The Maryland Fire and Rescue Institute of the University of Maryland is the State’s comprehensive training and education system for all emergency services.

The Institute plans, researches, develops, and delivers quality programs to enhance the ability of emergency service providers to protect life, the environment, and property.
Student Performance Objectives

• After completing this lesson, the student shall be able to possess the minimum standard level of knowledge and skills that are required to deal with aircraft operations and emergencies.

Overview

• Case History
• Mission
• History
• Relevant Organizations
• Personnel Roles and Responsibilities
• Training Programs
Case History

Mission

- The mission of ARFF personnel includes
  - Life safety
  - Property conservation
  - Environmental protection and preservation
  - Providing a rapid response to any incident

History
History

- ARFF was earlier called Crash Fire Rescue
- Civilian Aviation was slow to understand the importance of ARFF
- WWII brought to light the importance of quick response

FAR Part 139-Certification and Operations: Land Airports Serving CAB-Certified Air Carriers
- Identified five airport indexes which specify:
  - Types and amounts of extinguishing agents
  - Minimum number of ARFF apparatus
- Allowed for funding of the Airport Improvement Program

Relevant Organizations

- Federal Aviation Administration
- National Transportation Safety Board
- Transportation Security Administration
- National Fire Protection Association
Relevant Organizations

- Aviation-related unions
- Joint Aviation Authority
- International air Transportation Association
- Air Accident Investigation Branch

Relevant Organizations

- United Kingdom Civil Aviation Authority
- Transportation Canada
- International Aviation Fire Protection Association
- Aircraft Rescue Firefighting Working Group

Relevant Organizations

- Aircraft manufacturers
- American Association of Airport Executives
- Airports Council International
- International Coordinating Council of Aerospace Industries Association
- Other relevant organizations
Personnel Roles and Responsibilities

• Staffing
  – Director/Chief of ARFF Services
  – Crew for indexed apparatus
  – Strategically located for prompt response

Personnel Roles and Responsibilities

• Functional Positions
  – Airport firefighter
  – Emergency medical services personnel
  – Rescue team members
  – Driver/operator
  – Officer

Training Programs

• Types of training
  – Cadet (recruit) training
  – On-the-job training
  – In-service training
  – Special courses and seminars
Training Programs

• ARFF Training Requirements
  – Airport familiarization
  – Aircraft familiarization
  – Safety and aircraft hazards
  – Communications
  – Rescue

Training Programs

• ARFF Training Requirements
  – Extinguishing agents
  – Apparatus
  – Aircraft fire suppression, ventilation, and overhaul

Training Programs

• ARFF Training Requirements
  – Driver/operator
Training Programs

• ARFF Training Requirements
  — Airport/community emergency plans
  — Strategic and tactical operations

Student Performance Objectives

• After completing this lesson, the student shall be able to possess the minimum standard level of knowledge and skills that are required to deal with aircraft operations and emergencies

Review

• Case History
• Mission
• History
• Relevant Organizations
• Personnel Roles and Responsibilities
• Training Programs
Student Performance Objective

- After completing this lesson, the student shall possess an understanding of the components of an airport and be able to operate within the airport environment safely and competently.

Overview

- Airport Familiarization Training
- Types and Classification of Airports
- Airport Traffic Patterns
- Runway and Taxiway Designation Systems
- Airport Lighting, Marking, and Signage Systems
- Airport Design
- ARFF Fire Stations
Airport Familiarization Training

- Studying maps of the airport
- Studying airport markings, lighting, signage
- Driving and or walking the airport
- Participating in pre-incident planning sessions
- Participating in simulated incidents

Types and Classification of Airports

- Controlled
  - Air Traffic Control Tower with controllers
- Uncontrolled
  - No Air Traffic Control

Airport Traffic Patterns
Runway and Taxiway Designation Systems

- Runway numbers are taken from the nearest compass bearing then rounded off to the nearest 10 degrees.

Runway and Taxiway Designation Systems

- Parallel runways are lettered with a L, C, R.

Runway and Taxiway Designation Systems

- Taxiways are surfaces for aircraft movement on the airfield.
- Taxiways are designated by letters, names, or numbers, or a combination of the three.
Airport Lighting, Marking, and Signage Systems

• Surface lighting
  — Blue lights
  — White lighting
  — Green lights
  — Yellow/amber lights
  — Red lights
  — Runway status lights

Airport Lighting, Marking, and Signage Systems

• Markings
  — White
  — Red
  — Yellow

Airport Lighting, Marking, and Signage Systems

• Markings
  — Red and white envelope
Airport Lighting, Marking, and Signage Systems

• Markings
  – Black and white zipper markings

Airport Lighting, Marking, and Signage Systems

• Signs
  – Mandatory instruction signs
  – Runway hold position signs
  – Location signs
  – Direction signs
  – Information signs
  – Runway distance remaining signs
Airport Design

• Segmented Circle

Airport Design

• Grid maps

Airport Design

• Rapid Response Area and Critical Rescue and Fire Fighting Access Area
Airport Design

• Airport Topography

Airport Design

• Airport Structures
  – Terminal
  – Aircraft maintenance facilities

Airport Design

• Runways
Airport Design

- Runway End Safety Areas (RESA)

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Airport Design

- Taxiways

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Airport Design

- Run-up areas
Airport Design

• Safety Areas

On-Airport Navigation Aids

Airport Design

• Roads and Bridges
Airport Design

- Airport Ramps/Aprons

- Airport Security and Controlled Access Points

- Fences and Gates
• Designated Isolation Areas

• Water Supply

• Fuel Storage and Distribution
Airport Design

• Fueling Operations

Airport Design

• Ignition Sources

Airport Design

• Airport Drainage Systems
Airport Design

• Airport Construction

ARFF Fire Stations

Student Performance Objective

• After completing this lesson, the student shall possess an understanding of the components of an airport and be able to operate within the airport environment safely and competently.
Review

• Airport Familiarization Training
• Types and Classification of Airports
• Airport Traffic Patterns
• Runway and Taxiway Designation Systems
• Airport Lighting, Marking, and Signage Systems
• Airport Design
• ARFF Fire Stations
Student Performance Objective

• After completing this lesson, the student shall possess a knowledge and understanding of aircraft components, construction materials, and the types of aircraft engines and their application in today’s aircraft.

Overview

• Types of Aircraft
• Major Components of Aircraft
• Engine Types and Applications
Types of Aircraft

• Commercial Aircraft
  – Narrow Body
  – Wide Body
  – New Large Aircraft
• Commuter/Regional Aircraft
• Cargo Aircraft
• Combi-Aircraft
• General Aviation

Types of Aircraft

• Business/Corporate Aviation
• Military Aviation Aircraft
• Rotorcraft
• Fire Service Aircraft
• Unmanned Aircraft
• Other types of Aircraft

Types of Aircraft

Commercial Aircraft

• Narrow Body

Types of Aircraft

Commercial Aircraft

• Narrow Body

Types of Aircraft

Commercial Aircraft

• Narrow Body
Types of Aircraft

Commercial Aircraft

• Wide Body

Types of Aircraft

Commercial Aircraft

• New Large Aircraft

Types of Aircraft

Commercial Aircraft

• New Large Aircraft
Types of Aircraft
Military Aviation Aircraft

• Wide Variety of Aircraft

• Fighter and Attack Aircraft

• Bombers
Types of Aircraft
Military Aviation Aircraft

- Cargo

Types of Aircraft
Military Aviation Aircraft

- Refueling

Types of Aircraft
Military Aviation Aircraft

- Utility
### Types of Aircraft

#### Military Aviation Aircraft

- **Special Purpose**

- **Helicopter**
  - AH-64
  - CH-47

- **Multi Use Aircraft**
Types of Aircraft

Military Aviation Aircraft

- Military Aircraft Information
  - United States Air Force technical order:
  - TO 00-105E-9

Types of Aircraft

Rotorcraft

Types of Aircraft

Fire Service Aircraft
Types of Aircraft
Fire Service Aircraft

Types of Aircraft
Unmanned Aircraft

Types of Aircraft
Other types of Aircraft
Major Components of Aircraft
Fixed Wing Aircraft Components

Rotary Wing Aircraft Components

Engine Types and Applications
- Internal Combustion Reciprocating Engines
- Gas Turbine Engines
  - Turbojet
  - Turboprop
  - Turboshaft
- Engine Additions and Variations
Engine Types and Applications

- Internal Combustion Reciprocating Engines
  - General Aviation and Vintage aircraft

Engine Types and Applications

- Gas Turbine Engines
  - Air is drawn into the intake
    - Compressed
    - Mixed with fuel into a vapor
    - Ignited
      - Drives aircraft by expelling high speed exhaust
      - Drives a fan, prop, or rotor

Engine Types and Applications

- Gas Turbine Engines
  - Turbojet
  - Turbofan
  - Turboprop
  - Turboshaft
Engine Types and Applications

• Gas Turbine Engines
  - Turbojet

Engine Types and Applications

• Gas Turbine Engines
  - Turbofan

Engine Types and Applications

• Gas Turbine Engines
  - Turboprop
Engine Types and Applications

- Gas Turbine Engines
  - Turbojet
  - Turbofan
  - Turboprop
  - Turboshaft

Engine Types and Applications

- Engine Additions and Variations
  - Directional Exhaust Nozzles
  - Afterburners
  - Thrust Reversal Systems
  - Jet Assisted Take Off

Engine Types and Applications

- Engine Additions and Variations
  - Directional Exhaust Nozzles
Engine Types and Applications

- Engine Additions and Variations
  - Afterburners

- Engine Additions and Variations
  - Thrust Reversal Systems

- Jet Assisted Take-Off
Student Performance Objective

• After completing this lesson, the student shall possess a knowledge and understanding of aircraft components, construction materials, and the types of aircraft engines and their application in today’s aircraft.

Review

• Types of Aircraft
• Major Components of Aircraft
• Engine Types and Applications
Student Performance Objective

- After completing this lesson, the student shall possess a knowledge and understanding of aircraft construction methods and materials as well as the systems found in today's aircraft.

Overview

- Aircraft Construction and Structural Materials
- Aircraft Systems
Aircraft Construction and Structural Materials

• Construction components
  – Frames / Formers
  – Longerons
  – Stringer
  – Bulkheads

Aircraft Construction and Structural Materials

• Metals:
  – Aluminum
  – Aluminum alloys
  – Steel
  – Magnesium and magnesium alloys
  – Titanium

Aircraft Construction and Structural Materials

• Composites, advanced composites, and advanced aerospace materials
  – Composites
  – Advanced Composites
  – Advanced Aerospace Materials
Aircraft Construction and Structural Materials

- Plastics
- Wood

Aircraft Systems

- Fuel systems
  - Are the largest system and greatest hazard
  - Consist of two major parts
    - Tanks
      - Integral
      - Auxiliary
    - Distribution system
      - Lines, valves, pumps

Aircraft Systems

- Hydraulic Systems
  - Hydraulic fluid reservoir
  - Engine or engine-driven pumps
  - Appliances
  - Various hydraulic accumulators
  - Tubing/piping
Aircraft Systems

• Hydraulic Systems
  — Hydraulic Fluids
    • Hydrocarbon-based fluid
    • Vegetable-based fluid
    • Mineral Oil-based fluid
    • Synthetic

Aircraft Systems

• Wheel assemblies
  — Rims
    • Older Aircraft—Magnesium
    • Newer Aircraft—Aluminum
  — Tires
    • Inflated to 200 psi with nitrogen
  — Fusible Plugs
    • Release excess pressure when wheel is overheated

Aircraft Systems

• Braking systems can be very complex
  — Systems frequently overheat due to hard braking during landing at high speeds
  — They may
    • Incorporate an auto-braking system
    • Have two separate anti-skid systems
    • Utilize up to three independent sources of hydraulic power
Aircraft Systems

- Electrical Systems
  - Systems use both AC and DC current
  - Large aircraft operate 24/28-volt DC, 110/115-volt AC, and 400 Hz
  - Some aircraft may use systems with as high as 270-volt DC.

Aircraft Systems

- Batteries
  - Aircraft batteries are divided into three general types
    - Lead acid
    - Nickel Cadmium
    - Lithium ion

Aircraft Systems

- Auxiliary Power Units (APUs) are
  - Jet turbine engines mounted within the aircraft’s fuselage usually in the empennage
  - Used while the aircraft is on the ground to operate the following systems
    - Light the cabin
    - Maintain cabin temperatures
    - Provide backup power source while the aircraft is airborne
**Aircraft Systems**

- **Emergency Power Units (EPUs)**
  - Are a quick responsive means of providing emergency power while the aircraft is in flight
  - Electrical power to restart engines
  - Hydraulic power for flight control operation

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**Aircraft Systems**

- **Ram Air Turbine (RAT)**
  - Drops out of the aircraft with a propeller-driven generator
  - Electrical power to restart engines
  - Hydraulic power for flight control operation

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**Aircraft Systems**

- **Jet Fuel Powered Emergency Power Unit**
  - Is very similar to an APU which provides
  - Electrical power to restart engines
  - Hydraulic power for flight control operation
Aircraft Systems
• Monopropellant
  – Is used in some military aircraft such as the USAF F-16
  – Is fueled by Hydrazine (hypergolic) which
    • Is a clear oily liquid that smells like ammonia
    • Ignites spontaneously on contact with an oxidizer
    • Attacks the central nervous system

Aircraft Systems
• Ground Power Units
  – GPUs provide onboard electrical power while engines or APU are off
  – ARFF personnel should be aware of shutdown and disconnection procedures
  – ARFF crews should always ensure that the unit is shut down before connecting or disconnecting

Aircraft Systems
• Aircraft Lighting
  – Red light on left wing tip
  – Green light on right wing tip
  – White light found at the rear at the tip of the fuselage
  – High intensity white landing lights on nose gear and wings
Aircraft Systems

• Aircraft Lighting
  – Red anti-collision lights on the top and bottom of the aircraft indicate that the aircraft’s engines are operating

Aircraft Systems

• Aircraft Oxygen Systems
  – Oxygen Cylinders
  – Chemical Generating Oxygen Systems
  – Liquid Oxygen Systems

Aircraft Systems

• Aircraft Radar Systems
  – Are generally located in the nose of the aircraft
    • Are activated just before takeoff
    • Are deactivated after landing
  – Present both ignition sources and health hazards
    • Cause cellular damage to human tissue and cause adverse health effects
Aircraft Systems

• Fire protection systems
  – Areas covered are each engine, APU, and cargo compartments
    • There are two discharges per engine
    • There are one or two discharges to the APU
    • A heat-activated extinguisher bottle is installed to protect the lavatory trash bin

Aircraft Systems

• Fire protection systems
  – A typical fire suppression system consists of:
    • Pressurized containers
    • Tubing
    • Nozzles and appliances

Aircraft Systems

• Passenger/Crew air bags
  – Recent technology has developed self-contained aircraft restraint systems with air bags built into the restraint webbing
    • These are inflated with helium and deflate in less than 10 seconds after inflation
Aircraft Systems

- Flight deck emergency shutdown systems and procedures
  - Aircraft have simple and easy shutdown procedures
  - All procedures must be completed before shutting off electrical power

Aircraft Systems

- Flight deck emergency shutdown systems and procedures
  - Move the throttles to the “IDLE” position
  - Activate the aircraft’s fire protection system
    - Pulling the handle shuts off systems to the engine
    - Activation device discharges the firefighting agent

Aircraft Systems

- Ingress/egress systems
  - Doors
  - Outflow Valve
  - Aircraft Slides
  - Over-wing/under-wing hatches
Aircraft Systems

• Ingress/egress systems
  – Windows
  – Tail cone jettison systems
  – Rear air stairs that lower at the rear of the aircraft
  – Roof hatches

Aircraft Systems

• Ingress/egress systems
  – Emergency Cut-In Areas
    • Cutting into an aircraft is a very time-consuming and labor-intensive process and should be considered a last resort for entry

Aircraft Systems

• Data recording systems
  – Systems are international orange or bright red with a wide band of reflective material around them
  – The recording tape is a metal ribbon which is conducive to rusting and corrosion
Aircraft Systems

• Data recording systems
  – Flight Data Recorder (FDR)
    • Records information of over 100 aircraft systems for the last 25 hours

Aircraft Systems

• Data recording systems
  – Cockpit Voice Recorder
    • Records flight deck conversations for the last 25 hours

Aircraft Systems

• Miscellaneous systems and components
  – Anti-Icing Systems
  – Bleed Air System
  – Pressurized Cylinders
  – Pitot Tubes
  – Antennas
Student Performance Objective

• After completing this lesson, the student shall possess a knowledge and understanding of aircraft construction methods and materials as well as the systems found in today’s aircraft.

Review

• Aircraft Construction and Structural Materials
• Aircraft Systems
Lesson 6-1: Safety and Aircraft Hazards

Student Performance Objective

- After completing this lesson, the student shall possess a recognition of the importance of firefighter safety as it relates to aircraft rescue and firefighting.

Overview

- Airport Safety Programs
- Firefighter Safety
- Personal Protective Equipment
- Aircraft Firefighting Hazards
- Military Aircraft Hazards
- Terrorist Incidents
Airport Safety Programs (Risk Management Programs)

- Identify local risks and hazards
- Take actions to reduce or eliminate hazards
- Take actions to reduce risks to airport employees and public
- Take actions to reduce or eliminate damage to the airport and airport property

Firefighter Safety

- Fire station safety
  - “Safety Culture”

Firefighter Safety

- Emergency response and scene management
  - Situational Awareness
    - “Situational Awareness is the perception of environmental elements with respect to time or space, the comprehension of their meaning, and the projection of their status after some variable has changed, such as time, or some other variable, such as a predetermined event”
Firefighter Safety

- Emergency response and scene management
  - Vehicle Operations
    - Situation
    - Location
    - Weather conditions
    - Vehicle capabilities
    - Operator’s capabilities

Firefighter Safety

- Emergency response and scene management
  - Control Zones
    - Hot
      - Restricted
    - Warm
      - Limited Access
    - Cold
      - Support
    - Cordoned Area

Firefighter Safety

- Personnel accountability
  - Accounting for all personnel operating
  - Two In-Two Out Policy
  - Rapid Intervention Team
  - NFPA 1500
  - NFPA 403
Firefighter Safety

- Personnel decontamination
  - Decontamination is the physical removal of all contaminants
  - A decontamination corridor should be set up between the hot zone and the warm zone
  - A decontamination corridor should be set up between the hot zone and the warm zone

Firefighter Safety

- Dealing with atypically stressful events
  - Critical Incident Stress Debriefing
  - Post-Traumatic Stress Disorder (PTSD)
    - Monitor members for the signs and symptoms of PTSD

Personal Protective Equipment

- Personal Protective Clothing
  - Station Uniform
  - Structural Firefighting protective clothing
  - Proximity firefighting protective (PrPPE)
  - Chemical Protective Clothing
Personal Protective Equipment

• Self-contained breathing apparatus
  — Provides respiratory protection from deadly materials
  — Must be worn in any operation within an IDLH atmosphere
  — Must be maintained and worn in accordance with the manufacturer’s requirements

Personal Protective Equipment

• Personal alert safety systems
  — Sound an alarm when a firefighter becomes incapacitated for more than 30 seconds
  — Sound an alarm when activated manually

Personal Protective Equipment

• Hearing protection
  — Hearing protection is required in high noise areas
    • Ear Muffs
    • Ear Plugs
  — A radio interface headset system should be utilized
  — A hearing awareness and annual testing program should be implemented
Personal Protective Equipment

• Eye protection
  — Style is selected based on the hazard presented
  • Helmet mounted
  • Fitted goggles
  • Safety glasses

Aircraft Firefighting Hazards

• Hazardous conditions at the emergency scene
  — Maintaining situational awareness
  — Wreckage
  — Confined Space Hazards
  — Heat Related Issues
  — Other ON-Scene conditions

Aircraft Firefighting Hazards

• Fuel hazards
  — Primary hazard to occupants and firefighters
    • Aviation Gas (AVGAS) (Flammable Liquid)
    • Gasoline-Kerosene Blends (Flammable Liquid)
    • Kerosene – (Combustible Liquid)
Aircraft Firefighting Hazards
• Interior aircraft fire hazards
  – Limited egress
  – Structural collapse
  – Class A—Carpeting, paneling, refuse, upholstery
  – Class C—Electrical component

Aircraft Firefighting Hazards
• Hazardous aircraft components and materials
  – Landing gear
  – Hydraulic lines and pneumatic lines
  – Oxygen systems
  – Composite fibers
  – Biohazards

Aircraft Firefighting Hazards
• Hazardous aircraft components and materials (continued)
  – Pitot tubes
  – Air bags
  – Reciprocating engine hazards
  – Jet engine hazards
  – Air driven generators (ADG) and ram air turbine (RAT) deployment hazards
Aircraft Firefighting Hazards

- Hazardous aircraft components and materials (continued)
  - Wheel assembly hazards
  - Helicopter hazards
  - Ballistic recovery systems (BRS)
  - Hazards associated with aircraft cargo

Military Aircraft Hazards

- Special hazards associated with military aircraft
  - Hypergolic fuels
  - Chaff
  - Flares
  - Pyrotechnics
  - JATO (Jet Assisted Take-off)
  - Increased fuel load
  - Composite material construction

Military Aircraft Hazards

- Special hazards associated with military aircraft
  - Emergency ejection systems
Military Aircraft Hazards

• Special hazards associated with military aircraft
  – Canopies
    • Clamshell
    • Hinged
    • Sliding
    • Sliding (Mechanical)
  – Emergency Jettison
  – Propellant Actuating Devices

Military Aircraft Hazards

• Other Emergency Systems
  – Emergency Power Units (EPU)
  – Fire Protection / Detection systems
  – Emergency Doors / hatches

Military Aircraft Hazards

• Weapons and Weapon Systems
  – High Explosives (HE)
  – Munitions
  – Rockets
  – Missiles
  – Gravity Bombs
  – Nuclear Weapons
Terrorist incidents

- CBRNE
- Indications of a terrorist event
- Chemical Agents
  - Blister
  - Blood
  - Choking
  - Nerve

Student Performance Objective

- After completing this lesson, the student shall possess a recognition of the importance of firefighter safety as it relates to aircraft rescue and firefighting.

Review

- Airport Safety Programs
- Firefighter Safety
- Personal Protective Equipment
- Aircraft Firefighting Hazards
- Military Aircraft Hazards
- Terrorist Incidents
Lesson 7-1: Communications

Student Performance Objective

• After completing this lesson, the student shall possess a knowledge of the components of ARFF communications and each area’s importance in successful communications on an incident scene.

Overview

• Communications
• Types of Alerts
• Emergency Operations Centers/Dispatch Centers
• Mobile Command Posts
• Airport Communications Systems and Procedures
• ARFF Hand Signals and Light Signals
Communications

- ARFF Crews must communicate clearly with multiple entities
  - Other crews
  - Dispatchers
  - Telecommunicators
  - Air Traffic controllers

Types of Alerts

- Types of Alerts
  - Alert I
  - Alert II
  - Alert III

Emergency Operations Centers/Dispatch Centers

- Emergency Operations Center Dispatch Center
  - ARFF may have its own dispatch center
  - Dispatch will be consolidated or shared with other airport agencies
  - Airport EOC will be an area where representatives from all airport agencies can operate during a major emergency
Mobile Command Posts

- Support the Incident Commander
- Provide adequate interoperable communications to all units operating on the scene
- Provide computer access to the Incident Commander

Airport Communications Systems and Procedures

- Communications plan
- Audible alarms and direct-line telephones
- Radio systems
- Common communication policies/procedures
- Computers

Airport Communications Systems and Procedures

- Aviation radio frequencies
- Pilot/ARFF command communications
- Proper radio/telephone procedures
- Other communications methods
ARFF Hand Signals and Light Signals

- Hand signals
  - AHJ driven
- Light signals
  - Light signals allow vehicle communications with the Air Traffic Control Tower in case of radio failure

Student Performance Objective

- After completing this lesson, the student shall possess a knowledge of the components of ARFF communications and each area’s importance in successful communications on an incident scene.

Review

- Communications
- Types of Alerts
- Emergency Operations Centers/Dispatch Centers
- Mobile Command Posts
- Airport Communications Systems and Procedures
- ARFF Hand Signals and Light Signals
Student Performance Objective

• After completing this lesson, the student shall possess an understanding of ARFF apparatus as well as the components and operation of these vehicles.

Overview

• ARFF Apparatus Requirements
• Aircraft Rescue and Firefighting Apparatus
• Apparatus Features and Options
• Apparatus Fire Suppression Equipment
• Agent Resupply Methods
• Apparatus Maintenance
ARFF Apparatus Requirements

• Levels of Protection
• Readiness and Response Requirements
• Apparatus Design
• Fire Fighting Systems Testing

Aircraft Rescue and Firefighting Apparatus

• What AARF vehicles should be equipped with

• Areas where ARFF apparatus must be able to operate
Aircraft Rescue and Firefighting Apparatus

• Combined Agent Vehicles (Rapid Intervention Vehicles)

Aircraft Rescue and Firefighting Apparatus

• Structural Apparatus

Aircraft Rescue and Firefighting Apparatus

• Support Vehicles and equipment
Aircraft Rescue and Firefighting Apparatus

- NFPA Division of Apparatus Requirements
  - Capacity I
    - 120 to 528 gallons
  - Capacity II
    - 528 to 1585 gallons
  - Capacity III
    - 1585 gallons and above

Aircraft Rescue and Firefighting Apparatus

- FAA Division of Apparatus
  - Class 1: 120 gallons of water + 500 pounds DC
  - Class 2: 300 gallons of water + 500 pounds DC
  - Class 3: 500 gallons of water + 500 pounds DC
  - Class 4: 1500 gallons of water + 500 pounds DC
  - Class 5: 3000 to 4500 gallons of water + 500 pounds DC

Apparatus Features and Options

- Vehicle marking and lighting systems
- Antilock braking system
- Central tire inflation/deflation system
- Driver’s enhanced vision system
- Vehicle rear view backup camera system
Apparatus Features and Options

• Apparatus mounted video cameras
• High Mobility Suspension system (Independent Suspension)
• Monitoring and data acquisition systems
• Lateral acceleration indicator system

Apparatus Fire Suppression Equipment

• Fire Pumps
• Turrets
• Handlines
• Auxiliary Agent delivery systems

Apparatus Fire Suppression Equipment

• Ground sweep nozzles
• Under-truck nozzles
• Elevated waterways
Apparatus Fire Suppression Equipment

- Extendable Turrets (High Reach Extendable Turret)
  - Allow improved nozzle placement
- Penetrating Nozzles
  - Handheld
  - HRET Mounted
  - Skin Penetrator Agent Applicator Tool

Agent Re-Supply Methods

- Water:
  - Rapid Resupply
  - Sustained Resupply
  - Resupply Point

Agent Re-Supply Methods

- Foam:
  - Direct filling from 5-gallon containers
  - Overhead gravity filling in the fire station
  - Mechanical or hand transfer pump from
    - Drums
    - Totes
    - Foam tender
Agent Re-Supply Methods

- Personnel shall wear proper PPE when refilling agent
  - Respiratory protection
  - Eye protection
  - Head and hand protection

Apparatus Maintenance

- Apparatus should have a detailed Daily, Weekly, Monthly and Annual inspection checklist for that apparatus per manufacturer’s specification.
- Once reported, problems should be repaired by a certified ARFF vehicle mechanic in a timely manner.

Apparatus Maintenance

- A detailed record should be kept that includes the following
  - Mileage and engine hours
  - Fuel and oil levels
  - Fuel and oil consumption
  - Tire pressure, and tread depth
  - Parts information
Apparatus Maintenance

• A record of all required performance testing should be kept for the life of the vehicle
  – Annual Pump tests
  – Annual Department of Transportation inspections
  – Annual Aerial Device testing

Student Performance Objective

• After completing this lesson, the student shall possess an understanding of ARFF apparatus as well as the components and operation of these vehicles.

Review

• ARFF Apparatus Requirements
• Aircraft Rescue and Firefighting Apparatus
• Apparatus Features and Options
• Apparatus Fire Suppression Equipment
• Agent Resupply Methods
• Apparatus Maintenance
Student Performance Objective

• After completing this lesson, the student shall have the knowledge to effectively use power tools and rescue equipment when performing aircraft rescue operations.

Overview

• Rescue Tools and Equipment Safety
• Common Rescue Tools and Equipment
• Rescue Operations
• Rescue Tactics
• Procedures for Accessing the Aircraft Interior
• Aircraft Shutdown and Safetaying Procedures
• Victim Rescue
Rescue Tools and Equipment Safety

• Safety
  – Proper size-up completed and evaluated throughout the incident
• Flammable Atmospheres
  – Area constantly monitored for flammable or toxic environments
• Aircraft Stability
  – Crews should always consider the aircraft’s stability

Common Rescue Tools and Equipment

• Hand tools
• Power tools
• Lifting and pulling tools
• Lighting and electrical equipment
• Other equipment
• Emergency medical first aid equipment

Rescue Operations

• Rescue Team (4 to 6)
  – Two personnel operating handlines
  – Two personnel for forcible entry
  – Two personnel on back-up handline
  – Minimum of two, preferably four, personnel for Rapid Intervention Team
Rescue Operations

• Normal Environments
  – Extinguish Fires
  – Evacuation
  – Rescue

Rescue Operations

• Difficult Environments/Terrain
  – Localities with extremes in hot and cold weather conditions
  – Localities that experience torrential rains or heavy snowfalls
  – Airports with large bodies of water next to them
  – Localities with difficult or inaccessible terrain

Rescue Operations

• Water Environments
  – Rescue watercraft
  – Rescuer safety
  – Victims
    • Inside of aircraft
    • Outside of aircraft
Rescue Tactics

**First Priority**
- Protecting escape routes
- Stabilization of the wreckage

**Second Priority**
- Rescue of Entrapped Victims
- Provide emergency medical procedures
- Secure the area from ignition or re-ignition of fuel
- Provide interior fire protection
- Provide lighting and ventilation
- Attempt to preserve/protect evidence

Procedures for Accessing the Aircraft Interior

**Deploying and Using Access Devices**
- Ladders
- Elevated platforms
- Mobile air stairs
Procedures for Accessing the Aircraft Interior

- Gaining access through doors and hatches
  - Thorough aircraft familiarization with aircraft that routinely use the airfield
  - Knowledge as well as practical evolutions using the doors, hatches, and emergency exits

Procedures for Accessing the Aircraft Interior

- Aircraft Forcible Entry
  - Pry open doors and hatches
  - Cut through door hinges
  - Pry aircraft skin panels from the aircraft frame
  - Cut through the aircraft skin

Aircraft Shutdown and Safetting Procedures

- Throttles
- Bottles
- Batteries
Victim Rescue

- Victim location
- Evacuation routes
- Search procedures
- Extricating trapped victims
- Triage

Student Performance Objective

- After completing this lesson, the student shall have the knowledge, to effectively use power tools, and rescue equipment when performing aircraft rescue operations.

Review

- Rescue Tools and Equipment Safety
- Common Rescue Tools and Equipment
- Rescue Operations
- Rescue Tactics
- Procedures for Accessing the Aircraft Interior
- Aircraft Shutdown and Safetying Procedures
- Victim Rescue
Student Performance Objective

• After completing this lesson, the student shall possess an understanding of the proper agents, application methods, and application equipment for each agent utilized in Aircraft Rescue Firefighting.

Overview

• Primary Extinguishing Agents
• Auxiliary Extinguishing Agents
• Water
• Principles of Foam
• Theoretical and Practical Critical Fire Areas
• Foam Concentrates
• Foam Proportioning and Proportioning Systems
Overview

- Foam Application Devices
- Dry Chemicals
- Dry Powders
- Clean Agents
- Agent Conservation and Resupply

Primary Extinguishing Agents

- Designed for mass application
- Designed for rapid knockdown
- Effective on two-dimensional flammable liquid fires

Auxiliary (Complementary) Extinguishing Agents

- Must be compatible with primary agent
- Are effective on three-dimensional fire
- Are effective on specialized fires
- Are prone to flashback
- May be applied simultaneously with primary agent
Water

• Is the preferred agent for aircraft interior fires
• May be used to push fire away from the aircraft and rescue paths
• May be used in cooling operations
• May be utilized to shield passengers from heat from fire
• May be used for controlling spot fires

Principles of Foam

• Separates
• Cools
• Smothers
• Penetrates
• Forms a homogenous mass of minute bubbles

Theoretical and Practical Critical Fire Areas

• A defined area around an aircraft
  – Theoretical
    • A rectangle whose sides are:
      – Aircraft’s length
      – Aircraft’s width plus
        ▪ 40 feet for aircraft shorter than 65 feet
        ▪ 100 feet for aircraft longer than 65 feet
  – Practical
    • 2/3 of the theoretical critical fire area
Foam Concentrates

• Class A Foam
  — Wetting agent
    • Reduces water’s surface tension
    • Allows the agent to soak into combustible materials
    • Is effective on aircraft interior fires

Foam Concentrates

• Class B Foam
  — Hydrocarbons (Hydrophobic)
    • Will not mix with water and float on water’s surface
  — Polar Solvents (Hydrophilic)
    • Will mix with water

Foam Concentrates

• Class B Foam Basics
  — Mixing foams from different manufacturers
  — Foam proportioning
  — Foam Expansion
  — Application rates
  — Operational considerations
Foam Concentrates

• Aqueous Film Forming Foam (AFFF)
  — Is a synthetically produced material
  — Can be mixed with fresh, brackish, or salt water
  — Is compatible with auxiliary agents
  — Is available in an alcohol-resistant form

Foam Concentrates

• Aqueous Film Forming Foam (AFFF) continued
  — Creates a vapor suppressant film
    • An air/vapor-excluding film is released ahead of the foam blanket
    • The fast moving foam blanket the moves across the surface and around objects, adding further insulation
    • As the foam blanket continues to drain its water, more aqueous film is released

Foam Concentrates

• Protein and Fluoroprotein Foam
  — Is manufactured from protein hydrolysate
  — Requires the use of an aspirating nozzle
  — Is non-compatible with auxiliary agents
  — Must be used with fresh water
Foam Concentrates

• Film Forming Fluoroprotein Foam (FFFP)
  – Fluoroprotein with AFFF capabilities
  • Ensures the quick knockdown of AFFF
  • Has long-lasting heat resistance
  – FFFP is compatible with auxiliary agents

Foam Concentrates

• High-Expansion Foam
  – Detergent based special purpose foams
  – Basic applications
    • Subterranean spaces
    • Fixed extinguishing systems such as aircraft hangers
    • Class A applications

Foam Concentrates

• Synthetic Foams
  – Are made from petroleum products
  – Contain stabilizers
  – Should be verified compatible before use
Foam Concentrates

• Foam Concentrate Storage
  – Pails
  – Barrels (drums)
  – Intermediate bulk containers (Totes)
  – Apparatus tanks
  – Station bulk tanks

Foam Proportioning and Proportioning Systems

• Foam Proportioning
  – Induction
  – Injection
  – Batch-Mixing
  – Pre-Mixing
  – Testing

Foam Proportioning and Proportioning Systems

• Apparatus-Mounted Foam Proportioning Systems
  – Installed in-line eductors
  – Around-the-pump proportioners
  – Bypass-type balanced-pressure proportioners
  – Variable-flow demand type balanced pressure proportioners
Foam Proportioning and Proportioning Systems

• Apparatus-Mounted Foam Proportioning Systems (continued)
  – Variable-flow variable-rate direct-injection systems
  – Batch Mixing

Foam Proportioning and Proportioning Systems

• Portable Foam Proportioners
  – In-Line foam eductors
  – Foam Nozzle eductors
  – Self-Educting Master Stream Nozzles
    • Flow 350 GPM and above
    • Flow up to 14,000 GPM
  • High-Energy Foam Generating Systems

Foam Application Devices

• Roof and Bumper Turrets
• Handline Nozzles
• High Reach Extendable Turrets
• Foam carts
Dry Chemicals

- Dry chemical agents
  - Are effective for initial attack and quick knockdown of:
    - Three dimensional flowing fuel fires
    - Pressure fed fuel fires
    - Hydraulic fires
    - Lubricant fires

Dry Chemicals

- Dry Chemical Agent Compounds
  - Sodium Bicarbonate
  - Potassium Bicarbonate (PKP)
  - Urea-Potassium Bicarbonate
  - Potassium Chloride
  - Monoammonium Phosphate

Dry Chemicals

- Extinguishers
  - Two basic designs
    - Stored Pressure
    - Cartridge Operated
  - Two basic agents
    - A: B: C Multi-purpose
    - B:C
Dry Chemicals

• Apparatus Mounted Dry Chemical Units
  – Components:
    • Dry Chemical storage tank
    • Pressurized expellant cylinder
    • Valves and piping
    • Sufficient hose for handlines with nozzles

Dry Chemicals

• Apparatus Mounted Dry Chemical Units
  – Requirements:
    • Minimum of 500 pounds of SODIUM based Dry Chemical or
    • Minimum of 460 pounds of clean agent or
    • Minimum of 450 pounds of Potassium based dry chemical (PKP)

Dry Chemicals

• Dry Chemical Discharge Devices
  – Handline
    • Minimum flow of 5 lbs/second
    • Minimum range of 25 feet
  – Piggy backing
    • Minimum flow of 16 to 22 lbs/sec
    • Minimum range of 100 feet
  – Water Stream Injection
    • Injects the dry chemical into the foam stream
Dry Powders
• Class D Combustible Metals agents
  – MET-L-X
  – Lith-X
  – G-1

Clean Agents
• Halogenated Agents
• Halon Replacements
• FM-200
• Inergen

Agent Conservation and Resupply
• Water
  – Mobile—tankers/tenders
  – Fixed—hydrants
Agent Conservation and Resupply

• Foam Concentrate
  – Foam Trailers
  – Foam Tenders

Agent Conservation and Resupply

• Auxiliary Agent
  – It is imperative that the correct agent is utilized to reservice the unit.
  – Manufacturer’s recommendations must be adhered to.
  – Safety recommendations must be followed.

Student Performance Objective

• After completing this lesson, the student shall possess an understanding of the proper agents, application methods, and application equipment for each agent utilized in Aircraft Rescue Firefighting.
Review

• Primary Extinguishing Agents
• Auxiliary Extinguishing Agents
• Water
• Principles of Foam
• Theoretical and Practical Critical Fire Areas
• Foam Concentrates
• Foam Proportioning and Proportioning Systems

Review

• Foam Application Devices
• Dry Chemicals
• Dry Powders
• Clean Agents
• Agent Conservation and Resupply
Lesson 11-1: Fire Suppression, Ventilation, and Overhaul

Student Performance Objective

- After completing this lesson, the student shall have the knowledge to operate as an ARFF firefighter and understand the concepts required to extinguish a fire involving an aircraft, the proper ventilation techniques, and the overhauling of the aircraft to ensure complete extinguishment.

Overview

- Fire Suppression
- Aircraft Ventilation
- Overhaul
- Evidence Preservation
**Fire Suppression**

• Aircraft accidents without fire involvement
  – Fuel leakage
  – Controlling ignition sources

**Fire Suppression**

• Aircraft accidents with fire involvement
  – Total extinguishment
  – Maintaining escape/evacuation
  – Fire warning indicators

**Fire Suppression**

• Aircraft accidents with fire involvement
  – Attack techniques
    • Where to attack from (whenever possible)
    • First Fire Streams
    • Turret Streams
    • Handlines
    • Exposures
Fire Suppression

- Aircraft accidents with fire involvement
  - Agent application methods
    - Roll-On Method
    - Deflection or bank-down method
    - Base of the Fire Method
    - Rain-down (Rainfall) Method

Fire Suppression

- Aircraft accidents with fire involvement
  - Turret operations
    - Application of large amounts of foam
      - From a distance
      - During approach applying agent
      - During set-up and while the apparatus is in motion

Fire Suppression

- Aircraft accidents with fire involvement
  - Handline operations
    - Continue fire control
    - Maintain foam blanket
    - Keep rescue path open
    - Extinguish any spot fires
    - Conserve agent by limiting agent flow
    - Protect ARFF personnel
Fire Suppression

• Aircraft accidents with fire involvement
  — Water application
    • Finely divided streams (FOGs)
      — Absorb more heat
      — Are easily affected by wind and thermal columns
    • Straight Streams
      — Have greater reach
      — Are the preferred application technique for an aircraft interior fire

Fire Suppression

• Aircraft accidents with fire involvement
  — Foam application techniques
    • Correct application techniques
      — Insulate
      — Isolate

Fire Suppression

• Apparatus Placement and Positioning
Fire Suppression

• Turrets
  – Are large pre-plumbed master stream appliances capable of delivering large amounts of water or foam
  – Are capable of sweeping from side to side
  – May be aspirating or non-aspirating nozzles
  – May be equipped with a secondary nozzle for applying the auxiliary agent

Fire Suppression

• Handline nozzles
  – Have a flow that is less than 350 GPM
  – Can easily be safely handled by one to three firefighters
  – May be aspirating or non-aspirating nozzles

Fire Suppression

• Aspirating versus non-aspirating nozzles
  – Aspirating Nozzles
    • The aspirating nozzle induces air into the foam solution and agitates the stream
    • The aspirating nozzle is the most effective nozzle for generating low-expansion foam (6:1 to 10:1)
  – Non-Aspirating Nozzles
    • Can only be used with synthetic film forming foams
    • Have the ability to cover large areas with conventional variable stream nozzles
Fire Suppression

• Dry Chemical Agent Application
  — Extinguishers
  — Apparatus Mounted Units
    • A Dry Chemical handline
      — Must flow at least 5 lb/sec and have a minimum 25 foot reach
      — Is required to have at least 100 feet of proper hose
    • Dry chemical turrets
      — Flow 16 to 22 lbs/sec
      — Are used on three-dimensional flowing fuel fires

Fire Suppression

• Clean Agent Application
  — Apply in short bursts
  — Use the wind to your advantage

Fire Suppression

• Dual Agent Attack
  — A dual attack agent involves the use of primary agent and auxiliary agent simultaneously
    • Three-dimensional fuel fire fighting
      — Fuel is running, flowing, spraying or pouring into a pool on the ground
      — Auxiliary agent extinguishes the moving fuel
      — Primary agent extinguishes the pooled fuel
Fire Suppression

- Aircraft Interior Fire Attack
  - ARFF crews should determine the location of the fire before entering aircraft
  - ARFF crews should utilize handlines to conduct interior fire attack operations
  - A thorough overhaul will be needed to ensure deep-seated fires are completely extinguished
  - Baggage and cargo areas should be checked for extension

Fire Suppression

- Engine and APU/EPU Fire Suppression
  - The Flight Crew will make the first attempt to extinguish using on-board fire extinguishing systems
  - If the aircraft is unoccupied ARFF crews must be familiar with exterior APU fire/shutdown switch locations and procedures
  - If onboard systems do not extinguish fire
    - Clean, gaseous agents are the agent of choice
    - Direct large amounts of foam into the engine's intake
    - Dry Chemical may be used as a last resort

Fire Suppression

- Engine and APU/EPU Fire Suppression
  - ARFF crews may be forced to access and open the engine cowling, or APU/EPU access panel doors
  - Penetrating nozzles may be used to apply agent into the cowling or the compartment
  - Engine tail pipe fire occurs when too much fuel is injected into the engine during startup
  - Uncontained engine failure or disintegration is usually a catastrophic failure of an engine
Fire Suppression

• Wheel Assembly Fire Suppression
  — The safest approach is application of large amounts of water from a safe distance utilizing turrets
  — ARFF crews should approach from a 45 degree angle either fore and/or aft of the wheel assembly
  — If combustible metals are involved
    • Apply copious amounts of water with High-Flow turrets
    • After the knockdown of most of the fire, apply Class D dry powders for final extinguishment

Fire Suppression

• Wheel Assembly Fire Suppression
  — Older generation wheel assemblies contained elements creating hazardous issues for ARFF crews
    • Magnesium and Titanium
  — Newer generation wheel assemblies pose less of a hazard to ARFF crews
    • Cerametalic
    • Aluminum Alloy
    • Carbon

Fire Suppression

• Hydraulic components that may be encountered within the wheel assembly
  — Wheel assemblies overheat often due to hard braking
    • Fires around hydraulic fittings are possible
    • Fire should be quickly extinguished using the appropriate agent
    • Skydrol (aviation hydraulic fluid) thermally decomposes at high temperatures, and produces toxic vapors
Fire Suppression

• Exposure Protection
  – ARFF crews should prevent the spread of fire to uninvolved, exposed properties
  – The best approach is rapid extinguishment of fire
  – Protection must be prioritized based on the extent of exposure
  – Care should be taken to prevent pushing burning fuel to an uninvolved exposure
  – Care should be taken to avoid pushing fire or fuel into underground facilities, drains, waterways, and sewers

Fire Suppression

• Rocket / Rocket Engine Fires
  – Some aircraft are equipped with auxiliary rocket engines to provide additional thrust during takeoff
  – If the rockets themselves are ignited, do not try to extinguish
  – If a military aircraft has rocket-equipped missiles on board, crews should be positioned at a 45 degree angle to the longitudinal axis of the rocket/missile at the front and/or rear of the aircraft

Aircraft Ventilation

• Proper ventilation should be part of a planned and coordinated operation
• Initial ventilation may be accomplished by ARFF crews
  – Opening as many doors and hatches as possible
  – Knocking in side windows
  – Utilizing wind-driven ventilation whenever possible
Overhaul

- An overhaul is a thorough and systematic search for any remaining pockets of fire
  - A thorough search for any deep-seated remaining fire
- Full PPE and SCBA must be worn by all personnel involved in overhaul operations
- Fully charged handline(s) should be in place
- Preserve evidence when possible

Evidence Preservation

- ARFF crews should avoid disturbing possible evidence
  - ARFF departments should have detailed SOP/SOGs in place covering evidence preservation
  - Only authorized personnel should remove bodies that remain in wreckage
  - If it is absolutely necessary to remove a body prior to the arrival of the medical authority, the area must be thoroughly documented

Student Performance Objective

- After completing this lesson, the student shall have the knowledge to operate as an ARFF firefighter and understand the concepts required to extinguish a fire involving an aircraft, the proper ventilation techniques, and the overhauling of the aircraft to insure complete extinguishment.
Review

- Fire Suppression
- Aircraft Ventilation
- Overhaul
- Evidence Preservation
Lesson 12-1: Airport Emergency Planning

Student Performance Objective

- After completing this lesson, the student shall have the knowledge of the importance of effective planning, and the plans required by the agencies involved in airport operations.

Overview

- Administrative Responsibilities
- Airport/Community Emergency Plan (A/CEP) Components
- General A/CEP Considerations
- Emergency Response Considerations
- Emergency Response
- Training
- A/CEP Review
Administrative Responsibilities

• Provide for ARFF services
• Develop an Airport Certification Manual
• Develop an Airport/Community Emergency Plan
• Test/exercise the Airport’s/Community Emergency Plan

Airport/Community Emergency Plan Components

• Introduction
• Possible/probable incidents
• ARFF designations and signage
• Rescue and firefighting operations
• Media operations
• Legal obligations
• Joint training for plan maintenance

General A/CEP Considerations

• Safety management system
• Types of aircraft involved
• Types of accidents/incidents
• Possible accident sites
• Search and rescue within Bailout-Jettison areas
• Accident site accessibility
• Climatic and limited visibility considerations
General A/CEP Considerations

- Types of accidents/incidents
  - Incidents
    - Example: An ARFF response to an aircraft with hot brakes
  - Accidents
    - Low Impact
    - High Impact
    - Example: An aircraft crash.

General A/CEP Considerations

- Possible accident sites
  - A high percentage of aircraft incidents are on or near an airport:
    - Threshold of a runway
    - Departure of a runway
  - Accident Potential Zones
    - Clear Zone
    - APZ-1
    - APZ-2

General A/CEP Considerations

- Search and rescue within Bailout-Jettison Areas
  - Establish an area for military aircrews to bail out or jettison fuel or munitions
  - Identify flight parameters
  - Identify a Search and Rescue Coordinator
  - Activate an air search and rescue operation
  - Initiate a ground search and rescue operation
General A/CEP Considerations

• Accident site accessibility
  – A grid map should be prepared for the airfield
  • Showing terrain features and access routes

• Climatic and limited visibility considerations
  – Address response alternatives
  – Protect aircraft occupants
  – Activate alternate ARFF vehicle standby positions

Emergency Response Considerations

• Alerting emergency response and support personnel

• Primary response
  – Agencies notified on initial call
  • Aircraft Rescue Firefighting Units
  • Law Enforcement
  • Emergency Medical Services
  • Airfield/Airport Management
  • Air Carrier representative

Emergency Response Considerations

• Secondary response
  – Mutual Aid Support
  – Support Equipment Agencies (Maintenance)
  – Rehabilitation services
  – Mental Health Providers

• Other logistical support
  – Government Agencies
  – Military Assistance
  – American Red Cross
Emergency Response Considerations

• Mortuary Assistance
  – Dept. of Homeland Security (DMATS)
  – State Emergency management
  – Local Mortuary Response Teams
• FAA
  – Responsible for investigating all civil aircraft accidents
  – Determines the cause of civil accident/incidents

Emergency Response Considerations

• Air Traffic Control Tower
• United States Coast Guard
• Other agencies to assist in water operations
• Foreign language interpreters
• Religious organizations
• Communication services
• Public Works departments

Emergency Response Considerations

• Civil Air Patrol
• Airport tenants and fixed base operators
• Offices of Emergency Services Management
• Specialized search and rescue teams
• Construction contractors and equipment rental companies
• Transportation authorities
Other Operational Considerations

• Communications
• Public information and the news media

Emergency Response

• Response to accidents involving military aircraft
  – Unified Command with military officials
  – The ranking military officer may:
    – Become a technical advisor for the IC
    – Assume command if the incident has been declared a National Defense Area
  – There is a large amount of logistical help and expertise available to the unified command team
• Airport structure fires

Emergency Response

• Response to hazardous materials
  – The A/CEP shall:
    • Focus on the hazards commonly found on this airfield
    • Identify the organizations and agencies that are responsible
    • Identify roles and responsibilities provided by responding agencies
    • Assign responsibility for SARA title III reporting
Emergency Response

• Medical emergencies/contagious disease response
  – Identify procedures for
    • Providing medical care
    • Preventing the spread of contagious diseases

• Terrorism response
  – Identify roles and procedures for responding to a suspected terrorist incident
  – Identify a Designated Isolation Area

Emergency Response

• Response to Mass Casualty Incidents
  – Identify procedures for:
    • Isolating the uninjured
    • Triaging the injured
    • Treating the injured
    • Transporting the injured

• Post-incident scene control
  – Identify who can come into the incident site post-incident

Emergency Response

• Response to natural disasters
  – The A/CEP should address the following to mitigate the damage and restore aircraft operations
    • Process for monitoring developing severe weather conditions
    • Process for notifying aircraft owners and warning incoming aircraft
    • Initial protective measures to be taken
    • Post-disaster clean-up and restoration procedures
Training

• Training for mutual aid and support personnel
• Joint training exercises
  – The plan needs to be tested or exercised to verify its effectiveness
  • Tabletop exercises should be conducted annually.
  • A Full-Scale Disaster drill should be conducted every three years.
  • A non-threatening Post-Incident Analysis should be completed after each training session.

A/CEP Review

• The A/CEP should be reviewed and updated in accordance with the Authority Having Jurisdiction (AHJ)
• The AHJ should develop an evaluation system that
  – Includes highly trained evaluators
  – Identifies problems within the exercise or areas of the A/CEP requiring modification

Student Performance Objective

• After completing this lesson, the student shall have the knowledge of the importance of effective planning, and the plans required by the agencies involved in airport operations.
Review

• Administrative Responsibilities
• Airport/Community Emergency Plan (A/CEP) Components
• General A/CEP Considerations
• Emergency Response Considerations
• Emergency Response
• Training
• A/CEP Review
Lesson 15-1: Strategic and Tactical Operations

Student Performance Objective

• After completing this lesson, the student shall possess the knowledge required to respond to the accidents/incidents that the ARFF firefighter should expect to encounter. Students shall understand the strategies and tactics they will utilize to mitigate these events.

Overview

• Incident Management
• In-Flight Emergencies
• Ground Emergencies
• Low-Impact Crashes
• High-Impact Crashes
• Response Procedures
• Responses to Accidents Involving Military Aircraft
• Responses to Aircraft Incidents Involving Hazardous Materials
Incident Management

  - States that all Federal, State, local governments and tribal entities will adopt the National Incident Management System

Incident Management

- Components of NIMS-ICS
  - Common terminology
  - Modular organization
  - Integrated communications
  - Unified Command structure
  - Single action plan
  - Manageable span of control
  - Pre-designated incident facilities
  - Comprehensible resource management

Incident Management

- Major NIMS Position descriptions
  - Command
  - Operations
  - Planning
  - Logistics
  - Finance/Administration
  - Intelligence
Incident Management

• Required NIMS-ICS training
  — Formal training in positions
  — Scenario-based training

In-Flight Emergencies

• Aircraft fire warning indicator activations
  — Aircraft crew investigates
    • If Pilot feels aircraft is airworthy, the flight continues to its destination
    • If a problem exists, an emergency will be declared

In-Flight Emergencies

• Various System failures
  — Fuel delivery
  — Flight control
  — Engine failure or fire
  — Inoperable or malfunctioning flight controls
  — Hydraulic or mechanical gear failure
  — Special military considerations
  — Loss of cabin pressure
In-Flight Emergencies

• Onboard fire
  – If accessible to the flight crew, aircrew will attempt extinguishment
  – If inaccessible to the flight crew or the flight crew is unsuccessful in extinguishing the fire an emergency landing will be attempted immediately
  – If there is sufficient heat, and toxic gases build to a sufficient level, flashover may occur

In-Flight Emergencies

• Bird strike
• Structural failure
• Low or no fuel
• Lightning strike, turbulence, wind shear, or icing
• Medical emergencies
• Unruly passengers
• Terrorism

Ground Emergencies

• Operational plans should be developed that address the following types of ground emergencies
  – Overheated wheel assemblies
  – Overheated brakes
  – Wheel Fires
  – Combustible metal fires
  – Fuel/flammable liquid leaks and spills
Ground Emergencies

• Operational plans should be developed that address the following types of ground emergencies
  – Engine/APU fires
  – Engine failures
  – Heater fires
  – Aircraft interior fires
  – Aircraft ventilation

Ground Emergencies

• Ground collisions
  – Some airports utilize traffic alert and Collision Avoidance Systems
  – Surface Movement Guidance and Control Systems
    • Track the movement of aircraft and airport vehicles
    • Are monitored by the ATC who can intervene
    • Prevent aircraft incursions
  – ARFF personnel should expect that there are issues other than with the aircraft

Ground Emergencies

• Battery/electrical fires
  – Firefighters should
    • Ensure the power to the aircraft is shut down by having the flight crew shut down the aircraft prior to egress of the aircraft
    • Enter the aircraft and gain access to the flight deck if the flight crew has already egressed the aircraft and shut down all electrical systems
Low-Impact Crashes

- Wheels-up or Belly landings
  - Nose gear up with main gear down
  - Single main gear up
  - Landing gear up but not locked

Low-Impact Crashes

- Helicopter Crashes
  - Lightweight construction causes structural failure and collapse
  - Helicopters are designed to break apart into separate components

Low-Impact Crashes

- Rejected takeoff with runway overrun
  - Aircraft are usually intact and survivable
  - Overrun areas may be equipped with Engineered Materials Arresting Systems
High-Impact Crashes

• Controlled flight into terrain
  – Variety of causes
  – G-force of the collision above human tolerance
• Crashes involving structures
  – Aircraft stabilization
  – Involved structure
  – Exposures

Response Procedures

• Standard emergency response
  – Units respond to Runway Standby Positions per SOP/SOG and approved by the ATCT
• Size-up
  – Incident Commander
  – Driver / Operator
  – Company Officer / Firefighter
  – EMS responder/provider

Response Procedures

• Incident Priorities
  – Life Safety
  – Incident Stabilization
  – Property Conservation
  – Societal Restoration
Response Procedures

• Positioning Apparatus
  — Approach the scene with extreme caution
  — Consider the following prior to entering the crash scene
    • Stability of the terrain
    • Slope of the ground
    • Direction of the wind

Response Procedures

• Positioning Apparatus
  — Wind
  — Terrain
  — Wreckage
  — Hazardous Areas

Response Procedures

• Positioning Apparatus
  — Initial attack/fire control
    • The main objective during this attack is the rescue of trapped occupants
    • Initial arriving units should initiate agent application with roof and bumper turrets protecting the integrity of the fuselage
Response Procedures

• Positioning Apparatus
  – Reposition the apparatus or modify the agent stream if the application missed the fire, and reapply agent
  – Reposition apparatus and apply agent to other areas if the fire has been extinguished
  – Switch turrets to low flow or utilize bumper turrets after the initial knockdown of fire to conserve extinguishing agent

Response Procedures

• Initial Application for Non-fire Incidents
  – First arriving units will blanket fuel spills with foam creating a safe area around the aircraft
  – Other units will stand ready in case fire erupts
  – Crews will assist occupants down and away from slides and direct them to a safe area

Response Procedures

• Aircraft Accident Victim Management
  – Rapidly triage injured victims using a systematic method of analyzing the severity of their injuries.
  – Move triaged patients to the Treatment area within the first hour.
  – From treatment, patient will be moved to Transportation by priority.
Response Procedures

• Aircraft Accident Victim Management
  – Deceased Victims
    • Move only when necessary to perform a rescue task
    • The position should be marked, numbered, and documented where the victim was originally found
    • Removal of any deceased victims from an aircraft or debris field must receive prior authorization from the lead investigatory agency

Response Procedures

• Extinguishment
  – Elimination of all surface fire
    • In the aircraft
    • Outside of the aircraft
    • Extension of the fire control phase

Response Procedures

• Overhaul
  – A thorough overhaul must be completed before declaring the scene safe
    • Extinguish all hot spots
    • Cool all surfaces to ambient air temperatures
    • Preserve any evidence or the integrity of the aircraft for the investigating authority
    • Thoroughly document positions of any items that must be moved, or evidence
Response Procedures

• Incident Termination
  – Begin incident termination upon completion of all rescue, extinguishment, and any emergency operations
  – Terminate incident based on the following components
    • Decontamination of all apparatus and equipment
    • Resupply of ARFF apparatus
    • Rehabilitation of all responders

Response Procedures

• Post-incident responsibilities
  – Ensure the accident scene is secured
  – Provide mental health counseling services for all members involved in the operation
  – Provide fire protection standby activities and prevention of igniting fuels

Response Procedures

• Assisting in Site Cleanup
  – Completing incident reports
  – Completion of a systematic Post-Incident Analysis
  – Resupplying agents and station resupplies
  – Performing a post-incident debriefing with all responders
Responses to Accidents Involving Military Aircraft

• Precautions that civilian ARFF crews responding to a military aircraft incident should take
• Who to contact after a military aircraft incident
• Guarding the wreckage

Responses to Accidents Involving Military Aircraft

• Reporting a Military Aircraft Accident
• What to do after notification of a military aircraft accident
• What military officials will do when they arrive

Responses to Accidents Involving Military Aircraft

• Approaching the Site of a Military Aircraft Crash
  — Approach from upwind, if possible
  — Exercise caution while approaching the site in a vehicle to avoid striking survivors or armament near the crash site
  — Approach at a 45-degree angle from the front or rear of any externally carried tanks or pods that may contain rockets or missiles
Responses to Accidents Involving Military Aircraft

• Approaching the Site of a Military Aircraft Crash
  – Avoid and do not touch or disturb any armament found near or at the crash site
  – Be aware of the possibility of counter measures

Responses to Accidents Involving Military Aircraft

• Military Aircraft Fuel Hazards
  – Jet fuels
  – Hypergolic Fuels
  – Conventional weapons / Munitions Fire Fighting Procedures
    • Externally carried pods that may contain rockets or missiles should always be approached at a 45-degree angle from the front or rear

Responses to Aircraft Incidents Involving Hazardous Materials

• ARFF crews need to be aware of the possibility of the release of Hazardous Materials
  – Cargo
  – Fuels
  – Aircraft fluids
Student Performance Objective

• After completing this lesson, the student shall possess the knowledge required to respond to the accidents/incidents that the ARFF firefighter should expect to encounter. Students shall understand the strategies and tactics they will utilize to mitigate these events.

Review

• Incident Management
• In-Flight Emergencies
• Ground Emergencies
• Low-Impact Crashes
• High-Impact Crashes
• Response Procedures
• Responses to Accidents Involving Military Aircraft
• Responses to Aircraft Incidents Involving Hazardous Materials