

WELCOME TO TECHNICAL ORDER 00-105E-9, 1 FEBRUARY 2006, REVISION 11.

THIS IS SEGMENT 12 COVERING CHAPTER 8 FROM THE F-22A TO F-117A.

TO NAVIGATE

CLICK ON THE
BOOKMARKS AND
CLICK ON THE (+)
SYMBOLS, THEN
CLICK ON SUBJECT
LINKS TO GO TO
SPECIFIC VIEWS
IN THIS SEGMENT.



CONTINUE

NOTICE

CONTACT

**TO GO DIRECTLY TO THE TECHNICAL ORDER,
CLICK ON THE CONTINUE BUTTON.**

**TO SEE THE SEGMENT INFORMATION CHANGE NOTICE,
CLICK ON THE NOTICE BUTTON.**



**TO CONTACT THE TECHNICAL CONTENT MANAGER ,
CLICK ON THE CONTACT BUTTON.**

TECHNICAL ORDER 00-105E-9 TECHNICAL CONTENT MANAGER



WRITTEN CORRESPONDENCE:

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<http://www.afcesa.af.mil/CEX/cexf/index.asp>

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For technical order improvements, correcting procedures, and other inquiries, please use the above media most convenient.

SEGMENT 12 INFORMATION CHANGE NOTICE

This page is provided to notify the user of any informational changes made to Technical Order 00-105E-9 in this Segment and the current Revision. Informational changes will be referenced in the Adobe Reader's Bookmark tool as a designator symbol illustrated as a <[C]> for quick reference to the right of the affected aircraft. The user shall insure the most current information contained in this TO is used for his operation. Retaining out of date rescue information can negatively affect the user's operability and outcome of emergencies. If the user prints out pages his unit requires, the user shall print the affected page(s), remove and destroy the existing page(s), and insert the newly printed page(s) in the binder provided for that purpose. A Master of this TO shall be retained in the unit's library for reference, future printing requirements and inspections.

<u>CHAPTER</u>	<u>AIRCRAFT</u>	<u>PAGE</u>	<u>EXPLANATION OF CHANGE</u>
8	F-22A	ALL	File updated. Official designation changed from F/A-22 to F-22A effective 13 December 2005.
8	QF-106	ALL	File updated. Added paint scheme and dimensions page.
8	F-117	ALL	File updated. Incorporates Safety Supplement - 1, dated 19 May 2005.

NOTE

Chapter 8 contains emergency rescue and mishap response information for the following aircraft:

USAF	QF-4
USAF	F-5E/F
USAF	F-15
USAF	F-16
USAF	F/A-22A
USAF	QF-106
USAF	F-117A

AIRCRAFT PAINT SCHEME

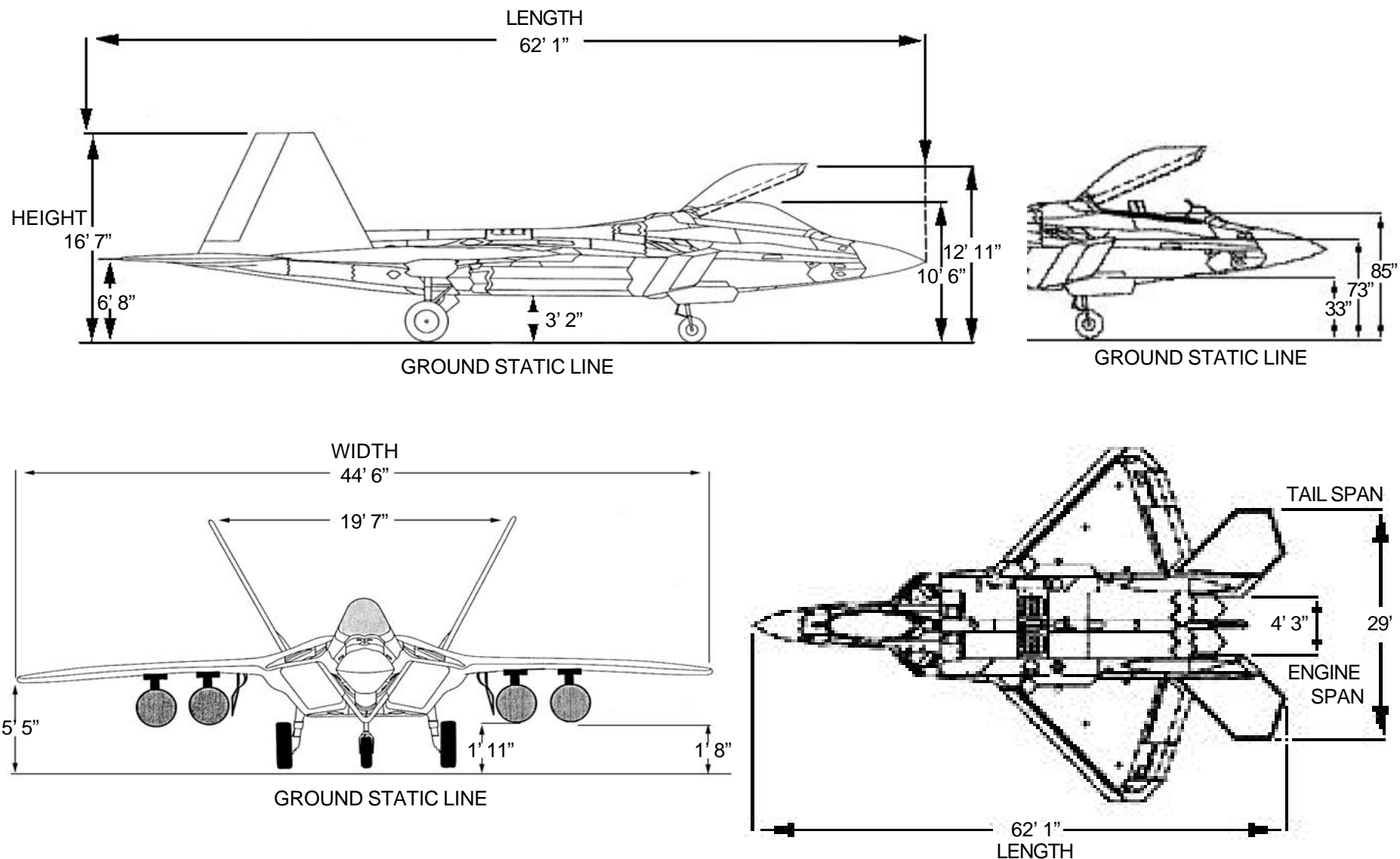
F-22A

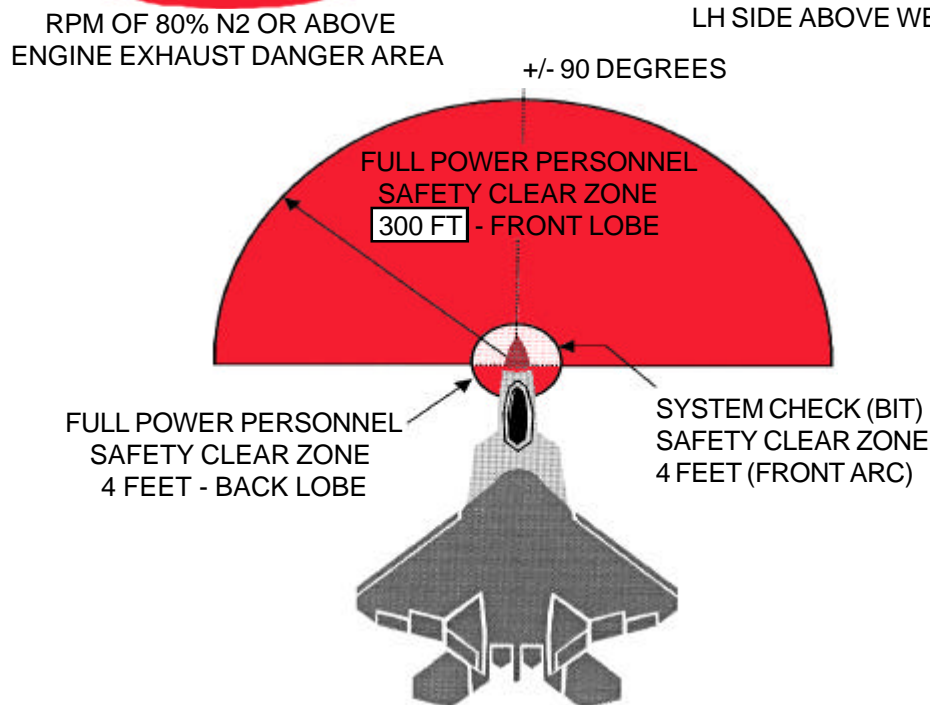


AIRCRAFT DIMENSIONS

F-22A
NOTE:

Height dimensions are typical for an aircraft fully serviced and with internal fuel.





AIRCRAFT HAZARDS-Continued

Top View for Screens and Windows

WARNING

DO NOT DRILL HERE. FUEL LINES AND AVIONICS ELECTRICAL LINES ARE LOCATED IN THIS AREA.

RIGHT WING

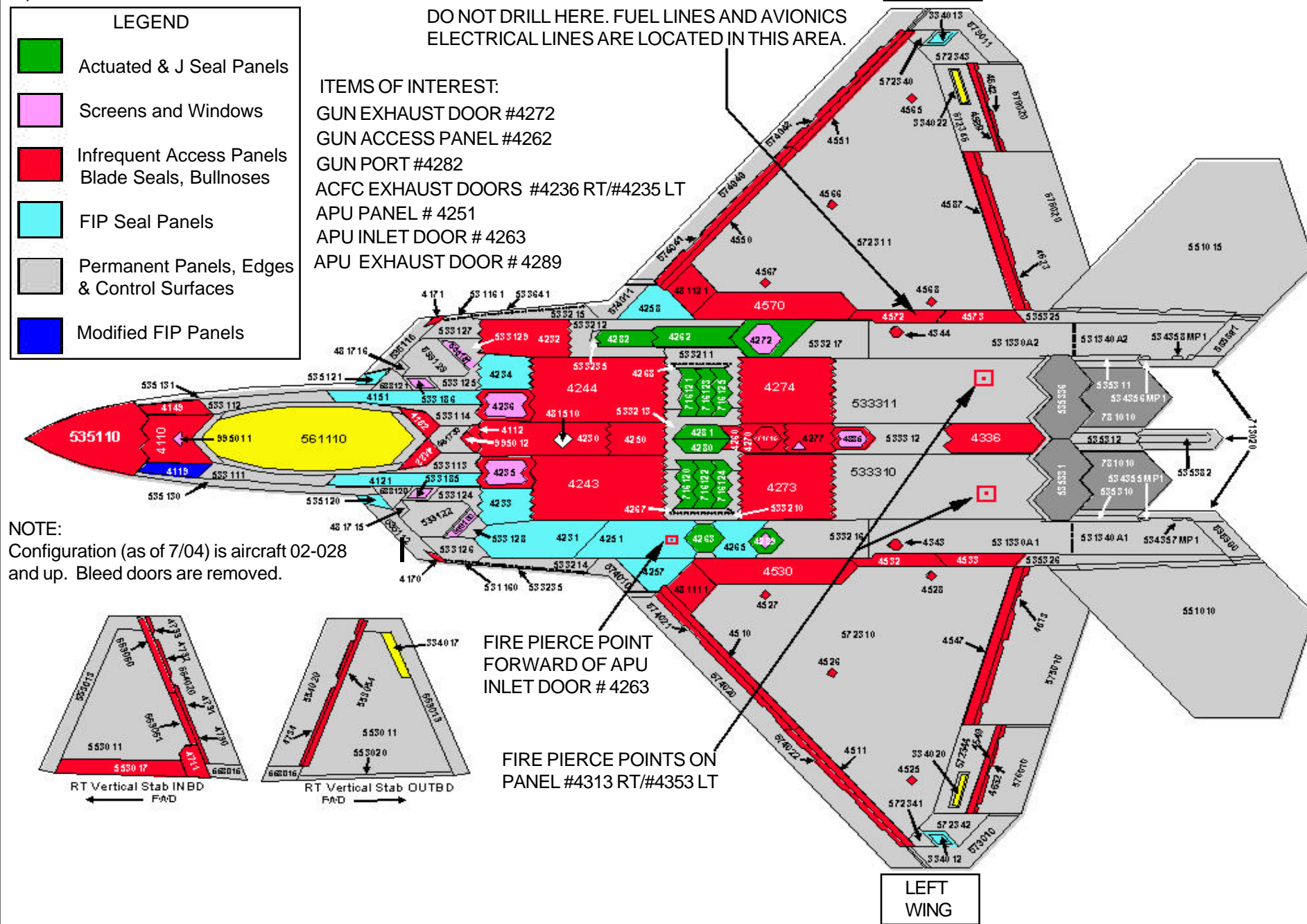
F-22A

LEGEND

- Actuated & J Seal Panels
- Screens and Windows
- Infrequent Access Panels
Blade Seals, Bullnoses
- FIP Seal Panels
- Permanent Panels, Edges
& Control Surfaces
- Modified FIP Panels

ITEMS OF INTEREST:

- GUN EXHAUST DOOR #4272
- GUN ACCESS PANEL #4262
- GUN PORT #4282
- ACFC EXHAUST DOORS #4236 RT/#4235 LT
- APU PANEL # 4251
- APU INLET DOOR # 4263
- APU EXHAUST DOOR # 4289



NOTE:

Configuration (as of 7/04) is aircraft 02-028 and up. Bleed doors are removed.

LEFT WING

AIRCRAFT HAZARDS-Continued

Bottom View for Screens and Windows

F-22A

LEGEND

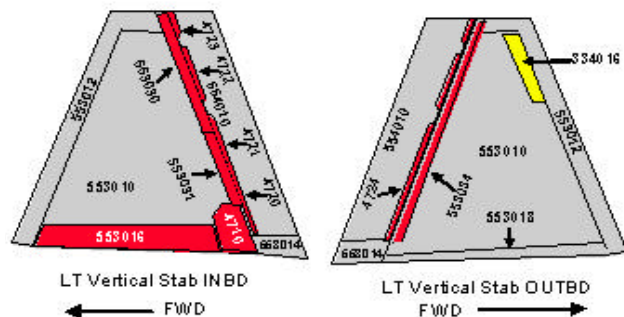
- Actuated & J Seal Panels
- Screens and Windows
- Infrequent Access Panels
Blade Seals, Bullnoses
- FIP Seal Panels
- Permanent Panels, Edges
& Control Surfaces
- Modified FIP Panels

ITEMS OF INTEREST:

AMAD SCREENS # 4223 & #4224

GUN PURGE DOOR #4283

NOTE:
Configuration (as of 7/04) is aircraft 02-028
and up. Bleed doors are removed.



FIRE ACCESS SCREENS FOR THE ATS
(AIR TURBINE STARTER EXHAUST)

LEFT
WING

RIGHT
WING

FIRE ACCESS FOR
ENGINE BAY DOORS

AIRCRAFT HAZARDS - Continued

HOT BRAKES, CANOPY JETTISON AND SEAT EJECTION TRAJECTORY

WARNING

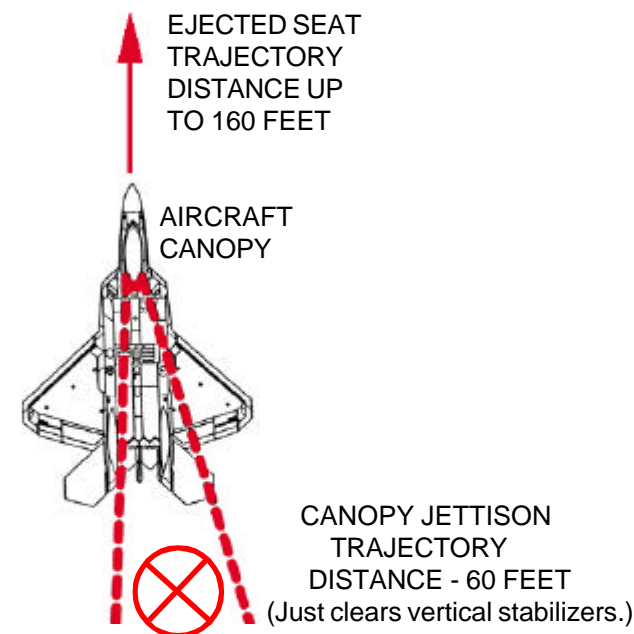
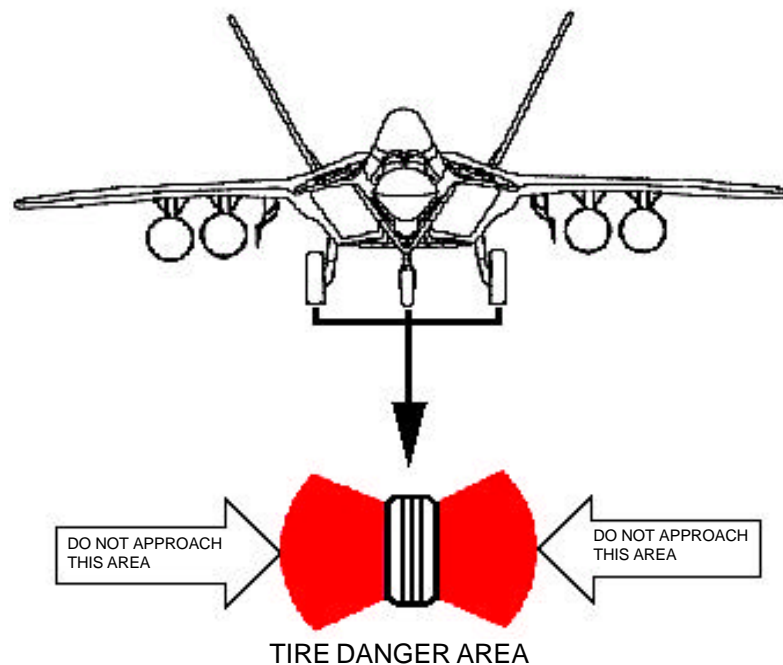
The dangers associated with hot brakes are the same as those associated with any other aircraft and should be approached and treated the same. The approach should be fore and aft, not from the side and this in itself presents hazards from the engine inlets and exhaust. Rescue crews should remember that heat build up in the wheels/brakes will occur after the aircraft has stopped taxiing. The aircraft should be parked and chock main landing gear only with the brakes off. **DO NOT CHOCK NOSE GEAR.** A 45 minute waiting period should be observed. The danger area depicted is the flying shrapnel/debris area, should the wheels/brakes explode.

WARNING

The ARFF/crash/rescue crew should be aware of the jettison trajectory area of the canopy when positioning firefighting equipment/vehicles and personnel when approaching a disabled aircraft, particularly if canopy jettisoning is anticipated by the crewmember or rescue crew. Danger area is directly aft and to the right of the aircraft centerline. Wind conditions affect the impact area and should be avoided. Injury or death to personnel will occur if danger area is entered during canopy jettisoning.

WARNING

An additional danger to canopy jettison is if the crew member selects a zero-zero seat ejection. The seat impact area will be forward of the aircraft up to 160 feet depending on wind conditions.



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AIRCRAFT HAZARDS-Continued

MOVABLE SURFACES DANGER AREAS

WARNING

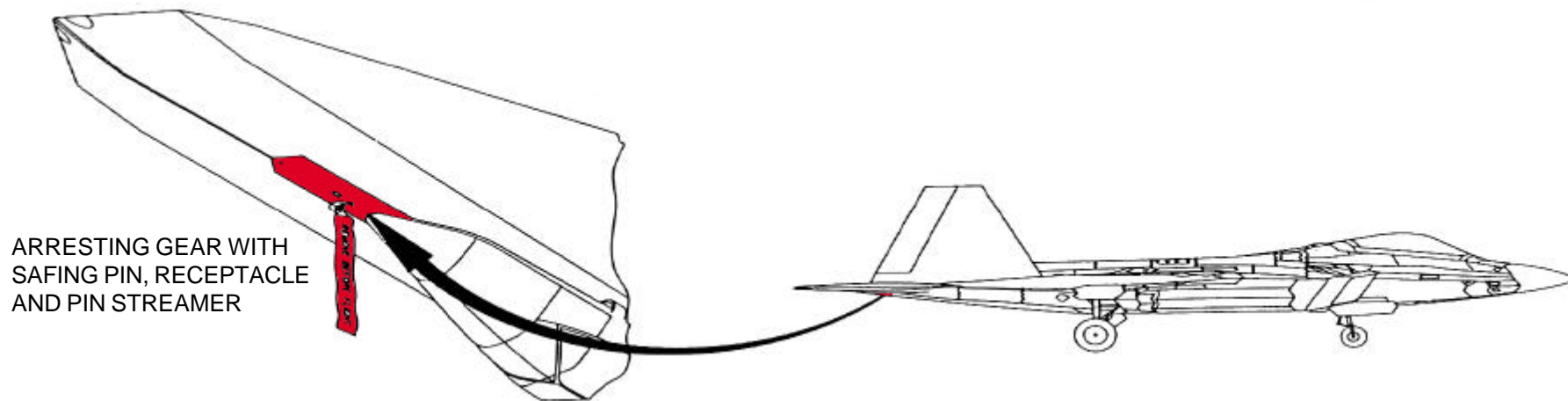
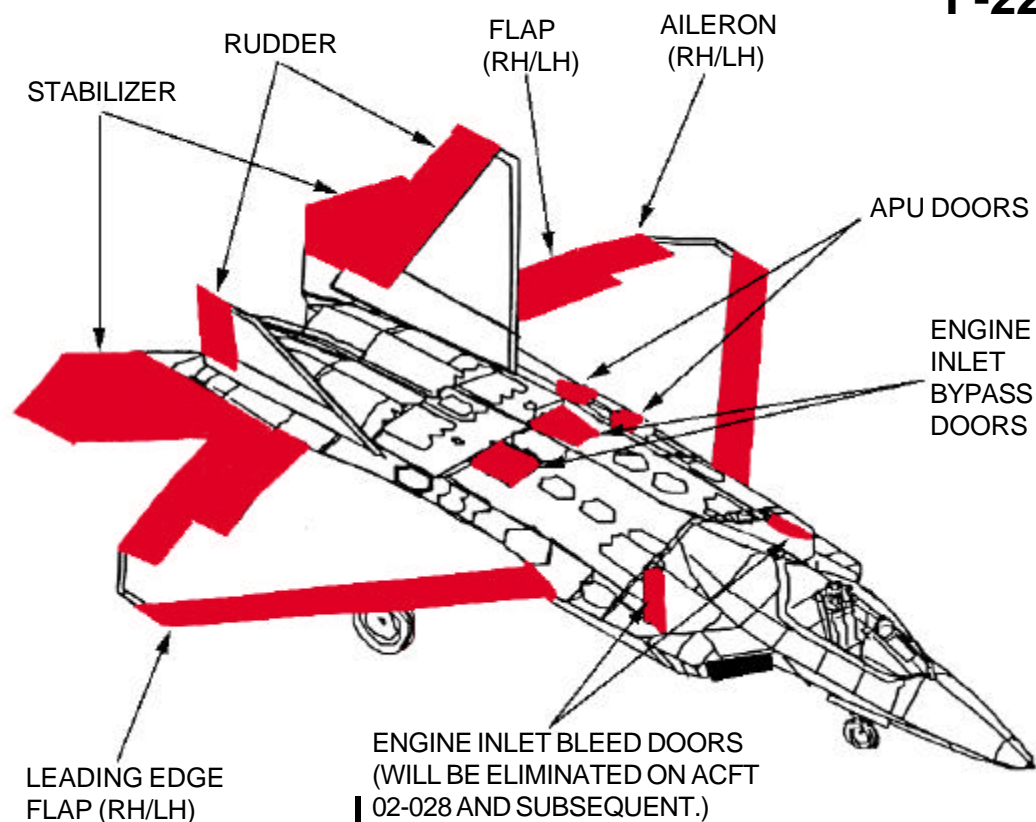
Personnel should stay clear of flight control surfaces when possible with the engines or APU running or external power and hydraulics applied. Danger areas are hi-lited with the rudders posing the least hazard. Failure to disregard danger areas can result in Injury or death.

WARNING

The arresting gear is located far centerline aft of the shoe hook. It is pneumatically extended and retracted. Injury or death to personnel can occur during operation.

WARNING

The safing pin prevents the cable movement required to actuate the arresting gear to extend. Personnel should stay clear of Arresting Gear at all times. Injury or death to personnel can occur if the hook safing mechanism fails.


F-22A

AIRCRAFT HAZARDS-Continued

F-22A

1. WEAPONS STORAGE AND LOCATIONS

NOTE:

Weapons information is discussed on this page and the next.

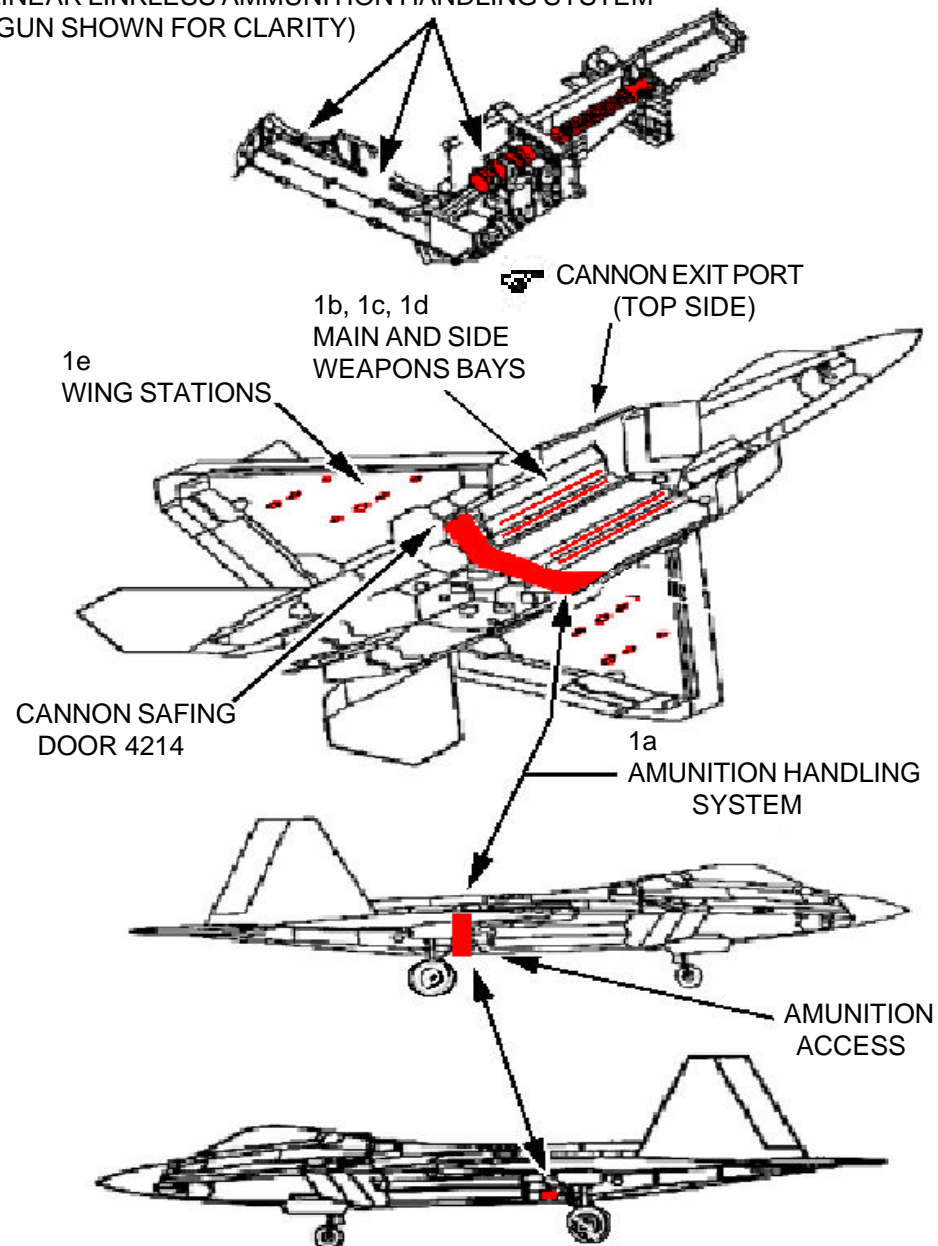
- a. Ammunition storage for the M61A2 20mm multibarrel cannon Linear Linkless system located immediately forward of the right main landing gear door and across the belly of aircraft. Storage system is an overlapping conveyor belt design holding 480 rounds.
- b. Air-to-Air: AIM-9M/X Sidewinder (1 per side weapons bay on LAU).
- c. Air-to-Air: AIM-120C AMRAAM, 3 per bay - total of 6.
- d. Air-to-Ground: 2 GBU-32 1,000 lb. JDAM (Joint Direct Attack Munition) PGMs on BRU-46 bomb racks.
- e. External carriage of 600 gal fuel tanks, AIM-9 and AIM-120 missiles.

NOTE:

T.O. 1F/A-22A-2 will contain authorized aircraft configurations.

1a

LINEAR LINKLESS AMMUNITION HANDLING SYSTEM
(GUN SHOWN FOR CLARITY)



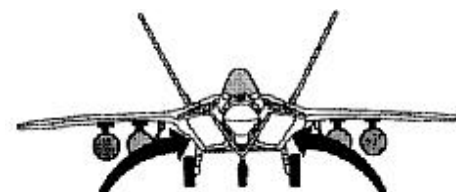
AIRCRAFT HAZARDS-Continued

AIRCRAFT WEAPONS/BAY LOCATIONS AND COUNTERMEASURES TYPES/DOORS

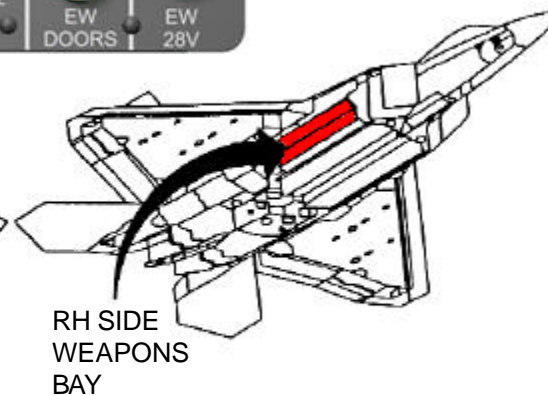
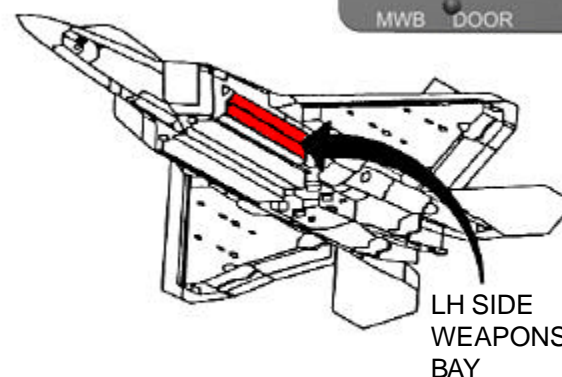
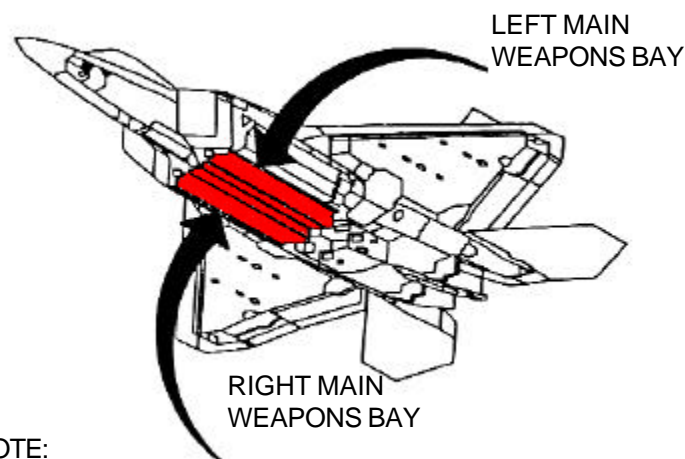
F-22A

NOTE:

Two evident hazards associated with the weapons bay doors are sharp edges and inadvertent opening and closing. The internal weapons loaded are: up to 6 AIM-120 missiles and AIM-9 missiles. Missile launchers are safed by PUSH/PULL handles located on each launcher. All bay doors pictured are closed.



DOOR SAFING PANEL



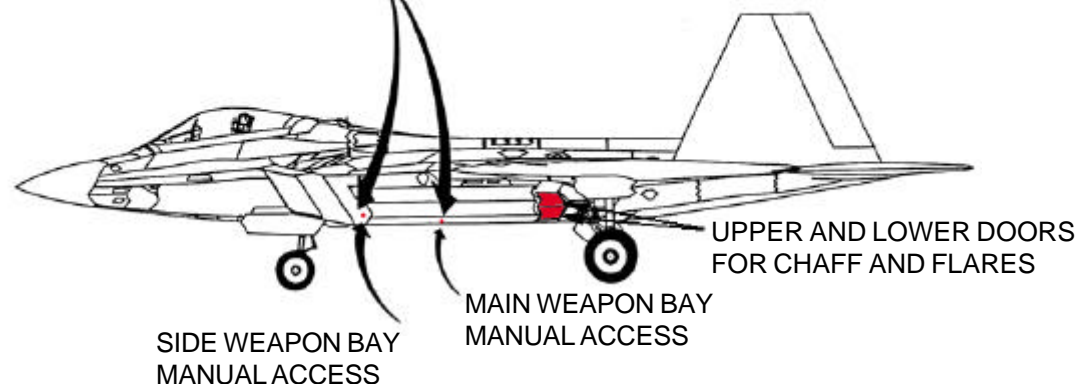
NOTE:

The Countermeasures Doors are located on each side of the aircraft between the landing gear doors and weapons bays doors. The doors provide for accessing and dispensing chaff and flares. The doors are opened on the ground utilizing the Portable Maintenance Aid when electrical and hydraulic power is available. Door Safing Switches are located in the Main Landing Gear Wheel Well on each respective side of the aircraft.

WARNING

Chaff and flares present an explosive hazard. Personnel should exercise extreme caution to prevent injury or death.

3/8" RECEPTACLE FOR MANUAL ACCESS



(ALL FUNCTIONS TYPICAL BOTH SIDES)

AIRCRAFT HAZARDS-Continued

FUEL STORAGE, OTHER FLUIDS, BATTERY DISCONNECT AND STORED ENERGY SYSTEM

ITEM	TYPE	APPROX. TOTAL QUANTITY
MAIN FUEL TANKS	JP-8	5000 TO 8000 LBS (733 - 1,17
APU	JP-8	5 GALS
HYDRUALIC FLUID	MIL-H-83282	35 GALS
BATTERIES	SULFURIC ACID GEL	10 LBS
ENGINE OIL LUBE	MIL-L-7808 OR 23699	6 GALS

NOTE:

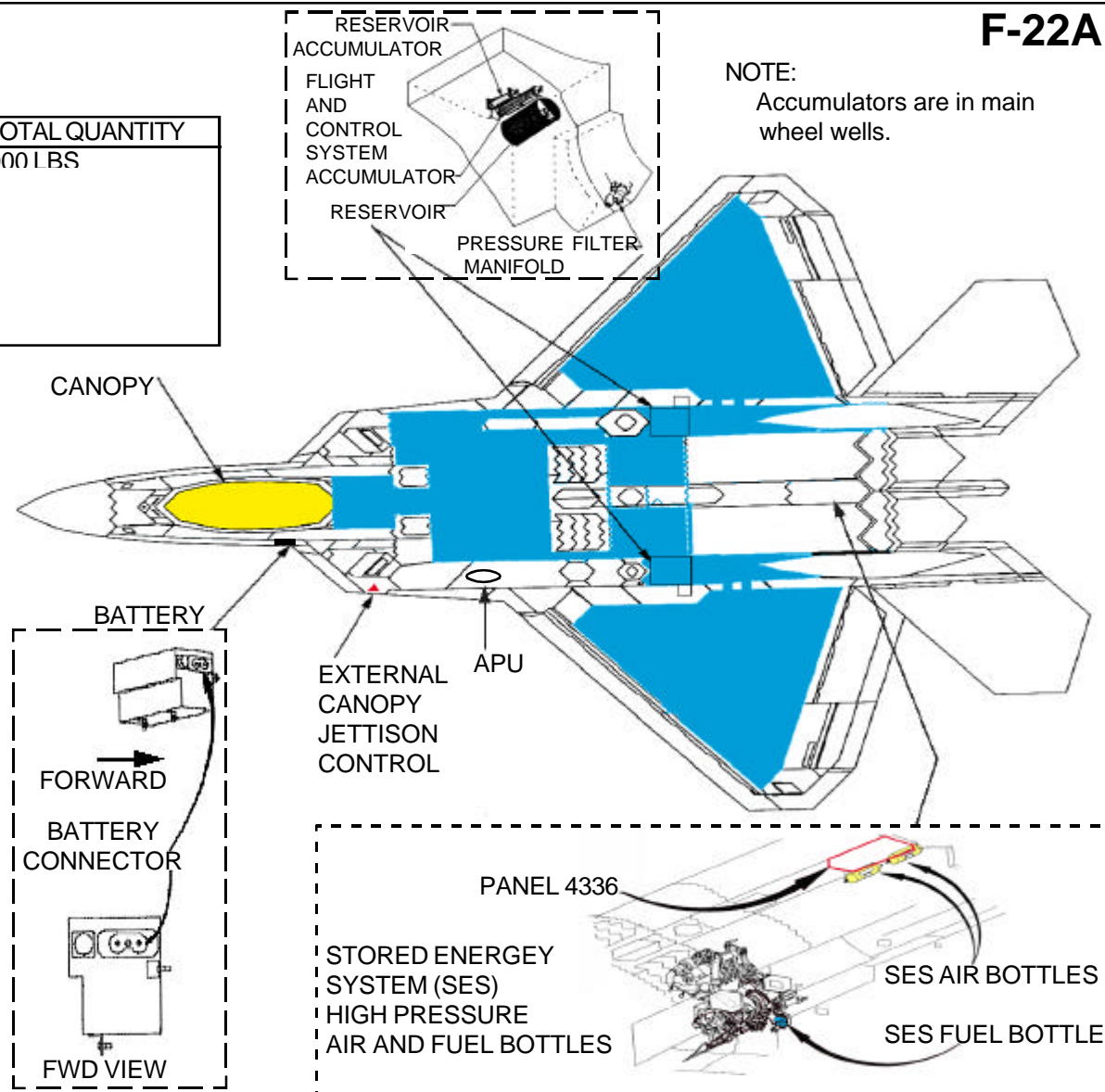
Personnel should prevent the puncturing of the fuel cells. The internal cells are divided into a forward and an aft system with all cells fabricated from an integral-type construction. The three feed cells are in the forward fuselage, and the left and right cells are located in the aft left and right fuselage, respectively. The remaining five cells are transfer cells that utilize gravity feed, ejector pumps, and electrical pumps to transfer fuel to the feed cells. These cells are the two wing cells in the forward mid fuselage and mid fuselage. All the internal cells are pressurized through the vent and pressurization valve which is connected to the On-Board Inert Gas Generating System (OBIGGS).

NOTE:

The battery and Charger/Controller System (BCCS) consists of the battery and a charger/controller unit supplying 28VDC to aircraft systems. The aircraft battery is located behind the Left Avionics Bay Door # 4135.

BATTERY DISCONNECT

- The battery switch must be positioned OFF, if possible.
- Disconnect battery terminals at battery disconnect at right side aft of battery.
- If cutting is necessary, cut through thermoplastic door # 4135 to access the battery as required, then disconnect the battery as prescribed in step b.



NOTE:

Accumulators are in main wheel wells.

NOTE:

The Stored Energy System (SES) provides fuel and high pressure air to the Turbine Power Module (TPM), mounted to the APU gearbox, to start the APU and provide a self-start capability to the aircraft's engines. High pressure air from the SES air bottles is also delivered to the APU door actuation system for door operation, and to the landing gear system for emergency gear extension. Care should be taken to avoid puncturing the fuel filled bottle.

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AIRCRAFT HAZARDS-Continued

F-22A

FUEL TANK LOCATIONS AND QUANTITIES

NOTE:

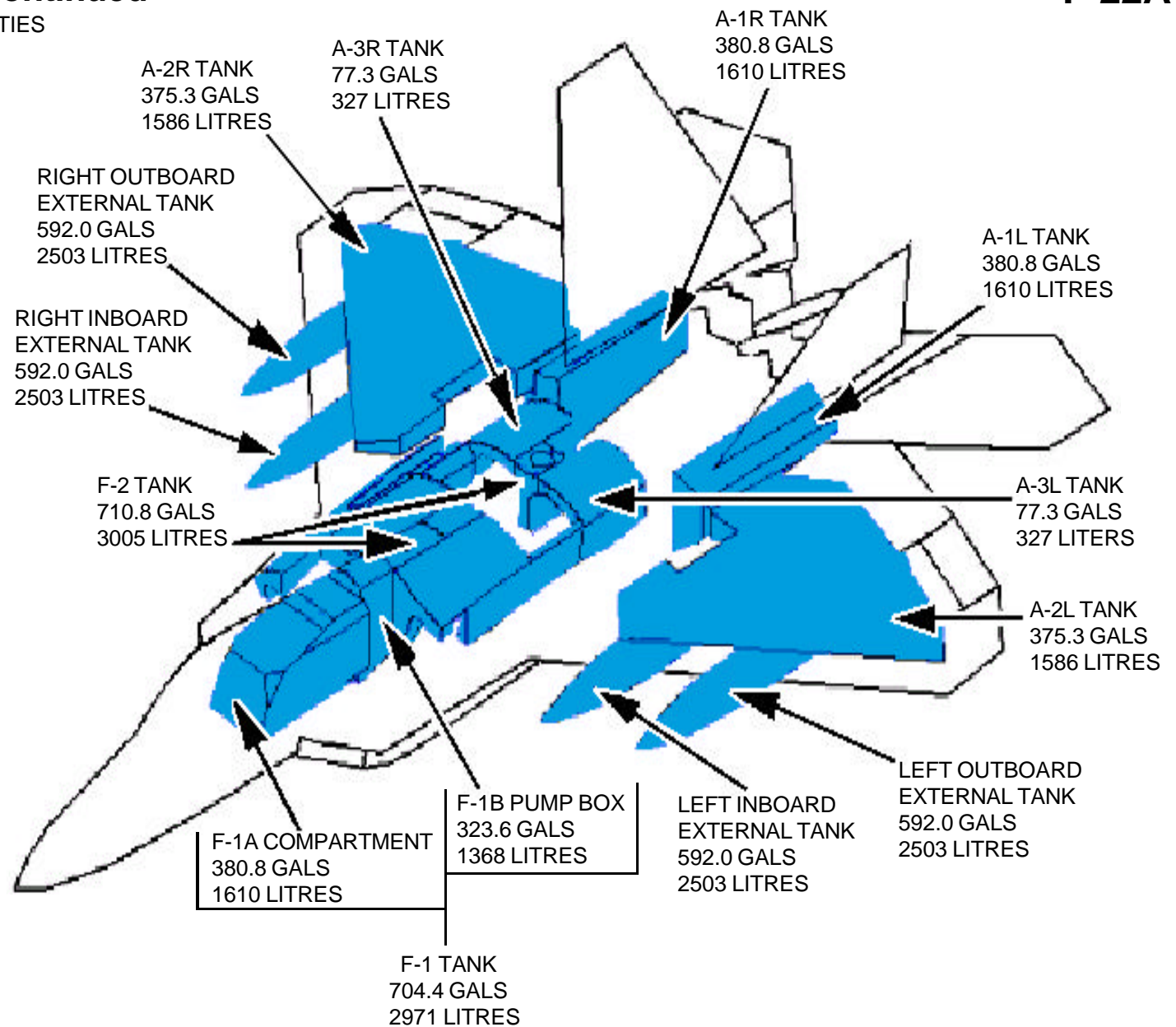
All quantities in US gallons and litres.

NOTE:

Total fuel: 5,450 gallons, 23,043 litres

Fuel weight: 36,515 lbs.

Fuel type: JP-8.



AIRFRAME MATERIALS

F-22A

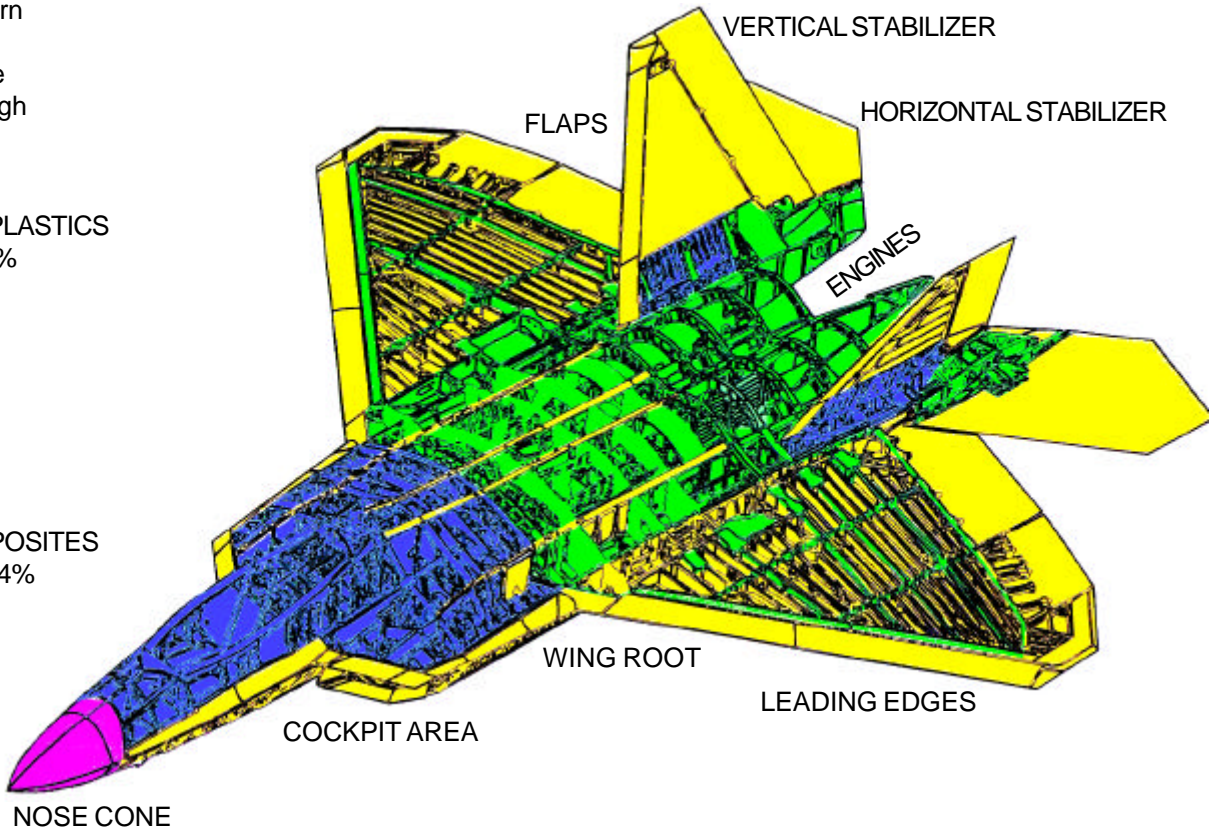
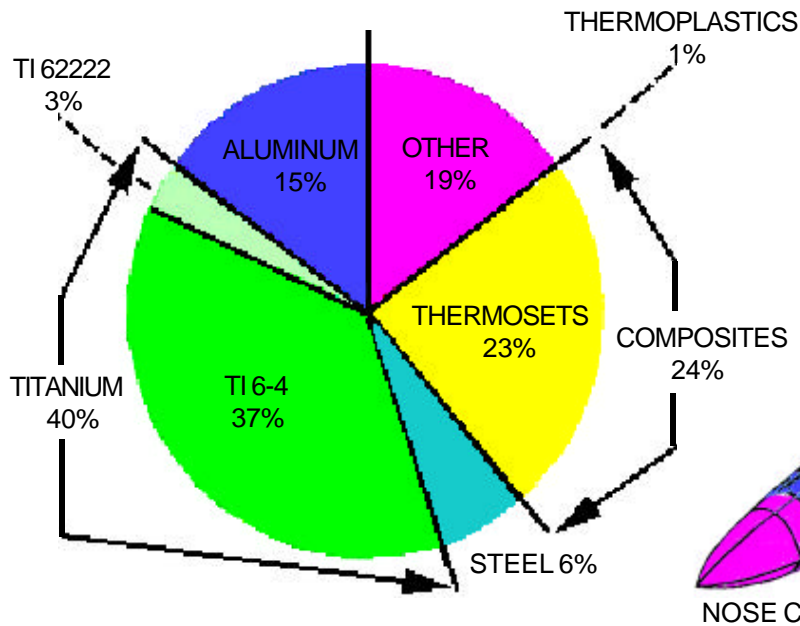
MATERIALS DISTRIBUTION

NOTE:
Organic composite structural laminates are made up of stacks of oriented thin lamina that consolidated under heat and pressure. Each lamina consists of a layer of high-strength, high-modulus, low-density reinforcing fibers embedded in a resin matrix. Fibers typically are materials such as carbon, boron, Kevlar 49, or fiberglass. The matrix can be either a thermosetting material such as epoxy, bismaleimide, or polyimide, or a thermoplastic material. If the matrix is thermosetting, a solid material is formed that cannot be reprocessed. Thermoplastic materials, however, can be reshaped by reheating and reforming.

WARNING

Self Contained Breathing Apparatus should always be worn during firefighting, rescue, and when removing bunkers to prevent respiratory complications from inhaling composite fibers and dust. Serious health problems will result through failure to observe this warning.

MATERIALS	MATERIALS LOCATION
OTHER	NOSE CONE
ALUMINUM	AFT OF NOSE CONE TO WING ROOTS AND BASE OF VERTICAL STABILIZERS
ALUMINUM BERYLLIUM (ALBEMET)	ALL OVER ACFT, MOSTLY NOSE AND SURROUNDS AVIONIC RACKS (EXTREME RESPIRATORY HAZARD)
ALUMINUM COPPER	AIRCRAFT BUSHINGS
TI 6222 (TITANIUM)	WING AND BODY SPARS, ENGINES
TI 6-4 (TITANIUM)	AND LOWER BASE OF STABILIZERS
STEEL	NOSE AND LANDING GEAR
THERMOPLASTICS (COMPOSITES) & THERMOSETS (COMPOSITES)	LEADING EDGES, FLAPS, HORIZONTAL STABILIZERS, WING, & BODY SPARS
CuBe (COPPER BERYLLIUM)	AIRCRAFT BUSHINGS



SPECIAL TOOLS/EQUIPMENT

Fire Drill II Power Rescue Saw 2-10' Ladders
 3/8" Drive Hand Electric Power Drill Rubber Mallet
 3/8" Universal Adapter Wire Cutters MFSOV Tool

AIRCRAFT ENTRY

WARNING

There is a canopy secondary lock, manually set by the pilot preventing any electrical or manual operation of the canopy. If pilot is incapacitated and secondary lock is in LOCKED position, there are only two options for entry: cut-in area at lock or canopy jettison. In order to effect entry ensure secondary lock is UN LOCKED.

1. NORMAL ENTRY - WITH POWER

- Actuate the canopy up/hold/down switch, located in the nose wheel well on the right sidewall fairing, to the UP position to the desired height. The canopy actuator has an internal mechanism allowing canopy support at any height.
- Internal canopy up/stop/down switch is located on the right console panel under the right canopy sill as well as the canopy manual unlock handle.

2. NORMAL ENTRY - NO POWER

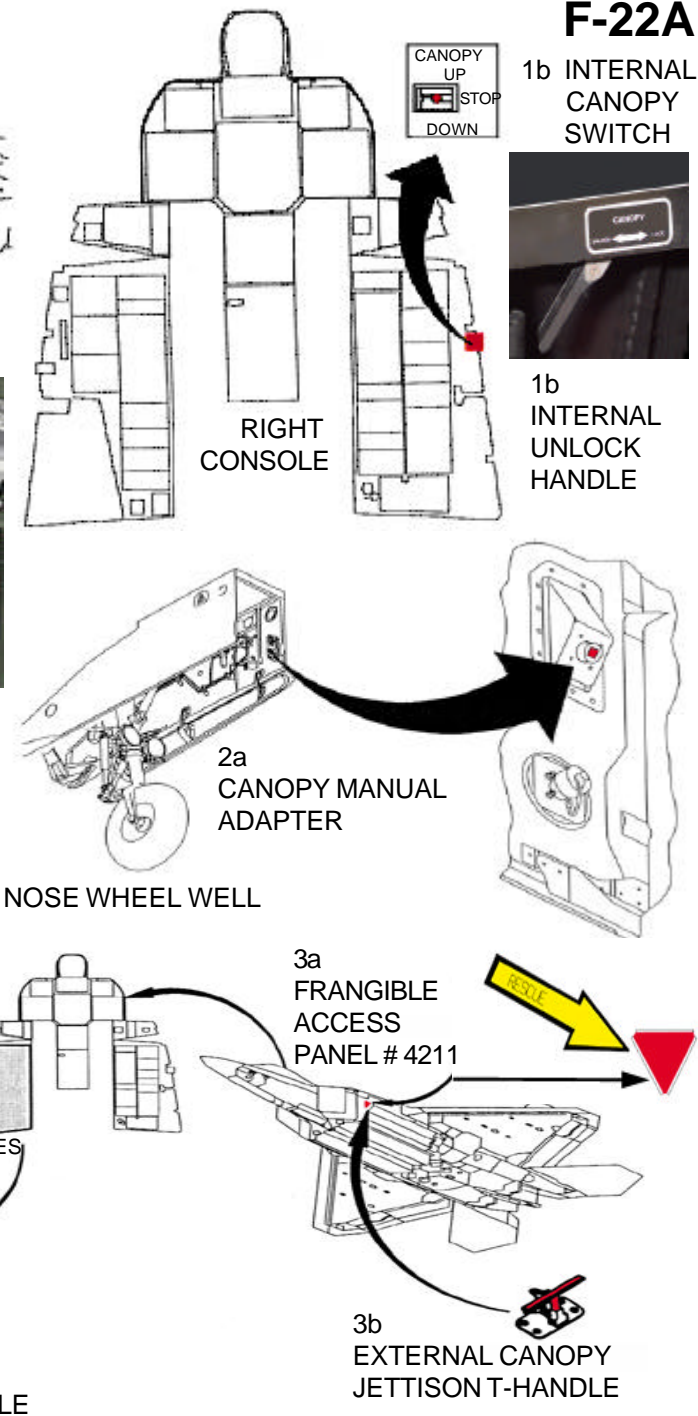
- Rotate the canopy manual adapter, located in the nose wheel well on the forward left sidewall, with a electric power drill or hand tool counterclockwise (3200 to 3600 revolutions) to the full open position. A 3/8" universal adapter will be required in order for hand tool or drill to fit properly in canopy manual adapter.

3. EMERGENCY ENTRY

- Proceed to Frangible Access Panel #4211, located on left side just aft of left inlet forward from the wing leading edge.
- Fracture the panel with a rubber mallet, (a tool or blunt object should not be used to break panel) then actuate the external jettison handle by pulling the ring out (set 2" inside panel) to jettison the canopy 8-10 inches. An additional 3/8" pull will ignite the battery for the jettison system. Personnel should be aware of impact area. See page F/A-22.6 for canopy impact area.
- The internal canopy jettison handle is located on the left console, left of the throttles, under the left canopy sill.

CLAMSHELL
TYPE
CANOPY1a
EXTERNAL CANOPY
SWITCH**WARNING**

Do not approach aircraft with engines running. Intake suction is extremely dangerous to all personnel. See page F/A-22.3.

**F-22A**1b INTERNAL
CANOPY
SWITCH1b INTERNAL
UNLOCK
HANDLERIGHT
CONSOLE2a
CANOPY MANUAL
ADAPTER

NOSE WHEEL WELL

3a
FRANGIBLE
ACCESS
PANEL #42113b
EXTERNAL CANOPY
JETTISON T-HANDLE3c
INTERNAL
CANOPY
JETTISON
HANDLE

THROTTLES

LEFT
CONSOLE

AIRCRAFT ENTRY-Continued

WARNING

If pilot is incapacitated and canopy will not open electrically, then ensure the pilot is clear of the canopy frame prior to jettisoning the canopy. Failure to comply may add additional injury to the pilot. If pilot is not clear of the canopy frame, then apply power saw to transparency per CUT-IN procedures.

NOTE:

If canopy is jammed after normal landing, do not jettison canopy. Go to 4a.

4. CUT-IN

- a. Cut along the canopy frame on all sides with the power rescue saw with carbide tip to remove the canopy glass.

5. CANOPY RAIL OR SILL CAMS

NOTE:

The canopy rails or sills have been modified to eliminate "canopy howling", an in-flight phenomenon. Canopy skirt clips engage the cams during closing to prevent howl.

WARNING

Footing on the canopy rail or sill must be firmly established prior to lifting of pilot so the extraction process is stable. Cams present a potential harness snag hazard during emergency ground egress and/or rescue of an incapacitated pilot. If footing is lost, pilot and rescuer may fall from aircraft causing injury or death to one or both personnel.

- a. 0.75" high cams are added along the outer edge of both left and right canopy rails or sills.
- b. The cams are installed on A/C 4003 and DIOT&E aircraft. Flight testing on A/C 4003 continues to progress.
- c. Final number of cams established at 12 per side.
- d. LM-Aero Marietta engineering review of cam installation indicates that the cams should not impede ground rescue access to an incapacitated aircrew, or cause any unstable footing on the canopy rails or sills for rescuers attempting to brace on the rails or sills to dead lift a pilot. Cams may add to traction of rescuer's boots. (Rescue crews are asked to discuss these issues and provide feedback.)
- e. Aircraft 4012 and up will incorporate a continuous height sill bracket.



CANOPY RAIL OR SILL



5a
CAM BLOCK

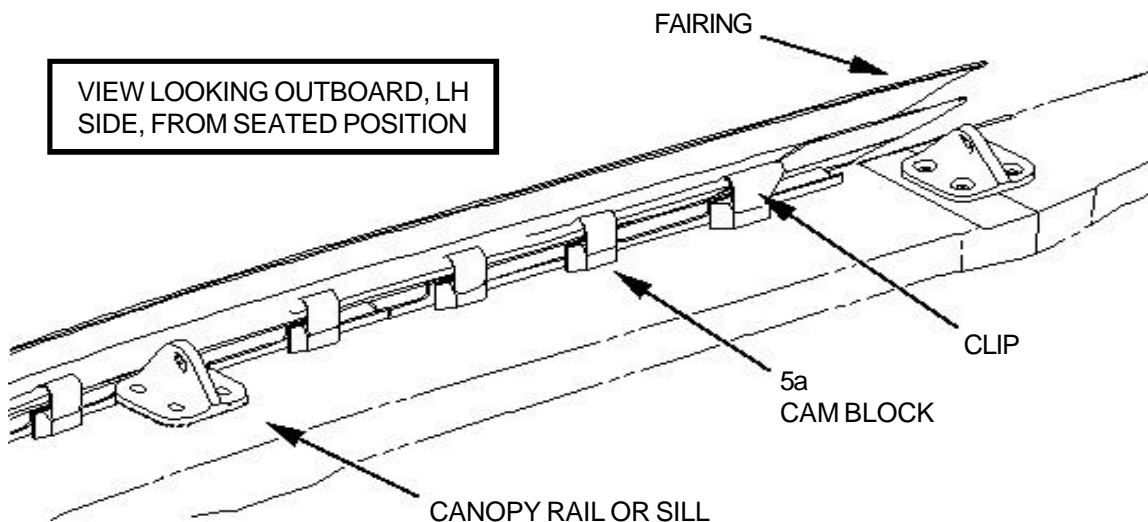


LEFT SIDE LOOKING AFT



LEFT SIDE LOOKING FWD

VIEW LOOKING OUTBOARD, LH
SIDE, FROM SEATED POSITION



F-22A

MAIN FUEL SHUT-OFF ACCESS

1. MAIN FUEL SHUT-OFF ACCESS FROM BOTTOM

NOTE:

Maintenance access for the main fuel shut off valve actuators are normally under panels # 4536 and 4576 on the lower sides of the aircraft. The valves are installed in the fuel cells, but the Valve Actuators and Manual Shutoff Handles are connected to the valves utilizing a linkage assembly. All illustrations are bottom views. **Use left engine shutdown for emergencies.**

NOTE:

Use this method only, if access to the cockpit is impossible. Bottom MFSOVs panels #1 and #2 screws can be removed by a battery powered drill or speedhandle.

WARNING

Top and side of MFSOVs #1 and #2 panels should not be cut into or penetrated. These panels have fuel lines and wiring bundles underneath. Also, cutting or penetrating through this area may damage the MFSOV handle and prevent its use.

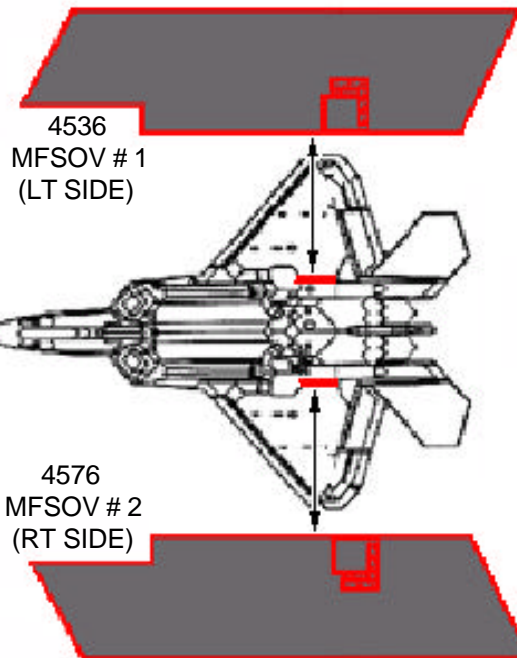
- Remove or break through access panels at fourth lower screw from right on left panel and left on right panel. (Panel coating may need to be removed in order to locate the fourth lower screw. Each panel consists of 35 #20 torque tip screws.)
- Remove the MFSOV electrical connector or cut the connector wires prior to manually actuating the MFSOV red manual lever.

NOTE:

The aircraft will continue to supply power to actuate the MFSOV to the position commanded by the Fire Switch/Light in the cockpit until power is terminated.

- Manually position the valves to close by positioning the Flapper Type Handles Full DOWN. Full UP is open. Depending on the RPM of the engine selected for shutdown, spool downtime can be 10 to 29 seconds. Shutdown may not be complete, but engines can be spooled down to IDLE allowing cockpit entry by eliminating the left engine intake ingestion danger.

LT MANUAL HANDLE EXPOSED
AFTER PANEL REMOVAL



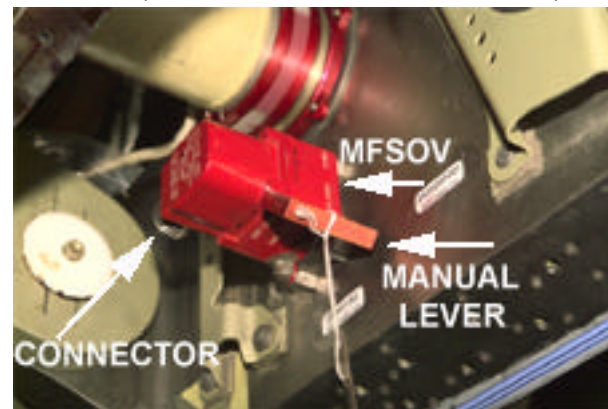
RT MANUAL HANDLE EXPOSED
AFTER PANEL REMOVAL



1a L/H MFSOV PANEL OPENING
(IF SOME SCREWS ARE REMOVED)



1a L/H MFSOV PANEL OPENING
(IF ALL SCREWS ARE REMOVED)



1b MFSOV COMPONENTS
(L/H MFSOV VIEW)

APU/ENGINE SHUTDOWN

1. APU SHUTDOWN

NOTE:

There are five (5) ways to shutdown the APU.

- (1) Position the APU switch to OFF.
- (2) Position the APU Emergency Shutdown switch in the left wheel well to EMER OFF.
- (3) Flood the APU inlet with extinguishing agent.
- (4) Command the APU to shutdown using the PMA.
- (5) Depress the APU FIRE Switchlight.

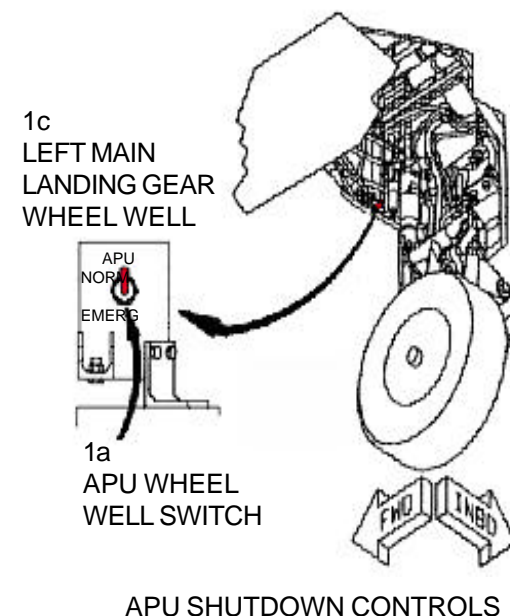
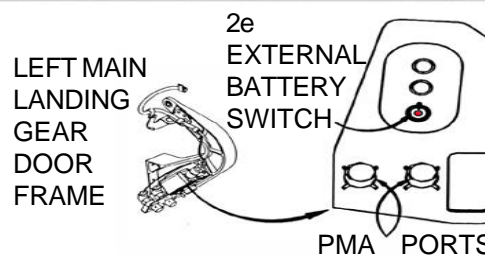
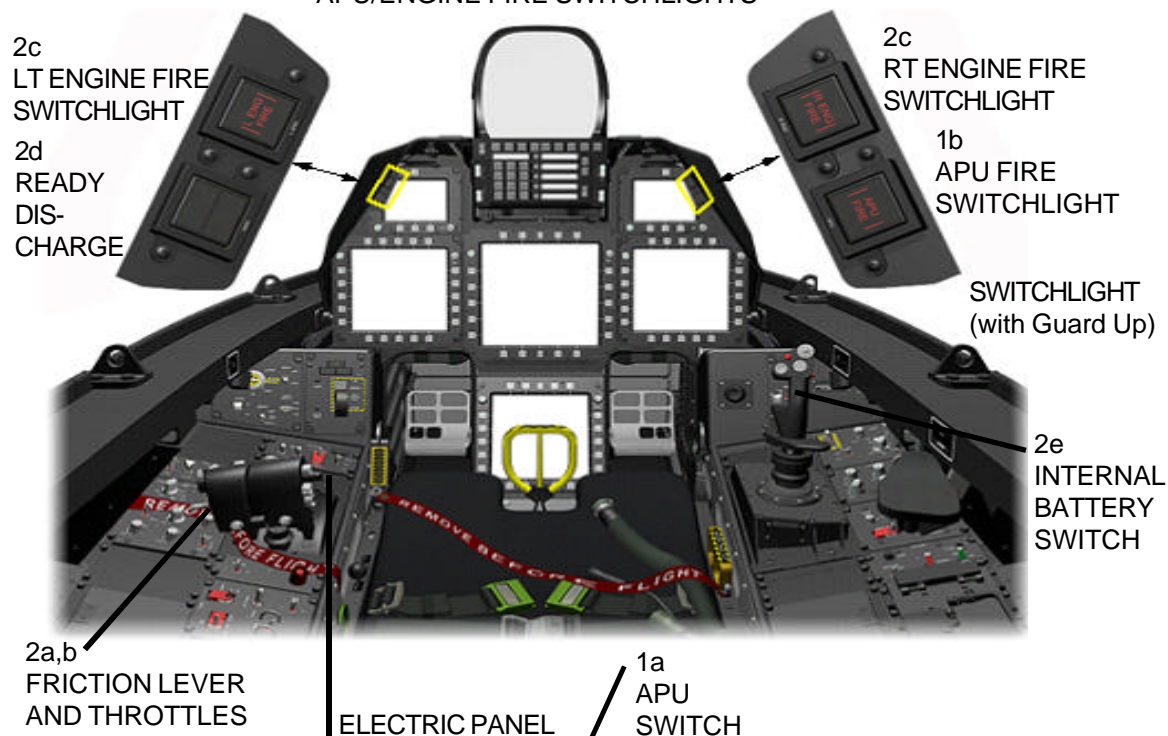
- a. Place the APU switch, located on the Electric Panel left console forward of throttles, to OFF.
- b. The APU FIRE Switchlight, located on the right glare-shield eyebrow, illuminates when a fire in the APU Compartment has been detected. Depressing the switchlight, on the ground, will shutdown the APU.
- c. The Emergency Shutdown Switch, located on the forward inboard side of the left main landing gear wheel well allows ground personnel to shutdown the APU during an emergency situation.

2. ENGINE SHUTDOWN

- a. Pull the friction lever, located left of left engine throttle, aft, to release throttle friction.
- b. Place the engine throttles, located on the left console, aft to lift over gate and continue aft to OFF.
- c. Depress the ENG FIRE warning switchlight, located on forward instrument panel, if illuminated. This action shuts off fuel, electrical power, ventilation, and air to the affected engine and arms the fire suppression system.
- d. If fire light remains illuminated: When the fire extinguisher is ready to discharge the extinguishing agent, the READY/DISCH switchlight, located on the forward instrument panel illuminates. When the switchlight is depressed, the READY light goes off and the DISCH switchlight illuminates indicating that the halon has been discharged to the selected compartment.
- e. Position battery switch, located on right corner panel, down to OFF. Another battery switch is located on the left main landing gear door frame above the PMA ports for external battery shutoff.

APU/ENGINE FIRE SWITCHLIGHTS

F-22A



SAFETYING EJECTION SYSTEM

1. ACES II EJECTION SEAT UPGRADE

Enhancements to this seat are numerous. Ejection initiators have been replaced with thermal batteries (shown with panel removed under the ejection control handle).

[Note the distinctive mechanical lock that places the bell-crank in the locked position when the ground safety level is in the de-armed position.]

The drogue chute is located in the upper aft area of the seat.

Pitot tubes are stowed closed.

Ballistic lines have been replaced by electrical wires.

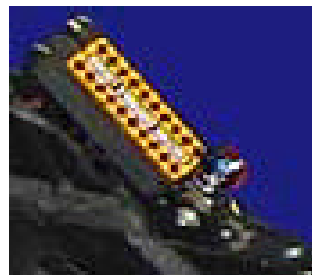
There is also the addition of arm and leg restraints.

A larger on-board oxygen bottle is now installed.

The restraints will separate either in salt or fresh water.

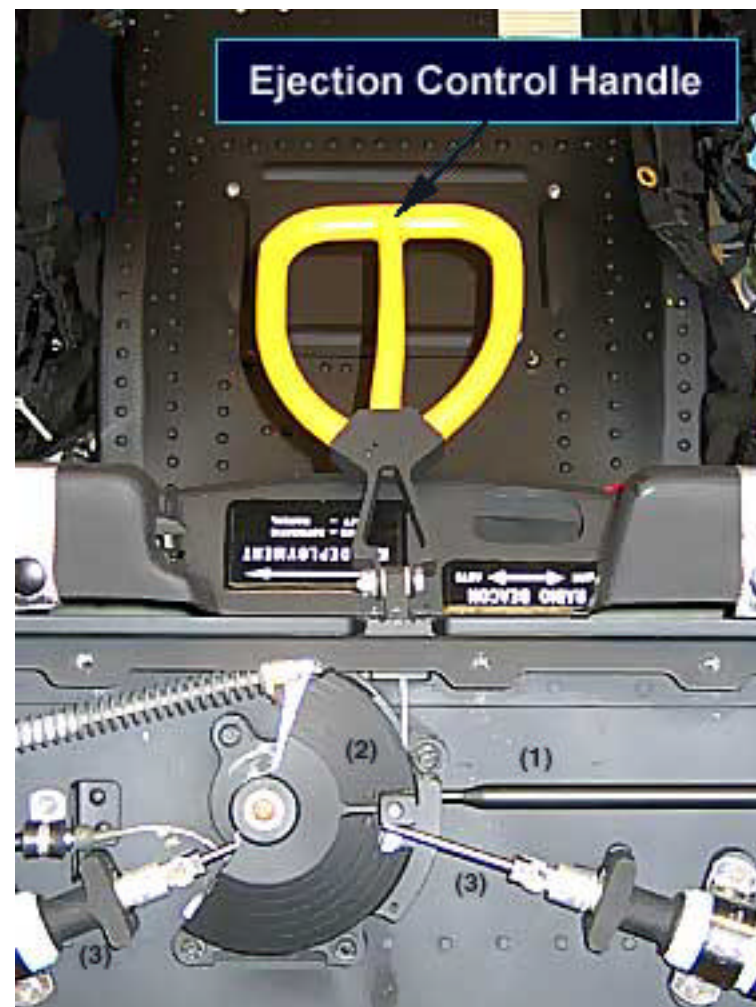


ADVANCED CONCEPT EJECTION SYSTEM UPGRADE FOR THE ACES II EJECTION SEAT



GROUND SAFETY LEVER
(SAFE POSITION)

F-22A



ACES II EJECTION SEAT WITH EJECTION CONTROL HANDLE. WITH PANEL REMOVED, THE GROUND SAFETY LEVER LOCK (1) AT BELLCRANK (2) WITH ATTACHED THERMAL BATTERIES (3) ARE EXPOSED. THESE THERMAL BATTERIES FIRE AND INITIATE THE EJECTION SEQUENCE WHEN THE EJECTION CONTROL HANDLE IS MOVED AND GROUND SAFETY LEVER IS UN-ARMED.

SAFETYING EJECTION SYSTEM AND AIRCREW EXTRACTION

F-22A

1. NORMAL SAFETYING OF ACES III EJECTION SEAT

WARNING

A Seat Armed Indicator located on the lower right side of the seat can indicate WHITE for OK and RED for SEAT ARMED. This indicates that the Advanced Recovery Sequencer (ARS) battery condition is serviceable or expended. If expended, the white sealant will be punctured by a protruding red pin. If this is a recent condition, it will take two hours for the seat to be considered safe to work around or remove. Electrical battery power is required to energize the recovery sequencer circuits for the numerous explosives on the seat. Use extreme caution and judgement in this case. If time permits, call the local Egress Shop before proceeding. If emergency exists and time does not allow inspection by the Egress Shop, sever all exposed electrical leads

NOTE:

The F/A-22 employs the ACES III Ejection Seat, structurally similar to the F-16 seat version. Sub system upgrades from the ACES II technology are incorporated, but does not affect the safing of the seat. Pitot tubes are stowed to prevent grasping while entering or egressing the cockpit.

NOTE:

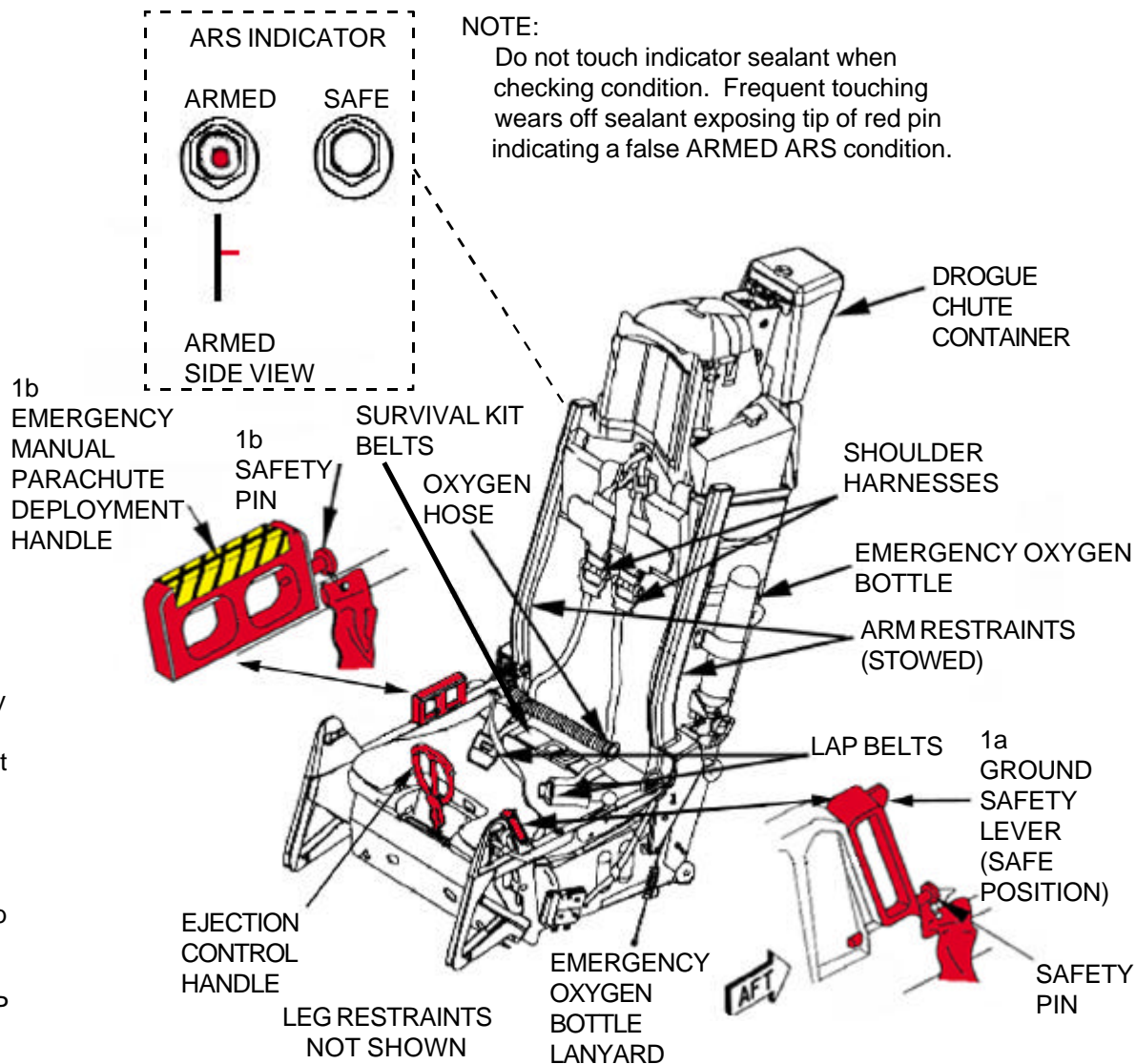
For rescue and extraction, the safety pins for steps a and b should be separate to prevent entanglement.

- a. Rotate Ground Safety Lever, located on left side of seat, UP and FORWARD, and install safety pin in lower part of lever after rotation facing forward.

NOTE:

The Ground Safety Lever mechanically safes the Ejection Control Handle. There is no safety pin for this handle.

- b. Install safety pin in the Emergency Manual Parachute Deployment Handle aft of handle facing forward.



SAFETYING EJECTION SYSTEM AND AIRCREW EXTRACTION-Continued

NOTE:

The Emergency Manual Parachute Deployment Handle can not be pulled upward. For obvious reasons, this handle **can not** be used in the process for extracting the pilot from the seat.

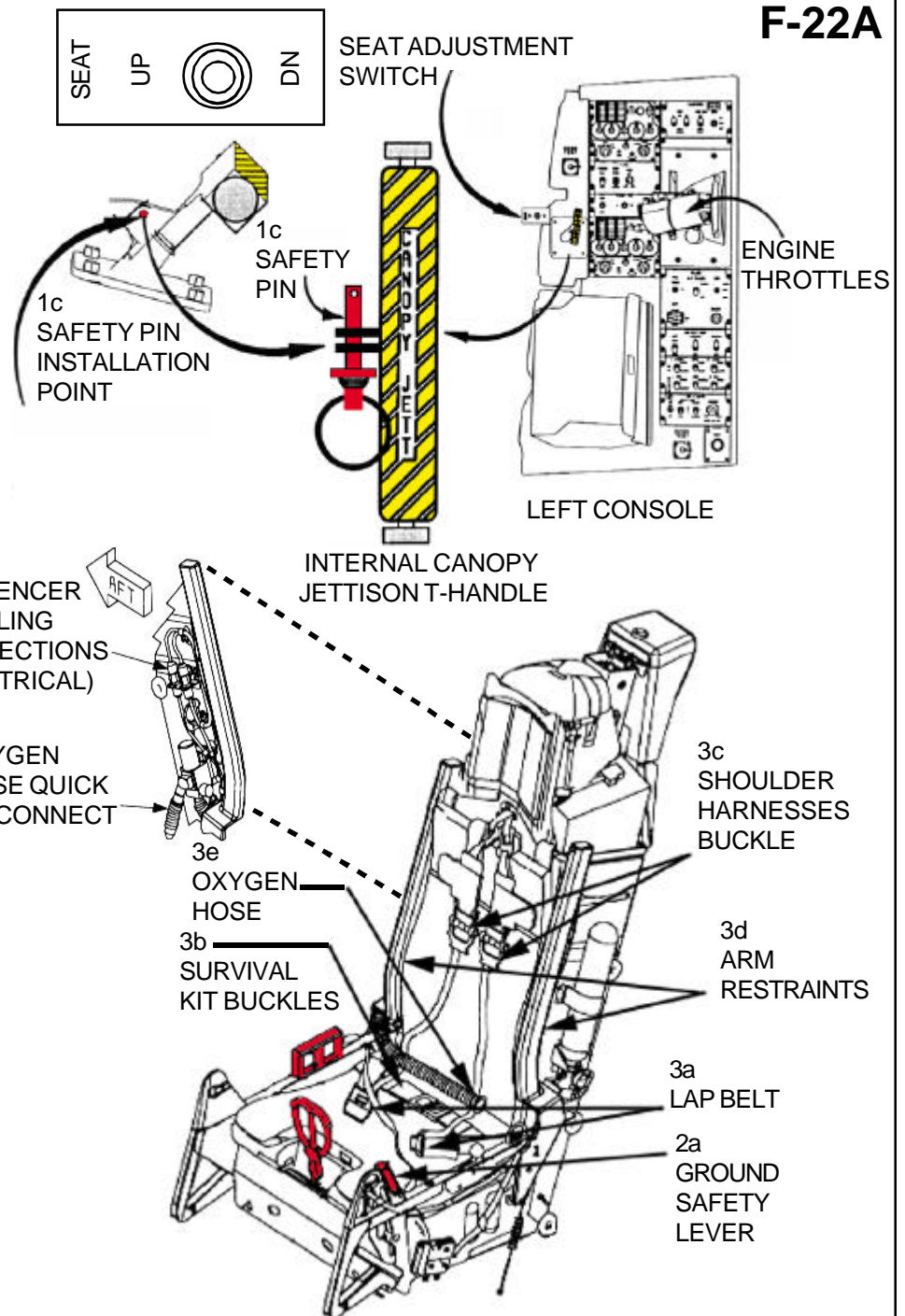
- c. Install safety pin in the Internal Canopy Jettison T-Handle located on the outboard left console, left of the engine throttles.

2. EMERGENCY SAFETYING EJECTION SEAT

- a. Rotate Ground Safety Lever, located on left side of seat, UP and FORWARD.
- b. Install safety pin in lower part of lever after rotation facing forward.

3. AIRCREW EXTRACTION

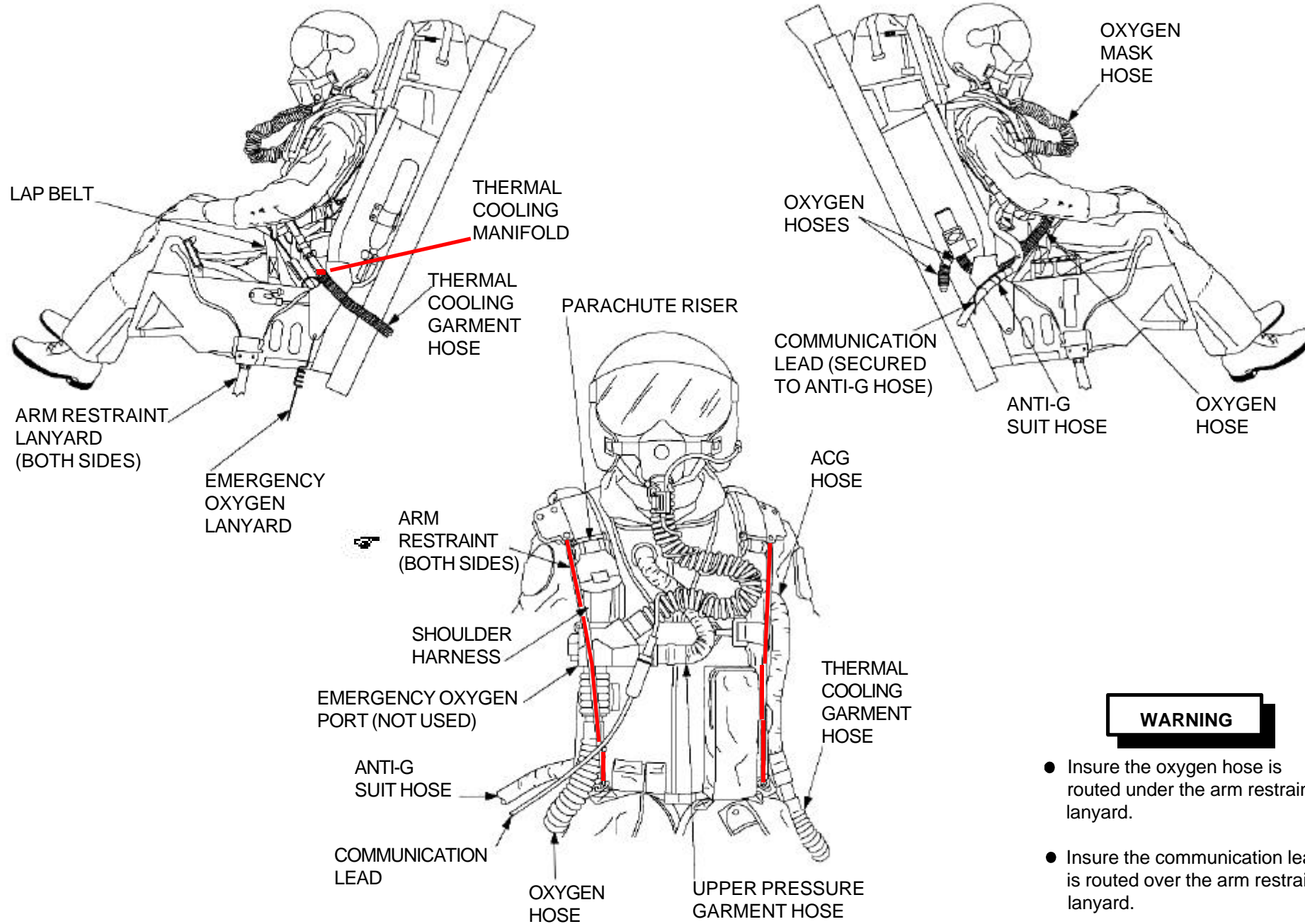
- a. Disconnect lap belt by lifting cover and pulling release bar.
- b. Disconnect left and right survival kit buckles by depressing PUSH TO RELEASE tab on each buckle.
- c. Disconnect left and right shoulder harness fittings/risers by squeezing latch and release bar simultaneously for each fitting.
- d. Remove left and right arm restraints from aircrew's shoulders.
- e. Disconnect normal and emergency oxygen hoses at suit disconnect.
- f. Disconnect communication lead at suit disconnect. See page F/A-22.21.
- g. Disconnect cooling garment hose at manifold. See page F/A-22.21.
- h. Disconnect G suit hose at suit quick disconnect. See page F/A-22.21.
- i. Lift crewmember from seat avoiding feet entanglement with Ejection Control Handle, safety pin streamers and leg restraints.



AIRCREW EXTRACTION-Continued

SEAT AND AIRCREW ORIENTATION

F-22A



WARNING

- Insure the oxygen hose is routed under the arm restraint lanyard.
- Insure the communication lead is routed over the arm restraint lanyard.

AIRCREW EGRESS

1. AIRCREW EGRESS

NOTE:

This information is based on pilot self ground egress. Responders should be ready to receive pilot, if possible, as pilot will be immediately leaving the unpredictable incident area.

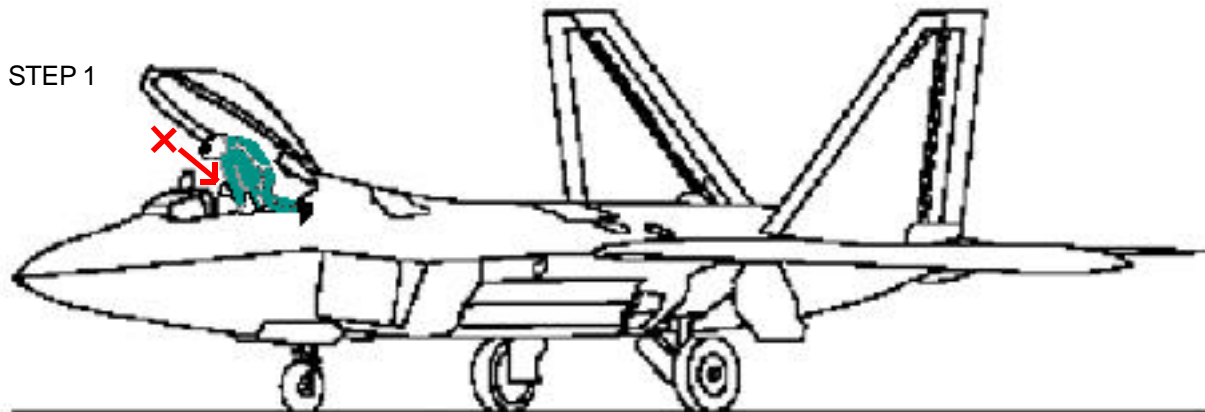
WARNING

Do not use any part of the ACES II ejection seat as a hand held area while climbing out of aircraft, most notably the pitot tubes located at top of seat. Inadvertent actuation of ejection seat components could have devastating and deadly results. This also includes the canopy jettison handle on the left console.

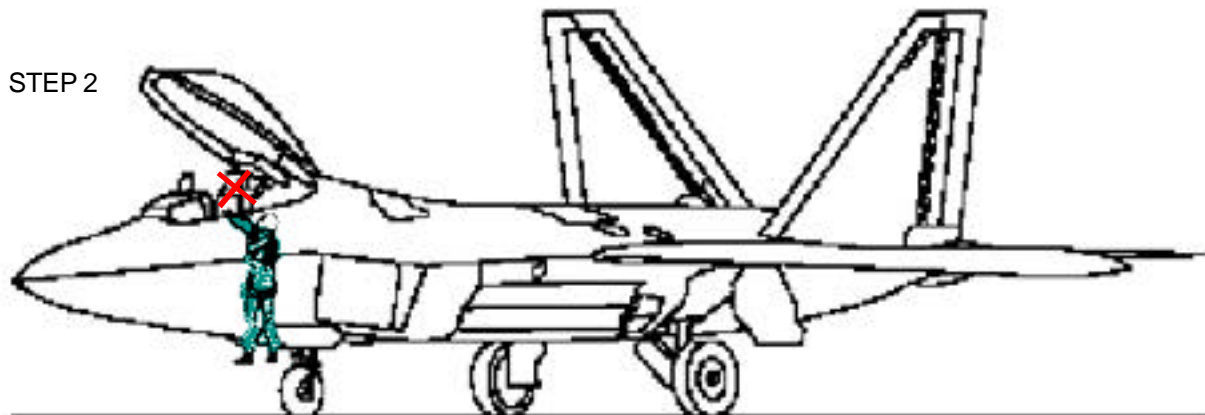
- a. STEP 1. Climb over least dangerous side of aircraft (i.e. no smoke, fire or running engine), grasping canopy rail or sill with both hands while lowering legs down side of aircraft. Watch for potential snagging of life support equipment while climbing over canopy rail or sill cams.
- b. STEP 2. Extend body, with both hands, while still holding onto canopy rail or sill.
- c. STEP 3. Release forward most hand from canopy rail or sill and rotate body to the facing away position from the engine intake. Release last hand from canopy rail or sill. Prepare to perform a Parachute Landing Fall upon hitting the ground.

F-22A

STEP 1



STEP 2



STEP 3



AIRCREW EGRESS TRAINING

1. AIRCREW EGRESS TRAINING WITH PROTECTIVE BLANKET

- a. KENF22EXT-01A, Aircrew Extraction Blanket, cost: \$225.00. This item can be found at the DoD EMALL <https://emall.prod.dodonline.net/scripts/emLogon.asp>
- b. Prior to accomplishing re-curring egress training, a protective blanket will be placed on both sides of cockpit fuselage. The blanket is used to prevent scratching or like damage to the aircraft equipment and coatings while the fire department accomplishes the required training. The blanket is not necessary if an actual emergency occurs. Do not use if blanket can not be secured to aircraft.
- c. The blanket attaches to the canopy sill at four points to include the left and right corners. Blanket straps and pins are used in concert with the canopy sill brackets. The fabric strap is placed over the bracket and then the pin is routed through the bracket to secure the strap and blanket in place. The pin diameters are as follows: front to rear - $\frac{1}{2}$ ", $\frac{5}{8}$ ", $\frac{3}{4}$ ", $\frac{3}{4}$ ".
- d. Insure blanket is cleaned of any dirt or grime prior to storage. Store in a clean, dry place and insure to keep away from equipment that may cause damage or tears to blanket while not in use. When transporting, do not place equipment or objects that may cause damage.



BLANKET MOUNTED ON LH SIDE



BLANKET MOUNTED ON RH SIDE



BLANKET ATTACHMENT ON LH CORNER



BLANKET ATTACHMENT ON RH CORNER

F-22A

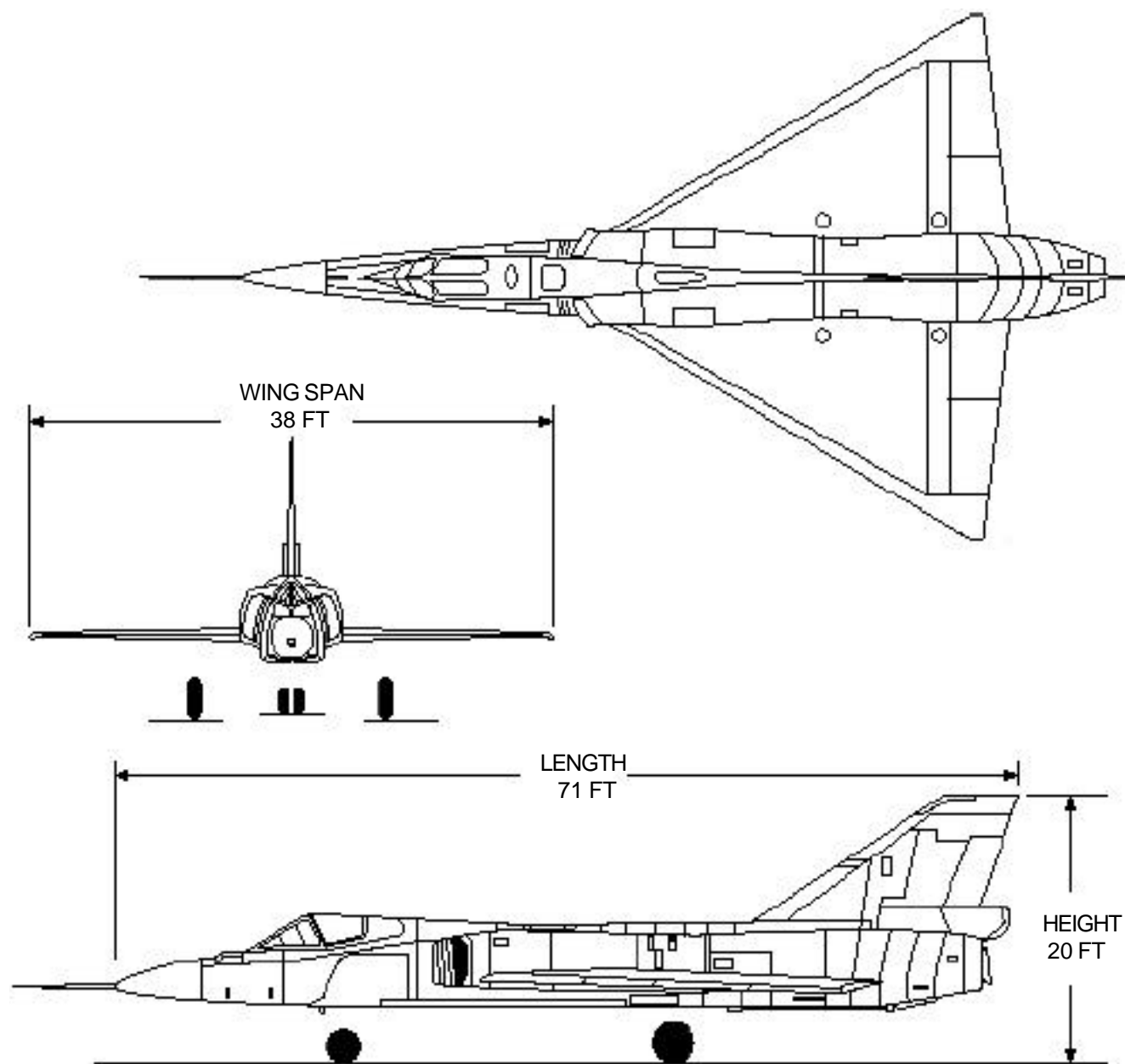
AIRCRAFT PAINT SCHEME

QF-106



AIRCRAFT DIMENSIONS

QF-106



AIRCRAFT SKIN PENETRATION POINTS

QF-106

WARNING

In the drone configuration (unmanned-QF), do not attempt fire extinguishment or use the skin penetrator agent application tool. Drone aircraft are equipped with a self-destruction mechanism. Maintain a safe distance of two thousand feet to damaged aircraft. 24 hours time is required for self destruct mechanism batteries to run down before aircraft can be safely approached. Do not attempt to fight any fires if aircraft is unmanned.

ORANGE TAIL AND WING TIPS
ARE DRONE DESIGNATIONS

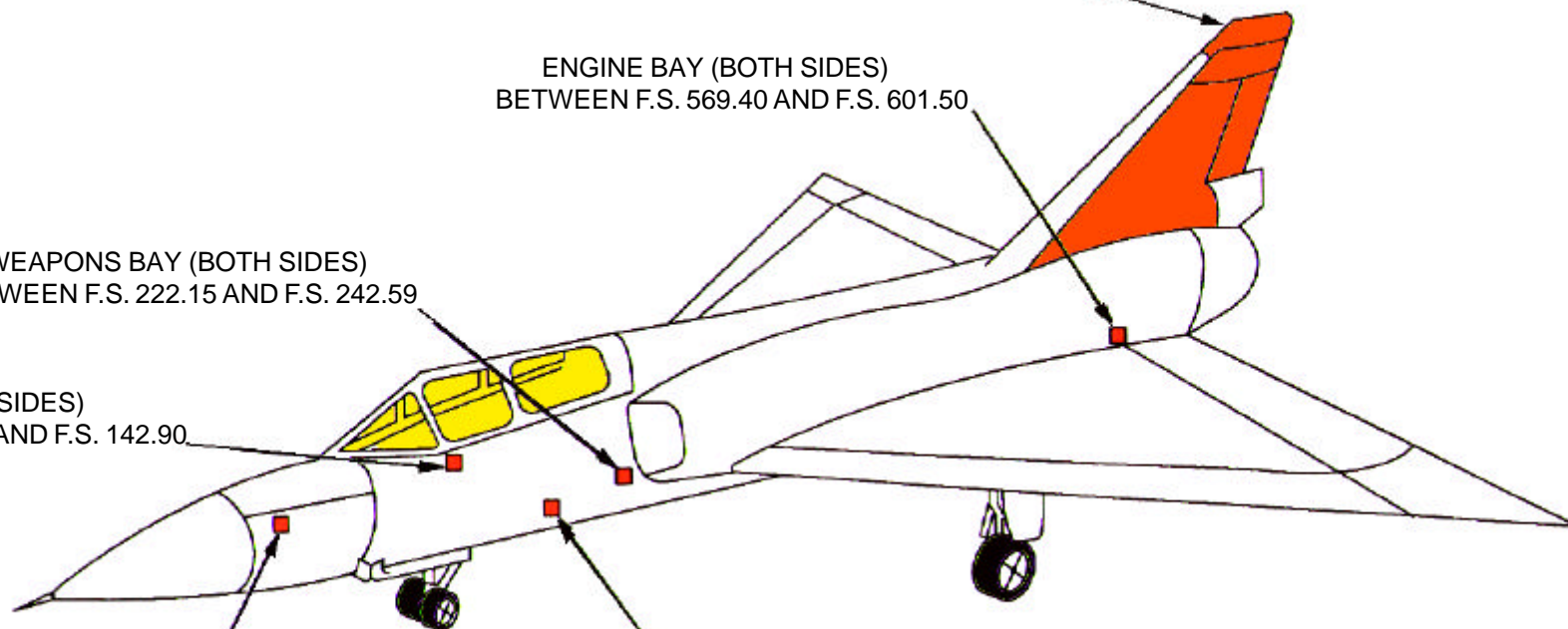
ENGINE BAY (BOTH SIDES)
BETWEEN F.S. 569.40 AND F.S. 601.50

WEAPONS BAY (BOTH SIDES)
BETWEEN F.S. 222.15 AND F.S. 242.59

COCKPIT (BOTH SIDES)
BETWEEN F.S. 138.00 AND F.S. 142.90

FWD EQUIPMENT BAY (BOTH SIDES)
BETWEEN F.S. 53.77 AND F.S. 59.31

LOWER EQUIPMENT BAY (BOTH SIDES)
BETWEEN F.S. 108.18 AND F.S. 157.90



1. NORMAL ENTRY

WARNING

Canopy hold open support assembly must be installed between canopy sill and frame. If electrical normal entry is attempted and the battery fails, cut-in procedures will have to be used - A Model.

- a. Open external canopy control access door, located on left forward fuselage.
- b. A Models, pull T-handle out approximately 6 inches, to release canopy latches, and manually raise canopy and install hold open support.
- c. B Models, pull latch handle fully out, rotate up and counterclockwise to stop, pull out about 1/2 inch and rotate down to original position to unlock canopy.
- d. B Models, hold switch in the UP position to open canopy.
- e. On B Models, if canopy does not open, pull down on canopy motor brake release handle, manually raise canopy and install hold open support.

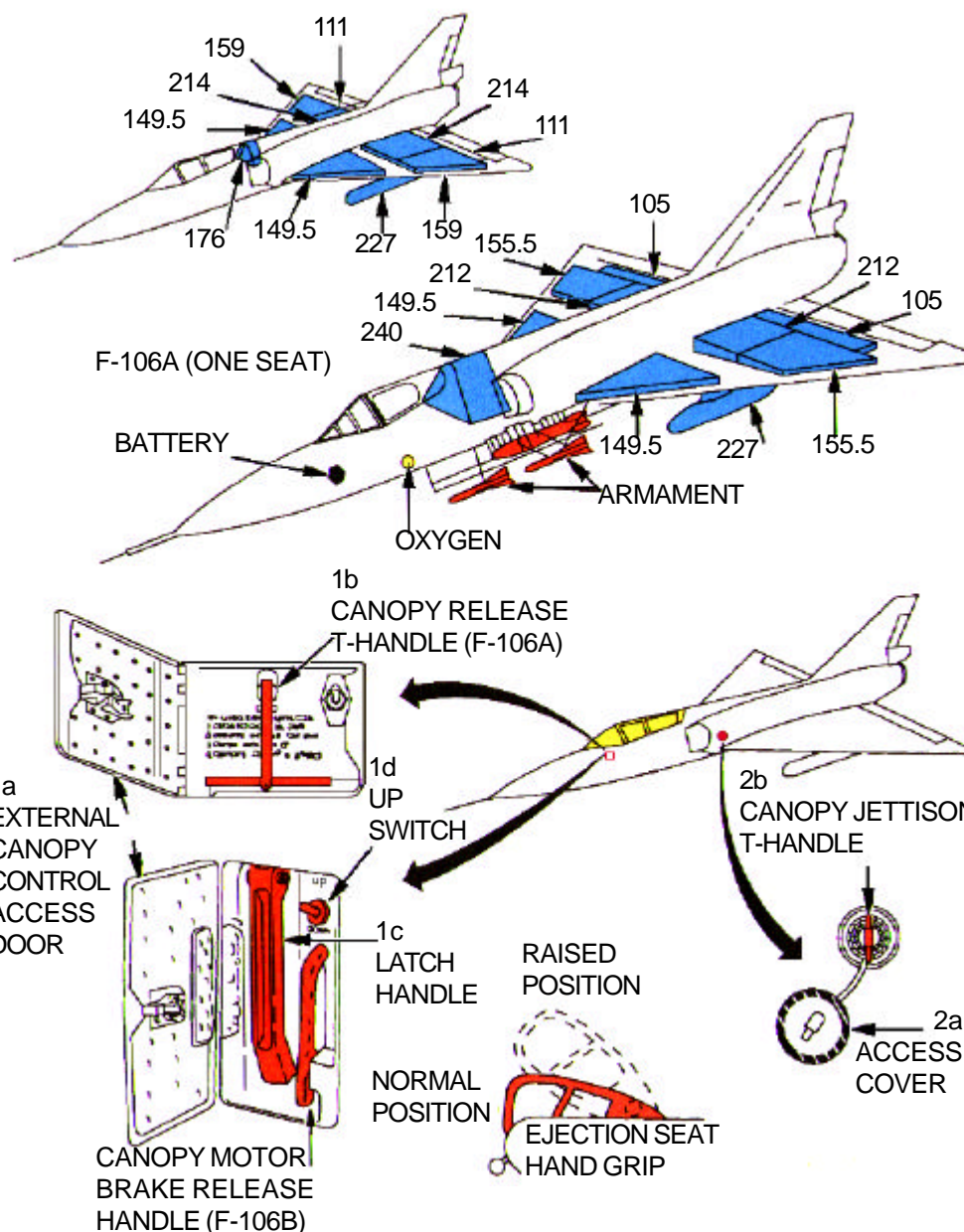
2. EMERGENCY ENTRY

WARNING

If handgrips are raised, do not pull external canopy jettison T-handle. Use cut-in method. Exercise caution to prevent injury in the event the canopy jettison charge fires while making entry to canopy.

- a. Push latch, located on left side of aircraft, in and remove access door.
- b. Pull T-handle out approximately 6 feet to jettison canopy.

F-106B (TWO SEATS)



F-106A (ONE SEAT)

BATTERY

OXYGEN

ARMAMENT

1b
CANOPY RELEASE
T-HANDLE (F-106A)

1a
EXTERNAL
CANOPY
CONTROL
ACCESS
DOOR

1d
UP
SWITCH

2b CANOPY JETTISON
T-HANDLE

1c
LATCH
HANDLE

RAISED
POSITION

NORMAL
POSITION

EJECTION SEAT
HAND GRIP

2a
ACCESS
COVER

CANOPY MOTOR
BRAKE RELEASE
HANDLE (F-106B)

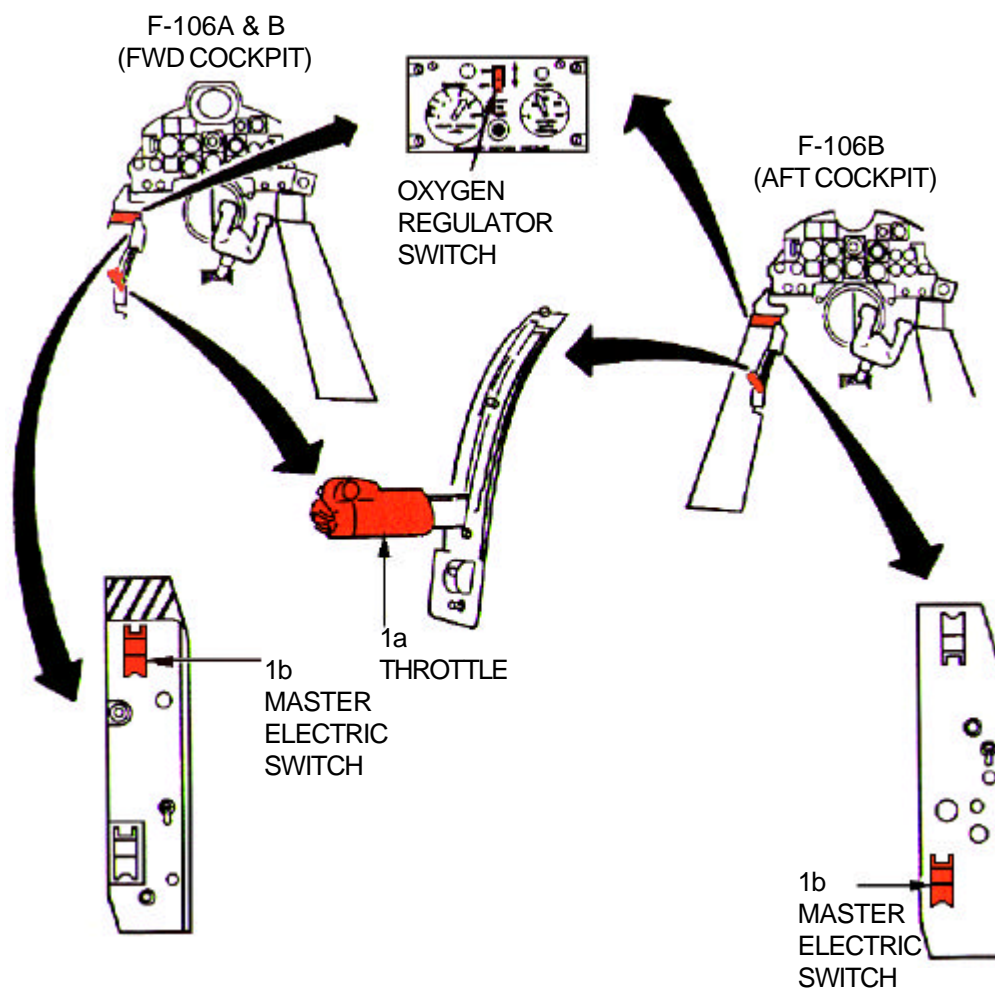
ENGINE SHUTDOWN

1. ENGINE SHUTDOWN

- Retard throttle, located in both cockpits left side outboard and aft, to OFF position.
- Place master electric switch, located in both cockpits left console, to OFF position.

NOTE:

On F-106Bs, engine shutdown is not possible from aft cockpit.



SAFETYING EJECTION SYSTEM AND AIRCREW EXTRACTION

QF-106

1. NORMAL SAFETYING EJECTION SEAT

- a. Insert ground safety pin, stored on right-hand console, into right side of each seat below right handgrip.

2. EMERGENCY SAFETYING EJECTION SEAT

- a. Manually trip to separate the ballistic hose quick disconnect, located left and right side of headrest. (A Models have two left side and one on right side.) (B Models have two left side and two on right side.)

NOTE:

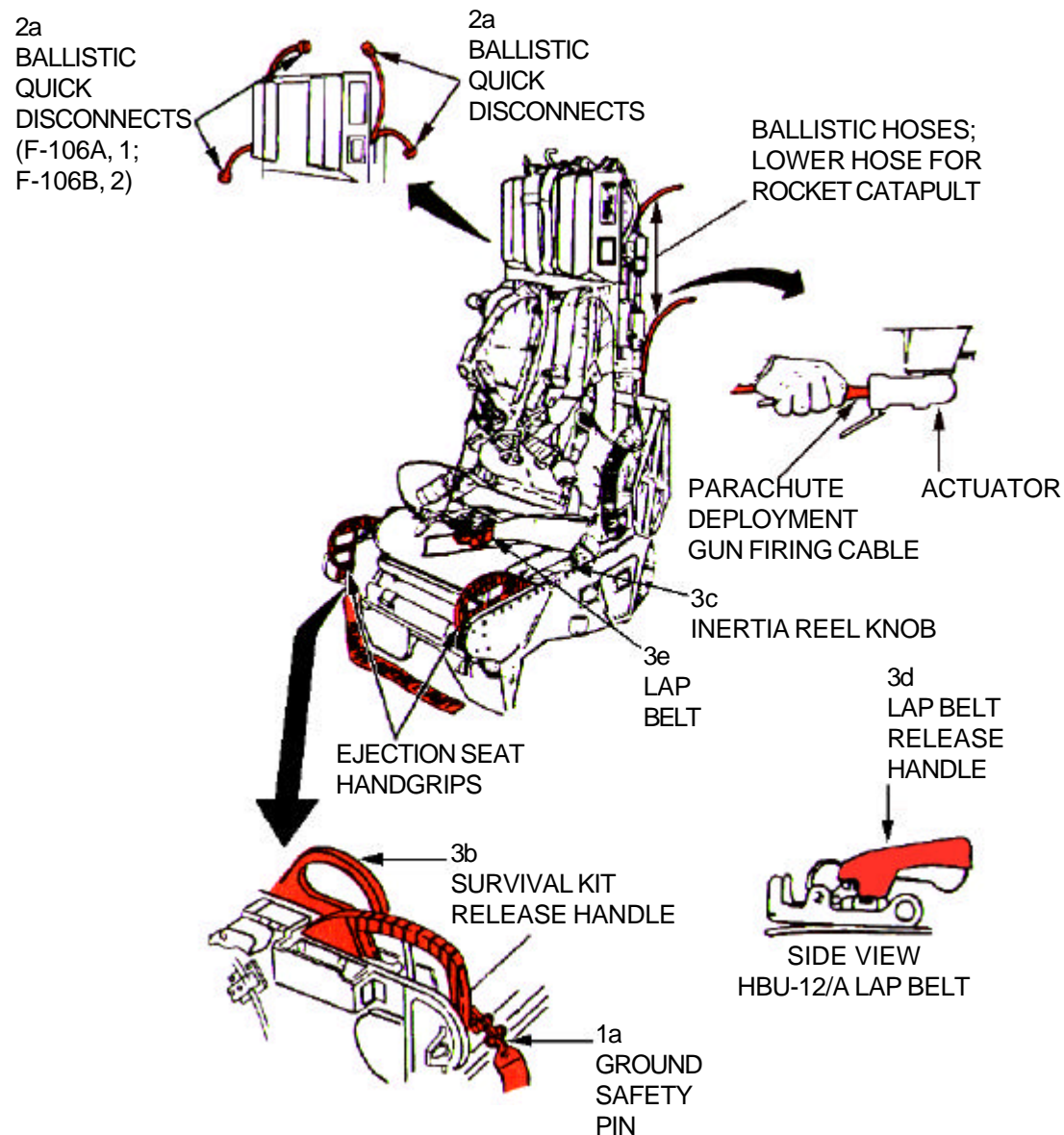
If determined more expeditious, cut catapult ballistic hose, located at lower left side of seat.

3. AIRCREW EXTRACTION

WARNING

Crewmembers are equipped with forced deployed parachutes. Disconnect parachute deployment gun firing cable, located left side of seat, by pulling the quick disconnect out.

- a. Place oxygen regulator switch, located on left side console, to OFF position.
- b. Pull survival kit release handle, located on right side of survival kit, up and aft to release survival kit.
- c. Rotate inertia reel release knob, located on left side of seat structure, and remove shoulder harness restraint straps.
- d. On HBU-12/A lap belt, squeeze together the black and silver grips of the handle and lift up
- e. Separate lap belt.
- f. Remove shoulder harness/negative "G" restraint strap loop ends.



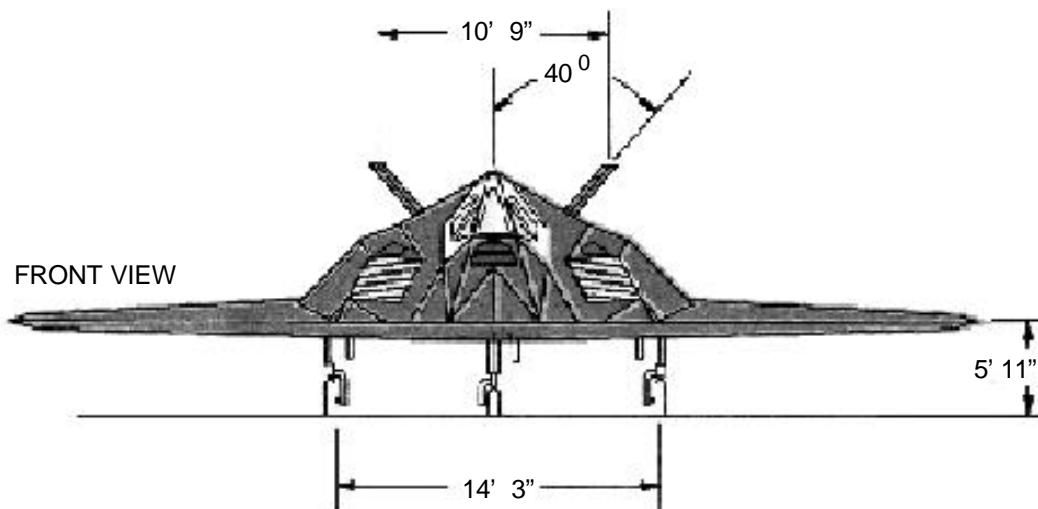
AIRCRAFT PAINT SCHEME

F-117A



AIRCRAFT DIMENSIONS

F-117A

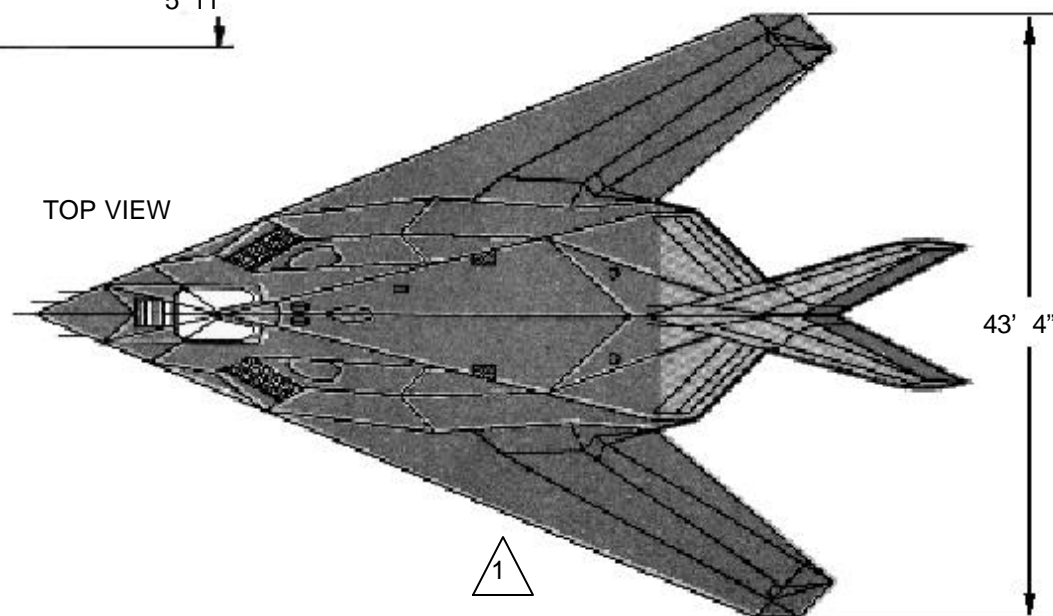


NOTE:

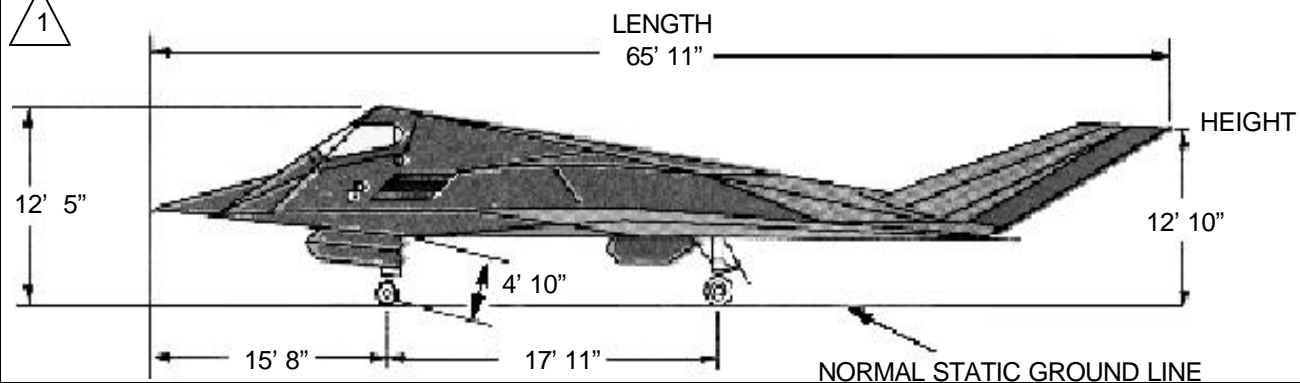


Dimension shown (side view) is for nose and main gear struts inflated to 3 inch extension.

TOP VIEW



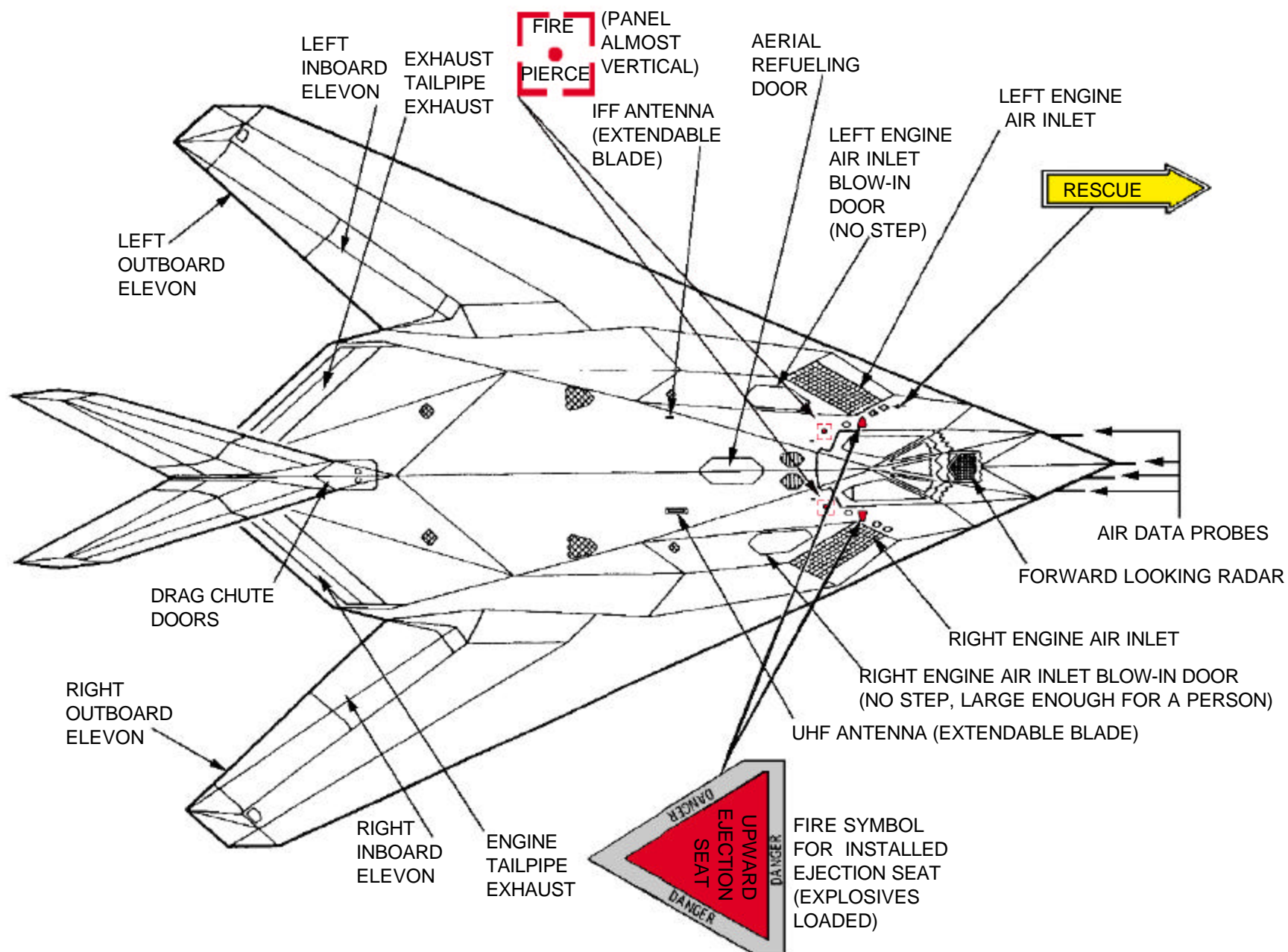
LEFT SIDE VIEW



AIRCRAFT HAZARDS

TOP VIEW

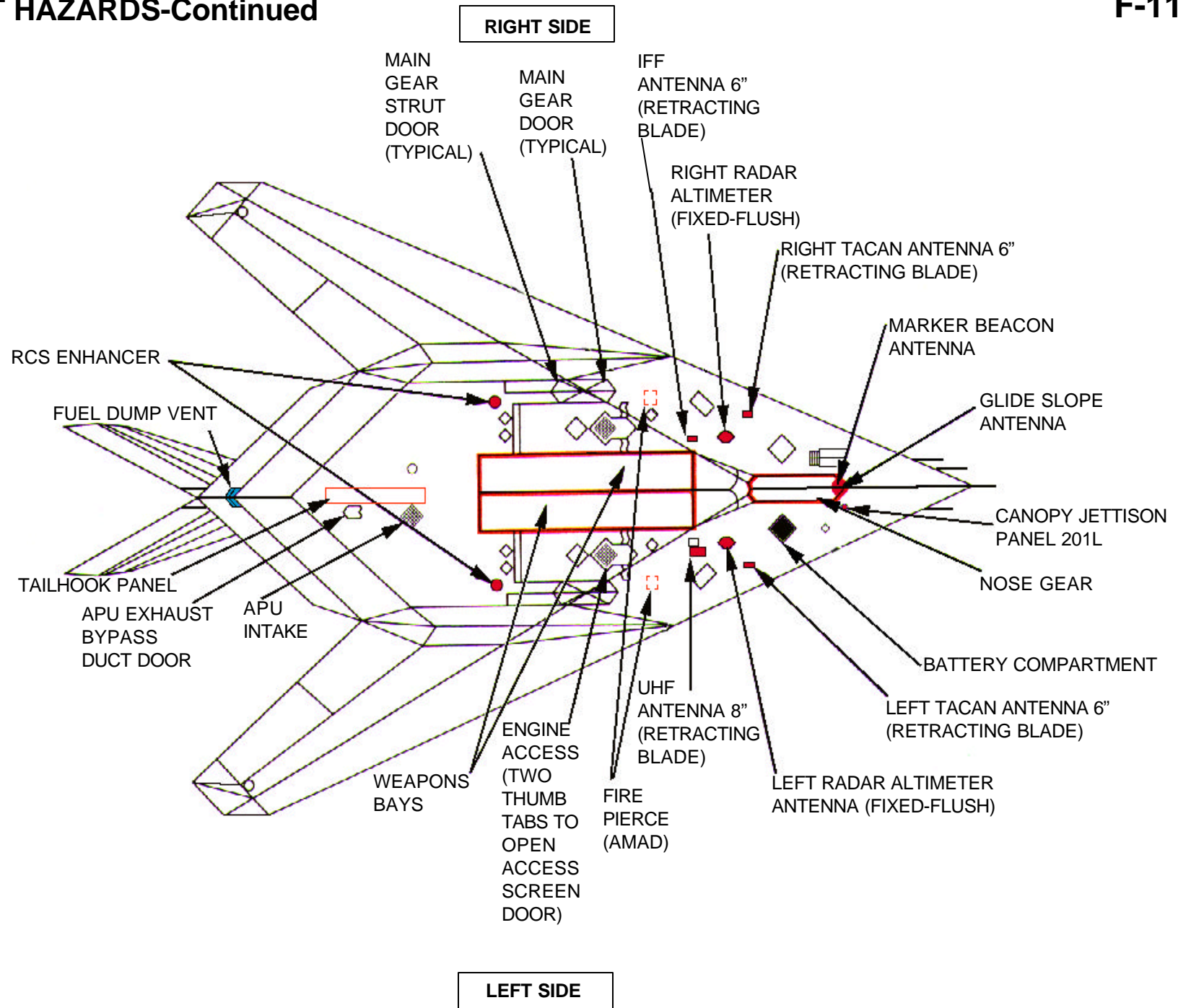
F-117A



AIRCRAFT HAZARDS-Continued

BOTTOM VIEW

F-117A



AIRCRAFT HAZARDS-Continued

LEFT AND RIGHT SIDE VIEWS

NOTE:

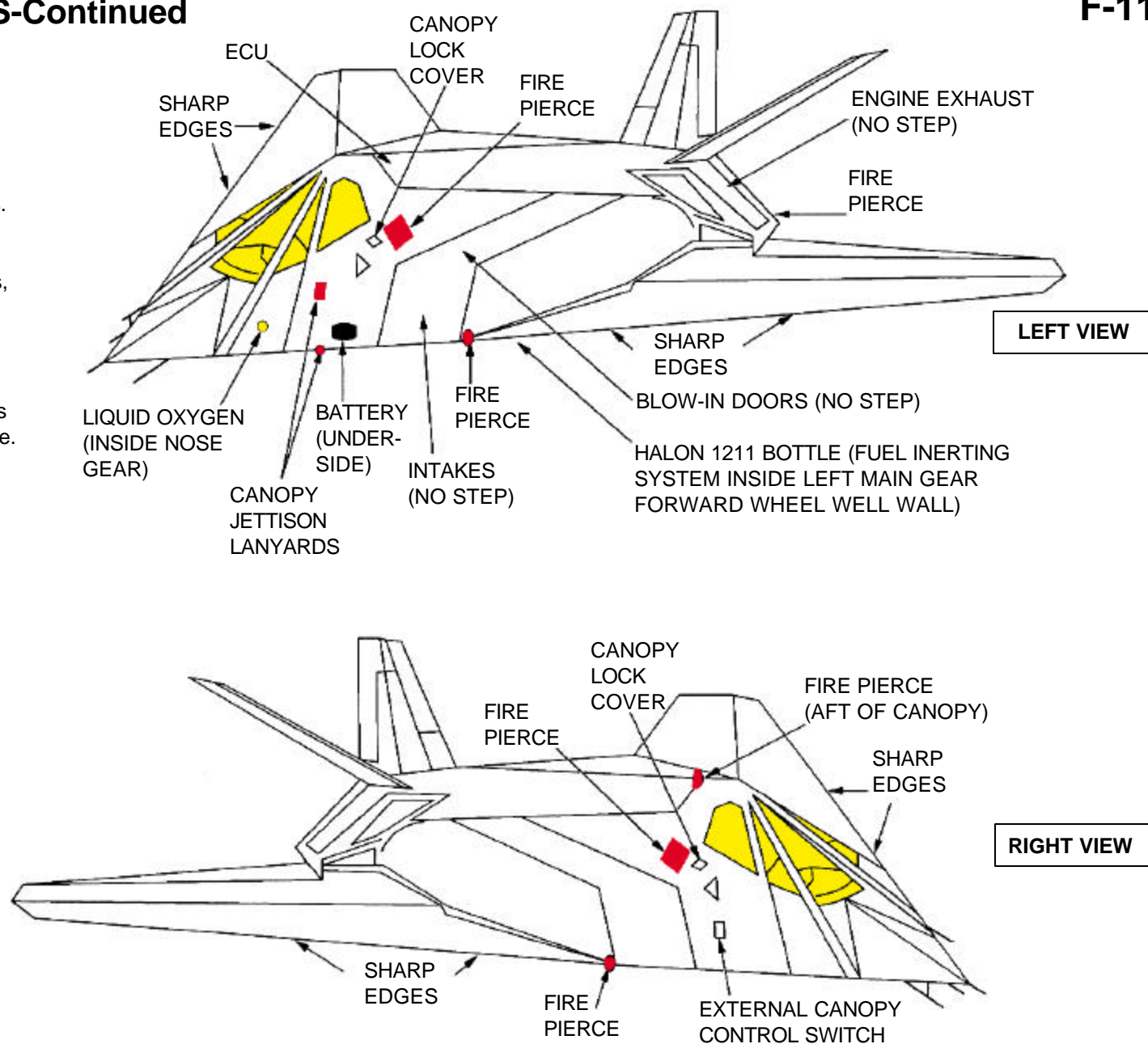
5 Gallons of Alcohol are located behind the Environmental Control Unit (ECU) (Served in the bomb bay. These areas are fire sources.

NOTE:

No Step Areas are Engine Intakes, Engine Exhaust and Inlet Blow In Doors.

NOTE:

The aircraft can have 2,000 pounds of munitions/weapons on each side.



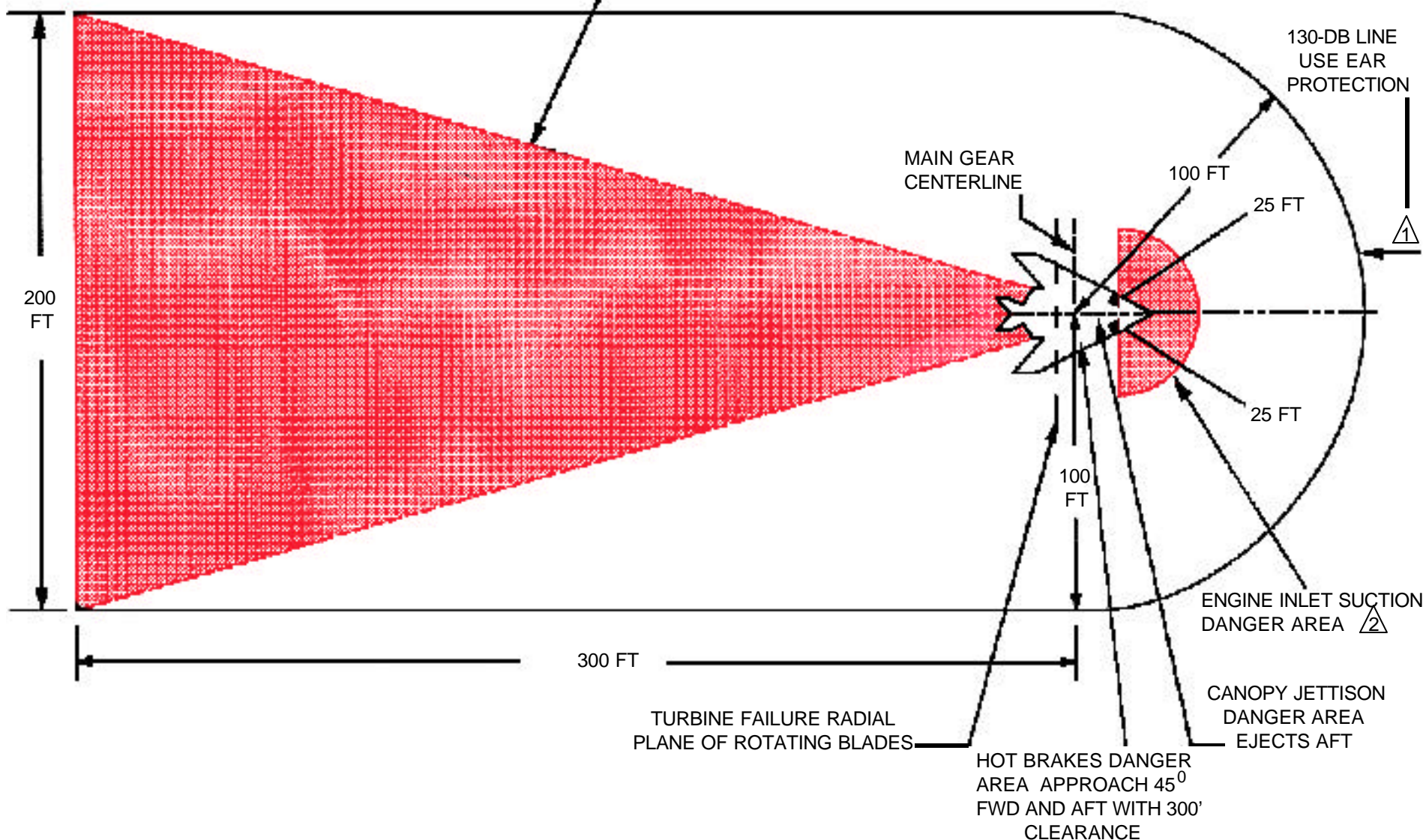
F-117A

AIRCRAFT HAZARDS-Continued

NOTE:

- ① When engine is running above idle power, area inside this line will have noise level generally above 130 decibels (db).
- ② This area shall be clear of all foreign objects.
- ③ Area of severe turbulence when engine is running above idle power.

ENGINE JET BLAST
DANGER AREA ③



NOTE:







Emergency lighting needed at night.
There is no RF emission radiation.

F-117A

AIRFRAME MATERIALS

F-117A

LEGEND

-  a. ALUMINUM - MAIN BODY
-  b. ALUMINUM - TITANIUM - AFT OF WING ROOTS
-  c. EPOXY FIBERGLASS - EDGES
-  d. GRAPHITE POLYETHERETHERKETONE (PEEK)
- RUDDER, A PLASTIC THAT BURNS @ 600 DEGREES WITH TOXIC SMOKE
-  e. GRAPHITE EXPOXY - WEAPONS BAY DOOR
-  f. POLYIMID - AFT TRAILING EDGE - BURNS AT A HIGHER TEMPERATURE. > 600 DEGREES

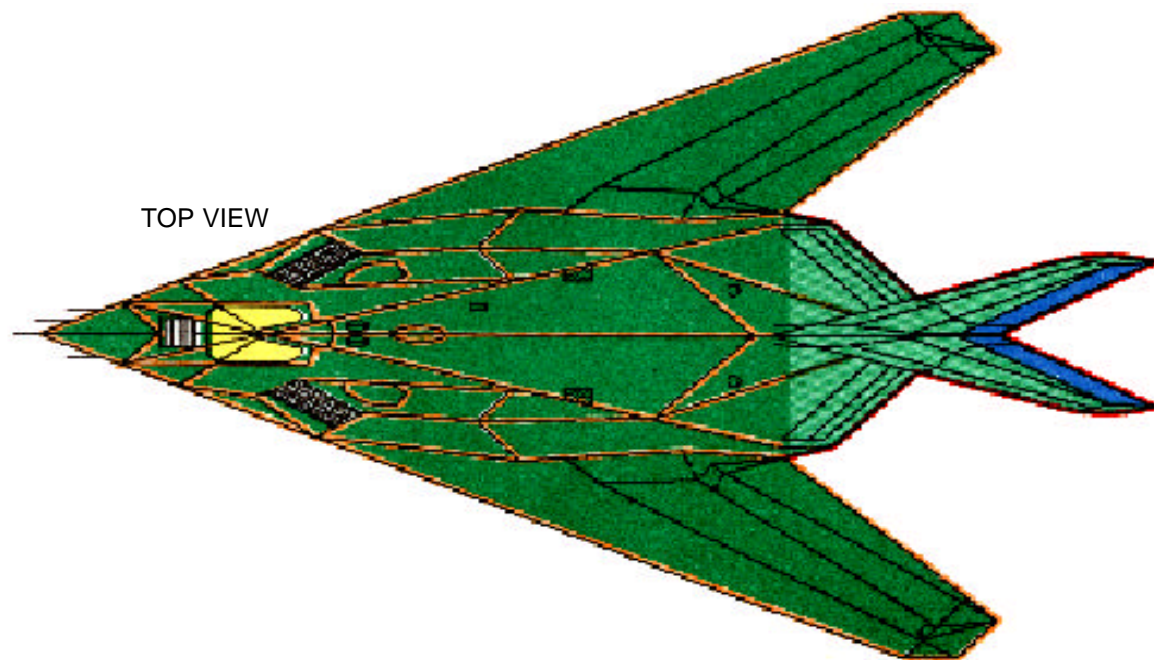
NOTE:

Composites comprise 5% or less of total structure and polyurethane plastic is paint coating.



FRONT VIEW

NORMAL STATIC
GROUND LINE



TOP VIEW



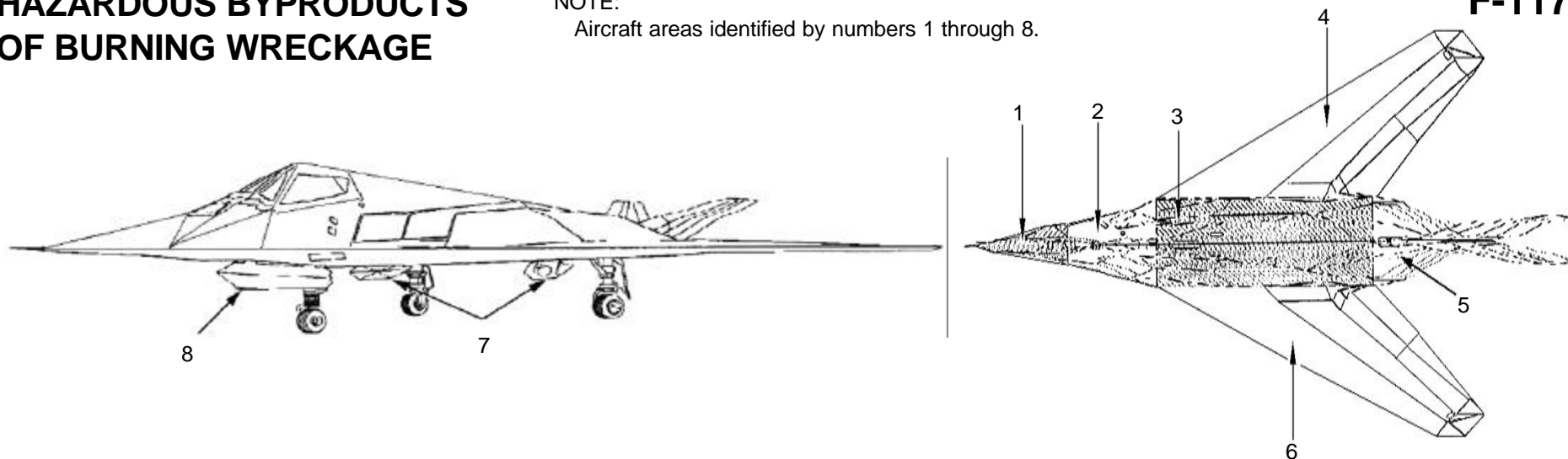
LEFT SIDE VIEW

NORMAL STATIC GROUND LINE

HAZARDOUS BYPRODUCTS OF BURNING WRECKAGE

NOTE:
Aircraft areas identified by numbers 1 through 8.

F-117A



GENERAL MATERIAL	SPECIFIC MATERIAL	AREA USED ON AIRCRAFT	BYPRODUCT
Fuel Hydraulic fluids Lubricants	Fuel, JP8 Oil, low temperature Oil, synthetic Molybdenum disulfide Grease, various types Fluid, hydraulic, various types	3,4,5,6,7,8	Carbon monoxide Carbon dioxide Sulfur oxides Polynuclear aromatic hydrocarbons Phosphorus oxides
Rubber (gaskets and tires) Honey comb core Plastics (gaskets, sleeving, electrical and thermal insulations, tubing, canopy, sheets, and parts	Neoprene Chloroprene Silicones Fluorosilicones Nitriles Polyvinyl chloride Nylons Polyolefins Teflons Polyurethanes Acrylic - polycarbonate Viton, Phenolics, Bismaleimides, Epoxies, and Polysulfide	Throughout aircraft	Carbon monoxide Carbon dioxide Polynuclear aromatic hydrocarbons Hydrochloric acid Hydrofluoric acid Nitrogen oxides Hydrogen cyanide Phosgene Formaldehyde Sulfur oxides

HAZARDOUS BYPRODUCTS OF BURNING WRECKAGE-Continued

F-117A

GENERAL MATERIAL	SPECIFIC MATERIAL	AREA USED ON AIRCRAFT	BYPRODUCT
Fabrics and fibers, natural and synthetic	Wool Kevlar Carbon fibers - epoxy coated Glass fibers - aramid, epoxy, teflon, and polyester coated Polyetherether ketone Polysulfide Cellulose	1,2,3,4,5,6	Hydrogen cyanide Nitrogen oxides Sulfur oxides Carbon monoxide Carbon dioxide Polynuclear aromatic hydrocarbons Hydrochloric acid Hydrofluoric acid Phosgene Formaldehyde
Metal alloys - structural, fillers, bonding, and welding	Aluminum, Chrome, Copper, Gold, Iron, Steel, Lead, Silver, Tin, Titanium, Zinc, and Trace metals	Throughout aircraft	All may melt and resolidify. No hazardous emissions.
Blanket insulation and other ceramics	Fiberfrax, Fused ceramic powders	1,3,5	None
Adhesives Sealants Paint Coatings	Polysulfides Silicones Flourosilicones Epoxy Polyurethane Buena - N Iron Silver Silicon dioxide Strontium chromate Lead chromate	Throughout aircraft	Hydrogen cyanide Nitrogen oxides Sulfur oxides Carbon monoxide Carbon dioxide Polynuclear aromatic hydrocarbons Hydrochloric acid Hydrofluoric acid Phosgene Formaldehyde

SPECIAL TOOLS/EQUIPMENT

Power Rescue Saw or equivalent
 Rescue Ladder for left side
 Rescue Ladder for right side
 1/2 In. Dr. Speed Handle with 1/2 In. Socket
 6 In. X 1/2 In. Extension
 Canopy Unlock Tool
 Extraction Kit
 Hydraulic Power Rescue Tool
 Ballistic Hose Dearing Cutter
 AT501C or equivalent
 Modified Bayonet Nozzle
 Fire Drill II

AIRCRAFT ENTRY**NOTE:**

Electric drills or pneumatic tools will not be used to manually raise the canopy. This unauthorized procedure will damage the canopy raising/lowering mechanism.

NOTE:

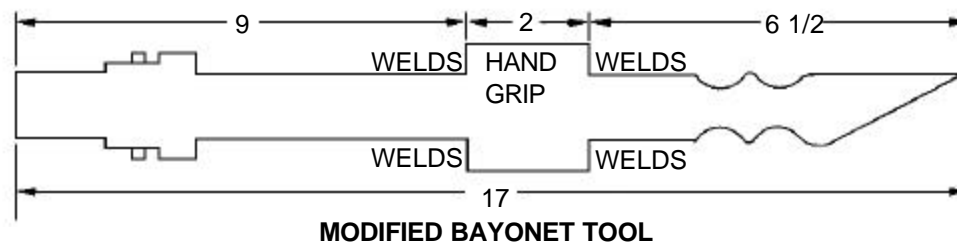
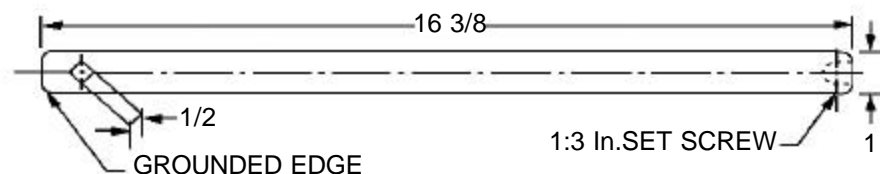
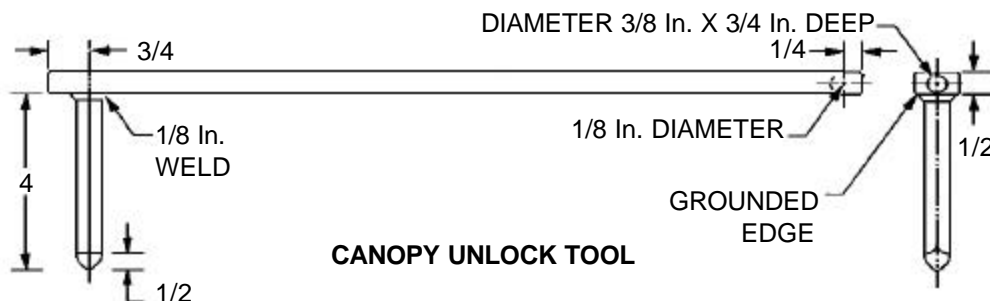
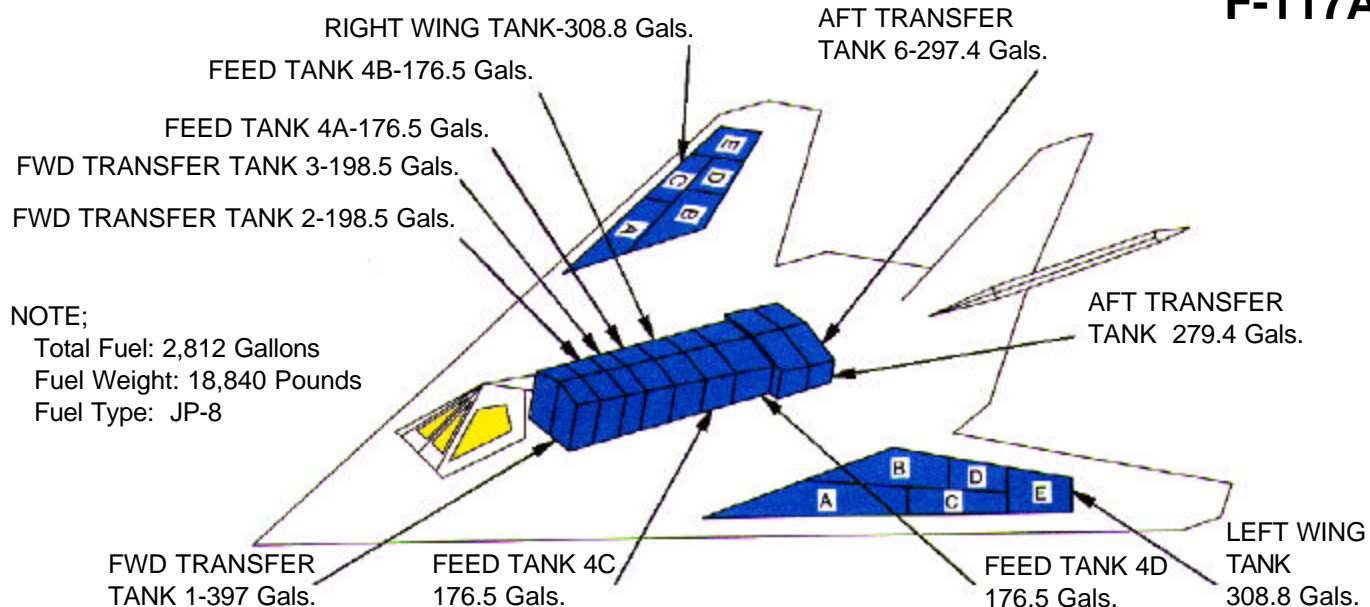
Primary communication hook-up is made by using the connection located in the nose gear compartment. However, the main gear compartments also have hook-ups.

NOTE:

The F-117A does not use a canopy strut or prop support for the aircraft canopy. A temporary prop may be used as an aid during rescue and extraction procedures.

NOTE:

The special tools (Canopy Unlock Tool and Modified Bayonet Tool) illustrated at the right are locally manufactured. All dimensions are measured in inches.

**F-117A**

AIRCRAFT ENTRY-Continued

F-117A

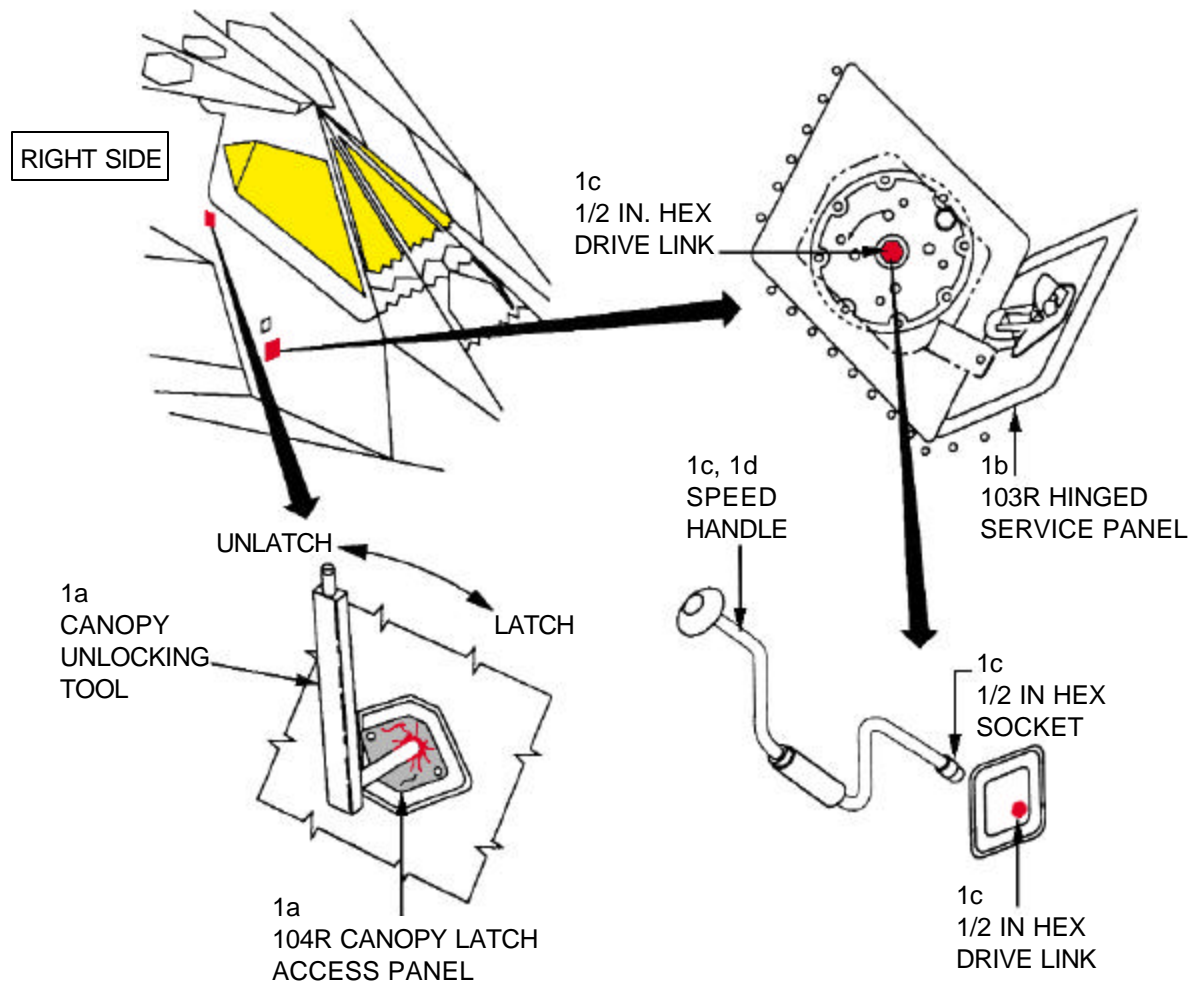
1. MANUAL ENTRY

- Punch through 104R canopy latch access panel with canopy unlocking tool. Rotate tool 90 degrees counterclockwise to unlock canopy. (Canopy may be unlocked from left side in the same manner by rotating handle 90 degrees clockwise.)
- Press latch to open 103R hinged service panel.
- Insert speed handle with socket attached (extension necessary when working from ladder) and place on 1/2 inch hex drive link located in center of opening.
- Crank speed handle 322 turns counterclockwise to raise canopy.

NOTE:

If canopy actuator motor crank fails, canopy can be opened if pilot is conscious by performing the following:

- 1) Unlock canopy with canopy unlocking tool.
- 2) Have pilot remove left and right canopy actuator pins.
- 3) Pry open canopy with pry bar to gain hand hold.
- 4) Lift canopy to full-open position.
- 5) Canopy may either be raised to shear hinges and pushed over side or locked open with canopy props depending upon situation. (At least two people are required for lifting canopy.)



AIRCRAFT ENTRY-Continued

F-117A

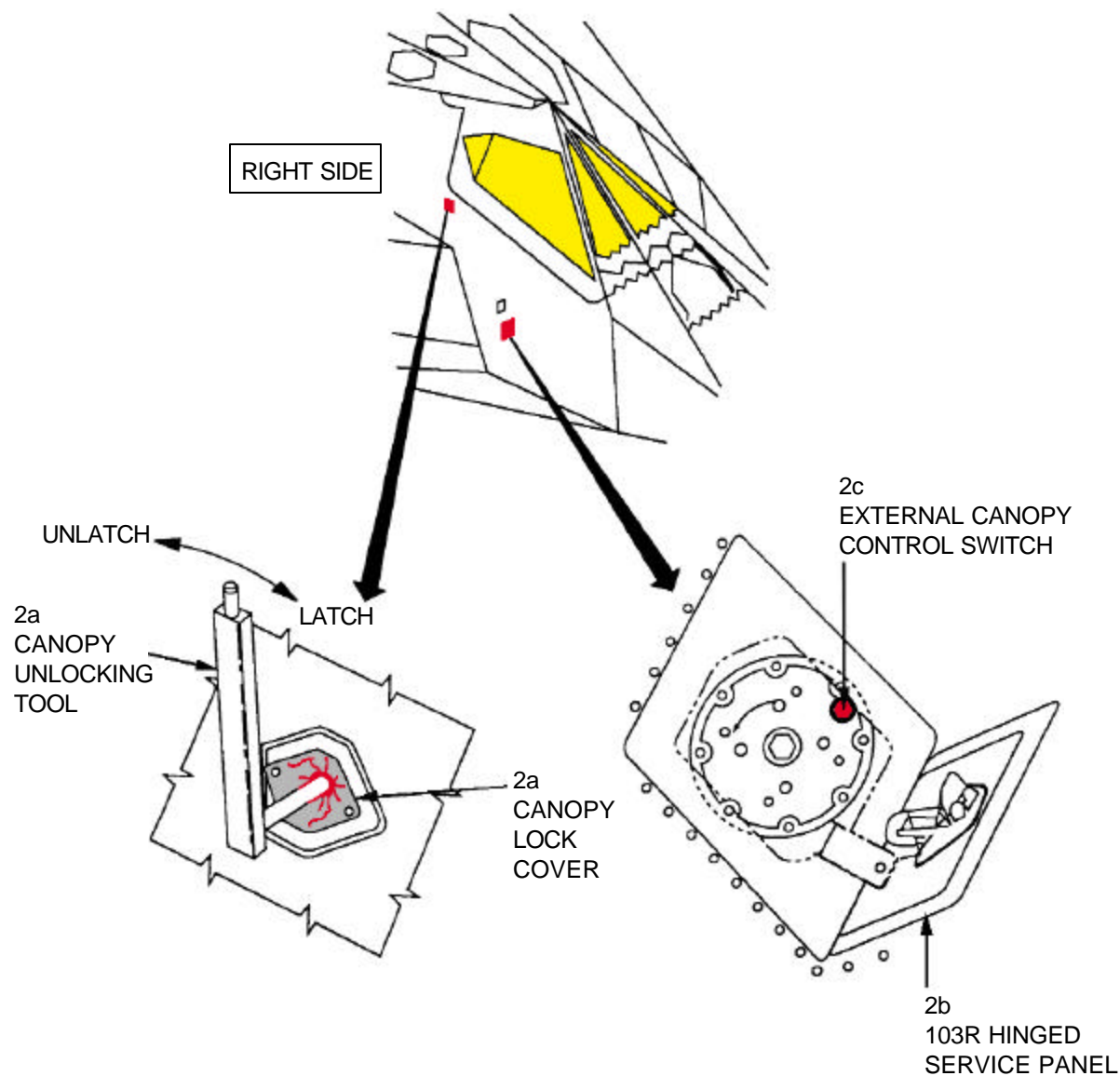
2. NORMAL ENTRY

- a. Access from right side is illustrated for these procedures. Punch through canopy lock cover, located right or left side of fuselage below aft portion of canopy, with canopy unlocking tool. Rotate tool 90 degrees counterclockwise to unlock canopy. (Canopy may be unlocked from left side in same manner, by rotating handle 90 degrees clockwise.)

NOTE:

If the canopy external unlocking latch is damaged on both sides of aircraft from impact, electrical and manual methods of raising canopy will not be possible. Under these conditions, cut-in method should be used.

- b. Press latch to open 103R hinged service panel.
- c. Turn and hold external canopy control switch in OPEN position to raise canopy.



AIRCRAFT ENTRY-Continued

F-117A

3. EMERGENCY ENTRY

WHEELS UP

WARNING

Canopy will not eject if open over eight inches. Do not jettison canopy if canopy and cockpit have been damaged from impact. If canopy is jettisoned under these conditions, pilot may suffer severe injury and/or death.

- a. Press latch to open 103L hinged service panel. Remove T-handle and lanyard.

CAUTION

Ensure area is clear to side and aft of cockpit before jettisoning canopy.

- b. Extend lanyard and T-handle to full length and pull hard to jettison canopy.

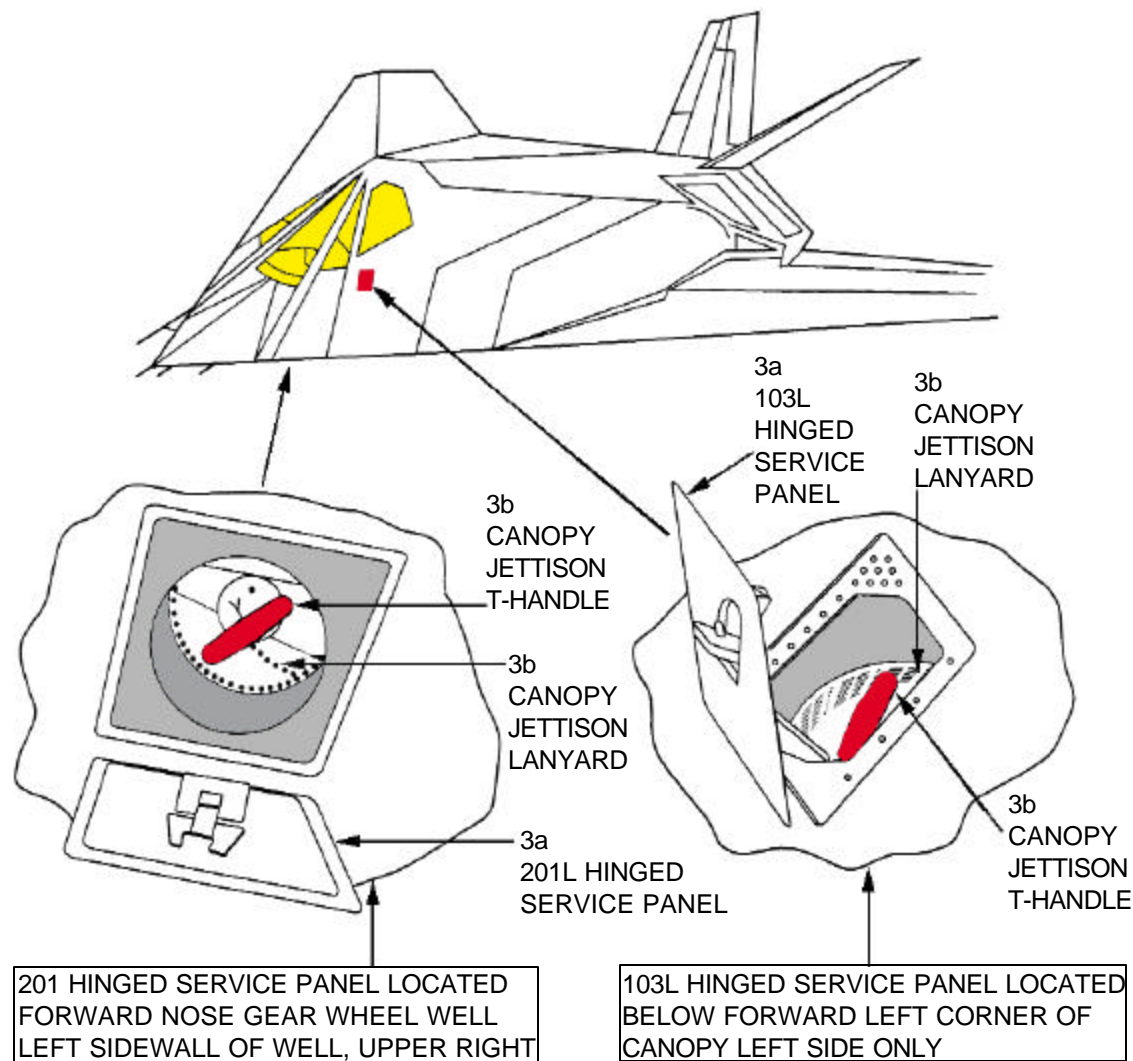
WHEELS DOWN

- a. Press latch to open 103L or 201L hinged service panel. Remove T-handle and lanyard.

CAUTION

Ensure area is clear to side and aft of cockpit before jettisoning canopy.

- b. Extend lanyard and T-handle to full length and pull hard to jettison canopy.



AIRCRAFT ENTRY-Continued

F-117A

4. CUT-IN

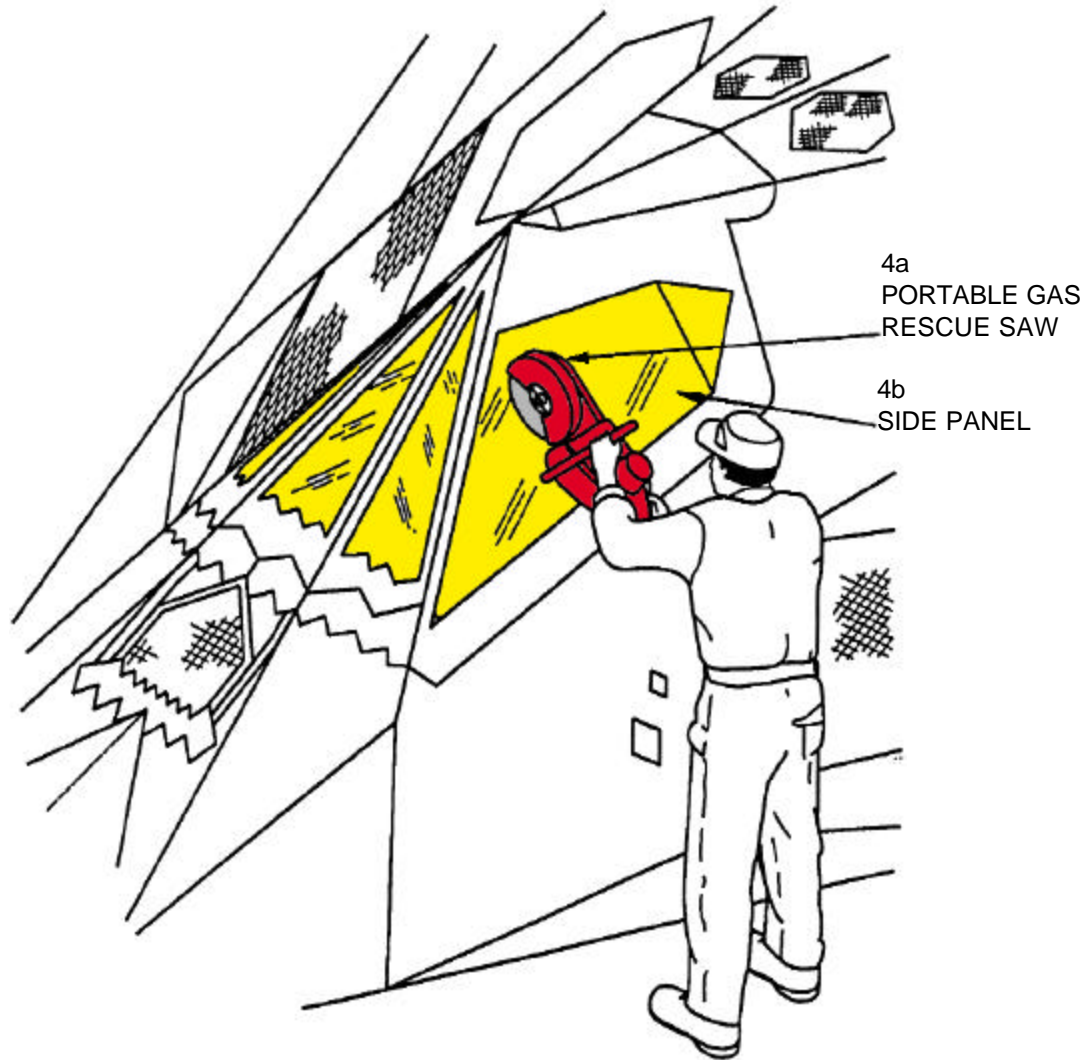
WARNING

Do not use portable gas rescue saw in an explosive atmosphere. This may cause an explosive and/or fire resulting in injury or death to pilot and rescue personnel.

- a. Using portable gas rescue saw, cut out left or right side panel by cutting along inside edge of canopy frame on all four sides of panel.
- b. Lift out panel.

NOTE:

Use 12 inch diameter metal blade with carbide tip, 3 and 1/8 inch pitch.



ENGINE SHUTDOWN

F-117A

1. ENGINE SHUTDOWN

NOTE:

Throttles cannot be retarded simultaneously.
Throttles must be retarded one at a time.

- a. Raise finger lifts, raise throttles located on left console and move aft to OFF position.

NOTE:

The INERT switch is used to make the fuel system inert by using Halon 1211. Halon 1211 is not used to extinguish fire.

- b. Set INERT switch on left console forward of throttles to ON.

NOTE:

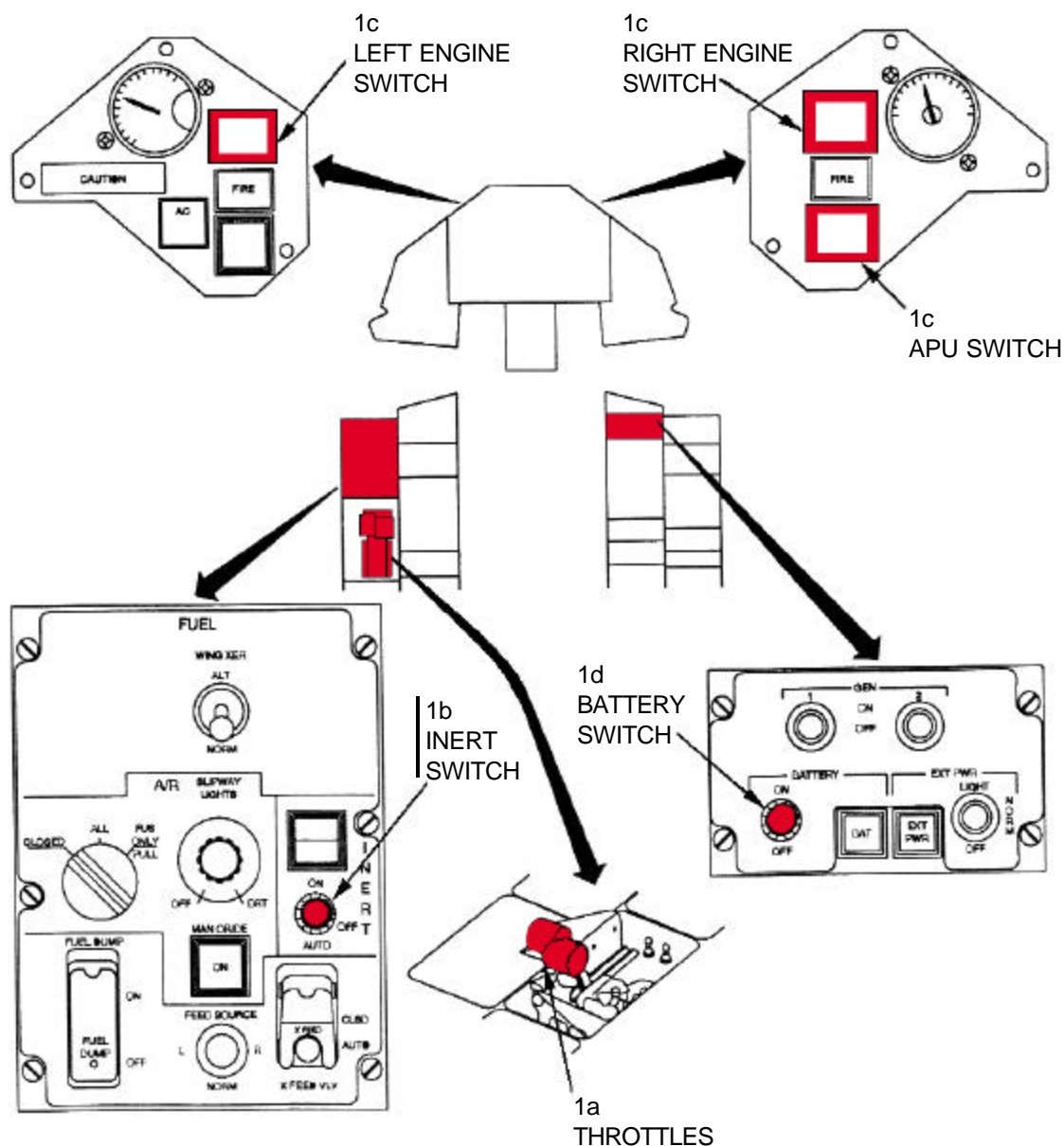
Ensure that the engine and APU switches are touched only once. Subsequent touching will cause firewall shutoff valves to reopen.

- c. Touch left engine, right engine and APU switches to ensure that fuel flow is shutoff.

NOTE:

- If fuel fails to stop, manual fuel shutoff valves are located in the forward section of the main landing gear well.
- BATTERY switch must be turned off last. Wait one or two seconds after step c. is performed before setting BATTERY switch to OFF to allow time for firewall shutoff valves to close electrically.

- d. Set BATTERY switch on right console to OFF.



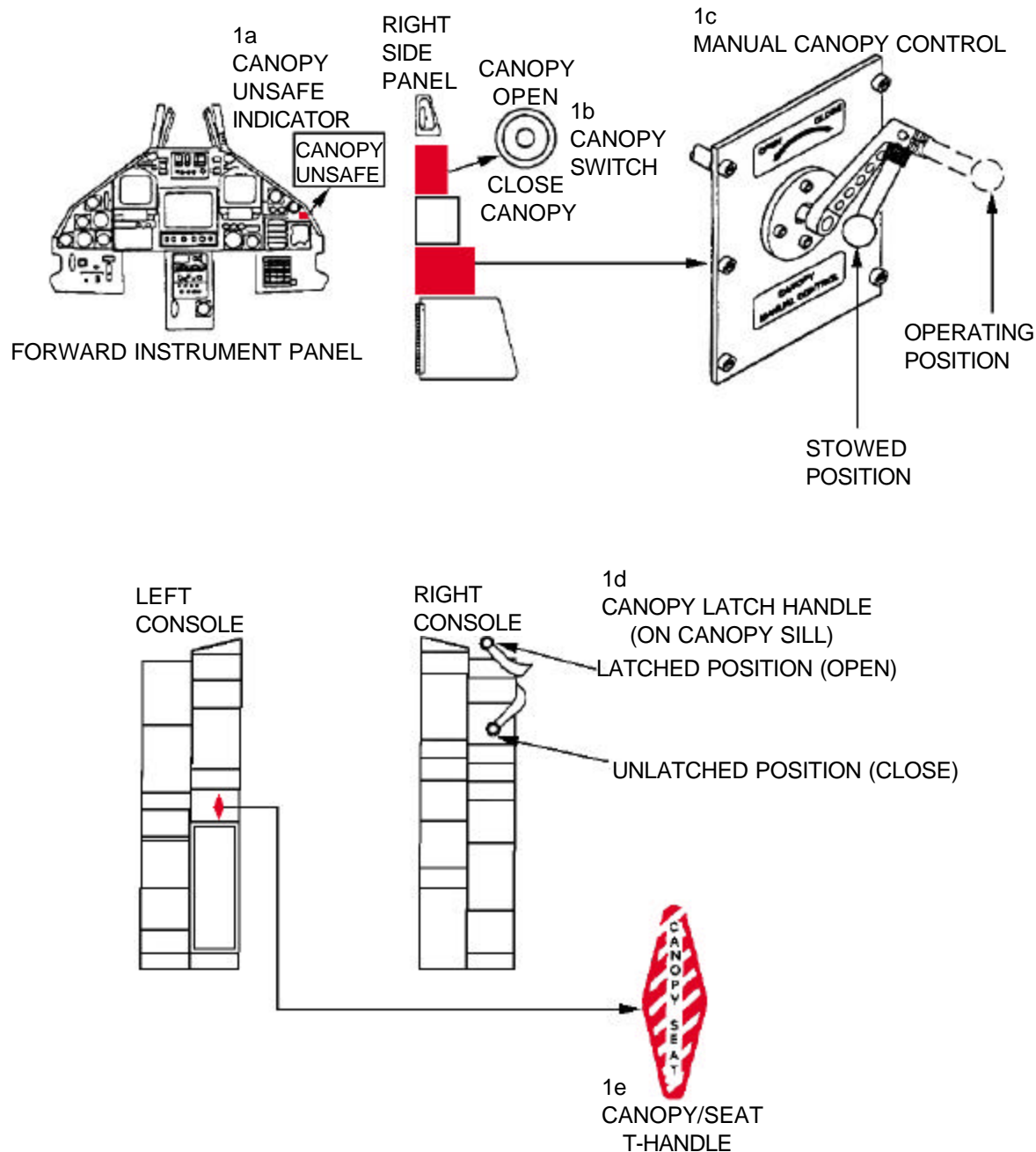
INTERNAL CANOPY CONTROLS

1. INTERNAL CANOPY CONTROLS

- Canopy Unsafe indicator is located on the forward instrument panel right corner. This indicator will illuminate when the canopy is unlatched (unlocked) or ajar.
- Canopy Open/Close switch is located on the right side panel. Move switch up for open, down for close.
- Canopy Manual Control is located on the right side panel. Handle must be pulled out of the stowed position to operate. This handle must be rotated clockwise to manually open the canopy and counterclockwise to manually close the canopy.
- Canopy Latch Handle is located on the canopy sill above the right console. Handle must be moved forward to latch (lock) the canopy and moved aft to unlatch (unlock) the canopy.
- Canopy/Seat T-Handle is located on the left console. This handle provides the pilot with the capability of jettisoning only the canopy without firing the ejection seat. When the T-handle is pulled straight up, the canopy will jettison. The T-handle requires an approximate 12 to 15 pound pull for the first 3/8 inch of travel to take up slack present in the lines. The handle then requires a 50 pound pull over one inch of travel to actuate the canopy jettison initiator. If the T-handle is turned 90 degrees counterclockwise after the canopy is jettisoned and pulled up further, **seat ejection will occur**. The T-handle will separate in the pilot's hand to prevent injury during the ejection.

WARNING

The seat will eject even if the Ground Safety Lock is rotated forward in the Safe Position if the Canopy/Seat T-handle is pulled!



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SAFETYING EJECTION SYSTEM AND AIRCREW EXTRACTION

1. EJECTION SYSTEM

NOTE:

The Advanced Concept Ejection System (ACES II) can be identified by pitot airspeed sensing inlet tubes at top of seat and two ejection control handles. **DO NOT USE PITOTS AS A HAND HOLD FOR GAINING COCKPIT ENTRY.**

- Rotate Ground Safety Lever, located left side of seat directly aft of the Ejection Control Handle, UP and FORWARD.
- Install Safety Pin inboard in left Ejection Control Handle.
- Install Safety Pin in the Canopy/Seat T-Handle. See item 1e on page F-15.16.

NOTE:

Do not use Emergency Manual Chute Handle. Actuation of this handle will cause pilot to deploy only after ejection. It does not release restraints.

- Install Safety Pin (if time allows) in Emergency Manual Chute Handle. **BEWARE OF INTANGLING.**

2. AIRCREW EXTRACTION

NOTE:

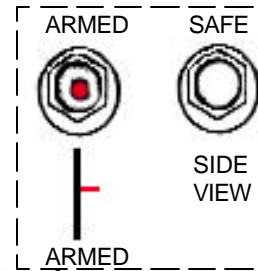
If seat has been damaged by fire or impact, ballistic hoses must be cut with disarming tool. If aircraft lands with all wheels up, or nose wheel up, pilot may have suffered severe back and/or neck injuries. In these situations, Kendrick Extraction Kit must be used to avoid causing further injuries that could disable or kill pilot. If possible, rescue should not be effected until pilot is secured in Kendrick device.

- Release lap belt buckle. Insert thumb into fitting, push cover up and roll serration bar downward with thumb to release.
- Release left and right survival kit buckles.
- Release left and right shoulder harness fittings. Insert thumb into fitting, push cover up and roll serration bar downward with thumb to release.
- Disconnect personnel leads: communication, oxygen hose, and "G" suit hose, if applicable. (Not illustrated.)

NOTE:

Do not touch indicator sealant when checking condition. Frequent touching wears off sealant exposing tip of red pin indicating a false ARMED ARS condition.

ARS INDICATOR



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