

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

**THIS IS SEGMENT 14 COVERING CHAPTER 10.**

**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:

**HQ AFCESA/CEXF**

**ATTN: Fire and Emergency Services Egress Manager**

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

**Safety Supplements: [http://www.afcesa.af.mil/CEX/cexf/\\_firemgt.asp](http://www.afcesa.af.mil/CEX/cexf/_firemgt.asp)**

**PHONE: (850) 283-6150**

**DSN 523-6150**

**FAX: (850) 283-6383**

**DSN 523-6383**

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

## SEGMENT 14 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 Retaining out of date rescue information can negatively affect the user's operability and outcome of emergencies.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>
10	MQ-1/RQ-1	ALL	File updated.

**NOTE**

Chapter 10 contains emergency rescue and mishap response information for the following aircraft:

<b>USAF</b>	<b>OV-10</b>
<b>USAF</b>	<b>MQ-1/RQ-1</b>
<b>USAF</b>	<b>RQ-4A</b>
<b>USAF</b>	<b>SR-71</b>
<b>USAF</b>	<b>U-2</b>



## CHAPTER 10

### U.S. AIR FORCE

#### OBSERVATION/RECONNAISSANCE

#### AEROSPACE EMERGENCY RESCUE AND MISHAP RESPONSE INFORMATION

##### 10-1. INTRODUCTION AND USE.

10-2. This section contains emergency rescue and mishap response information illustrations in alpha-numerical order relative to type and model of aircraft. This arrangement of illustrations is maintained from Chapter 4 throughout the remainder of the publication.

##### 10-3. GENERAL ARRANGEMENT.

10-4. Aircraft type designation has been positioned in the upper right corner of the horizontal illustration for rapid identification. Additional aids to rapid orientation are:

a. Recent technological advances in aviation have caused concern for the modern firefighter. Aircraft hazards, cabin configurations, airframe materials, and any other information that would be helpful in fighting fires, the locating and rescue of personnel will be added as the information becomes available.

b. Suggested special tools/equipment are listed in the upper left corner, on the Aircraft/Entry page of each listed aircraft.

c. Procedural steps covering emergency/normal entrances, cut-ins, engine/APU shutdown, safetying ejection/escape systems, and aircrew extraction are outlined on the left side of each page with coordinated illustrations on the right.

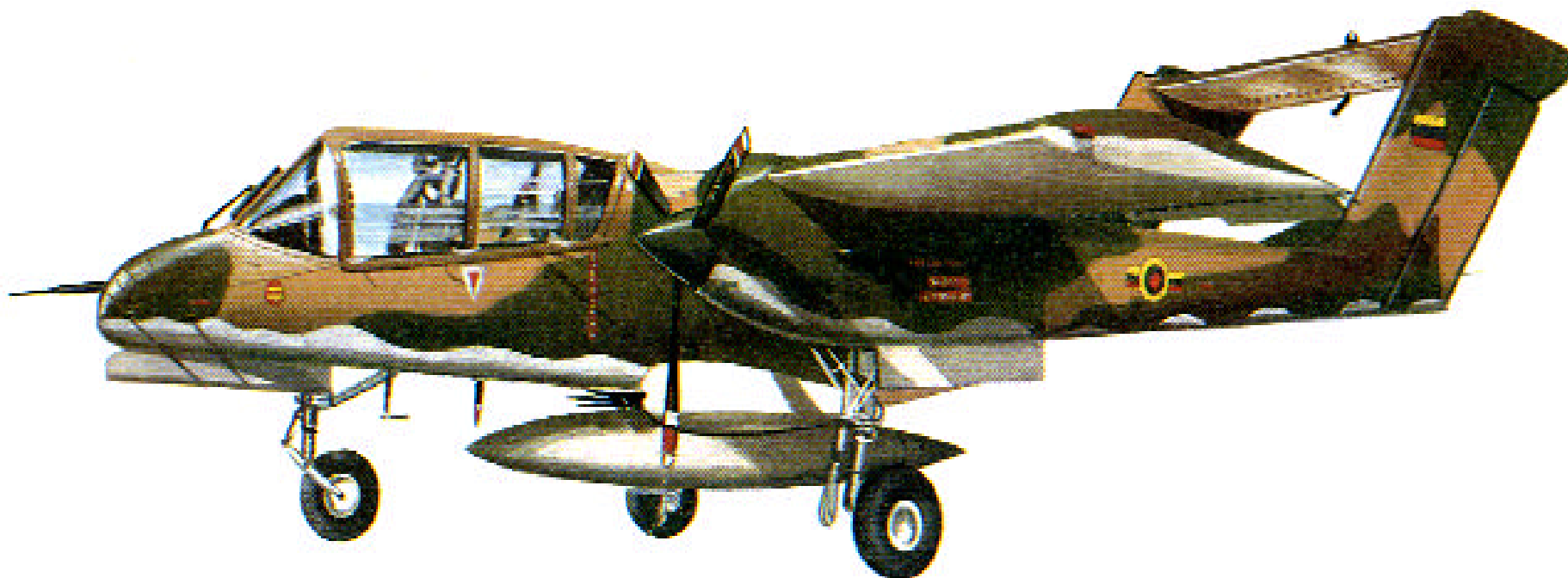
d. Illustrations located on right side of pages are coordinated with text by numerals and small letters depicting both paragraph and subparagraph on the page.

e. Each illustration is consistently colored and/or pattern keyed to highlight essential emergency rescue information.

f. Details are pulled directly from the illustration to highlight an area, thus eliminating unnecessary searching for desired information.

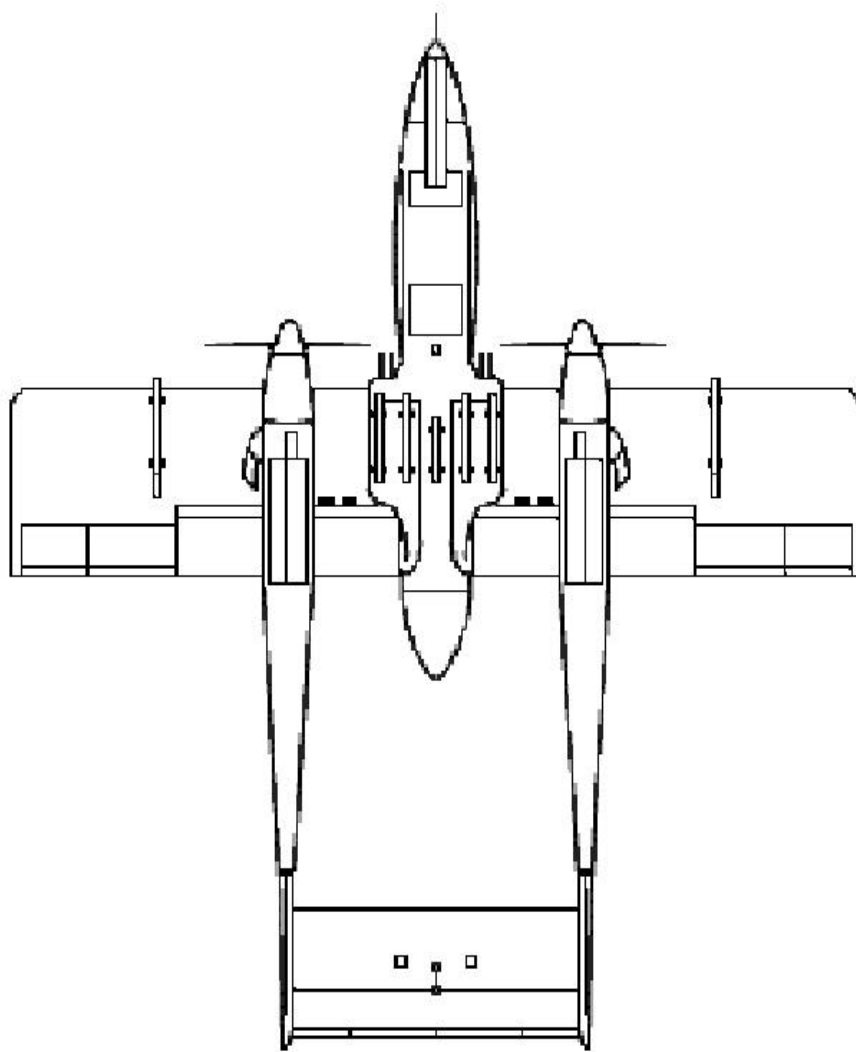
## AIRCRAFT PAINT SCHEME

OV-10A

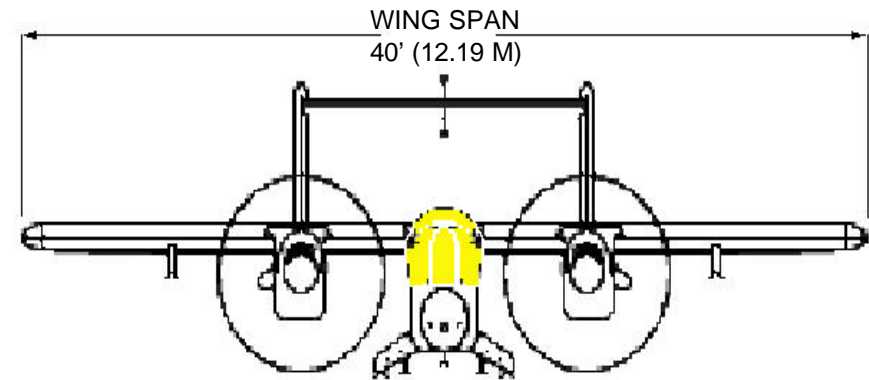
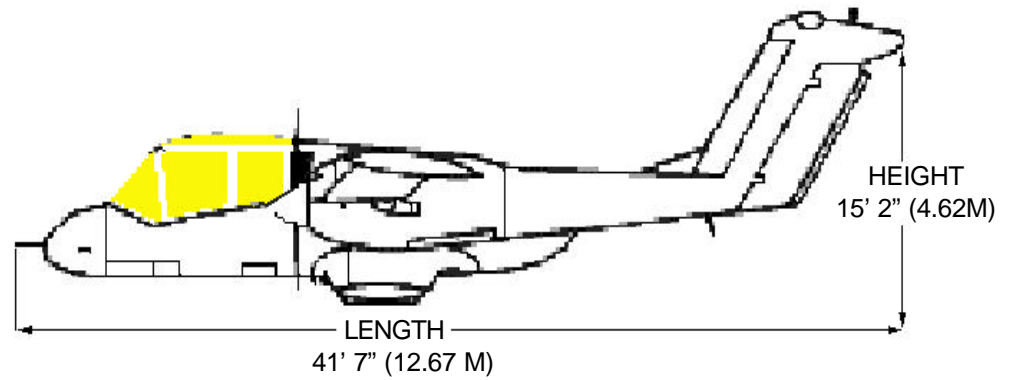


## AIRCRAFT DIMENSIONS

OV-10A

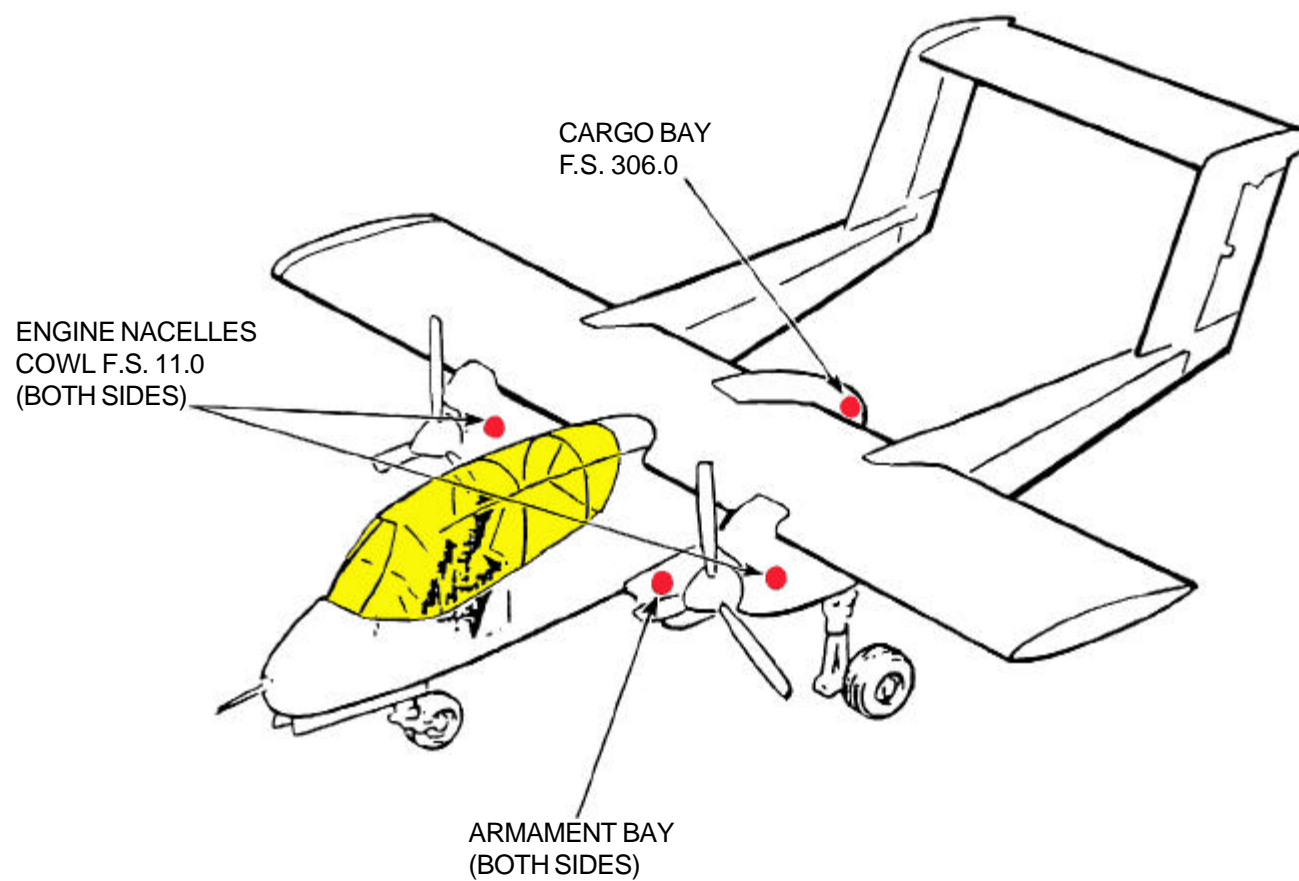


BOTTOM VIEW

WING SPAN  
40' (12.19 M)LENGTH  
41' 7" (12.67 M)HEIGHT  
15' 2" (4.62M)

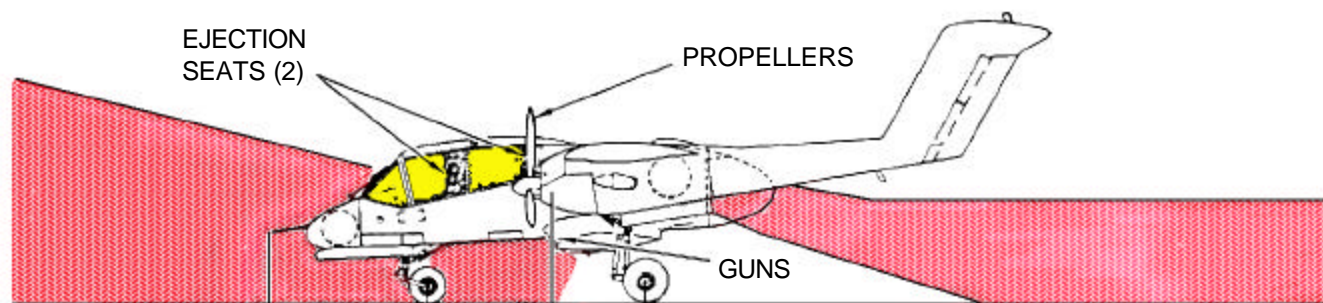
## AIRCRAFT SKIN PENETRATION POINTS

OV-10A



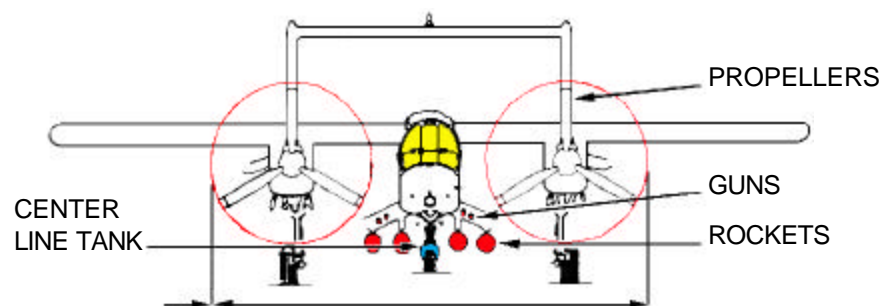


# DANGER AREAS

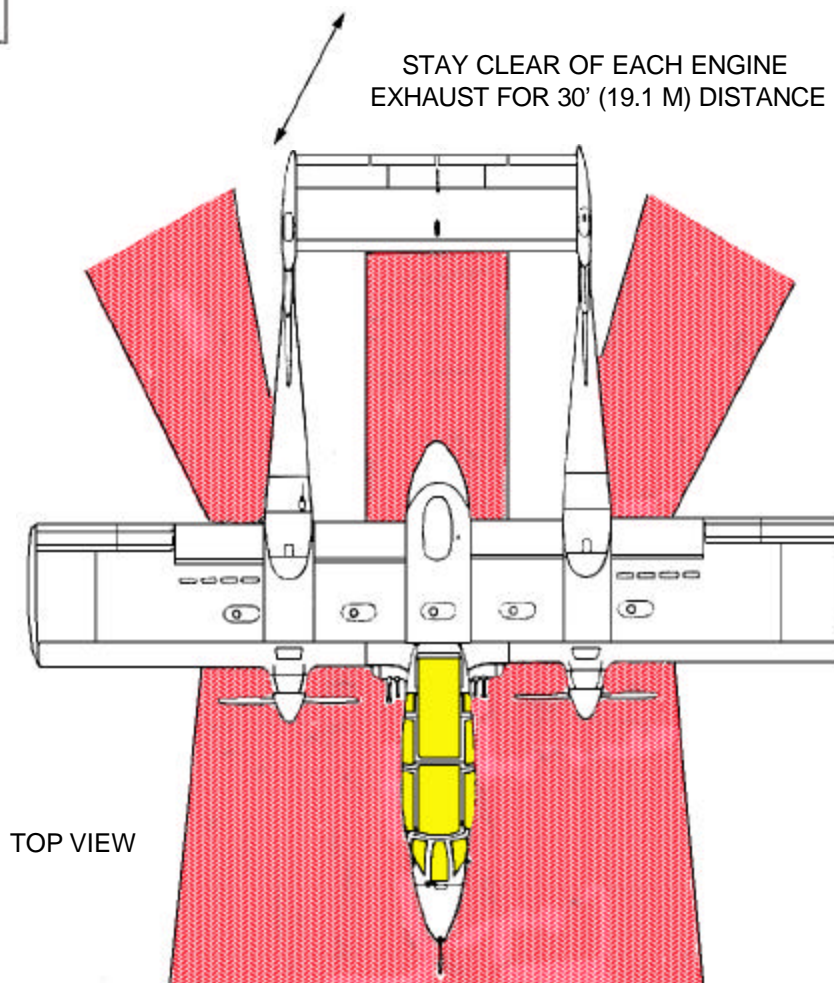
**OV-10A**

STAY CLEAR OF THIS AREA WITH ENGINES OPERATING AND OR GUNS OR ARMED ROCKETS

STAY CLEAR OF EACH ENGINE EXHAUST FOR 30' (9.1 M) DISTANCE



STAY CLEAR OF AREA IN FRONT OF AIRCRAFT (GUN AND ROCKET TRAJECTORIES)



TOP VIEW

STAY CLEAR OF THIS AREA WITH ENGINES OPERATING AND OR GUNS OR ARMED ROCKETS

## SPECIAL TOOLS/EQUIPMENT

Power Rescue Saw  
Fire Drill II

## AIRCRAFT ENTRY

## 1. NORMAL/EMERGENCY ENTRY

- a. Rotate pilot's cockpit canopy door handle, located on right and left side of fuselage, clockwise 90 degrees on right side and counterclockwise 90 degrees on left.

## NOTE:

Bungee will hold canopy open on right side only.

- b. Rotate observer's cockpit canopy door handle, located on right and left side of fuselage aft of pilot's cockpit, right side clockwise, left side counterclockwise.

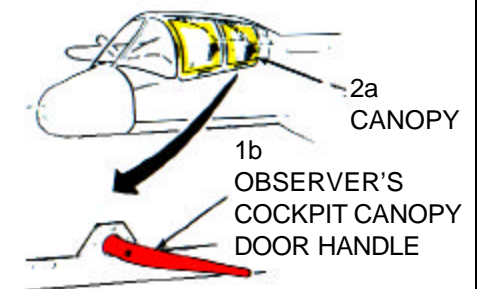
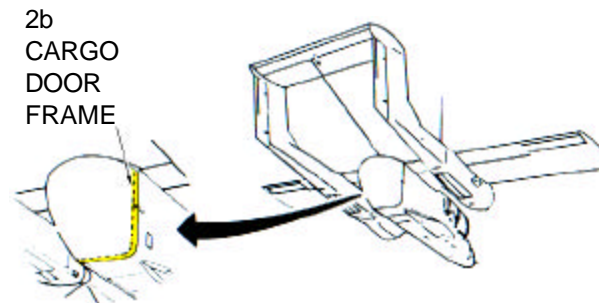
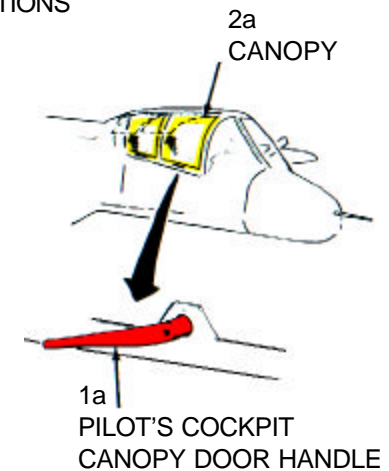
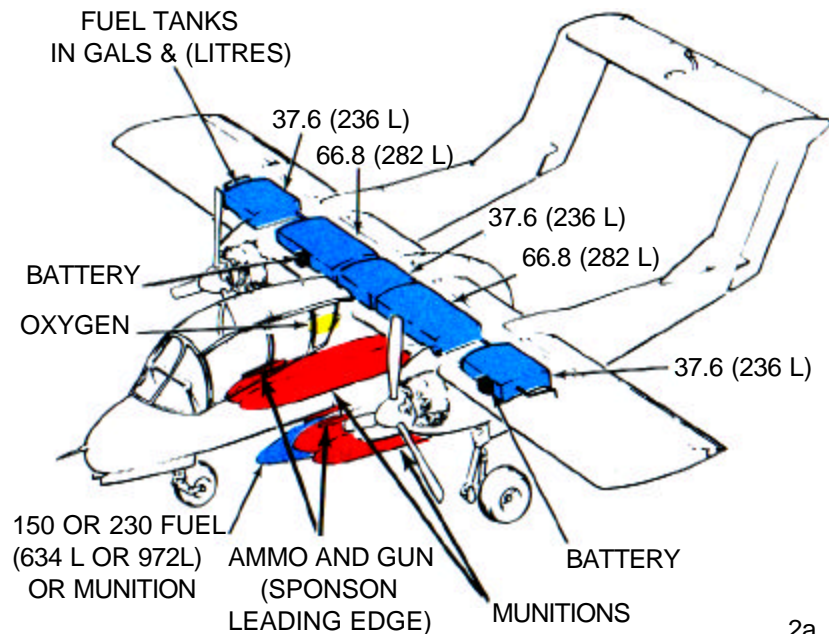
## NOTE:

Bungee will hold canopy open on right side only.

- c. Rotate cargo compartment door external handle, located on left side of fuselage, counterclockwise, then pull door open.

## 2. CUT-IN

- a. Cut acrylic plastic canopy next to canopy frame for pilot and observer.
- b. Cut aft of cargo door frame to gain access to cargo compartment.



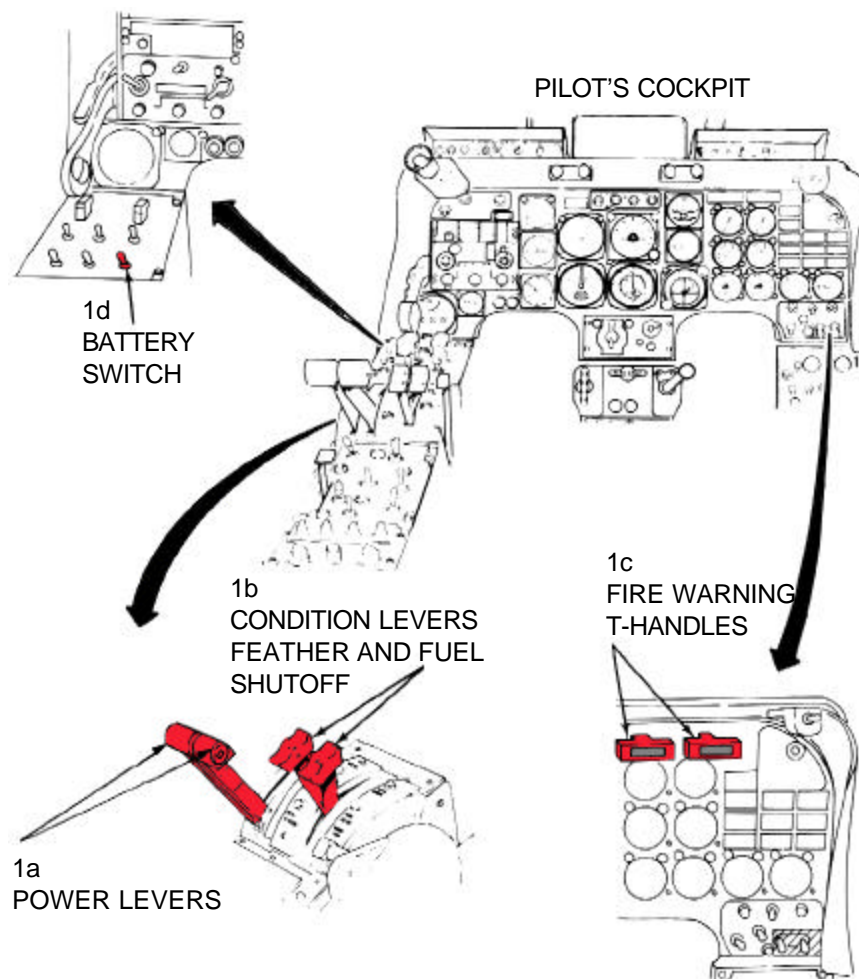
OV-10A

# ENGINE SHUTDOWN

OV-10A

## 1. ENGINE SHUTDOWN

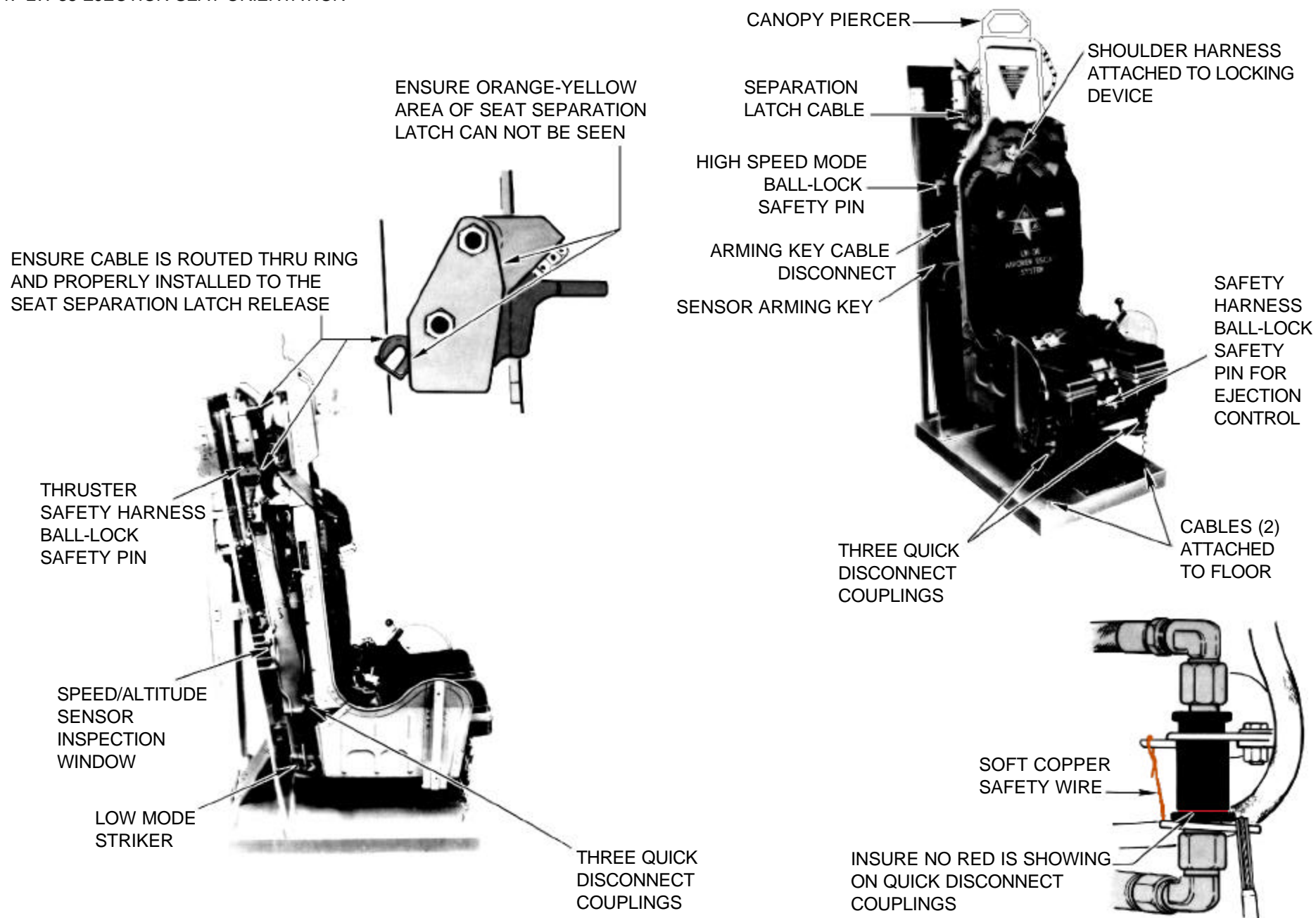
- a. Retard power levers, located on the left console both cockpits to GROUND START or MINIMUM THRUST position.
- b. Retard condition levers, located on the left console both cockpits, aft to the FEATHER and FUEL SHUT OFF position.
- c. If engines fail to shutdown: Pull fire warning T-handles, located on the right upper instrument panel, to the OUT position.
- d. Place battery switch, located on the left console just forward of power levers, to the OFF position.



# EJECTION SYSTEM INFORMATION

**OV-10A**

## 1. LW-38 EJECTION SEAT ORIENTATION





# SAFETYING EJECTION SYSTEM AND AIRCREW EXTRACTION

## 1. NORMAL SAFETYING EJECTION SYSTEM

- a. Insert initiating safety pin in the ejection control D-ring, located between legs of crewmember.
- b. Insert parachute thruster safety pin in thruster, located aft and to the side of seat head rest.

## 2. EMERGENCY SAFETYING EJECTION SYSTEM

### WARNING

- Quick disconnects must be disconnected on both seats to disable all initiators.
- When seats are in full down position, or when access to quick disconnects is not possible use normal safetying procedures above.

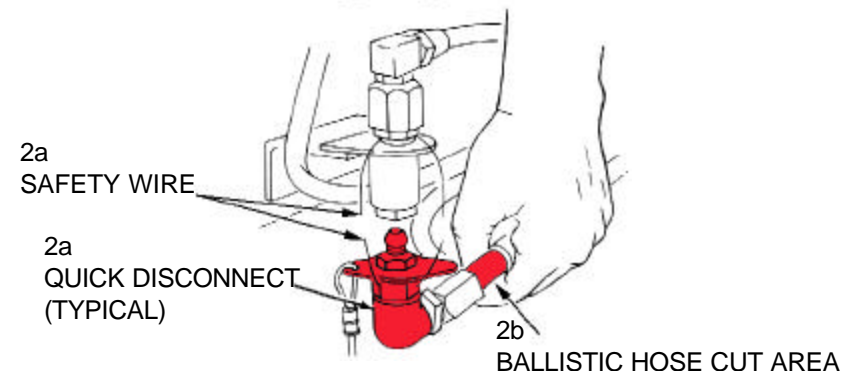
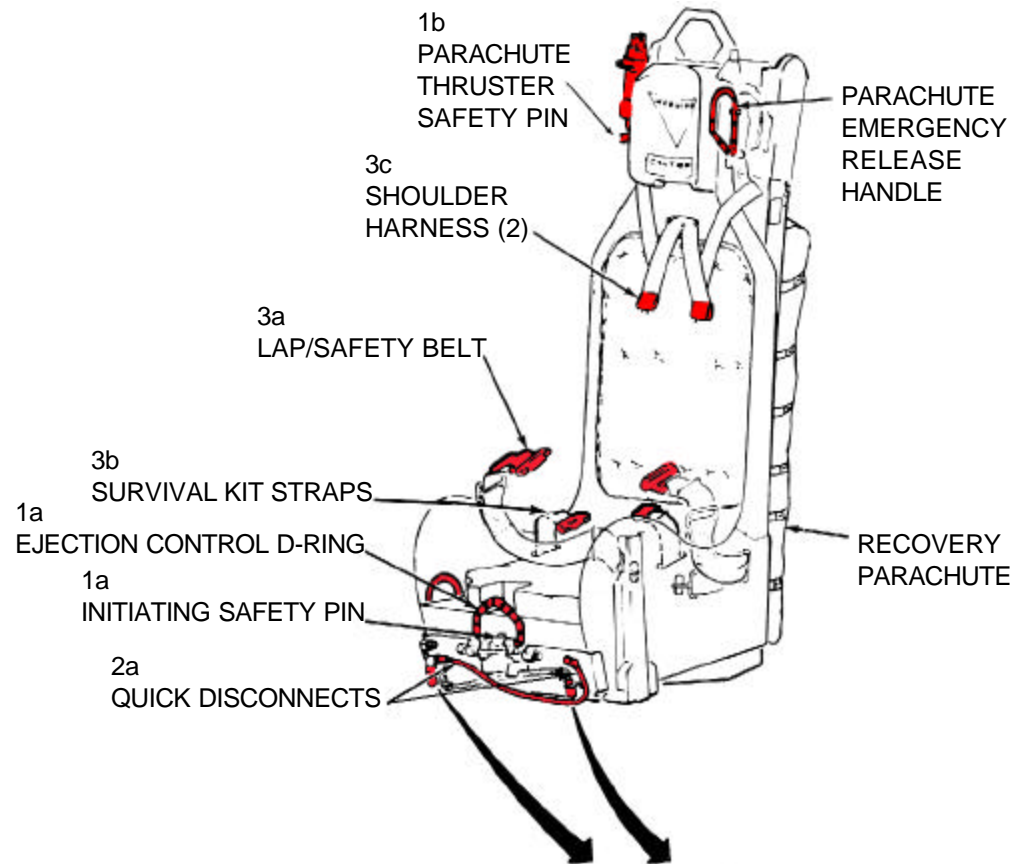
- a. Break or cut safety wire and push down sharply on quick disconnects, two located on forward part of seat bucket, one on right side and one on left side.
- b. If quickdisconnect fails to disconnect, cut ballistic hose of disconnect at the outlet port. If these efforts can not be done, normal safetying must be accomplished.

## 3. AIRCREW EXTRACTION

- a. Release lap/safety belt, located on midrift of crewmember, by pulling up on buckle lever.
- b. Release left and right survival kit straps, located on at each aft corner of seat bucket.
- c. Release Koch fittings on shoulder harness, located at each crewmember's shoulder.
- d. Remove crewmember(s).

### NOTE:

Pilot's seat shown. Observer's parachute and thruster mounted on opposite side.



## UAV PAINT SCHEMES

MQ-1/RQ-1



00000000-00

A91 00000000

## UAV GENERAL INFORMATION

The purpose of this UAV file is to inform Emergency Services and aircraft recovery personnel of the description, hazards, subsystems, materials, shutdown procedures, and weapons associated with this Unmanned Aerial Vehicle (UAV) system.

The RQ-1 "Predator" is a Medium Altitude Endurance (MAE) UAV. The RQ-1 can have the added ability to carry armed munitions (AGM-114).

The UAV is a mid-wing monoplane with a slender fuselage housing the payload and fuel, a high aspect ratio wing, and inverted-V tails.

The UAV is powered by a four cylinder Rotax engine requiring 100 octane aviation fuel type 100 LL Avgas with a capacity of 405 litres.

The primary function for the RQ-1 is video reconnaissance, assessing battle damage and battlefield chaos for intelligence planners, while the primary function of the MQ-1 is to attack land-based targets.

A Predator system is composed of three parts: the air vehicle with its associated sensors and communications equipment, the ground control station (GCS), and the product or data dissemination system. A typical Predator system has four air vehicles with sensors and data links, one GCS, and one Predator satellite communication SATCOM system. Predator missions do not employ support aircraft.

The sensors include an electro-optical/infrared (EO/IR) payload with a zoom lens and spotter lens, and a Northrop Grumman/Westinghouse Tactical Endurance Synthetic Aperture Radar (TESAR) or AN/AAS-52(V)1 infrared detecting set. It also carries other detection system payloads. The MQ-1 may also carry the AN/AAS-52(V)1 infrared detecting set and two AGM-114 missiles.

The UAV has a C-band line of sight (LOS) and a Ku-band satellite data link to provide over-the-horizon mission capabilities.

De-ice wings and tails are optional. Wings with missile capability do not have de-ice.

MQ-1/RQ-1

T. 00-105E-9



RQ-1 WITH PYLONS



RQ-1 WITHOUT PYLONS

# UAV SPECIFICATIONS AND DIMENSIONS

MQ-1/RQ-1

## NOTE:

MQ-1 shown, RQ-1 similar not shown.

### MQ-1/RQ-1 Weights:

Maximum Ramp Weight:	2250 lb.
Empty Operating Weight	
Without Anti-Ice System	1680 lb.
With Anti-Ice System	1760 lb.

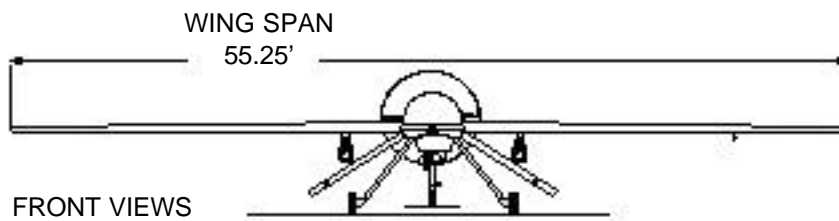
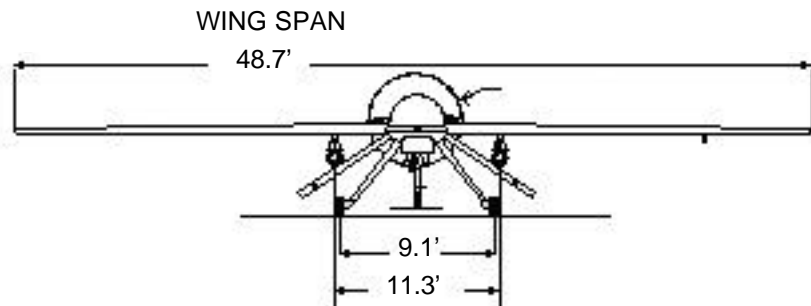
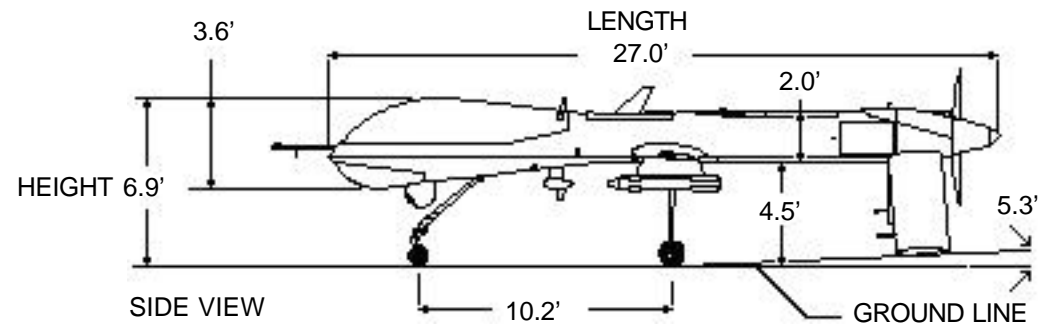
### Basic Airframe Weight

Without Anti-Ice System	1130 lb.
With Anti-Ice System	1210 lb.

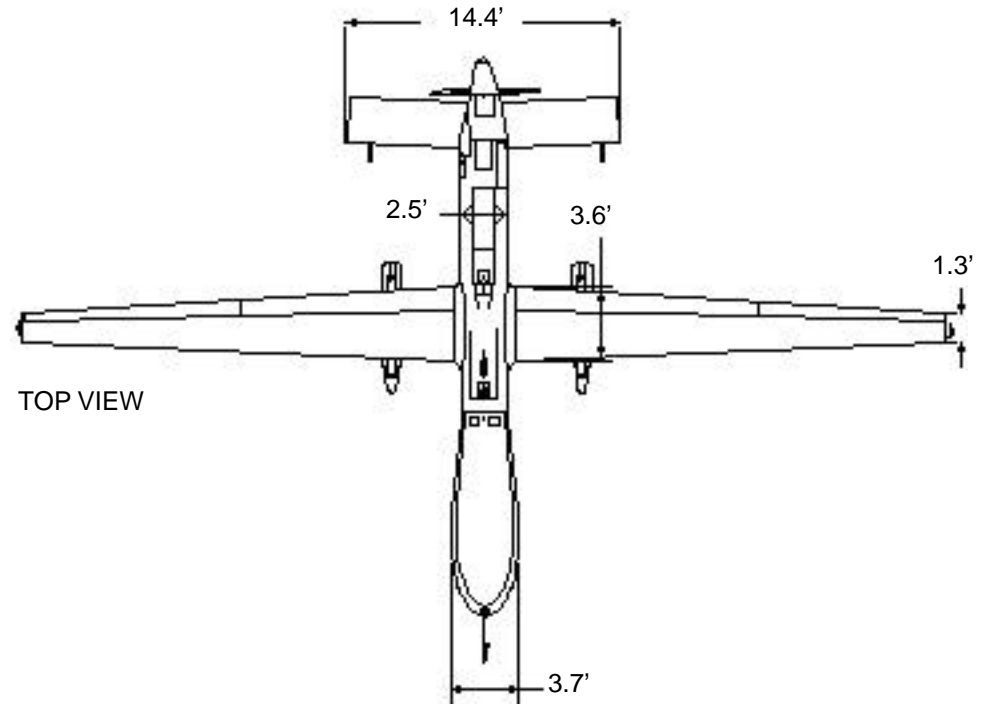
Fuel Weight (Full Tanks  $640 \pm 20$ ) 660 lb.

Maximum De-Icing Fluid 68 lb.

Data distribution system Predator Primary Satellite Link (PPSL)



(MQ-1L BLOCK 10 ONLY)





# UAV HAZARDS

MQ-1/RQ-1

## 1. PROPELLER AND LASER HAZARDS

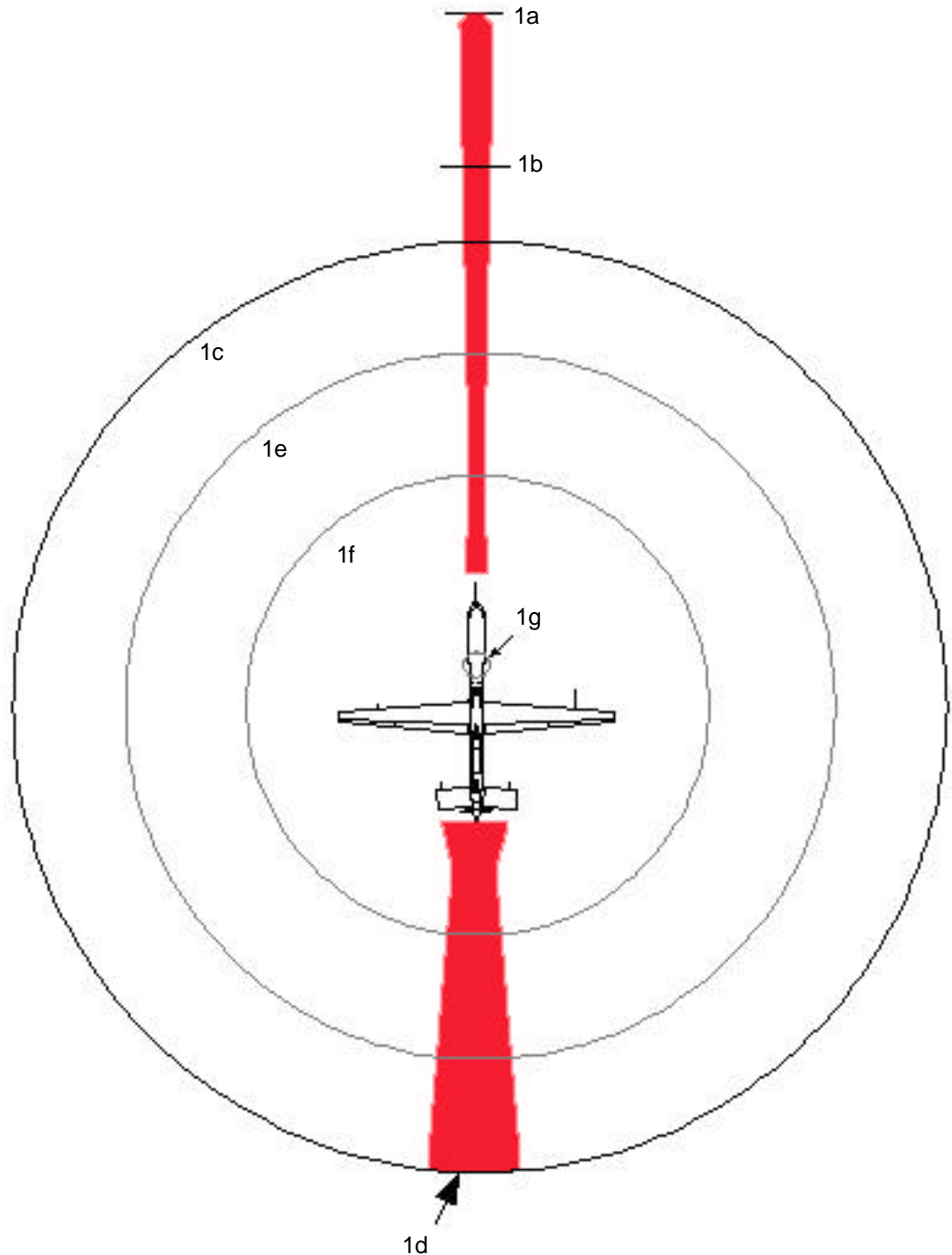
### WARNING

Propellers at any operating speed can cause injury.  
Do not approach propeller area when in motion.

### WARNING

Laser rangefinder designator (LRD) and laser target marker (LTM) are Class IV lasers that produce invisible non-ionizing IR radiation that can cause permanent blindness to people and animals. To prevent blindness, do not fire the LRD or LTM at areas where people or animals are present.

- a. 28 km - laser hazard from the AN/AAS-53(V)1 laser rangefinder designator (LRD) to personnel (MQ-1).
- b. 1km - laser hazard from the AN/AAS-52(V)1 laser target marker to personnel (MQ-1).
- c. 100 foot radius - noise hazard during engine run.
- d. 100 foot radius - direct propeller wash hazard.
- e. 70 foot radius - radiation hazard during high power checkout of the Ku-Band.
- f. 38 foot radius - radiation hazard during use of synthetic radar aperture (SAR).
- g. 1 foot radius - radiation hazard use of C-band.



# UAV HAZARDS - Continued

MQ-1/RQ-1

## 2. FUEL HAZARDS

### WARNING

Skin and eye irritation may occur. Do not breathe vapors, keep off skin, eyes, and clothes. Use approved personnel protective equipment when handling fuel.

#### Fuel Characteristics:

MQ-1 and RQ-1 utilizes aircraft fuel ASTM D910, MIL-G-5572F (approximately 640 lbs, 107 gal total).

- a. Forward Fuel Cell - rubberized bladder type contains 390 lbs., 65 gallons.
- b. Aft Fuel Cell - rubberized bladder type contains 250 lbs., 42 gallons.

## 3. WEAPONS - MQ-1

- a. The MQ-1 utilizes AGM-114 (Hellfire) missiles.

#### Missile Characteristics

Length: 1.63 (m)

Diameter: 178 (mm)

Wing Span: .33 (m)

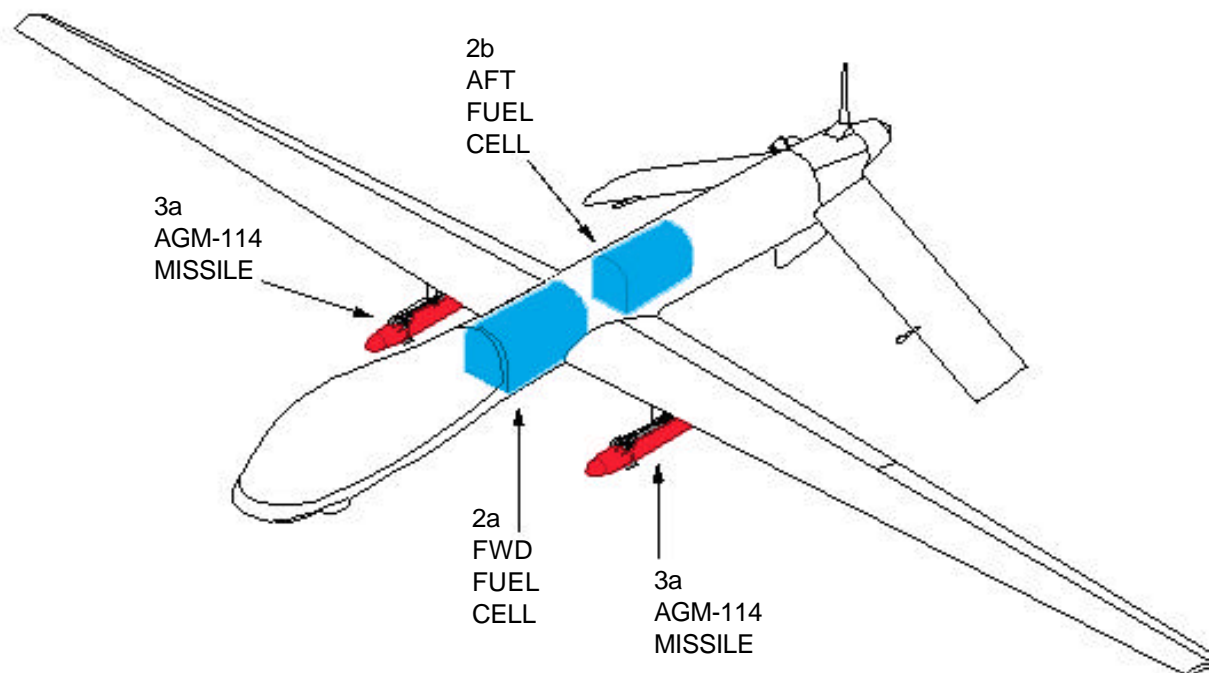
Launch Weight: 45.7 (kg)

Propulsion: Solid propellant (Thiokol M120E1)

Warhead:

K model - HE shaped charge, 12.5 kg HE blast/fragmentation.

M model - Blast/fragmentation.



## UAV HAZARDS - Continued

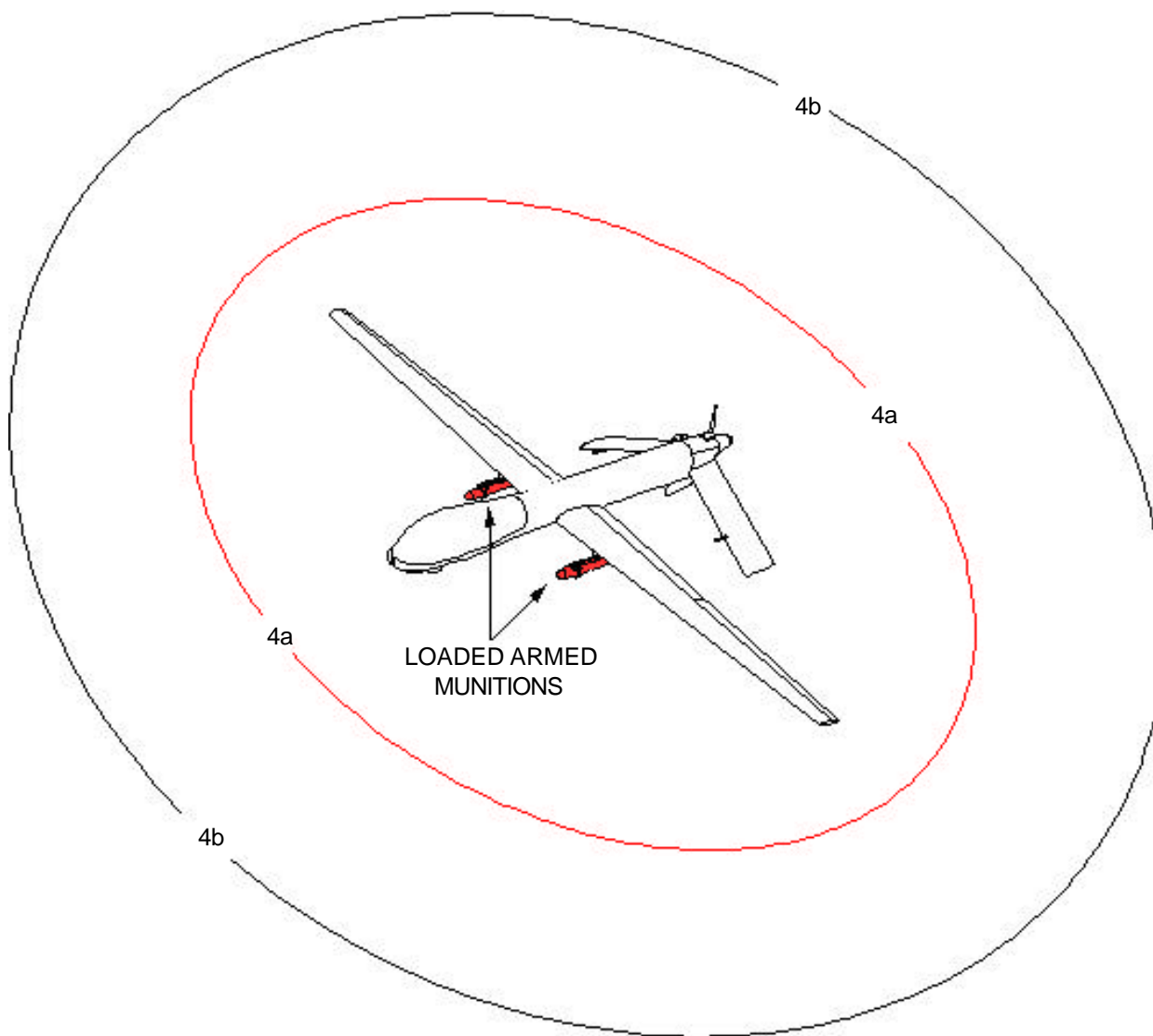
MQ-1/RQ-1

### 4. WEAPONS HAZARD FOR MQ-1

**WARNING**

MQ-1 may involve additional hazards when loaded with armed munitions.

- a. Personnel withdrawal distance for dropped or partial armed munitions, not involving fire, is 300 feet.
- b. Personnel withdrawal distance for UAV loaded with armed munitions during a fire is 4,000 feet.



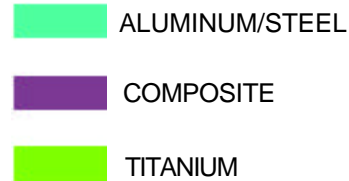
# UAV STRUCTURAL MATERIALS

MQ-1/RQ-1

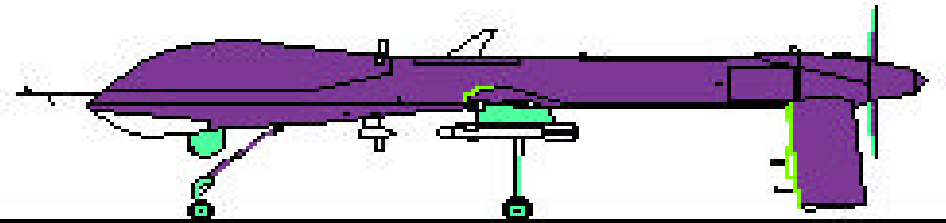
## 1. STRUCTURAL MATERIALS

### NOTE:

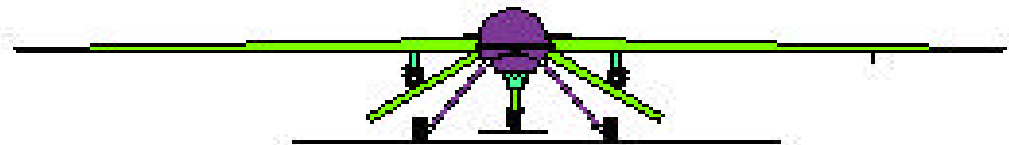
(RQ-1 shown, MQ-1 similar not shown)



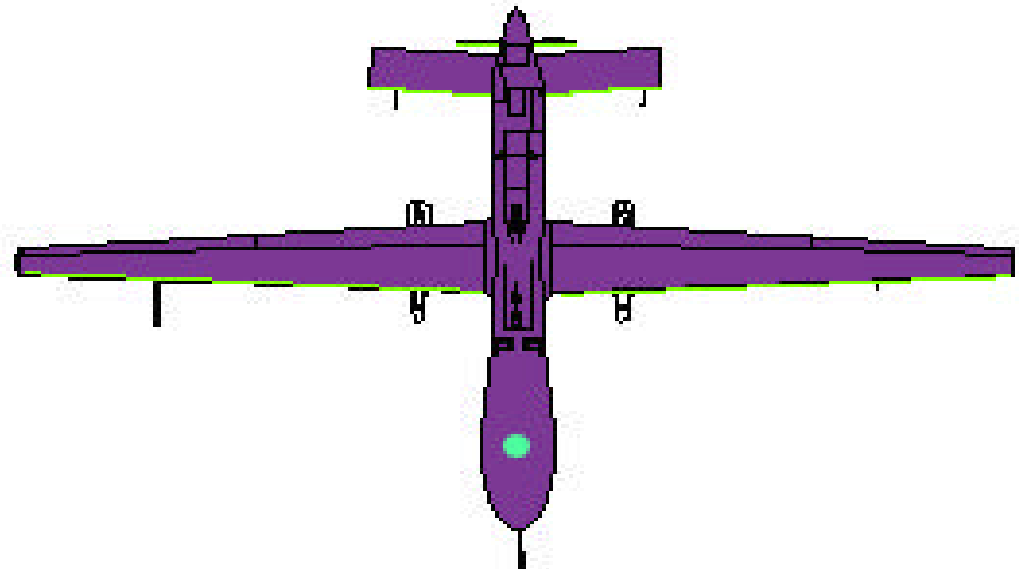
- Composite percentage is 92%. The outer fuselage is made of composite material consisting of carbon fiber and Kevlar, with quartz fiber. The vehicle is mainly a sandwich laminate structure. Core materials are Nomex, foam and wood. Fabric is predominately face layers for the sandwiched laminates. The landing gear is made from carbon fiber fabric layers. Internal support structures are made from carbon fiber unidirectional tape. Fibers are carbon and glass. The general material - carbon and glass fiber foam, Nomex and wood.
- The EO/IR Sensor is mostly composed of aluminum, glass, and internal electronics/circuit boards.
- The leading edges of the wings and tails are titanium where microscopic holes weep ethylene glycol deicing fluid only if aircraft is equipped with de-ice system.
- The internal support bulkhead structures are aluminum.
- The landing gear legs are composite, with aluminum and steel mechanisms at the top and bottom.
- The wheels are aluminum.
- The engine is aluminum and steel.
- The avionics boxes inside the fuselage are mostly aluminum, usually housing plastic and copper circuit boards.
- The batteries are nickle-cadmium (NiCad).
- Fuel cells are made of a rubberized fabric.
- The AGM-114 weapon pylons are made of aluminum.



LEFT SIDE VIEW



FRONT VIEW



BOTTOM VIEW

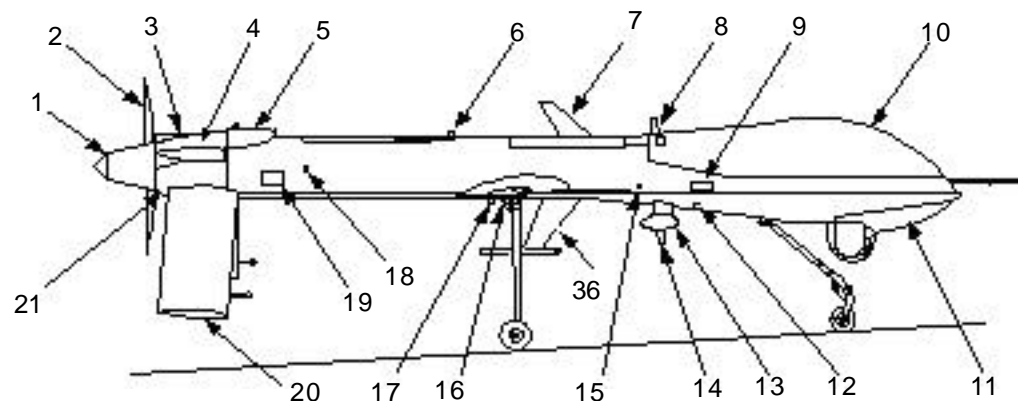


# MQ-1 EXTERNAL FEATURES

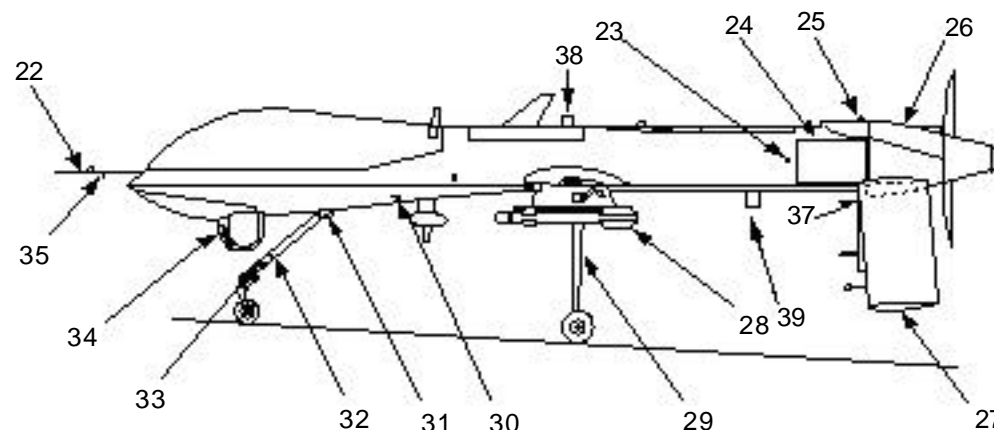
MQ-1/RQ-1

1. SPINNER ASSEMBLY
2. VARIABLE PITCH PROPELLER ASSEMBLY
3. COWL FLAP
4. AIR INLET TUBE FAIRING
5. COOLING DUCT COVER ASSEMBLY
6. UPPER APX-100 IDENTIFICATION FRIEND OR FOE ANTENNA
7. ULTRA HIGH FREQUENCY/VERY HIGH FREQUENCY ARC-210 ANTENNA
8. C-BAND UPPER OMNIDIRECTIONAL ANTENNA
9. GLOBAL POSITIONING SYSTEM TEST PANEL ACCESS  
(Engine kill switch under this panel for MQ-1L BLOCK 10)
10. KU SATELLITE COMMUNICATIONS RADOME ASSEMBLY
11. SYNTHETIC APERTURE RADAR RADOME/NON-RADIO FREQUENCY COVER
12. FRONT AVIONICS BAY COOLING AIR INLET
13. C-BAND DIRECTIONAL ANTENNA
14. C-BAND LOWER OMNIDIRECTIONAL ANTENNA
15. ENGINE KILL SWITCH (MQ-1L BLOCK 05)
16. MAIN LANDING GEAR RETRACT ASSEMBLY
17. LOWER APX-100 IDENTIFICATION FRIEND OR FOE ANTENNA
18. HEATED STATIC PORT (RIGHT)
19. GROUND POWER PANEL ACCESS
20. RIGHT TAIL ASSEMBLY
21. LOWER ENGINE COWL ASSEMBLY
22. ALPHA PROBE ASSEMBLY
23. HEATED STATIC PORT (LEFT)
24. POWERBAY PANEL
25. RED WARNING STROBE LIGHT
26. UPPER ENGINE COWL ASSEMBLY
27. LEFT TAIL ASSEMBLY
28. AGM-114 PYLON, RAIL, & MISSILE (LT SIDE SHOWN ONLY)
29. MAIN LANDING GEAR
30. FRONT AVIONICS BAY COOLING AIR INLET
31. NOSE LANDING GEAR RETRACT ASSEMBLY
32. NOSE LANDING GEAR
33. NOSE WHEEL AND SHOCK
34. AN/AAS-52(V)1 INFRARED DETECTING SET TURRET
35. YAW STRING
36. LOWER UHF/VHF ARC-210 ANTENNA
37. ENGINE BAY AIR COOLING SCOOPS (MQ-1L BLOCK 10)
38. UPPER IR BEACON
39. LOWER IR BEACON

RIGHT SIDE (SHOWN WITHOUT AFM-114 PYLON INSTALLED)



LEFT SIDE

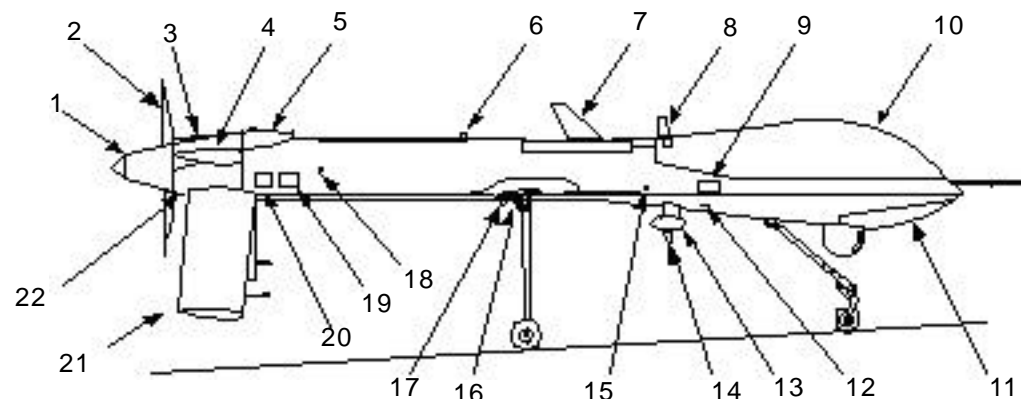


# RQ-1 EXTERNAL FEATURES

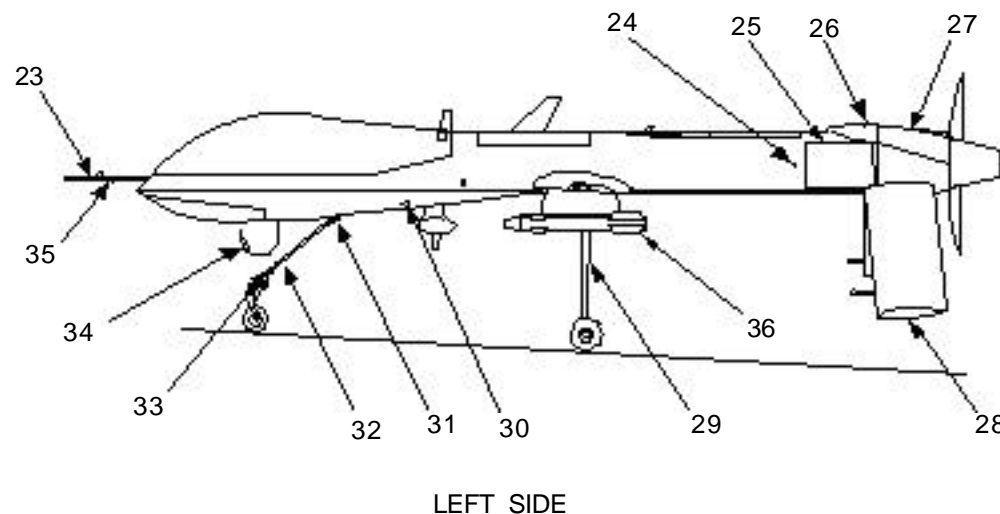
MQ-1/RQ-1

1. SPINNER ASSEMBLY
2. VARIABLE PITCH PROPELLER ASSEMBLY
3. COWL FLAP
4. AIR INLET TUBE FAIRING
5. COOLING DUCT COVER ASSEMBLY
6. UPPER APX-100 IDENTIFICATION FRIEND OR FOE ANTENNA
7. ULTRA HIGH FREQUENCY/VERY HIGH FREQUENCY ARC-210 ANTENNA
8. C-BAND UPPER OMNIDIRECTIONAL ANTENNA
9. GLOBAL POSITIONING SYSTEM TEST PANEL ACCESS
10. KU SATELLITE COMMUNICATIONS RADOME ASSEMBLY
11. SYNTHETIC APERTURE RADAR RADOME/NON-RADIO FREQUENCY COVER
12. FRONT AVIONICS BAY COOLING AIR INLET
13. C-BAND DIRECTIONAL ANTENNA
14. C-BAND LOWER OMNIDIRECTIONAL ANTENNA
15. ENGINE KILL SWITCH
16. MAIN LANDING GEAR RETRACT ASSEMBLY
17. LOWER APX-100 IDENTIFICATION FRIEND OR FOE ANTENNA
18. HEATED STATIC PORT (RIGHT)
19. GROUND POWER PANEL ACCESS
20. NETWORK JUNCTION BOARD PRINTED WIRE ASSEMBLY PANEL
21. RIGHT TAIL ASSEMBLY
22. LOWER ENGINE COWL ASSEMBLY
23. ALPHA PROBE ASSEMBLY
24. HEATED STATIC PORT (LEFT)
25. POWERBAY PANEL
26. RED WARNING STROBE LIGHT
27. UPPER ENGINE COWL ASSEMBLY
28. LEFT TAIL ASSEMBLY
29. MAIN LANDING GEAR
30. FRONT AVIONICS BAY COOLING AIR INLET
31. NOSE LANDING GEAR RETRACT ASSEMBLY
32. NOSE LANDING GEAR
33. NOSE WHEEL AND SHOCK
34. ELECTRO-OPTICAL/INFRARED SENSOR/AN/AAS-52(V)1
35. YAW STRING
36. AGM-114 PYLON, RAIL, AND MISSILE (LT SIDE SHOWN, RT SIDE NOT SHOWN) (MQ-1 ONLY)

RIGHT SIDE



RIGHT PYLON REMOVED FOR CLARITY

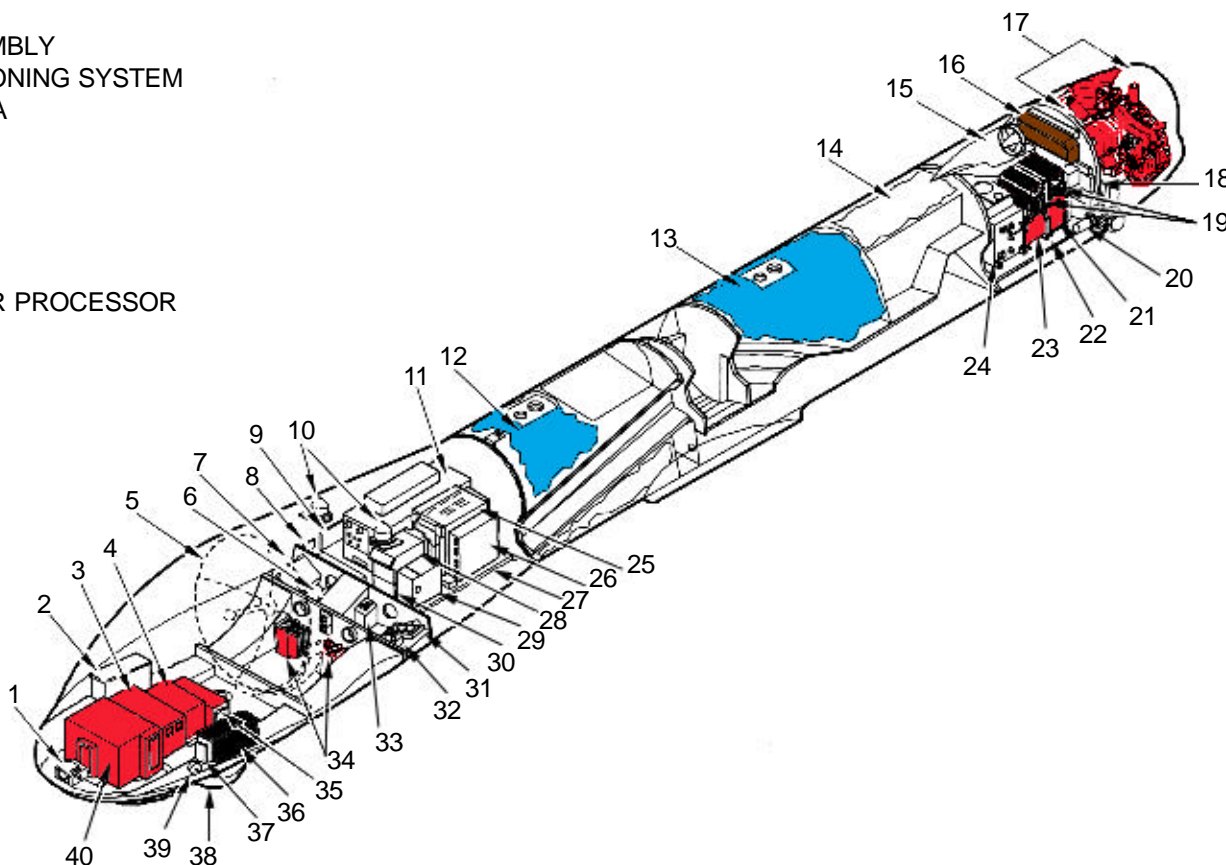


LEFT SIDE

# MQ-1 INTERNAL FEATURES

MQ-1/RQ-1

1. NOSE CAMERA
2. BATTERY 2
3. SYNTHETIC APERTURE RADAR ANTENNA ASSEMBLY
4. INERTIAL NAVIGATION SYSTEM/GLOBAL POSITIONING SYSTEM
5. KU-BAND SATELITE COMMUNICATIONS ANTENNA
6. UPPER VHF/UHF ANTENNA HEATER
7. AIRBORNE VCR
8. VHF/UHF ANTENNA SWITCH (AN/ARC-210)
9. CRYPTO PANEL
10. GPS ANTENNAS (LEFT & RIGHT)
11. KU-BAND SATELITE COMMUNICATIONS SENSOR PROCESSOR  
MODEM ASSEMBLY
12. FORWARD FUEL TANK
13. AFT FUEL TANK
14. ACCESSORY BAY
15. ENGINE COOLING FAN
16. OIL COOLER/RADIATOR
17. ENGINE (914I)
18. STARTER MODULE
19. AFT BATTERIES (2) (OPTIONAL)
20. TAIL SERVO (LEFT & RIGHT)
21. DUAL ALTERNATOR REGULATOR
22. REAR BAY AVIONICS BAY
23. SECONDARY CONTROL MODULE
24. SAR PROCESSOR OR AGM-114 ELECTRONIC  
ASSEMBLY
25. PRIMARY CONTROL MODULE
26. PAYLOAD & POWER DISTRIBUTION PANEL
27. FRONT BAY AVIONICS TRAY
28. AN/ARC-210 RADIO
29. FLIGHT SENSOR UNIT
30. IFF RECEIVER/TRANSMITTER
31. FRONT BAY POWER JUNCTION BOARD
32. DE-ICING CONTROLLER
33. ENERDYNE VIDEO ENCODER
34. BATTERY CHARGER CONTACTORS (2)
35. AN/AAS-52(V)1 DETECTING SET INFRARED
36. BATTERY 1
37. NOSE BLANKET HEATING CONTROLLER
38. AN/AAS-52(V)1 INFRARED DETECTING SET TURRET
39. ICE DETECTOR
40. SAR RECEIVER/TRANSMITTER



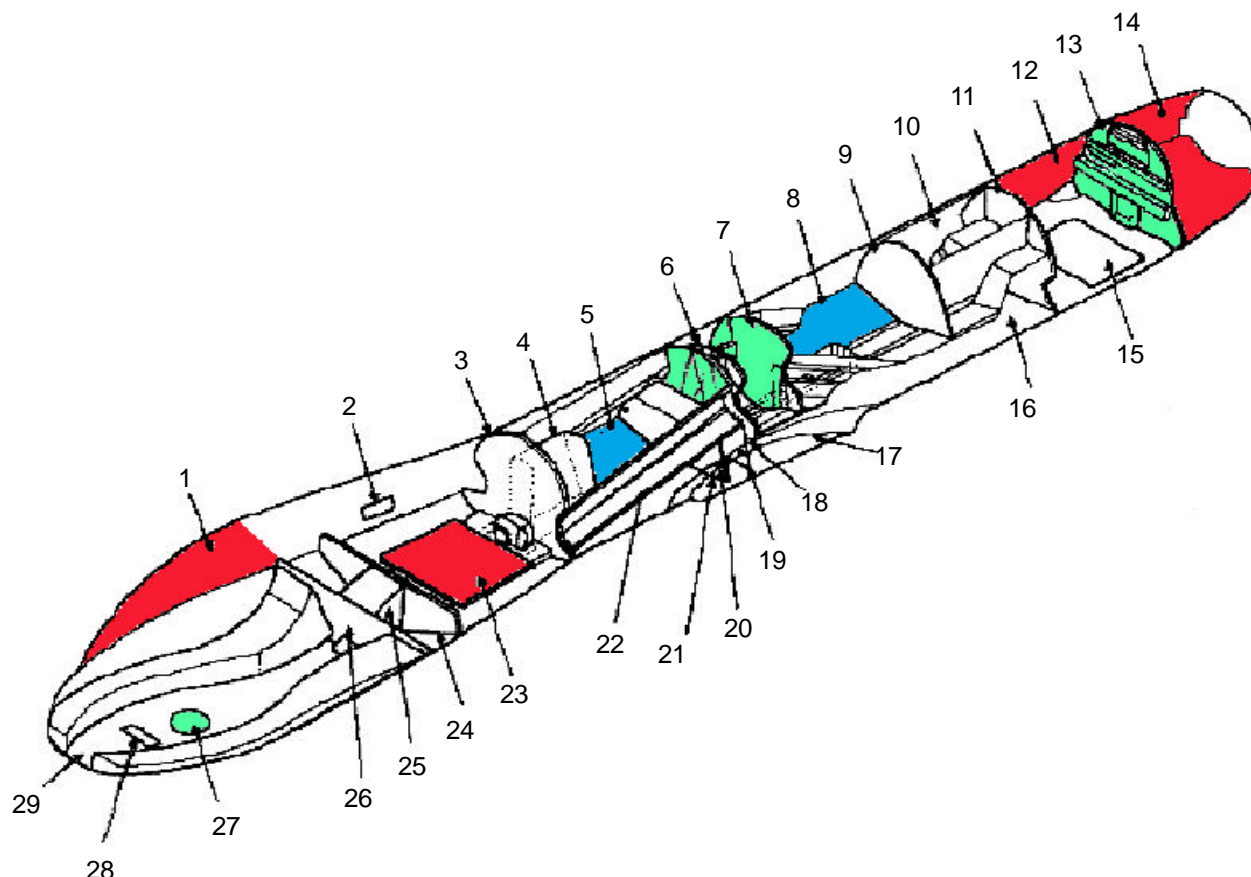
# RQ-1 INTERNAL FEATURES

MQ-1/RQ-1

## NOTE:

The fuselage is a semimonocoque composite structure.  
Bulkheads in the middle support the wings.

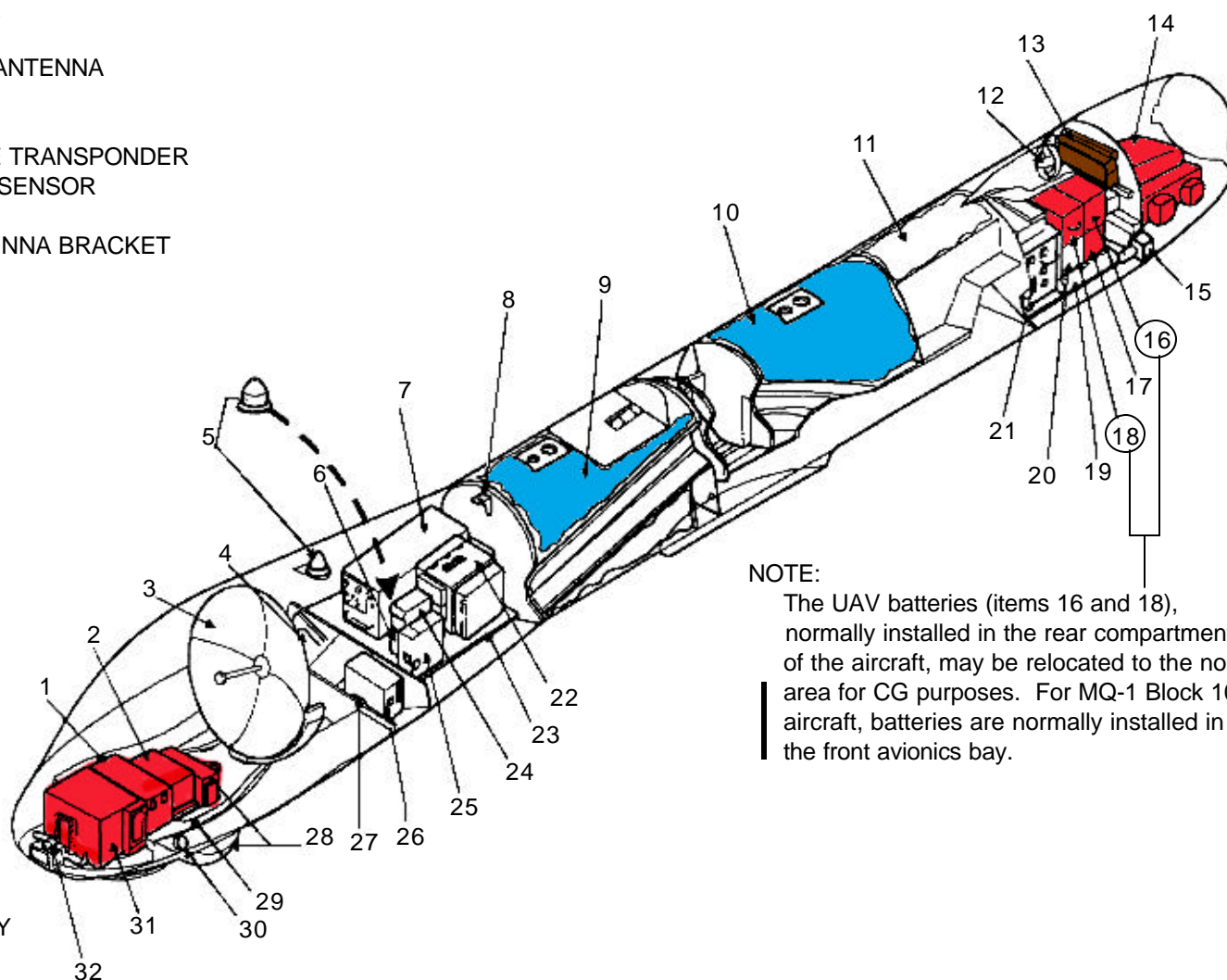
1. FRONT AVIONICS BAY
2. GPS TEST PANEL ACCESS
3. BULKHEAD 3
4. NOSE LANDING GEAR BAY
5. FORWARD FUEL CELL BAY
6. BULKHEAD 6 (ALUMINUM)
7. BULKHEAD 7 (ALUMINUM)
8. AFT FUEL CELL BAY
9. BULKHEAD 8
10. ACCESSORY BAY
11. BULKHEAD 9
12. POWERBAY
13. BULKHEAD 10 (ALUMINUM)
14. ENGINE BAY
15. AFT EQUIPMENT BAY TRAY
16. MAIN LANDING GEAR BAY
17. WING FILLET
18. MAIN LANDING GEAR ATTACHMENT
19. BULKHEAD 5
20. WING SPAR ATTACHMENT POINTS
21. BULKHEAD 4
22. CABLE CONDUIT
23. FRONT AVIONICS BAY TRAY
24. BULKHEAD 2
25. NOSE LANDING GEAR BAY PROTRUSION
26. BULKHEAD 1
27. OPENING FOR ELECTRO-OPTICAL/  
INFRARED SENSOR (ALUMINUM/GLASS)  
OR AN-AAS-52(V)1
28. OPENING FOR SAR ANTENNA ASSEMBLY
29. FRONT BAY PAYLOAD TRAY



# RQ-1 INTERNAL FEATURES-Continued

MQ-1/RQ-1

1. SYNTHETIC APERTURE RADAR ANTENNA
2. INERTIAL NAVIGATION SYSTEM/GPS
3. KU-BAND SATELLITE COMMUNICATIONS ANTENNA
4. VIDEO CASSETTE RECORDER
5. GPS ANTENNAS (LEFT AND RIGHT)
6. APX-100 IDENTIFICATION FRIEND OR FOE TRANSPONDER
7. KU-BAND SATELLITE COMMUNICATIONS SENSOR  
PROCESSOR MODEM ASSEMBLY
8. C-BAND UPPER OMNIDIRECTIONAL ANTENNA BRACKET
9. FORWARD FUEL CELL ASSEMBLY
10. AFT FUEL CELL ASSEMBLY
11. ACCESSORY BAY
12. ENGINE COOLING FAN
13. OIL COOLER/RADIATOR
14. 914F ENGINE
15. TAIL SERVO (LEFT AND RIGHT)
16. BATTERY ASSEMBLY #2
17. POWER SUPPLY
18. BATTERY ASSEMBLY #1
19. AFT EQUIPMENT BAY TRAY
20. SECONDARY CONTROL MODULE
21. SYNTHETIC APERTURE RADAR  
PROCESSOR/AGM-114 ELECTRONICS  
ASSEMBLY
22. PRIMARY CONTROL MODULE
23. FRONT BAY AVIONICS TRAY
24. ARC-210 RECEIVER/TRANSMITTER
25. FLIGHT SENSOR UNIT
26. VIDEO ENCODER
27. DE-ICE CONTROLLER
28. ELECTRO-OPTICAL/INFRARED SENSOR/  
AN/AAS-52(V)1 ELECTRONICS ASSEMBLY
29. FRONT BAY PAYLOAD TRAY
30. ICE DETECTOR
31. SYNTHETIC APERTURE RADAR (SAR)  
RECEIVER/TRANSMITTER
32. NOSE CAMERA ASSEMBLY



## NOTE:

The UAV batteries (items 16 and 18), normally installed in the rear compartment of the aircraft, may be relocated to the nose area for CG purposes. For MQ-1 Block 10 aircraft, batteries are normally installed in the front avionics bay.

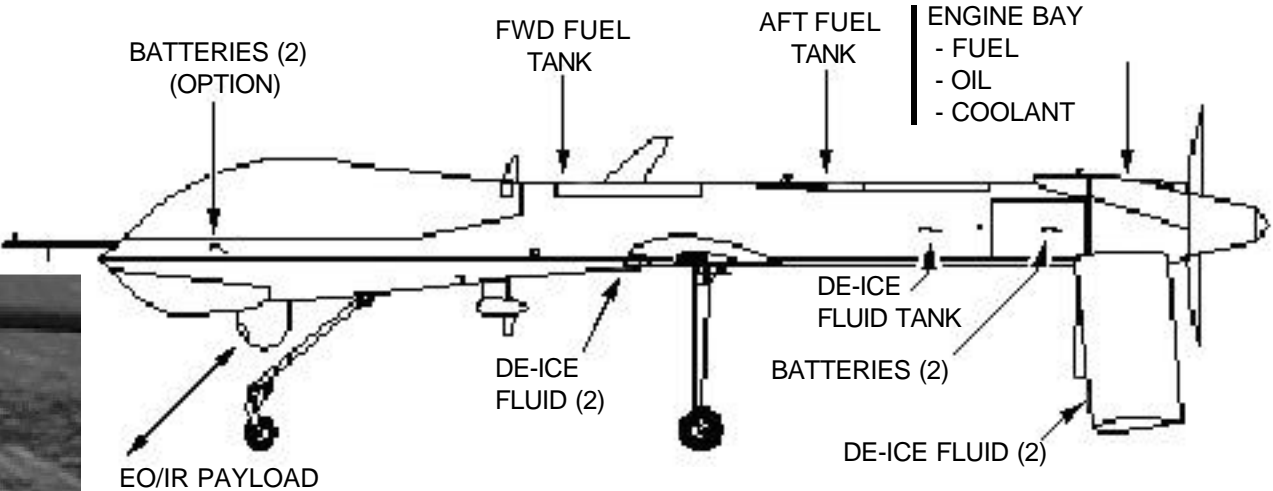
# HAZARDOUS MATERIALS INVENTORY

MQ-1/RQ-1

## 1. HAZARDOUS MATERIALS INVENTORY

The table lists the hazardous materials used on the UAV and the graphic defines the location of each material within the UAV. The airframe is comprised of numerous composite materials (e.g., Kevlar, carbon fibers, glass fibers and epoxy), none of which is considered hazardous in its cured state. However, precautions are required relative to handling of fractured composite materials and their combustion by-products.

SYSTEM, COMPONENT DESCRIPTION	GENERAL MATERIAL	HAZARDOUS MATERIALS
EO/IR Payload	Lens Coating	Thorium Fluoride
Batteries	Dry Cell	Nickel Cadmium (NiCad)
De-Ice Wings, Tails and Tank	Anti-Freeze (De-Ice Fluid)	Ethylene Glycol
Engine Bay A. Fuel B. Oil C. Coolant	Aviation Gasoline Lubricant  Coolant	Shell 100 LL TORCO Synthetic MPZ20/50 MOBIL 1 Formula 15/50 PRESTONE Anti-Freeze



FORWARD LOOKING INFARED (FLIR) POD  
(REFER TO PAGE 3-11 FOR RADIOACTIVE  
COATING HAZARDS)



# UAV APPROACH AND ENGINE SHUTDOWN

MQ-1/RQ-1

## 1. UAV APPROACH

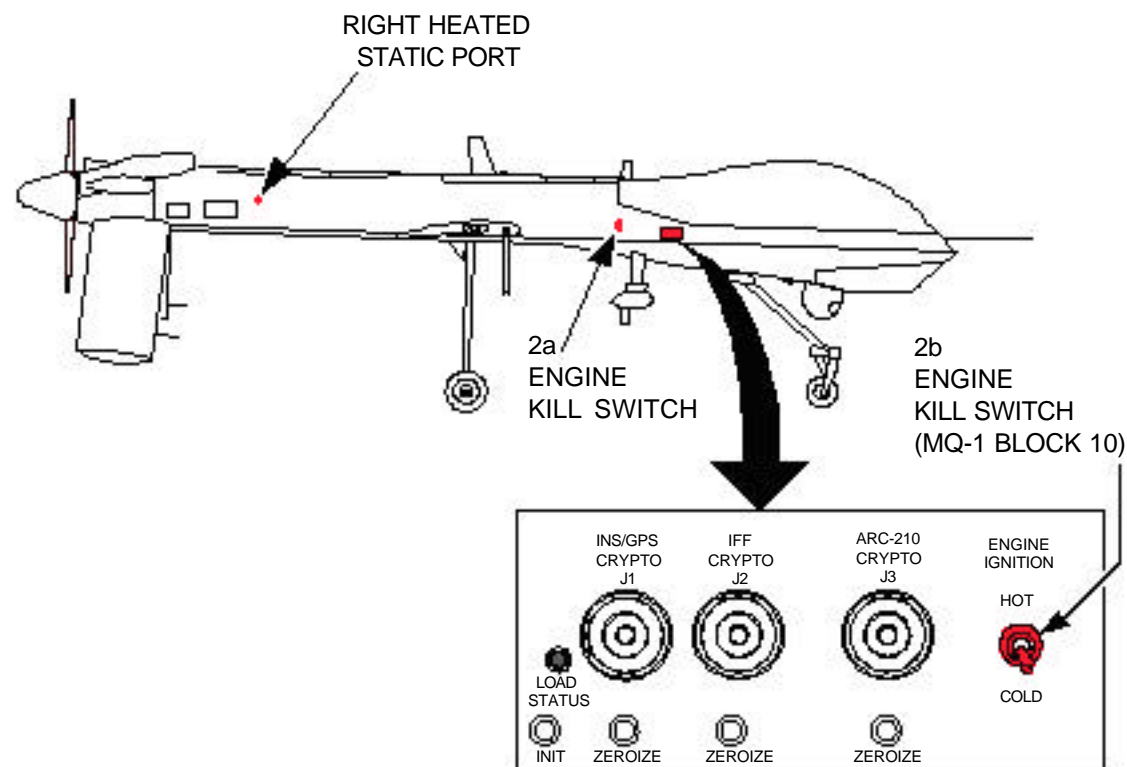
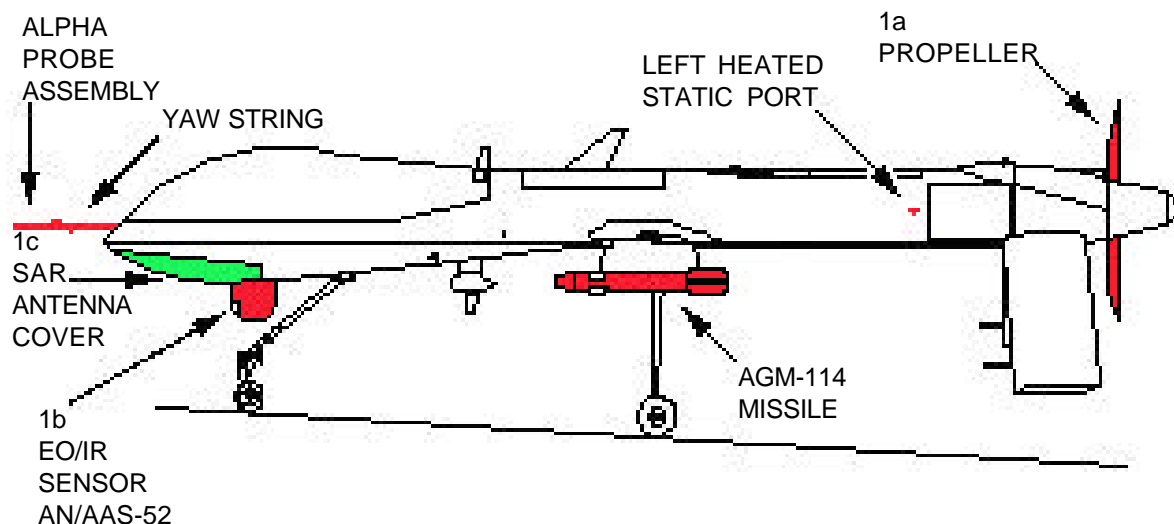
### WARNING

Approach can be made from either side. Be sure to avoid the propeller area and use extreme caution when entering the forward missile firing areas.

- Avoid the fuel powered propeller located at the aft section when engine is running.
- The EO/IR sensor has three glass lenses and is located under the nose dome. Laser capability is established from the AN/AAS-52 payload. Call sign for laser-equipped MQ-1 is Star 1, 2, etc. Fire protection must be informed when the laser is installed. A non-laser UAV is identified with call sign Kodar 1, 2, etc.
- The SAR antenna is located just forward of the EO/IR sensor, under the SAR antenna cover. The SAR antenna contains Byrellium. (See Chapter 3 hazard specifics and pages 7 and 8 for internal view of SAR.)
- Avoid heated static ports and heated pitot tubes on the wings.

## 2. ENGINE SHUTDOWN

- Use the engine kill switch, located on the right side fuselage and forward of right main landing gear to shut the engine down. This is the only method for engine shutdown. For MQ-1 Block 10 only, the engine kill switch is located under the forward test panel.
- If datalink is operating, it can be shutdown by the ground control station (GCS).

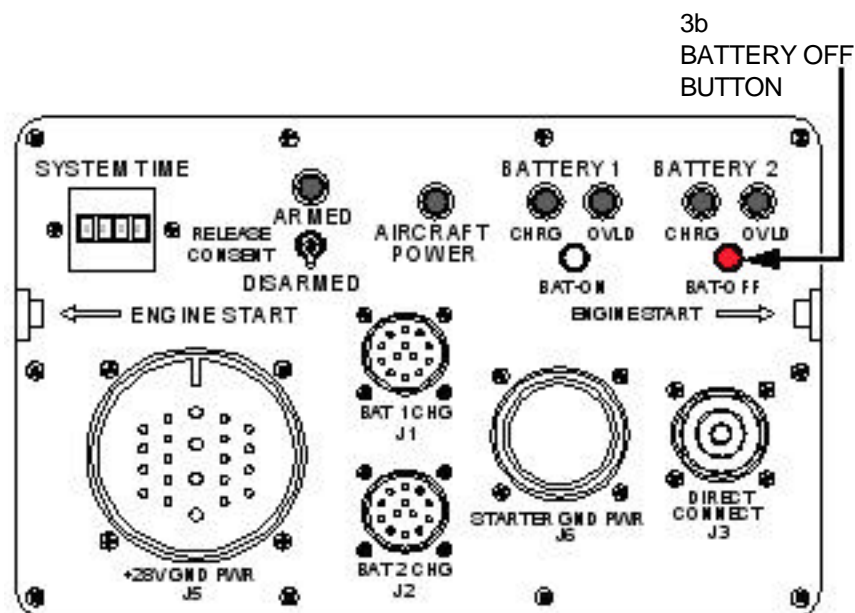
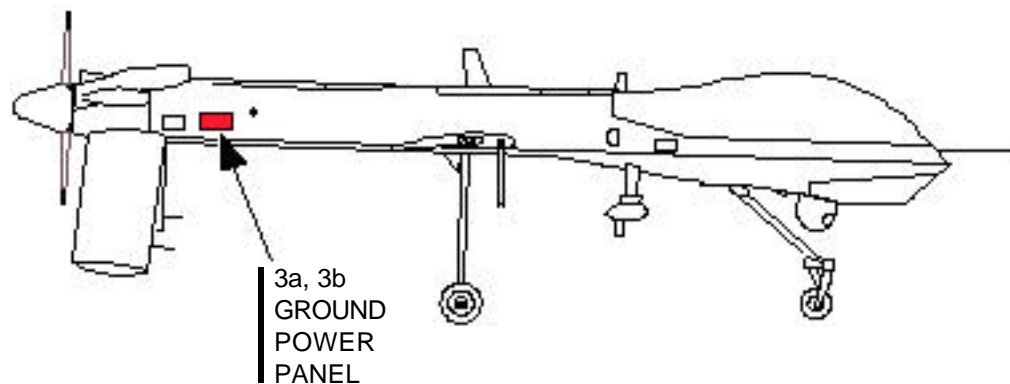


# BATTERY SHUTDOWN

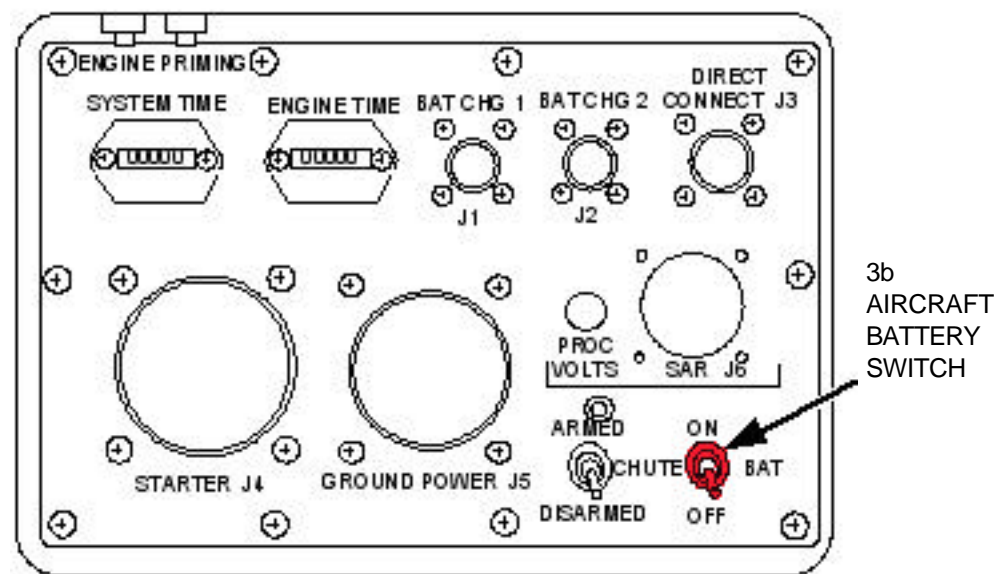
MQ-1/RQ-1

## 3. BATTERY SHUTDOWN

- The battery switch is located inside aft right side of the fuselage near the tail section behind the ground power panel. The two batteries are nickle-cadmium and are capable of giving off toxic fumes.
- For the MQ-1 BLOCK 10 - Battery Off Button: Push and hold BAT-OFF button for five seconds to turn power off.
- For the MQ-1 BLOCK 05 and RQ-1- Aircraft BAT Switch: Place BAT switch to OFF position to turn power off.
- Place the battery switch, inside the ground power panel area, in the OFF position to turn off all power to the UAV.



MQ-1 BLOCK 10



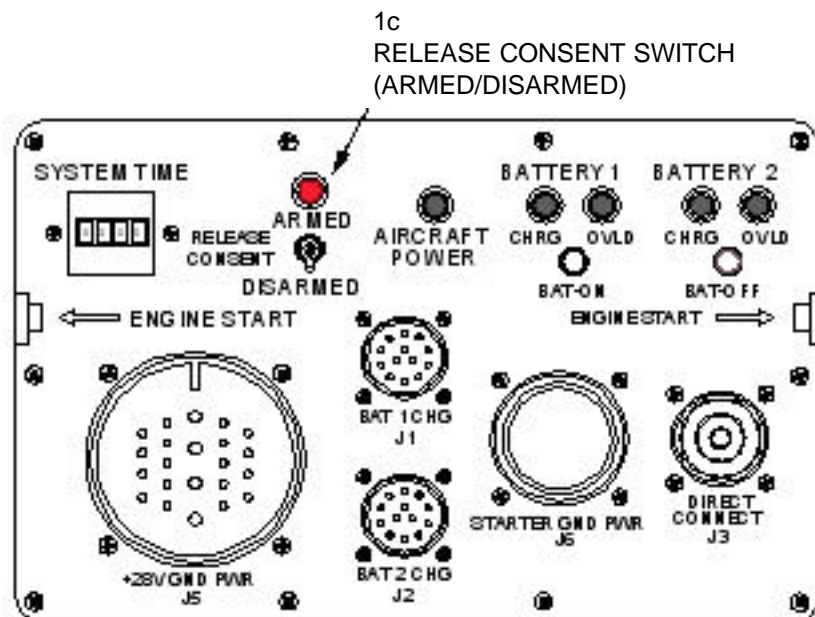
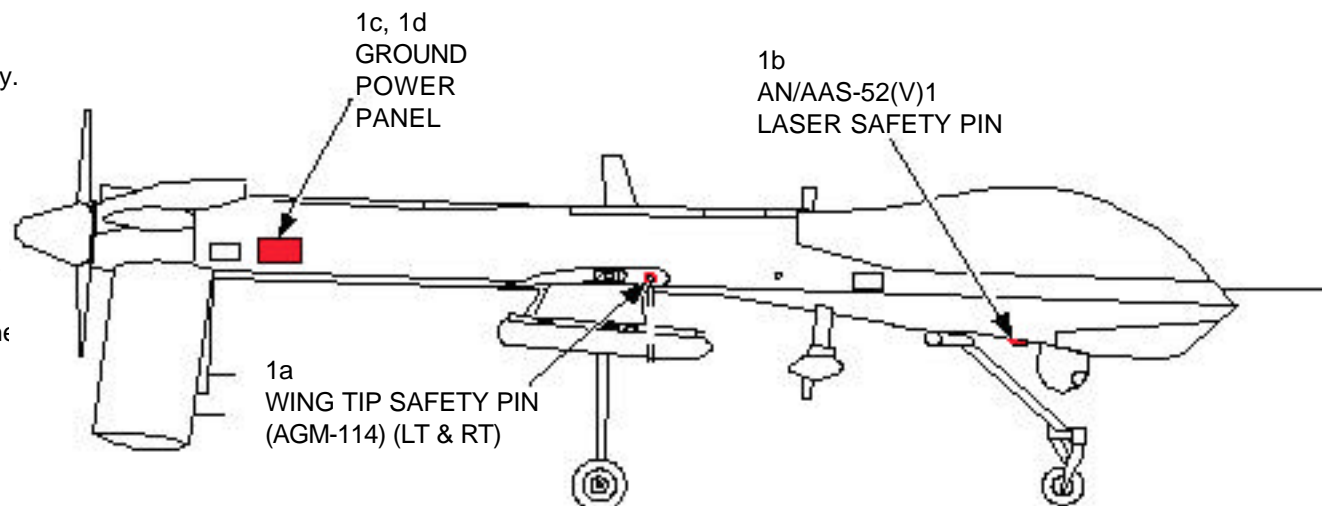
MQ-1 BLOCK 05 AND RQ-1

# WEAPONS SYSTEM SAFETYING

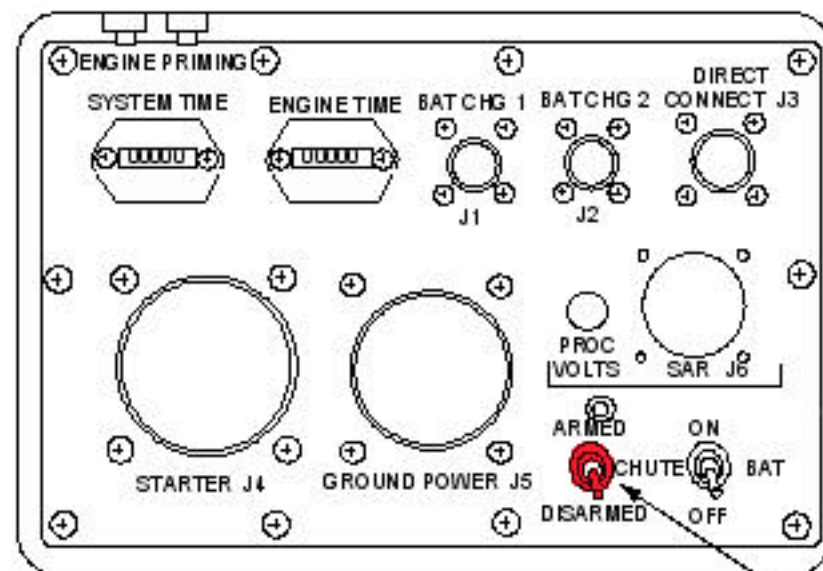
MQ-1/RQ-1

## 1. WEAPONS SYSTEM SAFETYING - MQ-1

- The AGM-114 system safe/arm pin assembly, located on each wing tip, acts as a safety device by interrupting power to the missile system when installed.
- The AN/AAS-52(V)1 laser safe/arm pin assembly is located just aft of the AN/AAS-52(V)1 turret assembly. When installed, the safety pin provides an interlock to prevent the laser from firing.
- The release consent switch, at the ground power panel, allows weapons to be armed/disarmed (MQ-1 BLOCK 10).
- The chute switch, at the ground power panel, allows weapons to be armed/disarmed (MQ-1 BLOCK 05).



MQ-1 BLOCK 10



MQ-1 BLOCK 05 AND RQ-1

1d  
CHUTE SWITCH  
(ARMED/DISARMED)

# MQ-1 SYSTEM HAZARDS

## 1. AGM-114 MISSILE SYSTEM

The system consists of a modified RQ-1 Predator aircraft, resulting in the MQ-1 UAV and components from an M-299 launcher (used on the AH-64 Apache helicopter), shipping containers, the Predator Ground Control Station (GCS), and the AN/AWM-101A launcher electronics tester. The production model of the MQ-1L evaluated for this study is further defined as "Block 5" by the government. The MQ-1L is a long endurance, medium altitude Unmanned Aerial Vehicle (UAV). The aircraft has the ability to incorporate different reconnaissance payloads. Aircraft control is provided via pilot commands from within a Ground Control Station (GCS). The GCS is enclosed in a portable shelter that incorporates workstations to enable the operators to control/monitor the MQ-1L and its sensor sub-systems and to exploit collected data. Control commands are up-linked from the GCS to the aircraft and reconnaissance imagery/aircraft status data is down linked via either C-band Line-Of-Sight or Ku-band Satellite links. The aircraft maximum gross weight is 2,250 pounds, with an empty weight of 1,680 pounds. It is powered by a standard commercial aircraft piston engine with a pusher propeller. The aircraft has an all-digital flight control system. The fuselage contains two avionics bays, one forward and one aft, for payload and avionics. The graphite-epoxy composite airframe has 5-g capability at its takeoff weight. The entire aircraft can be disassembled and transported within a single shipping container and can be reassembled in approximately eight hours by four trained personnel. The aircraft components consist of the fuselage, wings, tail surfaces, and landing gear. The fuselage contains the propulsion system, fuel system, and two payload/avionics bays.

## 2. PROPULSION SYSTEM

The engine is a Rotax 914 aircraft piston engine powering a variable pitch, two-blade composite pusher propeller. The engine uses airflow and liquid cooled cylinder heads for cooling and 7.6 liters of automotive oil for lubrication.

## 3. INTERNAL BAYS

The MQ-1L possesses two internal avionics bays within the fuselage to house equipment that adapts the platform for the AGM-114 function (payload) and also the necessary avionics required for continuous flight. The payload and avionics subsystems are distributed among the two bays.

# MQ-1/RQ-1



MQ-1

### NOTE:

The next generation Predator aircraft are expanding into new mission capabilities. This new variant will have a wing span of 80 - 86 feet using higher altitudes (above 50,000 feet) and extended range (ER), for military and peacetime use. The USAF designation Predator B-ER or MQ-9. ALTAIR will be for scientific, atmospheric research, surveillance, reconnaissance, and other missions. In the near future, the US Navy, USCG, Homeland Defense and NASA will be these aircraft.



MQ-9



## MQ-1 SYSTEM HAZARDS-Continued

### 4. FUEL SYSTEM

The aircraft's fuel is contained in the forward and aft fuel tanks located in the fuselage. Each fuel tank consists of a rubberized fuel bladder supported by the fuselage structure. Each tank has its own filler neck, cap, and fuel level sensor located in a small access hatch on top of the fuselage over each tank. The filler caps provide atmospheric venting as well as a means for servicing the tanks. The aircraft's two fuel tanks have a total capacity of 600 pounds, but standard maximum fuel is 550 pounds. The DIN 51600, O-NORMC 1103 EURO-SUPER RON 95, and AVGAS 100 LL BLUE fuels used are standard 95 to 100-octane reciprocating aircraft engine fuels.

### 5. PAYLOAD

The mission essential payloads consist of laser designators, television, and infrared systems. The MQ-1L has the AN/AAS-52 installed in the forward bay. The AN/AAS-52 sensor is part of a family of sensors based on the Forward-Looking Infrared Laser Range Finder/Detector system. This payload also supports a laser illuminator. The AN/AAS-52 system operates in day/night/adverse weather conditions to provide long-range surveillance, target acquisition, tracking, range finding, and laser designation for multiple laser-guided munitions.

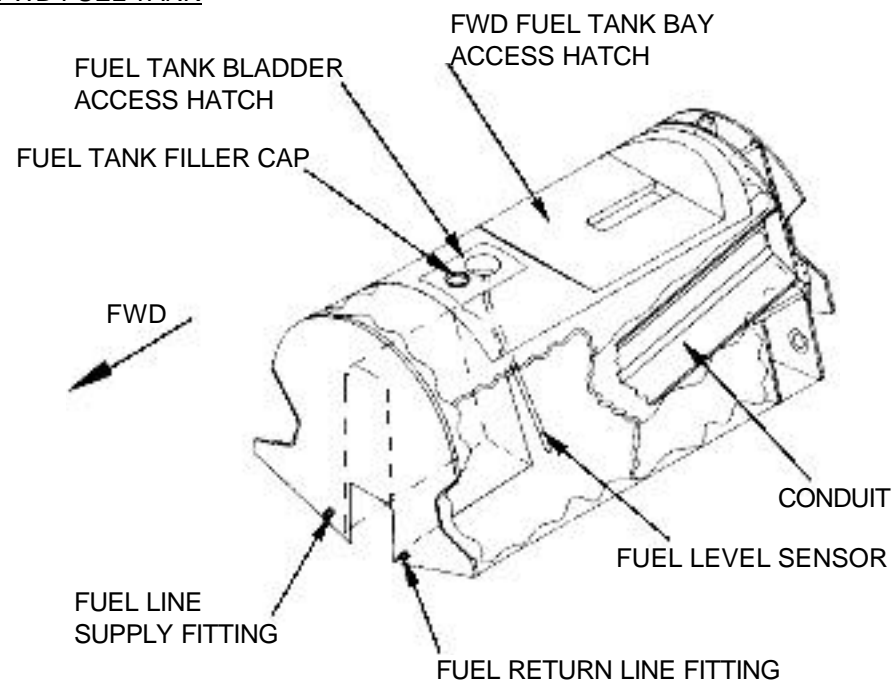
### 6. ELECTRICAL POWER SUBSYSTEM

The electrical power system for the aircraft includes a 3-kilowatt starter/alternator, a 28-volt direct current (DC) power supply, two 14 Amp-hour Ni-Cad battery packs (more battery packs can be added as mission requirements dictate), and the ground power panel. Newer aircraft have dual alternators and a starter. The alternator provides alternating current (AC) energy from the engine. This energy varies in proportion to engine speed. The AC energy from the alternator is supplied to the power converter. The power converter rectifies this power to render a stable 28-volt DC supply. This 28-volt power resides on the 28-volt bus and will be referred to as "+28 VDC". Battery power is used to augment/supply power in the event of engine/alternator failure. The battery packs are 13 centimeters (cm) x 15 cm x 30 cm and weigh approximately 8 pounds. It is comprised of two strings of rechargeable Ni-Cad dry cells. Battery energy is not used if the 28-volt bus remains above 28 volts. The batteries are intended as maintenance free and possess a lifecycle of approximately 500 charge/discharge cycles. The aircraft starter control connector that is located within the ground power panel must be plugged into the Starter/Ground Power Cart umbilical cord to be started. This electrical power connector provides ground electrical power so that use of onboard electrical power is not required.

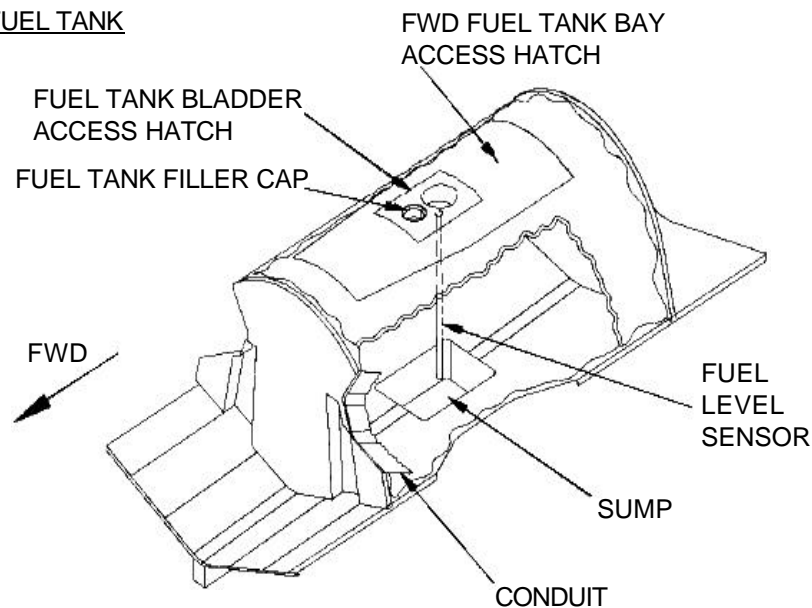
MQ-1/RQ-1

T. 00-105E-9

#### FWD FUEL TANK



#### AFT FUEL TANK





## MQ-1 SYSTEM LEVEL HAZARDS

### 1. MQ-1L SYSTEM LEVEL HAZARDS

Both the MQ-1L and AGM-114 weapon possess materials and components that present potential hazards to personnel during ground operations and pose collateral issues via unintended functions during flight.

- a. Ground Hazards. The items that pose ground hazards consist of the engine fuel and batteries. In addition, the operating MQ-1L poses occupational hazards such as moving parts (propeller), high voltages, sharp edges, and falling weights.
- b. Engine Fuel. Preparation for transport of the MQ-1L includes removal of residual fuel (to include "depuddling"). Atmospheric venting and fuel tank access during MQ-1L operations is provided via the filler caps.
- c. Batteries. The MQ-1L utilizes NiCad batteries to provide power when the engine alternator is not operating and at times when operational energy demands exceed the capacity of the engine alternator. This type of battery provides energy via chemical and not thermal means. When being transported, the batteries are in a discharged state and therefore pose no risk from an electrical perspective. Consequently, the medium used as a source of energy poses only a hazardous materials management concern when disposed of.
- d. Occupational Hazards. Those occupational hazards that exist from accessible areas in and around the aircraft are managed via cautions/warnings within the Technical Orders that are issued to the field.

### 2. AGM-114 SYSTEM LEVEL HAZARDS

- a. Ground Hazards. In addition to hazards posed by ordnance (rocket motor and warhead), the AGM-114 system also presents potential hazards due to the use of pressurized containers, EEDs, and a thermal battery.
- b. AGM-114 Pressurized Containers. There are two pressurized containers within the AGM-114, the accumulator and the gyro.
  - (1) Accumulator. The accumulator vessel proof pressure is 13,200 psi and the vent pressure is 13,500 psi (established via failure of a burst disk) that is incorporated to prevent internal pressures from reaching the 22,000 psi tested burst point. The operating pressure of the accumulator is 8,000 psi nominal (initial fill pressure).

## MQ-1/RQ-1

- (2) Gyro. The gyro vessel proof pressure is 5,400 psi and the vent pressure is 5,600 psi (established via failure of a burst disk) that is incorporated to prevent internal pressures from reaching the 6,750 psi design burst point. The gyro vessel operating pressure is 3,000 psi.
  - c. AGM-114 Electro-explosive Devices (EED). All AGM-114 EEDs meet the requirements of MIL-I-23659, including the 1-amp/1-watt, five minute no-fire requirement and passing the 25 KV Electrostatic Discharge (ESD) test. AGM-114 EEDs exist as de-ice, gyro, accumulator, and battery initiation squibs. The de-ice, gyro, and accumulator squibs initiate piston actuators. The de-ice squib assembly resides external to the weapon and has been designed for and tested to demonstrate no ejection of mechanical parts. The gyro and accumulator EEDs reside within the weapon body and have been tested to show that no venting or ejecta exit the missile. The battery squib is completely contained when functioned.
  - d. AGM-114 Thermal Battery. The AGM-114 thermal battery is initiated by either of two 1-amp/1-watt, five-minute no-fire initiators. The stimuli used to fire these squibs is derived from the AEA "Missile Squib Fire" signal and is switched by the "Squib Arm" discrete signal. These signals are provided from the AEA as part of the launch sequence. The launch sequence occurs after AEA is commanded as "powered", the missile is selected (powered), and "Arm" and "Fire" commands have been received from the GCS via the MQ-1L PCM. Once squibbed, the thermal battery is active and can provide electrical stimulus for no more than 30 minutes. Testing has also shown that the maximum skin temperature reached by the battery, even in a no-load condition, is 575°F. Analysis has shown that this may cause the accumulator to be heated enough to fail the burst disk, allowing the gas to vent through the control section, but will not cause ignition of the warhead or rocket motor. In addition, no inadvertent thermal battery ignition has occurred in over 175 LAT missiles launched, or missile handling and operation. Thus no safety related failures are expected from the thermal battery.
- ### 3. INADVERTENT ROCKET MOTOR INITIATION (MISSILE LAUNCH)
- a. An inadvertent rocket motor initiation event poses the potential for loss of life to personnel on the ground as well as a potential loss of asset and/or collateral damage during airborne operations. The stimuli required by the AGM-114 to initiate its rocket motor is intended to be supplied only as a consequence of an ordered set of sequential events via a distributed system. This system consists of the GCS, MQ-1L, and AEA. The aggregate of hardware/software/protocol of these three subsystems and specific ground-based management techniques constitutes the distributed system safety.

# UAV MUNITIONS

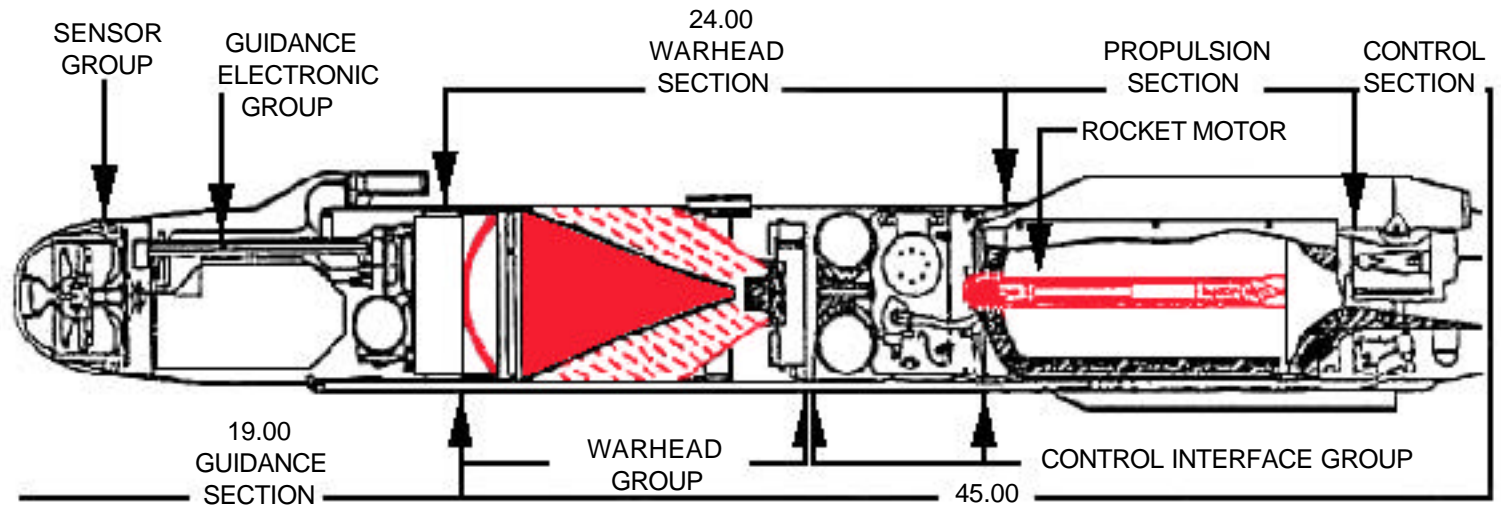
MQ-1/RQ-1

## 1. AGM-114K-2 MISSILE AND WARHEAD SUBSYSTEM

The AGM-114 missiles are laser-guided rocket propelled anti-armor and anti-material weapons developed by the U.S. Army to be deployed from a helicopter. The AGM-114K-2 configuration employs a dual shaped charge warhead system. A precursor warhead first defeats reactive armor, then the main warhead is functioned to defeat the remaining armor. The AGM-114M configured weapon employs a Blast-Fragmentation (blast-frag) warhead. The blast-frag warhead is designed to separate from the missile upon impact and penetrate the target before detonating. Both missiles consist of a Guidance Section, Warhead Section, Propulsion Section and Control Section. The explosive is two zirconium sponge incendiary charges. The colorized area with broken lines consists of zirconium particles with calcium stearate flakes.



AGM-114 MISSILE



AGM-114 K-2 MISSILE CONFIGURATION

# UAV MUNITIONS-Continued

## 2. AGM-114K-2 CONFIGURATION

The warhead function sequence is initiated when either crush switch (or back-up g-switch) located in the front of the weapon is closed. Upon receipt of this indication, the ESAF processor sends a trigger signal to the FWFM initiating the precursor warhead to defeat the reactive armor. The ESAF processor then sends a trigger signal to the Main Module after a preprogrammed factory delay ("Fuze Data" from the guidance section) causing its output to the main warhead to occur after the precursor warhead has had the opportunity to perform its task. This staging of functions allows the main warhead to defeat the main armor.

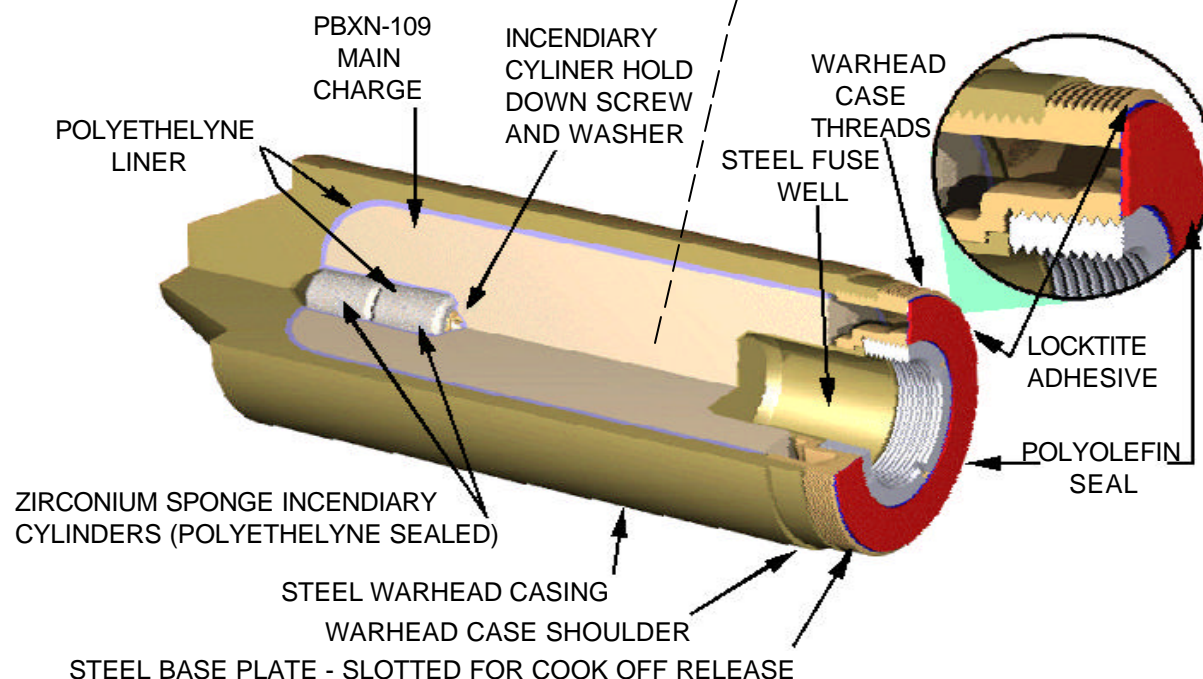
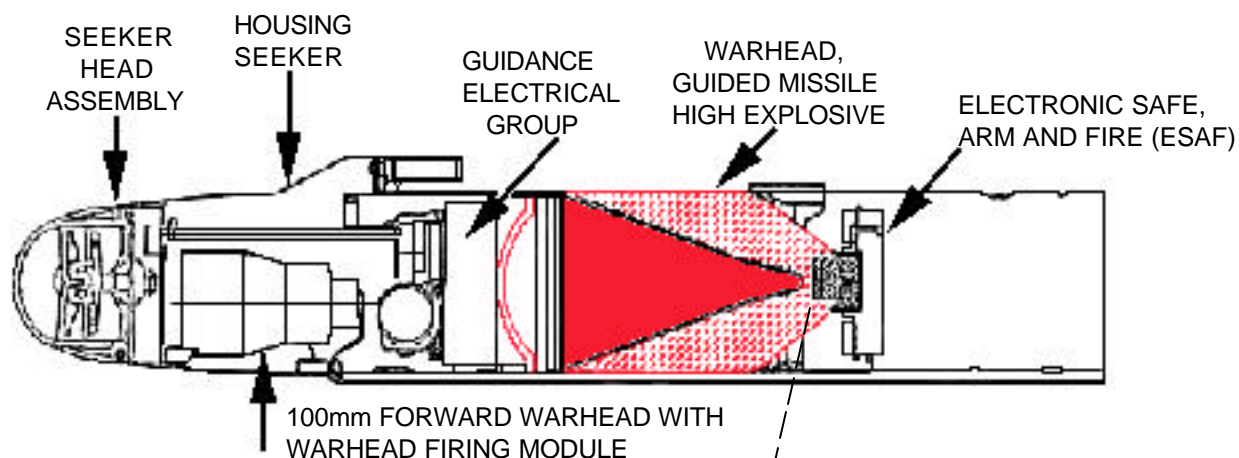
## 3. AGM-114K-2 HAZARD CLASSIFICATION

The classification for the AGM-114K-2 missile is listed below:  
 DOD Class/Division/SCG – 1.1E  
 DOT Label: Explosive 1.1E  
 DOT Proper Shipping Name: ROCKETS  
 UN Serial Number 0181

MQ-1/RQ-1

T. 00-105E-9

AGM-114 K-2 MISSILE CONFIGURATION



# UAV MUNITIONS-Continued

## 4. AGM-114M WARHEAD

The blast-frag warhead is installed in the warhead section in place of the main warhead for the K-2 missile. The precursor warhead is also removed. The blast frag warhead consists of a warhead body, 2.511 Kg PBXN-109 explosive fill, two zirconium sponge incendiary charges, and the fuze well and aft closure components. Two incendiary cylinders are bolted with a stainless steel bolt to the front inside of the steel case. These cylinders (111 grams each) are pressed sifted zirconium metal particles with calcium stearate flakes. The steel warhead casing with incendiary cylinders installed is coated internally with AC 5120 Polyethylene. The PBXN-109 explosive is cast into the case over the incendiary cylinders. A slotted base plate is screwed onto the aft end of the warhead case to allow attachment of the fuze well and Time Delay Fuze Assembly (TDFA). A polyolefin seal seals the slots. An 18-gram PBXN-5 booster pellet is placed between the fuze and inside of the fuze well.

## 5. AGM-114M CONFIGURATION

The warhead function sequence is initiated when either crush switch located in the guidance section is closed. Upon receipt of this indication, the time delay CCA in the TDFA provides a delay to allow time for the blast-frag warhead to pass through any barrier before providing an output to the blast-frag warhead. The warhead function consists of blast energy from the warhead main fill coupled with initiation of incendiary cylinders in the front of the warhead and case fragmentation.

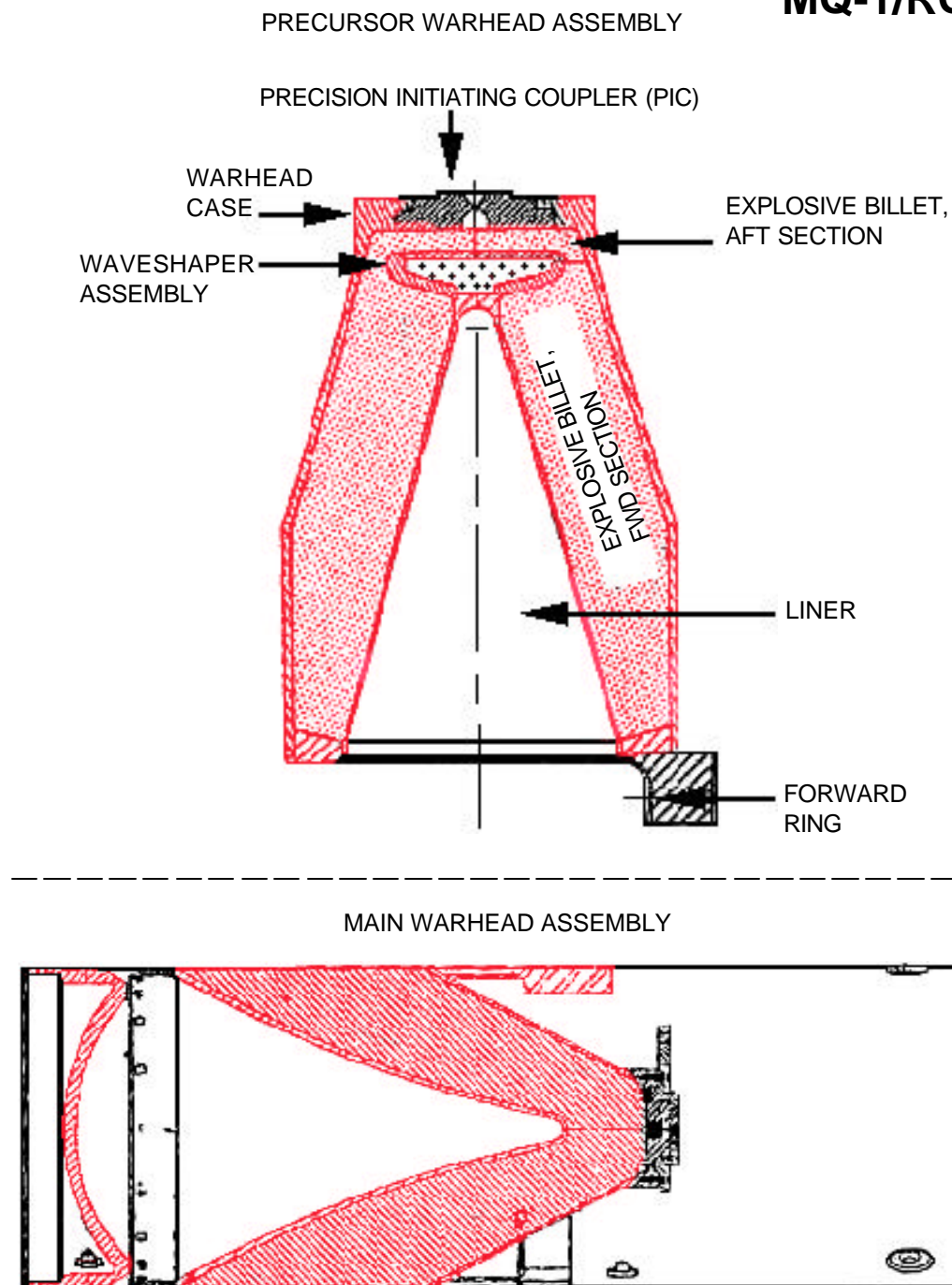
## 6. AGM-114M HAZARD CLASSIFICATION

The interim classification for the AGM-114M missile is listed below. The final hazard classification is in Tri-Service coordination:

DOD Class/Division/SCG – 1.1E  
 DOT Label: Explosive 1.1E  
 DOT Proper Shipping Name: ROCKETS  
 UN Serial Number 0181

MQ-1/RQ-1

T. 00-105E-9





## UAV GENERAL INFORMATION

The Global Hawk system is comprised of the Global Hawk High Altitude Endurance Unmanned Aerial Vehicle (HAE UAV) and a Common Ground Station (CGS). The primary mission is to provide overt, continuous, long endurance, all weather, day/night wide area reconnaissance and surveillance.

The aerial vehicle is a conventional design, high-aspect ratio, low wing, tricycle landing gear UAV powered by a single Allison AE3007H turbofan engine. It is capable of carry Electro-Optical (EO), infrared (IR), and Synthetic Aperture Radar (SAR) payloads simultaneously.

The CGS (not illustrated) is made up of two independent mobile, self-sustained van complexes; a Launch and Recovery Element (LRE) and a Mission Control Element (MCE).

Actual zero fuel weight varies based on kits installed in the UAV.

FUEL TANK CAPACITY: 2270 GALS (15,436 LBS)

ZERO FUEL WEIGHT: 11,300 to 12,250 LBS

### WARNING

When approaching the aircraft, ground and emergency response personnel should be aware of UAV hazards, such as hot brakes, running engine, antenna radiation and leaking fluids that may be flammable.

**RQ-4A**



# UAV DIMENSIONS AND CLEARANCES

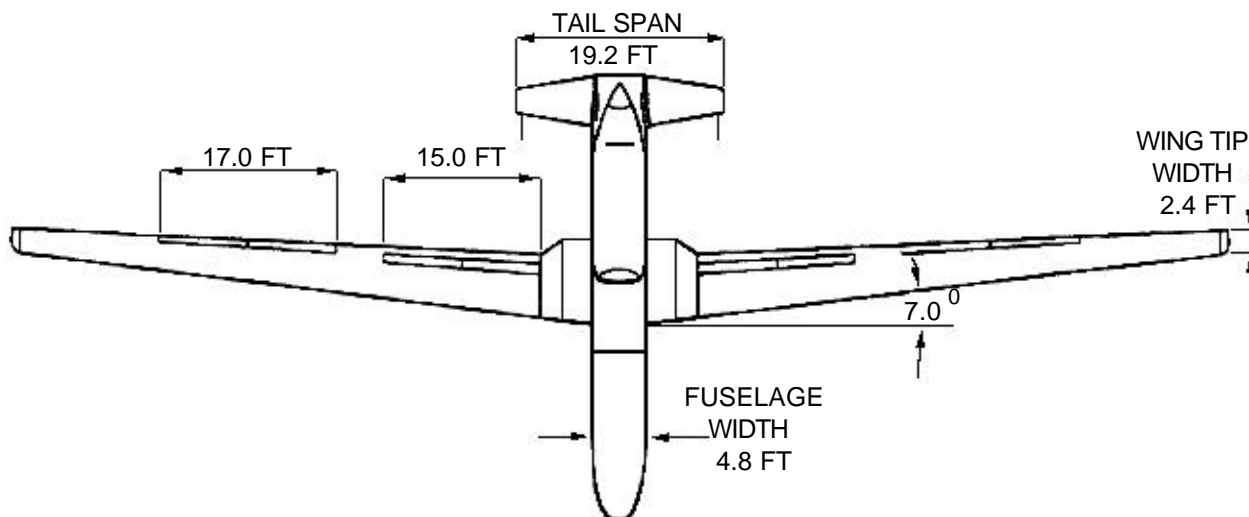
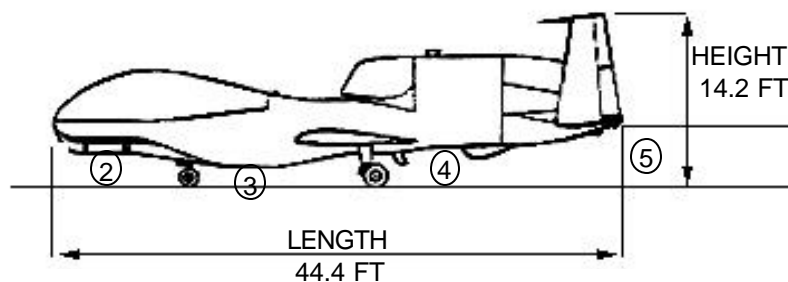
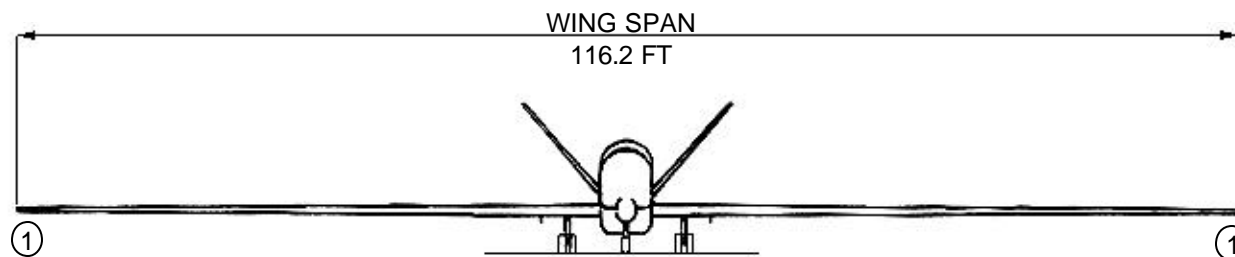
RQ-4A

## DIMENSIONS AND CLEARANCES

### NOTE:

Clearances are based on normal operating conditions with maximum gross weight fuel load. Tires are inflated to proper pressures. Struts are properly serviced and fully compressed due to the fuel load. Wing tip clearance shown at maximum deflection during tow (1.6G).

1. WING TIP: 26.0 INCHES
2. EO/IR PANEL: 33.5 INCHES
3. SAR RADOME: 19.5 INCHES
4. CDL RADOME: 27.5 INCHES
5. TAIL LIGHT COVER: 66.5 INCHES



# UAV HAZARDOUS MATERIALS

RQ-4A

## HAZARDOUS MATERIALS LOCATIONS

**FUEL: JP-8, 930 GALS - MAIN TANK**  
1215 GALS - WING TANKS

**ENGINE OIL: MIL-L-7606**  
**HYDRAULIC FLUID: MIL-L-5808**  
**HYD ACCUMULATOR (1)**  
2000 PSI - 2 GALS

**EO/IR LENS WITH THORIUM COATING**

**NICAD BATTERY(3) 28 VOLT**  
(STAINLESS STEEL BOXED)

**NITROGEN BOTTLES (3)**

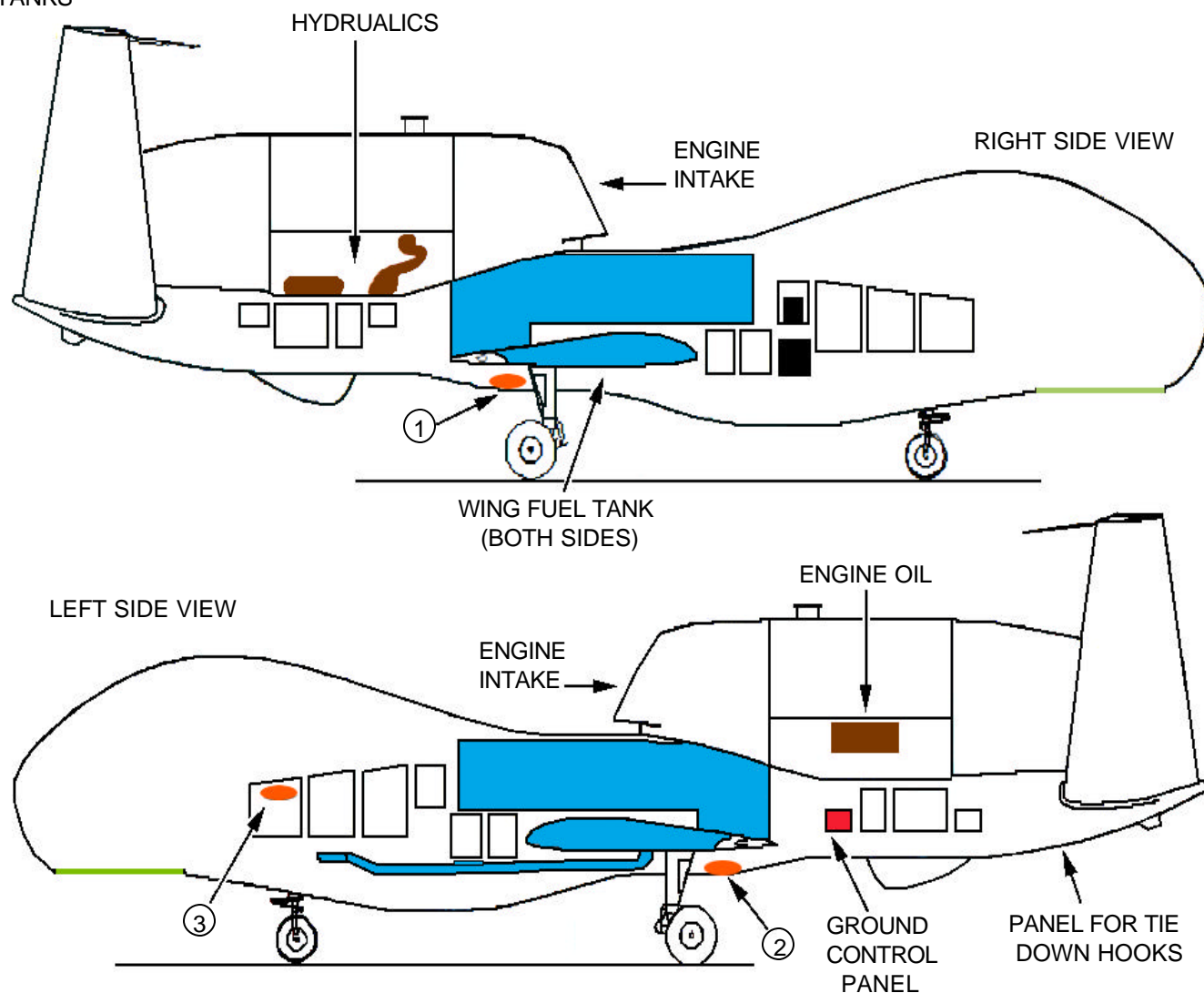
### NOTE:

All 3 nitrogen bottles at 3000 PSI

1. Emergency gear blowdown (right side MLG)
2. Emergency brake (left side MLG)
3. Ku SATCOM waveguide pressurization (forward left side equipment compartment)

### Tire pressures:

Nose Wheel 93 PSI  
Main Wheels 193 PSI



# UAV STRUCTURAL COMPOSITION

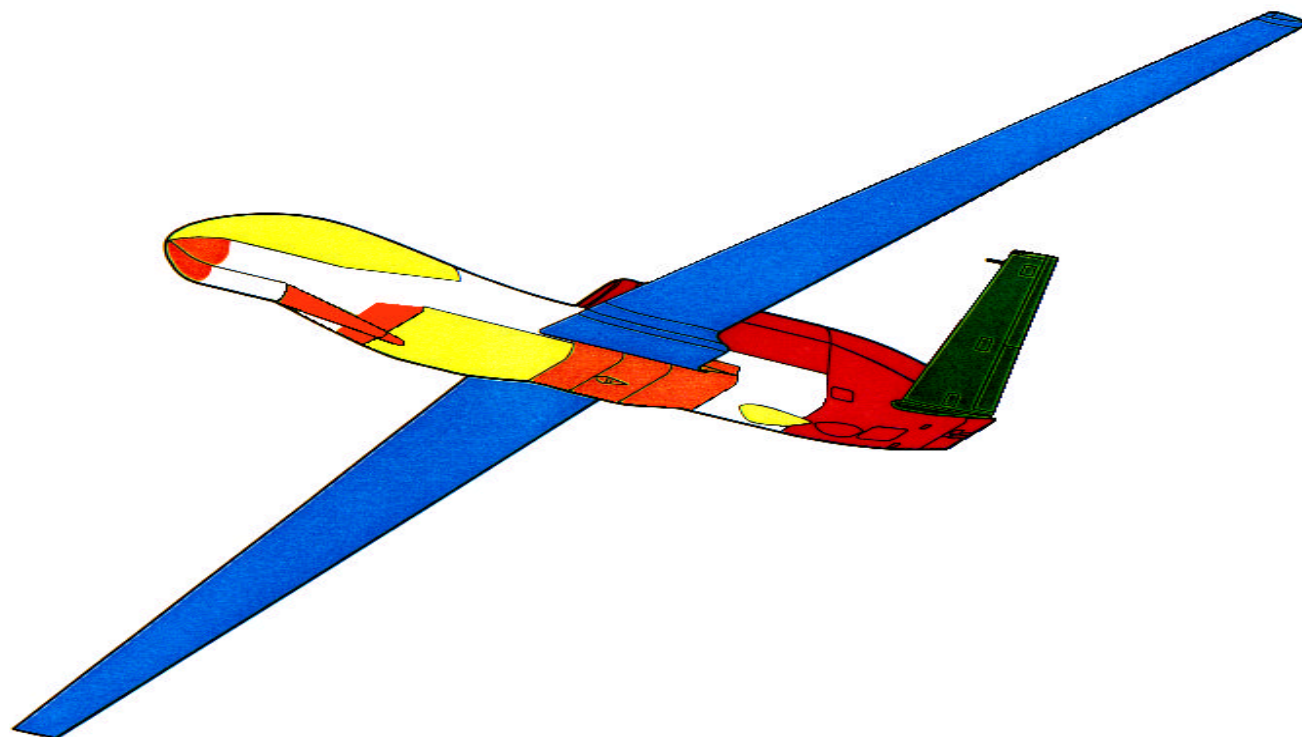
RQ-4A

## STRUCTURAL KEY

	WINGS
	RADOMES
	V-TAIL
	AFT FUSELAGE AND NACELLE
	FAIRINGS AND LANDING GEAR DOORS

### NOTE:

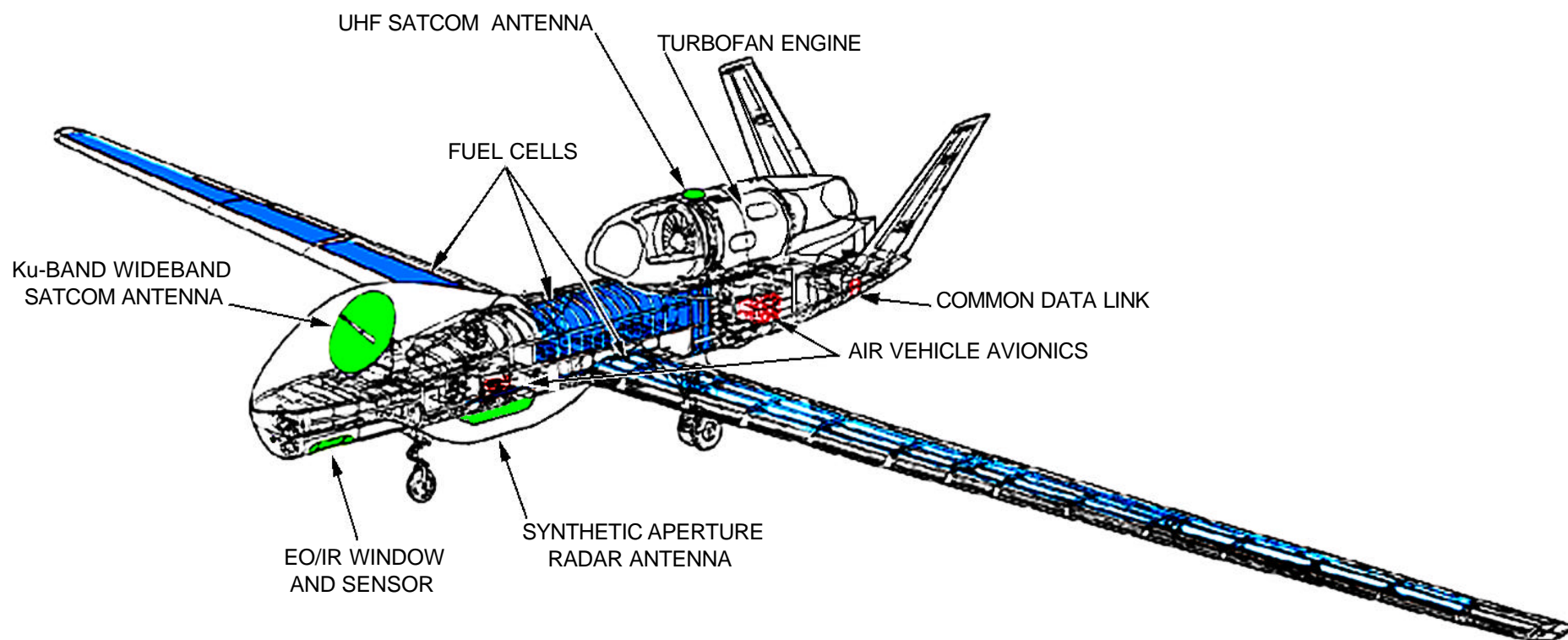
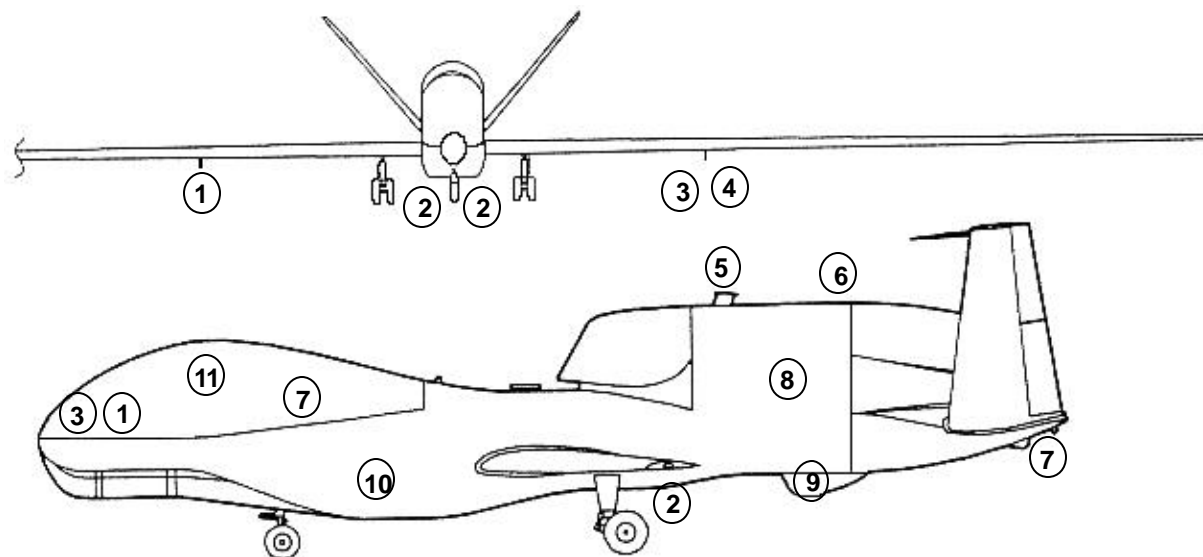
All external surfaces are made of graphite composite material. These materials are not considered exotic or advanced, but rather fiberglass. The wings, radomes, and cowlings are made of graphite epoxy. The engine is encased in kevlar for heat and fire protection. Gel coats are not used.- Thermoset resin is used. These materials are used in the manufacture of the major composite structures (wing, engine, nacelle, v-tail, etc.).



# UAV DANGER AREAS

## MULTIPLE ANTENNA LOCATIONS

1. UHF LOS C<sup>2</sup> and Voice Receiver
2. Radio Altimeters
3. UHF LOS C<sup>2</sup> Transmitter
4. VHF Voice
5. UHF SATCOM
6. GPS
7. IFF
8. Differential GPS
9. CDL
10. SAR
11. Ku SATCOM



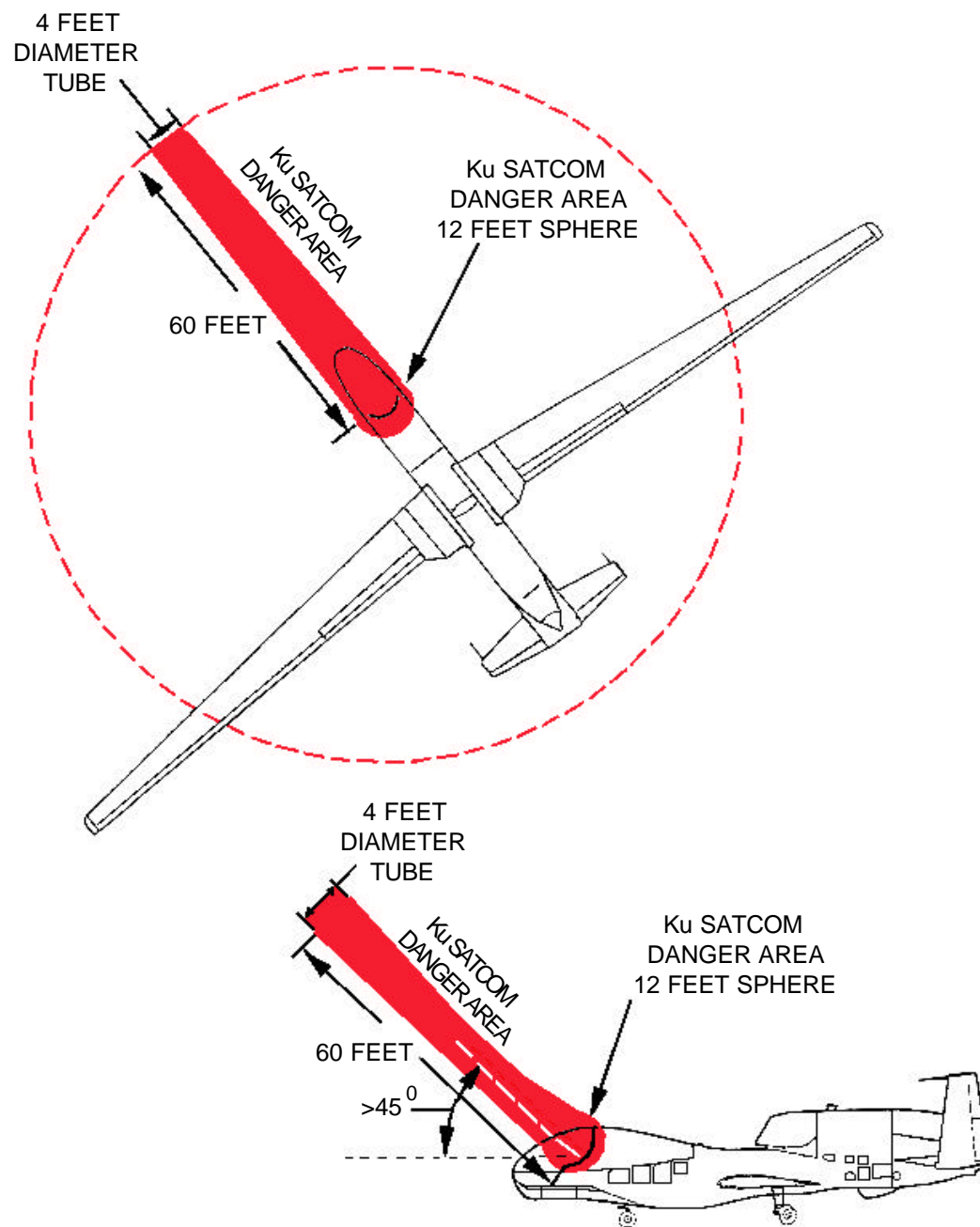
RQ-4A

# UAV DANGER AREAS-Continued

## Ku SATCOM ANTENNA RADIATION AREAS

### NOTE:

Dashed lines indicate Ku SATCOM antenna range of motion/radiation potential.

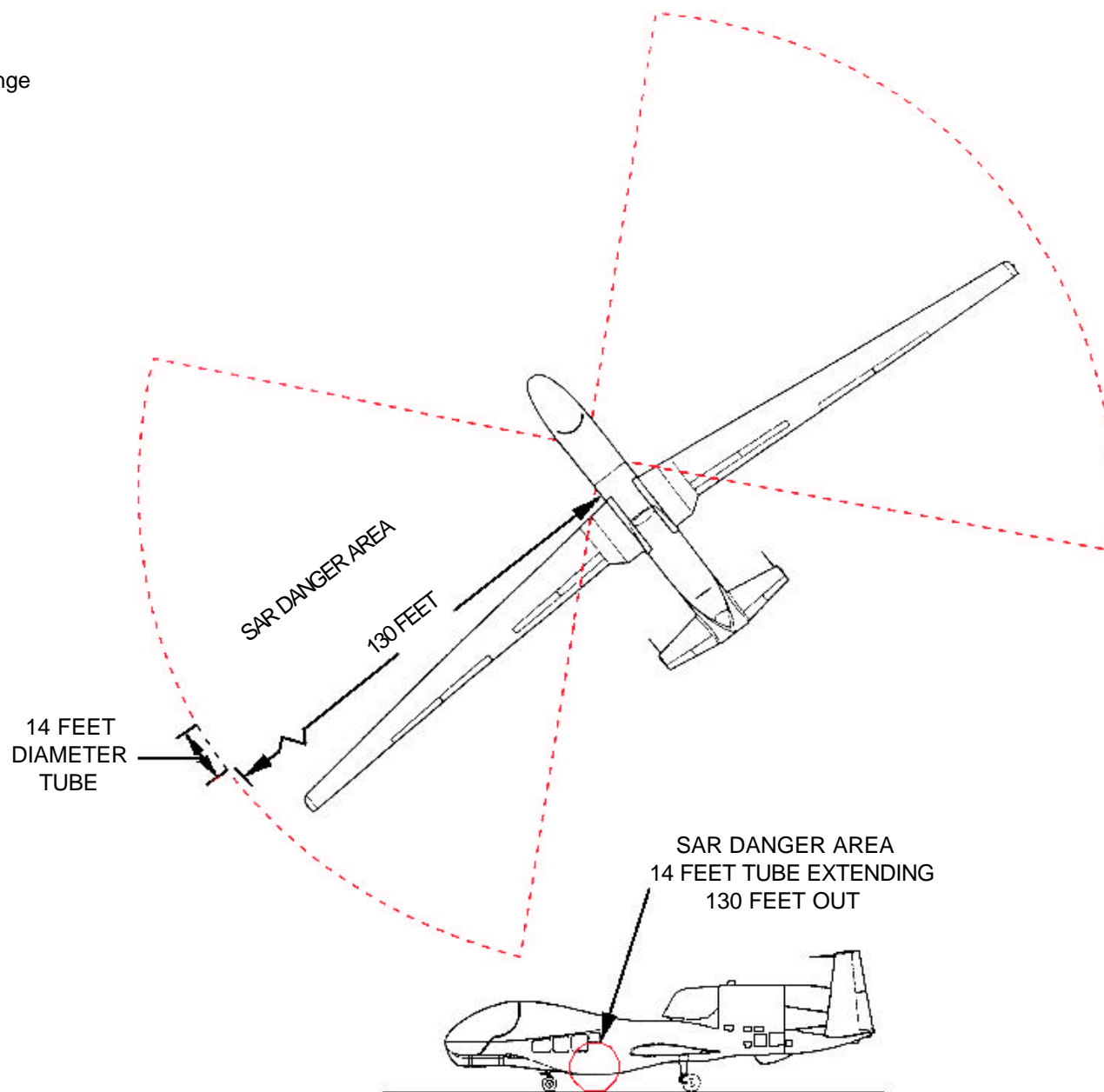
**RQ-4A**

# UAV DANGER AREAS-Continued

## SAR ANTENNA RADIATION AREAS

### NOTE:

Dashed lines indicate SAR antenna range of motion/radiation potential.

**RQ-4A**

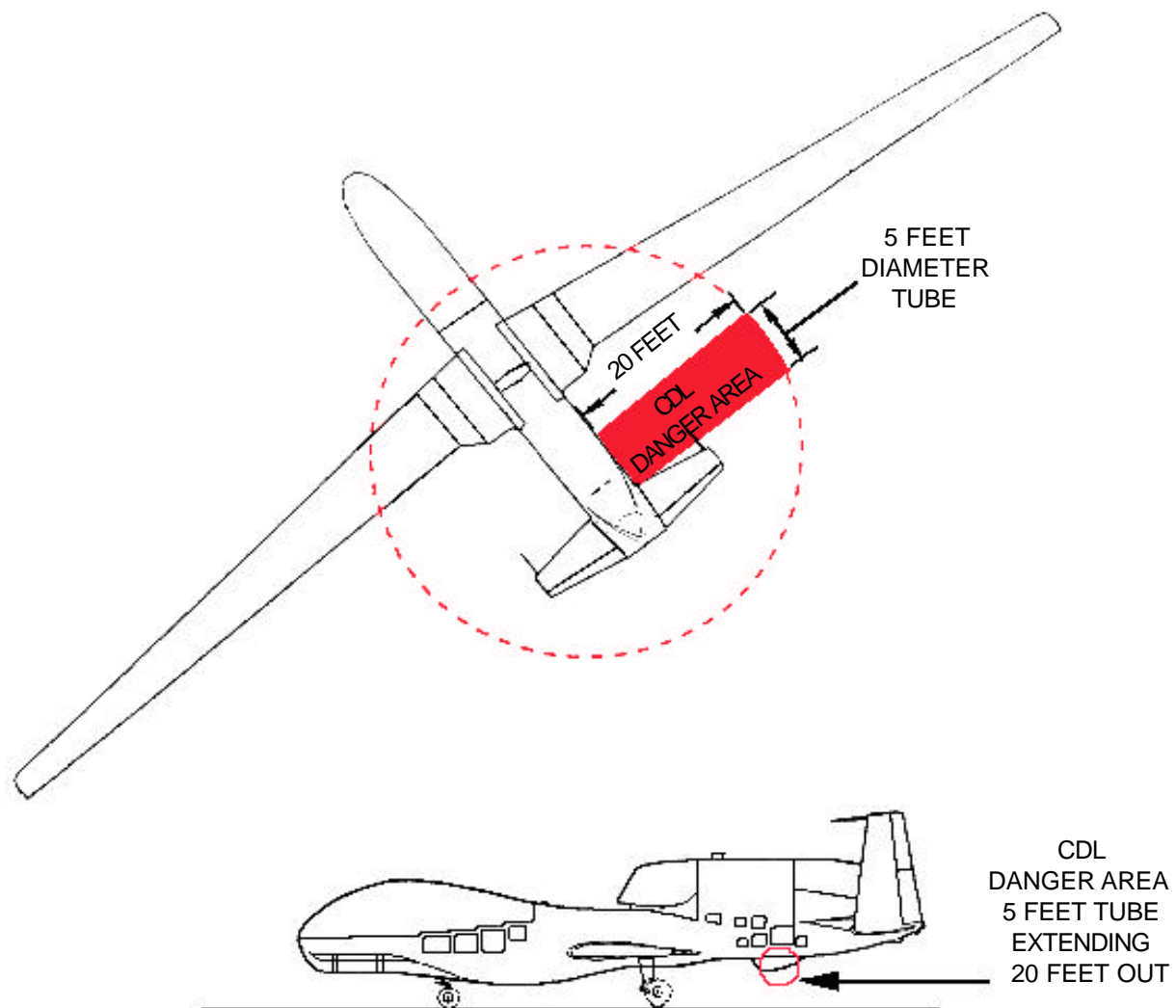


# UAV DANGER AREAS-Continued

## CDL ANTENNA RADIATION AREAS

### NOTE:

Dashed lines indicate CDL antenna range of motion/radiation potential.

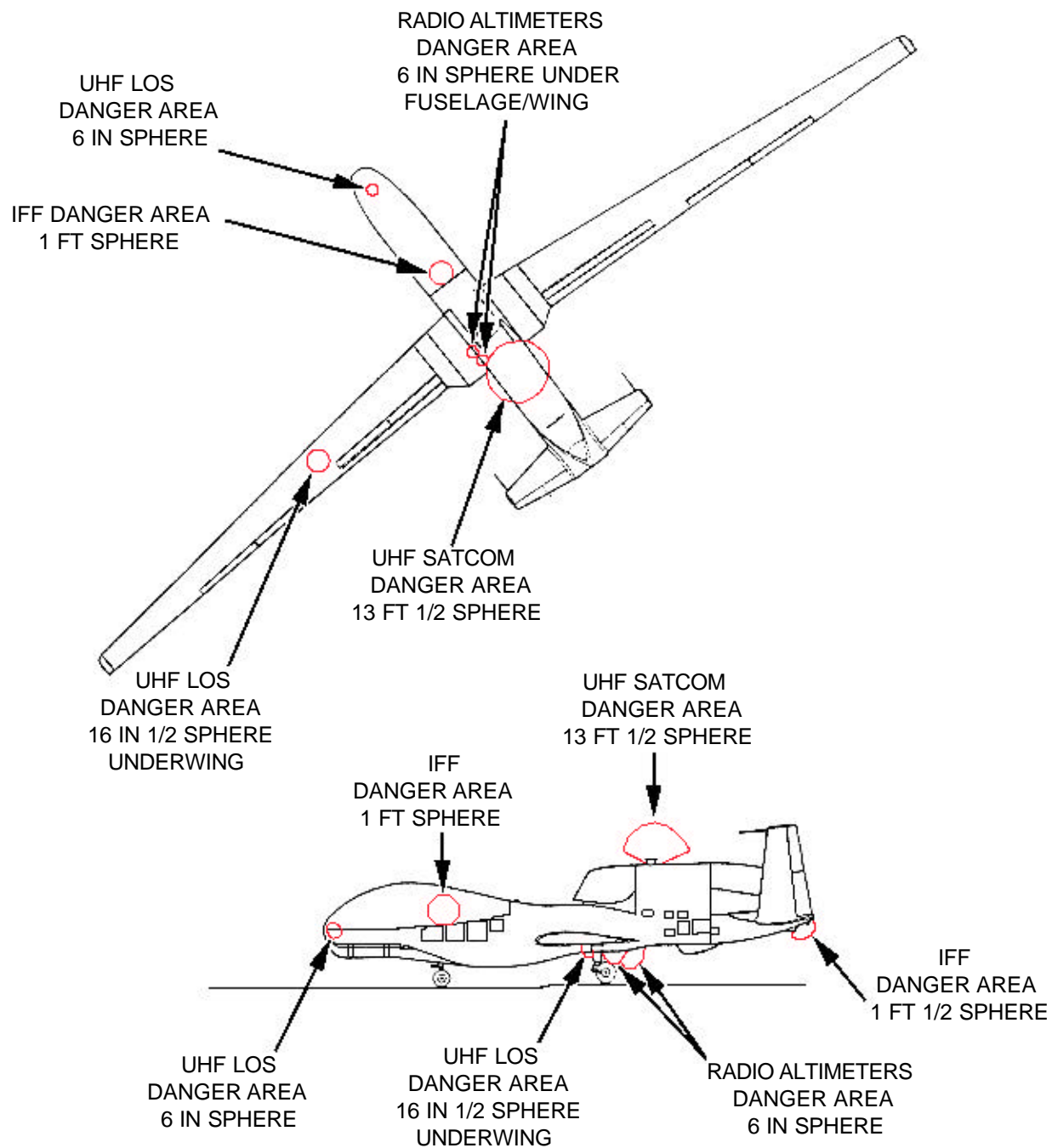
**RQ-4A**

# UAV DANGER AREAS-Continued

## FIXED ANTENNA RADIATION AREAS

### NOTE:

Radiation areas for fixed antenna varies in size.

**RQ-4A**

# UAV DANGER AREAS-Continued

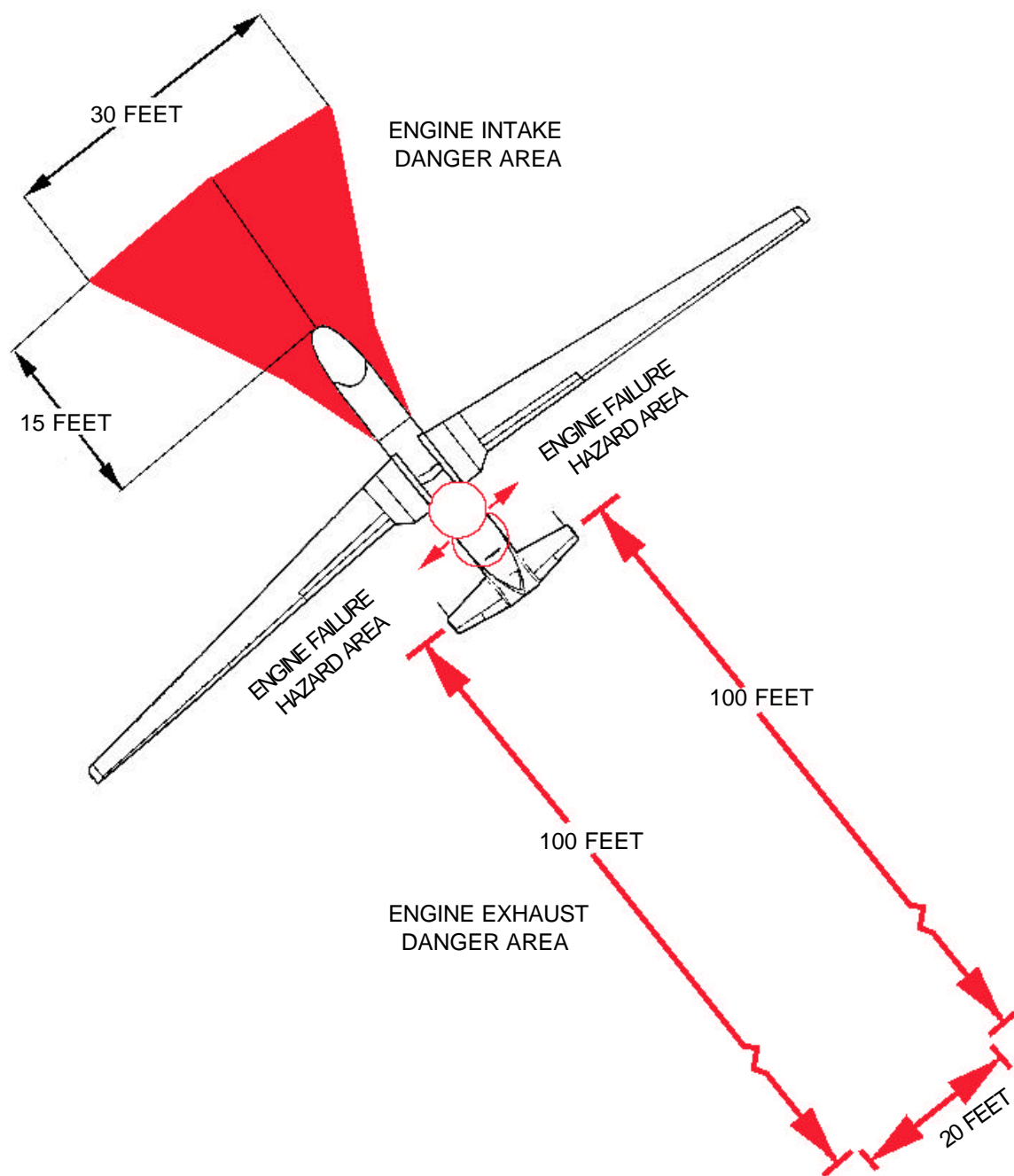
## ENGINE INTAKE, EXHAUST AND FAILURE AREAS

### WARNING

Clear all equipment and personnel from the aft of the aircraft (100 feet back and 20 feet wide). This area subject to the heat and exhaust air velocity produced by the engine.

#### NOTE:

These danger areas exist during normal operations, engine runs and taxiing procedures.



RQ-4A

# EMERGENCY ENGINE SHUTDOWN

RQ-4A

## 1. EMERGENCY ENGINE SHUTDOWN

### NOTE:

Items in capitalization denote the designations on the ground control panel (GCP).

- a. Install ground safety pin prior to engine shutdown, if time permits.

### NOTE:

The installed pin safes all radiation ICS, ISS (dangerous RF emissions), all EEDs (electro-explosive devices), all EOD items, disables landing gear retraction, inhibits commands for taxi and brake release and inhibits engine RPM greater than 70%.

- b. Move the EMER STOP switch, located on the GCP, up.

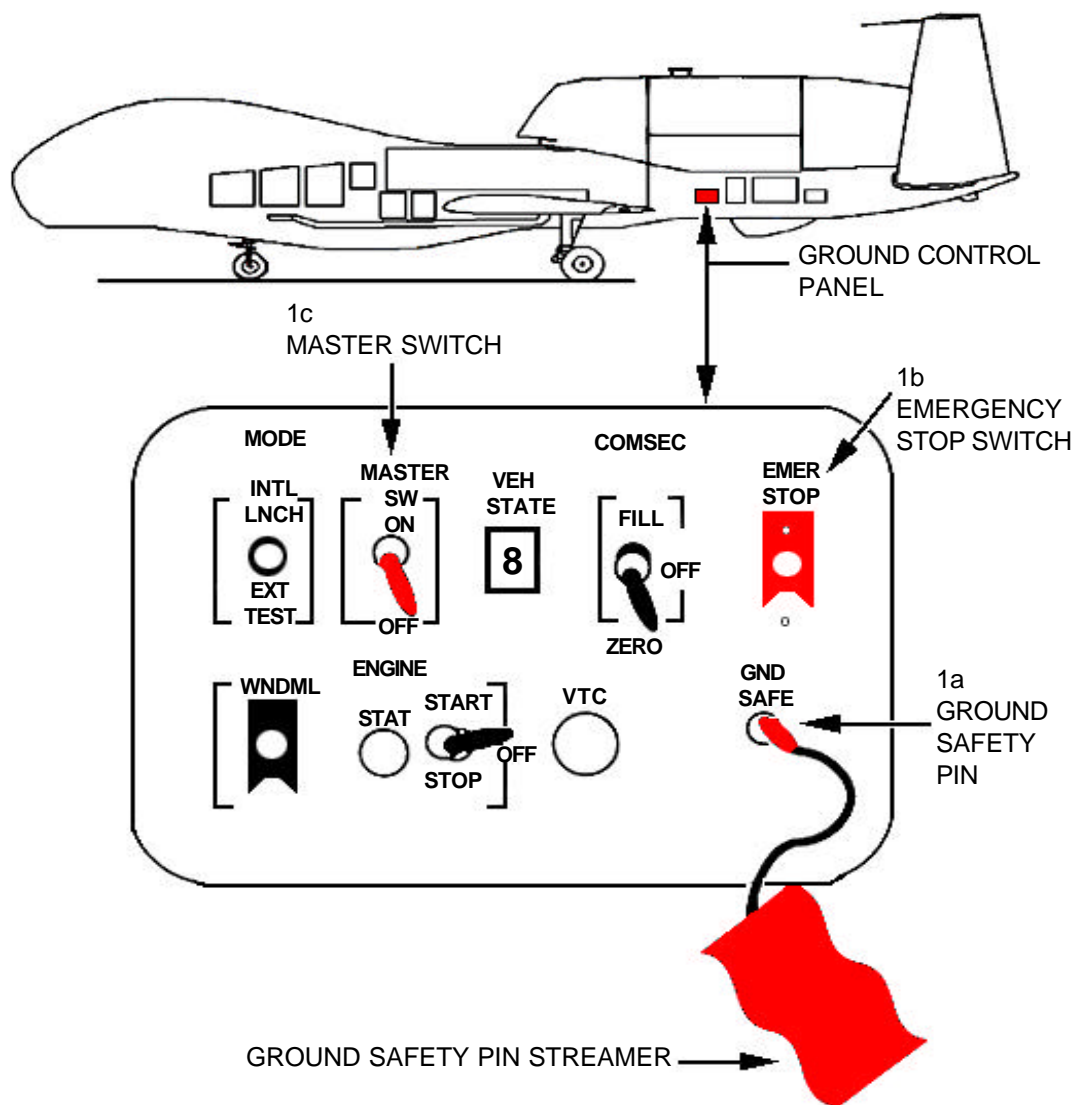
**CAUTION**

Brakes will release when engine is shutdown. Place wheel chocks at front and rear of MLG tires.

- c. Move the MASTER SW to the OFF position.

### NOTE:

This will remove all power from the UAV, closes the main fuel shut off valve, shuts down engine, releases brakes and logs event in IMMC fault log.



# UAV RECOVERY

## 1. DIVERT PROCEDURES

### NOTE:

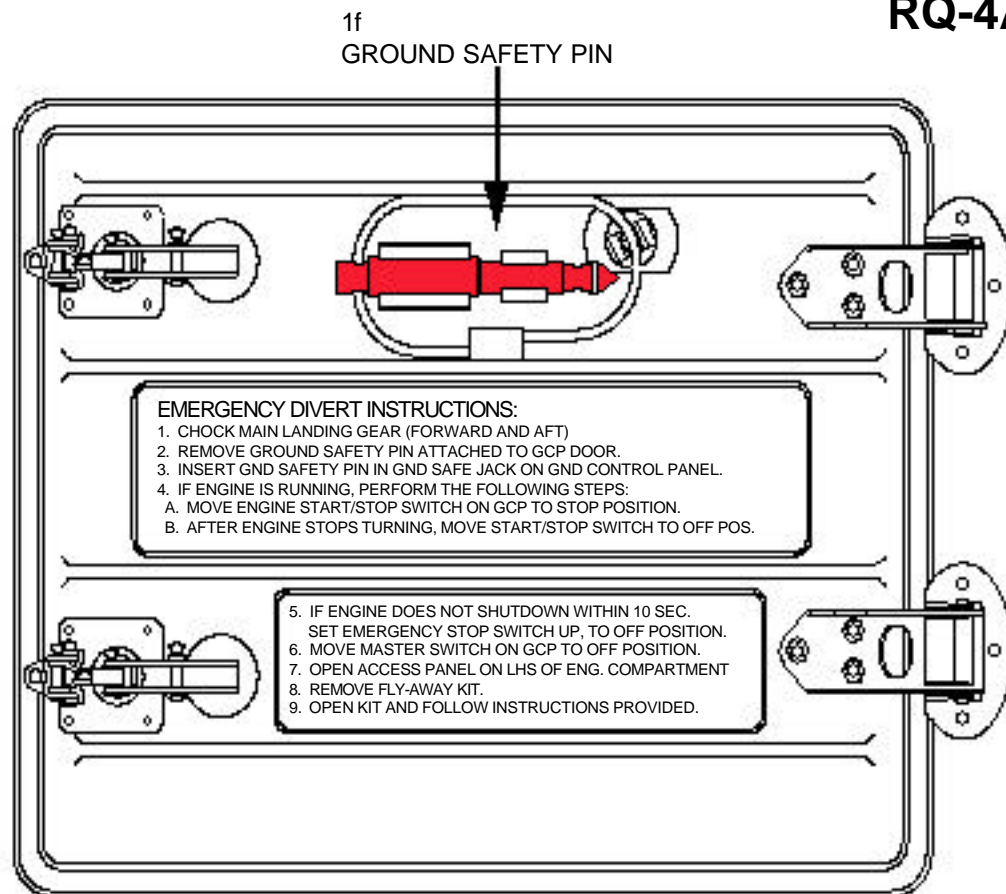
The following procedures and information are intended for crews designated with the assigned responsibilities.

- a. These procedures secures a Global Hawk that has landed and has stopped on the runway.

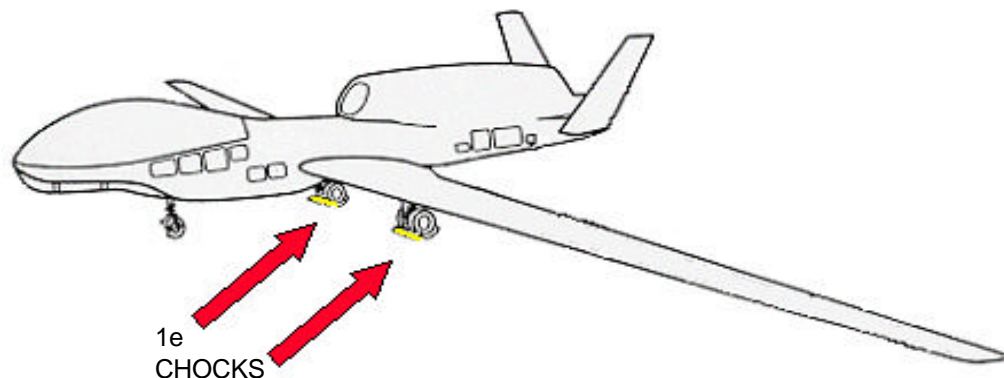
### WARNING

- There is no visual camera for the UAV operator. Maintain radio contact with the airfield control tower and the Command and Control Operator (CCO).
  - The UAV has several cryptographically keyed systems that may be classified SECRET. Contact the CCO to verify the level of classification.
  - Follow the standard procedures for potentially hot brakes. Do not enter wheel area from sides.
- b. Note the danger zones described in Figures 1 through 3. Communicate with CCO to determine which antennas are operating. Minimize exposure time within Danger Zones.
- c. Ground personnel will visually inspect the aircraft for hazards, such as hot brakes and leaking fluid.
- d. If not previously completed, open the Ground Control Panel (GCP) on the aft left-hand side of the aircraft.
- e. If not previously completed, follow all the steps on the Divert Instruction placard. Install chocks in proper locations. Refer to next page for Fly-Away Kit location and contents.
- f. Verify the Ground Safety Pin is in the GND SAFE jack and the engine has shutdown. Notify the CCO the Ground Safety Pin is inserted and the engine has shutdown.

RQ-4A



1e  
DIVERT INSTRUCTIONS PANEL





# UAV RECOVERY - Continued

RQ-4A

## 1. DIVERT PROCEDURES - CONTINUED

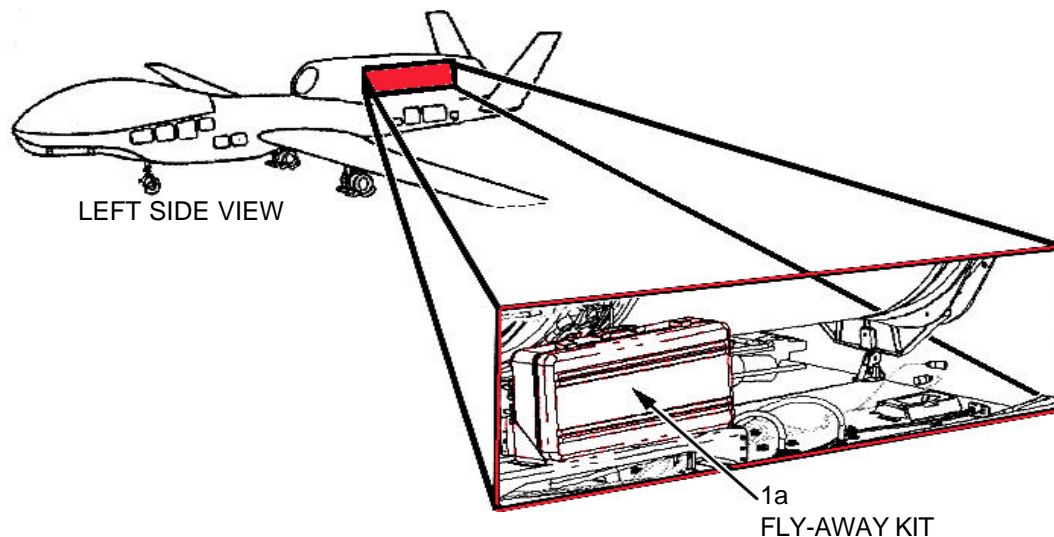
### NOTE:

The Ground Safe Pin performs the following functions:

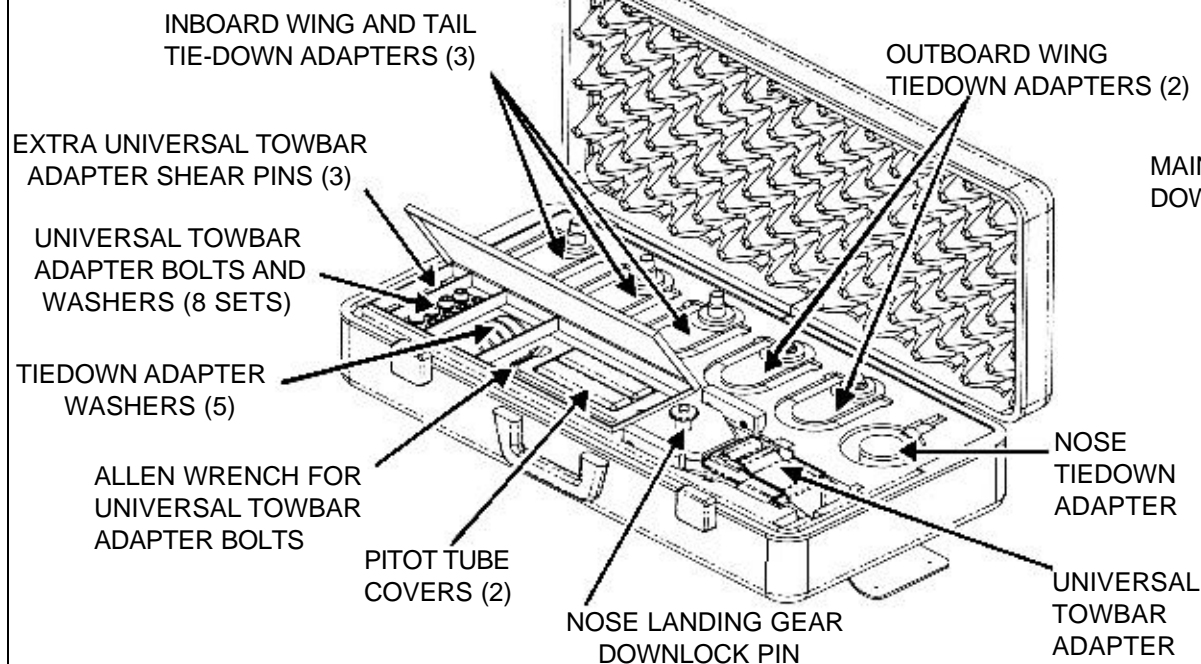
- (1) Inhibits dangerous RF emissions.
- (2) Disables landing gear retraction.
- (3) Inhibits commands for taxi and brake release.
- (4) Safes all Explosive Ordnance Devices (EOD).

- g. If not previously completed, open the left-hand side engine compartment access panel and locate the Fly-Away Kit . Remove the four mounting bolts that secure the Fly-Away Kit . Use a 7/16 inch wrench or socket to remove the mounting bolts.

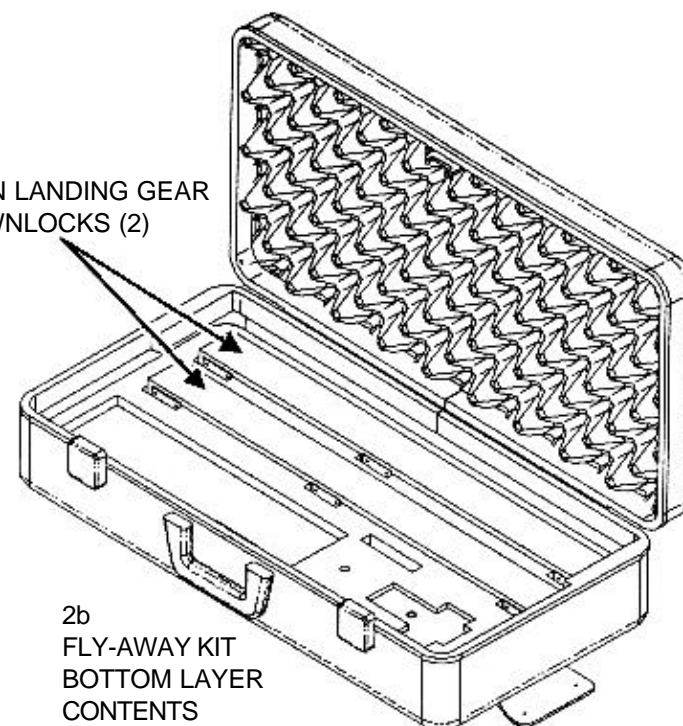
- h. See Fly-Away Kit layout and contents.



2a  
FLY-AWAY KIT  
TOP LAYER CONTENTS



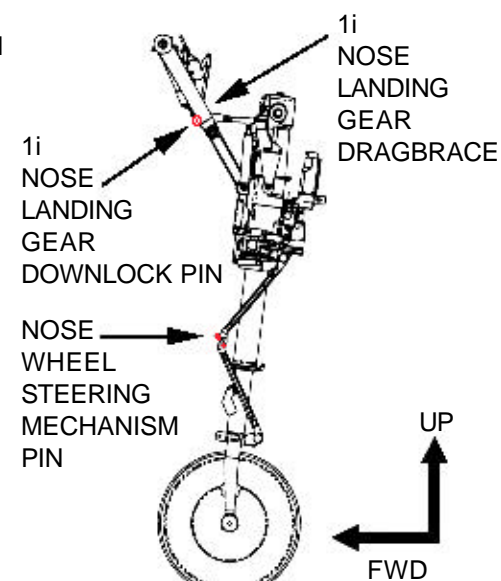
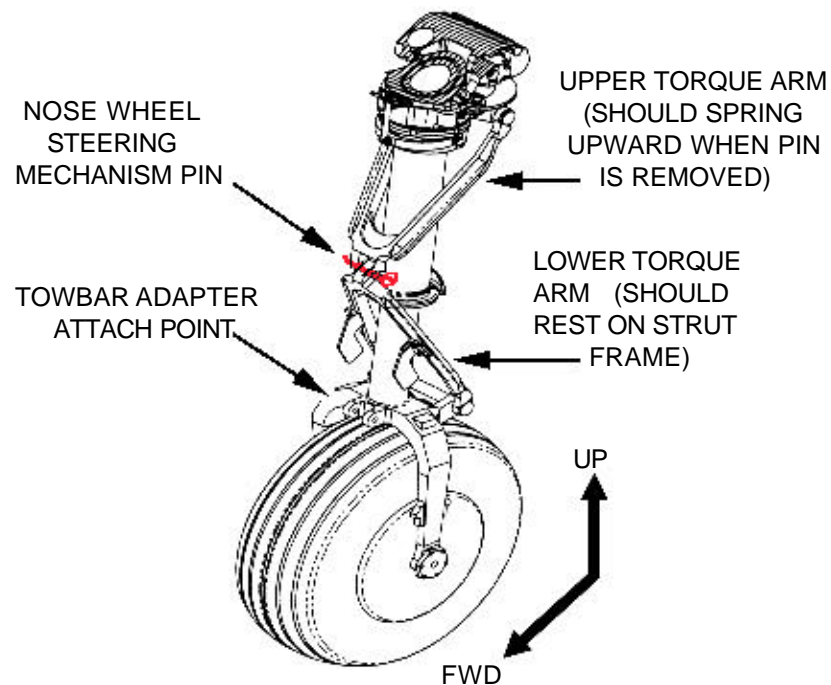
MAIN LANDING GEAR  
DOWNLOCKS (2)



# UAV RECOVERY - Continued

## 1. DIVERT PROCEDURES - CONTINUED

- i. Insert the Nose Landing Gear Downlock Pin in the hole provided on the NLG dragbrace.
- j. Install the Main Landing Gear Downlocks on the chrome of the MLG retract actuators.



1j  
MAIN LANDING  
GEAR DOWNLOCK



RQ-4A

# UAV RECOVERY - Continued

RQ-4A

## 1. DIVERT PROCEDURES - CONTINUED

- k. Verify the Master Switch, located on the GCP, is in the OFF position.
- l. Move the COMSEC Switch, located on the GCP, to the ZERO position then to the OFF position.
- m. Close Ground Control Panel (GCP) door.
- n. Tow aircraft to a hangar or a safe location.

### WARNING

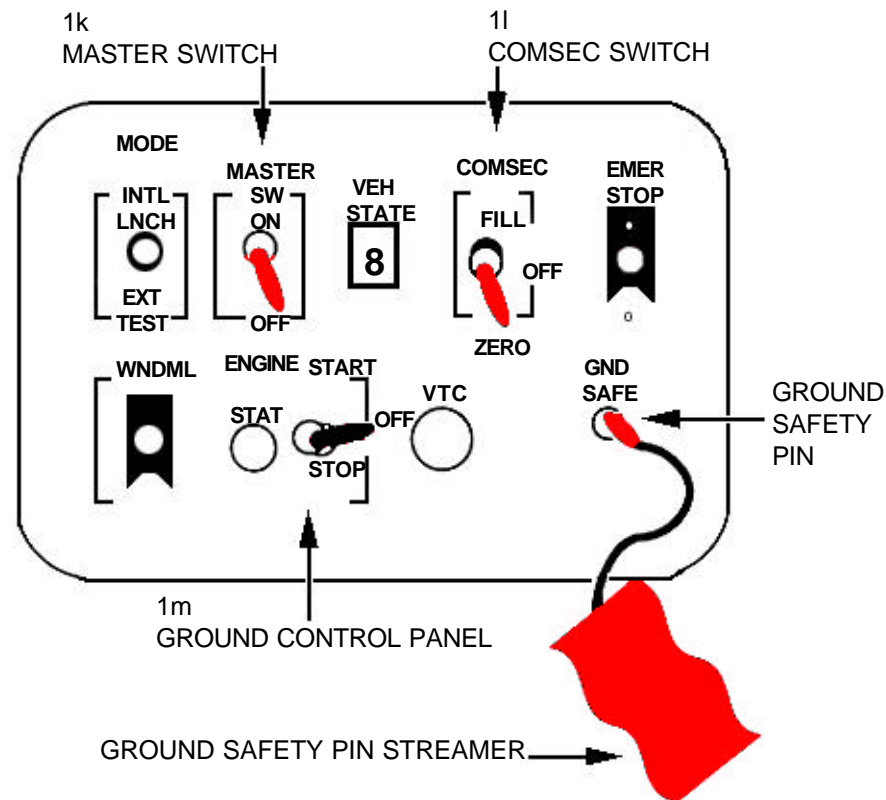
Failure to follow the safety precautions while towing the aircraft with personnel sitting on the outer wing section may result in injury or death to the personnel.

- (1) If the aircraft has landing in an unbalanced configuration (one wing heavier than the other), up to four personnel may sit on outer section of the high wing to balance the wings during towing in adverse or emergency conditions.

### CAUTION

Torque arm attach pin must be removed and torque arms separated before towing. If torque arms are not separated before towing, the Nose Landing Gear could be damaged during towing.

- (2) Disconnect the Nose Wheel Steering Mechanism. See previous page.
  - (a) While pushing in the ball-lock button on the end of torque arm attach pin, remove the cap and the pin from the torque arms.
  - (b) Be sure the upper torque arm raises to the full up position (upper torque arm should spring up) and the lower torque arm rests on the strut frame.
  - (c) Stow the pin in upper torque arm.





# UAV RECOVERY - Continued

RQ-4A

## 1. DIVERT PROCEDURES - CONTINUED

- n.(3) Install the Universal Towbar Adapter on the Towbar. If an F-5 or T-38 aircraft towbar is used the Universal Towbar Adapter is not required.
- (a) Turn the handle on the Towbar until the Universal Towbar Adapter fits snugly between the forks.
- (b) Secure the Universal Towbar Adapter to the Towbar with eight bolts, washers supplied in the Fly-Away Kit. Use the Allen Wrench supplied with the Fly-Away Kit to tighten the bolts. If a Torque Wrench with Allen Wrench adapters is available, torque the bolts to 95-105 inch-pounds above the prevailing torque. The prevailing torque should be between 10-80 inch pounds.

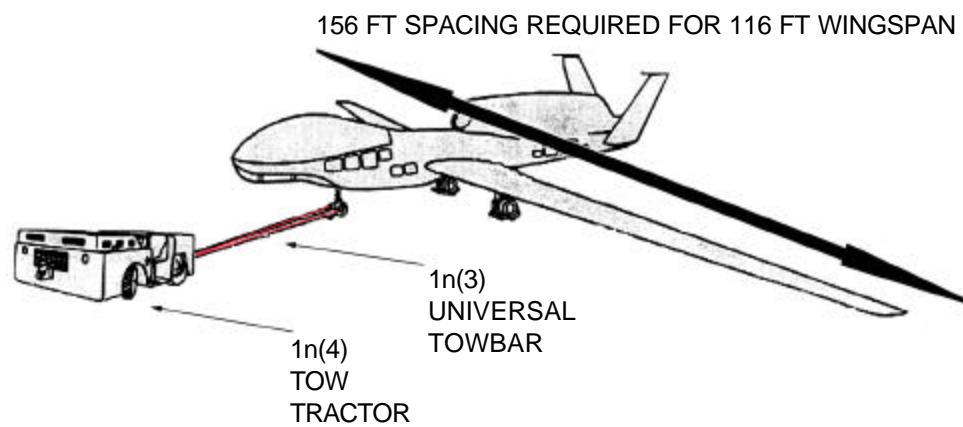
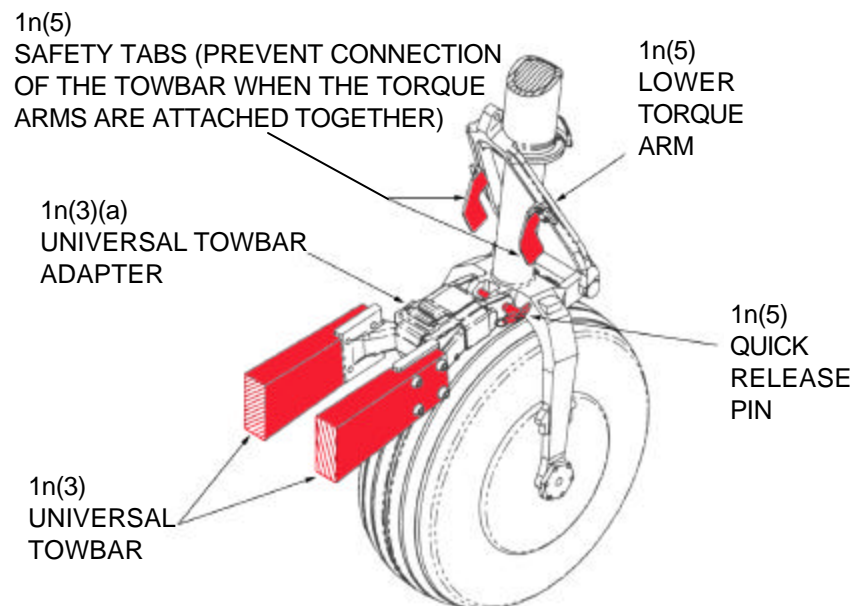
### NOTE:

Personnel performing this function must be familiar with safety precautions reflected in AFOSH STD 91-100.

- (4) Request the tow tractor driver to move the Tow Tractor into position.
- (5) Raise Lower Torque Arm upward. This will allow clearance to engage the Towbar Adapter/Towbar below the Safety Tabs. With the Lower Torque Arm raised, position the Towbar Adapter/Towbar on the Nose Landing Gear Strut and insert the quick release pin through the Nose Wheel Attach Point and the Towbar Adapter/Towbar.
- (6) Rest the Lower Torque Arm on the strut frame to prevent interference with the Nose Landing Gear Doors.
- (7) Attach the other end of the Towbar Adapter/Towbar to the Tow Tractor hitch.

### NOTE:

Whenever towing in areas with less than 20 feet of wing tip clearance on both sides (total of 156 feet space between obstructions), wing walkers should be used on both wing tips. A tail walker is required for backing the UAV.



## UAV RECOVERY - Continued

### 1. DIVERT PROCEDURES - CONTINUED

n.(8) If required, assign the wing walkers to the wing tips to help guide and balance the UAV. Note the illustrated large wing span.

(9) Assign one tow observer to ride on the Tow Tractor.

(10) Verify the brakes are off by physically moving the brake disk.

(11) The tow observer will request the wing walker assistants to remove the wheel chocks from the Main Landing Gear.

#### CAUTION

- Have the aircraft in motion before starting a turn.
- When a tow vehicle with automatic transmission is used, tow in the low range.
- Avoid sudden starts and stops. Failure to do so may result in shearing towbar pin.
- Whenever the UAV is towed, a wing walker should have a set of chocks to stop the UAV should the shear pin fail.
- If the shear pin fails, additional shear pins can be found in the Fly-Away Kit.
- Do not exceed 5 MPH while towing the UAV.
- The Nose Wheel must not be turned greater than 30 degrees while towing the UAV. Damage to the Nose Landing Gear Doors may occur if the 30 degree limit is exceeded.
- Before towing the UAV, ensure the winds in the area do not exceed 30 knots. Do not tow the UAV if the winds are in excess of 30 knots.



# UAV RECOVERY - Continued

RQ-4A

## 1. DIVERT PROCEDURES - CONTINUED

### CAUTION

Uneven pavement may cause wing to contact ground.  
156 feet of spacing is required for a 116 foot wing span.

- (12) Move the UAV to the designated area.
  - (13) Once UAV has cleared the runway, call airfield control tower and inform them the UAV is clear of the runway.
  - (14) At the destination, the observer will request the wing walkers to place the wheel chocks in front and back of both Main Landing Gear Wheels. (See next page.)
  - (15) If one wing is heavier than the other and will dip to the ground, place foam or other material under the wingtip to protect the wing.
- o. If the UAV is going to be parked outside for an extended period of time, cover the engine inlet and exhaust with clean tarps.

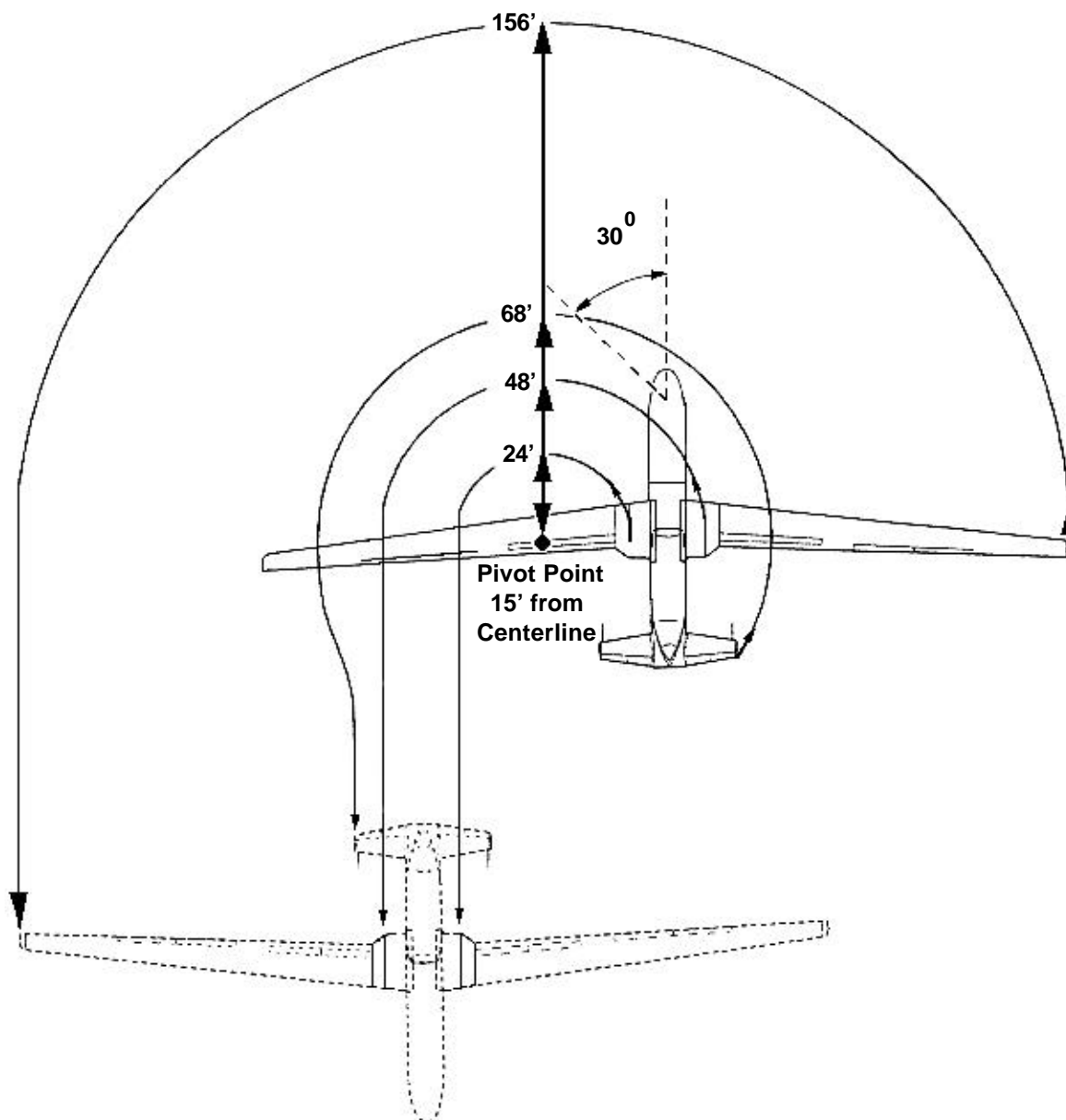
### WARNING

Failure to follow the safety precautions while towing the UAV with personnel sitting on the outer wing section may result in injury or death to the personnel.

#### NOTE:

If the UAV has landing in an unbalanced configuration (one wing heavier than the other), up to four personnel may sit on outer section of the high wing to balance the wings during towing in adverse or emergency conditions.

UAV TURNING AREAS AND GROUND CLEARANCES DURING TOW



# UAV RECOVERY - Continued

## 1. DIVERT PROCEDURES - CONTINUED

p. If a Grounding Cable is available, ground the UAV to a designated grounding point on the tarmac. The UAV grounding points are forward of the right wing and above the right wing on the right side of the fuselage.

- (1) Connect the Ground Cable clamp to a designated grounding point on the tarmac.
- (2) Connect the Ground Cable plug to the UAV receptacle.

q. If necessary, perform the following steps to secure the UAV to the ground.

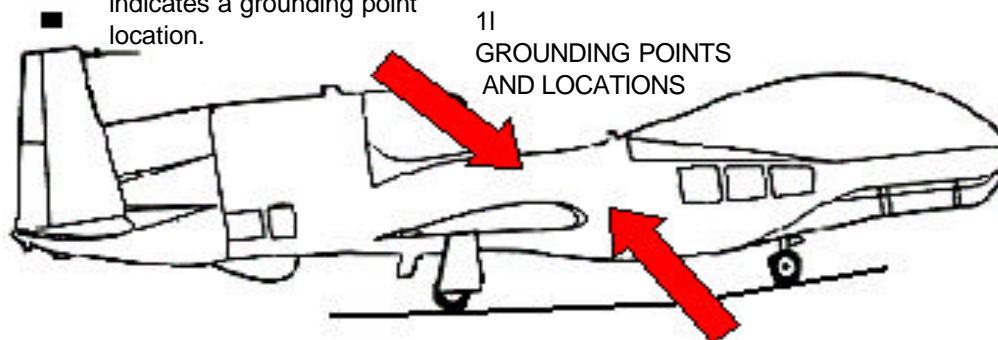
- (1) Remove tiedown adapter plugs or the mylar tape from the UAV at the illustrated locations.
- (2) Install the tiedown adapters, as specified, by part number and location on Table 1. The wing and tail tiedown adapters require a large washer, which is supplied in the Fly-Away Kit. Use a 1-1/16 inch wrench or socket to secure the tiedown adapters to the UAV.
- (3) Attach rope, chain or cargo straps to the tiedown adapters and secure the UAV to the ground. As near as possible, arrange the tiedowns in a symmetrical pattern. As a minimum secure the UAV at the nose, tail and right and left outer wing tiedowns.

r. Maintain security at the UAV to prevent unauthorized access. The UAV has several cryptographically keyed systems that may be classified SECRET. Moving the Comsec Switch to the ZERO position DID NOT declassify all the UAV systems.

s. Use a maintenance stand or equivalent to install the Pitot Tube Cover on the pitot tubes at the top of the ruddervators.

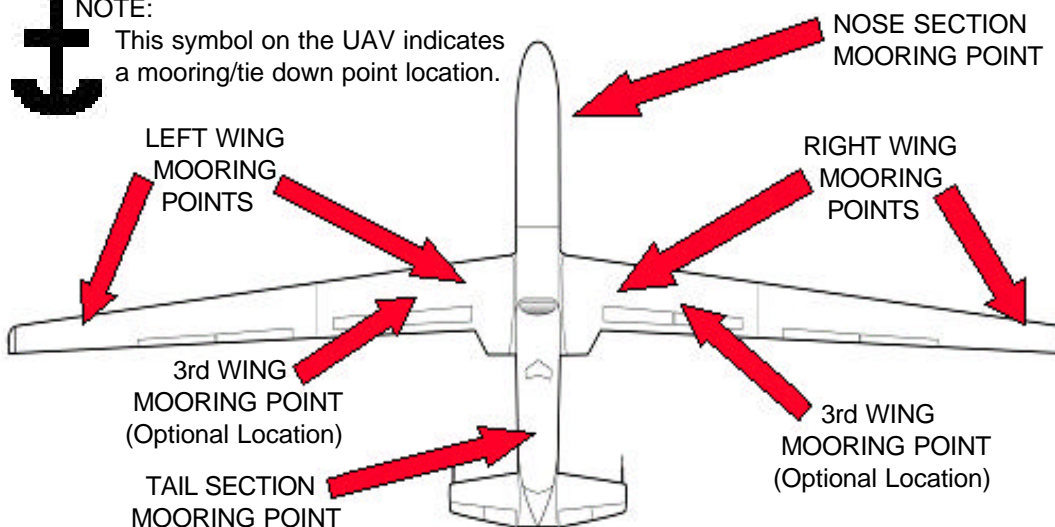
NOTE:

This symbol on the UAV indicates a grounding point location.



NOTE:

This symbol on the UAV indicates a mooring/tie down point location.



ADAPTER	LOCATION	PART NUMBER
Nose Section	To the right of the NLG-FS 205	3673310M218-1
Tail Section	Bottom of fuselage, below the ground power panel - FS 522	3673310M208-3
Lt Outboard Wing	Outboard of aileron, close to the wing tip - Xw 663	3673310M208-5
Lt Inboard Wing	Forward of MLG - Xw 67.5	3673310M208-3
Rt Outboard Wing	Outboard of aileron, close to the wing tip - Xw 663	3673310M208-5
Rt Inboard Wing	Forward of MLG - Xw 67.5	3673310M208-3

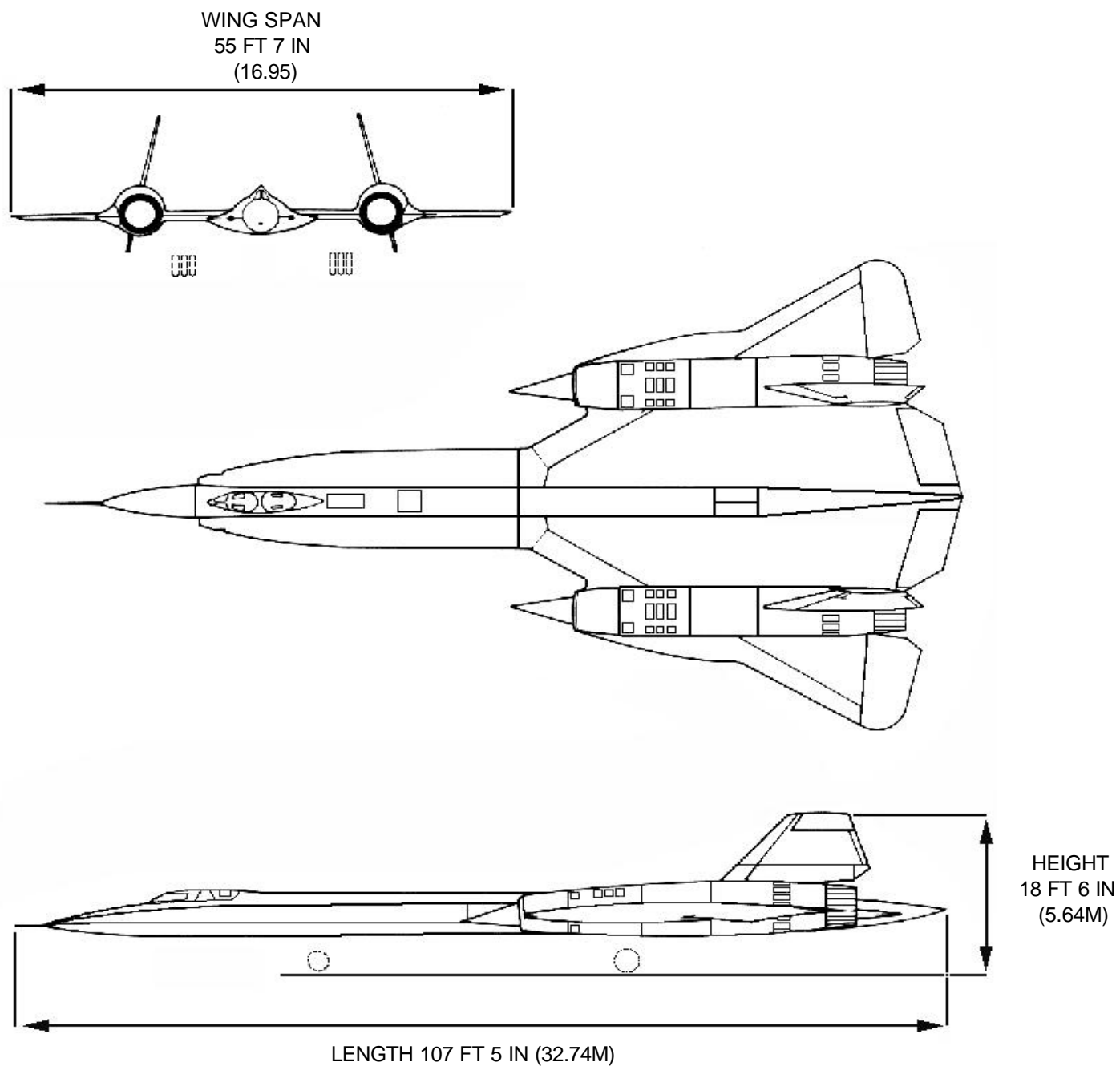
Table 1. UAV Tiedown Locations and Parts

RQ-4A



## AIRCRAFT DIMENSIONS

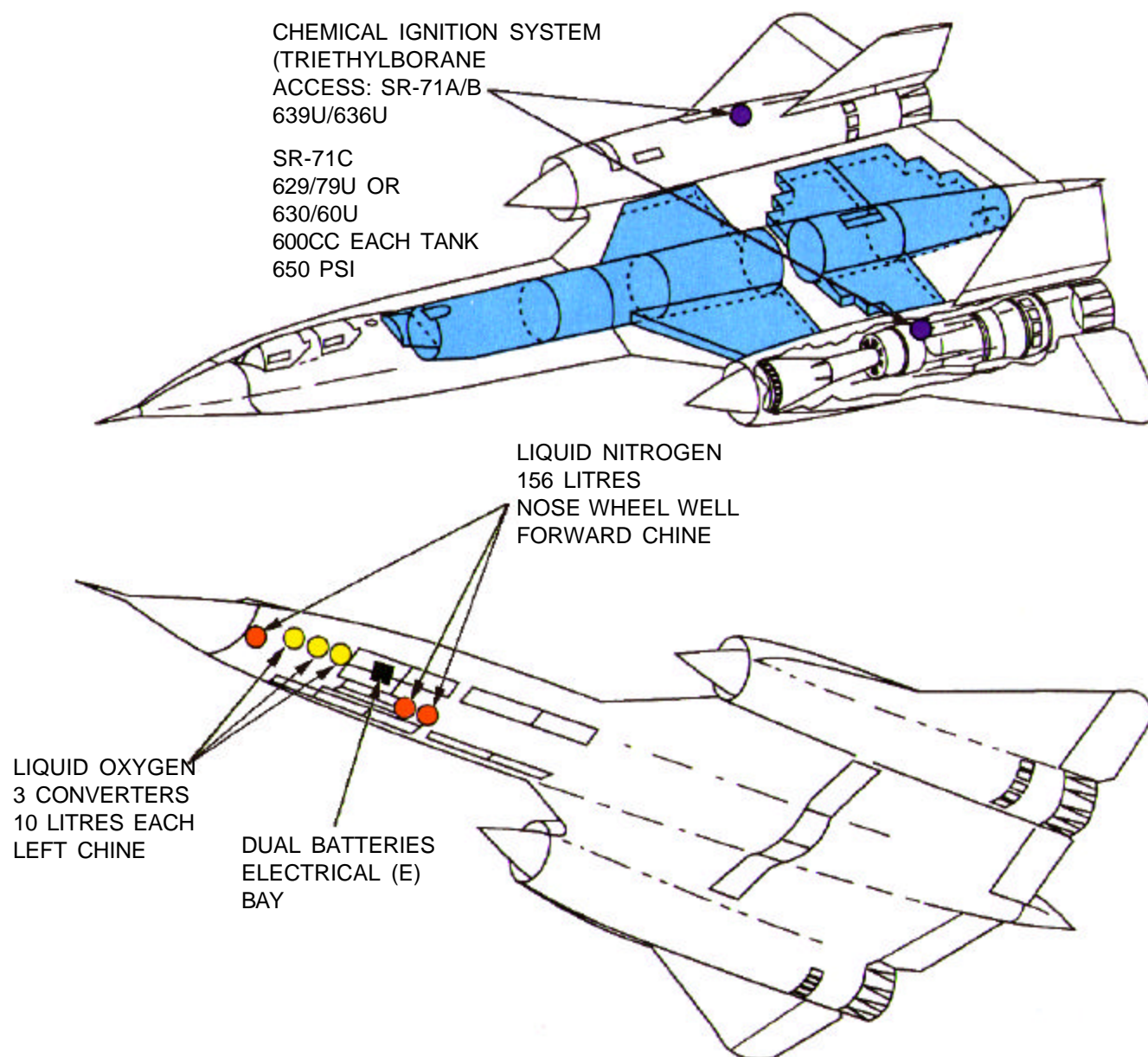
SR-71





## AIRCRAFT HAZARDS

SR-71



# AIRCRAFT HAZARDS-Continued

SR-71

## WARNING

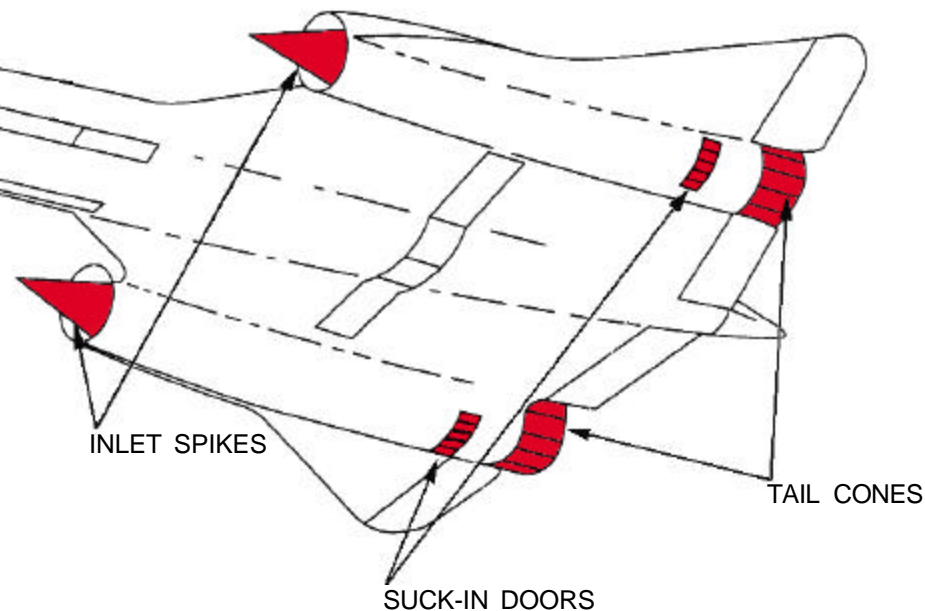
- The SR-71 is equipped with a chemical ignition system containing triethylborane (TEB). A 600cc tank is mounted on the top forward side of each engine. TEB will ignite when exposed to oxygen at all temperatures. TEB is pyrophoric liquid and reacts violently with carbon tetrachloride and halogenated hydrocarbons. Do not use halon 1211 to extinguish fires on the SR-71. Refer to table 10-1 for a complete list of acceptable and unacceptable fire fighting agents.
- Use extreme caution when applying cold liquid or gas extinguishing agents to hot metal surfaces. Applying the cold agents directly to hot metal surfaces can result in stress explosions with possible injury to personnel.

### 1. ENGINE AIR INLET DUCT FIRE

- a. Comply with emergency engine shutdown procedures.
- b. Apply dry chemical powder or CO2 directly into the engine inlet duct around the inlet spike.

### 2. ENGINE NACELLE AND TAILPIPE FIRES

- a. Place the chemical "IGNITER PURGE" switch, located on the right instrument panel, to the "DUMP" position (UP). Engines must be running at 5000 to 6000 RPM to dump the CIS tank.



## CAUTION

Actuate dump switch immediately to ensure hydraulic pressure and power will be available to dump the CIS tank. Power will be required for up to 10 seconds.

- b. Comply with emergency engine shutdown procedures.
- c. Apply dry chemical powder or CO2 directly into the lower "suck in" door located at the engine accessory section (aft).
- d. If a tail cone fire is indicated, apply agent directly into the engine tail cone.



# FIRE FIGHTING AGENTS FOR SR-71 FIRES

(EXCLUDING TEB FIRES)

ACCEPTABLE IN ORDER OF PREFERENCE:

1. AFFF fire extinguisher, 3M I.D. 98-0211- 0170-8.
2. Aqueous Film Forming Foam Liquid, FC206.
3. Aqueous Film Forming Foam, FC200.
4. Carbon Dioxide (CO<sub>2</sub>).
5. Purple K Powder (PKP).
6. Water spray or mist.

NOTE:

Dry chemical powder is preferred for nacelle fires.

UNACCEPTABLE:

1. Halon 1211.
2. Mechanical Foam.
3. Ansul +50 B Dry Chemical mixed with area water.
4. Ansul MetalX Dry Chemical mixed with area water.
5. Chlorobromomethane (CBM).
6. High Expansion Foam.
7. Soda and acid type extinguishers.

CAUTION

These agents may be used only as an absolute last resort to extinguish SR-71 fires.

(FIRE FIGHTING AGENTS FOR TEB FIRES)

APPROVED IN ORDER OF PREFERENCE:

1. AFFF fire extinguisher, 3M I.D. 98-0211- 0170-8.
2. Water spray or mist.

PROHIBITED:

1. Halon 1211.
2. Ansul MetalX Dry Chemical mixed with area water.
3. Chlorobromomethane (CBM).
4. High Expansion Foam.
5. Soda and acid type extinguishers.

SR-71

## SPECIAL TOOLS/EQUIPMENT

Power Rescue Saw  
 Ballistic Hose Darming Cutter  
 Knife Fire Drill II  
 1/2 Inch Drive Socket Wrench Extension  
 1/2 Inch Drive Socket Wrench Handle  
 Drogue Gun Safety Caps (2) Part # 5-10109-30  
 Canopy Handle (Optional)

## AIRCRAFT ENTRY

## 1. MANUAL ENTRY

- a. Insert socket wrench extension into 1/2 inch drive opening, located on left side of fuselage below each canopy, and rotate clockwise to unlock canopy.

## NOTE:

A firefighter on each side (2) of each canopy (2) are required to lift each canopy.

- b. Raise canopies to their normal open position. Canopies must either be held open or if conditions warrant, rotate the canopies aft at the hinge line to shear canopies from aircraft.

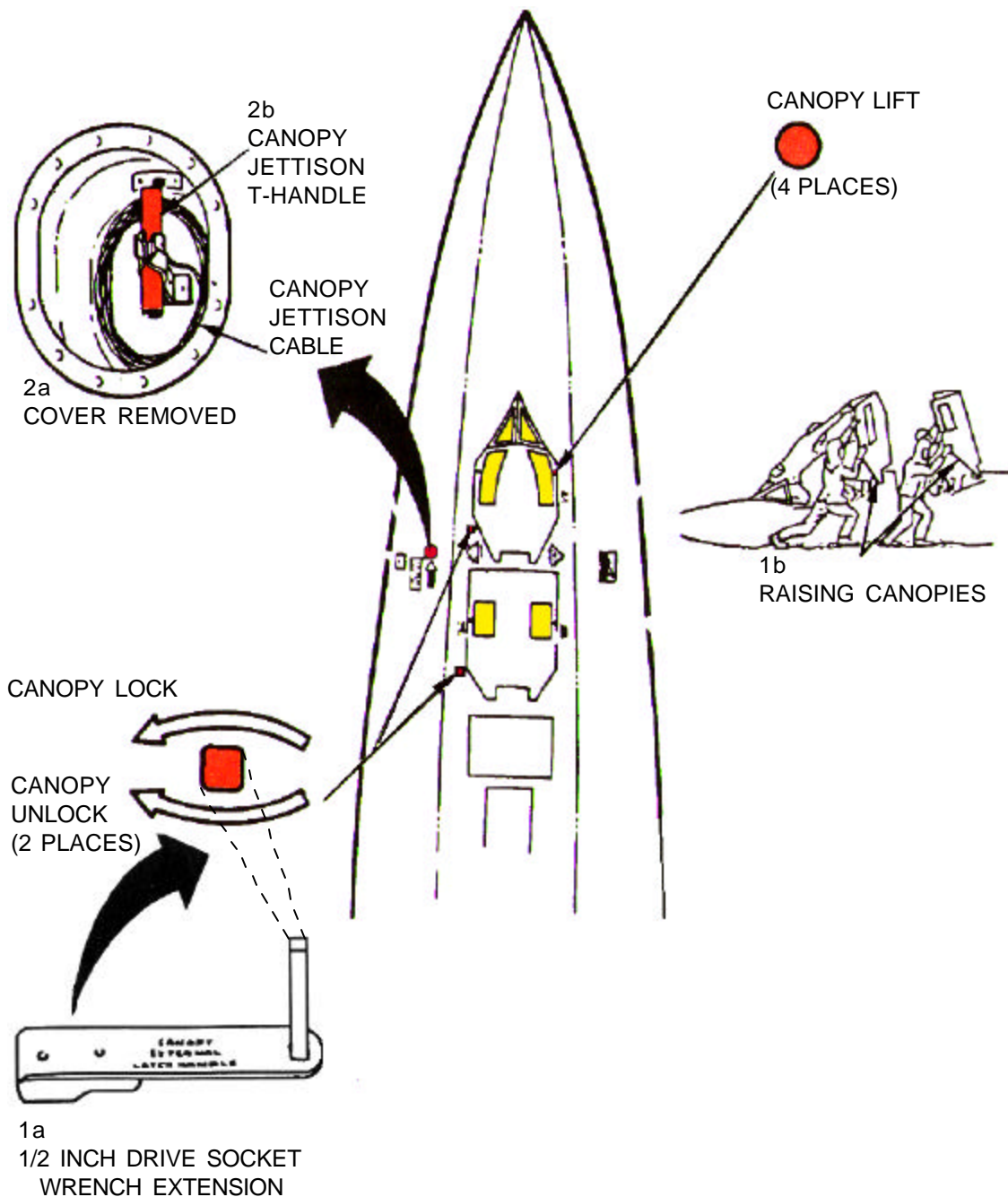
## 2. EMERGENCY ENTRY

- a. Press quick disconnect on jettison access cover, located on left side of fuselage below pilot's canopy (fwd), and remove cover.
- b. Pull canopy jettison T-handle out approximately 9 feet and pull sharply to jettison canopies.

**WARNING**

The ejection seats must be safetied immediately to prevent injury or death to personnel.

SR-71



# ENGINE SHUTDOWN

SR-71

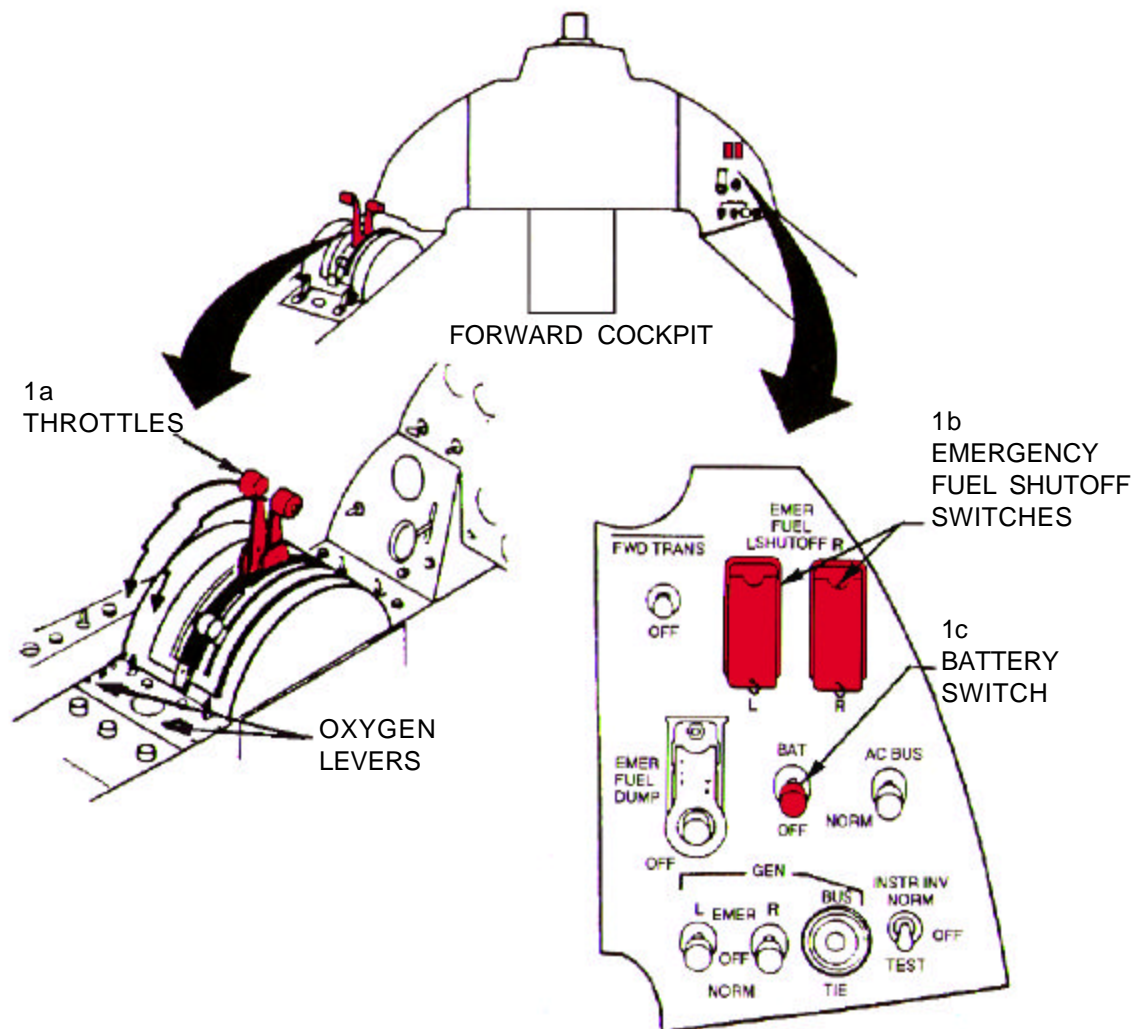
## 1. ENGINE SHUTDOWN

- Retard throttles, located on pilot's left side console, to IDLE DETENT then raise throttles and move aft to CUT-OFF position.
- Place emergency fuel shutoff switches, located on pilot's right instrument panel, to OFF position.

### NOTE:

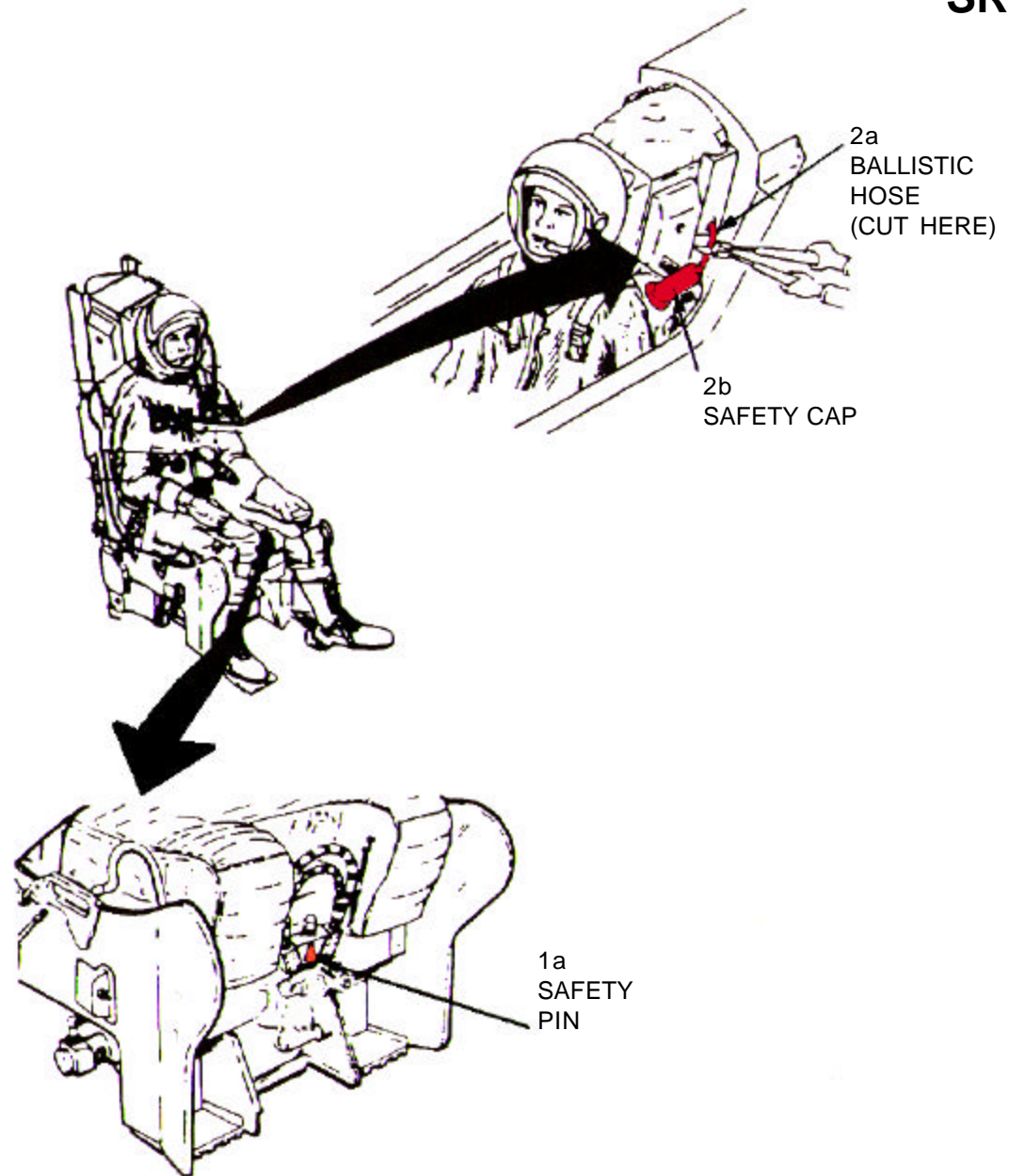
Wait 5 seconds to allow fuel valves to close before turning battery OFF.

- Place battery switch, located on pilot's right instrument panel, to OFF position.



## SAFETYING EJECTION SEAT

1. NORMAL SAFETYING EJECTION SEAT
  - a. Insert safety pin in seat ejection control handle, located front center of each seat.
2. EMERGENCY SAFETYING EJECTION SEAT
  - a. Cut ballistic hose, located on top left side of each ejection seat.
  - b. Install drogue gun safety caps on parachute drogue guns, located behind the left shoulder of each crewmember.

**SR-71**

# AIRCREW EXTRACTION

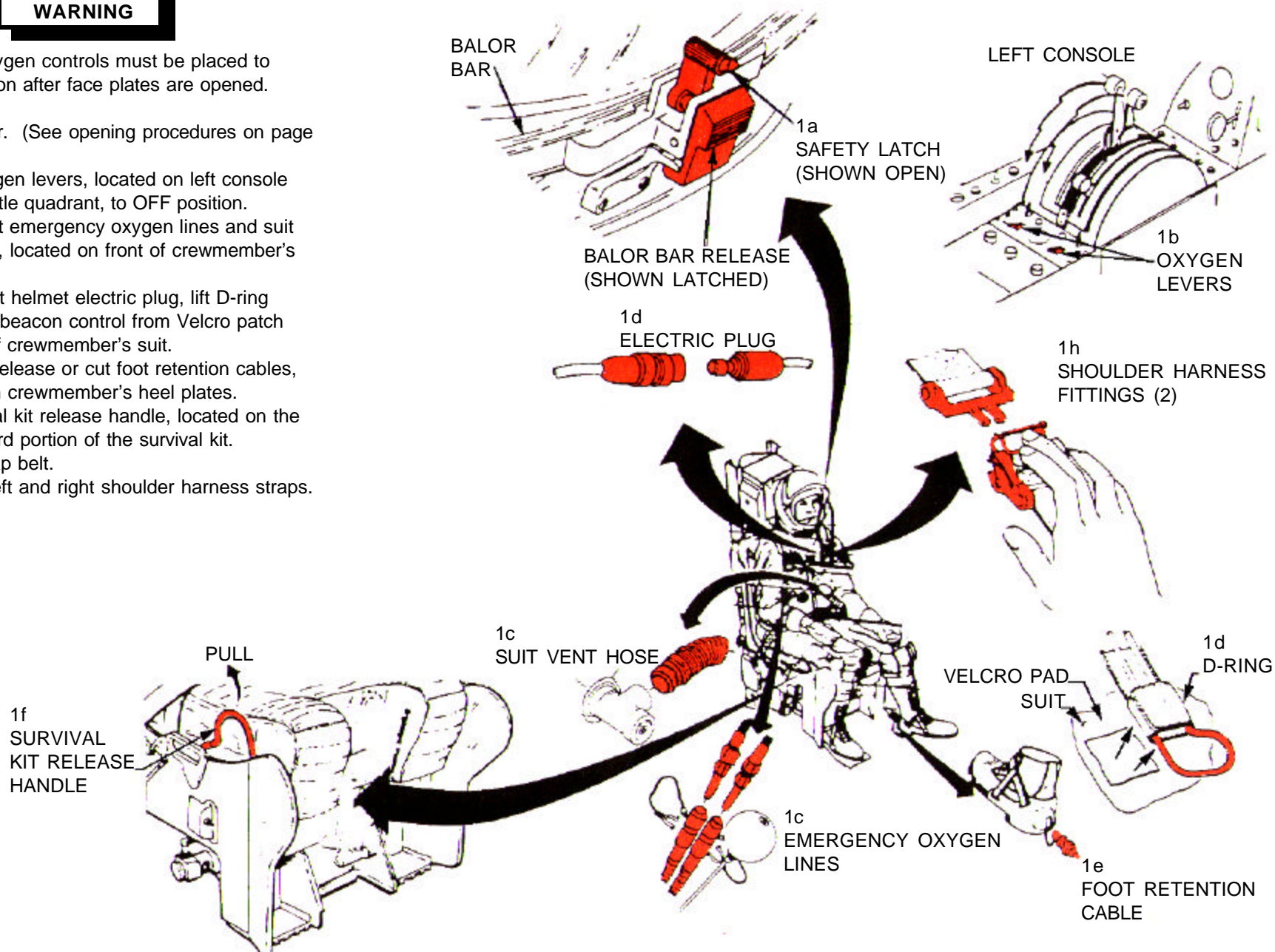
SR-71

## 1. AIRCREW EXTRACTION

### WARNING

Normal oxygen controls must be placed to OFF position after face plates are opened.

- a. Open visor. (See opening procedures on page SR-71.8)
- b. Place oxygen levers, located on left console aft of throttle quadrant, to OFF position.
- c. Disconnect emergency oxygen lines and suit vent hose, located on front of crewmember's suit.
- d. Disconnect helmet electric plug, lift D-ring and radio beacon control from Velcro patch on front of crewmember's suit.
- e. Manually release or cut foot retention cables, located on crewmember's heel plates.
- f. Pull survival kit release handle, located on the right forward portion of the survival kit.
- g. Release lap belt.
- h. Release left and right shoulder harness straps.



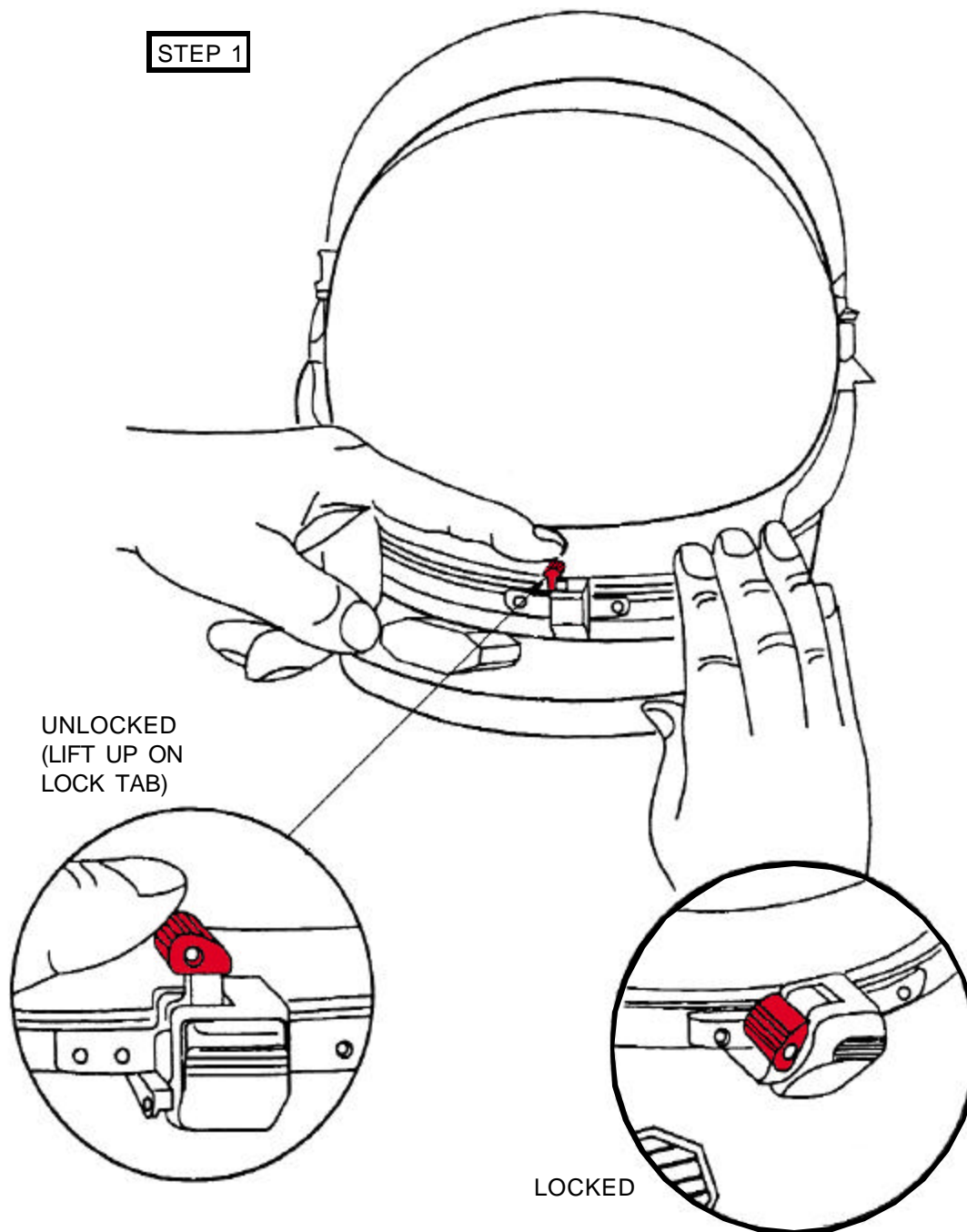


# VISOR LATCH OPENING PROCEDURES

SR-71

## 1. TO OPEN THE VISOR

- a. Facing the front of the helmet, identify the balor bar (aluminum alloy curved bar) that wraps around the front of the lower part of the visor.
- b. Lift up the 1/2 inch long locking tab, located left side of locking mechanism (looking visor head on), until it is in the vertical position.
- c. Push down on the entire balor bar, while holding bar down (movement is 1/8 inch), push in on the centrally located visor release latch (tends to have a rotating motion rather than a straight in push motion).
- d. While continuing to push in on the spring-loaded release latch, release the downward pressure on the balor bar. The balor bar will spring up.
- e. Force the balor bar up over the top of the helmet which will open the visor.

**STEP 1**

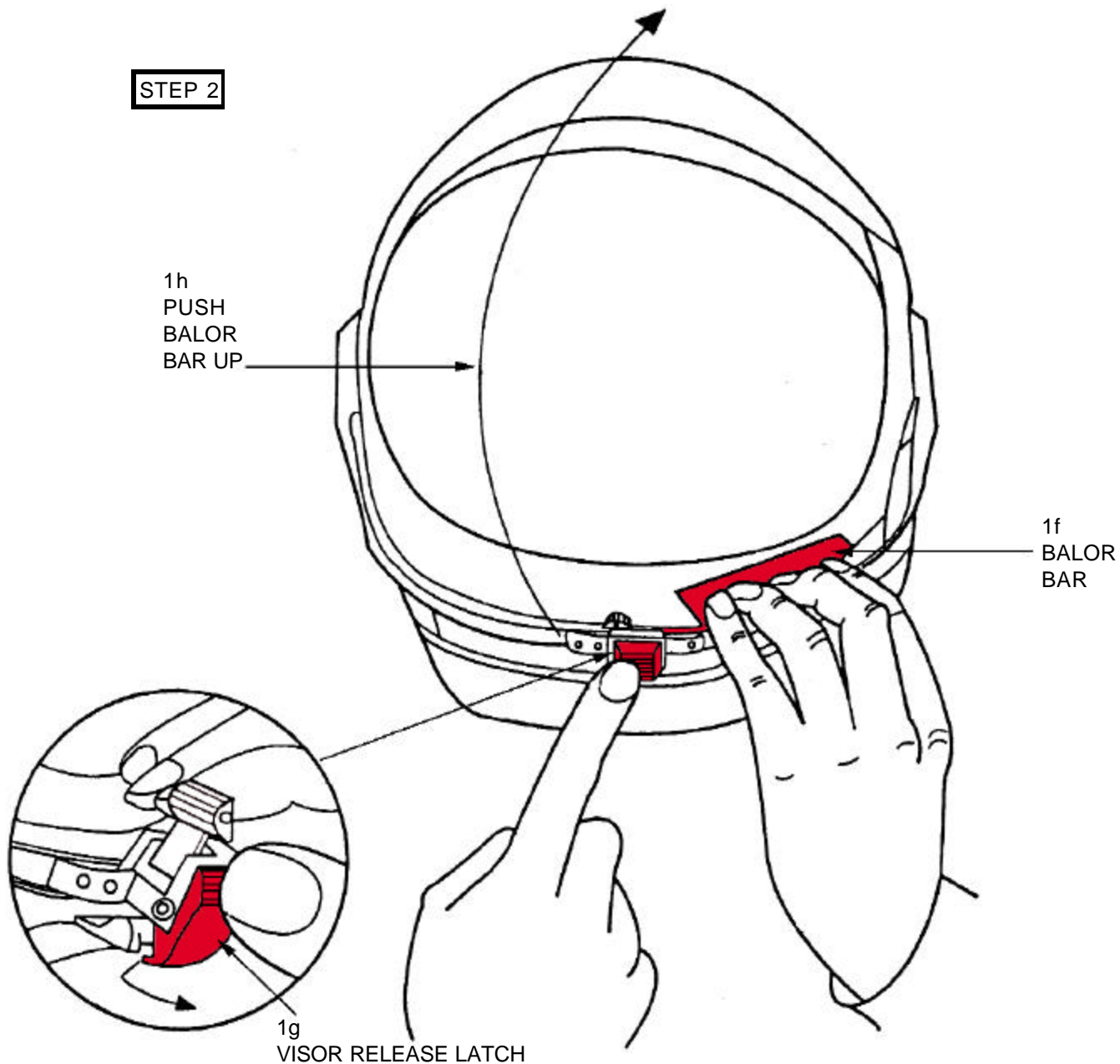


# VISOR LATCH OPENING PROCEDURES-Continued

SR-71

## 1. TO OPEN THE VISOR-Continued

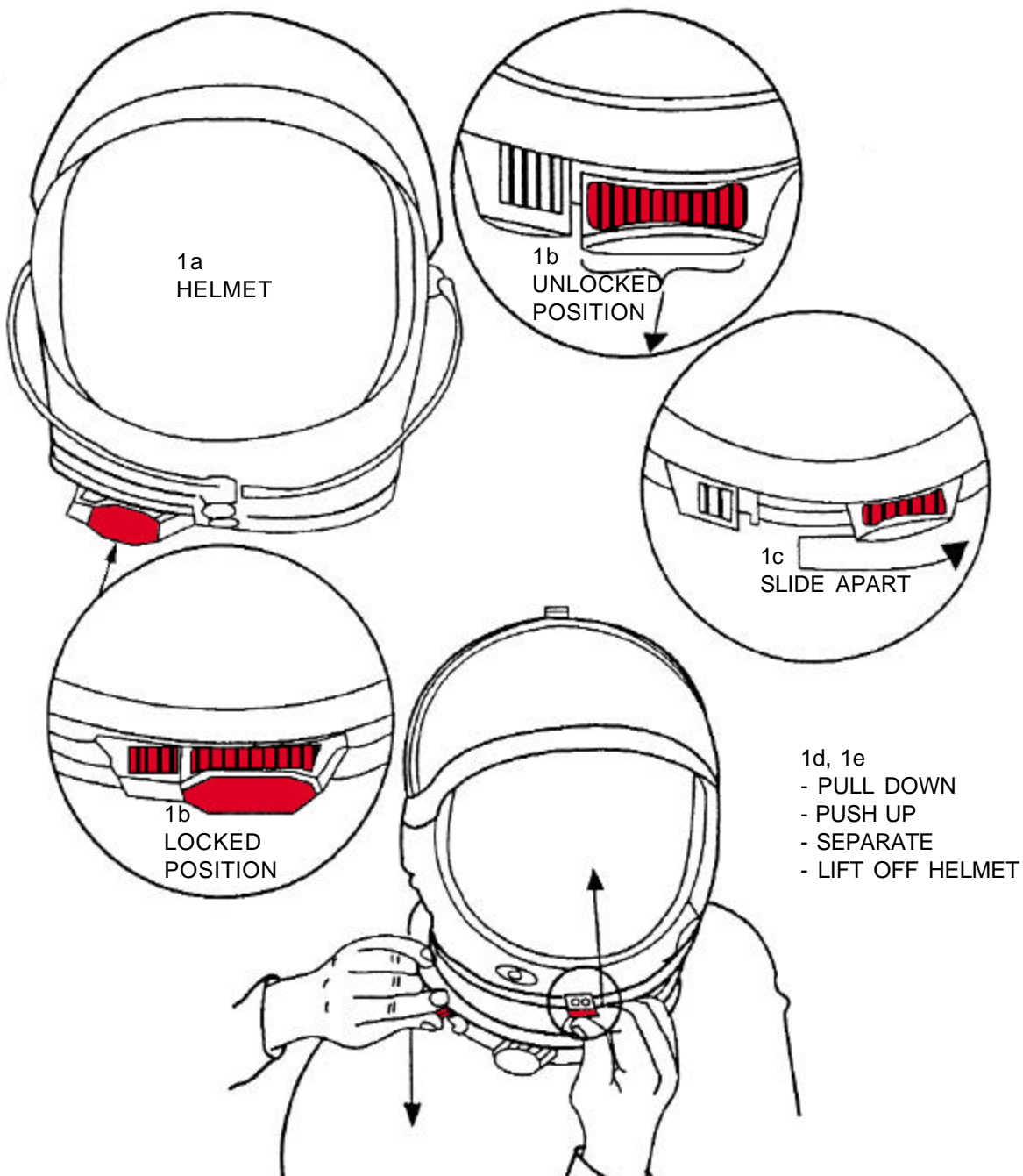
- f. Pull down on balor bar.
- g. While pulling down on balor bar, push in on the visor release latch.
- h. Lift the balor bar up and push it to the top of the helmet to the full open position.



# HELMET REMOVAL

## 1. TO REMOVE THE HELMET

- a. Facing the front of the helmet, identify the neck ring (the lower most metal ring before getting to the gold colored cloth of the suit).
- b. Slightly left of center (looking head on at the front of helmet) a black mechanism locks the neck ring to the suit. With both hands, grasp the left part of this latch with left hand and the right part (latch has raised lip) with right hand.
- c. Pull right portion away from neck ring and at same time pull latch apart until separated.
- d. At this point, the locking teeth (or dogs) inside the ring have now receded into the neck ring freeing the helmet from the suit.
- e. The seal between the helmet and neck ring will take some effort to separate once it is unlocked. This separation can be accomplished fairly easily by holding down on the neck ring locking mechanism while pulling up on the latch mechanism used to lock the balor bar in the down position.



SR-71

# AIRCRAFT PAINT SCHEME

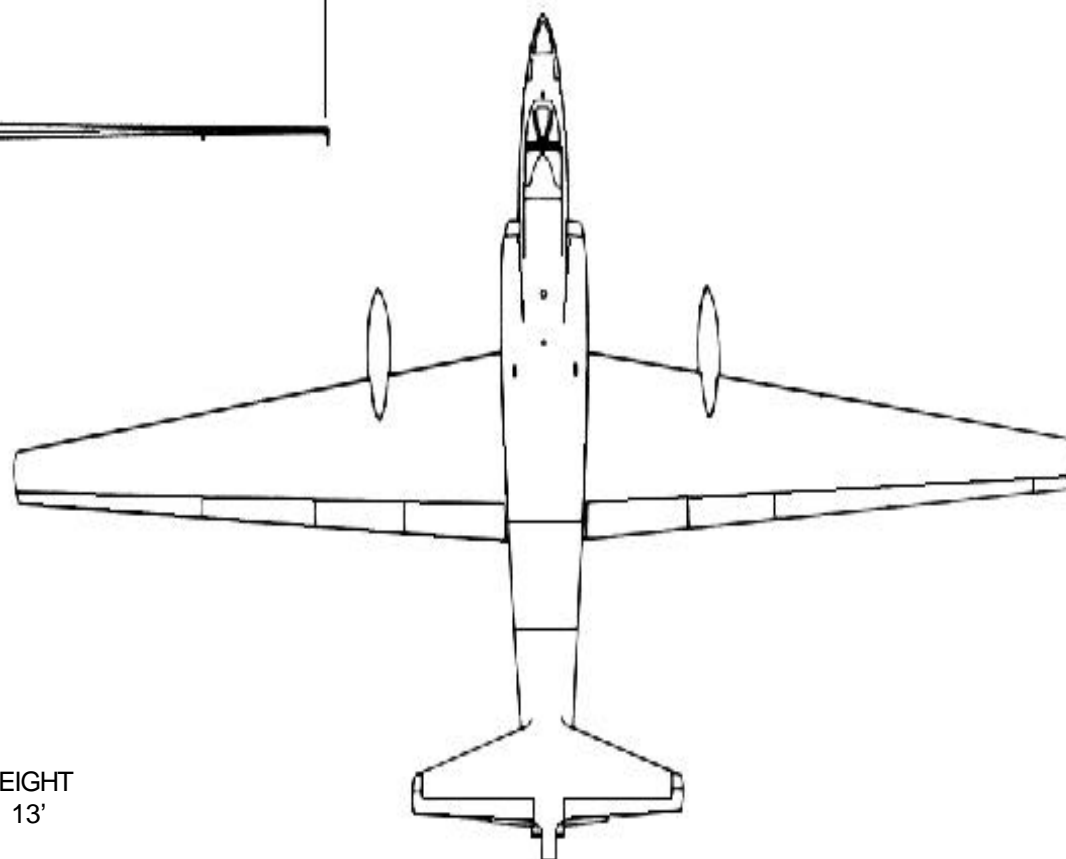
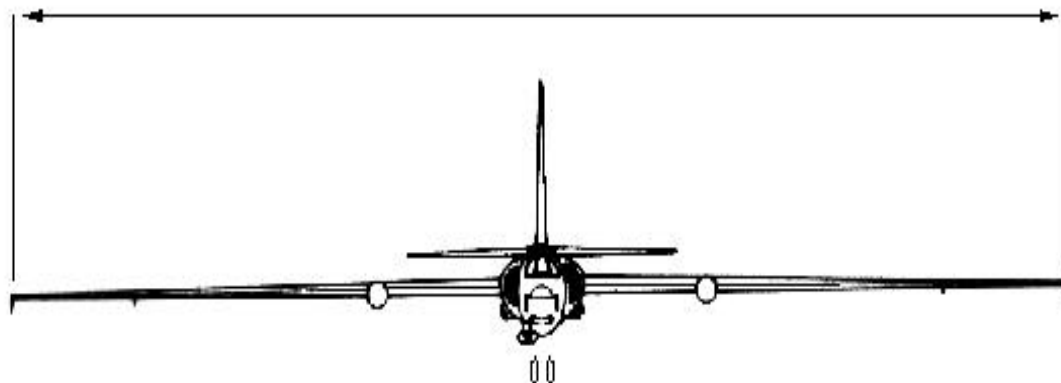
U-2S/TU-2S



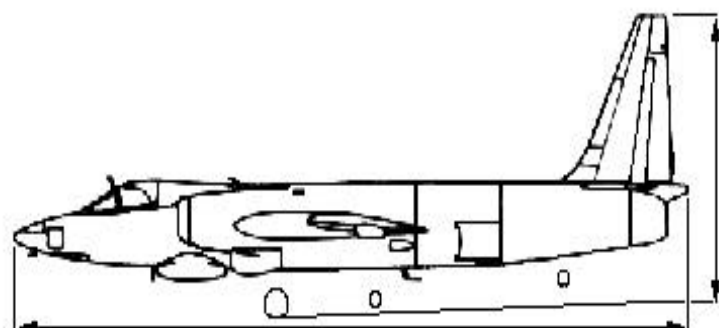
## AIRCRAFT DIMENSIONS

U-2S/TU-2S

WING SPAN  
104' 10"



HEIGHT  
13'



LENGTH  
63'

# AIRCRAFT SKIN PENETRATION POINTS, FIRE ACCESS DOORS, BAYS, AND HYDRAZINE BOTTLE LOCATION

U-2S/TU-2S

## NOTE:

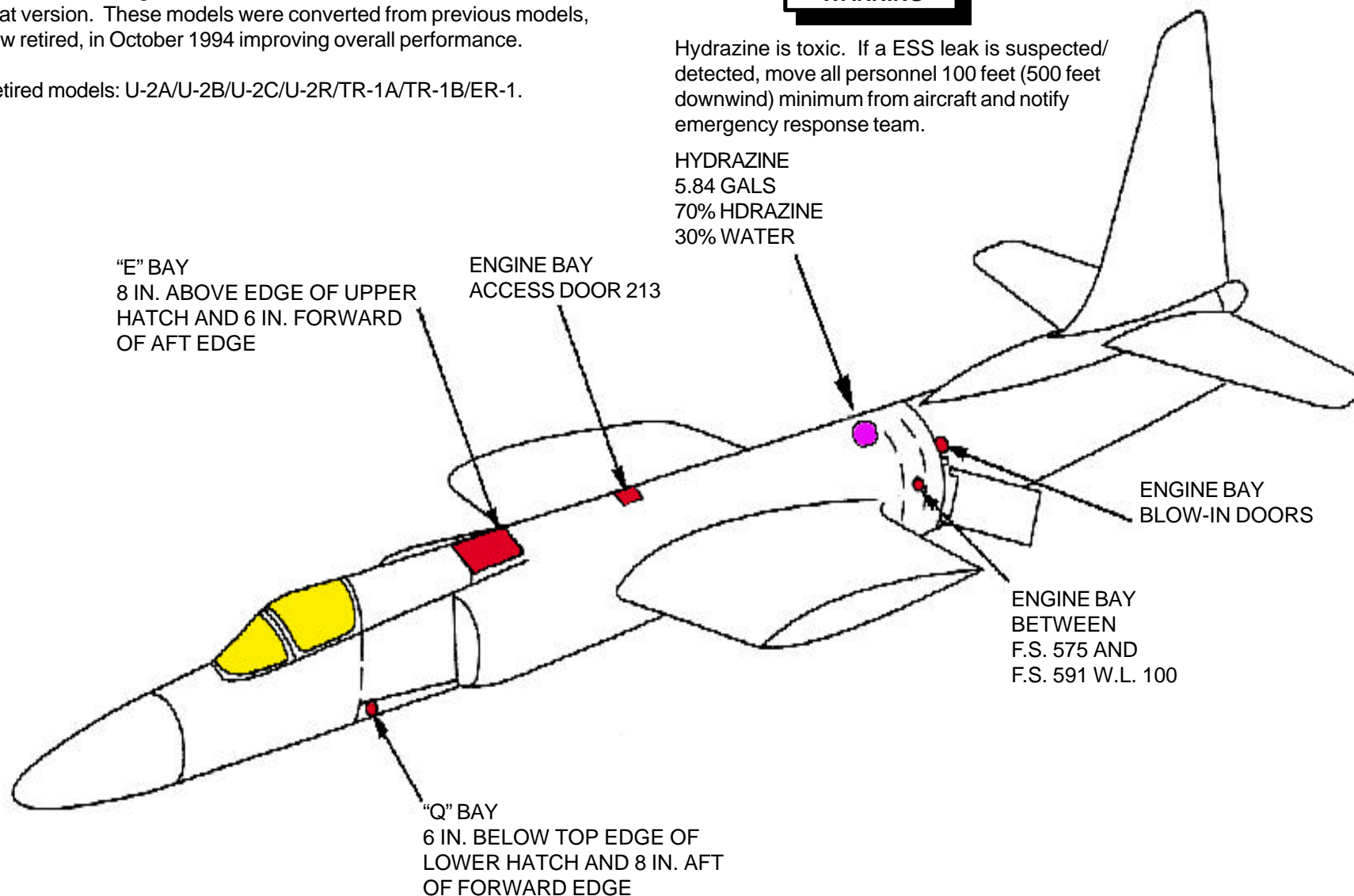
The U-2S is a single seat aircraft while the TU-2S is the trainer two seat version. These models were converted from previous models, now retired, in October 1994 improving overall performance.

Retired models: U-2A/U-2B/U-2C/U-2R/TR-1A/TR-1B/ER-1.

## WARNING

Hydrazine is toxic. If a ESS leak is suspected/ detected, move all personnel 100 feet (500 feet downwind) minimum from aircraft and notify emergency response team.

HYDRAZINE  
5.84 GALS  
70% HDRAZINE  
30% WATER

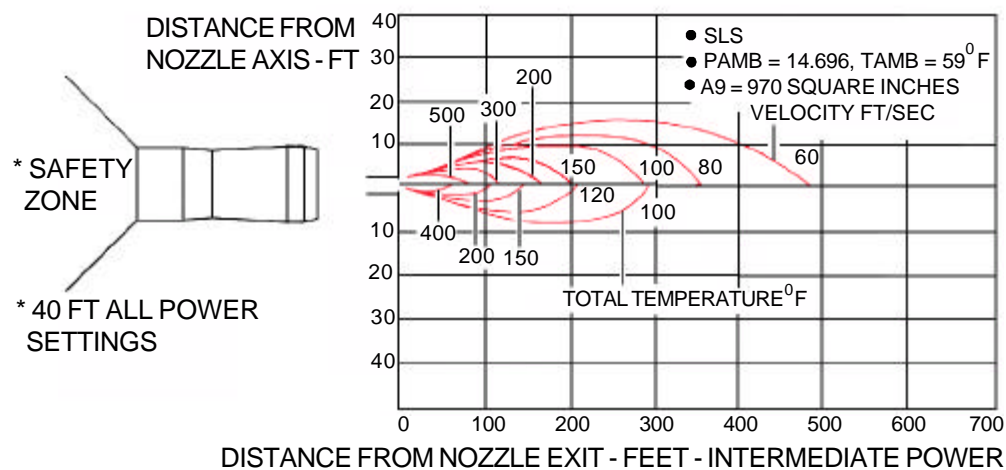
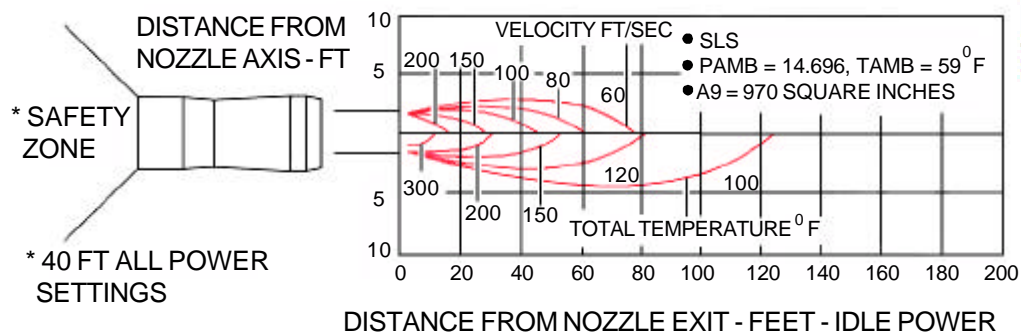


# AIRCRAFT HAZARDS INFORMATION

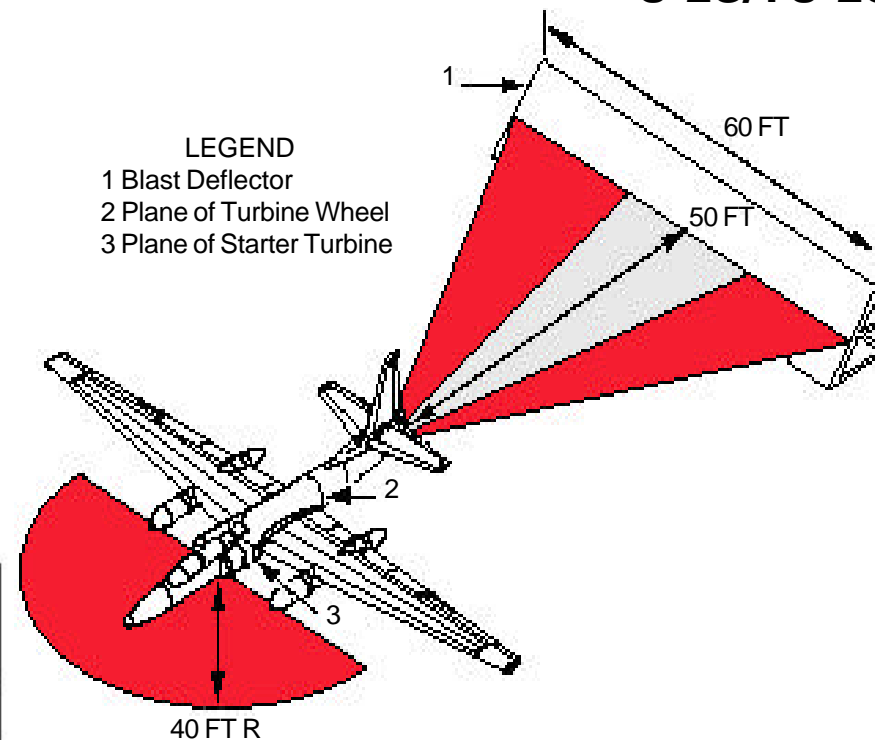
## 1. ENGINE GROUND RUNUP DANGER AREAS

### WARNING

- The area near the intake ducts, starter exhaust, and engine exhaust is very dangerous - keep clear.
- During start and runup, avoid plane of starter turbine and engine turbine wheels.
- During runup, engine noise may cause permanent damage to ears. Within 100 feet, use ear perscribed plugs. Within 50 feet use perscribed ear plugs and protective covers.
- If blast deflector is not available, clear aft exhaust area for 200 feet.



## U-2S/TU-2S





## SPECIAL TOOLS/EQUIPMENT

Power Rescue Saw  
 1/2 In. Drive Socket Wrench Extension  
 1/2 In. Drive Socket Wrench Handle  
 Disarming Tool Fire Drill II

## AIRCRAFT ENTRY- U-2S/TU-2S

**WARNING**

If engine is running, personnel approaching aircraft must be aware of the intake danger areas, see page U-2.4, and use a means of protecting themselves to reduce the hazard of injury or death from engine intake suction and exhaust.

## 1. MANUAL ENTRY

## NOTE:

In two seat aircraft, procedures are identical.

- a. Depress spring-loaded retaining button at the base of the canopy locking lever on the right side of the aircraft below the canopy rail. The canopy locking lever will spring free from its flush mounted position. Rotate the lever in a clockwise direction to release canopy lock. Lift canopy from rail and open toward left side of aircraft until hold-open prop latch engages.

- b. Insert 1/2 inch drive socket wrench extension into 1/2 inch square drive socket opening, located on right side of fuselage behind canopy, rotate handle counterclockwise.

## 2. EMERGENCY ENTRY

- a. Push quick-release button on access door, located on left forward side of fuselage below canopy, withdraw T-handle, and uncoil cable to approximately 6 feet. Do not apply tension to cable until it is uncoiled.
- b. Grasp T-handle and pull sharply. Canopy will jettison up and aft immediately. Avoid canopy impact area.

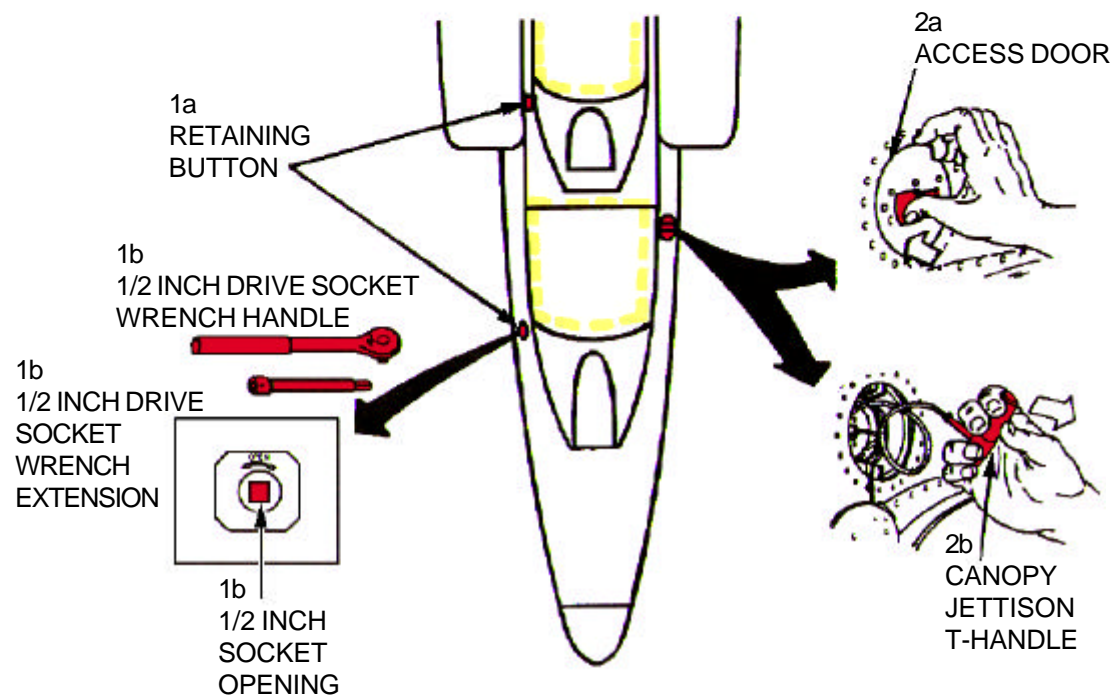
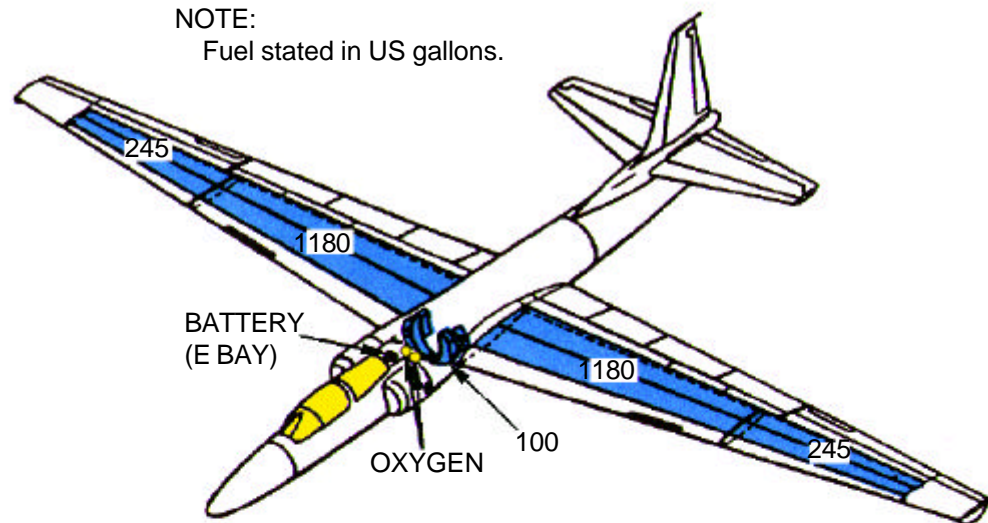
## 3. CUT-IN

- a. Cut-in around canopy frame on all four sides as required.

## U-2S/TU-2S

## NOTE:

Fuel stated in US gallons.



# ENGINE AND OXYGEN SHUTDOWN

## 1. ENGINE SHUTDOWN

### WARNING

Reaching between the control column and instrument panel to move the control column is hazardous, as control column initiator may pyrotechnically actuate and quickly position the control column forward, causing injury to personnel.

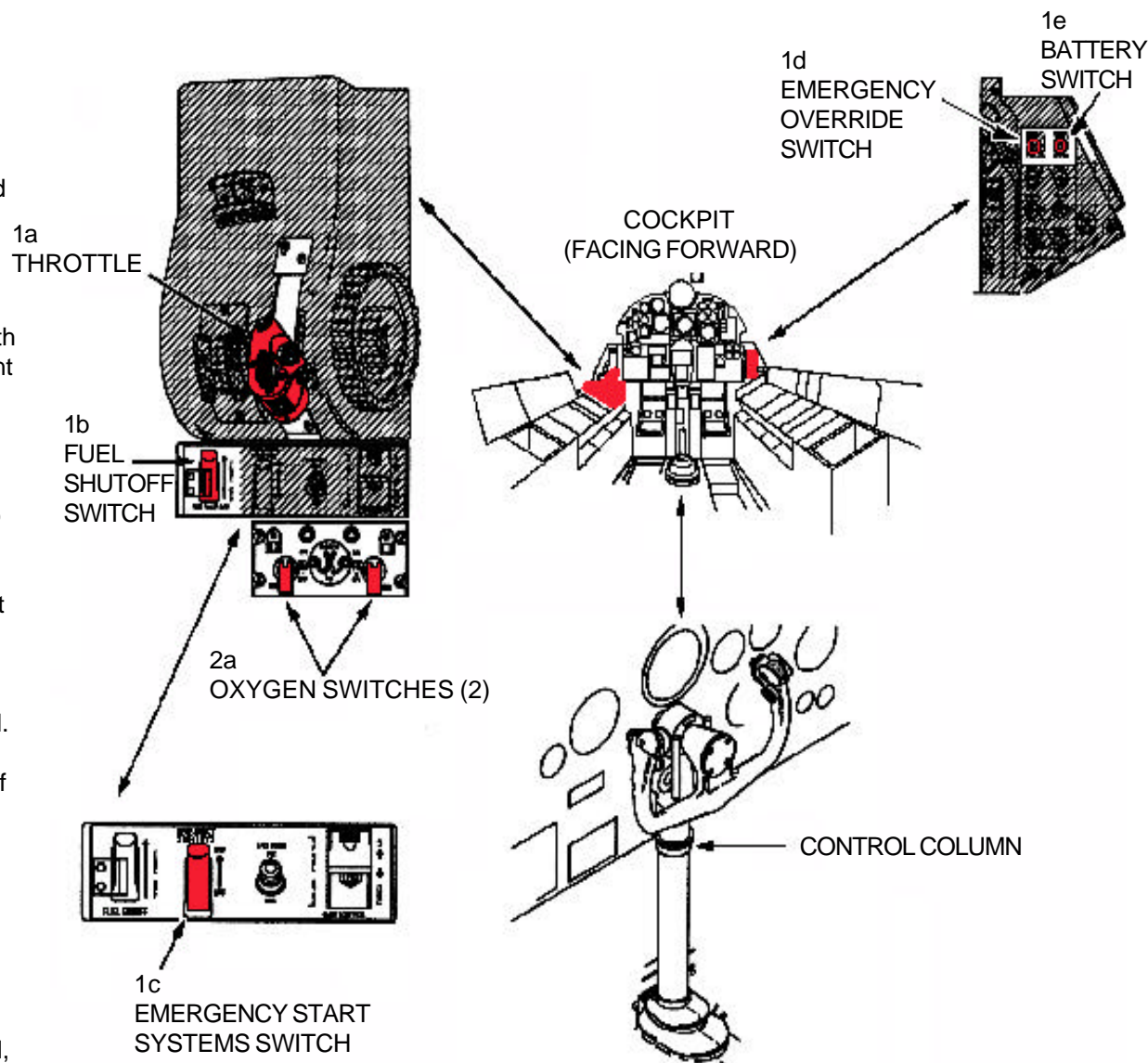
### NOTE:

The following sequence may appear to be in conflict with other published TOs, however this is the most expedient sequence during an emergency. Flight manuals and maintenance manuals should not come into play or be considered under these difficult circumstances.

- Pull throttle, located on forward left side console, aft to OFF.
- Move the guarded toggle fuel shutoff switch, located aft of throttle, right to OFF.
- Position emergency start systems (ESS) switch to OFF, located to right of the fuel shutoff switch, if armed.
- Press emergency override switch, located lower right of forward instrument panel, to OFF, if applicable.
- Position battery switch, located lower right of forward instrument panel, to OFF.

## 2. OXYGEN SHUTDOWN

- Position oxygen system consisting of two guarded toggle switches, located aft of fuel shutoff switch panel, aft to OFF.



U-2S/TU-2S

# AIRCREW EXTRACTION

U-2S/TU-2S

## 1. RAPID AIRCREW EXTRACTION

- a. Sever ballistic hoses at upper right of seat with disarming tool.
- b. Sever canopy unlock thruster lower hose with disarming tool.

### WARNING

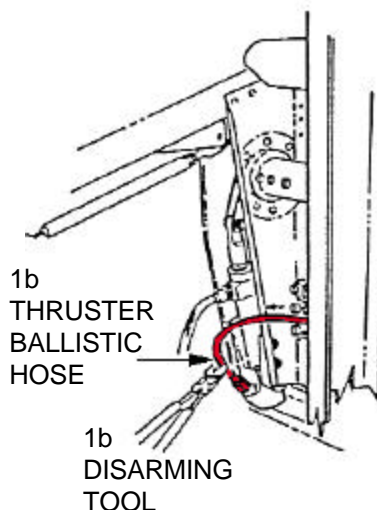
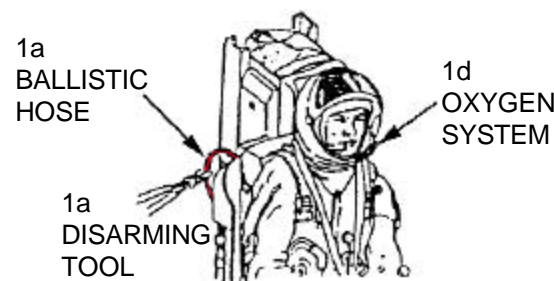
Reaching between control column and instrument panel to move control column is hazardous, as control column initiator may fire, causing injury to personnel.

- c. While avoiding placing arm between control column and instrument panel, move control column forward to end of travel.
- d. Insure oxygen system is OFF at helmet prior to unlocking faceplate or visor of helmet. (See VISOR LATCH OPENING PROCEDURES.)
- e. Depress thumb button and pull scramble handle to release personal restraints.

### NOTE:

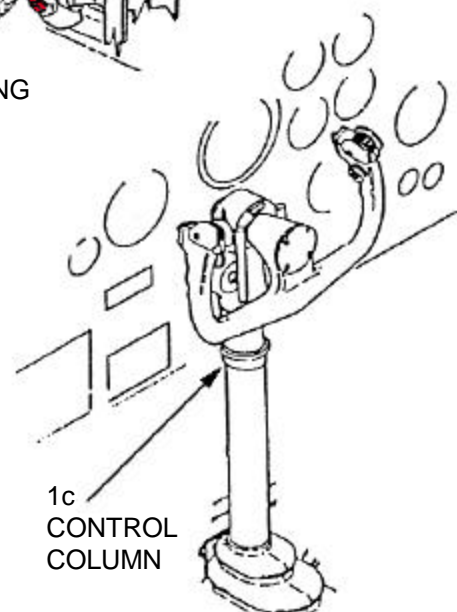
Expect several loud ballistic reports from equipment release initiators. This initiates a guillotine which cuts/disconnects the pilot from the spurs along with several other restraints.

- f. Pull up on kit handle to release kit from crew-member.
- g. Remove crewmember.



1f SURVIVAL KIT HANDLE

1e SCRAMBLE HANDLE

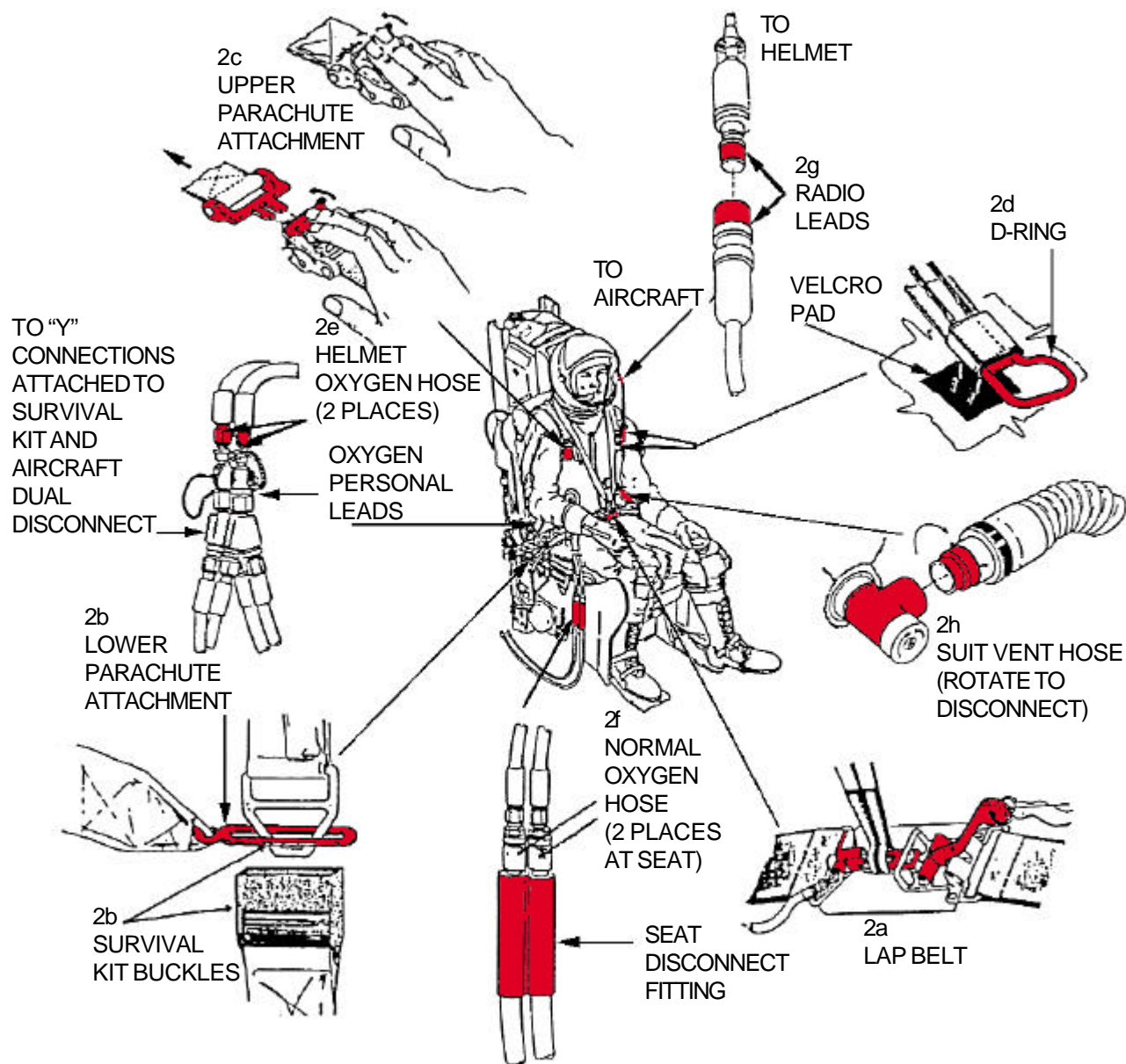
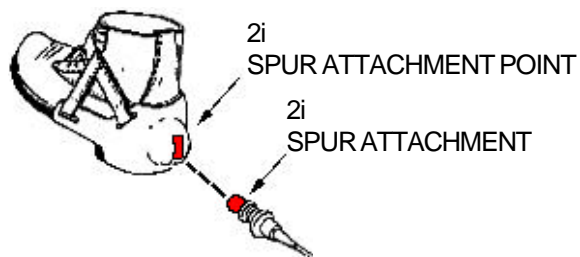




# AIRCREW EXTRACTION-Continued

## 2. NORMAL AIRCREW EXTRACTION

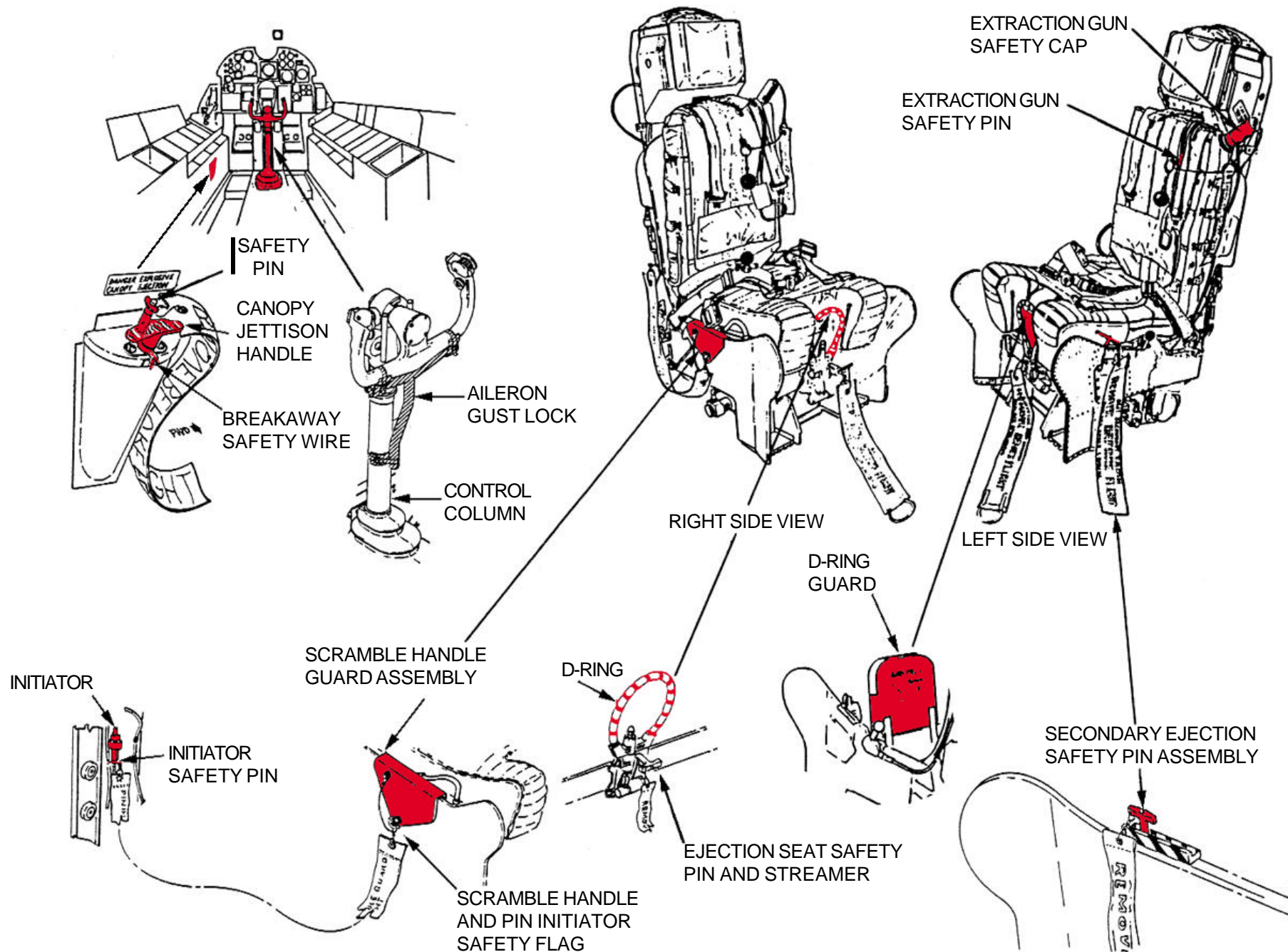
- a. Open lap belt (this will also release shoulder harness).
- b. Remove lower parachute attachments and survival kit belts.
- c. Disconnect upper parachute shoulder attachments.
- d. Lift parachute D-ring from Velcro pad.
- e. Disconnect both oxygen hoses from helmet.
- f. Unsnap oxygen keepers - 2 places.
- g. Disconnect radio leads.
- h. Disconnect suit vent hose.
- i. Disconnect spur attachments from spur attachment points. Spurs are manually disconnected by reaching down and rotating the cable from the back of each heel to the bottom of each heel and then pull the restraint free.
- j. Remove crewmember.



U-2S/TU-2S

# INTERNAL GROUND SAFETY DEVICES

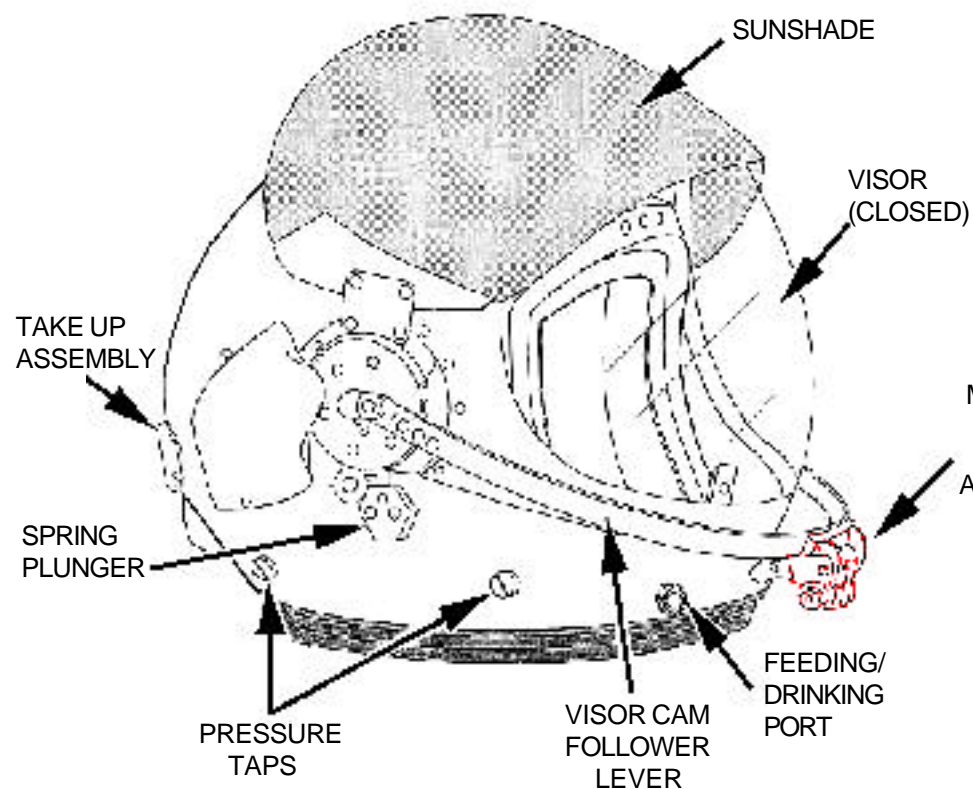
## U-2S/TU-2S



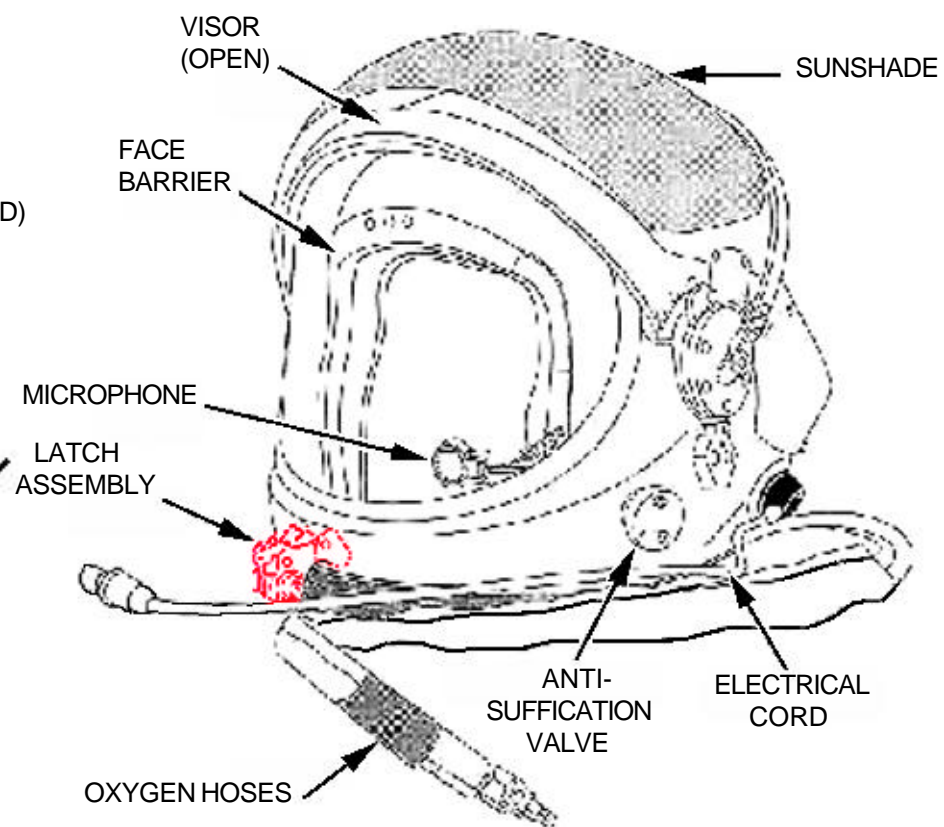


## HELMET COMPONENTS

U-2S/TU-2S



HELMET - VISOR CLOSED - RIGHT VIEW



HELMET - VISOR OPEN - LEFT VIEW