, such as a hard rubber lug-type or tractor tread, which allows for maximum traction and prevents melting when exposed to normal fireline conditions. Soles should not be made of composition rubber or plastic, which have low melting points. This does not preclude the use of boots with smooth, hard rubber soles or those with a well-defined tread. However, the disadvantage of those soles is their tendency to slip on smooth rock, logs, dry grass, and pine needle surfaces, which are often encountered in wildland fires. The height of the boot tops should be a minimum of 15.24 cm (6 in.), with 20.32 cm (8 in.) or greater preferred. Low-quarter boots or shoes should not be worn because they do not provide ankle support or keep out sparks and dirt. Pull-on type boots, such as structural fire-fighting rubber boots, cowboy boots, or engineering boots, are not recommended because they do not provide adequate ankle support, do not keep out sparks and dirt, and are loose-fitting and can cause blisters.

If available, flame-resistant clothing specially designed for wildland fire fighting should be worn. If flame-resistant clothing is not available, fire fighters should wear loose, cuffless trousers and shirts made of cotton or wool. Loose-fitting clothing reduces chafing and affords more protection. Collars and cuffs should be buttoned to protect the arms and neck from heat, burns, scratches, and insects.

Fire shelters, if available, should be worn by all fire fighters engaged in suppression activities. Gloves should be worn to protect hands and make hand work easier. Fire fighters should wear goggles for eye protection in excessively smoky or dusty environments.

A.6.2.4.3 The NWCG *Incident Response Pocket Guide* includes 10 "Standard Fire Orders," 18 "Watch Out Situations," 9 "Wildland Urban Watch Outs," and 4 orders that are utilized by some agencies under the acronym LCES (Lookouts, Communications, Escape Routes, and Safety Zones).

The 10 "Standard Fire Orders," which are listed on the USDA Forest Service website (www.fs.fed.us/fire/safety/10_18/10_18.html), are as follows:

(1) Keep informed on fire weather conditions and forecasts.
(2) Know what your fire is doing at all times.
(3) Base all actions on current and expected behavior of the fire.
(4) Identify escape routes and make them known.
(5) Post lookouts when there is possible danger.
(6) Be alert, keep calm, think clearly, act decisively.
(7) Maintain prompt communications with your forces, your supervisor, and adjoining forces.
(8) Give clear instructions and insure they are understood.
(9) Maintain control of your forces at all times.
(10) Fight fire aggressively, having provided for safety first.

The 18 "Watch Out Situations" (which also can be found on the USDA Forest Service website) are as follows:

(1) Fire not scouted and sized up.
(2) In country not seen in daylight.

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(3) Safety zones and escape routes not identified.
(4) Unfamiliar with weather and local factors influencing fire behavior.
(5) Uninformed on strategy, tactics, and hazards.
(6) Instructions and assignments not clear.
(7) No communication link with crew members or supervisors.
(8) Constructing line without safe anchor point.
(9) Building fireline downhill with fire below.
(10) Attempting frontal assault on fire.
(11) Unburned fuel between you and the fire.
(12) Cannot see main fire, not in contact with anyone who can.
(13) On a hillside where rolling material can ignite fuel below.
(14) Weather is getting hotter and drier.
(15) Wind increases and/or changes direction.
(16) Getting frequent spot fires across line.
(17) Terrain and fuels make escape to safety zones difficult.
(18) Taking a nap near the fireline.

The 9 "Wildland-Urban Watch Outs" are as follows:

(1) Poor access and narrow one-way roads
(2) Bridge load limits
(3) Wooden construction and wood shake roofs
(4) Inadequate water supply
(5) Natural fuels 30 ft or closer to structures
(6) Structures in chimneys, box canyons, narrow canyons, or on steep slopes (30 percent or greater)
(7) Extreme fire behavior
(8) Strong winds
(9) Evacuation of public (panic)

A.6.3.1.2 *Hand Tools.* Tools needed will vary by sections of the country due to differences in fuels, soil, and topography. All equipment selected for fire control work should be dependable, properly maintained, and used for the type of work for which it was designed. Many national standards and specifications are available to help fire department organizations purchase the proper equipment. Assistance in selecting appropriate tools can be obtained from federal, state, or provincial wildland fire-fighting agencies.

Power Saws. It is not necessary that fire suppression organizations own power saws; they are frequently available from woods operators, the same operators that communities often rely on for additional fire-fighting manpower.

Information on power saws can be secured from the manufacturers as well as from operators who have used the various makes and types. Because fire suppression can require carrying saws long distances over rough terrain, weight is an important consideration.

Saws should be equipped with adequate spark arresters to minimize the possibility of hot exhaust particles igniting nearby fuels. References for information on approved spark arresters for power saws can be found in Annex D.

Tractor Plows and Dozers. Tractor plows and dozers are valuable tools for wildland fire suppression. See Figure A.6.3.1.2(a) and Figure A.6.3.1.2(b). Most fire departments will not find it economical to own tractors or bulldozers, but they should carefully evaluate the use possibilities under existing conditions of terrain, fuels, and rates of fire spread. Heavy tractor equipment is frequently available from construction and logging operators, whose names and telephone numbers should be included in the fire plan. Recommendations for safe operation of tractor plows and dozers can be found in the National Wildfire Coordinating Group (NWCG) *Fireline Handbook.*

Any tractor plows or dozers used for wildland fire suppression should be equipped with protective canopies, winches, and adequate lights for operating at night. Unless turbocharged, tractor plows or dozers should also be equipped with approved spark arresters. References for information on approved spark arresters for tractor plows and dozers can be found in Annex D.



FIGURE A.6.3.1.2(a) A Dozer Properly Equipped with Protective Canopy, Lights, Brush Guards, and a Winch.



FIGURE A.6.3.1.2(b) A Tractor Plow Being Used in Suitable Terrain to Build Firelines Along the Flanks and Rear of a Wildland Fire.

A.6.3.1.3 *Fixed-Wing Aircraft.* The use of fire retardants dropped from aircraft is a modern, sophisticated attack tool in wildland fire control. It is likely that members of fire departments will become involved in the use of airtankers; therefore, they should be cognizant of the safety rules regarding airtanker operations. *[See Figure A.6.3.1.3(a)].*

Ground forces should be warned when drops will be made in their area. Often the airtanker pilot will make a dry run or high pass over the portion of the fire where the drop will be made. This usually indicates that the drop will be made within 1 to 3 minutes. If drops have already been made in the area, there usually will be no dry runs.

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FIGURE A.6.3.1.3(a) An Airtanker Making a Drop of Fire Retardant on a Wildland Fire.

A fire fighter who is unable to retreat to a safe place when an airdrop is imminent should follow these safety procedures:

(1) Lie face down with head toward oncoming aircraft and hard hat in place. If possible, grab something solid and get behind it to prevent being carried or rolled about by the drop. Spread feet apart for better body stability and to assist digging in.
(2) Hold tools firmly out to the side and away from the body. Flying tools or equipment can cause injury.
(3) Do not run unless escape is assured. Never stand up in the path of an airdrop.
(4) Stay away from large old trees and snags. Tops, limbs, or entire trees could break and fall, causing injury.

After the retardant drop has been made, there is a follow-up advantage on the fire. However, the following factors should be considered after the drop:

(1) Most retardants are slippery; therefore, be careful of footing and wipe off all hand tools, especially the handles.
(2) Heavy application of retardant on surfaced roads can be hazardous and should be washed down as soon as possible.
(3) Retardant should be washed from equipment and structures as soon as possible to prevent damage to finishes.
(4) Retardant could also damage agricultural or ornamental vegetation; actions should be taken to minimize such damage.

Rotary Wing Aircraft (Helicopters). The use of helicopters has become a key part of wildland fire protection *[see Figure A.6.3.1.3(b)]*; however, as with any other piece of fire-fighting equipment, definitive safety rules should be followed when using or operating near a helicopter. The following safety procedures apply to helicopter operations:

(1) Approach and departure
  (a) Get the pilot's attention and permission before approaching the helicopter.
  (b) Always approach in full view of the pilot. Never approach from the rear of the helicopter.



FIGURE A.6.3.1.3(b) A Helicopter Making a Water Drop on a Wildland Fire.

  (c) Always approach or depart in a crouched position. Gusts of wind can cause the rotor blades to drop dangerously low to the ground.
  (d) Safety helmets should be held securely to prevent their being blown away or blown up into the rotors by the rotor blast.
  (e) Never approach or depart a helicopter from ground that is upslope from the main rotor. Rotors are almost invisible when turning at high speed or under poor lighting conditions.
  (f) Keep clear of the main and tail rotors at all times. Do not walk to the rear of the helicopter when entering or exiting the helicopter.
  (g) Carry all long-handled tools in such a manner that the handles will not be inadvertently raised into the rotor path.
(2) Working around heliports
  (a) Stay at least 30 m (100 ft) from helicopters at all times unless you have a specific job that requires otherwise. Your presence can cause confusion and disrupt the pilot's concentration.
  (b) Do not face a landing helicopter unless you are wearing goggles.
  (c) Do not remain in an area that is consistently under the flight path of any helicopter.
  (d) Do not smoke within 15 m (50 ft) of any helicopter or fueling area.
(3) In-flight safety
  (a) Do not smoke in the helicopter.
  (b) Use the seat belt and keep it secured until the pilot instructs you to leave the helicopter.
  (c) Ensure that all loose gear and helmets, maps, papers, and so forth, are securely held to prevent their being blown about the helicopter or out the windows.
  (d) Do not let any gear get in the way of the pilot or the pilot's controls.
  (e) Never throw anything out of a helicopter.
  (f) Do not talk to the pilot unless necessary, particularly during takeoff and landing.
  (g) Be alert for hazards such as other aircraft and especially telephone and power lines.
  (h) Never slam the doors of a helicopter. The doors do not have spring-loaded locks, so the handles must be physically turned to the door.

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A.6.3.3.1 The threat to the lives of fire fighters and citizens is always the highest priority, and the IC's fire attack decision should be based on safety as the top priority. For low-intensity fires, consideration should be given to direct attack. For high-intensity fires with unpredictable fire behavior or difficult terrain, consideration should be given to indirect attack.

A.6.3.3.3(4) In wildland fire suppression and fire management, including prescribed burning, fire retardants fall into one of the following categories:

(1) *Long-Term Retardants.* Long-term retardants contain fire-retarding salts, ammonium sulfate, ammonium phosphate, or a combination, which alters the combustion process. Because the chemical additives alter the combustion process, they retard combustion until they are removed from the fuel. Long-term retardants are used for direct attacks that might not be in coordination with fire crews; short-term protection of items such as improvements, log decks, and forest fuels adjacent to a fireline; prescribed burning and backfiring; and mop-up. Chemical retardants can be applied to a fire by fixed-wing airtankers, helicopters with buckets or fixed tanks, fire engines, portable pumps, or back pumps.

(2) *Suppressants.* Suppressants are water with additives such as polymers or foam concentrate. They depend on water and moisture retention to suppress fire. When the water dries out, they are no longer capable of suppressing fire. Under optimum conditions, suppressants are effective for a few minutes to 1 hour. Suppressants are used in direct attack as follows: in support of on-the-line fire crews; short-term protection of items such as improvements, log decks, and forest fuels adjacent to a fireline; prescribed burning and backfiring; and mop-up. The methods of application include fixed-wing airtankers, helicopters with buckets or fixed tanks, fire engines, and back pumps.

Class A foams are familiar suppressants used in wildland fire attack and control. Class A foams are chemically derived surfactant-agent foams. As such, they have the ability to form an insulating blanket on the surface of fuels, as well as to increase the efficiency of water by increased penetration into fuels and to reduce the amount of water that runs off onto the ground.

The foam solution is a homogeneous mixture of water and foam concentrate. An aerated solution is created by forcing or entraining air into a foam solution by means of suitably designed equipment or by cascading it through the air at a high velocity. Very small amounts of Class A foam concentrate are needed, usually between 0.1 percent and 1.0 percent by volume of water.

The consistency of foam is a function of the inputs of air, water, and concentrate and of the generation method. Changes in any of these variables will change the foam. Aerial and ground foam delivery systems are designed to allow changing inputs in order to create different foam consistencies.

The viscosity and density, or consistency, of foam is described by drain time and expansion ratio. A wet foam has a rapid drain time and a low expansion ratio. A dry foam is characterized by long drain times and high expansion ratios. A dripping foam has properties of both wet and dry foams. Wet and dripping foams are excellent for suppression, for mop-up, and as a wetting treatment under a dry-foam fire barrier. Dry foam is used as a barrier for short-term protection of structures, improvements, and forest fuels. Thick, dry foams can be made by using compressed air foam systems (CAFS).

For mop-up, regular fire hose nozzles and aspirating nozzles with low water/air expansion rates are used. Aspirating nozzles with water/air expansion rates of ±10 to ±100 are available.

A.6.5 The logistics function is vital to the proper management of organizations involved in wildland fire control. Resource determinations need to be made before, during, and following wildland fire incidents. For many fire protection organizations, existing resources need to be reapplied only to meet wildland fire control requirements.

A.6.5.2 The establishment of appropriate facilities and usable space locations is an important aspect of the logistics function. Elements that should be considered when determining strategic locations include probable wildland fire locations, other emergency services available, adequacy of public roads and utilities, scope of communications networks, and extent of outside assistance required.

A general checklist for facilities includes the following items:

(1) Keep incident facilities at a manageable size.
(2) Enforce rules of conduct at facilities.
(3) Provide a bulletin board at an assembly area.
(4) Maintain proper accountability of all property.
(5) With safety in mind, locate a sleeping area.
(6) Participate in the development of a demobilization plan.
(7) Control dust when needed.
(8) Consider environmental protection when locating incident facilities.
(9) Keep first aid facilities accessible and well marked.
(10) Inspect facilities for safety and fire hazards and take corrective action when needed.
(11) Consider and supply computer support when needed.
(12) Have well-marked parking areas.
(13) Keep facilities clean.
(14) Locate shaded eating areas.

A.6.5.3 The communications element of the logistics function is vital to personnel safety and organizational effectiveness when wildland fires occur. A functional communications network provides rapid notification of wildland fire emergencies, alerting of organizational units, notification of the general public of incident status and/or evacuation needs, and uninhibited communication with key cooperators and other outside agencies.

A communications system by which fires and emergencies can be reported to the fire organization is essential. There must be telephone communications to some central location that serves as a dispatch center. An emergency telephone number, widely publicized in the response area and published in the local telephone company directory, must be established. It is essential that the fire protection organization have an alerting system by which its personnel can be summoned at any time of the day or night. Communication can come in a number of ways, including the use of radio-activated pagers and monitors, sirens, and telephone systems.

A.6.5.4 Actual resources and support required can vary for each wildland fire occurrence. Capabilities to provide the following support services should be evaluated by organizations having wildland fire control responsibility:

(1) Medical services
(2) Food service
(3) Lodging
(4) Potable water
(5) Transportation
(6) Designated rest and relaxation areas
(7) Sanitation
(8) Ground support
(9) Security

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A.6.5.4.2 The food service checklist should include the following:

(1) Sanitation requirements (i.e., state, local, and OSHA) should be met.
(2) Food service sanitation requirements should be met.
(3) Food handlers should keep hands clean and should avoid handling food without wearing proper clothing and gloves.
(4) Food handlers should be free of communicable disease.
(5) Perishable foods should be stored under refrigeration at 4°C (40°F) or lower until served.
(6) Hot foods should be kept at 66°C (150°F) or higher until served.
(7) Reusable food utensils should be cleaned thoroughly and immersed for 2 minutes in at least 77°C (170°F) water.
(8) First aid material and first aid treatment should not be in kitchen or serving areas.
(9) Recycling should be considered.

A.6.5.4.3 The sanitation checklist should include the following:

(1) Provide adequate toilet facilities and establish a regular inspection and maintenance schedule to keep them clean.
(2) Provide trash and garbage collection points and daily removal.
(3) Locate garbage or trash collection points downwind of sleeping or eating areas.

A.6.5.4.4 The water supply checklist should include the following:

(1) Use a safe local water supply or haul it from a domestic water supply in trucks approved for potable water only.
(2) Have the water tested and protect it from contamination.

A.6.5.4.5 The ground support checklist should include the following:

(1) Provide direction signs on roads to facilities and drop points.
(2) Place signs at incident facilities and drop points.
(3) Plan adequate rest for drivers.
(4) Isolate and place signs at fuel storage area.
(5) Develop and enforce vehicle control plan.
(6) Plan for transportation for both personnel and equipment to and from incident camp to actual incident.
(7) Provide maintenance and fueling according to schedule.
(8) Inspect equipment condition.
(9) Maintain all equipment records.
(10) Provide transportation and support vehicles.

Annex B Air Operations for Forest, Brush, and Grass Fires

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 General. This annex presents fundamental information for agencies desiring to use aircraft for any and all aspects of wildland fire prevention, detection, and suppression. It presents necessary and useful information on procedures, practices, organization, and management, as well as suggested policy.

B.1.1 Aircraft Uses. Many agencies in different countries use aircraft for reconnaissance, fire detection, fire suppression, fuel management, and coordination of ground control forces.

B.1.2 Definitions of Aeronautical and Air Operations Terminology.

B.1.2.1 Abort. An order to terminate a preplanned aircraft maneuver (e.g., abort takeoff, abort retardant drop run).

B.1.2.2 AGL. Above ground level.

B.1.2.3 Air Attack. An operation involving the use of aircraft as part of the fire suppression action.

B.1.2.4 Air Tactical Group Supervisor (ATGS). The officer, normally airborne, in tactical command of all aircraft operating at an incident.

B.1.2.5 Airtanker. A fixed-wing aircraft equipped to drop fire retardants or fire suppressants.

B.1.2.6 Airtanker Coordinator/Birddog Pilot/Lead Plane Pilot. The pilot of the control aircraft, working under supervision of the air tactical group supervisor (ATGS), who designates targets of retardant drops and coordinates the movement of airtankers.

B.1.2.7 Air Traffic. Aircraft operating in the air or on an airport surface, exclusive of loading ramps and parking areas.

B.1.2.8 Autorotation. A nonpowered flight condition, with the rotor system maintaining the required flight rpm at a given forward airspeed. Autorotation is due to the relative wind upward through the rotors, caused by the weight, forward speed, and descent of the helicopter.

B.1.2.9 Birddog/Air Attack. The aircraft carrying the officer or individual in charge of air attack operations over a fire.

B.1.2.10 Break. Weak or missed area in retardant or suppressant drop.

B.1.2.11 Bucket. A specially designed bucket carried by the helicopter like a sling load and used to drop retardants or suppressants.

B.1.2.12 Candling. See B.1.2.67, Torching.

B.1.2.13 Canopy. The uppermost layer of tree foliage.

B.1.2.14 Chicot (*French*). See B.1.2.62, Snag.

B.1.2.15 Crown Fire. Fire traveling in the upper foliage of standing timber.

B.1.2.16 Density Altitude. Pressure altitude for ambient temperature. In standard International Civil Aviation Organization (ICAO) atmosphere, density and pressure altitude are equal. For a given pressure altitude, the higher the temperature, the higher the density altitude.

B.1.2.17 Direct Attack. A drop with the main portion of retardant or suppressant falling on the flame front.

B.1.2.18 Down Loading. The reduction in aircraft gross weight made to compensate for loss of performance due to increase in density altitude.

B.1.2.19 Dozer Line. A physical fire break made by dozers or tractor plows.

B.1.2.20 Drift. The effect of wind or smoke on retardant/suppressant drop.

B.1.2.21 Drop Accuracy. The assessment of a drop (i.e., where a load lands in relation to the target) made by the air tactical group supervisor or a fireline supervisor.

B.1.2.22 Drop Sequence. The order and method in which the tanks are released.

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B.1.2.23 Drop Zone. Drop target area.

B.1.2.24 Dry Run. A simulated retardant or suppressant run made on a target by the birddog, lead plane, or airtanker. Used to indicate approach and target to airtanker and to check for flight hazards.

B.1.2.25 Early. Landing before the target. Retardant/suppressant dropped before the target is reached. Sometimes referred to as *short*.

B.1.2.26 Elevation. The elevation of the lead plane or the birddog when it is over the target on a dry run.

B.1.2.27 ETA. Estimated time of arrival.

B.1.2.28 ETD. Estimated time of departure.

B.1.2.29 Final. That portion of the flight path that is aligned with the retardant/suppressant drop line.

B.1.2.30 Flank. Side of a fire joining base or rear to head.

B.1.2.31 Ground Effect. Reaction of the wing or rotor downwash against ground surface, forming a "ground cushion" that increases lifting capability of that section of air.

B.1.2.32 Ground Fire. Fire in duff, ground debris, or low-growing vegetation.

B.1.2.33 Head. The side of the fire having the fastest rate of spread.

B.1.2.34 Heading. The compass direction in which the longitudinal axis of an aircraft points.

B.1.2.35 Helibase. Location for parking, fueling, and maintenance of helicopters within the general area of an incident.

B.1.2.36 Helibase Manager. The officer responsible for managing resources/supplies at a helibase, heliport, or helispot.

B.1.2.37 Helibucket. See B.1.2.11, Bucket.

B.1.2.38 Helicopter Coordinator. With instructions from the air tactical group supervisor (ATGS), the person responsible for coordinating tactical or logistical mission(s) by helicopters assigned to an incident.

B.1.2.39 Heliport. A designated landing area that is accessible by road and large enough to accommodate, at a minimum, two helicopters. It should have fueling facilities, a wind indicator, fire extinguishers, surfaced pads, tie-downs, parking areas, a water source, telephone and radio communications, officers for base personnel, pilots' rest areas, and lights.

B.1.2.40 Helispot. Location where a helicopter can land and take off.

B.1.2.41 Helitack. The initial attack phase of fire suppression using helicopters and trained airborne teams to achieve immediate control of wildland fire in a safe and economical manner.

B.1.2.42 Helitack Crew Member. A fire fighter trained in the use of helicopter accessories and in techniques to attack and suppress wildland fire.

B.1.2.43 Helitack Supervisor. The person directly in charge of a helitack crew.

B.1.2.44 Helitank. A tank that is attached to a helicopter and used to carry liquids such as suppressants or retardants.

B.1.2.45 Hot Spot. A particularly active part of a fire within or along the fire boundary.

B.1.2.46 Incident Commander (IC). The chief of an incident management team under the ICS.

B.1.2.47 Incident Command System (ICS). Qualifying and organizing personnel to manage wildland fires or other incidents.

B.1.2.48 Initial Attack. The first action taken to suppress a fire, whether it be ground or air attack.

B.1.2.49 Knot. Nautical mile per hour.

B.1.2.50 Late Drop. Retardant or suppressant landing beyond the target.

B.1.2.51 Line. A stretch of retardant or suppressant laid by aircraft to support constructed line or to retard fire spread.

B.1.2.52 Line Length. The distance actually covered on the ground by a single retardant or suppressant drop at a given coverage level.

B.1.2.53 "Load and Return." An order to a pilot to return to air tanker base, reload, and return to the drop area.

B.1.2.54 Low Drop. A drop lower than recommended minimum drop height.

B.1.2.55 Orbit. The circular holding pattern an aircraft makes over one specific spot or area.

B.1.2.56 Paracargo. Cargo and equipment that is attached to parachutes for dropping from aircraft for support of ground crews.

B.1.2.57 Parallel Attack. An outside (indirect) attack parallel to and removed from the fire's edge. A parallel attack generally is used only with long-term retardants in an air attack operation.

B.1.2.58 Restricted Air Space. See B.1.2.66, Temporary Flight Restriction.

B.1.2.59 Retardant, Long-Term. Solution having a chemical retarding action on fire even after water content has evaporated.

B.1.2.60 "Return and Hold." An order to a pilot to return to base and wait for further instructions; denotes mission completed and further loads not required.

B.1.2.61 Salvo. The dropping of the entire retardant or suppressant load at one time.

B.1.2.62 Snag. Any dead or living tree rising above the forest canopy.

B.1.2.63 Split Load. A drop sequence wherein the load is dropped in increments.

B.1.2.64 Spot Fire. A fire outside or ahead of the main fire boundary.

B.1.2.65 Suppressants. Agents (i.e., water or foam) used to extinguish the flaming and glowing phases of combustion by direct application to burning fuels.

B.1.2.66 Temporary Flight Restriction (TFR). Special use airspace obtained under U.S. Federal Aviation Regulations, Part 91.137, for the use of air attack or other incident aircraft.

B.1.2.67 Torching. The burning of the foliage of a single tree, or a small group of trees, from the bottom up.

B.1.2.68 Traffic Pattern. The traffic flow that is prescribed for aircraft landing at, taxiing on, and taking off from an airport. The usual components of a traffic pattern are upwind leg, crosswind leg, base leg, and final approach.

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B.1.2.69 Trail Drop. To drop retardant from separate compartments in rapid succession in order to give an extended pattern on the ground.

B.1.2.70 Weather Advisory. In aviation forecast practice, an expression of hazardous weather conditions not predicted in the area forecast, as they affect the operation of air traffic and as prepared by the National Weather Service.

B.1.2.71 Wetting Agent. Chemical added to water to reduce surface tension.

B.2 Aircraft and Equipment Suitability and Selection.

B.2.1 Fixed-Wing Aircraft.

B.2.1.1 Detection, Reconnaissance, and Survey. Small airplanes (single- and multi-engine) are used for detection, reconnaissance, and surveys. Airplanes for fire reconnaissance are used in combination with ground detection systems in areas of high fire occurrence. The use of aircraft for checking areas not visible from ground detection units is an accepted practice. Reconnaissance flights are usually scheduled following lightning storms. Flights to check "going" fires and controlled fires from previous days provide the latest information on conditions and progress.

Recently, heat-sensing systems, known as forward-looking infrared (FLIR) systems, have been developed for use with small aircraft. These systems are economically feasible, and simplicity of operation warrants their consideration for detection and reconnaissance activities. With further development, the detection could be computerized.

Surveys of an area before and after a burn can provide a detailed review and study of an area that could otherwise be expensive and time consuming. Many times the measurement of burn areas can be accomplished with a minimal amount of flying time.

Small airplanes can be made available for other jobs in connection with wildland fire protection. It is standard practice for agencies that do not own their own aircraft to contract with a local fixed base operator (FBO) to provide the aircraft and pilot.

B.2.1.2 Paracargo and Freight. Numerous types of small, medium, and large airplanes are used for transporting freight and dropping paracargo to fire camps or isolated crews. Not all airplanes are suitable for freight activities, and relatively few can be modified into good paracargo aircraft. Most civilian airplanes now being used were designed and built for carrying passengers and require special modifications to be suitable for freight or paracargo work.

Desirable features for airfreight and paracargo airplanes are as follows: sufficient capacity, smooth floors, inherent stability, moderate or low stalling and landing speeds, suitable paracargo discharge aperture, ample reserve power at near gross weight (multi-engine), easy control under marginal flying conditions, good visibility, stripped utility interior, cargo tie-down facilities, and approved seats, seat belts, and shoulder harnesses.

B.2.1.3 Amphibious Operations. Amphibious aircraft or float-equipped aircraft can be more versatile and serve more functions than land-based aircraft. In Alaska and some parts of Canada and the contiguous United States where suitable lakes and rivers are numerous and in coastal areas, this type of aircraft is used extensively.

As long as adequate water depth and an unobstructed water surface area are maintained, little or no preparation other than suitable docking or ramp facilities is required for a water-based operation. If no safe natural docking or beaching site is available, temporary docks can be constructed to facilitate loading and unloading and to avoid damage to the aircraft.

Many amphibious aircraft are equipped to drop suppressants such as foam.

B.2.1.4 Airtankers. Aircraft selection for wildland fire suppression and related uses presents certain problems. The performance characteristics of the aircraft should be such that safe and efficient operations can be conducted over typical terrain and at necessary elevations. The aircraft integrity should be such that atmospheric conditions will not present a structural problem.

Light airtankers can be operated cost effectively as initial attack aircraft on wildland fires where the fires are within 48 km (30 miles) of the air attack base. These aircraft are also capable of support action and accurate low-volume drops in confined areas.

Medium and larger airtankers with 7600 L or more (2000 gal or more) capacities, like the one shown in Figure B.2.1.4, are more cost effective for long-range, high-volume cascading on fires and retardant fireline construction. This should not preclude the use of large airtankers at short range, because many times fires are contained or controlled by several high-volume cascading actions.



FIGURE B.2.1.4 Lockheed C-130 Airtanker.

B.2.2 Rotary-Wing Aircraft. The helicopter has become a familiar multi-use fire-fighting aircraft in wildland fire suppression. This aircraft has become as necessary in today's fire suppression as hand tools, crews, tractors, smoke jumpers, engines, and airtankers.

B.2.2.1 Retardant and Suppressant Dropping. The versatility and maneuvering capabilities of the helicopter make this aircraft an important initial attack tool. Helicopters with capacities for dropping 303 L to 11,356 L (80 gal to 3000 gal) of suppressants or retardants are principal weapons in the helitack phase of wildland fire suppression. Helicopters generally utilize two methods of dropping: a bucket slung underneath the helicopter or a fixed external tank.

B.2.2.2 Initial Attack Transport. Helitack functions are designed to transport trained personnel to a fire as quickly as possible. Small crews, trained and properly equipped, can gain control of most incipient wildland fire situations if they can make fast initial attack. This can be accomplished by landing or rappelling near the fire.

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B.2.2.3 Reconnaissance and Scouting. Performance characteristics of the helicopter make it an excellent reconnaissance and scouting aircraft. Slow speed and the ability to operate in areas that could not be observed from fixed-wing aircraft, plus its usefulness in providing terrain and fire intelligence that otherwise could not be obtainable, are obvious benefits. Helicopters provide an ideal platform for using heat-sensing and mapping systems. The systems range from handheld units to permanently mounted units.

B.2.2.4 Shuttling Equipment and Personnel. Equipment can be moved to other fire areas by heliport to heliport or, where landings cannot be safely accomplished, by paracargo or sling load methods. Personnel (fire crews, helitack personnel, and others) can be airlifted as conditions warrant. Food and water can be delivered to line crews, and spike camps can be supported in this manner.

B.2.2.5 Rescue. Helicopters are an essential part of many rescue operations. The following are some uses:

(1) Airlifting medical personnel to care for and move injured persons to medical aid sites or hospitals
(2) Scouting and directing rescue crews
(3) Servicing isolated parties until rescue can be accomplished
(4) Rescue operations, although weather and performance limitations of the aircraft can, at times, prevent their use in rescue operations.

B.2.2.6 Other Uses. Helicopters can also be used for the following:

(1) Aerial ignition operations using helitorches, ping-pong dispensers, and other devices
(2) Rappelling of trained crews
(3) Retrieving of smoke jumpers
(4) Detection and prevention activities

B.3 Ground Facilities.

B.3.1 Ground Support Facilities. Permanent or auxiliary bases for aircraft engaged in wildland fire or related operational activities are arranged so that aircraft ground traffic, parking, and public movement will not delay or hinder the operation. Taxiways and loading areas should afford adequate width and clearance for safe ground maneuvering of the aircraft. Ramps or heliport pads are designed to support the gross weights of the aircraft and other necessary equipment.

B.3.1.1 Aircraft Rescue and Fire Fighting. In most cases, rescue and fire-fighting operations in response to accidents at an airport will be performed by regular airport fire-fighting personnel. However, it could be necessary at times for aircraft support personnel to furnish this service where such facilities are not provided by the airport management. The National Fire Protection Association has published a number of useful standards, manuals, and guides on this subject *(see Annex D)*.

Note: Air attack operations are not conducted without approved fire-extinguishing equipment and trained personnel on "fire guard."

B.4 General Operating Procedures.

B.4.1 Air Operations Plan. Considerable evaluation and study are necessary for those who plan air operations. Firsthand experiences and sound information from others who are using aircraft are extremely helpful.

Some of the factors involved for consideration include the overall objectives and needs for the operations; cost evaluation; availability of suitable aircraft to fulfill the objectives and needs; operational base locations; ground support facilities; communications; and the personnel necessary to operate aircraft, bases, and ground support facilities and to carry out overall supervision of the air operations.

B.4.2 Retardant and Suppressant Drops. The proper use of air attack is important to resource protection. The decision to use airtankers should be based on careful consideration of the following:

(1) Fire potential and its likelihood of causing extensive damage or requiring costly suppression efforts
(2) Threat to life safety
(3) Opportunity to obtain more economic control
(4) Availability of an airtanker organization sufficiently trained, equipped, and organized to perform the mission
(5) Accomplishing the mission during daylight hours so that terrain, visibility, and wind conditions permit safe and effective dropping

The airtanker is a highly specialized and costly fire-fighting tool. It is the responsibility of the incident commander to suspend the use of airtankers when they are no longer essential to suppression.

Specialists with airtanker experience should be consulted and assisted in the planning of the airtanker program. An airport facility guide and map showing the airports suitable for primary and auxiliary airtanker operations, within or adjacent to protection areas, should be made.

Airports selected for either primary or auxiliary airtanker operations should be rated on the number of airtankers that can be handled simultaneously. That capacity will depend on the size of the airport and of the area set aside for loading facilities, the mixing and loading facilities, the amount of fire-retardant chemical, and the available ground personnel.

The primary objective should be to have airports within 30-minute transit time from the areas to be protected by initial attack aircraft. The distance will depend on the performance of the aircraft.

Pre–wildland fire season planning should include preparing the base for airtanker operations by addressing the following:

(1) An operational check of mixing equipment
(2) Determination of the dry and wet chemical supply, water supply, and storage facilities
(3) Training of the ground crews that are to support the operation and the logistics necessary to keep the air attack aircraft operational

B.4.3 Detection, Reconnaissance, and Scouting. The essential components for a successful airborne detection, reconnaissance, and scouting operation are detailed in B.4.3.1 through B.4.3.11.

B.4.3.1 Preliminary Planning. Maps, charts, seen-area composites, spot maps, weather information, fire statistics, and any other information that could help in accomplishing the operation should be utilized.

B.4.3.2 Aircraft Selection Suitable for the Operation. The aircraft should satisfy all functions of the mission. Aircraft size, performance characteristics, visibility, and safety are of prime importance.

B.4.3.3 Aerial Observers. Aerial observers should have the proper training and have gained through actual experience the capabilities of distinguishing and interpreting their observations in relation to the mission's objectives. In wildland fire and related missions, the observer should be experienced in fire behavior, fuels, weather measurements, and fire suppression.

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B.4.3.4 Preflight Briefing. Pilot and observer should completely understand their individual responsibilities along with other combined efforts necessary in conducting a successful and safe mission.

B.4.3.5 Reconnaissance. The aircraft should be flown to provide the observer with the best possible visibility. The objective should be on the observer's side and as free as possible from visibility restrictions. Approaches should be planned to provide the necessary light and background.

Frequently, the pilot can offer assistance to verify questionable observations and, at times, assist by providing data from aircraft instruments, maps, and aircraft radio use.

Flying should be as smooth as possible to relieve the observer of unnecessary strain. The pilot should anticipate the observer's needs and maneuver the aircraft so that the observer does not have to shift position constantly.

B.4.3.6 Detection. Flight routes should be planned and timed to give the observer every possible advantage for the best observations. The selection routes should be prepared on charts for each foreseeable condition that could occur and to preclude overlapping of jurisdictions. Systematic profiling of critical areas along the proposed route is essential, to permit easier determination of alternate flight routes. It could be necessary to fly the flight routes several times before establishing the selected route. The observers then can continue to refine and make adjustments.

It could be necessary to adjust flight altitudes and place areas with backgrounds that limit visibility on proper profile for flight line adjustments to improve the efficiency of the detection flights.

B.4.3.7 Direction of Flight in Relation to Drainage. Normally, in mountainous areas, the flight routes should be planned to parallel the major drainages. This allows the observer to look up or down the secondary drainages. Flights across major drainages restrict the observation behind secondary and minor ridges.

B.4.3.8 Observation Distance. The observer should not waste any effort searching the distant horizon. Observations should be confined principally to the assigned strip. The search area ahead should be limited to 24 km (15 miles) or less. For intensive search, such as lightning coverage or during extreme or emergency fire danger, this distance should be reduced. About half the time is used in forward observation. The rest of the time is spent searching those areas that later will be hidden from view.

B.4.3.9 Flying Speed. The slow cruise speed of the aircraft is a good observation speed. Under certain conditions, slower speeds could be necessary to observe specific areas. The experience and training of the pilot and the observer have an important bearing on the flying speed. High and low speeds have certain advantages, depending on conditions and observation objectives.

B.4.3.10 Number and Frequency of Flights. The number and frequency of flights will depend on the desired objectives, available personnel and aircraft, and atmospheric conditions.

B.4.3.11 Estimating. Rapid and accurate estimating is essential to a successful mission. The following are some of the common methods of estimating from aircraft:

(1) Distance
   (a) Compare the lineal measurements of objects, either visually or from maps and air photos. Lakes, runways, and similar landmarks are suitable for this purpose.
   (b) Measure the approximate distance by using flight time and airspeed.
(2) Slope
   (a) Use aircraft instruments, such as the artificial horizon and altimeter.
   (b) Estimate the slope from topographic maps.

B.4.4 Communications. Satisfactory communications equipment should be installed in the aircraft either permanently or on a temporary basis.

B.4.4.1 Radio. Suitable transceivers, either permanently or temporarily installed, should be provided for each aircraft.

B.4.4.2 Air–Ground Signals. A copy of the air–ground signals should be carried in the aircraft and by all crew members.

B.4.5 Flight Plans. Planned periodic aircraft position reports should be made (frequency depends on the mission). The position reports should be followed up promptly if they are not received within a specified time limit. Any deviation or change from a planned route should be reported immediately and a new flight plan filed with notification of checkpoints and destination.

A definite procedure should be established designating personnel responsible for follow-up if aircraft is unreported at its destination. This is especially important for flights terminating during hours the dispatching office is not staffed.

Following flight procedures and requirements should be mandatory for each flight. Radio contact and a location report should be made at least at 15-minute intervals. A flight search should be initiated if contact cannot be established within 30 minutes.

B.4.6 Records and Reports. Adequate records and reports are necessary for proper management of air operations. The reports help determine whether the operation is being conducted safely and economically and is accomplishing the objectives of the plan. Once it is determined that both criteria are being met, reports can be reduced to a minimum.

Annex C Preparedness Planning

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

C.1 Three models are provided as examples for constructing the plan(s) in Section 5.1.

C.2 Moblization Plan. Written fire suppression mobilization plans are important even if prepared only in outline form. They should list all preplanned decisions and attack plans and outline other information needed for planned action. Such fire control plans allow a subordinate to take emergency action in the absence of the fire chief or other key individuals. Copies of the plans with necessary maps should be distributed to key fire officers. Plans should be updated at least annually and at any other time when required by changing conditions.

A mobilization plan should include the following information:

(1) Fire department organizational chart
   (a) Line of succession: Names and how to contact
   (b) Personnel roster: Names and how to contact

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(2) Cooperating agencies: Names and how to contact
(3) Resources
   (a) Reserve personnel: How to contact
   (b) List of available equipment: Types, locations, whom to contact, how to procure
   (c) List of available supplies and suppliers: Types, locations, whom to contact, how to procure
   (d) List of other available facilities: Types, locations, whom to contact
(4) Map of protected area that should include items such as the following:
   (a) Boundary of protected area and adjacent jurisdictions
   (b) Roads and other means of access such as heliports and airports
   (c) Locations of manpower, equipment, and facilities' resources
   (d) Water sources
   (e) Areas of concern
(5) Hazardous fuels
(6) High-risk ignition sources such as dumps, sawmills, logging operations, and recreation areas
(7) Fire weather information
   (a) Source of information
   (b) Methods of notifying the public
(8) Pre-attack plans

C.3 Fire Danger Operating Plan. The fire danger operating plan documents the establishment and management of the unit fire weather system and incorporates National Fire Danger Rating System (NFDRS) fire danger modeling into unit fire management decisions. (It should not be confused with the National Weather Service Fire Service Fire Weather Operating Plan.) Fire danger operating plans are required for each dispatch unit.

A standard fire danger operating plan has the following minimum components:

(1) *Roles and Responsibilities.* Defined for those responsible for maintenance and daily implementation of the plan, program management related to the plan, and associated training.
(2) *Fire Danger Rating Areas.* Aggregates of basic response areas, fire danger rating areas are defined by location of weather stations, NFDRS fuel models, and slope and climate classes. In most cases, the fire danger rating areas will be the same as fire management zones (FMZs) developed in the most current fire planning process.
(3) *NFDRS Thresholds.* Thresholds, or breakpoints, are used to define fire danger input for management decisions in each fire danger rating area. Activities, events, and fire operations affected by fire danger are identified, and appropriate NFDRS components or indices are selected as decision guides. Historical analysis of fire weather data is used to identify thresholds for staffing class, adjective rating, and preparedness level.
   (a) Staffing class (1, 2, 3, 4, 5) is based on the energy release component (ERC) or the burning index (BI). It is used to make daily internal fire operations decisions.
   (b) Adjective rating (low, moderate, high, very high, extreme) is based on staffing class and the ignition component. It is a general description of fire danger for the purpose of informing the public.
   (c) Preparedness level (1, 2, 3, 4, 5) is based on staffing class or index value and other local/area preparedness parameters and is meant for internal management direction and operational support.

Thresholds are established for each decision class to assist all appropriate management responses and are based on both historical weather (climatology) and fire occurrence.

C.4 Seasonal Risk Analysis. A seasonal risk analysis requires fire managers to step back, review current and predicted weather and fuels information, compare this information with historic weather and fuels records, and predict the upcoming fire season's severity and duration for any given area. It is important to incorporate drought indices into this assessment.

Information from a seasonal risk analysis can be used to modify step-up and re-attack plans. It provides the basis for actions such as prepositioning critical resources, requesting additional funding, and modifying memoranda of understanding (MOU) to meet anticipated needs.

Each field office selects and compares to normal the current value and seasonal trend of one or more of the following indicators that are most useful in predicting fire season severity and duration in that field office's area:

(1) NFDRS (or CFFDRS) index values (ERC, BI)
(2) Temperature levels
(3) Precipitation levels
(4) Humidity levels
(5) Palmer Drought or Standardized Precipitation Index
(6) 1000-hour fuel moisture (timber fuels)
(7) Vegetation moisture levels, live fuel moisture (brush fuels), and curing rate (grass fuels)
(8) Episodic wind events (moisture drying days)

Annex D Informational References

D.1 Referenced Publications. The following documents or portions thereof are referenced within this standard for informational purposes only and are thus not part of the requirements of this document unless also listed in Chapter 2.

D.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 1144, *Standard for Protection of Life and Property from Wildfire*, 2002 edition.

NFPA 1561, *Standard on Emergency Services Incident Management System*, 2002 edition.

D.1.2 Other Publications.

D.1.2.1 NWCG (National Wildfire Coordinating Group) Publications. National Interagency Fire Center Publications, Great Basin Cache Supply Office, 3833 So. Development Avenue, Boise, ID 83705.

NWCG-NFES No. 0065, *Fireline Handbook,* 1998.

NWCG-NFES No. 1077, *Incident Response Pocket Guide,* January 2002 edition.

D.1.2.2 U. S. Government Publication. Government Printing Office, Superintendent of Documents, P. O. Box 371954, Pittsburgh, PA 12550-7954, http://www.ccess.gpo.gov.

Federal Aviation Regulations, Part 91.137, "General Operating and Flight Rules."

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D.2 Informational References. The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.

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NFPA 402, *Guide for Aircraft Rescue and Fire Fighting Operations*, 2002 edition.

NFPA 403, *Standard for Aircraft Rescue and Fire-Fighting Services at Airports*, 2003 edition.

NFPA 407, *Standard for Aircraft Fuel Servicing*, 2001 edition.

NFPA 414, *Standard for Aircraft Rescue and Fire-Fighting Vehicles*, 2001 edition.

NFPA 1001, *Standard for Fire Fighter Professional Qualifications*, 2002 edition.

NFPA 1002, *Standard for Fire Apparatus Driver/Operator Professional Qualifications*, 2003 edition.

NFPA 1051, *Standard for Wildland Fire Fighter Professional Qualifications*, 2002 edition.

NFPA 1141, *Standard for Fire Protection in Planned Building Groups*, 2003 edition.

NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*, 2001 edition.

NFPA 1145, *Guide for the Use of Class A Foams in Manual Structural Fire Fighting*, 2000 edition.

NFPA 1150, *Standard on Fire-Fighting Foam Chemicals for Class A Fuels in Rural, Suburban, and Vegetated Areas*, 1999 edition.

NFPA 1201, *Standard for Developing Fire Protection Services for the Public*, 2000 edition.

NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*, 2002 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2002 edition.

NFPA 1521, *Standard for Fire Department Safety Officer*, 2002 edition.

NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, 2001 edition.

NFPA 1720, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments*, 2001 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus*, 2003 edition.

NFPA 1906, *Standard for Wildland Fire Apparatus*, 2001 edition.

NFPA 1977, *Standard on Protective Clothing and Equipment for Wildland Fire Fighting*, 1998 edition.

NFPA *Fire Protection Handbook*, 2003, 19th edition, Section 10, "Water-Based Suppression," and Section 11, "Fire Suppression without Water."

D.2.2 NWCG (National Wildfire Coordinating Group) Publications. National Interagency Fire Center Publications, Great Basin Cache Supply Office, 3833 So. Development Avenue, Boise, ID 83705.

NWCG-NFES No. 1256, *Wildland Fire Suppression Tactics, Reference Guide,* 1996.

NWCG-NFES No. 1363, *Spark Arrester Guide, General Purpose and Locomotive (6P/L),* Vol. 1, 2002.

NWCG-NFES No. 1845, *Foam vs. Fire,* 1995.

NWCG-NFES No. 1874, *Wildfire Cause and Determination Handbook,* 1978.

NWCG-NFES No. 2363, *Spark Arrester Guide, Volume 2: Multiposition Small Engine (MSE),* 2003.

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Teie, William C., *Fire Officer's Handbook on Wildland Firefighting,* Rescue, CA: Deer Valley Press, 1994.

D.3 References for Extracts. The following documents are listed here to provide reference information, including title and edition, for extracts given throughout this standard as indicated by a reference in brackets [ ] following a section or paragraph. These documents are not a part of the requirements of this document unless also listed in Chapter 2 for other reasons.

NFPA *101®*, *Life Safety Code®*, 2003 edition.

NFPA 1144, *Standard for Protection of Life and Property from Wildfire*, 2002 edition.

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 2002 edition.

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Index

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-A-

Abort (definition) B.1.2.1
Agencies ..... 5.1.3(4), 5.1.3(5)
  Cooperative agreements between 6.4.1.1, 6.4.1.2
  Definition 3.3.1
AGL (definition) B.1.2.2
AHJ .....*see* Authority having jurisdiction (AHJ)
Air attack ..... B.4.2; *see also* Drops
  Birddog/air attack aircraft (definition) B.1.2.9
  Definition B.1.2.3
Aircraft
  Birddog/air attack (definition) B.1.2.9
  Fixed wing .....*see* Airplanes
  Rescue of B.3.1.1
  Rotary wing .....*see* Helicopters
Air drops .....*see* Drops
Air-ground signals B.4.4.2
Air operations ..... Annex B
  Aircraft suitability/selection B.2
  Definitions B.1.2
  Ground facilities B.3
  Operating procedures B.4
  Plan for B.4.1
  Safety in 6.3.1.3, A.6.3.1.3
Airplanes ..... A.6.3.1.3; *see also* Airtankers
  Amphibious B.2.1.3
  Detection/reconnaissance/survey B.2.1.1, B.4.3.2
  Paracargo/freight B.2.1.2
Airports B.3.1
  Aircraft rescue/fire fighting at B.3.1.1
  Airtanker operations at B.4.2
Air tactical group supervisor (ATGS) (definition) B.1.2.4
Airtanker coordinator/birddog pilot/lead plane pilot (definition) B.1.2.6
Airtankers ..... A.6.3.1.3, A.6.3.3.3(4), B.2.1.4, B.4.2
  Definition B.1.2.5
Air traffic B.3.1
  Definition B.1.2.7
Altitude
  Density (definition) B.1.2.16
  Flight B.4.3.6
Amphibious aircraft B.2.1.3
Apparatus ..... 5.1.3(3)
  Definition 3.3.2, A.3.3.2
  Safeguards for 5.3.3, 6.2.4.2
  Types/availability of 6.3.1.2, A.6.3.1.2
Approved (definition) 3.2.1, A.3.2.1
Attack (fire) 6.3.3, A.6.3.3.1
  Air .....*see* Air attack
  Birddog/air attack aircraft (definition) B.1.2.9
  Direct A.6.3.3.1
    Definition B.1.2.17
  Helitack .....*see* Helitack
  Initial B.2.2.2
    Definition B.1.2.48
  Parallel (definition) B.1.2.57
Authority having jurisdiction (AHJ)
  Command organization by 6.2, A.6.2
  Communications established by 6.5.3.1
  Cooperative agreement, preparation and use of 6.4.1.1.1, 6.4.1.2
  Definition 3.2.2, A.3.2.2
  Organization structured by 6.1, A.6.1
  Post-incident activities 6.3.4.3.2, 6.3.5.1, 6.4.1.4
  Pre-incident planning 6.4.1
  Preparedness planning 5.1.1
  Risk and hazard assessment ..... Chap. 4
  Public information plan 6.2.3.1
  Safety requirements 5.3, 6.2.4, A.5.3, A.6.2.4.1, A.6.2.4.3
  Wildland fire control policy 1.3
Autorotation (definition) B.1.2.8
Aviation .....*See* Air operations

-B-

Birddog/air attack (definition) B.1.2.9
Birddog pilot (definition) B.1.2.6
Break (definition) B.1.2.10
Brush (definition) ..... 3.3.3; *see also* Wildland fire
Buckets ..... A.6.3.3.3(4)
  Definition B.1.2.11
Building site design and construction 4.5.5

-C-

Candling .....*see* Torching
Canopy (definition) B.1.2.13
Chicot (definition) .....*see* Snags
Clothing .....*see* Protective clothing and equipment
Command .....*see also* Incident commanders (IC)
  Definition 3.3.4
  Incident 6.2, A.6.2
  Strategic considerations 6.2.2
  Structure of ..... 6.4.1.2(4)
  Unified ..... 6.2.1, 6.4.1.2(4)
    Definition 3.3.27, A.3.3.27
Communications ..... 4.5.7(3), 6.5.3, A.6.5.3
  Air operations B.4.4
  Planning for ..... 6.4.1.2(5)
Companies A.6.1
  Definition 3.3.5, A.3.3.5
Company officers A.6.2
  Definition 3.3.6
Construction 4.5.5
Control of fires ..... 6.3.3, 6.4.1.2, A.6.3.3.1, B.4.2; *see also* Planning
  AHJ, control policies of 1.3
  Definition 3.3.7
  Fire protection features ..... 5.1.3(2)
  Hazard assessment 4.4, A.4.4
Cooperative agreements ..... 4.5.6.2(1), 5.1.3(4), 5.1.3(5), 6.4.1.1, 6.4.1.2
Crew A.6.1
  Definition 3.3.8
  Helitack (definition) B.1.2.42
Crew leaders (bosses) A.6.2
  Definition 3.3.9
Crown fire (definition) B.1.2.15

-D-

Defensible space 4.5.5.2
  Definition 3.3.10
Definitions ..... Chap. 3, B.1.2
Demobilization 6.3.4, 6.5.6
Density altitude (definition) B.1.2.16

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Detection flights ..... B.2.2.6, B.4.3.6; *see also* Reconnaissance flights
Direct attack A.6.3.3.1
Definition B.1.2.17
Down loading (definition) B.1.2.18
Dozer line ..... Fig. A.6.3.1.2(b)
Definition B.1.2.19
Dozers A.6.3.1.2
Drift (definition) B.1.2.20
Drop accuracy (definition) B.1.2.21
Drops A.6.3.1.3, B.4.2
Late drop (definition) B.1.2.50
Low drop (definition) B.1.2.54
Trail drop (definition) B.1.2.69
Drop sequence (definition) B.1.2.22
Drop zone (definition) B.1.2.23
Dry run A.6.3.1.3
Definition B.1.2.24

-E-

Early (definition) B.1.2.25
Elevation (definition) B.1.2.26
Emergency medical support ..... 6.5.4.1, A.6.5.4(1)
Enforcement A.4.5
Engineering A.4.5
Environmental laws 4.5.8
Equipment ..... 5.1.3(3), 6.3.2.3(7), 6.5.5
Helicopter shuttling of B.2.2.4
Safeguards for 5.3.3, 6.2.4.2
Types/availability of 6.3.1.2, A.6.3.1.2
ETA (definition) B.1.2.27
ETD (definition) B.1.2.28
Evaluations .....*see* Reviews and evaluations, post-incident

-F-

Facilities 6.5.2, A.6.5.2
Final (definition) B.1.2.29
Finance 5.2, 6.6
Definition 3.3.11
Fire apparatus .....*see* Apparatus
Fire danger operating plan C.3
Fire danger rating 6.4.1.3
Fire fighters .....*see* Personnel
Fire fighting .....*see also* Control of fires; Drops
At airports B.3.1.1
Capability, evaluation of 4.5.6
Safety in 6.2.4, A.6.2.4.1, A.6.2.4.3
Fire protection features ..... 5.1.3(2)
Fire reports 6.2.3.2.1, A.6.2.3.2.1
Fire-resistive design and construction 4.5.5.1
Fire retardants .....*see* Retardants
Fires .....*see* Wildland fire
Fire shelters A.6.2.4.1
Flame-resistant clothing 6.2.4.1, A.6.2.4.1
Flanks ..... Fig. A.6.3.1.2(b)
Definition B.1.2.30
Flight plans B.4.5
Foam ..... A.6.3.3.3(4)
Food services support ..... 6.5.4.2, A.6.5.4.2, A.6.5.4(2)
Footwear 6.2.4.1, A.6.2.4.1
Forest fire .....*see* Wildland fire
Forward looking infrared (FLIR) systems B.2.1.1
Fuels
Conditions A.4.4
Size-up ..... 6.3.2.3(2)
Treatment 4.5.3

-G-

Gloves 6.2.4.1
Grass fire .....*see* Wildland fire
Ground effect (definition) B.1.2.31
Ground fire (definition) B.1.2.32
Ground support
Facilities for B.3.1
Logistics for ..... 6.5.4.5, A.6.5.4.5, A.6.5.4(8)

-H-

Hand tools A.6.3.1.2
Hazard assessment 4.4, A.4.4, A.4.5
Size-up ..... 6.3.2.3(1)
Hazard identification ..... 5.1.3(1), 5.1.3(7)
Head (definition) B.1.2.33
Heading (definition) B.1.2.34
Head protection 6.2.4.1, A.6.2.4.1
Helibase manager (definition) B.1.2.36
Helibases B.3.1
Definition B.1.2.35
Helibuckets .....*see* Buckets
Helicopter coordinator (definition) B.1.2.38
Helicopters B.2.2
Equipment/personnel shuttling by B.2.2.4
Initial attack transport B.2.2.2
Reconnaissance/scouting by B.2.2.3, B.4.3.2
Rescue operations by B.2.2.5
Retardants, dropping of ..... A.6.3.1.3, Fig. A.6.3.1.3(b), B.2.2.1
Safety A.6.3.1.3
Heliports A.6.3.1.3, B.2.2.4, B.3.1
Definition B.1.2.39
Helispot (definition) B.1.2.40
Helitack ..... A.6.3.1.3, Fig. A.6.3.1.3(b), B.2.2.1, B.2.2.2
Definition B.1.2.41
Helitack crew member (definition) B.1.2.42
Helitack supervisor (definition) B.1.2.43
Helitanks ..... A.6.3.3.3(4)
Definition B.1.2.44
Hot spot (definition) B.1.2.45

-I-

Ignition prevention activities 4.5.2
Ignition sources, evaluation of ..... 4.3, A.4.4; *see also* Hazard assessment
Incident commander (IC) A.5.3
Definition 3.3.15, B.1.2.46
Responsibilities of 6.2.3, A.6.2
Fire attack/control 6.3.3.1, 6.3.3.2, A.6.3.3.1, B.4.2
Incident planning 6.4.1.4
Mop-up/demobilization 6.3.4.1.1, 6.3.4.2, 6.3.4.3.1
Resource evaluation ..... 6.3.1.1, 6.3.1.2(A)
Size-up 6.3.2.1, 6.3.2.2
Incident command system (ICS) (definition) ..... B.1.2.47; *see also* Command
Incident management ..... Chap. 6
Incident management systems 6.2, A.6.2
Definition 3.3.16, A.3.3.16
Incident planning ..... 6.4.1.4; *see also* Planning
Incidents .....*see also* Operations
Command at 6.2, A.6.2
Definition 3.3.14
Public information at 6.2.3.1.1
Safety requirements for .....*see* Safety requirements
Infrastructure 4.5.7
Initial attack B.2.2.2
Definition B.1.2.48

-K-

Knot (definition) B.1.2.49

-L-

Labeled (definition) 3.2.3
Late drop (definition) B.1.2.50

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LCES (Lookouts, Communications, Escape Routes, and Safety Zones) A.6.2.4.3
Lead plane pilots (definition) B.1.2.6
Liaison 6.2.5
Definition 3.3.17
Life safety 5.1.2
Line (definition) B.1.2.51
Line length (definition) B.1.2.52
Listed (definition) 3.2.4, A.3.2.4
"Load and return" (definition) B.1.2.53
Local fixed base operator (FBO) B.2.1.1
Logistics 6.5, A.6.5
Communications 6.5.3, A.6.5.3
Definition 3.3.18
Demobilization 6.5.6
Facilities 6.5.2, A.6.5.2
Supplies/equipment 6.5.5
Support services 6.5.4, A.6.5.4
Low drop (definition) B.1.2.54

-M-

Media alert systems ..... 6.2.3.1.1(1)
Medical examinations 5.3.4
Mitigation ..... Chap. 4
Definition 3.3.19
Plan 4.1, 4.5, A.4.1, A.4.5
Mobilization plan C.2
Mop-up 6.3.4
Mutual aid ..... *see* Cooperative agreements

-O-

Observers B.4.3.3, B.4.3.4, B.4.3.8
Officers, company ..... *see* Company officers
Operations 6.3, A.6.3
Aviation/air operations ..... *see* Air operations
Cooperation in ..... *see* Cooperative agreements
Definition 3.3.20
Fire attack/control ..... *see* Attack (fire); Control of fires
Mop-up/demobilization 6.3.4
Post-incident review 6.3.5
Resource evaluation 6.3.1
Size-up 6.3.2
Orbit (definition) B.1.2.55
Organizational structure 6.1, A.6.1

-P-

Paracargo B.2.1.2, B.2.2.4
Definition B.1.2.56
Parallel attack (definition) B.1.2.57
Personnel ..... 5.1.3(3), 5.1.3(6), 6.3.1.1, 6.3.2.3(7); *see also* Safety requirements
Helicopter shuttling of B.2.2.4
Qualifications of ..... 5.4, 6.4.1.2(6), A.5.4, B.4.3.3, B.4.3.4
Training of 6.2.5, B.4.2
Pilots A.6.3.1.3, B.4.3.5
Birddog/lead plane (definition) B.1.2.6
Qualifications of B.4.3.4
Planning 6.4
Air operations B.4.2, B.4.3.1
Definition 3.3.21
Financial 5.2, 6.6.1
Incident 6.4.1.4
Operating plan ..... 6.4.1.2(7)
Post-incident 6.4.1.5, 6.6.2
Preparedness ..... 5.1, 6.6.1, A.5.1, B.4.2, Annex C
Risk and hazard assessment and mitigation plan ..... Chap. 4
Potable water support ..... *see* Water supply
Power saws A.6.3.1.2
Preparedness ..... Chap. 5, Annex C
Preparedness planning ..... 5.1, A.5.1, B.4.2, Annex C
Prescribed fire ..... A.6.3.3.3(4)
Definition 3.3.22
Prevention (definition) ..... 3.3.23; *see also* Mitigation; Public education
Protective clothing and equipment 5.3.1, 6.2.4.1, A.6.2.4.1
Public education 4.5.4, A.4.5
Public information officers (PIO) 4.5.4, 6.2.3.1
Public information plans 6.2.3.1
Purpose of standard 1.2, A.1.2

-R-

Radio communications 6.5.3, A.6.5.3, B.4.4.1, B.4.5
Reconnaissance flights B.4.3.5
Aircraft for B.4.3.2
Airplane B.2.1.1
Helicopter B.2.2.3
Direction of B.4.3.7
Estimation in B.4.3.11
Flying speed B.4.3.9
Number of B.4.3.10
Observation in B.4.3.8
Personnel for B.4.3.3, B.4.3.4
Planning for B.4.3.1
Preflight briefing B.4.3.4
Records B.4.6
References ..... Chap. 2, Annex D
Reports 6.3.4.3, 6.6.2
Air operations B.4.5, B.4.6
Fire reports 6.2.3.2.1, A.6.2.3.2.1
Rescue operations
At airport B.3.1.1
Helicopter B.2.2.5
Restricted air space (definition) B.1.2.58
Retardants ..... 6.3.3.3(4), A.6.3.3.3(4)
Airtanker dropping of ..... A.6.3.1.3, Fig. A.6.3.1.3(a), B.4.2
Helicopter dropping of ..... A.6.3.1.3, Fig. A.6.3.1.3(b), B.2.2.1
Long-term ..... A.6.3.3.3(4)(1)
Definition B.1.2.59
"Return and hold" (definition) B.1.2.60
Reviews and evaluations, post-incident 6.2.3.2.2, 6.2.4.4, 6.3.5, 6.4.1.5, 6.4.1.5.1
Risk
Assessment ..... 4.3, A.4.5; *see also* Mitigation
Definition 3.3.24
Roads ..... 4.5.7(1)
Rural (definition) 3.3.25

-S-

Safety officers 5.3.2
Safety requirements .... 5.1.3(6), 5.3, 6.2.4, A.5.3, A.6.2.4.1, A.6.2.4.3
Salvo (definition) B.1.2.61
Sanitation services support ..... 6.5.4.3, A.6.5.4.3, A.6.5.4(7)
Saws, power A.6.3.1.2
Scope of standard 1.1
Scouting flights ..... *see* Reconnaissance flights
Seasonal risk analysis C.4
Security ..... 6.5.4.6, A.6.5.4.6(9)
Shall (definition) 3.2.5
Should (definition) 3.2.6
Size-up 6.3.2
Snags A.6.3.1.3
Definition B.1.2.62
Speed, flying B.4.3.9
Split load (definition) B.1.2.63
Spot fire (definition) B.1.2.64
Stakeholder (definition) 3.3.26
Standard (definition) 3.2.7
Supplies 6.5.5
Support services 6.5.4, A.6.5.4

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Suppressants ..... A.6.3.3.3(4); *see also* Retardants
Definition B.1.2.65
Survey aircraft B.2.1.1

-T-

Telephone communications 6.5.3.1, A.6.5.3
Temporary flight restriction (TFR) (definition) B.1.2.66
Ten Standard Fire-Fighting Orders 6.2.4.3, A.6.2.4.3
Torching (definition) B.1.2.67
Tractor plows A.6.3.1.2
Traffic pattern (definition) B.1.2.68
Trail drop (definition) B.1.2.69
Training ..... 5.1.3(6), 5.3.3, 5.4, 6.2.4.2, A.5.4, B.4.2

-U-

Unified command ..... 6.2.1, 6.4.1.2(4)
Definition 3.3.27, A.3.3.27
Utility corridors ..... 4.5.7(4)

-V-

Values at risk 4.1, 4.2, A.4.1, A.4.5
Definition 3.3.28, A.3.3.28

-W-

Watch Out situations 6.2.4.3, A.6.2.4.3
Water supply ..... 4.5.7(2), 6.5.4.4, A.6.5.4.4, A.6.5.4(4)
Weather advisory (definition) B.1.2.70
Weather conditions ..... 6.3.2.3(4), A.4.4
Wetting agent (definition) B.1.2.71
Wildfires ..... *see* Wildland fire
Wildland fire
Air operations for ..... Annex B
Attack/control of .....*see* Attack (fire); Control of fires
Control of .....*see* Control of fires
Crown fire (definition) B.1.2.15
Definition 3.3.30, A.3.3.30
Ground fire (definition) B.1.2.32
Mitigation .....*see* Mitigation
Prescribed fire .....*see* Prescribed fire
Prescribed fire (definition) 3.3.22
Size-up of 6.3.2
Spot fire (definition) B.1.2.64
Wildland/urban interface ..... 5.1.3(7)
Definition 3.3.31
Watch Outs A.6.2.4.3
Wildland/urban interface coordinator A.4.1
Definition 3.3.32, A.3.3.32
Wildland/urban interface protection specialist A.6.2.3
Definition 3.3.33
Wildland/urban intermix ..... 5.1.3(7)
Definition 3.3.34

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