LOCKHEED-CALIFORNIA COMPANY

MAINTENANCE TRAINING DEPARTMENT

STUDENT STUDY GUIDE

AH-56A

AIRCRAFT FAMILIARIZATION

THE INFORMATION CONTAINED IN THIS PUBLICATION IS INTENDED FOR TRAINING PURPOSES ONLY. IT IS BASED UPON THE LATEST INFORMATION AVAILABLE AT THE TIME OF PREPARATION. NO REVISIONS WILL BE SUPPLIED.

REFER TO OFFICIAL PUBLICATIONS FOR CURRENT MAINTENANCE AND OPERATING INSTRUCTIONS.

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12-1-68

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I. INTRODUCTION

This Study Guide is provided as a basic introduction to the AH-56A and the systems which make up the aircraft. Only a general overall view of the aircraft and systems will be provided, with no attempt to cover any items in detail. Those persons needing more detailed information are referred to the POMM 55-1520-222 series technical manuals and the Study Guide on the specific system.

The AH-56A, or Cheyenne, has been designed to replace the armed helicopters presently in operation. It is the first rotary wing aircraft designed specifically as an integrated weapons system. For a history of the development of the helicopter and the Lockheed rigid rotor see Section VI of this Study Guide.

The primary mission of the Cheyenne is to escort troop carrying helicopters and provide protection at the landing zone. Secondary missions include close support of ground troops, destruction of pinpoint targets, and general observation and spotting functions.

The Cheyenne has a cruise speed of 200 knots and a maximum speed of 220 knots at sea level on a standard day. It has a maximum vertical rate of climb of 1,800 feet per minute at sea level and a 3,400 feet per minute rate of climb at 80 knots. The Cheyenne can accelerate from zero to 200 knots in 38 seconds and decelerate from 200 knots to zero in 17 seconds.

Hovering capabilities include hovering out of ground effect at sea level on a standard day at 22,500 pounds gross weight, or on a 90 degree day at 5,000 feet at 16,995 pounds gross weight.

Normal range with maximum internal fuel is 875 nautical miles. Ferry range with maximum allowable fuel is 2,510 nautical miles. This range is sufficient to permit flying from San Francisco to Hawaii against a 30 knot head wind.

Normal gross weight, with full internal fuel and 1,145 pounds of military payload, is 16,995 pounds. By using STOL operation, a maximum gross weight of 29,000 pounds can be used. This means a military payload of up to 14,050 pounds as compared to an empty weight of 12,090 pounds.

II. COMPONENTS AND LOCATIONS

Name of Component	Number per Aircraft	Location in Aircraft
Airframe		
Forward Fuselage	1	From nose to FS 284
Mid Fuselage	1	FS 284 to FS 455
Aft Fuselage	1	FS 455 aft

Name of Component	Number per Aircraft	Location in Aircraft
Sponson	2	Either side of fuselage between FS 185 and FS 430
Wing	2	Centered around FS 317
Stabilizer	2	Aft end of aft fuselage
Ventral Fin	1	Aft end of aft fuselage
Rotors		
Main Rotor	1	Top of fuselage at FS 300
Tail Rotor	1	End of left stabilizer
Propeller	1	Aft end of aft fuselage
Engine and Powertrain		
Engine	1	Top of fuselage centered at FS 372
Main Transmission	1	Top of fuselage centered at FS 300
Propeller and Tail Rotor Drive Shaft	1	Inside mid and aft fuselage sections between main transmission and propeller gearbox
Propeller Gearbox	1	Aft end of aft fuselage
Tail Rotor Drive Shaft	1	Inside trailing edge of left stabilizer
Fuel System		
Internal Tanks	3	One in forward end of each sponson One in mid fuselage centered at FS 372
External Tanks	6	Up to 6 tanks may be mounted on wing stores pylons
Hydraulic System		
Power Package Number 1	1	Upper right accessory pad on forward side of transmission
Power Package Number 2	1	Lower left accessory pad on forward side of transmission

Name of Component	Number per Aircraft	Location in Aircraft
Oil Cooler	1	Right side of mid fuselage below engine
Engine Starter	1	Forward end of engine accessory gearbox
Rotor Brake	1	Aft side of main transmission
Negative Torque Valve	1	Forward side of main transmission
Engine Air Inlet Scavenge Fan	2	Left and right lower aft corners of engine air inlet cowl
Landing Gear Actuation Cylinder	2	Above and forward of main gear struts
Tail Wheel Retraction Cylinder	1	Integral with tail wheel shock strut
Master Brake Cylinder	2	Below floor at forward end of pilot's station
Flight Control System		
Cyclic Stick	2	One in each crew station
Collective Stick	2	One in each crew station
Control Decouplers	3	In pitch, roll and collective control linkage between crew stations
Directional Control Pedals	4	Two in each crew station
Main Rotor Servos	3	Below main transmission
Swash Plate Assembly	1	Between servos and transmission
Control Gyro	1	On top of main rotor
Tail Rotor Servo	1	Leading edge of left stabilizer
Auxiliary Systems		
Air Conditioning Package	1	Forward end of right sponson
Windshield Wiper	1	Copilot/gunner's forward windshield panel

Name of Component	Number per Aircraft	Location in Aircraft
Fire Detector Sensor	4	Three in engine compartment, one in APU compartment
Fire Detector Control Box	2	Main electrical compartment
Auxiliary Power Unit (APU)	1	Aft end of left sponson
Electrical Systems		
Alternator	2	Left and right middle accessory pads on main transmission
Supervisory/Regulator Panel	2	Main electrical compartment
Transformer/Rectifier	2	Floor of main electrical compartment
Battery	1	Below flight station aft of copilot/gunner
Inverter	1	Below flight station aft of copilot/gunner
Circuit Breaker Panel	4	Above and behind pilot
Armament Systems		
XM-51 Turret	1	Nose turret (interchangeable with XM-53)
XM-53 Turret	1	Nose turret (interchangeable with XM-51)
XM-52 Turret	1	Belly turret below pilot
Nose Turret Ammunition Drum	1	Mid fuselage just aft of belly turret
Belly Turret Ammunition Drum	1	Mid fuselage just aft of nose turret ammunition drum
Stores Pylons	6	Two on each wing and two on mid fuselage
Fire Control and Sighting Systems		
Pilot's Direct Sight	1	Above pilot's main instrument panel

Name of Component	Number per Aircraft	Location in Aircraft
Pilot's Helmet Sight	1	Reticle and sensors mounted on pilot's helmet, reference light source assemblies mounted on canopy structure above and behind pilot
Pilot's Weapons Control Panel	1	Below main instrument panel
Swivelling Gunner Station	1	Forward crew station
Avionic Systems		
Communication Control Panels		Pilot and copilot/gunner side and console panels
Navigation Control Panels		Pilot and copilot/gunner side and console panels
Computer Control Panel	1	Pilot's right console
Fault Location and Aural Warning System Panel (FLAWS)	1	Copilot/gunner's station behind seat

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III. GENERAL DESCRIPTION

A. System Description

In this Study Guide the aircraft will be discussed in ten sections, or subsystems. These are: (1) Airframe and Rotors, (2) Engine and Powertrain, (3) Fuel System, (4) Hydraulic System, (5) Flight Control System, (6) Auxiliary Systems, (7) Electrical Systems, (8) Armament Systems, (9) Fire Control and Sighting Systems, and (10) Avionic Systems.

B. Major Component Description

1. Airframe and Rotors

Figure 1 gives the major dimensions of the AH-56A. Figure 2 shows the manufacturing breakdown of the aircraft into major components. Reference to these figures will aid in visualizing the following descriptions.

Fuselage. The fuselage is conventional design, constructed of aluminum alloy materials, with the use of titanium and stainless steel at points of special heat or stress concentrations.

Non-load carrying secondary structure (fairings, compartment doors, and non-structural panels) is made of aluminum honeycomb material faced with various types of sheeting. Aluminum, plastic, and stainless steel facings are used in various areas. The major honeycomb structures are the sponsons on either side of the fuselage.

For construction purposes the fuselage is divided into three major units. These units are the forward fuselage, from the nose to approximately sixteen inches forward of the main rotor mast; the mid fuselage, from the end of the forward fuselage to approximately two feet aft of the end of the sponson; and the aft fuselage, or tail boom. During assembly the forward and mid fuselage sections are mated permanently together, and can be separated only at depot facilities. The aft fuselage section is attached with bolts and may be removed for shipping or storage purposes.

The forward fuselage supports the gun turrets and the swivelling gunner station, and contains the crew stations and various service compartments.

The mid fuselage forms the basic mount structure for the engine and main transmission, and also houses the main fuel tank and more service compartments.

The aft fuselage section supports the tail surfaces, tail rotor, and the propeller.

The sponsons serve as fairings for the air conditioning unit, fuel tanks, fueling control panel, auxiliary power unit and the landing gear. They also are used as integral work platforms for access to the service areas in the upper section of the fuselage.

The service compartments and access provisions are shown on figure 3. Figure 4 is the inboard profiles of the aircraft, showing the locations of major equipments. Table I lists the major service areas with information on the access to and contents of each. The listing begins at the nose of the aircraft and works aft, covering both sides.

Figures 5 through 12 show the crew station arrangements and instrument panels. They are presented here but will be referenced throughout the study guide, as individual items and systems are discussed.

Wings. The wings supply the two basic functions of supporting most of the aircraft weight during high speed forward flight and carrying the external armament pylons. The basic wing structure is a conventional box beam with attached leading and trailing edges. As all control is through the rotor system, no movable surfaces are required. Instead, the wings are built with fixed deflected areas which serve as ailerons to counteract most of the propeller torque during forward flight in the compound mode of operation.

Tail surfaces. The tail surfaces consist of two fixed horizontal stabilizers and a single fixed ventral fin. Construction of all three surfaces is conventional box beam with added leading and trailing edges.

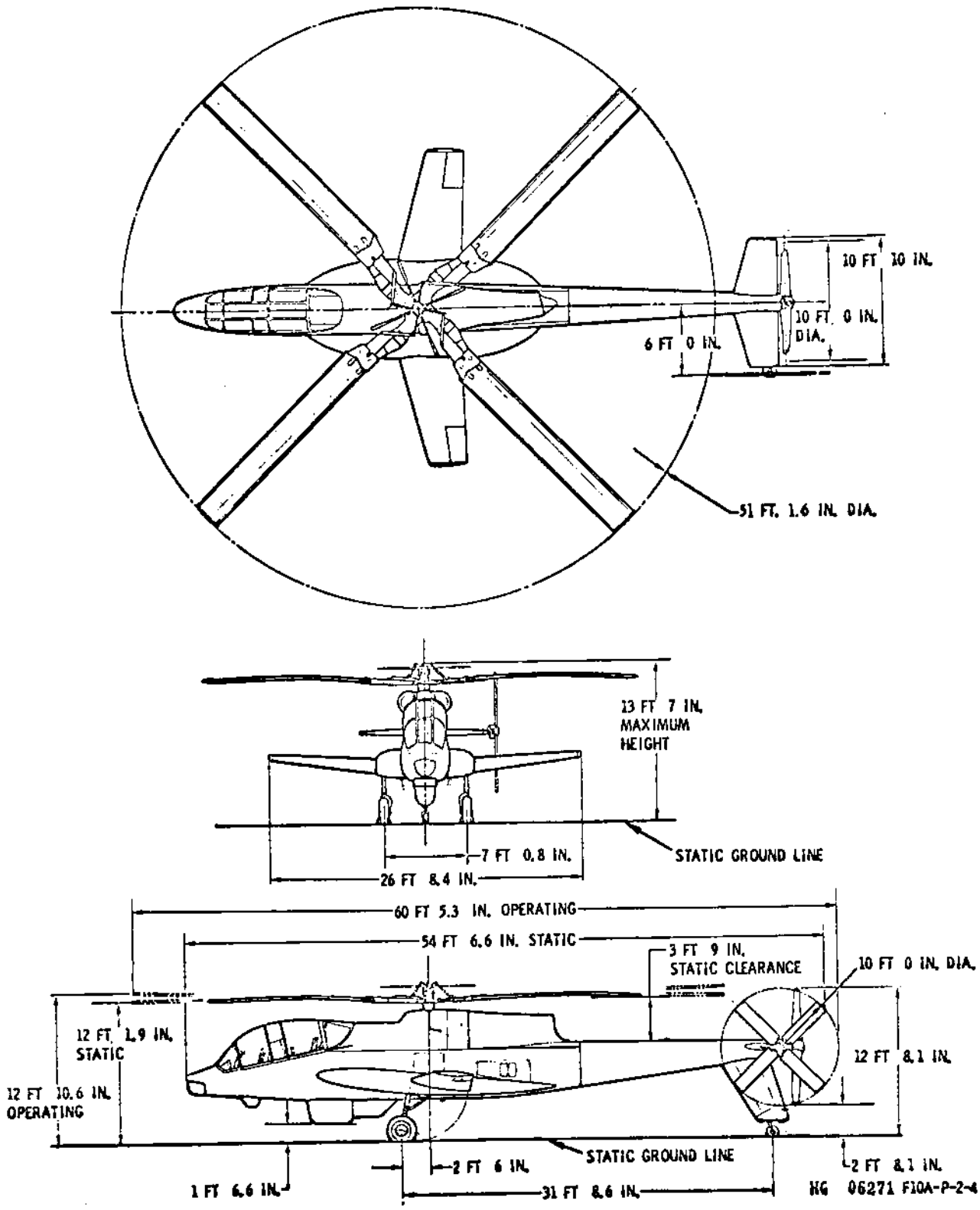
The left hand horizontal stabilizer serves as a support for the tail rotor, tail rotor drive shaft, and tail rotor servo. The leading and trailing edges serve as fairings over the servo and drive shaft.

The ventral fin houses the tail landing gear and also contains the flux gate compass transmitter and various avionic antennae.

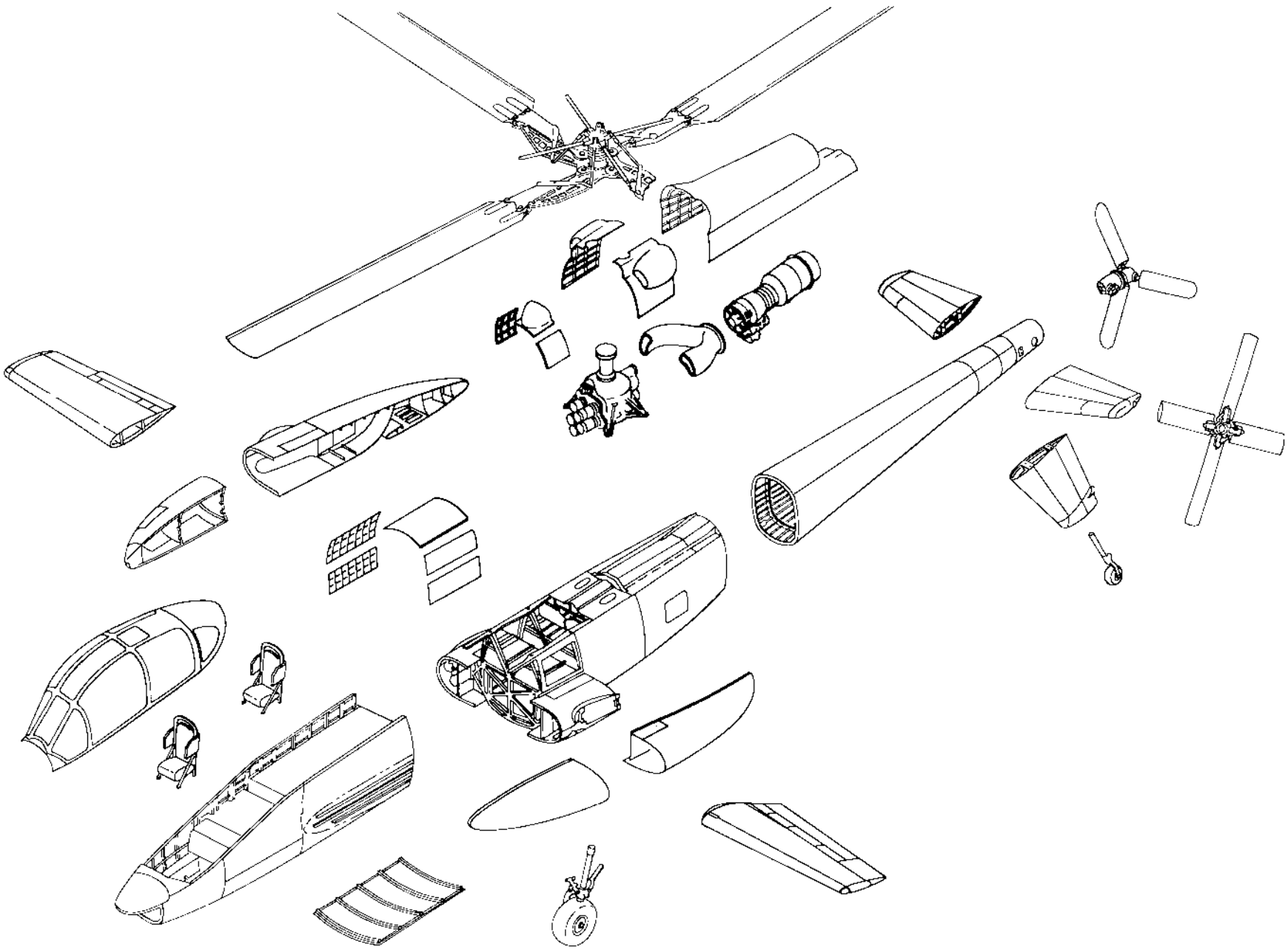
Main rotor. The main rotor is a four bladed rigid rotor 51.2 feet in diameter. It is made up of a fixed hub, movable hub sections, and the blades.

The main rotor hub consists of a four armed fixed hub with a movable section hinged to each arm. The movable sections provide mounting points for the blades and connect to the control system through blade pitch arms attached to the inboard ends of the sections. The hinge bearings are relieved of all centrifugal loads by the use of tension-torsion packs between the main hub and the movable hub section. These packs consist of thousands of turns of fine steel wire wrapped around two bushings then compressed and bonded together with an epoxy plastic. This forms a comparatively flexible bar which is bolted between the stationary and movable sections of the hub and permits the movable section to rotate around the hinges. This arrangement permits the use of light simple bearings which require no lubrication.

The main rotor blades are constructed of stainless steel spars with stainless steel leading edge and titanium trailing edge skins supported by aluminum honeycomb. The entire structure is bonded together with plastic bonding material.

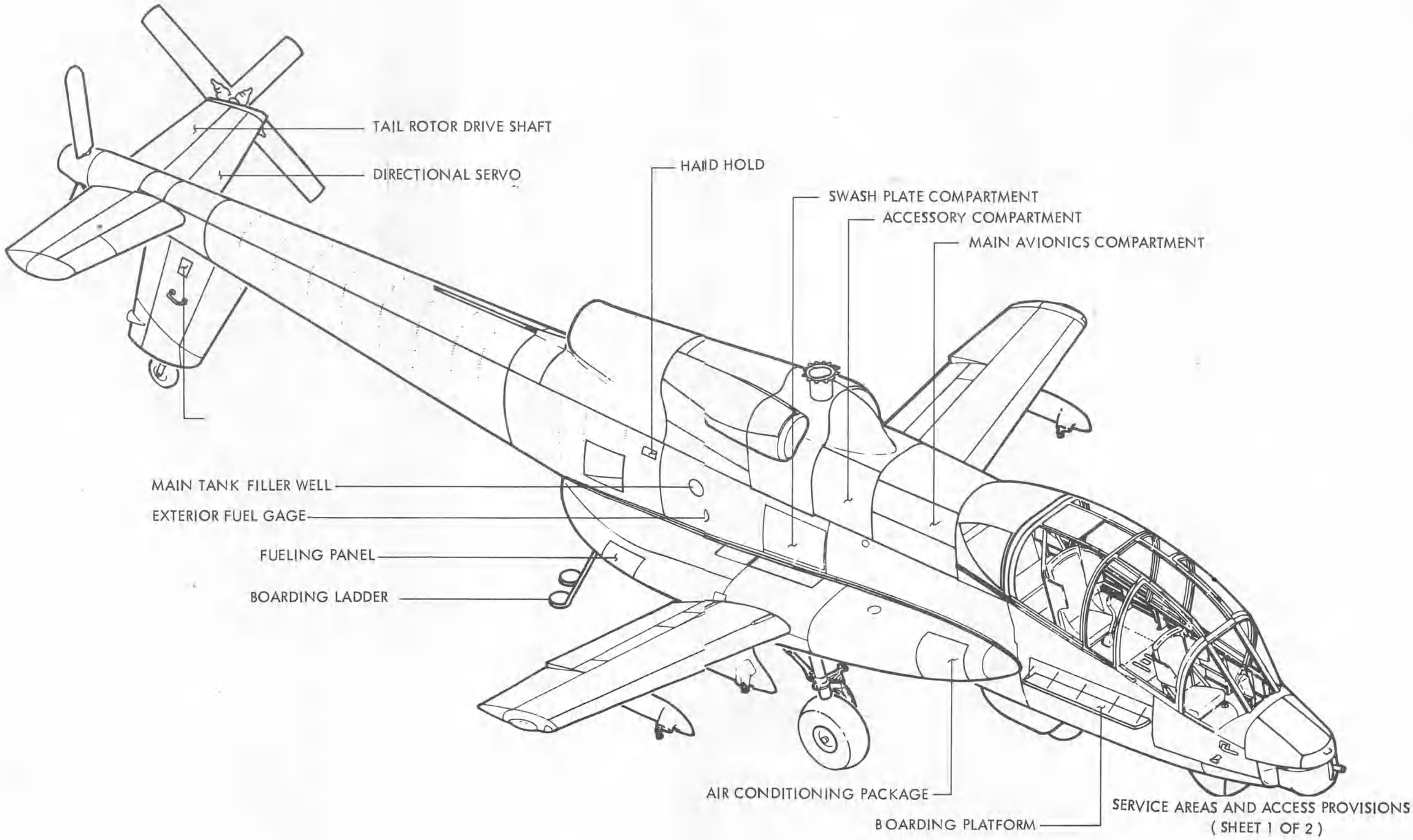


THREE VIEW DIAGRAM OF THE AH-56A

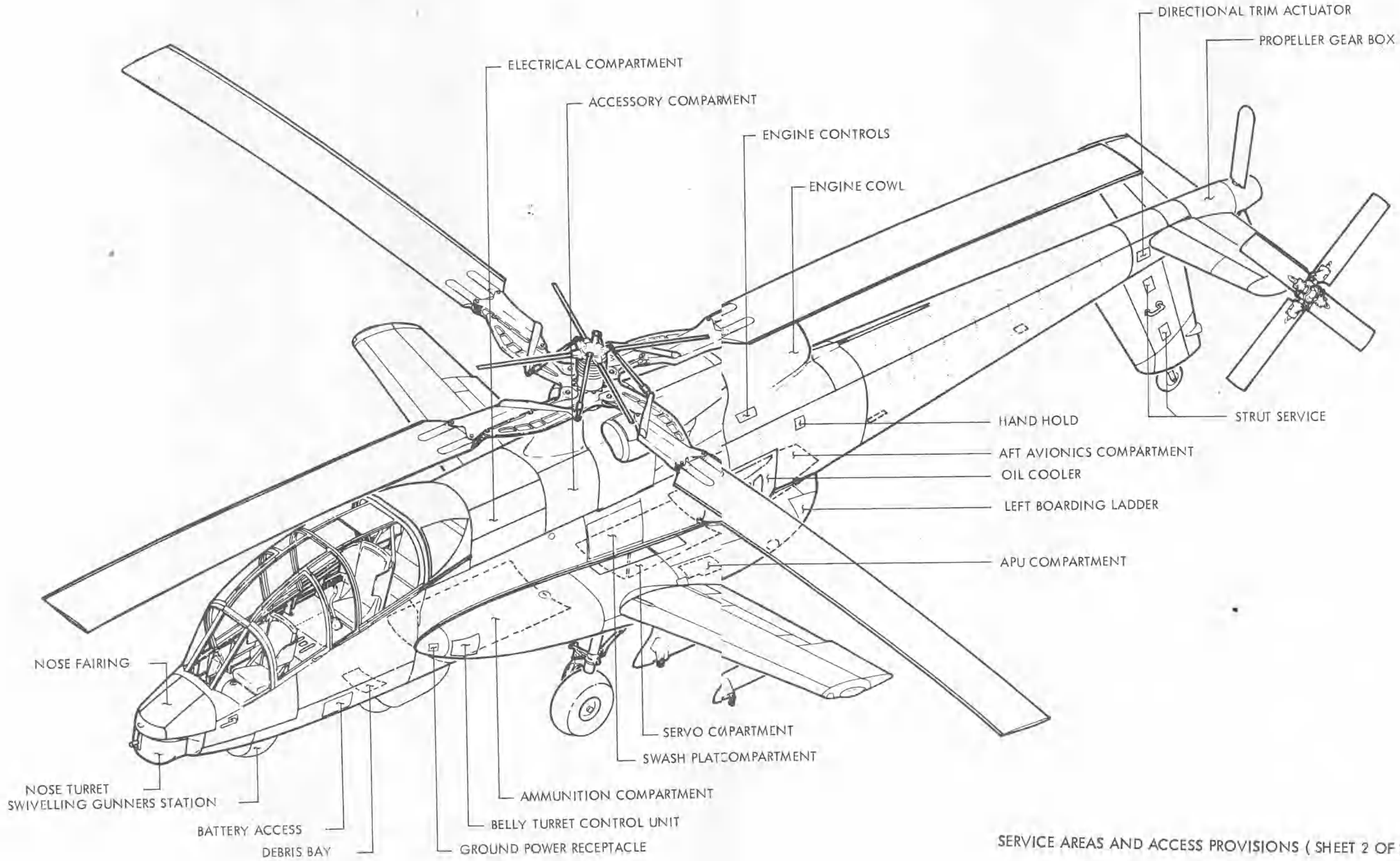


AIRCRAFT STRUCTURAL BREAKDOWN

FIGURE 2
AH-56A

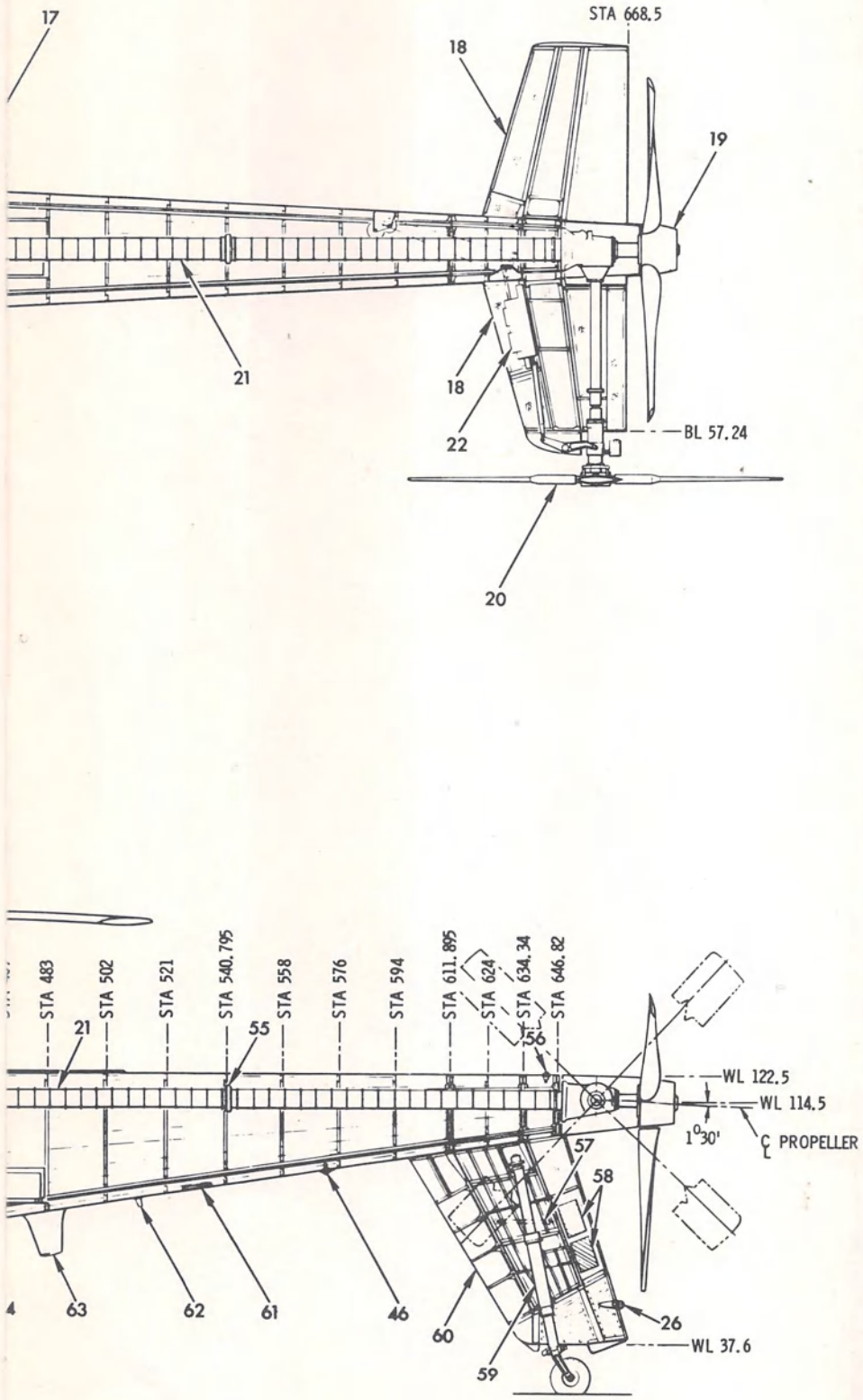


SERVICE AREAS AND ACCESS PROVISIONS
(SHEET 1 OF 2)



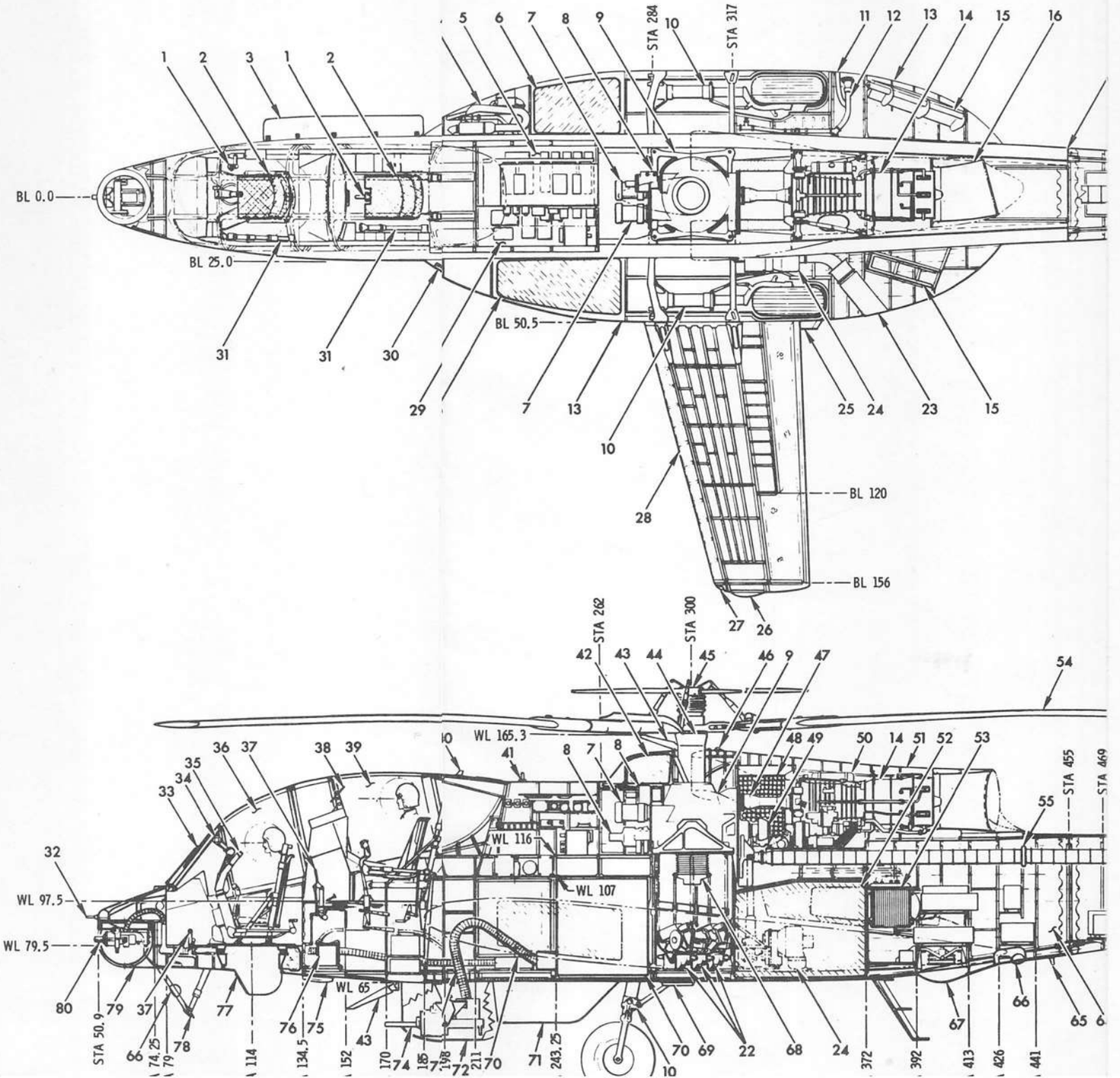
SERVICE AREAS AND ACCESS PROVISIONS (SHEET 2 OF 2)

FIGURE 4
AH-56A



1 Cyclic stick
2 Seat
3 Cockpit walkway
4 Environmental control unit
5 Main avionics compartment
6 Fuel tank
7 Generator
8 Hydraulic power package
9 Main transmission
10 Main landing gear
11 Drum fueling adapter
12 Pressure fueling adapter
13 Sponson
14 Engine
15 Boarding ladder
16 Tailpipe
17 Aft fuselage separation joint
18 Horizontal stabilizer
19 Propeller
20 Tail rotor
21 Propeller/tail rotor drive shaft
22 Servo actuator
23 APU exhaust
24 Auxiliary power unit
25 HF/SSB antenna strap
26 Anticollision light
27 Navigation light
28 Wing
29 Electrical compartment
30 External power receptacle
31 Collective lever
32 Glide slope antenna
33 Windshield wiper
34 Direct sight
35 Periscope sight
36 Copilot/gunners station
37 Directional pedals
38 Pilots direct sight
39 Pilots station
40 IFF antenna
41 VHF/FM homing antenna
42 Transmission oil tank
43 Cable cutter
44 Main rotor mast
45 Main rotor control gyro
46 Fuselage light
47 Torquemeter shaft
48 Engine air filter cowl
49 Rotor brake
50 Engine oil tank
51 Engine cowl
52 Oil cooler inlet
53 Oil cooler
54 Main rotor
55 Support bearing
56 Navigation and formation light
57 VOR/LOC antenna
58 VHF/FM antenna
59 Tail landing gear
60 Ventral fin
61 LORAN antenna
62 DME antenna
63 VHF/AM and UHF/AM antenna
64 Aft avionics compartment
65 IFF antenna
66 Searchlight
67 Doppler radome
68 Swashplate
69 ADF loop antenna
70 Magazine drum
71 Aft turret fairing
72 Belly turret
73 Ammunition chute (typical)
74 30-mm automatic gun
75 Marker beacon antenna
76 Battery
77 Periscope
78 Nose skid
79 Nose turret
80 40-mm grenade launcher
(alternate: 7.62-mm machine gun)

INBOARD PROFILE


BL 0.0
BL 25.0
BL 50.5
BL 120
BL 156
STA 284
STA 317
STA 262
STA 300
STA 455
STA 469
WL 165.3
WL 116
WL 107
WL 97.5
WL 79.5
WL 65
STA 50.9

COMPARTMENT OR AREA	TYPE AND LOCATION OF SERVICE ACCESS	TYPE OF FASTENERS	MAJOR EQUIPMENT
Nose Turret	Removable fairing on top of nose	19 camloc fasteners	Gun feed chutes and mechanism
	Removable fairing on turret	4 camloc fasteners	Gun and turret operating mechanism
Cockpits	Clamshell doors on right side	Bolt latches controlled by handle on lower frame	Copilot/gunner and pilot stations.
Swivelling Gunner Station	Sight head--Rotating bowl shaped cover under fuselage below copilot/gunner station	Solenoid operated latch which may be manually released by pressing with drift punch through hole near top edge to right of sight window opening	Sight head window and vent dessicator unit
	Upper sight elements -- Accessible from copilot/ gunner station	------	All elements above the turn-table and attachments for sight head.
Battery	Connection and disconnection--Access door on left side of fuselage just aft of sight head	2 quick release latches	Battery disconnect and one ICS ground station.
	Removal and replacement -- Plastic panel forming forward wall of debris bay	Camloc fasteners	Battery, inverter, and copilot/gunner flight control linkage
Debris bay	Electrically operated doors in bottom of fuselage directly under pilot station	Operated by electrical actuator controlled by switches in ground power receptacle box and in pilot's station	Access to battery, flight control linkage, brake cylinders, inverter, weapons control unit

TABLE I
SERVICE COMPARTMENT LOCATIONS AND ACCESS

COMPARTMENT OR AREA	TYPE AND LOCATION OF SERVICE ACCESS	TYPE OF FASTENERS	MAJOR EQUIPMENT
Boarding Platform	Hinged walkway on right side of fuselage at cockpit area	1 quick release latch	No equipment, used as access walkway to cockpit area
Ground Power Receptacle	Hinged panel in forward end of left sponson	1 quick release latch	Ground power receptacle, debris bay door switch, and ground power monitor switch
Air Conditioning Unit Compartment	Panel on forward end of right sponson	31 semi-quick fasteners	Environmental control air conditioning package
Belly Turret	Removable fairings on and around turret	Camloc fasteners, screws and quick release fasteners	Gun and turret mechanisms
Ammunition compartments	Hinged access panels	Forward panel - 3 quick release latches. Aft panel - 17 semi-quick fasteners	Nose gun ammunition in forward and belly gun ammunition in aft compartment
Electrical Compartment	Double hinged panel on upper left side of fuselage just aft of cockpit area	3 quick release latches	Electrical system relays, transformer/rectifiers, and supervisory/regulators
Main Avionics Compartment	Double hinged panel on upper right side of fuselage just aft of cockpit area	3 quick release latches	Central computer complex, ADF, and associated items
Accessory Compartment	Hinged panels on upper fuselage on both sides just aft of electrical and avionics compartments	5 quick release latches on each panel	Hydraulic power packages, alternators, hydraulic fill unit, forward end of main transmission

TABLE I
SERVICE COMPARTMENT LOCATIONS AND ACCESS

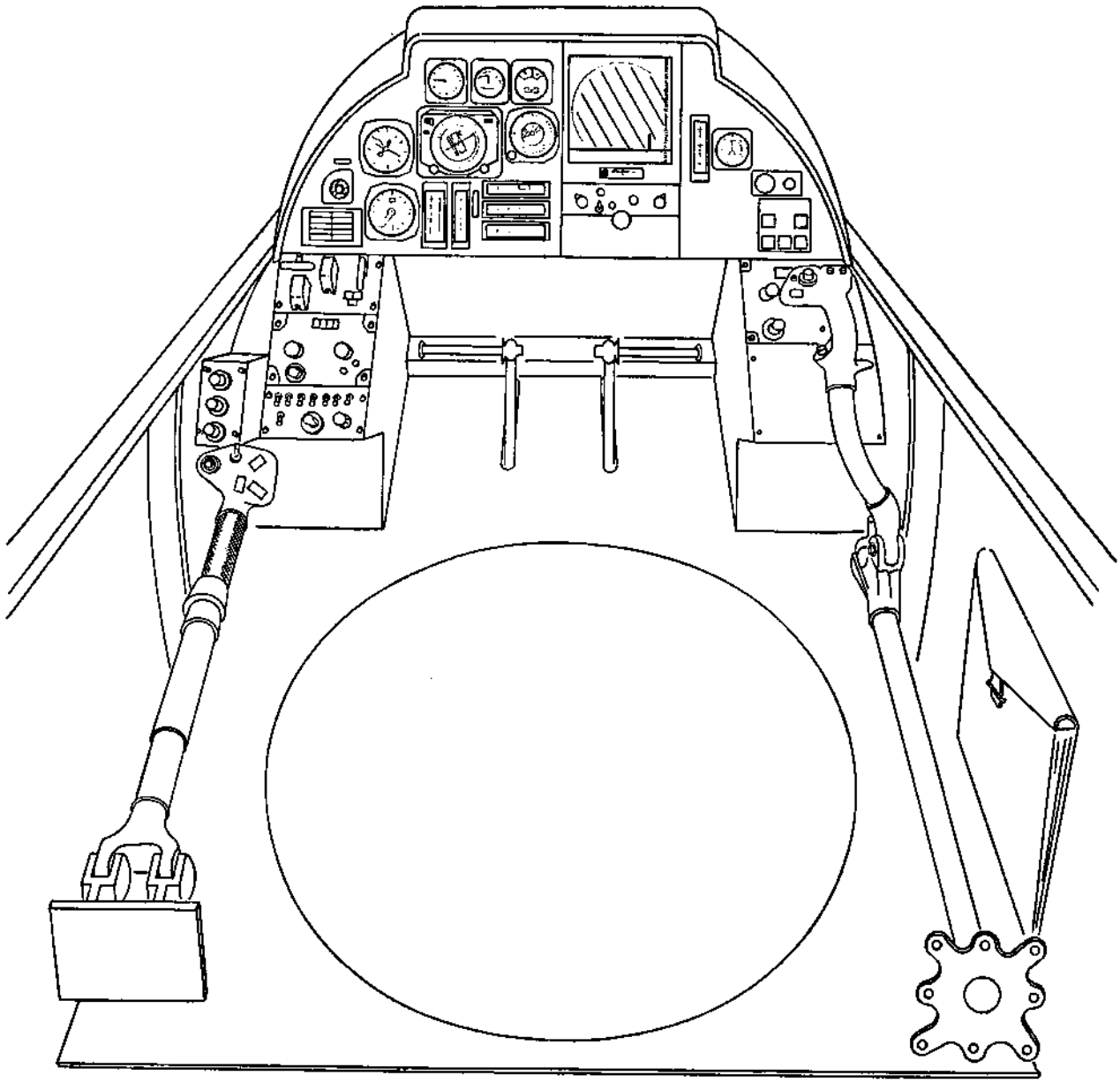
COMPARTMENT OR AREA	TYPE AND LOCATION OF SERVICE ACCESS	TYPE OF FASTENERS	MAJOR EQUIPMENT
Automatic Flight Control System Gyro Compartment	Cover plate in left forward end of accessory compartment	9 semi-quick fasteners	AFCS gyros and accelerometers
Swash Plate Compartment	Hinged panel on either side of fuselage just above sponson and centered on rotor mast	17 semi-quick fasteners on each panel	Swash plate and control rod ends
Controls Servo Compartment	Hinged panel in bottom of fuselage directly below rotor mast, also through cutouts in floor of swash plate compartment	14 semi-quick fasteners on bottom panel	Flight control servos
Engine Compartment	Sliding cowl on top of fuselage aft of rotor mast	2 quick release latches with camloc safety locks	Engine and engine accessories
Auxiliary Power Unit Compartment	Panel inboard aft end of left wheel well and hinged panel lower side of left sponson	15 camloc fasteners for both panels	Auxiliary power unit and right angle gear box
Fueling Control Panel	Hinged panel aft end of right sponson	2 quick release latches	Pressure fueling connector, drum fueling connector, and fueling controls
Left Boarding Ladder	Manually operated ladder stowed in aft end of left sponson	1 quick release latch	No equipment, ladder used for boarding left sponson

TABLE I

SERVICE COMPARTMENT LOCATIONS AND ACCESS

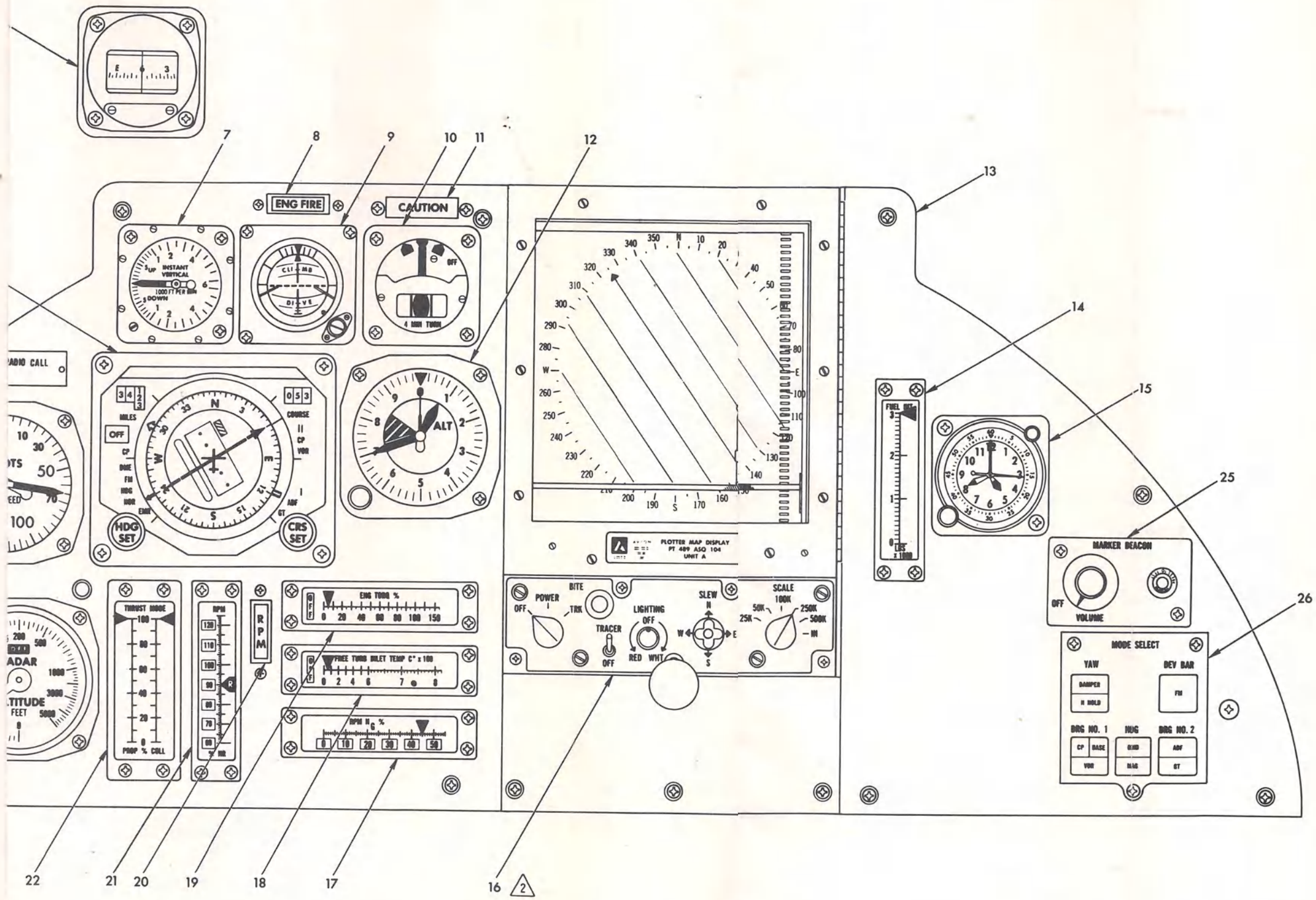
COMPARTMENT OR AREA	TYPE AND LOCATION OF SERVICE ACCESS	TYPE OF FASTENERS	MAJOR EQUIPMENT
Aft Avionics Compartment	Hinged panel in bottom of fuselage just forward of aft fuselage mating joint	25 semi-quick release fasteners	Self contained navigation equipment, radio navigation equipment, HF avionics

TABLE I
SERVICE COMPARTMENT LOCATIONS AND ACCESS



COPILOT/GUNNER'S STATION ARRANGEMENT

FIGURE 6
AH-56A

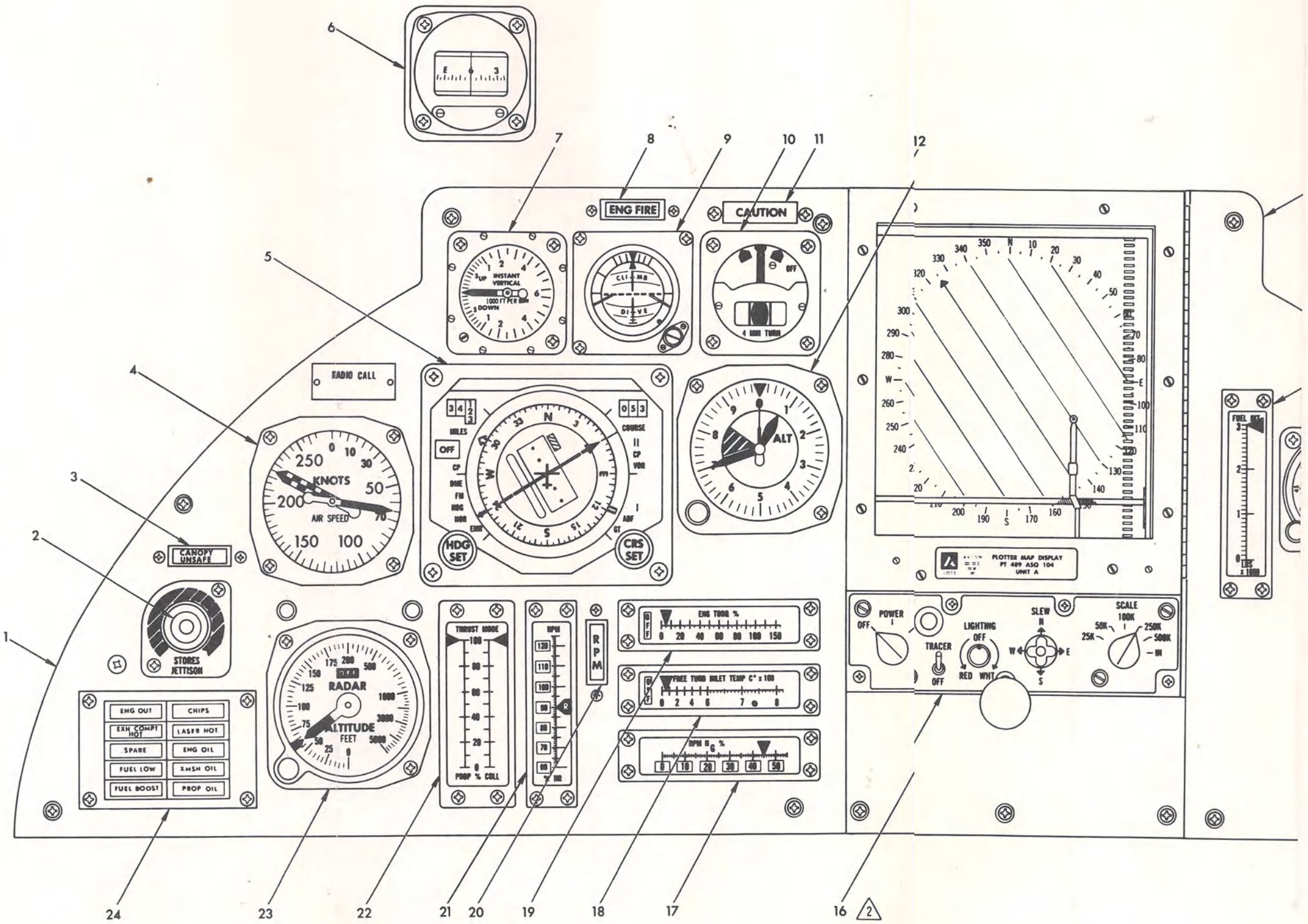


NOTE

1 INSTRUMENTS ARE NOT INSTALLED IN COPILOT/GUNNERS STATION ON AIRCRAFT SERIAL NO. 66-8826

△2 NOT INSTALLED ON AIRCRAFT SERIAL NO. 66-8826 AND 66-8827

COPILOT/GUNNER'S MAIN INSTRUMENT PANEL


ENG FIRE
CAUTION
INSTANT VERTICAL
1000 FT PER MIN
CLIMB
DIVE
OFF
4 MIN TURN
RADIO CALL
KNOTS
AIR SPEED
HDG SET
CRS SET
ALT
CANOPY UNSAFE
STORES JETTISON
RADAR
ALTITUDE
FEET
ENG OUT
CHIPS
EXH COMPT HOT
LASER HOT
SPARE
ENG OIL
FUEL LOW
XMSN OIL
FUEL BOOST
PROP OIL
THRUST MODE
PROP % COLL
RPM
ENG TORQ %
FREE TURB INLET TEMP C° x 100
PLOTTER MAP DISPLAY
PT 489 ASQ 104
UNIT A
POWER
OFF
TRACER
LIGHTING
RED
WHT
SLEW
SCALE
100K
FUEL QTY
LBS x 1000
1
2
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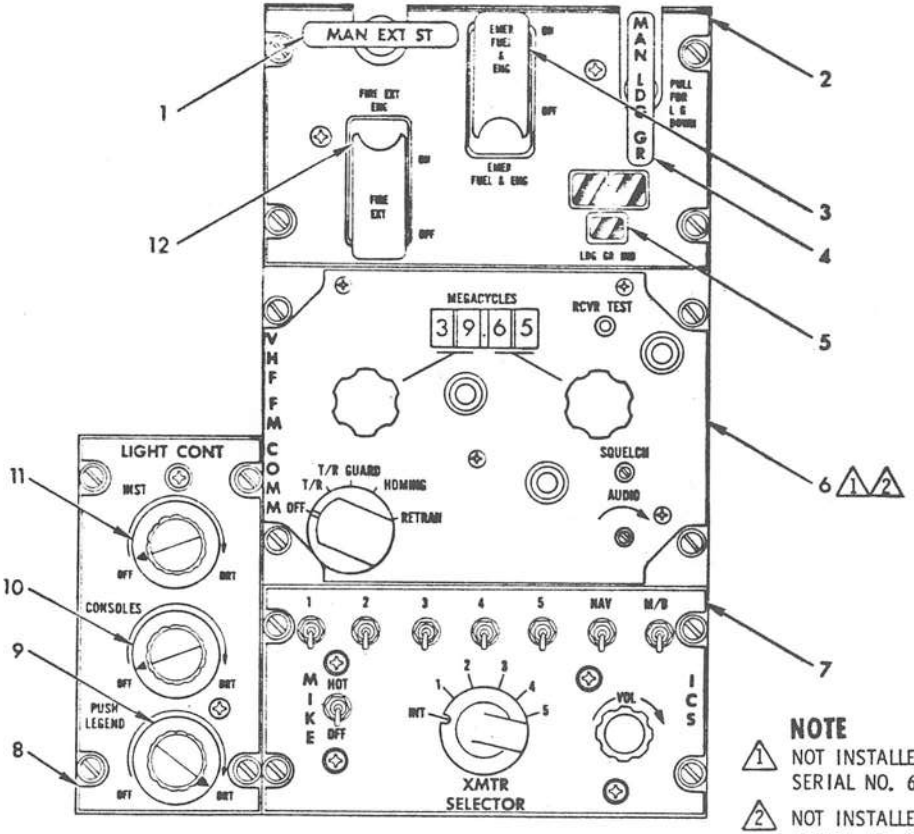
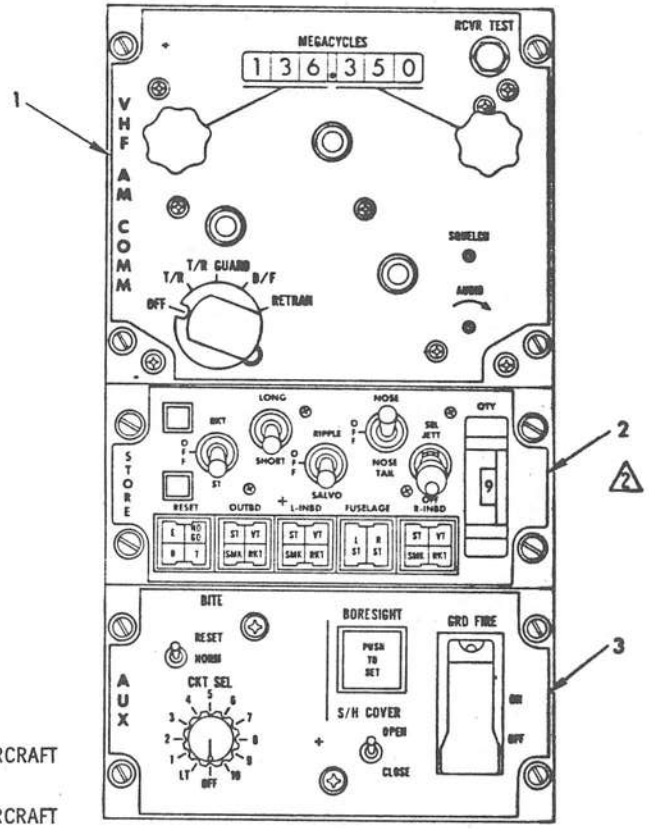




NOTE

1. NOT INSTALLED ON AIRCRAFT SERIAL NO. 66-8827
2. NOT INSTALLED ON AIRCRAFT SERIAL NO. 66-8828

COPILOT/GUNNERS LEFT FORWARD PANEL

1. MANUAL STORES RELEASE
2. MISCELLANEOUS EMERGENCY CONTROL PANEL
3. EMERGENCY FUEL AND ENGINE SHUTOFF SWITCH
4. MANUAL LANDING GEAR RELEASE HANDLE
5. LANDING GEAR POSITION INDICATORS
6. VHF/FM CONTROL PANEL ARC-114
7. ICS CONTROL PANEL
8. LIGHTING CONTROL PANEL
9. PUSH LEGEND LIGHTS RHEOSTAT
10. CONSOLES LIGHT RHEOSTAT
11. INSTRUMENT LIGHT RHEOSTAT
12. ENGINE FIRE EXTINGUISHER

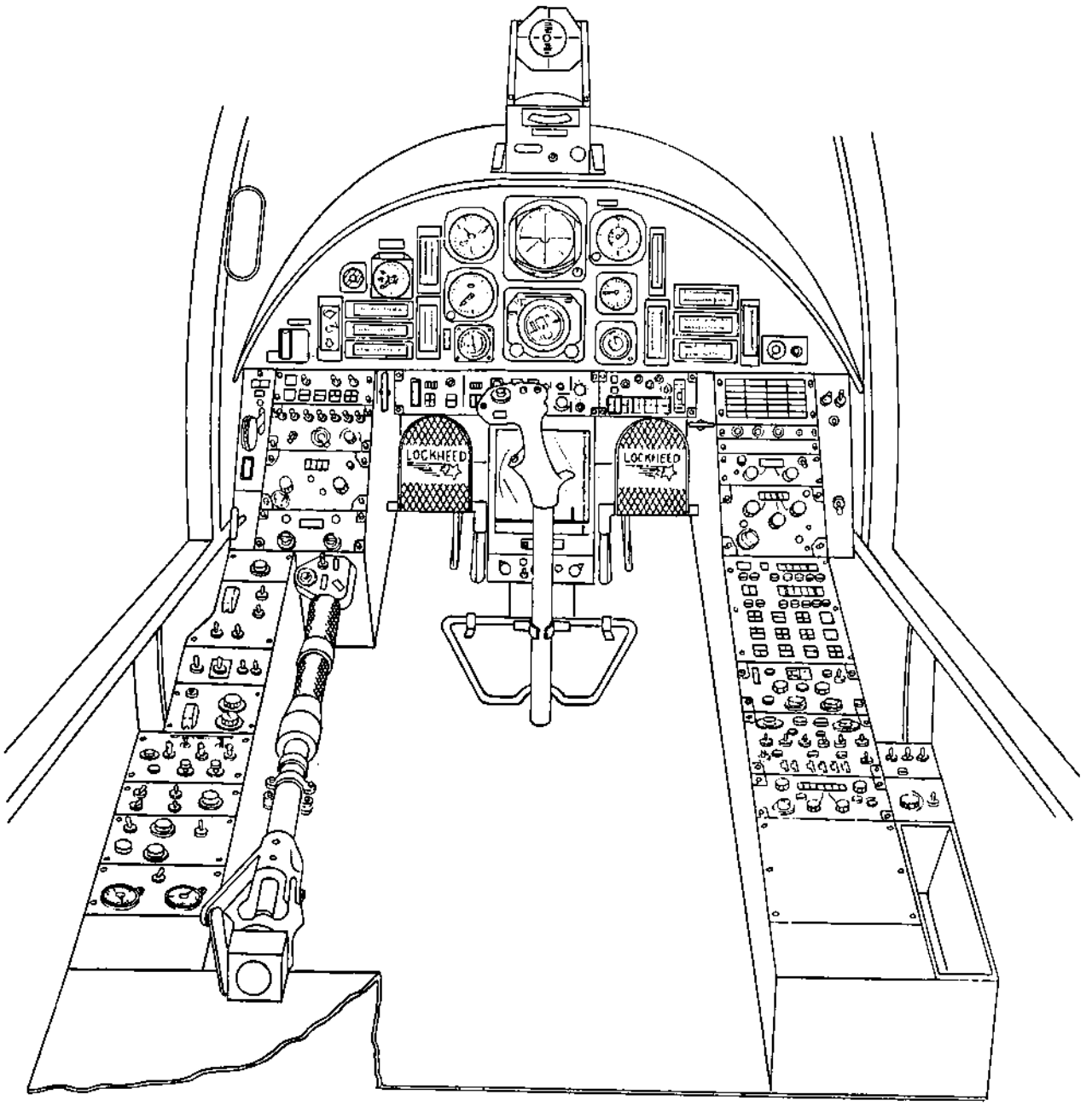
COPILOT/GUNNERS RIGHT FORWARD PANEL

1. VHF/AM CONTROL PANEL ARC 115
2. STORES CONTROL PANEL
3. AUXILIARY WEAPONS PANEL

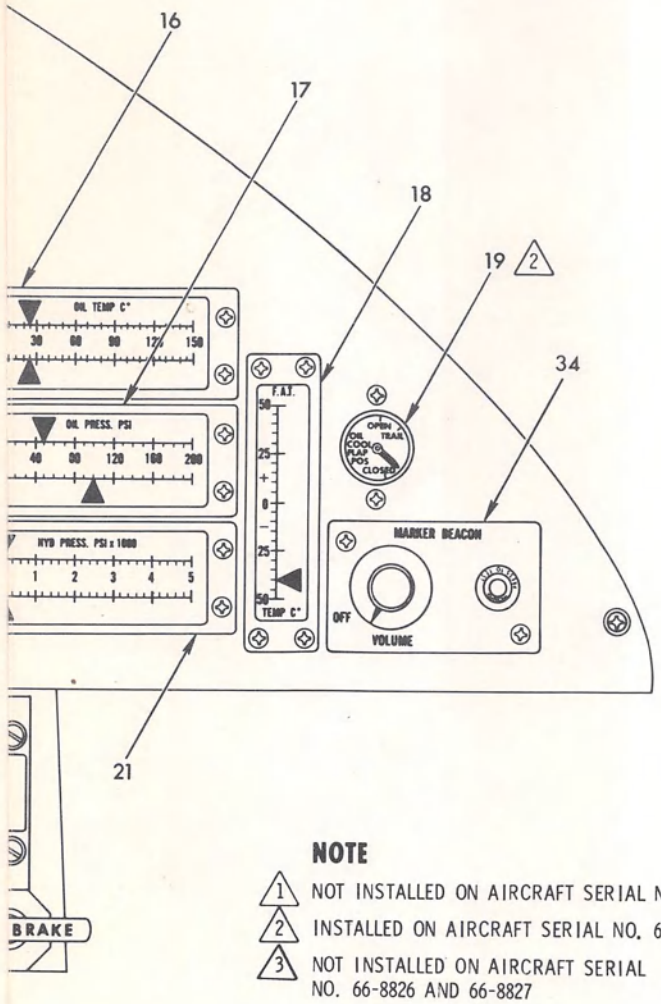
HG 06652
F10A-P-2-13

COPILOT/GUNNER'S FORWARD PANELS

FIGURE 7
AH-56A

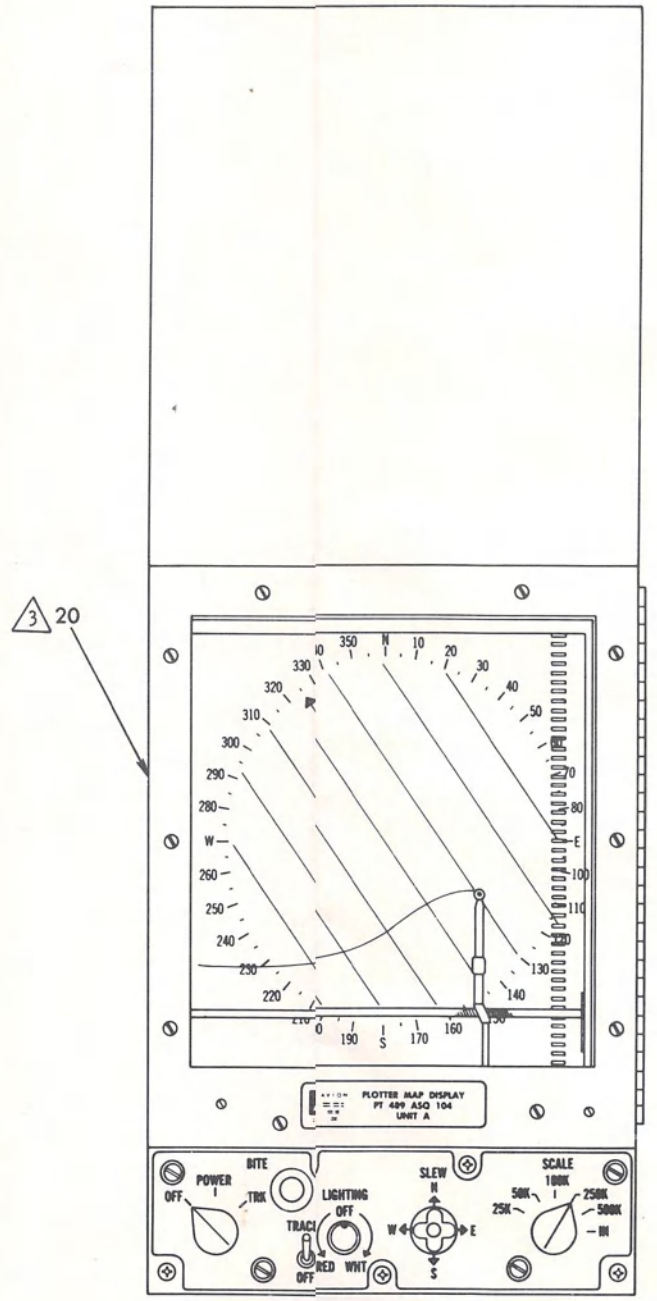


PILOT STATION ARRANGEMENT



NOTE

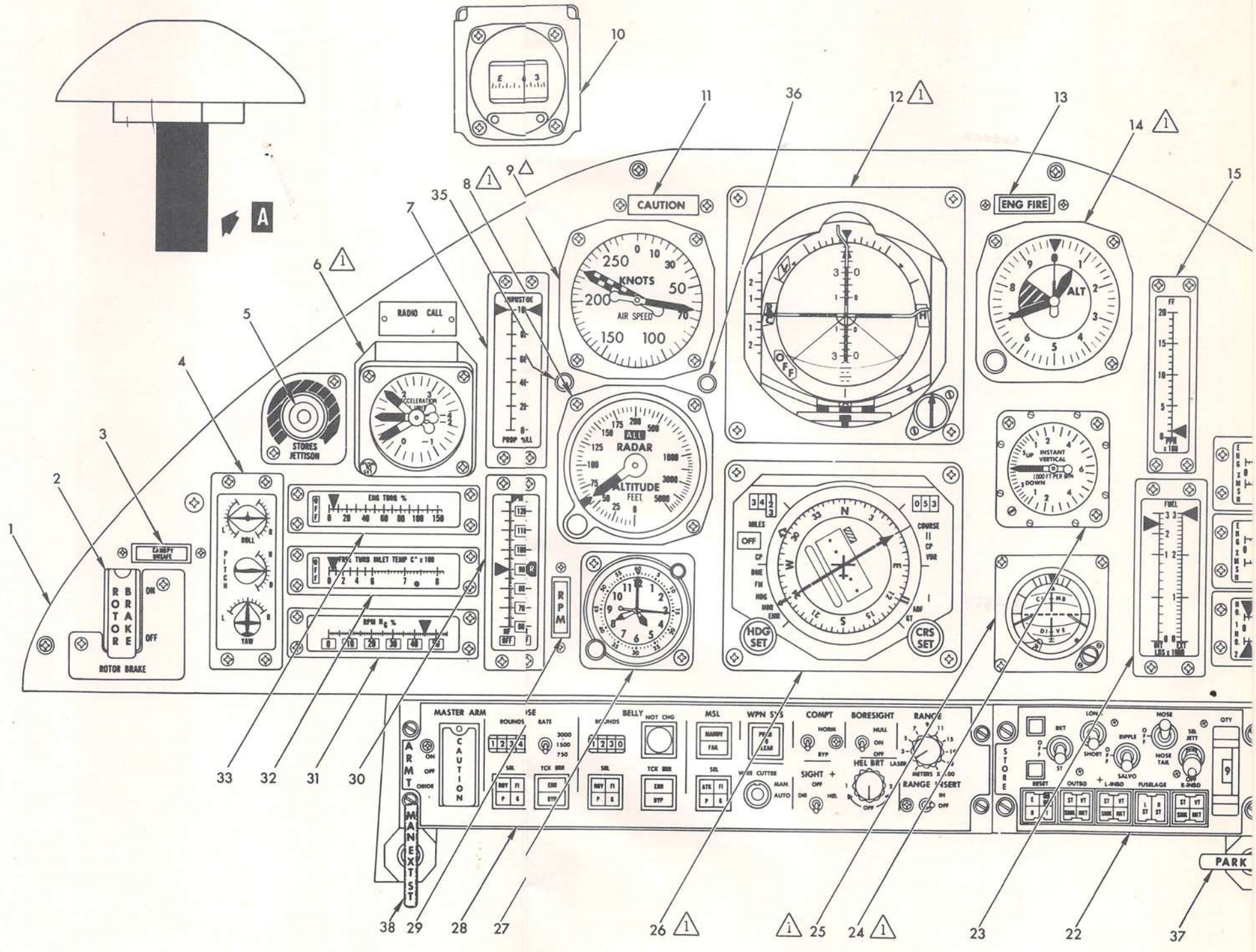
1. NOT INSTALLED ON AIRCRAFT SERIAL NO. 66-8826
2. INSTALLED ON AIRCRAFT SERIAL NO. 66-8827, ONLY
3. NOT INSTALLED ON AIRCRAFT SERIAL NO. 66-8826 AND 66-8827



VIEW **A**

1. Instrument panel
2. ROTOR BRAKE switch
3. CANOPY UNSAFE warning light
4. Trim position indicator
5. External STORES JETTISON switch
6. Accelerometer
7. Thrust mode indicator
8. Radar altimeter
9. Airspeed indicator
10. Standby compass
11. Master CAUTION light
12. Attitude director indicator
13. ENG FIRE warning light
14. Altimeter
15. Fuel flow indicator
16. Oil temperature indicator
17. Oil pressure indicator
18. Free air temperature indicator
19. Oil cooler flap position indicator
20. Map plotter
21. Hydraulic pressure indicator
22. Stores control panel
23. Fuel quantity indicator
24. Vertical velocity indicator
25. Standby attitude indicator
26. Bearing distance heading indicator (mod)
27. Clock
28. Weapons panel
29. Rotor RPM warning light
30. Power turbine and main rotor tachometer
31. Gas generator tachometer
32. Power turbine inlet temperature indicator
33. Engine torquemeter
34. Marker beacon control
35. Low altitude indicator
36. Doppler memory indicator
37. PARK BRAKE handle
38. MAN EXT ST release handle

PILOT'S MAIN INSTRUMENT PANEL


A
CAUTION
ENG FIRE
RADIO CALL
KNOTS
AIR SPEED
ALT
RADAR
ALTITUDE
FEET
STORES JETTISON
ROTOR BRAKE
ON
OFF
ROLL
PITCH
YAW
INSTANT VERTICAL
HDG SET
CRS SET
MASTER ARM
ARM
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MAN
EXT ST
CAUTION
BELLY
MSL
WPN SYS
COMPT
BORESIGHT
RANGE
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HEL BRT
RANGE INSERT
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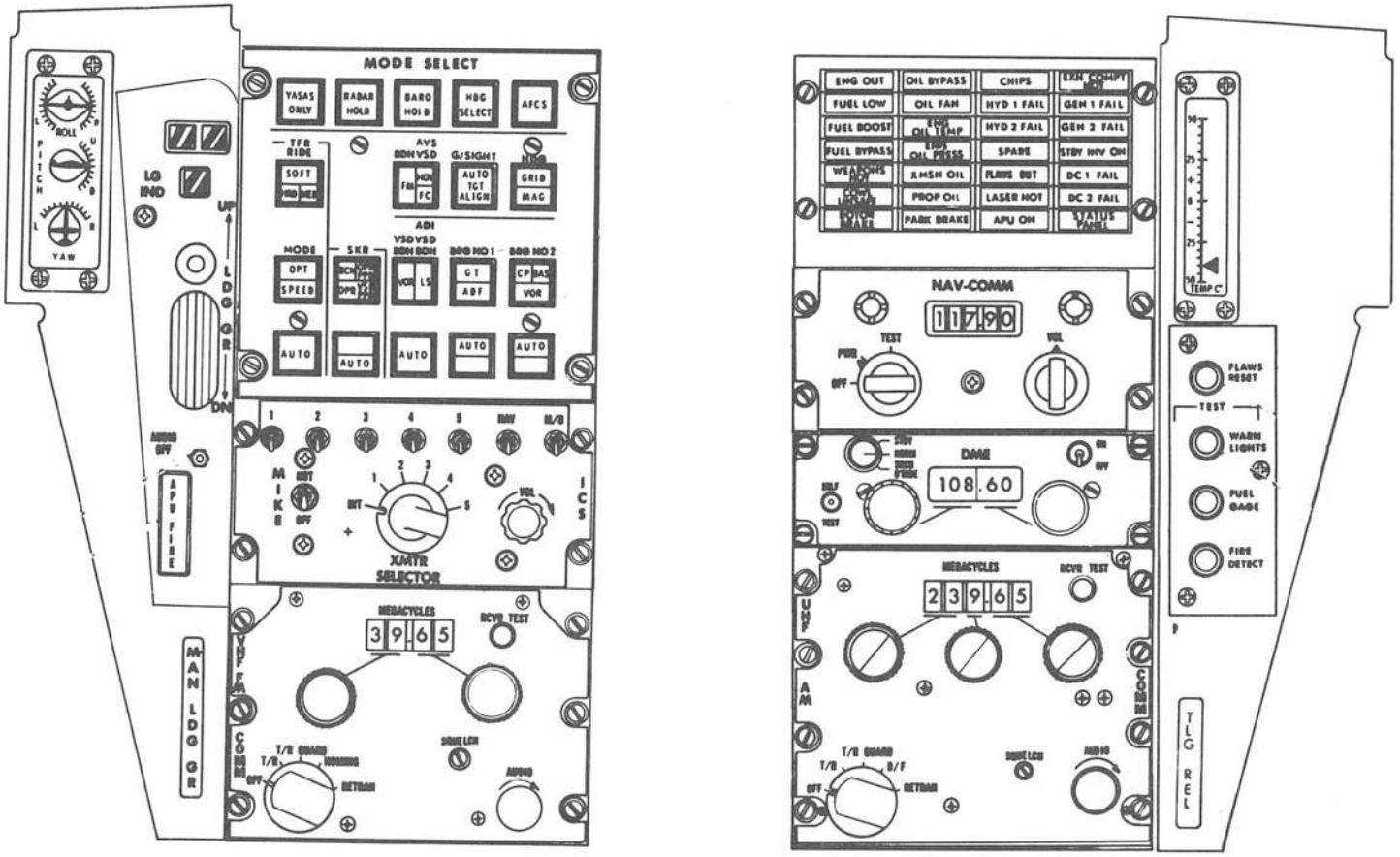
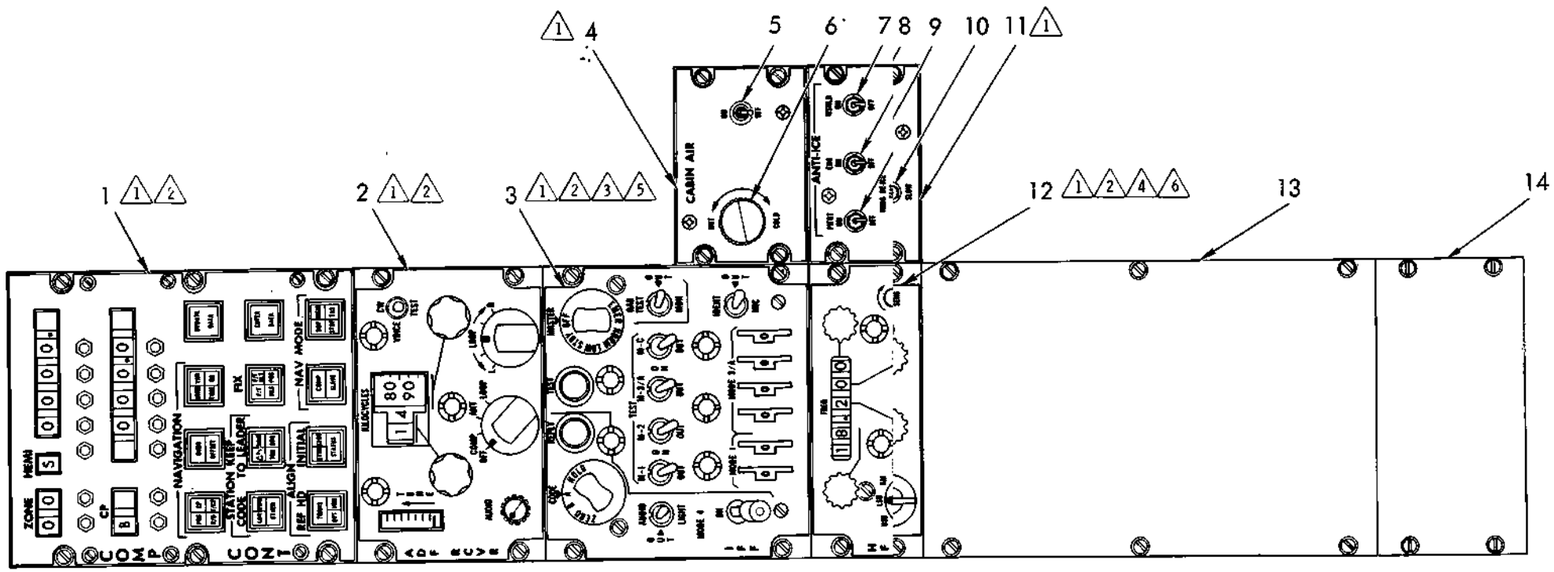


PILOT'S FORWARD PANELS

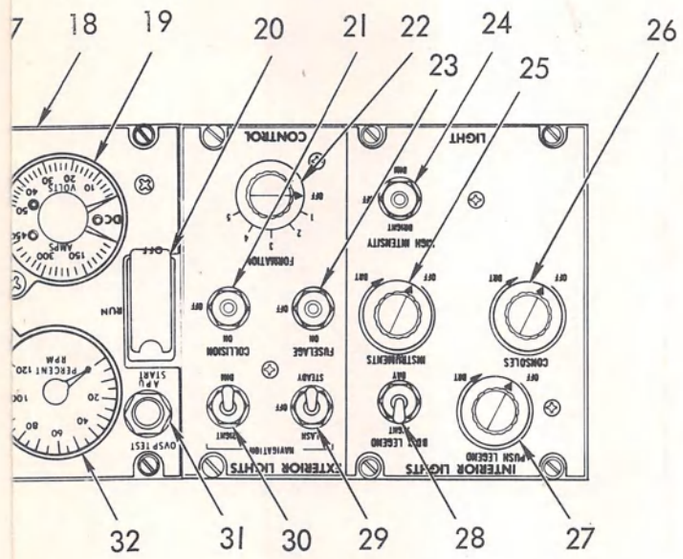
FIGURE 10
AH-56A



1. Computer control panel
2. ADF control unit
3. IFF control unit
4. Temperature control panel
5. CABIN AIR switch
6. CABIN AIR temperature selector
7. WDSHD ANTI-ICE switch
8. ENG ANTI-ICE switch
9. PITOT ANTI-ICE switch
10. WING DE-ICE switch
11. Anti-ice control panel
12. HF/SSB control unit
13. Filler panel
14. Filler panel

1 NOT INSTALLED ON AIRCRAFT ERIAL NO. 66-8826
2 NOT INSTALLED ON AIRCRAFT ERIAL NO. 66-8827
3 NOT INSTALLED ON AIRCRAFT ERIAL NO. 66-8828
4 NOT INSTALLED ON AIRCRAFT ERIAL NO. 66-8829
5 NOT INSTALLED ON AIRCRAFT ERIAL NO. 66-8830
6 NOT INSTALLED ON AIRCRAFT ERIAL NO. 66-8834

PILOT'S RIGHT CONSOLE



66-8826
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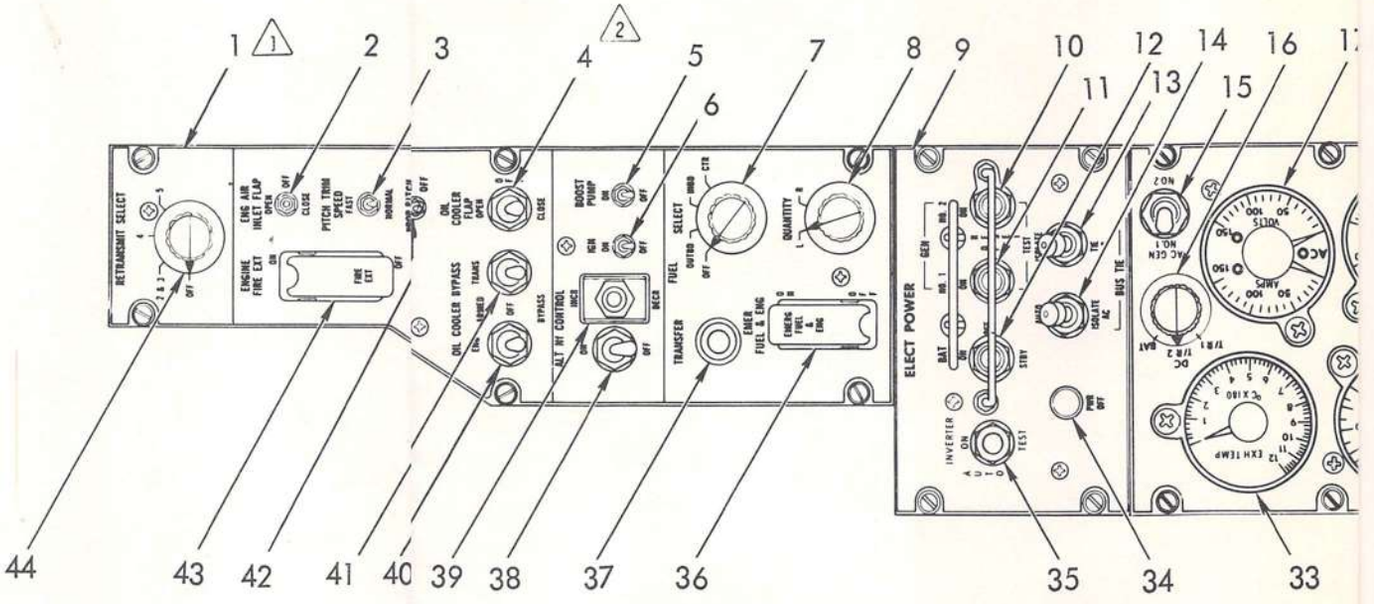
LY

1 Fuel control panel
2 ENG AIR INLET FLAP switch
3 PITCH TRIM SPEED switch
4 OIL COOLER FLAP switch
5 Fuel BOOST PUMP switch
6 Engine IGN switch
7 External FUEL SELECT switch
8 External FUEL QUANTITY switch
9 Electrical power control panel
10 GEN NO. 2 switch
11 GEN NO. 1 switch
12 BAT switch
13 DC BUS TIE switch
14 AC BUS TIE switch
15 AC VOLTAMMETER switch
16 DC VOLTAMMETER switch
17 AC voltammeter
18 Auxiliary power and electrical monitor panel ⚠1
19 DC voltammeter
20 APU switch
21 COLLISION lights switch
22 FORMATION lights variable transformer
23 FUSELAGE lights switch
24 HIGH INTENSITY lights switch
25 INSTRUMENTS lights switch-rheostat
26 CONSOLES lights switch-rheostat
27 PUSH LEGEND lights switch-rheostat
28 BDHI LEGEND lights switch
29 NAVIGATION lights switch
30 NAVIGATION lights intensity switch
31 APU OVSP TEST switch
32 APU tachometer
33 APU exhaust gas temperature indicator
34 Electrical PWR OFF pushbutton
35 INVERTER switch
36 EMER FUEL & ENG shutoff switch
37 External FUEL TRANSFER light
38 ALT Nf CONTROL switch
39 ALT Nf CONTROL master switch
40 ENG OIL COOLER BYPASS switch
41 TRANS OIL COOLER BYPASS switch
42 PROP PITCH switch
43 ENGINE FIRE EXT switch
44 RETRANSMIT SELECT switch

PILOT'S LEFT CONSOLE



⚠1 FUEL CONTROL PANEL FOR AIRCRAFT SERIAL NO.
IS SIMILAR TO PANEL SHOWN EXCEPT PANEL DOE
CONTAIN SWITCHES (4, 35, 36 and 40) AND SWITC
ARRANGEMENT DIFFERS

⚠2 INSTALLED ON AIRCRAFT SERIAL NO. 66-8827, ON

Each blade is attached to the movable hub by two bolts. The bolt nearest the trailing edge is a special expansion bolt to permit easy removal for blade folding. Folding the blades permits storage of the aircraft in a much smaller area than otherwise possible.

Tail Rotor. The tail rotor consists of a gimbal mounted hub and four blades. The rotor diameter is 10 feet.

The blades are constructed of H shaped titanium spar with titanium skins, supported by aluminum honeycomb, bonded to them. The extreme leading and trailing edge cavities are filled with plastic foam. The blades are controlled collectively in pitch by the directional control servo, mounted in the leading edge of the horizontal stabilizer.

Propeller. The propeller is a 10 foot diameter, three bladed, hydraulically actuated, controllable pitch, non-governing, pusher type. The propeller and propeller gear box (which includes the power take off for the tail rotor) are an assembly, and are not separated except at overhaul. The propeller pitch actuator mechanism, located in the propeller hub, may be changed at organizational level.

The propeller blade consists of a steel core with a foam filled fiberglass fairing to form the blade shape. The blades are quickly detachable and may be changed in the field without rebalancing the propeller.

The pitch setting is controlled by the pilot, or copilot/gunner, by use of twist grip controls on the collective sticks. The pitch may be varied from forward to reverse to drive the aircraft in either direction.

2. Engine and Powertrain

Engine. The AH-56A is powered by a T64-GE-16 free turbine engine, rated at 3,445 shaft horsepower under standard conditions. The bare engine weighs 690 pounds. The rated rpm is 13,600, and during operation the engine is essentially constant speed. Ground idle speed is approximately 65% of the rated rpm.

Figure 13 is a very simplified schematic of a basic free turbine engine. The engine is divided into four main sections, the compressor section, the combustion chamber section, the gas turbine section, and the power turbine section.

On the T64 the compressor section consists of a fourteen stage turbine compressor, which draws in approximately 300 cubic feet of air a minute and compresses it at a 13 to 1 ratio, or to about 190 psi. This high pressure air is dumped into the combustion chamber section, where it is mixed with fuel and ignited. From the combustion chamber the hot gases pass through the gas turbine, which extracts about 6,000 horsepower from the flow to drive the compressor. The exhaust from the gas turbine is passed on through the power turbine, which extracts most of the remaining power and transmits it, through the inner coaxial shaft, to the front of the engine. There is very little

power (jet thrust) left in the exhaust from the power turbine. Figure 14 shows an exterior view of the T64 engine.

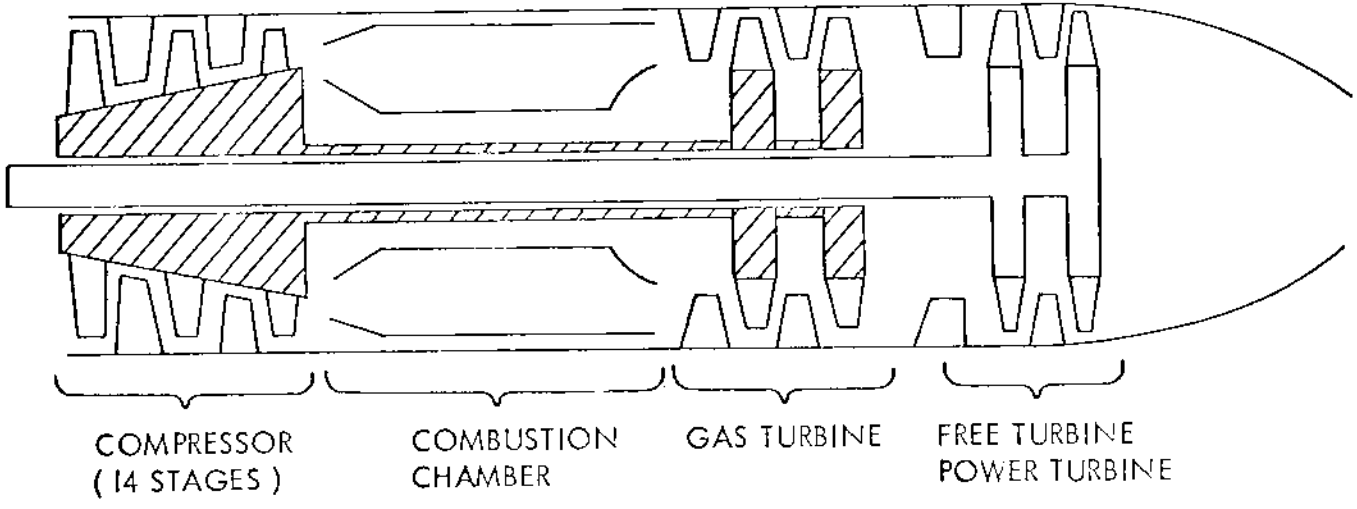
The output of the engine is connected to the main transmission through a torquemeter shaft. This shaft consists of the main power transmitting shaft and a coaxial shell, solidly joined at the engine end. The output ends of the shaft and shell are both flanged, and the flanges are machined into a series of square teeth. As the shaft assembly rotates a pair of electrical pickups sense the passing of these teeth. An electronic circuit measures the difference between the time of passage of the teeth on the shell and those on the main shaft. Under load the main shaft will twist slightly while the unloaded shell will not. The amount of twist will be proportional to the horsepower being transmitted, therefore, the difference in timing of the passage of the teeth on the two flanges will also be proportional to the horsepower. This timing is translated to an indicator reading calibrated in horsepower.

All jet engines are sensitive to foreign object damage. Some protection is given in the AH-56A by the location of the inlet ducts high on the sides of the fuselage. However, a helicopter will stir up a great deal of debris during takeoff and landing, and much of this may be sucked into the air inlets.

To protect the engine from this material, a filter system is installed in the inlet ducts. Figure 15 is a schematic of this system. The two air ducts are split by hinged doors and filter pack assemblies. With the doors in the open position, air can enter the engine plenum chamber directly or through the filters. When required, the doors can be closed to shut off the direct opening into the plenum and force all the air through the filter packs.

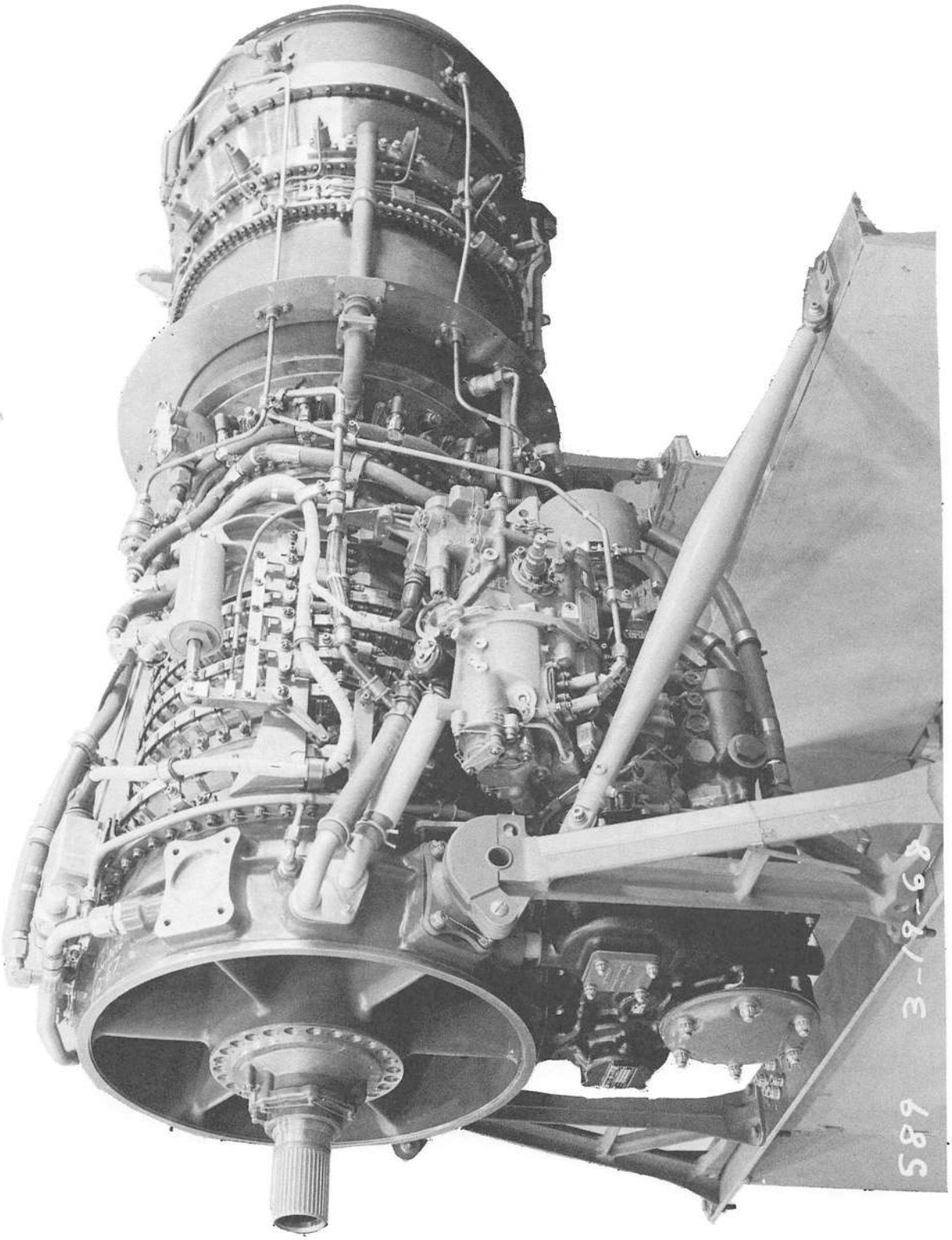
The filter pack consists of a large number of plastic assemblies which contain swirl vanes inside of a tube, with a diverter and exit ports near the down stream end. As dirty air is drawn through the tube it is spun by the vanes, and the heavy dirt is thrown to the wall of the tube by centrifugal force. The diverter assembly picks up the dirty air near the wall of the tube and directs it out through the exit ports into a collection chamber in the filter pack. The clean air continues straight through the tube into the plenum chamber. The dirt in the collection chamber is drawn off by a pair of hydraulically powered scavenge fans and blown overboard.

Under conditions of hovering or slow speed flight the main duct inlets may tend to restrict the inflow of air. Screened openings on the top and sides of the cowling allow extra air to be sucked in through the filter packs at these times to prevent air starving the engine. During high speed forward flight a positive ram pressure is built up in the plenum, and air would be forced backward through the filters and out of these screened areas. This would reduce the efficiency of the system. To prevent this reverse flow, those filter tubes which open into the screened areas are equipped with flapper valves on the inboard ends. Those tubes which are fed by the main ducts do not need the valves and none are installed.

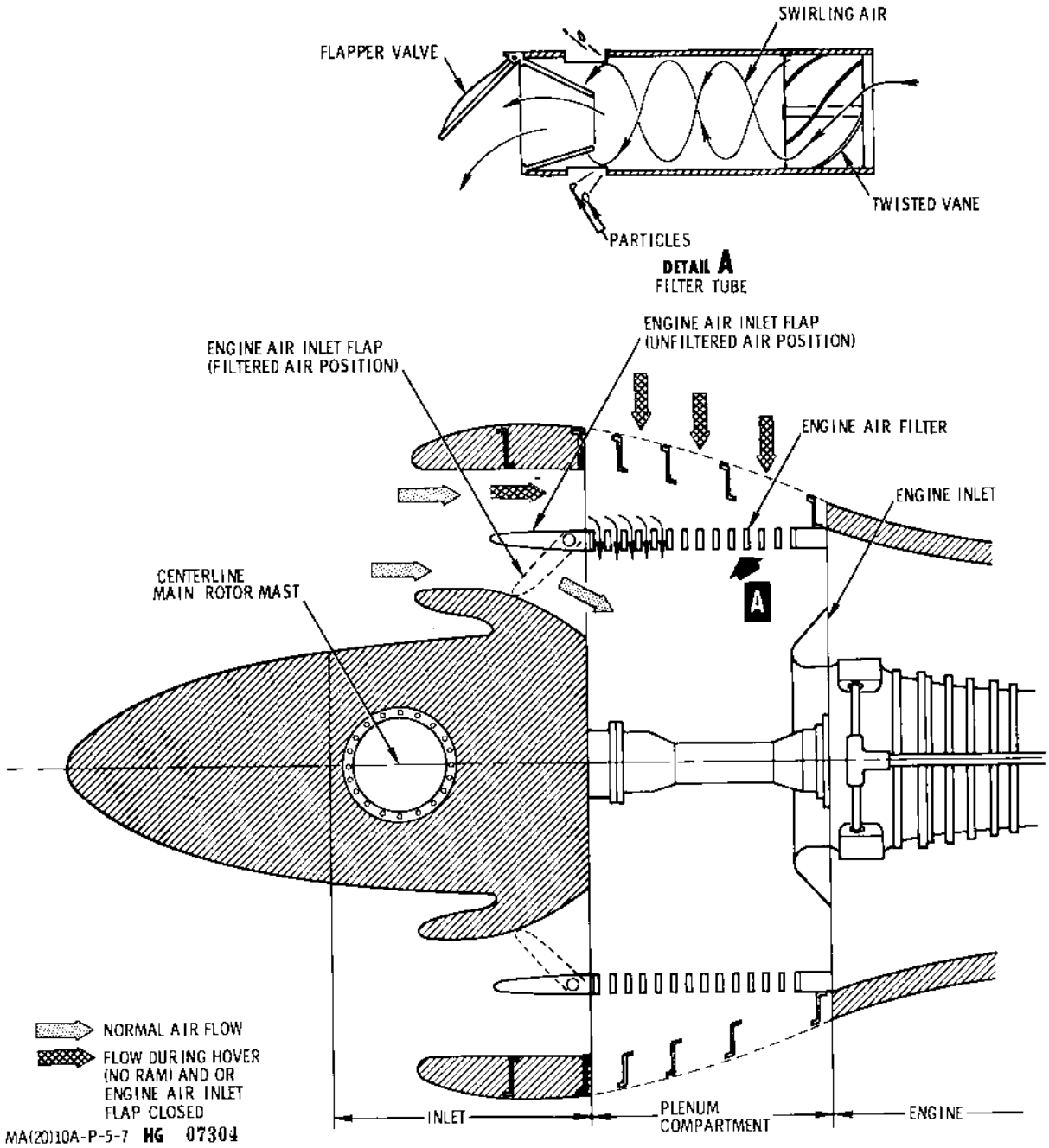


FREE TURBINE ENGINE SCHEMATIC

FIGURE 14
AH-56A



T64-GE-16 ENGINE



AIR INDUCTION SYSTEM SCHEMATIC

Main Transmission. The main transmission is the heart of the powertrain system (see Figure 16). It consists of a cast magnesium case containing spur and planetary gear trains to drive the main rotor, tail rotor and propeller, and the accessories. The transmission receives two separate power inputs; the main engine and the auxiliary power unit. The main engine drives both the rotor system and the accessory drive. An overrunning clutch in the transmission prevents the APU from driving the rotor system. The number 1 hydraulic power package is driven from the main rotor mast and operates whenever the main rotor is turning. This system is used to ensure hydraulic power during autorotation in event of a major failure in the transmission gear train. All other accessories are driven by either the engine or the APU through the accessory drive gear train.

A rotor brake system is provided on the aft side of the transmission housing. The brake is used to prevent windmilling of the rotor system while the aircraft is parked and to reduce the rundown time during shutdown. It may also be used to hold the rotors stationary with the main engine operating at ground idle rpm of the gas turbine.

At 100% engine rpm the main rotor turns 246 rpm and the tail rotor/propeller drive shaft turns at 1717 rpm.

Tail Rotor and Propeller Shaft. The main transmission is connected to the tail rotor and propeller by means of a three section tubular steel shaft. The shaft sections are bolted together and are supported at the joints by shock mounted ball bearings. Spline couplings at each end of the shaft connect into the main transmission and the propeller gearbox. These splines are the barrel type and permit slight misalignment of the shaft and gearboxes.

Propeller Gearbox. The propeller gearbox and propeller are one assembly of two units. This assembly is never separated except at overhaul. The gearbox provides two outputs, a straight through drive for the propeller and a right angle reduction gear drive for the tail rotor. At 100% engine rpm the propeller turns at 1717 rpm and the tail rotor turns at 1240 rpm.

The movement of the propeller control twist grips in the flight stations is mechanically applied to a mechanism in the gearbox, where it is used to control a hydraulic servo mechanism to change the propeller blade pitch. The gearbox contains the necessary hydraulic and lubrication systems to operate as an independent unit and is not connected into the aircraft hydraulic system.

Tail Rotor Drive Shaft. A tail rotor drive shaft connects the propeller gearbox with the tail rotor. The shaft is made of steel tubing and has a barrel spline at the gearbox end and a curvex coupling (face spline) at the rotor end. It is installed along the rear side of the stabilizer box beam and is covered by the trailing edge fairing.

3. Fuel System

The Cheyenne fuel system consists of three internal tanks and up to six external tanks, though present limitations restrict the external tanks to five at one time. The engine feed is from the main tank only, with the

other tanks transferring fuel into the main tank as needed. Fueling may be accomplished by using a single point pressure fueling system, by drum fueling (using the aircraft pump to suck fuel from storage tanks), or by regular fuel nozzles through filler wells.

Fuel Tanks. Figure 17 shows the relative positions of the fuel tanks. The main tank is located in the lower portion of the fuselage under the forward end of the engine. It has a capacity of 300 gallons (1,950 pounds) and is self sealing on all surfaces except the top.

The left sponson tank is in the forward end of the sponson. It has a capacity of 78 gallons (506 pounds) and is also self sealing. The right sponson tank is located in the sponson but does not extend as far forward. Space is left forward of the tank for the air conditioning unit, limiting the tank capacity to 60 gallons (390 pounds).

The sponson tanks are interconnected to the main tank at all times. As shown in figure 18, lines from the sponson tanks enter the forward corners of the main tank. A pair of stand pipes and flapper valves prevent fuel from entering the sponson tanks until about 1,000 pounds have been put in the main tank. As the tanks empty, all three will come down together until the sponsons are empty, slightly before the main tank is empty.

Four 450 gallon (2,925 pound) external tanks may be hung on the wing pylons and two 300 gallon (1,950 pound) tanks on the fuselage pylons. These tanks are conventional aircraft drop tanks and have no self sealing properties. Weight limitations restrict the maximum external fuel to the four wing tanks and one fuselage tank. This configuration permits 2,538 gallons (16,497 pounds) of fuel to be carried.

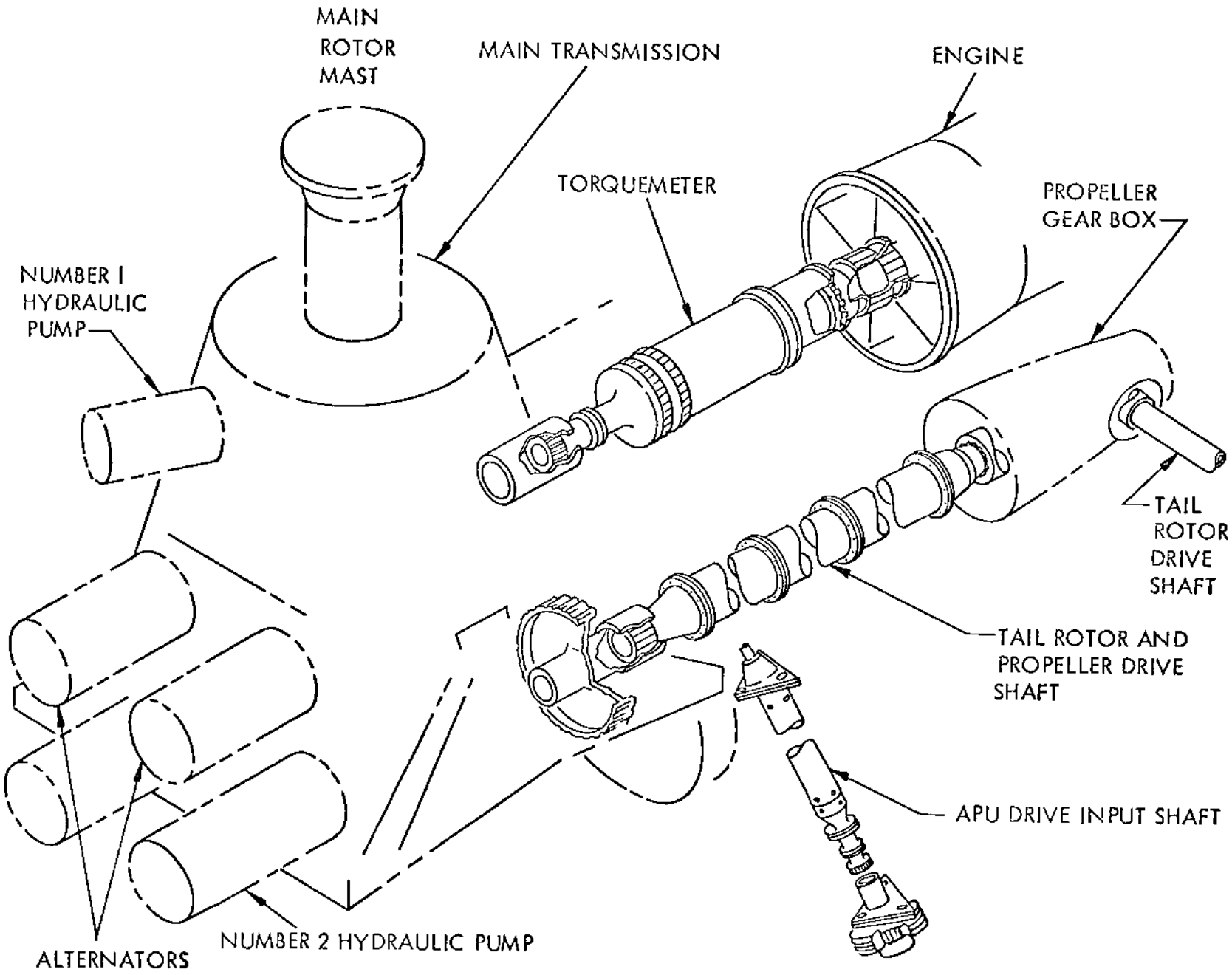
Pilot's Fuel Control Panel. The pilot has sole control of the fuel system, except for an emergency shut off switch in the copilot/gunner's station. The fuel control panel (see figure 19) is located in the forward end of the pilot's left console (see figure 12).

The ALT NF CONTROL switches are part of the engine rpm control system. The IGN switch permits shutting off the ignition system to allow motoring of the engine by the starter without operating the igniter plugs.

The BOOST PUMP switch controls the aircraft fuel boost pump, which provides positive fuel feed to the engine pump, and can also be used for fueling and defueling operations.

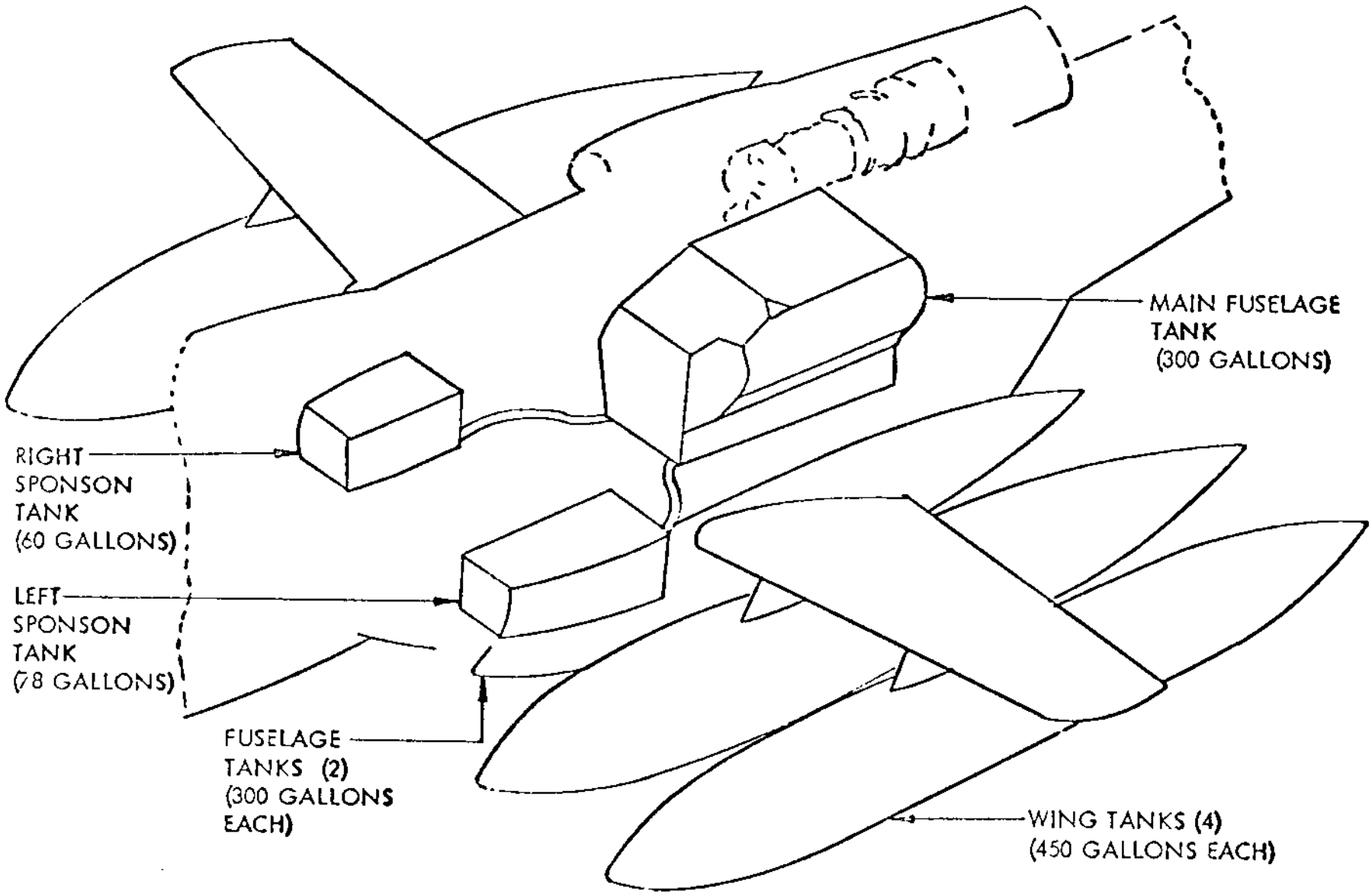
The TRANSFER light is controlled by a pressure switch in the fuel manifold between the external tanks and the main fuel tank. When external tanks are selected to feed, the fuel pressure in the manifold opens the switch and the light is out. When the selected tanks become empty the manifold pressure drops and the light comes on, indicating fuel transfer has stopped.

The SELECT switch selects the pair of external tanks to be fed into the main tank. The external tanks transfer fuel in pairs to maintain lateral



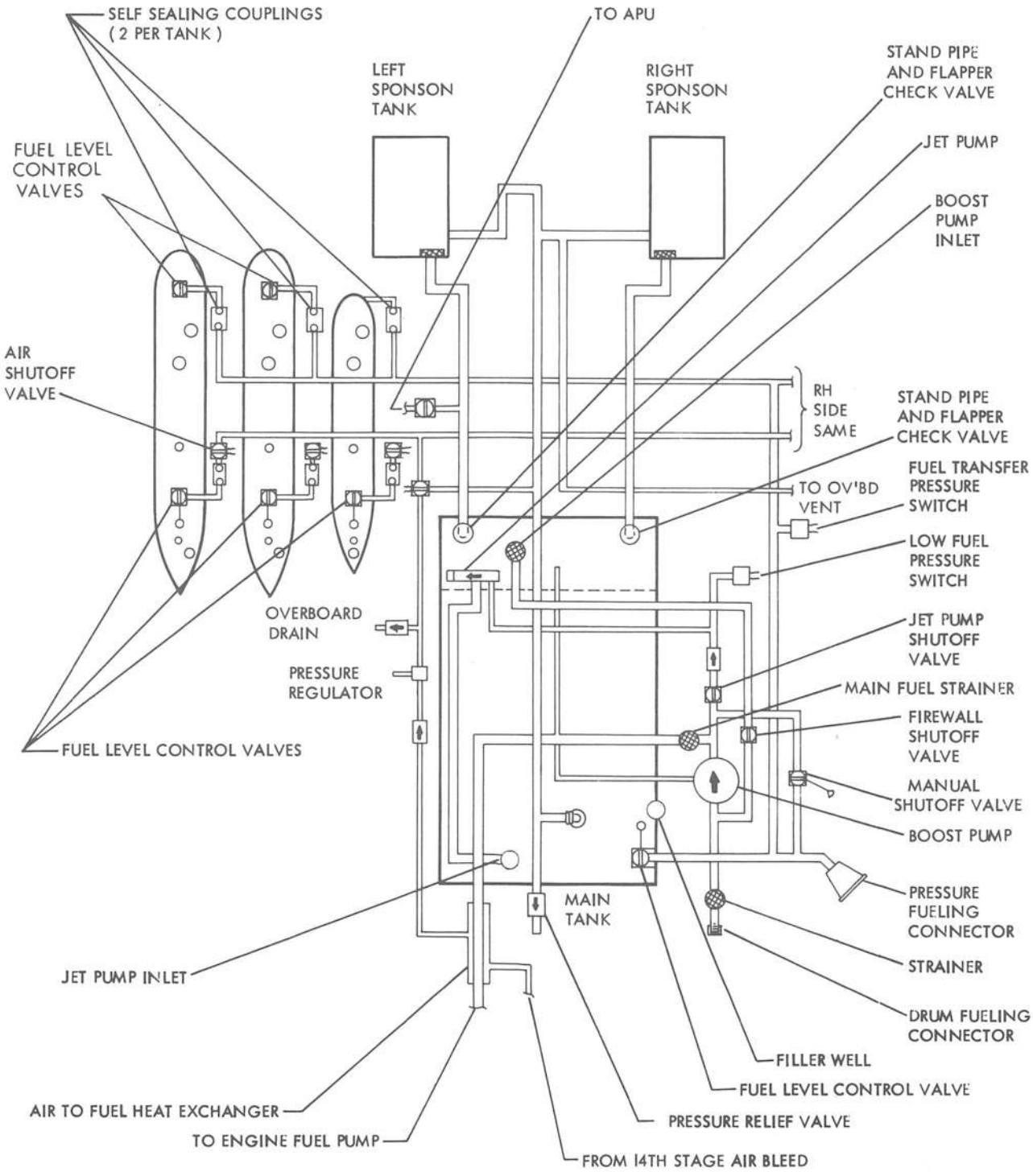
POWERTRAIN COMPONENTS

FIGURE 16
AH-56A

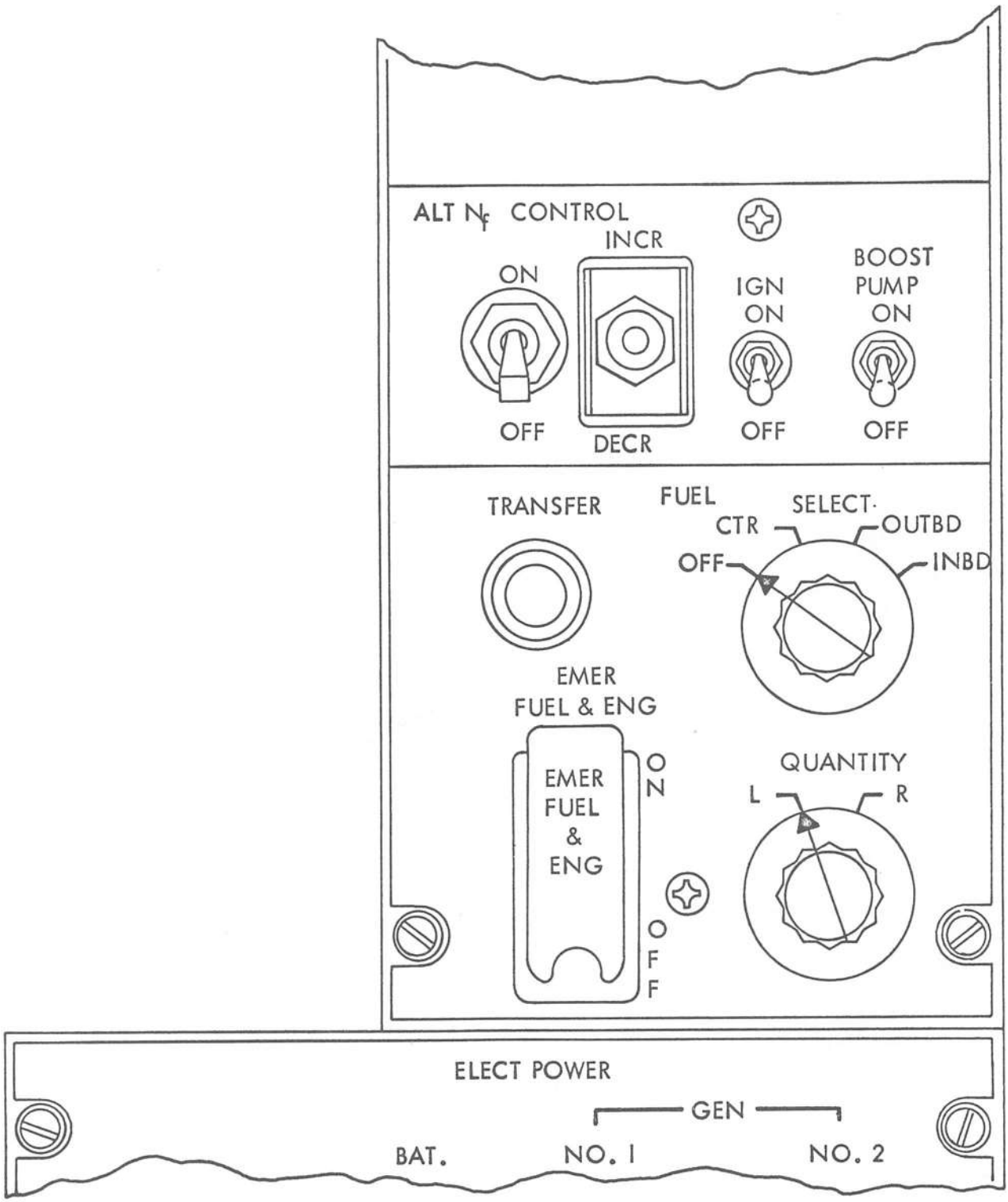


FUEL TANK ARRANGEMENT

FIGURE 17
AH-56A



FUEL SYSTEM SCHEMATIC



PILOT'S FUEL CONTROL PANEL

balance of the aircraft. Selecting a pair of tanks also sets up the fuel quantity circuits for that pair. The QUANTITY switch then selects which tank of the pair will be read on the external fuel quantity gage in the pilot's station.

The EMER FUEL & ENG switch is normally guarded in the ON position and is used to close the firewall shutoff valve in an emergency. This switch also causes the engine fuel control to shut off, stopping the engine even if the firewall shutoff fails to operate. The copilot/gunner also has an EMER FUEL & ENG switch, and both switches must be ON in order to get fuel to the engine.

Fuel Quantity System. Figure 20 is a block diagram of the fuel quantity system. The main fuel tank and the two sponson tanks each contain a float actuated fuel quantity transmitter. These transmitters are connected to totalize the readings of all three tanks on one indicator. Both the pilot and the copilot/gunner have internal fuel quantity indication. The transmitter in the main tank also has a mechanical movement with a dial visible from the fueling position. This dial is calibrated to read the fuel in the main tank when the fuel is below the standpipe level, and the total fuel in the internal tanks when the fuel is above the standpipes. There is an area of doubt at the change over point, and red markings warn that the cockpit gages must be used for accurate readings in that area.

The external tanks are equipped with capacitance type fuel probes. These probes are connected, by use of the SELECT and QUANTITY switches on the fuel control panel, to a gage in the pilot station only. No totalizer is provided and only one tank may be read at a time. The QUANTITY switch selects the left or right tanks, and relays controlled by the SELECT switch connect the desired transmitter to the indicator.

External Fueling Panel. A central fueling-defueling point is provided at the aft end of the right sponson. The panel (see Figure 21) contains a grounding receptacle, a pressure fueling switch and connector, a fuel hose connector for drum fueling, a boost pump switch, and a manual shutoff valve control handle.

For pressure fueling a fueling adapter on the truck hose is connected to the pressure fueling connector, the pressure fueling switch is turned on, and up to 45 psi fuel pressure applied. The system will accept 150 to 300 gallons per minute, depending on the number of tanks being filled. Automatic valves on the main and external tanks shut off the flow when the tanks are full. The sponson tanks fill by gravity flow from the main tank after the fuel level is above the standpipes.

The drum fueling feature uses the aircraft fuel boost pump to suck fuel from a supply tank and pump it into the aircraft tanks. To drum fuel the aircraft, a suction hose is connected to the drum fueling connector, the manual shutoff valve handle is pulled, and the boost pump started. The same automatic tank valves will shut off the flow to the tanks as they are filled.

In event manual fueling is desired, standard filler wells on the

main tank and the external tanks may be used. The external tanks have two wells per tank and internal baffle and valve systems make it necessary to fill the forward section of the tanks first and then the aft section when manual fueling.

4. Hydraulic System

Two hydraulic power systems are used on the AH-56A. The number 1 system powers only the flight controls and is referred to as the primary system. The number 2 system powers the flight controls through a dual set of actuators and also powers all other hydraulic systems. The number 2 system is referred to as the utility system.

Figure 22 is a block diagram of the hydraulic systems. Under normal conditions there is no hydraulic interconnection between the two systems. The four servo units are completely dual and only mechanically interconnected. Either hydraulic system alone will operate the flight controls with some loss of efficiency. The number 1 hydraulic power package is mounted on a pad on the upper right side of the forward face of the main transmission. The pump is driven by a gear mounted on the main rotor mast and will operate whenever the rotor is turning. The number 2 power package is mounted on the lower left accessory pad on the transmission and is powered through the accessory drive either by the APU or the main engine.

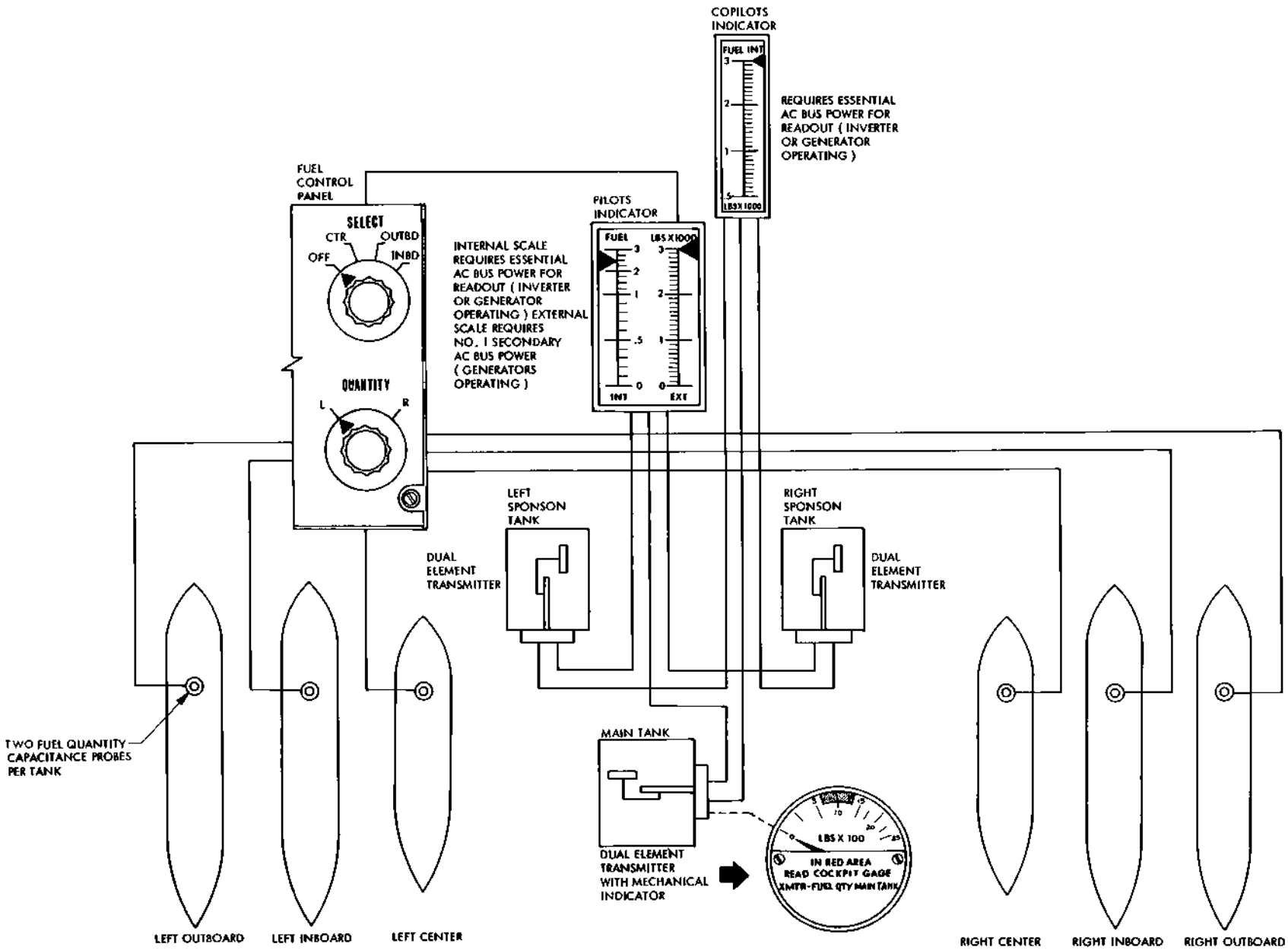
Hydraulic Power Package. (See figure 23.) The two hydraulic power packages are nearly identical except for size. The number 1 package is rated at 5 gpm and the number 2 package at 20 gpm. Each package includes the reservoir, pump, filters, pressure relief valve, low pressure warning transmitter, reverse flow check valve, and a reservoir bleed and relief valve. All of these components, except the pump and reservoir, are identical in both packages.

The package concept was used for reduction of maintenance time as changing one unit will eliminate the majority of the possible faults of the power system.

The hydraulic pumps are inline, axial, 7 pressure piston/cylinder type using a rotating cam plate to determine piston stroke. Output pressure is preset and is not adjustable outside of overhaul.

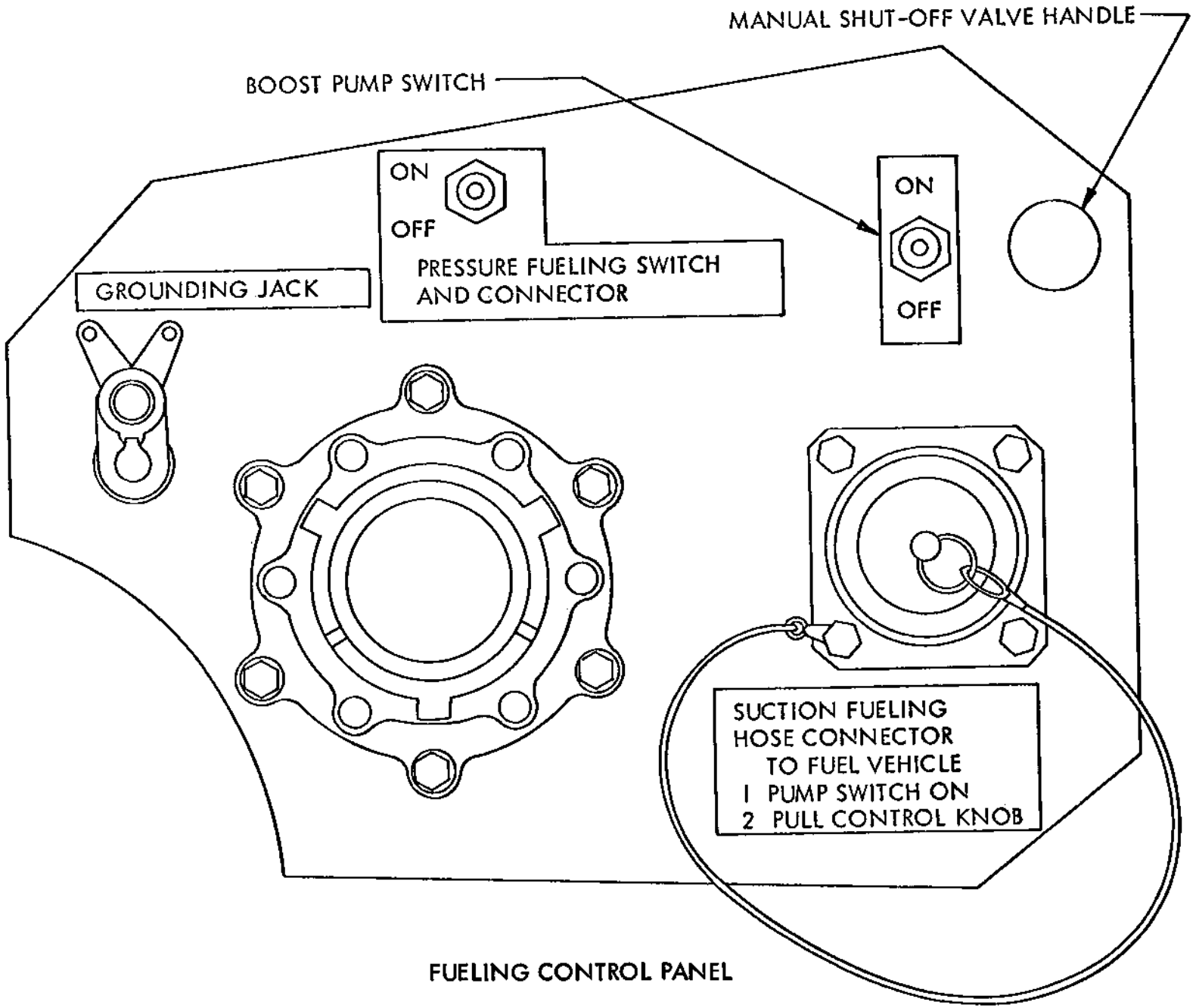
The outer shell of the reservoir is an integral part of the pump housing. The reservoir is pressurized through a large piston actuated by a small one. Pump output pressure is applied to the small piston which acts on the large piston to develop a 25 psi loading on the reservoir chamber. A plunger indicator extends from the end of the reservoir to show oil quantity. A bleed and relief valve is located at the high point of the reservoir to protect against over-pressurization. This valve can also be manually operated to bleed the system.

A solenoid operated bypass valve is incorporated to permit bypassing the pump pressure for testing purposes. The solenoids on both packages are controlled by a three position switch on the pilot's collective lever. Because of the small quantity of fluid in the systems and the high rate of



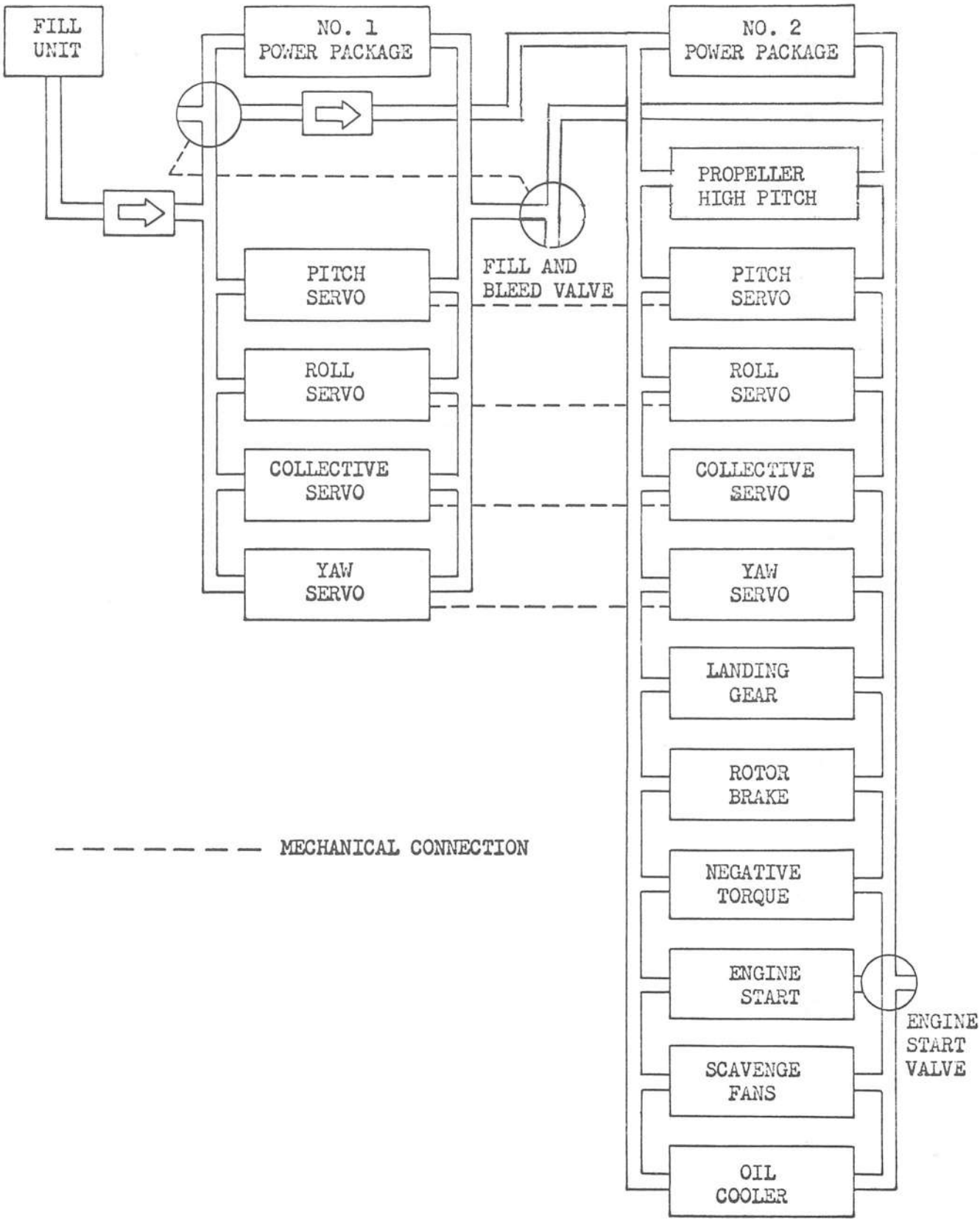
FUEL QUANTITY INDICATOR BLOCK DIAGRAM

FIGURE 20
AH-56A

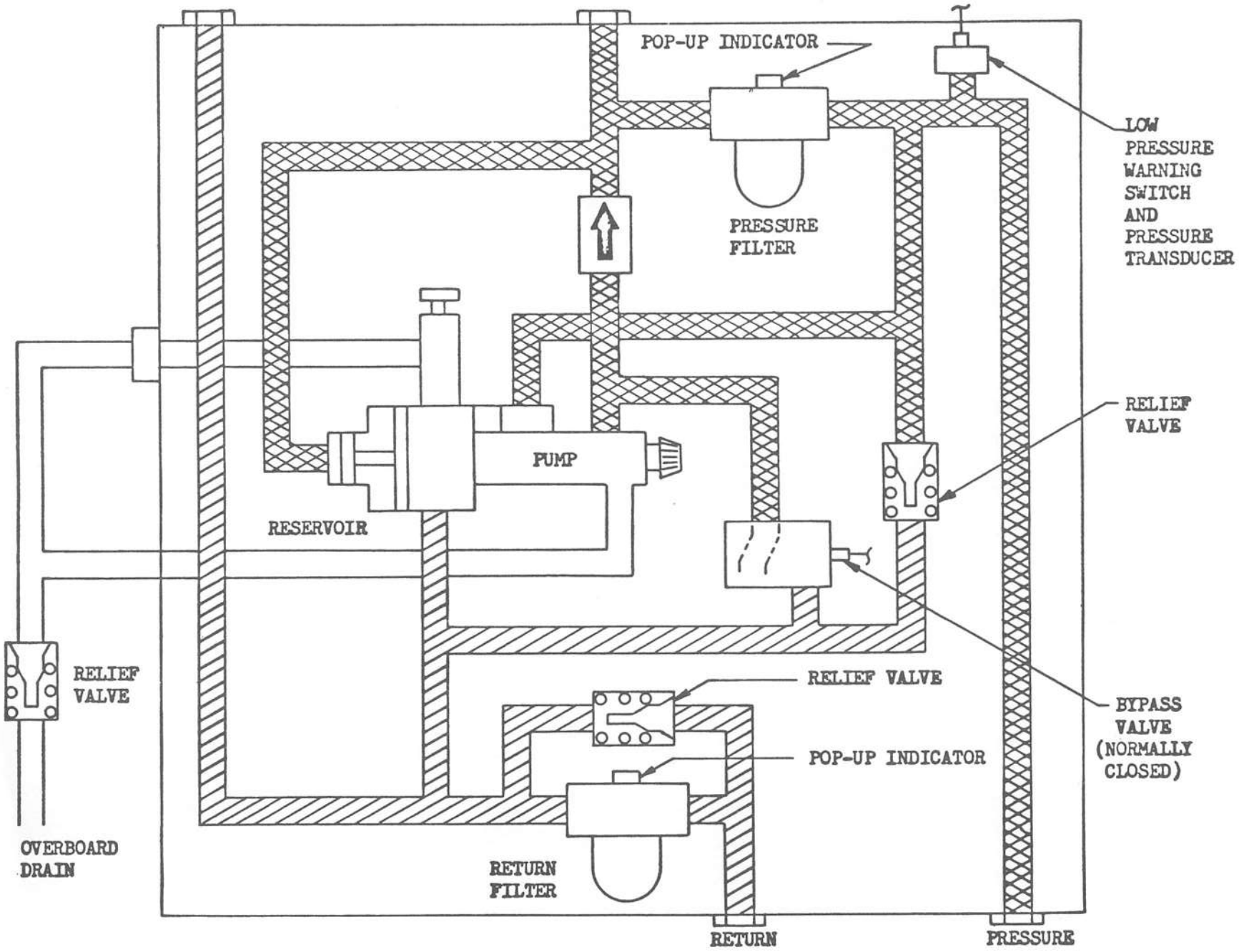


FUELING CONTROL PANEL

FIGURE 21
AH-56A



HYDRAULIC SYSTEM BLOCK DIAGRAM



HYDRAULIC POWER PACKAGE SCHEMATIC

FIGURE 23
AH-56A

flow during bypass operation, the bypass time must be strictly limited. The number 1 system can be bypassed for one minute and the number 2 system for two minutes maximum. Bypassing normally is used only to check the operation of the control servos on one system at a time. The number 2 pump is automatically bypassed during APU start, to relieve the load on the APU drive system.

The pressure relief valve, pressure transmitter, and filters are conventional in operation.

Fill Unit. (See Figure 22.) In order to help keep the systems clean, only oil in sealed cans is used. A fill unit is located in the right forward corner of the accessory compartment. This unit accepts a sealed can, punctures it, and by use of a manually operated pump transfers the oil into the system reservoir. The can is punctured on both ends so any oil not used must be thrown away. This is intentional, to prevent using opened cans which have set around collecting dirt. A FILL AND BLEED control handle next to the fill unit selects which reservoir will be filled. Because the number 1 power package is driven only when the main rotor is operating it is sometimes desirable to be able to use the number 2 power package to bleed the number 1 servos. A second valve controlled by the FILL AND BLEED handle connects the pressure sides of the two systems together. This mode of operation is used on the ground only and the handle is arranged so that it is impossible to close the accessory compartment door with the handle in the cross feed position.

Flight Control Servos. The flight control servos contain dual tandem hydraulic systems. Similar servos have been used for many years on Lockheed aircraft with practically no failures. Every portion of the system which might possibly jam or fail is so designed that failure of one system will not cause the other to fail. Servo functions will be discussed in the next section on flight controls.

Landing Gear. The retraction mechanism for the main landing gears consists of a small double acting cylinder mounted above and forward of each strut. The two main struts retract aft. After retraction the pressure is removed from the retraction cylinder and the gear holds up by action of over center linkage. Emergency extension is accomplished by mechanically forcing the over center linkage over center and allowing the gear to free fall.

The tail landing gear consists of a specially designed oleo strut with an integral retraction system. Number 2 hydraulic pressure is introduced into the retraction section of the strut and overcomes the normal air charge, forcing the strut to retract. The pressure remains on the strut all during the flight and the strut extends when it is removed.

Both the main and tail gears are controlled by a selector in the pilot's cockpit. The copilot/gunner can not retract the gear; however, he does have an emergency extension handle which will permit him to lower the gear if needed.

Rotor Brake. The rotor brake was described in the section on the main transmission.

Negative Torque System. In event of an auto rotation the propeller system will become a drag on the rotor, and if in a high pitch condition would slow the rotor down more than is desirable. To prevent this, a sensing system installed in the main transmission monitors the load on one of the planetary ring gears. As long as the load on this gear is in the positive direction nothing happens. As soon as the gear load reverses, as it will during auto rotation, the sensing mechanism operates a hydraulic valve which ports pressure to a mechanism connected into the propeller pitch control. This mechanism drives the pitch control to the minimum drag position, reducing the drag on the main rotor.

Engine Start System. The engine starter is a piston type hydraulic motor. Number 2 system pressure is directed to the starter motor through the starter selector valve (solenoid actuated from a switch in the cockpit). The cockpit switch is a momentary contact type and uses a holding circuit to keep the starter valve energized. When the starter motor reaches the maximum cranking speed, a speed sensing mechanism in the motor breaks the holding circuit, returning the selector valve to the off position.

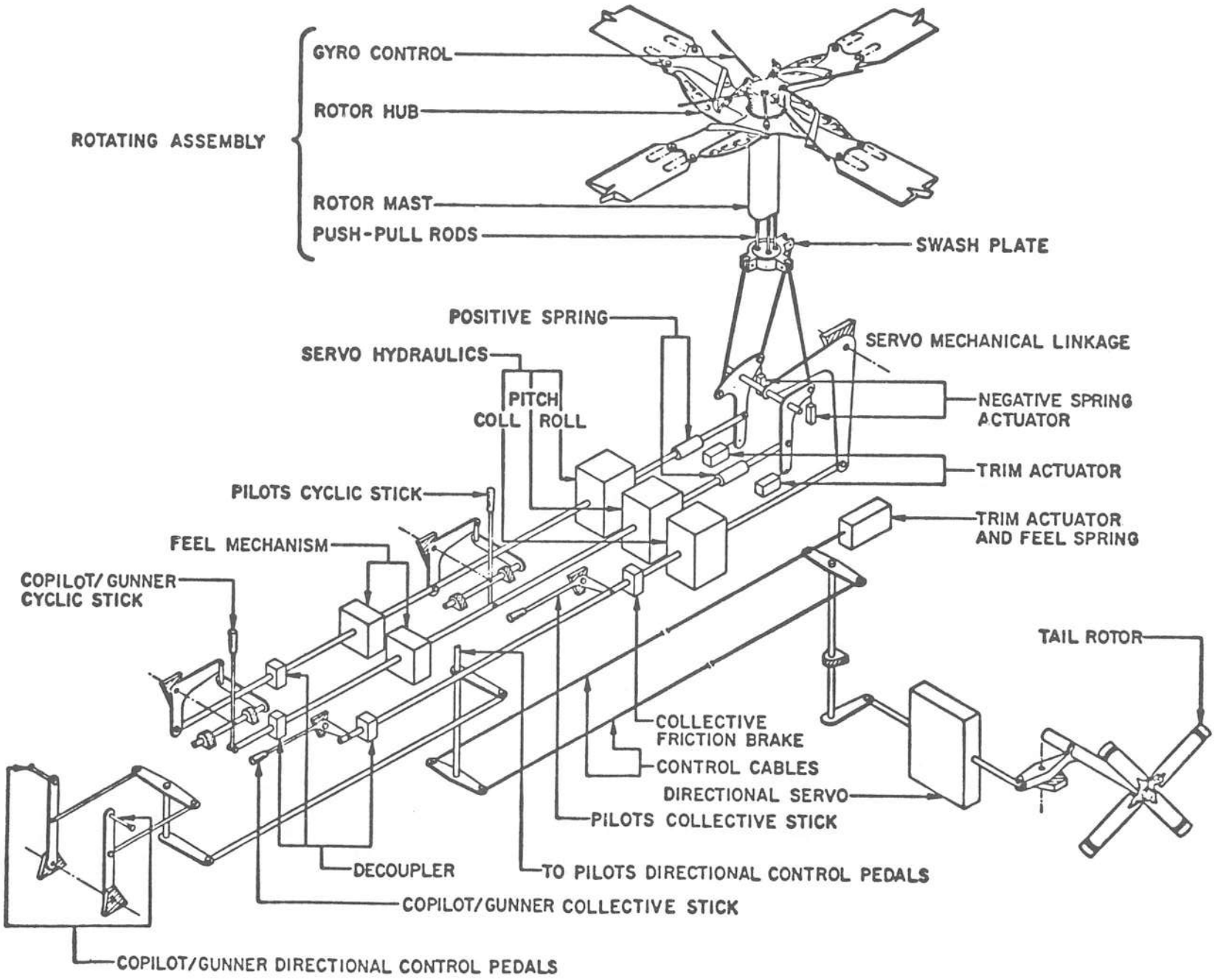
The starter motor flow requirements are almost the entire output of the number 2 system. In order to ensure sufficient flow to operate the starter, the starter valve cuts off the flow to the oil cooler fan and the engine air inlet fans during the start procedure. This flow is automatically restored when the starter motor is cutoff.

Scavenge Fan System. The use of the engine air inlet scavenge fans has been discussed in the section on the engine and powertrain. These fans operate when the filter doors are closed and pressure is on the number 2 system, except during engine start as noted above. The fan motors are piston type, constant displacement, and are speed regulated by flow limiter valves in the return lines.

Oil Cooler Fan System. A three section air to oil cooler system is installed in the left side of the mid fuselage just below the engine. One section cools the engine oil, one section the transmission oil, and the third section cools the hydraulic system number 2 oil. An air scoop on the left hand side of the fuselage and a duct supply the cooling air. Under hovering and low speed flight conditions there is not enough natural airflow to provide the needed cooling so an hydraulic motor driven fan is installed in the duct to augment the air flow. Number 2 system pressure is supplied to the motor at all times except during engine start. Fan speed is regulated by a flow limiter valve in the return line.

5. Flight Control System

Figure 24 is an operational block diagram of the flight control system. Most of the control linkages are quite standard and operate in the same manner as conventional helicopter controls. The essential differences in the rigid rotor system consist of the gyro control and the positive springs which provide the proper control response to the pilot. The gyro control consists of four arms extending from a common base plate. The assembly rotates



OPERATIONAL BLOCK DIAGRAM OF FLIGHT CONTROLS

FIGURE 24
AH-56A

at the same speed as the main rotor and acts as a stabilizing gyro within the control system. The gyro base is connected to the rotor blades by pitch control linkage. The gyro is gimbled to the mast and tends to remain in its own plane of rotation even if the rigid rotor/airframe should be displaced by an extremely strong gust of wind. Such a displacement will alter the angle between the gyro plane and the rotor plane and change the rotor blade pitch angles in a cyclic manner to return the rotor plane to its original position.

The cockpit controls consist of a cyclic stick for pitch and roll control, a collective lever for lift control, and directional pedals for directional control. Two sets of controls are provided, one in each crew station. As the copilot/gunner is mostly concerned with the gunnery phase of the flight, his controls would normally be in the way. To prevent interference, the linkage between the forward set of controls and the aft set passes through electro-mechanical decouplers. By pressing a button on the cyclic stick the copilot/gunner may decouple his controls and move them to a stowed position beyond the normal limits of travel. To recouple the controls, the copilot/gunner moves the controls into alignment with the pilot's controls and the decouplers will recouple automatically.

Because of the irreversible servos used in the control system, there is no natural feel on the controls. To supply this feel, a mechanism consisting of weights and springs is connected to the controls. Variable linkage in the feel mechanisms, controlled by signals from the air data computer, change the amount of force in relation to airspeed, while bob weights supply "G" loadings.

The control motions are applied to hydraulic position servos. These servos will produce an output movement proportional to the input movement. If a control is moved to a position and held there, the servo will assume a related position and remain there until the control is again moved.

In controlling the AH-56A, the pilot flies the control gyro by using the cycle stick and collective lever. The gyro in turn positions the main rotor and aircraft. In reference to figure 24, a forward motion on the cyclic stick will cause a rearward motion of the control push-pull rod to the servo. The servo output will move aft, compressing the positive spring and applying a force to the left side of the swash plate. Through the swash plate, this force is applied to the left side of the gyro control. The force causes the gyro to tip forward at 90 degrees to the applied force. The pitch control linkage causes cyclic pitch changes in the rotor blades which produces an aerodynamic force on the rotor disk in the roll direction. This force causes the main rotor to precess nose down until the rotor and gyro are again parallel. Since the rotor is rigidly attached to the airframe, the entire helicopter immediately pitches nose down as the pilot intended when he pushed forward on the cyclic stick. Cross coupling between the controls is canceled by the negative spring actuators, which act to oppose the positive spring moments resulting from the gyro precession.

Roll control follows a similar process, with the forces from the servo being applied in the pitch position on the swash plate and causing the gyro control to precess in roll.

Operation of the collective stick causes direct movement of the entire swash plate, causing the entire gyro to raise or lower. This action causes a collective pitch change on the rotor blades and changes the lift force.

Conventional type foot pedals are used for directional control. The pedal output is applied to a servo, which in turn operates the collective pitch control of the tail rotor. No decoupler mechanism is needed for the directional control, as the pedals are out of the way as far as the swivelling gunner station is concerned.

6. Auxiliary Systems

The auxiliary systems which will be discussed in this section are the environmental system, the windshield wiper, fire detector and extinguisher, and the auxiliary power unit.

Environmental System. The environmental system consists of an air cycle refrigeration unit, operated by engine bleed air from the fourteenth stage of the compressor section, and distribution ducting. Figure 25 is a simplified diagram of the environmental system. Air from the fourteenth stage air bleed is passed through a mass flow regulator and shutoff valve and into an air to air heat exchanger. The air from the engine is at a temperature around 600°F (315.5° C) because of compression heating. In the heat exchanger it is cooled to approximately 400°F (204° C) and then dumped into an expansion turbine, where it expands rapidly. As the air expands it cools further and comes out of the turbine at about 28°F (-3° C). This cold air passes into a mixing muff where it is mixed with enough bleed air direct from the engine to raise the temperature to the desired level. The amount of bleed air is controlled by a bleed air control valve, which is in turn controlled by a pneumatic servo system consisting of two pneumatic thermostats, one controllable located in the cockpit duct, and the other fixed and located near the refrigerator outlet. The temperature control range is from 35 to 180°F (1.6 to 82° C).

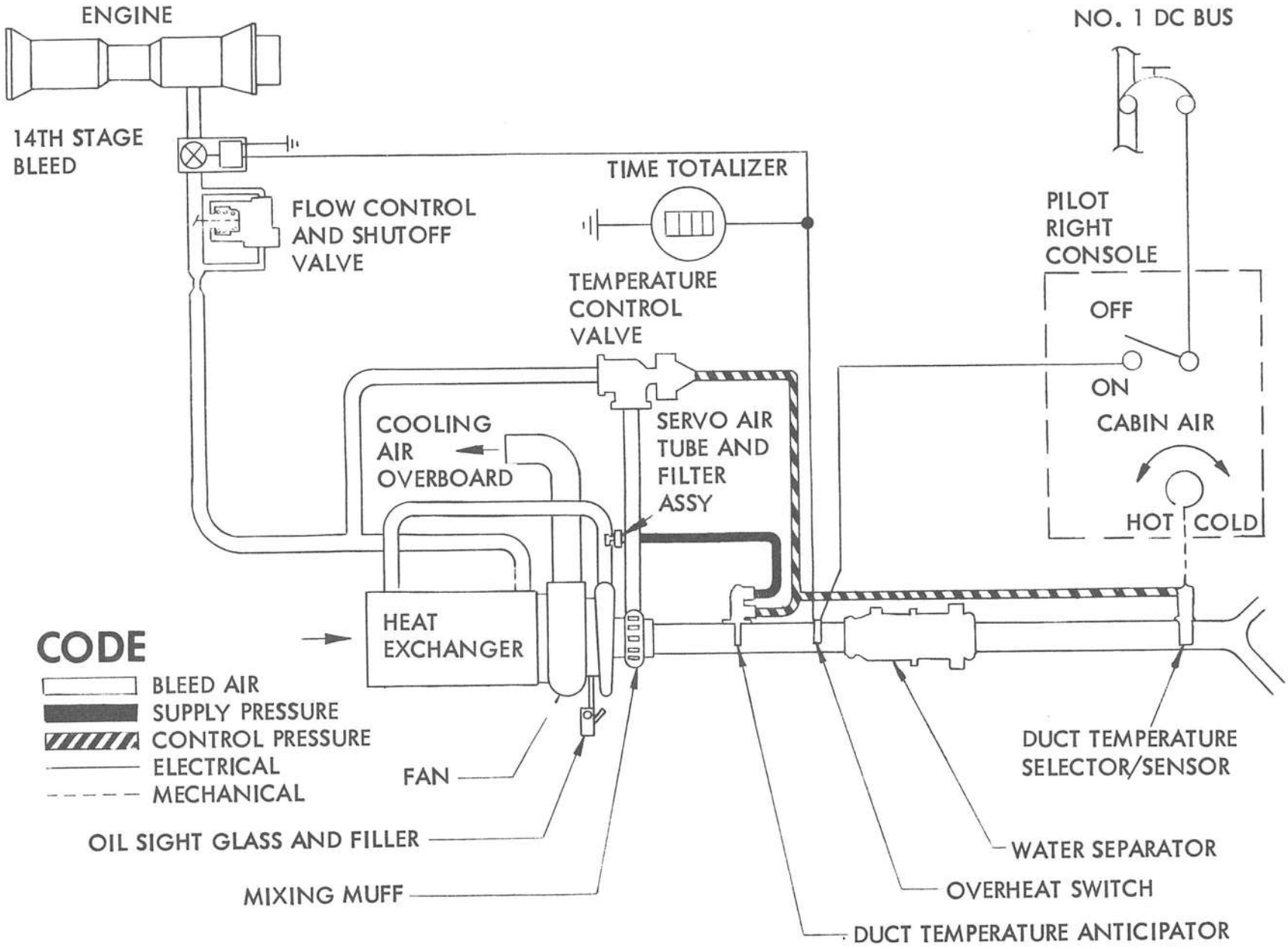
The mass flow regulator and shutoff valve are controlled electrically by a switch in the pilot's station. A thermal switch in the duct will shut off the system if the duct temperature should exceed 225°F (107° C).

A water separator removes 70% of the water in the conditioned air to prevent fogging of the cockpit canopy and to increase crew comfort.

The air from the water separator is distributed throughout the cockpit by ducts which end in diffusers or gasper outlets.

Windshield Wiper. An electric windshield wiper is provided on the copilot/gunner's forward windshield panel. The wiper is driven by a two speed DC motor. Two control switches on the pilot's right sub panel control the motor. One switch provides ON-OFF-PARK functions while the other selects high and low speed.

Fire Detector and Extinguisher System. The fire detection system is divided into three sections, one for the forward engine section, one for



ENVIRONMENTAL SYSTEM BLOCK DIAGRAM

FIGURE 25
AH-56A

the aft engine and exhaust compartment, and one for the APU compartment. Figure 26 shows the location of the system components.

The forward engine section, or zone 1, detector system is a radiation type detector with two sensors. The sensor elements are located in opposite ends of the compartment on opposite sides. These sensors are photo electric cells sensitive to infra-red radiation. The signal from the sensors goes to a control box which is designed to respond only to a fluctuating signal in the 4 to 20 cps range. This is the range of flicker of flame and thus the detector will not respond to a steady infra-red emission from the hot engine, but will respond if a flame develops. If a flame is detected, the control box actuates the fire warning lights on the pilot and copilot/gunner's panels and closes the engine compartment air vent. The fire extinguisher must be manually discharged into zone 1 by either crew member.

The aft engine and exhaust compartment detector is a heat sensing element type. A heat sensitive continuous loop element is routed around the lower portion of the area and connected to a control box. If the temperature in the compartment exceeds a set value, the resistance of the element is reduced and the control box actuates EXH COMPT HOT lights on the crew annunciator panels. There is no fire extinguisher protection for the exhaust compartment.

The APU compartment detection system is also a continuous element heat detector. This system operates in the same manner as the exhaust compartment overheat detector, with the addition that when the APU FIRE warning light on the pilot's right lower panel comes on, the APU is automatically shut down and the fire extinguisher is discharged into the compartment.

The fire extinguisher bottle is located in the aft section of the left wheel well. The extinguishing agent is bromotriflouromethane and is expelled from the bottle by a nitrogen charge. The bottle has two outlets, one for the engine compartment and one for the APU compartment. These outlets are opened by electrically fired explosive squibs. The zone 1 squib is fired by switches in the flight stations and the APU squib is automatically fired by the fire detector.

Auxiliary Power Unit. An auxiliary power unit gas turbine and a right angle drive assembly are mounted in the aft end of the left sponson. Access is through two hinged panels, one in the wheelwell and one on the bottom of the sponson. The APU drives the accessory section of the main transmission through the right angle drive, a centrifugal clutch, and a drive shaft.

The APU is designed and authorized for ground operation only. It is used for starting the main engine and for testing and operating the aircraft systems if the main engine is not operating. Safety features are incorporated in the system to protect against overspeed, overheating, low oil pressure, and fire.

The APU engine is a single stage centrifugal compressor coupled directly to a radial in-flow gas turbine. Compressor discharge air is expanded through the turbine plenum into the combustion area, where it is mixed with fuel and burned. The hot gases from the combustion are directed to the turbine

and then exhausted overboard through a duct in the trailing edge of the sponson. All generated power is available as shaft horsepower, except for that absorbed by the APU accessories.

The APU control panel is located at the aft end of the pilot's left console. As shown on figure 27, the panel contains a rpm indicator, an exhaust temperature indicator and an APU START switch. The indicators are used to monitor the operation of the APU during start. To start the unit, the APU START-RUN-OFF switch is held in the START position until the rpm indicator indicates over 5% rpm and then released to RUN. To shut down the APU the switch is placed in the OFF position.

7. Electrical Systems

The primary electrical power on the AH-56A is 3 phase, 115/200 volt, 400 Hz provided by two AC generators mounted on the main transmission. Because of variations in engine speed the frequency of the power may vary between 360 and 440 Hz. Below the low limit, the generators are automatically cut off. When engine operation below approximately 95% is desired the APU should be operated to ensure continued electrical system operation.

DC power is supplied by two transformer/rectifiers, located on the floor of the electrical compartment, and a battery, located in the forward end of the debris bay. The transformer/rectifier units are normally powered by separate generators, though if required both may be powered by the same generator.

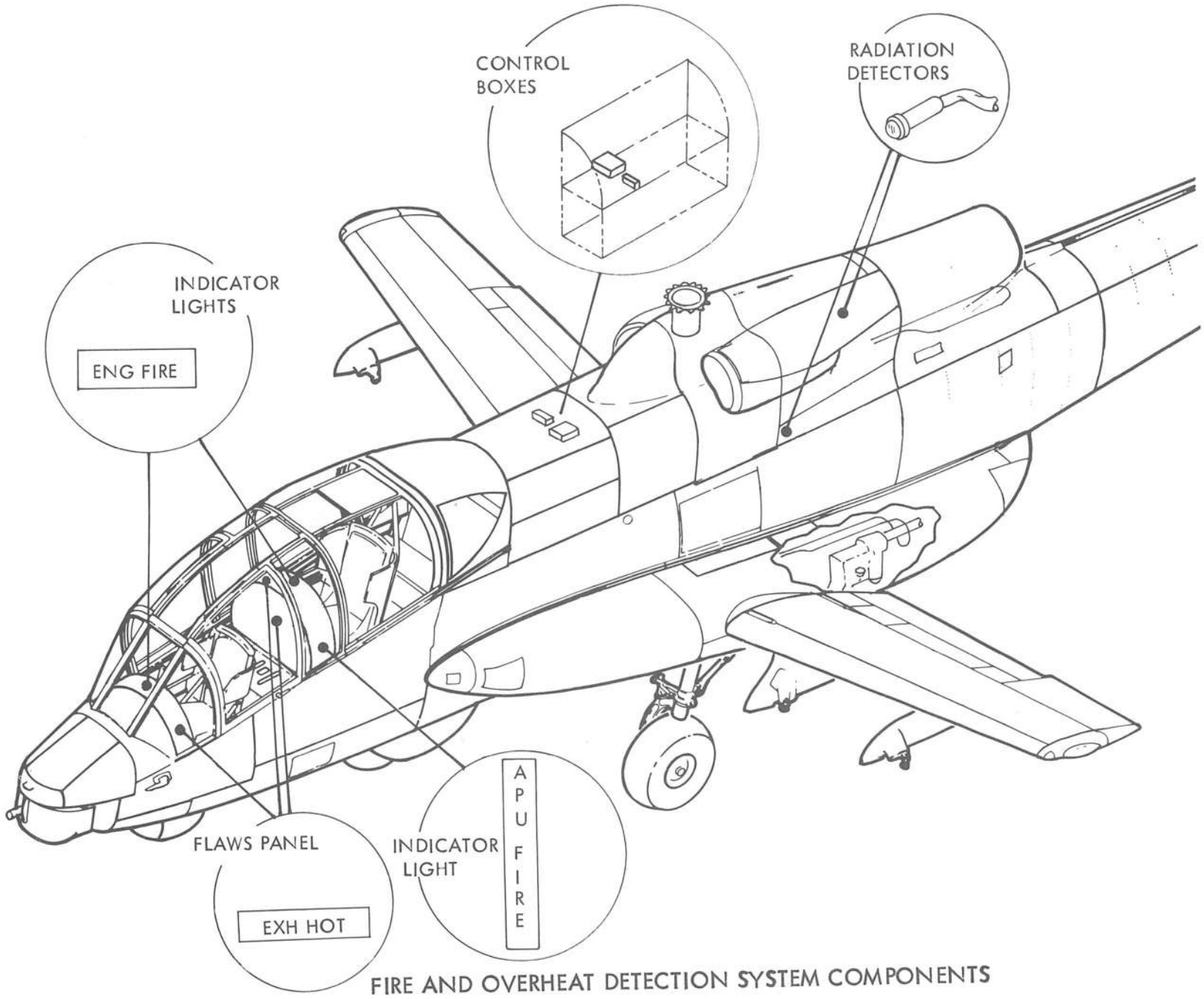
Emergency AC power is provided by a single phase inverter, located next to the battery. This inverter powers only the essential AC bus.

The AC generators are 20 KVA four pole, brushless, aircooled units. They are controlled by solid state supervisory/regulator panels located in the main electrical load center. These panels control the voltage to $\pm$ 2% and will shut down the generator if over or under voltage conditions, off frequency conditions, or feeder fault conditions occur. The same panels also control the transfer relay system which connects the alternators to the buses.

Electrical Power Control Panel. The controls for the electrical system are located on the pilot's left console, just aft of the fuel control panel. Figure 28 shows the arrangement of the controls on this panel.

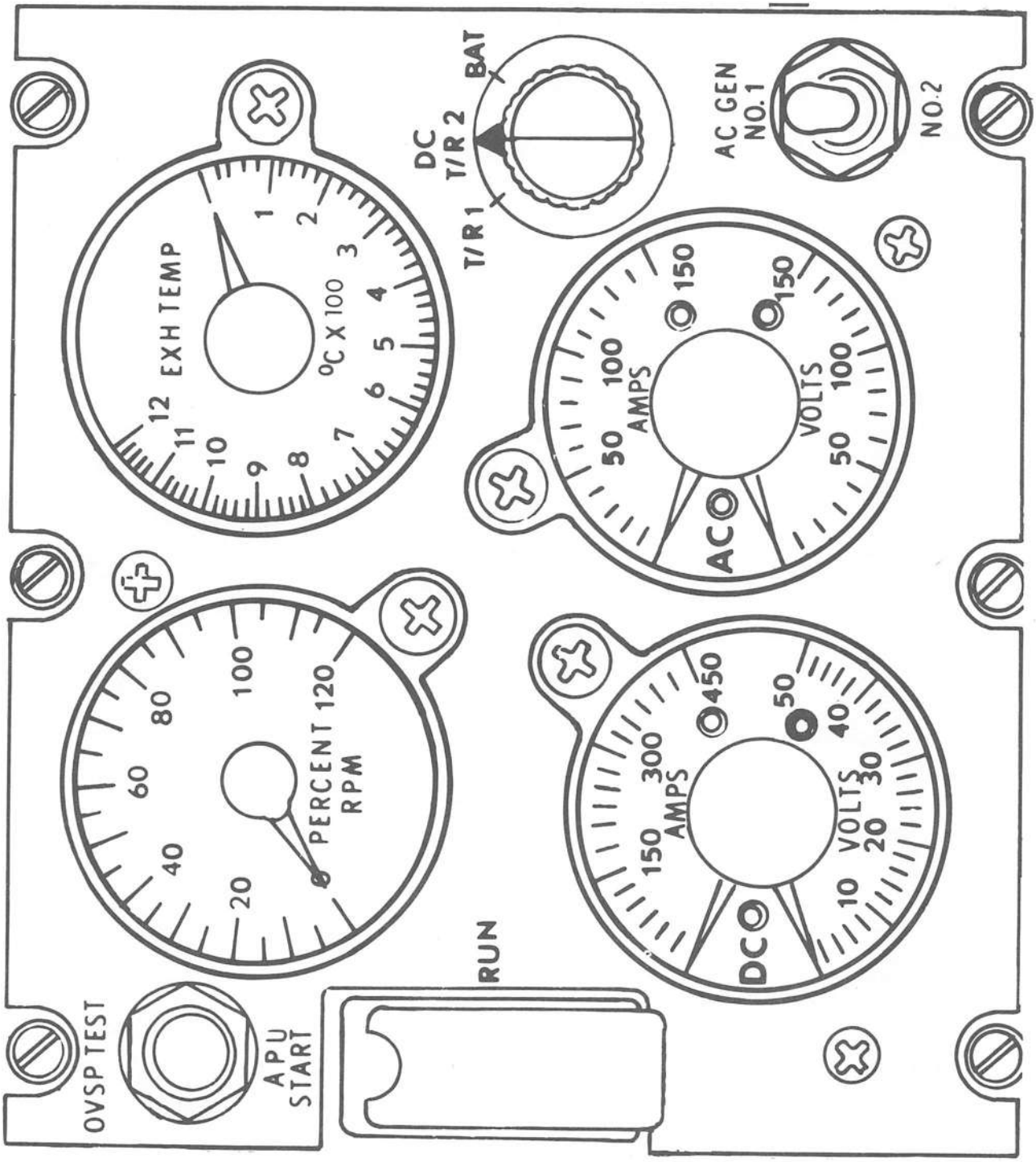
The INVERTER ON-AUTO-TEST switch is used to control the operation of the standby inverter. In the AUTO position in flight, the inverter will automatically come on whenever the power source for the essential AC bus fails. On the ground, the inverter is normally locked out. Use of the TEST position simulates a power failure on the bus and bypasses the ground lockout circuit so the inverter can run. The ON position overrides the normal circuits and applies inverter power to the essential bus, even though normal power is available.

The BAT ON-OFF-STBY switch controls the main battery contactors to connect the battery to the DC buses. Placing the switch in the ON position connects the battery to the number 2 DC bus. With the switch in the OFF

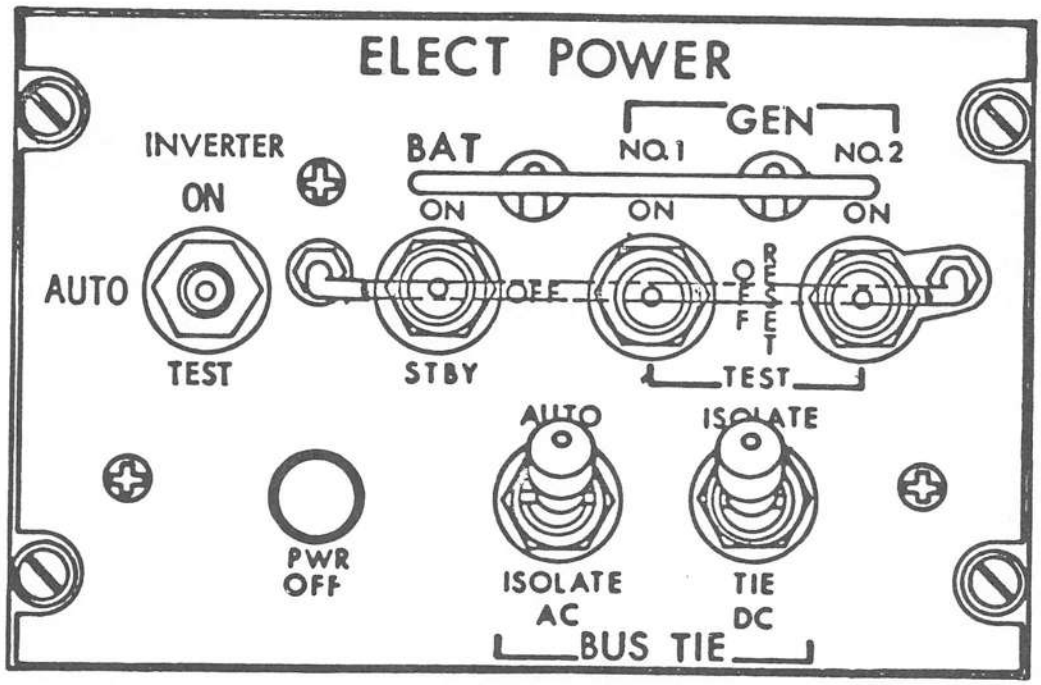


FIRE AND OVERHEAT DETECTION SYSTEM COMPONENTS

FIGURE 26
AF-56A



APU CONTROL PANEL



ELECTRICAL POWER CONTROL PANEL

position the battery is completely disconnected from all loads. The STBY position of the switch connects the battery to the ICS and VHF/FM radio and sets up circuits to permit firing of the nose gun on the ground.

The GEN NO. 1 and NO. 2 switches control the AC generators. The ON position signals the supervisory/regulator panel to energize the generator and connect it to the proper buses as required by existing conditions. The OFF/RESET position causes the supervisory/regulator panel to de-energize the generator and reset certain protective circuits in the panel. If the other generator is operating, the supervisory/regulator panel will connect the de-energized generator's bus to the operating unit. The TEST position energizes the generator without permitting it to be connected to any bus. GEN FAIL lights on the pilot's annunciator panel come on whenever the generators are not operating, either because they have been switched off or have been tripped by some fault. While using the TEST position of the control switch, the light will go out if the generator is operating properly.

The POWER OFF button mechanically operates the gang bar over the battery and generator switches to move them to the OFF position. The use of this system gives the pilot only one control to operate if he wishes to remove all power from the aircraft.

The BUS TIE switches provide the pilot with the ability to separate or connect the number 1 and number 2 bus systems. With the AC switch in AUTO, the bus normally powered by a failed generator will automatically be transferred to the operating one. If the pilot does not want this transfer to take place, he can place the switch in the ISOLATE position and prevent the transfer. The DC switch is normally kept in the ISOLATE position and the two DC buses are each fed by a separate transformer rectifier. If one transformer/rectifier should fail, the pilot can place the switch in the TIE position and power both buses from the remaining unit. The TIE position can also be used to operate the two transformer/rectifiers in parallel so they will share the entire load of both buses.

External Power System. An external power receptacle is installed in the forward end of the left sponson. (See figure 29.) This receptacle is the standard type with four large pins for the power input and two small pins for control power. The power unit used with the AH-56A must have a connection between the two small pins in order to permit application of the power to the system.

A solid state external power monitor unit, located in the main electrical load center, samples the power from the ground unit and will normally prevent application of power which is off frequency, high or low voltage, or reversed phase rotation. A three position control switch next to the receptacle controls the power monitor. The NORMAL position permits application of power if the frequency, voltage, and rotation are correct. An OVERRIDE position will permit emergency application of power which is not up to standard in frequency and/or voltage. Incorrect phase rotation can not be overridden. A RESET position is provided to reset the monitor after a faulty power supply has caused it to trip.

External power vs generator priority depends on which was on first. The first power on the buses will hold until shut down, even though the other power source is available.

Power Distribution. (See Figure 30.) The power distribution bus system consists of the following buses, powered as indicated:

The Number 1 Primary AC Bus is normally powered by the number 1 generator through the A side of the dual action Number 1 Generator Contactor. If the number 1 generator is not available, the bus will be powered by the Number 2 AC Bus through the B side of the contactor, unless the BUS TIE switch is in ISOLATE.

The Number 2 AC Bus is normally powered by the number 2 generator through the A side of the Number 2 Generator Contactor. If the number 2 generator is not available, the bus will be powered by the Number 1 Primary AC Bus through the B side of the contactor, unless the BUS TIE switch is in ISOLATE.

The Number 1 Secondary AC Bus is powered from the Number 1 Primary AC Bus, except during engine start. During engine start, the bus is disconnected to relieve some of the load on the APU.

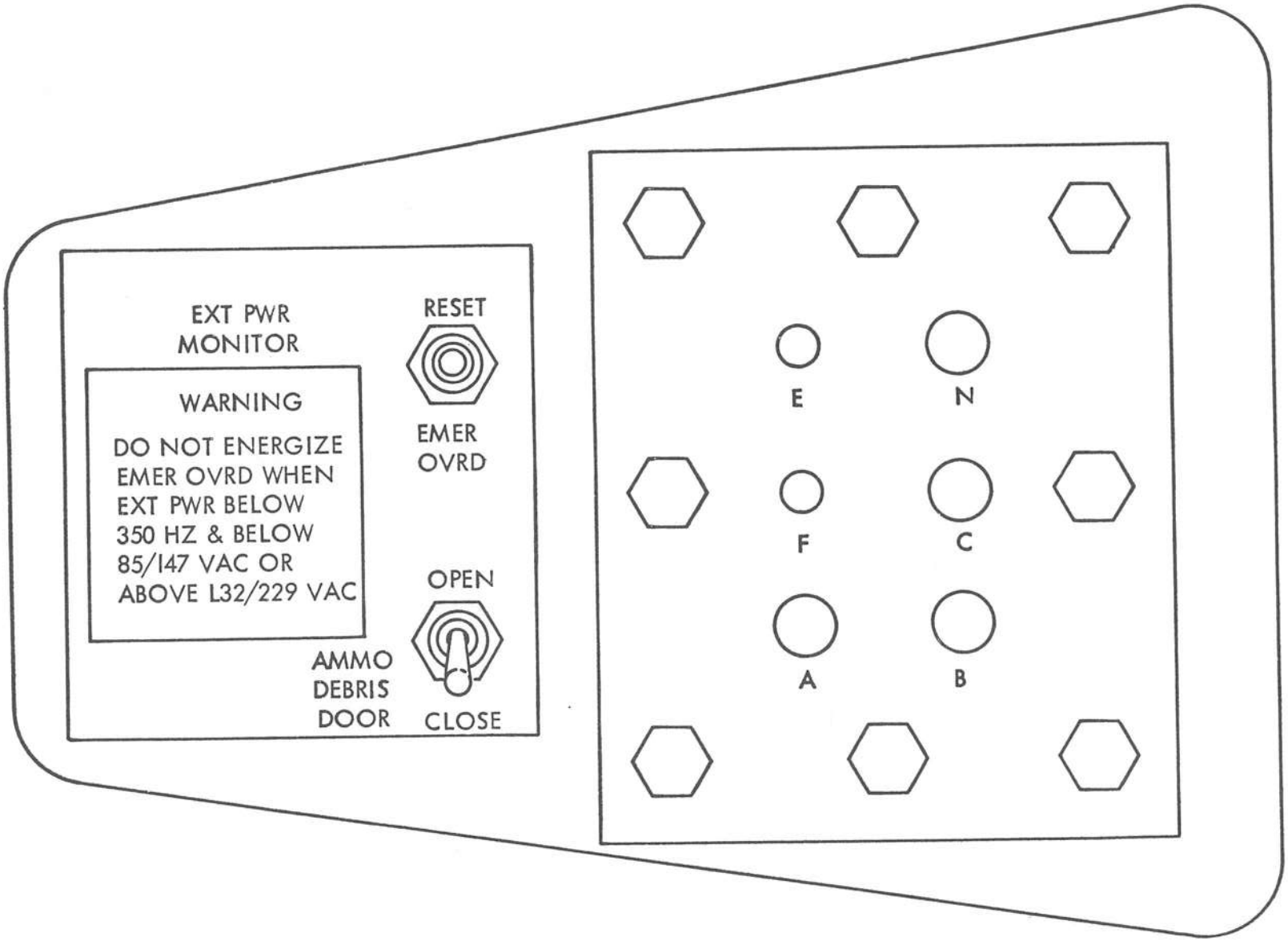
The Essential AC Bus is normally powered by A phase of the Number 1 Primary AC Bus. If the Number 1 Primary AC Bus is not powered in flight, an automatic transfer to the standby inverter will occur.

Two 26 VAC transformers are considered to be part of the Essential AC Bus. The number 1 transformer is always energized when power is available from the Number 1 Primary AC Bus or the inverter. The essential bus and the number 2 transformer are disconnected when the essential bus transfer relay is energized. This relay is energized during an emergency ground firing operation mode for the nose gun. Removal of the essential bus loads not needed during this emergency operation mode reduces the load on the battery.

The Number 1 DC Bus is normally powered by the Number 1 Primary AC Bus through transformer/rectifier Number 1. Closing the DC BUS TIE switch will energize the bus tie relay to connect this bus to the Number 2 DC Bus. The Number 2 DC Bus is normally powered by the number 2 generator through the transformer/rectifier Number 2. It may be tied to the Number 1 DC Bus by the bus tie relay. The battery is connected to the Number 2 DC Bus and may be used to power it when no other source is available.

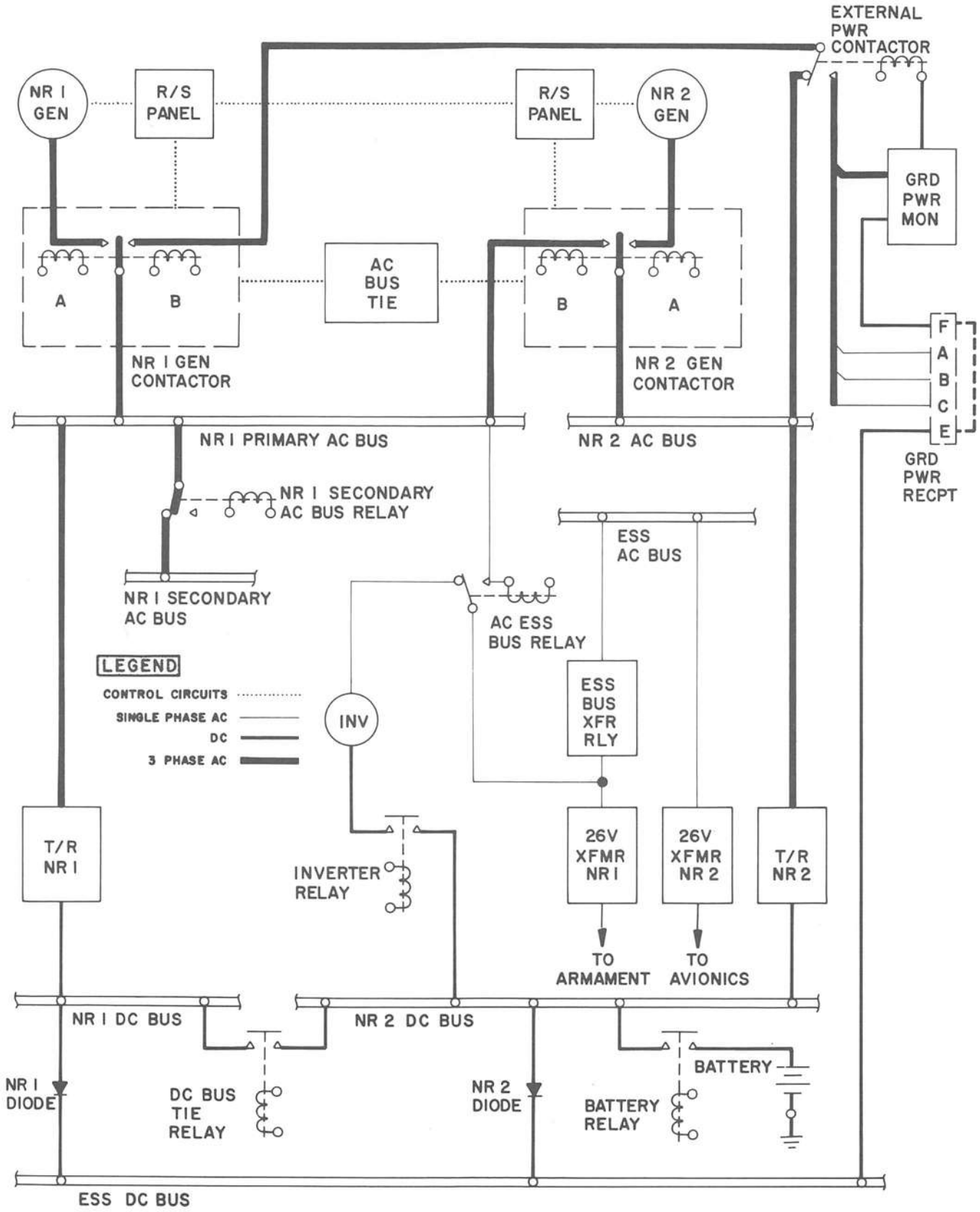
The Essential DC Bus is powered through diodes from both the Number 1 and Number 2 DC Buses. This arrangement assures power on the Essential DC Bus if power is available at any point.

All circuit breakers are located on four panels mounted above and behind the pilot. These panels are shown on figure 31. The number 1 and 2 panels, on the left side of the cockpit, contain the DC circuit breakers, except for two on the number 4 panel. The number 3 and 4 panels contain the AC circuit breakers. The breakers are arranged in groups and marked as to the bus which powers them.

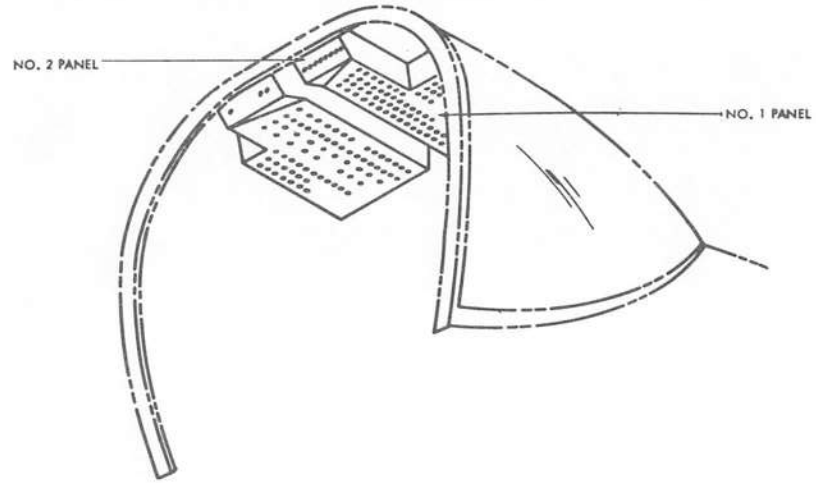


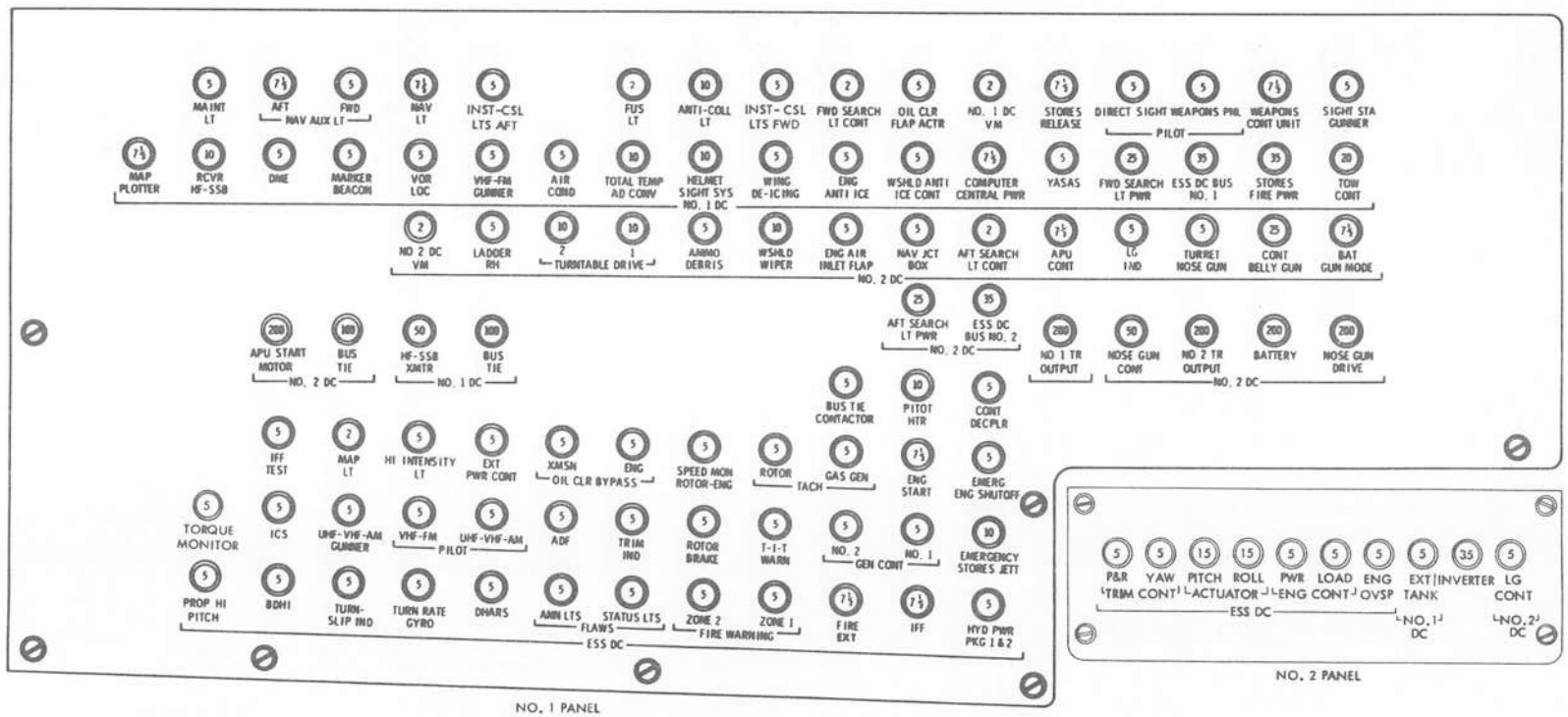
EXTERNAL POWER RECEPTACLE

FIGURE 29
AH-56A



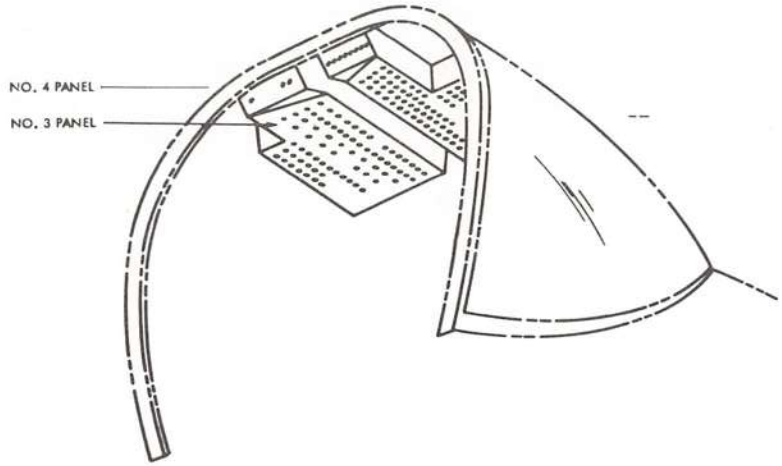
AC AND DC BUS DIAGRAM

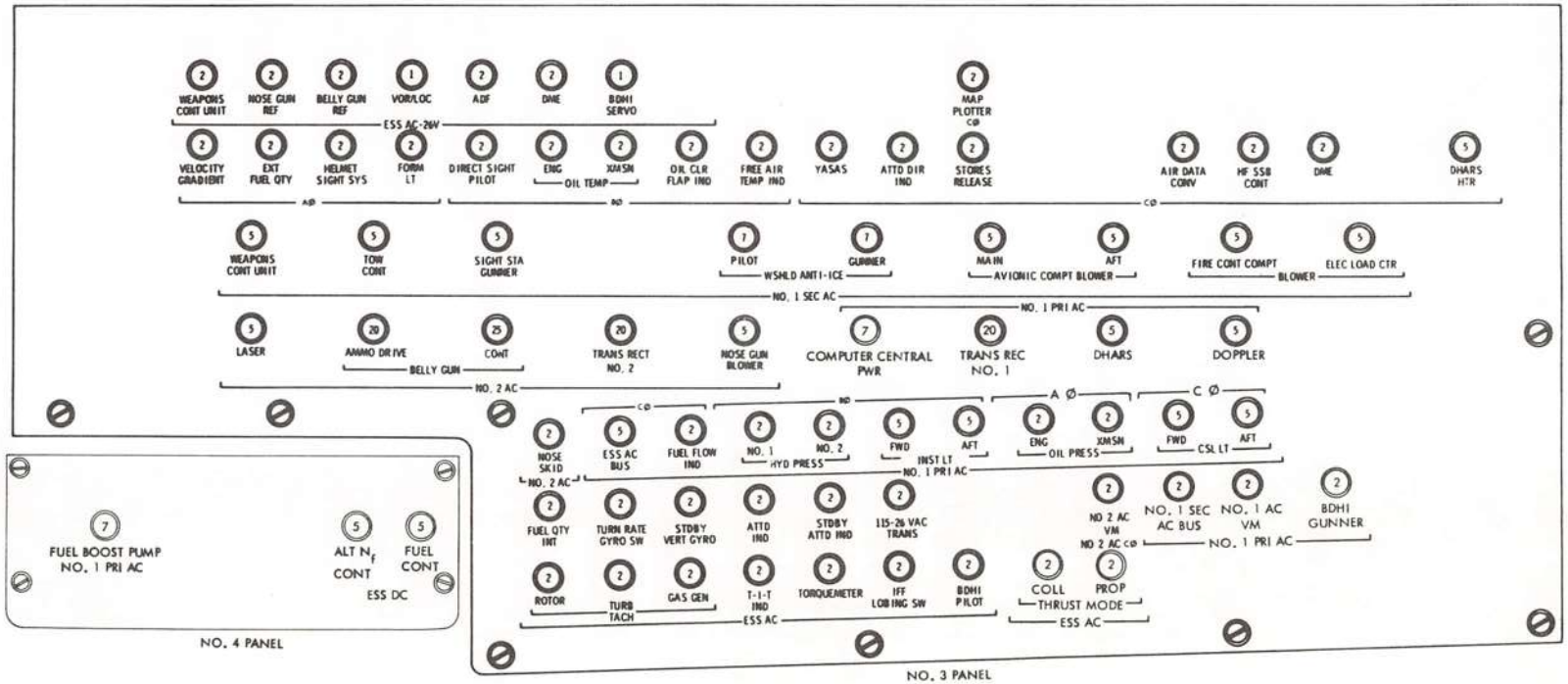




CIRCUIT BREAKER PANELS (SHEET 1 OF 2 SHEETS)

FIGURE 31
AH-56A





CIRCUIT BREAKER PANELS (SHEET 2 OF 2 SHEETS)

FIGURE 31
AH-56A

Lighting Systems. Figure 32 shows the lighting control panels in the crew stations. In general, the pilot has control of the exterior lights and the lights in the aft flight station. The copilot/gunner has control of the instrument lighting in the forward station. Each crew member has control of an exterior searchlight.

The following light controls are in the pilot's station:

PUSH LEGEND Brightness Control. This controls the brightness of the various indicator/switch units on the armament and computer control panels.

BDHI LEGEND Switch. Controls the brightness of the legend lights on the BDHI indicator.

CONSOLES Brightness Control. Controls the brightness of the console lighting.

INSTRUMENTS Brightness Control. Controls the brightness of the instrument lights.

HIGH INTENSITY Switch. Controls high intensity white lights in both crew stations. These lights are commonly called thunder storm lights and are used to provide light if the crew's night vision has been wiped out by a lightning flash or a bright flare.

NAVIGATION Switches. Control the standard wing and tail navigation lights to steady or flashing and bright or dim.

FUSELAGE Switch. Controls two white lights, one on the top of the fuselage just back of the rotor mast and the other on the bottom of the fuselage just aft of the aft fuselage joint.

COLLISION Switch. Controls the oscillating anti-collision lights mounted in the wing tips.

FORMATION Rotary Switch. This five position switch controls the brightness of electro-luminescent formation light panels. Three of these panels are installed on the aircraft, one on the upper surface of each wing and one on the top of the fuselage aft of the cockpit.

An ON-OFF-STOW switch and a five position thumb switch on the pilot's collective lever control the aft search light. This light is mounted in the aft avionic bay door and consists of a retractable lamp, similar to a landing light, with the added feature of being able to rotate 360 degrees when extended. The ON-OFF-STOW switch turns the lamp on and off and causes the assembly to return to the stowed position. With the switch in the ON position the thumb control will extend, retract, and rotate the unit as desired.

The copilot/gunner has only INST, CONSOLE, and PUSH LEGEND brightness controls and searchlight controls for the forward search light. These controls all operate in the same manner as the similar ones for the pilot.

The copilot/gunner's searchlight is mounted just aft of the nose turret and is identical to the pilot's searchlight.

Four maintenance lights are provided. A fixed light in the left forward corner of the battery compartment provides illumination for the inspection of the battery and controls. It is controlled by a switch mounted on the same bracket as the light, just forward of the battery access door in the left side of the nose. Three extension cord mounted lights are provided, one in the accessory bay for use in the accessory bay, the main avionic compartment, and the electrical compartment; one in the ammunition bay; and one in the aft avionic compartment. These lights are provided with clamps to permit clipping to structure in the work areas and are controlled by switches mounted on the light assemblies. As these lights are powered by the Number 1 DC Bus, the number 1 transformer rectifier must be operating or the DC BUS TIE switch must be in the TIE position to operate the lights.

Other circuits which are of interest at the familiarization level are covered under the system with which they operate.

8. Armament System

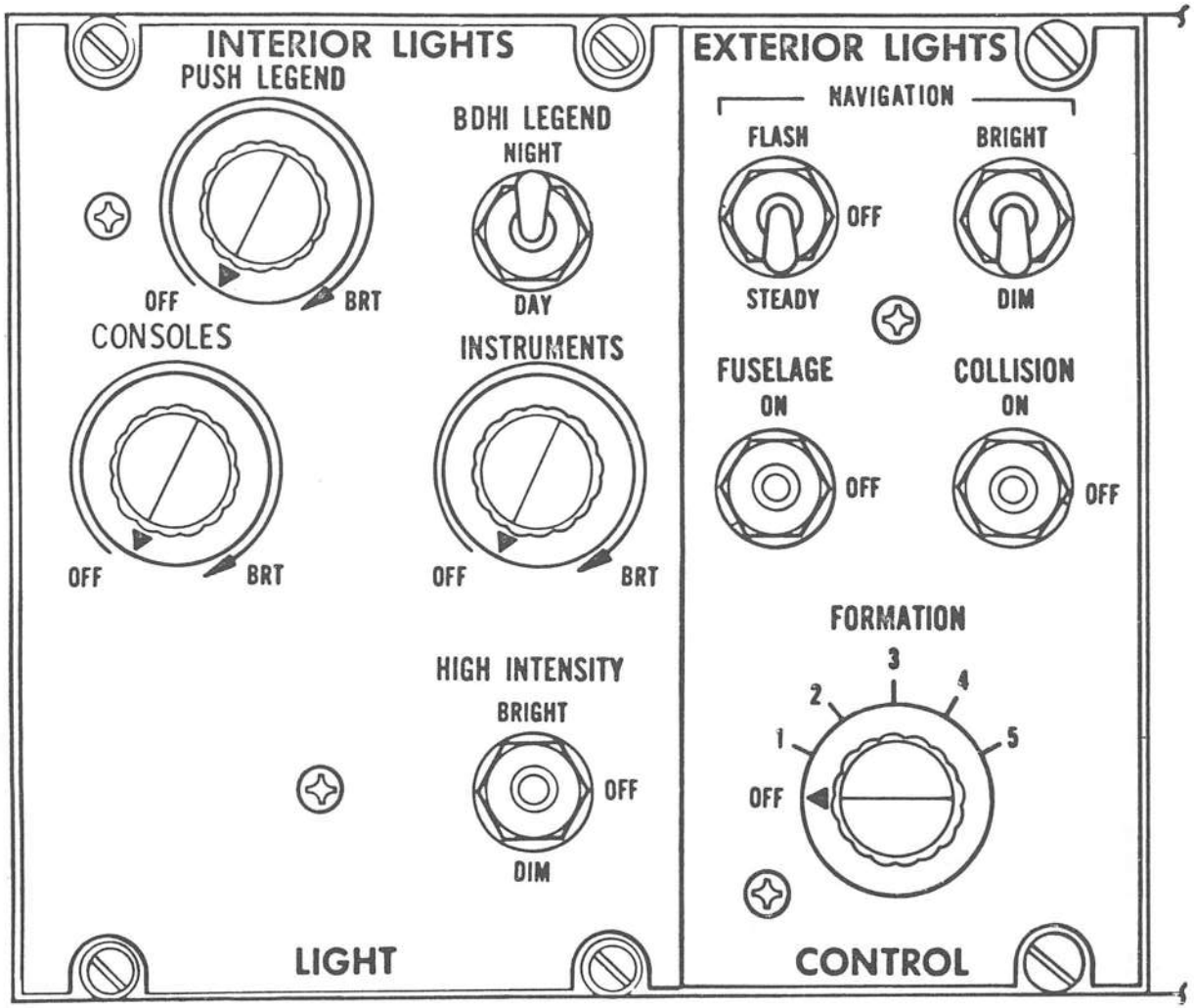
The Cheyenne is designed to be a fighting aircraft. To make it as effective as possible, a large variety of armament is used. This armament can be divided into three general classes, suppressive fire, light point fire, and heavy point fire systems. All three systems may be carried at the same time, creating great versatility during a given mission.

Either the pilot or the copilot/gunner may control any of the weapons. The pilot, as commander, is given selection priority over any weapon and can take control of the weapon even if the copilot/gunner had previously selected it. In normal operation, however, it is expected that the copilot/gunner will operate all weapons except the rockets and missiles. If desired, any combination of weapon control can be selected so that different weapons can be fired at the same time by both crew members.

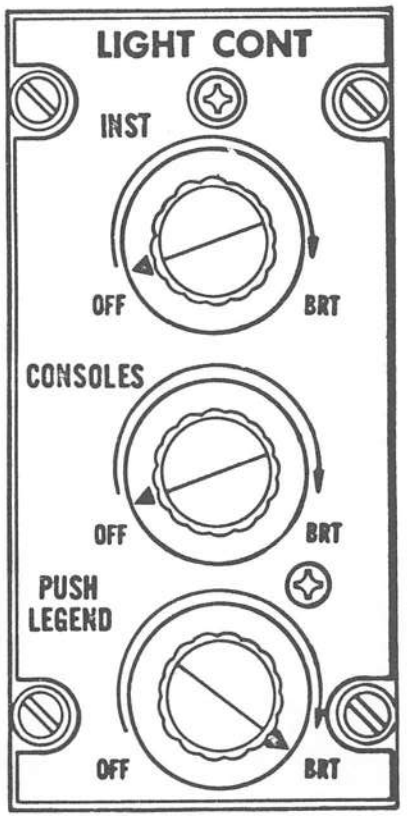
Suppressive Fire System. Two Suppressive Fire Systems are available on an interchangeable basis. The first of these is a 40 mm grenade launcher mounted in the nose turret (see figure 33). This launcher will fire 350 rounds per minute. Three types of ammunition are available at present, non-explosive practice, fragmentation grenades, and white phosphorous grenades. The grenade launcher magazine will hold 780 rounds in a flexible linked belt. This ammunition is fed into the turret through a chute system on the right side of the aircraft. The feed system is powered by an electric motor mounted on the ammunition drum. This motor also drives the gun mechanism through a system of rigid and flexible shafts. The spent cartridges and links are ejected overboard through the bottom of the turret.

The turret is electrically powered and may be controlled either by the pilot, through his helmet sight, or the copilot/gunner, through the swivelling gunner station. How this control is accomplished will be discussed in the section on fire control and sighting systems.

PILOT'S

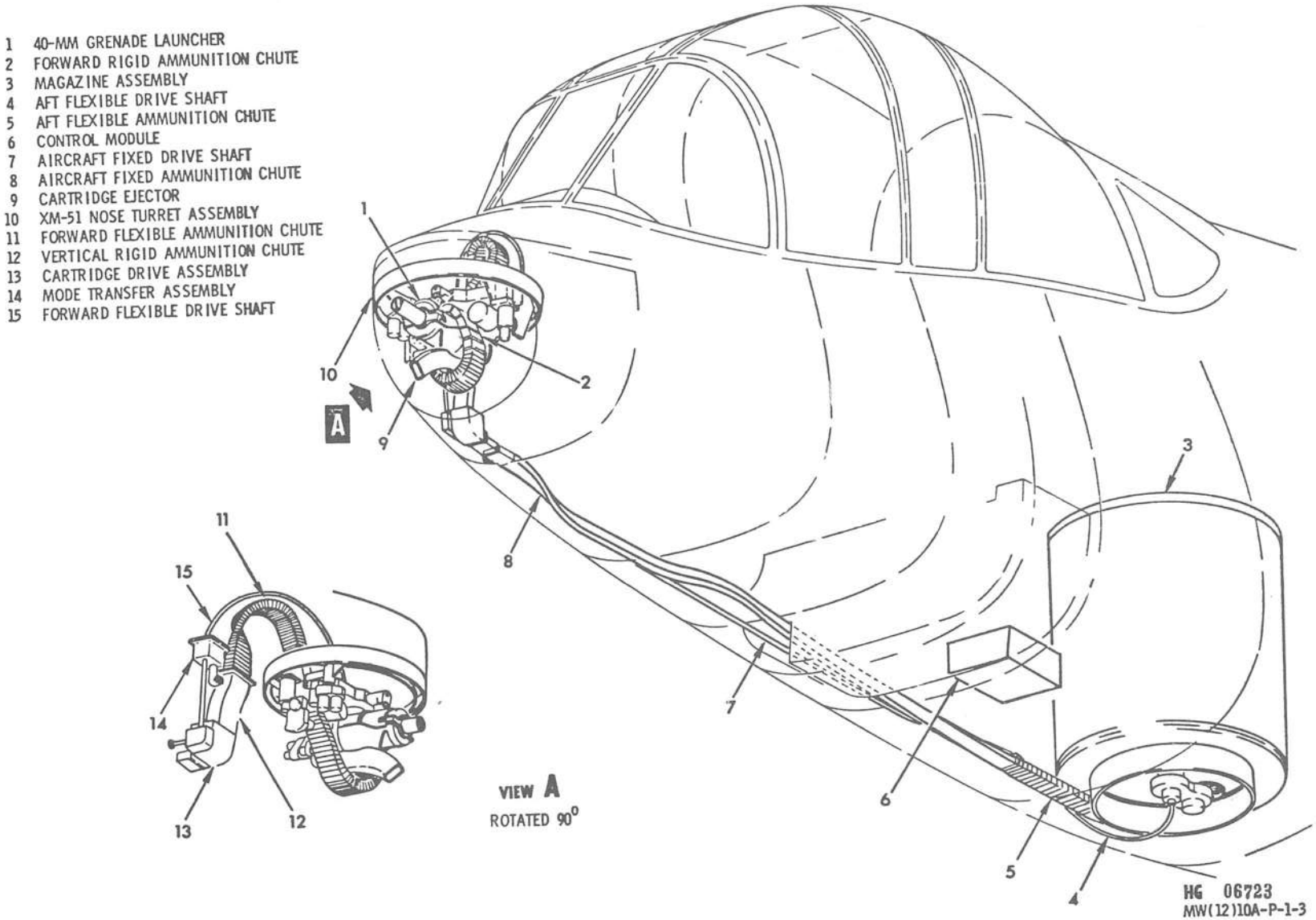


COPILOT/GUNNER'S



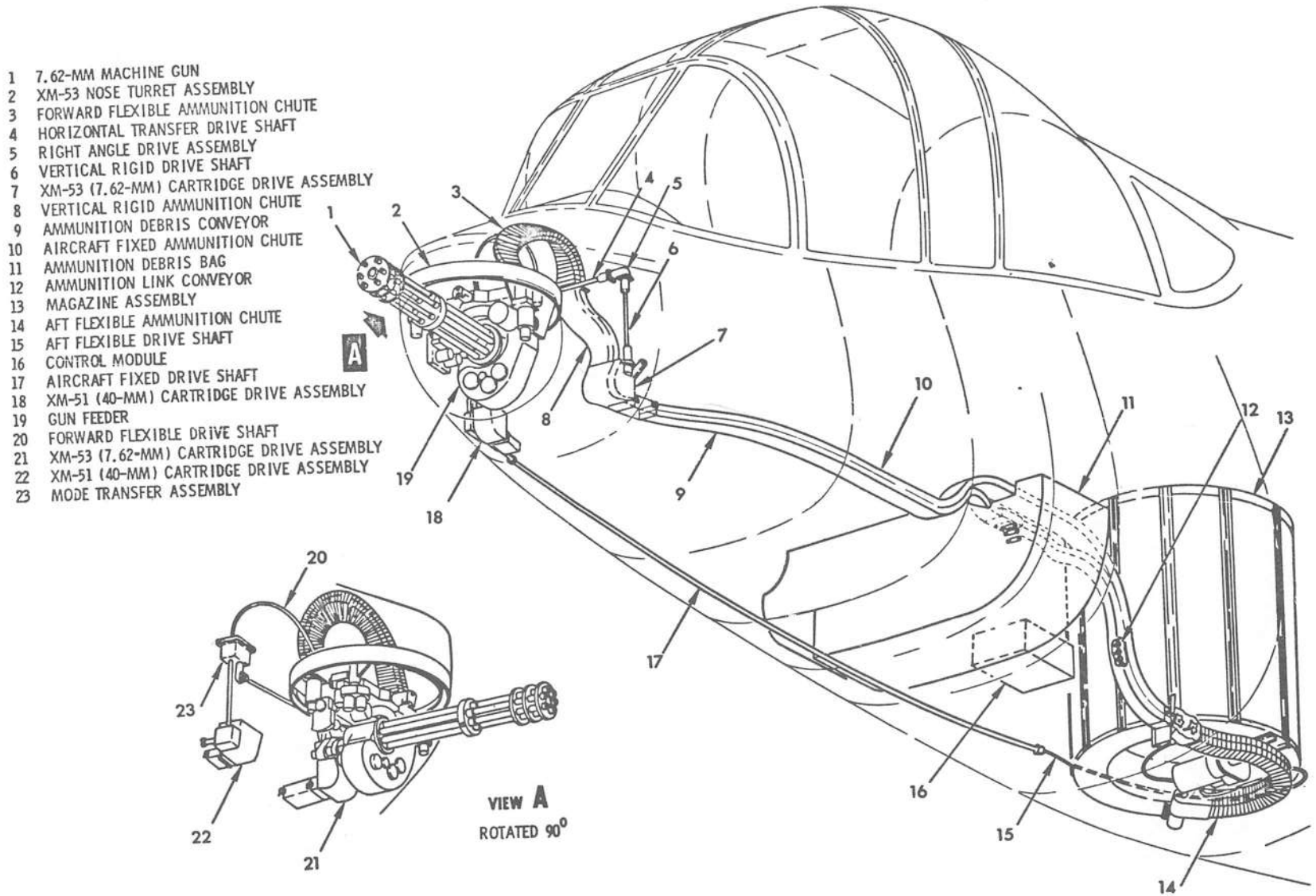
LIGHTING CONTROL PANELS

FIGURE 32
AH-56A



XM-51 ARMAMENT SYSTEM

FIGURE 33
AH-56A



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XM-53 ARMAMENT SYSTEM

FIGURE 34
AH-56A

Turret rotation is approximately 100 degrees left and right, while elevation limits are 18 degrees up and 70 degrees down.

The second Suppressive Fire System is a 7.62 mm mini-gun installed in a similar turret (see figure 34). The entire turret and ammunition feed mechanism are changed when changing systems. The systems can be changed in ten minutes, if necessary.

The mini-gun can be fired at four different rates, 750, 1500, 3000, or 6000 rounds per minute. Selector switches on the weapons control panels permit selection of any of the three slower speeds on the first detent of the trigger switch. The second detent will always fire at the maximum rate.

The ammunition drum for the 7.62 mm holds 11,570 rounds of unlinked ammunition. This is fed through a power conveyor to the turret. This conveyor is located on the left side of the aircraft.

The conveyor and the mini-gun are driven by the same basic shafting system used with the grenade launcher. The motor which powers the system is mounted on the ammunition drum.

The 7.62 mm spent cartridges are light enough that they could be blown into the tail rotor and propeller, if ejected overboard , therefore, the spent brass and any dud shells are returned to the conveyor from the gun and carried back into the debris bay in the fuselage just below the pilot. After being collected in the debris bay the brass may be dumped by opening a small set of bomb bay type doors, either during hovering flight or after landing.

The turret and turret control is practically identical to the grenade launcher system. The main differences being due to the physical differences in the guns and the different ballistic characteristics.

Light Point Fire System. The Light Point Fire System consists of a 30 mm gun mounted in a belly turret (see figure 35). The system is designed for use against trucks and light armored vehicles.

The gun fires 450 rounds per minute of dual capability fragmentation and shaped charge ammunition. The magazine holds 2010 rounds of unbelted ammunition. The ammunition is fed through a power feed system into the gun and the spent brass is ejected overboard.

Turret control is similar to the control of the nose turret, with either crewman being able to control it. Turret rotation is 200 degrees either way from the forward position, giving 360 degree coverage with the weapon. Gun elevation is 27 degrees up and 60 degrees down, maximum. Cams prevent the gun from pointing at any of the aircraft structure by limiting the up elevation in those areas where danger of hitting the aircraft exists.

Heavy Point Fire System. The Heavy Point Fire System consists of an assortment of wing mounted stores, missiles, and rockets (see figure 36). The two main systems used are the TOW missile and the 2.75 inch folding fin aircraft rockets.

TOW stands for Tube launched, infra-red Optically aimed, Wire guided missile. Pods containing three missiles each may be mounted on the inboard wing pylons.

The 2.75 inch rockets may be mounted on any wing station and up to 152 of them may be carried at one time. No rockets or missiles are mounted on the fuselage pylons because of the danger to the tail rotor and propeller from rocket blast or debris from the pod.

Either crewman can control the heavy point stores; however, it is anticipated that the pilot will normally be the prime operator. Rockets are fired in the same manner as from a fixed wing aircraft, by pointing the aircraft at the target and firing the selected rockets. The rockets may be fired either singly or in groups in ripple fire. If the copilot/gunner is flying the aircraft he can select rockets and fire them in the same manner as the pilot.

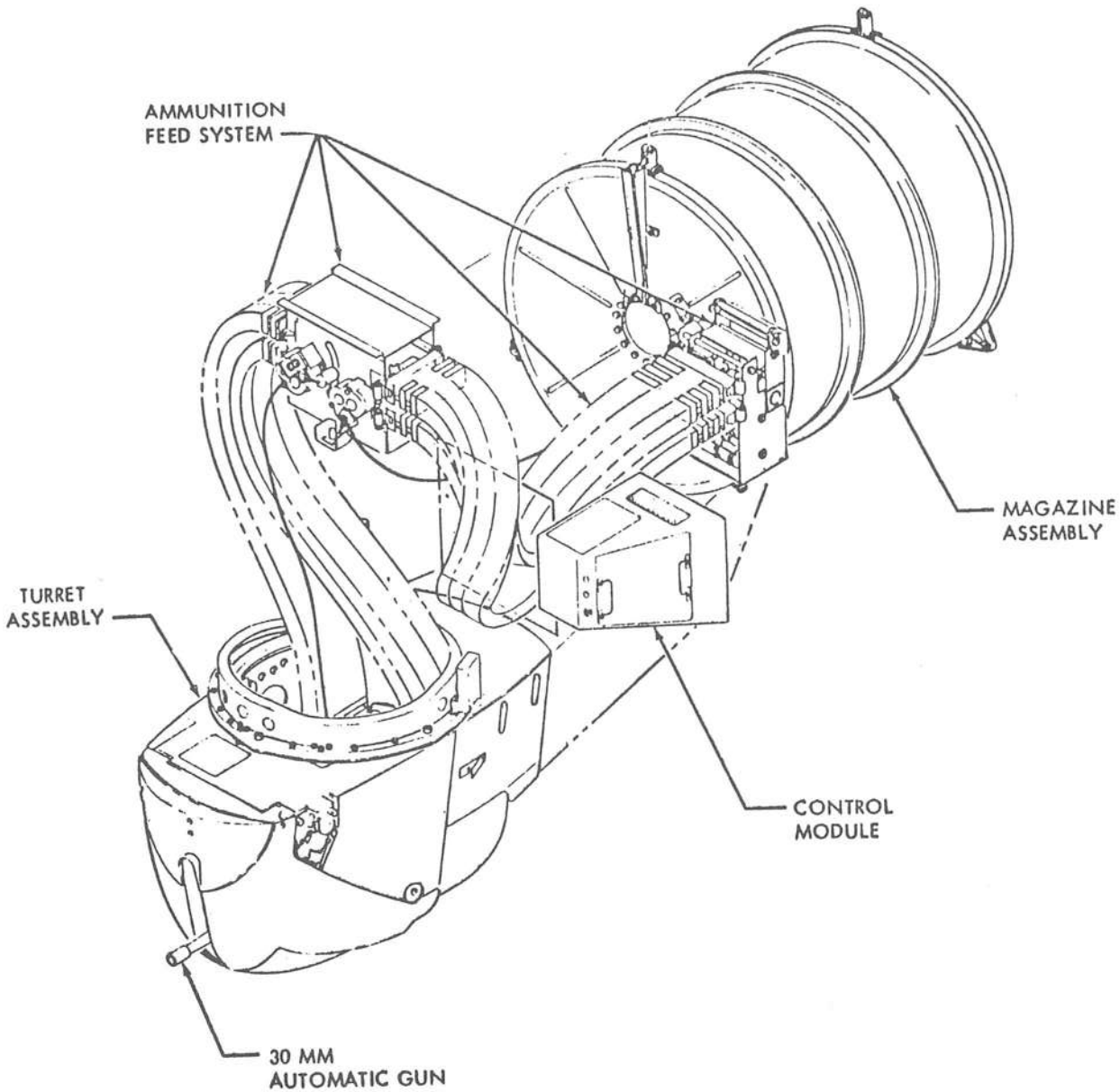
Firing the TOW missile is a cooperative effort. The copilot/gunner sights on the target with his swivelling gunner station sight. He then informs the pilot that he is on target and the pilot selects the TOW. Signals from the swivelling gunner station are applied to the pilot's attitude director indicator pointers and the pilot flies the aircraft to center the pointers. The copilot/gunner holds on the target during the maneuver and when the pointers are centered, the sightline is parallel to the aircraft axis. With the pointers centered the pilot fires the missile. A computer sets an initial turn into the missile control so that the missile flies into the line of sight. The missile tracker recognizes the missile signal and sends control signals to the missile to hold it in the line of sight. After the tracker has acquired the missile the pilot may take any evasive action he desires while the copilot/gunner holds the sight line on target by swivelling the station. The missile will follow down the line of sight until it impacts on the target. As can be seen it would be very difficult for the copilot/gunner to fire the TOW by himself, though he does have the controls to do so if necessary.

9. Fire Control and Sighting Systems

Because of the variety of weapons available and the number of alternate sighting methods the fire control and sighting systems become a rather complex subject. The subject is further complicated by the fact that the various systems are interrelated, and action in one system often affects the others. In this Study Guide we will first discuss the pilot's weapons controls, then the pilot's sighting systems. Finally the copilot/gunner's swivelling gunner station will be covered.

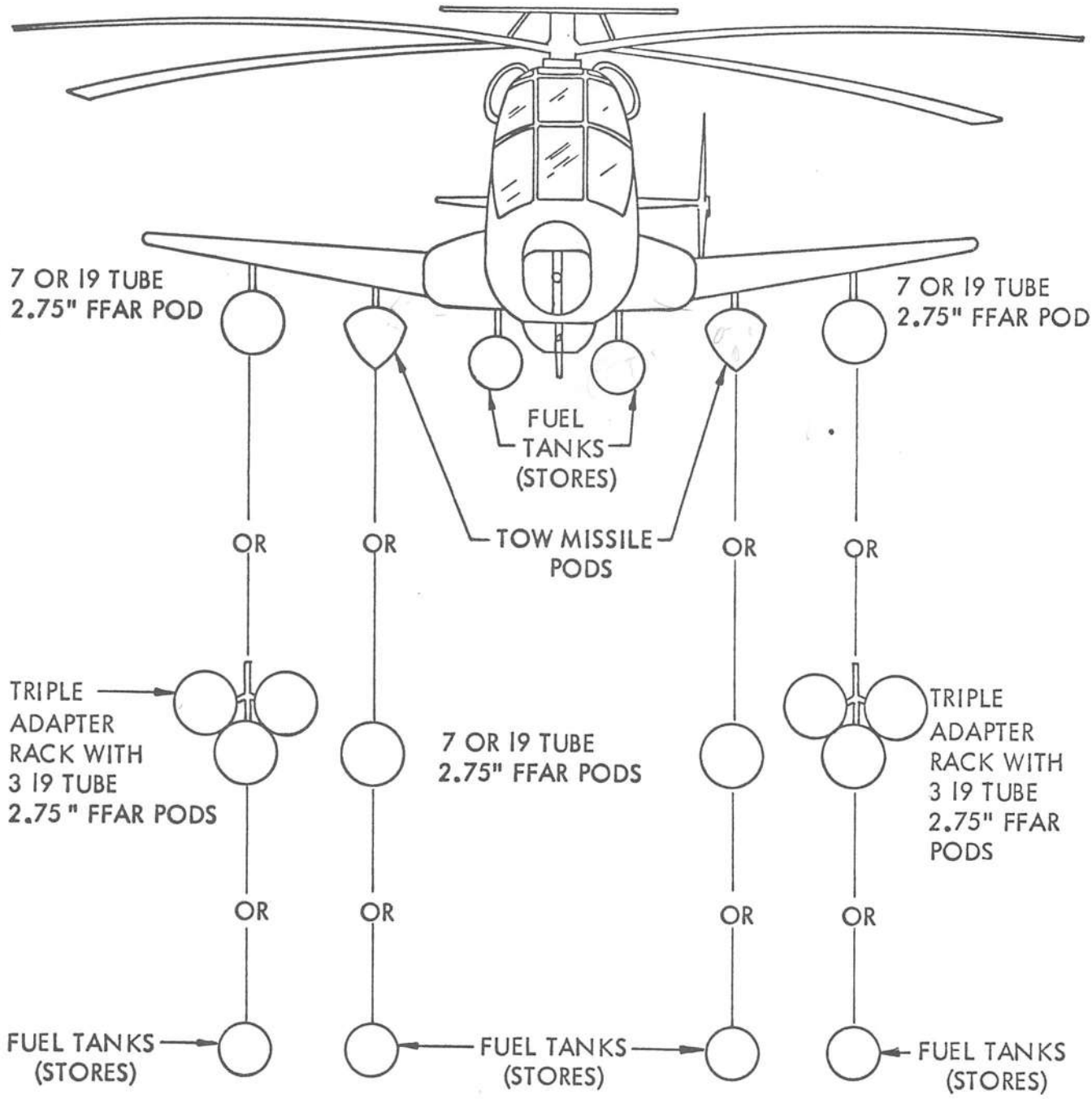
Pilot's Weapons Control Panel. The pilot's weapons control panel is located below the main instrument panel and provides the pilot with selection of the nose and belly turrets, the TOW missile, and the pilot's sights. Figure 37 shows the arrangement of the weapons control panel. The functions of the various controls are as follows:

The MASTER ARM switch controls all weapon firing circuits. The copilot/gunner also has a MASTER ARM switch and for normal operation both switches are placed in the ON position. The ORIDE position is provided to allow use of the



XM-52 ARMAMENT SYSTEM

FIGURE 35
AU-556A



EACH STATION HAS 2,000 POUNDS CAPACITY

weapons with only one switch operated in an emergency. The ORIDE position also permits firing the guns with the landing gear extended. In the normal firing mode the guns are disabled when the landing gear is extended for safety reasons. There are conditions in combat where firing the guns on the ground or during landing and take off is required and the override mode permits this to be done.

The NOSE ROUNDS counter shows the number of rounds remaining in the nose gun system. It is set by the armorer when the weapon is loaded and counts down as the gun is fired.

The NOSE RATE switch selects the rate of fire of the 7.62 mm minigun on the first trigger detent. This switch has no effect on the 40 mm system.

The NOSE SELECT indicator/switch is a multipole push button switch used to enable the nose gun. Pushing the switch will energize the nose gun circuits and light the RDY section of the indicator if the gun is operational. At the same time the P section of the indicator will light to indicate that the pilot has selected the gun and has control of it. A similar switch on the copilot/gunner panel also lights to indicate to the copilot/gunner that the pilot has selected the nose weapon. If the copilot/gunner has selected the nose weapon the RDY and G sections of the pilot's indicator will light to indicate that the selection has been made. The pilot has priority over the copilot/gunner, and if the copilot/gunner has made the selection and the pilot presses the switch he will cancel the first selection and set up pilot control of the weapon.

If for any reason the weapon is not ready to fire when, or after, the selection is made, the FI light will come on to indicate fire interrupt, and the weapon will be disabled. Fire interrupts will occur if the weapon is not tracking the sight within prescribed limits, ammunition is not reaching the gun, or if the belly gun is firing through the debris path of the 40 mm grenade launcher.

The NOSE TCK ERR indicator/switch is similar to the select switch, but with two indicators. If the weapon is not tracking the sight within 1 degree, the ERR section will light and firing will be interrupted. If the pilot wishes to continue firing even with the inaccurate sighting, he presses the switch and the BYP section of the indicator will light and the fire interrupt will be canceled. If the sight tracking returns to within limits the ERR light will go out. The pilot can then restore the interrupt safety circuit by again pressing the switch.

The BELLY ROUNDS counter and the TCK ERR indicator/switch perform the same functions for the belly turret as their counterparts in the nose system.

The belly gun requires charging before it is ready to fire. A dud round will leave the gun in the uncharged condition and interrupt firing. The BELLY NOT CHG indicator/switch light comes on when the gun is not charged. While this light is on, the belly gun can not be selected. If the light comes on while the gun is already selected, it will cancel the selection. Pressing

the switch will operate the gun charger and restore the system to operating condition.

The BELLY SELECT indicator switch operates in the same manner as the NOSE SELECT indicator/switch. It has the additional functions of showing FI if the swivelling gunners station is rotated more than 90 degrees from straight ahead while the pilot has the belly gun selected or if the NOT CHG light is on. The swivelling gunner station has a glass viewing window which could be blown out by the muzzle blast of the 30 mm gun if the window were facing the gun, and a fire interrupt occurs whenever the station is rotated to a position where the blast could hit the glass.

The MSL MAN/FAIL indicator tells the pilot that the TOW missile has locked into the tracker and he can now maneuver (MAN light on) or that something has failed in the missile control system and the missile has hung fire.

The WIRE CUTTER switch enables the pilot to cut the missile guide wire in event the automatic cutter should fail to operate. Normally, this switch is left in the AUTO position and the wire is cut as soon as the missile impacts the target. Operating the switch to MAN will cut the wire at any time, even before impact if desired.

The WPN REL indicator/switch lights when any weapons have been selected. Pushing the switch will cancel all selections which have been made by the pilot, except for rocket selections. This allows the pilot to clear all of his weapons with one action.

The COMPT NORM/BYP switch controls the computer ballistic and aircraft motion computations into the sighting system. In the NORM position the computer corrects the aim point of the weapon to compensate for the ballistic characteristics of the weapon, the motion of the aircraft, and the range to the target. If the pilot feels that something has gone wrong with the computer he can place the switch in BYP and eliminate these corrections. The turret will then track parallel to the sight line and the pilot will have to make his own corrections by aiming off target the required amount.

The SIGHT switch selects which of the two pilot sights he will use. The DIR position trains the selected turret to the direct sight line of sight. The HEL position connects the signals from the pilot's helmet sight to the selected turret computer so that the turret will follow the helmet sight. In the OFF position no sight is selected and the selected turret will remain in the stowed position.

The HELMET potentiometer controls the dual reticle lamps in the helmet sight. In the center position both lights are out. Rotation in either direction will light one or the other of the lights. The dual system guards against loss of the sight by failure of a single lamp.

The BORESIGHT switch is used to check the operation and boresight of the helmet sight. To check the boresight the pilot places the switch ON, which turns on both the helmet sight and the fixed sight. He then superimposes

the helmet sight reticle on the fixed sight reticle and moves the switch to NULL. The computer compares the helmet position to the fixed sight line and indicates whether the boresight is correct. If the boresight is faulty, the reticle in the helmet sight will flash on and off to warn the pilot that the sight is not accurate.

The multi-position RANGE switch is used by the pilot to insert estimated ranges into the computer ballistics calculations when the laser range finder is not available. The pilot selects the nearest position to his estimate of the range and presses the RANGE INSERT switch to enter the range into the computer. If the copilot/gunner is using the laser range finder on the same target, the pilot places the RANGE switch in LASER and enters the actual range as measured by the range finder.

External Stores Control Panel. Identical external stores control panels are installed in the two crew stations. Figure 38 shows the arrangement of the panel. In the pilot station the external stores panel is located just below the main instrument panel to the right of the weapons control panel. The pilot's stores panel has priority. Any section made by the copilot/gunner will be canceled if the pilot makes the same selection. The functions of the various controls are as follows:

The RKT-OFF-ST switch acts as a secondary master armament switch for the external stores and as the selector for rocket or stores release. To release the external stores the MASTER ARM switches must be ON and the RKT-OFF-ST switch selected to the type of store desired.

The LONG-SHORT switch selects a weapon release interval of either 185 or 85 milliseconds between release of multiple rockets.

The RIPPLE-OFF-SALVO switch in the RIPPLE position sets the rockets to fire in multiple groups at the rate set by the LONG-SHORT switch. In the OFF position the selected stores or rockets will release one at a time, one for each actuation of the firing release. The SALVO position will cause all selected stores to release at the same time for one operation of the release switch.

The NOSE-NOSE TAIL switch arms the fuzes in the stores.

The SEL JETT-OFF switch sets up the circuits to jettison the stores from selected weapon stations at one time.

The QTY selector selects the total number of weapons to be released in the RIPPLE or SALVO conditions.

The R-INBD indicator/switch selects the right inboard weapon station and indicates the type of weapon installed on that station. Pressing the switch once selects the station and lights the indicator lights, a second press cancels the selection and turns out the lights.

The FUSELAGE indicator/switch is a four position selector for selecting the fuselage stations. The first actuation will select the left fuselage station, the second the right station, the third will select both stations, and

a fourth actuation will return the system to off.

The L-INBD indicator/switch operates the same as the R-INBD, except for the left station.

The OUTBD indicator/switch operates the same as the INBDs, except that it selects both stations on an alternating sequence beginning at the left side. By firing the outboard stations alternately, the lateral out of balance condition of the aircraft is kept at a minimum.

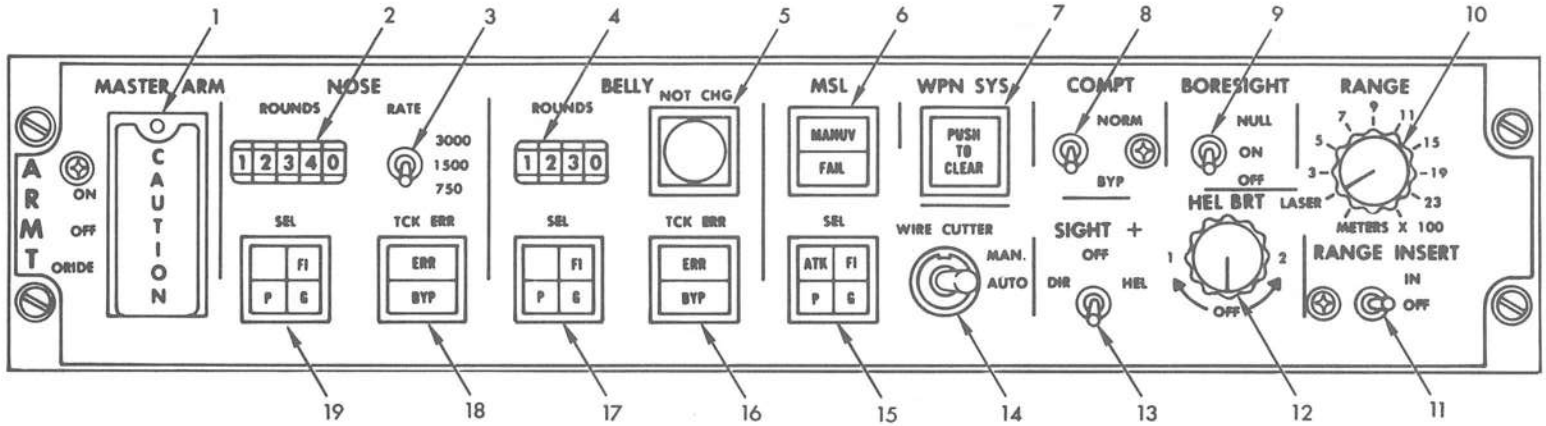
The RESET indicator switch indicates the status of the selected stations and systems and permits cancelling all except the FUSELAGE selections. An E indicator light shows an empty station has been selected. A NO GO light indicates some possible malfunction in the control system and prevents operation of the weapon. An R light indicates an incorrect selection has been made on the panel, such as selecting for rockets on a station which contains another type of store. A T light will show while a ground test circuit is actuated. Pressing the switch will cancel all selections except the FUSELAGE selection, which must be manually reset.

Pilot's Direct Sight. A reflector type sight is mounted on the pilot's instrument panel glare shield. This sight acts as fixed sight for the guns or rockets and is automatically adjusted to the correct boresight by selection of the weapon. The sight mount is factory boresighted to the aircraft and the sight may be replaced without further boresighting.

Pilot's Helmet Sight. The pilot's helmet sight provides an optical-electronic system for measuring the position of the pilot's head, and therefore the direction in which he is looking, and translating this position into a sight line. This sight line information is then fed into the selected gun turret and causes the gun to point at the same target the pilot is observing. The system consists of a helmet sight and sensor assembly attached to the pilot's helmet, two light sources mounted on the canopy structure above and behind the pilot, and a sensor electronic assembly for processing the signals from the helmet sight sensors.

The helmet sight and sensor assembly contains a system for projecting a collimated sight reticle through a plastic sight piece in front of the pilot's eye, and four photo sensors mounted two on each side of the helmet. Rotating planes of light from the light source assemblies cross the sensors at different times, depending upon the position of the pilot's head. The sensors send signals to the electronics assembly, which compares them with reference signals from the light sources and computes the position of the helmet sight line. This information is then fed to the central computer complex where it is translated into turret position signals. The system contains various interlocks and check circuits which will prevent any failures of the sight components from causing the turrets to track in a random manner.

Swivelling Gunner's Station. Practically all of the copilot/gunner's fire control and sighting equipment is mounted on a turntable in the floor of the forward flight station and entire assembly is known as the

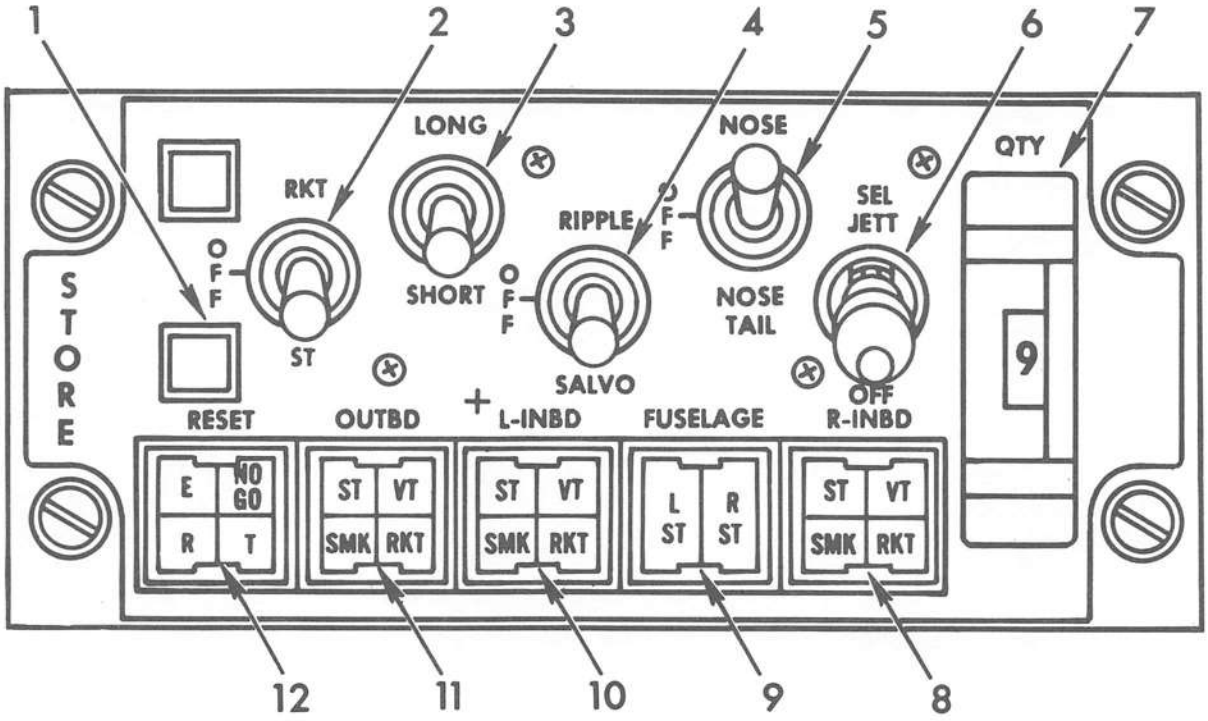


F10A-P2-6-16

1 Master arm switch
2 Nose gun rounds counter
3 Nose gun rate selector switch
4 Belly gun rounds counter
5 Belly gun not changed indicator light
6 Missile status indicator light
7 Weapons selection clearing switch
8 Computer normal bypass pushbutton switch
9 BORESIGHT switch
10 RANGE mode and distance select knob
11 RANGE INSERT switch
12 Helmet sight reticle brightness control knob
13 Direct/helmet SIGHT selector switch
14 WIRE CUTTER switch
15 Missile selector and status indicator pushbutton
16 BELLY gun tracking error indicator pushbutton
17 BELLY gun selector and status indicator pushbutton
18 NOSE gun tracking error indicator pushbutton
19 NOSE gun selector and status indicator pushbutton

PILOT'S WEAPONS CONTROL PANEL

FIGURE 37
AH-56A



1 Rocket/stores selected annunciator lights
2 Rocket/stores selector switch
3 Firing interval selector switch
4 Rocket firing mode selector switch
5 Fuse arming switch
6 Stores selective jettison enable switch
7 Rocket quantity selector dial
8 Right inboard pylon pushbutton selector switch
9 Fuselage pylon pushbutton selector switch (sequential)
10 Left inboard pylon pushbutton selector switch
11 Right and left outboard pylon pushbutton selector switch
12 Pylon selected reset pushbutton switch

EXTERNAL STORES CONTROLS PANEL

swivelling gunner's station. The major items on the swivelling gunner's station are the copilot/gunner's seat, a periscopic sight, a direct sight, right and left hand control grips, a weapons control panel, and the laser range finder. A great deal of other equipment is also part of the station, but will not be discussed at this level. Figure 39 shows an overall view of the complete gunner's station.

Copilot/gunner's Seat. The seat is mounted on the aft side of the turntable. It is armor plated on combat aircraft and adjustable in the up and down position. There is no tilt or fore and aft adjustment. Two safety switches, actuated by heel plates on the turntable floor just forward of the seat, insure that the station can not be swivelled unless the operator's feet are in a safe position.

Periscopic Sight. The periscopic sight is mounted on the front side of the turntable, between the operator's knees. The optical system of the sight looks downward into a large viewing mirror in the sightnead below the fuselage. The optical system permits selection of three magnifications, 1.5 power, 4.25 power,or 12 power.

To aim the sight, the viewing mirror is moved in train and elevation. A very slight movement of the mirror in train develops an error signal in a servo mechanism which causes the turntable to rotate to follow the mirror. Position signals from the mirror and turntable are fed into a computer, which translates them into sight line information for the turrets. The mirror is gyro stabilized. After acquiring a target, the copilot/gunner can select stabilized mode of operation and the sight will lock onto a stationary target and hold it, even though the pilot is maneuvering the aircraft.

Direct Sight. An optical display direct sight is mounted on the top of the periscope tube. This sight is synchronized with the periscopic sight and is used for rough aiming of the periscopic sight, short range sighting, and as a fixed sight if the copilot/gunner is flying the aircraft and using the guns in the fixed position.

Right and Left Hand Grips. The station hand grips provide control of the sight and station (see figure 40). The right hand grip has five switches which perform the following functions:

PLT TGT switch will cause the swivelling station to train on the same target the pilot is sighting with the helmet sight. This permits the pilot to point out a target to the gunner for closer examination with the high magnification of the periscopic sight.

TCK control is a pressure sensitive four direction control for the main viewing mirror. As noted before, the mirror is moved to aim the sight and the turntable follows in train.

The SIGHT STAB switch is a push on push off switch which engages or disengages the gyro stabilization from the system. In the stabilized position the sight will hold on target as the aircraft moves. In the direct position the sight moves only in response to the TCK control and so will not hold on a

target unless the gunner manually controls it to do so. A small light just forward of the grip indicates when the system is in direct mode.

The SEAT CTR switch is a push on push off switch with one position leaving the sight free to operate, and the other forcing a return to the center position both in train and elevation. This permits the copilot/gunner to return from any position to the forward position with the single action of one switch. A small light forward of the grip indicates that the seat center mode is selected.

A standard two detent trigger switch on the front of the grip provides the control to fire the selected weapons.

The left hand grip also has five switches which perform the following functions:

TRIM switch is a standard five position trim switch and is provided to give the copilot/gunner some control of the aircraft in an emergency while he is returning to seat center and unstowing his controls.

The CIRCLE SEL switch signals the computer which of three stadiametric ranging rings the copilot/gunner is using for manual ranging. These rings are 9, 18 and 27 mil diameters and are used in estimating ranges when the laser range finder can not be used.

The MAG SEL switch is used to select the magnification desired on the periscopic sight. It also signals the computer which magnification is being used so that this information can be incorporated in the necessary computations.

The RADIO-ICS switch keys the copilot/gunner's mike for either ICS or radio transmission.

The RANGE INSERT switch will operate the laser range finder, if it is operable, or insert the manual range determined by the setting of the CIRCLE SEL and MAG SEL switches when the laser is not operating.

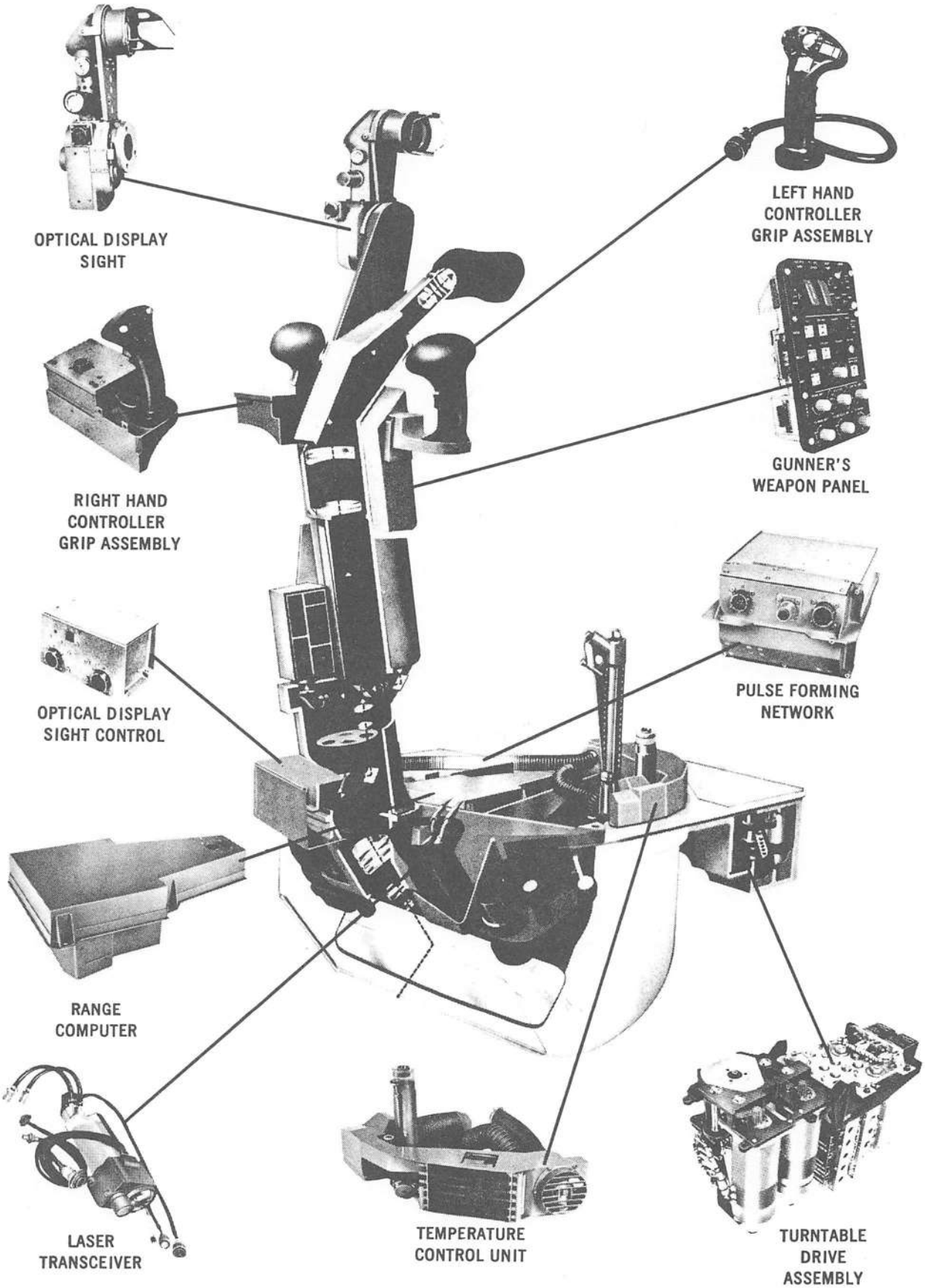
Weapons Control Panel. The swivelling gunner station weapons control panel is mounted on the aft side of the periscopic sight tube. Figure 41 shows the layout of this panel. The control functions are as follows:

The MASTER ARM switch functions the same way as the pilot's MASTER ARM switch.

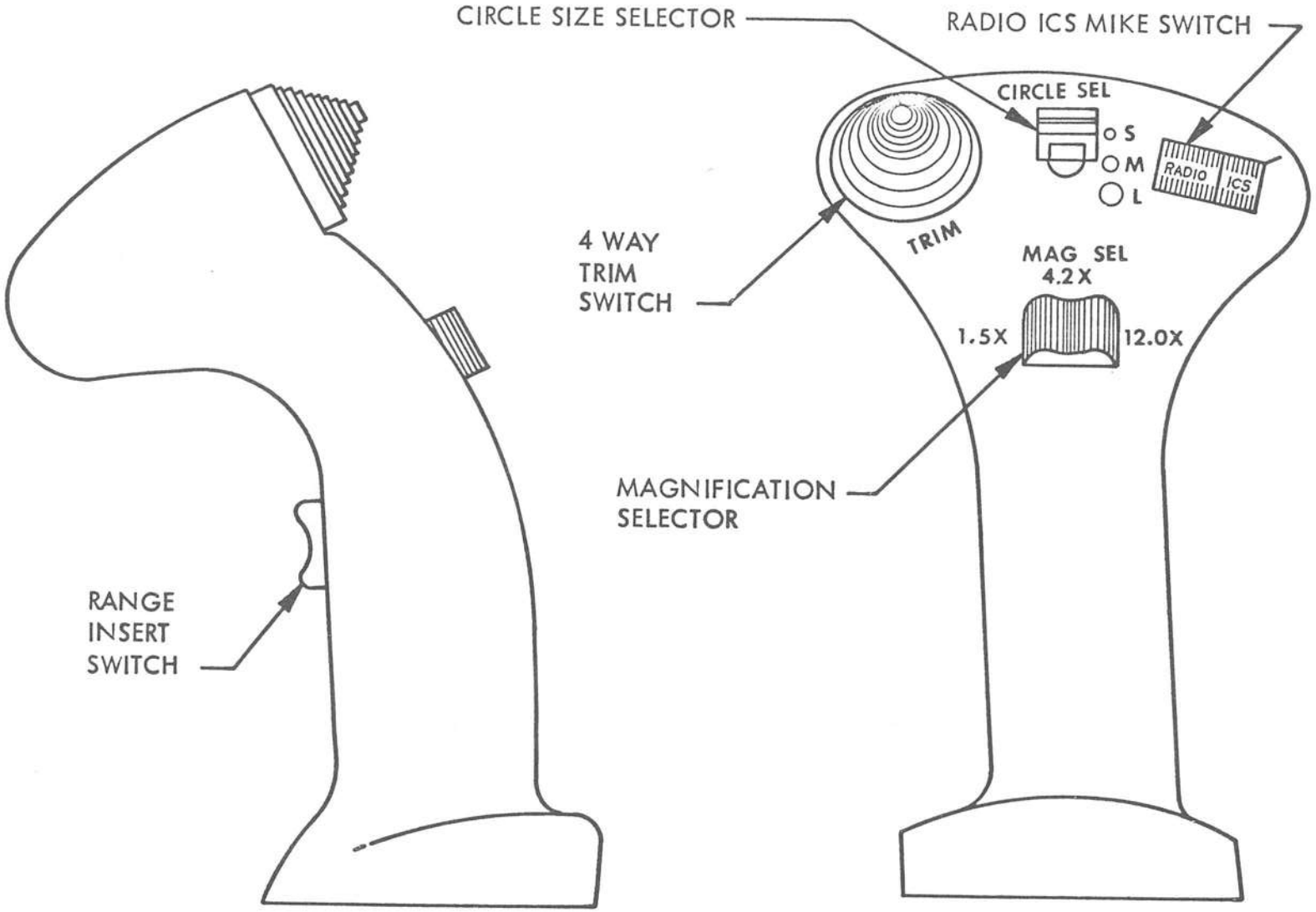
The PLT SELECT ORIDE switch can be used to cancel the pilot's weapons panel selections in an emergency. If the pilot has selected some weapon and then been disabled, this switch is the only way that the copilot/gunner can gain control of that weapon.

The SEAT PWR switch is the master control switch for the entire station. Unless this switch is ON none of the other station controls will function.

FIGURE 39
AH-56A

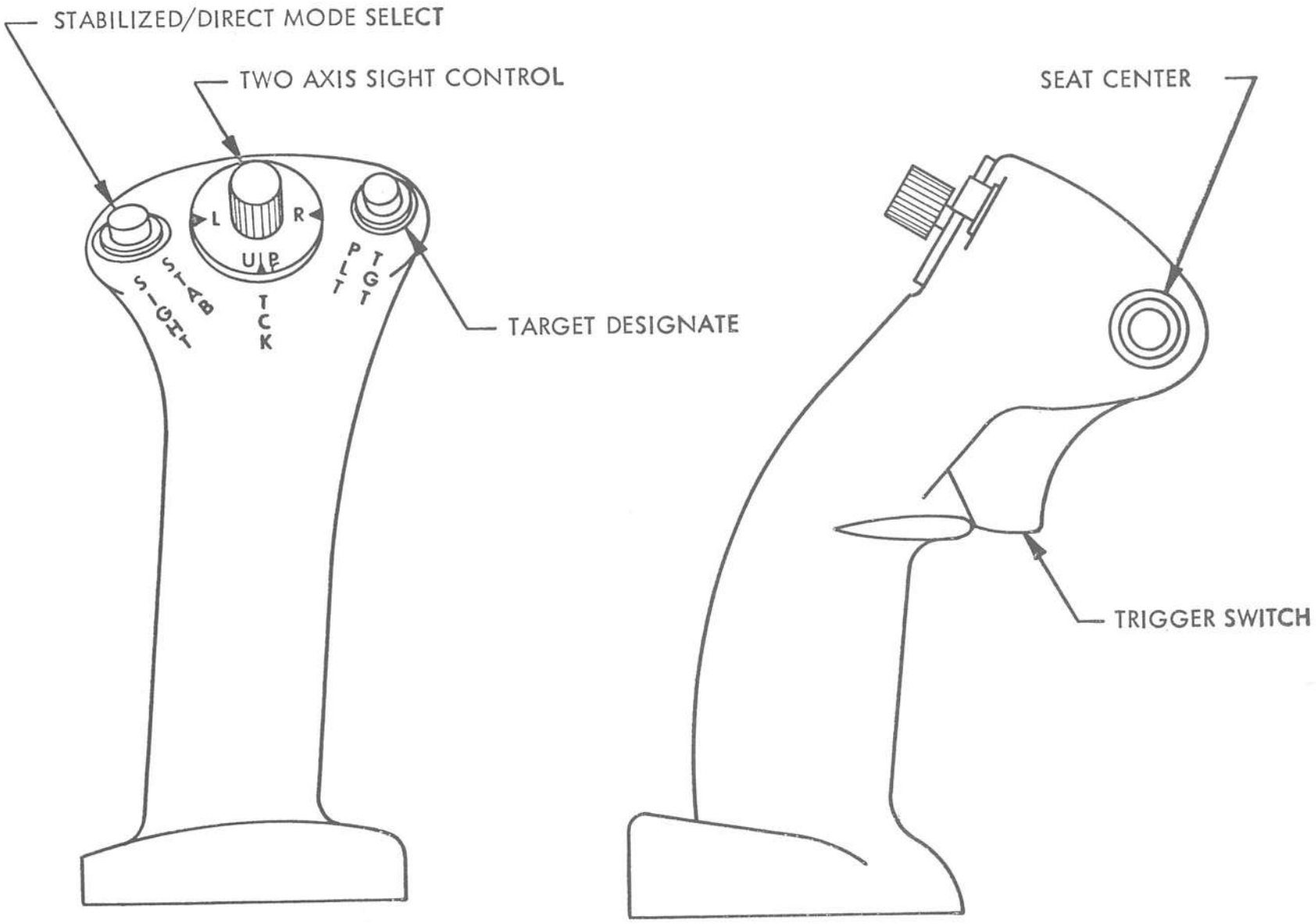


SWIVELLING GUNNER STATION



SWIVELLING GUNNER STATION LEFT AND RIGHT HAND GRIPS
(SHEET 1 OF 2)

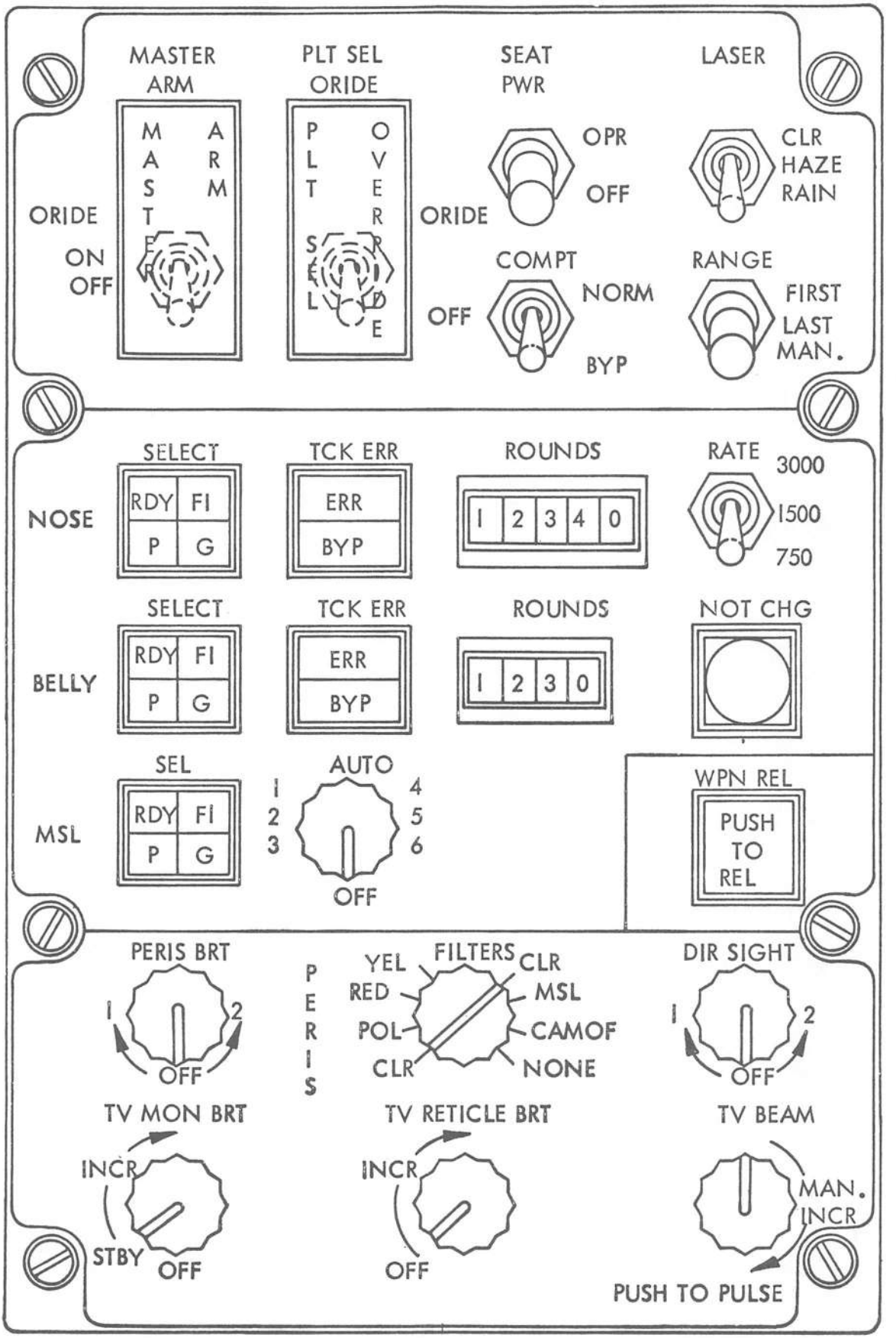
FIGURE 40
AH-56A



RIGHT HAND GRIP

SWIVELLING GUNNER STSTION LEFT AND RIGHT HAND GRIPS
(SHEET 2 OF 2)

FIGURE 40
AH-56A



COPILOT/GUNNER'S WEAPONS CONTROL PANEL

The COMP NORM-BYP switch connects or bypasses the computer ballistic correction functions for the swivelling gunner station.

The LASER CLR-HAZE-RAIN switch changes the gain of the laser range finder to compensate for weather conditions.

The RANGE FIRST-LAST-MAN switch controls which laser return will be used for ranging, or selects the stadiametric range if desired.

The NOSE, BELLY, MSL, and WPN REL switches all operate in the same manner as their counterparts on the pilot's panel.

The PERIS BRT control controls the brightness of the periscopic sight reticle.

The FILTERS selector selects filters, clear, polaroid, red, or yellow, to be inserted into the periscope optics. The other markings refer to filters for a proposed low light level television system which is not installed at present.

The DIR SIGHT control controls the reticle on the direct sight.

The remaining controls were designed for the low light level television sight and are not connected.

Laser Range Finder. Laser ranging can be defined as an optical radar. It uses a coherent light source, which means a light on a single wave length with all waves in phase with each other. This type of light can be projected out in a manner similar to a radio beam and be reflected back to a receiver in a manner similar to radar. The system has advantages of being much more accurate and of focusing to cover a very small area, as compared to radar. The accuracy of this system on the AH-56A is classified; however, a large laser system installed for satelite tracking in New Mexico has an accuracy of 25 feet at 500 miles.

The laser transceiver is installed in the swivelling gunner station sight head and looks into the same mirror as the periscopic sight. With the laser selected and the RANGE INSERT switch depressed, the laser sends out pulses which strike the target and return to the receiver section. The time needed for the return is measured and a computer translates this time into a range. This range is displayed numerically in the field of view of the periscopic sight and is also entered into the central computer complex for use in computations.

An external stores control panel and an auxiliary control panel are mounted off of the swivelling gunner's station on the right forward panel. The stores panel is identical with the pilot's stores panel. The auxiliary control panel contains test controls, a S/H COVER OPEN-CLOSE switch and a GRD FIRE switch.

The sight head is protected by a cover when the aircraft is on the ground. This cover is a bowl shaped unit with a hole in one side to expose

the sight window. Normally this cover rotates with the station and so keeps the same relative position to the window. Operation of the S/H COVER switch starts an automatic cycle in which the cover is locked to the aircraft and the station swivels 180 degrees and then picks up the cover again. In this manner the cover can either be opened or closed.

The GRD FIRE switch is an emergency control to permit firing of the nose turret on the ground when the only power available is the battery. Operation of this switch nullifies the ground safeties on the turret. For this reason this switch should never be operated except in emergency.

10. Avionic Systems

The avionics aboard the Cheyenne breaks down into five major groups: (1) Communications and Identification, (2) Computer Central Complex, (3) Navigation and Display, (4) Integrated Fire Control, and (5) Fault Location and Aural Warning System (FLAWS). Figures 5 through 12 may be used with the following descriptions for locating the various units.

a. Communications and Identification

The Cheyenne carries a great variety of communication equipment. Five different radios, covering the radio bands from high frequency to ultra high frequency, permit all types of tactical air to ground communication and also allow the Cheyenne to function as a radio relay station. This ability to retransmit incoming signals on another frequency extends the radio range of the ground troops by many hundreds of miles.

As this familiarization discussion will often be used by persons not familiar with radio systems a brief explanation of some of the terms to be used will be helpful.

Radio sets are classified according to the frequency on which they operate. Frequency has for many years been expressed in terms of kilocycles (Kc) and megacycles (Mc), or thousands (K) or millions (M) of cycles per second. Recently the electrical-electronic industry has adopted the term Hertz (Hz) to stand for cycles per second and frequencies are now expressed in kiloHertz (KHz) or megaHertz (MHz). The terms mean the same thing, except that Hz insures that it is cycles per second which is meant and eliminates the possible confusion of "cycles" which could be interpreted as per some other unit of time.

Early radio systems operated at low and medium frequencies in the range of approximately 40,000 Hz to 180,000 Hz (40 KHz to 180 KHz). As technology progressed, higher and higher frequencies were utilized and the range from 3 to 30 MHz became known as the High Frequency (HF) band, from 30 to 220 MHz as the Very High Frequency (VHF) band, and above 220 MHz as the Ultra High Frequency (UHF) band.

The low and medium frequencies are the commercial broadcast bands. The HF band is used mainly for communications and includes amateur radio, commercial radio telegraph, and "short wave" stations used in many countries for commercial radio. These frequencies have the characteristic that they are reflected by an ionized layer in the upper atmosphere, and so follow the curve of the earth and permit long range communication.

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The Cheyenne carries a great variety of communication equipment. Five different radios, covering the radio bands from high frequency to ultra high frequency, permit all types of tactical air to ground communication and also allow the Cheyenne to function as a radio relay station. This ability to retransmit incoming signals on another frequency extends the radio range of the ground troops by many hundreds of miles.

As this familiarization discussion will often be used by persons not familiar with radio systems a brief explanation of some of the terms to be used will be helpful.

Radio sets are classified according to the frequency on which they operate. Frequency has for many years been expressed in terms of kilocycles (Kc) and megacycles (Mc), or thousands (K) or millions (M) of cycles per second. Recently the electrical-electronic industry has adopted the term Hertz (Hz) to stand for cycles per second and frequencies are now expressed in kiloHertz (KHz) or megaHertz (MHz). The terms mean the same thing, except that Hz insures that it is cycles per second which is meant and eliminates the possible confusion of "cycles" which could be interpreted as per some other unit of time.

Early radio systems operated at low and medium frequencies in the range of approximately 40,000 Hz to 180,000 Hz (40 KHz to 180 KHz). As technology progressed, higher and higher frequencies were utilized and the range from 3 to 30 MHz became known as the High Frequency (HF) band, from 30 to 220 MHz as the Very High Frequency (VHF) band, and above 220 MHz as the Ultra High Frequency (UHF) band.

The low and medium frequencies are the commercial broadcast bands. The HF band is used mainly for communications and includes amateur radio, commercial radio telegraph, and "short wave" stations used in many countries for commercial radio. These frequencies have the characteristic that they are reflected by an ionized layer in the upper atmosphere, and so follow the curve of the earth and permit long range communication.

The VHF and UHF signals are not normally reflected by the ionized layer and so can only be received in line of sight ranges. These frequencies are used for short range communications, television and FM radio, and for tactical military communication.

Table II is a chart of the frequency spectrum covered by equipment presently installed in the AH-56A. The last column lists the equipment on the Cheyenne in the frequency bands on which each operates.

The VHF-UHF communication system consists of the LOHAP, or Light Observation Helicopter Avionic Package, developed for the Army by Sylvania. This system is very versatile, small in size, and light weight. As used on the AH-56A, the LOHAP consists of four radios, an interphone system,and an automatic direction finder (ADF).

The normal compliment of LOHAP radio sets consists of two AN/ARC-114 VHF-FM sets, one in each crew station, an AN/ARC-115 VHF-AM in the copilot/gunner station, and an AN/ARC-116 UHF-AM in the pilot's station. An ICS control panel is installed in each station. The pilot station also contains an ARN-89 ADF set and a retransmit selector panel. All of these units are interconnected through the ICS junction box, mounted in the debris bay. This box is the distribution center for practically all of the radio, navigation, audio warning, and ICS functions.

The ICS control panels (see figure 42) are mounted in the left forward panels in each station. These panels provide independent audio and transmit control for each crew member. No equipment numbers are shown on the face of the panel, as many of the sets are interchangeable and can be changed at any time. The present switch functions are listed on the drawing and those using the system will soon memorize the information applicable to their particular installation.

The top row of switches control the audio output from the various radios to the crew member's headset. The down position cuts off the audio while the up position connects it. The NAV switch controls the audio from the ADF VOR/LOC and DME (these are navigation equipments and will be discussed later). The M/B switch controls the marker beacon receiver audio.

The MIKE switch permits energizing the crewman's microphone without his having to press the microphone button, thus freeing his hands for other jobs. This function is available on interphone only and the XMTR SELECTOR switch must be in the INT position.

The XMTR SELECTOR switch position determines which transmitter will receive the microphone signal. The INT position is interphone only, while the numbered positions connect both the interphone and the respective transmitter.

The VOLUME control acts as the master level control for all audio signals except the ADF and IFF. The individual signal levels are adjusted at the respective receivers, but can all be controlled simultaneously by this one control.

The interphone, FLAWS, ECM (if installed), and IFF audio signals are unswitched and will always be heard if the systems are operating.

The AN/ARC-114 radios provide VHF-FM clear voice communication over a line of sight range. The sets will transmit and receive on any of 920 channels in the frequency range of 30.00 to 75.9 MHz, and if desired, simultaneously guard an emergency frequency channel. The installation in the pilot's station may be used in the navigation system as a homing receiver to home on a ground VHF-FM station. It can also operate in conjunction with other sets to retransmit incoming messages. This function will be covered in more detail later.

The AN/ARC-114's are completely self contained, except for the antennae, and are mounted in the pilot's and copilot/gunner's left forward panels. The units are 4 1/8 inches high, 5 3/4 inches wide and 6 1/2 inches deep and weigh 6 pounds each.

The AN/ARC-115 radio provides non-tactical VHF AM communication with civil air control towers and navigational control centers. It operates on any of 1,360 channels in the range of 116.00 to 149.975 MHz. It also can monitor an emergency channel at the same time. The AN/ARC-115 is also part of the retransmit system.

The AN/ARC-115 is normally installed in the copilot/gunner's right forward panel and is just slightly larger than the AN/ARC 114. By a simple change of the jumper plugs on the ICS junction box the AN/ARC 115 is interchangeable with the AN/ARC-116.

The AN/ARC-116 radio provides non-tactical UHF-AM communication with military control towers and air navigation control centers as well as tactical air to air communications. The system can be set to any of 3,500 channels between 225.0 and 399.9 MHz. Like the rest of the sets, it also has emergency frequency guard and retransmit capability.

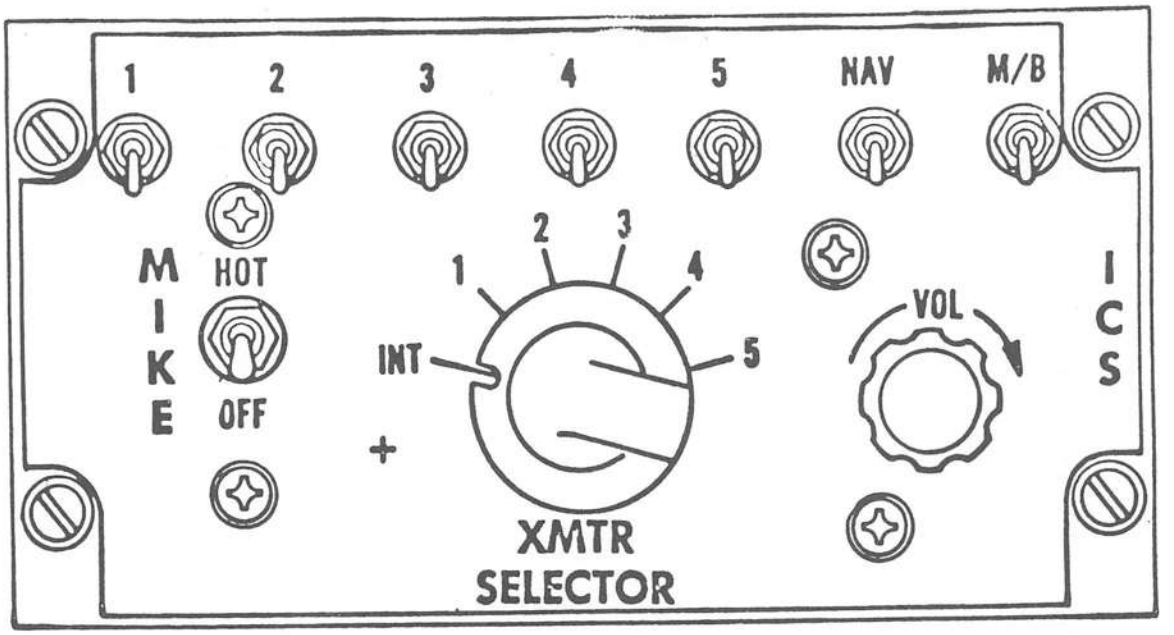
The AN/ARC-116 is normally installed in the pilot's lower right panel. By changing the ICS junction box jumper plugs it can be interchanged with the AN/ARC-115.

The retransmit function uses the pilot's AN/ARC 114 as the master set. Positioning the retransmit selector switch, on the forward end of the pilot's left console, will interconnect this set with another in such a manner that anything received on one will be immediately retransmitted on the other. The three available combinations are: (1) Switch position 2&3 - Pilot's VHF-FM (AN/ARC-114) to the pilot's UHF-AM (AN/ARC-116) or VHF-FM (AN/ARC-115), which ever is installed. (2) Switch position 4 - provision for pilot's VHF-FM to pilot's HF SSB set. This set will be discussed later. (3) Switch position 5 - Pilot's VHF-FM to the copilot/gunner's VHF-FM.

One precaution which must be observed while operating in retransmit position 5 is to be sure the two VHF-FM sets are not tuned to the same channel. At best, this condition would result in transmitting only a regenerative squeal, and at worst, it could destroy the sets.

MHz	DESIGNATION	TYPE	USE	EQUIPMENT
400	ULTRA HIGH FREQUENCY (UHF)	LINE OF SIGHT	MILITARY AIR COMMUNICATION	AN/ARC-116, UHF AN/ARN-58, GS
220	VERY HIGH FREQUENCY (VHF)		TV COMMERCIAL	
150			CIVIL AIR COMMUNICATION AND NAVIGATION	AN/ARC-115, VHF-AM AN/ARN-82, VOR/LOC
108			FM AND TV COMMERCIAL	
80			COMMERCIAL TV TACTICAL FM	AN/ARN-58, MKR BCN AN/ARC-114, VHF-FM
30	HIGH FREQUENCY (HF)	LONG RANGE	GENERAL RADIO COMMUNICATION	AN/ARC-102, HF-SSB
3	MEDIUM AND LOW FREQUENCY		AM COMMERCIAL RADIO AND NAVIGATION	AN/ARN-89, ADF
0.1				

TABLE II
RADIO FREQUENCY AND UTILIZATION CHART



PILOTS ICS PANEL CONTROL FUNCTIONS

AUDIO SWITCHES

1 VHF/FM - 1*
2 UHF/AM
3 VHF/AM
4 HF-SSB
5 VHF/FM - 2*
NAV ADF, VOR/LOC, & DME
M/B MARKER BEACON

XMTR SELECTOR

INT INTERPHONE
1 VHF/FM - 1*
2 UHF/AM
3 VHF/AM
4 HF-SSB
5 VHF/FM - 2*

MIKE

PROVIDES HOT MIKE OPERATION IN INTERPHONE MODE ONLY.

VOL

MASTER VOLUME CONTROL FOR SWITCHED AUDIOS.

UNSWITCHED AUDIOS

INTERPHONE
FLAWS
ECM
IFF

* COPILOT/GUNNERS PANEL CONTROL FUNCTIONS ARE IDENTICAL EXCEPT FOR ITEMS MARKED WITH AN ASTERISK. THESE ITEMS ARE REVERSED IN POSITION.

ICS CONTROL PANEL

In addition to the LOHAP system, a high frequency single side band (HF SSB) AN/ARC-102 radio is provided for long range general communication. Because this set operates below the line of sight frequencies, the signals are reflected by the ionized atmosphere and so follow the curve of the earth. Under proper conditions the AN/ARC-102 can transmit half-way around the world. However, normal operating ranges are usually under 1,000 miles. The HF SSB system consists of a control panel in the aft end of the pilot's right console, a receiver/transmitter, antenna coupler, and load balancing unit located in the aft avionics bay. The system does not have retransmit function at the present time. The retransmit position 4 is provision only. The retransmit function will be added at a later date.

The interphone provides the crew with communication between each other and with two ground crew stations. The ground crew connectors are located inside the forward end of the battery access door and inside the hand hold over the aft end of the right sponson. Ground operation of the interphone system will be covered in section IV.

An AN/APX-72 IFF system is provided to identify the aircraft to ground or airborne radar. The system consists of a control panel, near the aft end of the pilot's right console, a transponder, test set, and antenna switching unit, in the aft avionic bay, and two antennae, one on the top and one on the bottom of the fuselage. The transponder is also connected through a computer to the interphone so the crew may have an audio indication of radar contact. An incoming radar signal will trigger one of 4,096 coded replies to identify the aircraft.

b. Computer Central Complex

Mention has been made several times in discussion of the fire control system of the computer central complex (CCC). This system makes most of the computations necessary for control of the armament and those used in the navigation system.

The CCC is located in the main avionic bay, and consists of a signal transfer unit (STU), a digital interface unit (DIU), and three central processor units (CPU) mounted together in a single chassis.

The signal transfer unit is a small general purpose computer which provides arithmetic, control, and program memory functions. The digital interface unit regulates power and provides interface between the computer and the using units. Each central processor unit is capable of up to 31,250 computations per second. The three CPUs operate in triple redundant fashion, with the results of the computations being compared for verification of accuracy.

The computer functions are too complex to discuss in a familiarization course. It will be sufficient for our purposes to note that the CCC receives data from the pilot's helmet sight, the swivelling gunner's station, the doppler navigation system, the air data computer, and the radio direction finders and uses this information to develop answers to ballistic and navigation problems. By using one large computer on a time sharing basis, more accurate results can be obtained than would come from several smaller computers.

c. Navigation and Display Systems

Radio Navigation Systems. The Cheyenne carries five radio navigational aids, which permit accurate navigation even in event of failure of the self contained navigation systems. The normal radio navigation equipment consists of an AN/ARN-82 VOR/LOC, and AN/ARN-58 GS/MB, an AVQ-70 DME, an AN/ARN-89 ADF, and a homing function on the AN/ARC-114 VHF/FM #1 communication set.

The AN/ARN-82 provides ability to home on VHF omni-range stations (VOR) and provides localizer functions during instrument approach (LOC).

The AN/ARN-58 provides glide slope and marker beacon indications during instrument landing approach. In conjunction with the AN/ARN-82 the system provides complete instrument landing capability on any field with ILS equipment.

The AN/AVQ-70 measures the slant distance to a selected VOR (omni-range) station and is used in conjunction with the AN/ARN-82 homing to pinpoint the aircraft location.

The AN/ARN-89 automatically will indicate the bearing to a selected radio station and is used for position triangulation.

The pilot's VHF/FM receiver is also provided with homing capability and can be used to lead the aircraft to a given station.

Self-Contained Navigation System. A Doppler Heading Attitude Reference System (DHARS) gives the Cheyenne the capability to keep track of its position without any reference to outside information. The system combines an inertial navigator with doppler speed measuring to maintain a constant dead reckoning position throughout the flight.

The doppler section measures the aircraft velocity in the heading, drift, and vertical directions and provides radar altitude information. The inertial system provides heading, pitch, and roll attitude reference. The outputs of the sytems are displayed in various ways on the pilot's attitude and heading instruments and as Universal Transverse Mercator (UTM) grid coordinates on the computer control panel. The accuracies of the system are classified, but are generally much more accurate than the results obtained by conventional navigation methods.

Display Systems. Two bearing distance heading indicators (BDHI) are installed, one in each flight station. These instruments display the information from the homing and direction finding radios, along with distance to selected VOR stations and aircraft heading. The information to be displayed on the BDHI is controlled by a MODE SELECT panel, located on the left forward panel for the pilot and on the right side of the main instrument panel for the copilot/gunner.

Two attitude director indicators (ADI) are provided, one in each station. These instruments display steering directions for navigation, instrument landing, and fire control.

The computer control panel in the pilot's right console, provides the pilot the method of inserting navigational information into the computer and for the computer to give the pilot answers to the problems he has presented. The computer panel can present the UTM coordinates of the aircraft location, check points, targets located by the swivelling gunner station, and the distance bearing and elevation change between two points located by the swivelling gunner station.

Two map plotters are provided, one in each station. These plotters take sections of standard maps and will trace the track of the aircraft over the map, constantly showing the exact location over the terrain. Various scale maps can be used, depending upon the type of mission and the accuracy desired.

Backup navigation equipment includes a flux gate remote compass, a standby attitude indicator, and a magnetic compass in each station.

d. Integrated Fire Control System.

The fire control system functions have already been discussed. Most of the operation of the fire control system is a function of the CCC, with inputs from the pilot's helmet sight, swivelling gunner station, Doppler, and air data computer.

e. Fault Location and Aural Warning System

Sensors throughout many of the aircraft systems detect faulty operation of the systems and trigger warning lights on the crew annunciator panels and/or on a FLAWS panel behind the copilot/gunner. At the same time, certain critical malfunctions trigger a tape recorded voice warning which verbally tells the crew that the malfunction is occuring. The warning lights will stay lit and the verbal warning continue until the crew acknowledges the message by pressing a switch. The FLAWS panel has a memory system whereby the ground crew can recall the warnings which have occurred during the flight for reference. The FLAWS system is one of the factors which permits rapid maintenance of the systems. A FLAWS warning will direct the maintenance man to a location where, usually, the BITE indicators will locate the trouble to a replaceable component.

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IV. OPERATING PROCEDURES

Certain ground operating procedures are common to much of the maintenance done on the aircraft. This section will discuss the procedures and safety precautions to be followed for ground operation of the APU, the hydraulic system, the electrical system, and the ICS. Detailed operation procedures in the POMM 55-1520-222 series technical manuals should be followed for the actual operation of the equipment. The following information is intended to merely emphasize and reenforce the information in the manuals.

A. Auxiliary Power Unit Operation (See Figure 27)

1. Starting the auxiliary power unit.

Before starting the APU, check to be sure that the following conditions are met:

a. APU exhaust shield - removed.

b. Battery - connected.

c. Fuel - sufficient quantity in left sponson tank.

d. APU - secure and serviced.

e. Hydraulic power package number 2 - serviced.

f. Cockpit electrical switches - set as specified in manual. (Especially check hydraulic system switch on pilot's collective lever is in BOTH position.)

g. Circuit breakers - set as specified in manual.

h. Ground personnel - clear of exhaust area, standby on fire extinguisher.

To start the APU perform the following steps:

a. BAT switch - move to ON.

b. APU start switch - move to START, when APU rpm is over 5% release to RUN.

c. Instruments - observe APU exhaust temperature and tachometer during start. Abort start if limits are exceeded.

2. Stopping the auxiliary power unit.

To shut down the APU perform the following steps:

a. APU start switch - move to OFF.

b. BAT switch - as required.

c. APU exhaust shield - install if aircraft is to be left parked.

B. Hydraulic Power System Ground Operation

CAUTION

Do not operate the hydraulic systems in bypass position for more than 1 minute on number 1 system and 2 minutes on number 2 system. Bypass operation generates excessive heat and will damage the pumps if permitted to continue more than the above times.

1. Operation with the APU running.

Before starting the APU check to be sure the following conditions are met:

a. Number 2 hydraulic power package - secure and serviced.

b. Hydraulic system switch on pilot's collective lever - in BOTH position.

Starting APU will automatically operate the number 2 system.

If it is desired to test the number 1 system operation with the APU only operating, pull the BLEED AND FILL handle in the right forward corner of the accessory section. The number 2 pump will then power the number 1 system.

2. Operation with the main engine running.

Before starting main engine check to be sure the following conditions are met:

a. Hydraulic power packages nr 1 and nr 2 - secure and serviced.

b. Hydraulic system switch on pilot's collective lever - in BOTH position.

c. BLEED AND FILL handle - pushed in.

Starting the main engine will automatically operate both hydraulic systems, if rotor brake is released. The rotors must turn for nr 1 system operation.

C. Electrical System Ground Operation (See Figure 28 and 29)

1. External power operation.

Before applying external power to the aircraft check to be sure the following conditions are met:

a. Cockpit electrical switches - as specified in manual.

b. Circuit breakers - as specified in manual.

To apply external power perform the following steps:

a. Connect ground power supply to aircraft receptacle.

b. Start ground power supply and adjust to nominal 120/208 volts at 416 Hz.

c. Place BAT switch ON.

CAUTION

Do not place the EXT PWR MONITOR switch in the EMER OVRD position.

d. Momentarily place the EXT PWR MONITOR switch in the RESET position, then release.

NOTE

If the external power voltage and frequency are not within acceptable limits or the phase rotation sequence is incorrect, the external power monitor will drop out and prevent external power from being applied to the aircraft. After correcting the cause of the power being out of limits, the system can be reset by moving the EXT PWR MONITOR switch to RESET and releasing. In an emergency, the frequency and voltage protection may be overridden by placing the EXT PWR MONITOR switch in the OVRD position. This will allow power which is not within the frequency and voltage limits to be applied to the aircraft, but will not allow a reversed phase rotation to be applied. DO NOT override the external power monitor when electrical power is below 350 Hz and/or below 85/147 VAC, or above 132/229 VAC, as read on the instruments on the generator set. If the external power monitor is overridden under these conditions major damage to the aircraft electrical equipment will result.

To remove external power, shut down ground power supply and disconnect from the aircraft.

2. Power system operation with APU or engine running.

Running the APU or engine automatically runs both AC generators. To apply power to the system from the generators perform the following steps:

a. Place generator control switches ON.

b. If external power is on the aircraft, shut down the ground power supply and disconnect from aircraft.

To remove power while the engine is running, merely move generator switches to OFF/RESET position.

D. Intercommunication System Ground Operation (See Figure 42)

1. Preparation for operation.

Apply power to the essential DC bus by one of the following methods:

a. Place BAT switch ON.

b. Apply external power to aircraft.

c. Operate APU or engine and apply power to buses.

NOTE

Do not use battery if other methods of powering bus are available.

Check that the ICS circuit breaker on the nr 1 panel (aft breaker on next to outboard row) is closed.

2. Operation

a. Plug in ground crew head sets, if needed.

b. Keying any mike will permit talking to all stations.

NOTE

The crew station microphones are keyed by the RADIO-ICS switches on the cyclic sticks and the left swivelling gunner station hand grip. Use the ICS position of these switches to prevent accidentally transmitting on the air while using the ICS. If the XMTR selector switch on the ICS panel is in INT position there is no possibility of accidental radio transmission. For ground maintenance operation, where radio is not required, the INT position should always be selected.

V. DETAILED THEORY AND DESCRIPTION

No detailed theory or descriptions are given in this Study Guide. If more detail than has been given in sections III and IV is desired, refer to the POMM 22-1520-222 series Technical Manuals and the Study Guides for the particular system.

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VI. SUPPLEMENTARY DATA

A reprint from the LOCKHEED HORIZONS magazine is supplied with this Study Guide. This article covers the history of the development of the helicopter, including the development of the Lockheed rigid rotor system. This information will help in understanding the problems of helicopter design and some of the reasons why certain systems are designed as they are.

COMPONENT	ITEM NO	ITEM	LUBRICANT	LUBRICATION INTERVAL	APPLICATION METHOD	REMARKS
ENGINE	A	OIL TANK	MIL-L-7808F	AS REQ'D	OIL CAN	ADD OIL AS NECESSARY TO MAINTAIN LEVEL AT HALF WAY POINT OF SIGHT GAGE. RECHECK AFTER INITIAL RUN UP
	B	NF FEEDBACK CABLE	MIL-G-81322	300 HRS	ON ASSY & EA. INSTL	APPLY FILM TO FLEXIBLE CABLE (SQ. END)
	C	STARTER SPLINE	MIL-G-81322	600 HRS OR EACH INSTL	HAND	APPLY FILM TO SPLINE
	D	NC TRANSFER SPLINES	MIL-G-81322	600 HRS OR EACH INSTL	HAND	APPLY FILM TO EACH SPLINE
	E	MOUNTS	VV-L-800	ON ASSY	OIL CAN	APPLY TO LOWER TEE FITTING BUSHINGS ONL
ENGINE COWL ASSY (1002838)	A	ROLLERS (1002050 & 1002603)	MIL-M-7866	ON ASSY		APPLY DRY FILM TO AFT & MID ROLLER ASSY'S
	B	FUEL CONTROL ACCESS DOOR		ON ASSY		④
FILTER COWL INSTL (1002251)	A	HINGE PIN		ON ASSY		④
PROPELLER	A	GEAR BOX	MIL-L-7808F	AS REQ'D	OIL CAN	ADD OIL AS NECESSARY TO MAINTAIN LEVEL AT HALF WAY POINT ON SIGHT GAGE. RECHECK AFTER INITIAL RUN UP. ⚠
	B	ACTUATOR				⚠ ACTUATOR TO TOP EXTREMITY OF TARGET BOUNDARY LIP.
	C	DRIVE SHAFT BEARING (2 PLACES)	MIL-G-81322	ON ASSY & 600 HRS	GUN	PROCEDURE: (1) ROTATE DRIVE SHAFT DURING GREASING TO CHANNEL GREASE AROUND BEARING (2) OPERATE DRIVE SYSTEM AT GROUND IDLE FOR 10 MINUTES (3) SHUT DOWN, AND (4) ALLOW BEARINGS TO COOL BEFORE RESTARTING * (SEE BOX)
	D	** (SEE BOX)				
MAIN TRANSMISSION	A	OIL TANK	MIL-L-7808F	AS REQ'D	OIL CAN	ADD OIL AS NECESSARY TO MAINTAIN LEVEL AT HALF WAY POINT OF SIGHT GAGE RECHECK AFTER INTGRVAL RUN-UP
	B	OIL TANK FILLER DOOR (1003415)		ON ASSY		④
	C	ACCESSORY ACCESS DOOR (1003837)		ON ASSY		④
	D	ACCESSORY DRIVE SPLINES	MIL-G-81322	ON ASSY & EA. INSTL	BY HAND	APPLY FILM TO SPLINE
APU	A	OIL CAVITY	MIL-L-7808F	AS REQ'D	OIL CAN	ADD OIL AS NECESSARY TO MAINTAIN LEV. AT HALF WAY POINT OF SIGHT GAGE
	B	RIGHT ANGLE GEAR BOX	MIL-L-7808F	AS REQ'D	OIL CAN	ADD OIL AS NECESSARY TO MAINTAIN LEVEL AT HALF WAY POINT OF SIGHT GAGE RECHECK AFTER INITIAL RUN UP (CAPACITY: 82 CC)
	C	ZENDIX COUPLING ADAPTER SPLINE (1001462)	MIL-G-81322	ON ASSY & EA. INSTL	HAND	COAT SPLINES AND FILL SPLINE CAVITY WITH GREASE
SWIVELING GUNNER'S STATION	A	TURNTABLE DRIVE GEARS		ON ASSY		APPLY SOLID FILM LUBE PER MIL-L-23398
	B	VISOR LATCHING MECH	MIL-S-8660	ON ASSY	BRUSH	APPLY TO ALL SURFACES
	C	SIGHTHEAD ACTUATOR RING	MIL-G-81322	ON ASSY	BRUSH	APPLY TO ALL SURFACES
	D	SIGHTHEAD MOUNTING BOLTS	MIL-G-81322	ON ASSY	BRUSH	APPLY TO ALL SURFACES
	E	DIRECT SIGHT RESOLVE SHAFT		ON ASSY	BRUSH	APPLY FILM OF BEACON GREASE
	F	RESOLVER PACKAGE		ON ASSY	BRUSH	APPLY FILM OF BEACON GREASE
ARMAMENT	A	XM129 GRENADE LAUNCHER				LUBRICATE PER U.S. ARMY SPEC. TM9-1010-211[3]
	B	XM134 MACHINE GUN				LUBRICATE PER U.S. ARMY SPEC. TM9-1005-226[5]
	C	XM140 AUTOMATIC GUN				LUBRICATE PER U.S. ARMY SPEC. FOMM-1005-28[5]

PURGE BEARINGS PER ABOVE PROCEDURE WHEN AIRCRAFT IS INACTIVE 30 DAYS OR LONGER.

* DRIVE SHAFT SPLINE-TRANSMISSION END - MIL-G-81322 - ON ASSY & EACH INSTL - HAND. REMARKS: COAT SPLINES AND FILL CAVITY WITH GREASE.

COMPONENT	ITEM NO	ITEM	LUBRICANT	LUBRICATION INTERVAL	APPLICATION METHOD	REMARKS
1 SLIDING CANOPY	A	RACK	MIL-G-81322	ON ASSY	HAND	
	B	LATCH	MIL-G-81322		HAND	APPLY TO SPRINGS & CAMS
2 GUNNER'S DOOR	A	HINGE PIN				④
	B	LATCH	MIL-G-81322		HAND	APPLY TO JOINTS. DO NOT APPLY TO BEARINGS.
3 STEP LADDER	A	HINGE PIN				④
4 WALKWAY (1002219)	A	HINGE PIN				④
	B	LATCH	MIL-G-81322		HAND	APPLY TO SPRINGS & PIVOT PINS
5 DEBRIS DOOR (1002259)	A	HINGE PIN				④
6 LWR ACCESS DOOR FS 418-441 (1003481)	A	HINGE PIN				④
7 WING ACCESS DOORS (1000804)	A	HINGE PINS				④
8 SWASHPLATE ACCESS DOOR (1002652) - EA.	A	HINGE PIN				④
9 BATTERY ACCESS DOOR (1001887)	A	HINGE PIN				④
	B	LATCH	MIL-G-81322		HAND	APPLY TO SPRING & PIVOT PIN
10 HANDHOLD DOORS-FUSELAGE	A	HINGE PINS				④
11 APU ACCESS DOOR	A	HINGE PINS				④
12 SERVO-MECH ACCESS DOOR (1002313)	A	HINGE PIN				④
	B	HOLD-OPEN LATCH	MIL-G-81322		HAND	APPLY TO SPRING
13 AVIONICS DOOR (1001431)	A	HINGE PIN				④
	B	LATCH	MIL-G-81322		HAND	APPLY TO SPRINGS & PIVOT PINS
14 AMMO DOOR-FWD (1003184)	A	HINGE PIN				④
	B	LATCH	MIL-G-81322		HAND	APPY TO SPRINGS & PIVOT PINS
15 AMMO DOOR-AFT (1000376)	A	HINGE PIN		ON ASSY		④
16 REFRIG AIR CYCLE (1001694)	A	OIL SUMP	MIL-L-7808F	AS REQ'D	OIL CAN	ADD AS NECESSARY TO MAINTAIN OIL LEVEL HALF WAY UP SIGHT GAGE (CAPACITY 90CC)
17 CO-PILOT/GUNNERS SEAT ASSY (1003580)	A	VERT ADJUST SLEEVE 1004017-101 (2 PLACES)		ON ASSY		③
	B	TORSION TUBE 1008023-101 & -102		ON ASSY		③
	C	VERT ADJUST RETAINING PIN 1004235-101 (2 PLACES)		ON ASSY		③
18 PILOT'S SEAT ASSY (1003805)	A	VERT ADJUST SLEEVE 1003519-101 (2 PLACES)		ON ASSY		③
	B	VERT ADJUST FITTING 1003521-101 & -102		ON ASSY		③
	C	VERT ADJUST ARM 1004298-101 (2 PLACES)		ON ASSY		③
	D	VERT ADJUST PIN 1004297-101 (2 PLACES)		ON ASSY		③
	E	HOR ADJUST HANDLE 1004295-101		ON ASSY		③
	F	HOR ADJUST PIN 1006741-101 (2 PLACES)		ON ASSY		③
	G	INERTIA REEL BELLCRANK 1005964-101		ON ASSY		③
	H	TRACK SUPPORT FITTING 1003522-101 & -102		ON ASSY		③
	I	ROLLER 1004293-101 (4 PLACES)		ON ASSY		③
19 TAIL ROTOR	A	BLADE CUFF (4 PLACES)	MIL-L-7808F	AS REQ'D	OIL CAN	TO CHECK OIL LEVEL ROTATE EACH BLADE TO A VERTICAL DOWNWARD POSITION. OIL LEVEL SHOULD BE AT HALF WAY POINT IN SIGHT GAGE. TO REPLENISH, ROTATE BLADE TO BE FILLED SO THAT A LINE PASSING THRU THE CENTER OF THE VENT PORT (PORT NEAREST TO HUB) AND FILLER PORT IS APPROXIMATELY HORIZONTAL. REMOVE VENT AND FILLER PLUGS AND ADD OIL THRU FILLER PORT UNTIL PROPER OIL LEVEL IS OBTAINED.
	B	HUB SPINDLE MECH	MIL-L-7808F	AS REQ'D	OIL CAN	ADD OIL THRU FILLER PORT ON TANK FITTING AS NECESSARY TO MAINTAIN OIL LEVEL AT HALF WAY POINT ON SIGHT GAGE.
20 MAIN LANDING GEAR & DOORS	A	WHEEL BEARING	MIL-G-81322	300 HRS	GUN	JACK GEAR AND ROTATE WHEEL DURING GREASING TO CHANNEL GREASE AROUND BEARING
	B	ACTUATOR	MIL-H-5606	300 HRS	OIL CAN	APPLY 4 OR 5 DROPS TO FELT WIPER RING HOLE
21 TAIL LANDING GEAR	A	WHEEL BEARING	MIL-G-81322	300 HRS	GUN	JACK GEAR AND ROTATE WHEEL DURING GREASING TO CHANNEL GREASE AROUND BEARING
	B	ACTUATOR	MIL-H-5606	300 HRS	OIL CAN	APPLY 4 OR 5 DROPS TO FELT WIPER RING HOLE AT BOTTOM OF STRUT

9. APPLICABLE TO PHASE II AIRCRAFT ONLY.

8. FLIGHT AND FIELD SERVICE USE ONLY.

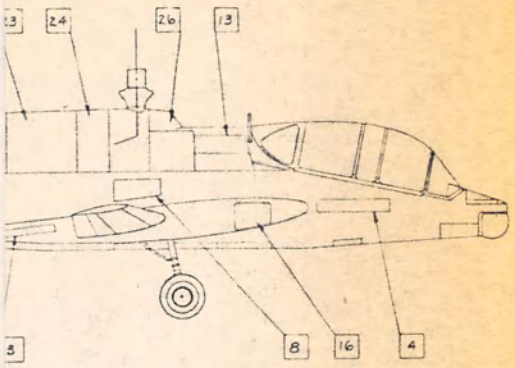
⚠ ACTUATOR MUST BE SERVICED AS SPECIFIED BEFORE FURTHER FLIGHT IF OIL LEVEL IS AT OR BELOW TARGET CENTER DOT MARKED ON SIGHT GAGE.

6. IF LUBRICATION IS FOR NORMAL LIFE OF COMPONENT. LUBRICATION INTERVAL IS SPECIFIED "ON ASSY".

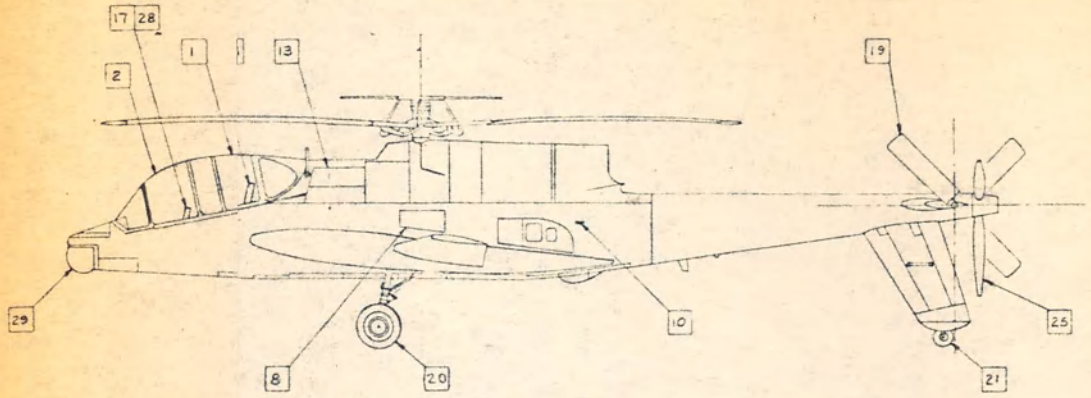
5. NORMAL AIRCRAFT OPERATING AMBIENT TEMPERATURE RANGE IS -65°F TO +125°F.

④ INSTALL HINGE PIN WITH AN APPLICATION OF MIL-C-16173 GRADE 3 CORROSION PREVENTIVE COMPOUND AND LUBRICATE WITH VV-L-800.

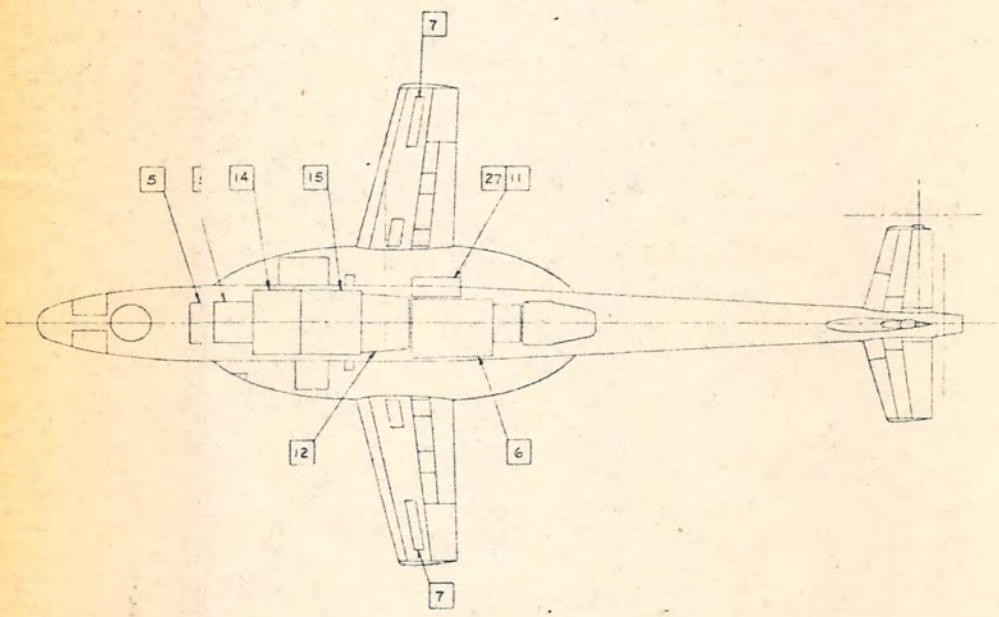
③ SOLID FILM LUBE PER LAC PROCESS SPEC. C-0515.
2. IF LUBRICATION IS FOR NORMAL LIFE OF COMPONENT, LUBRICATION INTERVAL IS SPECIFIED AS "ON ASSY."
1. NORMAL AIRCRAFT OPERATING AMBIENT TEMPERATURE RANGE IS -65°F TO +125°F.



RIGHT SIDE VIEW

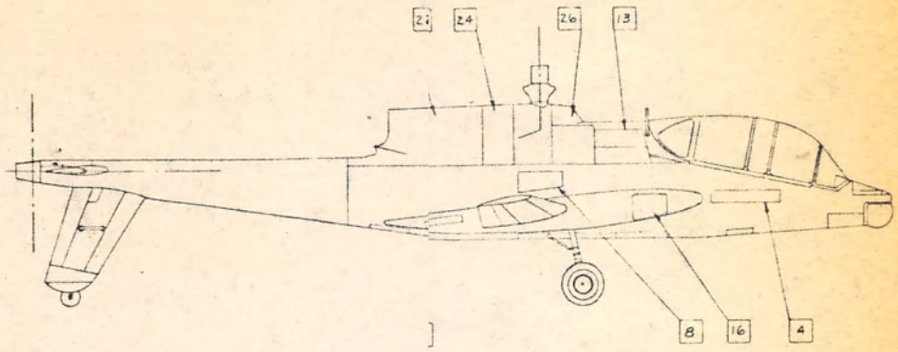


LEFT SIDE VIEW

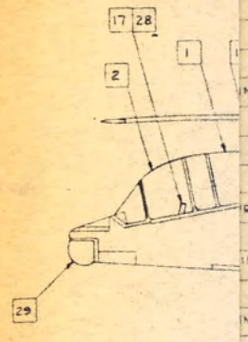


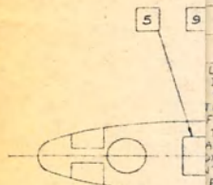
BOTTOM VIEW

AH-56A LUBRICATON LIST



IGHT SIDE VIEW





STUDENT STUDY GUIDE

AH-56A

AIRFRAME

THE INFORMATION CONTAINED IN THIS PUBLICATION IS INTENDED FOR TRAINING PURPOSES ONLY. IT IS BASED UPON THE LATEST INFORMATION AVAILABLE AT THE TIME OF PREPARATION. NO REVISIONS WILL BE SUPPLIED.

REFER TO OFFICIAL PUBLICATIONS FOR CURRENT MAINTENANCE AND OPERATING INSTRUCTIONS.

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GAYLORD SMITH

APPROVED BY:

F. CHENEY

11-25-68

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I. INTRODUCTION (See figure 1 and 2)

The AH-56A Advanced Aerial Fire Support System is a two (2) place compound helicopter gunship, developed specifically as an integrated weapons platform. Its primary missions are to escort troop-carrying helicopters, and to provide continuous fire suppression, especially during troop landing operations using a deadly variety of weapons including machine guns, grenade launcher, rockets, and anti-tank missiles.

The AH-56A airframe includes wings which provide almost all of the lift at higher speeds, and an aft mounted propeller enabling speeds in excess of 250 mph.

The AH-56A compound helicopter airframe is exceptionally strong by design, and is strategically armored for additional protection against enemy fire. Design concepts include ease of maintenance, and grouping of components common to each major system into separate compartments or service centers. Approximately 60% of the fuselage external surface consists of access doors, and panels. All doors are hinged, and are provided with hold-open devices and quick operating latches. Compartments are painted white and lighted by ship's battery power. Built-in ladders, walkways, and platforms eliminate the requirement for these cumbersome ground support items. Structural sealing and environmental protective measures have been incorporated, assuring maximum protection against corrosive elements, with minimum maintenance.

II. COMPONENTS AND LOCATIONS

Name of Component	Number per Aircraft	Location in Aircraft
Forward Fuselage	1	FS/50.9 to manufacturing break at FS/284
Midfuselage	1	FS/284 to disassembly joint at FS/455
Wings, Left & Right	2	Attached to left and right carry-through structure at FS/284 and FS/314, at BL/50.5 L&R
Aft Fuselage & Empennage	1	FS/455 to FS/667, includes ventral, left and right horizontal stabilizers

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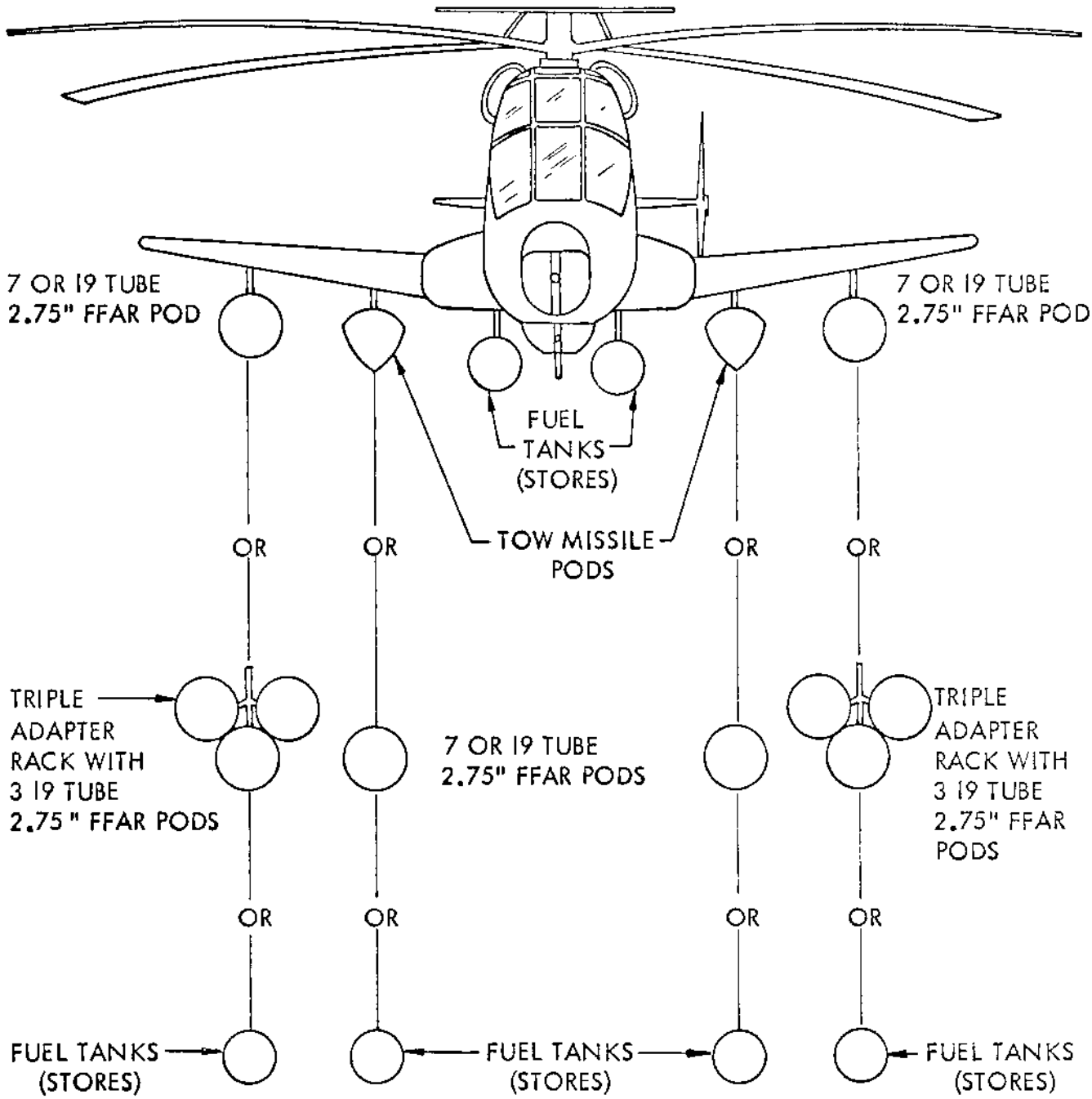
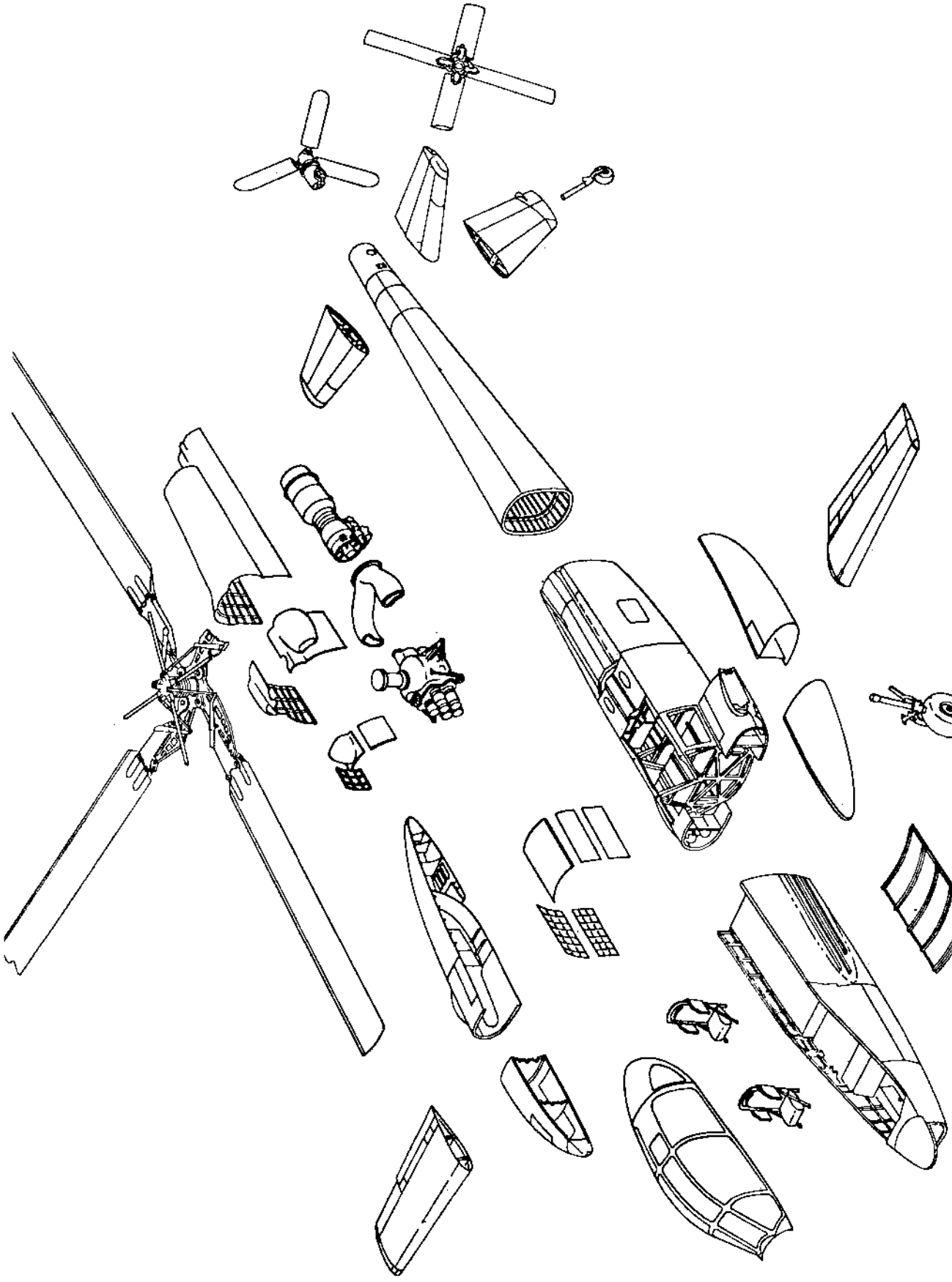


EACH STATION HAS 2,000 POUNDS CAPACITY

AH-56A COMPOUND HELICOPTER

FIGURE 2
AH-56A



EXPLODED VIEW OF AIRPLANE MAJOR COMPONENTS

III. GENERAL DESCRIPTION

A. System Description (See figures 3 and 4).

The AH-56A compound helicopter airframe serves as a functional aerodynamic enclosure or platform, containing various systems which make up the weapons system as a whole. Its major purpose is providing the best possible means of delivery, bringing to bear against an enemy the complete weapons system, and at the same time providing best possible protection for that system as a whole.

Use of common alloys assure that most repairs can be made in the field using available materials and skills. Major structural assemblies are designed to be replaceable. The aft fuselage section is attached by a series of bolts through a bulkhead ring, and quick disconnects on cables and fluid lines allow rapid removal of the entire assembly for repair, replacement, or if necessary, to facilitate air shipment of the vehicle, or for crash retrieval. Wings and stabilizers are replaceable assemblies, utilizing simple and straight-forward mounting provisions and techniques. Absence of movable control surfaces in these assemblies, with their attendant cabling and piping, further simplifies replacement procedures. Major secondary structural fairing components also are readily replaceable, such as: leading and trailing edges of wings and stabilizers; upper fuselage fairings and engine cowling; plus all doors and secondary paneling.

Semimonocoque construction is used throughout the fuselage, consisting primarily of two upper, and two lower longerons, intermediate stringers, and skin. Longerons are 7075-T6 aluminum extrusions, and stringers are made from 2024-T3 aluminum alclad sheet. Skins are also 2024-T3 alclad sheet, except for an area associated with engine exhaust on the upper aft fuselage, which is titanium.

Functional service centers, for the most part, are housed above the primary structure (WL/116) in secondary fairing structure. Honeycomb construction is used throughout the secondary structure and is designed to be easily replaced if damaged. Multiple structural elements are utilized in strategic locations, such as in the torsion-box main frame forgings, to provide redundancy.

B. Major Component Description

1. Forward Fuselage (See figures 3 and 4).

The forward fuselage extends from the nose (FS/50.9) to the manufacturing break (FS/284), and is semimonocoque construction. Closely spaced stringers, coupled with numerous compartment bulkheads, covered with 2024-T3 alclad aluminum skin, imparts a high degree of rigidity to this fuselage section. Rigidity of this assembly is a design necessity to assure gunnery errors are not induced due to structural deflection between the copilot/gunner's sighting station and the two turrets.

The forward portion of each left and right sponson, which is of

honeycomb construction, imparts additional torsional stiffness to the primary structure of the forward fuselage. Additionally the sponsons serve as built-in maintenance platforms, house fuel tanks, air conditioning package, external power receptacle, and provide aerodynamic forward fairings for the retracted main landing gear.

The forward fuselage is entirely compartmentized into functional service centers, with the inherent strength associated with bulkhead construction. All compartments are provided with doors containing quick releases and hold-open devices.

Forward fuselage compartments include the interchangeable XM-51 40 mm grenade launcher or XM-53 7.62 mm minigun ball turret in the nose, with quick access provisions to the turret mechanism for maintenance or replacement. The belly turret, between stations 185 and 211, houses the XM-52, 30 mm automatic gun and is easily accessable for maintenance.

The ammo compartment, directly aft of the belly turret, contains two ammo drums. The forward drum supplies the nose turret, while the aft drum contains ammo for the belly turret, and is semi-rigidly mounted permitting it to carry primary structural loads.

Directly above the ammo compartment on the left side is the electrical load center; opposite, on the right side, is the main avionics compartment.

Immediately forward of the ammo compartment is the battery and secondary flight control linkages compartment. Also housed within this compartment is the debris bag, which collects nose turret minigun spent rounds. Electrically operated bomb-bay type doors on the bottom of the fuselage provide man-access to the components of this compartment.

The canopy, housing the flight crew stations, is constructed of clear acrylic plastic, with windshields of glass. The individual panels are framed in aluminum extrusions. Access to the front copilot/gunner's station, and to the aft pilot's station, is provided by gull-wing type doors at either side. Mechanical spring cartridges provide assistance in opening the doors, and hold-open devices are included.

Crew station boarding provisions include a retractable walk-way on the right side, that can be operated internally by the pilot, or externally by ground personnel.

Copilot/gunner's (forward) station and pilot's (aft) station contain conventional type cyclic, collective control sticks, and directional pedals. The cyclic stick requires a control lock when the vehicle is parked. Cyclic and collective control sticks in the forward station are designed to be quickly decoupled and stowed to provide clearance during swiveling gunner's station operation.

2. Midfuselage (See figures 3 and 4).

The midfuselage extends from the manufacturing assembly joint at FS/284 aft to the disassembly tension joint at FS/455. The midfuselage, like the forward fuselage, is semimonocoque construction. The four major longerons are utilized, together with stringers and bulkhead rings. Skins are principally 2024-T3 aluminum alclad with aluminum faced honeycomb panels used adjacent to the fuel tank.

The heart, or foundation, of the primary load carrying structure is the torsion-box section. This section consists of two forged aluminum alloy main frame bulkheads located 33 inches apart at FS/284 and 317. The frames are structurally connected through the longerons and additional 1/4 inch thick extruded elements, and is further rigidized with conventional webs, which also provide compartment separation. Cross-sectionally, the frames conform to the entire circumferential contour of the fuselage. The frames extend to the outboard limits of either sponson, where main landing gear, and wing mounting provisions are provided, while the transmission is mounted on the upper portion of the frame. This assembly forms the torsion-box which provides a stress path carry-through structure for absorbing and spreading wing, rotor, and landing gear loads.

The major sponson sections are assembled to the midfuselage section. They are constructed of ring and stringer stiffeners, skinned conventionally, as well as with aluminum faced honeycomb. Sponsons provide a fairing for the retracted main landing gear, the APU, and various other smaller components. Also of vital importance to the mechanic is the fact they provide comfortable work platforms for all top-side service centers. Boarding ladders are incorporated into the trailing edge of each sponson. The left one is manually operated, while the opposite one is electrically actuated automatically by the ground/air safety switch position.

Entrance is gained to the flight control servo package through a door on the underside of the fuselage directly between the two main frame forgings.

Swashplate access is gained through doors at either side of the fuselage below the transmission, and directly between the main frames.

The 300 gallon self sealing fuel tank is located under the steel decking separating the engine compartment from the fuel tank compartment. Entrance is gained through a removable bottom panel, which exposes the entire tank, and a manhole for internal access.

Just aft of the fuel tank is the aft avionics bay, and doppler antenna with access doors through the lower skin. This area also provides access to the disassembly tension joint, consisting of 4 major bolts, fluid line disconnects, and drive shaft coupling.

The fairing structure atop the fuselage houses the accessory compartment, transmission, engine air inlet plenum area, and engine. Access doors permit easy entrance into these areas, or the entire fairing

structure may be removed to facilitate replacement of major components. Part of this overall fairing consists of the sliding engine cowl, which can be opened or closed by one man from either side.

3. Wings (See figures 3 and 4).

The wings, which are each 130 square feet in area, serve as the prime lifting surfaces during high-speed forward flight, which greatly reduces the load on the main rotor. Major wing components are the main box beam section, leading edge, trailing edge, and wing tip. Each wing has provisions for two pylon stores stations accepting either fuel tanks, or various weapons. Navigation, and oscillating beacon lights are installed in the wing tips. In addition, there is an electro-luminescent panel formation light flush mounted on top of each wing.

The wings are each attached to the fuselage main frame bulkheads by 4 principal bolts at FS/284 and FS/317, at BL/50.5 L & R. Inspection panels are provided to facilitate installation of the wing, as well as for maintenance of components associated with external stores.

Various construction materials and manufacturing techniques are incorporated, such as the two layer aluminum bonded one piece leading edge assembly and the conventional sheet metal inboard trailing edge adjoining the outboard section, which is of 181 glass fabric pre-pregnated epoxy. The tip is also of this material and is in two sections. All these components are attached to the box section or to hard structure by screws which assure relative ease of replacement.

4. Aft Fuselage and Empennage (See figures 3 and 4).

The aft fuselage extends from the disassembly tension joint at FS/455, aft to FS/667. Semimonocoque construction is also used in this assembly, and is visually apparent because few system components are housed within its confines. This assembly attaches to the midfuselage by four principal bolts that tie the four longerons of the two assemblies together. Each of the approximately twenty stringers are joined to the midfuselage by two bolts through angle clips.

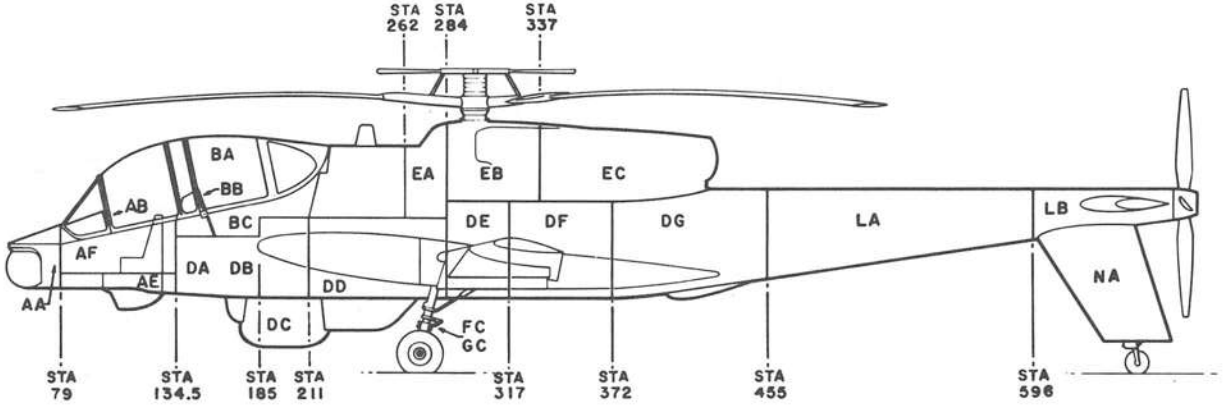
All materials are aluminum alloys, with the exception of an area on the upper fuselage which is of titanium. This area is where the engine exhaust strikes the fuselage. Three forged aluminum alloy frame rings are incorporated at FS/612 and FS/634 incorporating attachment provisions for the three stabilizers, (four principal bolts each), and the three-way integral gear box.

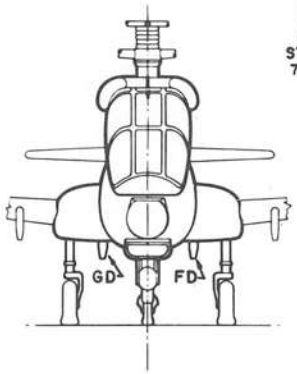
Both horizontal stabilizers are of dual-spar box beam construction. Leading and trailing edges are constructed of easily removable aluminum faced honeycomb sandwich. Tip assemblies are of 181 glass fabric pre-pregnated epoxy material. The left hand stabilizer is slightly heavier, due to an added auxiliary beam which forms a box structure around the tail rotor drive shaft. Also adding to the weight difference is the tail rotor dual servo actuator and drive shaft installed

AA – NOSE AREA
AE – SWIVELING GUNNERS STA.
AF – GUNNERS STATION MISC.
BA – PILOTS STATION MISC.
BC – PILOTS CENTER CONSOLE
AB – GUNNERS INSTRUMENT PANEL
DA – BATTERY & CONTROLS AREA

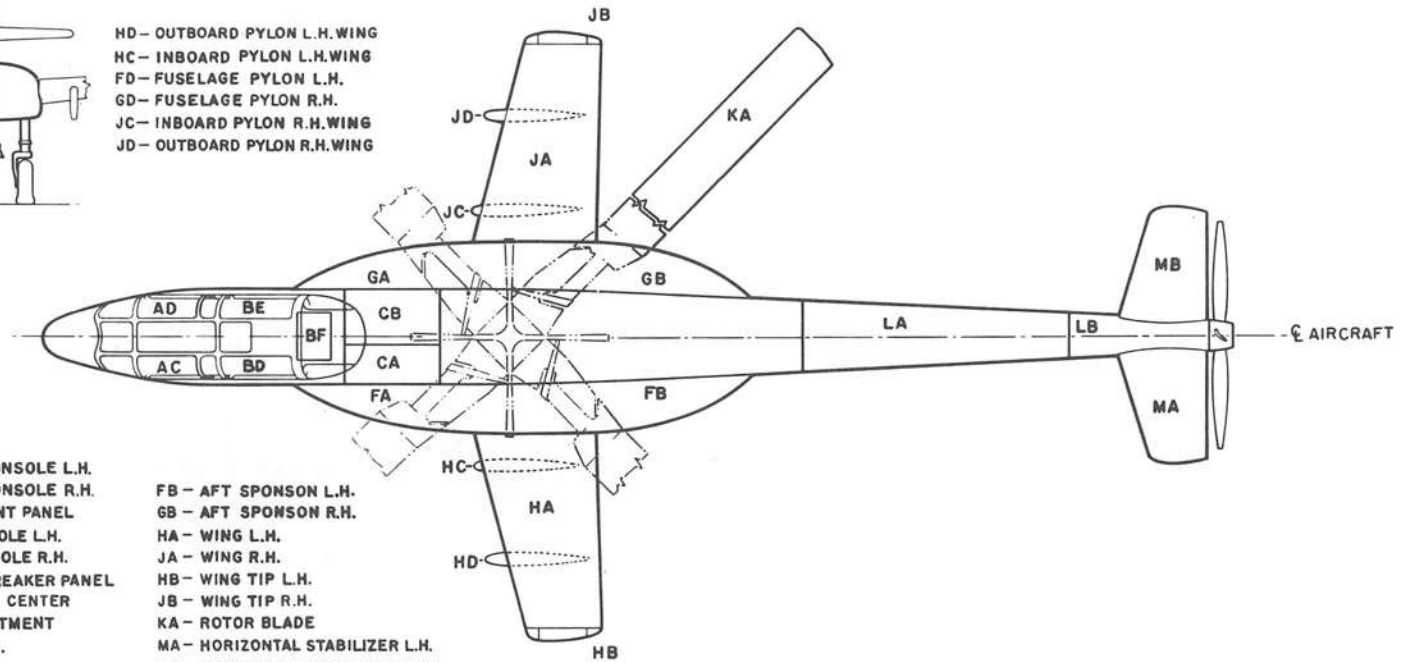
DB – FIRE CONTROL RACK
DC – TURRET
DD – AMMO COMPARTMENT
DE – SERVO AREA
DF – MAIN FUEL TANK AREA
DG – AFT AVIONICS COMPARTMENT
EA – TRANSMISSION ACC AREA

EB – TRANSMISSION AREA
EC – ENGINE
FC – LANDING GEAR L.H.
GC – LANDING GEAR R.H.
LA – AFT FUSELAGE
LB – EMPENNAGE
NA – VENTRAL FIN





HD – OUTBOARD PYLON L.H. WING
HC – INBOARD PYLON L.H. WING
FD – FUSELAGE PYLON L.H.
GD – FUSELAGE PYLON R.H.
JC – INBOARD PYLON R.H. WING
JD – OUTBOARD PYLON R.H. WING



AC – GUNNERS SIDE CONSOLE L.H.
AD – GUNNERS SIDE CONSOLE R.H.
BB – PILOTS INSTRUMENT PANEL
BD – PILOTS SIDE CONSOLE L.H.
BE – PILOTS SIDE CONSOLE R.H.
BF – PILOTS CIRCUIT BREAKER PANEL
CA – ELECTRICAL LOAD CENTER
CB – AVIONICS COMPARTMENT
FA – FWD. SPONSON L.H.
GA – FWD. SPONSON R.H.

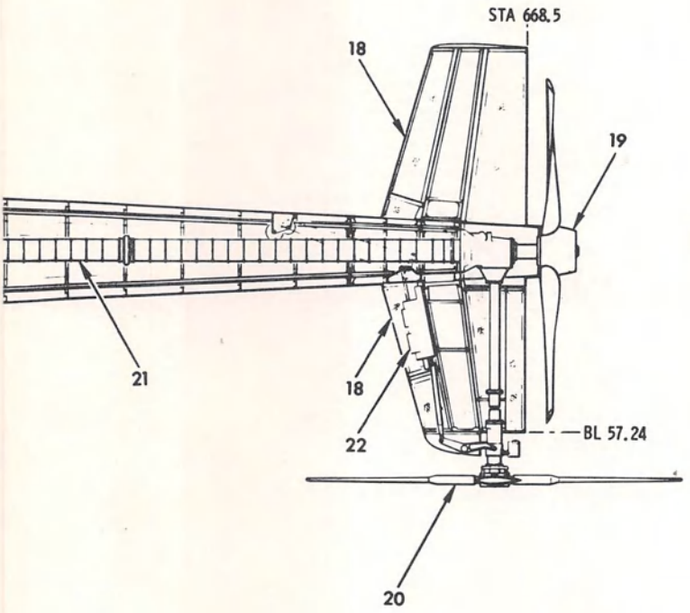
FB – AFT SPONSON L.H.
GB – AFT SPONSON R.H.
HA – WING L.H.
JA – WING R.H.
HB – WING TIP L.H.
JB – WING TIP R.H.
KA – ROTOR BLADE
MA – HORIZONTAL STABILIZER L.H.
MB – HORIZONTAL STABILIZER R.H.

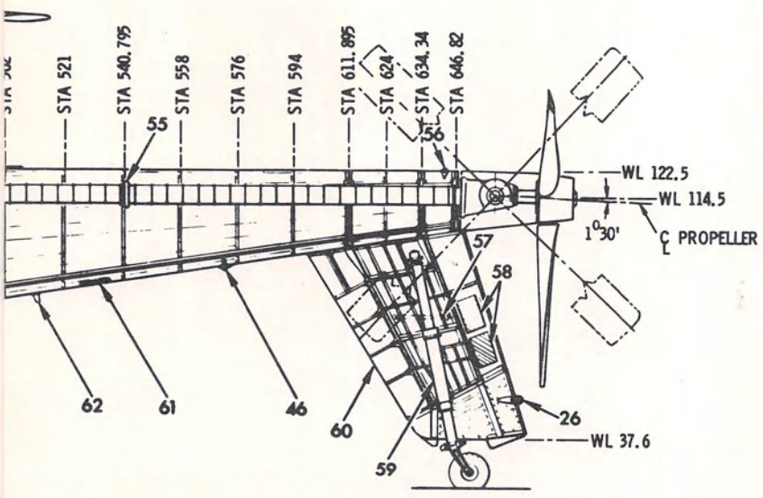
COMPARTMENT/COMPONENT LOCATION DIAGRAM

HG 04661

FIGURE 3
AH-56A

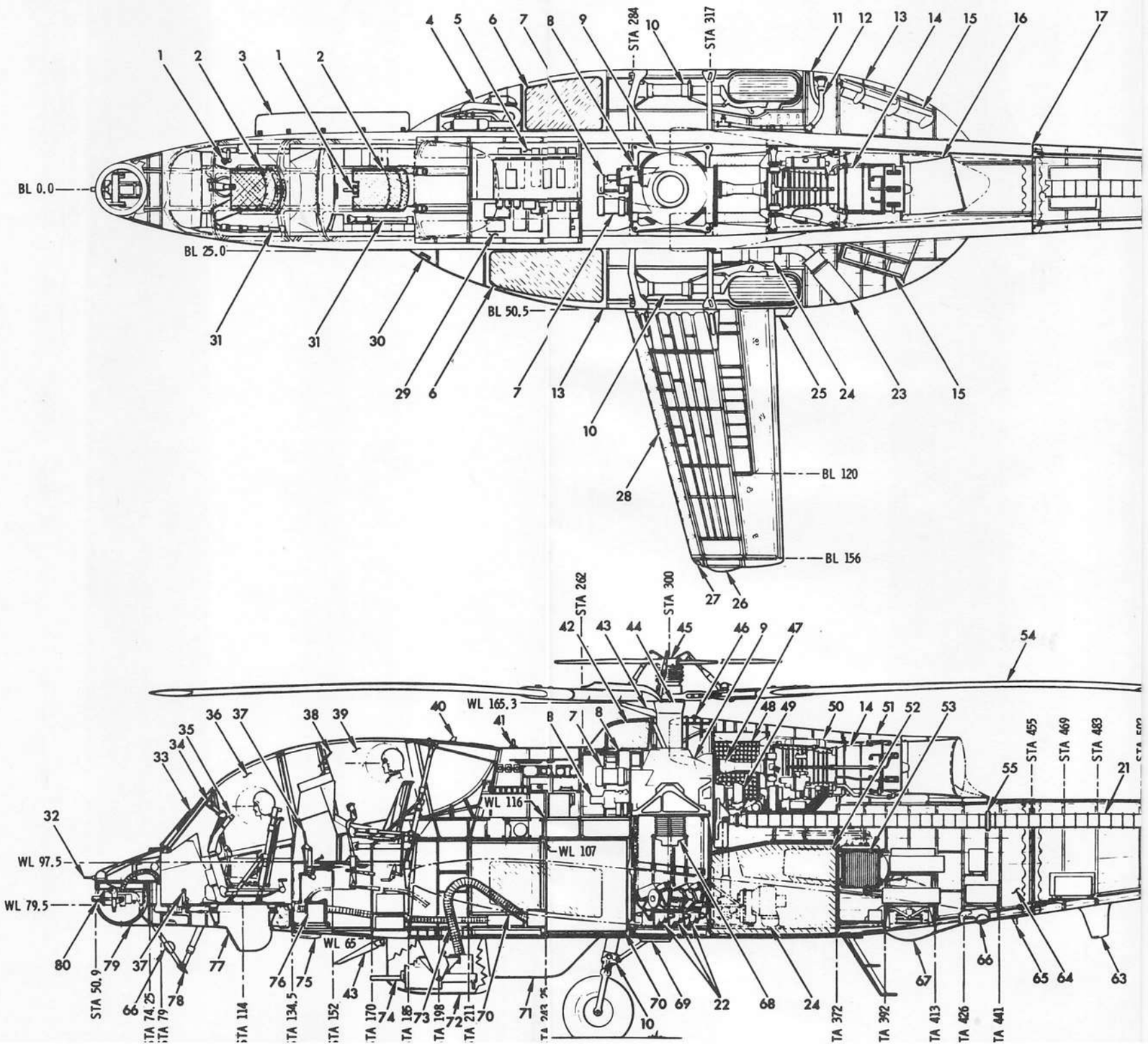
FIGURE 4
AH-56A





1 Cyclic stick
2 Seat
3 Cockpit walkway
4 Environmental control unit
5 Main avionics compartment
6 Fuel tank
7 Generator
8 Hydraulic power package
9 Main transmission
10 Main landing gear
11 Drum fueling adapter
12 Pressure fueling adapter
13 Sponson
14 Engine
15 Boarding ladder
16 Tailpipe
17 Aft fuselage separation joint
18 Horizontal stabilizer
19 Propeller
20 Tail rotor
21 Propeller/tail rotor drive shaft
22 Servo actuator
23 APU exhaust
24 Auxiliary power unit
25 HF/SSB antenna strap
26 Anticollision light
27 Navigation light
28 Wing
29 Electrical compartment
30 External power receptacle
31 Collective lever
32 Glide slope antenna
33 Windshield wiper
34 Direct sight
35 Periscope sight
36 Copilot/gunners station
37 Directional pedals
38 Pilots direct sight
39 Pilots station
40 IFF antenna
41 VHF/FM homing antenna
42 Transmission oil tank
43 Cable cutter
44 Main rotor mast
45 Main rotor control gyro
46 Fuselage light
47 Torquemeter shaft
48 Engine air filter cowl
49 Rotor brake
50 Engine oil tank
51 Engine cowl
52 Oil cooler inlet
53 Oil cooler
54 Main rotor
55 Support bearing
56 Navigation and formation light
57 VOR/LOC antenna
58 VHF/FM antenna
59 Tail landing gear
60 Ventral fin
61 LORAN antenna
62 DME antenna
63 VHF/AM and UHF/AM antenna
64 Aft avionics compartment
65 IFF antenna
66 Searchlight
67 Doppler radome
68 Swashplate
69 ADF loop antenna
70 Magazine drum
71 Aft turret fairing
72 Belly turret
73 Ammunition chute (typical)
74 30-mm automatic gun
75 Marker beacon antenna
76 Battery
77 Periscope
78 Nose skid
79 Nose turret
80 40-mm grenade launcher
(alternate: 7.62-mm machine gun)

INBOARD PROFILE


BL 0.0
BL 25.0
BL 50.5
BL 120
BL 156
STA 284
STA 317
STA 262
STA 300
WL 165.3
WL 116
WL 107
WL 97.5
WL 79.5
WL 65
STA 455
STA 469
STA 483
STA 50.9
STA 74.25
STA 79
STA 114
STA 134.5
STA 152
STA 170
STA 185
STA 198
STA 211
STA 372
STA 392
STA 413
STA 426
STA 441

in the inboard leading edge of the left stabilizer. Appropriate access panels are provided.

The vertical stabilizer, or ventral fin, is composed of a two-spar box beam, leading and trailing edges, and bottom fairing. This stabilizer houses the retractable tail wheel strut, flux gate valve, and VHF/FM antennas. The VOR/localizer antennas are attached to either side of the stabilizer.

The easily removable leading and trailing edges are made from aluminum faced honeycomb sandwich. The lower portion of the trailing edge houses the VHF/FM antennas under 181 glass fabric pre-pregnated epoxy skins.

The lower tip is fiberglass fairing housing the retracted tail wheel. The tail navigation light is mounted in the aft edge.

Appropriate access provisions have been incorporated to facilitate maintenance of internal components, and to assist with removal/installation of the major assemblies.

C. System Characteristics

1. Dimensions

See figure 5, which is self-explanatory, for overall vehicle dimensions and ground clearances.

The unit of measurement used on the Lockheed AH-56A compound helicopter for manufacturing, maintenance, or modification, is the inch. No longer increment of measurement is ever used. Manufacturing tolerances are normally given as .XX, ±0.03 inch and 0.XXX, ±0.010 inch. As an example, the dimension 6.50 inch would indicate six and fifty one-hundredths inches to a tolerance of ±0.03. The tolerance is established by the number of digits to the right of the decimal point. If the measurement is given in hundredths, or two digits to the right of the decimal point, then the tolerance is also in hundredths or 0.03. Three decimal places, or thousandths, the tolerance will be 0.010.

2. Fuselage Stations (See figure 6).

The longitudinal measurements of the airframe in one inch increments are referred to as "Fuselage Station Lines", even though the extension of these lines include the wings and stabilizers. Fuselage station lines (FS/XXX) use a zero reference point 50.9 inches ahead of the fuselage nose, which indicates the most forward point of the fuselage is at FS/50.9. Establishment of this measuring technique allows for possible future fuselage growth, and circumvents the necessity of using minus station numbers that could be confusing. Continuing aft in one inch increments, fuselage station lines accumulate totaling 649 inches at the aft end of the fuselage structure.

3. Water Lines (See figure 6).

The vertical measurements of the fuselage and its appendages in one inch increments are referred to as "Water Lines". WL/0.000 is at a point below the MLG tires when the landing gear struts are fully extended. From this zero reference point the water line measurement increases upward in one inch increments as far as necessary to include all portions of the vehicle. For example, the bottom of the fuselage at FS/300 is WL/65 - the aft flight station floor is WL/97.5- the upper longeron, where transmission and engine are mounted, is WL/116. When the vehicle is parked under static conditions, the ground line will be approximately WL/22.4.

NOTE

The ground or hangar floor should never be used as a measuring reference point. Use a "known" water line reference such as above, and measure up or down, and add or subtract as required.

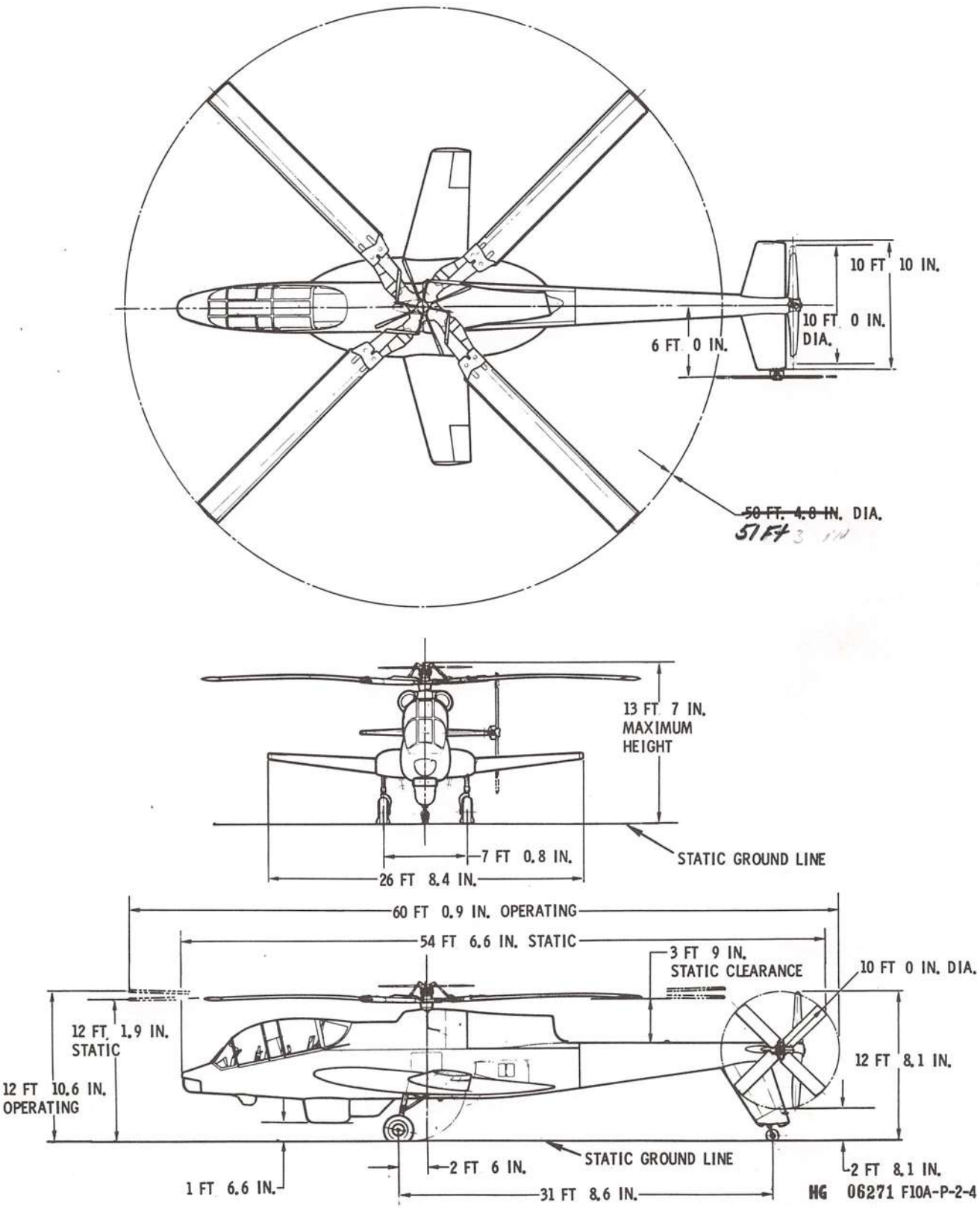
4. Buttock Lines (See figure 6).

The fuselage horizontal, or left/right, measurements in increments of one inch from a zero reference vertical plane that exactly bisects the longitudinal centerline from top to bottom, are called Buttock Lines. Buttock Lines are given as LEFT or RIGHT, and as an example are written BL/50.5L, or BL/50.5R which defines an exact lateral distance from the fuselage centerline of fifty and one half inches, either left or right. In all cases, left or right is determined as viewed from aft of the vehicle looking forward. Buttock lines extend as far as necessary to include all lateral appendages to the vehicle, such as wings and horizontal stabilizers. As a further example, the left wing attaches to the fuselage structure at BL/50.5L.

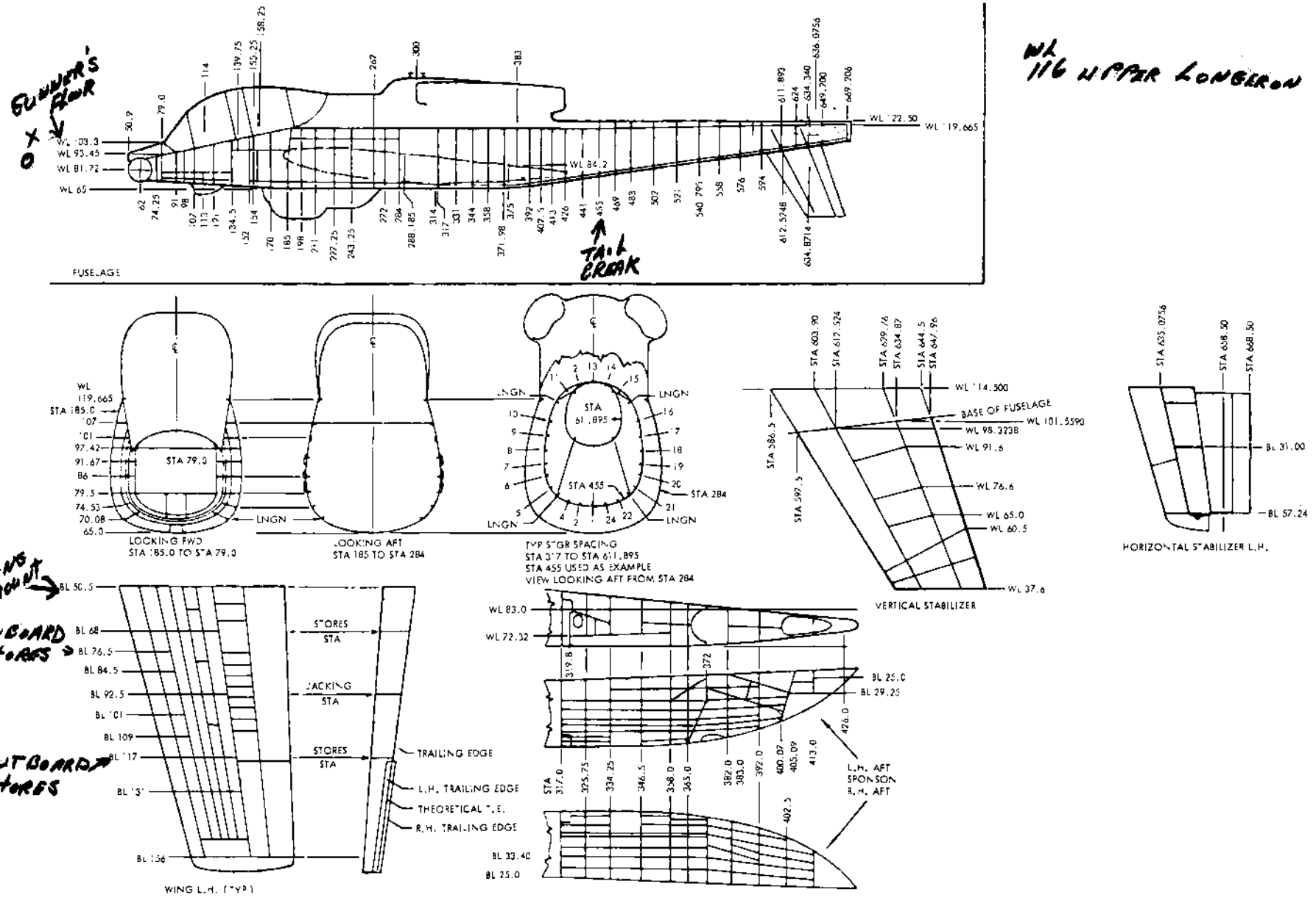
5. Minimum Ground Turning Radius and Clearances.

See figure 7 for complete self explanatory information concerning this subject matter.

FIGURE 5
AH-56A

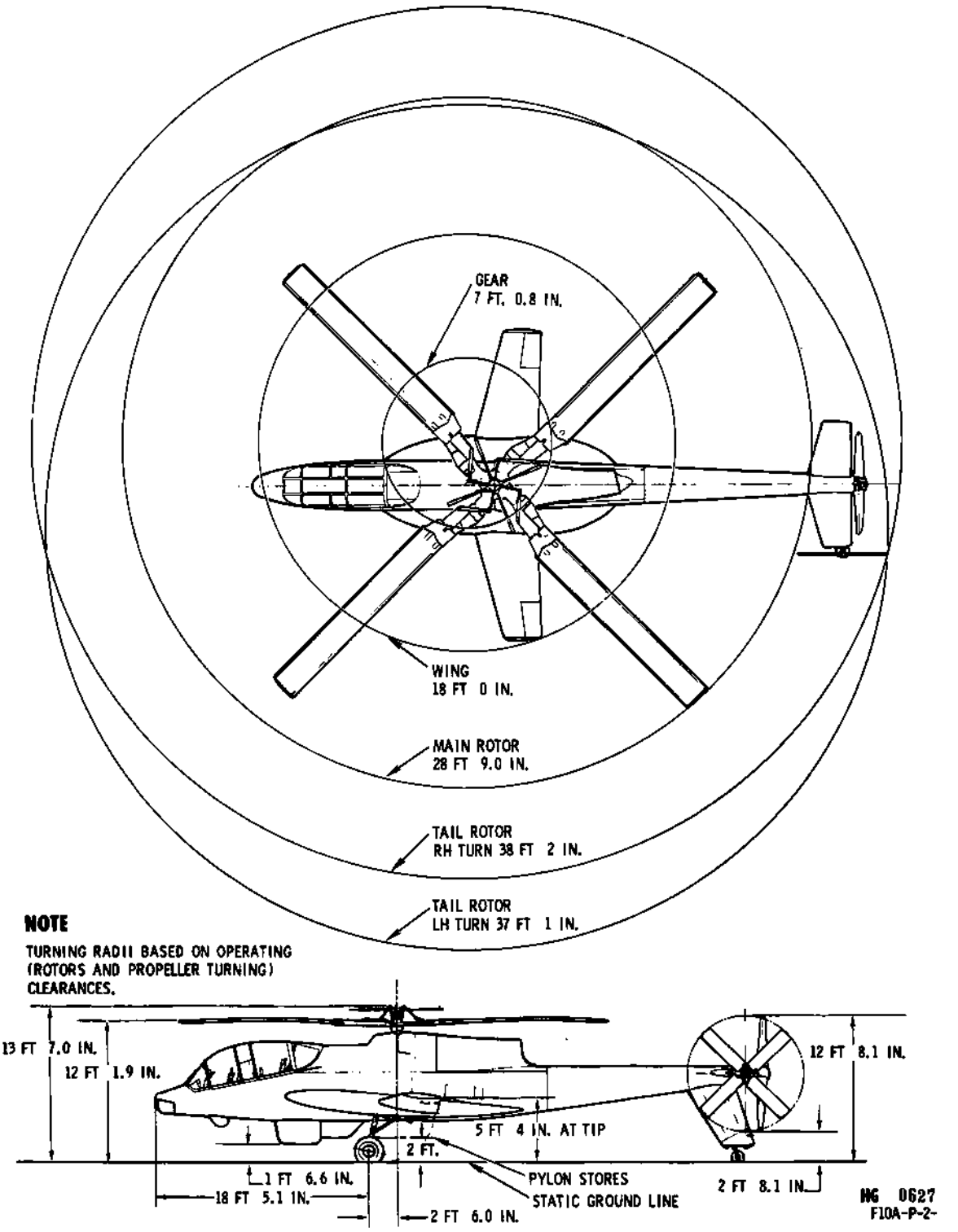


DIMENSION DIAGRAM



GRAPHIC STATIONS DIAGRAM

FIGURE 6
AH-56A



MINIMUM GROUND TURNING RADIUS AND CLEARANCES

IV. OPERATIONS

A. Towing (See figure 8).

The AH-56A compound helicopter can be towed, or pushed, as the case may be, from the tail landing gear using a standard tow bar attached directly to the tail wheel axle. Offset limits of 45° from vehicle centerline should be observed, in addition to adequate clearances between towing vehicle, tow bar, and protruding aircraft components.

The tail landing gear strut must be properly inflated to provide sufficient fairing clearances, and tail wheel lock must be unlocked. If desired, the rotor brake may be released to enable positioning of the main rotor, tail rotor, or propeller to provide additional clearance of obstructions. Safety pins should be installed as applicable, parking brakes released, and a safety man provided in the pilot's station to apply brakes if necessary, before actually towing the vehicle.

When necessary to move the vehicle over soft, uneven terrain, towing should be accomplished from the main landing gear using the fly-away kit cable slings and rings provided on the gear struts. During all towing operations, care should be exercised in crossing steep slopes, going too fast, and in avoiding abrupt starts, stops and turns. When negotiating steep slopes, the aft end of the vehicle should always be down-slope.

B. Parking

Good judgement is important in parking the AH-56A, as is true with any aircraft, and is dependent to a large degree upon conditions likely to be encountered during the parked period while the vehicle is relatively unattended. Conditions having a detrimental effect on a parked aircraft are numerous and varied, such as: time period vehicle is to be parked, wind velocity and direction, inclement weather, proximity to other operating aircraft, enemy action, and reaction time.

All aspects have been considered in the design of the AH-56A that offer a wide latitude in parking procedures and the amount of protection which appears advisable in any given set of circumstances.

Parking brakes are provided and should be utilized, along with wheel chocks front and rear of each main wheel, especially if anticipating high winds or an extended parked period.

A rotor brake has been included, which when ON, prevents wind or other aircraft from windmilling the rotor. The brake should be utilized whenever the vehicle is parked. To determine if rotor brake is on, attempt to rotate propeller or tail rotor.

Safety pins have been provided where necessary, and should be installed when and where applicable, such as main landing gear, armament components, and external stores.

Visual verification should determine that cyclic stick control locks are engaged. Ensure at the same time that the battery switch is OFF.

Normally, it would be advisable to take advantage of the tail wheel lock as additional protection against high winds rotating the entire aircraft.

Canopy access doors should be positioned open or closed, according to weather conditions and environment. Circumstances will almost always determine to what extent the numerous protective covers and shields will be used. Maximum protection should be provided, however, commensurate with the situation and governing directives. Always connect the electrical grounding wire when vehicle is parked.

C. Mooring (See figures 9, 10, 11, and 12)

Mooring of the AH-56A, as with any aircraft, is usually necessitated by high winds or gust conditions. Properly moored, the aircraft will withstand winds up to 60 knots from any direction, regardless of weight, or center of gravity conditions.

Mooring requirements vary with the ground surface available. If permanent ground mooring facilities are unavailable, a mooring kit, which is part of the fly-away kit, is required. The aircraft has five points at which mooring lines can be attached. These points are the three mooring and jacking point fittings, located in the wings and forward fuselage and require installation of jack adapters, plus use of the two rings on the main landing gear struts.

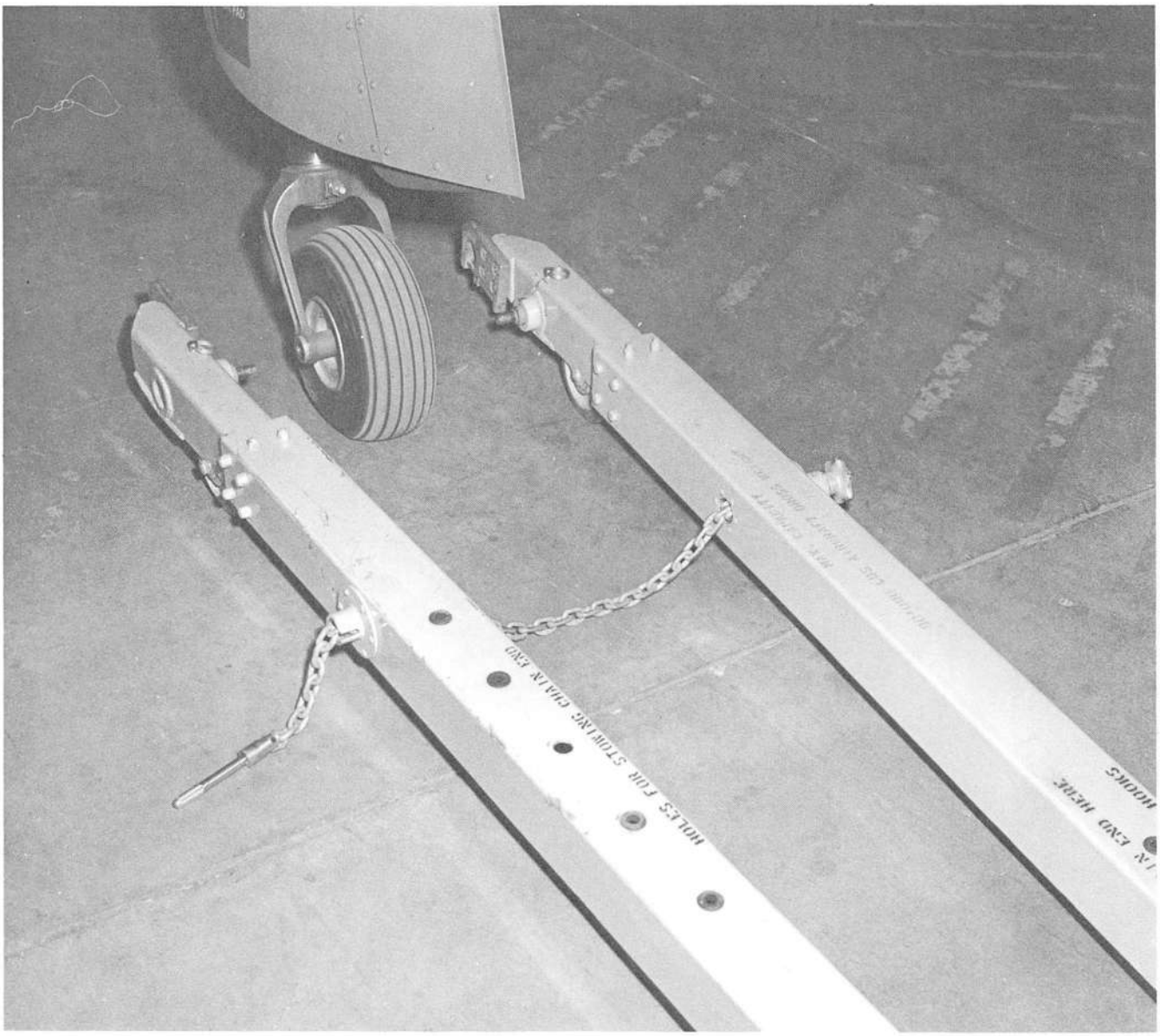
If time permits prior to conditions that warrant mooring, the vehicle should be headed into the direction from which highest winds are expected, and fully fueled. Preparation is identical with parking. To afford maximum protection, parking and rotor brakes applied, tail wheel locked, wheels chocked and cleated, controls locked, tail rotor tied down, battery switch off, grounding wire attached, canopy closed, and all protective covers and shields installed. Remove three set screws from wing and nose jacking points and install jack adapters (rings). Moor vehicle as shown in figures 9, 10, 11 and 12.

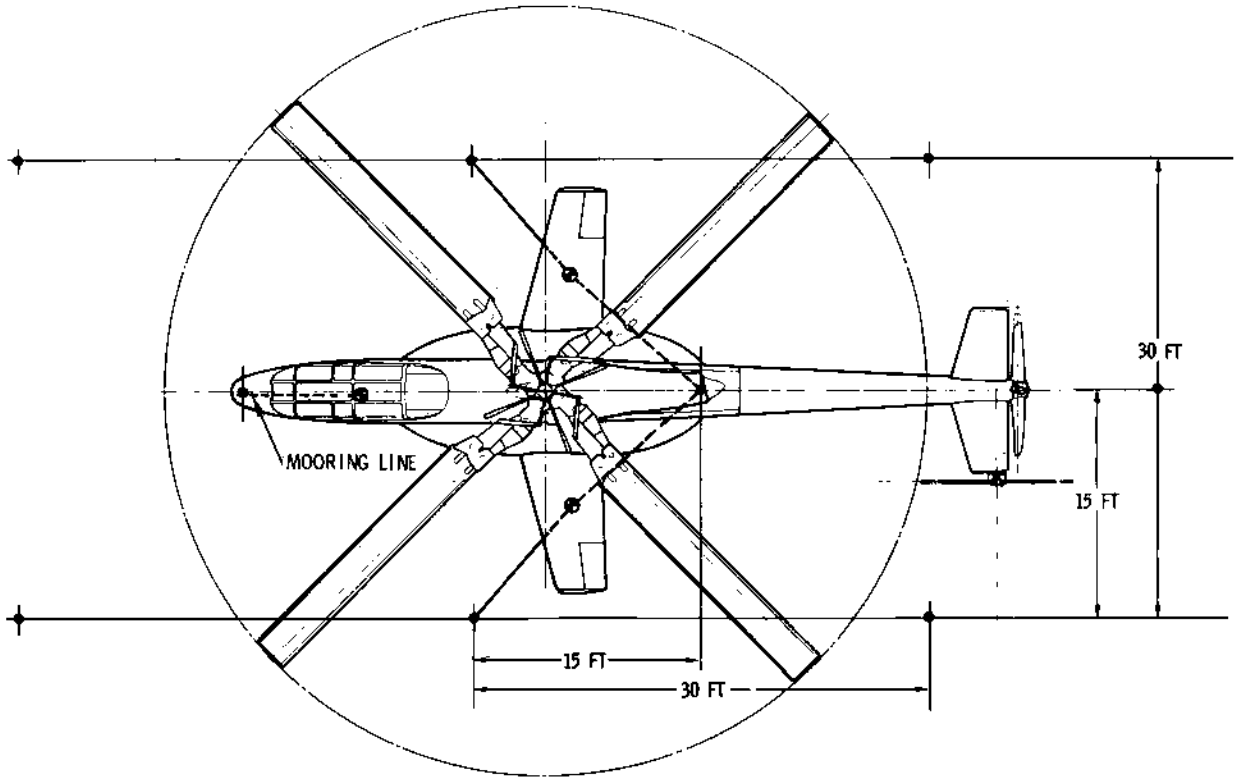
D. Jacking (See figure 13)

Two methods of jacking the AH-56A are provided. One method utilizes jack pads located at the lower end of each landing gear strut. The other method uses the wing, and forward fuselage jacking points.

CAUTION

When jacking at individual wheels, avoid jacking higher than necessary to obtain minimum tire clearance. Due to possibility of exceeding C.G. limits, always chock wheels not being jacked. Maintain level condition when jacking entire vehicle at wheels or wing and nose positions.


HOLES FOR STOWING CHAIN END

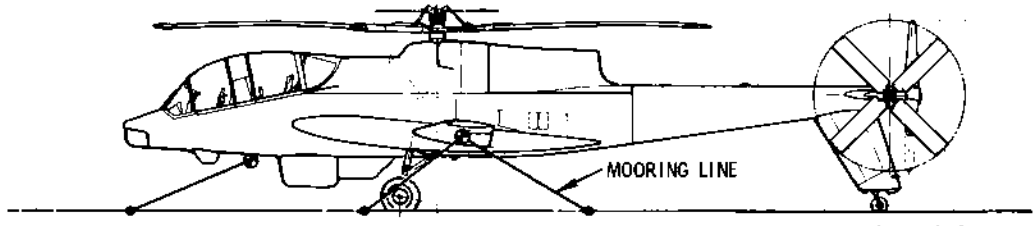


CODE

- AIRCRAFT MOORING POINT
- GROUND MOORING POINT

NOTE:

STANDARD GROUND MOORING PATTERN SHOWN



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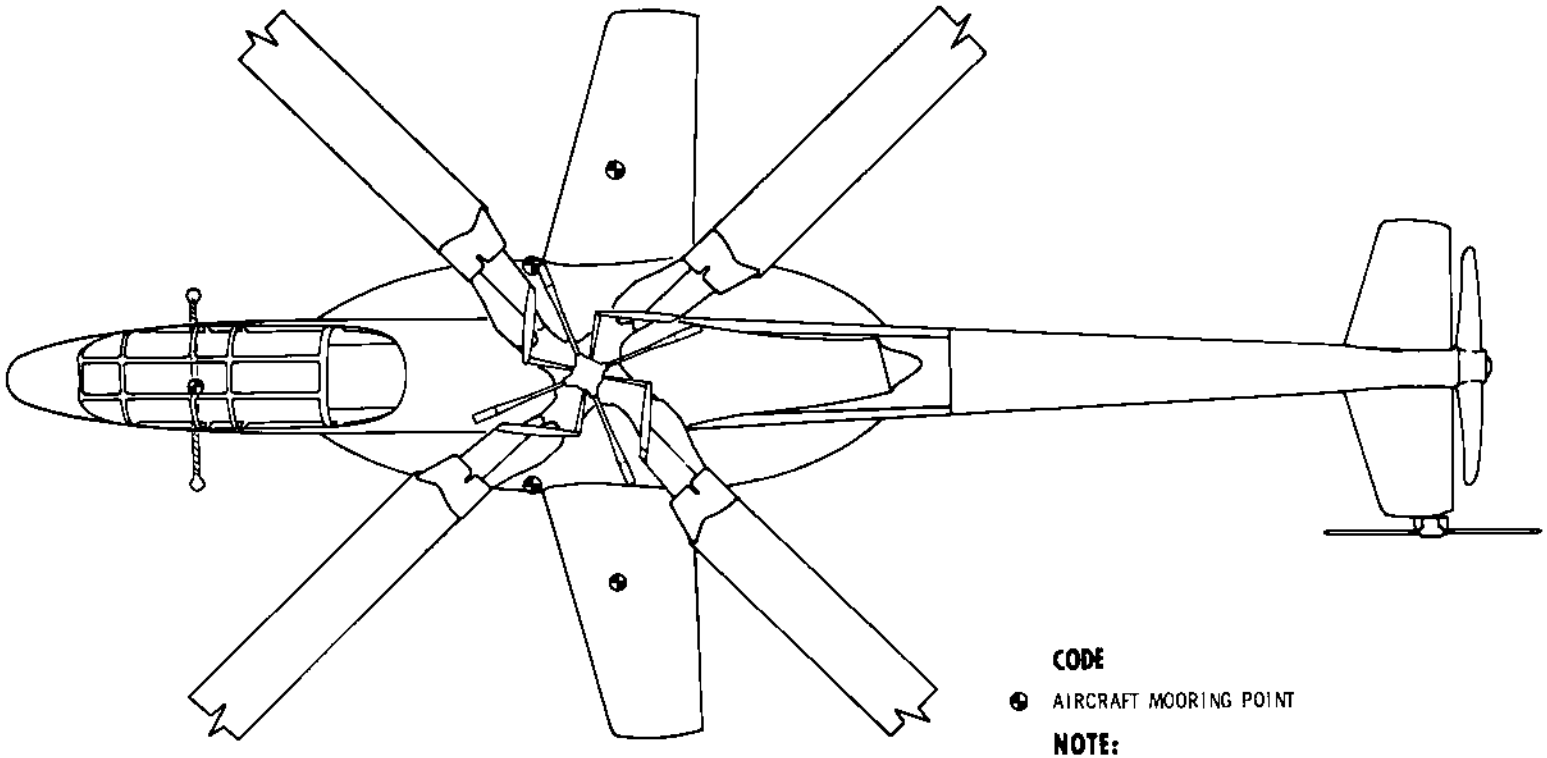
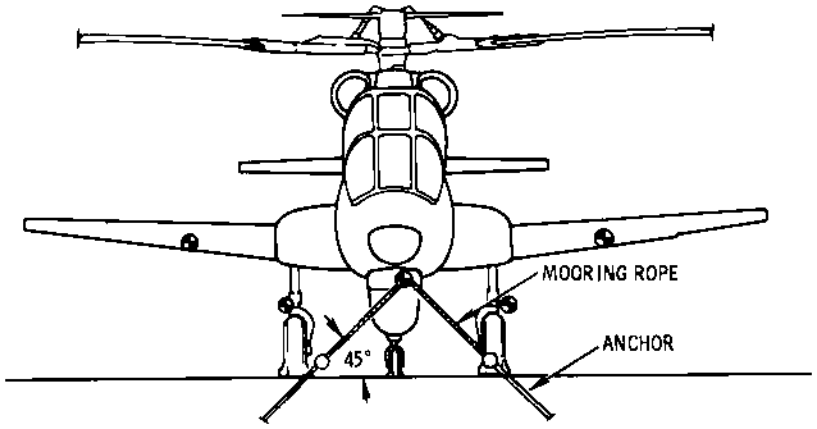
MOORING, PREPARED FACILITIES





CODE

● AIRCRAFT MOORING POINT

NOTE:

1 INSTALL ANCHORS SO THAT ANGLES BETWEEN MOORING ROPES AND GROUND SURFACE ARE APPROXIMATELY 45 DEGREES

2 EACH ANCHOR PLACED AS SHOWN WILL DEVELOP A MINIMUM OF 450 POUNDS WITHDRAWAL RESISTANCE

3 A NORMAL SURFACE IS A HARD, DRY SOIL SURFACE

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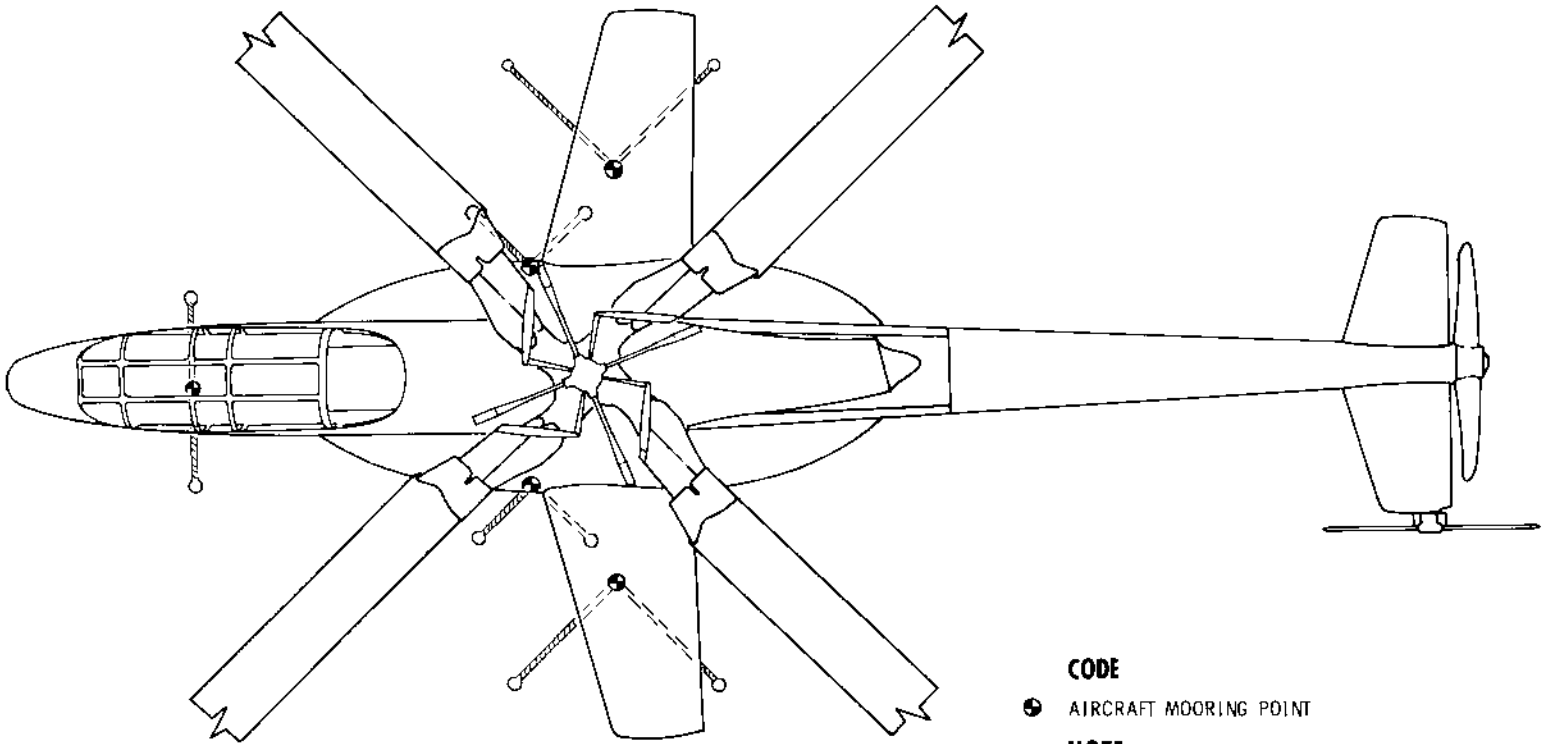
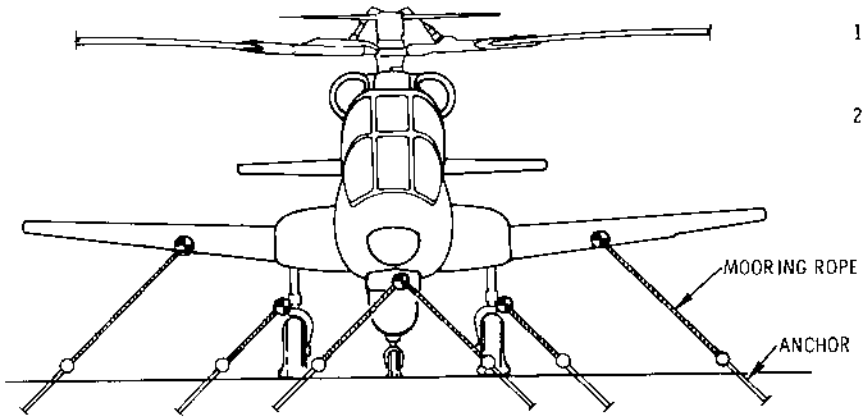
MOORING, NORMAL SURFACE

FIGURE 10
AE-56A





CODE

● AIRCRAFT MOORING POINT

NOTE:

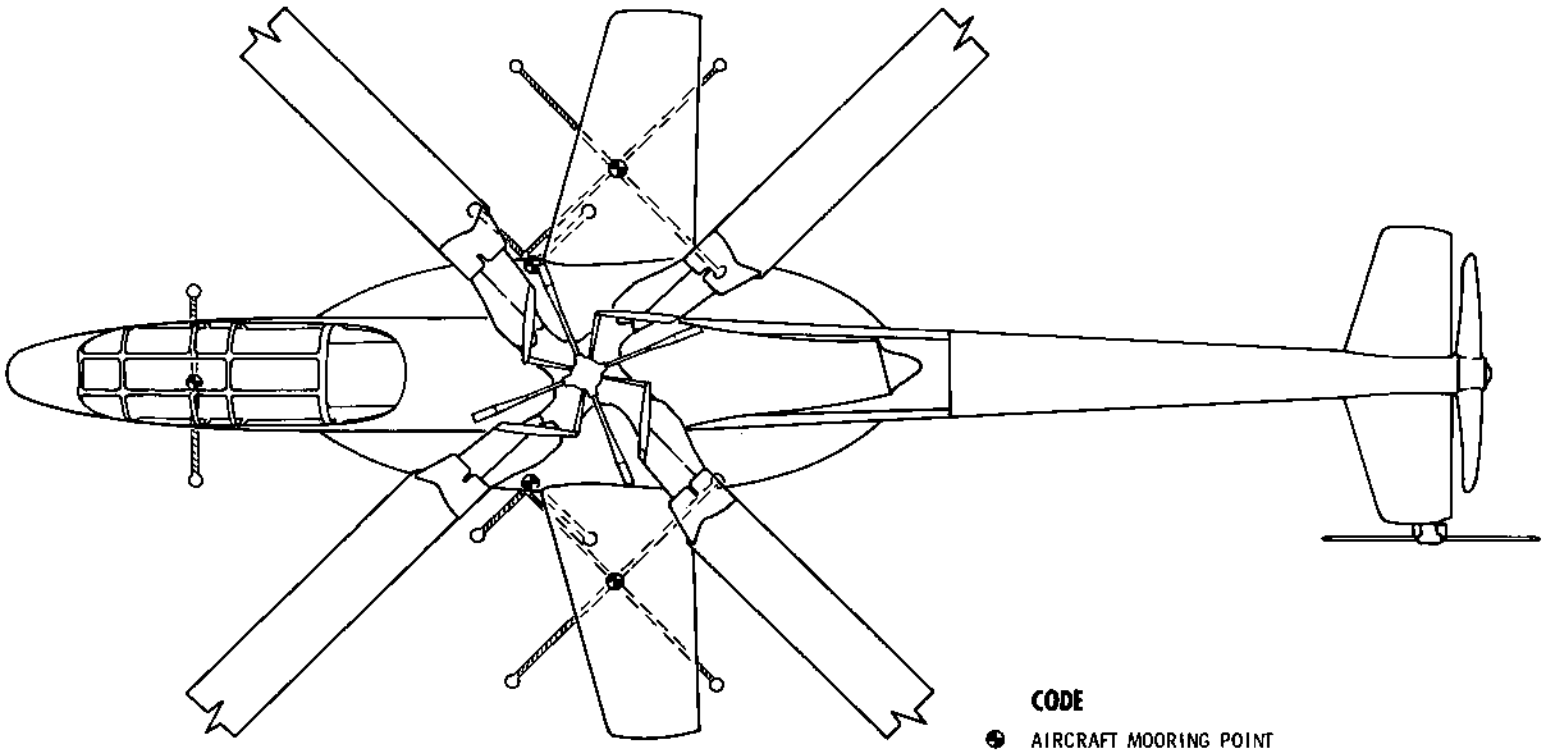
1 INSTALL ANCHORS SO THAT ANGLES BETWEEN MOORING ROPES AND GROUND SURFACE ARE APPROXIMATELY 45 DEGREES

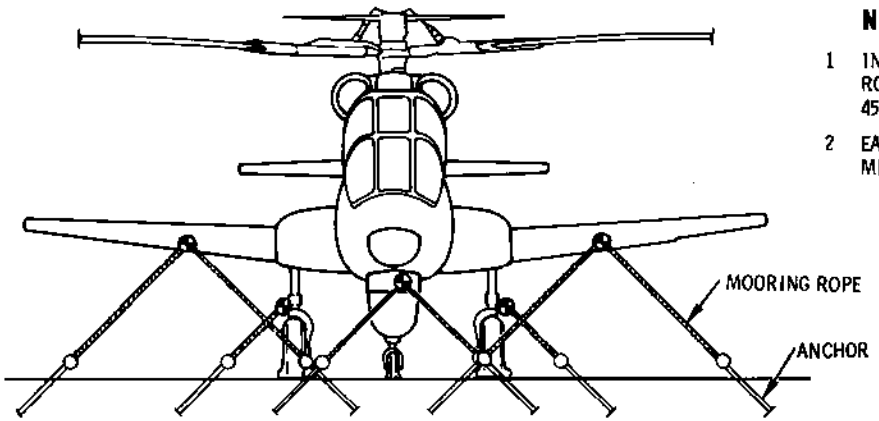
2 EACH ANCHOR PLACED AS SHOWN WILL DEVELOP A MINIMUM OF 350 POUNDS WITHDRAWAL RESISTANCE

HG 07307
MA(20)10A-P-1-10

MOORING, SLIPPERY SURFACE

FIGURE 11
AR-56A





CODE

● AIRCRAFT MOORING POINT

NOTE:

1 INSTALL ANCHORS SO THAT ANGLES BETWEEN MOORING ROPES AND GROUND SURFACE ARE APPROXIMATELY 45 DEGREES

2 EACH ANCHOR PLACED AS SHOWN WILL DEVELOP A MINIMUM OF 1400 POUNDS WITHDRAWAL RESISTANCE

HG 07308
MA(20)10A-P-1-11

MOORING, SOFT SOIL

FIGURE 12
AH-56A

A jack pad is provided at lower end of each gear strut which accommodates a standard low profile hydraulic jack. Landing gears may be jacked individually to facilitate maintenance, observing above caution. All three landing gears may be jacked simultaneously, keeping vehicle level for purposes of weighing, alignment, and symmetry inspections, or other maintenance as desired.

In the course of performing more extensive maintenance, the vehicle can be jacked at the wing and forward fuselage jacking and mooring positions. The fly-away kit adapters and standard hydraulic tripod jacks are required. The adapters screw into clearly marked fittings in aft wing spars and bottom of forward fuselage. The fittings are plugged with a set screw when not in use.

E. Leveling (See figure 14)

Maintenance requiring leveling of the AH-56A has been greatly simplified by including plumb bob provisions. A hanger at the top of the fuselage at FS/442.30 is provided to which the plumb bob string is attached. Directly below the hanger on the bottom of the fuselage, is a plate upon which a cross has been inscribed. String length is adjusted so that plumb bob just clears plate. The vehicle is then jacked as required, either from the gear or wings/fuselage until the plumb bob exactly centers the cross. The vehicle is then in a level condition. Access to these plumb bob leveling provisions is provided through the aft avionics compartment door.

NOTE

For best results, vehicle should be temperature soaked in a shade no wind environment prior to leveling. Verify periodically throughout the maintenance procedure that plumb bob remains centered. It may be necessary to re-level.

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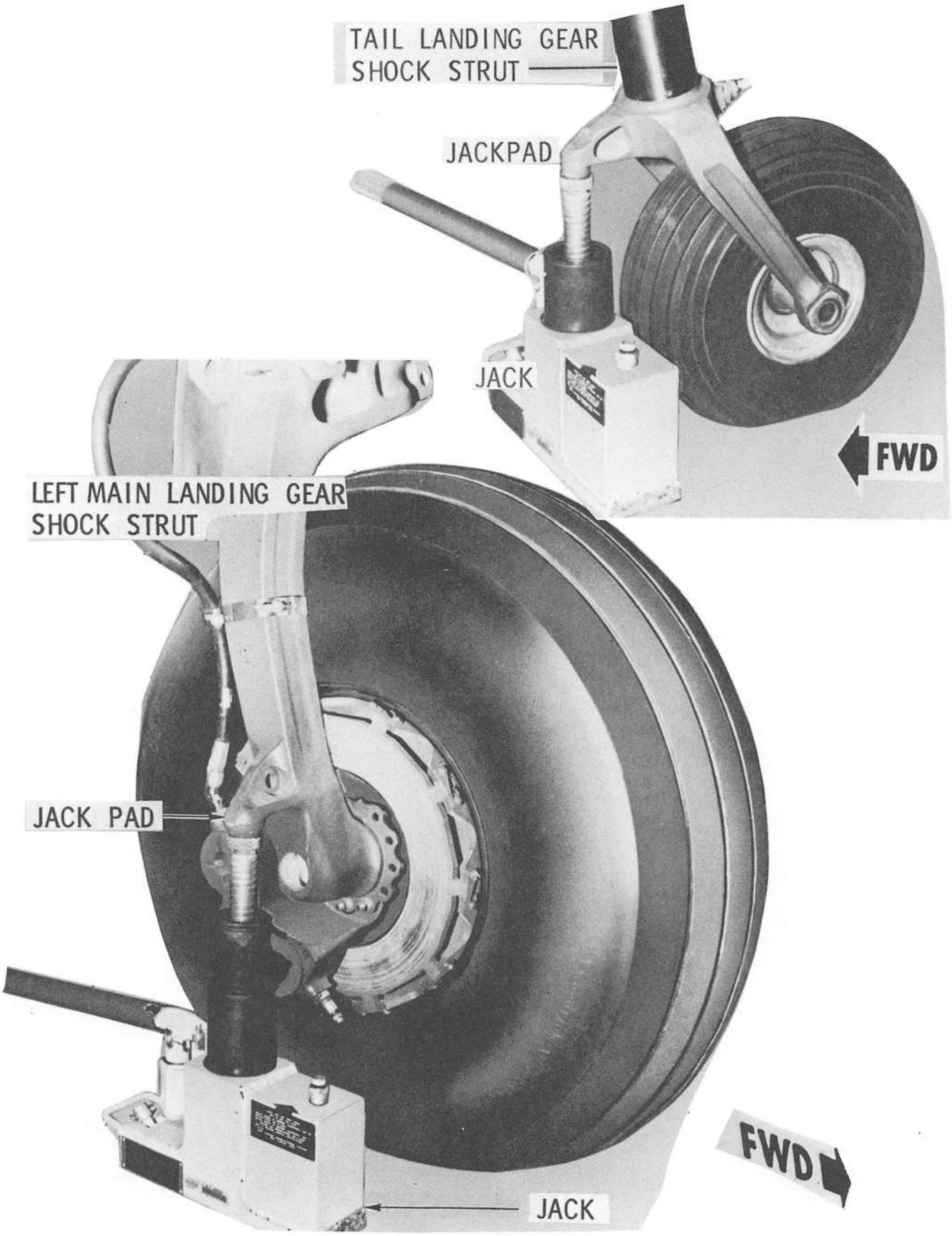
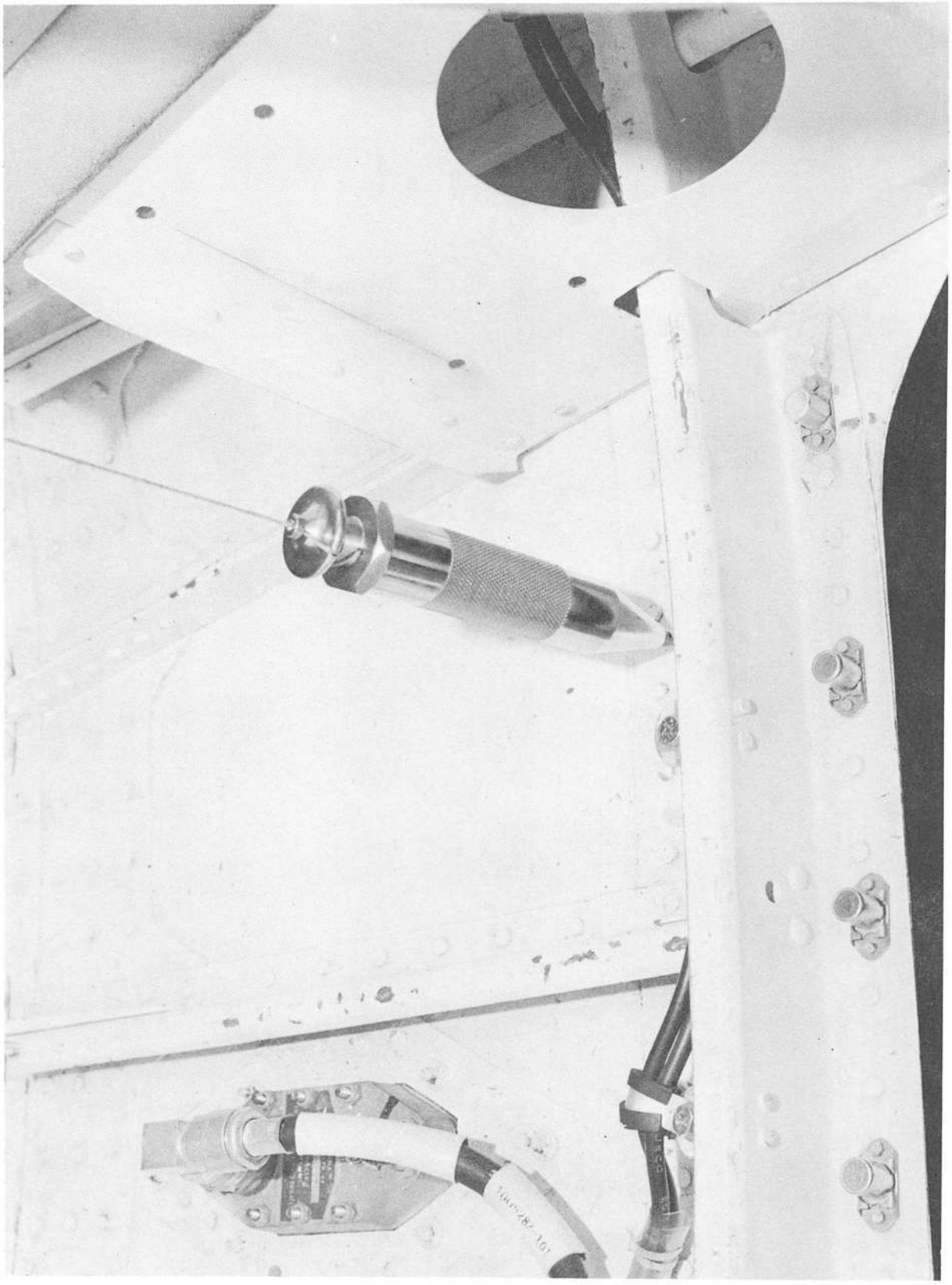

TAIL LANDING GEAR
SHOCK STRUT
JACKPAD
JACK
FWD
LEFT MAIN LANDING GEAR
SHOCK STRUT
JACK PAD
JACK
FWD



LEVELING

V. DETAILED THEORY AND DESCRIPTION

A. Forward Fuselage (See figure 15). Refer to figure 41 as required for compartment location and access information.

Construction is primarily of aluminum alloy semimonocoque type consisting of stringers, longerons, rings and bulkheads. Longerons are 7075-T6 aluminum alloy extrusions, and stringers are brake formed from 2024-T3 aluminum alclad sheet. Bulkheads, for the most part, are buildup assemblies consisting of webs and rings with formed or extruded stiffeners. Skins are made from 2024-T3 aluminum alclad sheet. The forward fuselage is entirely compartmentized with webs and decking forming walls and floors of the various compartments. The forward fuselage extends aft to FS/284, just forward of the main rotor mast, which is a manufacturing assembly break and is not intended as a disassembly joint.

The forward portion of each left and right sponson between FS/185 and 284 is included as part of the forward fuselage. Each sponson houses fuel tanks in addition to other components. The external power receptacle is housed in the forward portion of the left hand sponson, and an air cycle unit (air conditioning package) is housed in the right forward sponson. The forward fuselage sponsons are constructed principally of aluminum and fiberglass honeycomb sandwich.

Principal function of the forward sponsons is to house fuel tanks and other components, as well as provide integral work platforms.

The forward fuselage includes the following compartments and service centers:

Nose Compartment
Canopy and Crew Stations
Ammo Debris Compartment
Belly Turret Compartment
Ammo Magazine Compartment
Electrical Compartment
Main Avionics Compartment
Accessory Compartment

1. Nose Compartment.

The nose compartment structure includes the turret support platform, a nose fairing, and left and right turret fairings. All area forward of station 74.25 below the platform, and forward of station 79 above the platform, make up the nose compartment. The nose fairing is secured to structure by 19 quick-release fasteners, and is made of laminated 181 glass cloth, pre-impregnated with epoxy, and is bead reinforced for stiffness.

Nose turret fairings consist of the left and right wedge shaped assemblies. The molded fiberglass fairings are filled with hard foam, and are attached to bulkhead structure by 26 screws.

2. Cockpit Walkway (See figure 16).

The walkway extends from station 121 to 185 and provides a convenient means of entry into the cockpit from the right hand sponson, and it also doubles as a maintenance platform. The walkway is attached to the fuselage by three hinges, and is supported by five cables when in the extended position. The walkway is operated manually, either from a center external latch or from the pilot's station. The retraction control includes a "tee" handle in the pilot's station to the right of the seat on the floor that the pilot can reach while fully strapped in his seat. Pulling the handle up retracts the walkway into the stowed faired position. When released, the handle returns to its well automatically. The latch striker is adjustable in order that flushness of the faired position can be controlled.

3. Canopy Access Doors and Emergency Egress Doors (See figure 17).

Canopy structure is of aluminum frames with clear panels of stretched acrylic plastic. The two windshields are constructed of laminated glass and vinyl, with an electro-conductive layer on the inside that provides for electro-anti-icing. Additionally the copilot/gunner's windshield is equipped with an electric windshield wiper.

Each of the four doors in the canopy is hinged at the top with a break-away type hinge for emergency jettison purposes. The two right-hand doors are equipped with both internal and external locking handles. Spring cartridges and telescoping door supports assist in opening the doors in addition to providing a means of locking them in several partially opened positions. These doors are protected by a canopy unsafe warning system that alerts the crew by light indication of a door "not locked" condition. The pilot's left door contains a combination clear vision/exhaust-ventilation panel that can be opened independently of the main door.

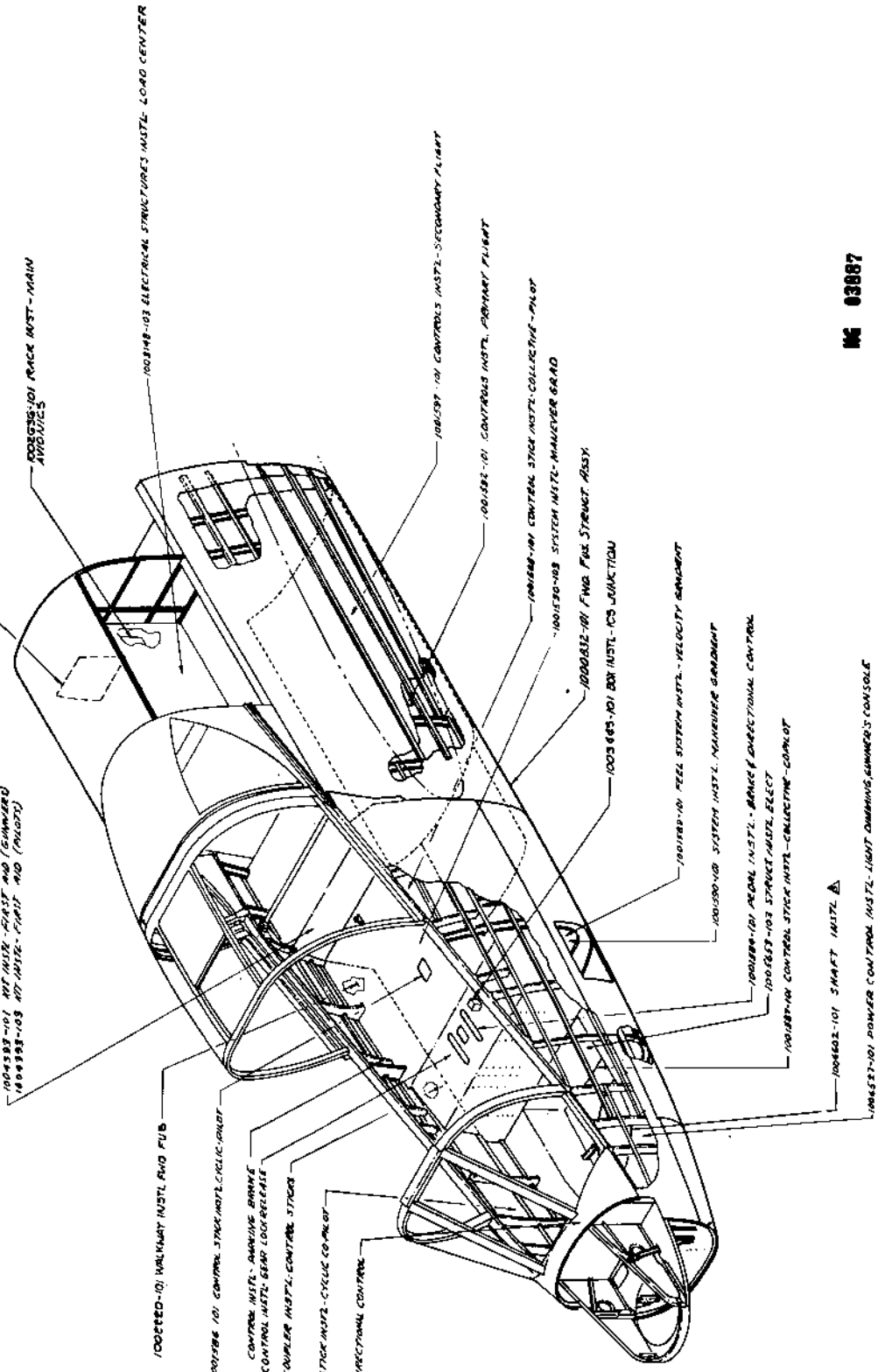
Internal and external jettison handles are provided separately for each of the four doors. The handles operate an explosive device that disengages the upper hingeline. The lower latch mechanism separates easily after hingeline disengagement and allows the door to fall clear. The jettison system is protected by safety pins.

4. Crew Stations

Crew accommodations are provided in a tandem arrangement for a pilot in the aft station and a copilot/gunner in the forward station. The aft station floor is raised 18 inches above the forward station floor to provide maximum visibility for the pilot. The cockpit interior is insulated to reduce noise levels and provide thermal protection. Hard plastic trim is installed along the interior sides to maintain a smooth finish.

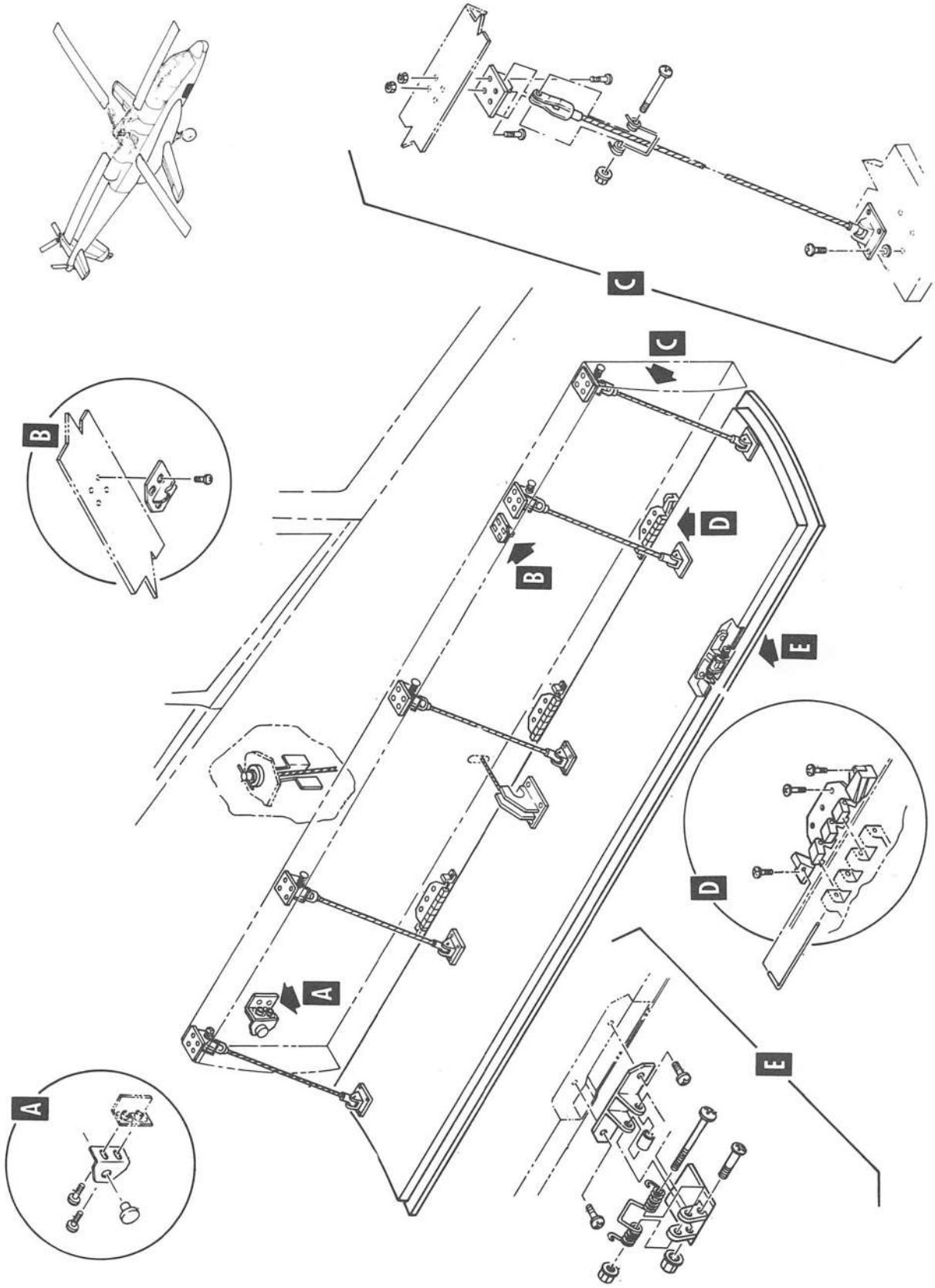
Flight controls are conventional in location and installation, except that the copilot/gunner's cyclic and collective sticks can be decoupled and stowed out of the way to permit swiveling gunner station operation. Provisions for locking the controls are also provided.

FIGURE 15
AH-56A



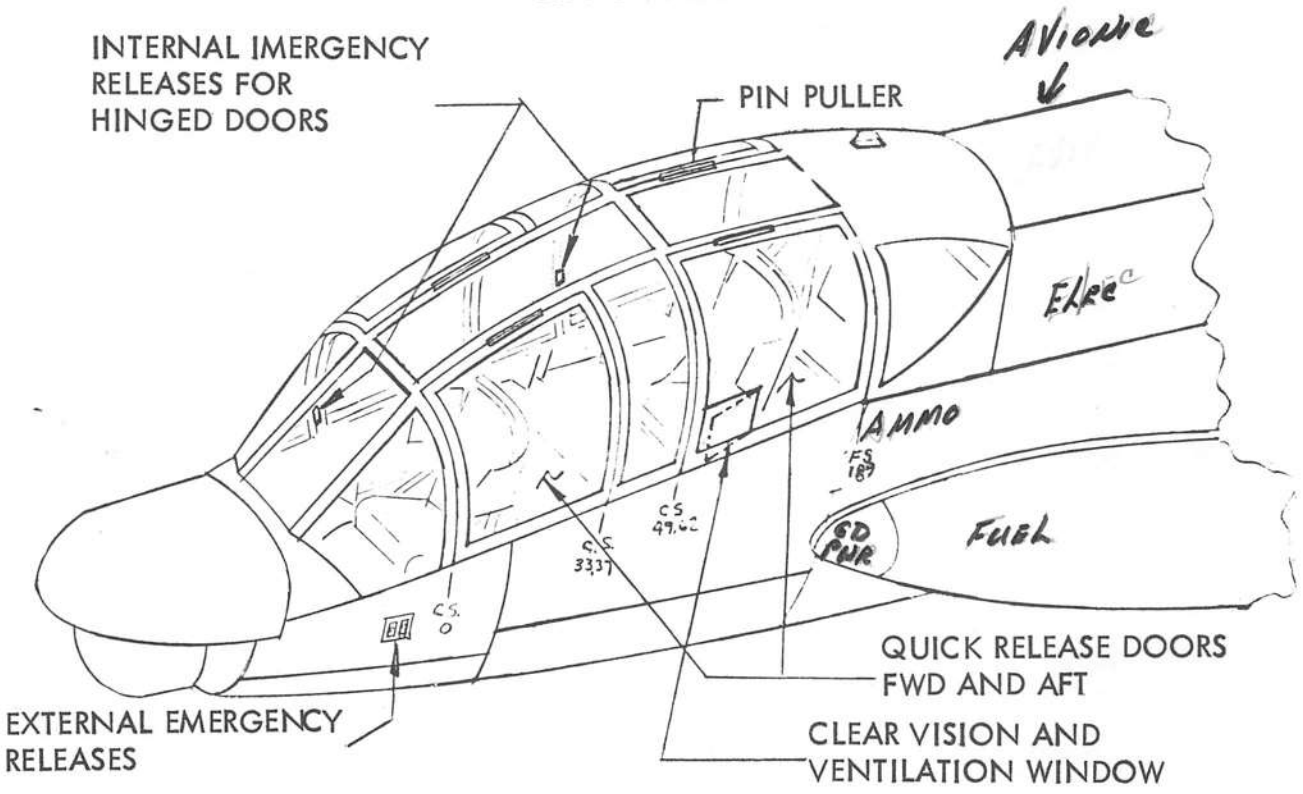
FORWARD FUSELAGE STRUCTURE

FIGURE 16
AH-56A

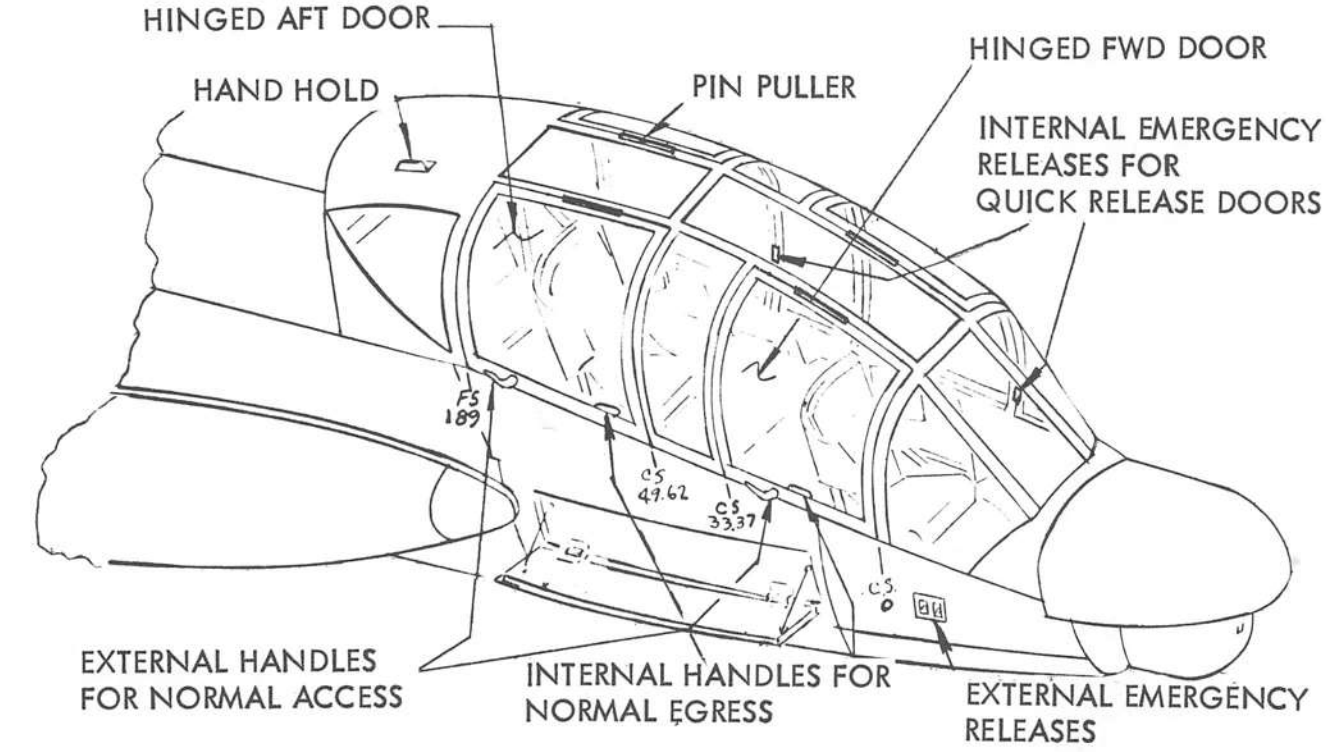


COCKPIT WALKWAY

LEFT HAND SIDE



RIGHT HAND SIDE



CANOPY ACCESS DOORS AND EMERGENCY EGRESS DOORS

The pilot's collective stick has twist grip controls for complete control of the engine and propeller. The copilot/gunner's collective stick has no provisions for engine starting, idling, or shut off, but has provisions for in flight control of engine and propeller.

Cockpit furnishings include mirrors attached to each side of the canopy front frame. Both stations have right hand side map cases, and a hand operated fire extinguisher is accessible from either station. Relief tubes are located to the left on the floor of the copilot/gunner's station, and to the right rear of the pilot's seat. The installation consists of funnels, rubber tubing above floor level, and polyethylene tubing below floor level, terminating at a stainless steel overboard tube at FS/358.

Instrument panels, (See figures 18, 19 and 20) consist of a forward main tee-panel, containing flight, navigation, and system monitoring instruments. In addition, left and right lower panels and consoles containing system controls at either side are provided. Instruments are integrally lighted and panels are edge lighted. In addition, flood, utility, and storm lights are provided.

Pilot's seat assembly (See figure 21) is manually adjustable fore and aft and vertically. Construction is of welded tubular steel with sheet metal back and pan, and a horizontal track assembly. The back and seat pan are assembled as a single unit to the track assembly. The track contains the controls for selective vertical adjustment. Channels function as tracks for the seat pan rollers, providing fore and aft adjustable movement. Fittings at the rear of each left and right channel attach the entire track assembly to the tubular steel support structure. The seat structure is bolted to the floor and overhead cockpit structure. Both seats have removable seat and back cushions so that the seat can accommodate back pack parachutes and survival kits. Both seats are also designed to absorb crash loads to reduce crew injury and are equipped with standard safety belts, crotch straps and shoulder harnesses with inertia reels, and have provisions for mounting armor plate.

Copilot/gunner's seat, (See figure 21) structure is of 6061-T6 aluminum alloy frame with back plate and seat pan attached. The seat pan is removable to permit access to swiveling gunner's station components. The seat is attached to vertical steel supports anchored to the swiveling station. The seat is adjustable only vertically, and is not interchangeable with the pilot's seat.

5. Ammo Debris Compartment (See figure 22)

WARNING

TAKE ADEQUATE MEASURES TO PREVENT INADVERTENT DOOR OPERATION WHILE WORKING IN AMMO DEBRIS COMPARTMENT TO AVOID PERSONNEL INJURY.

This compartment functions as a collection bay for spent and unused 7.62 mm rounds from the nose turret. Because of the light weight of the empty brass, it is retained instead of ejected overboard where it could damage propeller and tail rotor. Spent rounds are collected in a fitted and zippered bag. Zippers allow access to the master brake and parking valve cylinders, and pilot's controls through the top, and to the fire control avionics to the rear. The battery, (See figure 23) is also located in this compartment, with an additional access door on left side of fuselage. The forward panel of the bag is made of clear poly-carbonate plastic to allow visual inspection of the battery and controls area. The sides of the bag are 2024-T3 aluminum sheet. The bag is closed at the bottom by the bomb bay type doors. The bag is designed to contain a maximum of 11,570 spent rounds, weighing 370 pounds, or 5.5 cubic feet.

The two doors are electrically actuated by means of the ammo debris control switch on the pilot's right subpanel. The motor is 115 vac continuous duty, electrically reversible, electro-mechanical actuator. Linear motion is obtained by driving a jackscrew through a reduction geartrain. The stroke is limited internally by mechanical stops, and controlled by a torque limiting device, which senses load buildup at either end of the stroke and shuts off power at a predetermined limit. The linkage from actuator to the doors is adjustable to obtain a snug contoured closed-door fit.

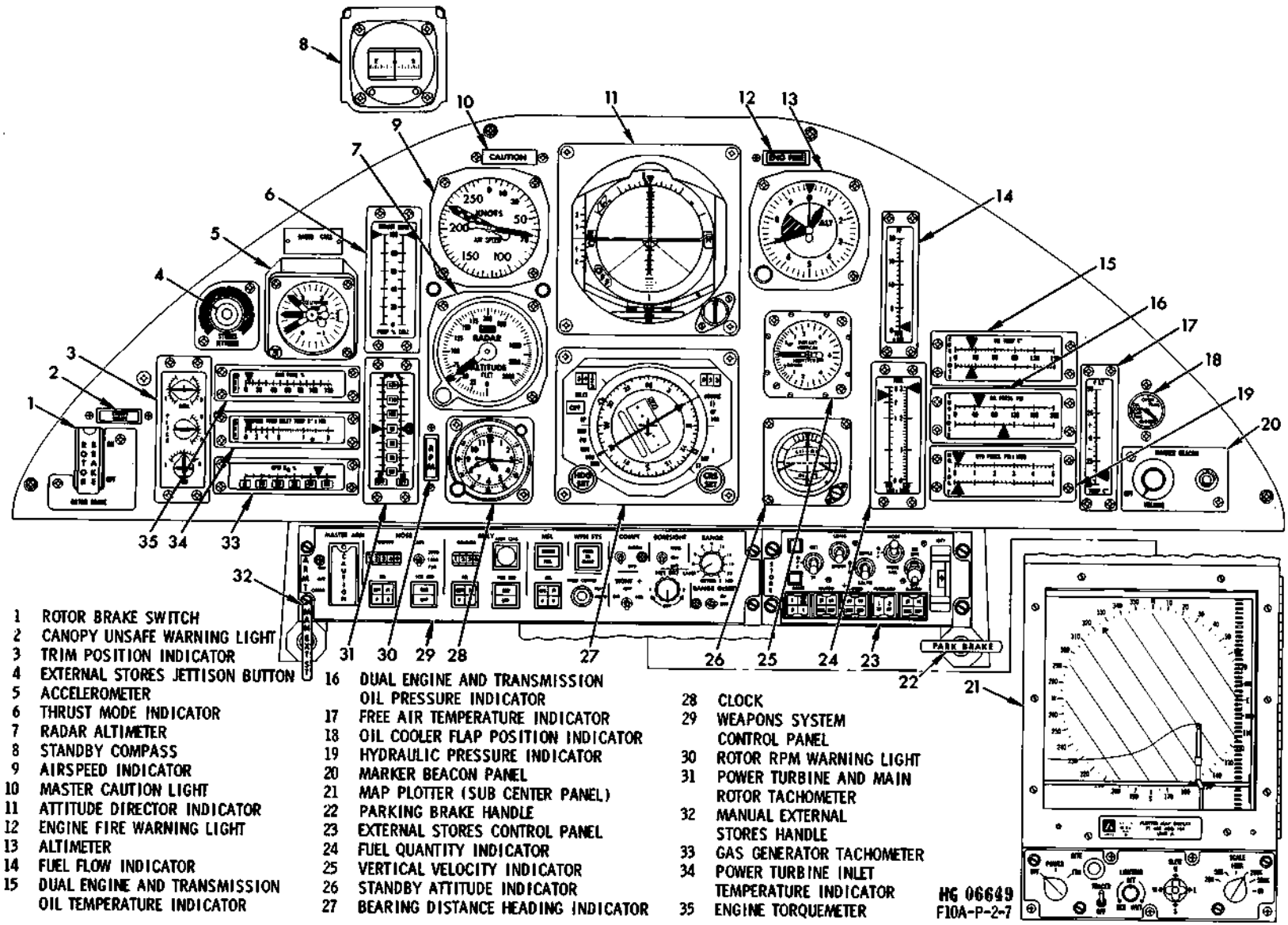
Operationally, the pilot, if practical to do so, would come to a near hover and empty the debris bag before returning to base to reduce turn-around time. Two alternate methods of opening the debris bay are provided. If external electrical power is available or APU is operating, an electrical switch within the external power receptacle compartment may be employed. If no electrical power is available a manual pin under a panel in the floor of the pilot's station can be pulled, allowing the doors to fall open.

6. Belly Turret, Compartment (See figure 24, sheet 1 and 2)

The belly turret is located between the debris bag and ammo compartment. The entire turret, including turntable, is mounted to structure within the compartment directly above the turret by four principal bolts. The turret assembly is functionally complete mechanically, and houses the 30 mm cannon. Fairings with quick operating fasteners shroud the turret and extend aft covering a portion of the forward ammo compartment door. The compartment above the turret houses the ammo feed system.

7. Ammo Drum Compartment (See figure 24, sheet 1 and 2)

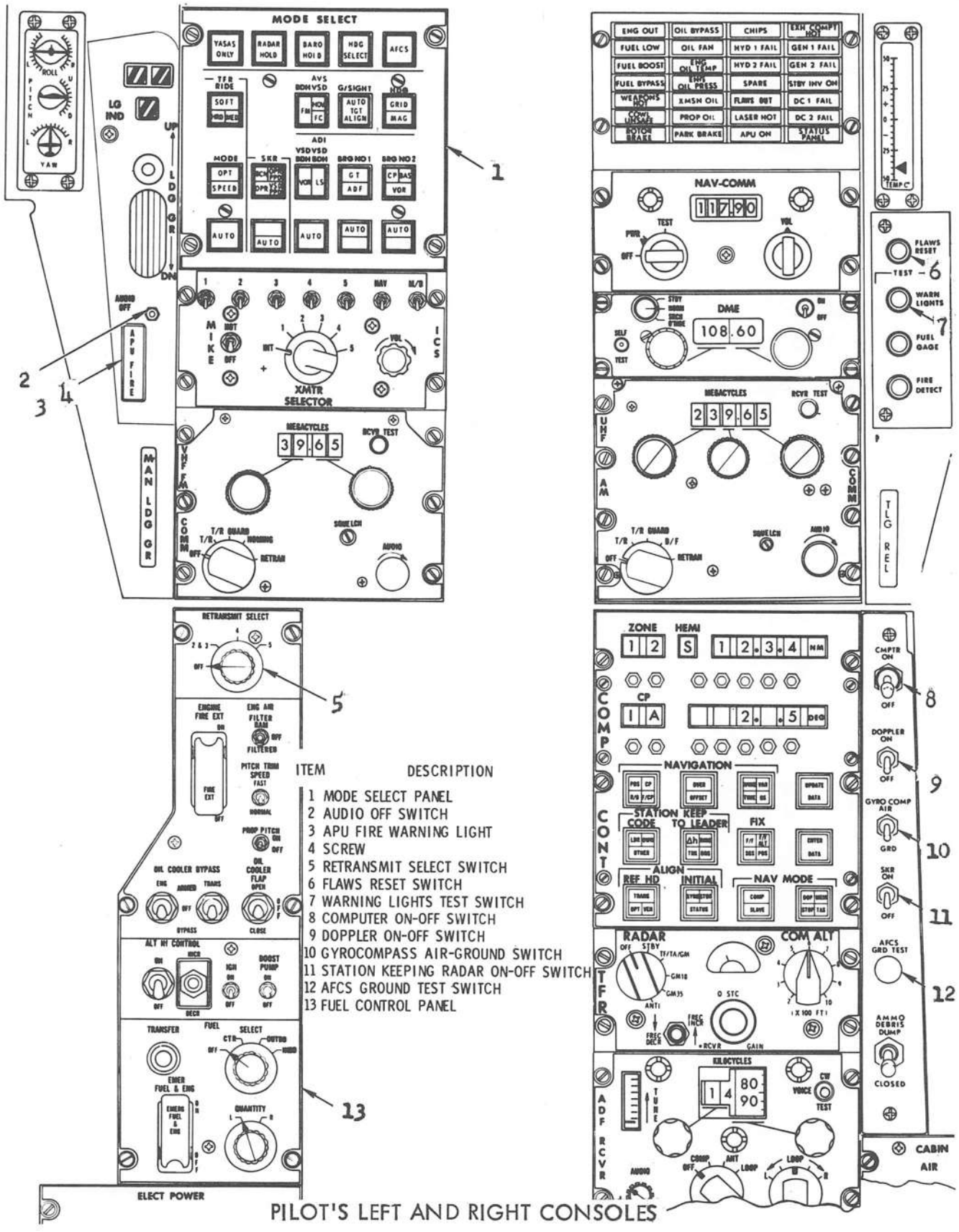
This compartment is located at FS/211 and extends aft to FS/284. Vertically, it extends from the underside of the fuselage to WL/107. It houses two magazine drums. The forward drum supplies the nose turret and is installed upright. The aft drum supplies the belly turret, is installed horizontally, and carries primary structural loads. The vehicle can be flown without this drum if spreader bars are used. No other major components, with the exception of ammo feed chutes and



1 ROTOR BRAKE SWITCH
2 CANOPY UNSAFE WARNING LIGHT
3 TRIM POSITION INDICATOR
4 EXTERNAL STORES JETTISON BUTTON
5 ACCELEROMETER
6 THRUST MODE INDICATOR
7 RADAR ALTIMETER
8 STANDBY COMPASS
9 AIRSPEED INDICATOR
10 MASTER CAUTION LIGHT
11 ATTITUDE DIRECTOR INDICATOR
12 ENGINE FIRE WARNING LIGHT
13 ALTIMETER
14 FUEL FLOW INDICATOR
15 DUAL ENGINE AND TRANSMISSION OIL TEMPERATURE INDICATOR
16 DUAL ENGINE AND TRANSMISSION OIL PRESSURE INDICATOR
17 FREE AIR TEMPERATURE INDICATOR
18 OIL COOLER FLAP POSITION INDICATOR
19 HYDRAULIC PRESSURE INDICATOR
20 MARKER BEACON PANEL
21 MAP PLOTTER (SUB CENTER PANEL)
22 PARKING BRAKE HANDLE
23 EXTERNAL STORES CONTROL PANEL
24 FUEL QUANTITY INDICATOR
25 VERTICAL VELOCITY INDICATOR
26 STANDBY ATTITUDE INDICATOR
27 BEARING DISTANCE HEADING INDICATOR
28 CLOCK
29 WEAPONS SYSTEM CONTROL PANEL
30 ROTOR RPM WARNING LIGHT
31 POWER TURBINE AND MAIN ROTOR TACHOMETER
32 MANUAL EXTERNAL STORES HANDLE
33 GAS GENERATOR TACHOMETER
34 POWER TURBINE INLET TEMPERATURE INDICATOR
35 ENGINE TORQUEMETER

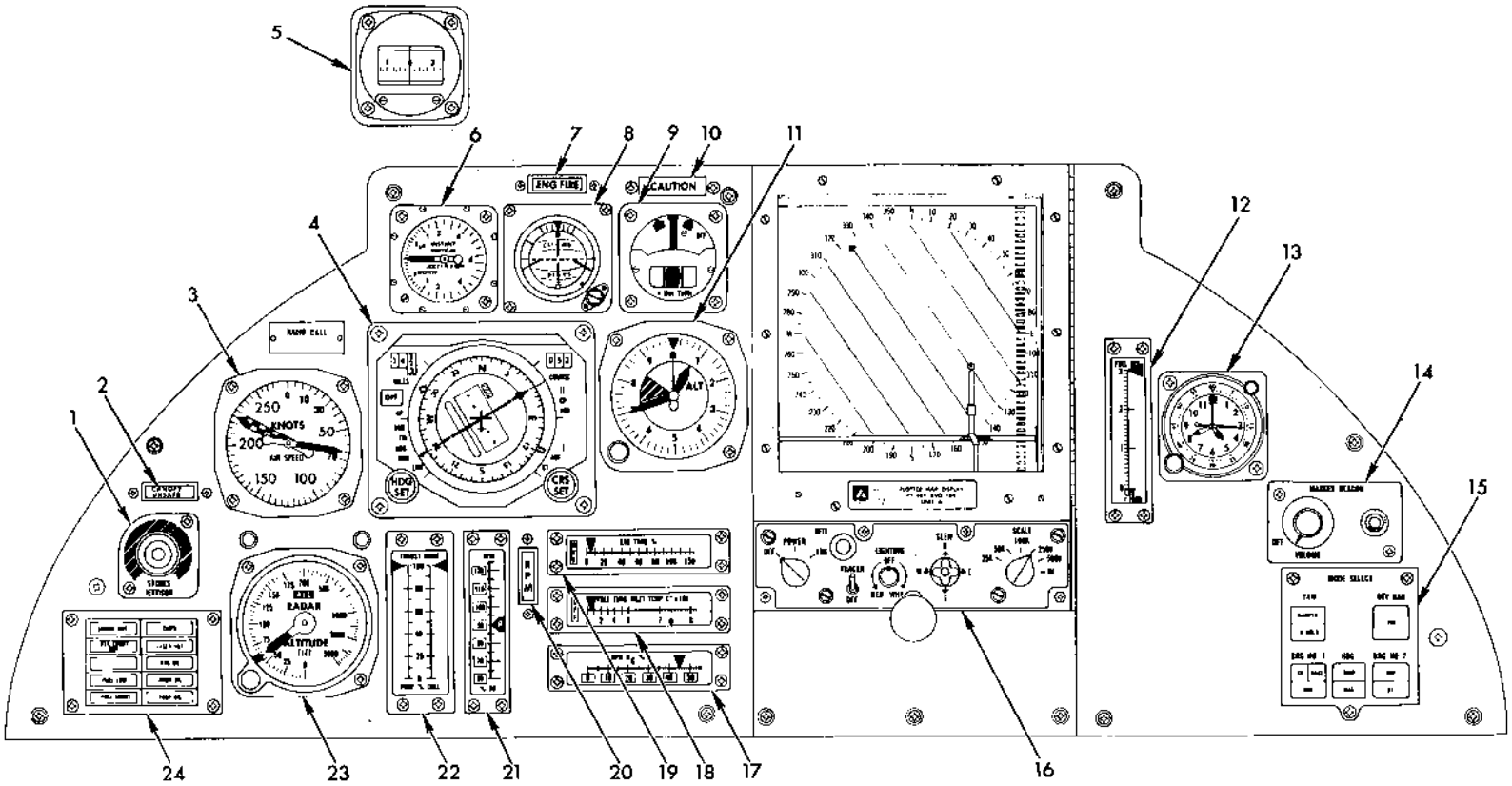
PILOT'S INSTRUMENT PANEL

FIGURE 18
AH-56A



ITEM	DESCRIPTION
1	MODE SELECT PANEL
2	AUDIO OFF SWITCH
3	APU FIRE WARNING LIGHT
4	SCREW
5	RETRANSMIT SELECT SWITCH
6	FLAWS RESET SWITCH
7	WARNING LIGHTS TEST SWITCH
8	COMPUTER ON-OFF SWITCH
9	DOPPLER ON-OFF SWITCH
10	GYROCOMPASS AIR-GROUND SWITCH
11	STATION KEEPING RADAR ON-OFF SWITCH
12	AFCS GROUND TEST SWITCH
13	FUEL CONTROL PANEL

PILOT'S LEFT AND RIGHT CONSOLES



1	EXTERNAL STORES JETTISON BUTTON	9	TURN-AND-SLIP INDICATOR	17	GAS GENERATOR TACHOMETER
2	CANOPY UNSAFE WARNING LIGHT	10	MASTER CAUTION LIGHT	18	POWER TURBINE INLET TEMPERATURE INDICATOR
3	AIRSPEED INDICATOR	11	PRESSURE ALTIMETER	19	ENGINE TORQUEMETER
4	BEARING DISTANCE HEADING INDICATOR	12	INTERNAL FUEL QUANTITY INDICATOR	20	ROTOR RPM WARNING LIGHT
5	STANDBY COMPASS	13	CLOCK	21	MAIN ROTOR TACHOMETER
6	VERTICAL VELOCITY INDICATOR	14	MARKER BEACON PANEL	22	THRUST MODE INDICATOR
7	ENGINE FIRE WARNING LIGHT	15	NAVIGATION MODE SELECT PANEL	23	RADAR ALTIMETER
8	STANDBY ATTITUDE INDICATOR	16	MAP PLOTTER	24	ANNUNCIATOR PANEL

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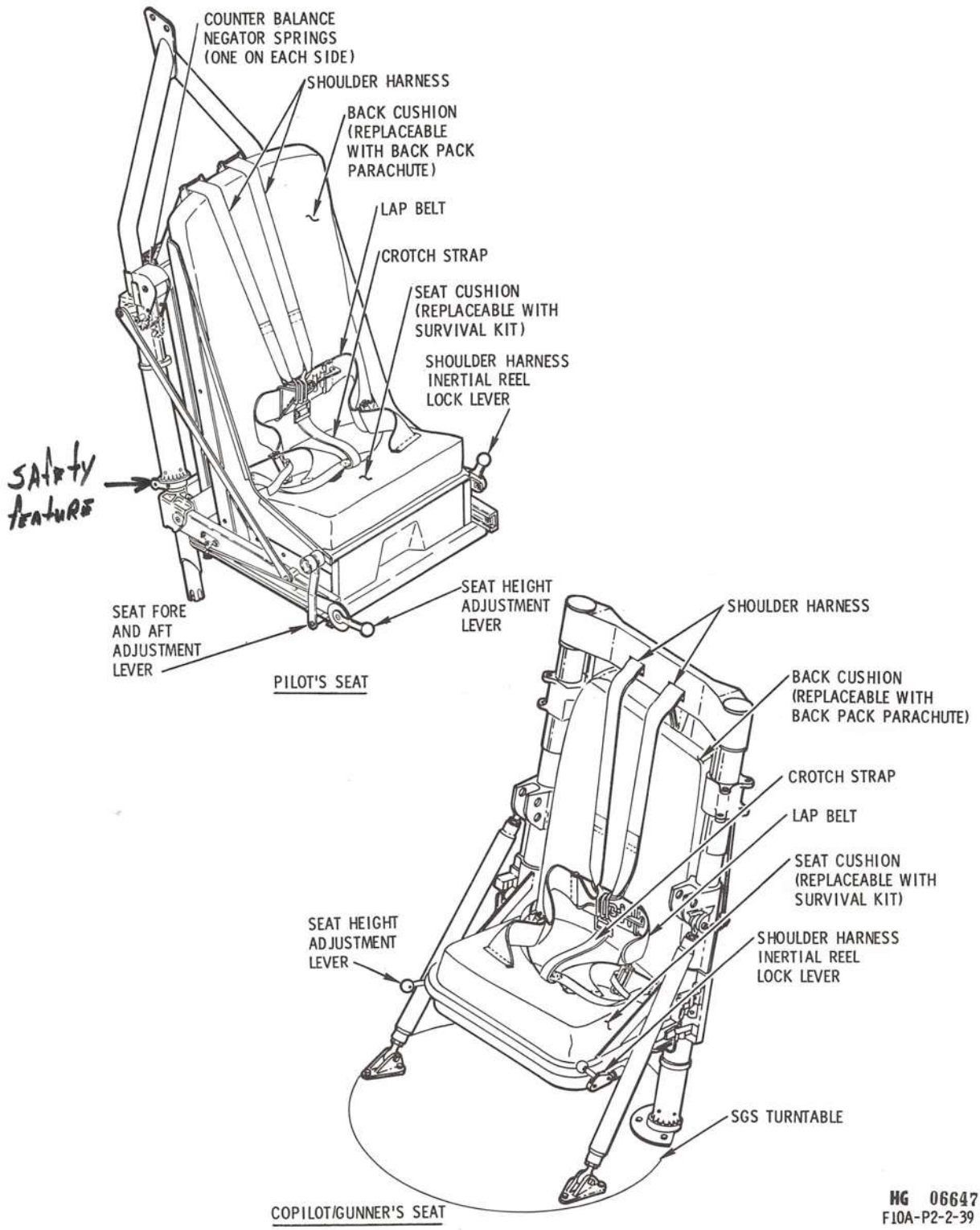
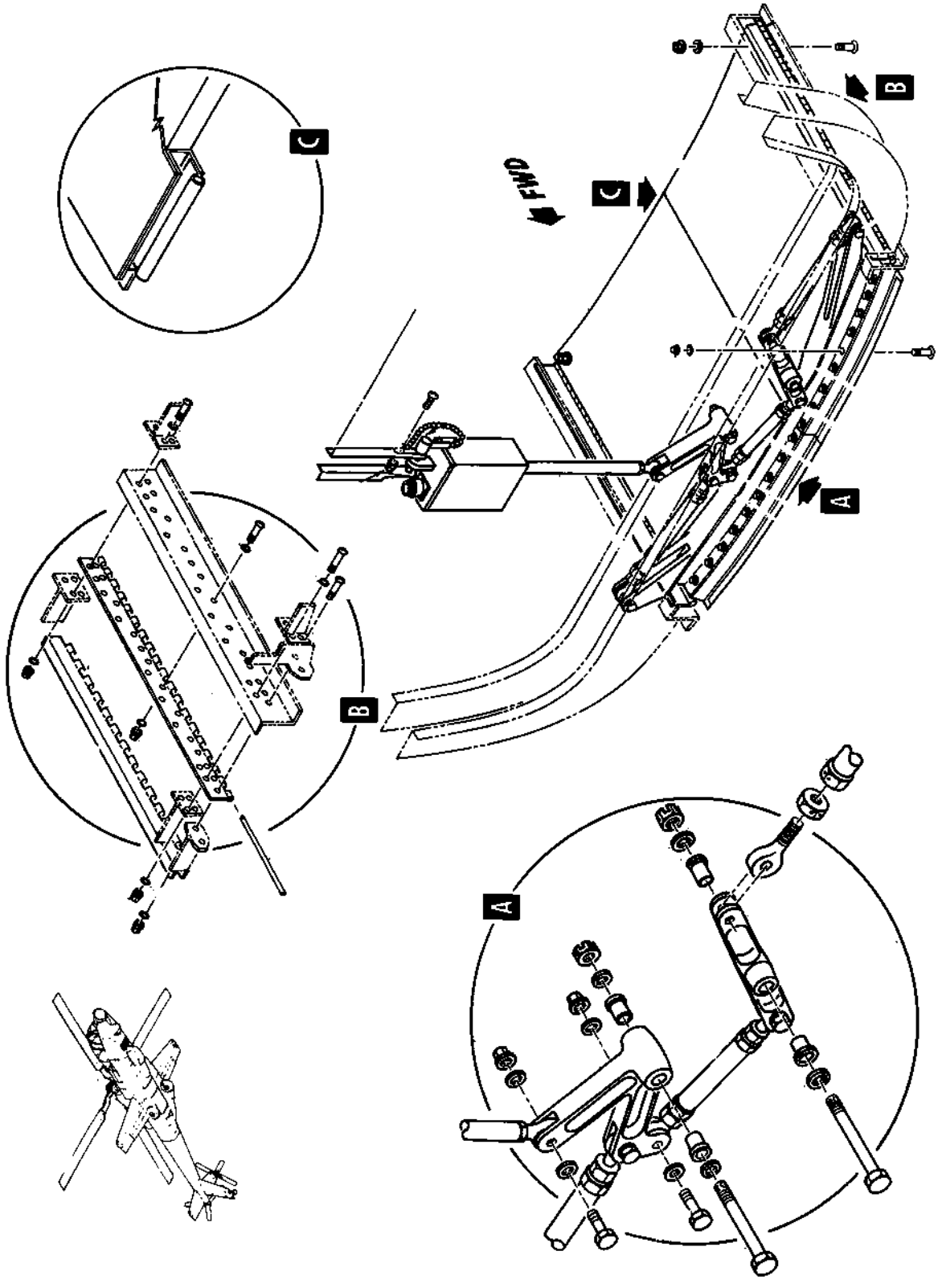
F10A-P-2-11

COPILOT/GUNNER'S INSTRUMENT PANEL

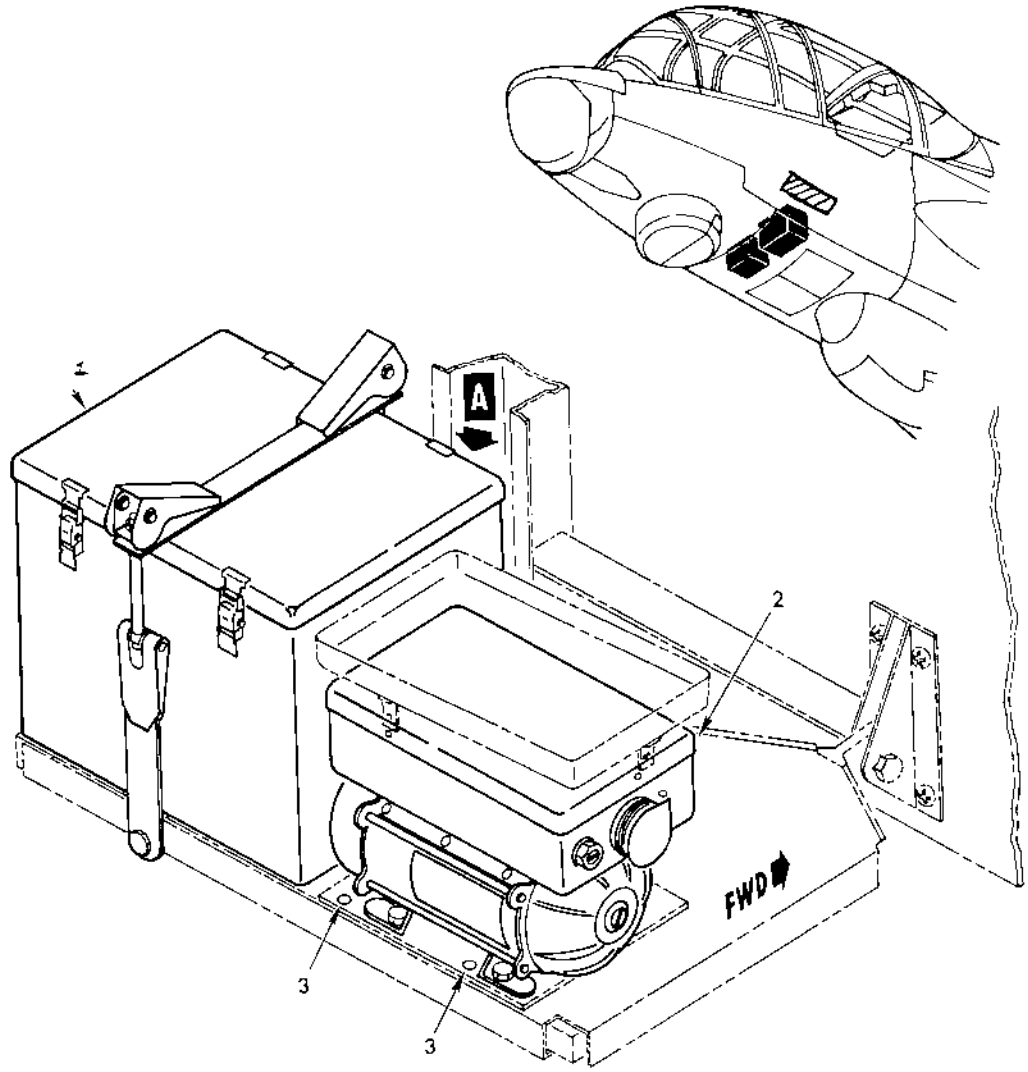
FIGURE 20
AH-56A

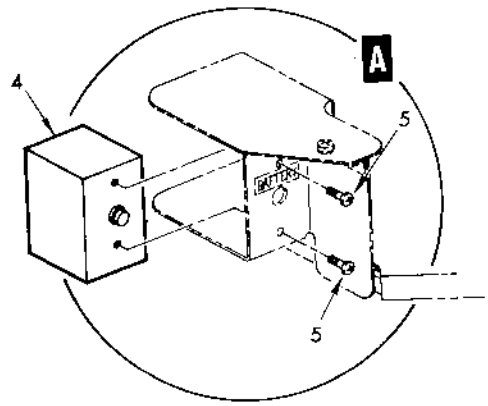


PILOT AND COPILOT/GUNNER SEATS



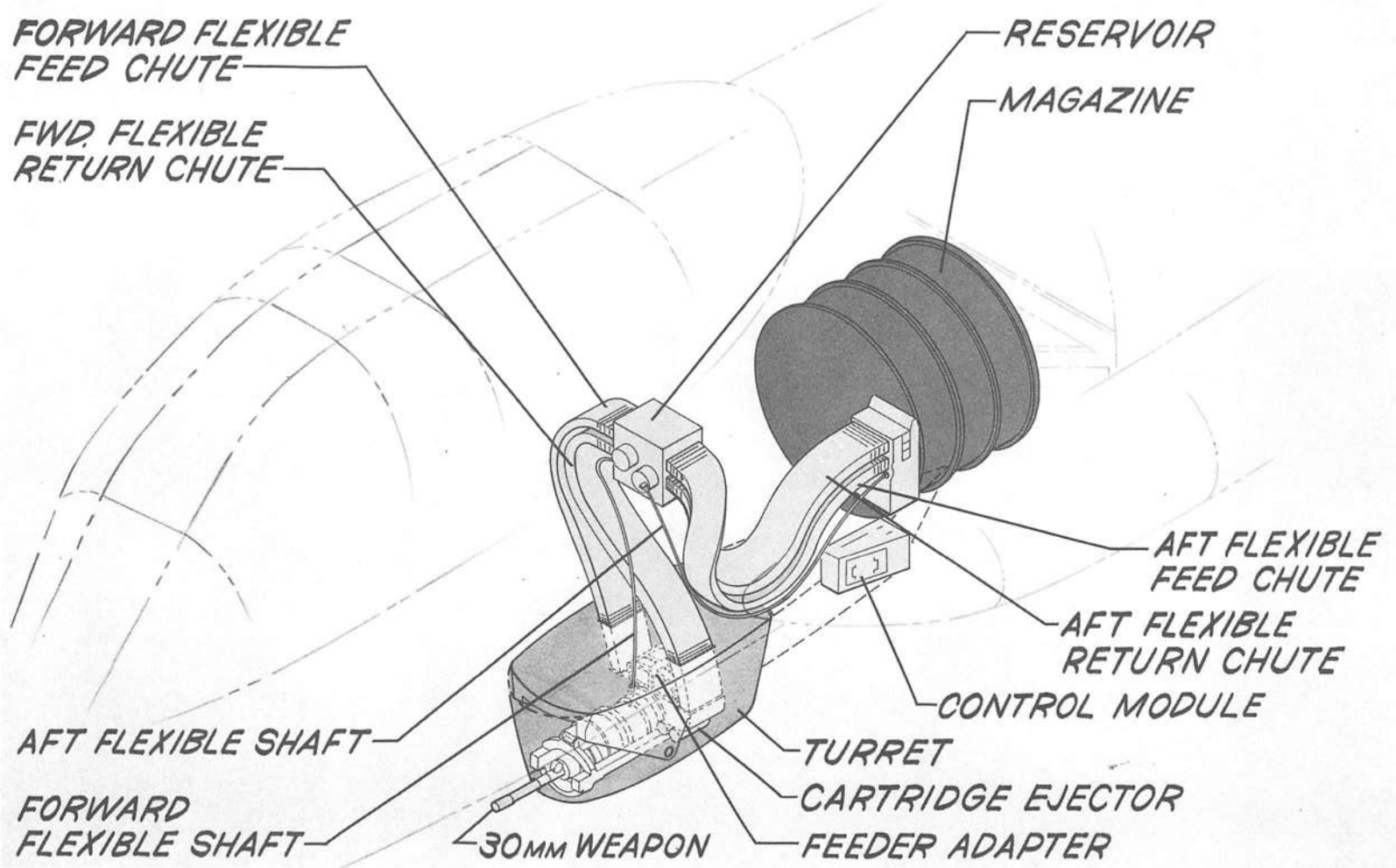
AMMO DEBRIS COMPARTMENT DOOR





ITEM	DESCRIPTION
1	BATTERY
2	INVERTER (PU-543 B/A)
3	SCREW
4	CIRCUIT BREAKER
5	SCREW

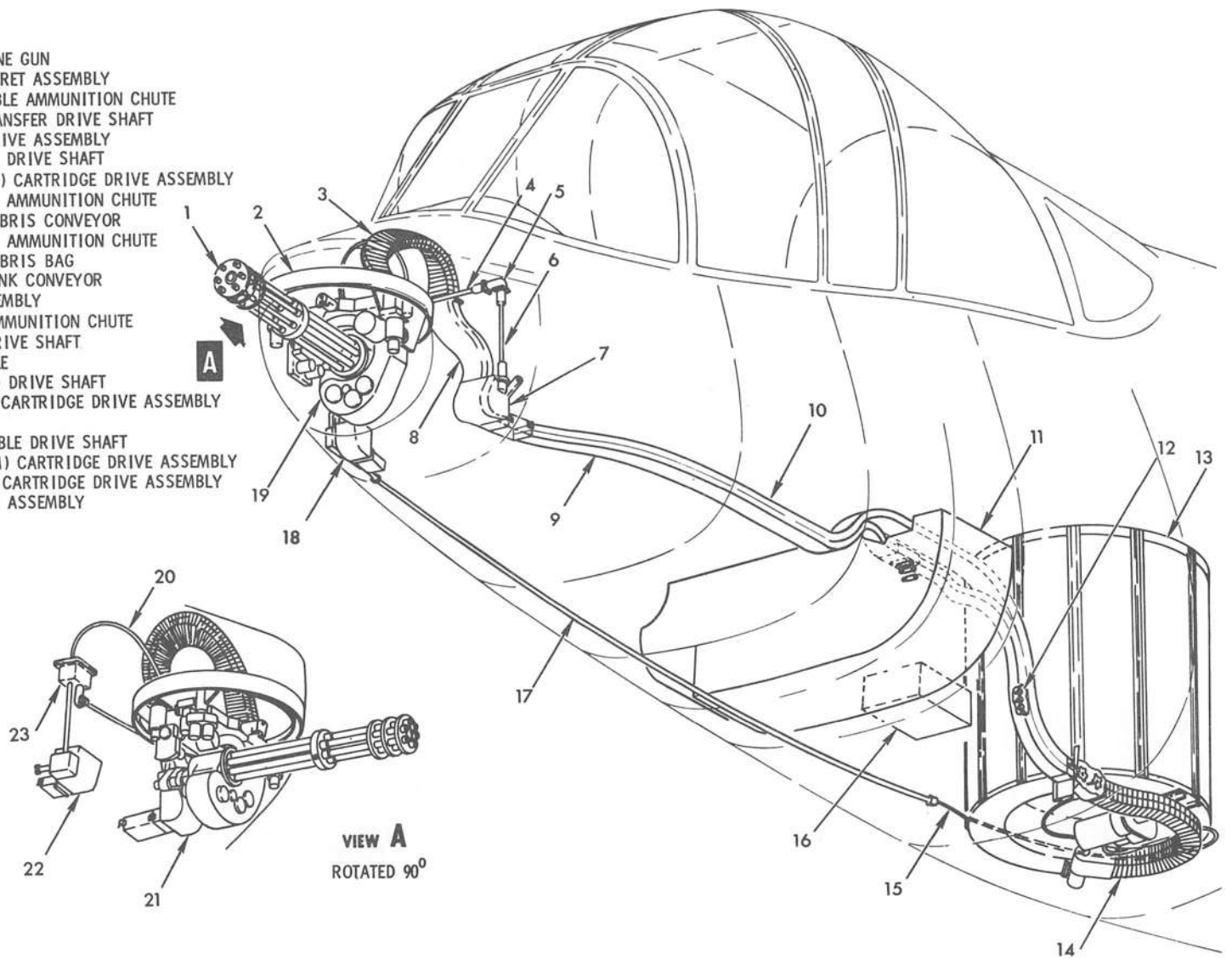
BATTERY INSTALLATION



AMMO DRUM COMPARTMENT (SHEET 1 OF 2)

FIGURE 24
AH-56A

1 7.62-MM MACHINE GUN
2 XM-53 NOSE TURRET ASSEMBLY
3 FORWARD FLEXIBLE AMMUNITION CHUTE
4 HORIZONTAL TRANSFER DRIVE SHAFT
5 RIGHT ANGLE DRIVE ASSEMBLY
6 VERTICAL RIGID DRIVE SHAFT
7 XM-53 (7.62-MM) CARTRIDGE DRIVE ASSEMBLY
8 VERTICAL RIGID AMMUNITION CHUTE
9 AMMUNITION DEBRIS CONVEYOR
10 AIRCRAFT FIXED AMMUNITION CHUTE
11 AMMUNITION DEBRIS BAG
12 AMMUNITION LINK CONVEYOR
13 MAGAZINE ASSEMBLY
14 AFT FLEXIBLE AMMUNITION CHUTE
15 AFT FLEXIBLE DRIVE SHAFT
16 CONTROL MODULE
17 AIRCRAFT FIXED DRIVE SHAFT
18 XM-51 (40-MM) CARTRIDGE DRIVE ASSEMBLY
19 GUN FEEDER
20 FORWARD FLEXIBLE DRIVE SHAFT
21 XM-53 (7.62-MM) CARTRIDGE DRIVE ASSEMBLY
22 XM-51 (40-MM) CARTRIDGE DRIVE ASSEMBLY
23 MODE TRANSFER ASSEMBLY



HG 06725
MW(12)10A-P-1-10

AMMO DRUM COMPARTMENT (SHEET 2 OF 2)

associated wiring, are located in this compartment.

Two access doors are provided for rearming or magazine removal. The forward door is hinged on the right side at BL/20.75 and extends from FS/211 to FS/243.25. This door is secured with three quick operating latches, and a hold open device is installed at the forward edge. The aft door is similarly hinged and extends from FS/243.25 to FS/284. It is secured with 18 quick opening fasteners, and a hold open device is also provided.

8. Electrical Compartment

The electrical compartment is located in the upper fuselage fairing structure on the left side directly behind the canopy and forward of the accessory compartment between FS/211 and FS/243.25. The floor of the compartment is WL/107, which is directly above the ammunition drum compartment. Entrance is gained from the left sponson through a double hinged door. The upper fixed hinge is at WL/141 and the center folding hinge is at WL/129, forming two door panels. The door is secured with five quick operating latches, one on each side of the upper panel, and three along the bottom of the lower panel. A hold open device is provided.

Two electrically driven compartment cooling fans are located in this compartment. To facilitate cooling, an inlet port is built into the lower panel and an exhaust port is provided in the upper panel. One of the fans is located in the partition separating the main avionics compartment, and cools the computer central.

The following components are included in the electrical compartment:

Transformer-Rectifier (2)
Flasher, Light
Controller, Temperature, Windshield (2)
Electric Power Monitor AC (external power)
Panel, Regulator, Supervisory (2)
Systems Relay Panels, Nr 1, 2, 3, 4, and 5
Diode Assembly, Trim Actuator
Resistor, Thermocouple Lead Spool
Actuator Control, Power Trim
Amplifier, Engine Control System, Dual
Entire bus-transfer system components

9. Main Avionics Compartment (See figure 25)

The main avionics compartment is located in the upper fairing structure on the right side directly aft of the canopy. The compartment floor is at WL/107, directly above the ammunition drum compartment, and extends upward to the top of the fuselage. Entrance is gained from the right sponson through double hinged doors. The upper fixed hinge is at WL/141, the lower folding hinge is at WL/129, forming two door panels. The door is secured with five quick operating latches, one on each side of the upper panel, and three along the bottom of the lower panel. A hold open device is provided. An

exhaust port is built into each door panel to facilitate cooling. A compartment fan is provided.

The compartment houses the Computer Central Complex, which is composed of the Digital Interface Unit, the Signal Transfer Unit, and three Central Processor Units. The compartment includes the following components:

Vertical Situation Display Generator (auto mode)
ADF Receiver (ARN-89)
AFCS Amplifier/Controller Assembly (auto mode)
Air Data Converter
Mark XII Computer (provision only)
IFF Receiver (APX-72)
IFF Lobing Switch
IFF Test Switch (TS-1843)
Digital to Analog Converter
Fire Alarm Control Units (2)
Computer Central Complex
- Signal Transfer Unit
- Digital Interface Unit
- Central Processor Unit (3)

10. Accessory Compartment (See figure 25)

The accessory compartment is that area forward of the main transmission and aft of the avionics and electrical load center compartments, in upper forward fuselage area. Access is provided by left and right doors, 30 by 27 inches, between FS/262 and 292, and between WL/116 and 143. Each door is hinged at the top and fastened with five quick operating latches, one on each side of the door and three along the bottom. Each door has a hold open rod that stows along forward edge. Access to the transmission oil tank is provided in the fairing just above the RH accessory compartment door.

The accessory compartment contains the following components:

Two 20 KVA generators mounted on the forward section of the main transmission, complete with cooling ducts.

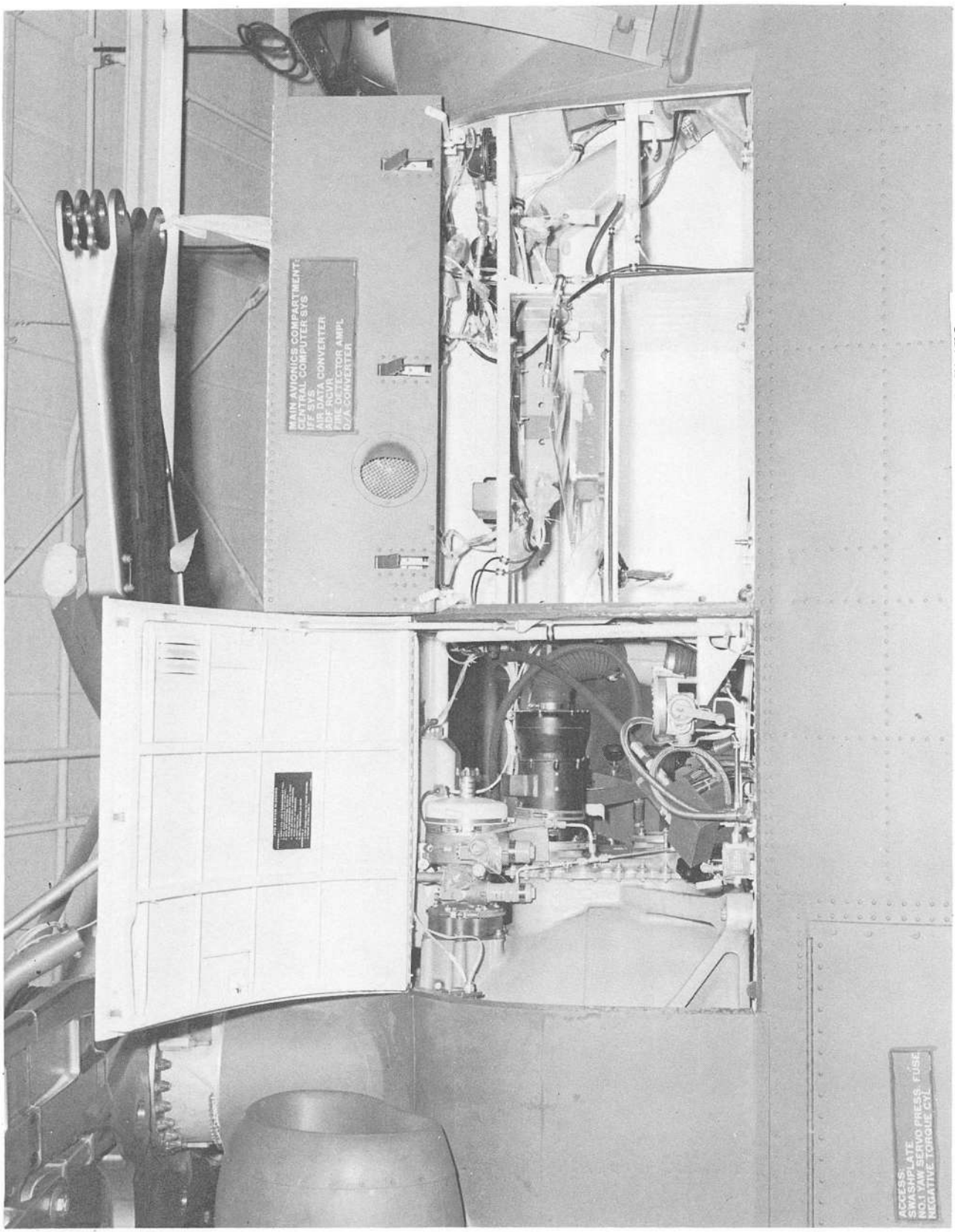
Number one (primary) flight control hydraulic package mounted on the upper right hand forward portion of transmission.

Number two (utility) hydraulic power package mounted just below the left hand generator.

Hydraulic filler pump mounted on the access sill (WL/116) in right hand forward section of the compartment.

Automatic flight control system (AFCS) rate gyro assembly and accelerometers on left hand side of compartment floor WL/107. (auto mode)

Gyro compartment on the right side of the floor houses the YAWSAS



MAIN AVIONICS, AND ACCESSORY COMPARTMENTS

computer/rate gyro, rate switching gyro, and rate gyro.

B. Midfuselage (See figure 26). Refer to figures 3 and 41 as required for additional location, and access provision information.

The midfuselage extends aft from the manufacturing break at FS/284 to the disassembly tension joint at FS/455. Like the forward fuselage, the midfuselage is semimonocoque construction, consisting of four main extruded 7075-T6 aluminum longerons, intermediate stringers, rings, and bulkheads. Skin is made from 2024-T3 aluminum alclad sheet, with aluminum honeycomb sandwich material used adjacent to the main fuel tank and in fuselage underside doors.

Heart of the midfuselage primary structure is the torsion-box which is formed by the two primary frames at FS/284 and FS/317. Both frames are trussed aluminum alloy forgings extending through the fuselage to BL/50.5L and R where landing gear trunnion fittings and wing mounting provisions are provided. These frames provide load carry-through structure for landing gear, wings, and transmission/rotor. Multiple structural elements are used throughout the structure to provide redundancy resulting in increased serviceability in the event of structural battle damage. This is especially noteworthy of the main frames. If any one member is destroyed, structural loads will transfer around it.

The portion of the sponsons associated directly with the midfuselage continue aft from FS/272 to FS/430. Center sections of the sponsons house the wing attach structure and main landing gear trunnion fittings, and are permanently attached to the two forged frames adding torsional stiffness to the primary structure. Aft of FS/317 the sponsons are conventional ring, stiffener, and skin construction. Left midfuselage sponson houses the auxiliary power unit and manual boarding ladder. The right sponson houses the majority of the internal fuel system components, including refueling panel, and contains the automatic electrically operated boarding ladder. Both sponsons are secondary structural fairings and serve as walkways and maintenance platforms for all topside service centers.

The midfuselage includes the following airframe associated components and compartments:

Oil Cooling Air Inlet Duct
Left Boarding Ladder
Right Boarding Ladder
Transmission Cowl
Engine Air Inlet Plenum Compartment
Engine Sliding Cowl
Swashplate Compartment and Access
Control Servo Compartment and Access
Main Fuel Tank Compartment
Aft Avionics Compartment

1. Oil Cooling Air Inlet Duct (See figure 27)

The oil cooler air inlet duct is a ram air scoop. It is installed

on the left side of the midfuselage between stations 349.5 and 402.5. The duct is divided into two assemblies, a forward duct and an aft duct. The aft duct includes two spring loaded suction doors. The forward duct is made of bonded laminated glass cloth ribs and skin. It is secured to aft duct with a series of internal and external screws. The aft duct is made of aluminum alloy skin and ribs riveted together. The aft duct, containing the suction doors, streamlines the forward duct into the fuselage contour. It is attached by a series of screws around the edges. The suction doors are spring loaded to close flush with the duct outside skin when the vehicle is not operating. The doors move inward and allow airflow directly to the oil cooler core face during periods of no ram air flow into the forward duct. The aft air inlet must be removed in order to remove door hinge pins and springs. A hydraulic powered fan is utilized to direct air through the cooler.

2. Left Boarding Ladder (See figure 28)

The left boarding ladder is manually operated from the ground. It slides on tracks and is stowed and latched within the trailing edge of the sponson. It is constructed of welded aluminum rungs and rails. The ladder is readily removable by extending it far enough to expose the bumper retaining screws, and removing the bumpers which allow the ladder to be withdrawn.

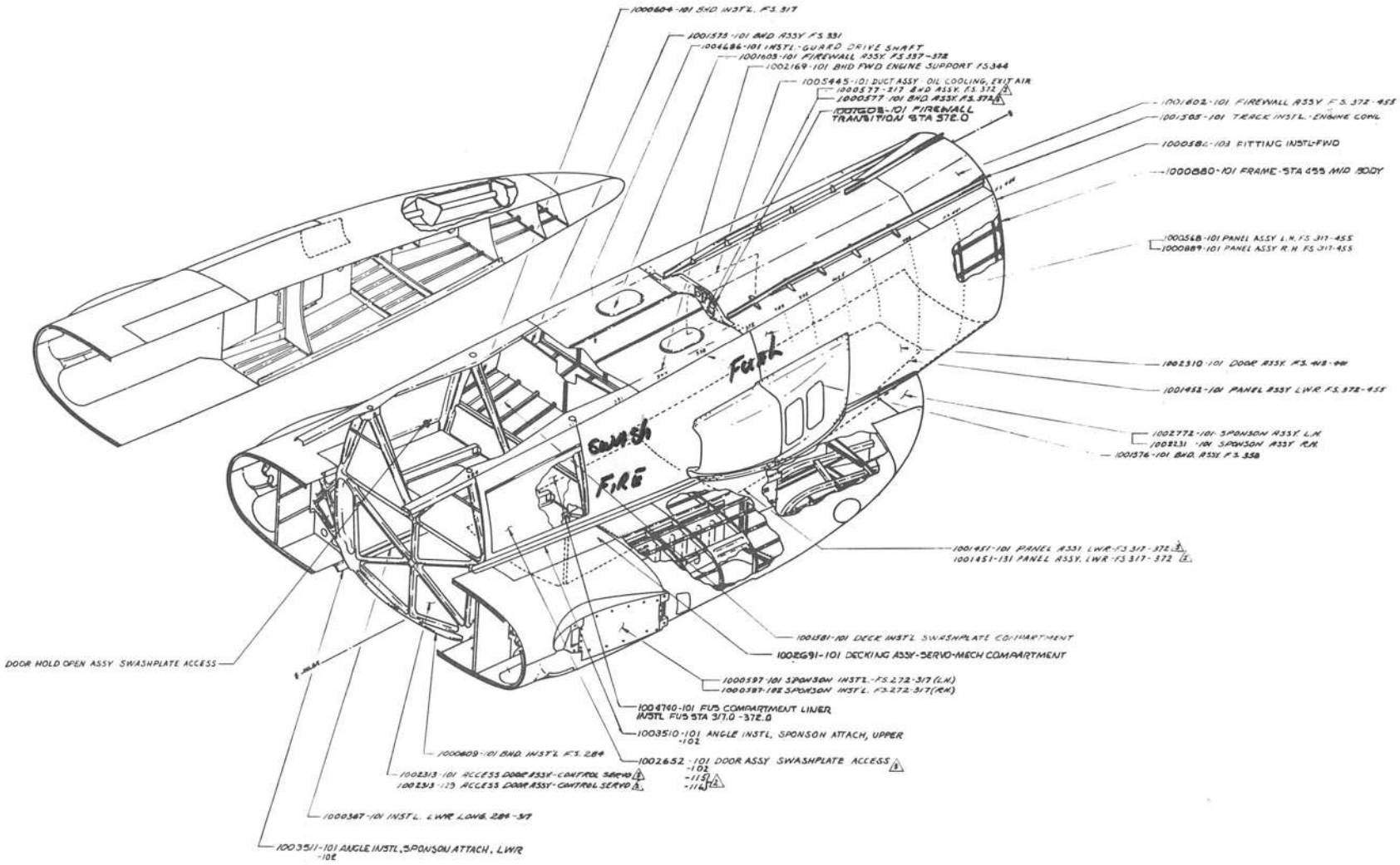
3. Right Boarding Ladder (See figure 29)

The right boarding ladder is electrically operated by a reversible linear actuator. The actuator automatically receives power for extension and retraction from the landing gear control circuit through the right hand main landing gear ground-air safety switch. With electrical power on, and the weight of aircraft on the gears, compressing the ground/air safety switch, the ladder will extend. The ladder is constructed of a single aluminum tube with two plates welded in position to form steps. The actuator is identical with the debris compartment door actuator, except for stroke length.

WARNING

ENSURE PERSONNEL ARE CLEAR BEFORE ACTUATING LANDING GEAR GROUND AIR SAFETY SWITCHES OR PERFORMING GEAR OR LADDER MAINTENANCE WHEN ELECTRICAL POWER IS APPLIED TO AIRCRAFT. SERIOUS INJURY MAY RESULT IF PERSONNEL ARE CAUGHT BETWEEN LADDER AND STRUCTURE.

In the event that the ladder fails to extend normally, the trunnion pivot bolt may be removed through the fueling station and dust cover access. Lower the ladder to expose the actuator attach bolt and remove bolt. Removal of the extended ladder is accomplished by working through the hole in refueling station and sponson dust cover to pull the trunnion pivot bolt. Record number and placement of



MIDFUSELAGE STRUCTURE

FIGURE 26
AH-56A

FIGURE 27
AH-56A

OIL COOLER AIR INLET DUCT

LEFT BOARDING LADDER

· RIGHT BOARDING LADDER

washers to facilitate reinstallation. Remove flexible dust seal-to-structure. The actuator is removed by disconnecting the ladder and structure mounting bolts and electrical connector. Ladder flush fit with sponson is accomplished by adjusting the actuator jackscrew end fitting--shortening jackscrew for tighter sponson contact. Ladder extended position structural clearances become critical if jackscrew is lengthened more than 17.50 inches, measured between actuator mounting bolt holes.

4. Transmission Cowl (See figure 30)

The transmission cowling consists of a left and right fixed cowl enclosing the transmission, maintaining normal contour with adjacent cowls. The transmission cowl contains left and right engine air intake scoops and air diverter doors, and is not intended to be removed for routine maintenance or servicing. It can be removed, however, to facilitate transmission replacement.

Access panels are provided to adjust or install/remove the diverter door push rods. The two cowls are bolted together by a single bolt at the centerline and slightly above the torquemeter housing. Two additional bolts secure the forward part of the cowl to transmission bracketry located behind the transmission oil tank. Four screws per panel attach the lower flanges to WL/116 longerons. Anti-icing components, transmission oil tank, and fairing depend upon the cowls for support. To facilitate removal, it is necessary to remove the accessory compartment access doors and open the filter cowls.

The diverter doors are installed inside the left and right scoop and are electrically operated by the pilot. They serve to divert or close off the ram air scoops during ground operation in unprepared areas, causing engine intake air to flow through the filter cowls avoiding possible ingestion of FOD.

5. Engine Air Inlet Plenum Compartment (See figure 30)

The area between station 319 and station 341, from the fuselage to the decking shrouds just below the WL/116 longerons, comprise the engine air inlet plenum compartment. The plenum compartment collects engine inlet air from the ram air scoops or filter cowls, and delivers it to the engine at low velocity and higher pressure than outside atmosphere. The transmission cowls form the forward face of the plenum compartment. The rear of the compartment is formed by the engine cowl and the forward vertical firewall (bellmouth). The left and right filter cowls form the sides of the compartment. The plenum compartment stainless steel decking is made up of formed assemblies installed with quick release fasteners. The assemblies are called plenum compartment removable shrouds.

The filter cowls, which enclose the plenum compartment, are removable left and right assemblies between stations 319 and 341. They include a removable dust filter element that filters all engine inlet air when the diverter doors close off the ram air scoops. Filter scavenge fans, mounted to adjacent structure and ducted to the filter cowls,

scavenge dust and debris that has been entrapped by the filters and blows it overboard. The filter cowl is secured by quick release fasteners at top of cowl and to transmission cowl, in addition to two quick release fasteners at top of cowl and to transmission cowl, in addition to two quick release spring pin hinges at WL/116 longerons. The cowl also incorporates an unsafe warning light switch with quick release connector that must be disconnected during cowl removal procedure.

6. Engine Sliding Cowl (See figure 31, sheet 1 and 2)

The engine sliding cowl is an inverted U-shaped assembly, 9.5 feet long, enclosing the entire engine compartment. The cowl is secured by two left and right interconnected tension latches at the forward end, coupled through torque tubes to aft end shear pins. The latches can be latched or unlatched from either side. The cowl can be slid aft on three anti-friction tracks, exposing the entire engine. The aft portion of the cowl includes an ejector-type engine exhaust duct of corrosion resistant steel. The forward portion of the cowl is made of aluminum skins, frames, longerons, and stringers. The aft portion is constructed of titanium, and has provisions for mounting engine protective armor plate.

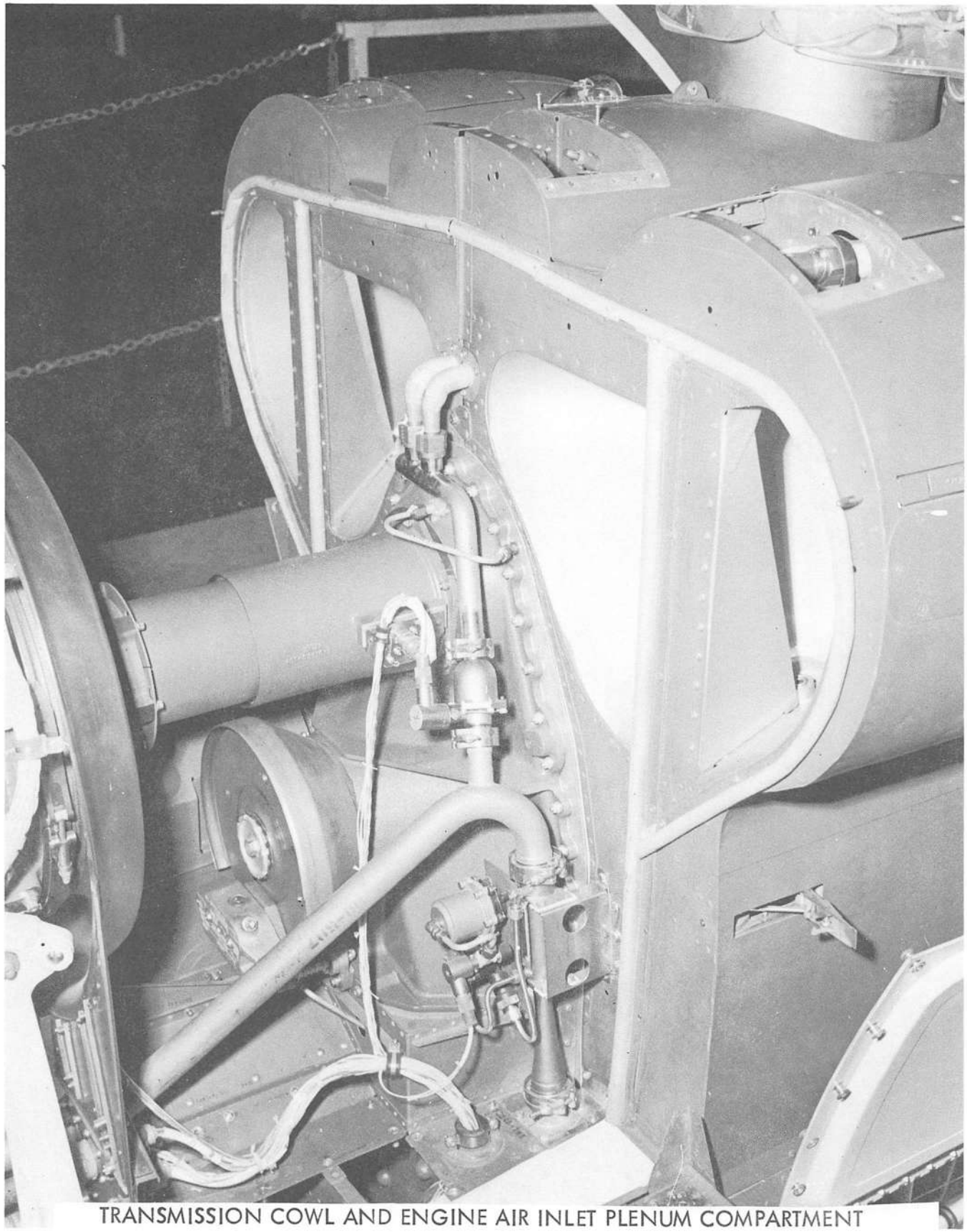
An electrical circuit, composed of a switch mounted to the left rear of the cowl and actuated by a torque tube cam, illuminates a cowl UNSAFE warning light on the pilot's annunciator panel when cowl is not properly latched.

Each latch linkage is adjustable for proper closure. Adjustment is made separately by rotating the fork assembly as required to obtain a latch closure force of 5 to 10 pounds. The three tracks have cut-outs with cover plates to facilitate cowl removal. With the cover plates removed, the cowl rollers aligned with track cut-outs, the cowl can be lifted free and lowered to the ground by using the maintenance crane and sling.

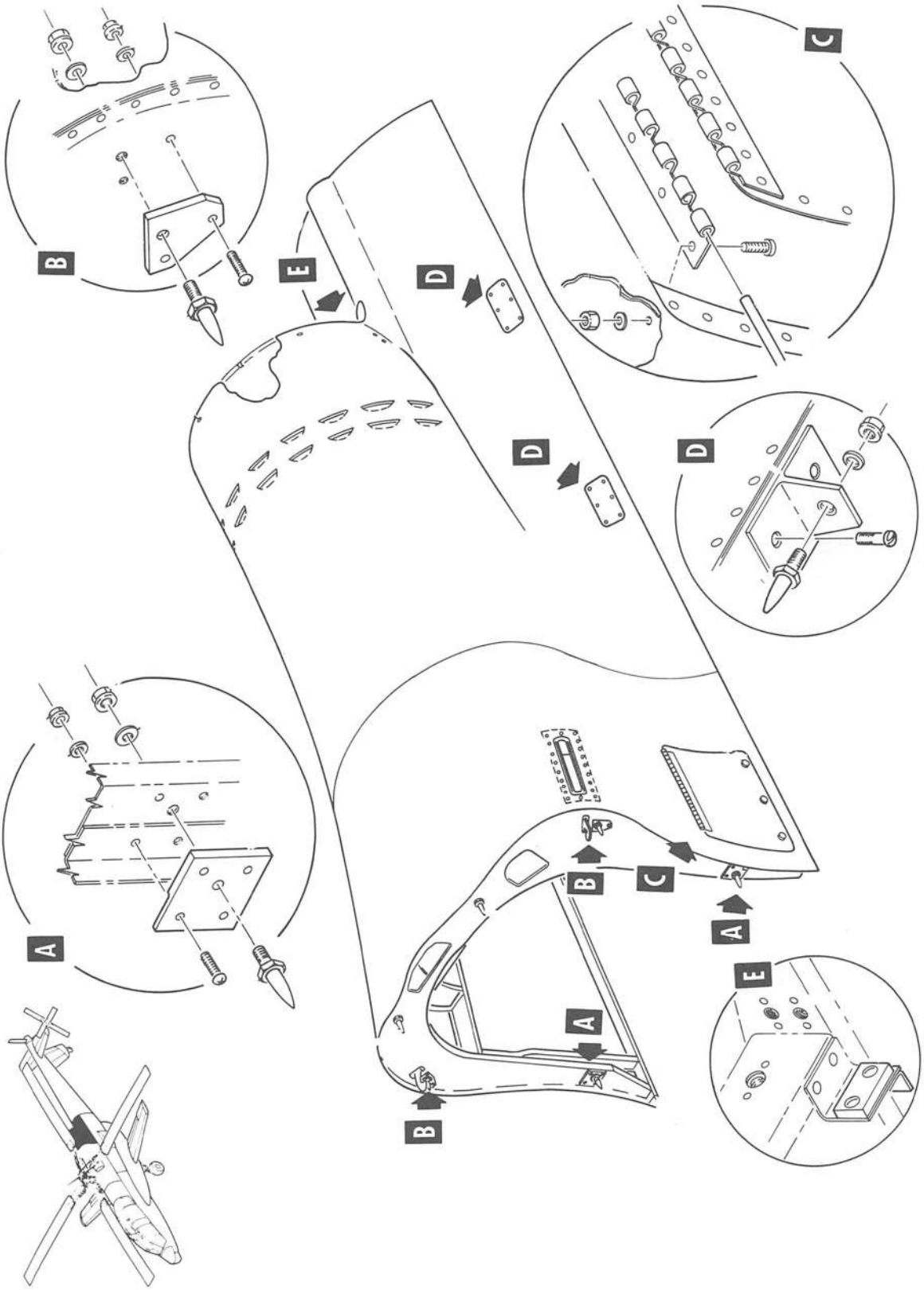
7. Swashplate Compartment and Access (See figure 32)

The swashplate compartment is located between stations 284 and 317 directly below the swashplate. Other components housed within this compartment include the hydraulic manifold and rotor brake control valve with associated plumbing, located in the left side of the compartment. The fire extinguisher system bottle is installed in the aft right side, and the negative torque selector valve is mounted forward on the right side. A retention/hoisting cable and turnbuckle is stowed on the deck at WL/90, and is used to hold the control servo package in place when it is necessary to remove the main transmission.

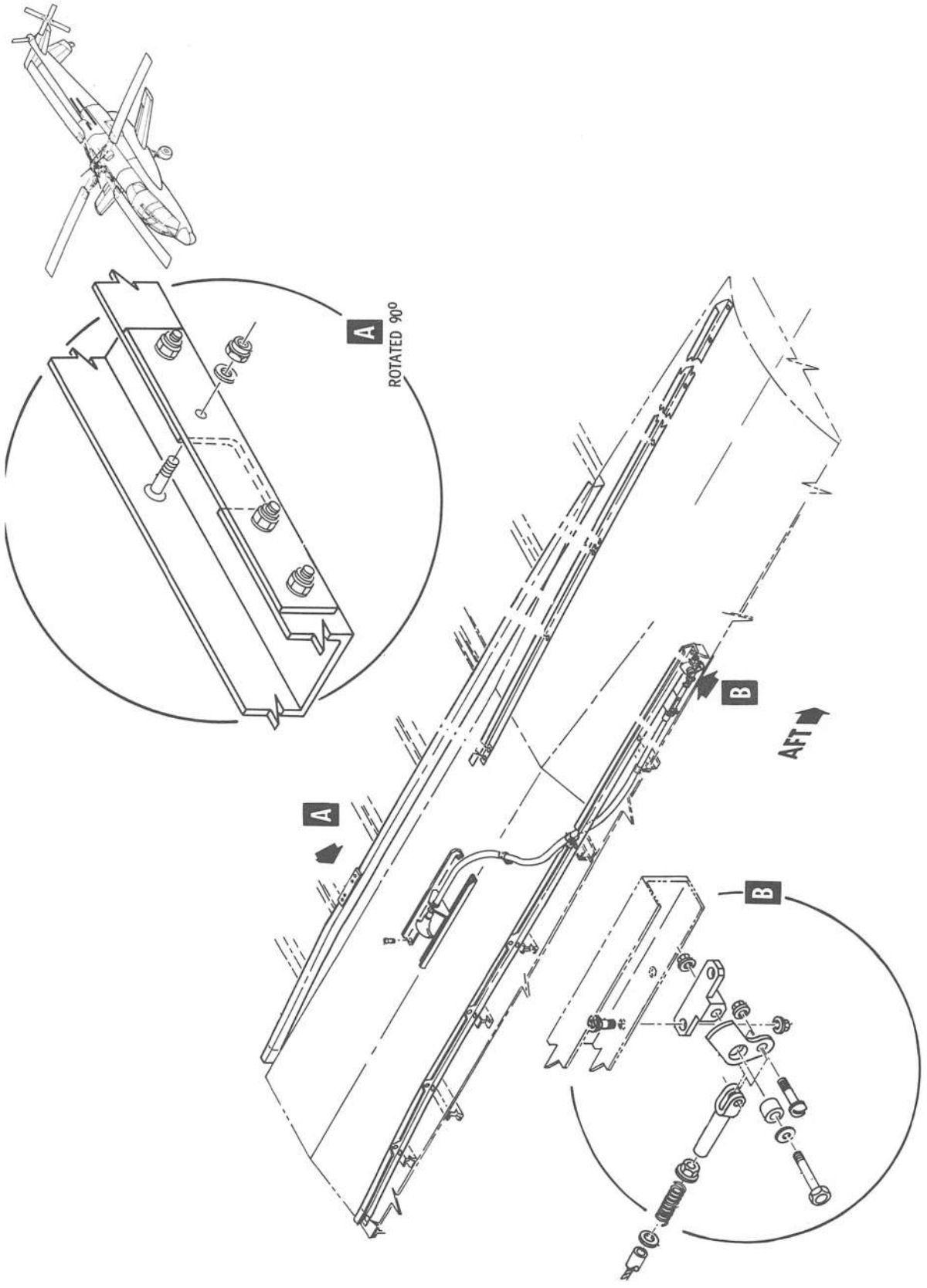
Access doors are provided on both sides of the fuselage between stations 284 and 317. The bottom of the doors follow sponson contours and they are hinged at the top at WL/116. Each door is secured with 17 semi-quick-opening fasteners, and a hold open chain arrangement is provided.



TRANSMISSION COWL AND ENGINE AIR INLET PLENUM COMPARTMENT

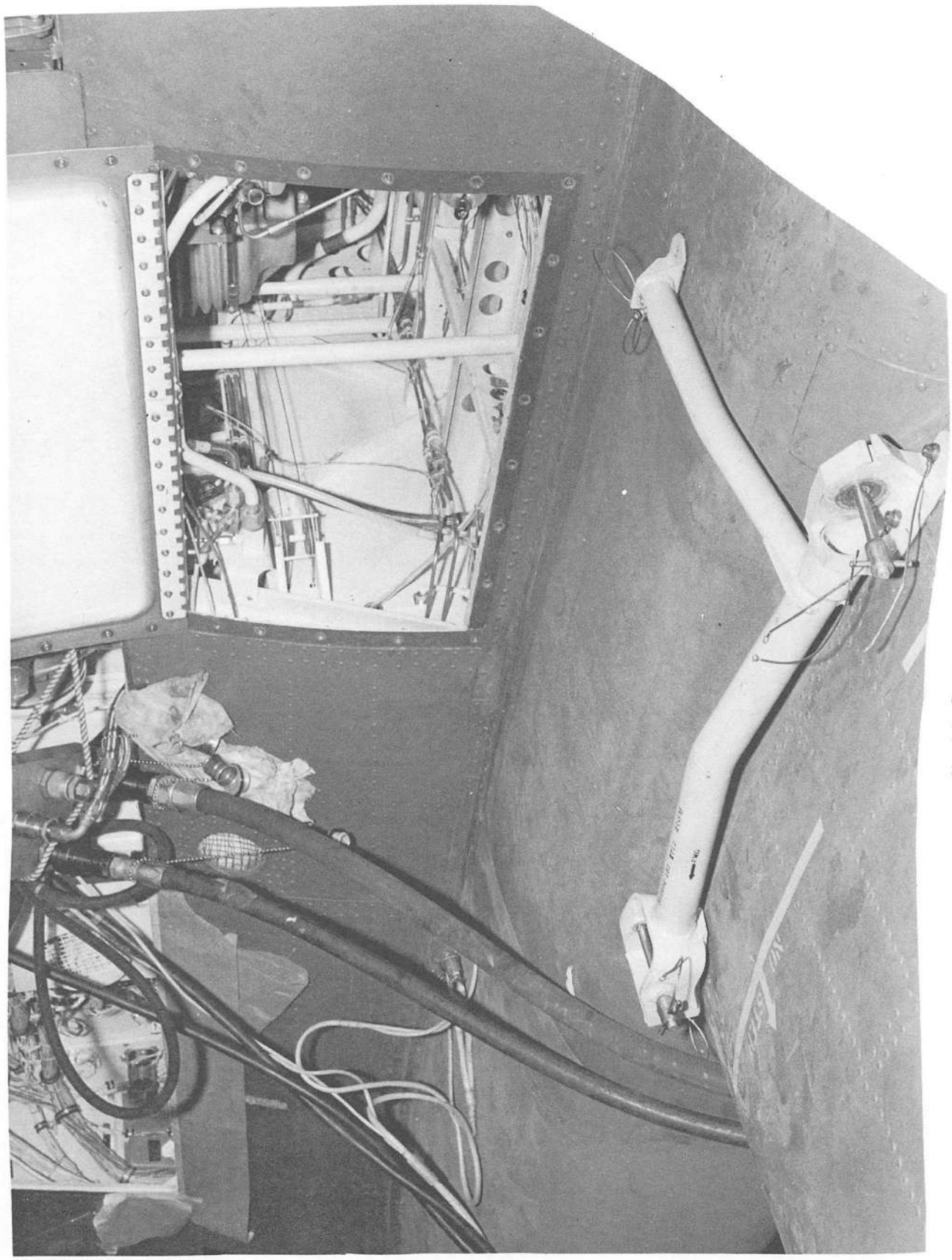


SLIDING ENGINE COWL, (SHEET 1 OF 2)



SLIDING ENGINE COWL, (SHEET 2 OF 2)

FIGURE 32
AH-56A



SWASHPLATE COMPARTMENT

8. Control Servo Compartment and Access (See figure 33)

The servo compartment is directly below the swashplate compartment between stations 284 and 317. The upper part of this compartment forms the decking for the swashplate compartment. Components within this compartment include the servo package with roll, pitch, and collective servo actuators. Limited access to the top of the installed servo package is provided through cut-outs in the deck of the swashplate compartment. Fuel lines between main and sponson tanks pass through this compartment, along with wing fuel transfer and vent lines.

Access is provided through a fuselage bottom door hinged at the right side. The door is secured by quick-release fasteners, and a hold open device is provided that attaches between door and right main landing gear strut.

9. Main Fuel Tank Compartment (See figure 34)

The area between stations 317 and 372, below WL/100 to the bottom of the fuselage houses the 300 gallon self-sealing main fuel tank. The main frame at station 317 forms the forward part of the compartment. All open areas between the strut elements of the frame are filled with fitted blocks of polyurethane rigid foam to retard fire and provide a flat walled surface for the rubber tank. All joints, fittings, rivets, and fasteners within the compartment are sealed, covered with tape, and covered overall with a brush coat of sealant. After sealant is cured, all surfaces are covered with talc.

The tank is constructed of rubber impregnated nylon barrier exterior and interior thicknesses, with an internal layer of latex type sealing compound. The tank is supported within the compartment by nylon cords laced between eyelets on the tank and compartment structure. Fuselage sidewalls forming the sides of the tank compartment are constructed of aluminum honeycomb core, and secured to fuselage structure by screws and rivets.

The access panel covers the entire bottom of the compartment, and is made from aluminum honeycomb core innerfaced with a laminated glass cloth formed panel, and outer faced with aluminum sheet. It is secured with a single row of screws around all four sides. A smaller removable panel located in the center of the main panel offers access to a removable tank manhole, which permits man access into the fuel tank for maintenance without removing the entire tank.

10. Aft Avionics Compartment (See figure 35)

This compartment extends from station 392 to the aft fuselage disassembly tension joint at station 455. The doppler radome is attached to the bottom of the compartment between stations 392 and 413. Avionic components within the aft avionics compartment include the following:

AN/ASH-19 Voice Warning Reproducer Set

Adapter, Compass Electronics
Analog-to-Digital Converter (A/D Conv)(auto mode)
VOR/LOC Receiver (ARN-82)
Doppler Signal Data Converter (SDC)
DME Interrogator (AVQ-70)
HF/SSB Receiver/Transmitter (ARC-102)
Marker Beacon/Glide Slope Receiver (ARN-58)
HF/SSB Coupler
Balun
Radar Station Keeping System (SRSK)(auto mode)

In addition to above avionics components, the oil cooler fan and ducting, the aft gear box drive shaft, fluid line disconnects, and fuel vent system relief valve are located within this compartment.

Aft avionics compartment access door is located directly aft of the doppler radome between stations 413 and 441. The door is hinged on the right side and is secured by quick opening fasteners. The aft searchlight is mounted in the door, and door mounted fairings streamline the radome into fuselage contour. The door is large enough to provide man access for maintenance, or to disassemble the aft fuselage joint preparatory to removal of the aft fuselage.

C. Wings (See figure 36) Refer to figure 41 as required for additional location, and access provision information.

The wings are the prime lifting surfaces for all high speed forward flight and consequently serve to unload the main rotor during such conditions. Each wing is 130 square feet in area and has no movable flight controls. The outboard trailing edge of each wing, however, contains a built-in deflection area producing a constant left aileron (roll) effect proportional to forward airspeed and propeller torque factors. The left wing trailing edge from BL/120 outboard is deflected upward +5° from the theoretical chord line, while the same portion of the right wing is deflected downward -5°. This built-in left aileron effect counteracts the torque produced by the propeller.

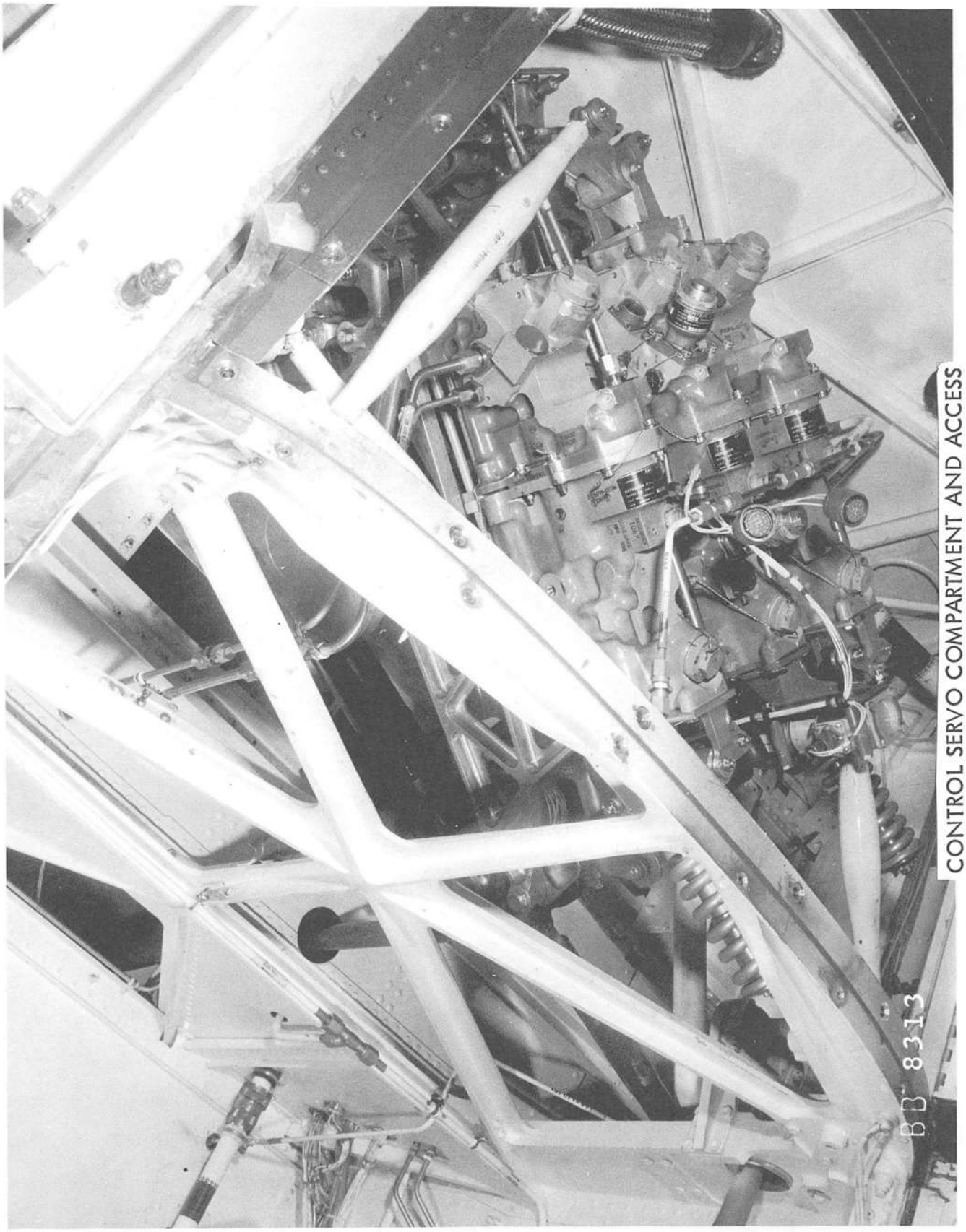
Each wing has provisions for two external stores pylons with necessary control cables, electrical wires, and plumbing. Navigation and anti-collision lights are installed in the wing tips, and a flush mounted electro luminescent panel formation light is installed on top of the wing.

Each wing attaches to the sponson center section with bolts and screws at BL/50.5. Four (4) major bolts secure the wing spars to the two mid-fuselage main frames, and in addition there are six (6) horizontal bolts along the top of the wing mating plane, and four (4) along the bottom. Wing attachment fittings are accessable from the main wheel wells, and through wing panels.

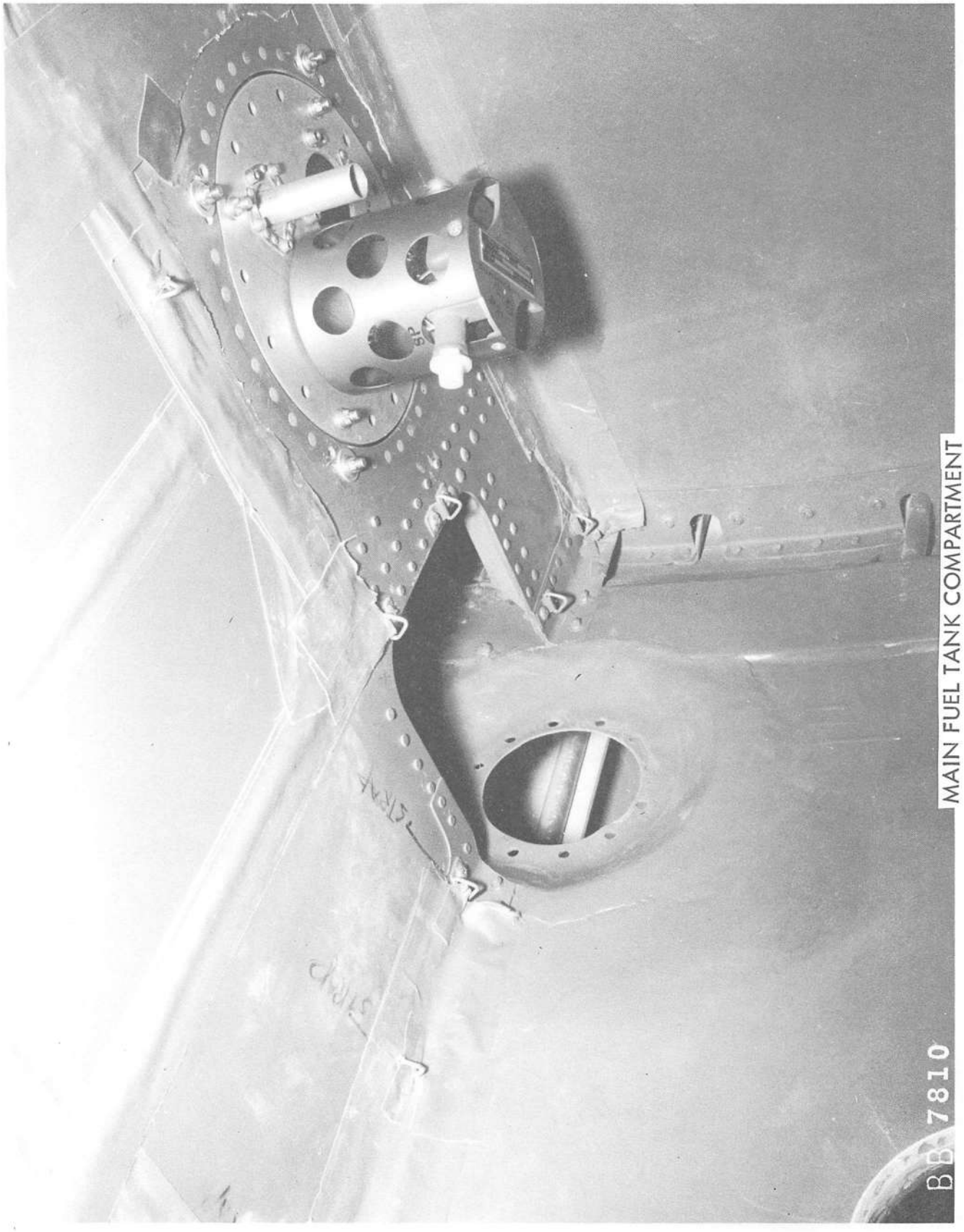
Leading aerodynamic design particulars include the following:

Angle of incidence at M.A.C., +10° 15' 22"
Downward twist from root to tip, -3° 10' 39"

FIGURE 33
AH-56A



CONTROL SERVO COMPARTMENT AND ACCESS


MAIN FUEL TANK COMPARTMENT
BB 7810

AFT AVIONICS COMPARTMENT

Dihedral, +7° 33' 17"
Angle of leading edge sweep, 15° 09' 28"
Angle of trailing edge sweep, 2° 00' 17"
Aspect ratio, 5.5
M.A.C. - BL/71.2 - 25% of M.A.C. occurs at station 300

Spanwise measurement for location purposes is accomplished by simply extending left and right buttock lines from a known position, such as the wing-to-fuselage mating plane of BL/50.5. Buttock lines are vertical reference planes perpendicular to a horizontal wing reference plane, therefore, they do not occur 90° to dihedral such as commonly used Wing Stations do. Wing ribs, for example, are positioned vertically, but canted in relation to dihedral angle.

Wing major components include the following:

Box-beam structure
Leading edge
Trailing edge
Wing tip

1. Box Beam Structure

The box beam structure consists of two main beams, mating plane beam, four (4) stringers, and seven (7) ribs. The two spanwise main beams are of dual-spar construction, consisting of extruded aluminum top and bottom caps with aluminum sheet metal webs and stiffeners. The inboard end of each cap incorporates forged aluminum attach fittings. Each of the four attach fittings mates with the main fuselage frame at FS/284 and 317 with one major bolt each. The forward beam is located along the 12% chord plane and the aft box beam is at 56.77% of chord. The mating plane box beam located chordwise at BL/50.5 ties the fore and aft beams together, providing torsional stiffness and contour. The four spanwise stringers within the box are conventional aluminum sheet metal build-up riveted to upper and lower skins. The seven (7) ribs are also conventional construction riveted to the skins. Ribs located at BL/68 and 117 are strengthened and include mounting provisions for external stores. This also applies to the jacking rib at BL/92.5.

The lower skin is installed with blind type fasteners and includes two access panels, one installed between BL/50.5 and 68 with 50 screws, and the outboard panel between BL/117 and 150 installed with 30 screws.

2. Leading Edge

The leading edge consists of two thicknesses of 2024-T3 aluminum sheet. Each sheet is formed separately, and bonded together under heat and pressure. It is further stiffened with riveted ribs, and has anti-ice provisions. The leading edge is installed and removed in one section, and is attached to the forward beam caps by 114 screws.

3. Trailing Edge

The trailing edge is composed of two major assemblies. The sheet metal assembly is attached to the rear beam and extends aft to an auxiliary beam at 75% of chord between BL/50.5 and 120. This structure is made up of ribs and skin, and contains access doors on the upper surface, one at each stores station (BL/68 and 117). Each is installed with approximately 20 screws. The lower wing surface in this area has a hinged door at BL/50.5, secured with 18 screws for access to wing/fuselage fasteners. Access panels at the two stores stations are also provided.

The remainder, or extreme trailing edge section is composed of 181 glass fabric pre-pregnated epoxy. It is arranged in two sections, inboard and outboard. The inboard section is attached to the auxiliary beam at 75% of chord, and extends spanwise from BL/50.5 to BL/120. This section is attached with 56 screws.

The outboard section extends from BL/120, outboard of the sheet metal skin, to the tip at BL/156, and from the rear beam aft to the extreme trailing edge. This section is attached with 40 screws. A high frequency single side band transmitter/receiver antenna, for long distance AM/SSB voice communication, is incorporated into the entire trailing edge span of both wings. Straps at the trailing edge root area of both wings connect the antenna to the fuselage mounted transmitter. Placards in this area warn of high voltage.

4. Wing Tip

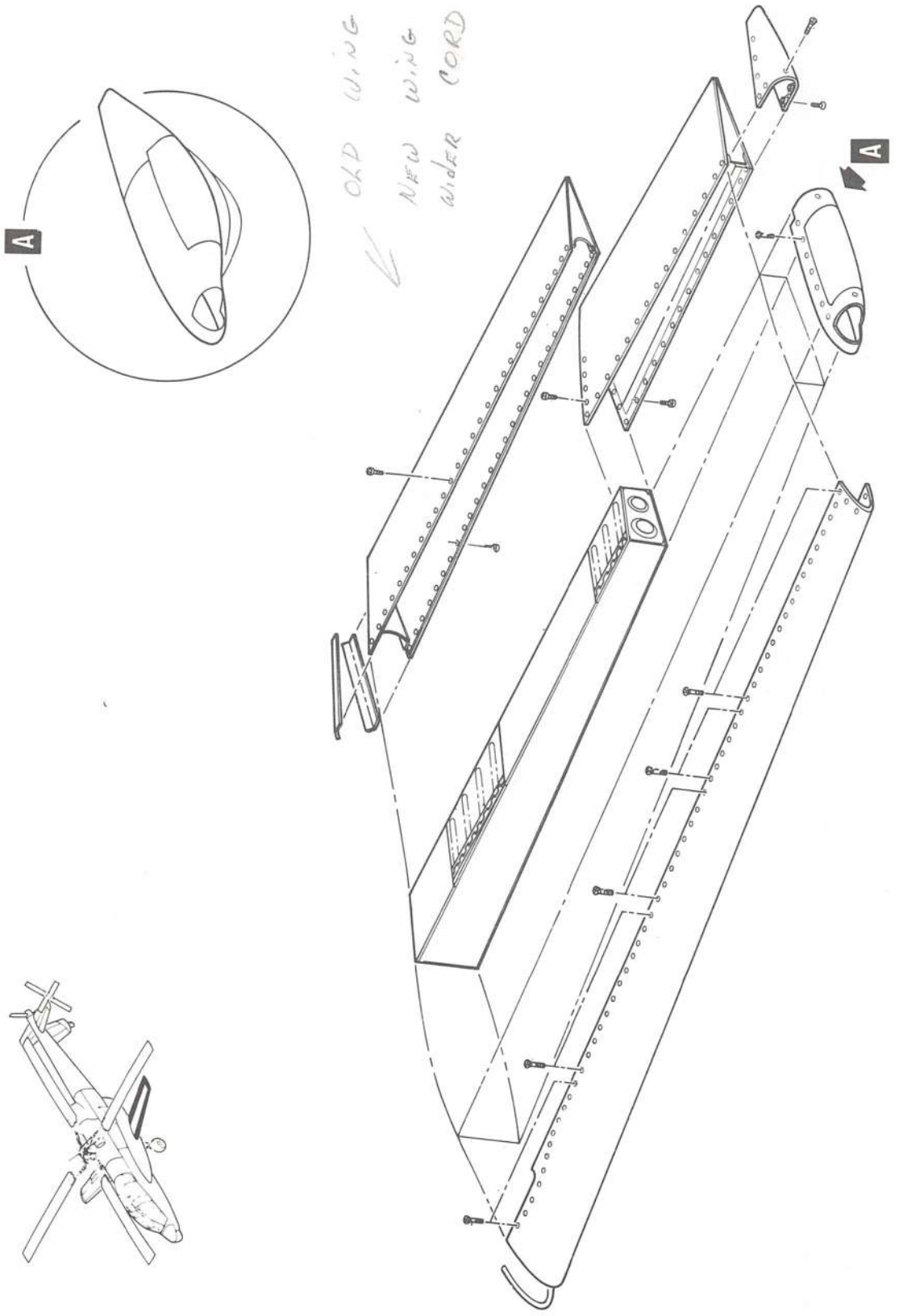
The wing tip is also constructed of 181 glass fabric pre-pregnated epoxy and made in two sections. The forward section contains the formation light and the oscillating beacon, and is installed with 18 screws. The aft section of the tip is made of the same material and is installed with 14 screws.

The maintenance crane and wing sling are utilized in wing removal or installation. All external stores should be removed prior to removal and all slack taken up on the hoist cable before disconnecting all electrical connections, control cables, and fuel, air, and vent lines. Remove all wing to fuselage attachment bolts, leaving the four main ones until last. Only minor structural repair is authorized at direct level maintenance.

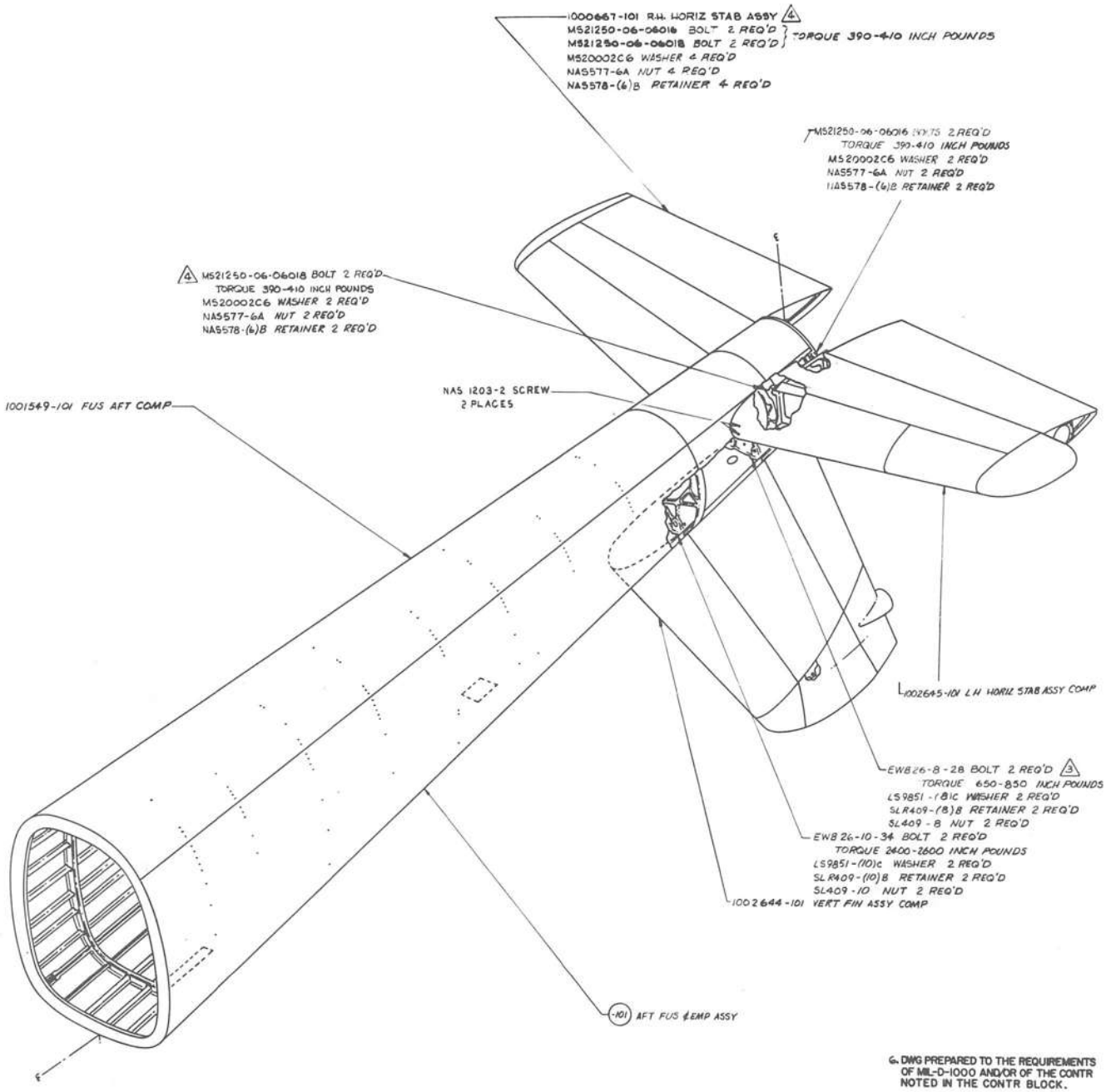
D. Aft Fuselage and Empennage (See figure 37)

The aft fuselage is semimonocoque construction consisting of the four (4) longerons and twenty-one (21) stringers with formed bulkhead rings. It is primary structure and extends from the disassembly tension joint at FS/455 to FS/646.8. Aft of this point, secondary cowling structure for the propeller gear-box extends the fuselage to station 671.6. Empennage components and the gear-box attach to three forged aluminum rings at stations 611.9, 634.3, and 646.8. These rings carry the loads of the propeller, anti-torque rotor, horizontal stabilizers, and ventral fin. The bulkhead at station 540.795 includes the structure to support the aft

OLD Wing 125'
NEW Wing will have
WIDER CORD 225'



WINGS



6. DWG PREPARED TO THE REQUIREMENTS OF MIL-D-1000 AND/OR OF THE CONTR NOTED IN THE CONTR BLOCK.
5. SEAL PER LAC PROCESS SPEC C-3759M.
(4) BOND FAYING SURFACES OF LOWER ATTACH POINT OF STABILIZER AND FS. 634.34 BULKHEAD IN ACCORDANCE WITH LAC PROCESS SPEC C-1478.
(3) BOND ATTACH POINTS IN ACCORDANCE WITH LAC PROCESS SPEC C-1478.
2. SYMBOL 'I' INDICATES ANTICIPATED REPLACEMENT SPARES USAGE.
[redacted]
MG 04852
1. ODD DASH NUMBER SHOWN, NEXT HIGHER CONSECUTIVE EVEN DASH NUMBER OPPOSITE.
NOTES:

AFT FUSELAGE AND EMPENNAGE

bearing hanger for the propeller/tail rotor drive shaft. The aft fuselage attaches to the midfuselage with 48 bolts, two (2) at each stringer and one (1) at each longeron. Pulley brackets at stations 483, 521, and 611.895 support propeller and tail landing gear swivel lock control cables. Fairleads are installed at stations 502 and 540.795 and pulley brackets at stations 594 and 624, to guide the directional control cables through the aft fuselage. The bottom fuselage door at station 455 provides man access to the disassembly joint, fluid line disconnects, cable and electrical disconnects, as well as the drive shaft assembly joint.

The empennage consists of the left and right horizontal stabilizer and a vertical (ventral) fin below the fuselage. Each component has box beam construction with dual-spars and contoured ribs. Spars are made from extruded aluminum caps, aluminum sheet metal webs, and stiffeners. Ribs are built up of formed aluminum alloy parts. Leading and trailing edges are removable and are made with bonded honeycomb sandwich construction and aluminum alloy skins. Removable tip assemblies of pre-impregnated laminated glass cloth are installed on each stabilizer. The lower end of the ventral fin has a fiberglass cloth fairing to house the retractable tail landing gear wheel.

1. Left Horizontal Stabilizer (See figure 38)

   The left horizontal stabilizer is attached to the fuselage with four bolts. It has two spars, four ribs, removable leading edges, trailing edge, and tip. The trailing edge contains an auxiliary beam that forms a box structure around the tail rotor drive shaft. The tip rib on this side is an aluminum forging with support lugs for the tail rotor pitch change yoke. The directional servo actuator is mounted in the leading edge of the stabilizer.

   The left horizontal stabilizer leading edge consists of two sections. Each section is made of bonded aluminum honeycomb core and aluminum alloy skin. Both sections are secured to the top and bottom front spar cap flanges by screws.

   The left horizontal stabilizer trailing edge consists of a single assembly made of bonded honeycomb core and aluminum alloy skin. Because this assembly has an added auxiliary beam forming a box structure around the tail rotor drive shaft, it is not interchangeable with the right horizontal stabilizer trailing edge.

   The left horizontal stabilizer tip is removable and is made of pre-impregnated laminated glass cloth. It is not interchangeable with the right horizontal stabilizer tip.

   Repair of the left horizontal stabilizer is limited to the replacement of leading edges, trailing edges, and tip assemblies. Leading edges are installed with top and bottom screws along the span edges and in the ribs. In order to loosen the assembly, after screws are removed, it may be necessary to jar at rib stations with hands only. The trailing edge is similarly installed with screws along spanwise edges and top and bottom tip rib.

The tip assembly is also installed with screws along top and bottom skin edges.

Normally, the tail rotor drive shaft should be disconnected, and tail rotor and shaft removed before disconnecting and removing the stabilizer. With these components removed, the reduced weight will permit removal of the stabilizer by three crewmen without use of the maintenance crane.

2. Right Horizontal Stabilizer (See figure 39)

The right horizontal stabilizer is attached to the fuselage with four (4) bolts. It has two (2) spars, three (3) ribs, removable leading edge, trailing edge, and tip. The stabilizer leading edge consists of two (2) sections made of bonded aluminum honeycomb core and aluminum alloy skin. Both sections are secured to the top and bottom front spar cap flanges with screws. The trailing edge is a single assembly of bonded honeycomb core and aluminum alloy skin. The stabilizer tip is also removable and is installed with screws.

3. Ventral Fin (See figure 40)

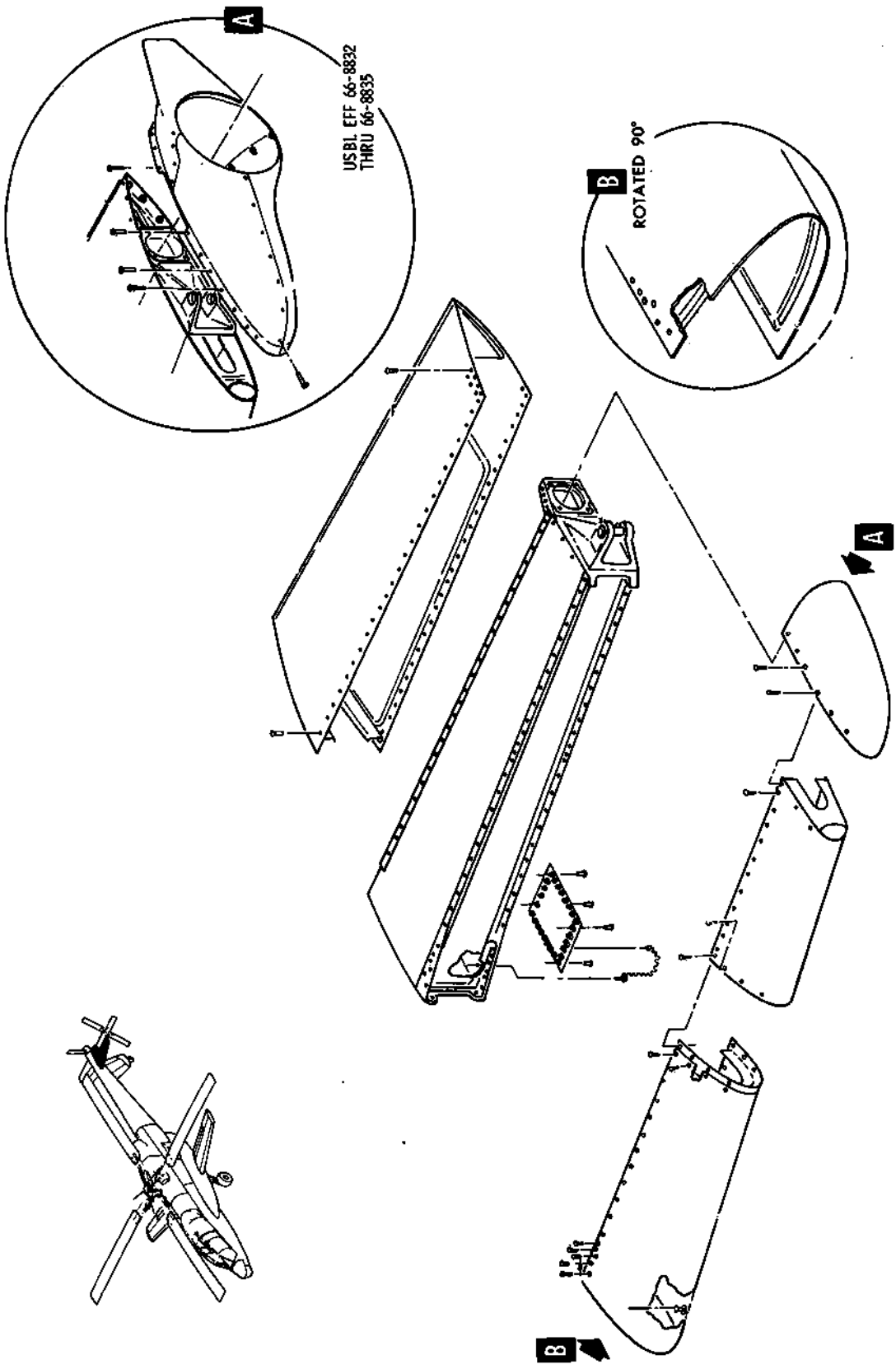
The ventral fin is composed of a box beam, leading edge, trailing edge, and bottom fairing. The stabilizer houses the tail landing gear, remote compass transmitter, and VHF/FM antenna. A VOR/LOC antenna is attached on each side of the fin. The box beam is constructed of two (2) spars made of extruded aluminum caps, aluminum sheet metal webs and stiffeners. The fin attachment fittings are forged aluminum. Ribs between the spars also serve as support structure for the tail landing gear. The box beam is attached to the aft fuselage at stations 612.5 and 634.9 with four (4) bolts. Two panels are provided at the top rear of the box beam to gain access to the attachment bolts. Removable panels fastened with quick-release fasteners are also provided for tail landing gear strut access.

The leading edge is constructed of aluminum skin over honeycomb core. Access doors are provided to the tail landing gear selector valve and to the remote compass transmitter.

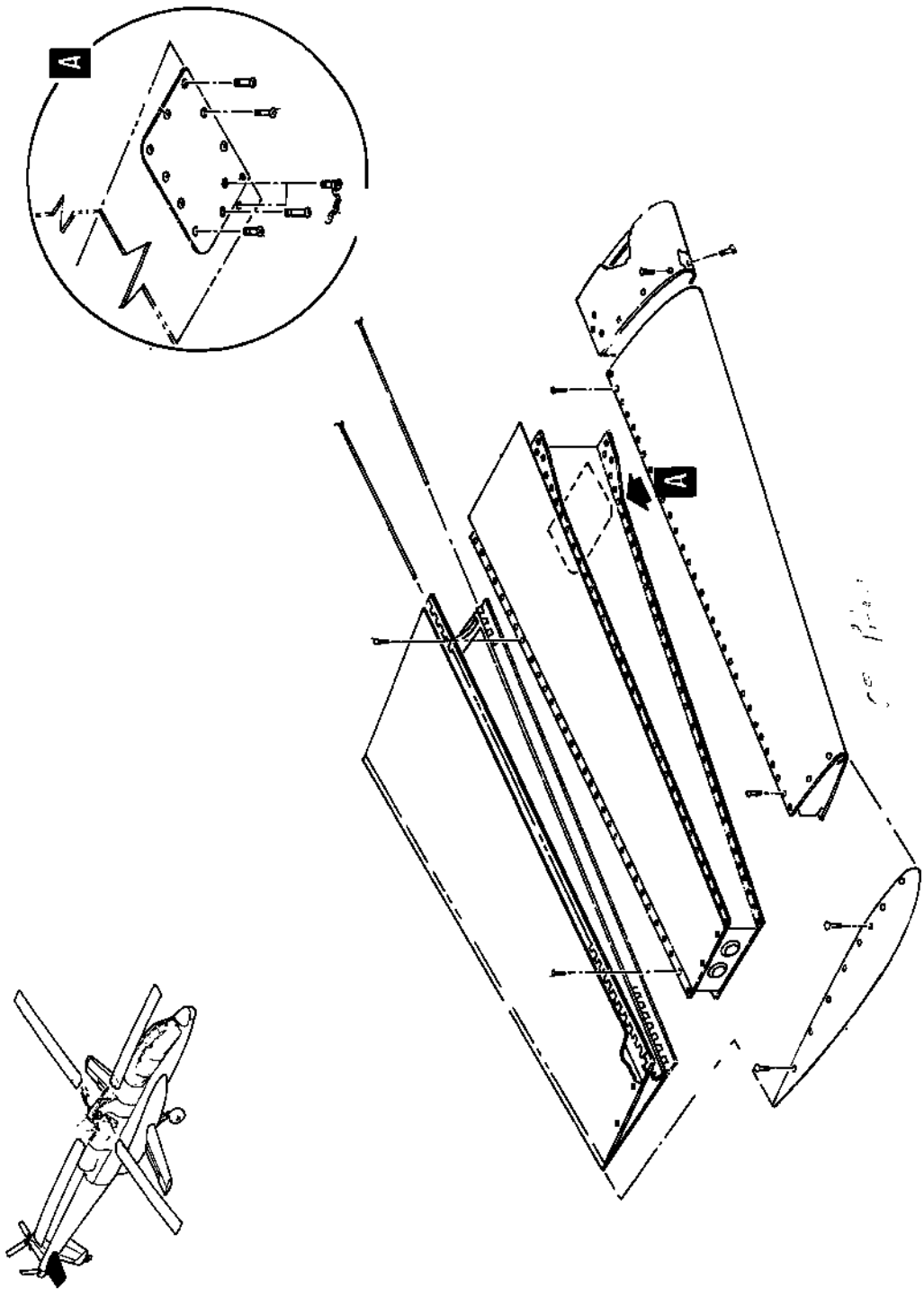
The trailing edge is made in two (2) sections. The top section is composed of honeycomb sandwich material with aluminum alloy skin. The lower section is composed of honeycomb sandwich material with laminated glass fabric skin.

The bottom fairing is fiberglass and houses the retractable tail landing gear wheel. The fairing consists of three (3) sections -- forward fairing, center fairing, and aft fairing. The aft fairing also houses a navigation light.

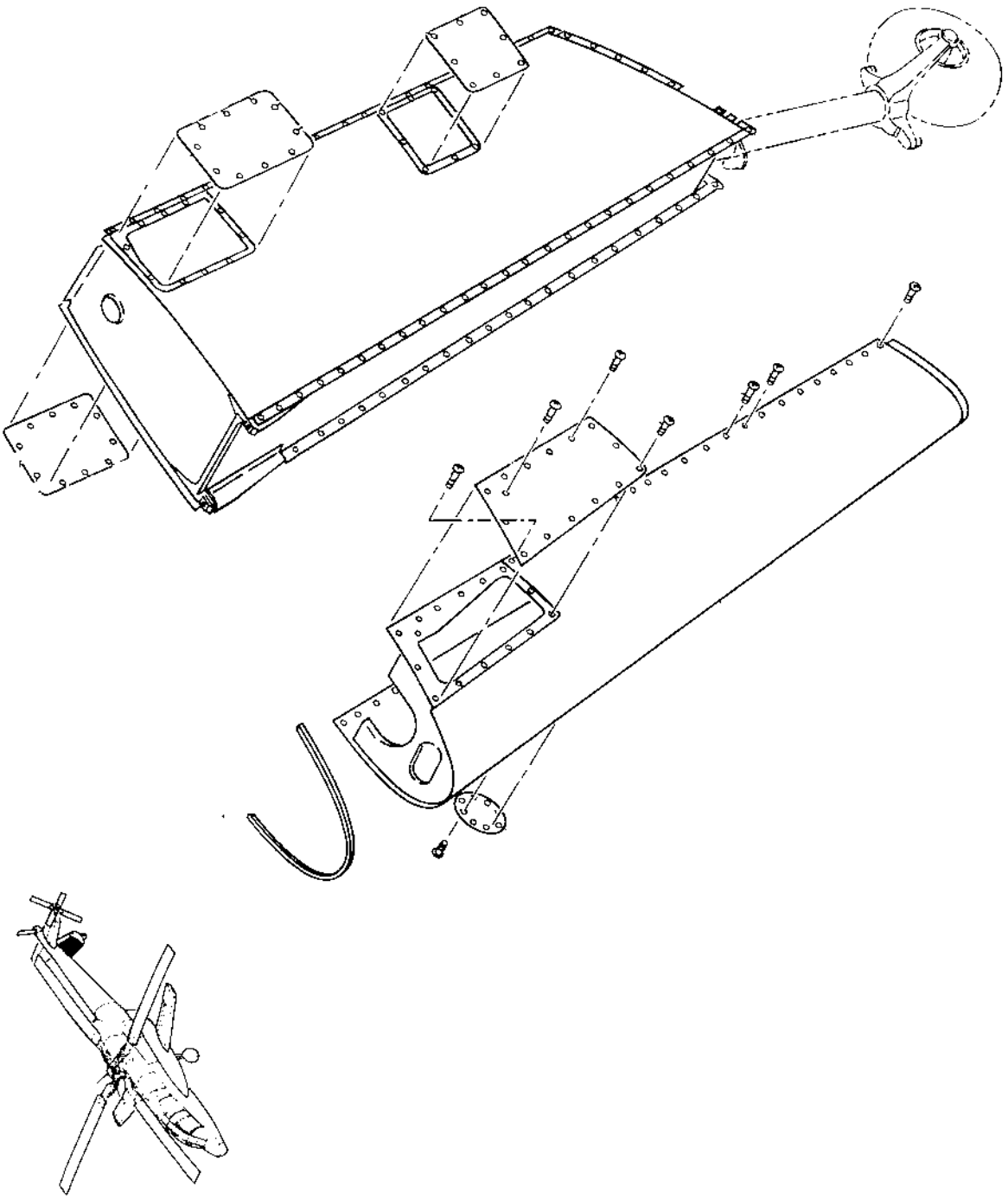
Repair of the ventral fin is limited to replacement of the leading and trailing edges, fairings and access panels. To replace the ventral fin, the vehicle must be jacked utilizing the nose and wing jacking points.



LEFT HORIZONTAL STABILIZER



RIGHT HORIZONTAL STABILIZER



VENTRAL FIN

Repair of the aft fuselage at direct level maintenance is limited to minor structural repair. Most, if not all, minor repairs can be made without removing the aft fuselage. The necessity for removal, however, can be associated with replacement, or disassembly for air shipment of the vehicle. Aft fuselage removal requires jacking the aircraft from the nose and two wing positions to eliminate any aircraft weight on the deflated tail landing gear strut. Current procedure requires removal of the propeller, tail rotor, and aft gear box, in addition to all three stabilizers. A suitable cradle or sling arrangement is required to adequately support the aft fuselage before loosening attachment bolts at station 455. All fluid lines must be disconnected and capped, electrical plugs disconnected and covered for protection. Control cables must be disconnected and secured against damage. Static system flush mounted lines must be disconnected and capped, and the propeller/tail rotor drive shaft disconnected.

It is anticipated, however, the above procedure will be greatly simplified with the advent of a suitable shipping dolly which may not require removal of all empennage components. In any event, however, a nose jack must remain under the forward fuselage for support when ever the aft section is removed. If the vehicle is to be moved after aft fuselage removal, a suitable swiveling dolly must replace the nose jack. Such a dolly and other items to facilitate handling and shipment have been proposed.

E. Structural Sealing and Environmental Protection

The purpose of structural sealing is threefold: one, to isolate internal compartments containing fluids or harmful gases; two, to prevent entrance of corrosive, or otherwise harmful agents into structural cavities; three, to seal or fair-in air swept gaps and joints for aerodynamic reasons. Whenever repairs are made, or for any reason structural sealing integrity is impaired, it should be corrected in accordance with the repair manual, which will also list the approved types of sealing compounds.

Faying surfaces are overlapping joints usually associated with riveted skin edges and compartment webs. They can be permanent, or semi-permanent joints assembled with rivets, screws, or quick-operating fasteners. Sealing compound is applied to the permanent type faying surfaces of the joint immediately prior to fastening together. Rivets are usually shot wet, that is, sealing compound is applied either to the rivet or rivet hole before inserting the rivet. After all fasteners have been installed, a brush coat of sealing compound is applied to both sides of the joint. This type joint is practically impervious to leakage or corrosion and is used extensively on the AH-56A, such as engine firewall and fuel tank areas.

Doors, covers, and panels that require frequent opening have a seal molded to the faying surface with which the access cover contacts. A thick coat of sealing compound is applied, with a non-sticking parting agent applied to the door surface. The door is then installed with normal torque at the fasteners which squeezes out excess sealant. After

48 hours curing time, the door can be removed and excess sealant trimmed off. Due to sealant curing time, replacement of a complete seal would normally be accomplished during routine inspection/maintenance cycles. Small areas of damage can be patch repaired more quickly by wiping off the excess sealant. Removable fasteners, except quick operating type, are sealed between head and contact surface with a low adhesive compound.

Major component attachment joints such as wings and stabilizers are protected by either a formed rubber seal or by a fillet of sealing compound applied with a pressure gun.

All external butt joint gaps and lap joints, as well as semi-removable panels are sealed with a bead or fillet of sealing compound. All other canopy and frequently opened access provisions have replaceable seals of various types.

Environmental protection against harmful and corrosive elements is further evidenced by extensive use of corrosion resistant steels, titanium, metal plating, fiberglass, and most especially, paint.

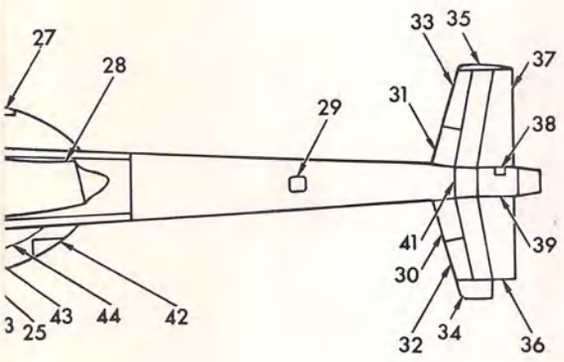
Internally, the entire vehicle is painted with three (3) coats of zinc chromate, either before or after assembly as necessary, except in compartment areas, where two (2) coats of chromate are followed by two (2) coats of general purpose white epoxy. Externally, one (1) coat of zinc chromate primer is followed by one (1) pre-treat coat, and two (2) coats of corrosion inhibiting acrylic lacquer.

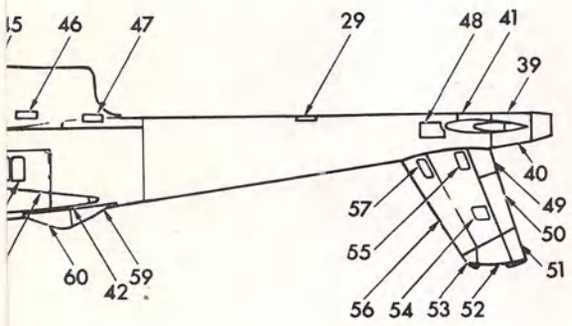
F. Smoothness and Gap Requirements

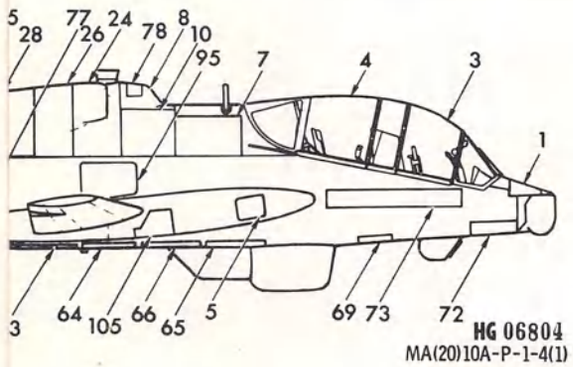
In general, all external airswept surfaces shall be smooth and flush within certain allowable deviations in skin waviness, joint mismatch, and gaps. Aerodynamic drag penalties and structural strength impairment, among other factors, determine extent of deviation allowable, which differs widely over various surfaces of the entire aircraft. Inspection and repair should be accomplished in accordance with detailed allowable deviations and repair procedures in applicable manuals whenever such conditions are found to exist on the aircraft. The following explains some of the terms and deviations that may be encountered:

The fuselage, wings, and empennage contain fixed joints (permanent), replacable joints (semi-permanent field reparable), and interchangeable joints (doors, panels, subcomponents, etc). All fixed and replaceable joints have a maximum allowable gap of 0.060 inch. All interchangeable joints cannot exceed 0.120 inch gap. All fuselage joints cannot exceed 0.060 inch in mismatch, which means one side of the joint higher by this amount than the other. Wing and empennage fixed joints have an allowable mismatch of plus 0.015 inch (upstream), and a minus 0.025 inch (downstream). Wing replaceable joints, and empennage replacement joints, have an allowable mismatch of plus 0.040 and minus 0.010 inch (downstream). Wing interchangeable joints are plus 0.050 and minus 0.020, while the empennage interchangeable joints deviation allowable is plus 0.050 and minus 0.010 inch.

It will be noted that some of the foregoing plus tolerances allow for a







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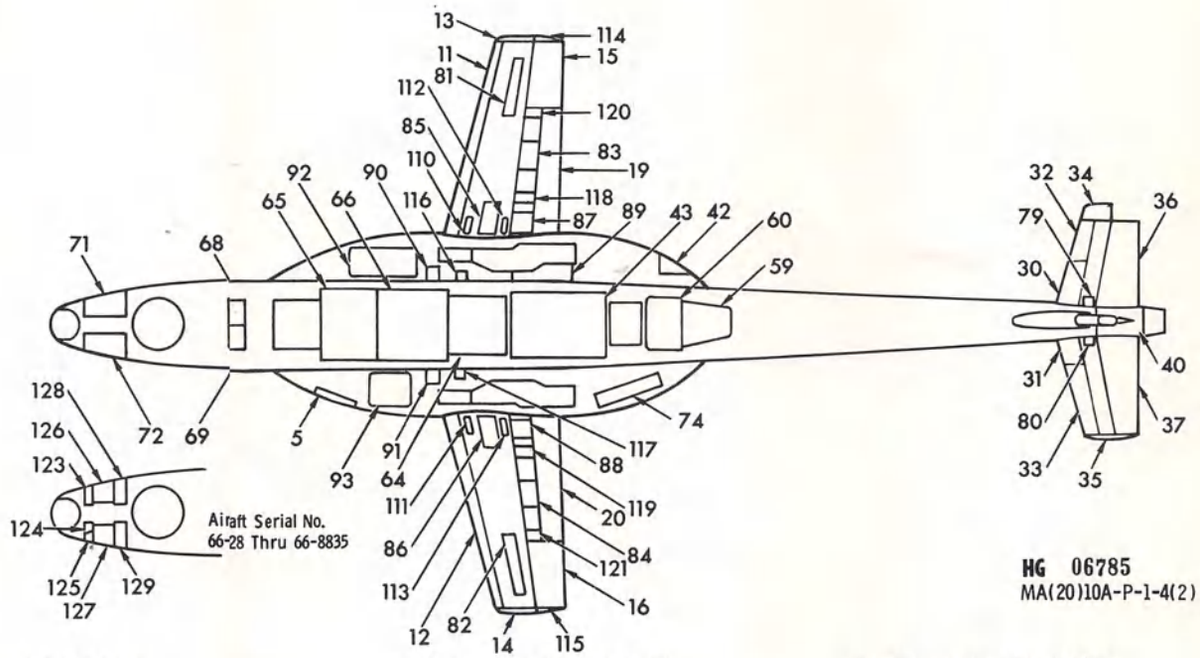

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1 Nose fairing
2 Copilot/gunners left doc
3 Copilot/gunners right d
4 Pilots sliding canopy
5 Environmental control it access panel
6 Electrical access door
7 Main avionics access d
8 Transmission oil tank er
9 Accessory left access d
10 Accessory right access or
11 Wing leading edge
12 Wing leading edge
13 Wing forward tip
14 Wing forward tip
15 Wing outboard trailing e
16 Wing outboard trailing e
17 Wing stores access doo
18 Wing stores access pan
19 Wing inboard trailing e
20 Wing inboard trailing e
21 Wing pylon access door
22 Wing pylon access door
23 Transmission left cowl
24 Transmission right cow
25 Left filter cowl
26 Right filter cowl
27 Pressure and suction fing access door
28 Engine cowl
29 Drive shaft access door
30 Stabilizer inboard leadiedge
31 Stabilizer inboard leadiedge
32 Stabilizer outboard lead edge
33 Stabilizer outboard lead edge
34 Stabilizer tip
35 Stabilizer tip
36 Stabilizer trailing edge
37 Stabilizer trailing edge
38 Propeller oil filler accedoor
39 Propeller upper cowl
40 Propeller lower cowl
41 Drive shaft access pan
42 Left boarding ladder
43 Forward oil cooling air et duct
44 Aft oil cooling air inlet duct
45 Fuel control access door
46 Engine cowl adjustment access panel
47 Engine cowl adjustment access panel
48 Directional trim access panel
49 Ventral fin upper trailing edge
50 Ventral fin lower trailing edge
51 Ventral fin aft fairing
52 Ventral fin center fairing
53 Ventral fin forward fairing
54 Strut access panel
55 Strut access panel
56 Ventral fin leading edge
57 Ventral fin attachment access panel
58 Strut access panel
59 Aft avionics access door
60 Doppler radome
61 Inlet duct forward suction door
62 Inlet duct aft suction door
63 Main fuel tank access panel
64 Control servo access door
65 Forward ammo magazine access door
66 Aft ammo magazine access door
67 External power receptacle access door
68 Ammo debris left door
69 Ammo debris right door
70 Battery disconnect access door
71 Controls and cartridge drive access panel
72 Cartridge drive access panel
73 Cockpit walkway
74 Right boarding ladder
75 Engine cowl adjustment access panel
76 Engine cowl adjustment access panel
77 Gravity fueling cap
78 Transmission oil access door
79 Stabilizer attachment access panel
80 Stabilizer attachment access panel
81 Wing inspection access panel
82 Wing inspection access panel
83 Wing inspection access panel
84 Wing inspection access panel
85 Wing inspection access panel
86 Wing inspection access panel
87 Wing attachment access door
88 Wing attachment access door
89 APU lower access door
90 Fuel quantity transmitter access door
91 Fuel quantity transmitter access door
92 Sponson fuel tank access panel
93 Sponson fuel tank access panel
94 Swashplate left access door
95 Swashplate right access door
96 Flux valve access panel
97 Tank inspection access panel
98 Tank inspection access panel
99 Wing attachment access panel
100 Wing attachment access panel
101 Wing attachment access panel
102 Wing attachment access panel
103 APU upper access door
104 Landing gear attachment access panel
105 Landing gear attachment access panel
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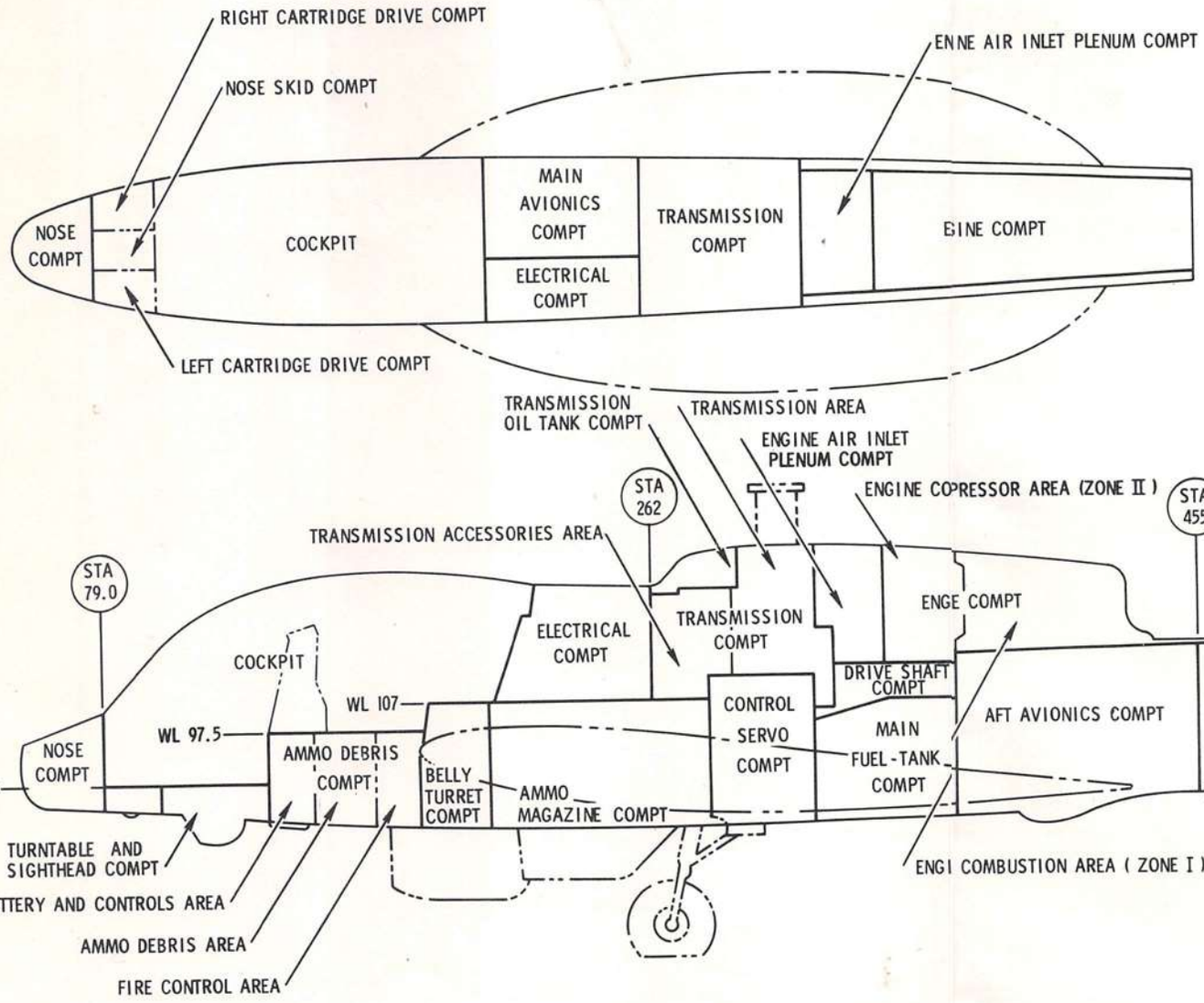
109 Wing beam access panel
110 Wing beam access panel
111 Wing beam access panel
112 Wing beam access panel
113 Wing beam access panel
114 Wing aft tip
115 Wing aft ip
116 Stores rigging access door
117 Stores rigging access door
118 Wing stores rigging access door
119 Wing stores rigging access door
120 Wing stores rigging access door
121 Wing stores rigging access door
122 Ventral fin center fairing
123 Cartridge drive access panel
124 Cartridge drive access door
125 Cartridge drive access panel
126 Cartridge drive access panel
127 Cartridge drive access panel
128 Controls access panel
129 Drive shaft access panel

COMPONENT LOCATION AND ACCESS PROVISIONS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EINE COMPT
LEFT CARTRIDGE DRIVE COMPT
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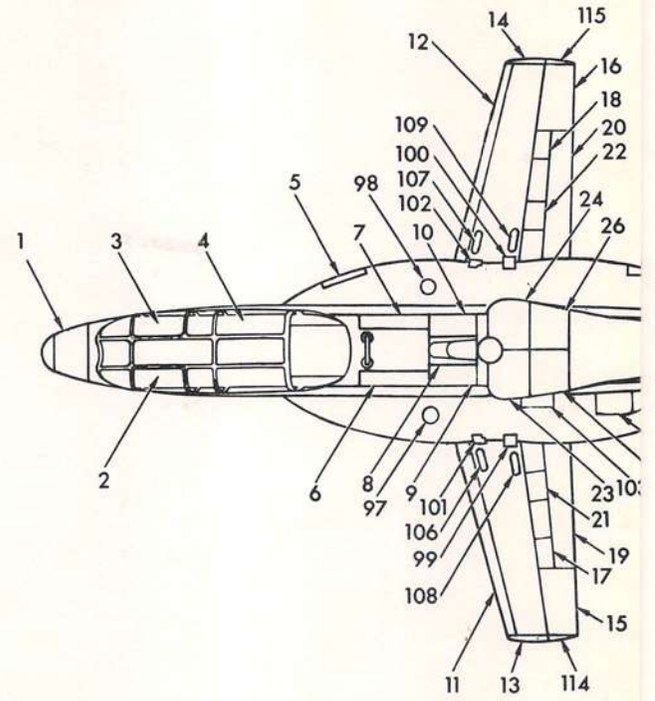
TRANSMISSION AREA
ENGINE AIR INLET PLENUM COMPT
STA 262
ENGINE COPRESSOR AREA (ZONE II)
STA 455
TRANSMISSION ACCESSORIES AREA
STA 79.0
COCKPIT
ELECTRICAL COMPT
TRANSMISSION COMPT
ENGE COMPT
DRIVE SHAFT COMPT
WL 107
CONTROL SERVO COMPT
AFT AVIONICS COMPT
WL 97.5
MAIN FUEL-TANK COMPT
NOSE COMPT
AMMO DEBRIS COMPT
WL 79.5
BELLY TURRET COMPT
AMMO MAGAZINE COMPT
TURNTABLE AND SIGHTHEAD COMPT
BATTERY AND CONTROLS AREA
AMMO DEBRIS AREA
FIRE CONTROL AREA
ENGI COMBUSTION AREA (ZONE I)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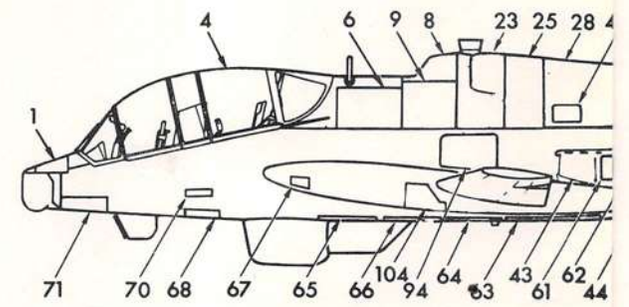
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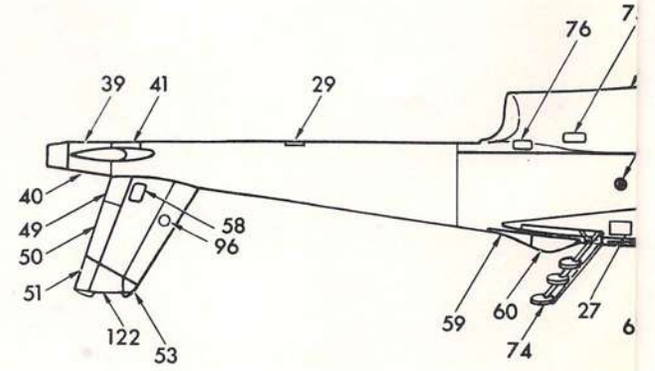
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greater upstream mismatch than the downstream minus tolerances. Airflow separation occurs more readily on the downstream minus mismatch than on the upstream side of a joint opposing air flow, which results in high drag rise. Gaps and mismatches should be controlled during repair so as not to exceed the tolerances. In any event, gaps are filled from the bottom out with sealing compound using a pressure gun.

The term deviation means from actual skin surface contour, and not from theoretical contour. Fuselage skin joints will be lap type facing aft and down, wing and empennage joints are butt and lap. The allowable deviation from actual contours on the wings and empennage, forward of 30 percent chord, and air intakes forward of station 325 is ±0.06 inch. Allowable deviation on wings and empennage aft of 30 percent chord and fuselage forward of station 300 is ±0.09 inch. Fuselage contour deviation aft of station 300 is ±0.12 inch.

Smoothness is interpreted in terms of local skin waves within a 6 inch length with waves running normal to airstream (across), and waves which run parallel to airstream. Deviation is measured by laying a straight edge across wave tops and measuring depth of wave trough. Allowable deviation in areas forward of 30 percent chord of wings and empennage, and forward of fuselage station 300 is 0.06 inch when waves are across airstream and 0.03 inch when waves are parallel to airstream. Wave deviation on fuselage aft of station 300 is 0.09 inch when waves run across airstream, and 0.05 for parallel waves.

It is for the foregoing aerodynamic reasons that flush rivets and fasteners are used forward of 30 percent chord on wings and empennage, forward of station 175 on canopy, forward of station 262 on sponsons, forward of station 185 on fuselage, and forward of station 325 on the sliding engine cowl. All other rivets aft of these areas can be non-flush type. Hex, or tension type heads are not permitted, however.

G. Alignment and Symmetry (See figure 42)

Alignment and symmetry inspection of any aircraft requires skilled personnel and the utmost in careful workmanship to obtain accurate and meaningful figures. Generally speaking, this type precise inspection is seldom required or necessarily recommended. If, however, the airworthiness of the aircraft becomes suspect due to some possible overstress condition it has encountered, or some unusual flight characteristic persists, then the advisability of an alignment and symmetry inspection may be considered.

Alignment means trueness, or non-deviation of major aircraft sections from a given reference, within allowable limits. Symmetry means dimensional relationship of all major airframe sections to each other within allowable limits, (symmetrical).

For best results, the aircraft should be temperature soaked in a shade, no wind, constant temperature environment, prior to the inspection. Aircraft should be complete, with empty fuel tank, and ammo and external stores removed. Canopy and all doors, panels, and cowls closed and locked. The aircraft is jacked until all tires are clear using the nose

and wing jacking points. Precise leveling is accomplished by dropping calibrated plumb bobs, or linear scales from the measuring and leveling points located in each main-wheel well and at the aft part of the mid-fuselage. An engineers level, in preference to a transit, is positioned approximately 11 feet to the left of the nose. By taking alternate sightings on the wheel well measuring points, the wing jacks are adjusted as required to obtain a laterally level condition. The nose jack is adjusted as required to obtain a sighting at the aft midfuselage measuring point that is 0.085 inch higher than the recorded lateral measurement to obtain a longitudinal level condition. Because of the accuracy required, the built-in leveling provisions should not be used, except to note any deviation.

After the vehicle is leveled, the actual measuring procedure can begin. Measuring points are strategically located throughout the fuselage, wings, and empennage. These points are measured in various ways, such as projecting the point to ground level (concrete floor) by plumb bob, measuring vertical distances, and measuring between certain points. The measurements obtained are then compared with precise tables in applicable maintenance repair manuals. Any measurement difference is added or subtracted as required from the appropriate measurement called for in the tables. This difference, if any, is then compared to the allowable plus or minus tolerance table to determine if an "IN" or "OUT" of limits condition exists.

Some of the vehicle's design characteristics that are verified by this type inspection are included in the following:

Fuselage trueness longitudinally and vertically, as well as twist.

Wings are checked in angle of incidence, which is the fore and aft chord line plane angle at which the wing is mated to the fuselage.

Dihedral, or the up and down angle spanwise, that the wing is mounted to the fuselage.

Twist, the downward twist of the outer portion of the wing.

Sweep, the aft deflection of the wing in relation to a lateral centerline.

Additionally, all of the above individual wing characteristics are compared symmetrically with the opposite wing.

The empennage is checked in much the same manner in similar areas as the wing, in addition to the perpendicularity of the ventral fin.

H. Weight and Balance (See figure 43, sheet 1 and 2)

Weight and balance inspection of an aerial vehicle involves a precise weighing procedure to determine the exact center of gravity in relation to fuselage stations. Center of gravity is a term used to describe the exact point at which an aircraft would balance, both laterally and longitudinally, if suspended. An aircraft should never be flown when C.G.

AIRPLANE ALIGNMENT CHECK

DISTANCE	NOMINAL MEASUREMENT	MEASURED DISTANCE	ALLOWABLE DIFFERENCE
A 3L p	351.816		
A 3R p	351.816		
DIFF.	0.0		

DISTANCE	NOMINAL MEASUREMENT	MEASURED DISTANCE	ALLOWABLE DIFFERENCE
Bp 3Lp	209.72		
Bp 3Rp	209.72		
DIFF	0.0		

DISTANCE	NOMINAL MEASUREMENT	MEASURED DISTANCE	ALLOWABLE DIFFERENCE
Bp 6Lp	206.62		
Bp 6Rp	210.15		
DIFF			

FUSELAGE ALIGNMENT

POINT	DISTANCE TO ℄ MEASUREMENT	ALLOWABLE DIFFERENCE	VERTICAL MEASUREMENT (7)	ALLOWABLE DIFFERENCE
A	0			
10_p	.78 L			
B_p	0			
C_p	.43 L			

ALIGNMENT, INCIDENCE & DIHEDRAL CHECK

POINT	ALIGNMENT DIM	ALIGNMENT MEASURED	ALIGNMENT ALLOW. DIFF	INCIDENCE (7) LEVEL DIFF.	INCIDENCE (7) NOM DIFF.	INCIDENCE (7) MEASURED DIFF	INCIDENCE (7) ALLOW. DIFF	DIHEDRAL (7) LEVEL DIFF	DIHEDRAL (7) NOMINAL DIFF	DIHEDRAL (7) MEASURED DIFF	DIHEDRAL (7) ALLOW. DIFF
WING ROOT											
1L	65.30										
1R	65.30										
2L	65.55			1L-2L							
2R	65.55			1R-2R							
WING TIP											
3L	156.55							3L-1L			
3R	156.55							3R-1R			
4L	156.55			3L-4L							
4R	156.55			3R-4R							
HORIZONTAL STABILIZER TIP											
5L	55.24										
5R	63.40										
6L	54.64			5L-6L							
6R	63.40			5R-6R							
HORIZONTAL STABILIZER ROOT											
7L	17.00			7L-8L				8R-8L			
7R	10.95			8R-7R							
8L	12.90							6L-8L			
8R	10.08			DIFF.				6R-8R			
DIFF											

LOCATION OF POINTS

POINT	BL	STA	WL	OTHERWISE DESCRIBED	SHOWN ON DWG
A	0.0				
B	0.0	434.62	75.47		1001452 (SHT 1 OF 2)
C	43 L	597.63	96.17		1000782 (SHT 2 OF 2)
1 L&R	65.30 1/R	292.54	81.48	.75 AFT OF 12% CHD	1000786 (SHT 2 OF 2)
2 L&R	65.55 1/R	318.06	77.06	1.00 FWD OF 56.77% CHD	1000786 (SHT 2 OF 2)
3 L&R	156.55 1/R	315.07	90.90	1.12 AFT OF 12% CHD	1000806
4 L&R	156.55 1/R	331.04	89.29	.50 FWD OF 56.77% CHD	1000806
5 L	55.24	644.10	112.05		1000635
5 R	63.40	645.75	113.10		1000667
6 L	54.64	653.88	111.72		1000635
6 R	63.40	654.98	113.10		1000667
7 L	17.0	635.85	111.35	.62 FWD OF 27.6% CHD	1000 635
7 R	10.95	633.97	111.43	1.45 FWD OF 27.5% CHD	1000 667
8 L	12.90	648.35	110.83	.34 AFT OF 55% CHD	1000 635
8 R	10.08	648.10	111.60	.41 AFT OF 55% CHD	1000667
9 L&R	3.40	638.29	95.38	.47 FWD OF 30% CHD	1000594
10	.78 L	74.62	71.26		1000730 (SHT 1 OF 8)
11 L&R	45.25	319.00	74.620		1000606
D	3.50 L	442.30			1001452 & 1001602

VERTICAL STABILIZER PERPENDICULARITY CHECK

POINTS	DISTANCE	ALLOWABLE DIFFERENCE
C_p TO 9L p	2.97	
C_p TO 9R p	3.83	

LEVELING INSTRUCTIONS

PLACE NOSE AND WING JACKS AT JACK POINTS AND RAISE SHIP UNTIL MAIN GEAR TIRES ARE CLEAR OF GROUND.

SET UP A SURVEYOR'S LEVEL APPROX AS SHOWN IN PLAN VIEW.

DROP LINES WITH PLUMB BOB FROM MEASURING AND LEVELING POINTS (11 L AND 11 R); DETERMINE THAT LINES ARE VISIBLE FROM LEVEL.

LEVEL SHIP LATERALLY WITH WING JACKS UNTIL POINTS 11 L AND 11 R ARE LEVEL.

LEVEL SHIP LONGITUDINALLY WITH NOSE JACK UNTIL POINT "B" IS .085 INCH ABOVE POINTS 11 L AND 11 R.

RECHECK POINTS 11 L AND 11 R TO INSURE THAT SHIP IS LEVEL LATERALLY. READJUST IF NECESSARY. CHECK LEVELING PLATE AT STA 442.30 HANG PLUMB BOB FROM LEVELING NOTCH AND NOTE ANY DEVIATION FROM LEVEL AS INDICATED BY LEVELING PLATE.

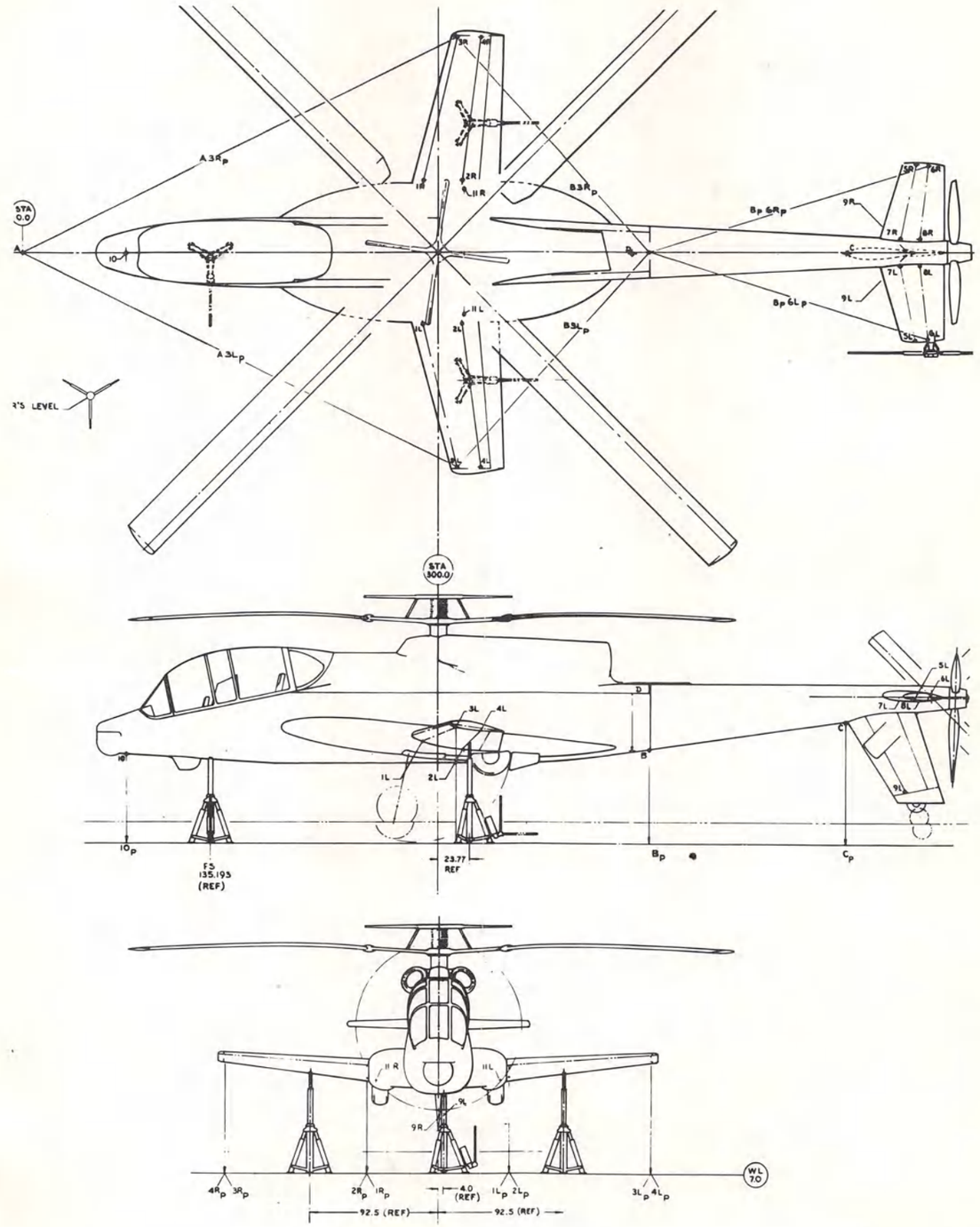
NOTES 1, 2 AND 3 DELETED

4 ALIGNMENT AND SYMMETRY WORK TO BE ACCOMPLISHED IN SHADE, IN STILL AIR AND AT A CONSTANT TEMPERATURE

5 VEHICLE COMPLETE WITH FUEL TANKS EMPTY, TURRETS IN PLACE AND STORES REMOVED

6 SUBSCRIPT "P" INDICATES ALIGNMENT POINTS PROJECTED TO THE GROUND, AND ALL MEASUREMENTS TO THESE POINTS ARE ALONG THE GROUND

(7) STATIC DEFLECTION TO BE DETERMINED ON FIRST ARTICLE



ALIGNMENT AND SYMMETRY

WEIGHT DEFINITIONS

WEIGHT EMPTY

\+ GUNS, TRAPPED FUEL, TRAPPED OIL, EXTERNAL AUXILIARY FUEL TANKS (IF NOT TO BE DISPOSED OF DURING FLIGHT), AND ANY CHART A ITEMS, IN PLACE, WHICH ARE NOT A PART OF WEIGHT EMPTY.

− ANY CHART A ITEMS, OR OTHER ITEMS OF WEIGHT EMPTY, WHICH ARE MISSING FROM THE AIRCRAFT.

= **BASIC WEIGHT**

\+ OIL, CREW, CREWMEN'S BAGGAGE, EMERGENCY AND EXTRA EQUIPMENT.

= **OPERATING WEIGHT**

\+ FUEL, CARGO, AMMUNITION, BOMBS, DROP LOADS, EXTERNAL AUXILIARY FUEL TANKS, ETC.

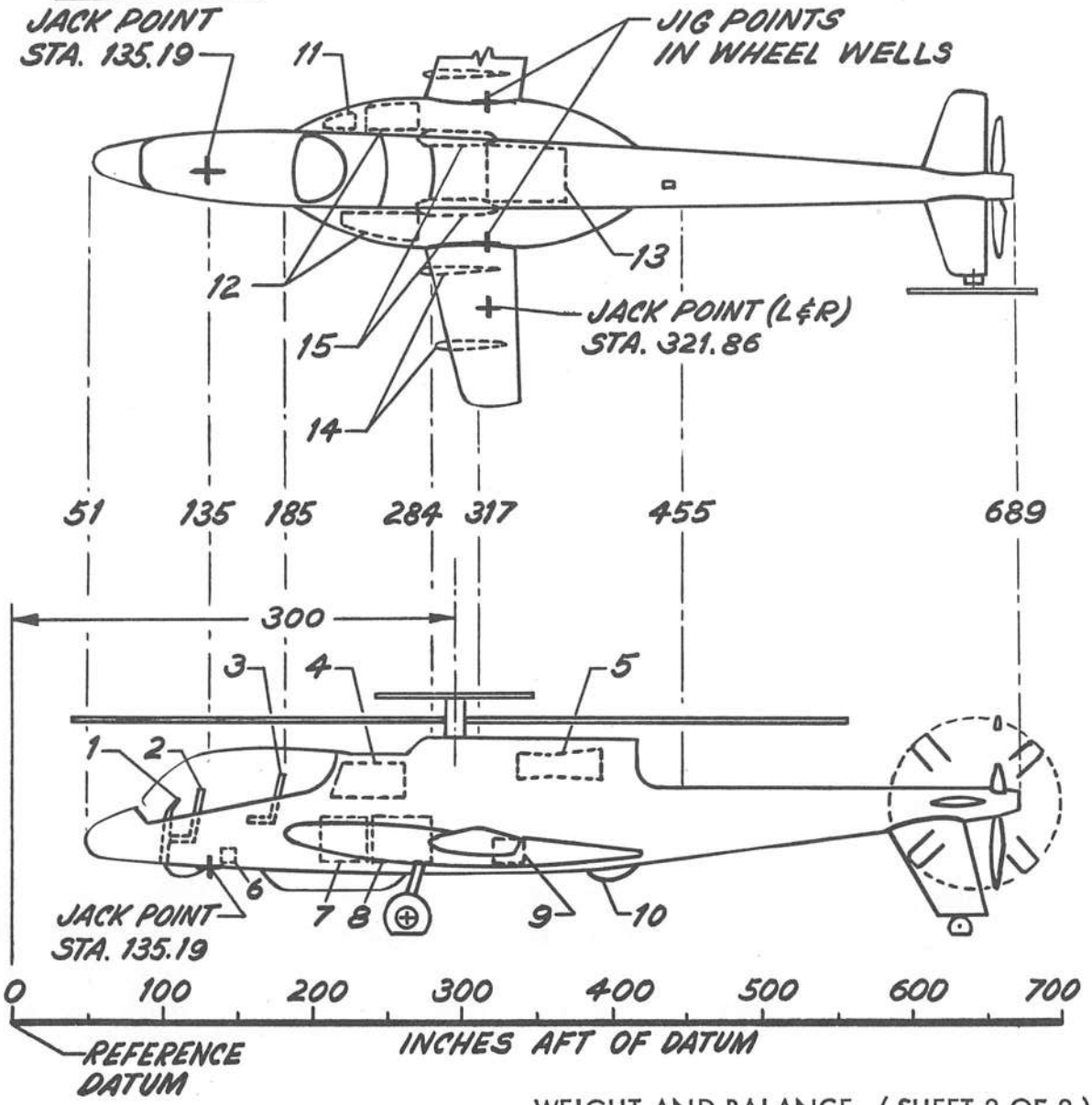
= **GROSS WEIGHT-TAKEOFF**

− EXPENDED ITEMS-FUEL, OIL, BOMBS, AMMUNITION, EXTERNAL AUXILIARY FUEL TANKS (IF DISPOSED OF), ETC.

= **GROSS WEIGHT-LANDING**

WEIGHT AND BALANCE, (SHEET 1 OF 2)

AIRPLANE DIAGRAM



1 PERISCOPIC SIGHT
2 GUNNER'S SEAT
3 PILOT'S SEAT
4 ELECTRONICS, ELECTRICAL EQUIPMENT
5 ENGINE
6 BATTERY
7 AMMUNITION DRUM
8 AMMUNITION DRUM
9 AUX POWER UNIT
0 DOPPLER ANTENNA
11 AIR CYCLE UNIT
12 SPONSON FUEL TANKS
13 MAIN FUEL TANKS
14 WING PYLONS
15 FUSELAGE PYLONS

WEIGHT AND BALANCE, (SHEET 2 OF 2)

FIGURE 4.3
AA-56A

(Center of Gravity) is beyond limits for many reasons. Among them -- safety,-- flight characteristics can be severely changed and in extreme cases can make an aircraft uncontrollable. Exceeding the C.G. limits can also overstress the airframe, or rotor system, drastically reducing the fatigue life expectancy.

The AH-56A compound helicopter has been designed with the optimum C.G. occurring at station 300, which is the vertical centerline of the main rotor mast. The fore and aft C.G. limits are equi-distant either side of the mast, and have the greatest total spread at the empty weight condition, approximately 24 inches; 12 inches in front and 12 inches aft of the mast centerline. Total C.G. spread decreases approximately proportional to the increase of gross weight. At a gross weight of 22,000 pounds, total C.G. travel limits decrease to approximately 14 inches.

Design structural limits are based on a 160,000 inch pound moment. Fore and aft C.G. travel limits are obtained by dividing the total weight of the vehicle, at the configuration it is to be flown, into 160,000 inch pounds. The answer obtained is C.G. travel limit, for that particular weight condition, to only one side of the mast centerline in inches. Total C.G. travel distance, fore and aft of the mast would be double the figure obtained.

Figure 44 depicts a normal mission profile center of gravity envelope, and shows the center of gravity travel from an empty condition to a combat loaded weight, and further displays the travel as the load is expended. The center of gravity travel stays within fore and aft limits under all normal load conditions.

For the AH-56A compound helicopter, it is unnecessary to express C.G. in terms of percent of MAC because design dictated wing location with respect to the rotor. Therefore, since the rotor provides all control forces, C.G. position is relevant only with respect to the rotor, and need be expressed only in terms of fuselage stations.

Lateral C.G. load limits are critical only with regard to assymmetrical external stores, external fuel loads and order of usage, and jettisoning. Observe pylon placards when loading external stores, and crew station placards for fuel management and jettison sequence.

WARNING

EXTERNAL STORES, ESPECIALLY FUEL TANKS, MUST BE SYMMETRICAL AT STORES STATIONS 1 AND 6, AND/OR 2 AND 5. FUEL STORES AT STATION 3 AND 4 MUST BE EQUAL WITHIN 300 POUNDS AT ALL TIMES, EXCEPT WHEN FUEL IS CARRIED AT STATION 4 ONLY. 1800 POUND MAX STORE MAY BE LOADED AT STATION 4 IF THERE IS NO LOAD AT STATION 3.

During servicing of external tanks, particular attention should be given to filling left and right tanks symmetrically, and in assuring that a

tank is not inadvertently missed during servicing. When stores are jettisoned, they must be jettisoned all at once, or in left and right pairs.

Refer to Chart E, Figure 45 (sheets 1 through 12) for weighing instructions, vehicle dimensions, weights, arms, and moments of various components, in addition to various configurations. Always refer to latest Chart E during actual weighing, as well as other applicable Technical Manuals. Terms used in weighing and computing the center of gravity include the following:

DATUM - The reference point from which measurements are made to determine the ARM. Datum is located 51 inches ahead of the nose.

ARM - The distance in inches of any item or component of equipment from the DATUM line.

MOMENT - The ARM times the WEIGHT of the item.

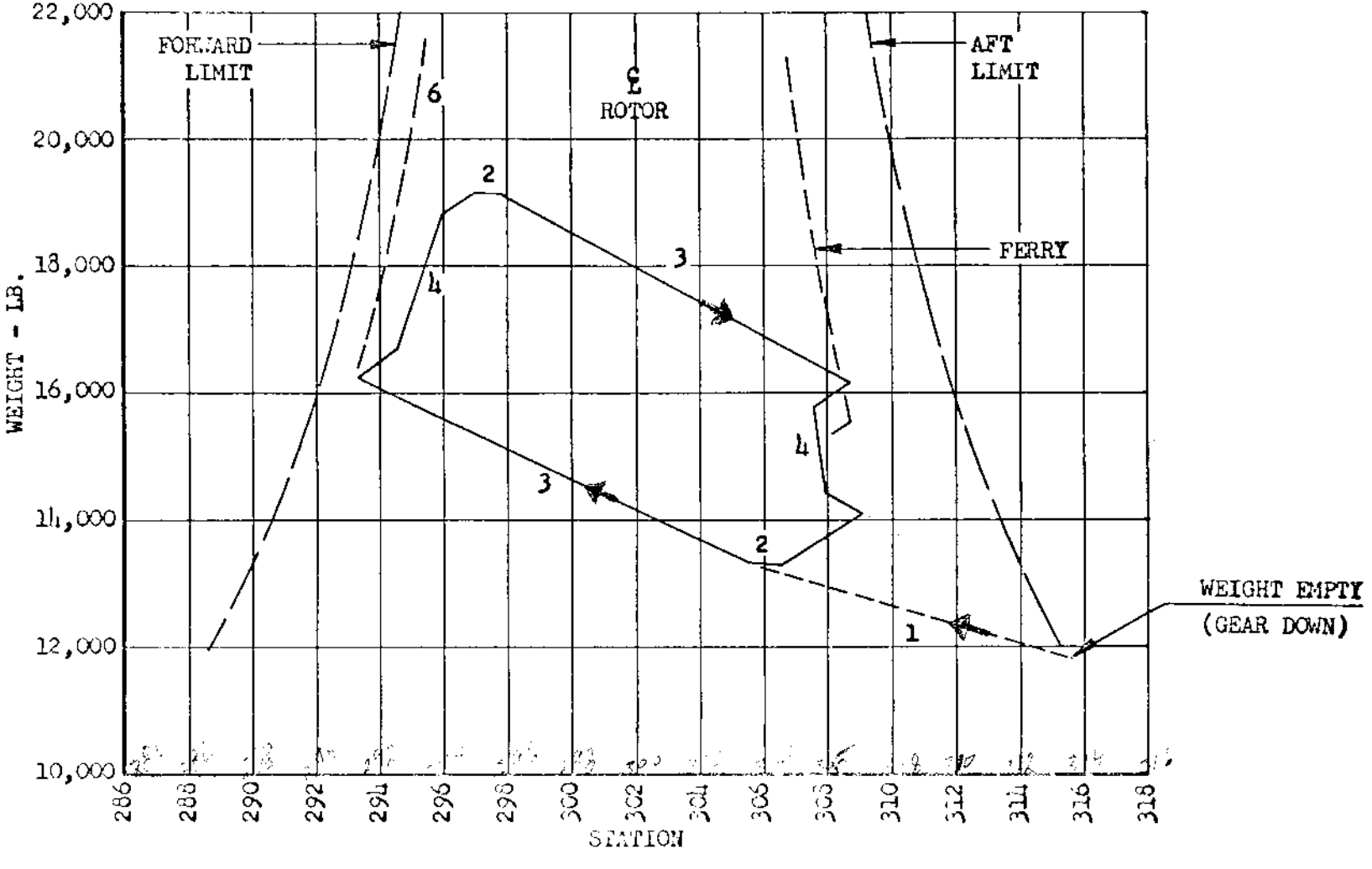
BASIC WEIGHT - Established with landing gears extended, canopy and sliding cowl closed, and includes all fully serviced oil systems. Preferably all equipment, according to the "equipment check list", should be installed, less the ammo, and the fuel tanks drained.

LEVELING - The vehicle must be level during weighing. This can be accomplished by jacking all wheels clear from either the gear, or nose and wing jacking points, and by utilizing the plumb bob leveling provisions located inside the fuselage at station 442.

When weighing on wheels, or wheel jacks, it is necessary to measure dimension "B" and "D" in relation to jig point dimension to determine dimension "E" and "F". Refer to airplane diagram, (See figure 45, sheet 2). When weighing on nose and wing jacks, these measurements are not necessary. Therefore, the following established dimensions for "E" and "F" may be inserted directly into the Airplane Weighing Record (See figure 46); "E" = 135.19 inches, "F" = 323.77 inches.

Weighing should be accomplished in an environment free of wind such as a hangar. The following equipment list is optimum. Substitution of higher capacity cells, or even platform scales may be dictated by circumstances, if the standard Army electronic weighing kit is unavailable. Weighing at the wheels is preferable to avoid the height encountered when weighing at wing and nose jacking points.

Jacks, three (3) hand operated hydraulic type for wheel jacking points.
Two (2) 10,000 pound capacity electric weighing cells.
One (1) 5,000 pound capacity cell.
Three (3) electrical cables for cells.
Three (3) adapters between jacks and cells.
Plumb bob and string.
Steel tape, 50 feet.
Masking tape.
Small block, or plate extension for tail jacking point measurement.



LOADINGS

1. UNUSABLE FUEL, OIL, PILOT, TURRETS, LESS GUNS
2. LANDING GEAR RETRACTION
3. GUNNER, GUNS, FULL AMMO.
4. INTERNAL FUEL - FULL
5. EXTERNAL FUEL
6. EXTERNAL STORES

CENTER OF GRAVITY ENVELOPE

FIGURE 44
AE-56A

Standard weighing kits generally contain all the equipment required and operate on 24 vdc, or 110 vac. Generally, it is necessary to plug-in the cells using the appropriate cable set for a warm-up period prior to weighing. Complete operating instructions accompany each kit, and strict adherence to instructions is necessary to obtain accurate results.

When cells and adapters are in place on jacks, the aircraft is then jacked evenly, being careful not to induce side loads on the cells, until all wheels are clear, maintaining a level attitude according to the plumb bob leveling device. Record cell readings in appropriate places on DD form 365B, (See figure 46). Using string plumb bob, and masking tape, the centerline between main wheel jackpads is located and marked. The center of the tail wheel jackpad is similarly marked by utilizing the block in the equipment list to clear obstructions. The jig points, one in each main wheel well, are projected to the floor and marked with the aid of a plumb bob.

The longitudinal distance at fuselage centerline is measured and recorded between main wheel jig points and previously marked centerline between main wheel jackpads (approximately 49.1 inches). This figure will vary depending upon the amount of main landing gear strut extension. The distance between the tail landing gear jackpad marked position, plus width of block used, to the main wheel jackpad centerline is measured and recorded (approximately 371.6 inches). Lower vehicle until cells are clear and record unloaded reading, which is subtracted from loaded weight. This procedure should be accomplished twice as a check for errors, using last readings if differences were negligible.

Center of gravity is the distance from datum to jig point (319.0 inches) plus (+) distance from jackpoint centerline to jig point (-49.10 inches, or as measured) plus (+) tail wheel weight (1161 pounds, or as weighed) times (X) distance between main wheel jackpads and tail wheel jackpad (371.6 inches approximately) divided (÷) by total weight (13510 pounds) equals (=) center of gravity (C.G.), or:

$$319.0 + (-49.10) + \frac{\text{T.W. X M.L.G. to T. WHEEL DISTANCE}}{\text{TOTAL WEIGHT}} = 301.8 \text{ FS/CG}$$

The above figures can be recorded in the proper blocks in figure 46 and a sample weight and balance problem worked out if desired.

All weights and measurements obtained should be compared with aircraft historical weight and balance records DD form 365C. If inventory of equipment, according to the check list, is identical with last recorded inventory, and no other changes have occurred effecting vehicle weight, the C.G. should be the same as last recorded inspection. A slight negligible difference, however, may be expected.

If a C.G. difference is obtained that is considered greater than negligible, then an error must be considered. This would entail reviewing all aspects of the procedure, and even using another weighing kit to discover the error.

NOTE

The purpose of the foregoing weight and balance information is not intended as a full and complete course on the subject, but only a general familiarization. Complete Technical Manuals are devoted to this subject, such as TM55-405-9, and applicable AH-56A manuals.

I. Ground Support Equipment

Design of the AH-56A compound helicopter has endeavored, in so far as possible, to reduce or eliminate entirely, ground support equipment of a special nature. The following lists include only those items considered to be special, and/or pertinent to the airframe. Additional information is provided where necessary.

1. Special tools and ground support equipment (See figure 47, sheet 1 through 4).

   a. Jack, Hydraulic/Hand, Type A5
   b. Jack, Folding Tripod, Type B6
   c. Hoist, Manual Bomb, AERO 14C
   d. Tiedown Kit, Aircraft Mooring, AA1730-1301
   e. Maintenance Platform, Model B1
   f. Pump, High Pressure Injection, P/N W8346
   g. Generator Set, B10-B
   h. Compressor, Air, P/N BM452, Engine Driven
   i. Dolly, Engine Handling
   j. Dolly, Transmission
   k. Dolly, Main Rotor Hub
   l. Dolly, Main Rotor Blade
   m. Handling Tool, Main Rotor Blade
   n. Dolly, Propeller and Gearbox
   o. Dolly, Tail Rotor Hub and Blades
   p. Crane, Portable Maintenance

2. Flyaway Kit (See figure 48, sheet 1 through 5)

   This is a support kit consisting of those items needed to store, tie down, and/or protect the aircraft when operating from a remote site. Components of the kit are as follows:

   a. Safety Mechanical Assembly, Main Landing Gear
   b. Cover Assembly, Sight Head, External
   c. Cover Assembly, Pitot Tube
   d. Cover Assembly, Tail Rotor Hub
   e. Cover Assembly, Propeller Hub
   f. Cover Assembly, Canopy
   g. Cover Assembly, Nose Turret
   h. Cover Assembly, Belly Turret
   i. Cover Assembly, Main Rotor Hub
   j. Shield Assembly, Air Inlet
   k. Shield Assembly, Exhaust Duct

WEIGHING INSTRUCTIONS

1. AIRCRAFT CONDITION
   A. The basic weight condition is established with landing gear extended, cockpit canopy and engine sliding cowl closed, and includes oil for the engine, the transmission, the hydraulic system, and propeller gear box.
2. FUEL DRAINING
   A. Drain fuel from the tank sump drain valve while the aircraft is in normal ground attitude (approximately level).
   B. Fuel remaining aboard after draining the tank sump is "trapped" fuel.
   C. The basic weight is established with "unusable" fuel (equivalent to the zero point of the gages). If the aircraft is weighed after draining fuel by the above method, the following correction shall be made to the "as weighed" condition to obtain the basic weight:

	Pounds	Moment/1000
ADD	_____	_____

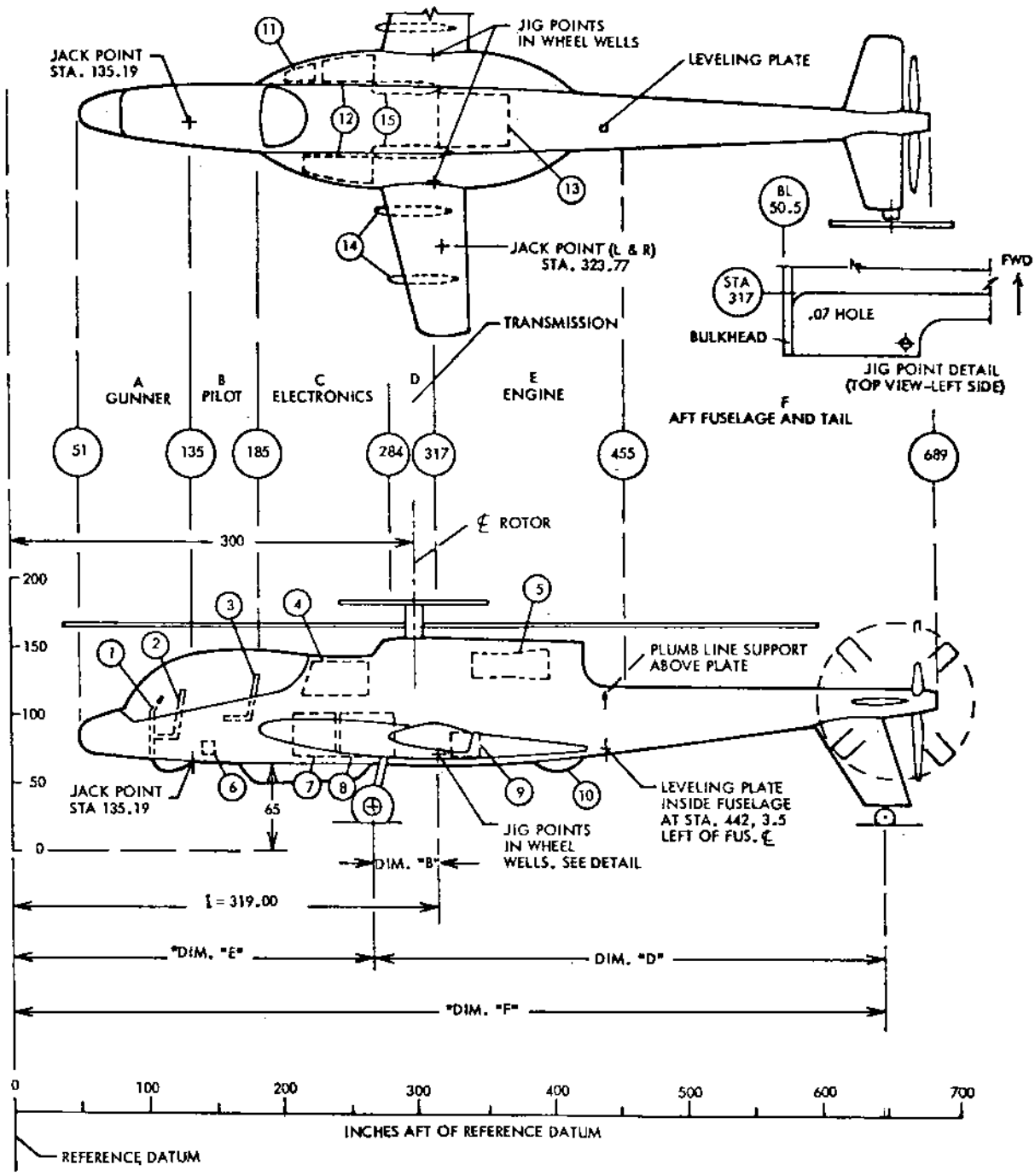
   D. If the aircraft is weighed with a completely dry fuel system, the "unusable" fuel weight and moment listed on Chart A shall be added to the "as weighed" condition to obtain the basic weight.

	Pounds	Moment/1000
ADD	_____	_____

3. LEVELING
   A. Plumb bob leveling suspension fitting and leveling plate are located inside the aft fuselage at Station 442. See Page 2 for locations.
   B. The aircraft ground attitude is approximately level. Exact leveling can be obtained by adjusting the pressure in the shock struts, or by the use of jacks.
4. MEASURING
   A. The jig point is a small hole at Station 319.00, on the aft bulkhead in each main gear wheel well, from which a plumb bob line can be suspended. See Page 2 for location.
   B. When weighing on wheels, or on wheel jack points, measure dimension "B" and "D" during weighing and after leveling. Using these actual dimensions and the jig point dimension "I", determine "E" and "F". For checking purposes, see Page 3 for approximate values of "E" and "F".
   C. When weighing on the nose and wing jack points, actual measurements during weighing are not necessary. After leveling, the following dimensions for "E" and "F" may be inserted directly in the weighing form:

      Nose jack point dimension "E" = 135.19
      Wing jack point dimension "F" = 323.77

AIRPLANE DIAGRAM

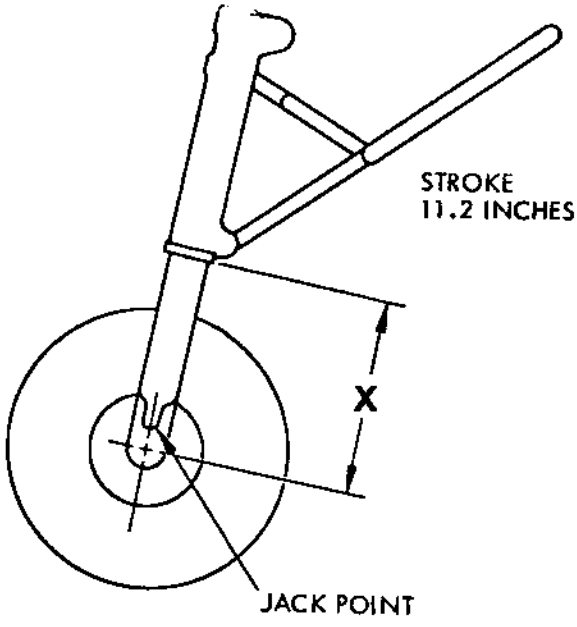


*THE PROCEDURE FOR OBTAINING DIMENSIONS "E" AND "F" IS EXPLAINED IN THE WEIGHING INSTRUCTIONS ON PAGE 1.

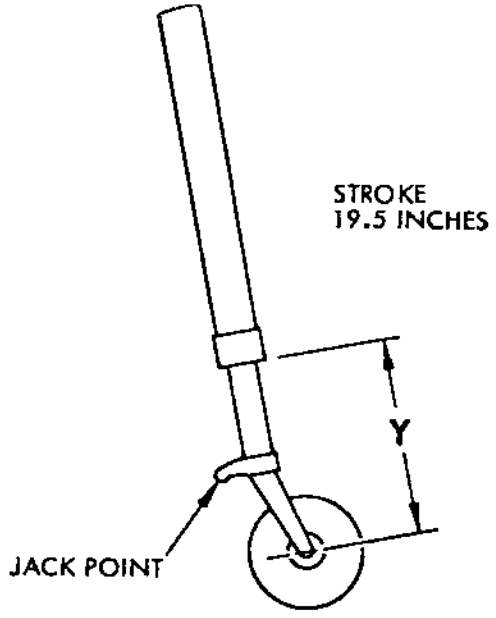
1. PERISCOPIC SIGHT
2. GUNNER'S SEAT
3. PILOT'S SEAT
4. ELECTRONICS, ELECTRICAL EQUIPMENT
5. ENGINE
6. BATTERY
7. AMMUNITION DRUM
8. AMMUNITION DRUM
9. AUX. POWER UNIT
10. DOPPLER ANTENNA
11. AIR CYCLE UNIT
12. SPONSON FUEL TANKS
13. MAIN FUEL TANK
14. WING PYLONS
15. FUSELAGE PYLON

LANDING GEAR DIMENSIONS

MAIN GEAR				TAIL GEAR			
X		* DIM. E		Y		* DIM. F	
		WHEELS	JACK POINT			WHEELS	JACK POINT
FULLY COMPRESSED	19.5	270.4	270.9	FULLY COMPRESSED	9.7	648.4	639.8
	21.0	270.1	270.6		11.0	648.7	640.1
	22.0	269.9	270.4		12.0	648.9	640.3
	23.0	269.7	270.2		13.0	649.1	640.5
	24.0	269.5	270.0		14.0	649.3	640.7
	25.0	269.3	269.8		15.0	649.6	641.0
	26.0	269.1	269.6		16.0	649.8	641.2
	27.0	268.9	269.4		17.0	650.0	641.4
	28.0	268.6	269.1		18.0	650.2	641.6
	29.0	268.4	268.9		19.0	650.4	641.8
FULLY EXTENDED	30.7	268.0	268.5		20.0	650.6	642.0
					21.0	650.8	642.2
					22.0	651.0	642.4
					23.0	651.2	642.6
					24.0	651.4	642.8
					25.0	651.6	643.0
					26.0	651.9	643.3
					27.0	652.1	643.5
					28.0	652.3	643.7
				FULLY EXTENDED	29.2	652.6	644.0



RIGHT HAND GEAR
LOOKING OUTBOARD



* APPROXIMATE. DETERMINE ACTUAL DIMENSIONS DURING WEIGHING.

FUEL

INTERNAL	
WEIGHT (POUNDS)	MOMENT 1000 438 GAL. ARM VARIES
100	34
200	69
300	103
400	138
500	172
600	206
700	241
800	275
900	302
1000	328
1100	352
1200	382
1300	412
1400	442
1500	471
1600	502
1700	533
1800	563
1900	594
2000	624
2100	655
2200	685
2300	716
2400	746
2500	776
2600	811
2700	845
2800	880
* 2847	897
2900	914
3000	945
3100	977

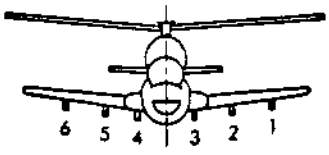
EXTERNAL		
WEIGHT (POUNDS)	MOMENT/1000 300 GAL. EACH ARM VARIES	450 GAL. EACH ARM VARIES
100	29	28
200	58	57
300	86	85
400	114	113
500	141	141
600	169	169
700	197	197
800	225	225
900	252	253
1000	280	281
1100	308	309
1200	336	337
1300	364	365
1400	393	393
1500	415	421
1600	460	449
1700	497	477
1800	532	505
1900	567	533
* 1950	586	547
2000	601	561
2100	631	589
2200		618
2300		649
2400		684
2500		720
2600		757
2700		794
2800		832
2900		870
* 2925		880
3000		902
3100		932
3200		963

LATERAL LOADING REQUIREMENTS

TANKS PLUS FUEL MUST BE LOADED SYMMETRICALLY AT STORE STATIONS 1 AND 6 AND/OR AT 2 AND 5.

TANKS PLUS FUEL MUST BE LOADED SYMMETRICALLY AT STATIONS 3 AND 4 EXCEPT AS FOLLOWS:

1800 POUNDS (MAX) TANK PLUS FUEL MAY BE LOADED AT STATION 4 IF THERE IS NO LOAD AT STATION 3



STORE STATIONS

INTERNAL FUEL ARM TABLE

CAPACITY	ARM
1/4	344.0
1/2	315.1
3/4	311.8
FULL	315.0

* FULL TANKS WITH SPECIFICATION MIL-F-5624 (JP-4) AT 6.5 LB./GAL. (CALCULATED CAPACITY)

TOTAL WEIGHT OF FUEL IS DEPENDENT UPON THE SPECIFIC GRAVITY AND TEMPERATURE. THEREFORE, THE NOTATION "FULL" DOES NOT APPEAR ON THE FUEL QUANTITY GAGES. VARIATION SHOULD BE ANTICIPATED IN GAGE READINGS WHEN TANKS ARE FULL.

FUEL USING SEQUENCE WITH EXTERNAL FUEL

1. FUEL AT STATIONS 3 AND 4 UNTIL EMPTY. FUEL REMAINING AT STATIONS 3 AND 4 MUST BE EQUAL (± 300 POUNDS) AT ALL TIMES EXCEPT WHEN FUEL IS CARRIED AT STATION 4 ONLY.
2. FUEL AT STATIONS 1 AND 6 UNTIL EMPTY. FUEL REMAINING AT STATIONS 1 AND 6 MUST BE EQUAL (± 150 POUNDS) AT ALL TIMES.
3. FUEL AT STATIONS 2 AND 5 UNTIL EMPTY. FUEL REMAINING AT STATIONS 2 AND 5 MUST BE EQUAL (± 300 POUNDS) AT ALL TIMES.
4. INTERNAL FUEL

AMMUNITION

XM-134 NOSE TURRET

TOTAL ROUNDS	AMMUNITION ARM 227.0		CASES RETAINED ARM 161.0	
	WEIGHT	MOMENT / 1000	WEIGHT	MOMENT / 1000
1000	54	12	27	4
2000	107	24	54	9
4000	214	49	108	17
6000	322	73	163	26
8000	429	97	217	35
10000	536	122	271	44
11570	620	141	314	51

XM-129 NOSE TURRET

TOTAL ROUNDS	AMMUNITION IN DRUM ARM 227.0		AMMUNITION IN CHUTE ARM 140.0	
	WEIGHT	MOMENT / 1000	WEIGHT	MOMENT / 1000
70	0	0	55	8
100	24	5	55	8
200	103	23	55	8
400	261	59	55	8
600	419	95	55	8
780	561	127	55	8

XM-140 BELLY TURRET

ROUNDS	AMMUNITION ARM VARIABLE	
	WEIGHT	MOMENT / 1000
200	188	47
400	377	94
600	565	142
800	754	192
1000	942	243
1200	1130	294
1400	1319	346
1600	1507	396
1800	1696	444
2010	1894	498

EXTERNAL STORES

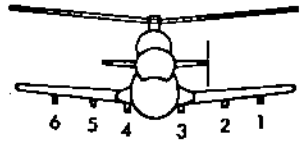
ROCKETS

ROCKET MOUNTING ARM 300.0								
NO.	XM-159A POD (EMPTY)			XM-157A POD (EMPTY)			TRIPLE ADAPTER STA 1 AND 6 ONLY	
	WEIGHT	MOMENT/1000		WEIGHT	MOMENT/1000		WEIGHT	MOMENT/1000
		STA. 1 AND 6	STA. 2 AND 5		STA. 1 AND 6	STA. 2 AND 5		
2	226	68	68	104	31	31	140	42
4	453	136		207	62			
6	679	204		311	93			

FFAR 2.75 INCH ROCKETS IN XM-159A PODS			
NO.	WEIGHT	MOMENT/1000	
		STA. 1 AND 6	STA. 2 AND 5
10	218	65	65
20	435	131	131
30	653	196	196
38	*827	248	248
40	870	261	
50	1088	326	
60	1305	392	
70	1523	457	
80	1740	522	
90	1958	587	
100	2175	653	
110	2393	718	
114	*2480	744	

FFAR 2.75 INCH ROCKETS IN XM-157A PODS			
NO.	WEIGHT	MOMENT/1000	
		STA. 1 AND 6	STA. 2 AND 5
10	218	65	65
14	*305	92	92
20	435	131	
30	653	196	
40	870	261	
42	*914	274	

*MAXIMUM LOADING



STORE STATIONS

LATERAL LOADING REQUIREMENTS

ROCKETS MUST BE LOADED SYMMETRICALLY AT STATIONS 1 AND 6 AND/OR AT STATIONS 2 AND 5.

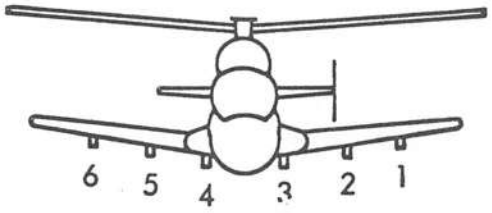
EXTERNAL STORES

STORES ARM 300.0	
WEIGHT PER STATION	MOMENT / 1000
20	6
40	12
60	18
80	24
100	30
200	60
300	90
400	120
500	150
600	180
700	210
800	240
900	270
1000	300
1100	330
1200	360
1300	390
1400	420
1500	450
1600	480
1700	510
1800	540
1900	570
*2000	600

TOW MISSILE ARM 300.0		
NO.	STA. 2 AND 5 ONLY	
	WEIGHT	MOMENT / 1000
2	86	26
4	172	52
6	*258	77

TOW POD (EMPTY) ARM 300.0		
NO.	STA. 2 AND 5 ONLY	
	WEIGHT	MOMENT / 1000
2	102	31

*MAXIMUM LOADING



STORE STATIONS

LATERAL LOADING REQUIREMENTS

STORES MUST BE LOADED SYMMETRICALLY AT STATIONS 1 AND 6 AND/OR AT STATIONS 2 AND 5.
TOW MUST BE LOADED SYMMETRICALLY AT STATIONS 2 AND 5.
STORES MUST BE LOADED AND RELEASED SYMMETRICALLY AT STATIONS 3 AND 4 EXCEPT AS FOLLOWS:

1500 POUNDS (MAX.) STORE MAY BE LOADED AT STATION 4 IF THERE IS NO LOAD AT STATION 3
WEIGHING CHART "E", (SHEET 7 OF 12)

TYPICAL SERVICE LOAD CONDITIONS

ITEM	ARM	ROCKETS		STORES		FERRY	
		WEIGHT	MOMENT / 1000	WEIGHT	MOMENT / 1000	WEIGHT	MOMENT / 1000
PILOT	171.0	200	34	200	34	200	34
COPILOT-GUNNER	115.0	200	23	200	23	200	23
FUEL (AT 6.5 LB/GAL)							
INTERNAL	VAR.	1100	352	1800	563	2847	897
EXTERNAL	VAR.					12600	3772
AMMUNITION							
XM-134	VAR.	322	73				
XM-140	VAR.	754	192	1894	498		
XM-129	VAR.			616	135		
EXTERNAL STORES							
STORES	300.0			4000	1200		
ROCKET MOUNTING	300.0	1045	314				
ROCKETS (152)	300.0	3307	992				
*DROPPABLE FUEL TANKS							
450 GAL (4)	304.0					772	234
300 GAL (1)	302.5					150	45
TOTAL		6928	1980	8710	2453	16769	5005

DIMENSIONAL DATA

WING SPAN	26 FT. 9 IN.	WHEEL BASE	31 FT. 9 IN.
OVERALL LENGTH	60 FT. 1 IN.	WHEEL TREAD	7 FT. 1 IN.
OVERALL HEIGHT	13 FT. 7 IN.		

MISCELLANEOUS DATA

ITEM	WEIGHT	ARM	MOMENT / 1000
PILOT	200	171.0	34
COPILOT-GUNNER	200	115.0	23
*DROPPABLE FUEL TANKS			
450 GAL EA. (2)	386	304.0	117
300 GAL EA. (2)	300	302.5	91

*TANK WEIGHT INCLUDES UNUSABLE FUEL.

SEE LATERAL LOADING REQUIREMENTS ON PAGE 4.

CENTER OF GRAVITY

(SEE PAGE 10 FOR GROSS WEIGHTS ABOVE 16900 LB.)

CG LIMITS — GEAR DOWN — WITHOUT SKIDS / WITH SKIDS

GROSS WEIGHT (POUNDS)	MOMENT/1000 FOR ARM SHOWN													
	288.5	289.0	289.5	290.0	290.5	291.0	295.0	300.0	308.0	308.5	309.0	309.5	310.0	310.5
13000	3751	3757	3764	3770	3777	3783	3835	3900	4004	4011	4017	4024	4030	4037
100	3779	3786	3792	3799	3806	3812	3865	3930	4035	4041	4048	4054	4061	4068
200	3808	3815	3821	3828	3835	3841	3894	3960	4066	4072	4079	4085	4092	4099
300	3837	3844	3850	3857	3864	3870	3924	3990	4096	4103	4110	4116	4123	4130
400	3866	3873	3279	3886	3893	3899	3953	4020	4127	4134	4141	4147	4154	4161
500	3895	3902	3908	3915	3922	3929	3983	4050	4158	4165	4172	4178	4185	4192
600	3924	3930	3937	3944	3951	3958	4012	4080	4189	4196	4202	4209	4216	4223
700	3952	3959	3966	3973	3980	3987	4042	4110	4220	4226	4233	4240	4247	4254
800	3981	3988	3995	4002	4009	4016	4071	4140	4250	4257	4264	4271	4278	
900	4010	4017	4024	4031	4038	4045	4101	4170	4281	4288	4295	4302	4309	
14000		4046	4053	4060	4067	4074	4130	4200	4312	4319	4326	4333	4340	
100		4075	4082	4089	4096	4103	4160	4230	4343	4350	4357	4364	4371	
200		4104	4111	4118	4125	4132	4189	4260	4374	4381	4388	4395	4402	
300		4133	4140	4147	4154	4161	4219	4290	4404	4412	4419	4426	4433	
400		4162	4169	4176	4183	4190	4248	4320	4435	4442	4450	4457	4464	
500		4190	4198	4205	4212	4220	4278	4350	4466	4473	4481	4488		
600			4227	4234	4241	4249	4307	4380	4497	4504	4511	4519		
700			4256	4263	4270	4278	4337	4410	4528	4535	4542	4550		
800			4285	4292	4299	4307	4366	4440	4558	4566	4573	4581		
900			4314	4321	4328	4336	4396	4470	4589	4597	4604	4612		
15000			4343	4350	4358	4365	4425	4500	4620	4628	4635	4643		
100			4371	4379	4387	4394	4455	4530	4651	4658	4666	4674		
200			4400	4408	4416	4423	4484	4560	4682	4689	4697			
300				4437	4445	4452	4514	4590	4712	4720	4728			
400				4466	4474	4481	4543	4620	4743	4751	4759			
500				4495	4503	4511	4573	4650	4774	4782	4790			
600				4524	4532	4540	4602	4680	4805	4813	4820			
700				4553	4561	4569	4632	4710	4836	4843	4851			
800				4582	4590	4598	4661	4740	4866	4874	4882			
900				4611	4619	4627	4691	4770	4897	4905	4913			
16000				4640	4648	4656	4720	4800	4928	4936	4944			
100					4677	4685	4750	4830	4959	4967				
200					4706	4714	4779	4860	4990	4998				
300					4735	4743	4809	4890	5020	5029				
400					4764	4772	4838	4920	5051	5059				
500					4793	4802	4868	4950	5082	5090				
600					4822	4831	4897	4980	5113	5121				
700					4851	4860	4927	5010	5144	5152				
800					4880	4889	4956	5040	5174	5183				
900						4918	4986	5070	5205	5214				

CG LIMITS
GEAR DOWN
WITH SKIDS
WITHOUT SKIDS

THE FORWARD AND AFT CG LIMITS ARE BASED ON CONTRACTOR'S STRUCTURAL ANALYSIS. MOMENT/1000 FOR LANDING GEAR RETRACTION IS PLUS 16 WITHOUT SKIDS AND PLUS 24 WITH SKIDS. LOADINGS BASED ON THE GEAR DOWN CONDITION WHICH FALL WITHIN THE LIMITING MOMENTS IN THE TABLE WILL BE SATISFACTORY FOR FLIGHT WHEN THE GEAR IS RETRACTED.

CENTER OF GRAVITY

(SEE PAGE 9 FOR GROSS WEIGHTS BELOW 17,000 LB)
(SEE PAGE 11 FOR GROSS WEIGHTS ABOVE 20,900 LB)

CG LIMITS — GEAR DOWN — WITHOUT SKIDS / WITH SKIDS

GROSS WEIGHT (POUNDS)	MOMENT/1000 FOR ARM SHOWN											
	291.0	291.5	292.0	292.5	293.0	295.0	300.0	305.0	306.5	307.0	307.5	308.0
17000	4947	4956	4964	4973	4981	5015	5100	5185	5211	5219	5228	5236
100	4976	4985	4993	5002	5010	5045	5130	5216	5241	5250	5258	5267
200	5005	5014	5022	5031	5040	5074	5160	5246	5272	5280	5289	5298
300	5034	5043	5052	5060	5069	5104	5190	5277	5302	5311	5320	5328
400	5063	5072	5081	5090	5098	5133	5220	5307	5333	5342	5351	5359
500	5093	5101	5110	5119	5128	5163	5250	5338	5364	5373	5381	5390
600	5121	5130	5139	5148	5157	5192	5280	5368	5394	5403	5412	5421
700	5150	5160	5168	5177	5186	5222	5310	5399	5425	5434	5443	5452
800		5189	5198	5207	5215	5251	5340	5429	5456	5465	5474	5482
900		5218	5227	5236	5245	5281	5370	5460	5486	5495	5504	5513
18000		5247	5256	5265	5274	5310	5400	5490	5517	5526	5535	5544
100		5276	5285	5294	5303	5340	5430	5521	5548	5557	5566	
200		5305	5314	5324	5333	5369	5460	5551	5578	5587	5597	
300		5334	5344	5353	5362	5399	5490	5582	5609	5618	5627	
400		5364	5373	5382	5391	5428	5520	5612	5640	5649	5658	
500		5393	5402	5411	5421	5458	5550	5643	5670	5680	5689	
600		5422	5431	5441	5450	5487	5580	5673	5701	5710	5720	
700		5451	5460	5470	5479	5517	5610	5704	5732	5741	5750	
800		5480	5490	5499	5508	5546	5640	5734	5762	5772	5781	
900			5519	5528	5538	5576	5670	5765	5793	5802	5812	
19000			5548	5558	5567	5605	5700	5795	5824	5833	5843	
100			5577	5587	5596	5635	5730	5826	5854	5864	5873	
200			5606	5616	5626	5664	5760	5856	5885	5894	5904	
300			5636	5645	5655	5694	5790	5887	5915	5925		
400			5665	5675	5684	5723	5820	5917	5946	5956		
500			5694	5704	5714	5753	5850	5948	5977	5987		
600			5723	5733	5743	5782	5880	5978	6007	6017		
700			5752	5762	5772	5812	5910	6009	6038	6048		
800			5782	5792	5801	5841	5940	6039	6069	6079		
900			5811	5821	5831	5871	5970	6070	6099	6109		
20000			5840	5850	5860	5900	6000	6100	6130	6140		
100				5879	5889	5930	6030	6131	6161	6171		
200				5909	5919	5959	6060	6161	6191	6201		
300				5938	5948	5989	6090	6192	6222	6232		
400				5967	5977	6018	6120	6222	6253	6263		
500				5996	6007	6048	6150	6253	6283	6294		
600				6026	6036	6077	6180	6283	6314			
700				6055	6065	6107	6210	6314	6345			
800				6084	6094	6136	6240	6344	6375			
900				6113	6124	6166	6270	6375	6406			

CG LIMITS — GEAR DOWN — WITH SKIDS / WITHOUT SKIDS

THE FORWARD AND AFT CG LIMITS ARE BASED ON CONTRACTOR'S STRUCTURAL ANALYSIS. MOMENT/1000 FOR LANDING GEAR RETRACTION IS PLUS 16 WITHOUT SKIDS AND PLUS 24 WITH SKIDS. LOADINGS BASED ON THE GEAR DOWN CONDITION WHICH FALL WITHIN THE LIMITING MOMENTS IN THE TABLE WILL BE SATISFACTORY FOR FLIGHT WHEN THE GEAR IS RETRACTED.

CENTER OF GRAVITY

(SEE PAGE 10 FOR GROSS WEIGHTS BELOW 21,000 LB.)
(SEE PAGE 12 FOR GROSS WEIGHTS ABOVE 24,900 LB.)

CG LIMITS — GEAR DOWN — WITHOUT SKIDS / WITH SKIDS

GROSS WEIGHT (POUNDS)	MOMENT/1000 FOR ARM SHOWN									
	292.5	293.0	293.5	294.0	295.0	300.0	305.0	305.5	306.0	306.5
21000	6143	6153	6164	6174	6195	6300	6405	6416	6426	6437
100	6172	6182	6193	6203	6225	6330	6436	6446	6457	6467
200	6201	6212	6222	6233	6254	6360	6466	6477	6487	6498
300	6230	6241	6252	6262	6284	6390	6497	6507	6518	6528
400		6270	6281	6292	6313	6420	6527	6538	6548	6559
500		6300	6310	6321	6343	6450	6558	6568	6579	6590
600		6329	6340	6350	6372	6480	6588	6599	6610	6620
700		6358	6369	6380	6402	6510	6619	6629	6640	6651
800		6387	6398	6409	6431	6540	6649	6660	6671	6682
900		6417	6428	6439	6461	6570	6680	6690	6701	6712
22000		6446	6457	6468	6490	6600	6710	6721	6732	6743
100		6475	6486	6497	6520	6630	6741	6752	6763	6774
200		6505	6516	6527	6549	6660	6771	6782	6793	
300		6534	6545	6556	6579	6690	6802	6813	6824	
400		6563	6574	6586	6608	6720	6832	6843	6854	
500		6593	6604	6615	6638	6750	6863	6874	6885	
600		6622	6633	6644	6667	6780	6893	6904	6916	
700		6651	6662	6674	6697	6810	6924	6935	6946	
800		6680	6692	6703	6726	6840	6954	6965	6977	
900			6721	6733	6756	6870	6985	6996	7007	
23000			6751	6762	6785	6900	7015	7027	7038	
100			6780	6791	6815	6930	7046	7057	7069	
200			6809	6821	6844	6960	7076	7088	7099	
300			6839	6850	6874	6990	7107	7118	7130	
400			6868	6880	6903	7020	7137	7149	7160	
500			6897	6909	6933	7050	7168	7179	7191	
600			6927	6938	6962	7080	7198	7210	7222	
700			6956	6968	6992	7110	7229	7240	7252	
800			6985	6997	7021	7140	7259	7271	7283	
900			7015	7027	7051	7170	7290	7301	7313	
24000			7044	7056	7080	7200	7320	7332	7344	
100			7073	7085	7110	7230	7351	7363		
200			7103	7115	7139	7260	7381	7393		
300			7132	7144	7169	7290	7412	7424		
400			7161	7174	7198	7320	7442	7454		
500			7191	7203	7228	7350	7473	7485		
600			7220	7232	7257	7380	7504	7515		
700				7262	7287	7410	7534	7546		
800				7291	7316	7440	7565	7576		
900				7321	7346	7470	7595	7607		

CG LIMITS — GEAR DOWN
WITH SKIDS
WITHOUT SKIDS

THE FORWARD AND AFT CG LIMITS ARE BASED ON CONTRACTOR'S STRUCTURAL ANALYSIS. MOMENT/1000 FOR LANDING GEAR RETRACTION IS PLUS 16 WITHOUT SKIDS AND PLUS 24 WITH SKIDS. LOADINGS BASED ON THE GEAR DOWN CONDITION WHICH FALL WITHIN THE LIMITING MOMENTS IN THE TABLE WILL BE SATISFACTORY FOR FLIGHT WHEN THE GEAR IS RETRACTED.

CENTER OF GRAVITY

(SEE PAGE 11 FOR GROSS WEIGHTS BELOW 25000 LB)

CG LIMITS GEAR DOWN — WITH SKIDS — WITHOUT SKIDS

GROSS WEIGHT (POUNDS)	MOMENT/1000 FOR ARM SHOWN						
	294.0	294.5	295.0	300.0	304.5	305.0	305.5
25000	7350	7363	7375	7500	7613	7625	7638
100	7379	7392	7405	7530	7643	7656	7668
200	7409	7421	7434	7560	7673	7686	7699
300	7438	7451	7464	7590	7704	7717	7729
400	7468	7480	7493	7620	7734	7747	7760
500	7497	7510	7523	7650	7765	7778	7790
600	7526	7539	7552	7680	7795	7808	7821
700	7556	7569	7582	7710	7826	7839	7851
800	7585	7598	7611	7740	7856	7869	7882
900	7615	7628	7641	7770	7887	7900	7912
26000	7644	7657	7670	7800	7917	7930	7943
100	7673	7686	7700	7830	7947	7961	7974
200	7703	7716	7729	7860	7978	7991	
300	7732	7745	7759	7890	8008	8021	
400	7762	7775	7788	7920	8039	8052	
500	7791	7804	7818	7950	8069	8083	
600	7820	7834	7847	7980	8100	8113	
700		7863	7877	8010	8130	8144	
800		7893	7906	8040	8161	8174	
900		7922	7936	8070	8191	8205	
27000		7952	7965	8100	8222	8235	
100		7981	7995	8130	8252	8266	
200		8010	8024	8160	8282	8296	
300		8040	8054	8190	8313	8327	
400		8069	8083	8220	8343	8357	
500		8099	8113	8250	8374	8388	
600		8128	8142	8280	8404	8418	
700		8158	8172	8310	8435	8449	
800		8187	8201	8340	8465	8479	
900		8217	8231	8370	8496	8510	
28000		8246	8260	8400	8526	8540	
100		8275	8290	8430	8556	8571	
200		8305	8319	8460	8587	8601	
300		8334	8349	8490	8617	8632	
400		8364	8378	8520	8648	8662	
500		8393	8408	8550	8678	8693	
600		8423	8437	8580	8709	8723	
700		8452	8467	8610	8739	8754	
800		8482	8496	8640	8770	8784	
900		8511	8526	8670	8800		
29000		8540	8555	8700	8831		
100			8585	8730	8861		
200			8614	8760	8891		
300			8644	8790	8922		
400			8673	8820	8952		
500			8703	8850	8983		
600			8732	8880	9013		
700			8762	8910	9044		
800			8791	8940	9074		

CG LIMITS
GEAR DOWN
WITH SKIDS
WITHOUT SKIDS

GROSS WEIGHT LIMITATIONS

TAKEOFF ------ POUNDS*
LANDING ------ POUNDS*

*SERVICE ACTIVITIES SHALL INSERT OR SUBSTITUTE CURRENT FIGURES FROM THE LATEST APPLICABLE OPERATOR'S MANUAL.

THE FORWARD AND AFT CG LIMITS ARE BASED ON CONTRACTOR'S STRUCTURAL ANALYSIS.

MOMENT/1000 FOR LANDING GEAR RETRACTION IS PLUS 16 WITHOUT SKIDS AND PLUS24 WITH SKIDS. LOADINGS BASED ON THE GEAR DOWN CONDITION WHICH FALL WITHIN THE LIMITING MOMENTS IN THE TABLE WILL BE SATISFACTORY FOR FLIGHT WHEN THE GEAR IS RETRACTED.

AIRPLANE WEIGHING RECORD

FOR USE IN T.O. 1 1B-40-A AND 1B-40

DATE WEIGHED | MODEL | SERIAL NUMBER

PLACE WEIGHED | WEIGHING PERSONNEL

REACTION (Wheels, jackpoints, etc.)	SCALE READING	TARE	NET WEIGHT	ARM	MOMENT
LEFT MAIN					
RIGHT MAIN					
SUB-TOTAL (both mains)				E	
NOSE OR TAIL				F	
TOTAL (As Weighed)				H	

MEASUREMENTS

B = _____ the distance from the jig point, to the center line of the main reactions. Obtain by measurement.

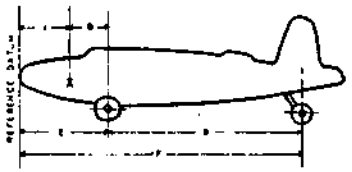
I = _____ the distance from the reference datum to the jig point of the airplane, from which a plumb bob can be dropped to the ground. Obtain from the airplane diagram in Chart E.

E = _____ 1/ the distance from the reference datum to the center line of the main reactions.
E = I + B
B = I - B *(If the jig point is aft of the center line of the main reactions.)*

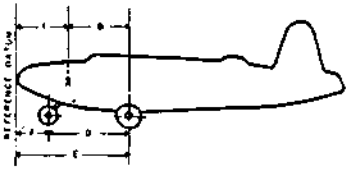
D = _____ the wheel base *(or the distance between fore and aft reactions.)* Obtain by measurement.

F = _____ 1/ the distance from the reference datum to the center line of the nose or tail reaction.
F = E - D *(For nose wheel type aircraft)*
F = E + D *(For tail wheel type aircraft)*

TAIL WHEEL AIRPLANE



NOSE WHEEL AIRPLANE



DIAGRAMS FOR MEASURING VARIOUS TYPES OF AIRPLANES TO DETERMINE ARM OF SUPPORT POINTS.

1/ Check dimensions E and F against approximate dimensions listed on Chart E.

DD FORM 1 SEP 54 365B

AIRPLANE WEIGHING RECORD

FOR USE IN T.O. 1 1B-40-A AND 1B-40

DESCRIPTION	NET WEIGHT	ARM	MOMENT	1/ INDEX NO. WEIGHT
TOTAL (As Weighed)				
OIL IN AIRPLANE	-		-	
TOTAL OF ITEMS WEIGHED BUT NOT PART OF BASIC WEIGHT (From Col. I below)	-		-	
TOTAL OF BASIC ITEMS NOT IN AIRCRAFT WHEN WEIGHED (From Col. II below)	+		+	
BASIC AIRPLANE (Post to Chart C)				

COLUMN I				COLUMN II			
ITEMS WEIGHED BUT NOT PART OF BASIC WEIGHT	WEIGHT	ARM	MOMENT	BASIC ITEMS NOT IN AIRPLANE WHEN WEIGHED	WEIGHT	ARM	MOMENT
TOTAL				TOTAL			

REACTIONS USED

TYPE SCALES

REMARKS

1/ Enter constant used.

AIRCRAFT WEIGHING RECORD

Lockheed-California Company
Military Maintenance Training

FIGURE 46
AE-56A

l. Pin, Safety, Pylon (6)
m. Pin, Safety, Nose Turret (2)
n. Pin, Safety, Belly Turret
o. Actuator, Blade Folding (2)
p. Shield, APU Exhaust

For reasons of clarity of operation or usage (not clearly shown in figure 48) of some of the above items, a further description follows:

Safety Mechanical Assembly, Main Landing Gear, (See figure 48, sheet 4). These are flagged safety pins, one for each main landing gear. They are installed through holes provided in the jury strut and prevent the main gear from being inadvertently retracted on the ground. No safety pin is provided for the tail gear.

Actuator, Blade Folding (See figure 48, sheet 5). Two are provided to permit two opposite blades to be folded, mainly for parking space considerations. They consist of jackscrews which are installed between movable hub and blade after removing one blade mounting bolt. They are operated by a 1/2 inch drive speed handle.

3. Tow Bar (See figure 49)

The AH-56A compound helicopter uses the standard Army tow bar FSN 1730-294-5320. Two pins of the tow bar engage each side of the tail wheel hollow axle. An adjustable chain between the two legs of the tow bar assure disengagement does not occur.

4. Self Fueling Hose (See figure 50)

The fueling hose is used for fueling from 55 gallon drums when other fueling sources are unavailable. The hose is 36 feet long with a drum adapter, and aircraft quick-disconnect coupler. Dust covers are supplied for each end of the hose, as are grounding clips and plugs.

5. Maintenance Crane and Sling Set (See figure 51, sheets 1 through 6)

The maintenance Crane is a multi-purpose hoist, which is used with a sling set for installation and removal of various aircraft components. It is in kit form and can be readily assembled in either of two configurations, one that mounts the crane on the aircraft, or alternately on a stand for ground operation. The crane weighs 160 pounds when configured for aircraft mounting and 240 pounds, including the stand, in the ground configuration.

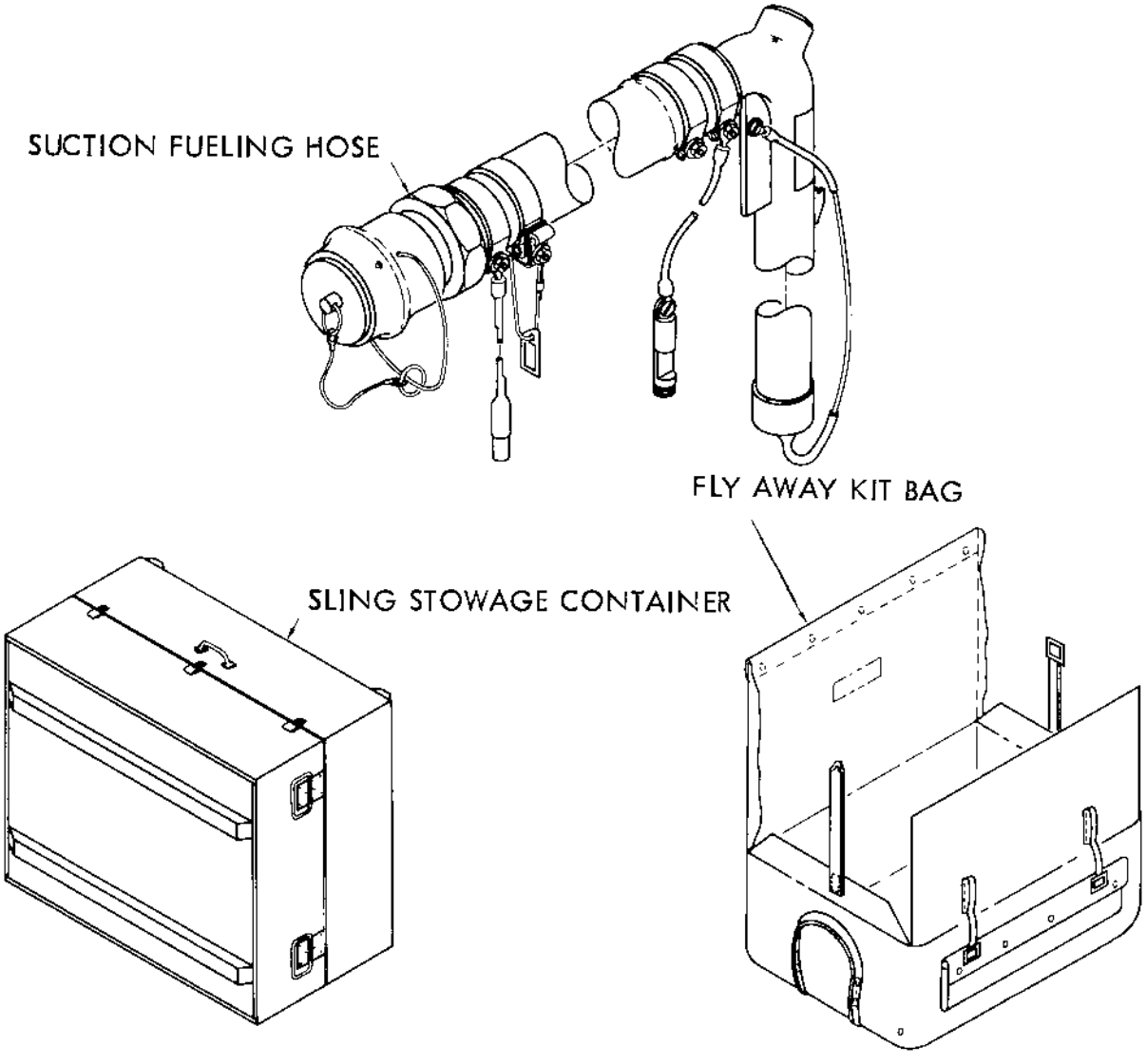
The crane can be attached to the aircraft with or without the wing installed. Adjustable strut and boom positions are determined by the component to be lifted.

Structural capabilities of the crane are as follows:

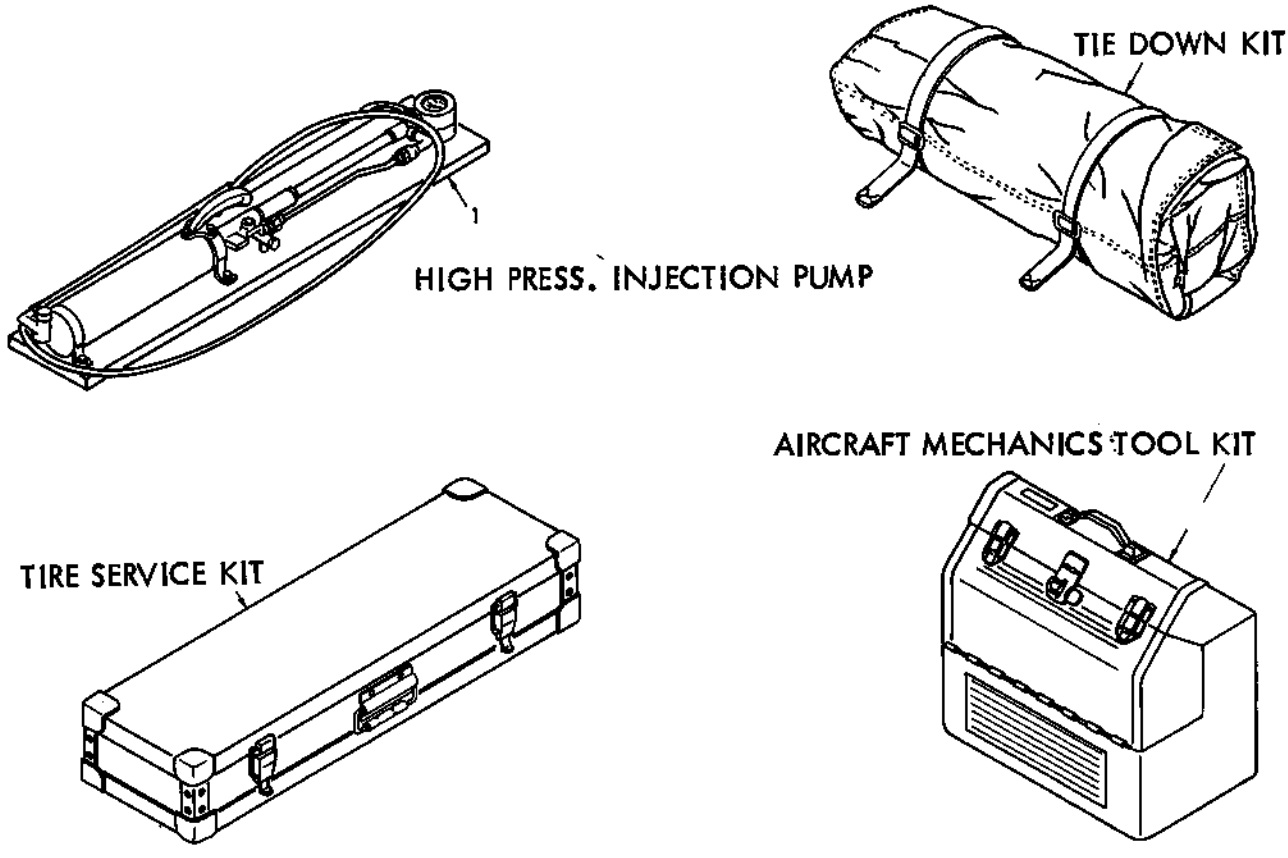
Static Load Limit	1750 lbs.
Proof Load	3500 lbs.
Ultimate Load	5250 lbs.

When used with the individual sling from the sling set, the crane is capable of hoisting the following components (approximate weights shown):

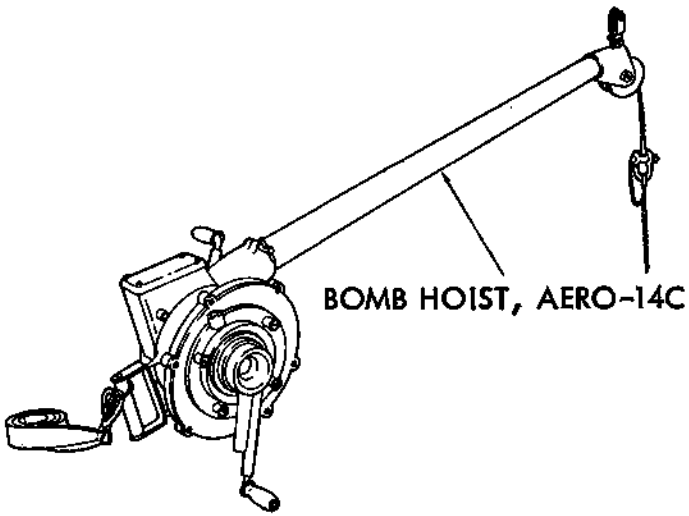
Main Rotor Blade (1)	265 lbs.
Main Rotor Gyro Assembly	50 lbs.
Main Rotor Hub and Gyro, Complete	1350 lbs.
Main Transmission, Complete, Wet	1200 lbs.
Engine (Complete)	900 lbs.
Tail Rotor Assembly, Hub and Blades	160 lbs.
Propeller, Hub and Gear Box	300 lbs.
Wing	125 lbs.
Horizontal Stabilizer	40 lbs.
Swiveling Gunner's Station	280 lbs.

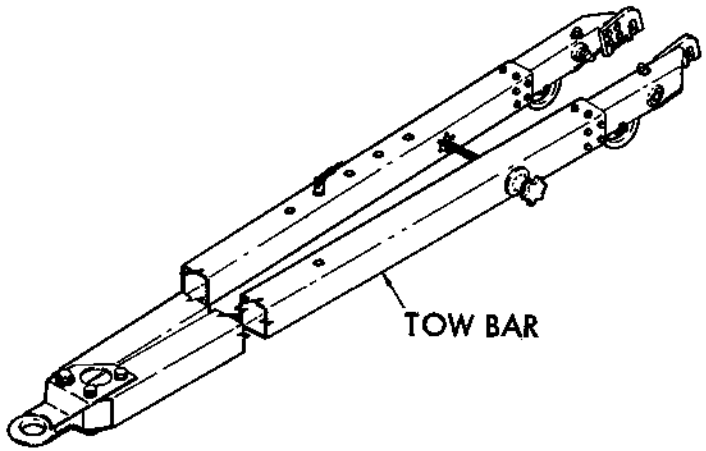


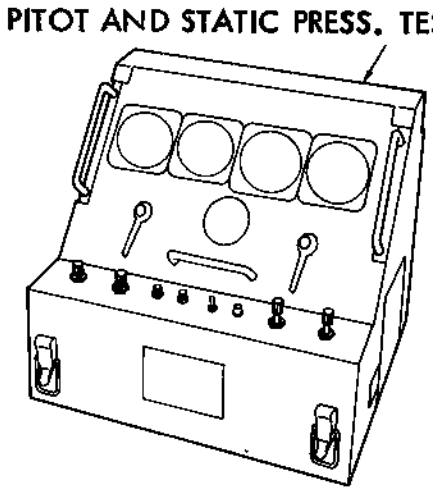
SPECIAL TOOLS AND GROUND SUPPORT EQUIPMENT (SHEET 1 OF 4)

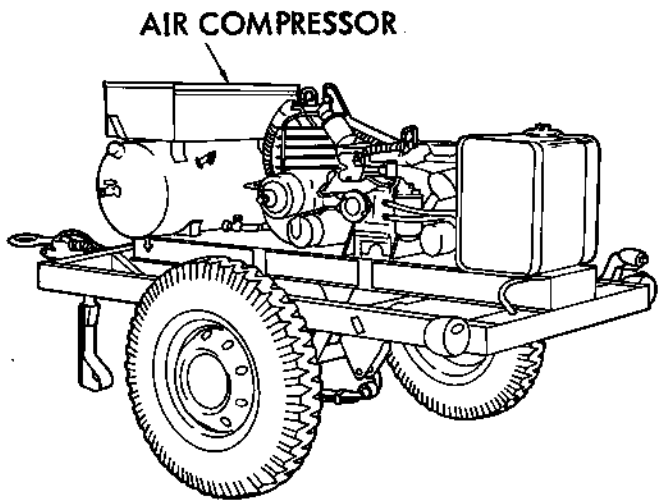


SPECIAL TOOLS AND GROUND SUPPORT EQUIPMENT (SHEET 2 OF 4)



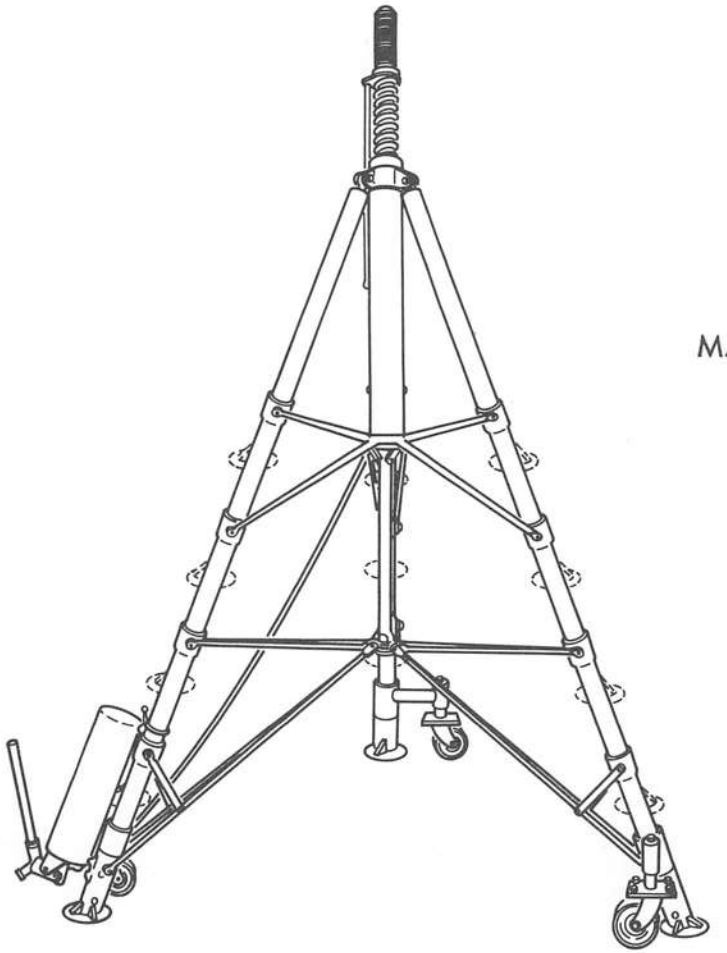




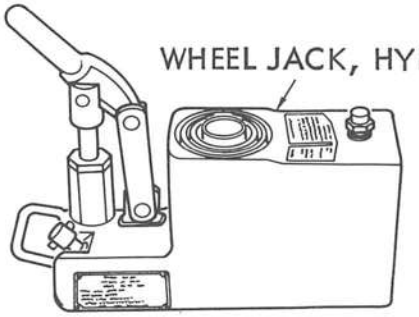


SPECIAL TOOLS AND GROUND SUPPORT EQUIPMENT (SHEET 3 OF 4)

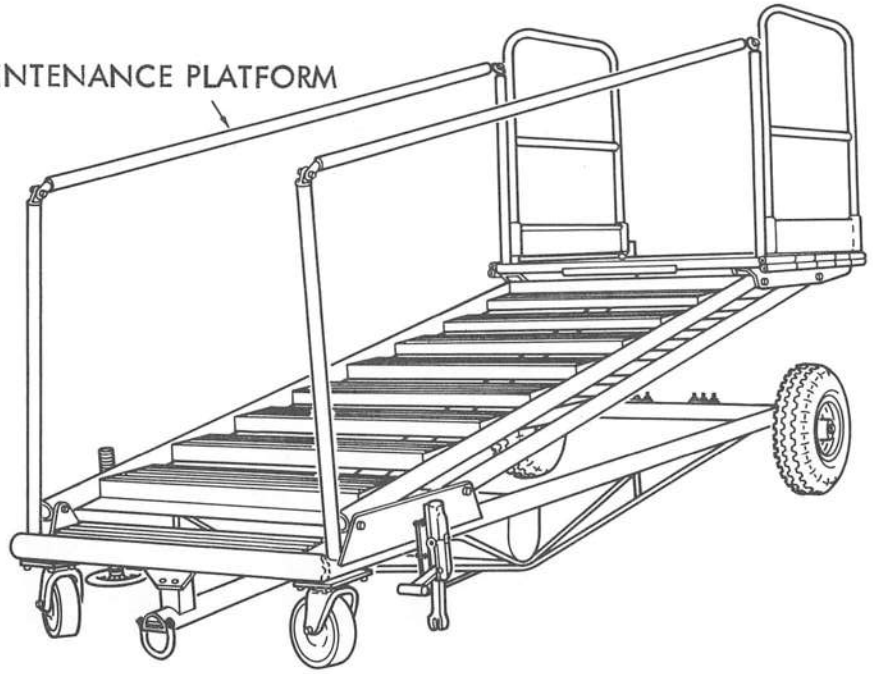
WING AND FUSELAGE JACK, HYD.



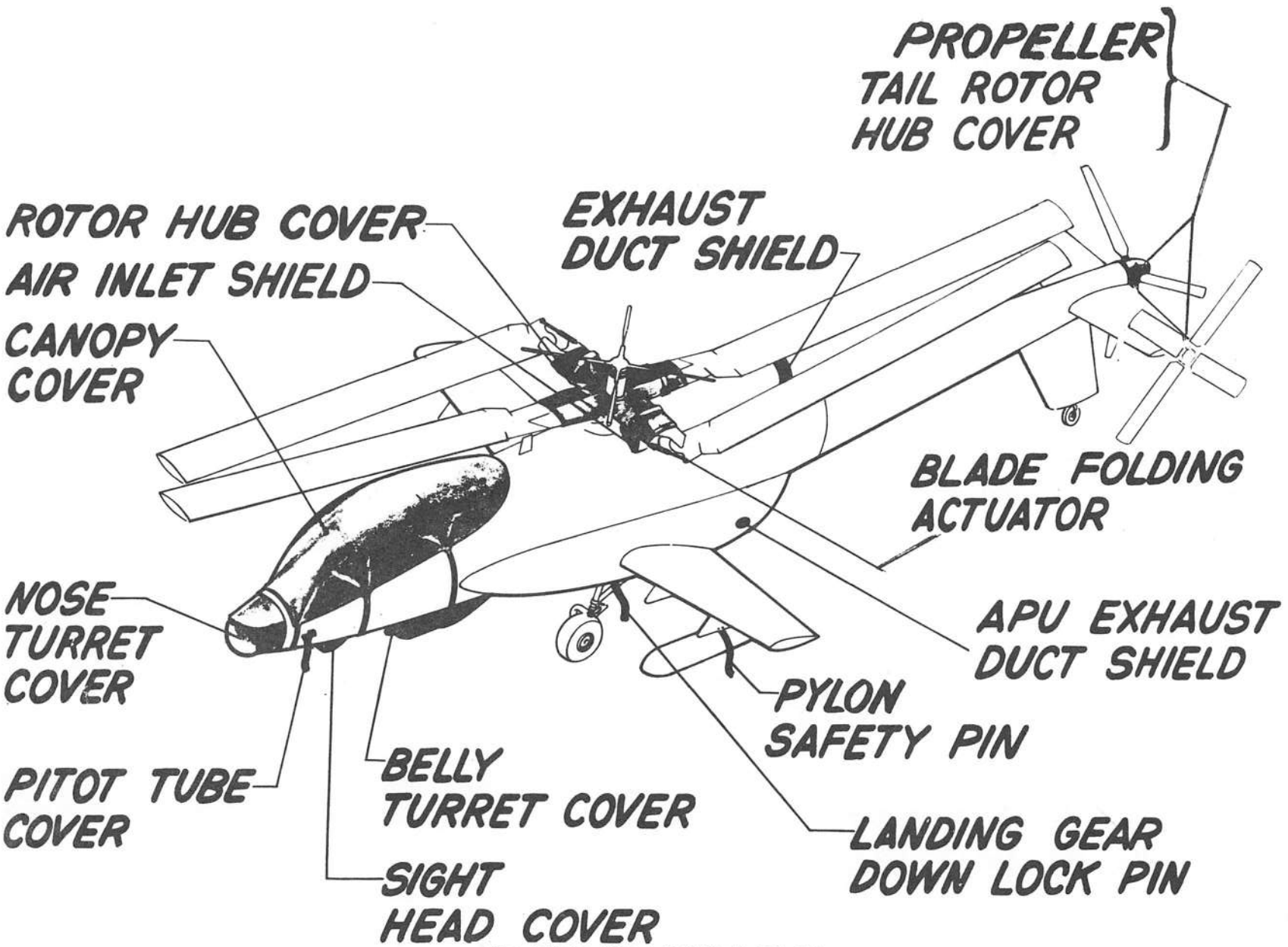
WHEEL JACK, HYD.



MAINTENANCE PLATFORM



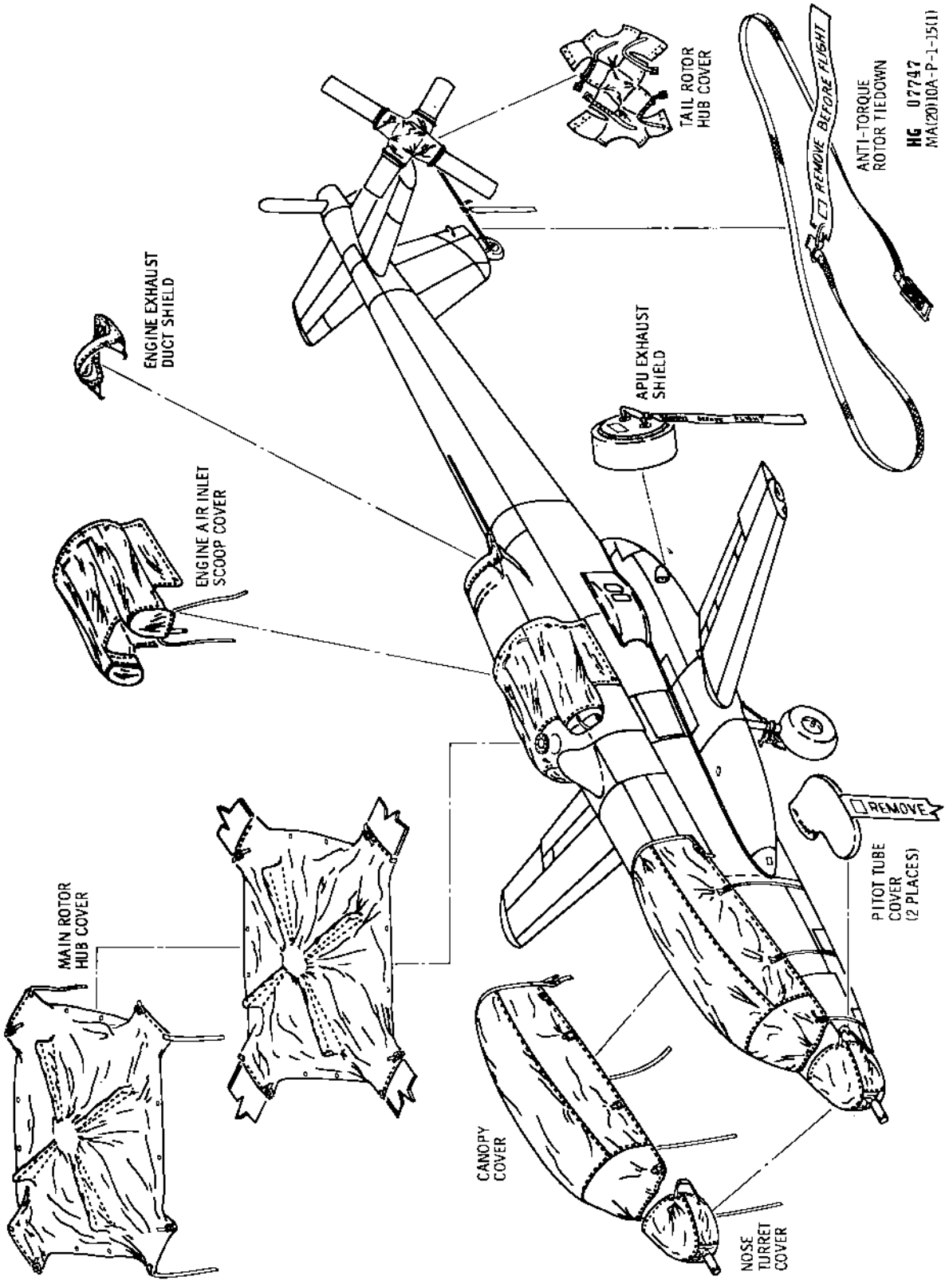
SPECIAL TOOLS AND GROUND SUPPORT EQUIPMENT (SHEET 4 OF 4)



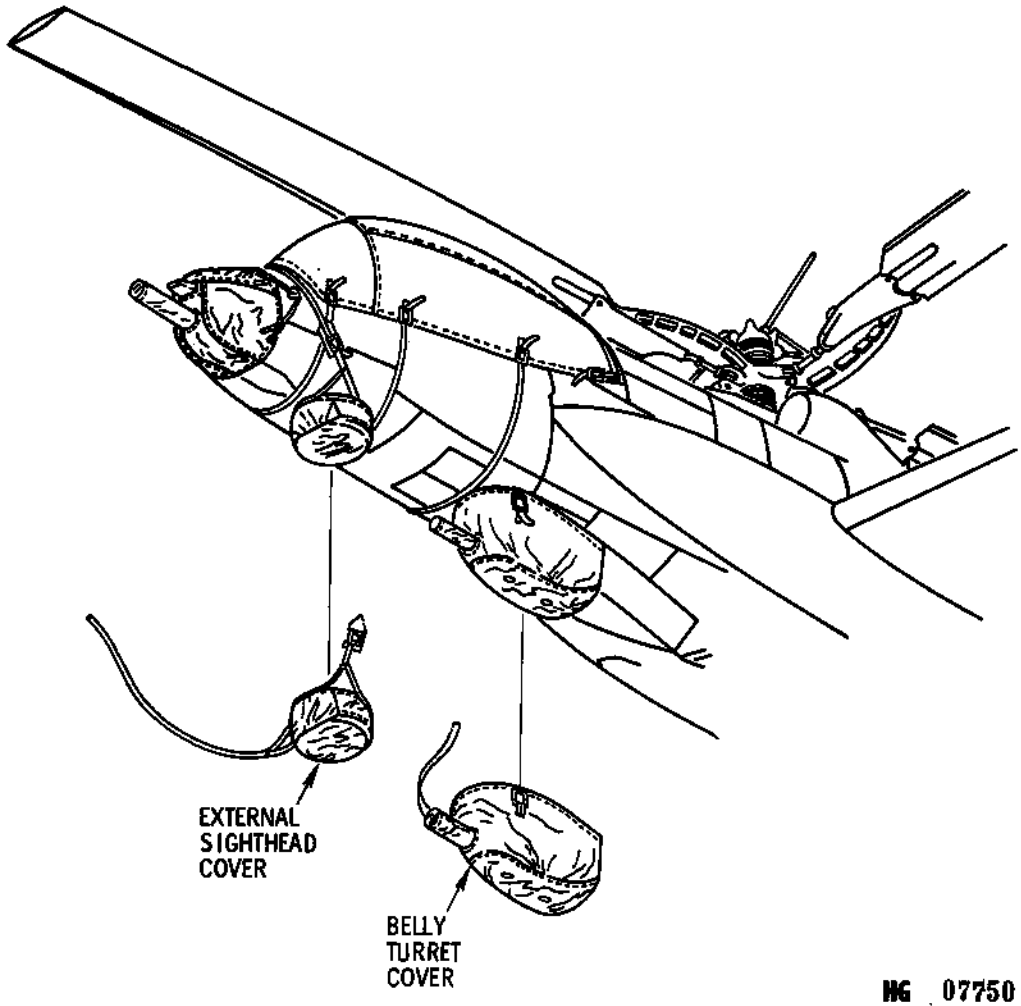
FLYAWAY KIT (SHEET 1 OF 5)

FIGURE 48
AH-56A

FIGURE 48
AH-56A



FLYAWAY KIT (SHEET 2 OF 5)



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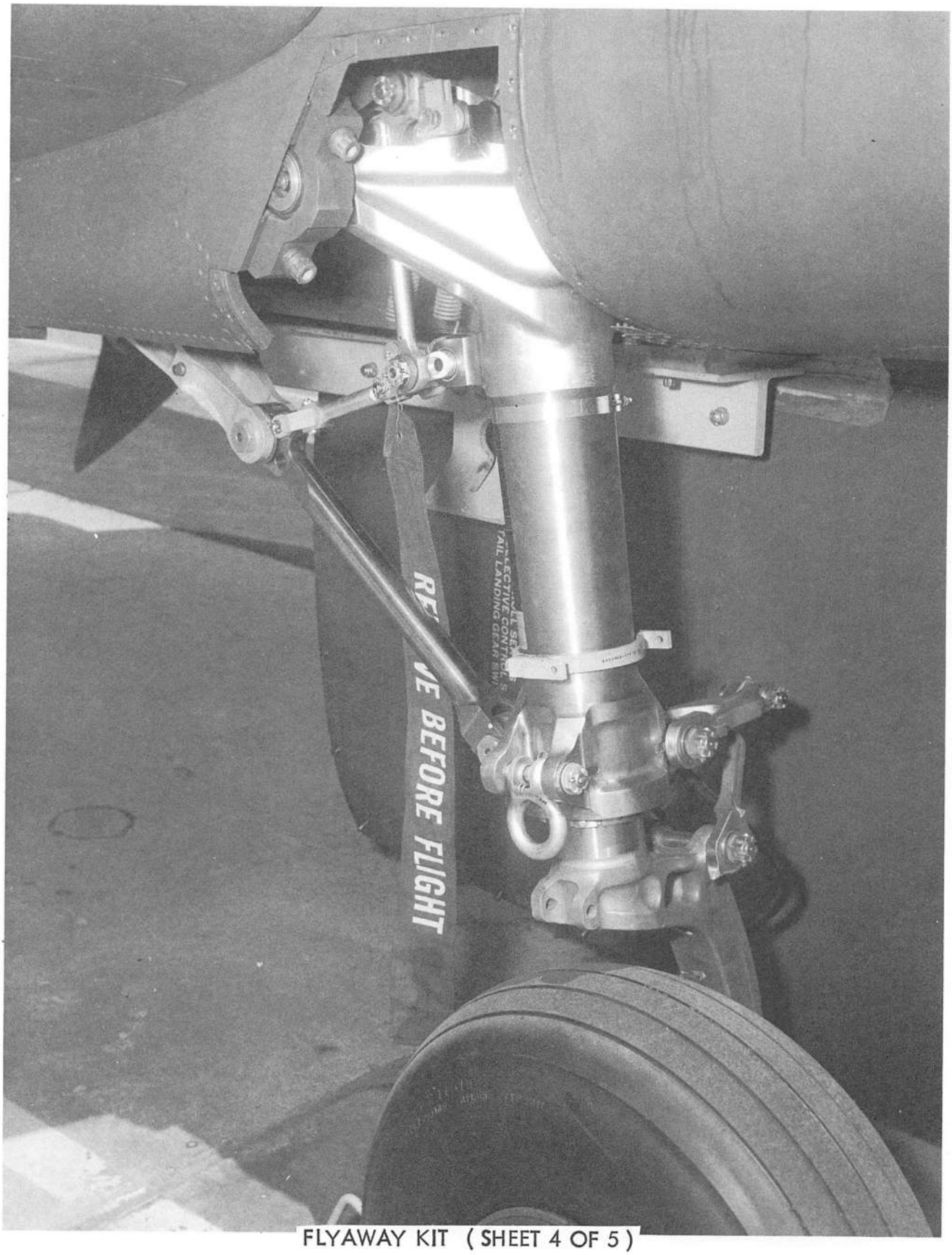
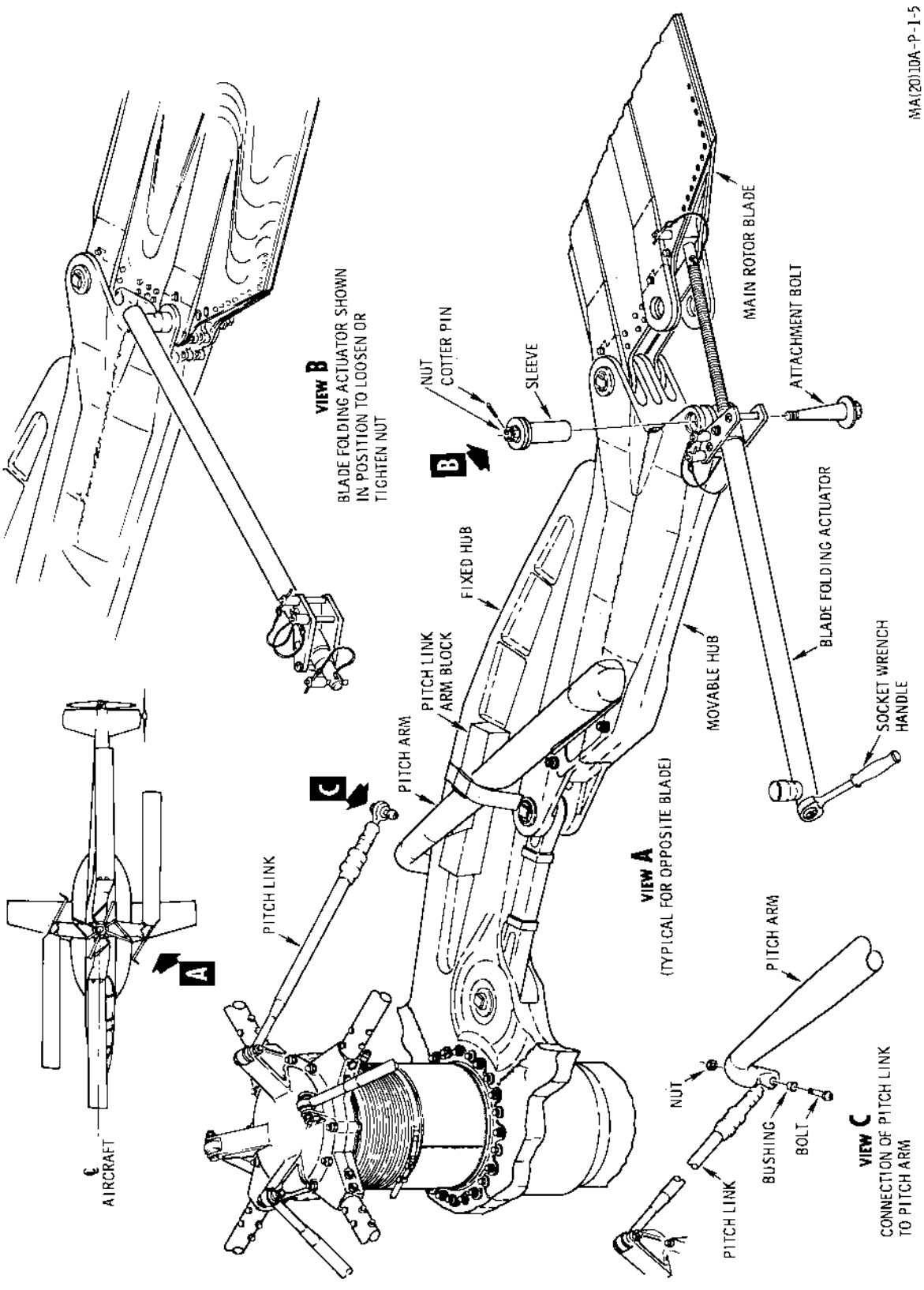
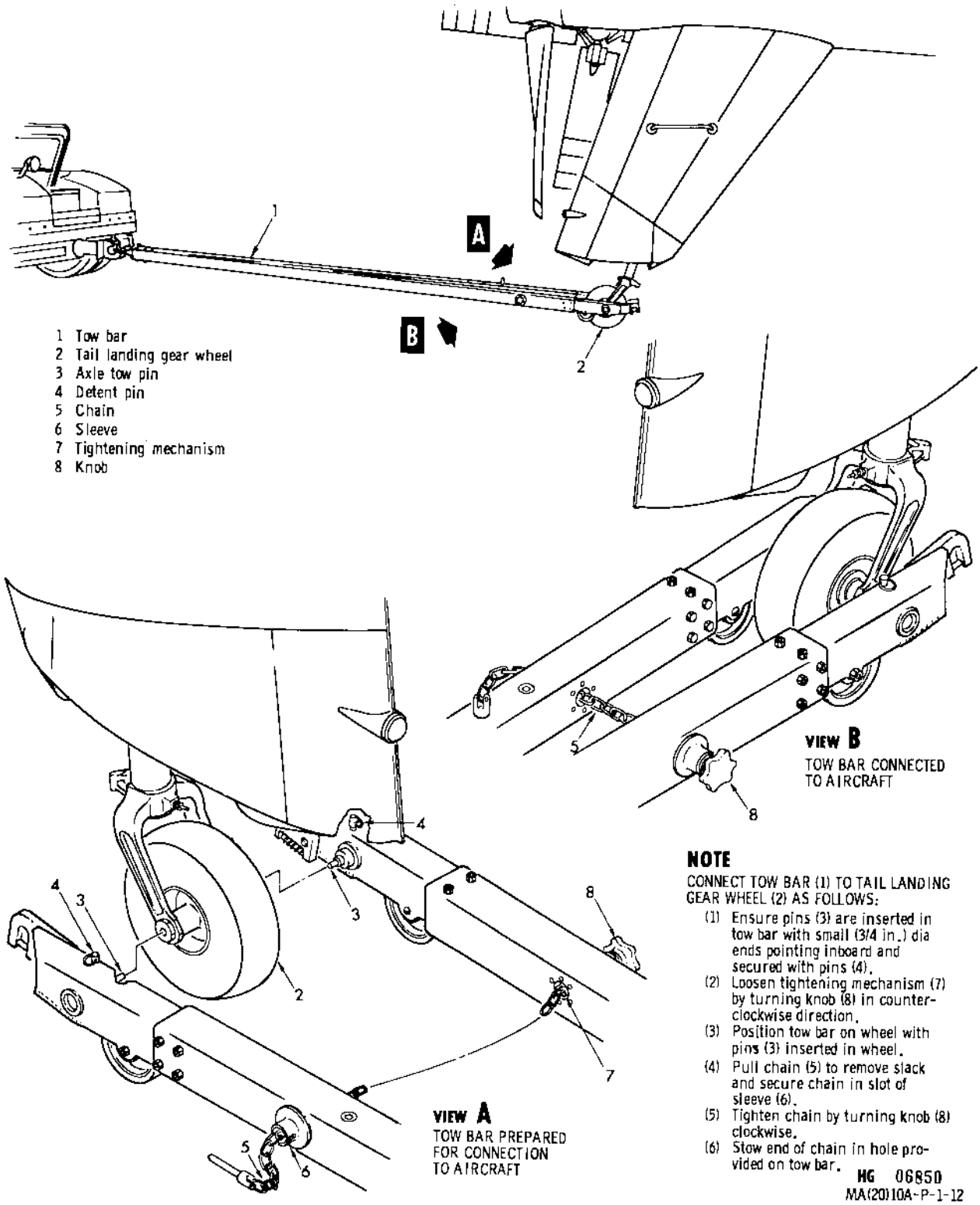
FLYAWAY KIT (SHEET 3 OF 5)



FLYAWAY KIT (SHEET 4 OF 5)


MA(2010A-P-1-5
FLYAWAY KIT (SHEET 5 OF 5)
VIEW B
BLADE FOLDING ACTUATOR SHOWN IN POSITION TO LOOSEN OR TIGHTEN NUT
NUT
COTTER PIN
SLEEVE
MAIN ROTOR BLADE
ATTACHMENT BOLT
FIXED HUB
PITCH ARM
PITCH LINK ARM BLOCK
MOVABLE HUB
BLADE FOLDING ACTUATOR
SOCKET WRENCH HANDLE
VIEW A
(TYPICAL FOR OPPOSITE BLADE)
PITCH LINK
AIRCRAFT
PITCH ARM
NUT
BUSHING
BOLT
PITCH LINK
VIEW C
CONNECTION OF PITCH LINK TO PITCH ARM



1 Tow bar
2 Tail landing gear wheel
3 Axle tow pin
4 Detent pin
5 Chain
6 Sleeve
7 Tightening mechanism
8 Knob

VIEW B
TOW BAR CONNECTED TO AIRCRAFT

VIEW A
TOW BAR PREPARED FOR CONNECTION TO AIRCRAFT

NOTE

CONNECT TOW BAR (1) TO TAIL LANDING GEAR WHEEL (2) AS FOLLOWS:

(1) Ensure pins (3) are inserted in tow bar with small (3/4 in.) dia ends pointing inboard and secured with pins (4).
(2) Loosen tightening mechanism (7) by turning knob (8) in counter-clockwise direction.
(3) Position tow bar on wheel with pins (3) inserted in wheel.
(4) Pull chain (5) to remove slack and secure chain in slot of sleeve (6).
(5) Tighten chain by turning knob (8) clockwise.
(6) Stow end of chain in hole provided on tow bar.

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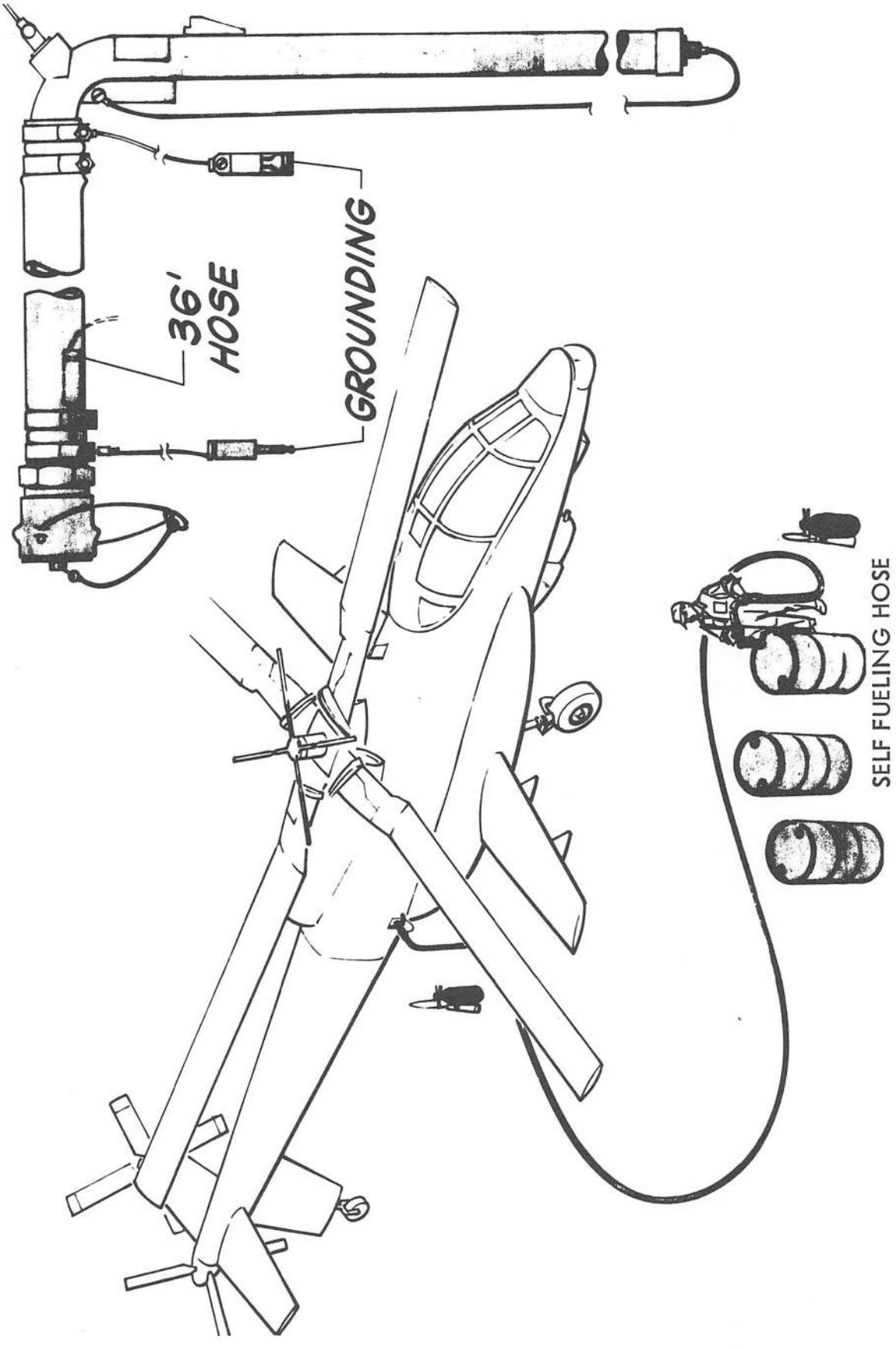
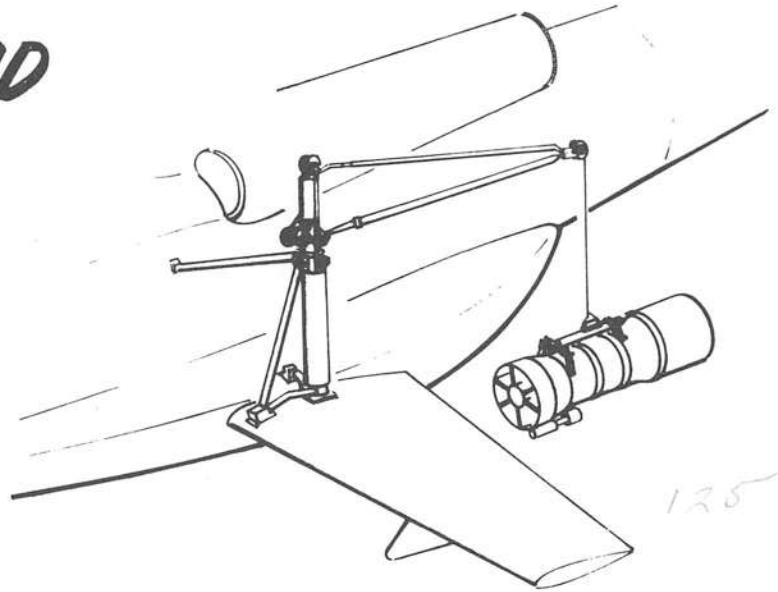
TOW BAR

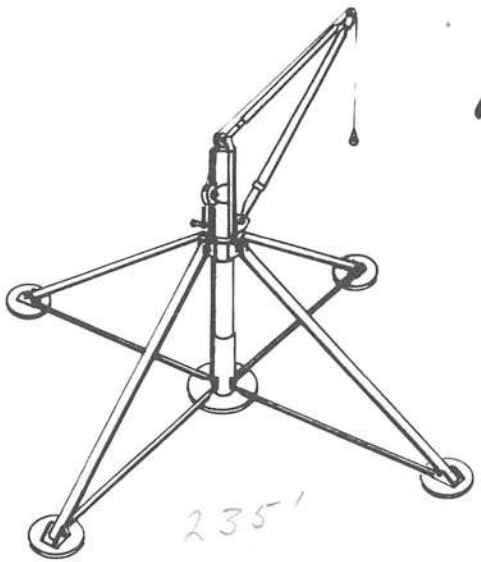
FUELING FROM DRUM



MOUNTED ON GROUND STAND WILL HANDLE FOLLOWING:

- PROPELLER GEAR BOX WITH/WITHOUT PROPELLER
- ROTOR BLADE
- PILOTS SEAT
- SWIVELLING GUNNER'S STATION
- WING
- ENGINE HOT SECTION
- COWLING



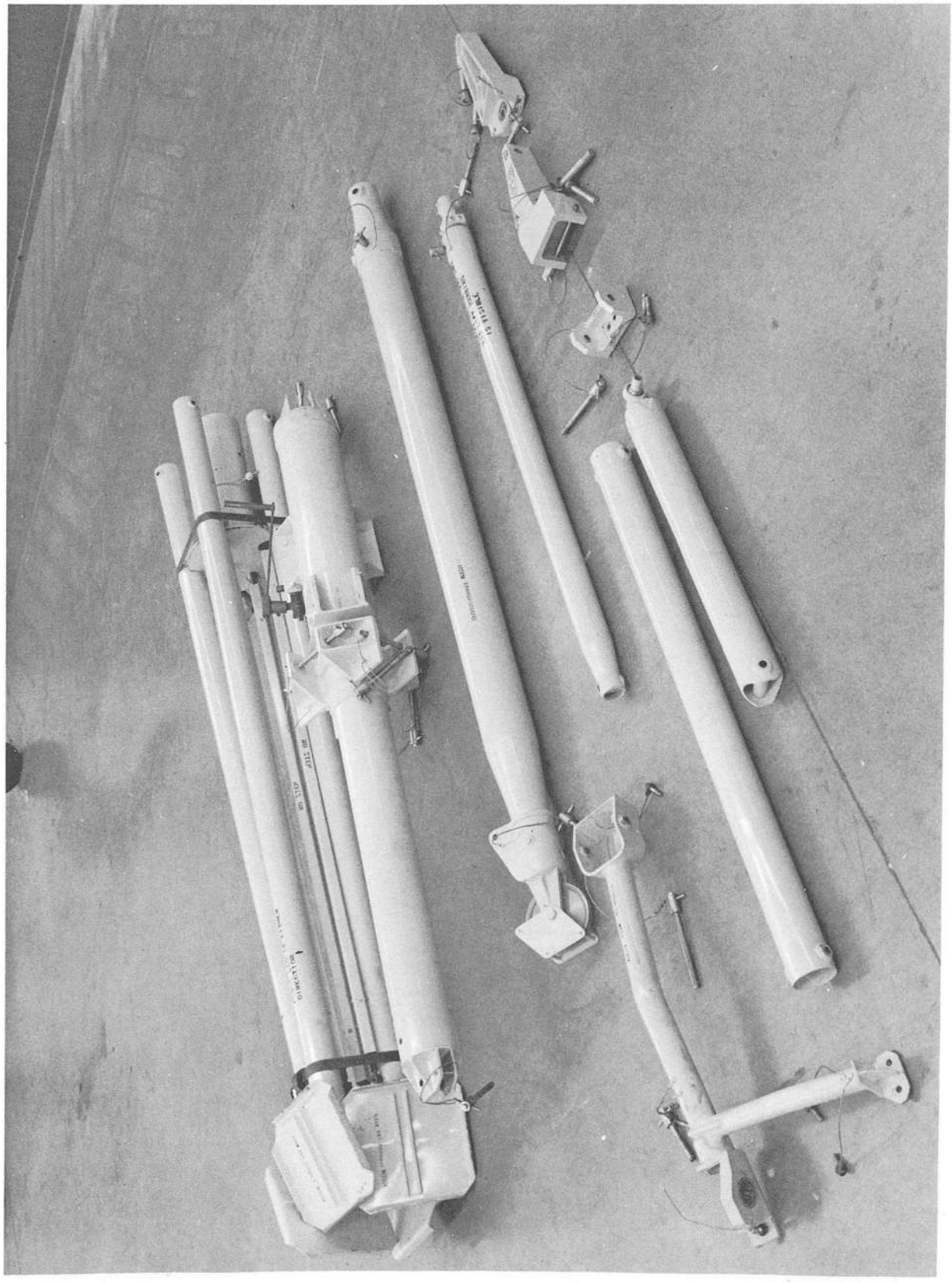


MOUNTED ON VEHICLE WILL HANDLE FOLLOWING:

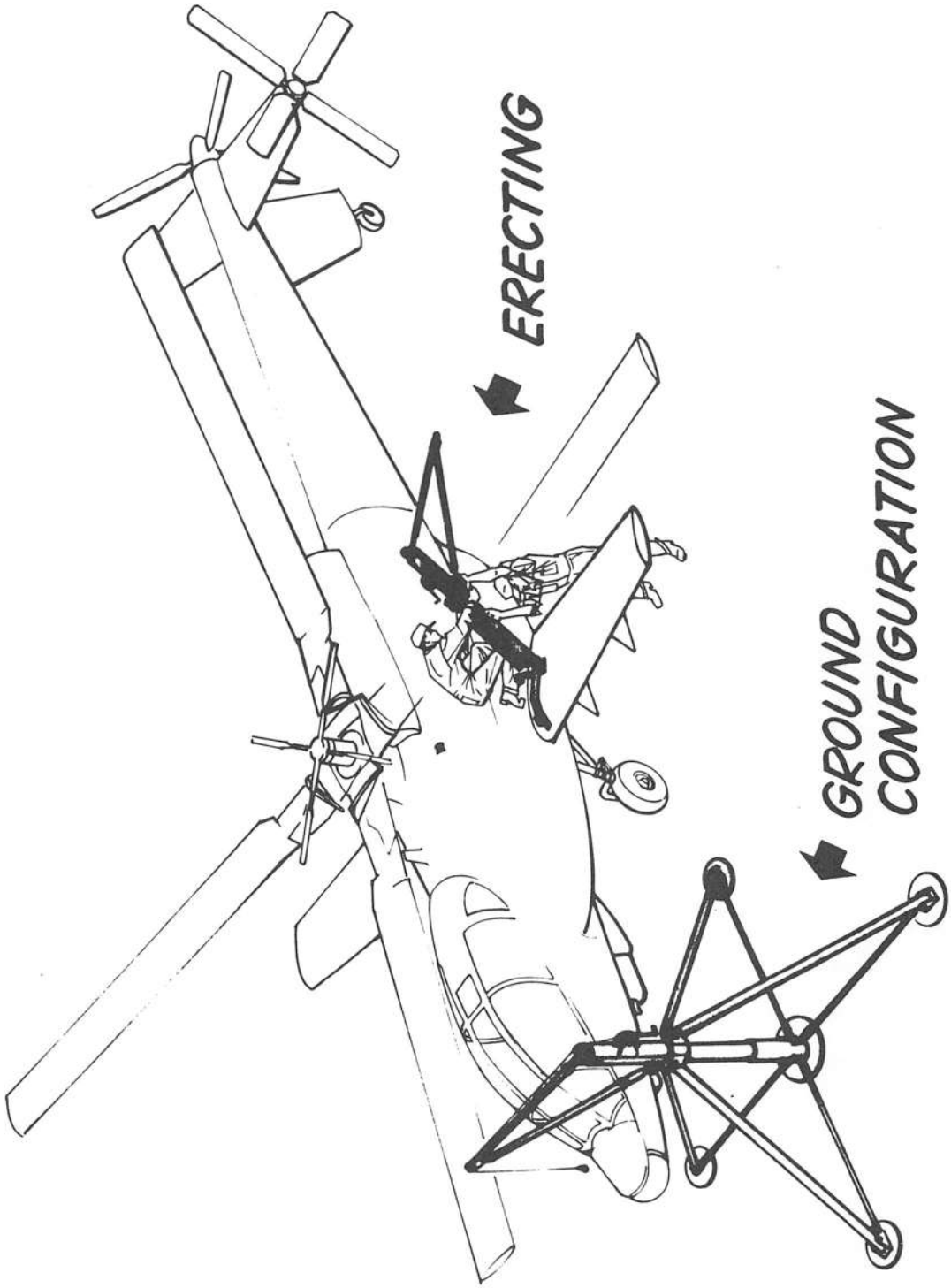
- TRANSMISSION
- ENGINE
- ROTOR HUB
- GYRO
- ROTOR BLADE

MAINTENANCE CRANE AND SLING SET, (SHEET 1 OF 6)

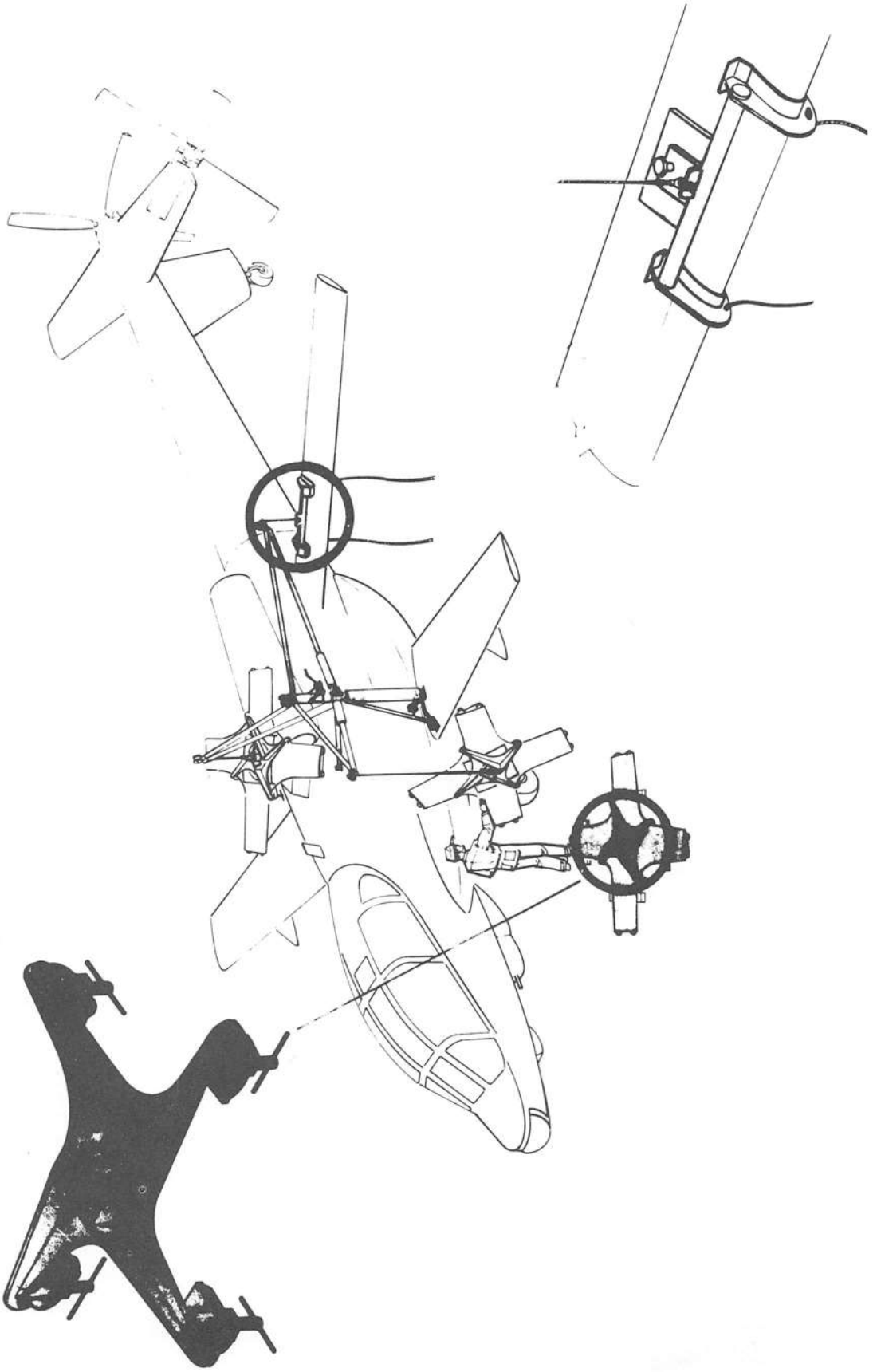
FIGURE 51
AH-56A



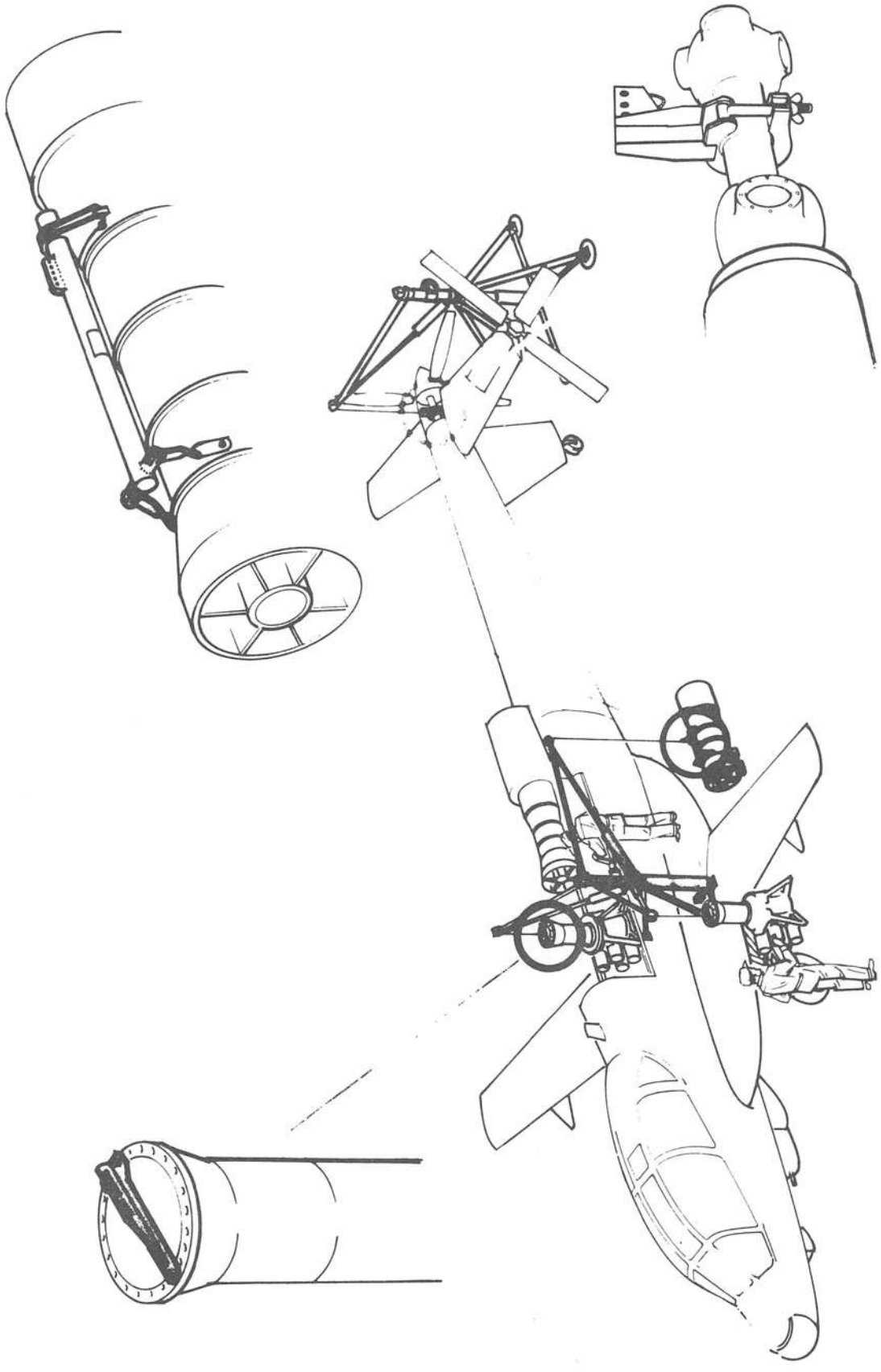
MAINTENANCE CRANE AND SLING SET, (SHEET 2 OF 6)



MAINTENANCE CRANE AND SLING SET, (SHEET 3 OF 6)

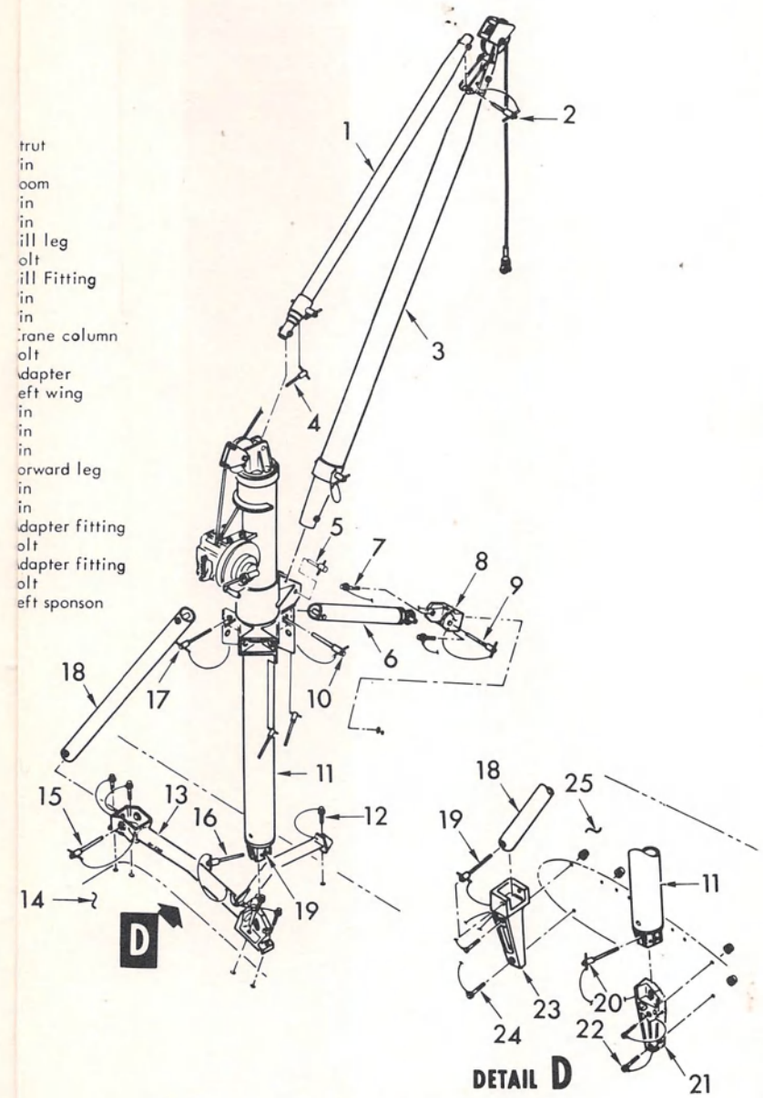


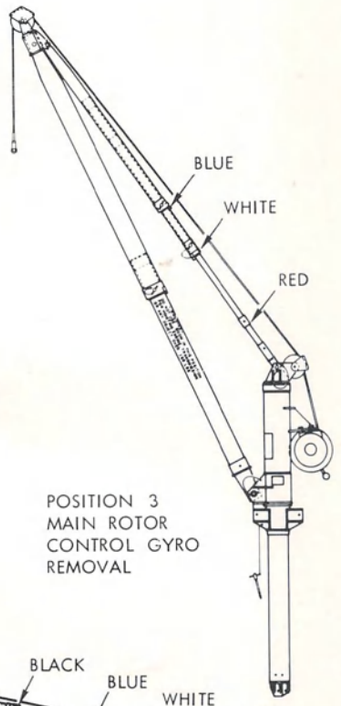
MAINTENANCE CRANE AND SLING SET, (SHEET 4 OF 6)



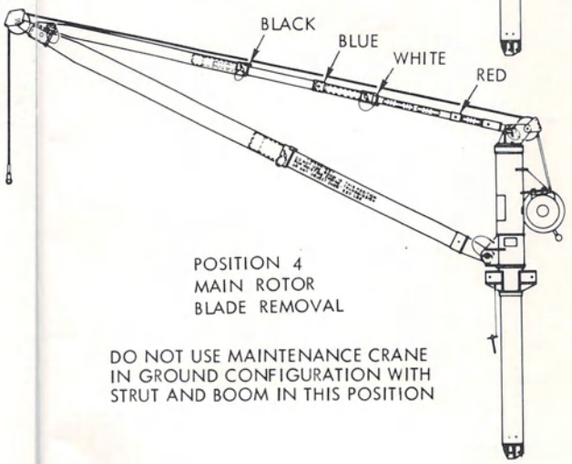
MAINTENANCE CRANE AND SLING SET, (SHEET 5 OF 6)

STRUT AND BOOM POSITION	MAXIMUM WEIGHT WHICH CAN BE LIFTED	COLOR BANDS SHOWING ON STRUT
1	1750 LB	NONE
2	1750 LB	NONE
3	280 LB	RED, WHITE, BLUE
4	280 LB	RED, WHITE, BLUE BLACK





POSITION 3
MAIN ROTOR
CONTROL GYRO
REMOVAL

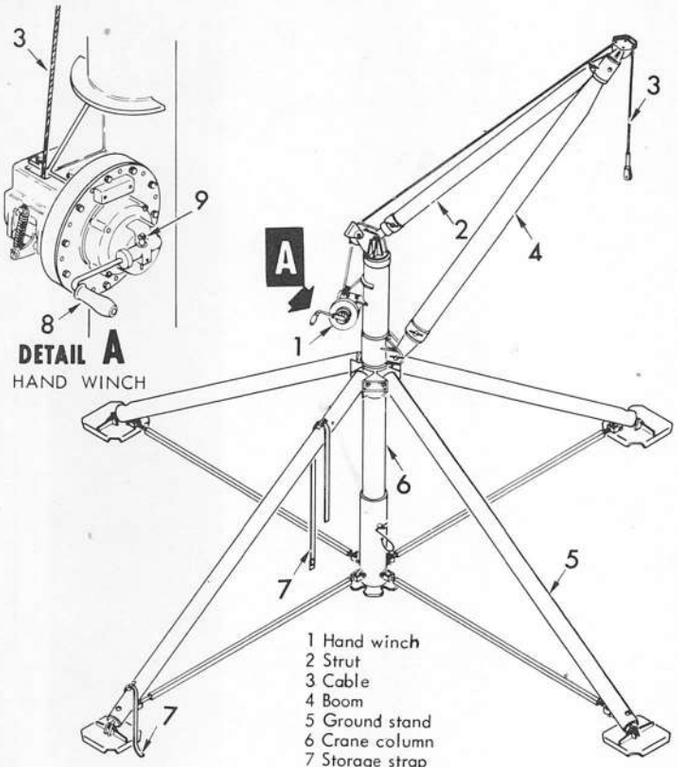


POSITION 4
MAIN ROTOR
BLADE REMOVAL

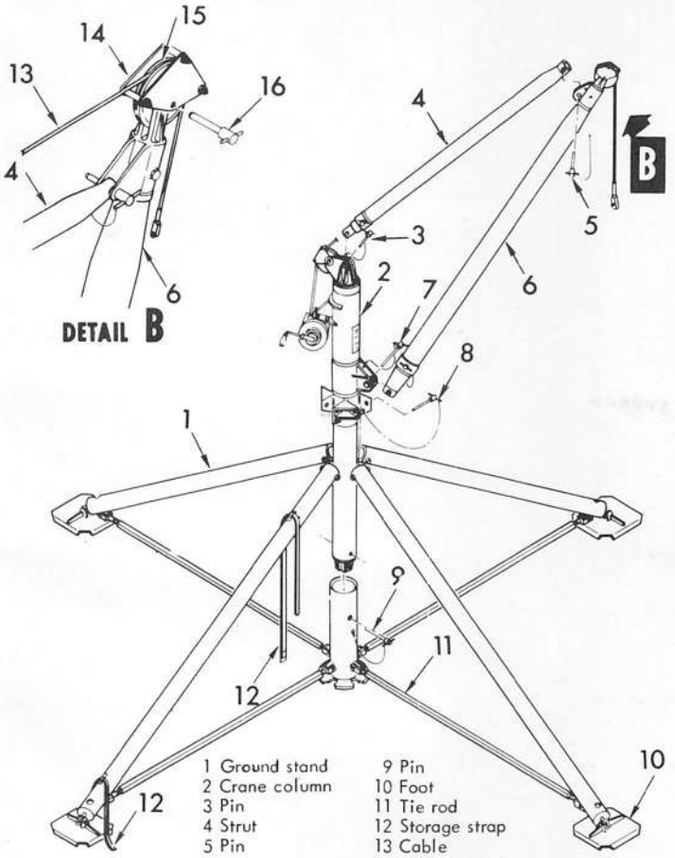
DO NOT USE MAINTENANCE CRANE
IN GROUND CONFIGURATION WITH
STRUT AND BOOM IN THIS POSITION

MAINTENANCE CRANE AND SLING SET, (SHEET 6 OF 6)

Lockheed-California Company
Military Maintenance Training

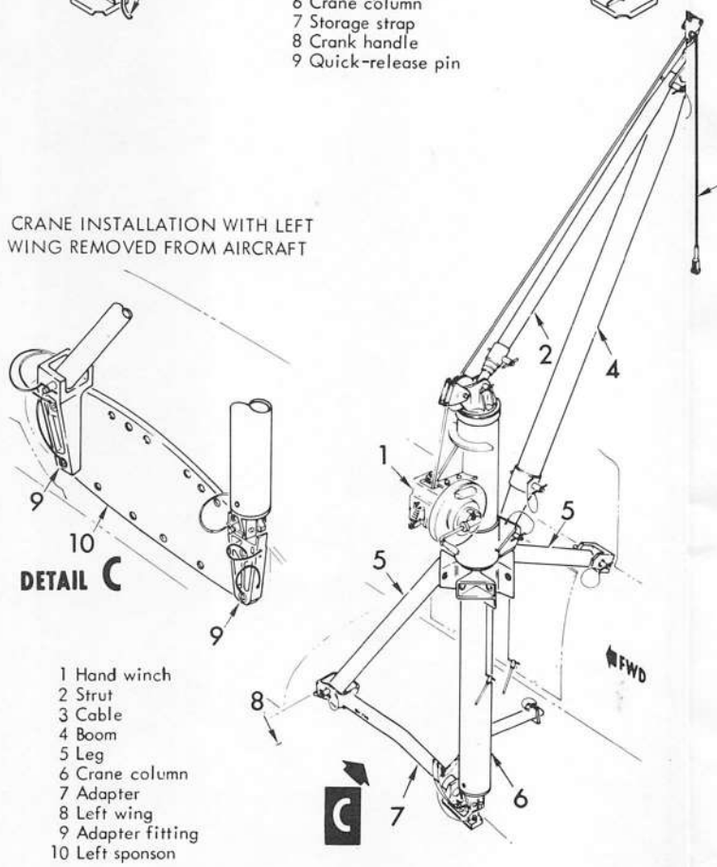


1 Hand winch
2 Strut
3 Cable
4 Boom
5 Ground stand
6 Crane column
7 Storage strap
8 Crank handle
9 Quick-release pin

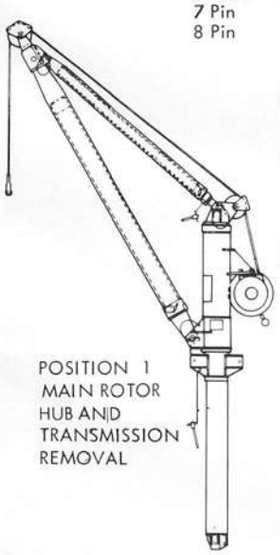


1 Ground stand
2 Crane column
3 Pin
4 Strut
5 Pin
6 Boom
7 Pin
8 Pin
9 Pin
10 Foot
11 Tie rod
12 Storage strap
13 Cable
14 Pulley guard
15 Pulley
16 Pin

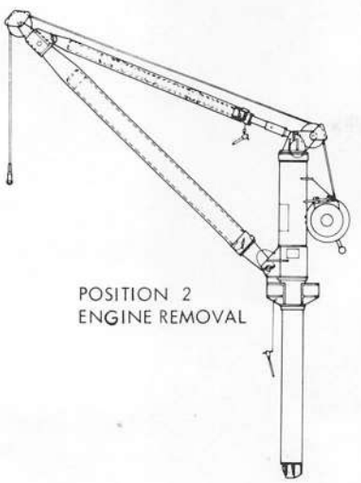
CRANE INSTALLATION WITH LEFT WING REMOVED FROM AIRCRAFT



1 Hand winch
2 Strut
3 Cable
4 Boom
5 Leg
6 Crane column
7 Adapter
8 Left wing
9 Adapter fitting
10 Left sponson



POSITION 1
MAIN ROTOR
HUB AND
TRANSMISSION
REMOVAL



POSITION 2
ENGINE REMOVAL

1 S
2 P
3 B
4 P
5 P
6 S
7 B
8 S
9 P
10 P
11 C
12 B
13 A
14 L
15 P
16 P
17 P
18 F
19 P
20 P
21 A
22 B
23 A
24 B
25 L

VI. SUPPLEMENTARY DATA

A. Honeycomb Construction and Sample Repairs (See figure 52, sheets 1 through 6).

Honeycomb material is used extensively throughout the secondary fairing structure of the AH-56A compound helicopter. Honeycomb construction is principally of two types; aluminum honeycomb core faced with aluminum sheet, or faced with laminated pre-impregnated epoxy glass cloth, such as utilized in the forward sponsons. Although official repair procedures and techniques involving honeycomb are scheduled for subsequent release, the following general information is included herein as being representative of the forthcoming data.

Some important reasons for using honeycomb, or sandwich structure, in aircraft are included in the following:

Yields a high strength to weight ratio, or more strength for less weight, for the materials used in its construction.

Almost all commonly used structural materials can be fabricated into a honeycomb configuration.

Honeycomb can be produced to exacting standards.

Advanced manufacturing technology permits high production rates and is readily available.

High rigidity characteristics, when used in secondary paneling and fairings, permit use of simple and wide spaced fasteners, which generally enhances removal and replacement.

Procedures for manufacturing honeycomb structure are varied and complicated in many instances. For a better understanding in the maintenance, inspection, and repair of honeycomb structure, a very brief description of fabricating procedures is deemed appropriate.

All metal honeycomb sandwich consists of the honeycomb core, which varies in individual cell size and shape as well as wall thickness, and the facing sheets of alclad aluminum, steel, plastic, etc.

Using aluminum sheet as an example, the inner sheet is usually formed in the shape of a pan with one inch flanges which mates flush with the outer facing sheet, leaving approximately a one inch space between the facings throughout the rest of the assembly. The actual honeycomb core is machined to fill this space and closely follows the formed contours. The alclad aluminum sheets are then thoroughly cleaned by immersing them in a solution of alkaline cleaner at a temperature of 170°F to 190°F for 10 to 15 minutes. They are then rinsed in agitated water for 3 to 5 minutes. The rinse is followed by immersion for 3 to 5 minutes in a 24 percent (by weight) solution of sulfuric acid, and 12 percent sodium dichromate in water at 150°F. Parts are again rinsed and forced hot air dried in an oven at 160°F to 210°F. At this point the parts cannot be touched with the hand, and are further protected from contamination under

"clean-room" conditions.

Application of adhesive must be accomplished within 16 hours of cleaning, or the parts must be re-cleaned. Liquid adhesive is applied to the facing sheets to a dried thickness of .0002 inch to .0015 inch by either spray or roller. The adhesive is dried at room temperature for 30 minutes, followed by forced air oven drying at temperatures between 160°F and 220°F for one hour. Both sides of the honeycomb core are primed with adhesive, using a roller, and similarly dried. A sheet of film adhesive is then applied to all faying surfaces. These adhesive coated parts then must be assembled under proper heat and pressure within 14 days.

When the components are assembled, they are generally positioned in some type of simple holding fixture, and placed in an autoclave (oven). The assembly is then often shrouded with an airtight covering to which vacuum pump hoses are attached. The vacuum aids in evacuating trapped air from the assembly and adhesive. Air pressure is applied within the autoclave at 5 to 50 pounds at temperatures ranging up to 350°F for up to 1 hour. Degassing can be accomplished by momentarily releasing pressure and then reapplying full bonding pressure. After bonding, the assemblies are cooled under pressure at approximately 140°F, and are then removed and stored vertically in an area free of air movement and temperature changes to minimize warpage.

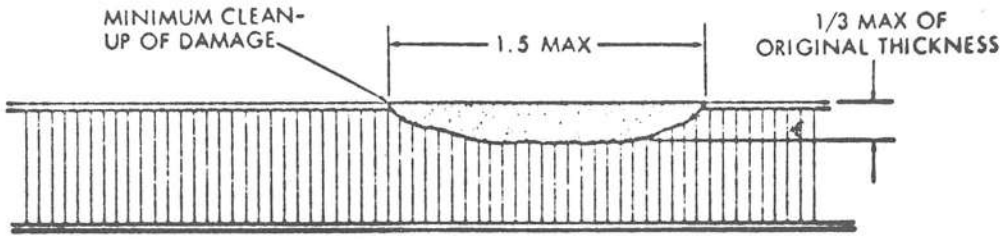
One of the most critical areas of honeycomb construction, in regard to fatigue characteristics, is the attachment points, especially those around the flanges. Care should be exercised in replacing these fasteners, and in avoiding rough handling during removal and replacement.

Environment can have a degrading effect on honeycomb structure when facing sheet and fastener sealing integrity has deteriorated. Humidity, moisture, various fluids and gasses, all have a deteriorating effect on the core and bonding adhesive if permitted to enter the interior areas through poorly sealed flanges and fasteners. Entrapped moisture can cause corrosion, facing to core bond separation, and delamination of fiberglass type facings. Generally, areas of moisture accumulation must be radiographically inspected to determine if corrosion is present.

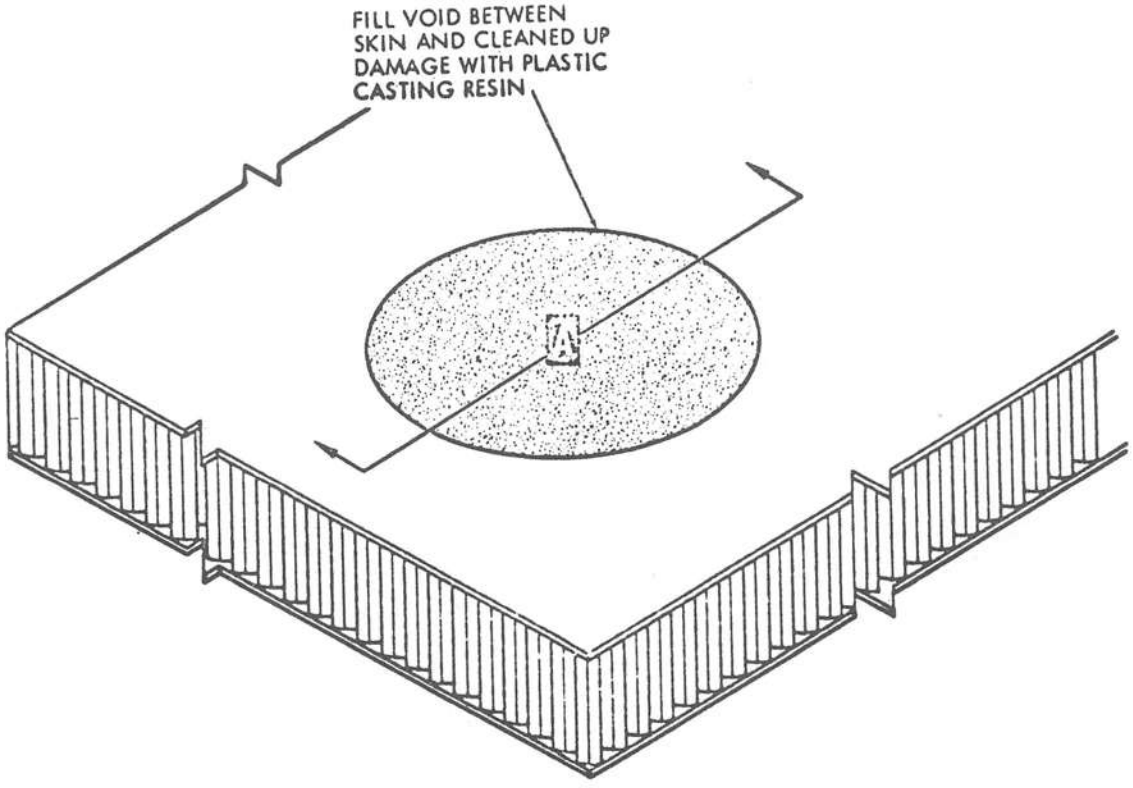
When moisture and corrosion exist, and it is further determined the affected area is reparable according to applicable repair manuals, the required procedure will be approximately as follows:

> The allowable repair area will not usually be more than three (3) inches in diameter. An approximate one (1) inch hole is cut through the inner facing, if it is accessable, and through the core to the opposite facing. Using a heavy gauge wire, or other suitable tool, the individual core cells around the hole containing moisture are punctured. A suitable shroud with vacuum pump provisions is secured over the affected area along with a heat blanket. Heat is applied at approximately 190°F and vacuum is cycled from 0 to 15 inches Hg to the area for two (2) to four (4) hours, or until the area is thoroughly dry. A core plug of next higher density, coated with film adhesive is inserted. Overlay patches of glass cloth are temporarily taped over the plug while the assembly is oven bonded.

TYPICAL REPAIR OF HONEYCOMB STRUCTURE
(MONOR DAMAGE TO OUTER OR INNER SKIN AND HONEYCOMB CORE)

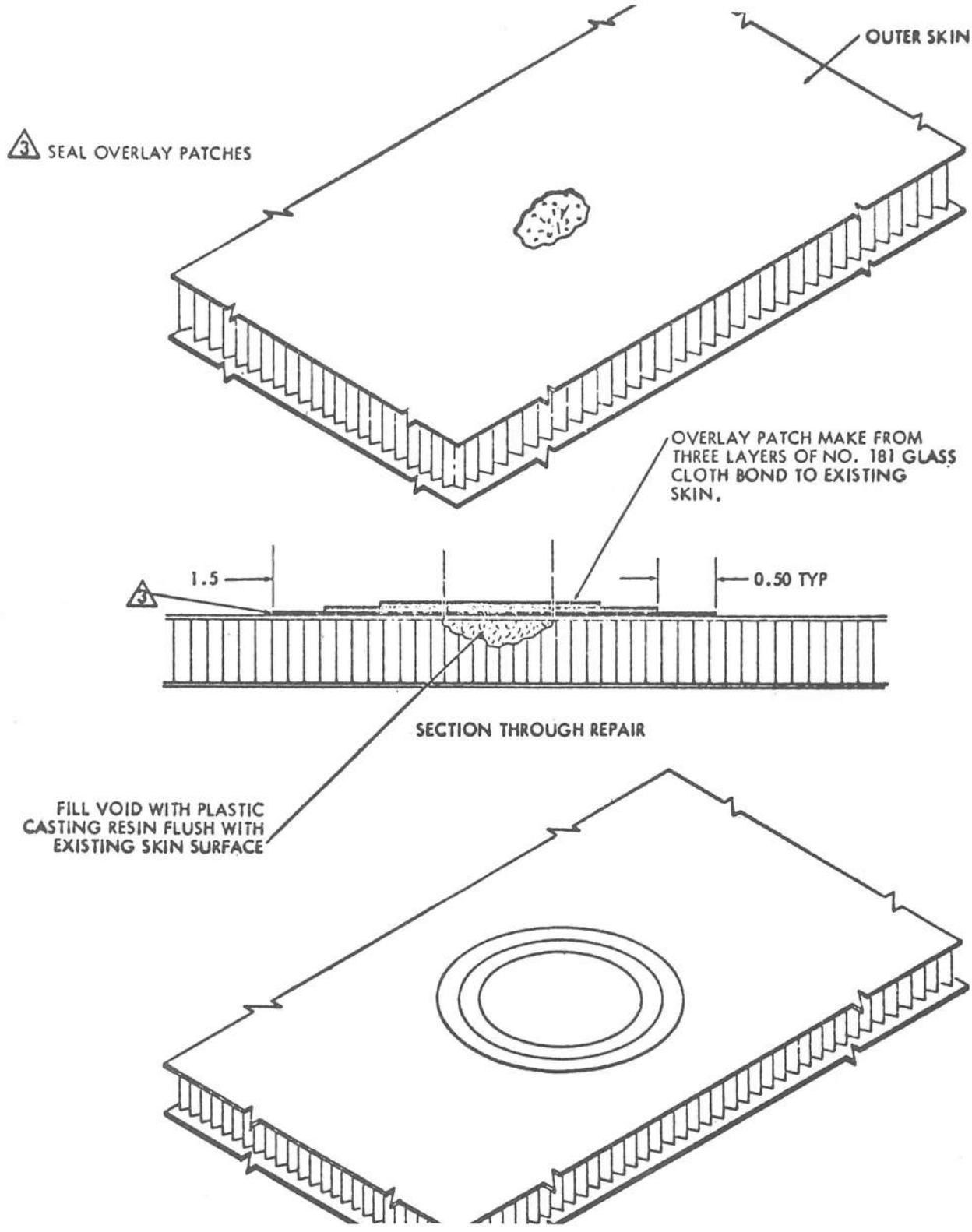


A SECTION THROUGH REPAIR



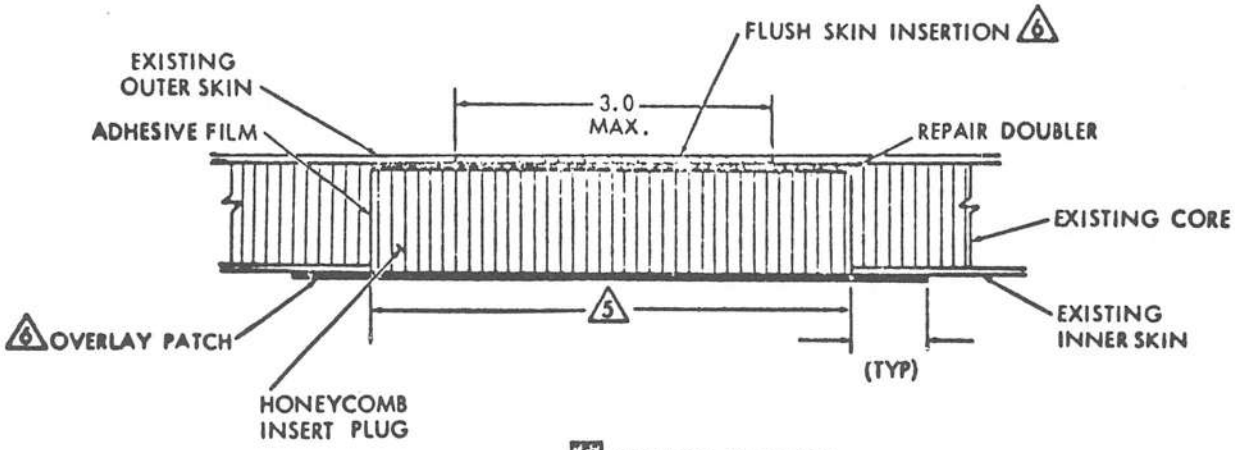
HONEYCOMB CONSTRUCTION AND TYPICAL REPAIRS, (SHEET 1 OF 6)

ONE-TIME FERRY FLIGHT REPAIR - HONEYCOMB STRUCTURE



HONEYCOMB CONSTRUCTION AND TYPICAL REPAIRS, (SHEET 2 OF 6)

TYPICAL FLUSH REPAIR OF HONEYCOMB STRUCTURE
(DAMAGE TO INNER AND OUTER SKINS AND HONEYCOMB CORE)



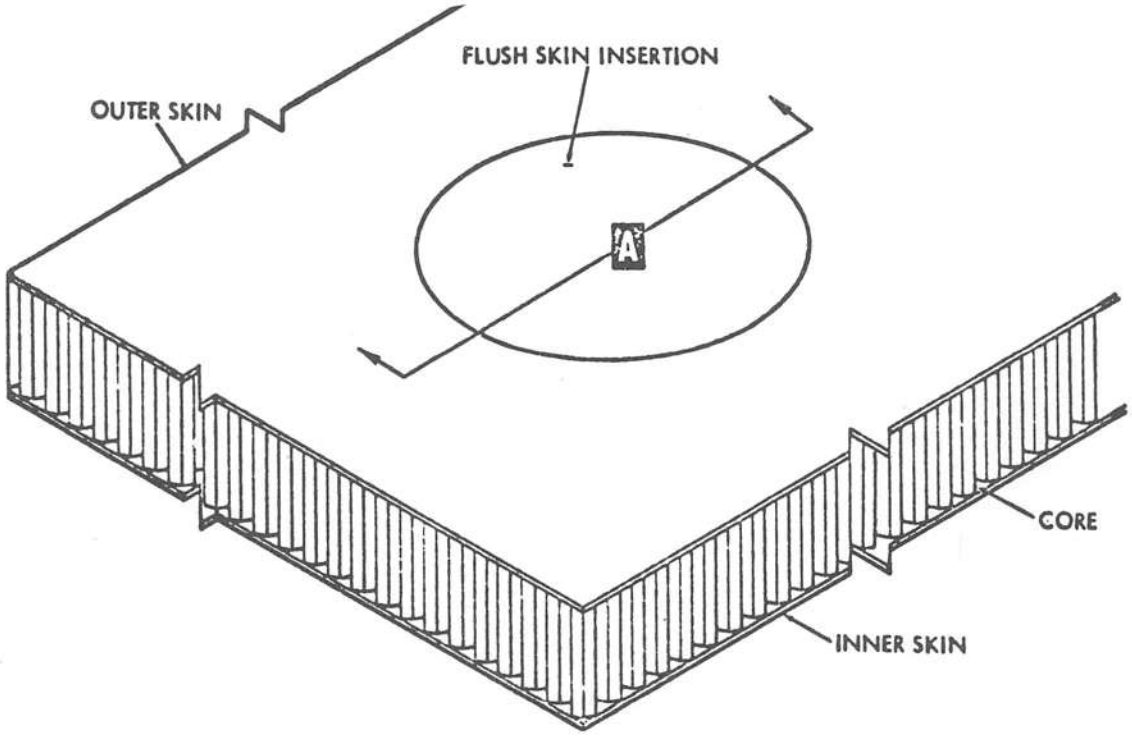
NOTE

MAKE DOUBLER AND OVERLAY PATCH FROM SAME TYPE MATERIAL ONE GAGE HEAVIER THAN EXISTING SKIN.

MAKE HONEYCOMB INSERT PLUG FROM EXISTING TYPE AND SIZE HONEYCOMB CORE.

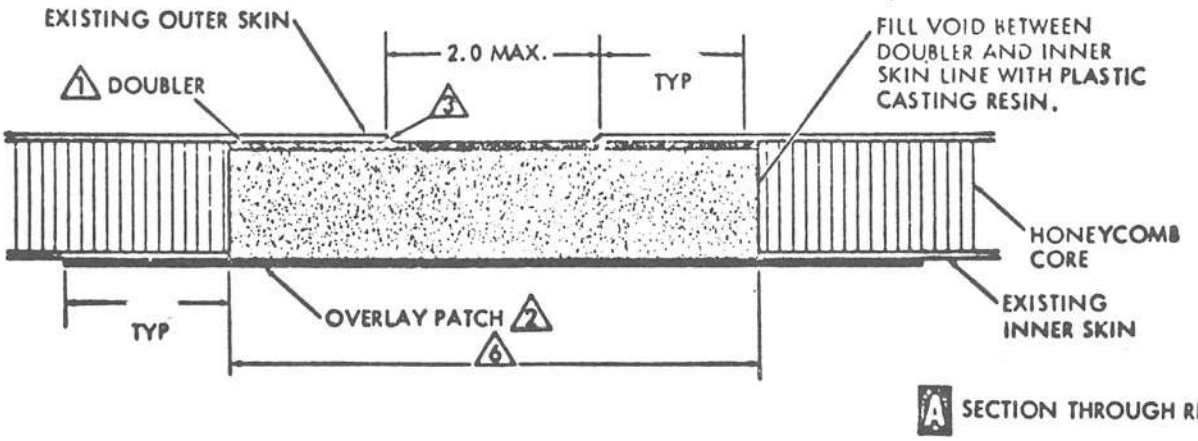
5 DIAMETER 3.0 INCH PLUS OVERLAP

6 SEAL OVERLAY PATCH AND INSERTION PATCH.



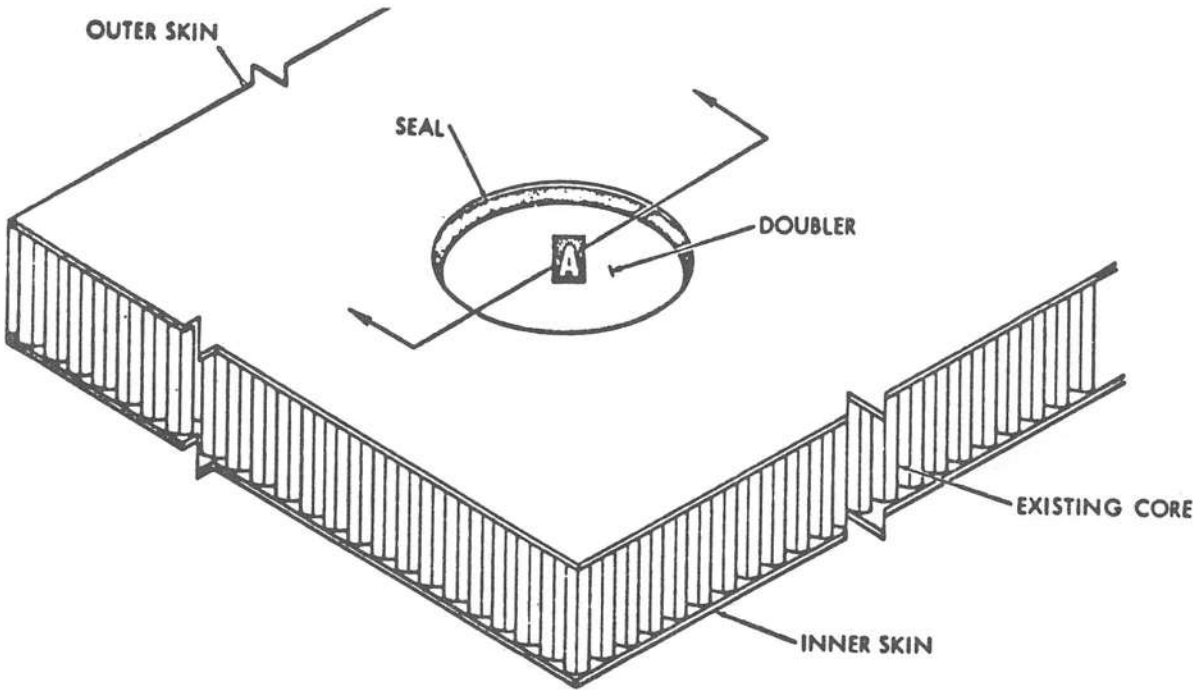
HONEYCOMB CONSTRUCTION AND TYPICAL REPAIRS, (SHEET 3 OF 6)

TYPICAL REPAIR OF HONEYCOMB STRUCTURE
(DAMAGE TO OUTER SKIN AND HONEYCOMB CORE)



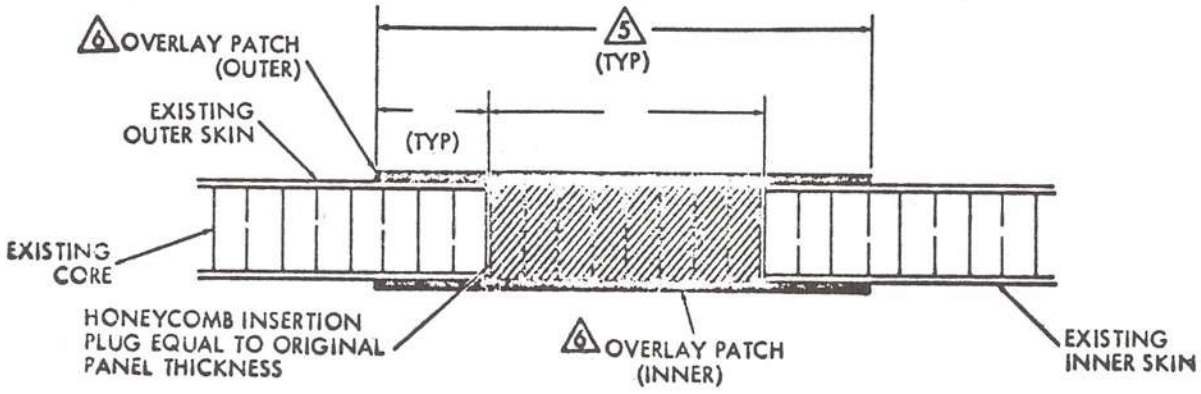
NOTE

1. MAKE DOUBLER FROM SAME TYPE MATERIAL ONE GAGE HEAVIER THAN EXISTING OUTER SKIN AND BOND TO REMAINING HONEYCOMB CORE
2. MAKE OVERLAY PATCH FROM SAME TYPE MATERIAL ONE GAGE HEAVIER THAN EXISTING SKIN. BOND PATCH TO INNER SKIN AND EPOXY RESIN FILLER.
3. SEAL AROUND EDGES OF DOUBLER AND OVERLAY PATCH.
6. DIAMETER 2.0 INCHES PLUS OVERLAY



HONEYCOMB CONSTRUCTION AND TYPICAL REPAIRS, (SHEET 4 OF 6)

TYPICAL REPAIR OF HONEYCOMB STRUCTURE
(DAMAGE TO INNER AND OUTER SKINS, AND HONEYCOMB CORE)

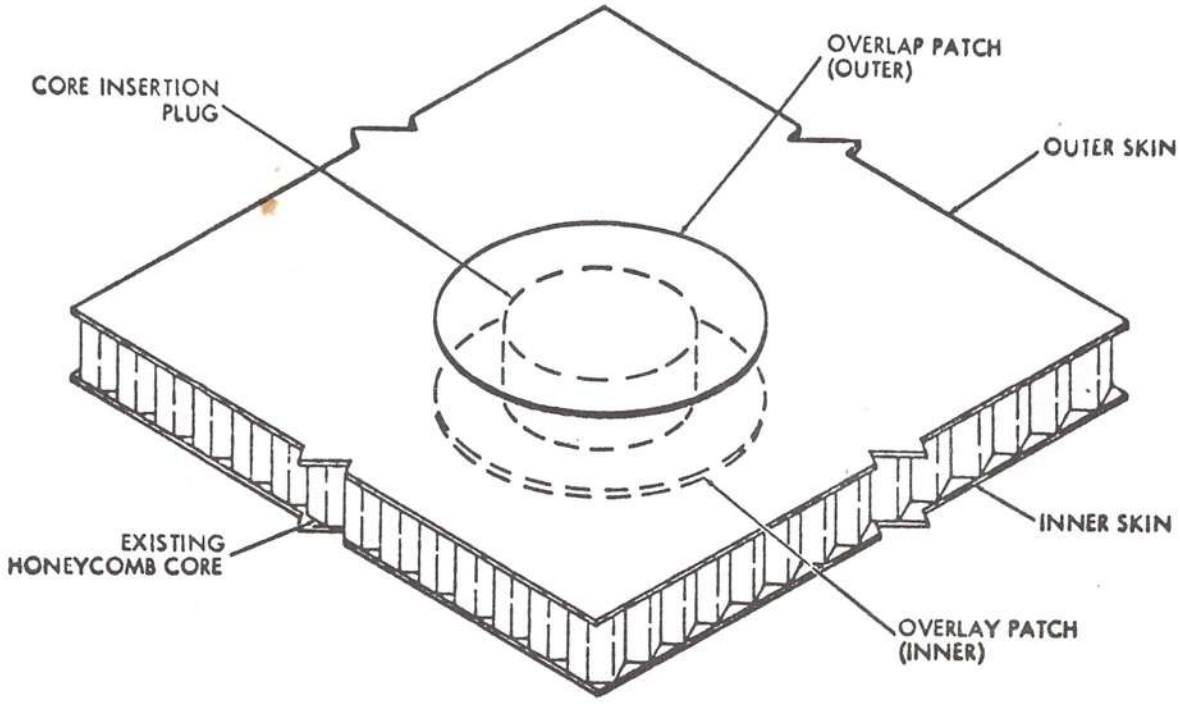


SECTION THROUGH REPAIR

MAKE OVERLAY PATCHES FROM SAME TYPE MATERIAL ONE GAGE HEAVIER THAN EXISTING SKIN.

MAKE HONEYCOMB CORE INSERT PLUG FROM SAME HONEYCOMB CORE AS ORIGINAL.

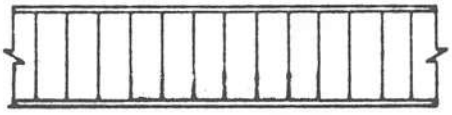
5 4.0 INCHES PLUS CALCULATED OVERLAP.
6 SEAL OVERLAY PATCHES.



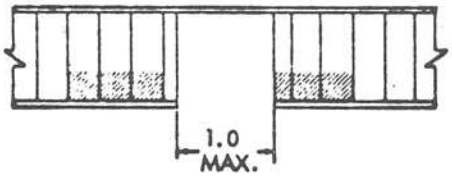
MOISTURE REMOVAL AND REPAIR OF HONEYCOMB STRUCTURE

NOTE

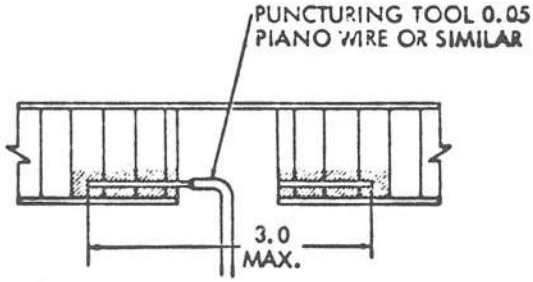
1. OVERLAP PATCH MAKE FROM 4 PILES OF 181 FIBERGLASS.
2. MAKE CORE PLUG FROM SAME TYPE CORE AS ORIGINAL BUT NEXT HIGHER DENSITY.
4. SEAL OVERLAY PATCHES.



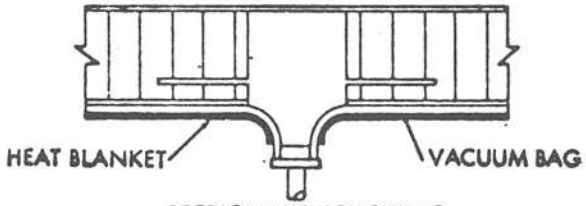
SECTION VIEW THROUGH MOISTURE AREA



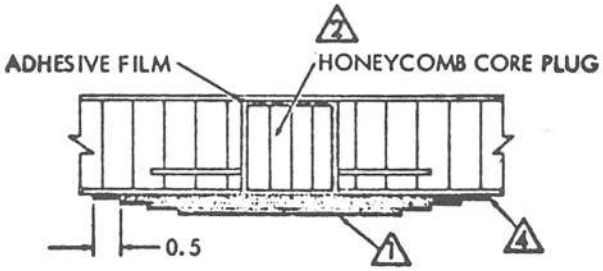
SECTION VIEW SHOWING HOLE CUT IN LOWER SKIN AND CORE



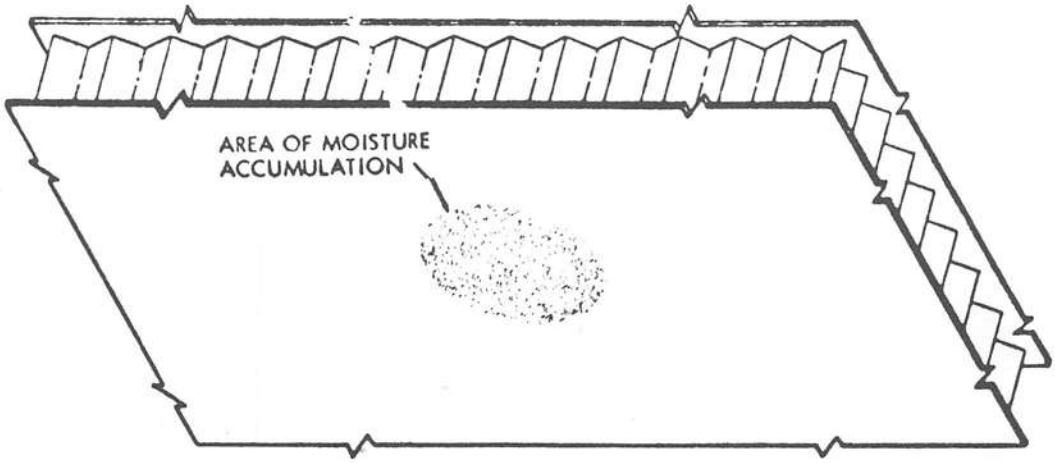
SECTION VIEW SHOWING PUNCTURING OF CORE CELLS



SECTION VIEW SHOWING VACUUM BAG AND HEAT BLANKET IN POSITION



SECTION VIEW SHOWING HOLE REPAIRED AFTER MOISTURE HAS BEEN REMOVED



HONEYCOMB CONSTRUCTION AND TYPICAL REPAIRS, (SHEET 6 OF 6)

Plastic type casting resin is sometimes used to fill out damage caused by dents or nicks. Doubler patches of the same material as facing sheet are often used to strengthen a repair of honeycomb core plug, or resin type filler.

Deep scratches and cracks in facings are often stop-drilled at each end of the damage, selecting a drill size at least three (3) times the thickness of skin, pre-setting drill depth to prevent core damage. Inspect for possibility of internal moisture. Manufacture a repair overlap patch of the same skin material one gauge thicker. Clean the faying surfaces and apply a 0.0005 inch thickness of adhesive primer and allow to cure. After curing, film adhesive is applied and the patch is taped in place and oven temperature bonded.

Laminated flange separation or damage can be thoroughly cleaned, inspected for moisture and core separation, re-primed and bonded with film adhesive under pressure and high temperature.

There are several methods of inspecting honeycomb construction. Some of these are very complex and time consuming, while others are simple and fast. One of the simplest methods of assuring that a bond exists between the core and facing sheet is referred to as "coin-tapping". By tapping a heavy coin along the surface of a panel or door, the different tone of an unbonded area is quite apparent compared to a bonded area.

Another commonly used inspection method is the "stub-meter". This meter indicates not only that the part is bonded, but also the quality of the bond compared to a given standard. This meter consists of a probe, oscilloscope, and associated electronic equipment. The probe is touched to the panel surface and is vibrated at a pre-determined frequency. The panel response to this vibration determines the quality of the core to facing bond.

Ultrasonic testing methods are sometimes used, and will usually define the extent of a bond separation. However, this method will not define the quality of the existing bond. X-ray method of inspection can be used, but it has serious draw backs in field use, such as personnel danger, and skill level required for proper operation. It is also unreliable on glass honeycomb.

In conclusion, repair procedures for honeycomb structure are developed to equal as nearly as possible, the stiffness, strength, weight, durability, and surface smoothness of the original. Any necessity in the field requiring deviation from these properties, should be reason for considering replacement of the entire defective component. It is anticipated that forthcoming procedures will permit all, or most, negligible and minor damage to be repaired on the aircraft. Allowable repairs in the technical repair manuals should be closely adhered to, insofar as operational/maintenance considerations permit, in deciding to repair on the aircraft or to replace the entire component. Replacement, with later shop repair, may be the most practical procedure in many cases.

B. Static Electricity Discharge Wire (See figure 53)

The static electricity discharge wire is mounted to the tail wheel fork assembly, and provides a path to ground in order to discharge any accumulation of static electricity at moment of touch down or during ground operation of the vehicle.

C. Static Ground Provisions (See figure 54)

The static grounding stud is located within the left wheel well, and provides a bonded ground for attaching a grounding wire during fueling operations, maintenance, and parked periods.

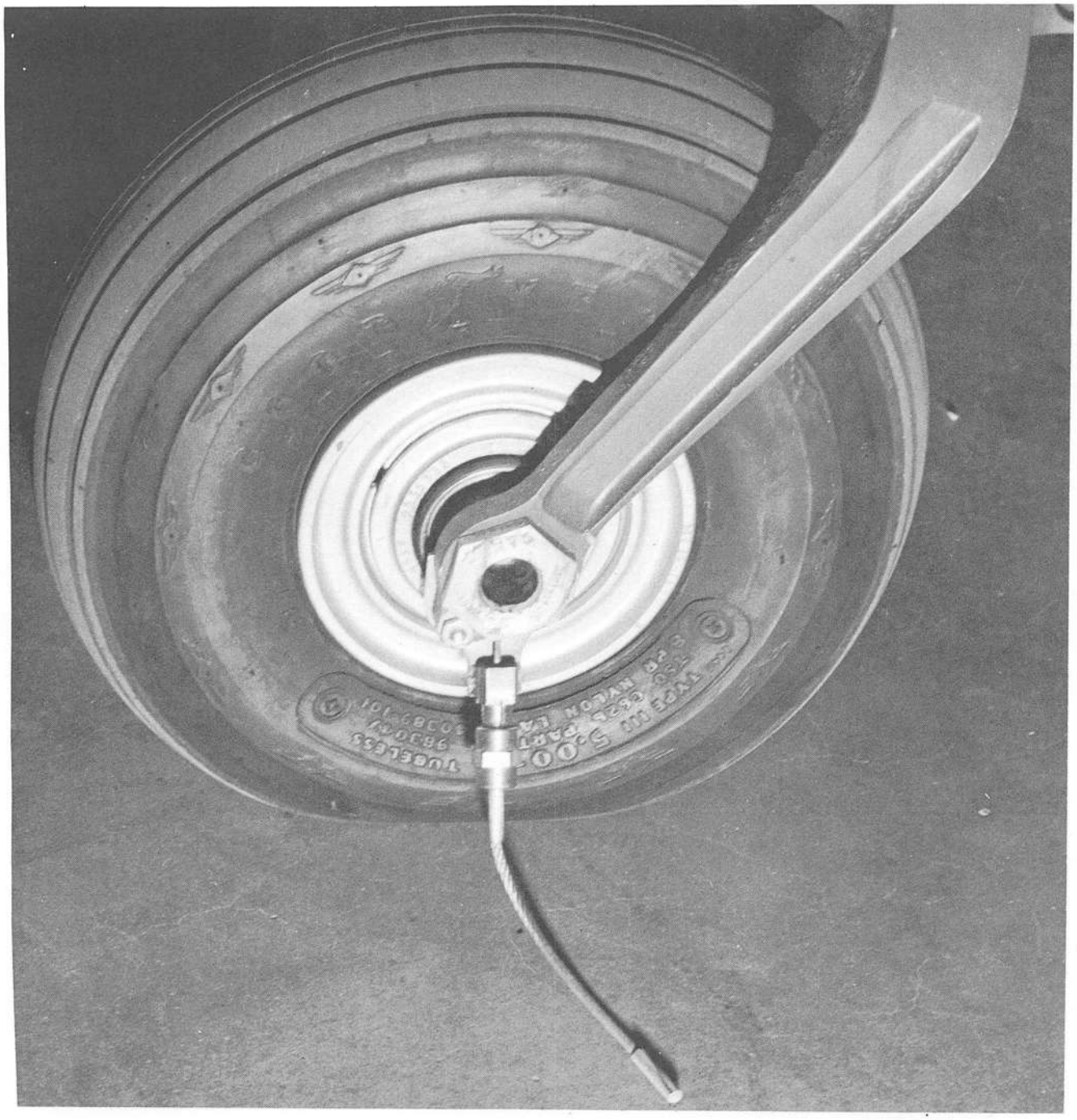
D. Cable Cutters (See figure 55)

Two cable cutters are provided, one on the lower fuselage below the pilot's station, and one on the upper fuselage aft of the pilot's station. They are designed to cut up to 3/8 inch cables that the vehicle may inadvertently encounter.

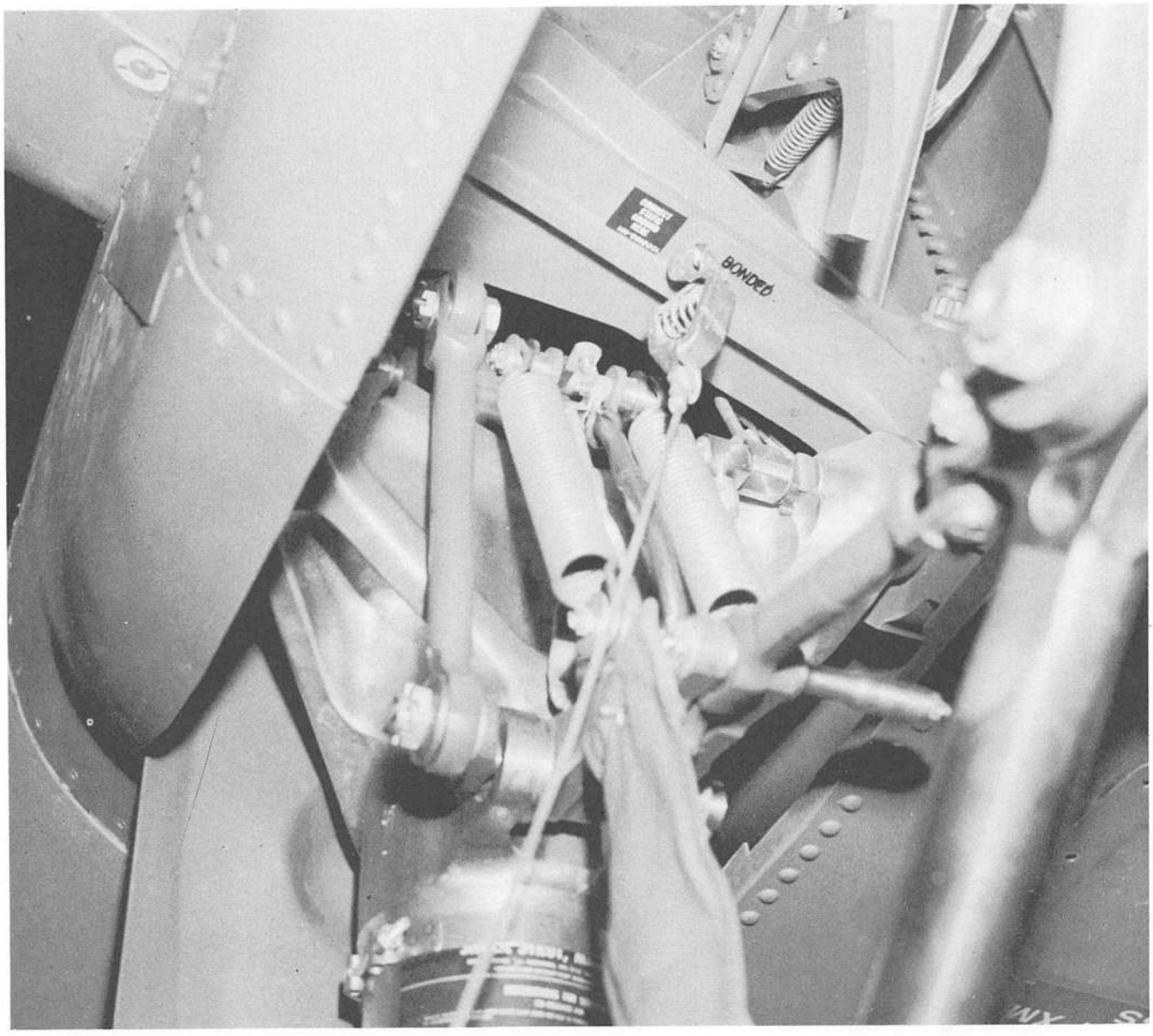
E. Fluid Capacities

The following list provides the capacity of the various components requiring fluid. Types of fluids and filling procedures may be found in the technical manuals and study guides pertaining to the particular systems.

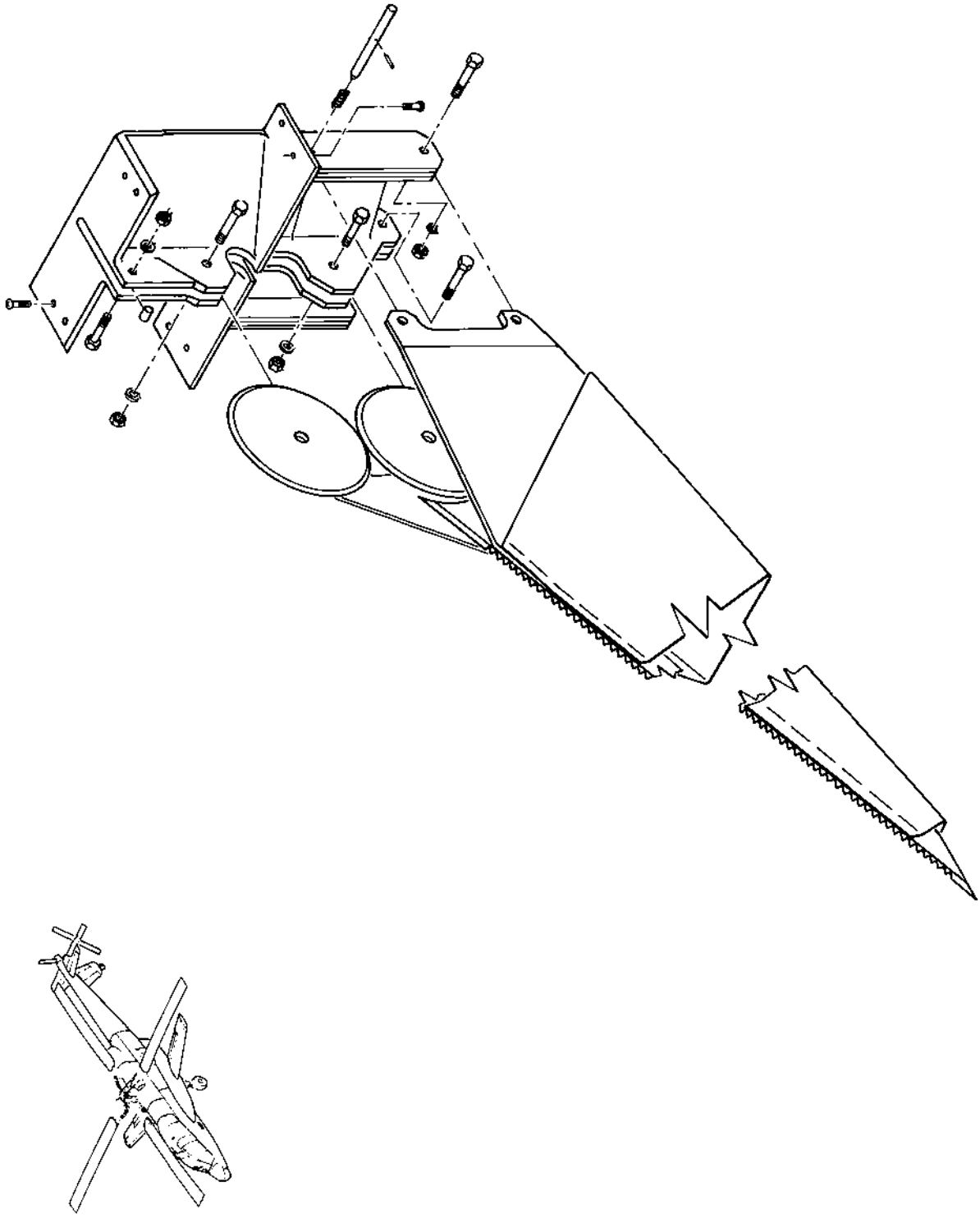
COMPONENT	CAPACITY
Hydraulic Power Package No. 1	1.56 qt (90 cu in.)
Hydraulic Power Package No. 2	2.68 qt (155 cu in.)
Propeller Gearbox	2.5 qt
Propeller Actuator	3.5 qt
Tail Rotor Oil Tank	1.0 qt
Tail Rotor Blade Cuffs	200 cc (each)
Auxiliary Power Unit	2.0 qt
Environmental Control Unit	90 cc
APU Clutch-Gearbox	82 cc
Master Brake-and-Parking Valve Cylinders	82 cc (5.0 cu in.)
Main Landing Gear Shock Strut	3.25 qt (each)
Tail Landing Gear Shock Strut	3.5 qt
Nose Skid Shock Absorber	0.5 pt



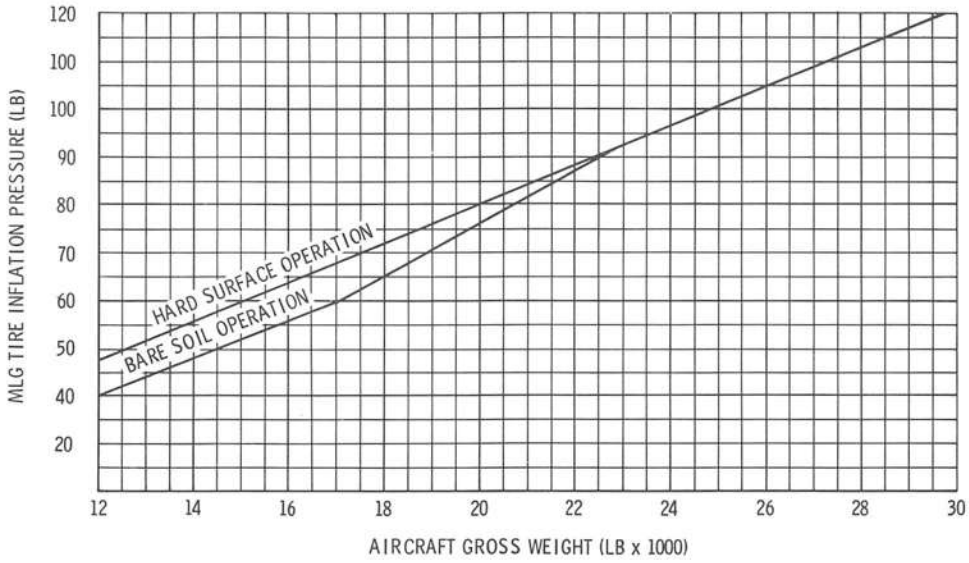
STATIC ELECTRICITY DISCHARGE WIRE



STATIC GROUND PROVISIONS



CABLE CUTTERS

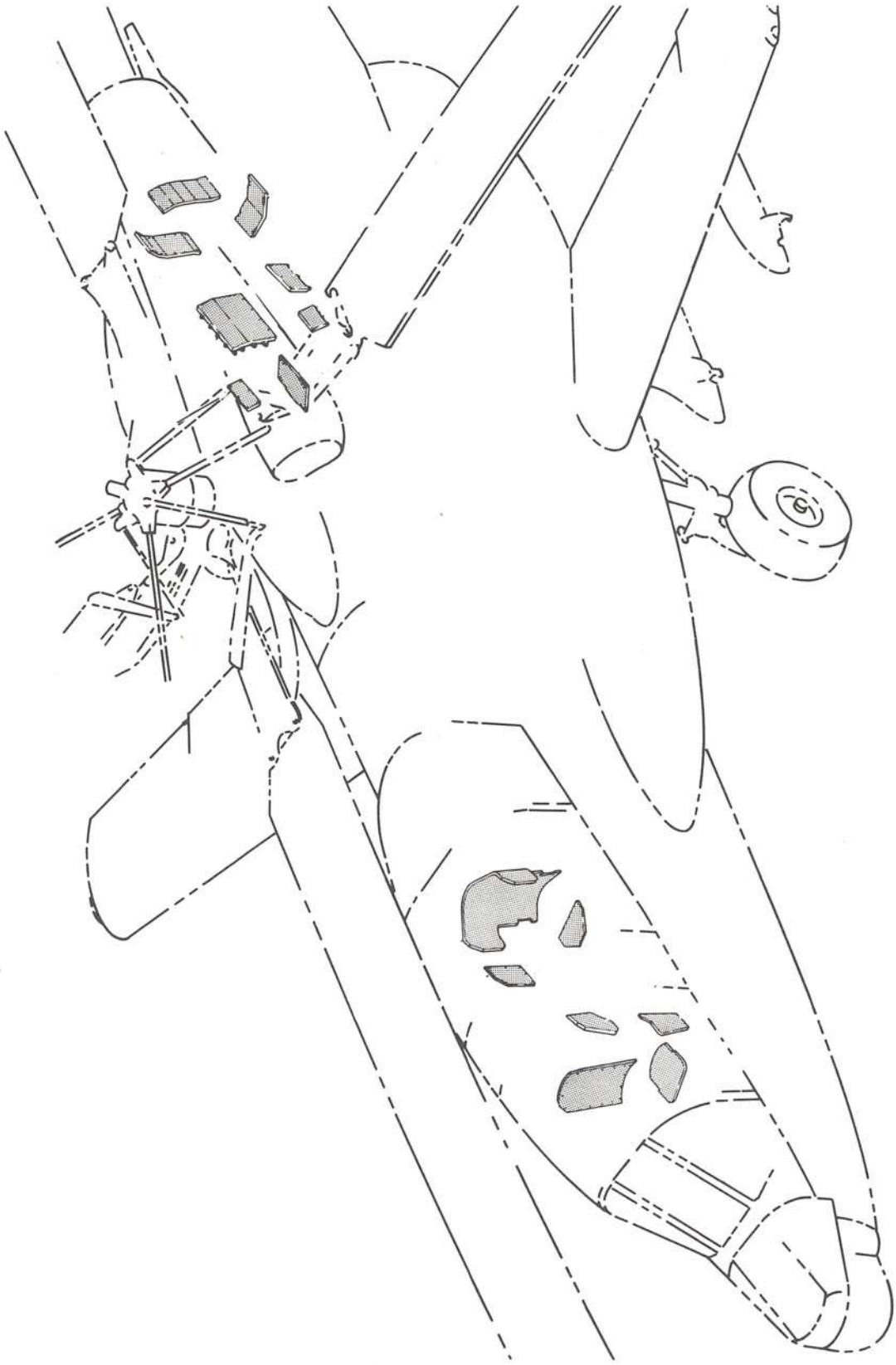


NOTE

INFLATE TLG TIRE AS FOLLOWS:
UP TO 16,995 LB GROSS WEIGHT, INFLATE TO 48 PSI
16,995 THRU 22,550 LB GROSS WEIGHT, INFLATE TO 70 PSI
22,550 THRU 29,695 LB GROSS WEIGHT, INFLATE TO 115 PSI

HG 06783
MA(35)10A-P-1-12

TIRE PRESSURES



PROTECTIVE ARMOR

COMPONENT	CAPACITY
Main Fuel Tank	300 gal
Left Sponson Fuel Tank	78 gal
Right Sponson Fuel Tank	60 gal
Engine Oil Tank	3.25 gal
Transmission Oil Tank	6.5 gal

F. Tire Pressures (See figure 56)

Figure 56 is self explanatory, showing tire inflation pressures at various gross weights, under hard and soft surface conditions.

G. Protective Armor (See figure 57)

For reasons of clarity some of the identical components to either the left or right side are not shown in figure 57.

The armor is strategically located to protect the crew as well as vital engine and fuel system components. Armor is composed of high-hardness ceramic frontal plates bonded to metallic backing material in high temperature areas, and to laminated fiberglass type backing material in other areas. The outer face of the ceramic tile is covered by a spall shield of a nylon-like material to restrain fragments after a ballistic impact. This type construction results in a light weight armor plate capable of stopping a 12.7 mm AP projectile at zero degrees obliquity traveling at 2700 feet per second.