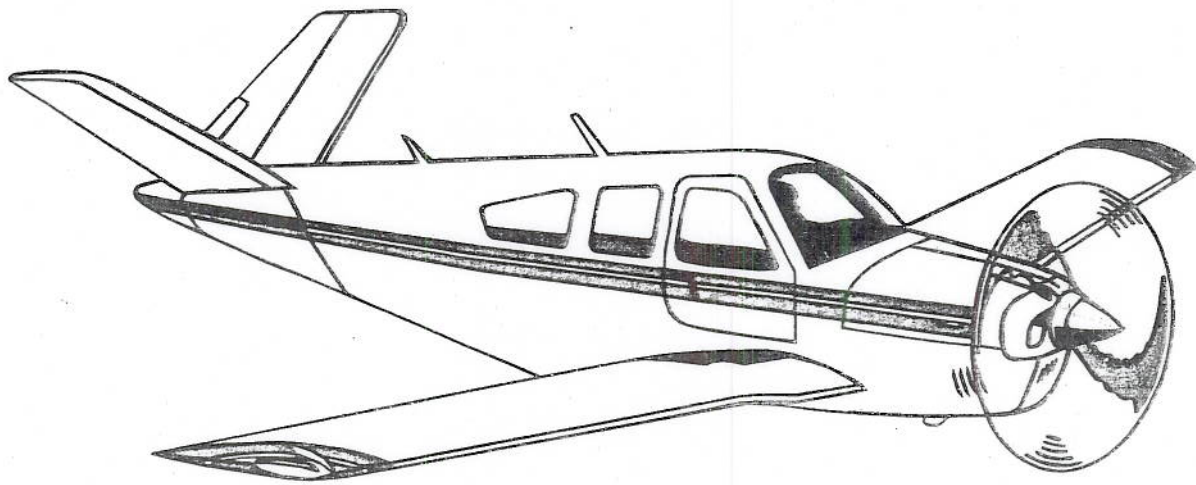


Small Aircraft Crash / Fire Rescue



Student Manual



**Department of Fire Services
Massachusetts Firefighting Academy
Direct Delivery Programs**

Small Aircraft Crash / Fire Rescue



Department of Fire Services
Massachusetts Firefighting Academy
Direct Delivery Programs

- 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

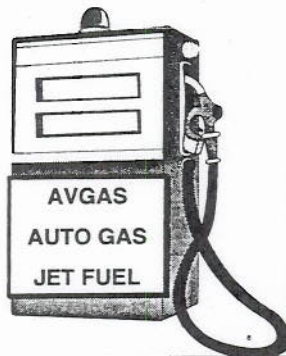
Objectives

- 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



Most Commonly Used Fuels

- Automotive Gasoline
- Avgas
- Jet Fuel

Automotive Gasoline

- Flashpoint - 45°
- Flammable Limits 1.2% - 7%
- Ignition Temperature 825° - 960°

Avgas

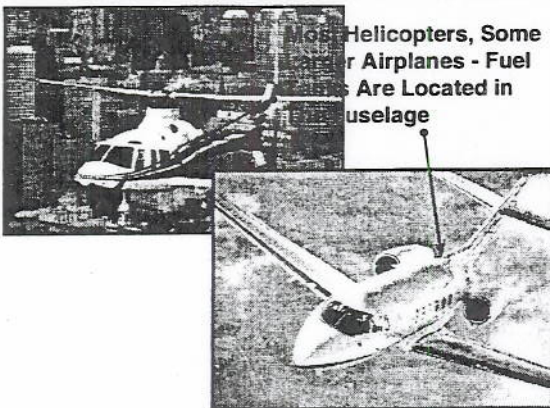
- Higher octane rating than auto fuel
- Flashpoint - 49°
- Flammable Limits 1 - 7%
- Ignition Temperature 825° - 960°

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



2004 Emergency Response Guidebook



A HANDBOOK FOR
FIRST RESPONDERS
DURING THE INITIAL PHASE
OF A DANGEROUS MATERIAL
INCIDENT

References

- Emergency Response Guidebook
- MSDS Sheets

13

Hazards

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

14

Aircraft Hydraulics

- Can operate up to 3000 psi
- Pressure can be "stored" in some components
- Hydraulic fluid can be hot, combustible and irritating

15

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

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Situations

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

20

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

21

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

22

Types of Aircraft

23

Most Aircraft are Light,

One or...

24

**Two Engine Airplanes or
Helicopters With Less Than
10 Seats!**

25

Basic Aircraft Info

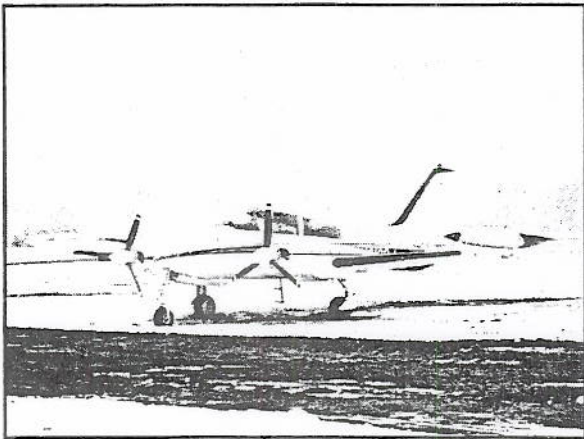
- Size of Plane
- Number of Engines
- Amount of Fuel
- Jet vs. Prop

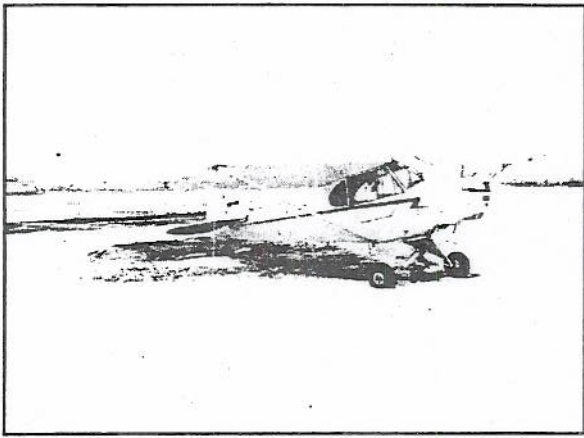
26

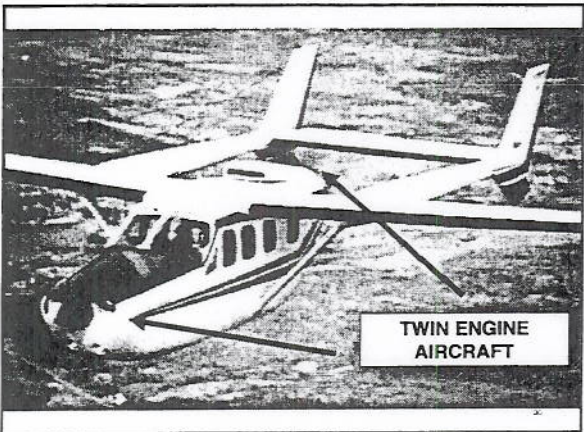
Fixed Wing

- Single Engine
 - High Wing
 - Low Wing
- Twin Engine
 - High Wing
 - Low Wing

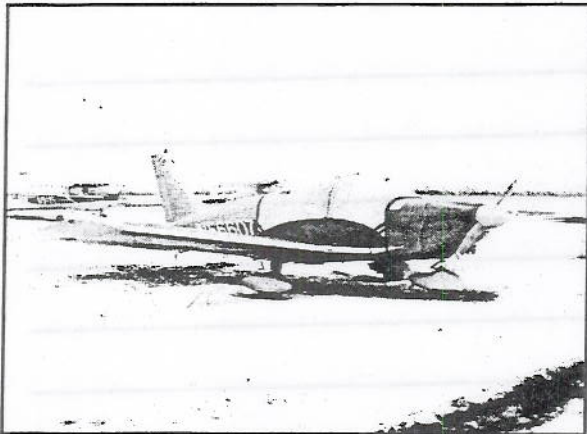
27

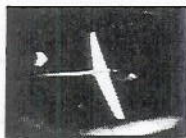






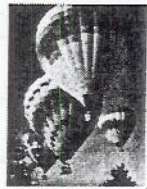
TWIN ENGINE
AIRCRAFT

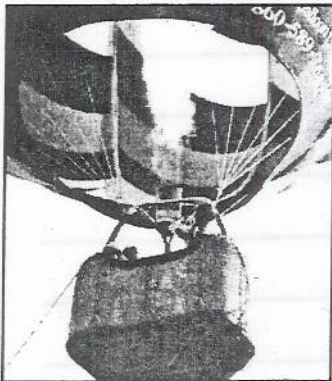




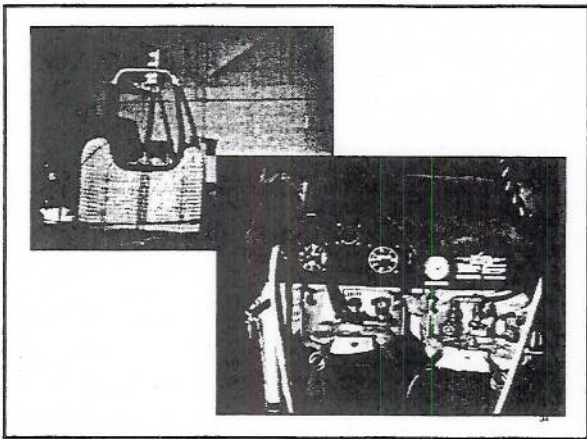
Others

- 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



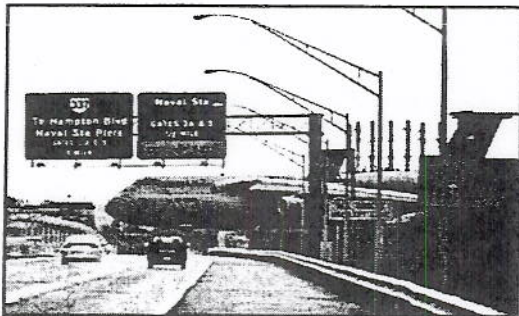
Crash Site Locations

Local Airport

- Working Relationship
- Pre-fire Inspections
- Planning

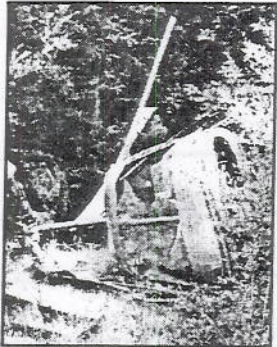
Airport Property

- 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



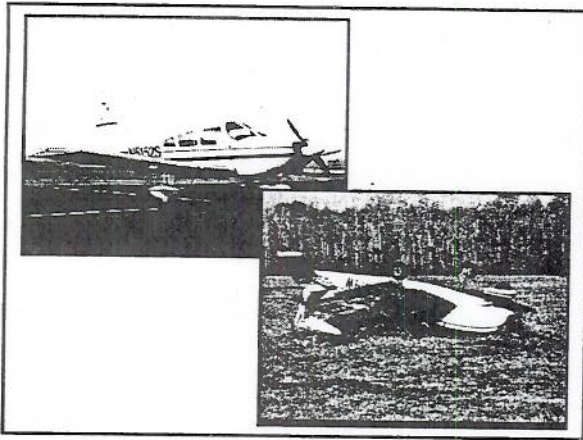


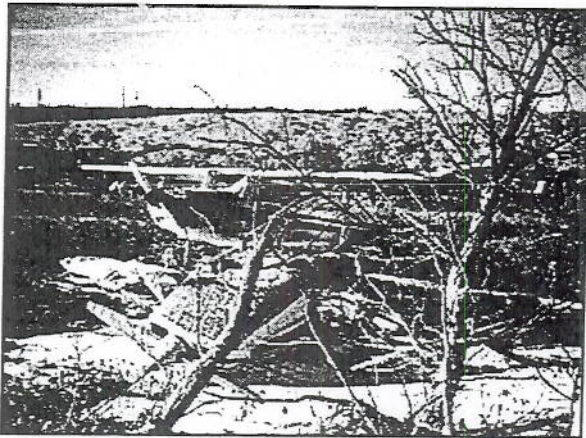
Mountains

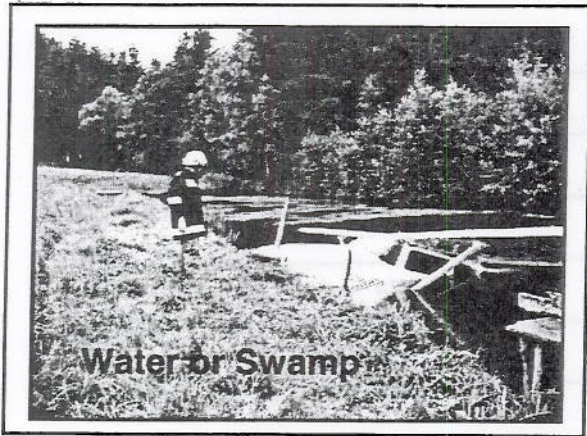
- Site Access
- Time Line
- Size of Area
- Fire or No Fire

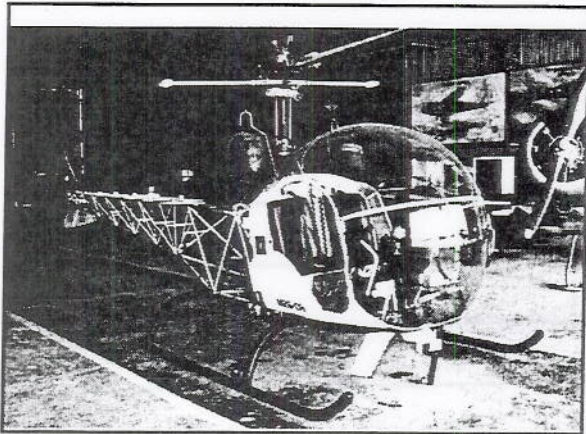
Fields

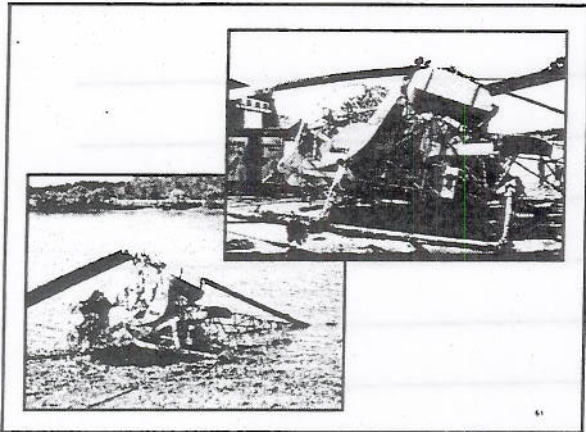
- Site Access

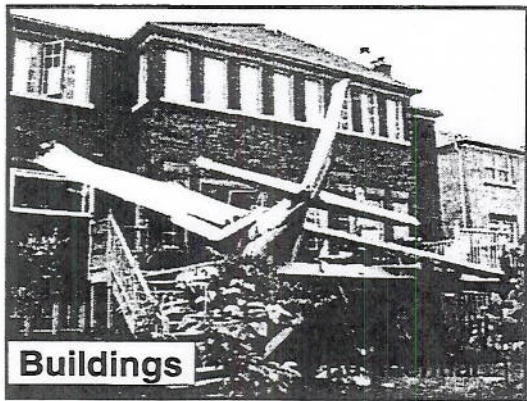


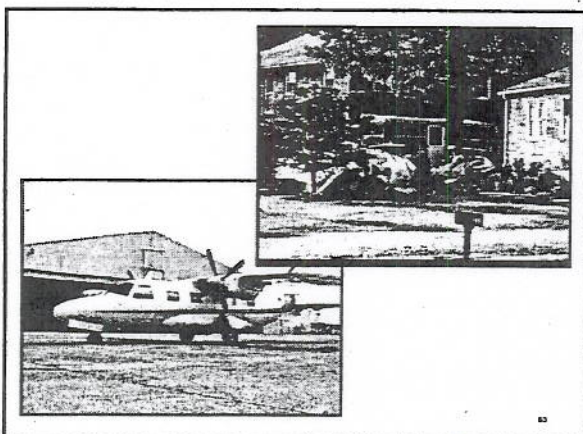




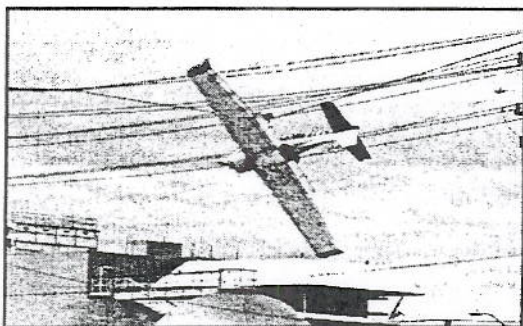






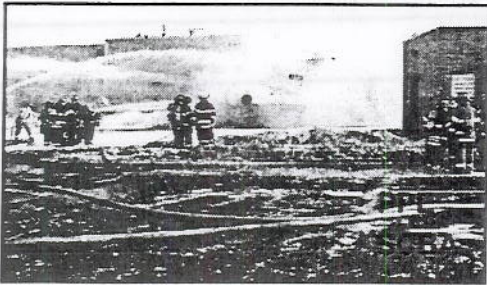


Wires



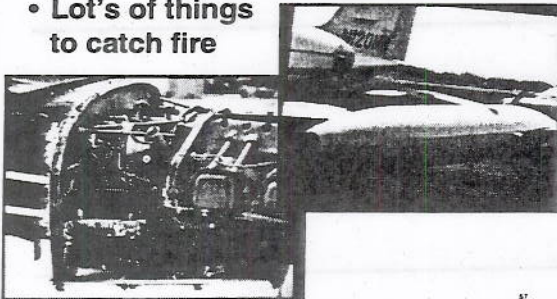
Suppression

Firefighter Safety



Accident Site Safety

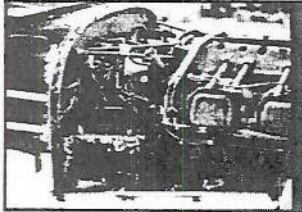
- Lot's of things to catch fire



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**

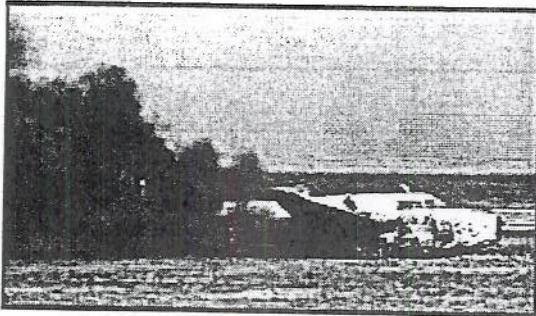
**Any time you approach
the downed aircraft,
the foam line will be utilized**

01

**Fire / No Fire
Leak / No Leak
Spill / No Spill**

02





Foam – AFFF / ATC

- Amount of spill outside the aircraft
- Vapor suppression of fuel outside the aircraft
- Vapor suppression of fuel still on-board 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

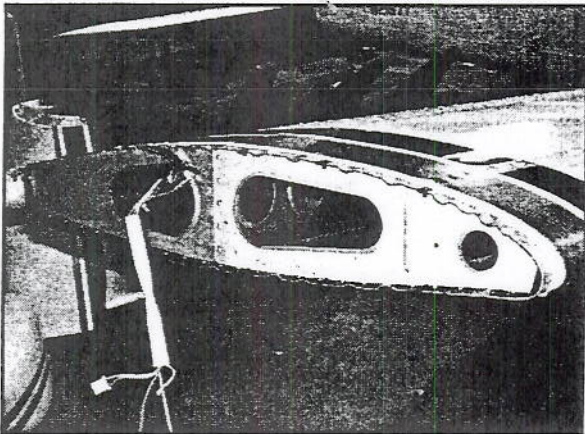
Aircraft Construction Older Aircraft

- 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)

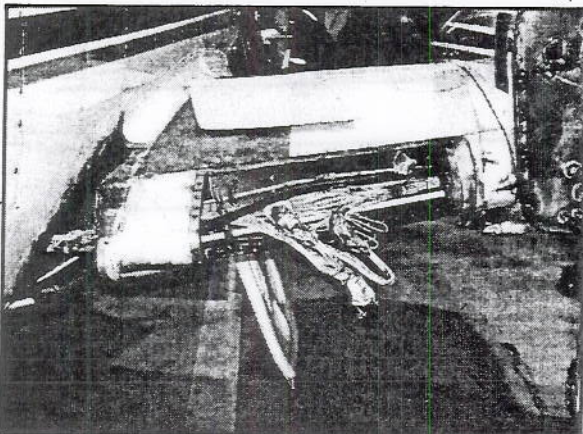


Location of Fuel Lines

- **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

73

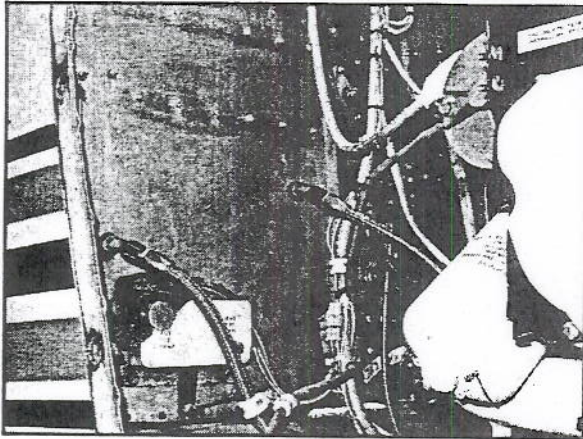


Location of Fuel Lines

- **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

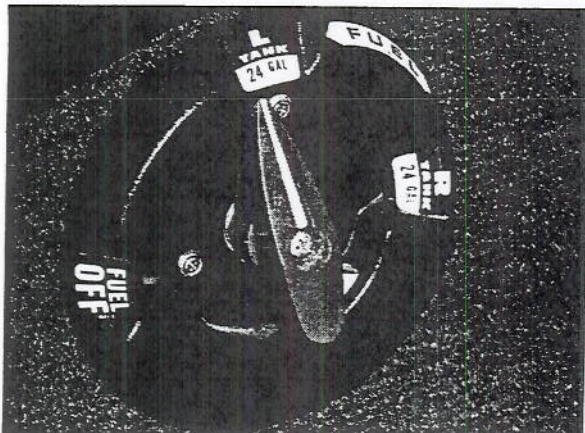
75



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

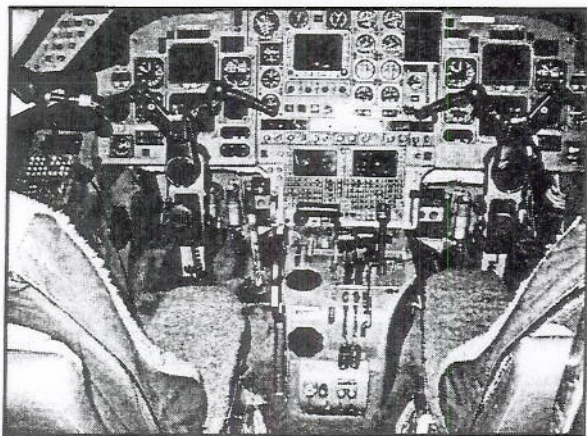
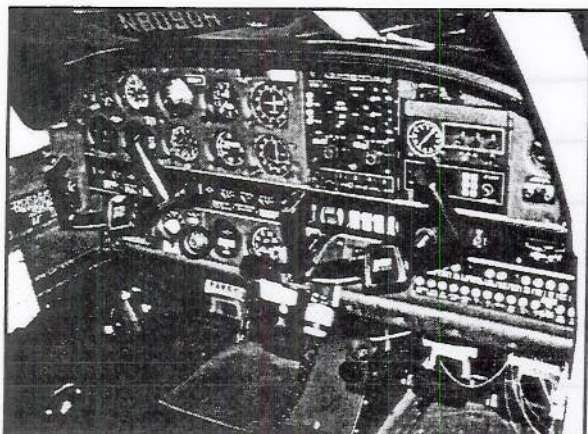
– Most often **RED** in color

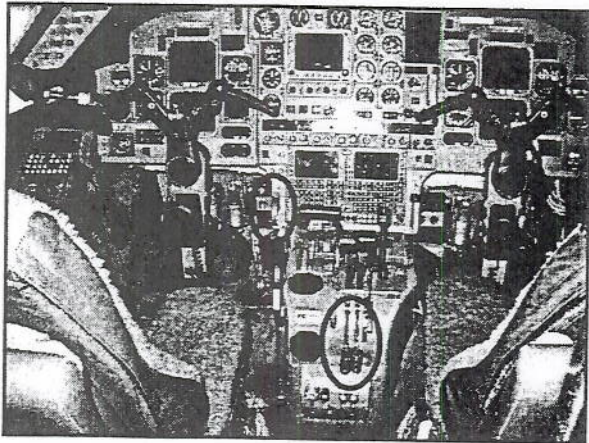


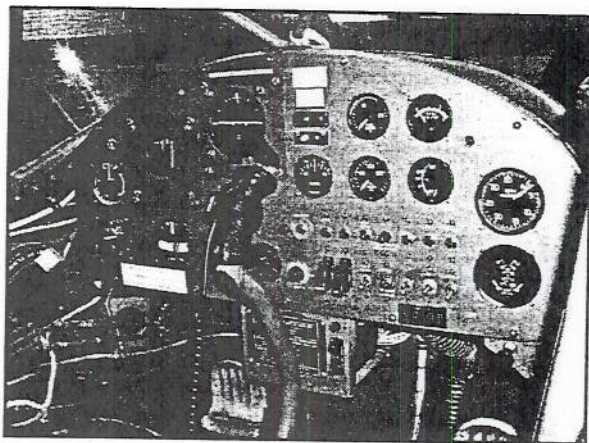
Fuel Shut-off Valve Location

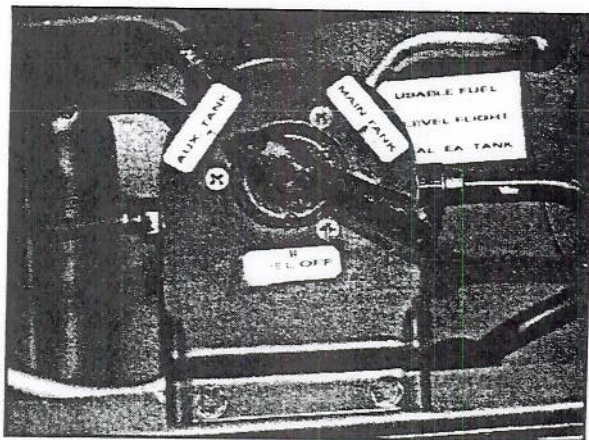
- Lower edges of the instrument panel
- On the wall of the interior fuselage around knee height
- On the floor between the seats just below the center of the instrument panel

79



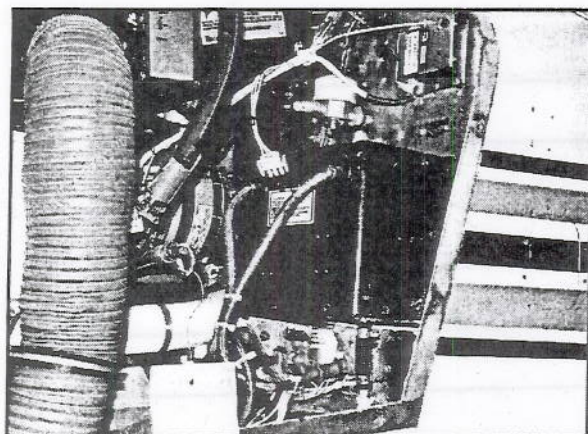
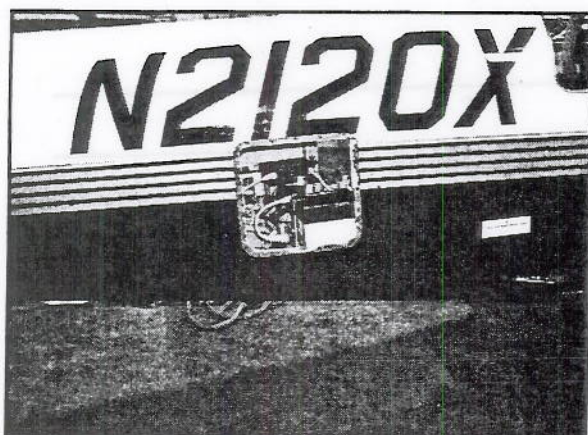






Battery Location – Single Engine

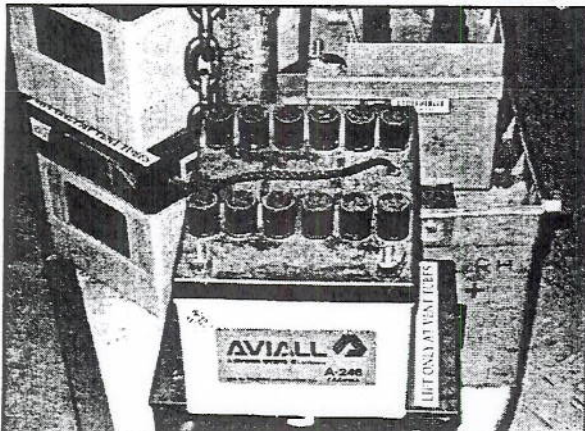
- Engine Compartment
- Wing Area
- Tail Section
- Mid-fuselage on a Rack

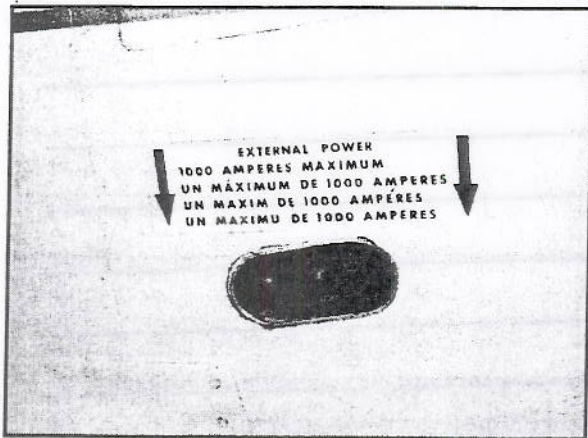


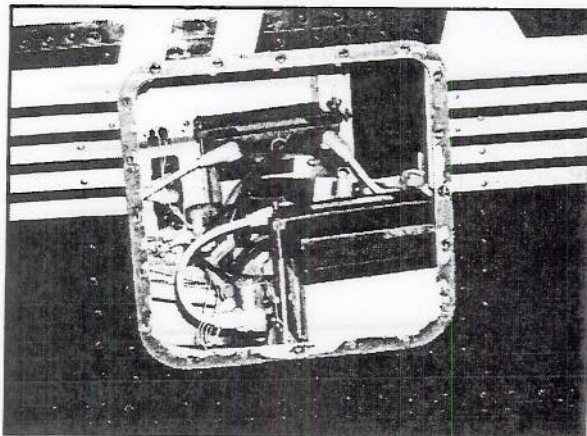
Battery Location – Twin Engine

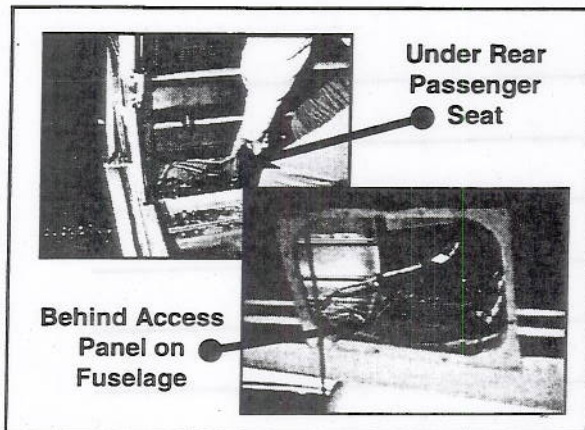
- Nose or Forward Section
- Wings
- Between the Engine and the Cabin

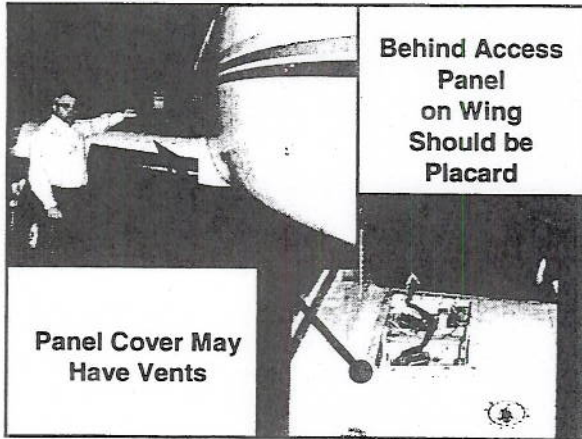
**The best way to disable the
electrical system is to
disconnect the battery**





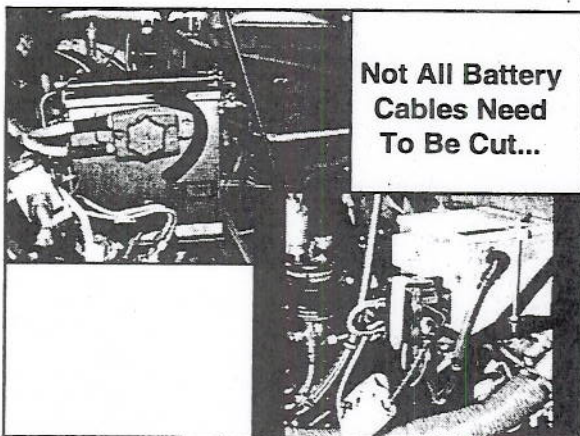






**Behind Access
Panel
on Wing
Should be
Placard**

**Panel Cover May
Have Vents**

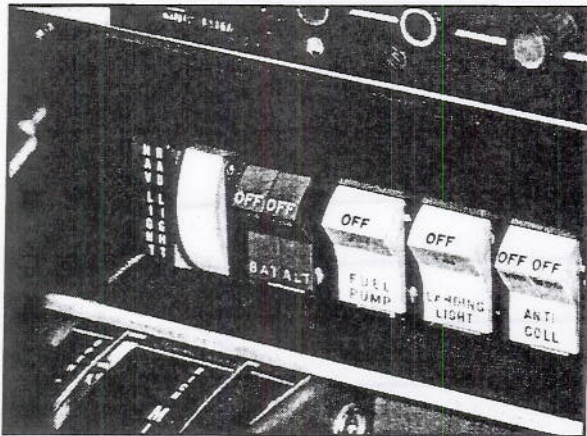


**Not All Battery
Cables Need
To Be Cut...**



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

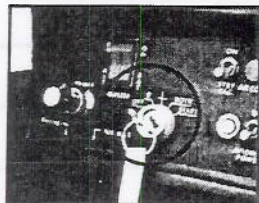
**Battery Master
Switch Should
Shut Off Most
Battery Items**





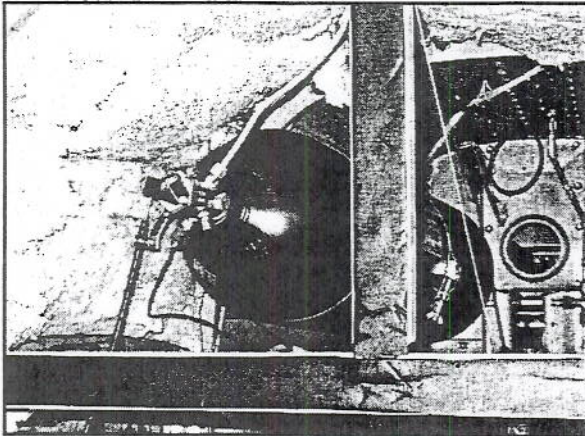
**Piston Engine Aircraft
Use
Magnetos to Provide
Spark and
Will Fire Even Without
A Battery**

**Always Treat A Propeller
Like it's HOT
Even With The Switch in
The Off Position**



Oxygen Systems

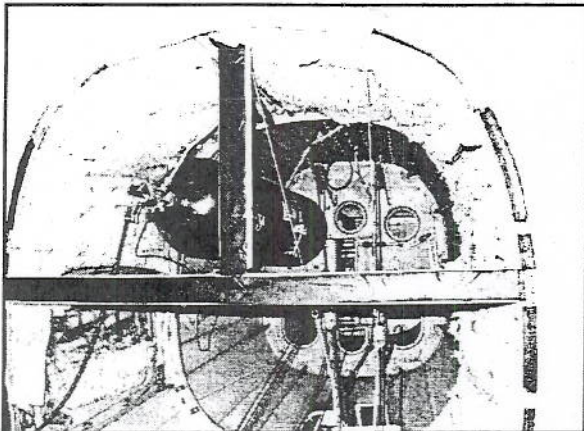
- **Built-in Systems**
 - Tanks located in the nose or tail
 - Connected by tubing running throughout the aircraft
- **Portable Systems**
 - Looks like a "D" or "E" oxygen cylinder



**Awareness of O₂ systems
is important**

**Cutting into an O₂ line
could result in a flash fire**

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Gaining Access

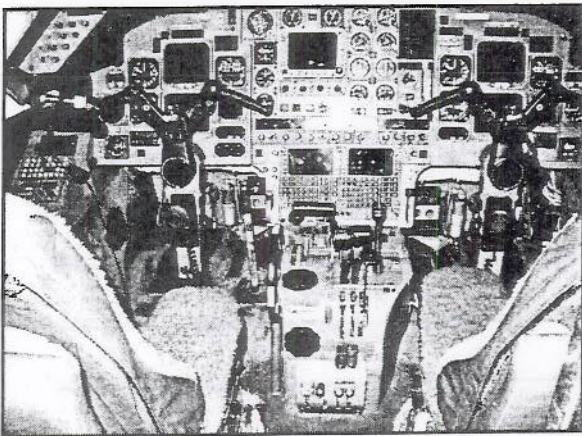
- Aircraft construction
- Egress points
- Know where to cut
 - Doors
 - Windows
 - Thin Skin

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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

104

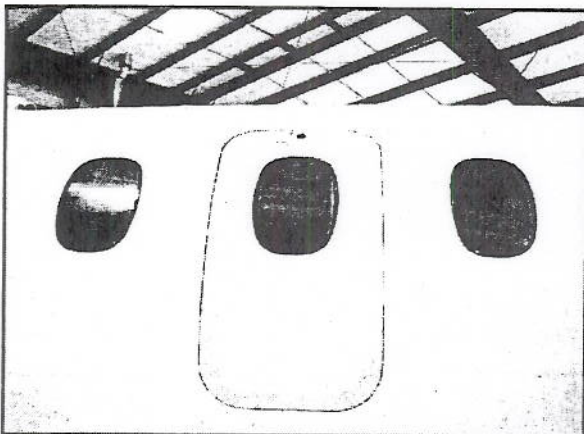


Access Point

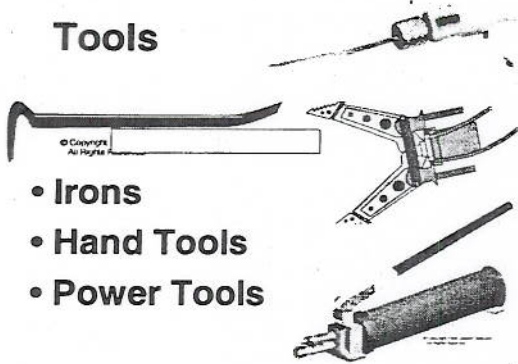
- Doors
- Windows
- Skin

TRY BEFORE YOU PRY!

108

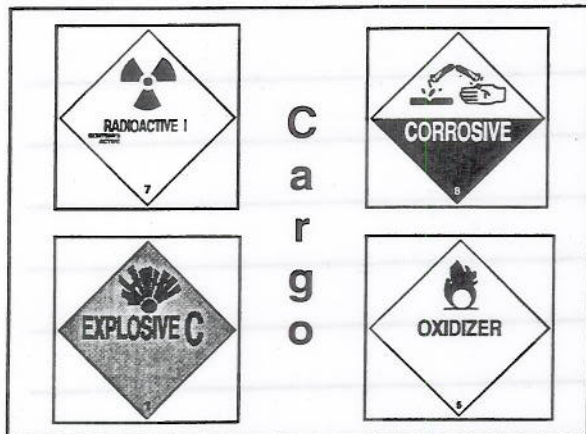


Tools



- Irons
- Hand Tools
- Power Tools

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Cargo and Location Fixed Wing

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

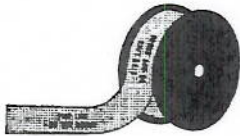
Cargo and Location Helicopters

- Packages
- Industrial Materials
- Sling Cargo
 - Bambi Bucket
 - Electrical / Radio

**The weight of the cargo
is always a factor**

112

**Securing and Safeguarding
the Crash Site**



113

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

114

Treat the entire area as a crime scene

115

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

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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

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**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

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**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

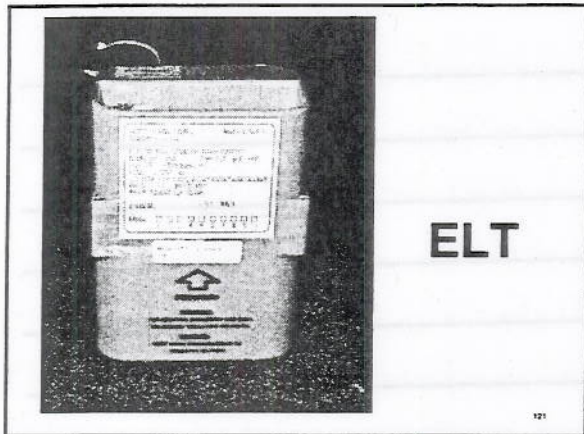
119

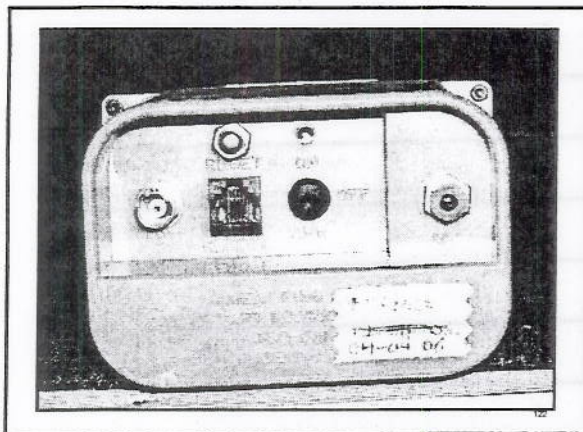
Before The Investigators Arrive

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

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- **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 victims 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!**

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**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



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Agencies to be Notified

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

126

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

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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

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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

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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

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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)

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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

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FAA Areas Of Responsibility *Continued*

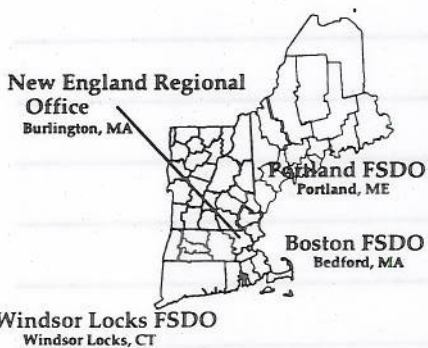
- If the FAR's are adequate to prevent a recurrence
- If air carrier or airport security standards or operations were involved
- If the medical certification standards of airmen were involved

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FAA Accident Investigations

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

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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
