QF-16 ARFF Familiarization

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Introduction

- The F-16 is a single engine, multi-mission all weather fighter aircraft. It is flown by the U.S. Air Force, as well as international customers. Boeing is modifying single-seat A and C Model (Block 15, 25 & 30) F-16s into the QF-16 Full Scale Aerial Target, which can be flown with or without a pilot*.
- The objectives of this course is to familiarize personnel with QF-16 ARFF procedures and hazards, as well as emergency pilot egress. This course is a supplement to T.O. 00-105E-9 for the production F-16.
- ARFF tactics will be reviewed and discussed.

*All flights in Jacksonville area will be **manned**

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Agenda

Classroom session immediately followed by a practical "hands on" session at the aircraft.

Each session will take approximately 30 minutes, for a total training session of 1 hr.

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Special Tools and Equipment

- Power Rescue Saw (K-12 or other carbide tipped blade)
- ¼ inch drive Socket / Speed Handle
- 0.149 to 0.125 diameter drill rod at least 8 inches (canopy unlock)
- Wire cutters/Dikes (MFSOV) / 9/64 bit for MFSOV door (A model aircraft)

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Safety Pins

- 2 Ejection seat
- 2 Canopy jettison
- 3 Landing gear
- 1 Arresting hook
- 1 EPU
- 1 Centerline fuel tank (if installed)
- 1 Chaff/Flare buckets (if used)

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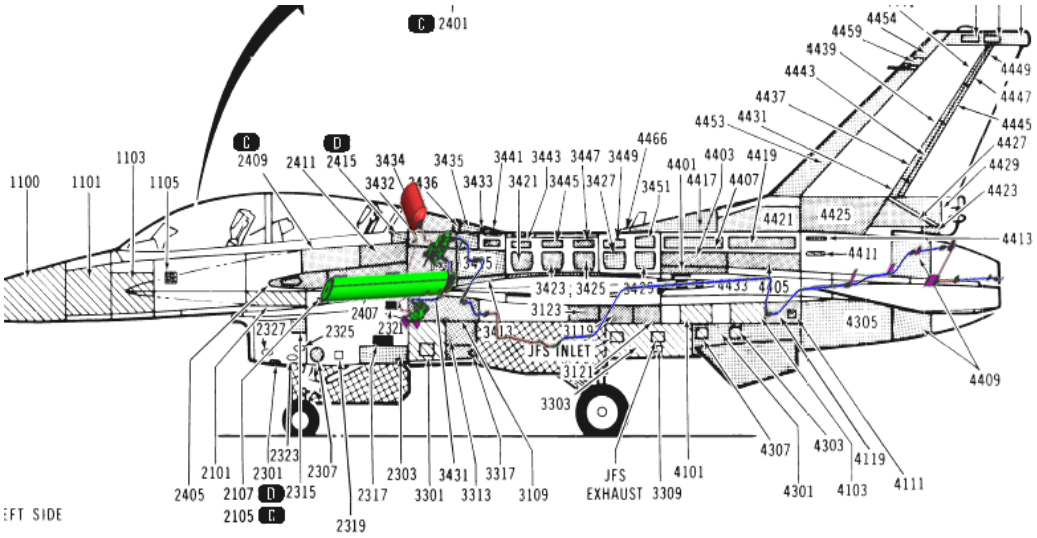
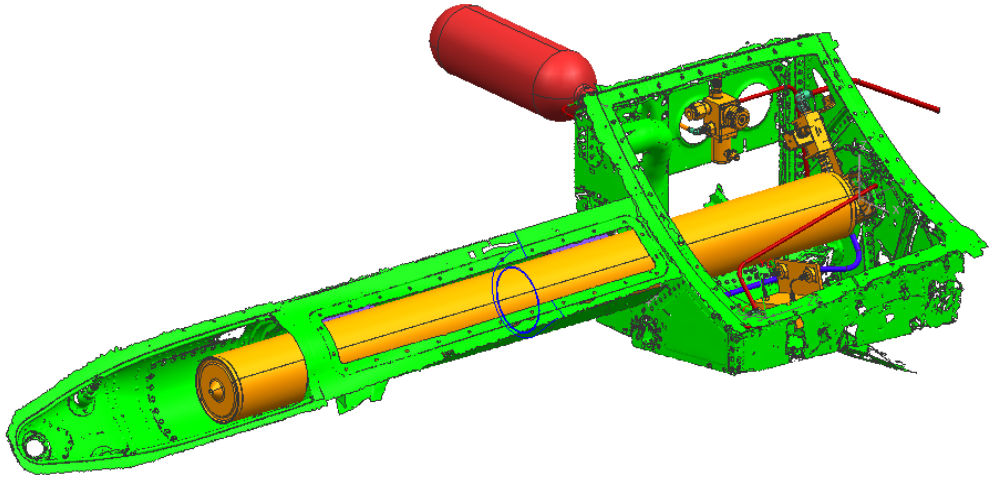
QF-16 Visual Augmentation System (VAS)



Overall Arrangement of Components in Former Gun Spaces



- VAS is similar to USAF Thunderbirds smoke system
- ~10 minute supply of 10-10 oil (6.7 gallons)

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QF-16 General Aircraft Information

Fluid Quantities

Jet-A / JP-8 Fuel

- 1,020 gallons maximum internal
- Centerline Tank - 300 gallons

Oils

- MIL-SPEC-7808 Engine/ADG/CSD Oil - 3 gallons
- MIL-SPEC 83282 Hydraulic Fluid - 5 gallons
- VAS 10-10 oil - 6.7 gallons

Hydrazine - 6.8 gallons

LOX - 5 liters

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QF-16 General Aircraft Information continued

Ballistic / Explosive Devices

- **20 mm Cannon – Gun and ammo drum removed for QF-16**
- **Chaff/Flares - Not used in Jacksonville area**
- **Pylon Ejectors – Centerline fuel tank only**
- **Ejection Seat – ACES II**
- **Canopy Jettison Rockets and Detonation Transfer Assembly (DTA) Lines – Inside and near canopy frame**

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QF-16 General Aircraft Information continued

Pressure Vessels / Components / Systems

- Hydraulic system components 3,250 psi
- VAS Nitrogen tank 3,000 psi – Inside ammo bay
- Tires

Batteries – Six (6)

- 4 FLCS (Flight Controls)
- 1 INU (Inertial Navigation Unit)
- 1 Main battery

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QF-16 Airframe Materials

F-16.8

AIRFRAME MATERIALS

WARNING

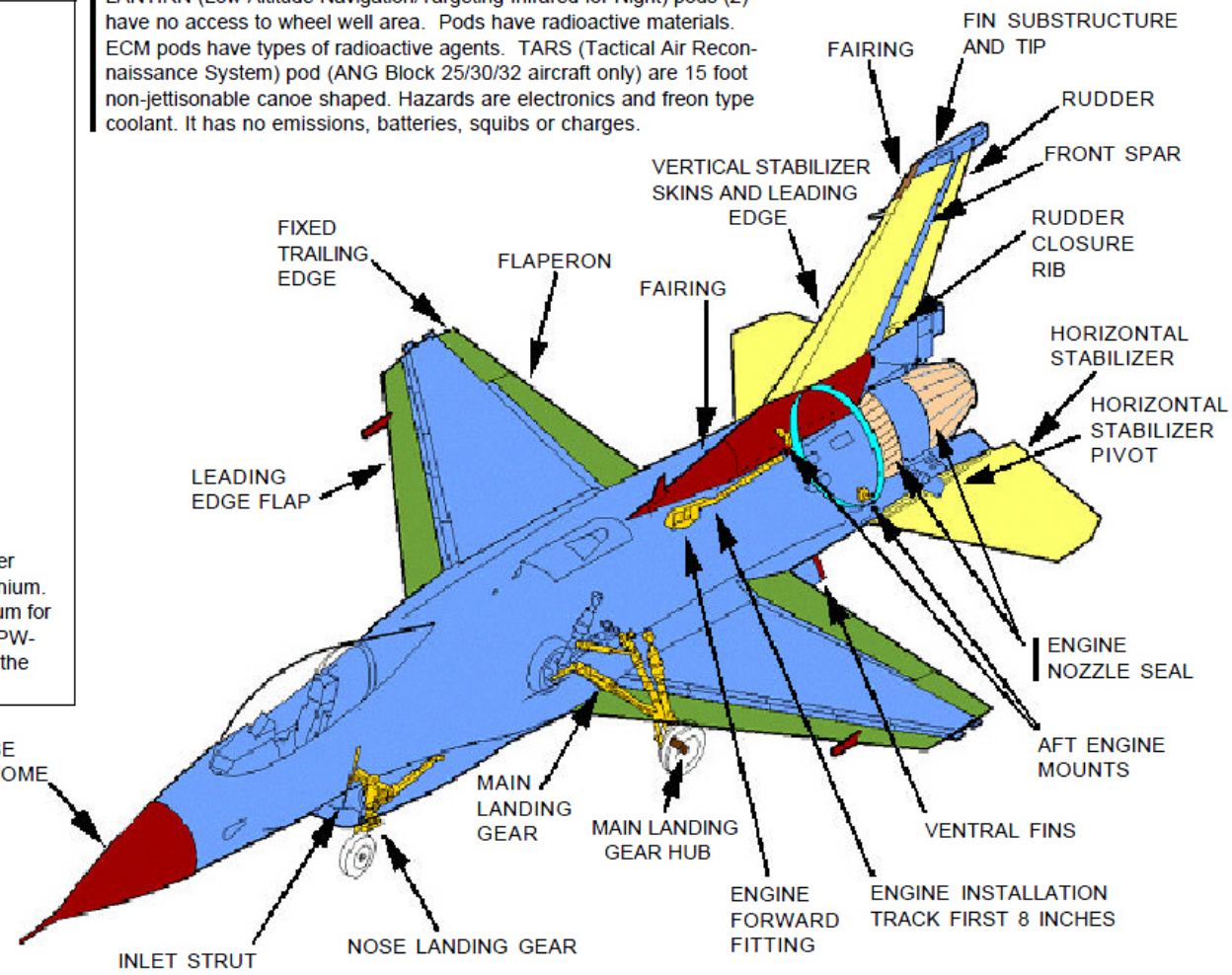
LANTIRN (Low Altitude Navigation/Targeting Infrared for Night) pods (2) have no access to wheel well area. Pods have radioactive materials. ECM pods have types of radioactive agents. TARS (Tactical Air Reconnaissance System) pod (ANG Block 25/30/32 aircraft only) are 15 foot non-jettisonable canoe shaped. Hazards are electronics and freon type coolant. It has no emissions, batteries, squibs or charges.

LEGEND

- ALUMINUM - 78.4%
- STEEL - 11.0%
- TITANIUM - 0.8%
- COMPOSITE - 3.0%
- FIBERGLASS - 6.8%
- M300 STEEL - 6.8%
- BONDED FULL DEPTH CORE - 6.8%

NOTE:
Engine heat shield and lower wing attach fittings are Titanium. The engine nozzle is Titanium for GE engines and the F100-PW-200/220 and composite for the F100-PW-229.

F-16



T.O. 00-105E-9

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QF-16 Airframe Materials continued

AIRFRAME MATERIALS-Continued

COMPOSITE WEIGHTS

NOTE:
Use the legend on page F-16.7 for composites color coding.

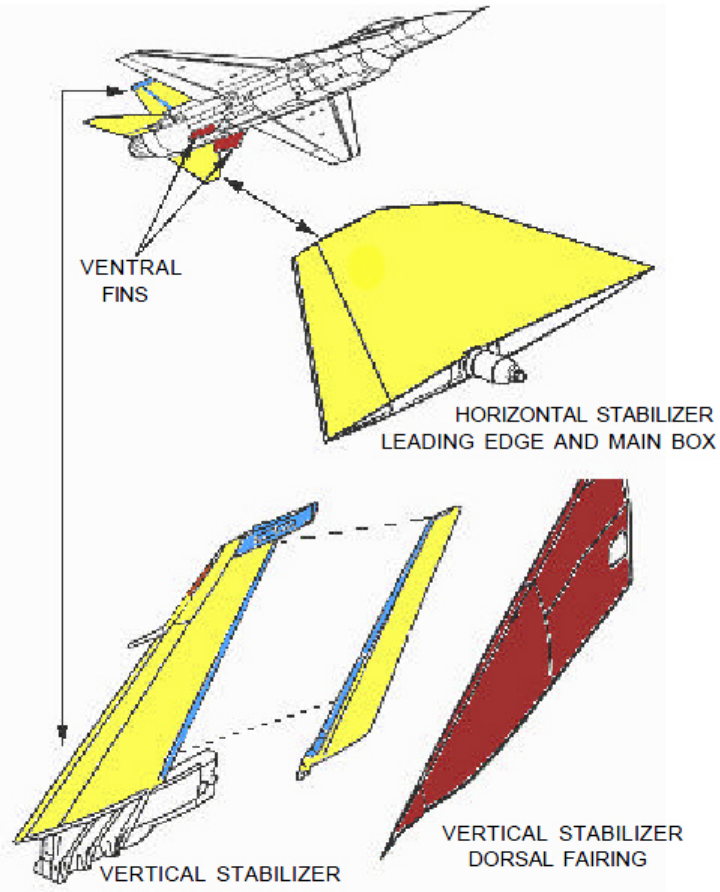
Various type versions of the F-16 use 171-222 pounds of composite materials for the skins of the horizontal tails, vertical fin and rudder, as well as certain structure inside the vertical fin.

F-16A/B: Small Tail 171 1lbs
F-16A/B: Big Tail 222.6 lbs
F-16C/D: 222.3 lbs

F-16 C/D COMPOSITE MATERIALS LOCATION AND DESCRIPTION
Composite materials are in the ventral fins, vertical and horizontal stabilizers and radome. Because of redesigns, expect to find other miscellaneous aircraft parts made out of composite materials. The C/D ventral fin is a bonded assembly that incorporates a fiberglass epoxy sandwich laminate in the aft region. The core is an organic material. The horizontal stabilizer consists of two basic structures, the main box and the leading edge assembly. The main box is skinned with a carbon fiber epoxy laminate. The laminate's surface layer is a glass woven fabric. Underneath the fabric layer are layers of unidirectional carbon fiber/ epoxy tape. Each tape layer has a specific fiber orientation. This will be obvious when looking at an impact-damaged piece. There may be woven fabrics dispersed among the tape layers. The laminate is bonded to a corrugated aluminum surface. There is a layer of fiberglass between the aluminum surface and the carbon fiber layer.

The leading edge is a sandwiched composite. The skin is a carbon fiber epoxy laminate bonded to an aluminum honeycomb core. A carbon fiber epoxy channel section is used as an aft closure beam bonded to the sandwiched laminate. A fiberglass wedge is used as a leading edge closure capped with stainless steel.

The radome is a glass/epoxy filament wound composite with a surface layer of a woven glass fabric. The F-16 radome fiber directions are longitudinal and circumferential. The fin box of the vertical tail is skinned with carbon fiber epoxy laminate. The lower fin leading edge is a carbon fiber/epoxy sandwich laminate. The rudder contains a carbon fiber / epoxy sandwich laminate. The core is an aluminum honeycomb material. The vertical tail dorsal fairing skin is fiberglass.



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Aircraft Danger Areas

Gun - Removed for QF-16
Missile Forward Zone - N/A for QF-16
Radar Hazard - N/A for QF-16
Antenna RF Hazards – Added antennae for QF-16
Canopy Jettison / Ejection Seat
Engine Inlet - 25 feet, regardless of thrust
Engine Exhaust – PW and GE Engines
Engine Turbine Plane of Rotation – Leading Edge of Stabs
JFS Plane of Rotation – L/H Wingtip Inbd to Engine Bay
JFS Exhaust – L/H Aft Fuselage
EPU (Hydrazine) Exhaust – R/H Fwd Wing Root Area
ECS Exhaust – L/H Main Gear Wheel Well (Fwd Wall)
Landing Gear
Tail hook - Hydraulic
Flight Controls - Hydraulic
Tires / Hot Brakes

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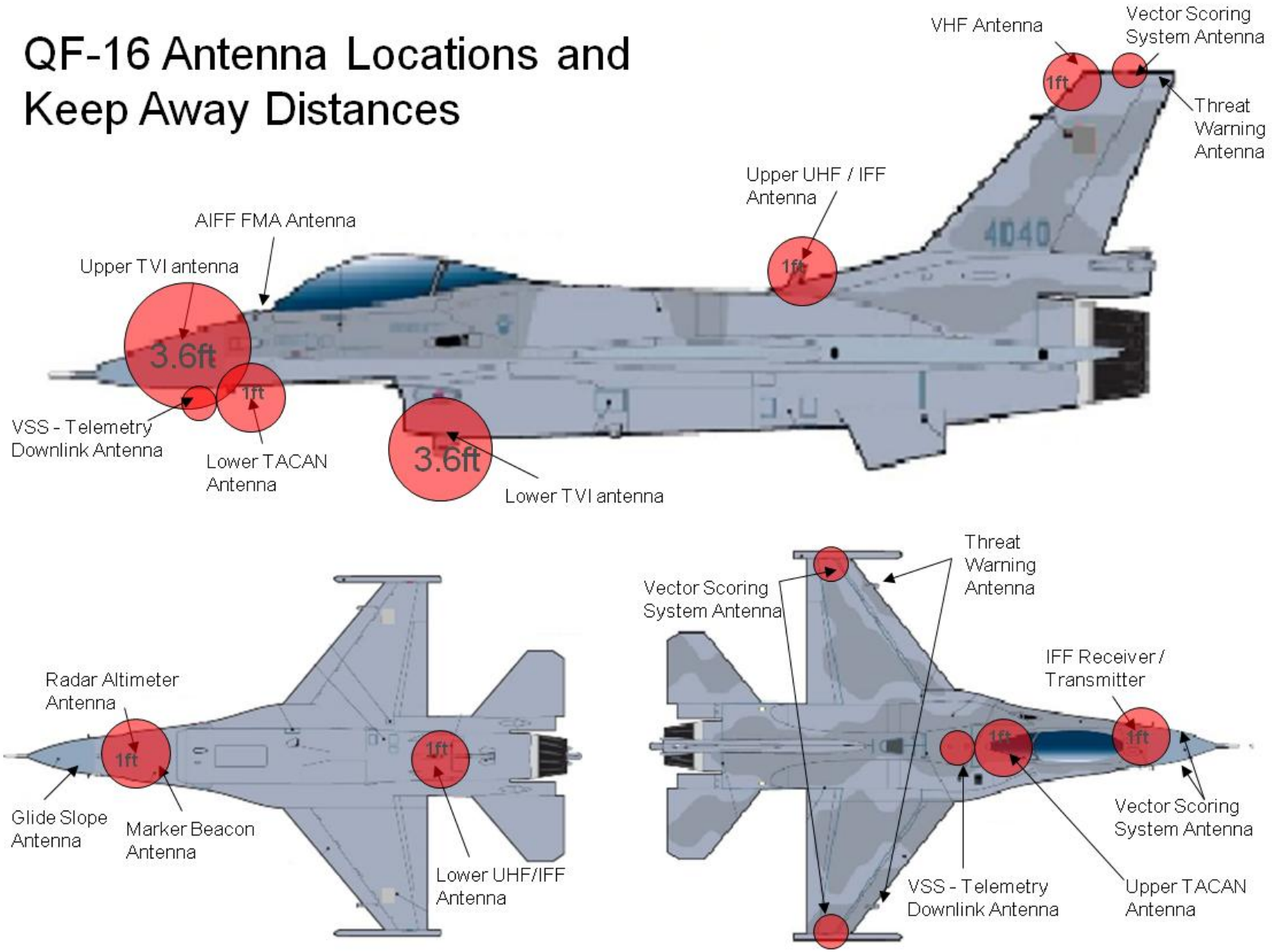
QF-16 Antenna Locations and Keep Away Distances



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Engine Inlet

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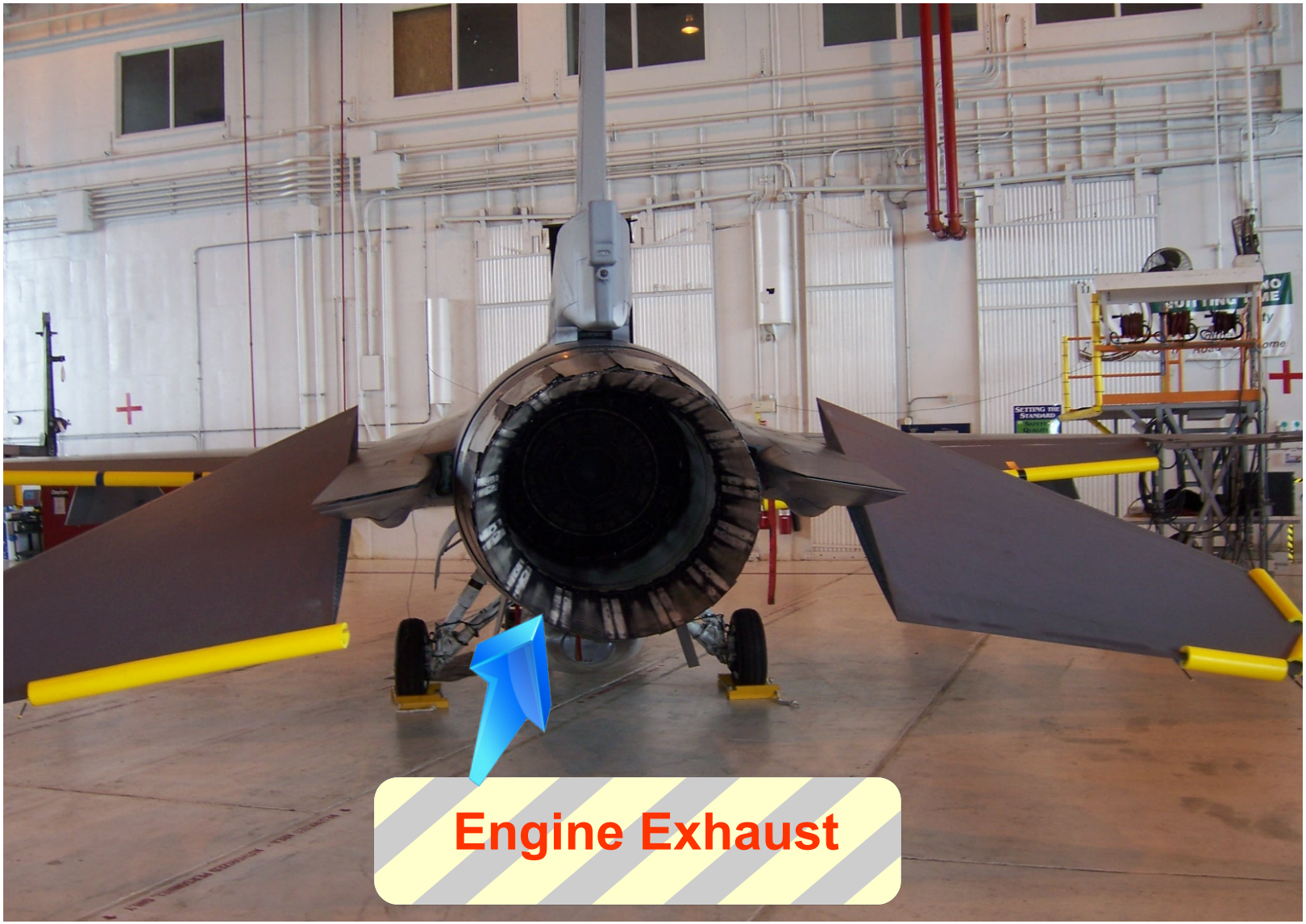
Jet Engine Exhaust



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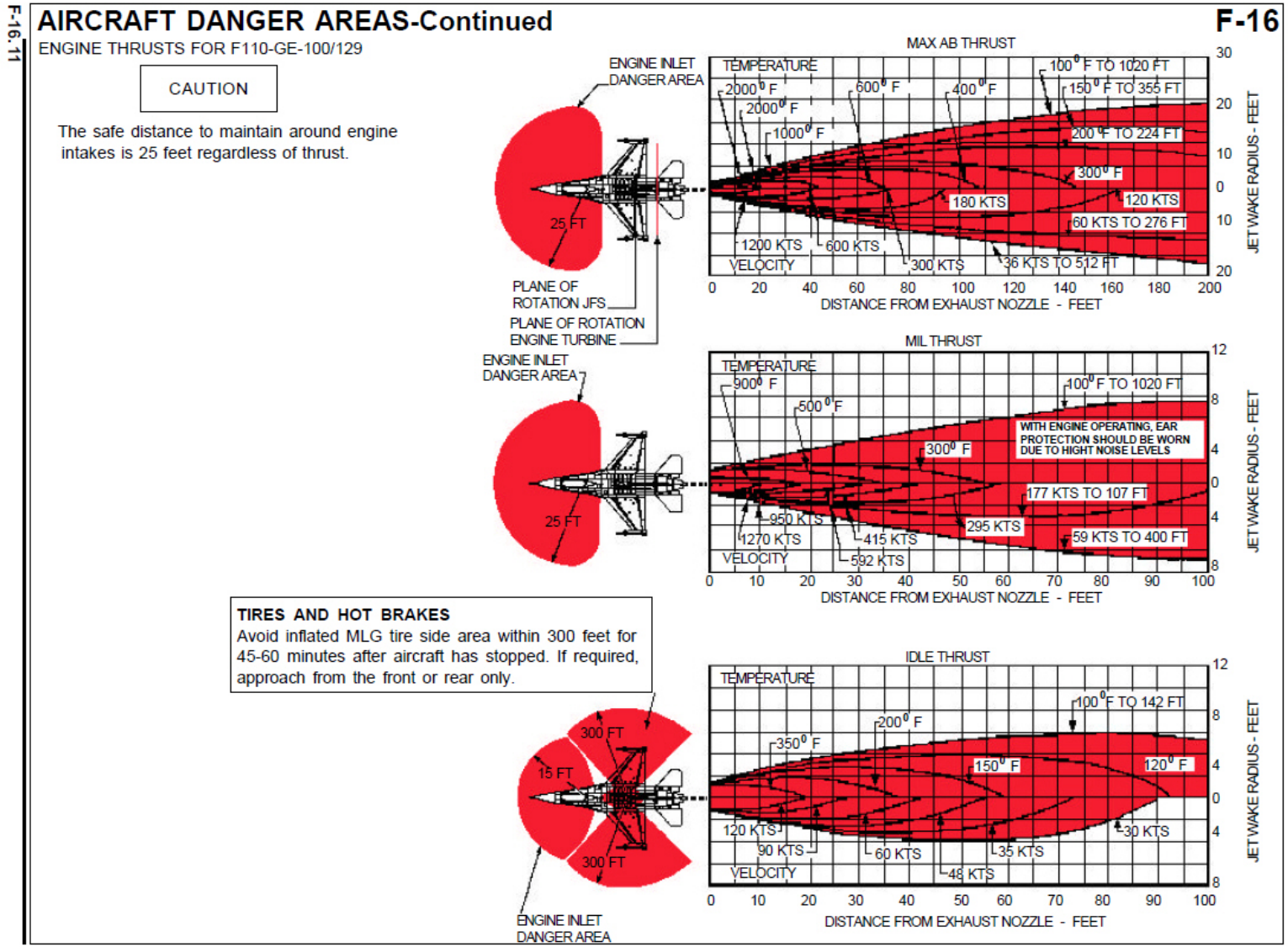
GE Engine, JFS, Inlet, Turbine Plane



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Pratt Engine, JFS, Inlet, Turbine Plane

F-16. 12

AIRCRAFT DANGER AREAS-Continued

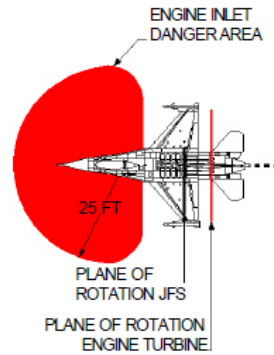
F-16

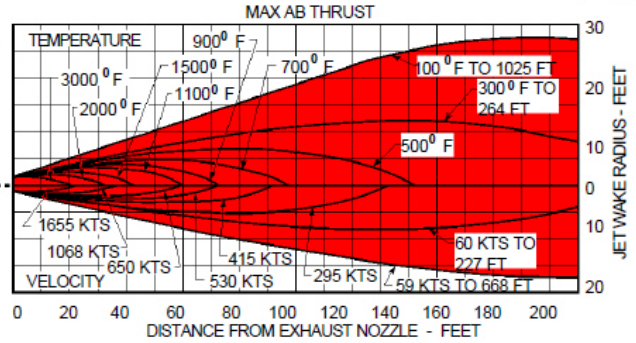
T.O. 00-105E-9

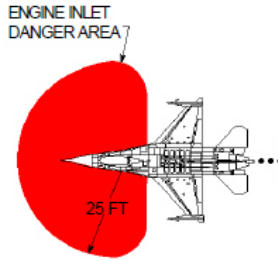
ENGINE THRUSTS FOR F100-PW-200/220

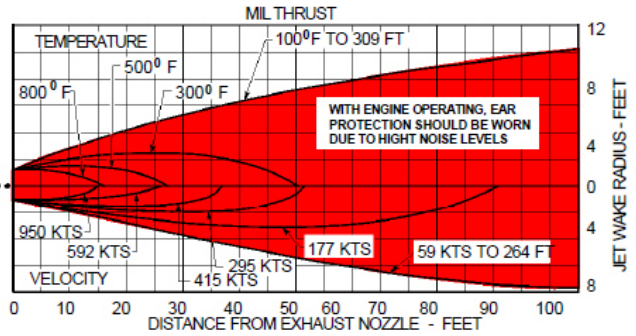
CAUTION

The safe distance to maintain around engine intakes is 25 feet regardless of thrust.

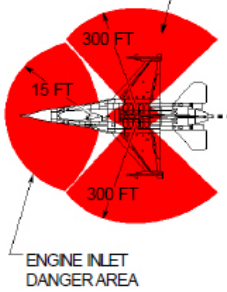


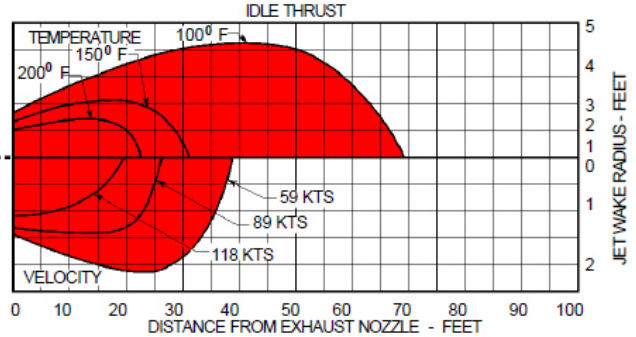






TIRES AND HOT BRAKES
Avoid inflated MLG tire side area within 300 feet for 45-60 minutes after aircraft has stopped. If required, approach from the front or rear only.





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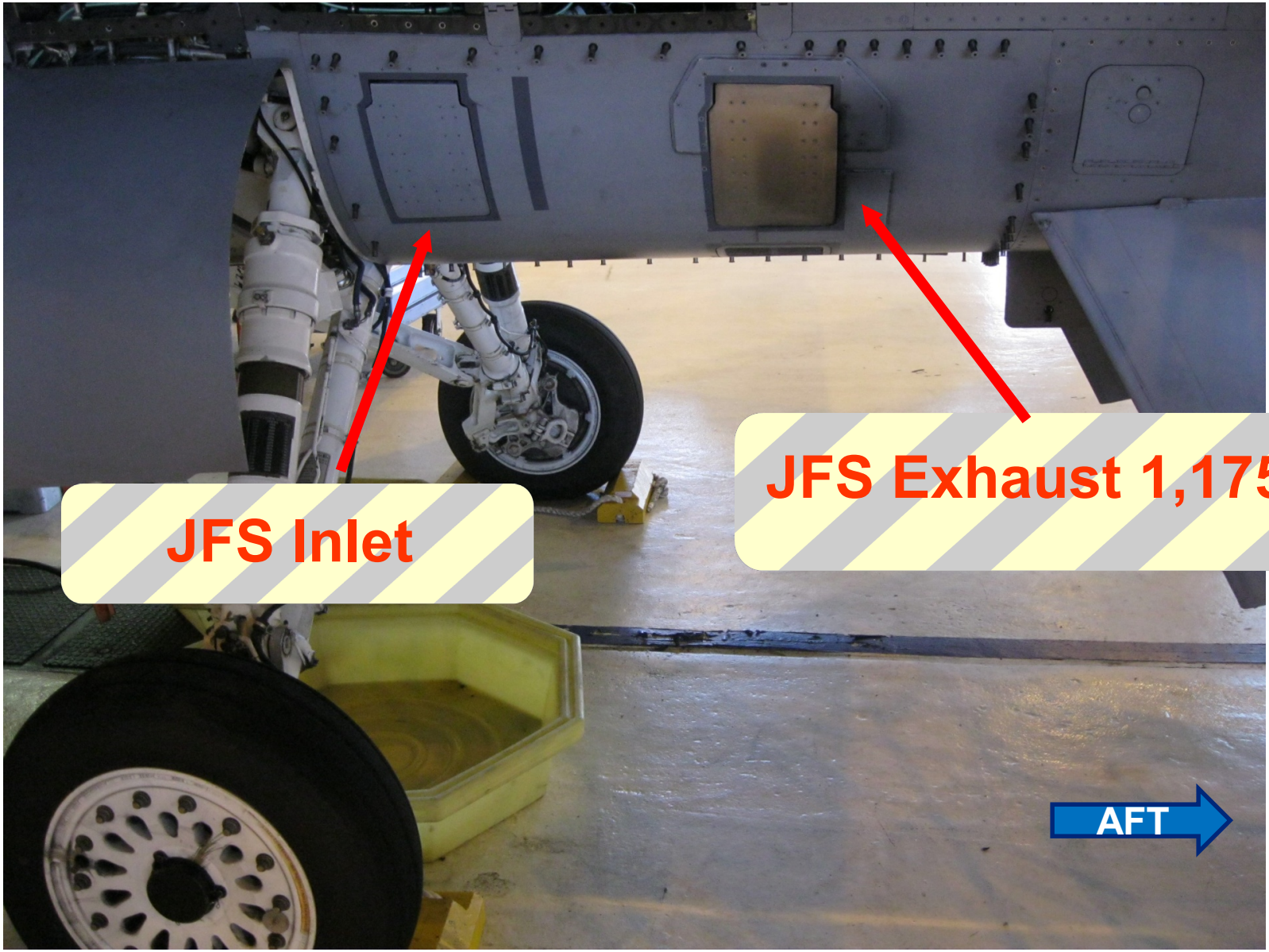
Jet Fuel Starter - JFS



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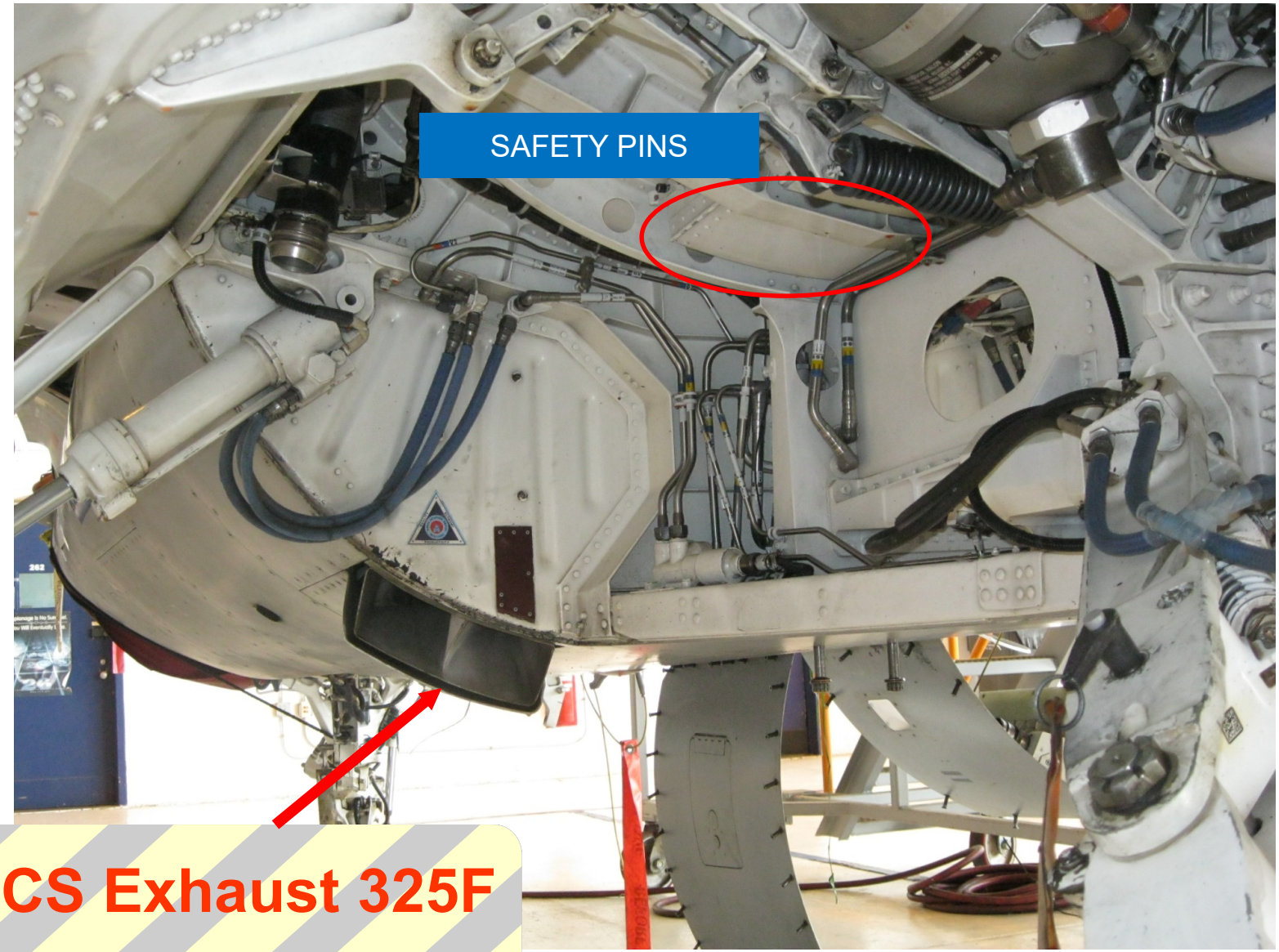
ECS Exhaust – L/H Wheel Well



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Ejection Seat

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VAS Oil Tank (Replaced Gun)

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Tail Hook

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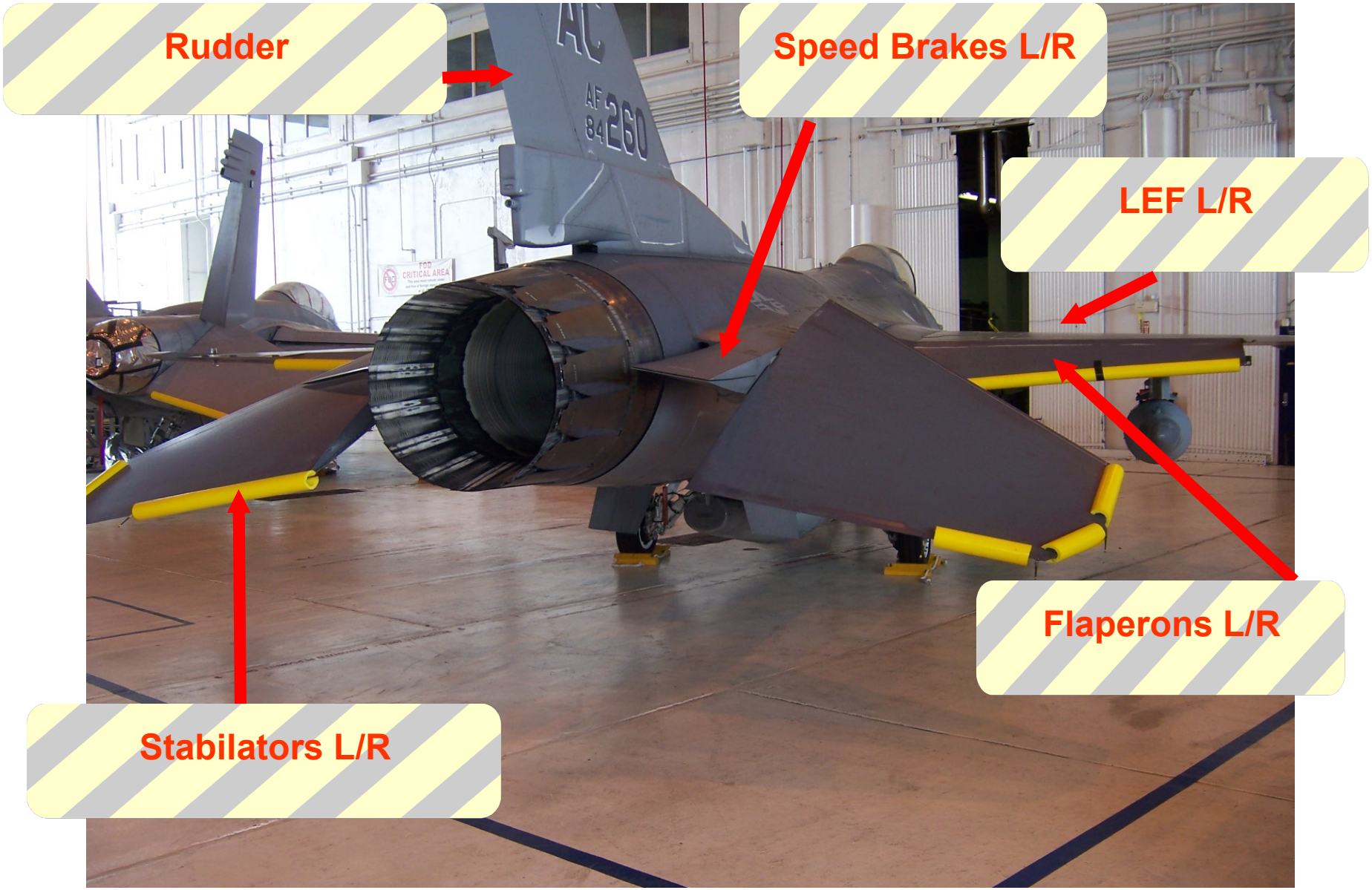
Flight Controls



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Aircraft Entry

AIRCRAFT ENTRY

CAUTION

Entry procedures vary if engine is running. Pilot maybe active or incapacitated and condition of aircraft is uncertain. Refer to either normal or emergency procedures.

WARNING

Personnel will not approach engine intake closer than 5 feet from either side or rear and maintain a safe distance of 25 feet from front of intake regardless of thrust. DO NOT PIN NOSE GEAR OR THE EPU UNTIL ENGINE IS SHUTDOWN! PERSONNEL IN THIS AREA ARE IN THE ENGINE INTAKE DANGER ZONE AND THE SAFETY PINS AND STREAMERS ARE CONSIDERED F.O.D. HAZARDS.

WARNING

FOR AN ACTIVATED EPU

The EPU is no longer required to be safed after EPU activation and/or until engine is shutdown. The EPU contains 6.8 gallons of hydrazine fuel. Safety pinning an activated EPU unnessarily places firefighters/rescue personnel in imminent danger working near the engine intake. Disregarding this WARNING could result in injury or death to rescue personnel and possible engine F.O.D. with the EPU safety pin assembly. (See Danger Zones on pages 11 thru 13.)

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Cockpit Entry Procedures

Normal Entry

If canopy is NOT locked from the inside, use electrical switch behind door 2105, located on the left wing strake

To Unlock Canopy

- **Use ¼ inch drive socket or speed handle to remove unlock access plug**
- **Insert at least 1/8 inch drill rod into opening and push inboard**
- **Verify canopy unlock handle is raised to unlock position**

Manual Entry

- **Ensure canopy is unlocked per above steps**
- **Rotate canopy opening mechanism clockwise using 1/4 inch drive socket (52- revolutions)**

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External Canopy Switch - Door 2105

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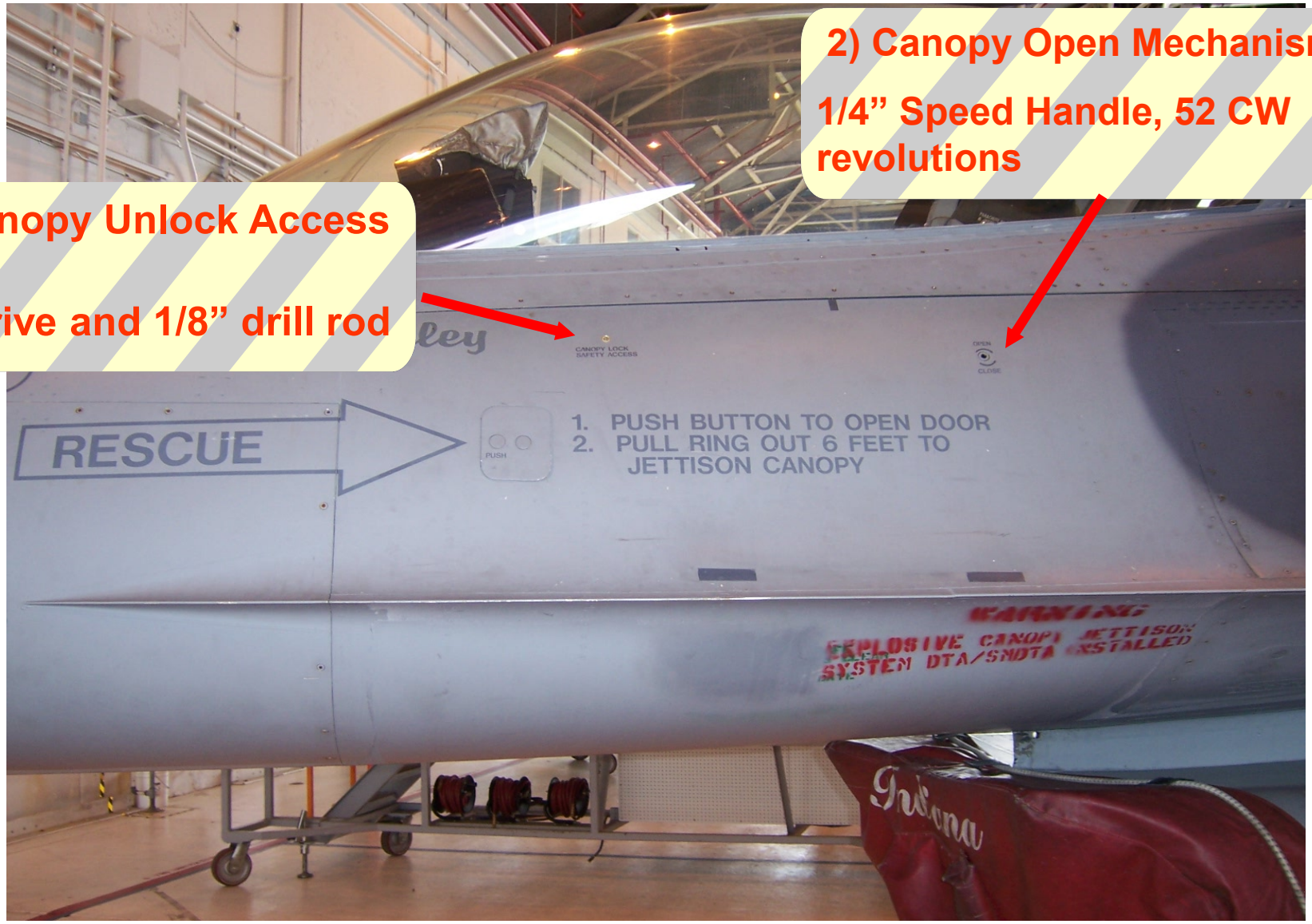
Manual Canopy Opening



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Cockpit Entry Procedures continued

Emergency Entry

Cutting canopy with Carbide Tipped power rescue saw

- Use extreme caution to avoid canopy frame where jettison rockets and ballistic components are located
- Due to strength of canopy, it must be cut from all sides for pilot extraction

Canopy emergency jettison

- Can be performed on either side of cockpit
- Do not jettison canopy if restrained by debris or jammed by crash damage

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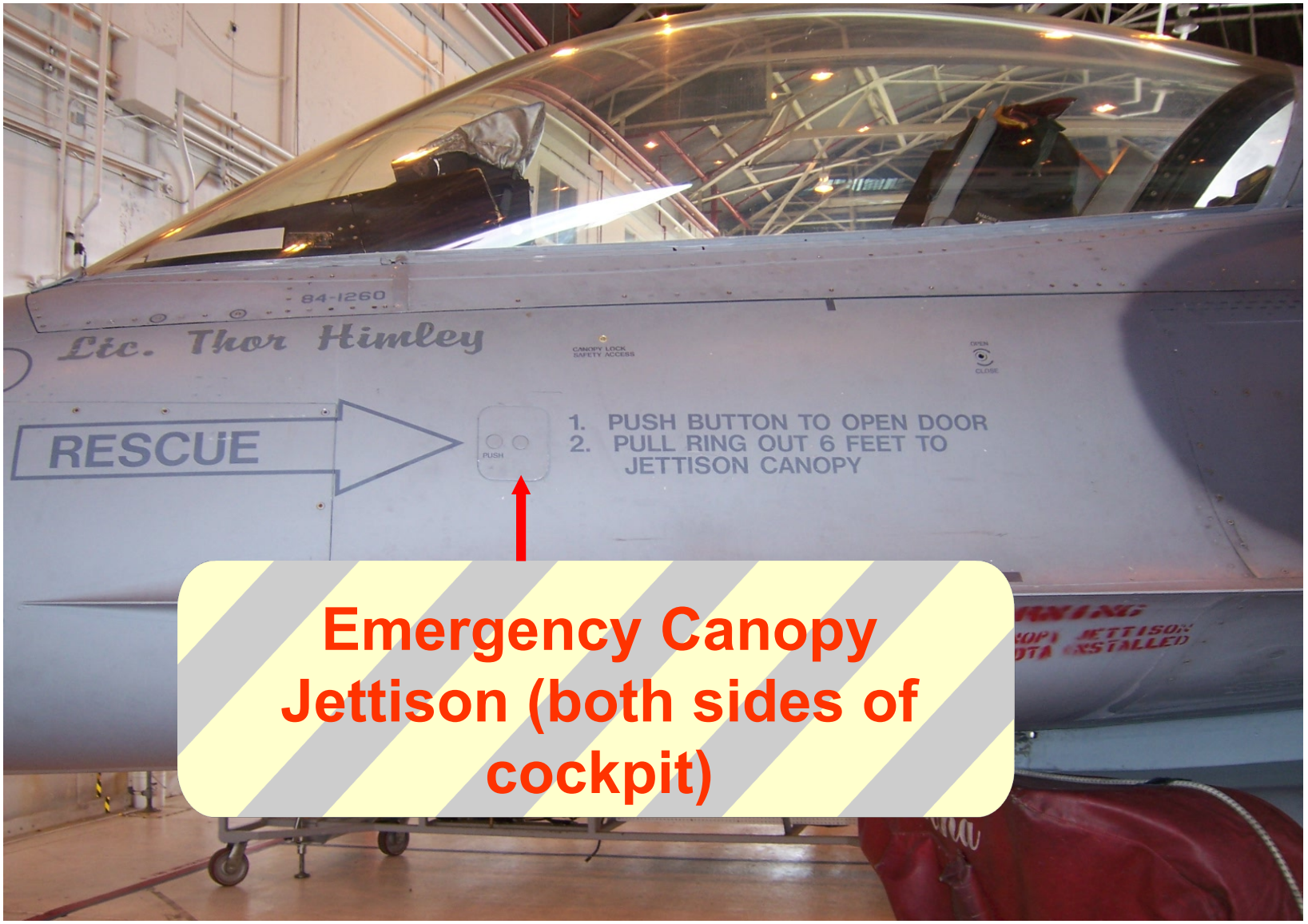
Emergency Canopy Jettison



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Inside the Cockpit

Safe Ejection Seat - Rotate Ground Safety Lever UP and FORWARD.

Throttle – OFF

- While tilting throttle grip upward/outboard and squeezing throttle cutoff release trigger to proceed from IDLE to OFF position.

If needed, Fuel Master – OFF

EPU Switch - OFF

Main Power/Battery switch – OFF

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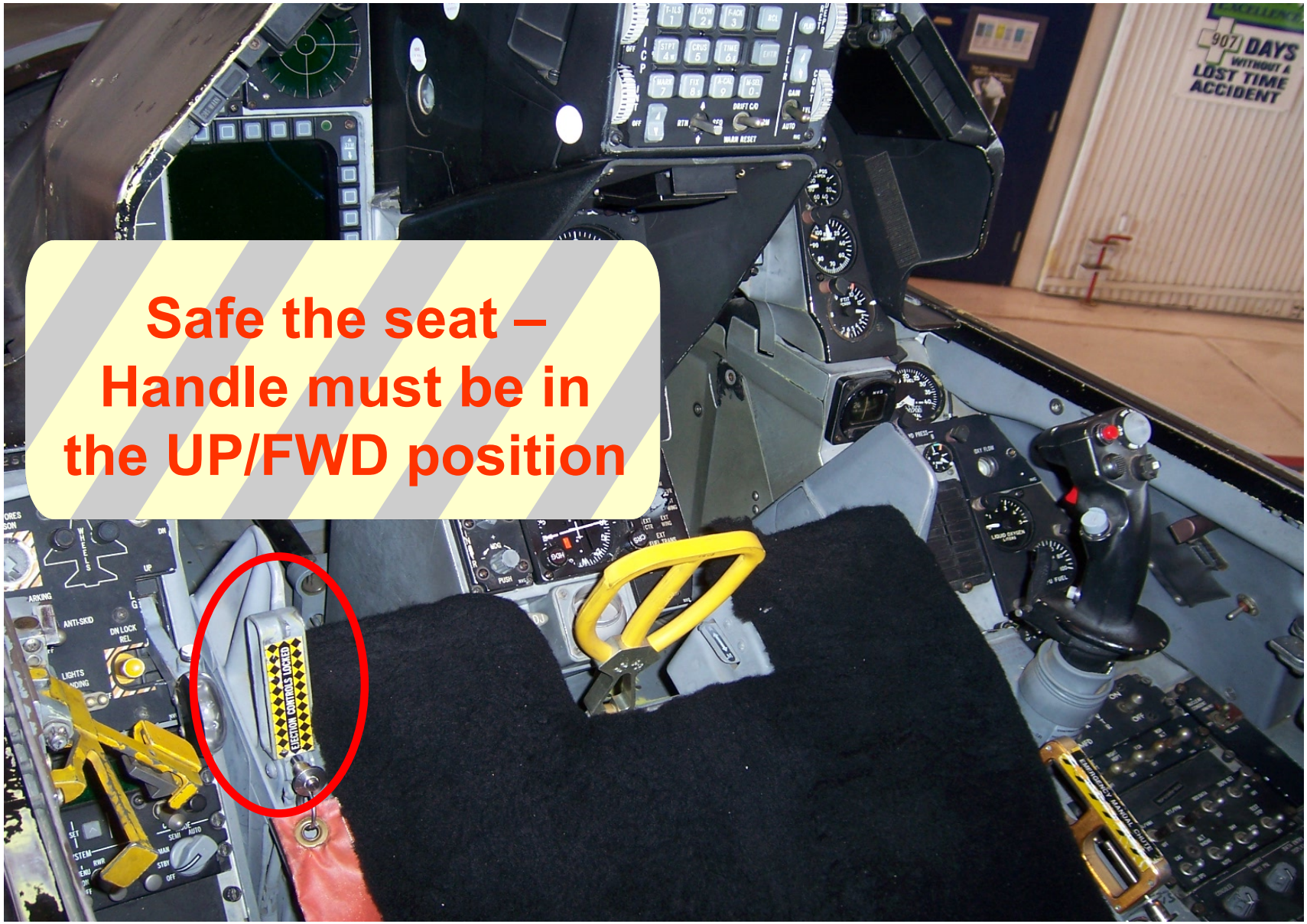
Safe the Seat



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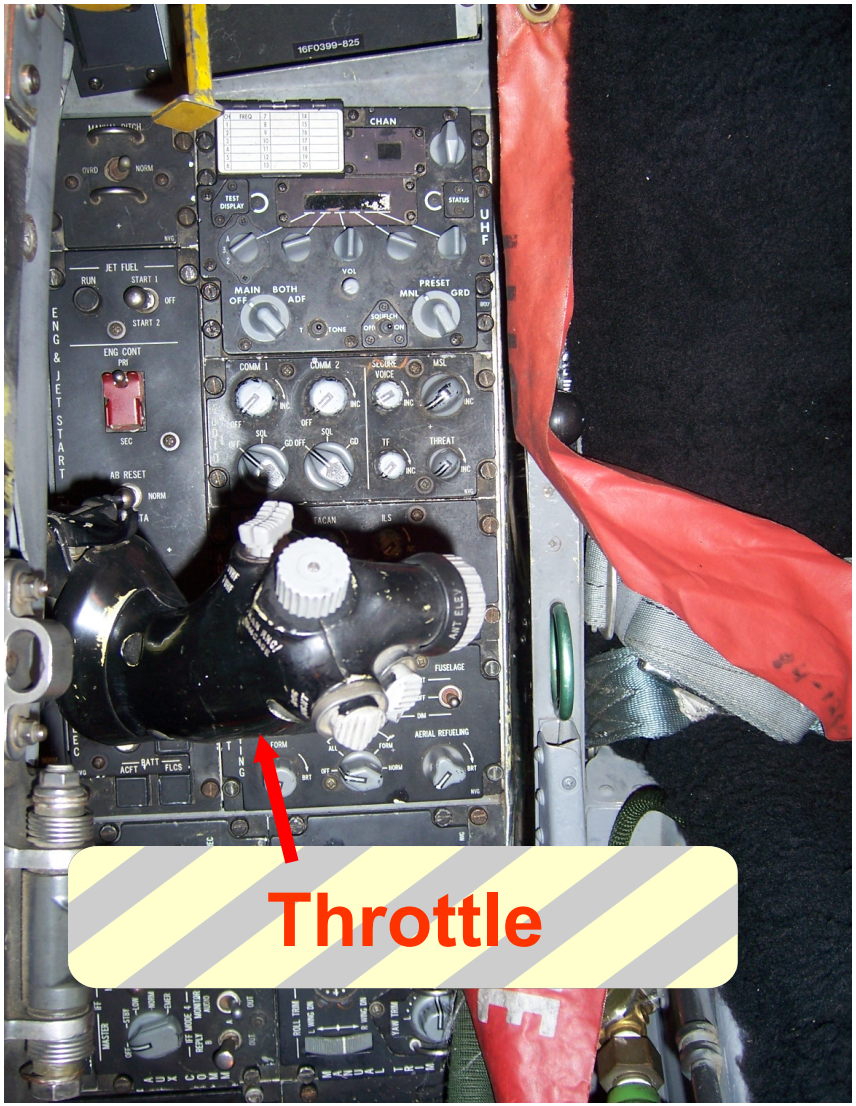
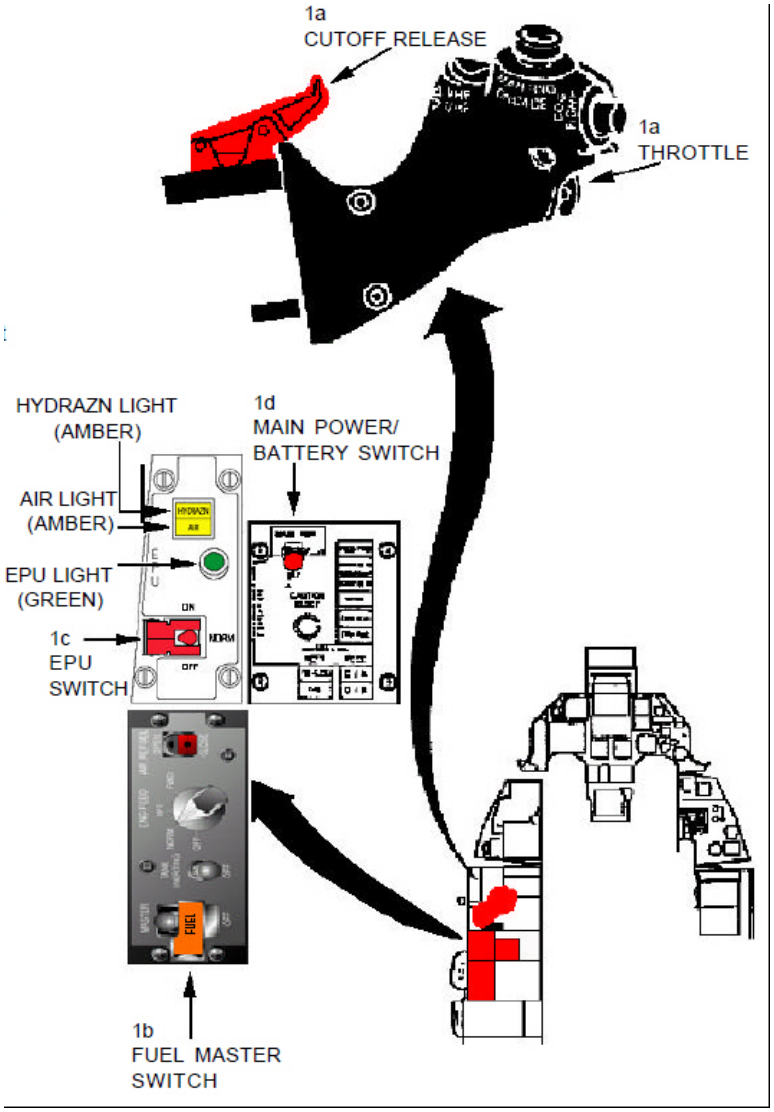
Left Console





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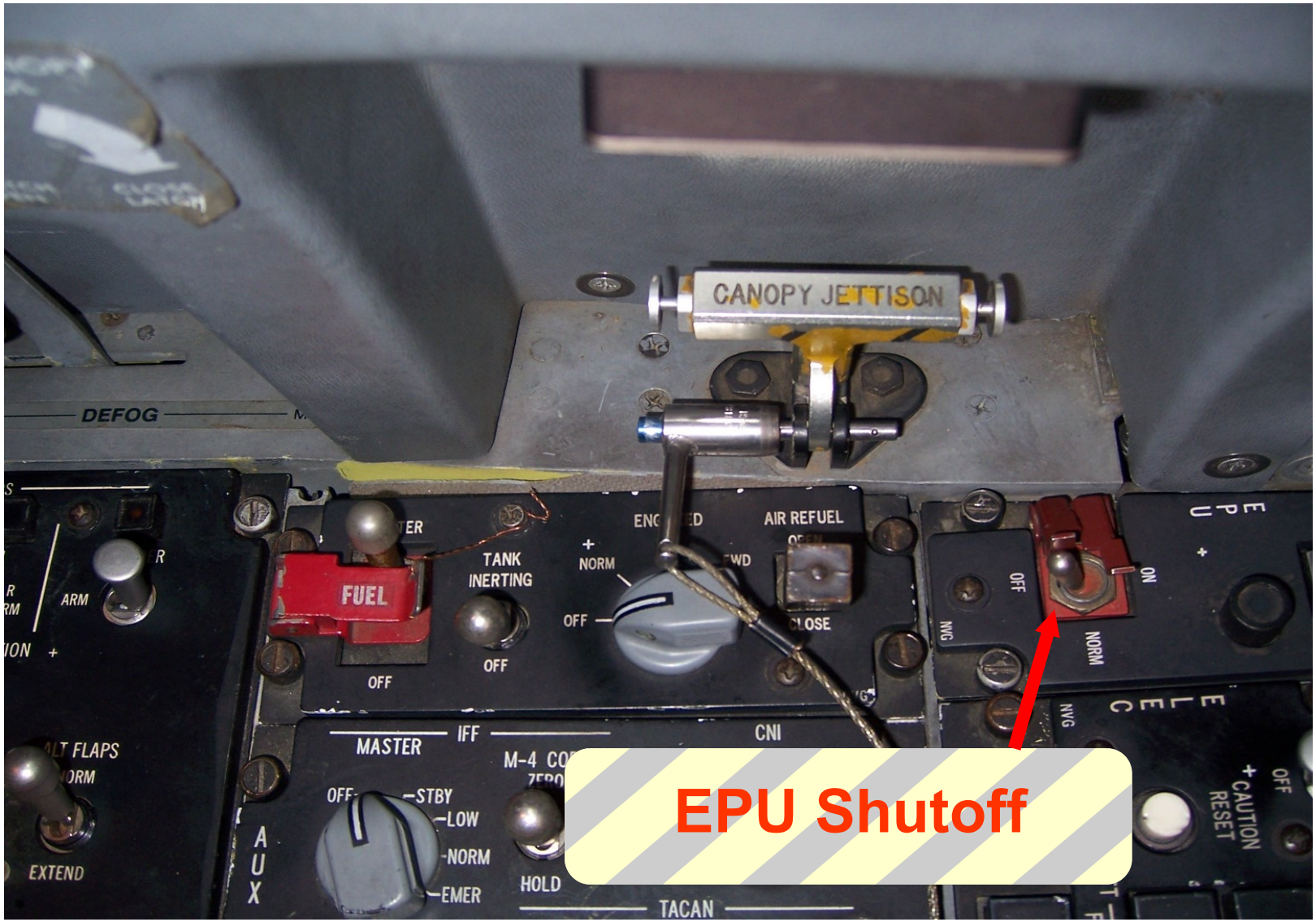
EPU Shutoff



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Master Fuel Switch

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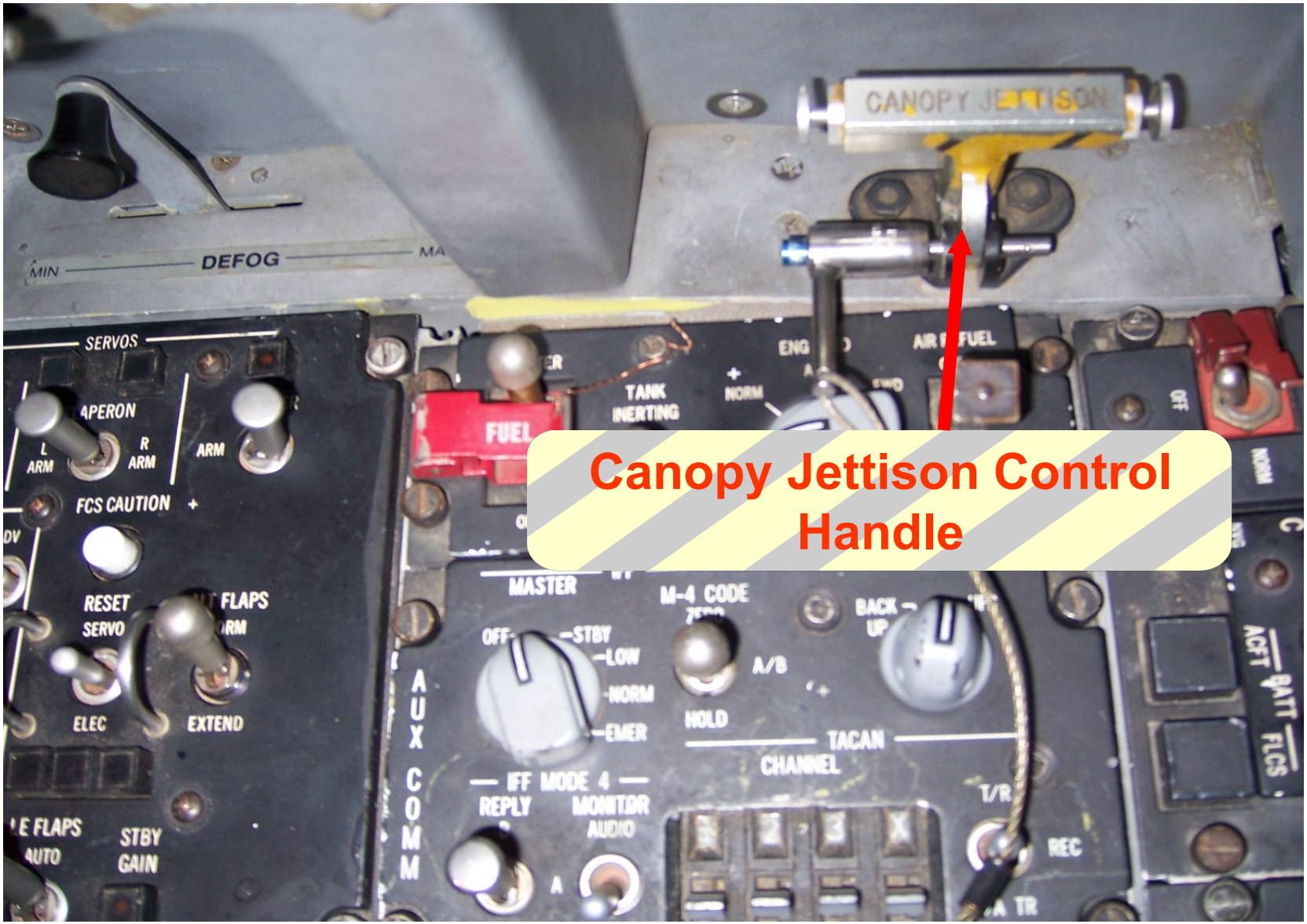
Canopy Jettison Handle



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Aircrew Extraction

F-16.25

AIRCREW EXTRACTION

F-16

T.O. 00-105E-9

3. AIRCREW EXTRACTION

NOTE:
Use of Emergency Manual Chute Handle **DOES NOT** release aircrew restraints.

a. Release lap belt by squeezing latch and release bar simultaneously.

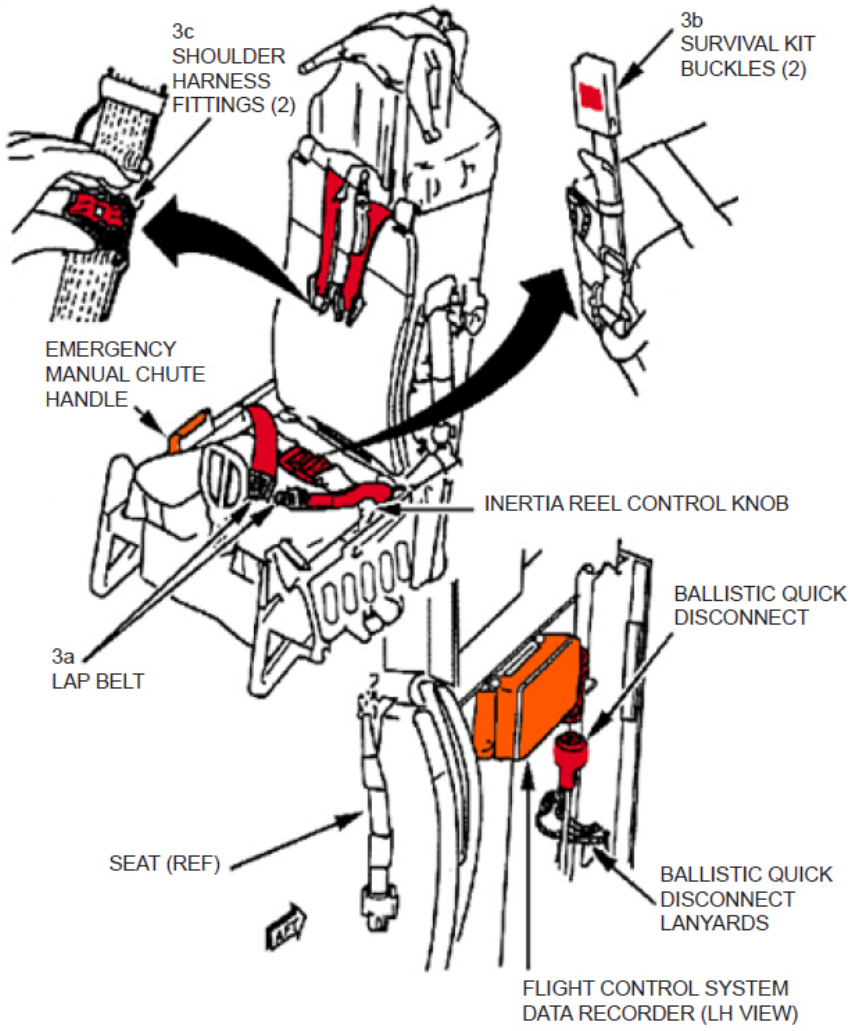
b. Release left and right survival kit buckles by de-pressing PUSH TO RELEASE button on each buckle.

c. Release left and right shoulder harness fittings by squeezing latch and release bar simultaneously for each fitting. (See pg F-16.27 for additional information.)

NOTE:

- If the aircraft has collapsed landing gear or is in a gear up configuration and if time permits after rescue is complete, disconnect the electrical harness from the Flight Data Recorder, located on the left upper portion of the seat (front seat only on F-16B aircraft.) Grasp the lanyards attached to the connector and pull sharply downward. This will preserve recorded data of the mishap.

- The "G" suit hose located to the left side of the seat is directional in its separation at the disconnect. Pull straight down with a 12 to 70 pound pull force. If an offset direction is taken to disconnect hose from aircrew member, disconnect will not occur.



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Aircrew Extraction

F-16.26

AIRCREW EXTRACTION-Continued

F-16

T.O. 00-105E-9

3. AIRCREW EXTRACTION - Continued

NOTE:
The shoulder harness fittings encountered may be different than the fitting mentioned on page F-16.22. Fittings may be a First or Second generation Koch or a Frost.

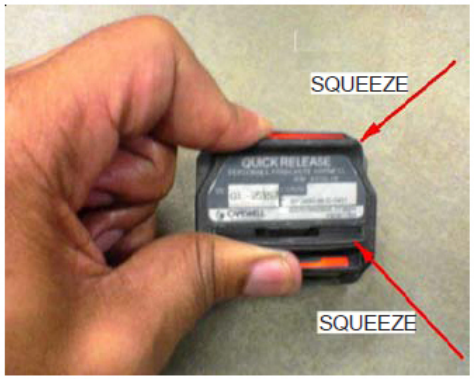
d. Release left and right Frost shoulder harness fittings by squeezing latch and release bar simultaneously for each fitting.

e. Release left and right First Generation Koch shoulder harness fittings by rotating and holding safety cover downward, then pushing thumb catch upward to release straps.

f. Release left and right Second Generation Koch shoulder harness fittings by lifting the safety cover, access the release bar, then rotate release bar downward to release straps.

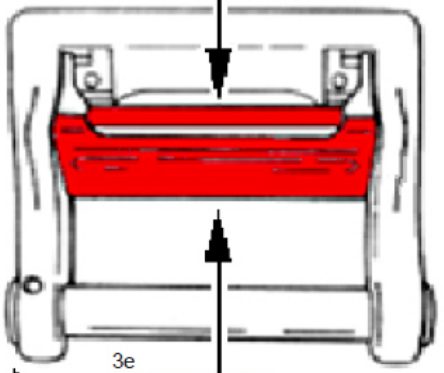
g. The chest and leg strap ejector snap is released by pulling on the thumb release.

3d
SQUEEZE LATCH



3d
SHOULDER HARNESS FITTINGS (2)
(FROST PARACHUTE CANOPY
RELEASE BODY, PN 81116-10)

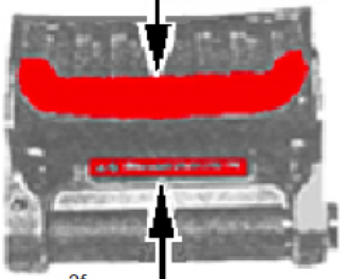
3e
THUMB CATCH



3e
SAFETY COVER

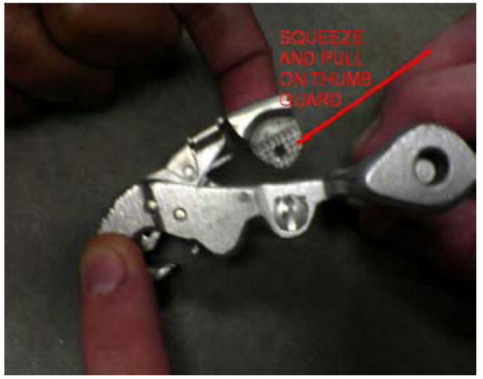
3e
SHOULDER HARNESS FITTINGS (2)
(1st GENERATION KOCH PARACHUTE
CANOPY RELEASE BODY, PN 015-11038-1)

3f
SAFETY COVER



3f
RELEASE BAR

3f
SHOULDER HARNESS FITTINGS (2)
(2nd GENERATION KOCH PARACHUTE
CANOPY RELEASE BODY, PN 990010-1)



3g
CHEST AND LEG STRAP EJECTOR
SNAP WITH CATCH (PN 68D37721)

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Hydrazine Hazards

F-16.5

EPU FUEL-H-70 HYDRAZINE HAZARD

F-16

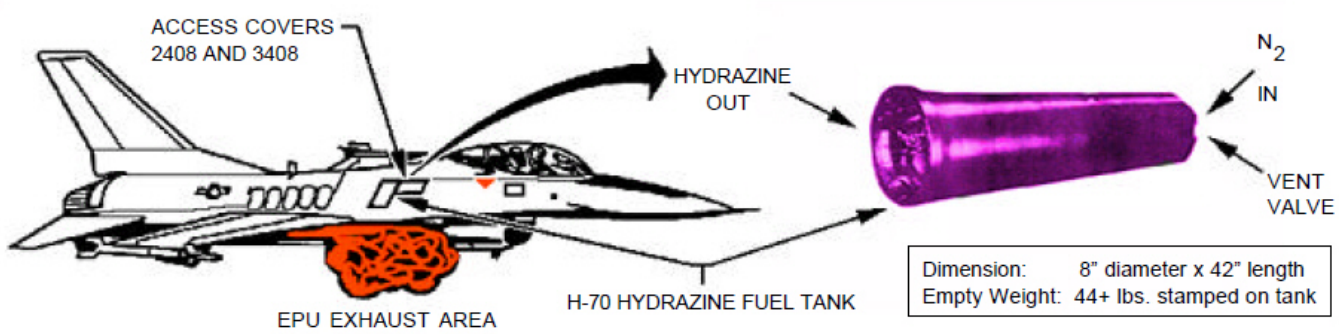
T.O. 00-105E-9

WARNING

AIRCRAFT CRASH OR EMERGENCY LANDING MAY RESULT IN HYDRAZINE SPILL OR VAPORS, RESCUE PERSONNEL WHO MAY BE EXPOSED SHALL WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE GARMENTS - FACE MASK AND PLASTIC OR RUBBER GLOVES AS A MINIMUM. SPILLED HYDRAZINE SHOULD BE DILUTED WITH EQUAL AMOUNTS OF WATER SPRAY TO RENDER NONFLAMMABLE.

CAUTION

IF EPU IS OPERATING IN THE HYDRAZINE MODE, SELF - CONTAINED BREATHING APPARATUS SHOULD BE WORN BY RESCUE PERSONNEL IN THE IMMEDIATE VICINITY OF AIRCRAFT AND DURING EMERGENCY CANOPY ENTRANCE. THE AMMONIA CONSTITUENT OF EPU EXHAUST MAY CAUSE IRRITATION OF EYES, NOSE AND THROAT.



GENERAL INFORMATION:

- F-16 Emergency Power Unit (EPU) Uses 70% Hydrazine and 30% Water Blend (H-70) as Fuel.
- Exhuast Gases from EPU Turbine are 40% Ammonia, 17% Nitrogen, 15% Hydrogen and 28% Water.
- EPU Operation Results in Noise Similar to a high pitched whine.
- Fire Hazards of Hydrazine are Similar to JP-4.
- Odor (Ammonia) Threshold is 2 to 3 ppm.
- OSHA Hydrazine Exposure Limit is 1.0 ppm Average Over an 8 Hour Period.
- ACGIH Hydrazine Exposure Limit is 0.01 ppm Average Over an 8 Hour Period; Excursion Up to 0.3 ppm are Permitted, Provided 0.01 ppm Average for 8 Hours is Not Exceeded.
- For additional information, refer to TO 1F-16A/C-2-49GS-00-1, Section IV, H-70 Fuel Spill Management and Neutralization.

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Hydrazine Hazards continued

- Unless weight is on wheels, the EPU will start up when the engine is shutdown.
- If the EPU fires during the emergency ground rescue sequence, reduced electrical and hydraulic demands will permit hydrazine quantity to support ~15 minutes of operation if the EPU pin is not installed.
- If conditions make installation of the EPU safety pin impossible or impractical, disconnecting the battery in the R/H wheel well will prevent startup of EPU.
- Warning - DO NOT pin EPU after activation, until the engine is shutdown. Imminent danger to crew working near the engine intake.

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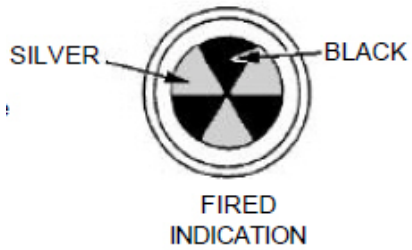
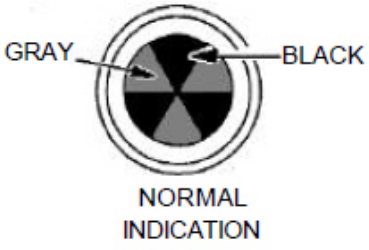
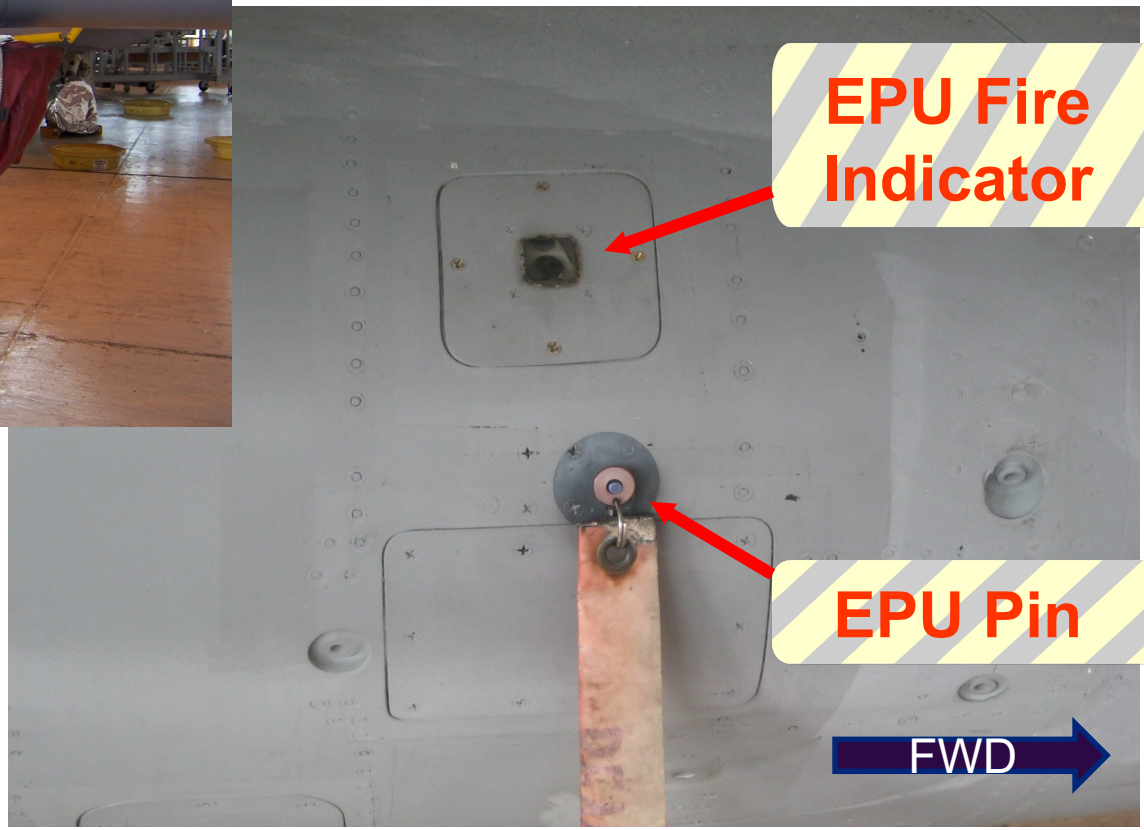
EPU Safety Pin and Fire Indicator







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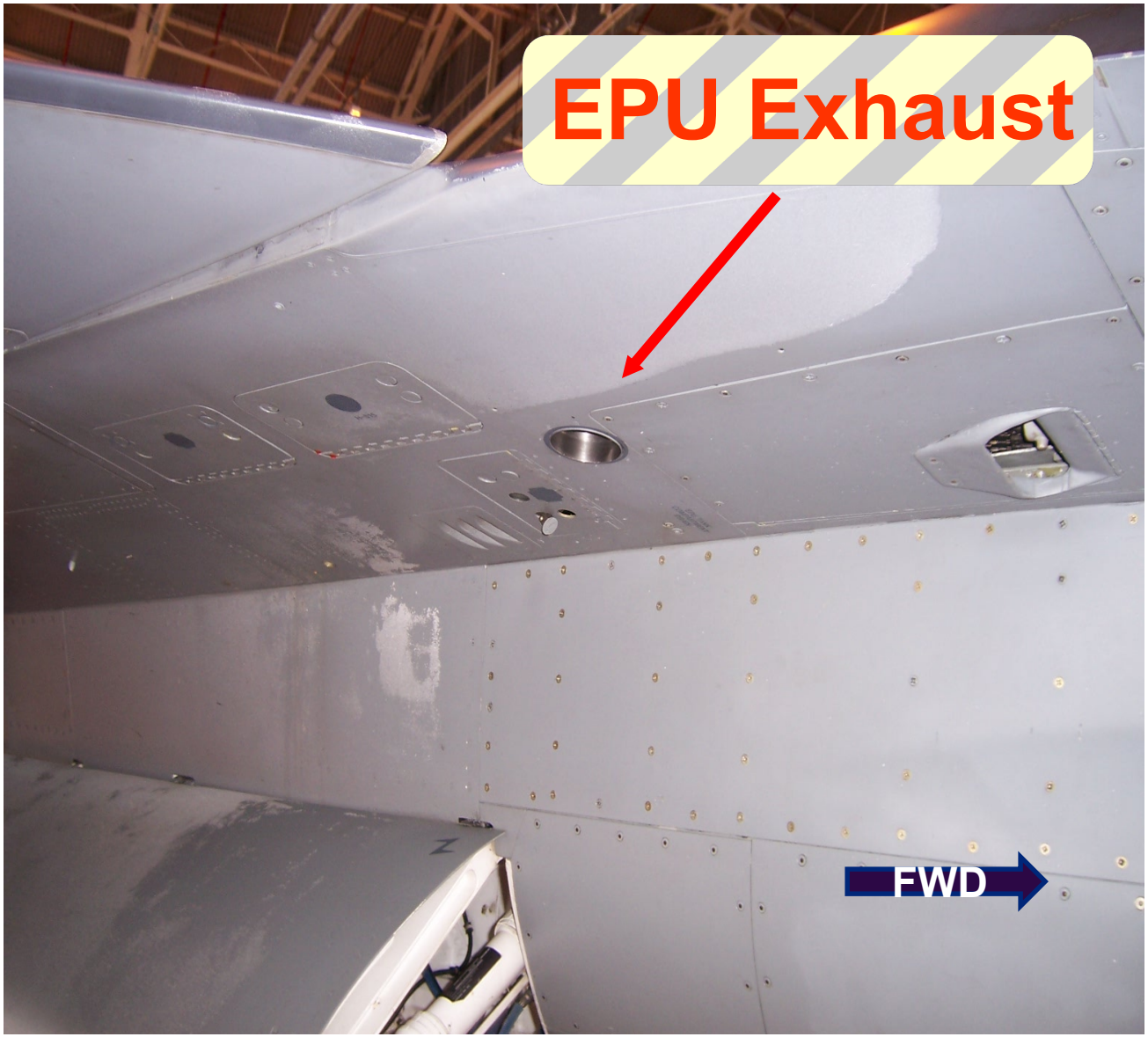
EPU Exhaust - Right Wing Strake



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EPU Leak Detector Pellet

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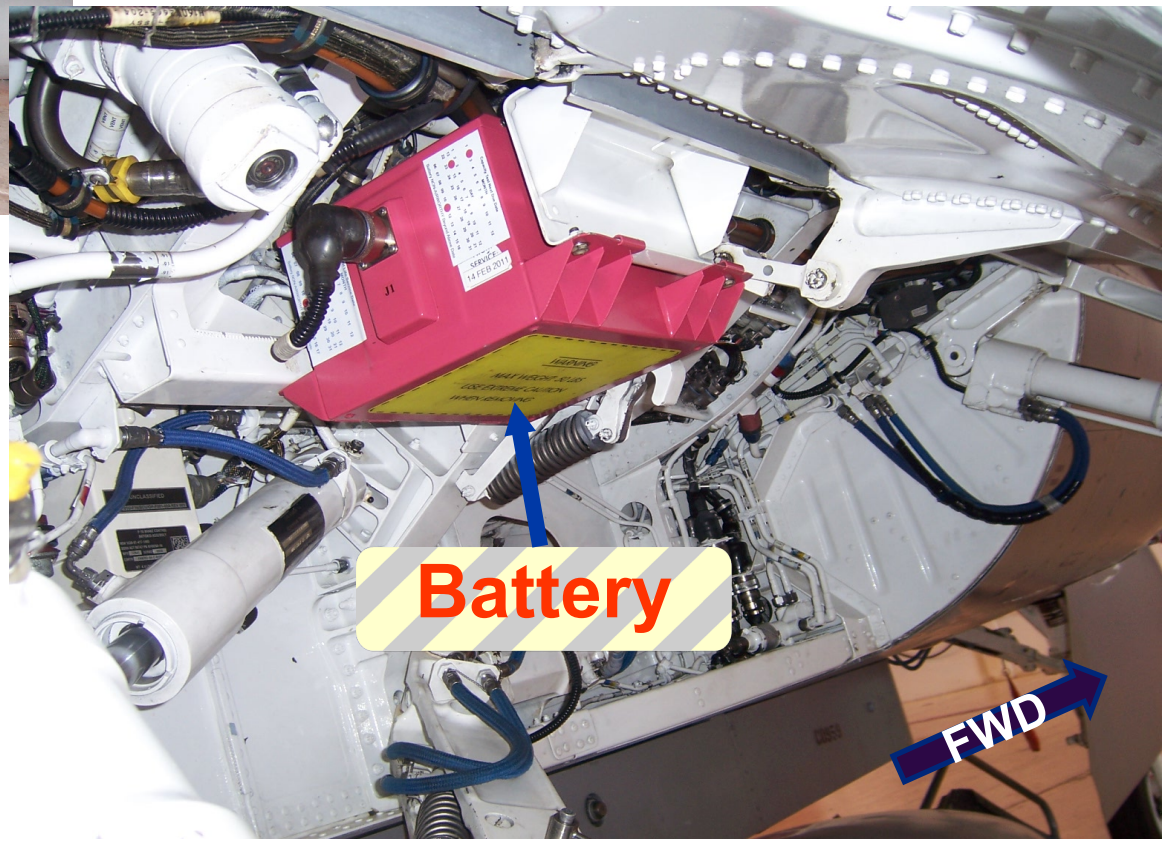
Main Battery - R/H Main Wheel Well



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Emergency Engine Shutdown

There are multiple scenarios where an emergency engine shutdown may be required.

1. Incapacitated pilot, or unmanned cockpit, or ejected seat, with unimpeded entry
2. Incapacitated pilot, or unmanned cockpit, or ejected seat, with impeded entry
3. Activated EPU – Pilot Active

The engine inlet's proximity to the cockpit may add significant risk to the rescue operation.

The numerous emergency shutdown methods are outlined in detail in T.O. 00-105E-9. This presentation will identify the Master Fuel Shutoff Valve (MFSOV) location.

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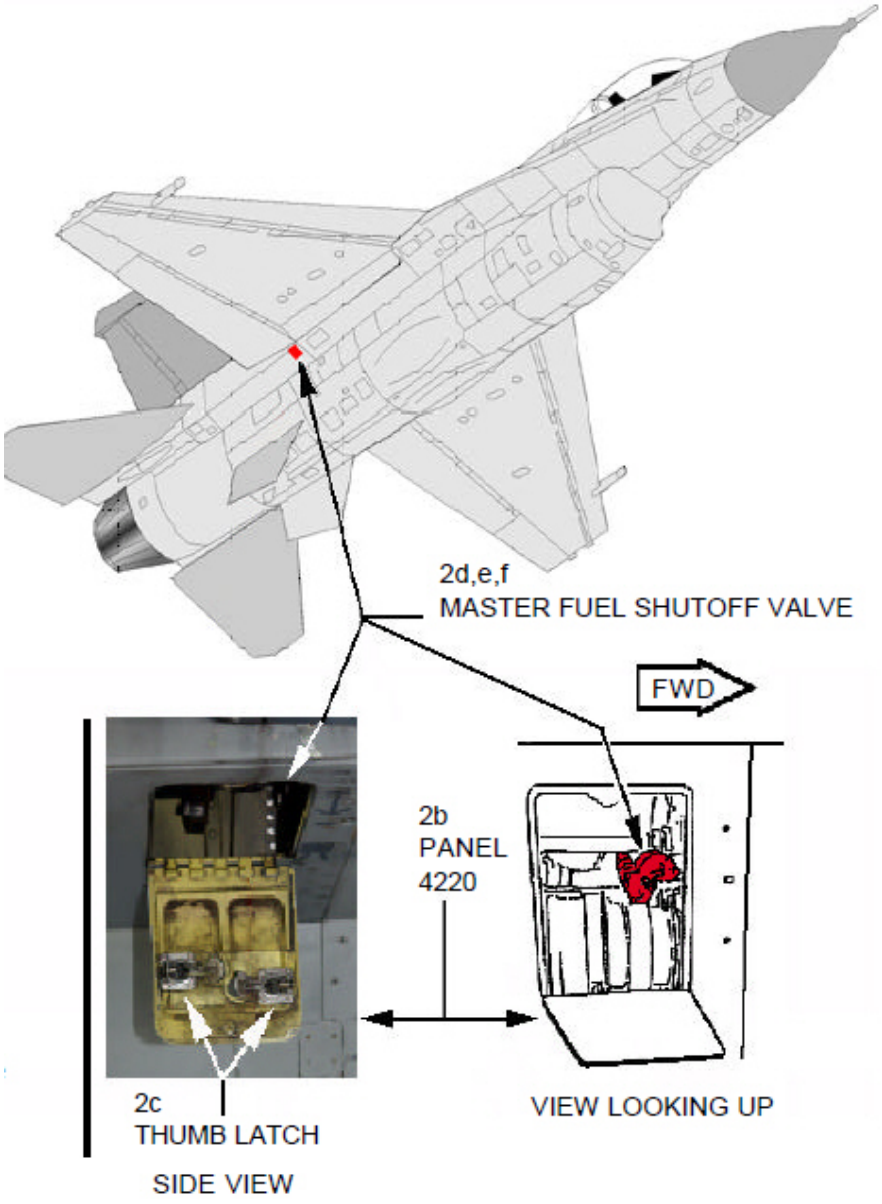
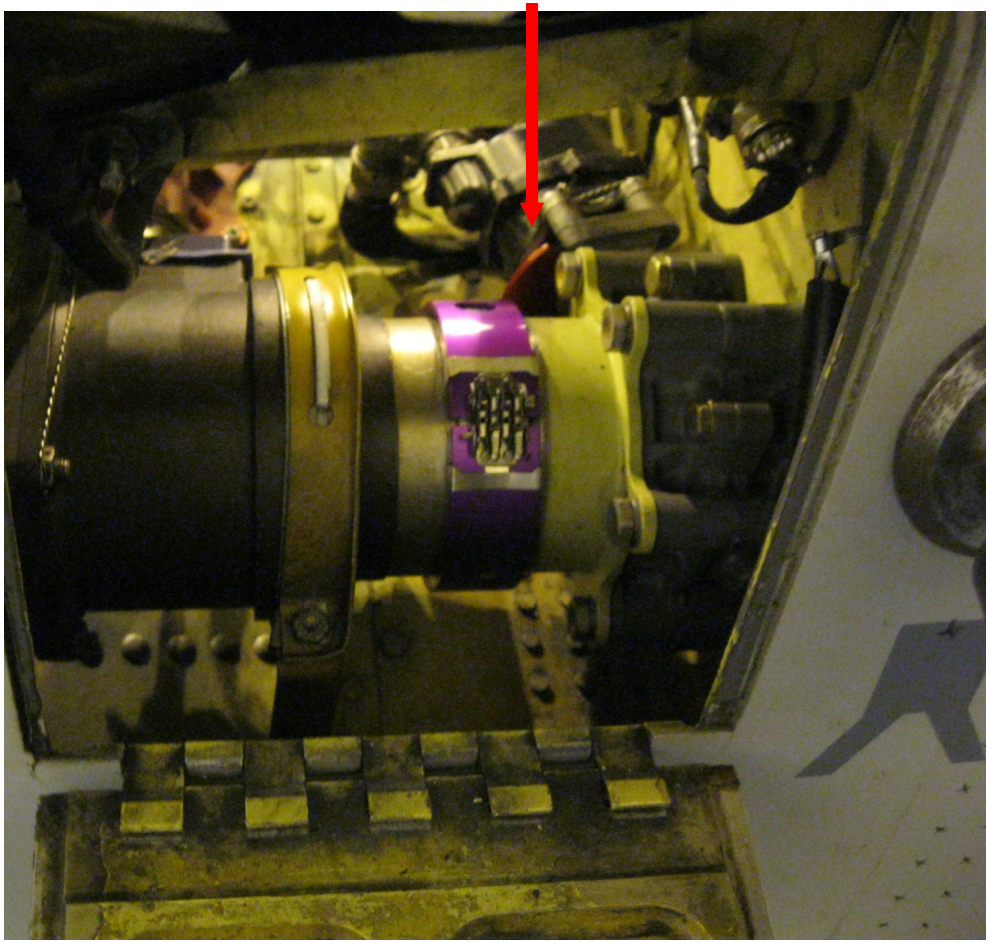
MFSOV Location



OFF POSITION (need OPEN position picture)



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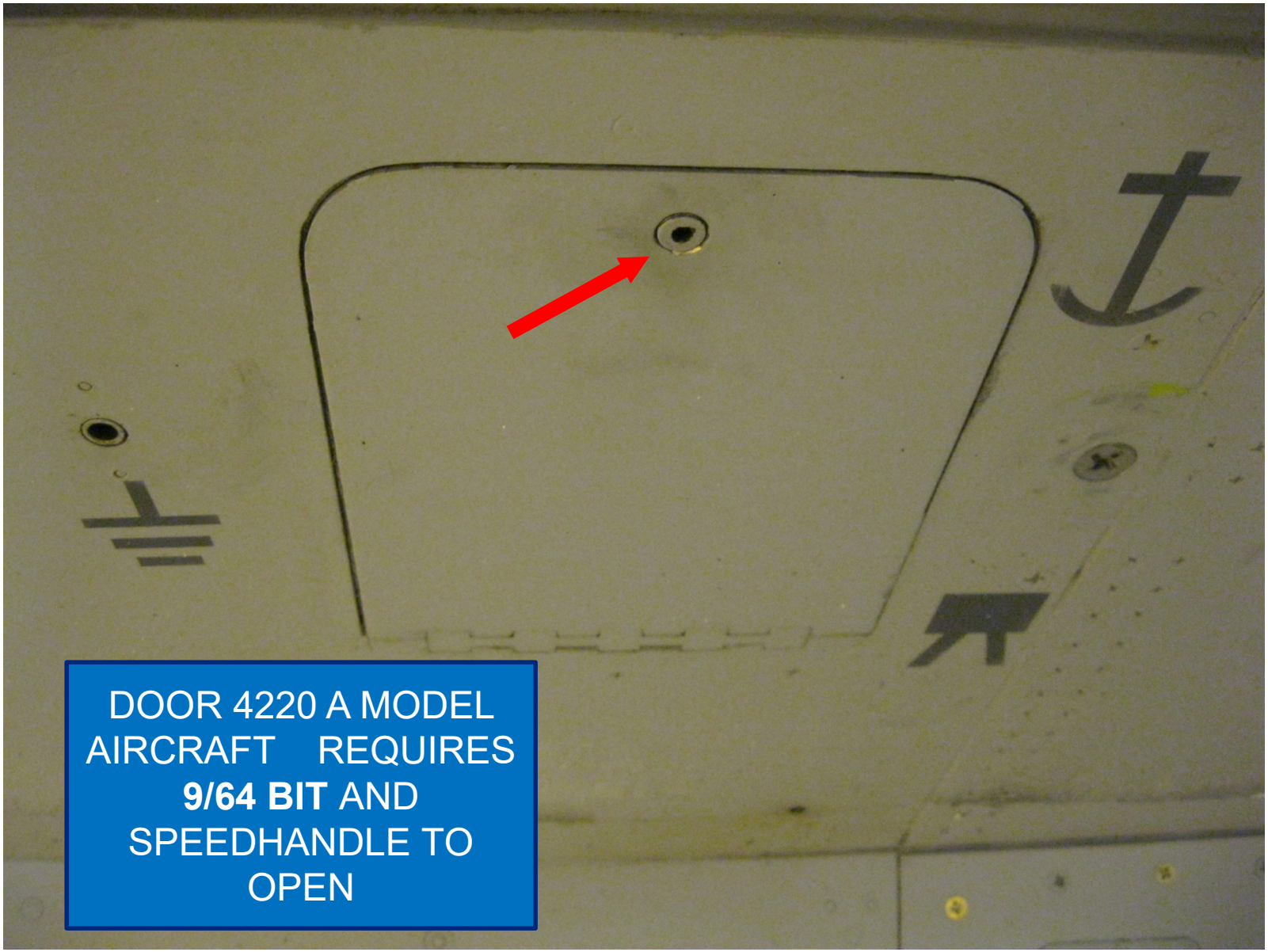
MFSOV – **A** Model QF-16's



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ARFF coverage is required per Navair #80R-14.

All firefighters must clearly understand their assigned role in a pilot rescue situation prior to an emergency. ARFF Gear must be ready.

Truck #1 Positions are: Driver, Rescue 1 and Rescue 2.

The "Driver's" role is clearly defined: Get the ARFF truck there and set up on the rescue side of the aircraft.

Engage pump and operate the turret if need be.

Rescue 1(Turret or other): Role is to open canopy for rescue, using all available means

Rescue 2 (Captain or other): Role is to bring ladder and extract pilot from cockpit.

Truck #2 sets up on non- rescue side & assists.

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Proper ARFF Set Up Demo

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QF-16 ARFF QUIZ

Why is it necessary to wear SCBA when fighting QF-16 fires?

What side are the rescue controls located on a QF-16 to open the canopy?

What is the first thing a firefighter should do before attempting to rescue an QF-16 pilot?

Why do you cut into the plastic on the QF-16 canopy only during emergency access procedures?

Once the QF-16 ejection seat is safe, what are the next steps to be accomplished in the cockpit?

It takes 52 cranks with a 1/4” speed wrench to manually open an QF-16 canopy. True or False?

Where is the emergency EPU shut down switch located on an QF-16?

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Answers

1 = Hydrazine

2 = Left side

3 = Always safe the Ejection seat

4 = So as not to set off the rocket motors

5 = Throttle and Battery

6 = True.

7 = Left cockpit console near fuel shutoff.

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Proper Pilot Extraction

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First Aid

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First Aid

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Questions?

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IN HANGAR / RAMP

Bump Caps
Safety Glasses
High Vis Vests

Nothing above waist that can fall into cockpit

NO CAMERAS

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