Small Aircraft Crash / Fire Rescue

Student Manual

Department of Fire Services
Massachusetts Firefighting Academy
Direct Delivery Programs
Small Aircraft Crash / Fire Rescue

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I. Introduction
II. Fuel
III. Type
IV. Location / Position
V. Suppression
VI. Extrication
VII. Securing

Goal:

Firefighters will improve their knowledge, awareness and inter-operability at small aircraft incidents
Objectives

- Identify the hazards involved with a small aircraft incident
- Identify personal safety as it relates to small aircraft incident hazards
- Demonstrate an understanding of the needs and importance of Incident Management at small aircraft incidents
- Adapt / utilize basic firefighting practices and concepts when mitigating a small aircraft incident

What Is a Small Aircraft?

- Less than 12,000 lbs takeoff weight
- 1 or 2 engines
- 1 to 10 seats
- Includes helicopters & balloons

Fuels

AVGAS
AUTO GAS
JET FUEL
Most Commonly Used Fuels

- Automotive Gasoline
- Avgas
- Jet Fuel

Automotive Gasoline

- Flashpoint: $45^\circ$
- Flammable Limits: $1.2\% - 7\%$
- Ignition Temperature: $825^\circ - 960^\circ$

Avgas

- Higher octane rating than auto fuel
- Flashpoint: $45^\circ$
- Flammable Limits: $1 - 7\%$
- Ignition Temperature: $825^\circ - 960^\circ$
Jet Fuels

- High Grade Kerosene
- Flash Point  -10°
- Flammable Limits  1.3% - 8%
- Ignition Temperature  440° - 475°

Location of Fuel Tanks

- Fixed Wing
  - Wings
  - Fuselage
- Helicopters
  - Fuselage

Helicopters, Some
for Airplanes - Fuel
Are Located in
Fuselage
References

- Emergency Response Guidebook
- MSDS Sheets

Hazards

- Battery
- Hydraulic Fluid
- Oxygen
- Ballistic Parachutes
- Tires / Brakes

Aircraft Hydraulics

- Can operate up to 3000 psi
- Pressure can be “stored” in some components
- Hydraulic fluid can be hot, combustible and irritating
500 psi – 2000 psi Hydraulic Fluid

Ballistic Recovery
- Smaller Productions
- Ultralights
- Homebuilt

Usually "Red" Handle
Located Near The Pilot
Fires The "Rocket" which in turn deploys the parachute

Even Parachutes
Emergency Cut-Away
Equivalent to a .38 Cal.
Avoid Pulling Any Handles
Cirrus® Airframe Parachute System

- Is a ballistic actuated parachute system designed to lower a small aircraft and its crew safely to the ground
- Solid propellant rocket is used to deploy the canopy (parachute) quickly and safely so the aircraft will fall at a speed of approximately 1600 feet per minute

Situations

- Mid-Air Collision
- Engine Failure
- Loss of Aircraft Control
- Pilot Incapacitation

First Responder Safety Concerns

- Five components to system
  - One rocket, two shot gun primers, two line cutters
- Located aft of passenger cabin
  - Approach from side or front of aircraft
  - 100 foot safety zone especially to rear
  - 150 mph when deployed
- No-cut zones (cable) over the top of the cabin to baggage compartment
First Responder Safety Concerns (con’t)

- Burn and explosion hazard if not deployed
- Dust and inhalation hazard
- Tether lines of canopy after deployment
- Wind conditions
- Composite material of aircraft may compromise CAPS integrity if not deployed
- Notify authorities of CAPS system

Types of Aircraft

Most Aircraft are Light,

One or...
Two Engine Airplanes or Helicopters With Less Than 10 Seats!

Basic Aircraft Info
- Size of Plane
- Number of Engines
- Amount of Fuel
- Jet vs. Prop

Fixed Wing
- Single Engine
  - High Wing
  - Low Wing
- Twin Engine
  - High Wing
  - Low Wing
Others

- Experimental / Home Built Aircraft
- Ultra Lights
- Gliders
- Hot Air Balloons

Cooking With Gas
Helicopters

- Passenger
- Medical
Medical Helicopters

- Passengers
  - 3 Crew
  - 1 or 2 Patients
- Medical Concerns
  - Equipment
  - Bio-Hazards

Crash Site Locations
Local Airport

- Working Relationship
- Pre-fire Inspections
- Planning

Airport Property

- Runways
- Grass Areas
- Approach or Departure Ends
- Buildings on Airport Property
Wooded Areas

- Site Access (paved or dirt roads)
- Location of Woods
- Rescue of Victims
- Fire or No Fire

Mountains

- Site Access
- Time Line
- Size of Area
- Fire or No Fire
Fields

- Site Access
Suppression

Firefighter Safety

Accident Site Safety
- Lots of things to catch fire
The Main Source of Ignition Would Probably be Electrical

Most Aircraft Electrical Systems Are 12 or 24 Volt
Some Aircraft "May Not" Have An Electrical System

Mitigation
- Damming
- Diking
- Pad / Booms

Class "B" Foam
- Fuel Fire
- Vapors / Spill
- Size of Spill vs. Amount of Foam
- Resources for Foam Re-Supply
Any time you approach the downed aircraft, the foam line will be utilized

Fire / No Fire
Leak / No Leak
Spill / No Spill
Foam – AFFF / ATC

- Amount of spill outside the aircraft
- Vapor suppression of fuel outside the aircraft
- Vapor suppression of fuel still onboard the craft
  - Protect the victims on board
  - Protect rescue personnel working in and around the crash site

Spill (with Fire)

- Amount of fuel that is burning
- Quick fire knockdown
- Vapor suppression to avoid re-ignition
- Protect all personnel
Extrication

Victim Extrication

- Number of Victims
- Location of Incident
- Location of Victims
- Construction

Aircraft Construction

Older Aircraft

- Metal Tube or Wood
- Tube with fabric covering
  - The sealer used on this type is extremely flammable
  - Fabric is synthetic or cotton
- Aluminum (tubular or formed)
Aircraft Construction
Newer Aircraft

- Aluminum Framework
- Aluminum Outer Covering
- Fiberglass Outer Covering
- Composite Matter
  (stronger than steel, but lightweight)
Location of Fuel Lines

• Low Wing
  – Fuel lines run through the wing under the floor of the cockpit and forward through the main fuel on and off valve then into the engine compartment

Location of Fuel Lines

• High Wing
  – Fuel lines run through the wing down the sides of the cabin to the lowest point and through the main fuel on and off valve and then into the engine compartment
Fuel Valve Shut-off

- Located in the cockpit within the reach of the pilot
- Single engine aircraft have one shut-off valve
- Multi engine aircraft have two shut-off valves
- Shut-off valves are well marked with large indicator knobs, valves, dials or levers
  - Most often RED in color
Fuel Shut-off Valve Location

- Lower edges of the instrument panel
- On the wall of the interior fuselage around knee height
- On the floor between the seats just below the center of the instrument panel
Battery Location – Single Engine

- Engine Compartment
- Wing Area
- Tail Section
- Mid-fuselage on a Rack
Battery Location –
Twin Engine

- Nose or Forward Section
- Wings
- Between the Engine and the Cabin

The best way to disable the electrical system is to disconnect the battery
Panel Cover May Have Vents

Behind Access Panel on Wing Should be Placard

Not All Battery Cables Need To Be Cut...

Look For "External Power" Plug-in - Battery Will Be Close By

Battery Master Switch Should Shut Off Most Battery Items
Piston Engine Aircraft
Use
Magnetos to Provide
Spark and
Will Fire Even Without
A Battery

Always Treat A Propeller
Like It's HOT
Even With The Switch In
The Off Position

Oxygen Systems

- Built-in Systems
  - Tanks located in the nose or tail
  - Connected by tubing running throughout the aircraft
- Portable Systems
  - Looks like a "D" or "E" oxygen cylinder
Awareness of $O_2$ systems is important

Cutting into an $O_2$ line could result in a flash fire
Gaining Access

- Aircraft construction
- Egress points
- Know where to cut
  - Doors
  - Windows
  - Thin Skin

Access

- Control wheel located in the front of each seat
  - Should move easily
  - If not, cut
- Seats move backward and forward on rails and are easier to remove
- Do not use windows for extrication unless designated as emergency exits
Access Point

- Doors
- Windows
- Skin

TRY BEFORE YOU PRY!

Tools

- Irons
- Hand Tools
- Power Tools
Cargo and Location
Fixed Wing

- Packages
- Newspapers
- Luggage
- Medical Material
- Coffins
- Mail
- Contraband

Cargo and Location
Helicopters

- Packages
- Industrial Materials
- Sling Cargo
  - Bambi Bucket
  - Electrical / Radio
The weight of the cargo is always a factor

Securing and Safeguarding the Crash Site

The Crash Site
- Secure the area
- Protect the wreckage
- Non-essential personnel should secure the area outside the 100’ perimeter
- Locate and identify aircraft pieces
- Check for marks on the ground or adjacent buildings
Treat the entire area as a crime scene

Preservation of the Scene

Title 49 CFR, Part 830 requires that prior to the NTSB taking custody of the wreckage, the wreckage may only be disturbed or moved to the extent necessary to:

- Remove persons injured or trapped
- Protect the wreckage from further damage
- Protect the public from injury

Title 49 Transportation Safety Board
Subpart C: Preservation of Aircraft Wreckage, Mail, Cargo and Records

(a) The operator of an aircraft involved in an accident for which notification must be given is responsible for preserving to the extent possible, any aircraft wreckage, cargo and mail aboard the aircraft and all records, including all recording medium of flight maintenance and voice recorders pertaining to the operation and maintenance of the aircraft and to the airmen until the Board takes custody thereof or a release is granted pursuant to Sec. 831.12 (b) of this chapter
Title 49 Transportation Safety Board
Subpart C: Preservation of Aircraft Wreckage, Mail, Cargo and Records

(b) Prior to the time the Board or its authorized representative takes custody of aircraft wreckage, mail or cargo, such wreckage may not be disturbed except to the extent necessary:
1. To remove persons injured or trapped
2. To protect the wreckage from further damage; or
3. To protect the public from injury

Title 49 Transportation Safety Board
Subpart C: Preservation of Aircraft Wreckage, Mail, Cargo and Records

(c) Where it is necessary to move aircraft wreckage, mail or cargo, sketches, descriptive notes, and photographs shall be made, if possible, of the original positions and condition of the wreckage and any significant impact marks

(d) The operator of the aircraft involved in an accident or incident shall retain all records, reports, internal documents and memoranda dealing with the accident until authorized by the Board to the contrary

Before The Investigators Arrive

Treat it Like a Crime Scene

- Beware of pilots/aircraft owners attempting to remove or add (fuel) anything from/to the wreckage
- Emergency Locator Transmitter ELT
  - Important to silence as soon as possible
  - Civil Air Patrol
Allow as little traffic through the scene as possible

- As much as possible document anything disturbed in rescue operations
- The IIC may authorize the removal of any victim fatally injured before they arrive on scene

Document - Document - Document

- Advise the Coroner/Medical Examiner to hold for possible pathological/toxicological examinations
Nothing should be removed from the site!

Protect and Preserve All Documents Found at the Site

- Pilot Certificate and Medical Certificate
- Logbooks
- A/C Registration, Airworthiness Certificate
- Maps, Charts, etc.
- Witness Information

Agencies to be Notified

- MA State Police
- Massachusetts Aeronautics
- Federal Aviation Administration
- National Transportation Safety Board
- Department of Environmental Protection
- Medical Examiner
National Transportation Safety Board

- Must investigate and determine the facts, conditions, and circumstances and the cause, or probable cause of any aircraft accident
- The primary reason for their investigation is to make recommendations to prevent a recurrence of an accident

NTSB Field Office

- There are 10 NTSB field offices throughout the country. The New York field office covers most of the Northeast
- The offices are staffed by Air Safety Investigators, who will assume the role of Investigator In Charge (IIC) at the accident site

NTSB Investigator In Charge

- Manages the investigation
- Collects "ALL" available data about the accident
- Writes a "Factual Report" used to determine the "Cause(s)" or "Probable Cause"
- Coordinates with all other agencies participating in the investigation
NTSB IIC Authority

- By an Act of Congress, they may:
  - Enter any property where an accident has occurred
  - Inspect, and/or copy records pertaining to the accident
  - Authorize who may participate in an investigation
  - Order autopsies or obtain copies of autopsy reports
  - Authorize removal of wreckage
  - Release factual information about an accident

Federal Aviation Administration

- The NTSB investigates to make recommendations to prevent a recurrence
- The FAA is the regulatory agency responsible for writing, promulgating, and enforcing the Federal Aviation Regulations (FAR's title 14 CFR)

FAA Areas of Responsibility

FAA investigation will determine:
  - If there was a violation of the FAR's
  - If the performance of FAA owned or non-FAA owned facilities (navigation aids, radio equipment, etc.) was a factor
  - If the airworthiness of an FAA certificated aircraft was involved
  - If the competency of an FAA certificated airman, air agency, air carrier, commercial operator, or airport was involved
FAA Areas Of Responsibility Continued

➢ If the FAR's are adequate to prevent a recurrence
➢ If air carrier or airport security standards or operations were involved
➢ If the medical certification standards of airmen were involved

FAA Accident Investigations

• Will be conducted "concurrently" with the NTSB investigation
• The FAA will appoint an Investigator In Charge (IIC)

New England Regional Office
Burlington, MA

Portland FSDO
Portland, ME

Boston FSDO
Bedford, MA

Windsor Locks FSDO
Windsor Locks, CT
When To Report an Accident

- Certainly when you have a scene!
  - Maybe even sooner!
- Sometimes it may take a while to locate the scene
  - Low Flyer Reports
    - Plot them on a map
- An aircraft accident may be fluid

Calling the Operations Center

› Information to be relayed:
  › Location of the accident
  › Type of aircraft
  › Types of injuries/number of fatalities
  › Registration (“N” number)
  › Pilot information (name, address, phone, etc.)
  › How accessible is the accident site
    › Special clothing
    › Transportation

How to Report an Accident

- The pilot is responsible for reporting any accident or incident - pilots may be hesitant to report to FAA
- Report any suspected accident or incident to: (24 hrs a day, 7 days a week)

  New England Region
  Regional Operations Center
  (781) 238-7001