

CERTIFICATION CURRICULUM MANUAL

CHAPTER TWO

BASIC AIRCRAFT RESCUE FIRE SUPPRESSION

NFPA 1003, 2019 Edition

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**CHAPTER TWO
BASIC AIRCRAFT RESCUE FIRE SUPPRESSION
CURRICULUM OUTLINE**

SECTION	SUBJECT	RECOMMENDED HOURS
200 – 4.1	General	18
200 – 4.2	Response	20
200 – 4.3	Fire Suppression	48
200 – 4.4	Rescue	34
	TOTAL RECOMMENDED HOURS*	120

* The recommended hours for training include time for skills evaluation and are based on 12 students. Hours needed depend on the actual number of students.

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REFERENCE LIST FOR THE BASIC AIRCRAFT RESCUE FIRE SUPPRESSION CURRICULUM

This Reference List is provided as a general guide for both instructors and students to locate information pertaining to the specific objectives in the TCFP Curriculum. This list is not all inclusive and does not in any way limit TCFP development and use of questions to test the objectives of the curriculum:

Required References

Aircraft Rescue and Fire Fighting. (6th edition) (2015). Stillwater, OK: Fire Protection Publications. International Fire Service Training Association (IFSTA)

Code of Federal Regulations, 14 CFR, Part 139, Subpart A, Certification of Airports: General. (Amended January 16, 2013). U.S. Department of Transportation, Federal Aviation Administration

Code of Federal Regulations, 14 CFR, Part 139, Subpart D, Certification of Airports: Operations. (Amended January 16, 2013). U.S. Department of Transportation, Federal Aviation Administration

Code of Federal Regulations, 49 CFR, Part 175.310 Transportation of flammable liquid fuel; aircraft only means of transportation. (October 1, 2011 edition). U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration

Code of Federal Regulations, 49 CFR, Part 830.10 Preservation of aircraft wreckage, mail, cargo, and records. (August 24, 2010, edition). U.S. Department of Transportation, National Transportation Safety Board

Certification Curriculum Manual. Texas Commission on Fire Protection. (Most current edition). Austin, TX: Texas Commission on Fire Protection.

Essentials of Fire Fighting and Fire Department Operations. (7th edition) (2018). Stillwater, OK: Fire Protection Publications. International Fire Service Training Association (IFSTA)

NFPA 1003: Standard for Airport Fire Fighter Professional Qualifications. (2019 edition). NFPA Publications Quincy, MA: NFPA Publications. National Fire Protection Association

NFPA 1403: Standard on Live Fire Training Evolutions. (2018 edition). NFPA Publications Quincy, MA. National Fire Protection Association

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NFPA 1500: Standard on Fire Department Occupational Safety and Health Program. (2021 edition). NFPA Publications Quincy, MA: NFPA Publications. National Fire Protection Association

Recommended References

The most current edition of the following publications is recommended (not required) supplemental material for program use.

Ballistic recovery systems (BRS) FAA 13-04 cert alert “Additional Precautions for Approaching Aircraft with Ballistic Parachutes, Ejection Seats, and Airbags.” July 29, 2013.

FAA Advisory Circular: AC 120-60B - Ground Deicing and Anti-icing Program, December 20, 2004

FAA Advisory Circular: AC 150/5210-23 – ARFF Vehicle and High Reach Extendable Turret (HRET) Operation, Training and Qualifications, September 30, 2010

National Transportation Safety Board Accident Reports, <http://www.nts.gov>.

Pumping and Aerial Apparatus Driver/Operator Handbook. (3rd edition) (2015). Stillwater, OK: Fire Protection Publications. International Fire Service Training Association.

Unmanned aircraft/drones UAV/UAS, <https://www.faa.gov/uas/>

USAF TO 00-105E-9 Aerospace Emergency Rescue and Mishap Response Information (Emergency Services). Current Edition April 2015 Revision Number 16.

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EQUIPMENT LIST

Personal Protective Equipment

- A complete NFPA 1971-compliant firefighter protective ensemble per student
- Self-Contained Breathing Apparatus (SCBA)

Communications Equipment

- Two-way radio
- Light Gun (ATC)

SOP/MOP/SOG/PP:

- Airport/FD/Organizational Incident-Specific Response SOPs
- Incident Management Protocol
- Airport Emergency Plan (actual or training version)
- Airport Grid Map
- Aircraft schematics/diagrams
- AHJ Triage Protocol
- Fire attack procedures
- SDS for each extinguishing agent

Access to ATC (or a simulated ATC)

- Radio communication
- Light-gun signals

Training Devices/Props/Simulators

- Aircraft firefighting simulator (interior and exterior)
- Aircraft fuel spill tank/containment area (burn pan or equivalent)
- APU/EPU prop or equivalent
- Wheel assembly fire prop or equivalent

Vehicles

- ARFF vehicles for assigned aircraft
- ARFF vehicle with 250 gpm minimum turret
- Support vehicles per AHJ

Training Extinguishing Agents

- Approved Extinguishing agents as required by aircraft
- Charged and staffed handline

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Tools and Equipment

- Electric hand lanterns and portable lighting
- Tube cutter (used to disarm ejection seats – per AHJ)
- Insulated cutter rated with an insulation resistance of 20,000 volts
- Mechanical ventilation device
- Pry axe
- Rotary powered saw
- Harness cutters
- Powered rescue tools (battery-powered, pneumatic, and/or hydraulic)
- Portable fire extinguishers (as needed)
- Cutting tools
- Pulling device
- Mechanical ventilation device
- Ladders
- Rescue mannequin
- Simulated victims
- Triage tags
- Thermal Imager
- Property conservation equipment
- Simulated debris field
- Heat source
- High reach device (airstairs)

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COURSE INSTRUCTOR INFORMATION BASIC AIRCRAFT RESCUE FIRE SUPPRESSION

Overview

The Basic Aircraft Rescue Fire Suppression curriculum is designed to provide clear guidance that ensures adequate presentation of the information required to meet the Job Performance Requirements (JPRs) of National Fire Protection Association (NFPA) 1003, *Standard for Airport Fire Fighter Professional Qualifications*, 2019 edition.

The Basic Aircraft Rescue Fire Suppression curriculum is Chapter 2 of the Texas Commission on Fire Protection (TCFP) Curriculum Manual.

Certification Level	TCFP Section Number	NFPA 1003 Chapter
Basic Aircraft Rescue Fire Suppression	200	4

Layout

The NFPA numbering sequence is mirrored to allow easy correlation between this document and the NFPA Standard. For example, 200-4.2.1 identifies the section in Basic Aircraft Rescue Fire Suppression that corresponds to NFPA section 4.2.1.

TCFP Standards Manual

It is critical that the Course Instructor review the chapters in the TCFP Standards Manual that apply to this curriculum. Of primary importance are the following chapters: Chapter 421, Standards for Certification; Chapter 437, Fees; Chapter 423, Subchapter B - Minimum Standards for Aircraft Rescue Fire Fighting Personnel. These chapters do not address every issue that could impact this curriculum; therefore, the Course Instructor is encouraged to become familiar with the TCFP Standards Manual.

Supplemental Information

Instructors are expected to provide supplemental information if the main reference text does not provide adequate information to ensure successful completion of the Job Performance Requirements (JPRs) as listed in the curriculum.

Components of the Curriculum

Each section of the curriculum identifies the NFPA Job Performance Requirement (JPR) and subdivides the requisite knowledge requirements into learning components. For example:

Curriculum	Explanation
200 – 4.2.4 Perform an airport operation, given an assignment, a hazardous condition, and the airport policies and procedures, so that unsafe conditions are detected and reduced in accordance with the airport policies and procedures.	Section Number and NFPA JPR
Requisite Knowledge: Airport and aircraft policies and procedures for hazardous conditions.	Requisite Knowledge Statement

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1. Airport policies and procedures for hazardous conditions	First part of Requisite Knowledge
a. Airport certification manual b. Airport emergency plan c. Notification of the emergency ... etc.	Associated learning components
2. Aircraft policies and procedures for hazardous conditions	Second part of Requisite Knowledge
a. Airport emergency plan (AHJ) b. Standardized response c. Coordination with flight crew ... etc.	Associated learning components

Skills

NFPA Requisite Skill requirements are addressed in the corresponding Skill Sheets.

**Description of Certification Level
 Basic Aircraft Rescue Fire Fighting Personnel**

An Airport/Aircraft Rescue Fire Fighter (ARFF) shall meet all of the job performance requirements and certification requirements of Fire Fighter II as detailed in NFPA 1001 *Standard for Fire Fighter Professional Qualifications* and NFPA 1003 *Standard for Airport Fire Fighter Professional Qualifications*, Code of Federal Regulations (CFR) Title 14, Part 139, and US Department of Transportation (US DOT) Federal Aviation Administration (FAA) Advisory Circulars (AC) specific to the role of ARFF Personnel.

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SECTION 200

BASIC AIRCRAFT RESCUE FIRE SUPPRESSION

Basic Aircraft Rescue Fire Fighting Personnel

The Fire Fighter II who has demonstrated the skills and knowledge necessary to function as an integral member of an aircraft rescue and fire fighting (ARFF) team.

200-4.1 General

200-4.1.1 Qualifications

To be qualified as an Airport Fire Fighter, the candidate shall meet the requirements for Texas Commission on Fire Protection (TCFP) certification as Fire Fighter II, as defined in NFPA 1001 and the requirements for Airport Fire Fighter defined in this standard.

200-4.1.1.1 Duties

These requirements shall be divided into three major duties: response, fire suppression and rescue.

200-4.1.1.2 Function

The primary function of the Airport Fire Fighter shall be to execute fire suppression and rescue activities.

200-4.1.1.3 General Knowledge Requirements

Fundamental aircraft fire-fighting techniques, including the approach, positioning, initial attack, and selection, application, and management of the extinguishing agents; limitations of various sized hand lines; use of personal protective equipment (PPE); fire behavior; fire-fighting techniques in oxygen-enriched atmospheres; reaction of aircraft materials to heat and flame; critical components and hazards of civil aircraft construction and systems related to ARFF operations; special hazards associated with military aircraft systems; a national defense area and limitations within that area; characteristics of different aircraft fuels; hazardous areas in and around aircraft; aircraft fueling systems (hydrant/vehicle); aircraft egress/ingress (hatches, doors, and evacuation chutes); hazards associated with aircraft cargo, including dangerous goods; hazardous areas, including entry control points, crash scene perimeters, and requirements for operations within the hot, warm, and cold zones; and critical stress management policies and procedures.

- 1) Fundamental aircraft fire-fighting techniques of approach

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- a. Size up
 - i. Weather
 - ii. Terrain
 - iii. Debris trail
 - iv. Exposures
 - v. Aircraft
 - 1. Size/type
 - 2. Fire
 - a) Absence
 - b) Presence
 - 3. Souls on Board (SOB)
 - 4. Fuel on board
- 2) Fundamental aircraft fire-fighting techniques of positioning
- a. Weather
 - b. Terrain
 - c. Exposures
 - d. Aircraft
 - i. Size/Type
 - ii. Fire
 - 1. Absence
 - 2. Presence
 - e. Impact
 - i. High
 - ii. Low
 - f. Non-impact
 - i. Fire
 - 1. Interior
 - 2. Exterior
 - ii. No fire
 - g. Egress routes
 - h. Wreckage
 - i. Intact
 - ii. Fragmented
 - iii. Debris trail
 - iv. Upside down
 - i. Scene preservation
 - j. Hazardous areas
 - i. Fuel
 - 1. Jet fuels
 - 2. Aviation Gasoline (AVGAS)

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3. Other fuels
 - ii. Engines
 1. Jet turbine
 2. Propellers
 3. Rotors
 - iii. Military ordnance/armament
 - iv. Collapse zones
 - v. Dangerous goods
- 3) Fundamental aircraft fire-fighting techniques of initial attack
 - a. Rescue of occupants
 - i. Isolation
 - ii. Insulation
 - b. Fire control
 - i. Interior
 - ii. Exterior
 - c. Loss control
- 4) Fundamental aircraft fire-fighting techniques of fire extinguishing agents
 - a. Selection
 - i. Water
 - ii. Foaming agents
 - iii. Dry chemicals
 - iv. Halogenated agents and halon replacements
 - v. Dry powders
 - b. Application
 - i. Turret
 - ii. Hand line
 - iii. Hand held extinguishers
 - iv. Special appliance(s)
 - c. Management
 - i. Conservation of agent
 - ii. Replenishment
- 5) Limitations of various sized hand lines
 - a. Diameter
 - b. Discharge
 - c. Length of hand line
 - d. Reach of agent application

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- 6) Use of Personal Protective Equipment (PPE)
 - a. Personal Protective Clothing
 - i. Station/work uniform
 - ii. Structural fire-fighting protective clothing
 - iii. Proximity fire-fighting protective clothing
 - iv. Chemical protective clothing
 - b. Respiratory protection (SCBA)
 - i. Conditions that require respiratory protection
 1. Oxygen deficiency
 2. Elevated temperatures
 3. Toxic environments
 4. Smoke (by-products of combustion)
 - c. Donning of PPE
 - d. Doffing of PPE
 - e. Care of PPE
 - f. Cleaning of PPE
 - g. Inspections of PPE
 - h. Limitations of PPE
 - i. Maintenance of PPE
 - i. Replacement
 - ii. Storage

- 7) Conditions that require respiratory protection
 - a. Oxygen deficiency
 - b. Elevated temperatures
 - c. Toxic environments
 - d. Smoke (by-products of combustion)

- 8) Fire behavior
 - a. Class A fires
 - i. Aircraft interior
 - ii. Aircraft cargo
 - iii. Airport structures
 - b. Class B fires
 - i. Pooled fuel
 - ii. Three-dimensional
 - c. Class C fires
 - i. Avionics
 - ii. Wiring
 - d. Class D fires
 - i. Landing gear
 - ii. Engine components

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- 9) Fire-fighting techniques in oxygen-enriched atmospheres
 - a. Recognizing an oxygen enriched atmosphere
 - b. Defensive tactics to reduce oxygen concentration

- 10) Reaction of aircraft materials to heat and flame
 - a. Aluminum and aluminum alloy
 - b. Steel
 - c. Magnesium and magnesium alloy
 - d. Titanium
 - e. Advance aerospace (composite) materials
 - f. Wood

- 11) Critical components and hazards of civil aircraft construction and systems related to ARFF operations
 - a. Pinching and limb severing hazards
 - b. Propeller dangers
 - c. Helicopter hazards
 - d. Jet-Engine hazards
 - e. Evacuation hazards
 - f. Ballistic recovery systems
 - g. Landing gear
 - h. Wheel assemblies
 - i. Electrical systems
 - j. Hydraulic systems
 - k. Advanced aircraft composite materials
 - l. Fuel systems
 - m. Radar systems
 - n. Pressurized cylinders
 - o. Oxygen supply systems
 - p. Protruding devices
 - q. Ram Air Turbine (RAT)

- 12) Special hazards associated with military aircraft systems
 - a. Pinching and limb severing hazards
 - b. Propeller dangers
 - c. Helicopter hazards
 - d. Jet-engine hazards
 - e. Evacuation hazards
 - f. Ejection seats
 - g. Landing gear
 - h. Wheel assemblies

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- i. Electrical systems
 - j. Hydraulic systems
 - k. Advanced aircraft composite materials
 - l. Fuel systems
 - m. Special or exotic fuels
 - n. Radar systems
 - o. Pressurized cylinders
 - p. Oxygen supply systems
 - q. Protruding devices
 - r. Ram Air Turbine (RAT)
 - s. Weapons and weapon systems
 - t. Aircraft emergency systems
- 13) A national defense area and limitations within that area
- a. Department of Defense (DOD) designation
 - b. Exclusion area for ARFF
- 14) Characteristics of different aircraft fuels
- a. Civilian
 - b. Military
- 15) Hazardous areas in and around aircraft
- a. Hazard areas in the aircraft
 - i. Cockpit/flight deck
 - ii. Cargo area
 - iii. Galley
 - iv. Avionics area
 - v. Energized electrical area
 - b. Hazardous areas around the aircraft
 - i. Propellers
 - ii. Engines
 - iii. Military armament
 - iv. Collapse zones
 - v. Wheel assembly
 - vi. Aircraft radar
 - vii. Ram Air Turbine (RAT)
 - viii. Ballistic Recovery System (BRS)
- 16) Aircraft egress/ingress (hatches, doors, and evacuation chutes)
- a. Aircraft egress
 - i. Doors

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- ii. Hatches
 - iii. Slides
 - iv. Door height
 - v. Stairs
 - vi. Emergency exits
 - vii. Emergency rafts
 - viii. Flight deck windows
 - b. Aircraft ingress
 - i. Doors
 - ii. Hatches
 - iii. Door height
 - iv. Stairs
 - v. Ladders
 - vi. Emergency exits
 - vii. Air stairs
- 17) Hazards associated with aircraft cargo, including dangerous goods
 - a. Laws and regulations
 - i. Classifications of dangerous goods
 - ii. Shipment of dangerous goods
 - b. Product identification
 - i. Identification
 - ii. Verification
 - iii. Information gathering
 - c. Personal Protective Equipment (PPE)
 - i. NFPA levels of protection
 - 1. Structural gear
 - 2. Proximity gear (PrPPE)
 - 3. Chemical protective clothing
 - a) Vapor protective
 - b) Liquid splash protective
 - ii. Environmental Protection Agency (EPA) levels of protection
 - 1. Level A
 - 2. Level B
 - 3. Level C
 - 4. Level D
 - d. Dangerous goods operations
 - e. Agricultural applications

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- 18) Hazardous areas, including entry control points, crash scene perimeters, and requirements for operations within the hot, warm, and cold zones
 - a. Hazardous areas
 - b. Entry control points
 - c. Crash scene perimeters
 - d. Operational Zones
 - i. Hot Zone (Restricted Zone)
 - ii. Warm Zone (Limited Access Zone)
 - iii. Cold Zone (Support Zone)

- 19) Critical stress management policies and procedures
 - a. Policies
 - i. Authority Having Jurisdiction (AHJ)
 - b. Procedures
 - i. Coping with stress
 - ii. Critical Incident Stress Debriefing (CISD)

Instructor Note 200-A.4.1.1.3

Airport Fire Fighters should possess knowledge of military aircraft at those airports that accept military aircraft or at those airports that are co-located with a military installation with either separate or shared runways. This knowledge should include the following:

- (1) Military cargo/passenger aircraft
- (2) Military tanker aircraft
- (3) Military fighter/attack aircraft
- (4) Military helicopter aircraft

USAF Technical Order 00-105E-9 *Aerospace Emergency Rescue and Mishap Response Information (Emergency Services)*, contains specific information concerning aircraft rescue and firefighting procedures and should be consulted prior to any attempts to perform rescue operations if trained military specialists are not available for immediate assistance. USN/USMC aircraft information is located in NAVAIR 00-80R-14 and 00-80R-14-1. These documents contain specific information concerning fire-fighting and rescue operations for aircraft in the military inventory. They specifically address the following:

Instructor Note (Cont. 200-A.4.1.1.3)

(1) Entry. If emergency controls are activated, an explosive charge will explosively separate the canopy from the aircraft.

(2) Ejection systems. All fighter, bomber, and attack aircraft are equipped with ejection seats. Once access has been gained to the cockpit, caution is extremely important, because these ejection seats, when activated, are propelled out of the aircraft by an explosive charge. Airport Fire Fighters should not touch or activate any controls. Note that if a canopy or hatch has been separated from an aircraft, the ejection seat is automatically armed. Extreme caution must be exercised in crew removal.

(3) Extrication. The aircrew member is secured to the seat by a series of straps, harnesses, and restraint belts. These restraints can be released by cutting if the release procedure is unknown.

(4) Ordnance. Fighter and attack aircraft will have forward firing ordnance located in the forward part of the fuselage and wings.

(5) Engine shutdown. Engine shutdown usually can be accomplished by pulling T-handles, as on a commercial jet.

200-4.1.1.4 General Skills Requirements

Don PPE; operate hatches, doors, and evacuation chutes; approach, position, and initially attack an aircraft fire; select, apply, and manage extinguishing agents; shut down aircraft systems, including engine, electrical, hydraulic, and fuel systems; operate aircraft extinguishing systems, including cargo area extinguishing systems.

200-4.1.2 Occupational Safety and Health

The job performance requirements of this chapter shall be accomplished in accordance with the requirements of the authority having jurisdiction and NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*.

200-4.2 Response

This duty involves the timely arrival at an incident or accident and the capability to perform emergency functions. The duty also includes responding to hazardous conditions and performing standby operations.

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- 200-4.2.1** Respond to day and night incidents or accidents on and adjacent to the airport, given an assignment, operating conditions, a location, a grid map, a vehicle, and a prescribed response time, so that the route selected and taken provides access to the site within the allotted time.

Requisite Knowledge: Airport familiarization, including runway and taxiway designations, frangible gate locations, airport markings, lights, instrument landing system (ILS) critical areas, and critical rescue and fire-fighting access areas, recognize the impact of low-visibility conditions on movement areas and areas of response in and close to the airport; designated isolation areas; vehicular traffic controls on airfield; bridge load limits; controlled access points; aircraft traffic patterns and taxi routes; fuel storage and distribution locations; airport and immediate local area topographic layout, drainage systems, water supplies, airport facilities and security.

Airport familiarization, including:

- 1) Runway and taxiway designations
 - a. Runway identification
 - i. Designation
 1. Compass heading
 2. Numbers and letters
 - ii. Markings
 1. White
 2. Yellow
 - iii. Signage
 - iv. Lighting
 1. White
 2. Amber
 3. Red
 4. Green
 - b. Taxiway identification
 - i. Designation
 1. Phonetic alphabet
 2. Name
 - ii. Markings
 - iii. Signage
 - iv. Lighting
 1. Blue
 2. Green
- 2) Frangible gate locations

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- a. AHJ
 - b. Gate controlled access
 - c. Alternate response route
 - i. Weather
 - ii. Location
 - iii. Terrain
 - iv. Topography
- 3) Airport markings
- a. Aircraft Operations Area (AOA)
 - i. Pavement markings
 - 1. White
 - 2. Red
 - 3. Yellow
 - ii. Signs
 - 1. Mandatory instruction
 - 2. Runway hold position
 - 3. Location signs
 - 4. Direction signs
 - 5. Destination signs
 - 6. Information signs
 - 7. Runway distance remaining signs
 - b. Non aircraft operations area
 - i. AHJ
 - ii. Department of Transportation (DOT)
 - iii. Designated diesel vehicle regeneration area
- 4) Lights
- a. Surface lighting
 - i. Blue lights
 - ii. White lights
 - iii. Green lights
 - iv. Red lights
 - v. Amber or yellow lights
- 5) Instrument Landing System (ILS) critical areas
- a. Locations per AHJ
 - b. Identification
 - c. Interference
 - d. Alternate response routes
 - e. Hazards

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- 6) Critical Rescue and Fire-Fighting Access Areas (CRFFAA)
 - a. Location in relation to grid map (AHJ)
 - b. Size
 - i. Departure and approach area
 - ii. Distance from runway centerline

- 7) Recognize the impact of low-visibility conditions on movement areas and areas of response in and close to the airport
 - a. Driver's Enhanced Vision Systems (DEVs)
 - i. Night vision
 - ii. Navigation
 - iii. Tracking

- 8) Designated isolation areas (AHJ)
 - a. Predetermined area designed for temporary parking for aircraft experiencing hazardous cargo problems
 - b. Know isolation location for your airport (AHJ)
 - i. Hijacking
 - ii. Bomb threat
 - iii. Terrorist attack
 - iv. Weapons of Mass Destruction (WMD)
 - v. Biohazards
 1. Cargo
 2. Passengers
 - c. Military

- 9) Vehicular traffic controls on airfield
 - a. Navigational Aids (NAVAIDS)
 - b. Construction
 - c. Airport markings
 - i. Hold bars
 - ii. Safety zones
 - d. Airport ramps
 - e. Fences and gates
 - f. All weather roads

- 10) Bridge load limit/overpass clearance (AHJ)
 - a. Road weight limits
 - b. ARFF apparatus weight and height
 - c. Local area bridges in the response area covered by AHJ
 - d. Alternate routes

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- 11) Controlled access points
 - a. Solid red marking
 - b. Fences and gates
 - c. Mandatory signs

- 12) Aircraft traffic patterns and taxi routes (AHJ)
 - a. Patterns used by aircraft in the vicinity of the airport
 - b. Emergency declarations for aircraft
 - c. Components of the pattern
 - i. Crosswind leg
 - ii. Downwind leg
 - iii. Base leg
 - iv. Final approach
 - d. Designated routes for aircraft to final destinations

- 13) Fuel storage and distribution locations (AHJ)
 - a. Airport fuel operations
 - i. Fuel storage
 - ii. Supply methods
 - iii. Fuel distribution systems
 - iv. Aircraft fueling methods
 - b. Airport fuel operation locations
 - c. Emergency fuel operation shut-down
 - d. Preplanning for emergencies
 - e. Fire protection systems

- 14) Airport and immediate local area topographic layout
 - a. Airport layout
 - b. Airport markings
 - c. Length and width of runways
 - d. Taxiway identification
 - e. Streets and highway within the emergency response area on airport, and off airport
 - f. Grid map
 - g. Local terrain features
 - h. Response area off airport property
 - i. Bodies of water
 - j. Airport structures

- 15) Drainage systems (AHJ)
 - a. Drainage system dynamics

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- b. Drainage system openings
 - c. Fuel/water separator
 - d. Containment for drainage
 - e. Run off locations
 - f. Airport without drainage system
 - i. Pre-planning for the event
 - ii. Confinement
 - iii. Containment
 - iv. Clean up and recovery efforts
- 16) Water supplies (AHJ)
- a. Sources
 - i. Wells
 - ii. Tanks
 - iii. Domestic supply
 - b. Hydrant locations
 - c. Mobile supply types
 - i. Fire apparatus
 - ii. Tankers/tenders
 - d. Mutual aid response for water supply
 - e. Pre-planning for water supply strategies
- 17) Airport facilities
- a. Terminals
 - i. Life safety concerns
 - ii. Jetways
 - iii. Baggage handling areas
 - iv. Mass transportation equipment
 - v. Hotels
 - vi. Parking garages
 - vii. Controlled access
 - b. Aircraft Maintenance Facilities
 - i. Fuel system repair
 - ii. Painting facilities
 - iii. Hazardous materials storage
 - iv. Aircraft electrical, avionics and radar systems repair locations
 - v. Welding and cutting locations
 - vi. Office locations and high occupancy areas
 - vii. Fire prevention

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- 18) Airport Security and Controlled Access Points
 - a. Airfield perimeter fencing/protection
 - b. Controlled access points (already stated)
 - i. Manned access points
 - ii. Unmanned access points - Radio Frequency Identification (RFID) or remote control
 - iii. Manually operated gates
 - iv. Frangible gates
 - c. Vehicle incursion prevention systems
 - i. Tiger teeth (tire damaging systems)
 - ii. Barriers
 - d. Airfield vehicle eligibility markings
 - i. Decals
 - ii. Lighting
 - e. Airfield personnel eligibility identification
 - i. Security Identification Display Area (SIDA)

Requisite Skills: Read, interpret, and take correct action related to grid maps, water distribution maps, airport markings, and lights.

- 200-4.2.2** Communicate critical incident information regarding an incident on or adjacent to an airport, given an assignment involving an incident and an incident management system (IMS) protocol, so that the information provided is accurate for the incident commander.

Requisite Knowledge: Incident management system (IMS) protocol, the airport emergency plan, airport and aircraft familiarization, communications equipment and procedures, and incident communications procedures.

- 1) Incident Management System (IMS) protocol
 - a. IMS and the functional responsibilities (AHJ)
 - b. Strategic goals
 - c. Tactical objectives
 - d. IMS Organizational Chart (AHJ)
 - e. Chain of command (AHJ)
- 2) The airport emergency plan (AHJ)
 - a. Mutual aid resources
 - b. Fire rescue resources
 - c. Emergency medical resources
 - d. Law enforcement resources

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- e. Other airport personnel
 - f. Critical stress management
 - g. Mitigation
- 3) Airport familiarization (AHJ)
- a. Airport traffic flow systems
 - i. Aircraft
 - ii. Vehicular
 - b. Location of incident
 - i. Runways
 - ii. Taxiways
 - iii. Grid map
 - c. Access control points
 - d. Approach safety areas
 - e. Departure safety areas
 - f. National Defense Area limitations
- 4) Aircraft familiarization
- a. Aircraft types
 - i. Commercial
 - ii. General aviation
 - iii. Military aircraft
 - iv. Unmanned Aircraft Vehicle (UAV)/Unmanned Aircraft Systems (UAS)
 - b. Aircraft systems
 - c. Hazards of aircraft
 - d. Aircraft fuels
 - e. Aircraft evacuation
- 5) Communications equipment and procedures
- a. Airport communication systems
 - b. Communication protocols
 - i. Radio communications
 - 1. International Civil Aviation Organization (ICAO)
 - 2. ICAO phonetic alphabet
 - ii. Computers
 - 1. Mobile Data Terminals (MDT)
 - 2. Mobile Computer Terminals (MCT)
 - 3. Global Positioning Systems (GPS)
 - iii. Air Traffic Control Tower (ATCT) Light-gun signals and their meanings

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1. Steady green
 2. Steady red
 3. Flashing red
 4. Flashing white
 5. Alternating red/green
 - iv. Aircraft Hand signals
 1. Recommend evacuation
 2. Recommend stop
 3. Emergency contained
 - v. Other fire-fighting audible/visible signals
 1. Back out or retreat
 2. Apparatus is running out of agent
 3. Open or close hand line
 4. Change hand line nozzle/stream pattern
 5. Advance with hand line
 6. Back out with hand line
- 6) Incident communications procedures
- a. Emergency response notification methods (AHJ)
 - i. Categories of emergency alerts (Federal Aviation Administration - FAA)
 - b. Pilot/ARFF (Discrete Emergency Frequency - DEF)
 - c. Agency operations frequencies
 - d. Mutual aid frequencies

Requisite Skills: Operate communications systems, communicate an accurate situation report, Implement Incident Management System (IMS) protocol and airport emergency plan, and recognize aircraft types.

200-4.2.3 Communicate with applicable air traffic control facilities, given a response destination on or adjacent to an airport and radio equipment, so that all required clearances are obtained.

Requisite Knowledge: Airfield familiarization, airport operational procedures, avoiding runway/aircraft movement area incursion, communications equipment and frequencies, tower light signals, aviation terminology, and phonetic alphabet.

- 1) Airfield familiarization
- 2) Airport operational procedures

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- 3) Avoiding runway/aircraft movement area incursion
- 4) Communications equipment and frequencies
 - a. Air Traffic Control Tower (ATCT)
 - i. Ground control
 - ii. Local control or tower frequencies
 - iii. Discrete Emergency Frequency (DEF) (AHJ)
 - b. Aviation radio
 - i. Procedures
 - ii. Terminology
 - c. Fire frequency radio (AHJ)
- 5) ATCT light-gun signals
 - a. Used in the event of communication failure with ATCT
 - b. Colors
 - i. Steady green
 - ii. Steady red light
 - iii. Flashing red light
 - iv. Flashing white light
 - v. Alternating red and green light
- 6) Aviation terminology
- 7) Phonetic alphabet

Requisite Skills: Operate communications equipment and use aviation terminology and phonetic alphabet.

- 200-4.2.4** Perform an airport operation, given an assignment, a hazardous condition, and the airport policies and procedures, so that unsafe conditions are detected and reduced in accordance with the airport policies and procedures.

Requisite knowledge: Airport and aircraft policies and procedures for hazardous conditions.

- 1) Airport policies and procedures for hazardous conditions
 - a. Airport Certification Manual (ACM)
 - b. Airport Emergency Plan (AEP)
 - c. Notification of the hazardous condition
 - i. Accident
 - ii. Incident
 - iii. Emergency

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- d. Response
 - e. Initiation of IMS
 - f. ARFF safety
 - g. Airport structure emergencies
 - i. Terminals
 - ii. Hangars
 - h. Fuel storage and distribution
 - i. Fuel spills
 - j. Aircraft fueling operations
 - k. Aircraft maintenance areas
 - i. Welding
 - ii. Painting
 - l. Airport Environment
 - i. Construction
 - ii. Traffic
 - iii. Drainage
 - iv. Airport topography
 - v. Review wildlife management plan
 - m. Designated isolation areas
 - i. Bomb threats
 - ii. Terrorists
 - iii. Hazardous materials
 - iv. Hijacking
 - v. Weapons of Mass Destruction (WMD)
 - vi. Biohazards
 - vii. Hot brakes
 - viii. Weapons malfunction
- 2) Aircraft policies and procedures for hazardous conditions
- a. Airport emergency plan (AHJ)
 - b. Standardized response
 - c. Coordination with flight crew
 - d. Aircraft familiarization
 - e. Aircraft emergencies
 - i. Ground emergencies
 - ii. In-flight emergencies

Requisite Skills: Recognize hazardous conditions and initiate corrective action.

Instructor Note 200-A.4.2.4

Hazardous conditions include foreign object debris (FOD), special fuels, fueling operations (grounding and bonding), welding operations, hazardous materials operations, corrosion control, fuel-cell maintenance, and military operations.

200-4.3 ***Fire Suppression***

This duty involves the attack, control, and extinguishment of fires involving aircraft, aircraft cargo, airport facilities, and other equipment related to airport operations and property conservation. The primary purpose of this duty is to protect lives and property.

- 200-4.3.1** Extinguish an aircraft fuel spill fire, given approved PPE, an assignment, agent application procedures, a fire-fighting vehicle hand line flowing a minimum of 95 gpm (359 L/min) of approved foam extinguishing agent, and a fire sized to the flow rate used, so that the agent is applied using the prescribed techniques and the fire is extinguished as required by the AHJ.

Requisite Knowledge: The fire behavior of aircraft fuels in pools, physical properties and characteristics of aircraft fuel, and agent application rates and densities.

- 1) Fire behavior of aircraft fuels in pools
 - a. Flame spread
 - b. Flashback (re-ignition)
 - c. Vapors
 - d. Flammability

- 2) Physical properties of aircraft fuels
 - a. Aviation gasoline (AVGAS)
 - i. Weight
 - ii. Specific gravity
 - iii. Vapor density
 - b. Jet-A (grade of kerosene)
 - i. Weight
 - ii. Specific gravity
 - iii. Vapor density
 - c. Other fuels
 - i. Bio-fuel
 - ii. Blended

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- iii. Military grade
 - iv. Alternative fuels
- 3) Characteristics of aircraft fuels
- a. Flashpoint
 - b. Auto ignition temperature
 - c. Explosive limits
 - i. Upper
 - ii. Lower
 - d. Flame spread
 - e. Vapor pressure
- 4) Agent application rates and densities
- a. Agent application - minimum 95 gpm @ at nozzle pressures specified by manufacturer
 - b. Agent application and proportioning (in accordance with manufacturer's specifications) approved foam extinguishing agent and a fire sized to the flow rate used

Requisite Skills: Operate fire streams and apply agent.

Instructor Note 200-A.4.3.1

The use of pressurized flammable gas or flammable liquid is acceptable for this simulation. Depending on the square footage of the local training simulators and the flow rate of the assigned application device, the specified time of extinguishment might need to be modified. When using simulators with lower square footage or different flow rates of agent application, the specified time of extinguishment will need to be proportional.

For example, a hand line flowing 95 gpm (359 L/min) would be required to extinguish a fire of 750 ft² in 90 seconds. The formula is $95 \text{ gpm} / 0.13 = 730$ fire square footage for 750 ft² (69.7 m²) fire with a flow rate at 359L/min (95 gpm).

- 200-4.3.2** Extinguish an aircraft fuel spill fire, given an assignment, approved PPE, an ARFF vehicle turret flowing the approved minimum required flow, a fire sized to the approved flow rate used, and the procedures for agent application, so that the agent is applied according to procedures and the fire is extinguished as required by the AHJ.

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Requisite Knowledge: Operation of ARFF vehicle agent delivery systems, the fire behavior of aircraft fuels in pools, physical properties and characteristics of aircraft fuel, the procedures for agent application, and agent application rates and densities.

- 1) Operation of ARFF vehicle agent delivery systems
 - a. As per manufacturer operating procedures
 - b. Per AHJ

- 2) Fire behavior of aircraft fuels in pools
 - a. Flame Spread
 - b. Flashback (re-ignition)
 - c. Vapors
 - d. Flammability

- 3) Physical properties of aircraft fuels
 - a. Aviation gasoline (AVGAS)
 - i. Weight
 - ii. Specific gravity
 - iii. Vapor density
 - b. Jet-A (grade of kerosene)
 - i. Weight
 - ii. Specific gravity
 - iii. Vapor density
 - c. Other fuels
 - i. Bio-fuels
 - ii. Blended
 - iii. Military grade
 - iv. Alternative fuels

- 4) Characteristics of aircraft fuels
 - a. Flashpoint
 - b. Auto ignition temperature
 - c. Explosive limits
 - i. Upper
 - ii. Lower
 - d. Flame spread
 - e. Vapor pressure

- 5) Agent application rates and densities

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- a. Agent application rate - minimum 250 gpm @ at nozzle pressures specified by manufacturer
- b. Agent application and proportioning (in accordance with manufacturer's specifications) approved foam extinguishing agent and a fire sized to the flow rate used

Requisite Skills: Apply fire-fighting agents and streams using ARFF vehicle turrets.

Instructor Note 200-A.4.3.2

See A.4.3.1. For example, a candidate using a turret flowing 250 gpm (946 L/min) is required to extinguish a fire of 2067 ft² (192 m²) fire with a flow rate at 250 gpm (946 L/min).

- 200-4.3.3** Extinguish a three-dimensional aircraft fuel fire as a member of a team, given a team, approved PPE, an assignment, fire-fighting vehicle hand line(s) using primary and secondary agents, and agent application procedures, so that a dual-agent attack is used, the agent is applied according to procedures, the fire is extinguished, and the fuel source is secured.

Requisite Knowledge: The fire behavior of aircraft fuels in solid, pressurized, and atomized states; physical properties and characteristics of aircraft fuel; advantages and limitations of agents; agent application rates and densities, agent application procedures; and methods of controlling fuel sources.

- 1) Fire behavior of aircraft fuels in solid, pressurized, and atomized states
 - a. Explosive atmosphere
 - b. Higher proliferation of vapors
- 2) Physical properties of aircraft fuels
 - a. Aviation gasoline (AVGAS)
 - i. Weight
 - ii. Specific gravity
 - iii. Vapor density
 - b. Jet fuel
 - i. Weight
 - ii. Specific gravity

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- iii. Vapor density
 - c. Other fuels
 - i. Bio-Fuels
 - ii. Blended
 - iii. Military grade
 - iv. Alternative fuels
- 3) Characteristics of aircraft fuels
 - a. Flashpoint
 - b. Auto ignition temperature
 - c. Explosive limits
 - i. Upper
 - ii. Lower
 - d. Flame spread
 - e. Vapor pressure
- 4) Advantages of agents
- 5) Limitations of agents
- 6) Agent application rates and densities
 - a. Agent application rate
 - i. Minimum 95 gpm @ at nozzle pressure specified by manufacturer
 - ii. Minimum 5 lbs/second dry chemical
 - b. Agent application densities
 - i. Agent application and proportioning (in accordance with manufacturer's specifications) approved foam extinguishing agent and a fire sized to the flow rate used
 - ii. Amount of dry chemical proportionate to hazard
- 7) Agent application procedures
 - a. Rapid knock down
 - b. Vapor suppression
- 8) Methods of controlling fuel sources
 - a. Shut off source
 - b. Control ignition source
 - c. Suppress vapors
 - d. Prevent run-off

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Requisite Skills: Operate fire streams and apply agents; and secure fuel sources.

Instructor Note 200-A.4.3.3

Three-dimensional or running fuel fires involve a fuel leak from an elevated or pressurized source. The fuel burns as it falls through the air, and, once on the ground, the burning fuel can pool or run across the ground surface. These fuel fires are extremely difficult to extinguish. They must be recognized and action must be taken to extinguish them early in the incident or accident for successful fire-fighting operations. Typically, these fires cannot be extinguished by smothering agents such as AFFF, because those agents cannot seal the surface and exclude oxygen. Such fires are more successfully extinguished by shutting off the fuel flow or by using agents, such as dry chemicals, that interfere with the chemical chain reaction.

200-4.3.4 Attack a fire on the interior of an aircraft while operating as a member of a team, given a team, approved PPE, an assignment, a fire-fighting vehicle hand line, an extinguishing agent, and a ladder or other means of accessing the aircraft, so that team integrity is maintained, the attack line is deployed for advancement, ladders or other means are used, access is gained into the fire area, effective agent application practices are used, the fire is approached, attack techniques facilitate suppression given the level of the fire, hidden fires are located and controlled, hazards are avoided or managed, and the fire is brought under control.

Requisite Knowledge: Techniques for accessing the aircraft interior according to the aircraft type, methods for advancing hand lines from a fire-fighting vehicle, precautions to be followed when advancing hose lines to a fire, observable results that a fire stream has been applied, dangerous structural conditions created by fire, principles of exposure protection, potential long-term consequences of exposure to products of combustion, physical states of matter in which fuels are found, common types of accidents or injuries and their causes, the role of the backup team in fire attack situations, attack and control techniques, and techniques for exposing hidden fires.

- 1) Techniques for accessing the aircraft interior according to aircraft type
 - a. Assessing the exterior prior to entry
 - i. Blistering or peeling of paint
 - ii. Visible signs of heavy interior fire
 - iii. Exterior is very hot to the touch

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- iv. Engine fires
 - v. Wheel assembly fires
 - vi. HVAC system fires
 - b. Access points
 - i. Doors
 - 1. Cabin
 - 2. Cargo
 - ii. Emergency exits
 - iii. Rear stairs
 - iv. Hatches
 - v. Windows
 - vi. Fuselage breach
 - c. Access equipment
 - i. Ladders
 - 1. Ground ladders
 - 2. Specialty ladders
 - ii. Elevated platforms
 - iii. Mobile air stairs
 - iv. Forcible entry tools
- 2) Methods for advancing hand lines from the fire-fighting vehicle
 - a. Proper PPE and SCBA
 - b. Deployment of hand line(s)
 - c. Advancement of hand line(s)
 - d. Two-person team
 - e. Two in/two out rule
 - f. Awareness of hazards
- 3) Precautions to be followed when advancing hose lines to a fire
 - a. Do not impede passenger evacuation
 - b. Deploy hand line(s) in a safe area
 - c. Watch for sharp objects
 - d. Avoid flammable liquids
 - e. Be aware of hazards present
 - f. Potential backdraft, flashover, rollover, and smoke explosion occurrences
- 4) Observable results that fire stream has been applied
 - a. Steam from hose line application on a hot object (steam conversion)
 - b. Cooling
 - c. Fire knock down
 - d. Displacement of products of combustion
 - e. Smoke transformation

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- 5) Dangerous structural conditions created by fire
 - a. Missing structural components
 - b. Fire/flame spread to concealed areas
 - c. Instability
 - d. Molten metals
 - e. Collapses
 - f. Weakened structural components

- 6) Principles of exposure protection
 - a. Hand line(s) should be in place to protect unburned portions
 - b. Protection of exposed or surrounding objects
 - c. Adequate water supply
 - d. Proper coverage to ensure cooling effect
 - e. Wind direction

- 7) Potential long-term consequences of exposure to products of combustion
 - a. Carcinogenic effects
 - b. Respiratory damage
 - c. Dermatological
 - d. Product specific effects
 - i. Composites
 - ii. Fuels
 - iii. Aircraft fluids

- 8) Physical states of matter in which fuels are found
 - a. Solid
 - b. Liquid
 - c. Vapor

- 9) Common types of accidents or injuries and their causes
 - a. Types
 - i. Physical
 - ii. Psychological
 - b. Causes
 - i. Inadequate training
 - ii. Lack of critical incident stress management
 - iii. Failure to comply with safety standards
 - iv. Dangerous conditions

- 10) The role of the backup team in fire attack situations
 - a. Two in/two out rule
 - i. Rescue of Primary Entry Team (Rapid Intervention Team/RIT)

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- ii. Exterior support operations
 - b. Observing and communicating conditions
- 11) Attack and control techniques
- a. Point of entry
 - b. Never impede egress of passengers
 - c. Observe hottest area of fire
 - d. Direct fire attack
 - e. Indirect fire attack
 - f. Cool exterior if entry is delayed
 - g. Piercing appliances
- 12) Techniques for exposing hidden fires
- a. Ventilation
 - b. Overhaul
 - c. Thermal imagers
 - d. Interior inspection
 - i. Light ballasts
 - ii. Galley area
 - iii. Lavatories
 - iv. Flight deck area
 - v. Avionics
 - vi. Cargo compartments
 - vii. Electrical components

Requisite Skills: Deploy fire-fighting vehicle hand line on an interior aircraft fire; gain access to aircraft interior; open, close, and adjust nozzle flow and patterns; apply agent using direct, indirect and combination attacks; advance charged and uncharged hose lines up ladders and up and down interior and exterior stairways; and locate and suppress interior fires.

Instructor Note 200-A.4.3.4

This requirement can be met by using a structural burn facility that is configured to simulate the interior layout and dimensions of an aircraft fuselage and that contains mannequins to simulate victims. The mock-up should include at least three metal seats and training dummies to simulate victims. It is intended that the size of the aircraft be the largest type that normally uses the airport and that the hand line be appropriate to the size of the aircraft.

200-4.3.5 Attack an engine or auxiliary power unit/emergency power unit (APU/EPU) fire on an aircraft while operating as a member of a team, given approved PPE, an assignment, fire-fighting vehicle hand line or turret, a correct agent, and agent application procedures, so that agent application procedures are followed, the fire is extinguished, and the engine or APU/EPU is shut down.

Requisite Knowledge: Techniques for accessing the aircraft engines and APU/EPUs, operation of on-board aircraft fire-fighting systems and potential hazards, safety procedures, methods for advancing hand line from a fire-fighting vehicle, methods for operating turrets, and methods for shutting down engine and APU/EPU operation.

- 1) Techniques for accessing the aircraft engines and APU/EPUs
 - a. Assessing the exterior prior to entry
 - a. Blistering or peeling of paint
 - b. Visible signs of compartment fire
 - c. Engine fires
 - b. Gaining access
 - a. Hatches
 - b. Cowlings
 - c. Fire ports
 - c. Access equipment
 - a. Ladders
 - i. Ground ladders
 - ii. Specialty ladders
 - b. Elevated platforms
 - c. Mobile air stairs
 - d. Forcible entry tools
- 2) Safety procedures
 - a. Avoid intake
 - b. Avoid exhaust
 - c. Avoid propellers
 - d. Engine/APU shut down
- 3) Methods for advancing hand line from a fire-fighting vehicle
 - a. Proper PPE and SCBA
 - b. Deployment of hand line(s)
 - i. Reel lines
 - ii. Preconnected hose lines
 - c. Advancement of hand line(s)
 - d. Two-person team

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- e. Two in/two out rule
 - f. Awareness of hazards
- 4) Methods for operating turrets
- a. Per manufacturer specification
 - b. As per AHJ
- 5) Methods for shutting down engine and APU/EPU operation
- a. Engine
 - i. By flight crew
 - 1. Fuel (throttles)
 - 2. On board extinguishing systems (bottles)
 - 3. Electrical (batteries)
 - ii. By ARFF crew
 - 1. Fuel (throttles)
 - 2. On board extinguishing systems (bottles)
 - 3. Electrical (batteries)
 - b. Auxiliary Power Unit (APU/EPU)
 - i. By flight crew
 - 1. Fuel (throttles)
 - 2. On board extinguishing systems (bottles)
 - 3. Electrical (batteries)
 - ii. By ARFF crew
 - 1. Flight deck
 - a) Fuel (throttles)
 - b) On board extinguishing systems (bottles)
 - c) Electrical (batteries)
 - 2. External controls
 - a) Engine shut down
 - b) Extinguishing systems

Requisite Skills: Deploy and operate fire-fighting vehicle hand line, operate turrets, gain access to aircraft engine and APU/EPU, and shut down engine and APU.

Instructor Note 200-A.4.3.5

Shutting down the aircraft includes turning off engines/power units, electrical, and oxygen systems. Training and evaluation of the engine/APU shut down and activation of onboard aircraft fire-fighting systems can be accomplished using simulation on actual aircraft or mock-ups.

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200-4.3.6 Attack a wheel assembly fire, as a member of a team, given PPE, a team, an assignment, an ARFF vehicle hand line, and correct agent, so that the fire is extinguished.

Requisite Knowledge: Agent selection and application procedure, special safety considerations, and the characteristics of combustible metals.

- 1) Agent selection and application procedure
 - a. Agent selection
 - i. Water
 - ii. Class D extinguishing agents
 - iii. Dry chemical
 - b. Application procedure
 - i. Mass application of water
 - ii. Adequate amount of class D agent for encapsulation
 - iii. Adequate amount of dry chemical for extinguishment
 - iv. Conservation of agent
- 2) Special safety considerations
 - a. Fusible plugs
 - b. Proper approach
 - c. Tire disintegration
 - d. Wheel fragmentation
 - e. Aircraft collapse
 - f. Appropriate utilization of PPE with SCBA
 - g. Hazardous or flammable fluid release
 - h. Engine intake
 - i. Engine exhaust
- 3) The characteristics of combustible metals
 - a. High ignition point
 - b. Intense pyrolysis
 - c. Extreme heat
 - d. Reactivity

Requisite Skills: Approach the fire in accordance with safety procedures; and select and apply agent.

200-4.3.7 Ventilate an aircraft through available doors and hatches while operating as a member of a team, given PPE an assignment, tools, and mechanical ventilation devices, so that openings are created, all ventilation barriers are removed, and the heat and other products of combustion are released.

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Requisite Knowledge: Aircraft access points; principles, advantages, limitations, and effects of mechanical ventilation; the methods of heat transfer; the principles of thermal layering within an aircraft on fire; and the techniques and safety precautions for venting aircraft.

- 1) Aircraft access points
 - a. Normal door operations
 - b. Over wing access
 - c. Cargo doors
 - d. Hatches
 - e. Breaks in structure of aircraft

- 2) Principles, advantages, limitations, and effects of mechanical ventilation
 - a. Negative pressure ventilation
 - i. Hydraulic
 - ii. Gas powered fans
 - iii. Electrical powered fans
 - b. Positive pressure ventilation
 - i. Gas powered fans
 - ii. Electrical powered fans

- 3) The methods of heat transfer
 - a. Conduction
 - b. Convection
 - c. Radiation
 - d. Direct flame impingement

- 4) The principles of thermal layering within an aircraft on fire
 - a. Smoke stratification
 - b. Heat travel
 - i. Vertical
 - ii. Horizontal

- 5) The techniques and safety precautions for venting aircraft
 - a. Techniques for venting aircraft
 - i. Mechanical
 1. Positive pressure
 2. Negative pressure
 - ii. Natural
 1. Horizontal

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2. Vertical
 - b. Safety considerations for venting aircraft
 - i. Flashover
 - ii. Rollover
 - iii. Backdraft
 - iv. Smoke explosion

Requisite Skills: Operate doors, hatches, and forcible entry tools; operate mechanical ventilation devices; and remove barriers.

Instructor Note 200-A.4.3.7

Training and evaluation of this task can be accomplished using actual aircraft or mock-ups and smoke-generation devices used for training.

- 200-4.3.8** Replenish extinguishing agents while operating as a member of a team, given an assignment, a fire-fighting vehicle, a fixed or mobile water source, a supply of agent, and supply lines and fittings, so that agents are available for application by the fire-fighting vehicle within the time established by the authority having jurisdiction (AHJ).

Requisite Knowledge: Re-supply procedures during an incident and operation procedures for fire-fighting vehicle replenishment.

- 1) Re-supply procedures during an incident
 - a. Water sources
 - i. Airport water distribution system
 - ii. Mobile water supply
 - iii. Additional water supplies
 - b. Water refill methods
 - i. Direct connection
 - ii. Overhead fill
 - c. Foam re-supply
 - i. Overhead gravity
 - ii. Mechanical or hand foam concentrate transfer pump
 - iii. 5-gallon container direct fill
 - d. Auxiliary agent refill
 - i. Knowledge of agent type
 - ii. Follow manufacturers procedures

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- iii. Service in a well-ventilated area and utilize respiratory protection
- 2) Operation procedures for fire-fighting vehicle replenishment
 - a. Per manufacturer specifications
 - b. Procedures per AHJ

Requisite Skills: Connect hose lines and operate valves.

Instructor Note 200-A.4.3.8

The replenishment task is time critical. Evaluating the proficiency potential of ARFF personnel to replenish the extinguishing agents on an ARFF vehicle requires that the AHJ evaluate several factors related to its own airport emergency plan in order to establish a fair benchmark for personnel. The following factors influence this time constraint:

- (1) Size of the ARFF vehicles' agent reservoirs
- (2) Available replenishment methods and their agent flow capacities
- (3) Proximity of replenishment means to the potential ARFF emergency locations in and around the airport

In making these evaluations, the AHJ must keep in mind that its overall objective is to ensure an adequate agent flow at the scene during an emergency. The following is an example of determining the replenishment time variable:

If the ARFF vehicle on the airport runway holds 1500 gal (5677L) of water and 150 gal (568 L) of AFFF, the replenishment means is a fixed water hydrant located at the midpoint of the runways. If the hydrant flow capacity is 250 gal (946 L/min) and if the average time to drive from the approach and departure end of any runway to the midpoint is 2 minutes, then a reasonable time to replenish a vehicle and return it to operation from the end of the runway is 18 minutes. This allows 2 minutes to drive to the hydrant, 4 minutes to connect to the hydrant, 7 minutes to fill the water tank, 3 minutes to disconnect from the hydrant, and 2 minutes to drive back to the end of the runway.

This might be considered a reasonable amount of time to replenish the vehicle at this particular airport, if additional vehicles are available continue support at the emergency scene, but it might be entirely too slow for an airport where this ARFF vehicle is the only vehicle available to support an aircraft scene. In this case, the replenishment plan should be re-evaluated and adjusted to reduce the time required.

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200-4.3.9 Preserve the aircraft accident scene, given an assignment and procedures, so that evidence is identified, protected, and reported according to procedures.

Requisite Knowledge: Airport emergency plan requirements for preservation of the scene, evidence identification, evidence protection, and evidence reporting procedures.

- 1) Airport emergency plan requirements for preservation of the scene
 - a. Scene security
 - b. Photographs
 - c. Sketches or drawings
 - d. Marking evidence locations
- 2) Evidence identification
 - a. During the primary search of an aircraft accident site
 - i. Life safety is the priority during this phase of the incident
 - ii. Evidence protection is secondary
 - b. During the secondary search of an aircraft accident site
 - i. Protection of evidence should have priority
 - ii. Since all the survivors should be rescued, slow down the search and protect evidence
- 3) Evidence protection
 - a. National Transportation Safety Board (NTSB) regulations
 - i. Removal of persons trapped or injured
 - ii. Protect the aircraft from further damage
 - iii. Protect the public from injury
 - b. Secure the scene
 - c. Document the moving of evidence
 - d. Secure and protect the Flight Data Recorder (FDR) or Cockpit Voice Recorder (CVR)
 - e. Special care should be taken in certain areas
 - i. In the cockpit or control areas
 - ii. Areas of primary structural failure or damage
- 4) Evidence reporting procedures
 - a. Documentation
 - i. Responder statements
 - ii. Witness statements
 - iii. Incident reporting

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- iv. Photographs
- v. Maps
- b. Discuss the relationships between various aircraft parts and occupants

Requisite Skills: Preserve the scene for investigators, and identify, protect, and report evidence.

200-4.3.10 Overhaul the accident scene, given PPE, an assignment, hand lines, and property conservation equipment, so that all fires are located, exposed, and extinguished and all property is protected from further damage.

Requisite Knowledge: Methods of complete extinguishment and prevention of re-ignition, reasons for conservation, operating procedures for property conservation equipment, overhaul procedures, signs of a hidden fire, methods of detecting hidden fires, and tools and equipment used for overhaul.

- 1) Methods of complete extinguishment and prevention of re-ignition
 - a. Thermal Imaging Cameras/Forward Looking Infra-Red (TIC/FLIR)
 - b. Overhaul
 - c. Secure aircraft operating systems
 - d. Vapor suppression
- 2) Reasons for conservation
 - a. Scene stabilization
 - b. Evidence protection
 - c. NTSB investigation
- 3) Operating procedures for property conservation equipment
 - a. Deployment of loss control systems
 - b. As per manufacturer's specifications
- 4) Overhaul procedures
 - a. Appropriate agency authorization
 - b. Use of PPE including SCBA
 - c. Aircraft stabilization
 - d. Air quality monitoring
 - e. Hazardous materials considerations
 - f. Hand line protection
 - g. Evidence protection

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- h. Hot spots located
 - i. Extinguishment and cooling
 - j. Pressurized systems identified
 - k. Void spaces opened or pierced
- 5) Signs of a hidden fire
- a. Smoke
 - b. Steam
 - c. Thermal Imaging Cameras/Forward Looking Infra-Red (TIC/FLIR)
- 6) Methods of detecting hidden fires
- a. Smoke
 - b. Steam
 - c. Thermal Imaging Cameras/Forward Looking Infra-Red (TIC/FLIR)
- 7) Tools and equipment used for overhaul
- a. PPE/SCBA
 - b. Hand line
 - c. Thermal Imaging Cameras/Forward Looking Infra-Red (TIC/FLIR)
 - d. Forcible entry tools
 - e. Air monitors

Requisite Skills: Use property conservation equipment; detect hidden fires, and use tools and equipment to expose hidden fires.

Instructor Note 200-A.4.3.10

It is known that during overhaul, Fire Fighters remove their respiratory protective equipment and as a result, expose themselves to probable contamination by carcinogens, toxic substances, and so forth. Respiratory protective equipment should be worn during overhaul and all PPE should be washed down after exposure in any incident involving fire.

200-4.4 Rescue

This duty involves gaining access to an aircraft and assisting in the evacuation process, performing disentanglement, and initial triage.

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Instructor Note 200-A.4.4

One of the primary tasks of rescue operations is for the airport fire fighter to maintain a habitable environment around the fuselage and to assist with aircraft evacuation by stabilizing slide chutes and assisting and controlling the evacuees.

- 200-4.4.1** Gain access into and out of an aircraft through normal entry points and emergency hatches, secure and shut down the aircraft, and assist in the evacuation process while operating as a member of a team, given PPE and an assignment, so that passenger evacuation and rescue can be accomplished.

Requisite Knowledge: Aircraft familiarization, including materials used in construction, aircraft terminology, automatic explosive devices, hazardous areas in and around aircraft, aircraft egress/ingress (hatches, doors, and evacuation chutes), military aircraft systems and associated hazards; capabilities and limitations of manual and power rescue tools and specialized high-reach devices, aircraft shutdown and safety procedures.

- 1) Aircraft familiarization
 - a. General aviation
 - b. Commercial
 - c. Military
- 2) Materials used in construction
 - a. Aluminum/aluminum alloys
 - b. Steel
 - c. Magnesium/magnesium alloys
 - d. Titanium
 - e. Advanced aerospace (composite) materials
 - f. Wood
- 3) Aircraft terminology
 - a. Fixed wing
 - b. Rotary wing
- 4) Automatic explosive devices
 - a. Ejection seats
 - b. Canopy removers
 - c. Initiators
 - d. Rotary actuators

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- e. Thrusters
 - f. Explosive squibs
 - g. Seat catapults
 - h. Ballistic Recovery System (BRS)
- 5) Hazardous areas in and around aircraft
- a. Wings
 - i. Fuel leaks and spills
 - ii. Weapons/missiles/rockets
 - iii. Pinching hazards
 - iv. No step areas – flight control surfaces
 - v. Anti-icing systems
 - b. Engines
 - i. Fuel leaks and spills
 - ii. Propellers
 - iii. Jet engines
 - 1. Intake
 - 2. Exhaust
 - c. Fuselage
 - i. Radar systems
 - ii. Appendages
 - iii. Overheated wheel assemblies
 - iv. Tire/wheel failures
 - v. Evacuation slides
 - d. Tail
 - i. Engine or APU fires
 - ii. Tail cones
 - iii. Evacuation slides
 - e. General hazards
 - i. Electrocutation hazards
 - ii. Composites
 - iii. Aircraft hazardous materials
 - iv. Aircraft cargo hazards
- 6) Aircraft egress/ingress (hatches, doors, and evacuation chutes)
- a. Aircraft doors
 - b. Aircraft hatches
 - c. Rear stairs
 - d. Tail-cone jettison
 - e. Escape slides
 - f. Emergency exits

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- g. Hatches
 - h. Windows
 - i. Fuselage breach
- 7) Military aircraft systems and associated hazards
- a. Fire protection/detection systems
 - b. Ejection systems
 - c. Weapon systems
 - d. Exotic fuels
- 8) Capabilities and limitations of manual and power rescue tools and specialized high-reach devices
- a. Flammable atmosphere
 - b. Stability of aircraft
 - c. Hands-on training
 - d. Safety standards apply
 - e. Hand tools
 - f. Power tools
 - i. Electric
 - ii. Hydraulic
 - iii. Pneumatic
 - g. Lifting and pulling tools
- 9) Aircraft shutdown and safety procedures
- a. Fuel cutoff/throttle
 - b. Fire shutoff “T” or “L” handles
 - c. Battery switch/disconnect

Requisite Skills: Operate power saws and cutting tools, hydraulic devices, pneumatic devices, and pulling devices; operate specialized ladders and high-reach devices; secure aircraft safety and shutdown.

Instructor Note 200-A.4.4.1

Securing the aircraft can include chocking/pinning the landing gear, safety ejection/ballistic chute systems, canopies, and safety weapon systems. Shutting down the aircraft includes turning off engines/power units, electrical, and oxygen systems. Training and evaluation of these tasks can be accomplished using simulation on actual aircraft or mockups.

200-4.4.2 Locate and disentangle an entrapped person from an aircraft as a member of a team, given approved PPE, a team, an assignment, and rescue tools, so that the person is freed from entrapment without undue further injury and hazards are managed.

Requisite Knowledge: Capabilities and limitations of rescue tools, search procedures, hazard identification, and control methods.

- 1) Capabilities and limitations of rescue tools
 - a. Flammable atmosphere
 - b. Stability of aircraft
 - c. Hands-on training
 - d. Safety standards apply
 - e. Hand tools
 - f. Power tools
 - i. Electric
 - ii. Hydraulic
 - iii. Pneumatic
 - g. Lifting and pulling tools
- 2) Search procedures
 - a. Exterior search
 - b. Interior search
 - c. Two in/two out rule
 - d. Rescue of survivors
 - e. Primary search
 - f. Secondary search
 - g. Preservation of evidence
- 3) Hazard identification
 - a. Aircraft hazardous/flammable materials
 - b. Aircraft dangerous goods
 - c. Post-crash aircraft hazards
 - i. Fire
 - ii. Electrical
 - iii. Disrupted aircraft systems
 - iv. Biohazard
 - v. Debris
 - vi. Hazardous materials
 - vii. Military aircraft hazards

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- 4) Control methods
 - a. Safety
 - b. Isolation
 - c. Insulation
 - d. Extinguishment

Requisite Skills: Perform search procedures, control hazards, remove victims, and operate rescue tools.

Instructor Note 200-A.4.4.2

Training and evaluation of this task can be accomplished using actual aircraft or mock-ups.

200-4.4.3 Implement initial triage of the victims of an aircraft accident, given PPE, an assignment, and the triage protocol of the AHJ, so that each victim is evaluated and correctly categorized according to protocol.

Requisite Knowledge: Categories of triage according to the triage protocol of the AHJ, and methods of assessment.

- 1) Categories of triage according to the triage protocol of the AHJ
- 2) Methods of assessment
 - a. Simple Triage and Rapid Treatment (START)
 - b. As per AHJ

Requisite Skills: Triage patients per protocol.