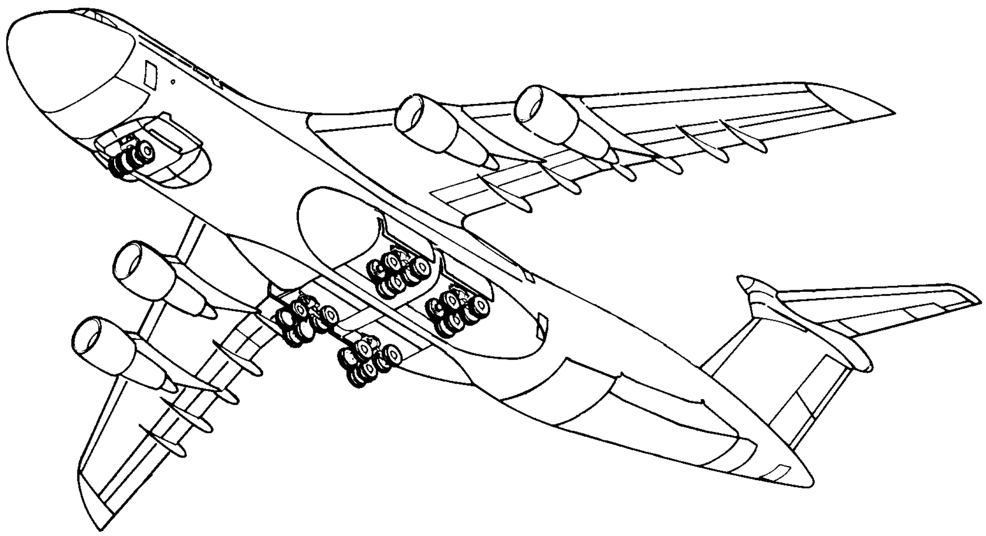
FOR TRAINING USE ONLY

C-5 HANDBOOK



FOR TRAINING USE ONLY

INTRODUCTION

This book is designed to be used as a quick-reference pocket handbook describing the systems and subsystems of the C-5 Galaxy aircraft.

As a training aid, this book gives you the distinct advantage of having the general information of twelve aircraft T.O.s condensed into one handbook.

The book is formatted in accordance with the aircraft T.O.s, 1C-5A-2-1 through 2-13, with the exception of the 2-11 wiring diagrams, which, due to the size and content could not be included. Each chapter in the handbook represents an aircraft T.O. starting with the 2-1. Additionally, for quick reference purposes, the first digit of the page numbers represents the last number of the T.O. from which the information was obtained and the page header reflects the T.O. title. Example: page **3**-1 comes from T.O. 1C-5A-2-**3**/Pneudraulics.

Basically, the handbook consists of descriptive text relating to pictures or drawings of the airplanes structural and system components.

For the most part, pictures and text within the book reflect that of the C-5B model aircraft. However, in some cases, references to "A-model not modified" and AF68-213 and AF68-216 "Space Container Module (SCM) airplanes " have been included.

ALTHOUGH THIS HANDBOOK IS DERIVED FROM TECH DATA, IT IS NOT INTENDED TO REPLACE THE T.O.s. NOR, WILL IT BE USED AS SUCH.

PRESSURES, READINGS, AND LIMITATIONS ARE SUBJECT TO CHANGE AND ARE ONLY USED IN THIS BOOK TO PROVIDE GENERAL PARAMETERS

TABLE OF CONTENTS

SERIALIZATION

C-5A Serialization

AF TAIL NUMBER	CONTRACT END ITEM
AF66-8303 - AF66-8307	001 - 005
AF67-167 - AF67-174	006 - 013
AF68-211 - AF68-228	014 - 031
AF69-001 - AF69-027	032 - 058
AF70-445 - AF70-467	059 - 081

C-5B Serialization

AF TAIL NUMBER	CONTRACT END ITEM
AF83-1285	0082
AF84-0059 - AF84-0062	0083 - 0086
AF85-0001 - AF85-0010	0087 - 0096
AF86-0011 - AF86-0026	0097 - 0112
AF87-0027 - AF87-0045	0113 - 0131

C-5 TECHNICAL ORDERS

The following is the list of organizational maintenance technical manuals applicable to the C-5 airplane:

T.O. NUMBER	T.O. TITLE
1C-5A-2-1	**Ground Handling and Servicing**
1C-5A-2-1-1	Cross Servicing Guide
1C-5A-2-2	**Airframe**
1C-5A-2-3	**Pneudraulics**
1C-5A-2-3FI-1	Hydraulic Power Generation Systems-Fault Codes 45000-45511
1C-5A-2-4	**Power Plant**
1C-5A-2-4FI-1-1	Propulsion System-Fault Codes 22000-22999 and 23000-23139
1C-5A-2-4FI-1-2	Propulsion System-Fault Codes 23140-23739
1C-5A-2-4FI-1-3	Propulsion System-Fault Codes 23740-23999, 24000-24099 and 49400-49499
1C-5A-2-4JG-1-1	Throttles Component Rigging
1C-5A-2-4JG-1-2	Throttles Complete Rigging
1C-5A-2-4JG-2	Power Plant Removal and Installation
1C-5A-2-5	**Fuel System**
1C-5A-2-5FI-1-1	Fuel System-Fault Codes 46000-46749
1C-5A-2-5FI-1-2	Fuel System-Fault Codes 46750-46999
1C-5A-2-5JG-l	Emergency Fuel Shutoff Valve Rigging
1C-5A-2-6	**Instruments**
1C-5A-2-6FI-1-1	Flight Director System No. 1-Fault Codes 51130-51309
1C-5A-2-6FI-1-2	Flight Director System No. 2-Fault Codes 51310-51489
1C-5A-2-6FI-1-3	Central Air Data Computer (CADC) Subsystem-Fault Codes 51000-51129, C-5A

1C-5A-2-12JG-9-4 . . . . Aft Cargo Doors Complete Rigging C-5A (AF68-213 and AF68-216)

1C-5A-2-13 . . . . **Environmental Control and Oxygen System**

1C-5A-2-13FI-1-1 . . . . Environmental Control System-Fault Codes 40000-41194

1C-5A-2-13FI-1-2 . . . . Environmental Control System-Fault Codes 40000-41194

1C-5A-2-13FI-1-3 . . . . Environmental Control System-Fault Codes 41195-41729

1C-5A-2-13FI-1-4 . . . . Environmental Control System-Fault Codes 41730-41999

1C-5A-2-13FI-1-5 . . . . Fire Extinguishing and Fire Suppression System-Fault Codes 49000-49511

1C-5A-2-14 . . . . **Interior Trim**

1C-5A-2-15 . . . . **Seal Repair and Replacement**

Additional information on operation, repair, parts listing, inspection, storage, weight and balance, cargo loading, power package buildup, airplane inventory, and critical alloys and precious metals may be found in the following publications:

1C-5A-1 . . . . Flight Manual

1C-5A-1-1 . . . . Performance Data

1C-5A-1-2 . . . . Partial Flight Manual, C-5A (SCM)

1C-5A-3 . . . . Structural Repair Instructions

1C-5A-3-1 . . . . Overhaul Instructions with Illustrated Parts Breakdown-Pylon Assembly

1C-5A-3-2 . . . . Overhaul Instructions with Illustrated Parts Breakdown-Cowl Door Assemblies and Pylon Aprons

1C-5A-4-1 . . . . Illustrated Parts Breakdown- Airframe Group

1C-5A-4-2 . . . . Illustrated Parts Breakdown-Hydraulic System

1C-5A-4-3 . . . . Illustrated Parts Breakdown-Fuel System

1C-5A-4-4 . . . . Illustrated Parts Breakdown-Utilities, Pneumatic System

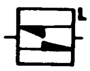
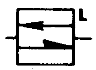
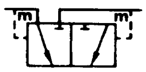
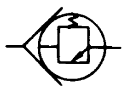
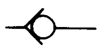
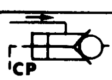
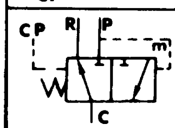
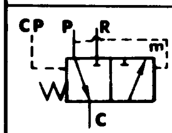
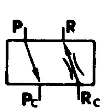
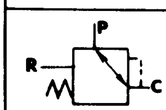
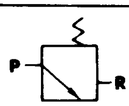
1C-5A-4-5 . . . . Illustrated Parts Breakdown-Flight Control and Instrument System

1C-5A-10JG-1-1	Buildup Instructions, Aircraft Power Package
1C-5A-10JG-1-2	Buildup Instructions, Aircraft Power Package
1C-5A-10JG-1-3	Buildup Instructions, Aircraft Power Package
1C-5A-10JG-1-4	Buildup Instructions, Aircraft Power Package
1C-5A-17	Aircraft Storage
1C-5A-21	Master Guide Aircraft Inventory Record
1C-5A-23	System Pecullar Corroslon Control Manual
1C-5A-36-1	Nondestructive Inspection
1C-5A-36-2	Nondestructive Inspection Manual
1C-5A-36-3	Nondestructive Inspection Manual
1C-5A-102	Operating Instructions, Air crew/Ground Crew, Malfunction Detection, Analysis, Recording System (MADARS), C-5A
1C-5A-102-1	Operating Instructions, Air crew/Ground Crew, Malfunction Detection, Analysis, Recording System (MADARS), C-5B
1C-5A-103	Digital Computer Program, Malfunction Detection, Analysis, and Recording System (MADARS), C-5A
1C-5A-01	List of Applicable Publications
1C-5A-06	Work Unit Code Manual
2J-TF39-6	Field Maintenance Instruction Turbofan Engine Model TF39- GE-1
00-25-113-C5	Critical Alloys and Precious Metals Parts List
00-25-06-2-4	C-5 Aerospace Ground Equipment Work Unit Code Manual

CHECKLIST NO.	SUBJECT
1C-5A-1CL-1	Pilots' Flight Crew Checklist
1C-5A-1CL-1-1	Pilots' Scroll Checklist
1C-5A-1CL-2	Flight Engineer's Flight Crew Checklist
1C-5A-1CL-2-1	Flight Engineer's Scroll Checklist
1C-5A-1CL-3	Navigator's Flight Crew Checklist
1C-5A-1CL-4	Loadmaster's Abbreviated Checklist
1C-5A-1CL-4-1	Loadmaster (Fwd) Scroll Checklist
1C-5A-1CL-4-2	Loadmaster (Aft) Scroll Checklist
1C-5A-1CL-5	Scanner's Flight Crew Checklist
1C-5A-1-2CL-1	Pilots' Flight Crew Checklist C-5A (SCM)
1C-5A-1-2CL-2	Flight Engineer's Flight Crew Checklist, C-5A (SCM)
1C-5A-1-2CL-4	Loadmaster's Abbreviated Checklist, C-5A (SCM)
1C-5A-1-2CL-5	Scanner's Flight Crew Checklist, C-5A (SCM)
1C-5A-2-1CL-1	Towing/Mooring
1C-5A-2-1CL-2	Jacking
1C-5A-2-1CL-3	Liquid Oxygen Servicing
1C-5A-2-1CL-4	Nitrogen Servicing
1C-5A-2-1CL-6	Refueling/Defueling
1C-5A-2-4CL-1	Engine Ground Operation
1C-5A-2-5CL-1	Fuel Tank Preparation, Entry and Closing
1C-5A-2-10CL-1	Airplane Kneeling System
1C-5A-2-12CL-1	Cargo Doors and Ramps
1C-5A-6CL-1	Acceptance and/or Functional Check Flight Procedures Checklist
1C-5A-9CL-1	Loadmaster On/Off Loading Procedures

SYMBOLS

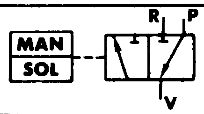
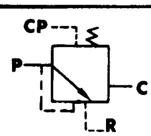
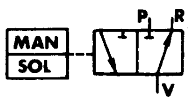
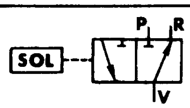
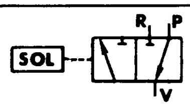
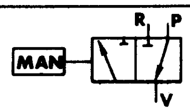
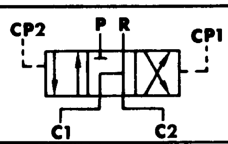
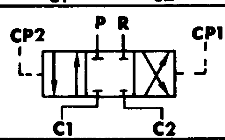
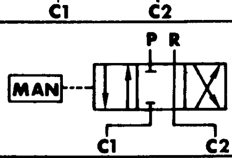
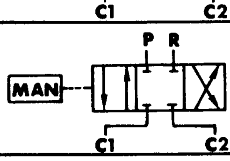
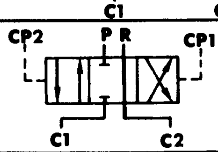
HYDRAULIC CARTRIDGES

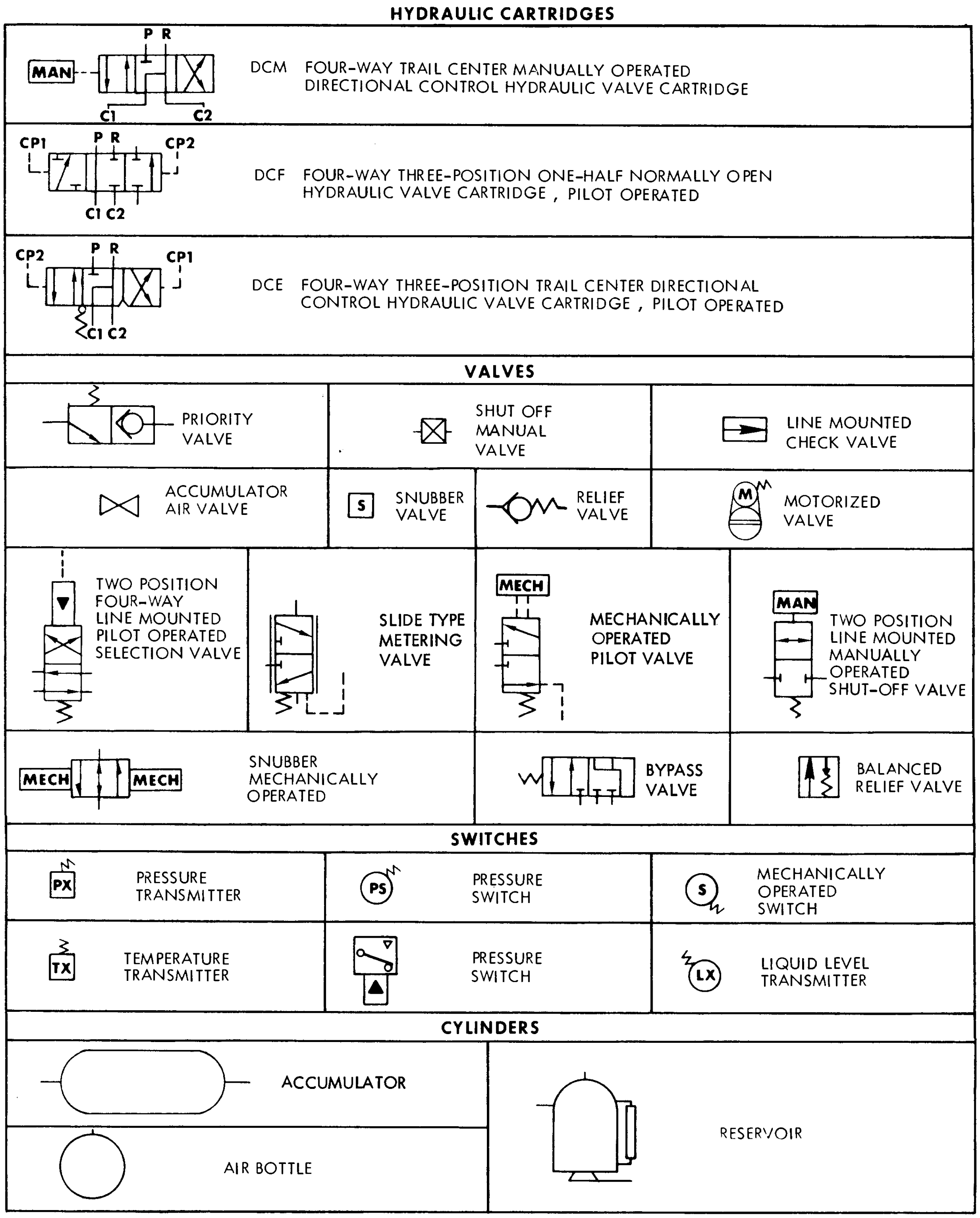
	FRT	TWO-WAY FLOW REGULATING HYDRAULIC VALVE CARTRIDGE
	FRF	ONE-WAY FLOW REGULATING HYDRAULIC VALVE CARTRIDGE
	RVF	ONE-WAY RESTRICTOR HYDRAULIC VALVE CARTRIDGE
	RVT	TWO-WAY RESTRICTOR HYDRAULIC VALVE CARTRIDGE
	SVA	SHUTTLE VALVE HYDRAULIC CARTRIDGE
	CVL	RELIEF CHECK HYDRAULIC VALVE CARTRIDGE (LOW PRESSURE CRACKING)
	CVA	CHECK HYDRAULIC VALVE CARTRIDGE (2-8 PSIG CRACKING PRESSURE)
	CVH	CHECK HYDRAULIC VALVE CARTRIDGE (HIGH PRESSURE CRACKING)
	CVP	PRESSURE OPERATED CHECK HYDRAULIC VALVE CARTRIDGE
	TWC	THREE-WAY NORMALLY CLOSED DIRECTIONAL CONTROL HYDRAULIC VALVE CARTRIDGE, PILOT OPERATED
	TWO	THREE-WAY NORMALLY OPEN DIRECTIONAL CONTROL HYDRAULIC VALVE CARTRIDGE, PILOT OPERATED
	FRA	ONE-WAY LIMITING DUAL PATH FLOW REGULATING HYDRAULIC VALVE CARTRIDGE
	PDA	PRESSURE REDUCER HYDRAULIC VALVE CARTRIDGE (100 - 850 PSI)
	PDC	PRESSURE REDUCER HYDRAULIC VALVE CARTRIDGE (850 - 2,600 PSI)
	PRA	PRESSURE RELIEF HYDRAULIC VALVE CARTRIDGE (HIGH PRESSURE)
	PRL	PRESSURE RELIEF HYDRAULIC VALVE CARTRIDGE (LOW PRESSURE)

LEGEND

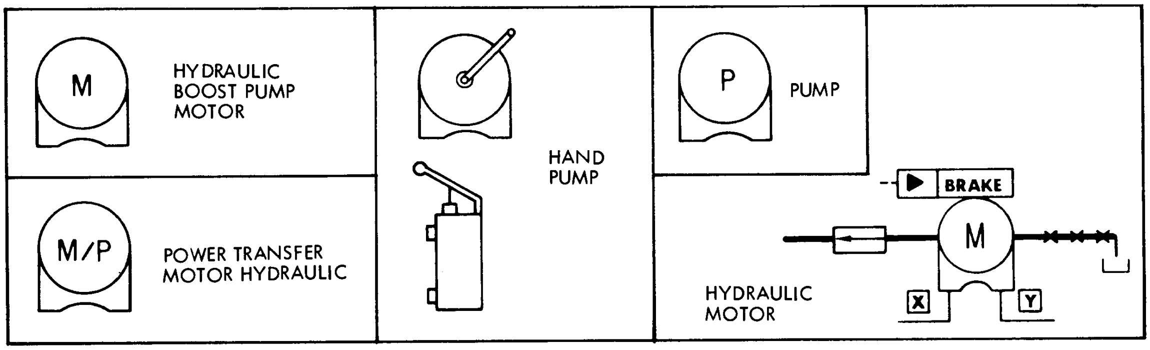
C	CYLINDER PORT
CP	CONTROL PRESSURE
L	LIMITER
M	INTERNAL PASSAGE
O	ORIFICE FLOW
P	SUPPLY PRESSURE
P_c	CONTROL SUPPLY PRESSURE
R	RETURN PRESSURE
R_c	CONTROL RETURN PRESSURE
V	PILOT PRESSURE

HYDRAULIC CARTRIDGES

	PVA	NORMALLY OPEN SOLENOID AND MANUALLY OPERATED TRAIL CENTER PILOT HYDRAULIC VALVE CARTRIDGE
	SOP	NORMALLY CLOSED PRESSURE OPERATED SHUTOFF HYDRAULIC VALVE CARTRIDGE
	PVC	THREE-WAY NORMALLY CLOSED SOLENOID AND MANUALLY OPERATED PILOT HYDRAULIC VALVE CARTRIDGE
	PVD	THREE-WAY NORMALLY CLOSED SOLENOID OPERATED PILOT HYDRAULIC VALVE CARTRIDGE
	PVE	THREE-WAY NORMALLY OPEN SOLENOID OPERATED PILOT HYDRAULIC VALVE CARTRIDGE
	PVH	THREE-WAY NORMALLY OPEN MANUALLY OPERATED PILOT HYDRAULIC VALVE CARTRIDGE
	DCO	FOUR-WAY THREE-POSITION TRAIL CENTER DIRECTIONAL CONTROL CONTROL HYDRAULIC VALVE CARTRIDGE , PILOT OPERATED
	DCC	FOUR-WAY THREE-POSITION DIRECTIONAL CONTROL HYDRAULIC VALVE CARTRIDGE , PILOT OPERATED
	DCD	FOUR-WAY THREE-POSITION MANUALLY OPERATED DIRECTIONAL CONTROL HYDRAULIC VALVE CARTRIDGE
	DCA	FOUR-WAY THREE-POSITION MANUALLY OPERATED DIRECTIONAL CONTROL HYDRAULIC VALVE CARTRIDGE
	DCB	FOUR-WAY DIRECTIONAL CONTROL HYDRAULIC VALVE CARTRIDGE , PILOT OPERATED

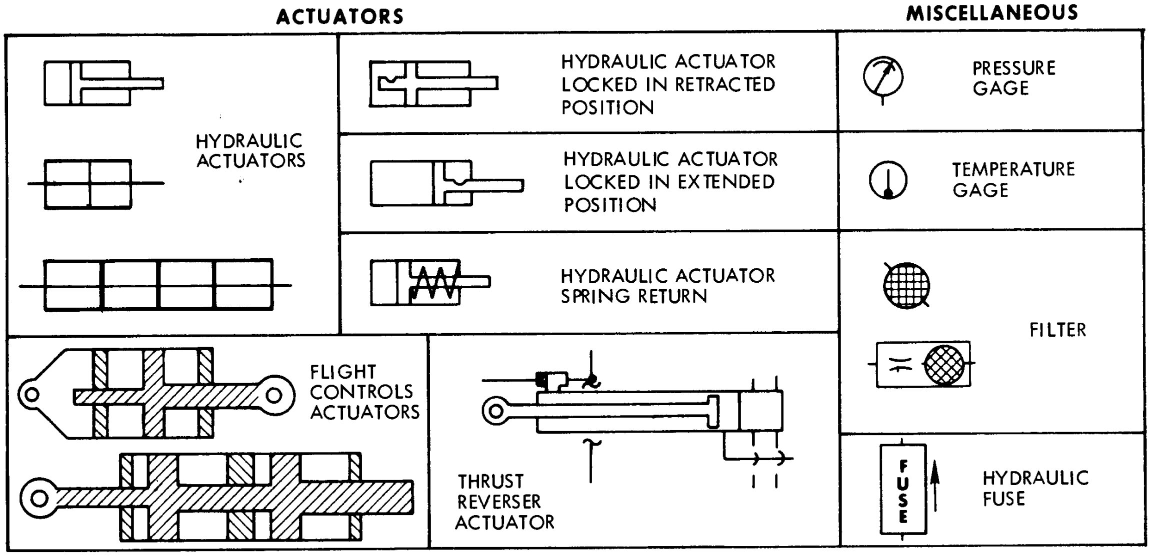

HYDRAULIC CARTRIDGES
MAN
P R
C1 C2
DCM FOUR-WAY TRAIL CENTER MANUALLY OPERATED DIRECTIONAL CONTROL HYDRAULIC VALVE CARTRIDGE
CP1 P R CP2
C1 C2
DCF FOUR-WAY THREE-POSITION ONE-HALF NORMALLY OPEN HYDRAULIC VALVE CARTRIDGE , PILOT OPERATED
CP2 P R CP1
C1 C2
DCE FOUR-WAY THREE-POSITION TRAIL CENTER DIRECTIONAL CONTROL HYDRAULIC VALVE CARTRIDGE , PILOT OPERATED
VALVES
PRIORITY VALVE
SHUT OFF MANUAL VALVE
LINE MOUNTED CHECK VALVE
ACCUMULATOR AIR VALVE
S
SNUBBER VALVE
RELIEF VALVE
M
MOTORIZED VALVE
TWO POSITION FOUR-WAY LINE MOUNTED PILOT OPERATED SELECTION VALVE
SLIDE TYPE METERING VALVE
MECH
MECHANICALLY OPERATED PILOT VALVE
MAN
TWO POSITION LINE MOUNTED MANUALLY OPERATED SHUT-OFF VALVE
MECH
MECH
SNUBBER MECHANICALLY OPERATED
BYPASS VALVE
BALANCED RELIEF VALVE
SWITCHES
PX
PRESSURE TRANSMITTER
PS
PRESSURE SWITCH
S
MECHANICALLY OPERATED SWITCH
TX
TEMPERATURE TRANSMITTER
PRESSURE SWITCH
LX
LIQUID LEVEL TRANSMITTER
CYLINDERS
ACCUMULATOR
RESERVOIR
AIR BOTTLE

MOTORS AND PUMPS



ACTUATORS

MISCELLANEOUS



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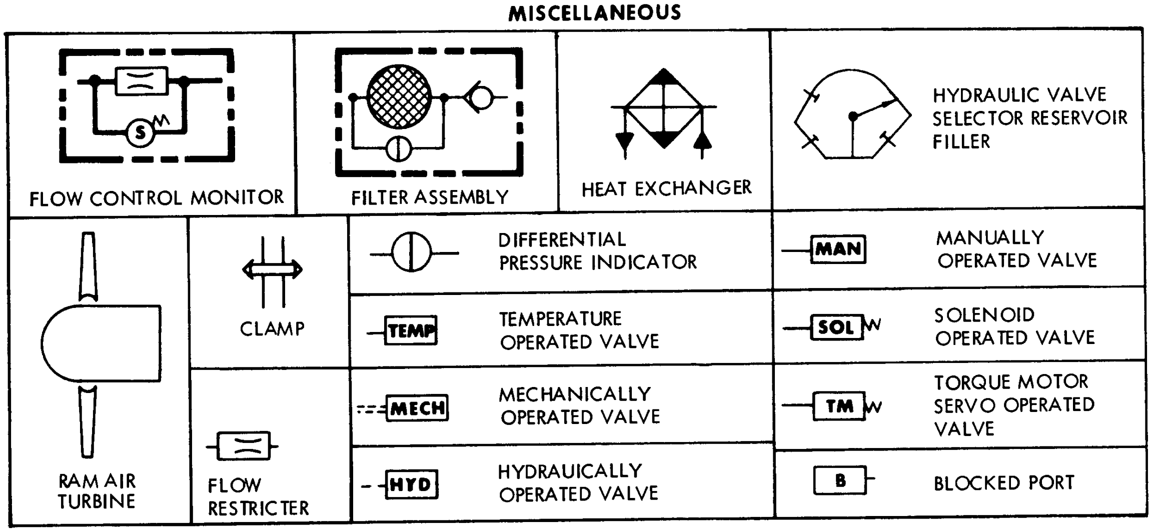
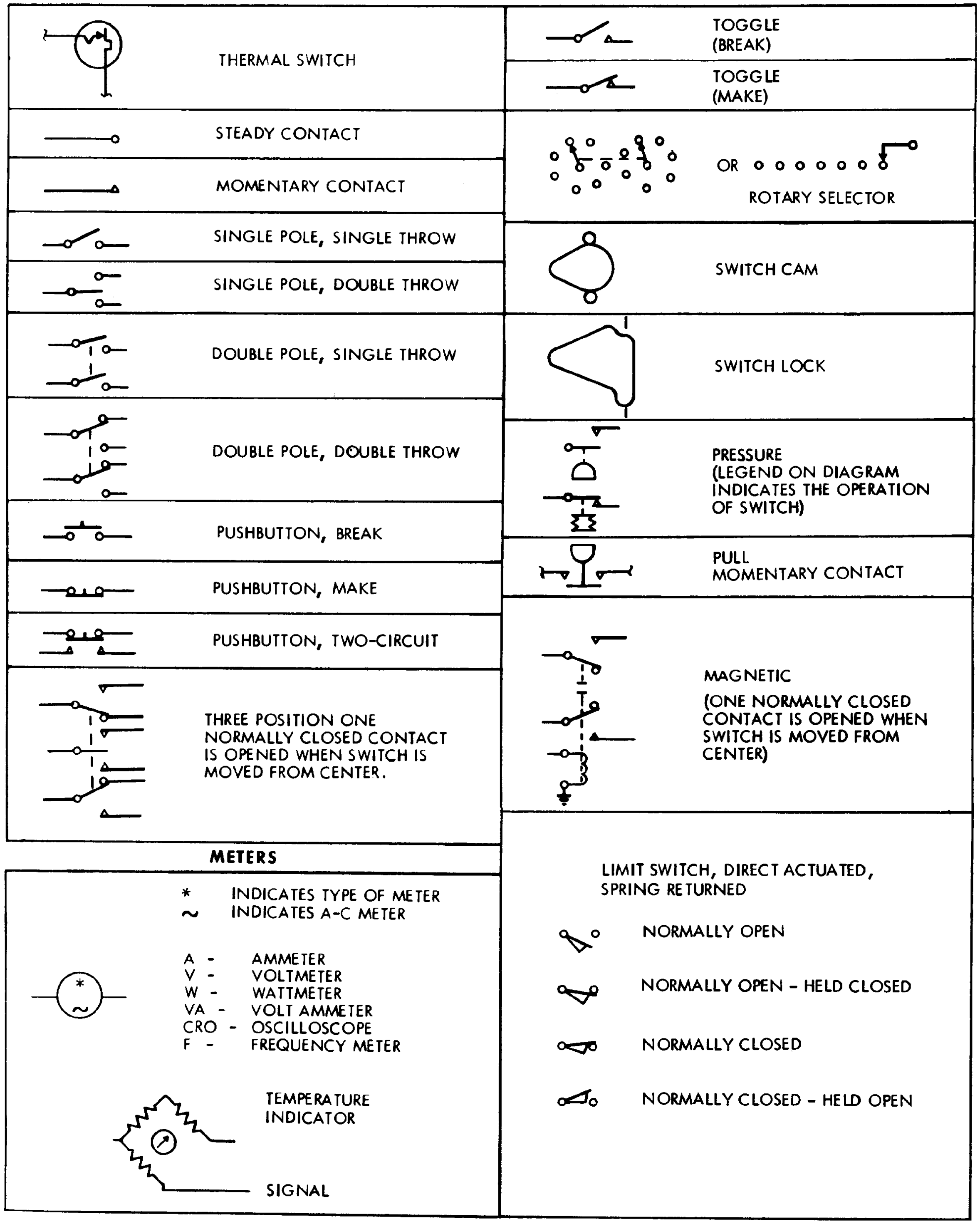
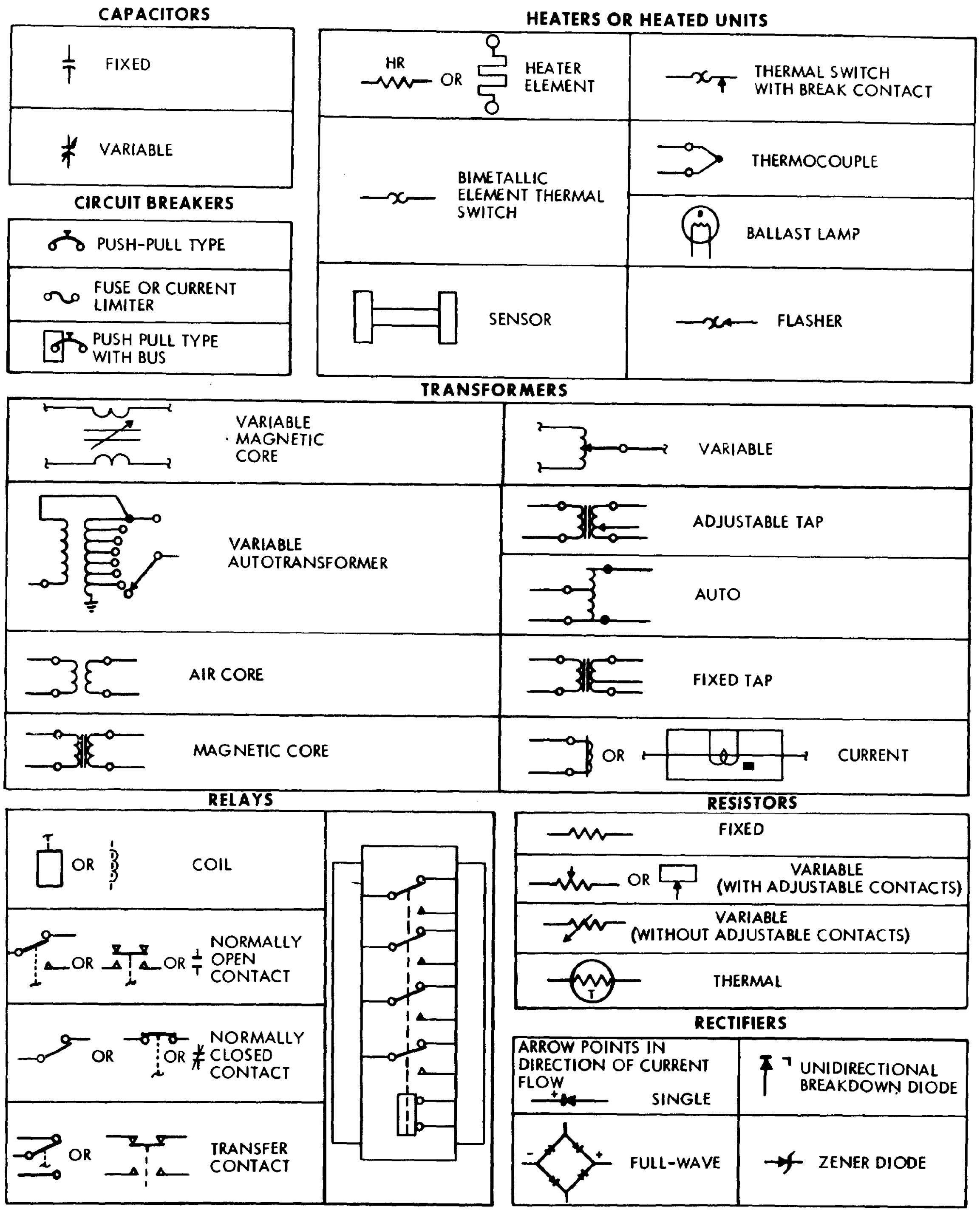


SWITCHES


THERMAL SWITCH
STEADY CONTACT
MOMENTARY CONTACT
SINGLE POLE, SINGLE THROW
SINGLE POLE, DOUBLE THROW
DOUBLE POLE, SINGLE THROW
DOUBLE POLE, DOUBLE THROW
PUSHBUTTON, BREAK
PUSHBUTTON, MAKE
PUSHBUTTON, TWO-CIRCUIT
THREE POSITION ONE NORMALLY CLOSED CONTACT IS OPENED WHEN SWITCH IS MOVED FROM CENTER.
TOGGLE (BREAK)
TOGGLE (MAKE)
OR
ROTARY SELECTOR
SWITCH CAM
SWITCH LOCK
PRESSURE (LEGEND ON DIAGRAM INDICATES THE OPERATION OF SWITCH)
PULL MOMENTARY CONTACT
MAGNETIC
(ONE NORMALLY CLOSED CONTACT IS OPENED WHEN SWITCH IS MOVED FROM CENTER)
METERS
* INDICATES TYPE OF METER
~ INDICATES A-C METER
A - AMMETER
V - VOLTMETER
W - WATTMETER
VA - VOLT AMMETER
CRO - OSCILLOSCOPE
F - FREQUENCY METER
TEMPERATURE INDICATOR
SIGNAL
LIMIT SWITCH, DIRECT ACTUATED, SPRING RETURNED
NORMALLY OPEN
NORMALLY OPEN - HELD CLOSED
NORMALLY CLOSED
NORMALLY CLOSED - HELD OPEN

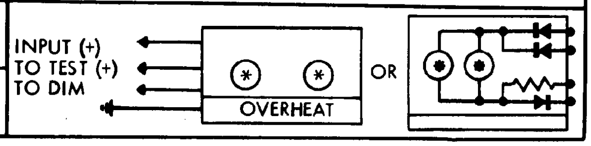

CAPACITORS
FIXED
VARIABLE
CIRCUIT BREAKERS
PUSH-PULL TYPE
FUSE OR CURRENT LIMITER
PUSH PULL TYPE WITH BUS
HEATERS OR HEATED UNITS
HR
OR
HEATER ELEMENT
THERMAL SWITCH WITH BREAK CONTACT
BIMETALLIC ELEMENT THERMAL SWITCH
THERMOCOUPLE
BALLAST LAMP
SENSOR
FLASHER
TRANSFORMERS
VARIABLE MAGNETIC CORE
VARIABLE
VARIABLE AUTOTRANSFORMER
ADJUSTABLE TAP
AUTO
AIR CORE
FIXED TAP
MAGNETIC CORE
OR
CURRENT
RELAYS
OR
COIL
OR
OR
NORMALLY OPEN CONTACT
OR
OR
NORMALLY CLOSED CONTACT
OR
TRANSFER CONTACT
RESISTORS
FIXED
OR
VARIABLE (WITH ADJUSTABLE CONTACTS)
VARIABLE (WITHOUT ADJUSTABLE CONTACTS)
THERMAL
T
RECTIFIERS
ARROW POINTS IN DIRECTION OF CURRENT FLOW
SINGLE
UNIDIRECTIONAL BREAKDOWN DIODE
FULL-WAVE
ZENER DIODE

LAMPS (*INDICATES COLOR)

	JEWELED INDICATOR OR WARNING LIGHT
	NON-JEWELED INDICATOR OR WARNING LIGHT OR ILLUMINATING LT
	JEWELED INDICATOR WITH PUSH TO TEST CIRCUIT
OR	LIGHT BULB
	LIGHT WITH CASE GROUND

COLORS

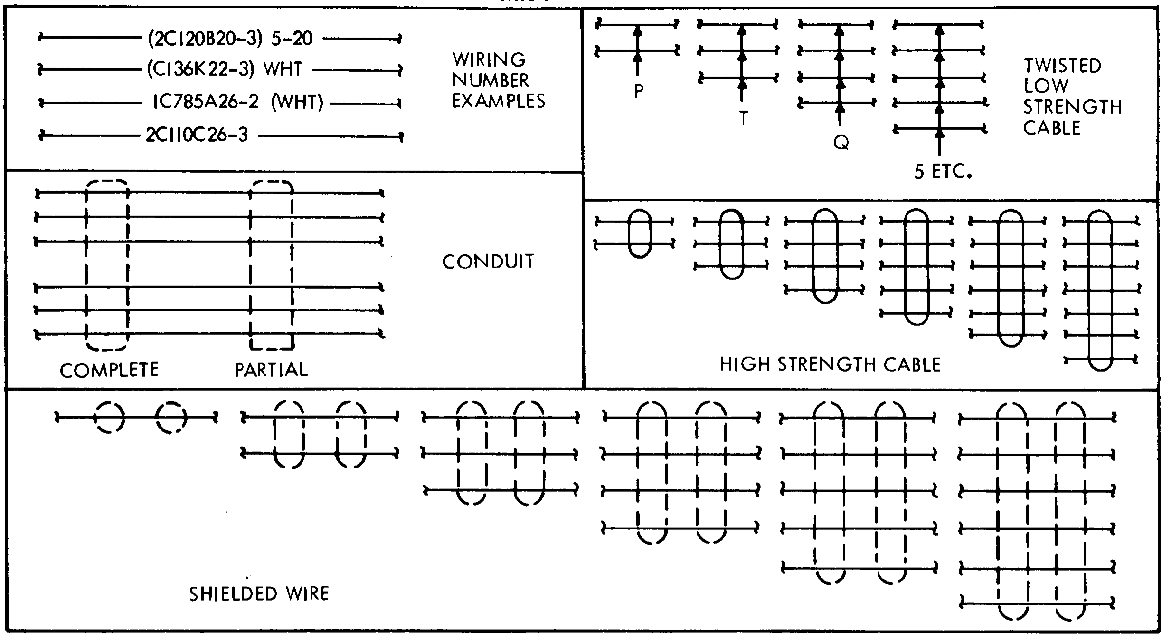
A	AMBER	R	RED
B	BLUE	W	WHITE
C	CLEAR	Y	YELLOW
G	GREEN	O	ORANGE
NE	NEON	P	PURPLE



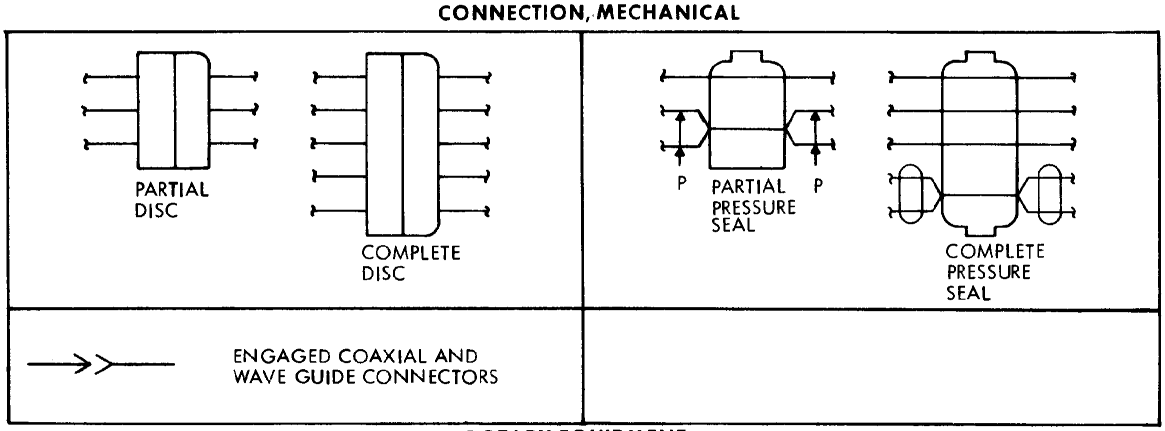
MISCELLANEOUS

	END CAP
OR	QUICK-DISCONNECT OR DRAW-OUT CONNECTOR
	WIRE CROSSING
	WIRE JUNCTION (SPLICE)
	GROUND
	HORN
	LOOP ANTENNA
	SPEED REGULATOR GOVERNOR
	INDUCTANCE OR COIL
----	MECHANICAL LINKAGE
	ANTENNA, GENERAL
	GROUND, CHASSIS OR FRAME CONNECTION - MAY BE AT SUBSTANTIAL POTENTIAL WITH RESPECT TO AIRCRAFT STRUCTURE
	PLUG, ADAPTER, PLUG
	TRANSISTOR, TRIODE PNP TYPE
	TRANSISTOR, TRIODE NPN TYPE
	TERMINAL BLOCK
	COAXIAL CABLE WITH SHIELD GROUNDED
	SERVICE OUTLETS RECEPTACLE
OR	BUS
	BATTERY
	PHOTOTUBE
	AMPLIFIER
Ω	OHM
∿	HERTZ
Ø	PHASE
>	GREATER THAN
<	LESS THAN

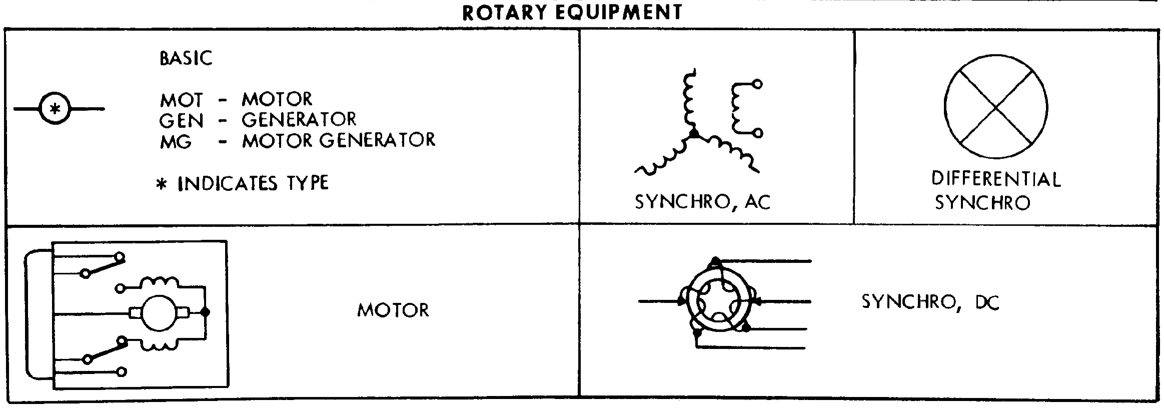
MISCELLANEOUS



CONNECTION, MECHANICAL



ROTARY EQUIPMENT



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GENERAL AIRPLANE INFORMATION

The C-5 Galaxy airplane is a high-speed, long-range, high sweptwing, T-tailed monoplane. The airplane is designed for transportation of general cargo, wheeled vehicles, or palletized cargo for aerial delivery. It is adaptable to personnel transportation and can accommodate 75 troops in the troop compartment, 270 troops in the cargo compartment when the palletized seat kit is installed, eight persons in the troop/courier compartment, seven persons in the relief crew compartment, and a maximum of seven flight crew personnel in the flight deck . The airplane is powered by four GE-TF-39 turbofan engines. The airplane landing gear is of the fully retractable modified tricycle type, with four steerable wheels on the nose landing gear (NLG) and six bogie-mounted wheels on each of the four main landing gear (MLG) assemblies.

Airplane Dimensions

The major dimensions of the airplane are illustrated on page 1-3. The dimensions are based on the airplane in a level attitude at maximum gross weight.

Major Component Weights

The weights of all major components of the airplane are listed on page 1-4. This information can be used to help determine the manpower or crane capacity required to remove or install a particular component.

Airplane Stations

See pages 1-7 thru 1-16 for airplane stations, water lines (WL), buttock lines (BL), and stringer numbers.

Danger Areas

The turbofan engines emit exhaust gases which are capable of reaching very high temperatures and velocities. All personnel should study the danger areas shown on pages 1-17 thru 1-21 in order to avoid these areas during system operation.

Airplane Exterior Walkways and No-step Areas

Certain areas on the upper surface of the wings, fuselage, and horizontal stabilizer have been designated as walkways and no-step areas. The walkway areas are clearly marked on the airplane. Do not walk or step in an area that is not designated as a walkway (page 1-22).

Airplane Maintenance and Ground Handling Markings

Certain symbols are placed on the exterior of the airplane to help maintenance personnel locate points of importance concerning maintenance and ground handling. These symbols are illustrated in pages 1-23 and 1-24.

Airplane Grounding

There are 14 ground receptacles on the airplane. Five are on the forward section of the left MLG pod, five are on the forward section of the right MLG pod, two are at the left overwing fuel caps, and two are at the right overwing fuel caps (page 1-60).

Interphone External Connections

Interphone external connections are provided for the use of the airplane interphone system by maintenance personnel during maintenance or ground operations (page 1-61).

Dimensions

Length	247 ft 10 in
Height	65 ft 1 in
Wing Span	222 ft 9 in
Wing Area	6,200 sq ft

Weights

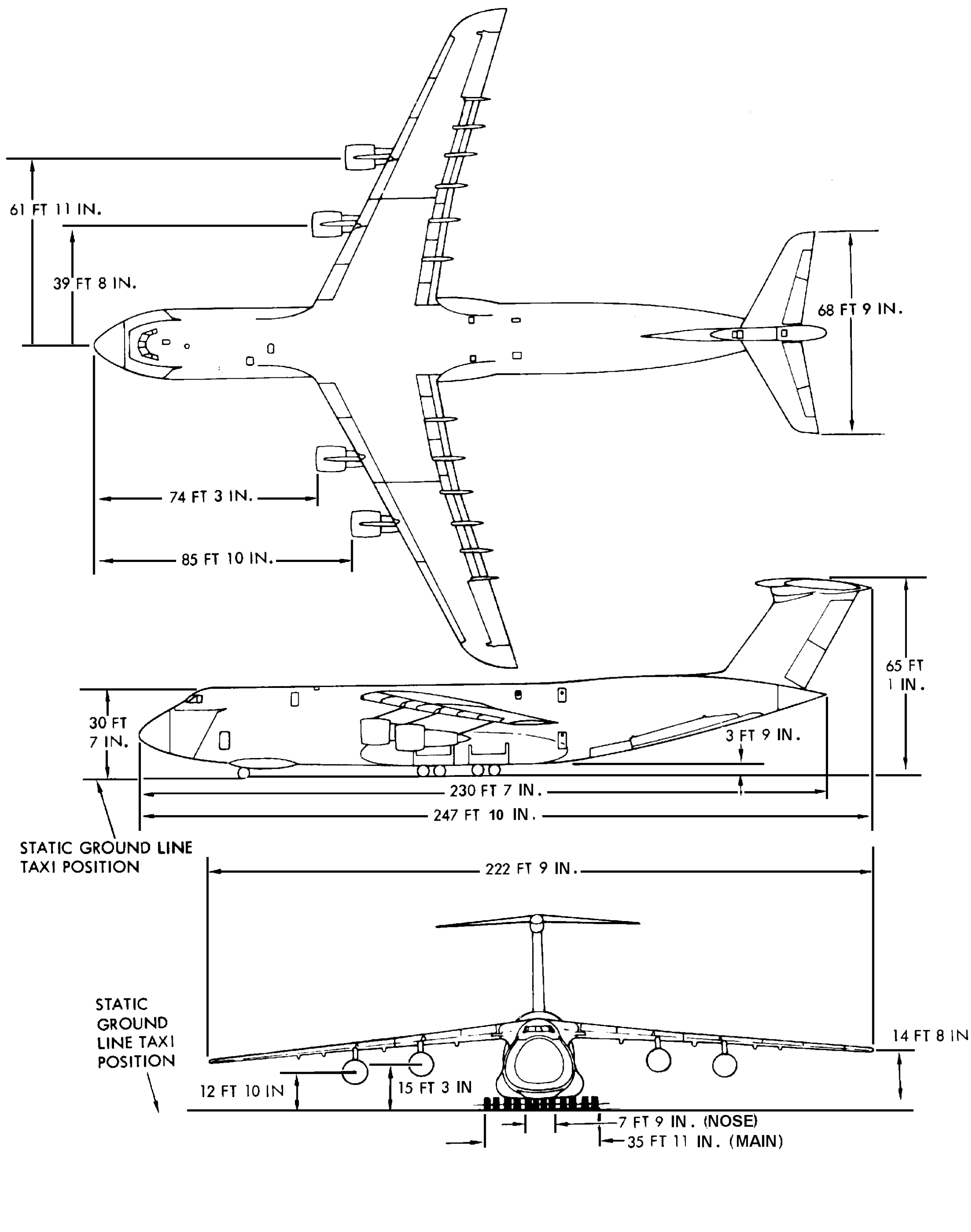
Normal Maximum Ramp Weight	769,000 lbs
Maximum Zero Fuel Weight	665,000 lbs
Maximum Landing Weight	769,000 lbs

Cargo Compartment

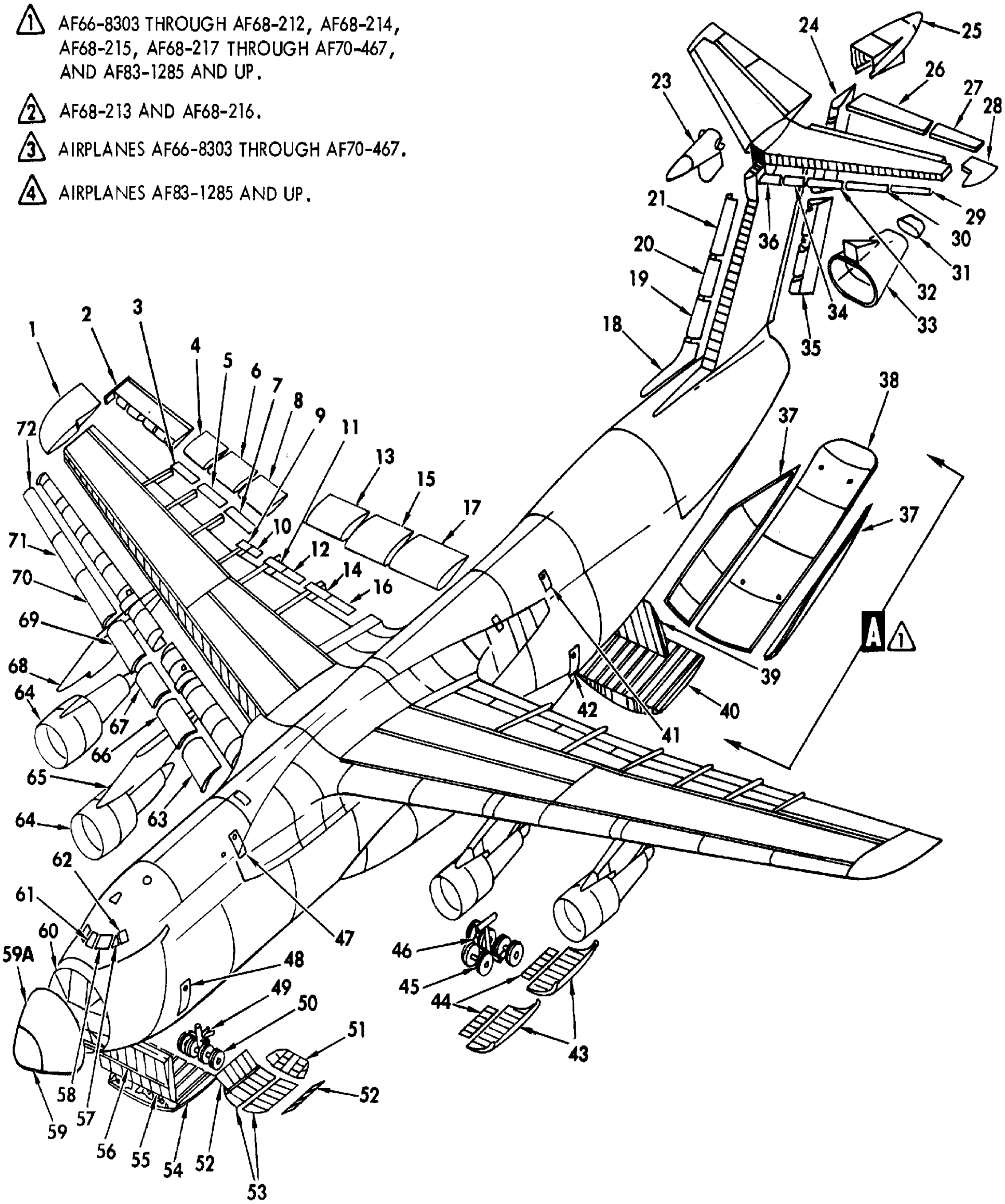
Length Including Ramps	144 ft 6 in
Height	13 ft 6 in
Width	19 ft
Forward Loading Height	13 ft 6 in
Aft Loading Height	9 ft 6 in
Total Volume	34,734 cu ft

Fuel System

Capacity	51,150 gal / 332,500 lbs
Single Point Refueling Rate	2,400 gpm
Jettison Rate	1,380 gpm



Aircraft dimensions

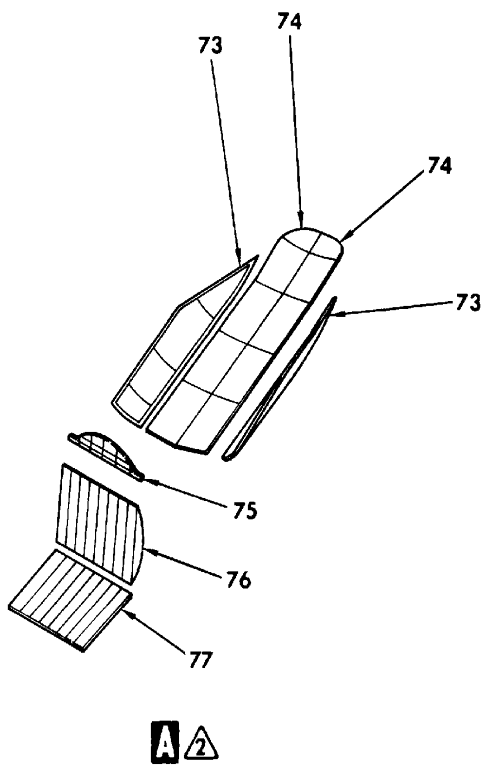


Major component weights (1 of 3)

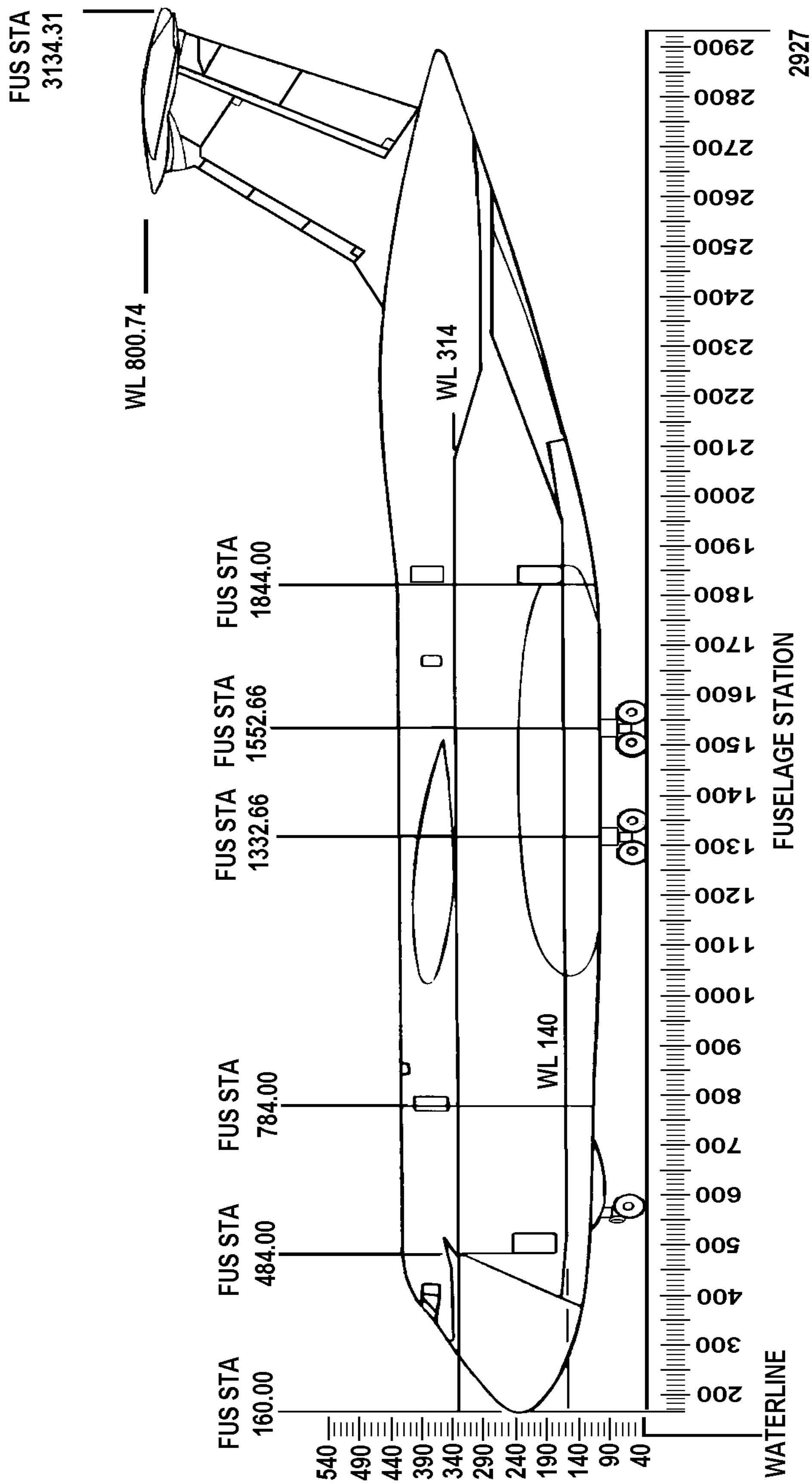
INDEX NO.	NOMENCLATURE	POUNDS △3	POUNDS △4
1	WING TIP	367	360
2	AILERON (INCLUDING BALANCE WEIGHT)	1010	1051
3	SPOILER (NO. 9)	64	65
4	FLAP (NO. 6)	190	223
5	SPOILER (NO. 8)	66	67
6	FLAP (NO. 5)	196	237
7	SPOILER (NO. 7)	75	79
8	FLAP (NO. 4)	217	258
9	SPOILER (NO. 6)	64	65
10	SPOILER (NO. 5)	67	65
11	SPOILER (NO. 4)	55	56
12	SPOILER (NO. 3)	59	59
13	FLAP (NO. 3)	293	349
14	SPOILER (NO. 2)	63	64
15	FLAP (NO. 2)	378	472
16	SPOILER (NO. 1)	63	65
17	FLAP (NO. 1)	461	549
18	DORSAL	26	31
19	VERTICAL STABILIZER LEADING EDGE	61	71
20	VERTICAL STABILIZER LEADING EDGE	41	32
21	VERTICAL STABILIZER LEADING EDGE	40	32
22	DELETED		
23	FORWARD BULLET FAIRING	148	146
24	UPPER RUDDER	272	283
25	AFT BULLET FAIRING (INCLUDING EQUIPMENT)	269	236
26	INBOARD ELEVATOR	298	321
27	OUTBOARD ELEVATOR (INCLUDING BALANCE WEIGHTS)	249	255
28	HORIZONTAL STABILIZER TIP	88	88
29	HORIZONTAL STABILIZER LEADING EDGE	10	12
30	HORIZONTAL STABILIZER LEADING EDGE	11	12
31	STATION KEEPING RADOME	23	23
32	HORIZONTAL STABILIZER LEADING EDGE	13	13
33	AFTERBODY STRUCTURE	260	253
34	HORIZONTAL STABILIZER LEADING EDGE	15	14
35	LOWER RUDDER	345	347
36	HORIZONTAL STABILIZER LEADING EDGE	15	13
37	SIDE AFT CARGO DOOR	395	422
△1 38	CENTER AFT CARGO DOOR	908	1015
39	AFT PRESSURE DOOR	1913	2098
40	AFT RAMP	3888	4248
41	AFT SERVICE DOOR	69	89
42	AFT PERSONNEL DOOR	93	81
43	MAIN LANDING GEAR OUTBOARD DOOR	278	382
44	MAIN LANDING GEAR INBOARD DOOR	47	47
45	MAIN LANDING GEAR WHEEL AND TIRE ASSEMBLY (INCLUDING BRAKE)	373	373
46	MAIN LANDING GEAR ASSEMBLY	7436	7451
47	FORWARD SERVICE DOOR	65	89
48	CREW DOOR	75	76
49	NOSE LANDING GEAR ASSEMBLY	3220	3734
50	NOSE LANDING GEAR WHEEL AND TIRE ASSEMBLY	248	243
51	NOSE LANDING GEAR KNEELING DOOR	75	105
52	NOSE LANDING GEAR OUTBOARD DOOR	54	56
53	NOSE LANDING GEAR INBOARD DOOR	165	224
54	FORWARD RAMP	3569	3501
55	FORWARD RAMP EXTENSION	1457	1261
56	FORWARD RAMP EXTENSION TOES	410	468
57	CLEAR VISION WINDSHIELD (INCLUDING FRAME)	42	42
58	MAIN WINDSHIELD	126	126
59	NOSE RADOME	83	83
59A	NOSE RADOME PLUG	590	590
60	VISOR DOOR	5969	5969
61	CENTER WINDSHIELD	72	72

Major component weights (2 of 3)

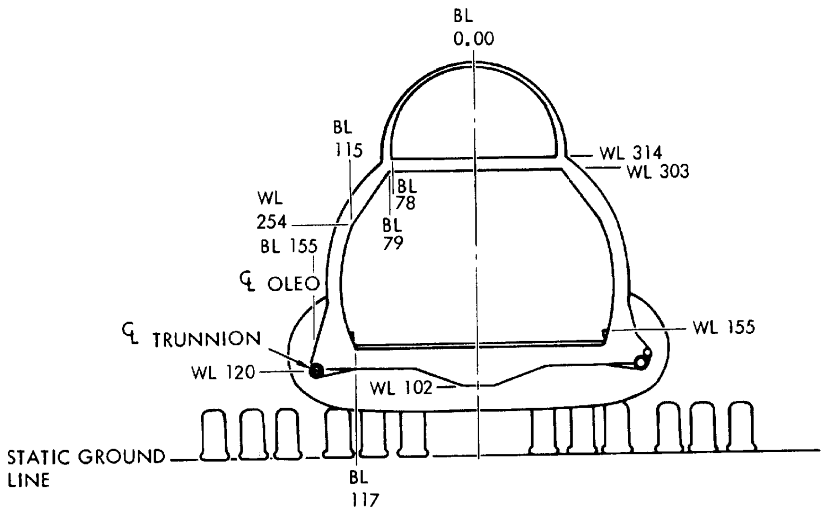
INDEX NO.	NOMENCLATURE	POUNDS △3	POUNDS △4
62	SIDE WINDSHIELD	36	36
63	SLAT (NO. 1)	381	387
64	POWER PLANT (Q.E.C.)	9409	10424
65	INBOARD PYLON	1239	1635
66	SLAT (NO. 2)	350	351
67	SLAT (NO. 3)	290	241
68	OUTBOARD PYLON	1274	1702
69	SLAT (NO. 4)	239	242
70	SLAT (NO. 5)	325	258
71	SLAT (NO. 6)	230	222
72	SLAT (NO. 7)	208	190
	FOLLOWING APPLY ONLY TO **AF68-213 AND AF68-216**		
73	SIDE AFT CARGO DOOR	556	
74	CENTER AFT CARGO DOOR HALF	903	
75	MOVING PRESSURE BULKHEAD	1376	
76	AFT PRESSURE DOOR	1959	
77	AFT RAMP	4142	



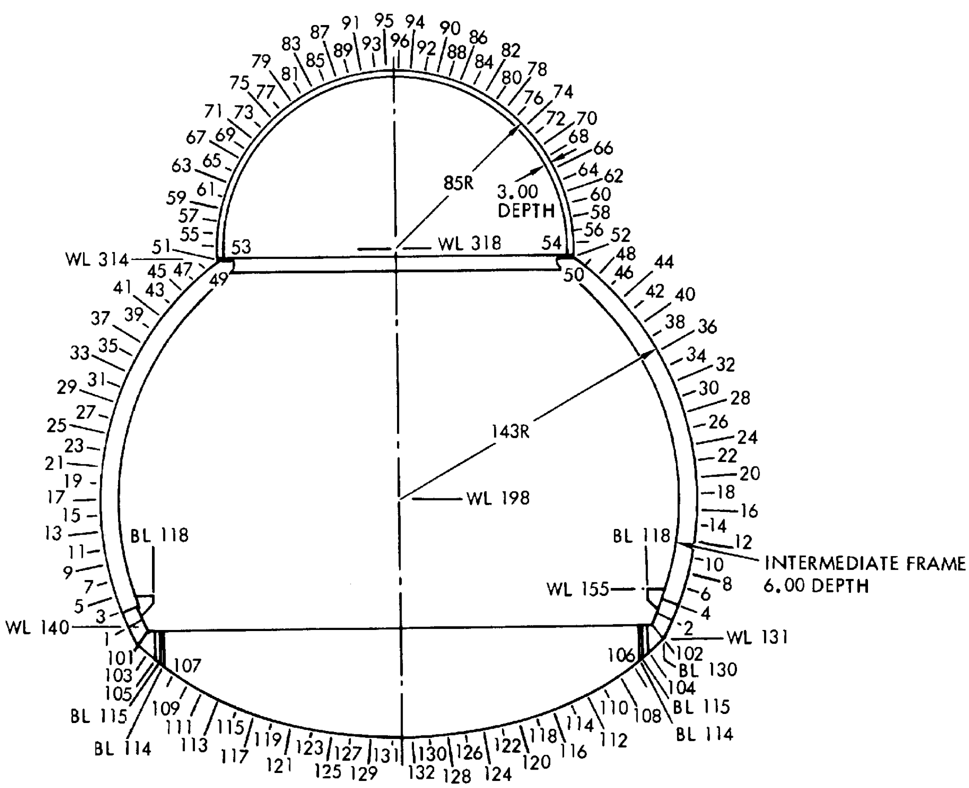
Major component weights (3 of 3)



Aircraft stations (1 of 10)



FUSELAGE SECTION
TYPICAL FOR FUS STA 1523.16
AND FUS STA 1603.16
(VIEW LOOKING FORWARD)



STRINGER LOCATION
(VIEW LOOKING FORWARD)

Aircraft stations (2 of 10)

STRINGER LOCATIONS FROM
FUS STA 524.00 TO FUS STA 1603.16
FOR THE UPPER AND LOWER LOBE

STRINGER NO LH	STRINGER NO RH	BL	WL
1	2	130.29	140.00
3	4	133.30	147.17
5	6	135.92	154.50
7	8	138.14	161.95
9	10	139.94	169.52
11	12	141.33	177.17
13	14	142.31	184.88
15	16	142.86	192.64
17	18	142.99	200.42
19	20	142.70	208.19
21	22	141.99	215.94
23	24	140.85	223.63
25	26	139.30	231.25
27	28	137.34	238.78
29	30	134.97	246.18
31	32	132.20	253.45
33	34	129.04	260.56
35	36	125.50	267.48
37	38	121.59	274.21
39	40	117.32	280.70
41	42	112.70	286.96
43	44	107.74	292.96
45	46	102.47	298.68
47	48	96.90	304.10
49	50	91.04	309.21
51	52	84.91	314.00
53	54	84.97	320.11
55	56	84.60	326.21
57	58	83.79	332.27
59	60	82.55	338.25
61	62	80.88	344.13
63	64	78.80	349.87
65	66	76.30	355.45
67	68	73.42	360.84
69	70	70.15	366.00
71	72	66.52	370.92
73	74	62.55	375.56

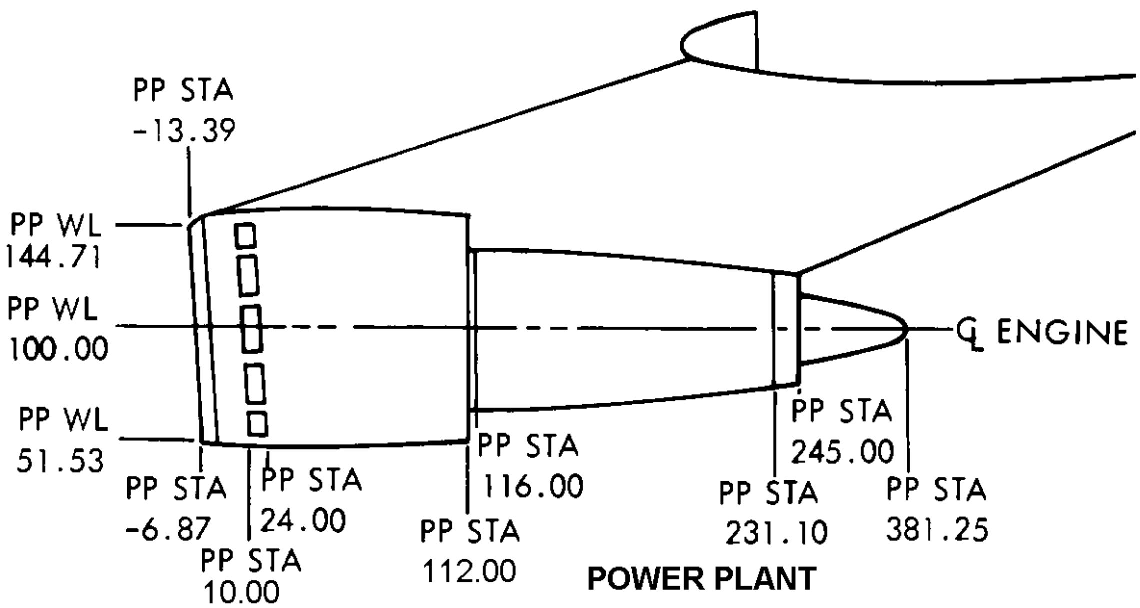
STRINGER LOCATIONS FROM
FUS STA 524.00 TO FUS STA 1603.16
FOR THE UPPER AND LOWER LOBE

STRINGER NO LH	STRINGER NO RH	BL	WL
75	76	58.25	379.90
77	78	53.65	383.93
79	80	48.78	387.61
81	82	43.65	390.94
83	84	38.30	393.88
85	86	32.75	396.44
87	88	27.03	398.59
89	90	21.17	400.32
91	92	15.20	401.63
93	94	9.15	402.51
95	96	3.06	402.95

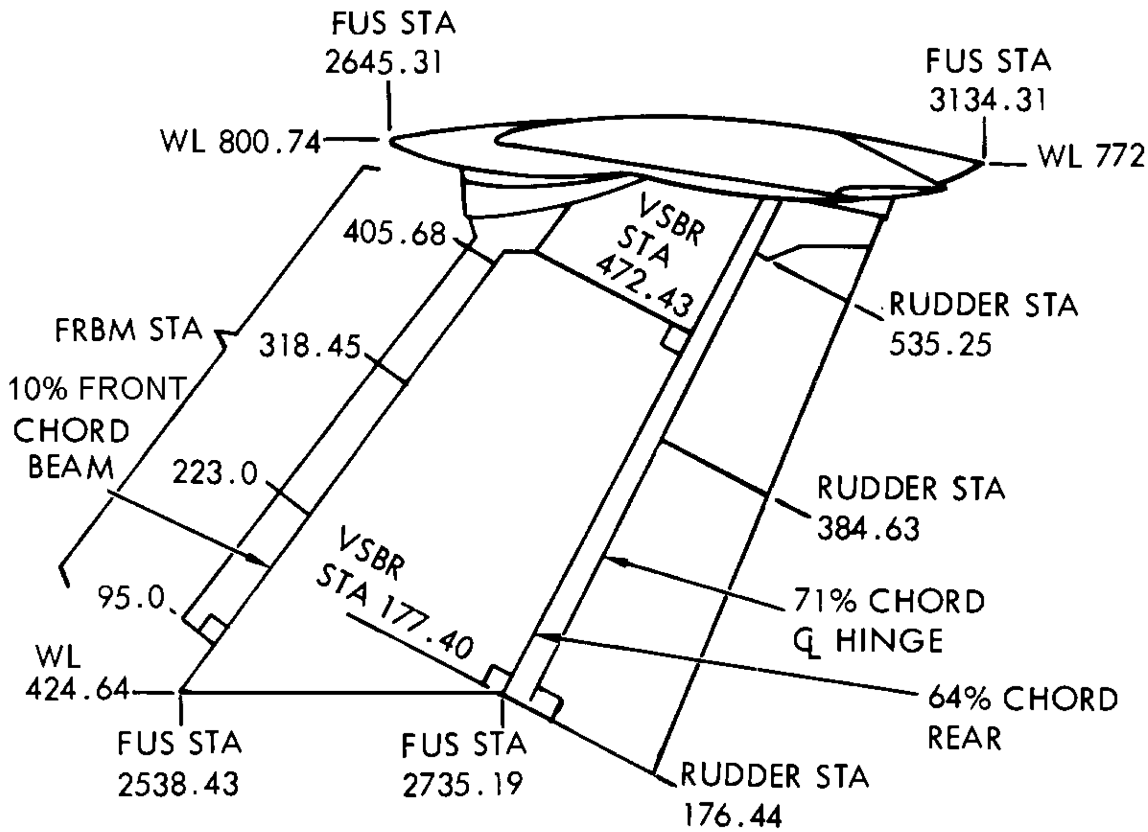
UNDERFLOOR STRINGER LOCATIONS
FROM FUS STA 524.0 TO FUS STA 1268.16
FROM FUS STA 1638.16 TO FUS STA 1964.00

STRINGER NO LH	STRINGER NO RH	BL
101	102	125.89
103	104	119.21
105	106	112.24
107	108	104.98
109	110	97.45
111	112	89.68
113	114	81.68
115	116	73.47
117	118	65.08
119	120	56.52
121	122	47.82
123	124	39.00
125	126	30.58
127	128	22.10
129	130	13.57
131	132	5.00

Aircraft stations (3 of 10)

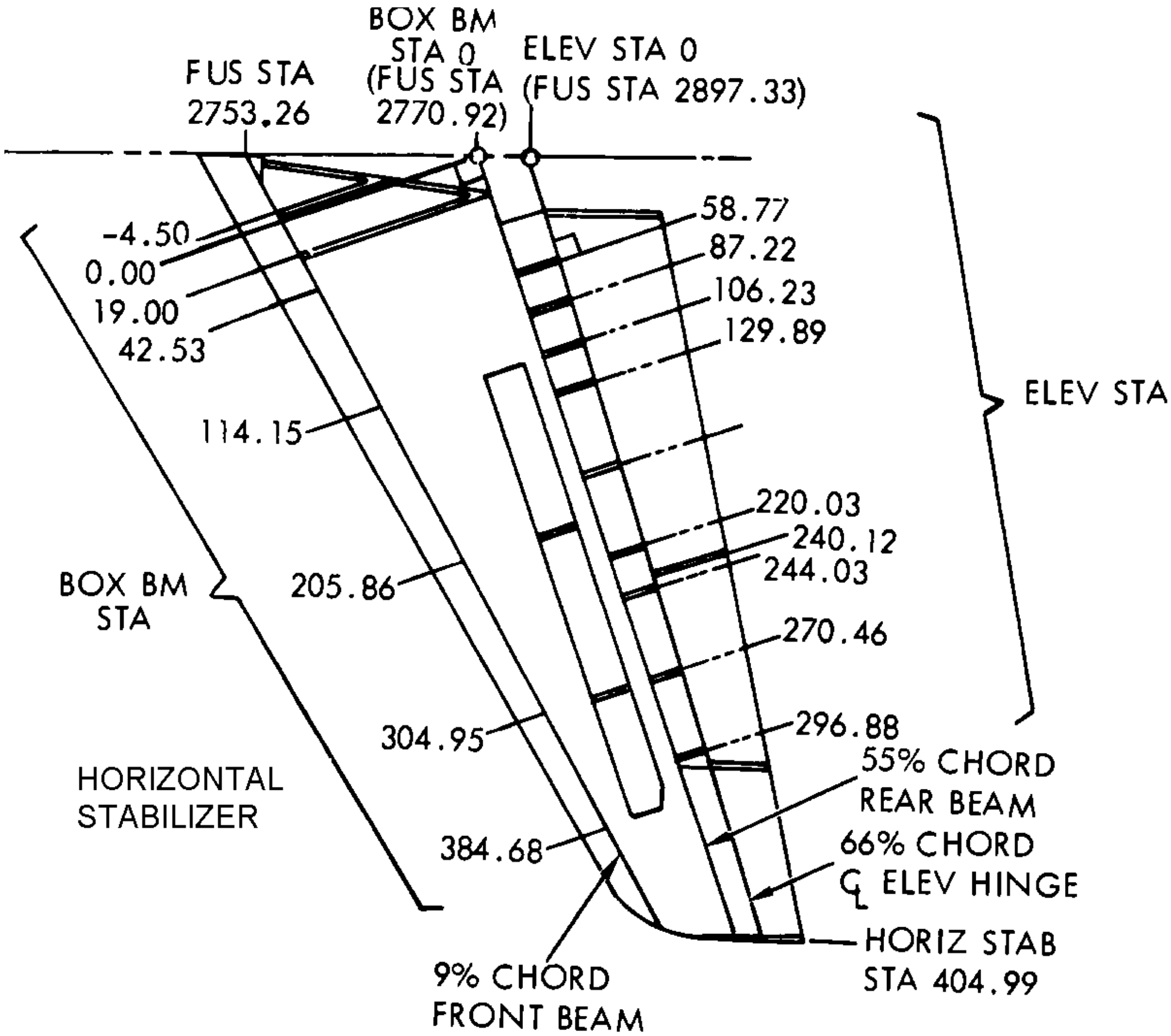


Aircraft stations (4 of 10)

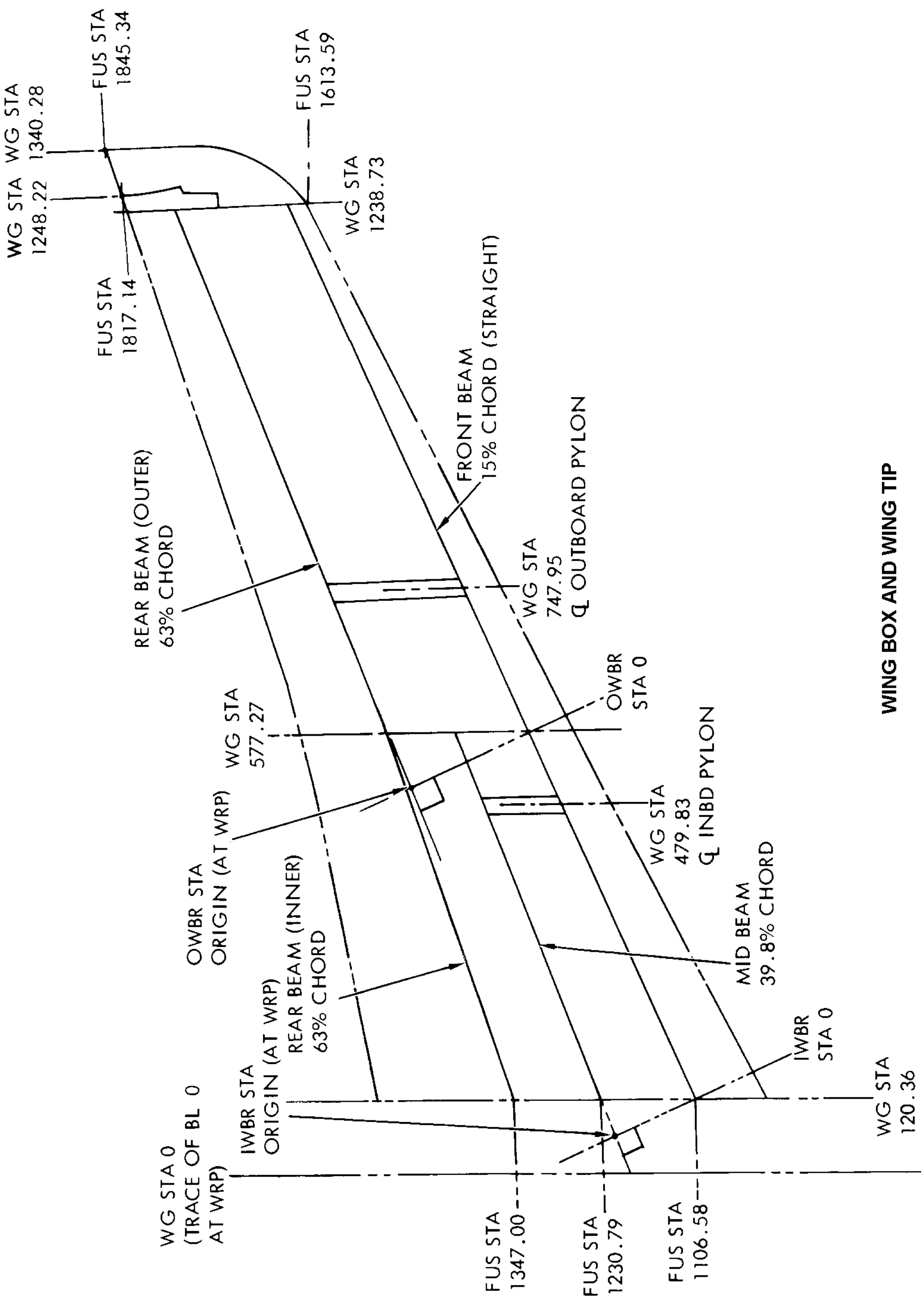


VERTICAL STABILIZER

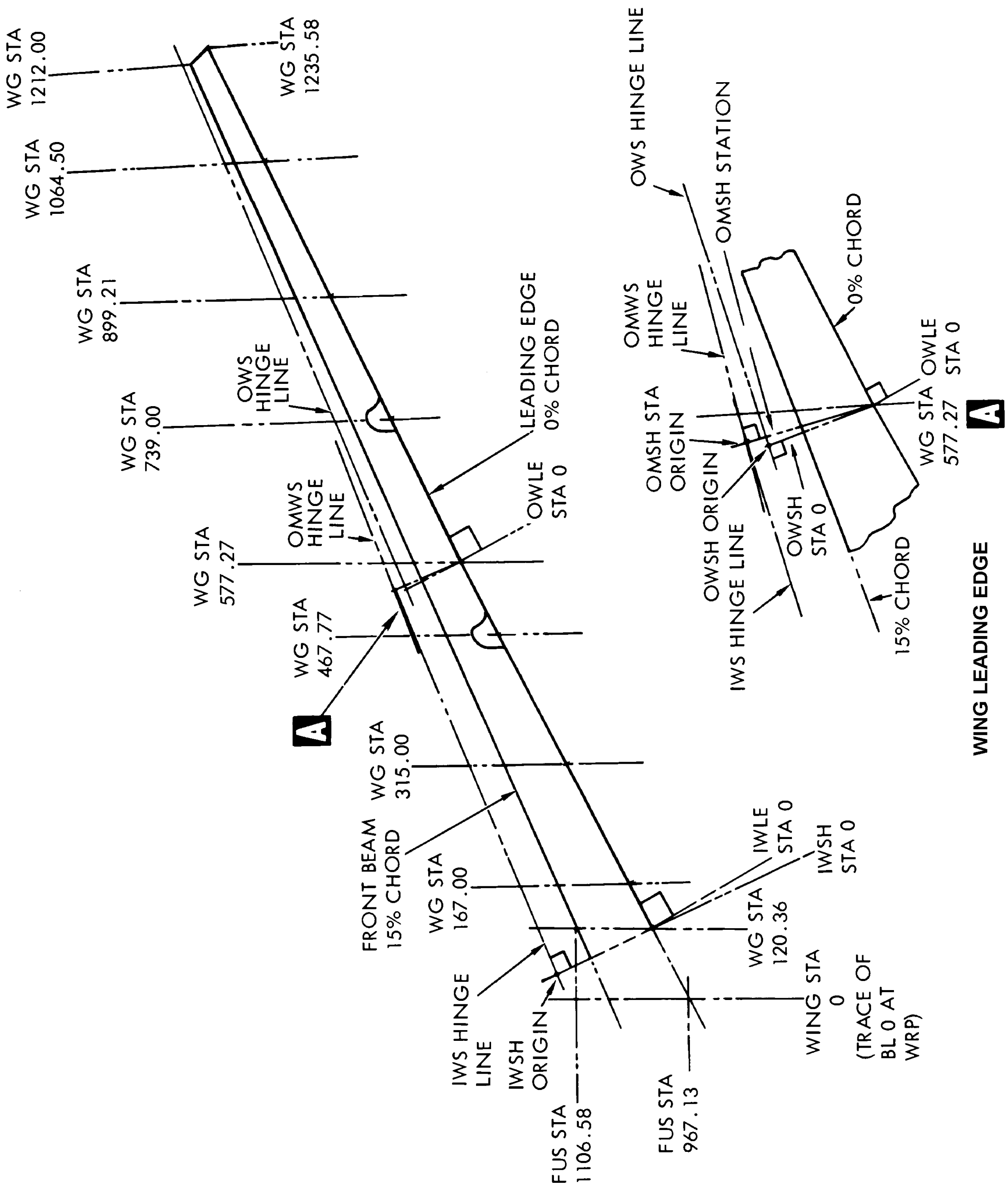
Aircraft stations (5 of 10)



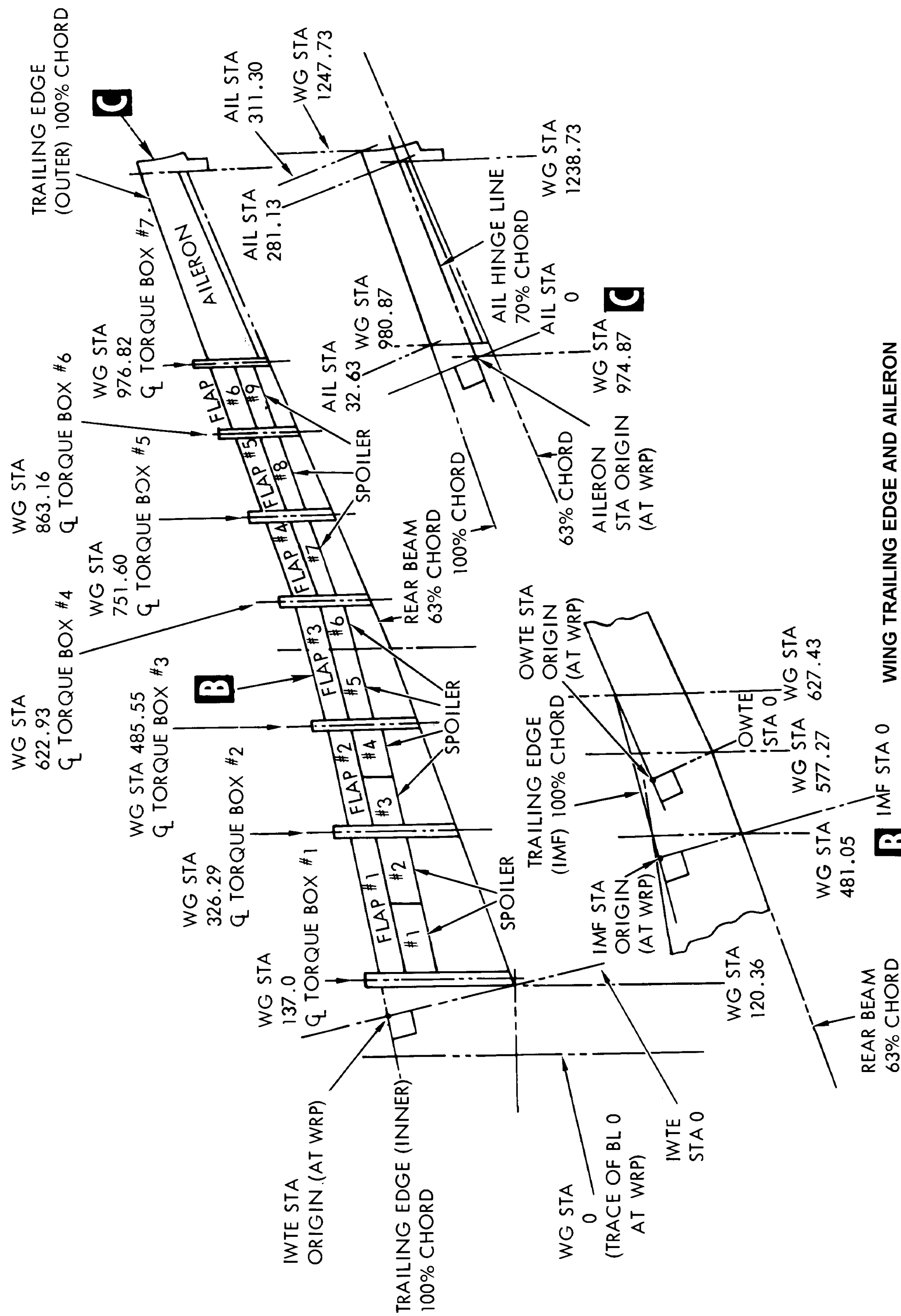
Aircraft stations (6 of 10)



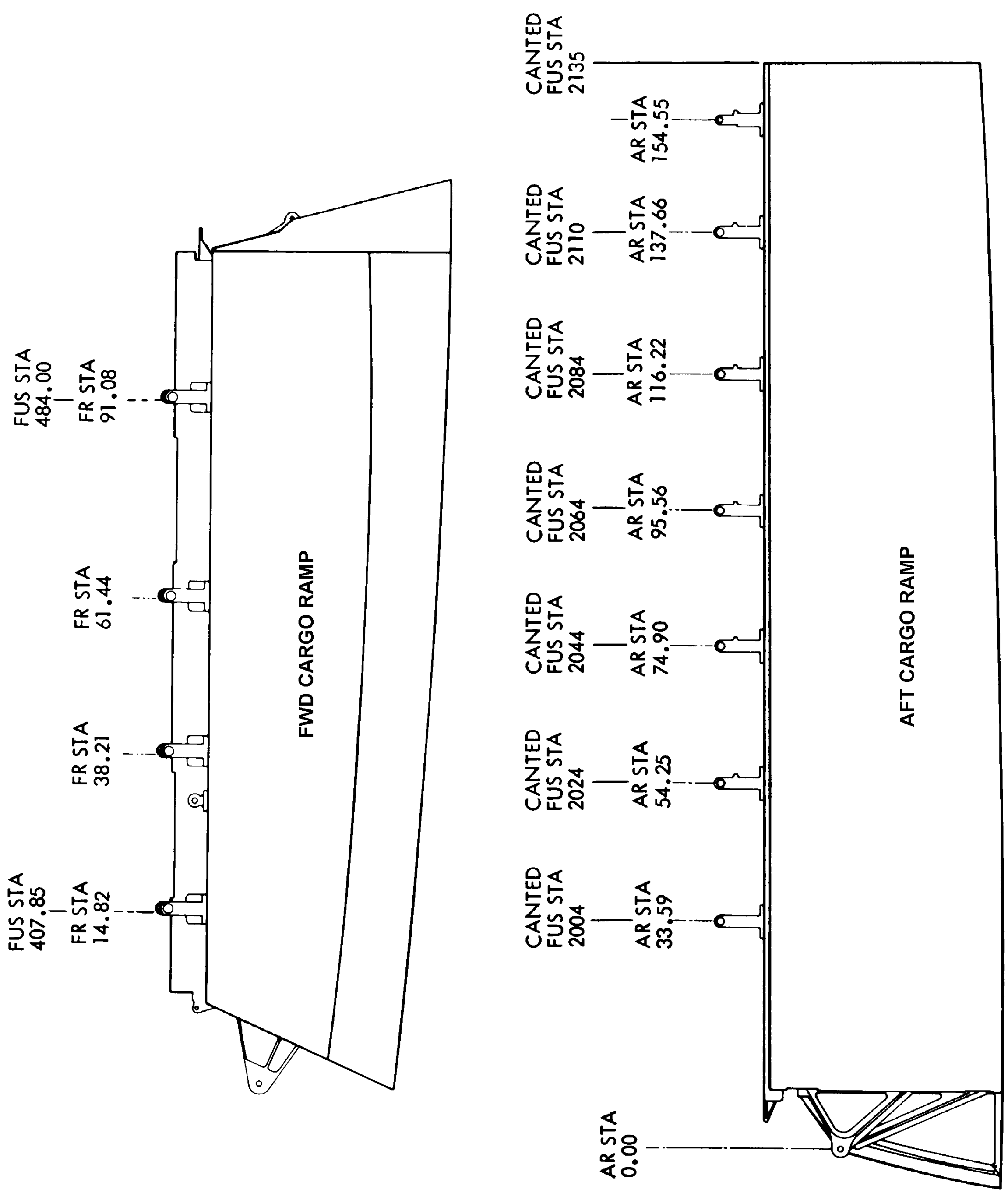
Aircraft stations (7 of 10)



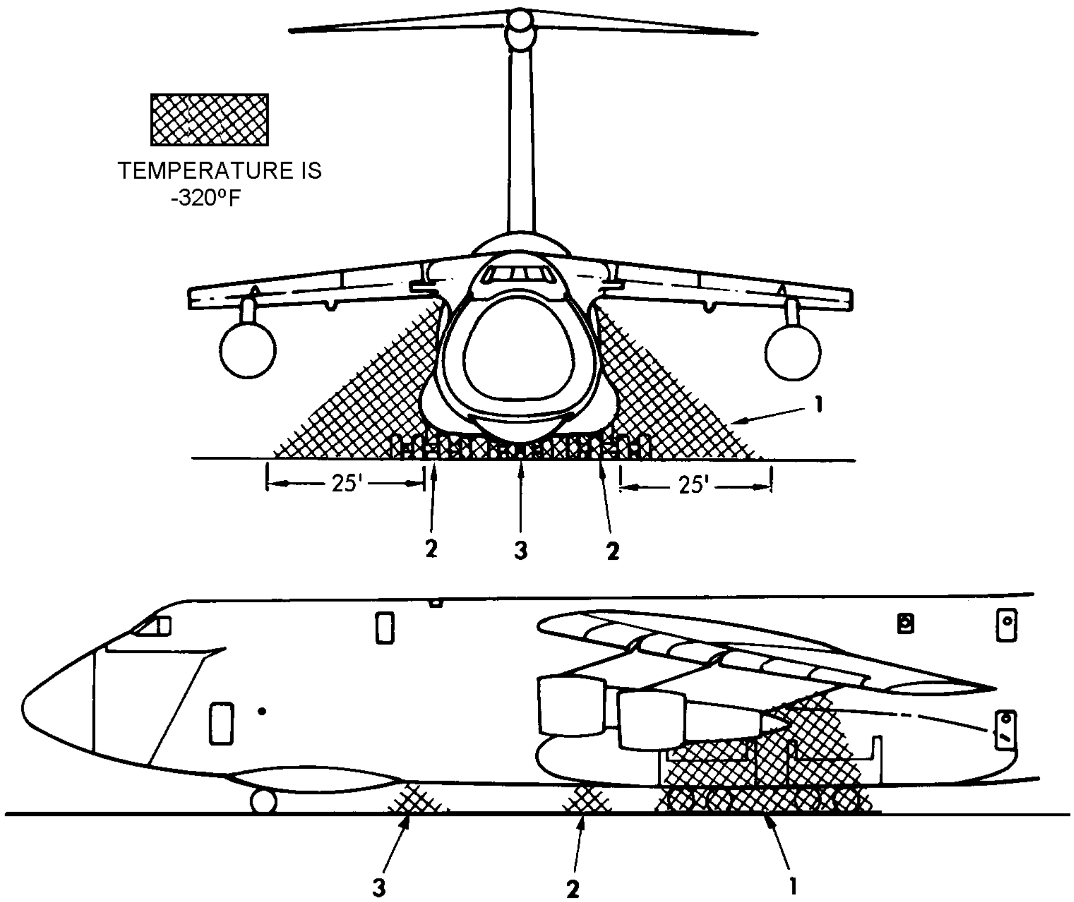
Aircraft stations (8 of 10)



Aircraft stations (9 of 10)



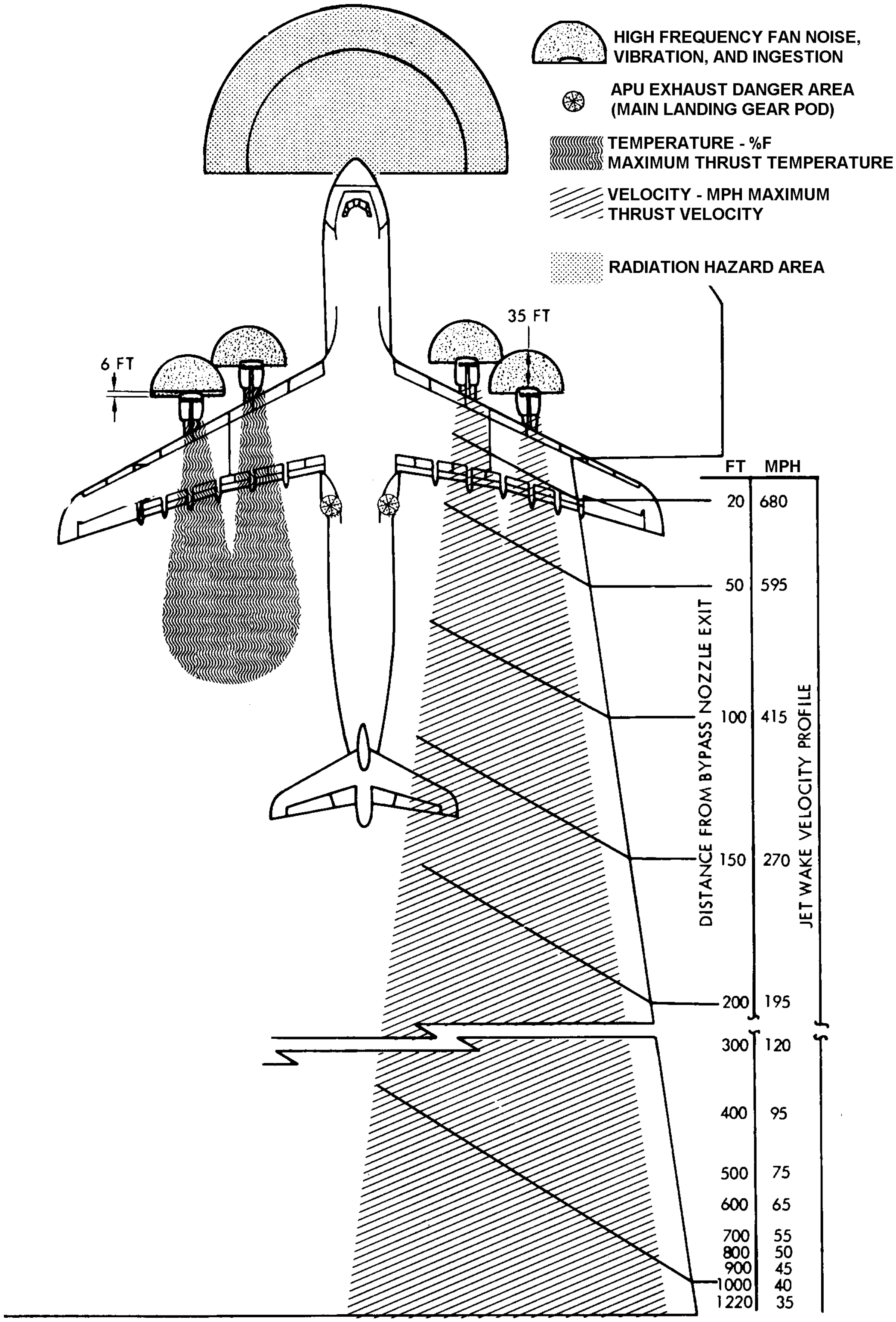
Aircraft stations (10 of 10)



1. DANGER AREA DURING SERVICING
2. DANGER AREA DURING POWER TRANSFER UNIT (PTU) AND FSS (OPERATION LEFT AND RIGHT FWD MLG POD)
3. DANGER AREA DURING CARGO UNDERFLOOR FSS OPERATION

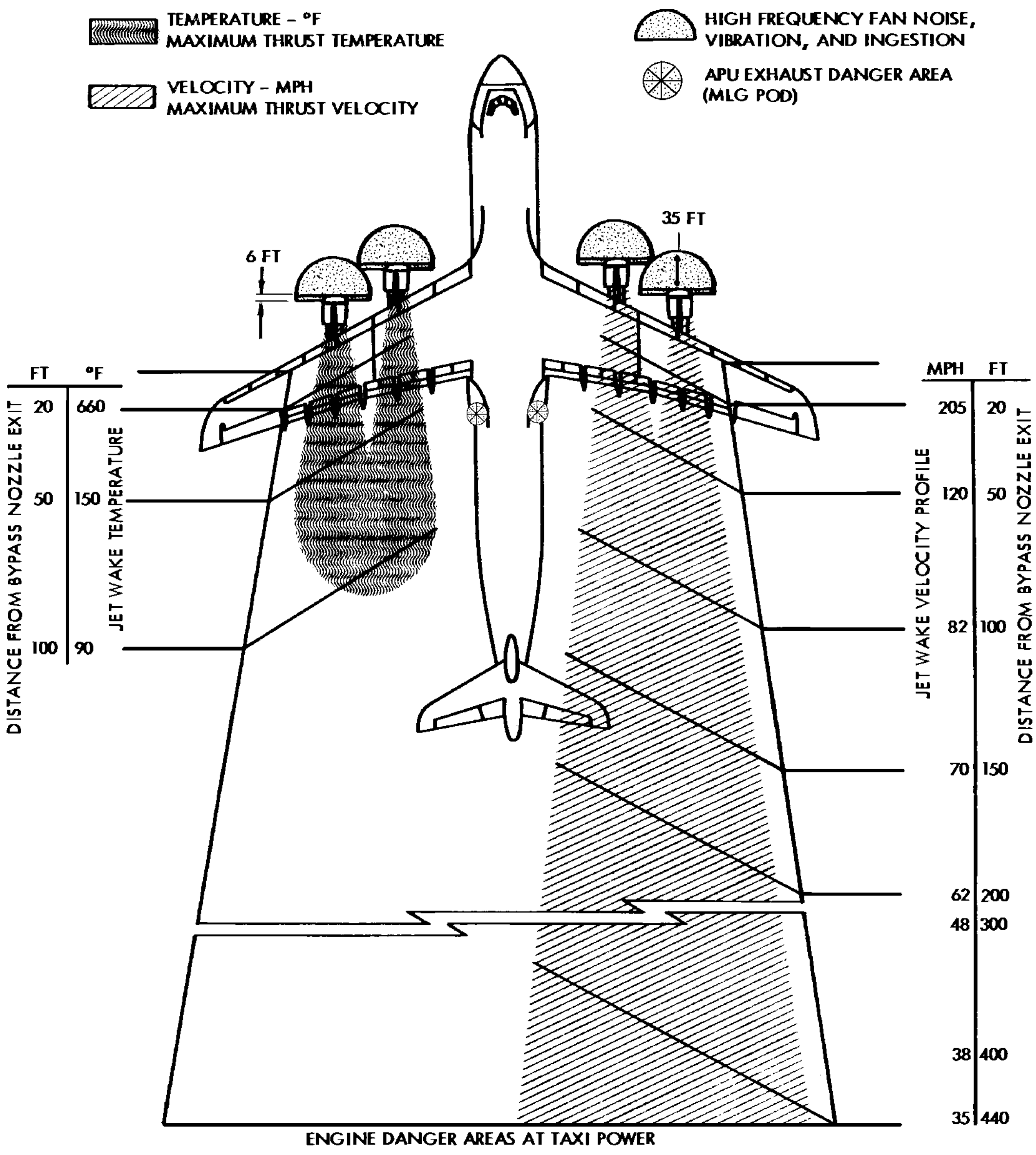
FIRE SUPPRESSION SYSTEM (FSS)
LIQUID NITROGEN OVERBOARD VENT DANGER AREAS

Danger areas (1 of 5)

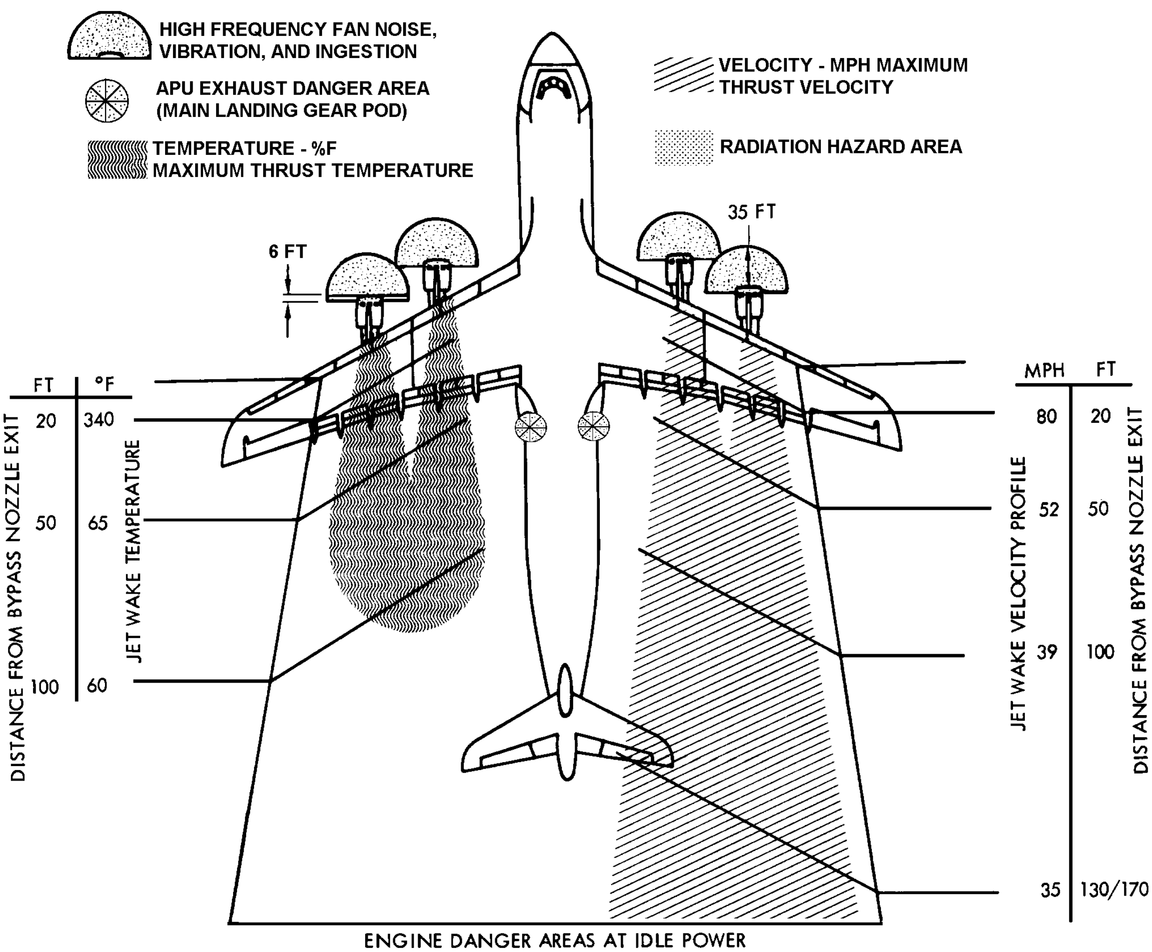


ENGINE DANGER AREAS AT TAKEOFF POWER

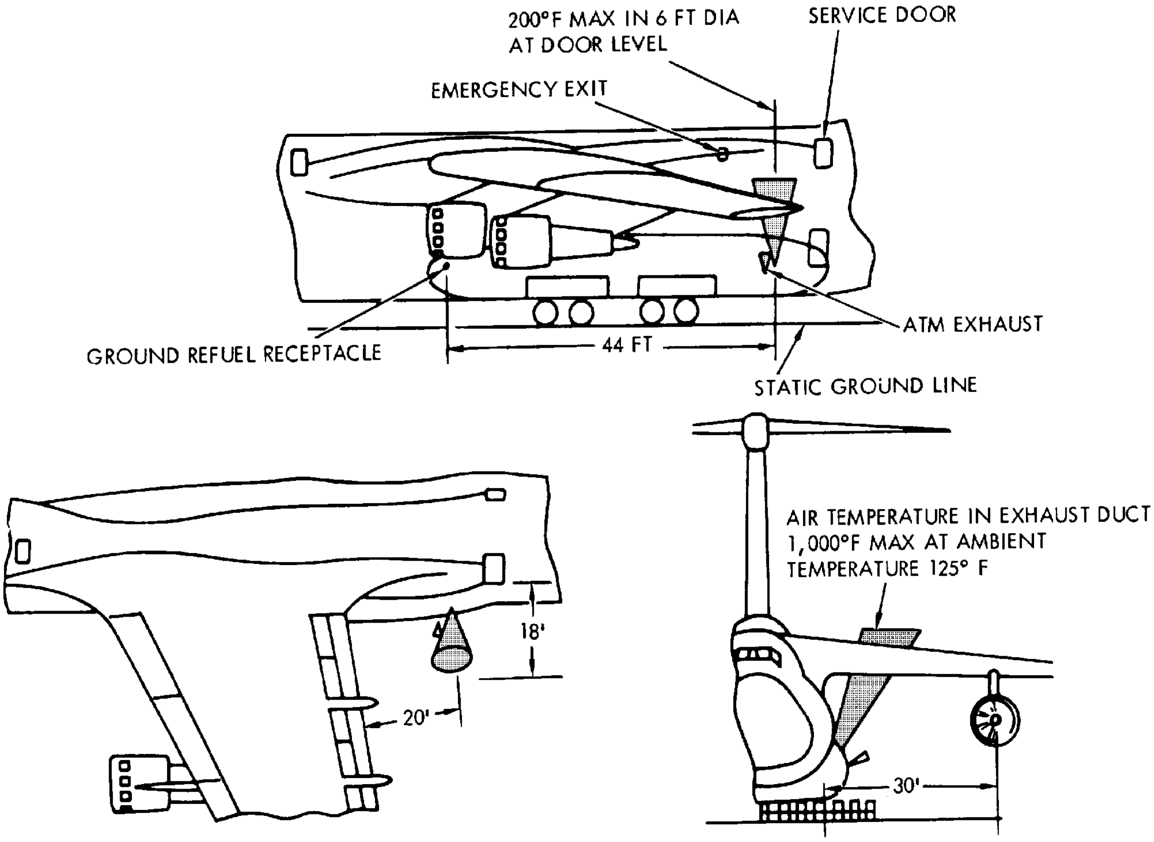
Danger areas (2 of 5)



Danger areas (3 of 5)



Danger areas (4 of 5)

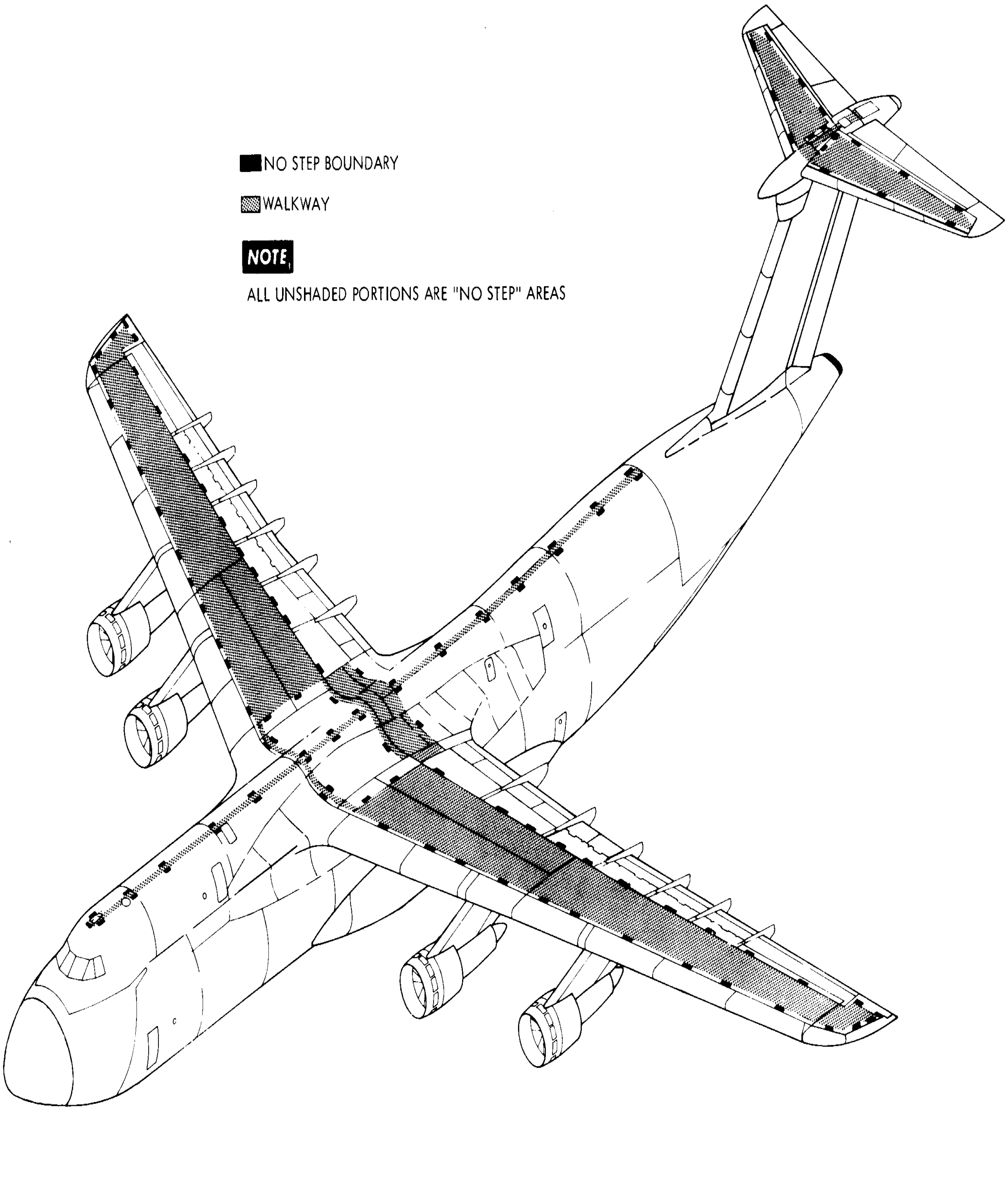


C-5 APU AND ATM EXHAUST FLOW

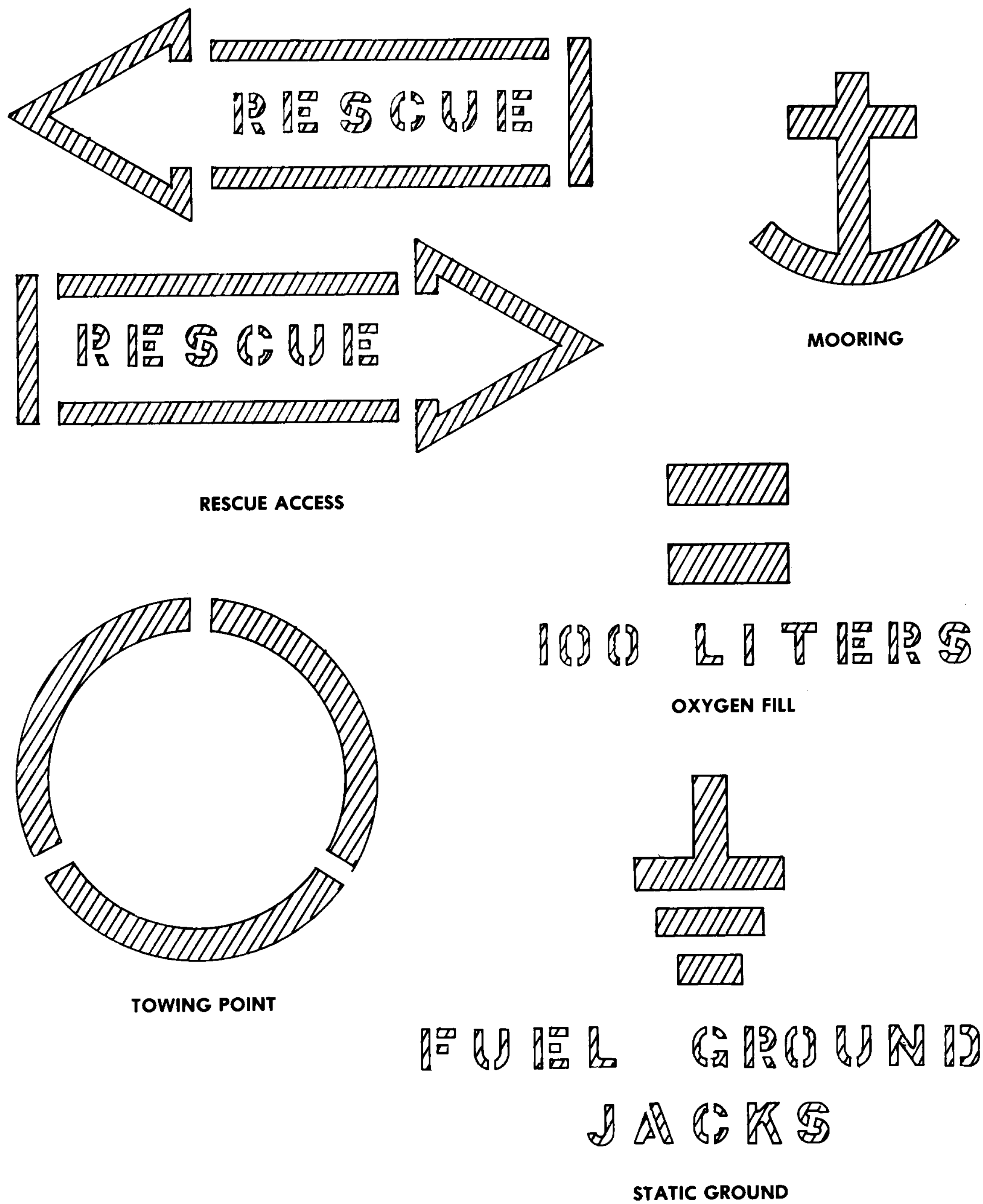
DECIBELS (DBA)	REQUIRED EAR PROTECTION	ALLOWABLE EXPOSURE TIME, IN MINUTES, FOR AN EIGHT HOUR PERIOD
0 - 84	NO PROTECTION REQUIRED	
85 - 109	EAR MUFFS AND EAR PLUGS	480
110 - 124	EAR MUFFS AND EAR PLUGS	480
125 - 130	EAR MUFFS AND EAR PLUGS	170
131 - 135	EAR MUFFS AND EAR PLUGS	71
136 - 140	EAR MUFFS AND EAR PLUGS	30
141 - 145	EAR MUFFS AND EAR PLUGS	13
146 - 150	EAR MUFFS AND EAR PLUGS	5
150 - 155	EAR MUFFS AND EAR PLUGS	2

APU EXHAUST DANGER AREA (MLG POD)

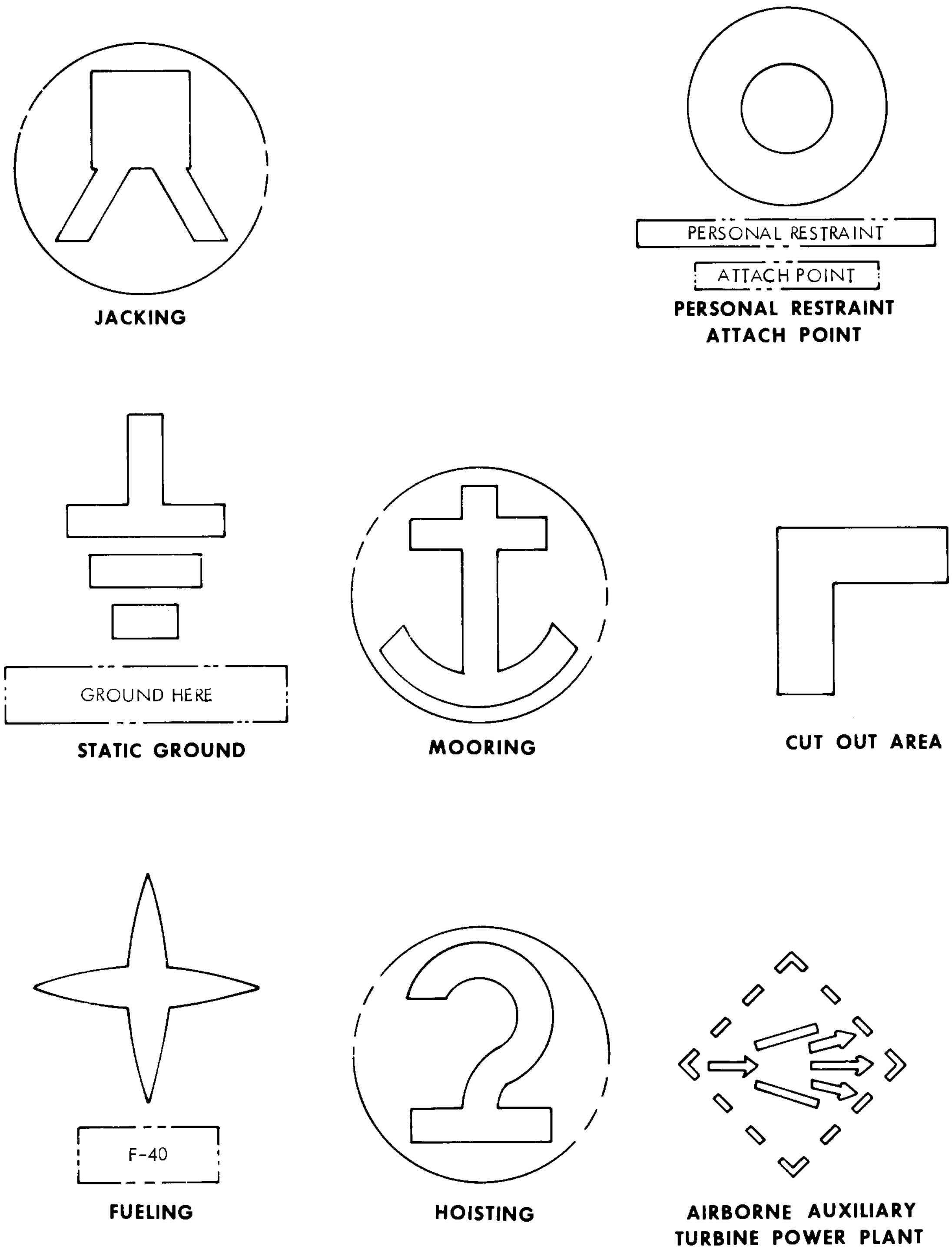
Danger areas (5 of 5)



Exterior walkways and no step areas



Aircraft maintenance and ground handling markings (1 of 2)



Aircraft maintenance and ground handling markings (2 of 2)

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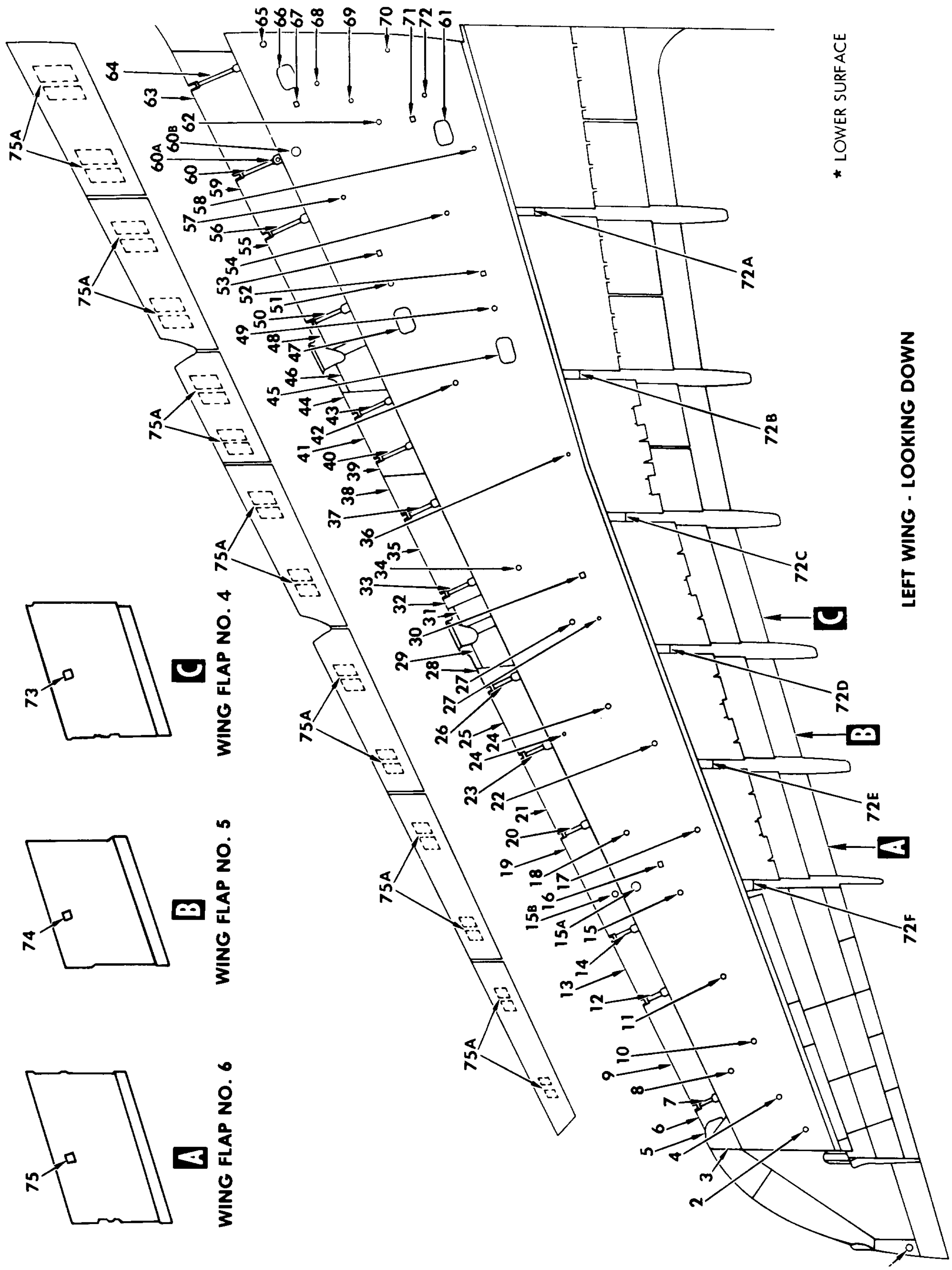


Wing external access provisions (1 of 12)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
1	3123-1	MAGNETIC DETECTOR ACCESS
2	FG410B14/ △1 20050-0000-0119	NO. 1 MAIN TANK FUEL PROBE
3	3113-9	SYSTEM ACCESS
4	FG410B13/ △1 20050-0000-0118	NO. 1 MAIN TANK FUEL PROBE
5	3113-10	FAIRING
6	3113-8	SYSTEM ACCESS
7	3113-7	NAS1153V8 BOLT
8	FG416B1/ △1 20049-0000-0106	NO. 1 MAIN TANK FUEL PROBE
9	3113-6	SYSTEM ACCESS
10	FG410B12/ △1 20050-0000-0117	NO. 1 MAIN TANK FUEL PROBE
11	FG410B11/ △1 20050-0000-0116	NO. 1 MAIN TANK FUEL PROBE
12	3113-5	NAS1153V8 BOLT
13	3113-4	SYSTEM ACCESS
14	3113-3	NAS1153V8 BOLT
15	FG410B10/ △1 20050-0000-0115	NO. 1 MAIN TANK FUEL PROBE
15A	N38260	NO. 1 MAIN OVERWING FILLER CAP

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
15B	AN3117-1	GROUNDING JACK
16	3113-2	NO. 1 MAIN TANK FUEL LEVEL CONTROL VALVE
17	FG410B9/ △1 20050-0000-0114	NO. 1 MAIN TANK FUEL PROBE
18	FG410B8/ △1 20050-0000-0113	NO. 1 MAIN TANK FUEL PROBE
19	3113-2	SYSTEM ACCESS
20	3113-1	NAS1153V8 BOLT
21	3112-12	SYSTEM ACCESS
22	FG415B5/ △1 20049-0000-0105	NO. 1 AUX TANK FUEL PROBE
23	3112-11	NAS1153V8 BOLT
24	FG410B19/ △1 20050-0000-0112	NO. 1 AUX TANK FUEL PROBE
25	3112-10	SYSTEM ACCESS
26	3112-9	NAS1153V8 BOLT
27	FG410B18/ △1 20050-0000-0111	NO. 1 AUX TANK FUEL PROBE
28	3112-8	SYSTEM ACCESS
29	3112-7	SYSTEM ACCESS
30	3113-1	NO. 1 AUX TANK FUEL LEVEL CONTROL VALVE
31	3112-6	SYSTEM ACCESS
32	3112-5	SYSTEM ACCESS

△1 PREFERED SPARE

Wing external access provisions (2 of 12)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
33	3112-4	NAS1153V8 BOLT
34	FG410B17/ △1 20050-0000-0110	NO. 1 AUX TANK FUEL PROBE
35	3112-3	SYSTEM ACCESS
36	FG415B2/ △1 20049-0000-0104	NO. 1 EXT RANGE TANK FUEL PROBE
37	3112-2	NAS1153V8 BOLT
38	3112-1	SYSTEM ACCESS
39	3111-14	SYSTEM ACCESS
40	3111-13	SYSTEM ACCESS
41	3111-12	SYSTEM ACCESS
42	FG415B4/ △1 20049-0000-0103	NO. 2 AUX TANK FUEL PROBE
43	3111-11	SYSTEM ACCESS
44	3111-10	SYSTEM ACCESS
45	3121-3	NO. 1 EXT RANGE TANK ACCESS
46	3111-9	SYSTEM ACCESS
47	3121-2	NO. 2 AUX TANK ACCESS
48	3111-8	SYSTEM ACCESS
49	FG410B7/ △1 20050-0000-0109	NO. 1 EXT RANGE TANK FUEL PROBE
50	3111-7	SYSTEM ACCESS
51	FG410B16/ △1 20050-0000-0107	NO. 2 AUX TANK FUEL PROBE
52	3121-7	NO. 2 AUX EXT RANGE TANK FUEL LEVEL CONTROL VALVE
53	3121-8	NO. 2 AUX TANK FUEL LEVEL CONTROL VALVE
54	FG410B6/ △1 20050-0000-0108	NO. 1 EXT RANGE TANK FUEL PROBE
55	3111-6	SYSTEM ACCESS
56	3111-5	SYSTEM ACCESS
57	FG410B15/ △1 20050-0000-0106	NO. 2 AUX TANK FUEL PROBE
58	FG415B3/ △1 20049-0000-0102	NO. 2 EXT RANGE TANK FUEL PROBE
59	3111-4	SYSTEM ACCESS
60	3111-3	SYSTEM ACCESS
60A	AN3117-1	GROUNDING JACK
60B	N38260	NO. 2 MAIN OVER-WING FILLER CAP
61	3121-4	NO. 2 EXT RANGE TANK ACCESS
62	FG415B1/ △1 20049-0000-0101	NO. 2 MAIN TANK FUEL PROBE
63	3111-2	SYSTEM ACCESS
64	3111-1	SYSTEM ACCESS
65	FG410B1/ △1 20050-0000-0101	NO. 2 MAIN TANK FUEL PROBE

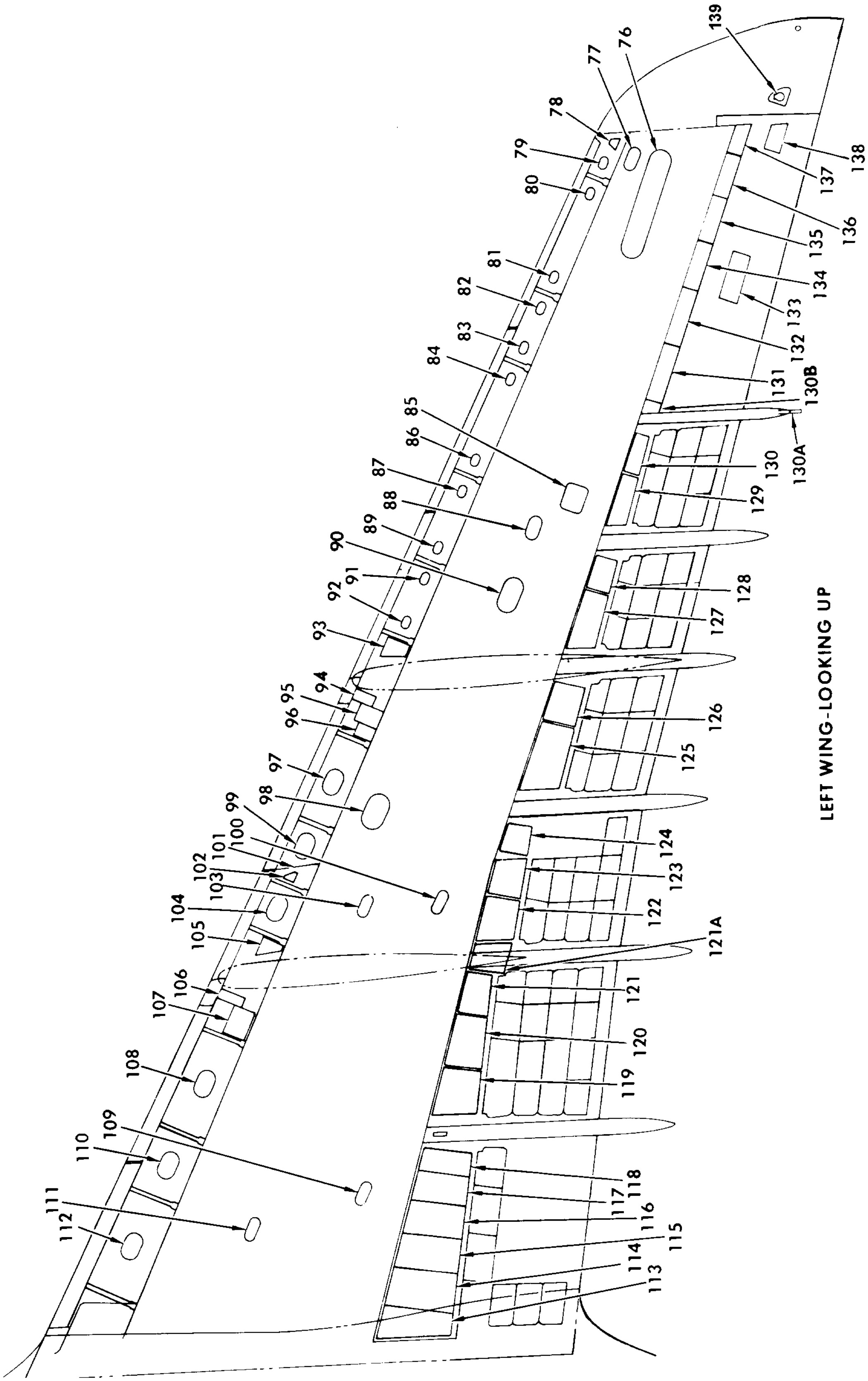
△1 PREFERED SPARE

Wing external access provisions (3 of 12)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE	INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
66	3121-1	NO. 2 MAIN TANK ACCESS			
67	3121-5	NO. 2 MAIN TANK FUEL LEVEL CONTROL VALVE	72	FG410B5/ ⚠1 20050-0000-0105	NO. 2 EXT RANGE TANK FUEL PROBE
			72A	4J33332-101B	SKIN
			72B	4J33333-103A	SKIN
68	FG410B2/ ⚠1 20050-0000-0102	NO. 2 MAIN TANK FUEL PROBE	72C	4J33334-101A	SKIN
			72D	4J33335-101A	SKIN
			72E	4J33336-101A	PANEL
			72F	4J33337-103B	SKIN
69	FG410B3/ ⚠1 20050-0000-0103	NO. 2 MAIN TANK FUEL PROBE	73	3132-1	SPOILER ACTUATOR CLEARANCE DOOR
			74	3133-1	SPOILER ACTUATOR CLEARANCE DOOR
70	FG410B4/ ⚠1 20050-0000-0104	NO. 2 EXT RANGE TANK FUEL PROBE	75	3133-2	SPOILER ACTUATOR CLEARANCE DOOR
			75A		SLAT ACCESS PANELS
71	3121-6	NO. 2 EXT RANGE TANK FUEL LEVEL CONTROL VALVE			

⚠1 PREFERED SPARE

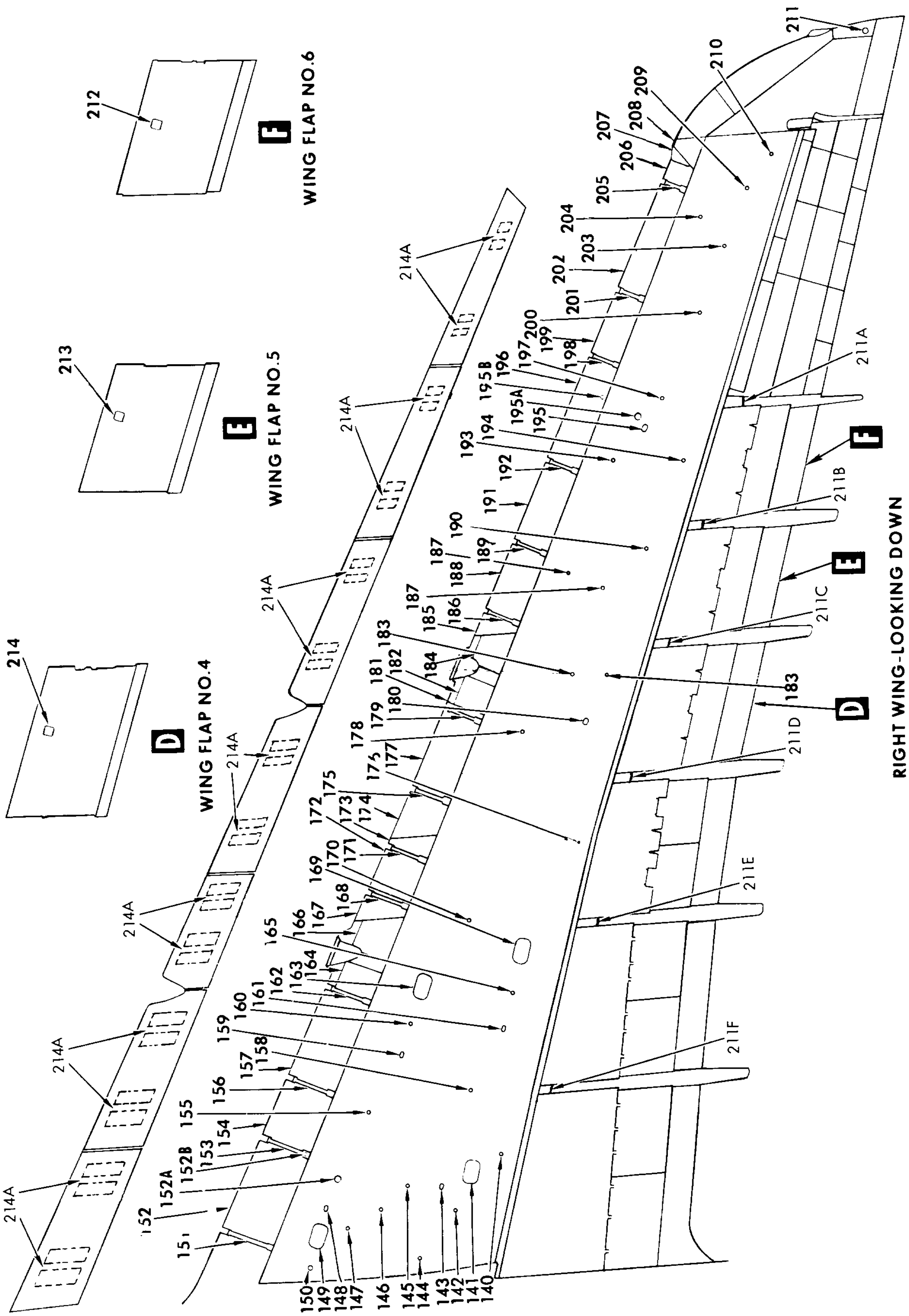
Wing external access provisions (4 of 12)



Wing external access provisions (5 of 12)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
76	3123-4	NO. 1 MAIN TANK ACCESS
77	3123-2	NO. 1 MAIN TANK BOOST PUMP
78	3213-8	SYSTEM ACCESS
79	3213-7	SYSTEM ACCESS
80	3213-6	SYSTEM ACCESS
81	3213-5	SYSTEM ACCESS
82	3213-4	SYSTEM ACCESS
83	3213-3	SYSTEM ACCESS
84	3213-2	SYSTEM ACCESS
85	3213-3	NO. 1 MAIN TANK STANDPIPE VENT
86	3213-1	SYSTEM ACCESS
87	3212-10	SYSTEM ACCESS (NO. 1 TANK FUEL QTY CONNECTORS)
88	3223-2	NO. 1 AUX TANK BOOST PUMP
89	3212-9	SYSTEM ACCESS
90	3223-3	NO. 1 AUX TANK OUTBD ACCESS
91	3212-8	SYSTEM ACCESS
92	3212-7	SYSTEM ACCESS
93	3212-6	SYSTEM ACCESS
94	3212-5	SYSTEM ACCESS
95	3212-4	SYSTEM ACCESS
96	3212-3	SYSTEM ACCESS (NO. 1 AUX FUEL QTY CONNECTORS)
97	3212-2	SYSTEM ACCESS
98	3213-1	NO. 1 AUX TANK INBD ACCESS AND DRY BAY ACCESS
99	3212-1	SYSTEM ACCESS
100	3223-2	NO. 1 EXT RANGE TANK BOOST PUMP
101	3211-9	SYSTEM ACCESS
102	3211-8	SYSTEM ACCESS
103	3223-1	NO. 2 AUX TANK BOOST PUMP
104	3211-7	SYSTEM ACCESS
105	3211-6	SYSTEM ACCESS
106	3211-5	SYSTEM ACCESS
107	3211-4	SYSTEM ACCESS
108	3211-3	SYSTEM ACCESS
109	3221-2	NO 2 EXT RANGE TANK BOOST PUMP
110	3211-2	SYSTEM ACCESS (NO. 2 AUX FUEL QTY CONNECTORS)
111	3221-1	NO. 2 MAIN TANK BOOST PUMP
112	3211-1	SYSTEM ACCESS (NO. 2 MAIN FUEL QTY CONNECTORS)
113	3231-1	STRUCTURE INSPECTION
114	3231-2	STRUCTURE INSPECTION
115	3231-3	STRUCTURE INSPECTION
116	3231-4	STRUCTURE INSPECTION
117	3231-5	STRUCTURE INSPECTION
118	3231-6	STRUCTURE INSPECTION
119	3232-1	STRUCTURE INSPECTION
120	3232-2	STRUCTURE INSPECTION
121	3232-3	STRUCTURE INSPECTION
121A	3232-11	STRUCTURE INSPECTION
122	3232-4	STRUCTURE INSPECTION
123	3232-5	STRUCTURE INSPECTION
124	3232-6	STRUCTURE INSPECTION
125	3232-7	STRUCTURE INSPECTION
126	3232-8	STRUCTURE INSPECTION
127	3232-9	STRUCTURE INSPECTION
128	3233-1	STRUCTURE INSPECTION
129	3233-2	STRUCTURE INSPECTION
130	3233-3	STRUCTURE INSPECTION
130A	4P10028-101A	FUEL JETTISON MAST
130B	4J53081-101B	PANEL
131	3233-4	STRUCTURE INSPECTION
132	3233-5	STRUCTURE INSPECTION
133	3233-2	STRUCTURE ACCESS
134	3233-6	STRUCTURE INSPECTION
135	3233-7	STRUCTURE INSPECTION
136	3233-8	STRUCTURE INSPECTION
137	3233-9	STRUCTURE INSPECTION
138	3233-3	STRUCTURE ACCESS
139	3223-1	LANDING LIGHT ACCESS

Wing external access provisions (6 of 12)



Wing external access provisions (7 of 12)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE	INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
			150	FG410B1/ ⚠1 20050-0000-0101	NO. 3 MAIN TANK FUEL PROBE
140	FG415B3/ ⚠1 20049-0000-0102	NO. 3 EXT RANGE TANK FUEL PROBE	151	4111-1	SYSTEM ACCESS
			152	4111-2	SYSTEM ACCESS
141	4121-2	NO. 3 EXT RANGE TANK ACCESS	152A	N38260	NO. 3 MAIN OVER-WING FILLER CAP
			152B	AN3117-1	GROUNDING JACK
			153	4111-3	SYSTEM ACCESS
142	FG410B5/ ⚠1 20050-0000-0105	NO. 3 EXT RANGE TANK FUEL PROBE	154	4111-4	SYSTEM ACCESS
143	4121-6	NO. 3 EXT RANGE TANK FUEL LEVEL CONTROL VALVE	155	FG410B15/ ⚠1 20050-0000-0106	NO. 3 AUX TANK FUEL PROBE
			156	4111-5	SYSTEM ACCESS
144	FG410B4/ ⚠1 20050-0000-0104	NO. 3 EXT RANGE TANK FUEL PROBE	157	4111-6	SYSTEM ACCESS
			158	FG410B6/ ⚠1 20050-0000-0108	NO. 4 EXT RANGE TANK FUEL PROBE
145	FG415B1/ ⚠1 20049-0000-0101	NO. 3 MAIN TANK FUEL PROBE	159	4121-7	NO. 3 AUX TANK FUEL LEVEL CONTROL VALVE
146	FG410B3/ ⚠1 20050-0000-0103	NO. 3 MAIN TANK FUEL PROBE	160	FG410B16/ ⚠1 20050-0000-0107	NO. 3 AUX TANK FUEL PROBE
			161	4121-8	NO. 4 EXT RANGE TANK FUEL LEVEL CONTROL VALVE
147	FG410B2/ ⚠1 20050-0000-0102	NO. 3 MAIN TANK FUEL PROBE	162	4111-7	SYSTEM ACCESS
148	4121-5	NO. 3 MAIN TANK FUEL LEVEL CONTROL VALVE	163	4121-3	NO. 3 AUX TANK ACCESS
149	4121-1	NO. 3 MAIN TANK ACCESS	164	4111-8	SYSTEM ACCESS

⚠1 PREFERED SPARE

Wing external access provisions (8 of 12)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE	INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
165	FG410B7/ ⚠1 20050-0000-0109	NO. 4 EXT RANGE TANK FUEL PROBE	184	4112-7	SYSTEM ACCESS
166	4111-9	SYSTEM ACCESS	185	4112-8	SYSTEM ACCESS
167	4111-10	SYSTEM ACCESS	186	4112-9	NAS 1153V8 BOLT
168	4111-11	SYSTEM ACCESS	187	FG410B19/ ⚠1 20050-0000-0112	NO. 4 AUX TANK FUEL PROBE
169	4121-4	NO. 4 EXT RANGE TANK ACCESS	188	4112-10	SYSTEM ACCESS
170	FG415B4/ ⚠1 20049-0000-0103	NO. 3 AUX TANK FUEL PROBE	189	4112-11	NAS 1153V8 BOLT
171	4111-13	SYSTEM ACCESS	190	FG415B5/ ⚠1 20049-0000-0105	NO. 4 AUX TANK FUEL PROBE
172	4111-12	SYSTEM ACCESS	191	4112-12	SYSTEM ACCESS
173	4111-14	SYSTEM ACCESS	192	4113-1	NAS 1153V8 BOLT
174	4112-1	SYSTEM ACCESS	193	FG410B8/ ⚠1 20050-0000-0113	NO. 4 MAIN TANK FUEL PROBE
175	4112-2	SYSTEM ACCESS	194	FG410B9/ ⚠1 20050-0000-0114	NO. 4 MAIN TANK FUEL PROBE
176	FG415B2/ ⚠1 20049-0000-0104	NO. 4 EXT RANGE TANK FUEL PROBE	195	4113-1	NO. 4 MAIN TANK FUEL LEVEL CONTROL VALVE
177	4112-3	SYSTEM ACCESS	195A	N38260	NO. 4 MAIN OVER-WING FILLER CAP
178	FG410B17/ ⚠1 20050-0000-0110	NO. 4 AUX TANK FUEL PROBE	195B	AN3117-1	GROUNDING JACK
179	4112-4	SYSTEM ACCESS	196	4113-2	SYSTEM ACCESS
180	4113-2	NO. 4 AUX TANK FUEL LEVEL CONTROL VALVE	197	FG410B10/ ⚠1 20050-0000-0115	NO. 4 MAIN TANK FUEL PROBE
181	4112-5	SYSTEM ACCESS			
182	4112-6	SYSTEM ACCESS			
183	FG410B18/ ⚠1 20050-0000-0111	NO. 4 AUX TANK FUEL PROBE			

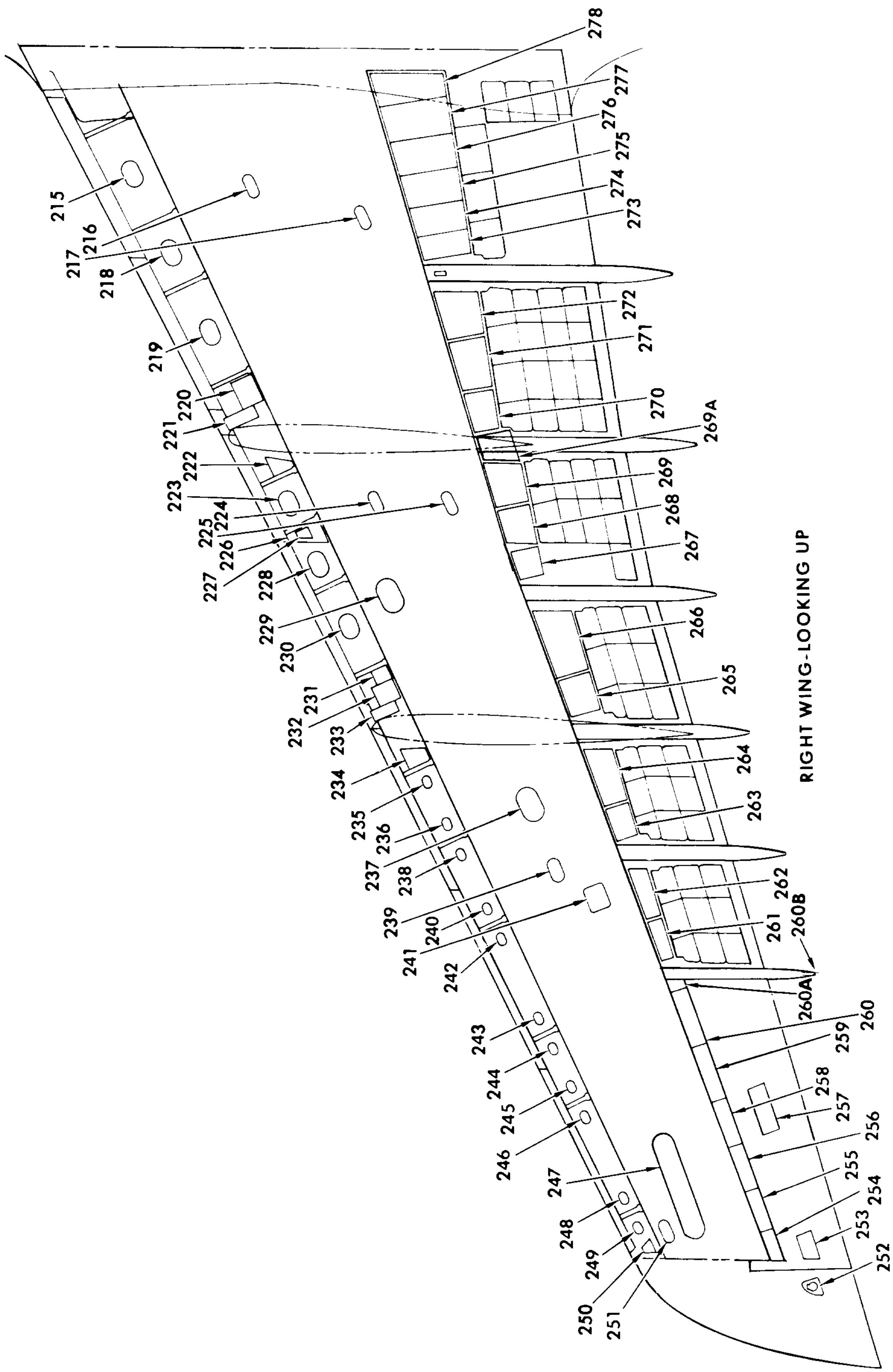
⚠1 PREFERED SPARE

Wing external access provisions (9 of 12)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
198	4113-3	NAS 1153V8 BOLT
199	4113-4	SYSTEM ACCESS
200	FG410B11/ △1 20050-0000-0116	NO. 4 MAIN TANK FUEL PROBE
201	4113-5	NAS 1153V8 BOLT
202	4113-6	SYSTEM ACCESS
203	FG410B12/ △1 20050-0000-0117	NO. 4 MAIN TANK FUEL PROBE
204	FG416B1/ △1 20049-0000-0106	NO. 4 MAIN TANK FUEL PROBE
205	4113-7	NAS 1153V8 BOLT
206	4113-8	SYSTEM ACCESS
207	4113-10	FAIRING
208	4113-9	SYSTEM ACCESS
209	FG410B13/ △1 20050-0000-0118	NO. 4 MAIN TANK FUEL PROBE
210	FG410B14/ △1 20050-0000-0119	NO. 4 MAIN TANK FUEL PROBE
211	4123-1	MAGNETIC DETECTOR ACCESS
211A	4J33337-104B	SKIN
211B	4J33336-102A	PANEL
211C	4J33335-102A	SKIN
211D	4J33334-102A	SKIN
211E	4J33333-104A	SKIN
211F	4J33332-102B	SKIN
212	4133-2	SPOILER ACTUATOR CLEARANCE DOOR
213	4133-1	SPOILER ACTUATOR CLEARANCE DOOR
214	4132-1	SPOILER ACTUATOR CLEARANCE DOOR
214A		SLAT ACCESS PANELS

△1 PREFERED SPARE

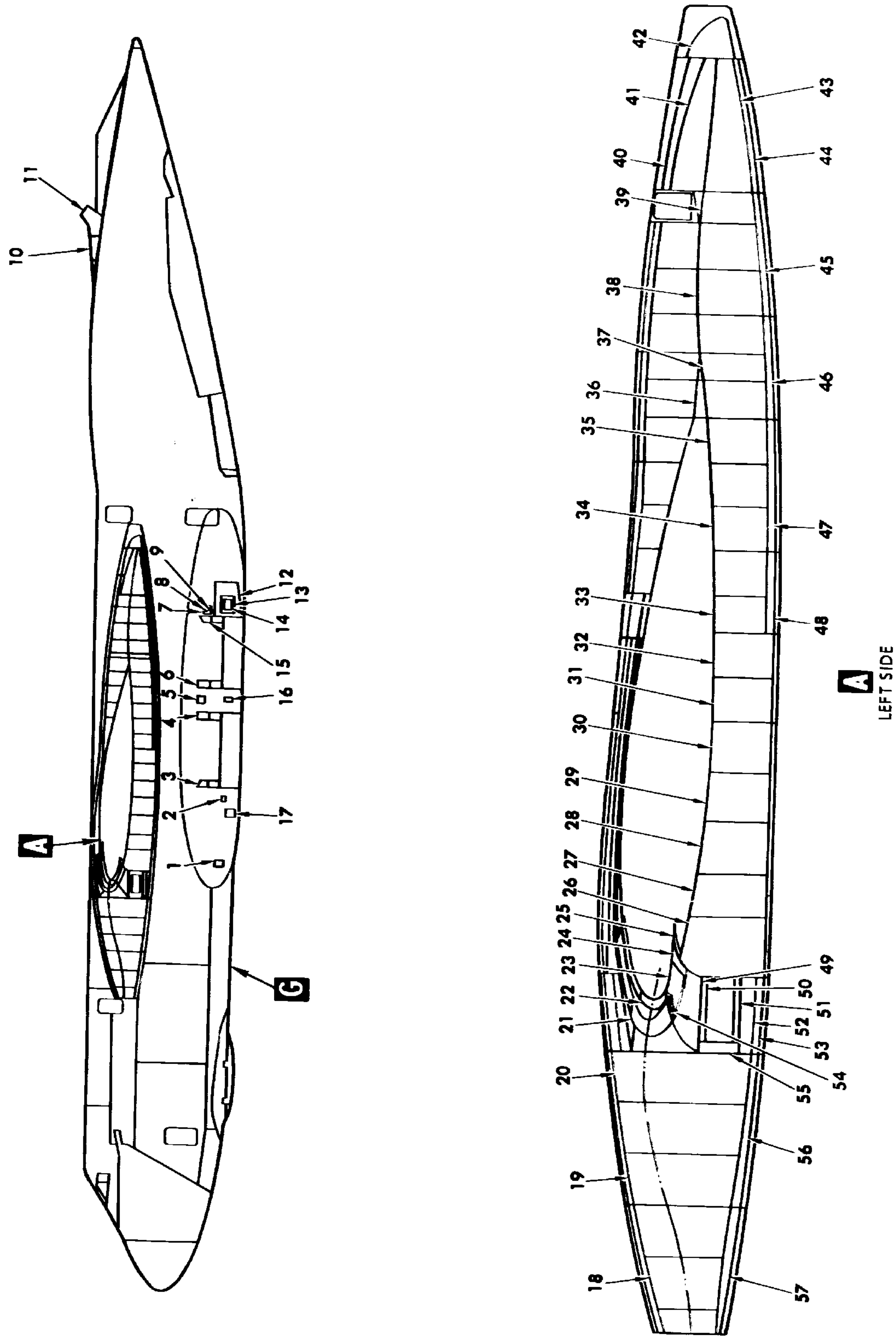
Wing external access provisions (10 of 12)



Wing external access provisions (11 of 12)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
215	4211-1	SYSTEM ACCESS (NO. 3 MAIN FUEL QTY CONNECTORS)
216	4221-1	NO. 3 MAIN TANK BOOST PUMP
217	4221-2	NO. 3 EXT RANGE TANK BOOST PUMP
218	4211-2	SYSTEM ACCESS (NO. 3 AUX FUEL QTY CONNECTORS)
219	4211-3	SYSTEM ACCESS
220	4211-4	SYSTEM ACCESS
221	4211-5	SYSTEM ACCESS
222	4211-6	SYSTEM ACCESS
223	4211-7	SYSTEM ACCESS
224	4223-1	NO. 3 AUX TANK BOOST PUMP
225	4223-2	NO. 4 EXT RANGE TANK BOOST PUMP
226	4211-9	SYSTEM ACCESS
227	4211-8	SYSTEM ACCESS
228	4212-1	SYSTEM ACCESS
229	4213-1	NO. 4 AUX TANK INBD ACCESS AND DRY BAY ACCESS
230	4212-2	SYSTEM ACCESS
231	4212-3	SYSTEM ACCESS (NO. 4 AUX FUEL QTY CONNECTORS)
232	4212-4	SYSTEM ACCESS
233	4212-5	SYSTEM ACCESS
234	4212-6	SYSTEM ACCESS
235	4212-7	SYSTEM ACCESS
236	4212-8	SYSTEM ACCESS
237	4223-3	NO. 4 AUX TANK OUTBD ACCESS
238	4212-9	SYSTEM ACCESS
239	4223-2	NO. 4 AUX TANK BOOST PUMP
240	4212-10	SYSTEM ACCESS (NO. 4 MAIN FUEL QTY CONNECTORS)
241	4223-1	NO. 4 MAIN TANK STANDPIPE VENT
242	4213-1	SYSTEM ACCESS
243	4213-2	SYSTEM ACCESS
244	4213-3	SYSTEM ACCESS
245	4213-4	SYSTEM ACCESS
246	4213-5	SYSTEM ACCESS
247	4223-4	NO. 4 MAIN TANK ACCESS
250	4213-8	SYSTEM ACCESS
251	4213-2	NO. 4 MAIN TANK BOOST PUMP
252	4223-1	LANDING LIGHT ACCESS
253	4233-3	STRUCTURE ACCESS
254	4233-9	STRUCTURE INSPECTION
255	4233-8	STRUCTURE INSPECTION
256	4233-7	STRUCTURE INSPECTION
257	4233-2	STRUCTURE ACCESS
258	4233-6	STRUCTURE INSPECTION
259	4233-5	STRUCTURE INSPECTION
260	4233-4	STRUCTURE INSPECTION
260A	4J53081-102B	PANEL
260B	4P10028-101A	FUEL JETTISON MAST
261	4233-3	STRUCTURE INSPECTION
262	4233-2	STRUCTURE INSPECTION
263	4233-1	STRUCTURE INSPECTION
264	4232-9	STRUCTURE INSPECTION
265	4232-8	STRUCTURE INSPECTION
266	4232-7	STRUCTURE INSPECTION
267	4232-6	STRUCTURE INSPECTION
268	4232-5	STRUCTURE INSPECTION
269	4232-4	STRUCTURE INSPECTION
269A	4232-11	STRUCTURE INSPECTION
270	4232-3	STRUCTURE INSPECTION
271	4232-2	STRUCTURE INSPECTION
272	4232-1	STRUCTURE INSPECTION
273	4231-6	STRUCTURE INSPECTION
274	4231-5	STRUCTURE INSPECTION
275	4231-4	STRUCTURE INSPECTION
276	4231-3	STRUCTURE INSPECTION
277	4231-2	STRUCTURE INSPECTION
278	4231-1	STRUCTURE INSPECTION

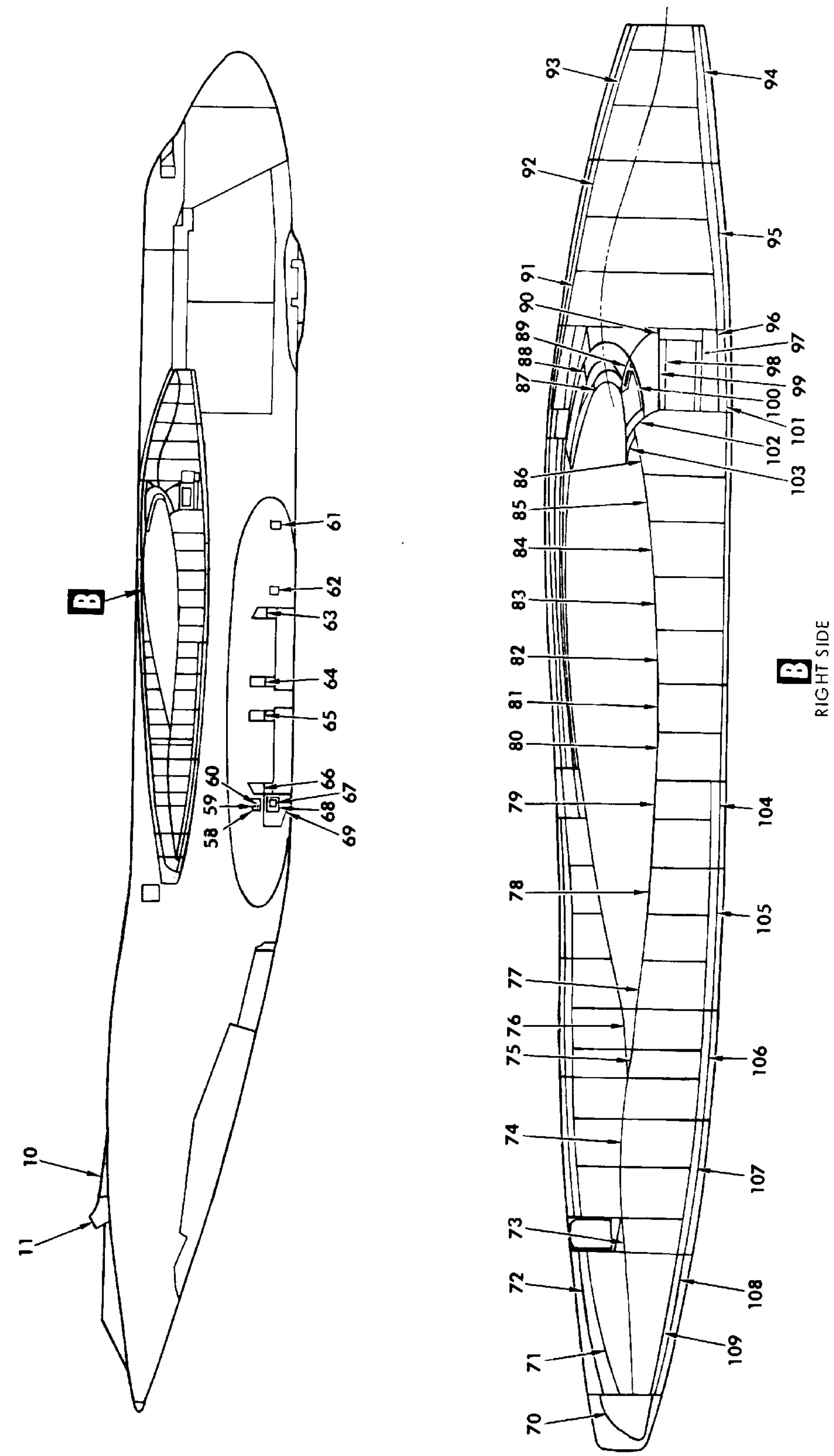
Wing external access provisions (12 of 12)



Fuselage external access provisions (1 of 10)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
1	1223-1	JACK PAD ACCESS
2	1223-3	SPR LIGHT ACCESS
3	1233-2	SLOT DOOR
4	1233-4	SLOT DOOR
5	1132-2	LOX CONVERTER ACCESS
6	1233-5	SLOT DOOR
7	1132-1	APU INLET
8	1132-1-1-1	ACTUATOR ACCESS
9	1132-1-1	ACTUATOR ACCESS
10	4F41192	FAIRING ASSEMBLY
11	4F42165	DORSAL LEADING EDGE
12	1233-7	ATM & APU ACCESS PANEL
13	1233-7-1	SERVICE PANEL
14	1233-7-1-1	FIRE PANEL
15	1233-6	SLOT DOOR
16	1233-3	LOX BREATHING FILL ACCESS
17	1233-1	RAT ACCESS
18	1122-11	STRUCTURE INSPECTION
19	1122-12	STRUCTURE INSPECTION
20	1122-13	STRUCTURE INSPECTION
21	1122-14	STRUCTURE INSPECTION
22	1122-16	STRUCTURE INSPECTION
23	1122-17	STRUCTURE INSPECTION
24	1122-18	STRUCTURE INSPECTION
25	1122-19	STRUCTURE INSPECTION
26	1133-1	STRUCTURE INSPECTION
27	1133-2	STRUCTURE INSPECTION
28	1133-3	STRUCTURE INSPECTION
29	1133-4	STRUCTURE INSPECTION
30	1133-5	STRUCTURE INSPECTION
31	1133-6	STRUCTURE INSPECTION
32	1133-7	STRUCTURE INSPECTION
33	1133-8	STRUCTURE INSPECTION
34	1133-9	STRUCTURE INSPECTION
35	5113-1	STRUCTURE INSPECTION
36	5112-4	STRUCTURE INSPECTION
37	5113-3	STRUCTURE INSPECTION
38	5113-4	STRUCTURE INSPECTION
39	5113-6	STRUCTURE INSPECTION
40	5111-6	STRUCTURE INSPECTION
41	5112-1	STRUCTURE INSPECTION
42	5112-3	STRUCTURE INSPECTION
43	5112-2	STRUCTURE INSPECTION
44	5113-7	STRUCTURE INSPECTION
45	5113-5	STRUCTURE INSPECTION
46	5113-2	STRUCTURE INSPECTION
47	1133-11	STRUCTURE INSPECTION
48	1133-10	STRUCTURE INSPECTION
49	1122-15	STRUCTURE INSPECTION
50	1123-15	STRUCTURE INSPECTION
51	1123-14	STRUCTURE INSPECTION
52	1123-13	STRUCTURE INSPECTION
53	1123-12	STRUCTURE INSPECTION
54	1122-20	STRUCTURE INSPECTION
55	1122-21	STRUCTURE INSPECTION
56	1123-11	STRUCTURE INSPECTION
57	1123-10	STRUCTURE INSPECTION

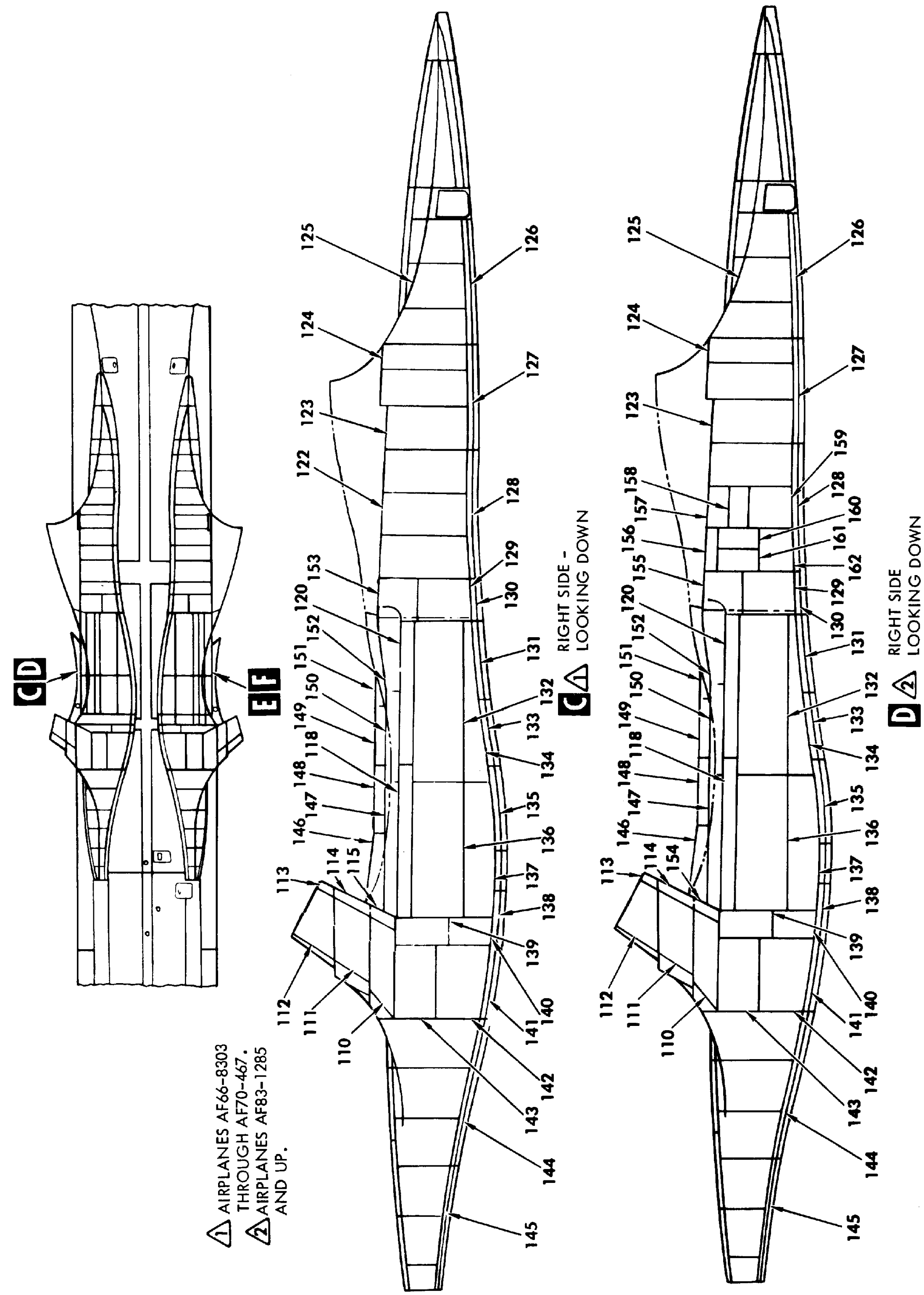
Fuselage external access provisions (2 of 10)



Fuselage external access provisions (3 of 10)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
58	2132-1	APU INLET
59	2132-1-1-1	ACTUATOR ACCESS
60	2132-1-1	ACTUATOR ACCESS
61	2223-1	JACK PAD ACCESS
62	2223-3	SPR LIGHT ACCESS
63	2233-2	SLOT DOOR
64	2233-4	SLOT DOOR
65	2233-5	SLOT DOOR
66	2233-6	SLOT DOOR
67	2233-7-1-1	FIRE PANEL
68	2233-7-1	SERVICE PANEL
69	2233-7	ATM AND APU ACCESS PANEL
70	6112-3	STRUCTURE INSPECTION
71	6112-1	STRUCTURE INSPECTION
72	6111-6	STRUCTURE INSPECTION
73	6113-6	STRUCTURE INSPECTION
74	6113-4	STRUCTURE INSPECTION
75	6113-3	STRUCTURE INSPECTION
76	6112-4	STRUCTURE INSPECTION
77	6113-1	STRUCTURE INSPECTION
78	2133-9	STRUCTURE INSPECTION
79	2133-8	STRUCTURE INSPECTION
80	2133-7	STRUCTURE INSPECTION
81	2133-6	STRUCTURE INSPECTION
82	2133-5	STRUCTURE INSPECTION
83	2133-4	STRUCTURE INSPECTION
84	2133-3	STRUCTURE INSPECTION
85	2133-2	STRUCTURE INSPECTION
86	2133-1	STRUCTURE INSPECTION
87	2122-16	STRUCTURE INSPECTION
88	2122-14	STRUCTURE INSPECTION
89	2122-20	STRUCTURE INSPECTION
90	2122-21	STRUCTURE INSPECTION
91	2122-13	STRUCTURE INSPECTION
92	2122-12	STRUCTURE INSPECTION
93	2122-11	STRUCTURE INSPECTION
94	2123-10	STRUCTURE INSPECTION
95	2123-11	STRUCTURE INSPECTION
96	2123-13	STRUCTURE INSPECTION
97	2123-14	STRUCTURE INSPECTION
98	2123-15	STRUCTURE INSPECTION
99	2122-15	STRUCTURE INSPECTION
100	2122-17	STRUCTURE INSPECTION
101	2123-12	STRUCTURE INSPECTION
102	2122-18	STRUCTURE INSPECTION
103	2122-19	STRUCTURE INSPECTION
104	2133-10	STRUCTURE INSPECTION
105	2133-11	STRUCTURE INSPECTION
106	6113-2	STRUCTURE INSPECTION
107	6113-5	STRUCTURE INSPECTION
108	6113-7	STRUCTURE INSPECTION
109	6112-2	STRUCTURE INSPECTION

Fuselage external access provisions (4 of 10)

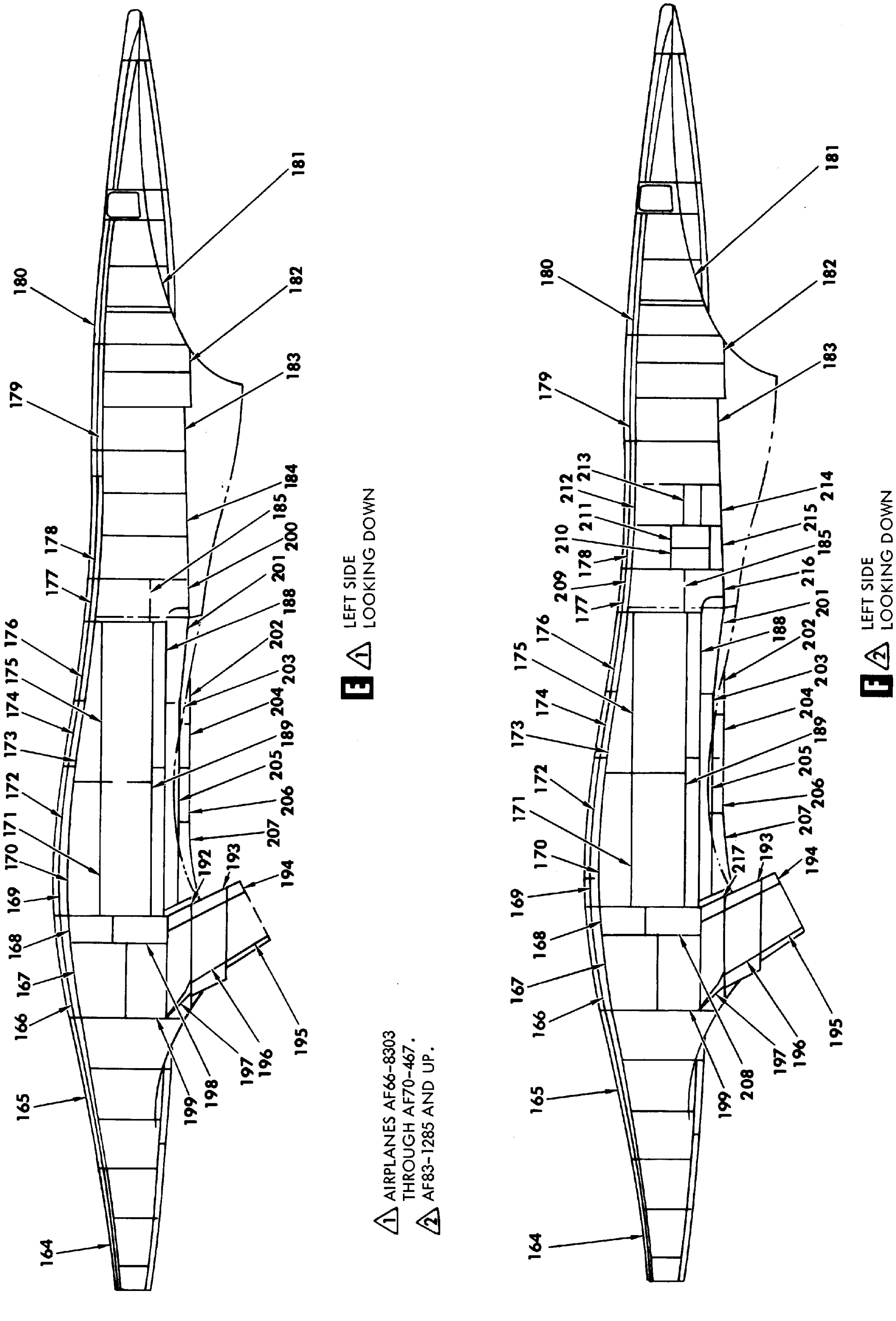


Fuselage external access provisions (5 of 10)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
110	2121-12	STRUCTURE INSPECTION
111	2121-13	STRUCTURE INSPECTION
112	2121-21	STRUCTURE INSPECTION
113	2121-19	STRUCTURE INSPECTION
114	2121-18	STRUCTURE INSPECTION
115	2121-20	STRUCTURE INSPECTION
118	2131-4	STRUCTURE INSPECTION
120	2131-11	STRUCTURE INSPECTION
121	2131-15	STRUCTURE INSPECTION
122	2131-17	STRUCTURE INSPECTION
123	6111-2	STRUCTURE INSPECTION
124	6111-3	STRUCTURE INSPECTION
125	6111-4	STRUCTURE INSPECTION
126	6111-5	STRUCTURE INSPECTION
127	6111-1	STRUCTURE INSPECTION
128	2131-16	STRUCTURE INSPECTION
129	2131-14	STRUCTURE INSPECTION
130	2131-13	STRUCTURE INSPECTION
131	2131-8	STRUCTURE INSPECTION
132	2131-10	STRUCTURE INSPECTION
133	2131-7	STRUCTURE INSPECTION
134	2131-9	STRUCTURE INSPECTION
135	2131-6	STRUCTURE INSPECTION
136	2131-3	STRUCTURE INSPECTION
137	2131-2	STRUCTURE INSPECTION
138	2131-1	STRUCTURE INSPECTION
139	2121-16	STRUCTURE INSPECTION
140	2121-17	STRUCTURE INSPECTION
141	2121-11	STRUCTURE INSPECTION
142	2121-14	STRUCTURE INSPECTION
143	2121-15	STRUCTURE INSPECTION
144	2121-10	STRUCTURE INSPECTION
145	2122-10	STRUCTURE INSPECTION

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
146	4W54000-104A	UPPER JOINT FAIRING PANEL
147	4W54010-104A	WING TO FUSELAGE FAIRING PANEL
148	4W54000-151A	UPPER JOINT FAIRING PANEL
149	4W54000-145A	UPPER JOINT FAIRING PANEL
150	4W54010-132A	WING TO FUSELAGE FAIRING PANEL
151	4W54000-144A	UPPER JOINT FAIRING PANEL
152	4W54010-108B	WING TO FUSELAGE FAIRING PANEL
153	4W13501	OUTBOARD UPPER WING TO FUSELAGE FAIRING PANEL
154	4W54027-102A	WING TO FUSELAGE FAIRING PANEL
155	4W54024-102A	OUTBOARD UPPER WING TO FUSELAGE FAIRING PANEL
156	4W54040-102A	OUTBOARD WING TO FUSELAGE FAIRING CLOSURE PANEL
157	4W54039-102A	UPPER WING TO FUSELAGE FAIRING PANEL
158	4W54030-102A	UPPER WING TO FUSELAGE FAIRING PANEL (DEWAR ACCESS)
159	4W54029-102A	UPPER WING TO FUSELAGE FAIRING PANEL
160	4W54038-102A	UPPER WING TO FUSELAGE FAIRING PANEL (DEWAR ACCESS)
161	4W54032-102A	UPPER WING TO FUSELAGE FAIRING PANEL (DEWAR ACCESS)
162	4W54031-102A	UPPER WING TO FUSELAGE FAIRING PANEL
163	4W54028-102A	WING TO FUSELAGE FAIRING PANEL

Fuselage external access provisions (6 of 10)

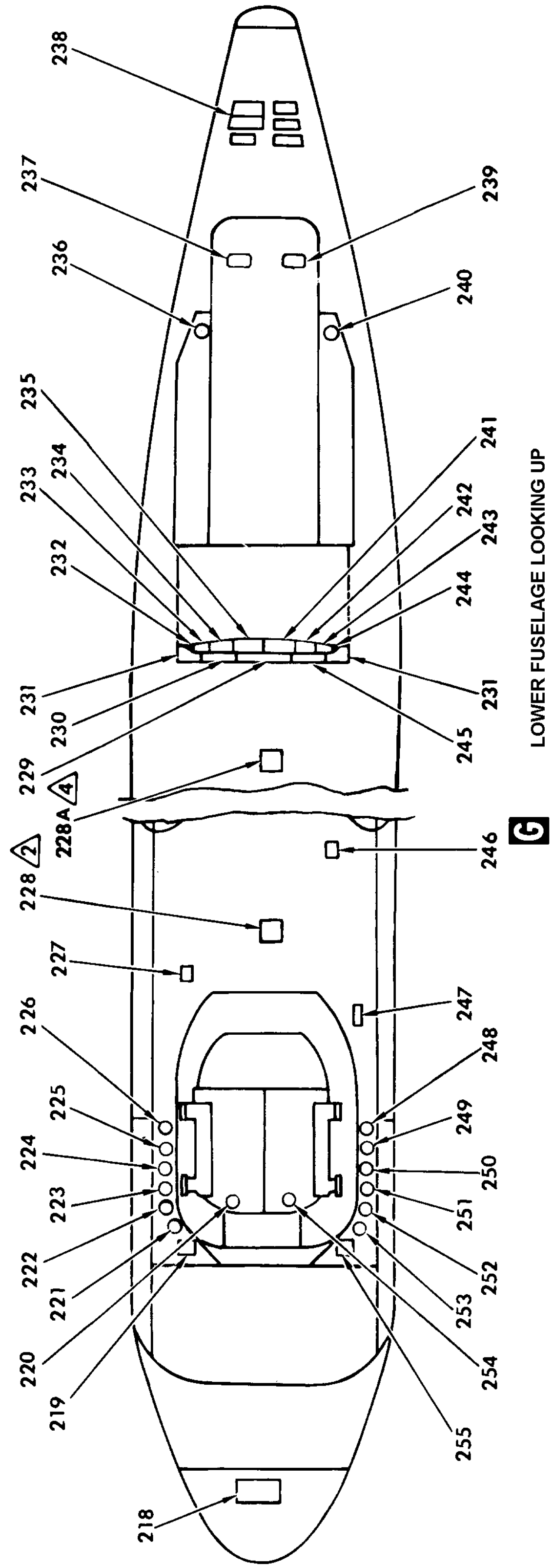


Fuselage external access provisions (7 of 10)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
164	1122-10	STRUCTURE INSPECTION
165	1121-10	STRUCTURE INSPECTION
166	1121-11	STRUCTURE INSPECTION
167	1121-14	STRUCTURE INSPECTION
168	1121-17	STRUCTURE INSPECTION
169	1131-1	STRUCTURE INSPECTION
170	1131-2	STRUCTURE INSPECTION
171	1131-3	STRUCTURE INSPECTION
172	1131-6	STRUCTURE INSPECTION
173	1131-9	STRUCTURE INSPECTION
174	1131-7	STRUCTURE INSPECTION
175	1131-10	STRUCTURE INSPECTION
176	1131-8	STRUCTURE INSPECTION
177	1131-13	STRUCTURE INSPECTION
178	1131-16	STRUCTURE INSPECTION
179	5111-1	STRUCTURE INSPECTION
180	5111-5	STRUCTURE INSPECTION
181	5111-4	STRUCTURE INSPECTION
182	5111-3	STRUCTURE INSPECTION
183	5111-2	STRUCTURE INSPECTION
184	1131-17	STRUCTURE INSPECTION
185	1131-14	STRUCTURE INSPECTION
188	1131-11	STRUCTURE INSPECTION
189	1131-4	STRUCTURE INSPECTION
192	1121-20	STRUCTURE INSPECTION
193	1121-18	STRUCTURE INSPECTION
194	1121-19	STRUCTURE INSPECTION
195	1121-21	STRUCTURE INSPECTION
196	1121-13	STRUCTURE INSPECTION
197	1121-12	STRUCTURE INSPECTION
198	1121-16	STRUCTURE INSPECTION
199	1121-15	STRUCTURE INSPECTION

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
200	4W13501	OUTBOARD UPPER WING TO FUSELAGE FAIRING PANEL
201	4W54010-1-7B	WING TO FUSELAGE FAIRING PANEL
202	4W54000-143A	UPPER JOINT FAIRING PANEL
203	4W54010-131A	WING TO FUSELAGE FAIRING PANEL
204	4W54000-145A	UPPER JOINT FAIRING PANEL
205	4W54010-103A	WING TO FUSELAGE FAIRING PANEL
206	4W54000-151A	UPPER JOINT FAIRING PANEL
207	4W55000-103A	UPPER JOINT FAIRING PANEL
208	4W54028-101A	WING TO FUSELAGE FAIRING PANEL
209	4W54031-101A	UPPER WING TO FUSELAGE FAIRING PANEL
210	4W54032-101A	UPPER WING TO FUSELAGE FAIRING PANEL (DEWAR ACCESS)
211	4W54038-101A	UPPER WING TO FUSELAGE FAIRING PANEL (DEWAR ACCESS)
212	4W54029-101A	UPPER WING TO FUSELAGE FAIRING PANEL
213	4W54030-101A	UPPER WING TO FUSELAGE FAIRING PANEL (DEWAR ACCESS)
214	4W54039-101A	UPPER WING TO FUSELAGE FAIRING PANEL
215	4W54040-101A	OUTBOARD WING TO FUSELAGE FAIRING CLOSURE PANEL
216	4W54024-101A	OUTBOARD UPPER WING TO FUSELAGE FAIRING PANEL
217	4W54027-101A	REAR WING TO FUSELAGE FAIRING PANEL

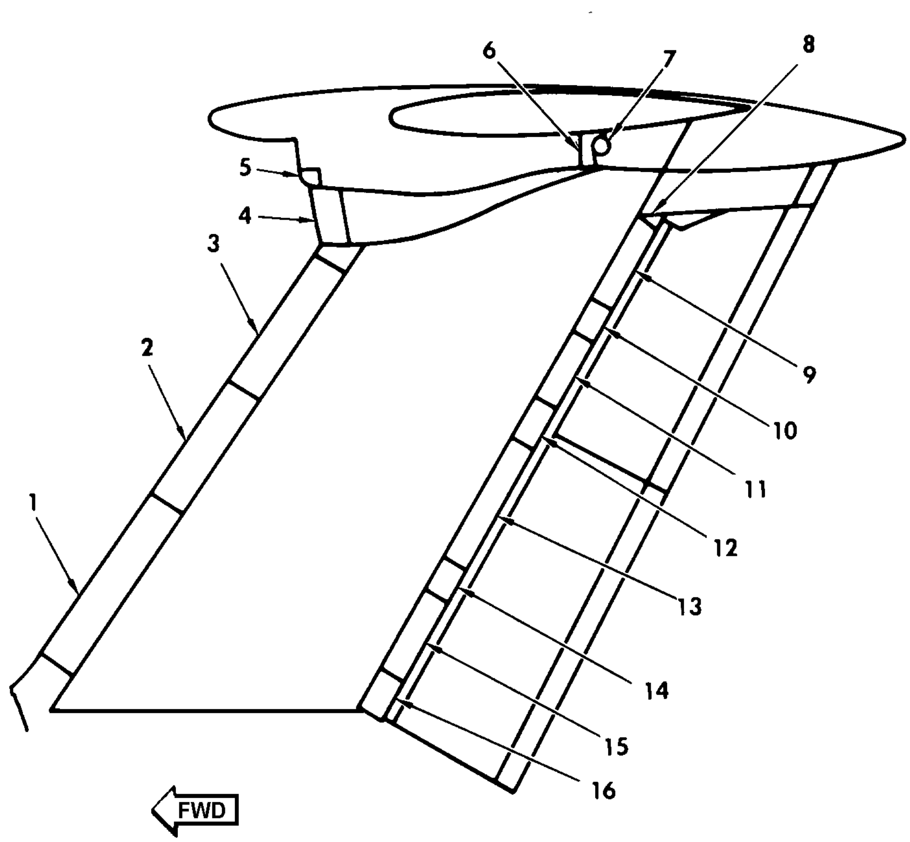
Fuselage external access provisions (8 of 10)



Fuselage external access provisions (9 of 10)

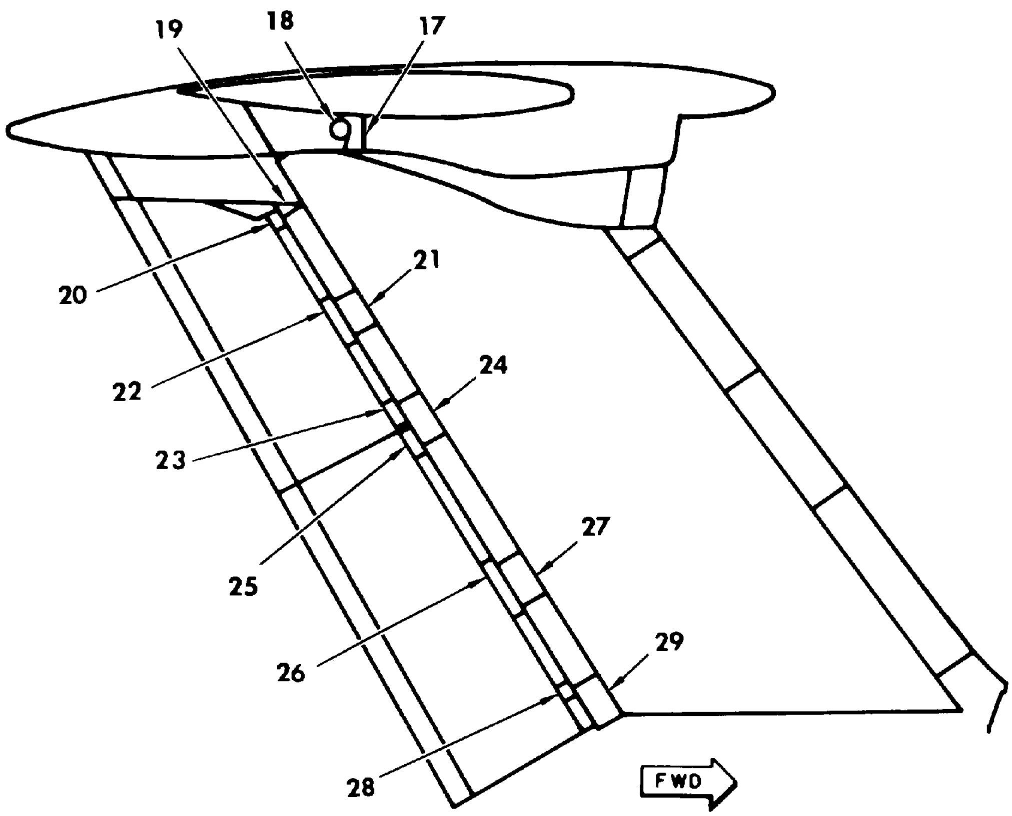
INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
218	4F73460-101A	ACCESS DOOR
219	4F31268	ACCESS DOOR
220	1213-9	BORESCOPE ACCESS
221	1213-8	BORESCOPE ACCESS
222	1213-7	BORESCOPE ACCESS
223	1213-6	BORESCOPE ACCESS
224	1213-5	BORESCOPE ACCESS
225	1213-4	BORESCOPE ACCESS
226	1213-3	BORESCOPE ACCESS
227	1213-1	WASTE OUTLET
228	4F34330	FORWARD BILGE ACCESS HATCH
228A	4F34330	AFT BILGE ACCESS HATCH
229	4F31257-103A	AFT FUS RAMP FAIRING PANEL
230	4F31257-107A	AFT FUS RAMP FAIRING PANEL
231	4F31257	AFT FUSELAGE STABILIZING STRUT ACCESS DOOR
232	4F53005-321C	ACCESS DOOR
233	4F53005-243B	AFT RAMP FWD FAIRING PANEL
234	4F53005-241A	AFT RAMP FWD FAIRING PANEL
235	4F53005-239B	AFT RAMP FWD FAIRING PANEL
236	5231-1	CARRIAGE MECH. ACCESS
237	4F61425-101A	CARRIAGE MECH. ACCESS
238	4F41223	AFTERBODY MAINTENANCE DOOR ASSEMBLY
239	4F61425-102A	CARRIAGE MECH. ACCESS
240	6231-1	CARRIAGE MECH. ACCESS
241	4F53005-240B	AFT RAMP FWD FAIRING PANEL
242	4F53005-242A	AFT RAMP FWD FAIRING PANEL
243	4F53005-244B	AFT RAMP FWD FAIRING PANEL
244	4F53005-322C	ACCESS DOOR
245	4F31257-108A	AFT FUS RAMP FAIRING PANEL
246	2213-1	EXTERNAL POWER RECEPTACLE
247	2212-1	POTABLE WATER ACCESS
248	2213-3	BORESCOPE ACCESS
249	2213-4	BORESCOPE ACCESS
250	2213-5	BORESCOPE ACCESS
251	2213-6	BORESCOPE ACCESS
252	2213-7	BORESCOPE ACCESS
253	2213-8	BORESCOPE ACCESS
254	2213-9	BORESCOPE ACCESS
255	4F31268	ACCESS DOOR

Fuselage external access provisions (10 of 10)



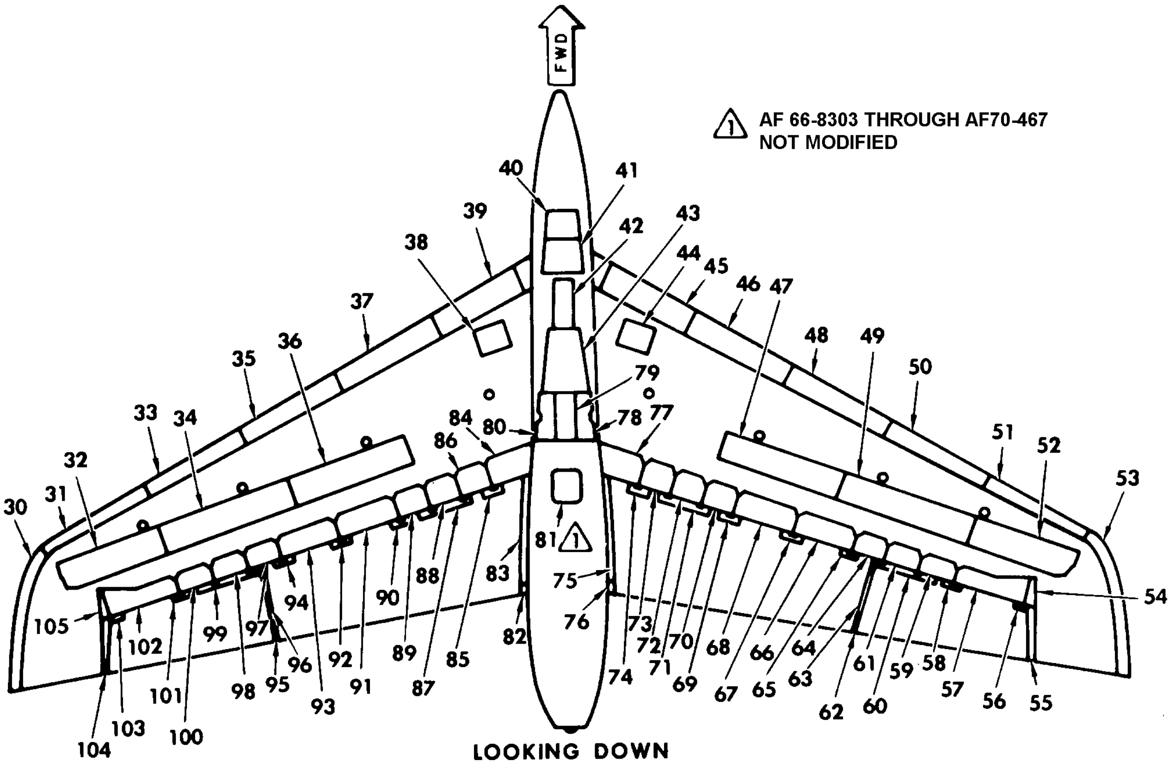
INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
1	L9113-1	VERTICAL STABILIZER LOWER LEADING EDGE
2	L9112-1	VERTICAL STABILIZER CENTER LEADING EDGE
3	L9111-3	VERTICAL STABILIZER UPPER LEADING EDGE
4	L9111-2	CHIN FAIRING LEADING EDGE
5	L9111-1	FORWARD BULLET LEADING EDGE SKIRT
6	L9121-1	PIVOT PIN ACCESS PANEL
7	L9121-2	PIVOT PIN ACCESS DOOR
8	L9131-1	REMOVABLE SHROUD PANEL ASSEMBLY
9	L9131-2	REMOVABLE SHROUD PANEL ASSEMBLY
10	L9131-3	UPPER RUDDER ACTUATOR ACCESS SHROUD PANEL
11	L9131-1	REMOVABLE SHROUD PANEL ASSEMBLY
12	L9132-1	VERTICAL STABILIZER ACCESS SHROUD PANEL
13	L9132-2	REMOVABLE SHROUD PANEL ASSEMBLY
14	L9133-1	LOWER RUDDER ACTUATOR ACCESS SHROUD PANEL
15	L9133-2	REMOVABLE SHROUD PANEL ASSEMBLY
16	L9133-3	REMOVABLE SHROUD PANEL ASSEMBLY

Empennage external access provisions (1 of 5)



INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
17	R9121-1	PIVOT PIN ACCESS PANEL
18	R9121-2	PIVOT PIN ACCESS DOOR
19	R9131-1	REMOVABLE SHROUD PANEL ASSEMBLY
20	R9131-3	UPPER HINGE ACCESS DOOR FOR UPPER RUDDER
21	R9131-2	UPPER RUDDER ACTUATOR ACCESS SHROUD PANEL
22	R9131-4	CENTER HINGE ACCESS DOOR FOR UPPER RUDDER
23	R9132-3	LOWER HINGE ACCESS DOOR FOR UPPER RUDDER
24	R9132-1	VERTICAL STABILIZER ACCESS SHROUD PANEL
25	R9132-4	UPPER HINGE ACCESS DOOR FOR LOWER RUDDER
26	R9133-4	CENTER HINGE ACCESS DOOR FOR LOWER RUDDER
27	R9133-1	LOWER RUDDER ACTUATOR ACCESS SHROUD PANEL
28	R9133-5	LOWER HINGE ACCESS DOOR FOR LOWER RUDDER
29	R9133-3	REMOVABLE SHROUD PANEL ASSEMBLY

Empennage external access provisions (2 of 5)



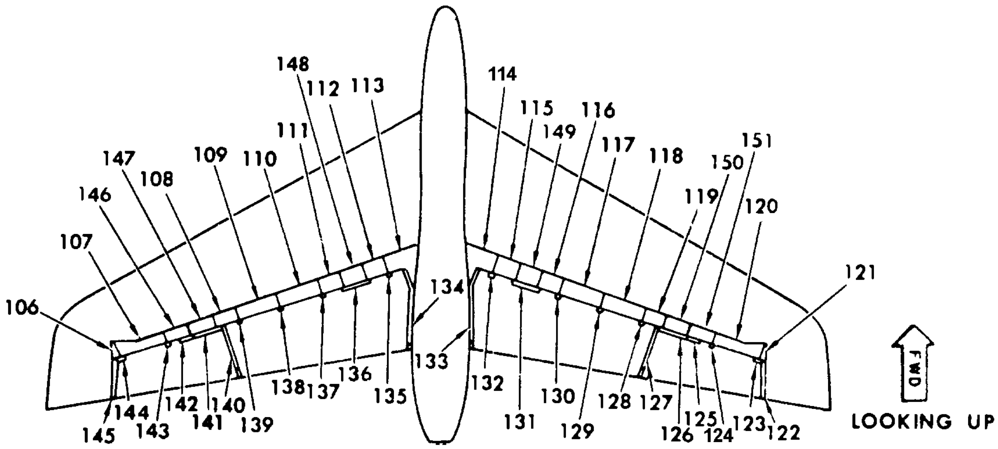
INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
30	7123-3	HORIZONTAL STABILIZER REMOVABLE TIP
31	7113-2	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 5
32	7113-1	HORIZONTAL STABILIZER BOX OUTBOARD REMOVABLE PANEL
33	7112-3	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 4
34	7112-2	HORIZONTAL STABILIZER BOX CENTER REMOVABLE PANEL
35	7112-4	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 3
36	7112-1	HORIZONTAL STABILIZER BOX INBOARD REMOVABLE PANEL
37	7111-2	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 2
38	7111-1	HORIZONTAL STABILIZER BOX ACCESS DOOR
39	7111-3	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 1
40	7111-7	PERSONNEL ACCESS PANEL
41	7111-6	PITCH TRIM ACTUATOR ACCESS PANEL
42	7111-5	CENTER BULLET UPPER FORWARD ACCESS PANEL
43	7111-4	CENTER BULLET UPPER CENTER ACCESS PANEL
44	8111-1	HORIZONTAL STABILIZER BOX ACCESS DOOR
45	8111-3	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 1
46	8111-2	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 2
47	8112-1	HORIZONTAL STABILIZER BOX INBOARD REMOVABLE PANEL

Empennage external access provisions (3 of 5)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
48	8112-4	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 3
49	8112-2	HORIZONTAL STABILIZER BOX CENTER REMOVABLE PANEL
50	8112-3	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 4
51	8113-2	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 5
52	8113-1	HORIZONTAL STABILIZER BOX OUTBOARD REMOVABLE PANEL
53	8123-3	HORIZONTAL STABILIZER REMOVABLE TIP
54	8123-2	HORIZONTAL STABILIZER TIP INBOARD ACCESS PANEL
55	8133-4	HORIZONTAL STABILIZER TIP INBOARD FAIRING
56	8133-3	OUTBOARD ELEVATOR LEADING EDGE ACCESS PANEL
57	8123-1	HORIZONTAL STABILIZER UPPER SHROUD PANEL
58	8133-2	OUTBOARD ELEVATOR LEADING EDGE ACCESS PANEL
59	8122-6	OUTBOARD ELEVATOR SERVO UPPER ACCESS PANEL
60	8133-1	OUTBOARD ELEVATOR LEADING EDGE UPPER ACCESS PANEL
61	8122-5	OUTBOARD ELEVATOR SERVO UPPER ACCESS PANEL
62	8132-5	ELEVATOR SPLIT STRIP FAIRING
63	8132-4	ELEVATOR SPLIT STRIP FAIRING
64	8122-4	HORIZONTAL STABILIZER UPPER SHROUD PANEL
65	8132-3	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
66	8122-3	HORIZONTAL STABILIZER UPPER SHROUD PANEL
67	8132-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
68	8122-2	HORIZONTAL STABILIZER UPPER SHROUD PANEL
69	8132-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
70	8122-1	HORIZONTAL STABILIZER UPPER SHROUD PANEL
71	8131-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
72	8121-3	INBOARD ELEVATOR SERVO UPPER ACCESS PANEL
73	8121-2	HORIZONTAL STABILIZER UPPER SHROUD PANEL
74	8131-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
75	8131-3	INBOARD ELEVATOR INBOARD STRIP FAIRING
76	8131-4	INBOARD ELEVATOR INBOARD STRIP FAIRING
77	8121-1	HORIZONTAL STABILIZER UPPER SHROUD PANEL
78	8121-4	CENTER BULLET UPPER AFT OUTBOARD ACCESS PANEL
79	7121-5	CENTER BULLET UPPER AFT INBOARD ACCESS PANEL
80	7121-4	CENTER BULLET UPPER AFT OUTBOARD ACCESS PANEL
⚠1 81	7131-6	CRASH DATA POSITION INDICATOR RECORDER
82	7131-4	INBOARD ELEVATOR INBOARD STRIP FAIRING
83	7131-3	INBOARD ELEVATOR INBOARD STRIP FAIRING
84	7121-1	HORIZONTAL STABILIZER UPPER SHROUD PANEL
85	7131-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
86	7121-2	HORIZONTAL STABILIZER UPPER SHROUD PANEL
87	7131-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
88	7121-3	INBOARD ELEVATOR SERVO UPPER ACCESS PANEL
89	7122-1	HORIZONTAL STABILIZER UPPER SHROUD PANEL
90	7132-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
91	7122-2	HORIZONTAL STABILIZER UPPER SHROUD PANEL
92	7132-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
93	7122-3	HORIZONTAL STABILIZER UPPER SHROUD PANEL
94	7132-3	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
95	7132-5	ELEVATOR SPLIT STRIP FAIRING
96	7132-4	ELEVATOR SPLIT STRIP FAIRING
97	7122-4	HORIZONTAL STABILIZER UPPER SHROUD PANEL
98	7122-5	OUTBOARD ELEVATOR SERVO UPPER ACCESS PANEL
99	7133-1	OUTBOARD ELEVATOR LEADING EDGE ACCESS PANEL
100	7122-6	OUTBOARD ELEVATOR SERVO UPPER ACCESS PANEL
101	7133-2	OUTBOARD ELEVATOR LEADING EDGE ACCESS PANEL
102	7123-1	HORIZONTAL STABILIZER UPPER SHROUD PANEL
103	7133-3	OUTBOARD ELEVATOR LEADING EDGE ACCESS PANEL
104	7133-4	HORIZONTAL STABILIZER TIP INBOARD FAIRING
105	7123-2	HORIZONTAL STABILIZER TIP INBOARD ACCESS PANEL

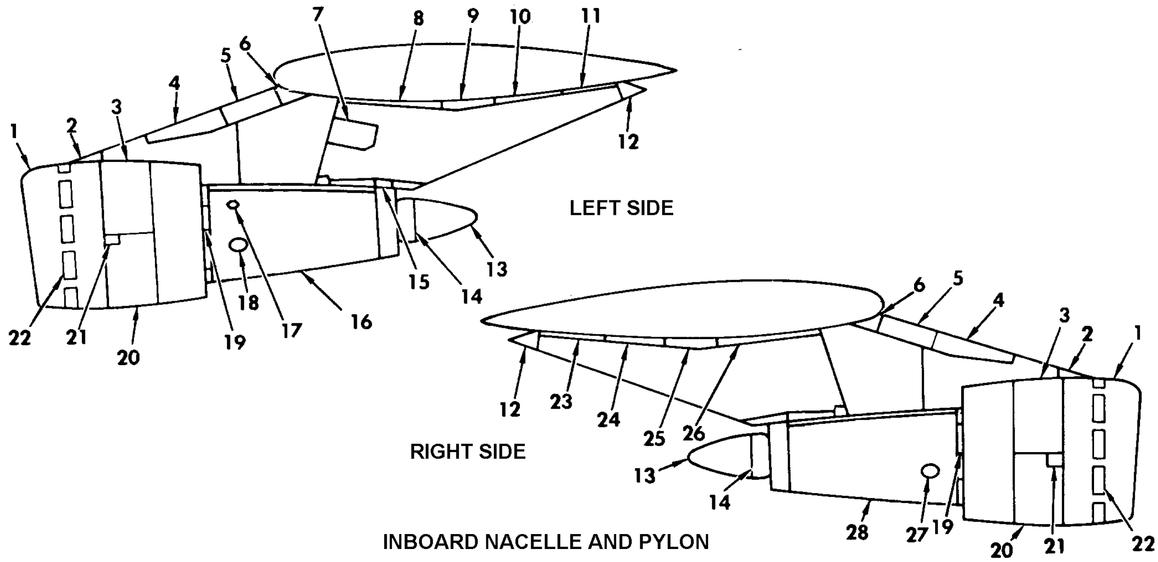
⚠1 AF66-8303 THROUGH AF70-467 NOT MODIFIED

Empennage external access provisions (4 of 5)



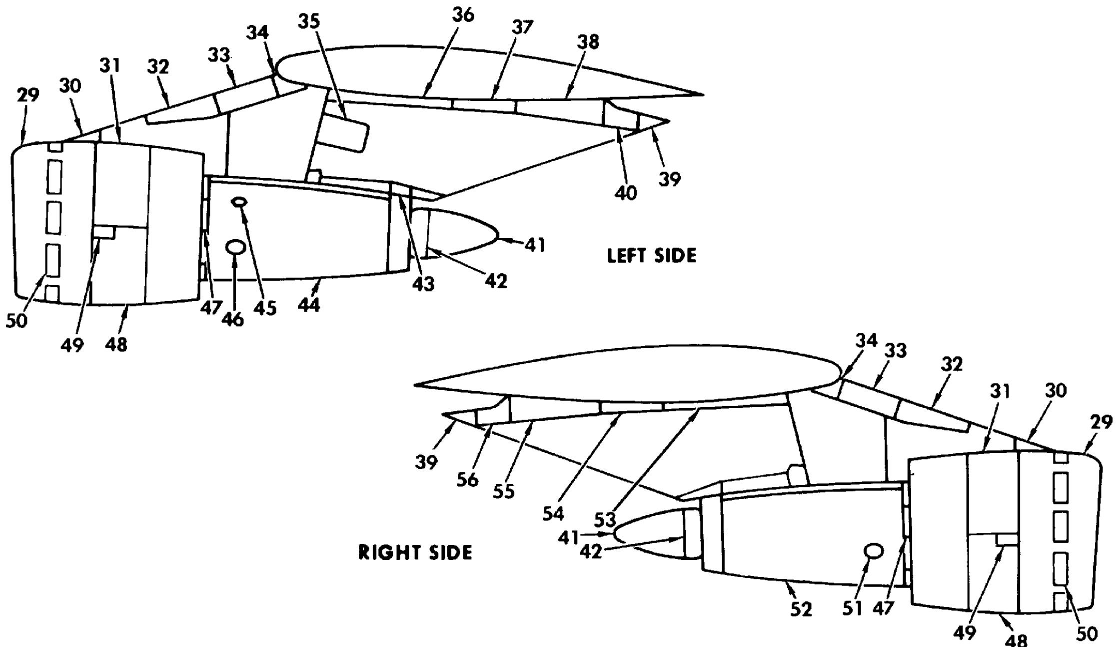
INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
106	8223-4	HORIZONTAL STABILIZER TIP INBOARD ACCESS PANEL
107	8223-3	HORIZONTAL STABILIZER LOWER SHROUD PANEL
108	8222-4	HORIZONTAL STABILIZER LOWER SHROUD PANEL
109	8222-3	HORIZONTAL STABILIZER LOWER SHROUD PANEL
110	8222-2	HORIZONTAL STABILIZER LOWER SHROUD PANEL
111	8222-1	HORIZONTAL STABILIZER LOWER SHROUD PANEL
112	8221-2	HORIZONTAL STABILIZER LOWER SHROUD PANEL
113	8221-1	HORIZONTAL STABILIZER LOWER SHROUD PANEL
114	7221-1	HORIZONTAL STABILIZER LOWER SHROUD PANEL
115	7221-2	HORIZONTAL STABILIZER LOWER SHROUD PANEL
116	7222-1	HORIZONTAL STABILIZER LOWER SHROUD PANEL
117	7222-2	HORIZONTAL STABILIZER LOWER SHROUD PANEL
118	7222-3	HORIZONTAL STABILIZER LOWER SHROUD PANEL
119	7222-4	HORIZONTAL STABILIZER LOWER SHROUD PANEL
120	7223-3	HORIZONTAL STABILIZER LOWER SHROUD PANEL
121	7223-4	HORIZONTAL STABILIZER TIP INBOARD ACCESS PANEL
122	7233-4	HORIZONTAL STABILIZER TIP INBOARD FAIRING
123	7233-4	HORIZONTAL STABILIZER LOWER SHROUD PANEL
124	7233-3	HORIZONTAL STABILIZER LOWER SHROUD PANEL
125	7233-2	HORIZONTAL STABILIZER LOWER SHROUD PANEL
126	7233-1	HORIZONTAL STABILIZER LOWER SHROUD PANEL
127	7232-4	ELEVATOR SPLIT STRIP FAIRING
128	7232-3	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
129	7232-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
130	7232-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
131	7231-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
132	7231-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
133	7231-3	INBOARD ELEVATOR INBOARD STRIP FAIRING
134	8231-3	INBOARD ELEVATOR INBOARD STRIP FAIRING
135	8231-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
136	8231-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
137	8232-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
138	8232-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
139	8232-3	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
140	8232-4	ELEVATOR SPLIT STRIP FAIRING
141	8233-1	HORIZONTAL STABILIZER LOWER SHROUD PANEL
142	8233-2	HORIZONTAL STABILIZER LOWER SHROUD PANEL
143	8233-3	HORIZONTAL STABILIZER LOWER SHROUD PANEL
144	8233-4	HORIZONTAL STABILIZER LOWER SHROUD PANEL
145	8233-4	HORIZONTAL STABILIZER TIP INBOARD FAIRING
146	8223-2	OUTBOARD ELEVATOR SERVO ACCESS PANEL
147	8223-1	OUTBOARD ELEVATOR SERVO ACCESS PANEL
148	8221-3	INBOARD ELEVATOR SERVO ACCESS PANEL
149	7221-3	INBOARD ELEVATOR SERVO ACCESS PANEL
150	7223-1	OUTBOARD ELEVATOR SERVO ACCESS PANEL
151	7223-2	OUTBOARD ELEVATOR SERVO ACCESS PANEL

Empennage external access provisions (5 of 5)



INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
1	4P21014	INLET COWL
2	4P52000	FAIRING
3		UPPER FAN COWL ACCESS PANEL
4	4P52071	LEADING EDGE ACCESS PANEL
5	4P52072	AFT LEADING EDGE PANEL
6	4P51011	FAIRING
7	PP3L	ACCESS DOOR
8	4P51013	FAIRING
9	4P51040	ACCESS TO PYLON AND WING ATTACH BOLT
10	4P51015	FAIRING
11	4P53344	FAIRING
12	4P51076 AND 4P51071	FAIRING
13	4P20007	AFT EXHAUST PLUG
14	4P20008	FORWARD EXHAUST PLUG
15	PP4L	ACCESS DOOR
16	4P20009	MAIN COWL ENGINE ACCESS DOOR
17	4P22042	ENGINE OIL TANK FILLER ACCESS
18	4P22141	PRESSURE RELIEF DOOR
19		INNER FAN COWL ACCESS PANELS
20		LOWER FAN COWL ACCESS PANELS
21		FORWARD GROUND HANDLING ACCESS PANELS
22		INLET COWL BLOW-IN DOORS
23	4P53343	FAIRING
24	4P51014	FAIRING
25	4P51039	ACCESS TO PYLON AND WING ATTACH BOLT
26	4P51012	FAIRING
27	4P22141	PRESSURE RELIEF DOOR
28	4P20010	MAIN COWL ENGINE ACCESS DOOR

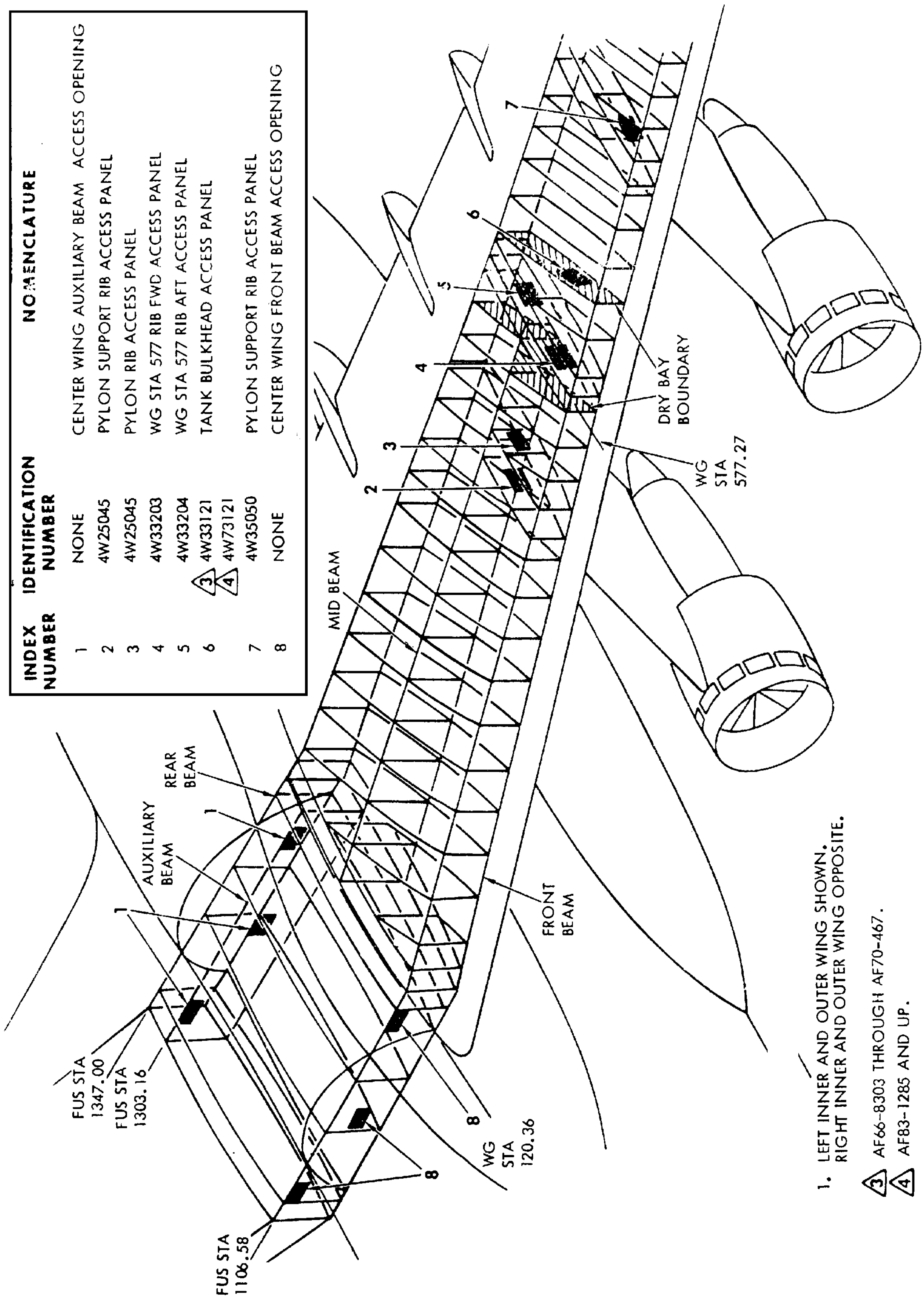
Pylon/nacelle external access provisions (1 of 2)



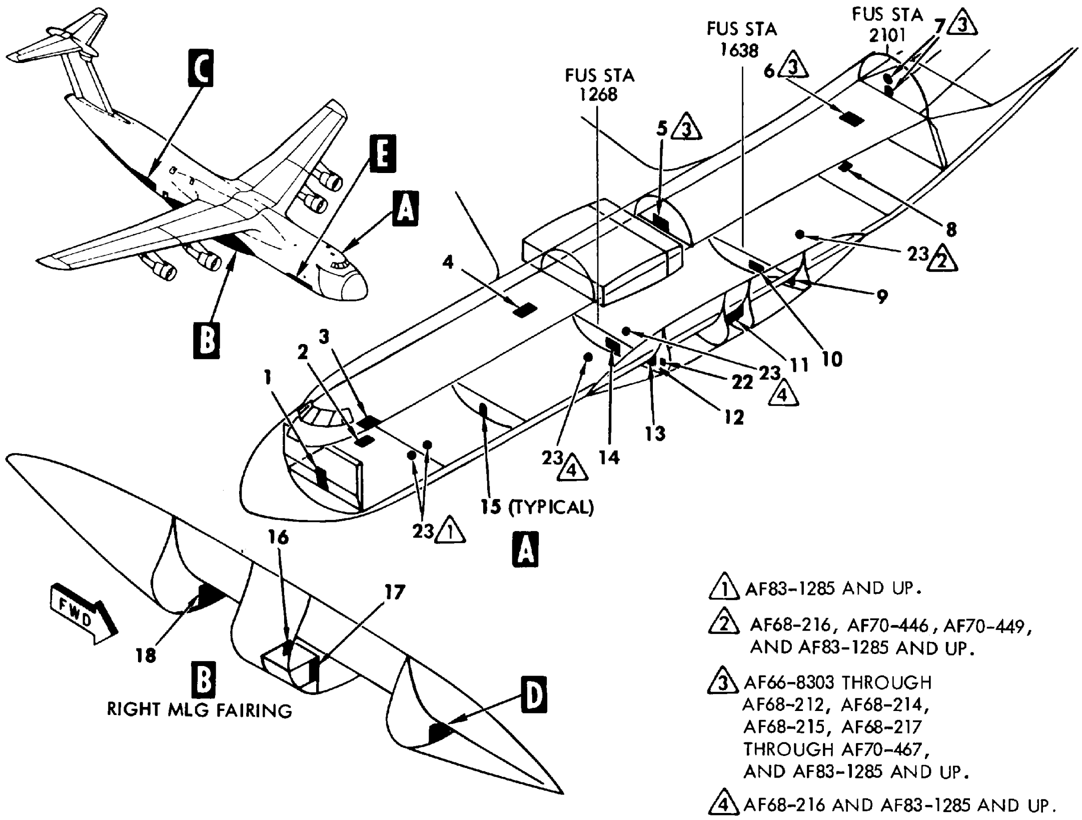
OUTBOARD NACELLE AND PYLON

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
29	4P21014	INLET COWL
30	4P52000	FAIRING
31		UPPER FAN COWL ACCESS PANELS
32	4P52071	LEADING EDGE ACCESS PANEL
33	4P52072	AFT LEADING EDGE PANEL
34	4P51001	FAIRING
35	PP3L	ACCESS DOOR
36	4P51003	FAIRING
37	4P51010	FAIRING
38	4P51005 AND 4P51077	ACCESS TO PYLON AND WING ATTACH BOLT
39	4P52169	FAIRING
40	4P52170	FAIRING
41	4P20007	AFT EXHAUST PLUG
42	4P20008	FORWARD EXHAUST PLUG
43	PP4L	ACCESS DOOR
44	4P20009	MAIN COWL ENGINE ACCESS DOOR
45	4P22042	ENGINE OIL TANK FILLER ACCESS
46	4P22141	PRESSURE RELIEF DOOR
47		INNER FAN COWL ACCESS PANELS
48		LOWER FAN COWL ACCESS PANELS
49		FORWARD GROUND HANDLING ACCESS PANELS
50		INLET COWL BLOW-IN DOORS
51	4P22141	PRESSURE RELIEF DOOR
52	4P20010	MAIN COWL ENGINE ACCESS DOOR
53	4P51002	FAIRING
54	4P51009	FAIRING
55	4P51004	ACCESS TO PYLON AND WING ATTACH BOLT
56	4P52171	FAIRING

Pylon/nacelle external access provisions (2 of 2)

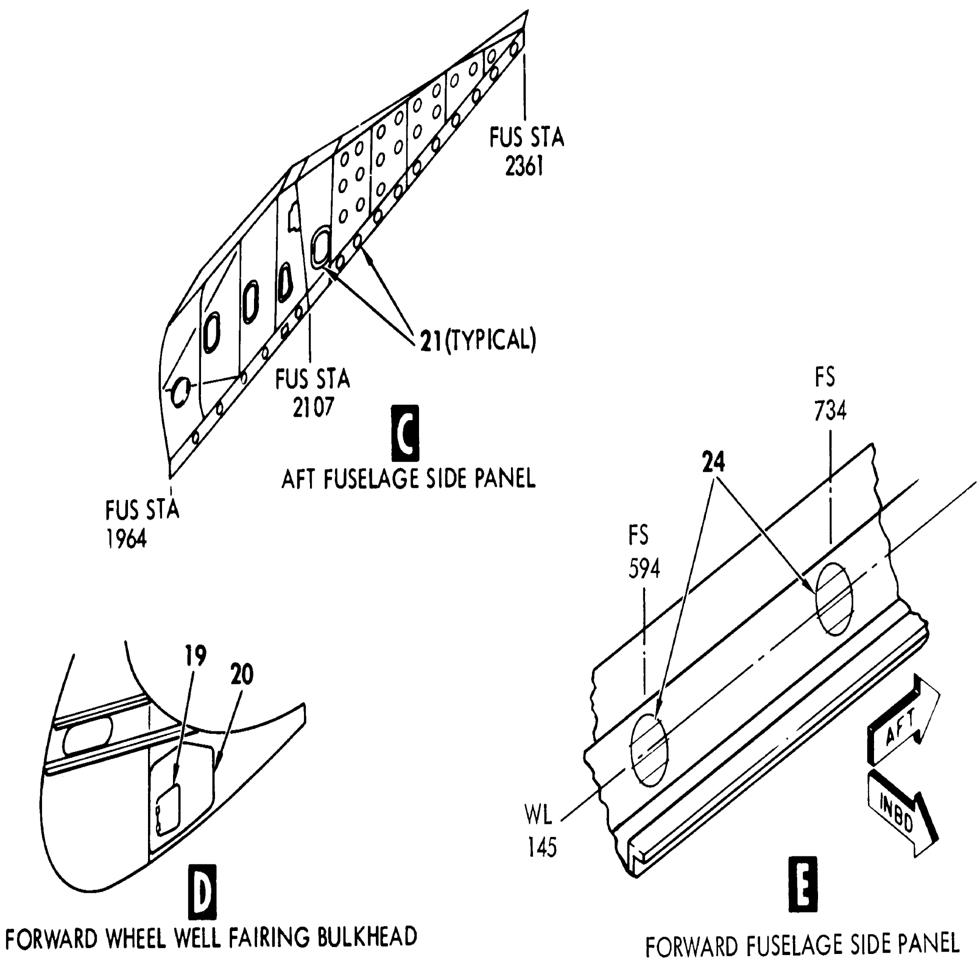


Wing internal access provisions



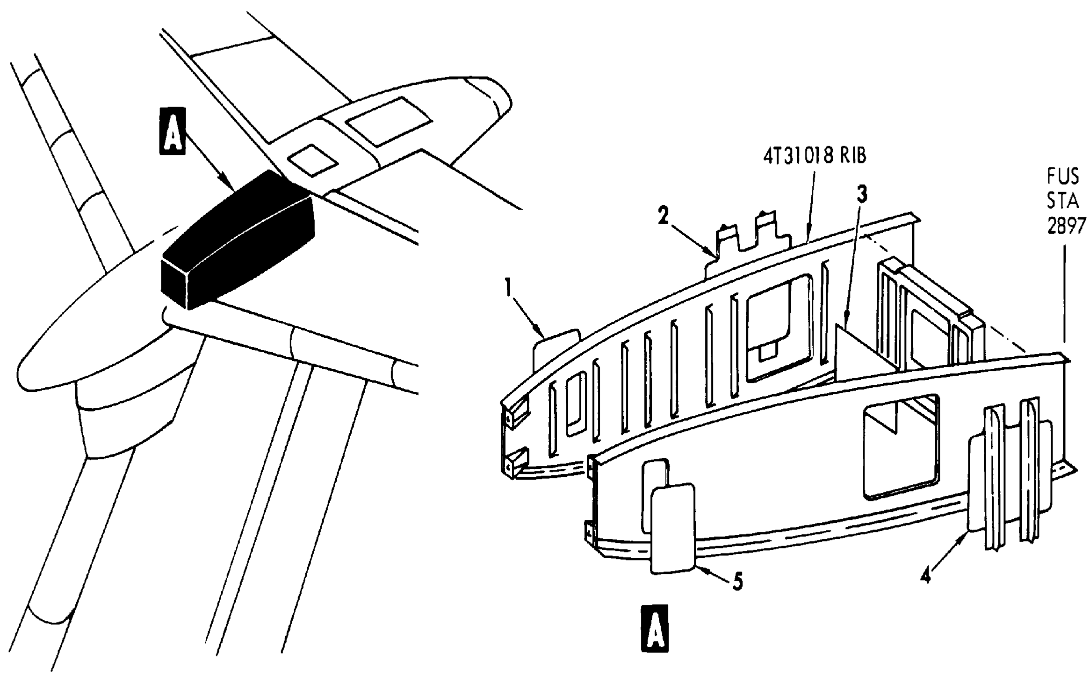
INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
1	4F52076	RAMP EXTENSION ACCESS DOOR FOR ACCESS TO VISOR DOOR
2	4F51057	FORWARD RAMP WINCH ACCESS DOOR
3	4F21450	FOLDING STAIR LADDER
4	4F11000	FLOOR HATCH FOR SECONDARY ACCESS TO CARGO COMPARTMENT
△3 5	TPF 13-1	TROOP COMPARTMENT TO CENTER WING AFT BEAM ACCESS DOOR
△3 6	4F12390	FOLDING STAIR LADDER
△3 7	4F41211	AFT FUSELAGE ACCESS DOOR
8	4F53058	AFT RAMP WINCH ACCESS DOOR
9	LWA13-2	RADAR ALTIMETER TRANSMITTER AND RECEIVER ANTENNA ACCESS DOOR
10	WA22	FUSELAGE STATION 1638 UNDERFLOOR ACCESS DOOR
11	LWB23-3	LIQUID OXYGEN ACCESS DOOR
12	LWF33-11	SPR FUEL DUMP VALVE ACCESS PANEL
13	LWF33-1	FORWARD WHEEL WELL FAIRING BULKHEAD ACCESS DOOR
14	WF22	FUSELAGE STATION 1268 UNDERFLOOR ACCESS DOOR
15	NONE	UNDERFLOOR CRAWLWAY
16	RWA11-5	MLG TIRE INFLATION UNIT AFT ACCESS PANEL
17	RWF31-4	MLG TIRE INFLATION UNIT FORWARD ACCESS PANEL
18	RWA33-2	ACCESS DOOR
△1 22	4E32422	PRESSURIZED POTABLE WATER SERVICE PANEL DOOR
23	△1 4F34312 △1 4F34313 △4 4F34314 △4 4F34315 △2 4F34316	BILGE DRAIN DOOR

Fuselage internal access provisions (1 of 2)



INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
19	RWF13-11	SPR FUEL DUMP VALVE ACCESS PANEL
20	RWF13-1	FORWARD WHEEL WELL FAIRING BULKHEAD ACCESS DOOR
21		MISCELLANEOUS ACCESS
24	4F12359	CARGO COMPARTMENT BUFFET-LAVATORY UNIT SERVICE DOOR

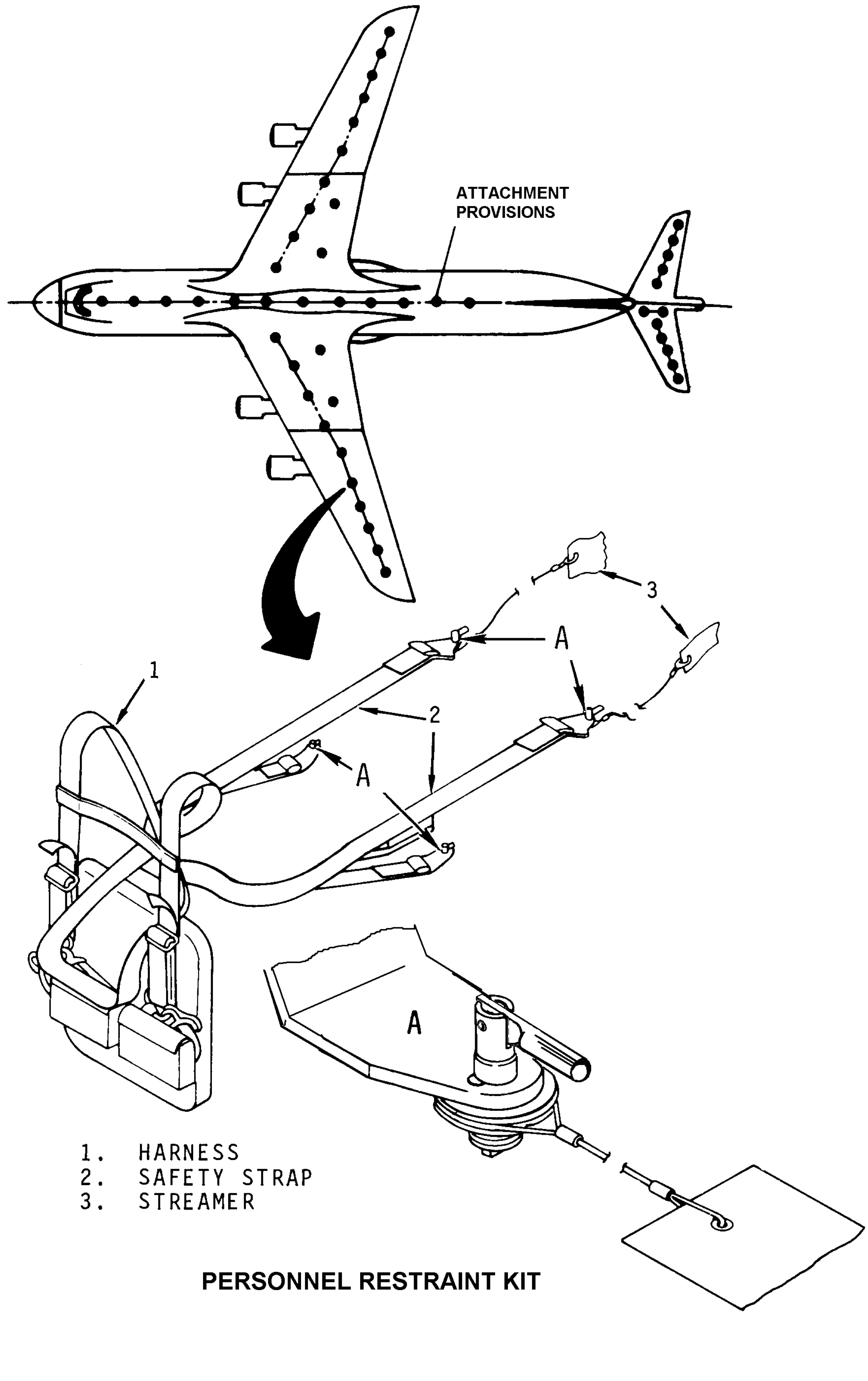
Fuselage internal access provisions (2 of 2)



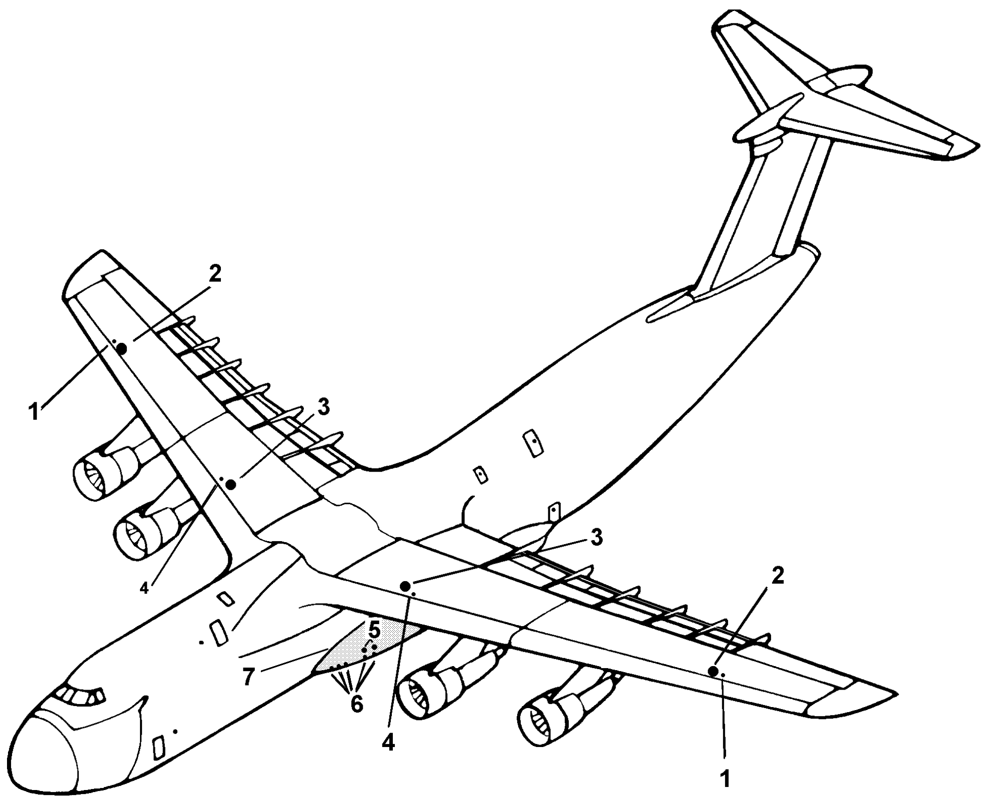
HORIZONTAL STABILIZER CENTER SECTION

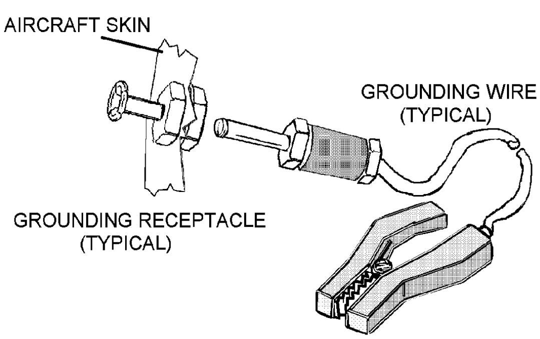
INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
1	4T31018-131A	PIVOT FITTING RIB ACCESS PLATE
2	4T31018-103A	PIVOT FITTING RIB ACCESS DOOR
3	4T33017-101A	TRANSVERSE BEAM ACCESS PANEL
4	4T31018-104A	PIVOT FITTING RIB ACCESS DOOR
5	4T31018-131A	PIVOT FITTING RIB ACCESS PLATE

Empennage internal access provisions



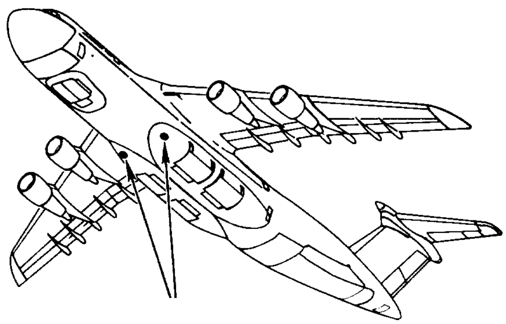
Restraint harness and attachment provisions

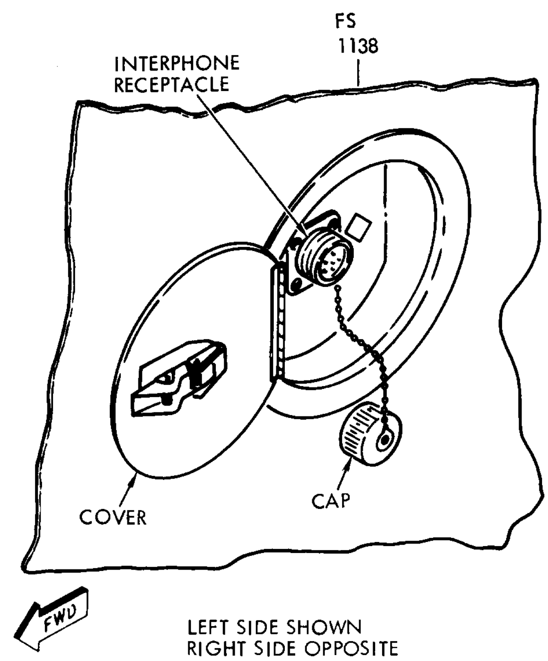




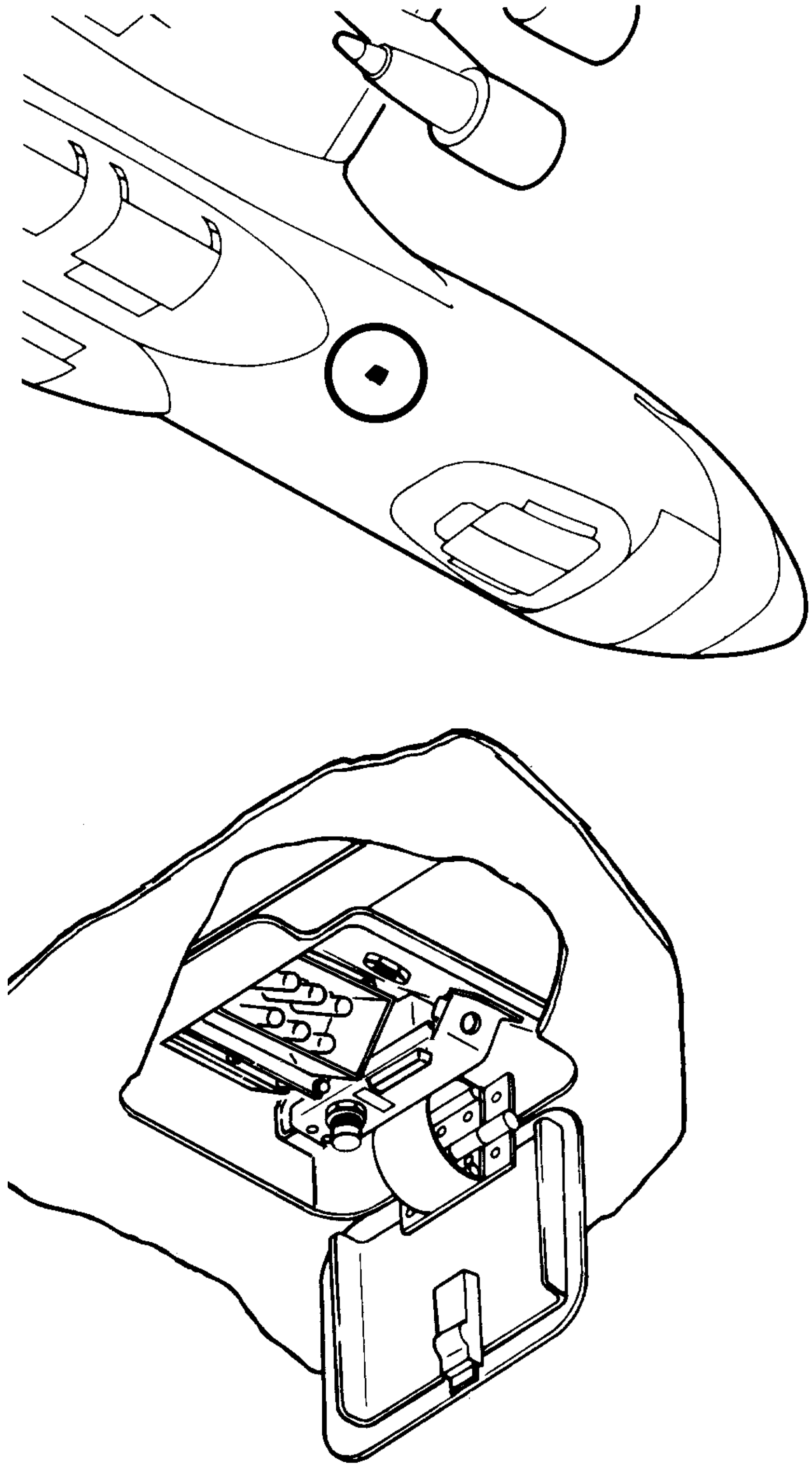
1. GROUNDING RECEPTACLE (OWSH STA 449)
2. OVERWING FUEL CAP (OWBR STA 445)
3. OVERWING FUEL CAP (IWBR STA 86)
4. GROUNDING RECEPTACLE (IWSH STA 101)
5. SPR ADAPTER
6. GROUNDING RECEPTACLE (TYPICAL 10 PLACES)
7. MLG FORWARD FAIRING

Grounding provisions

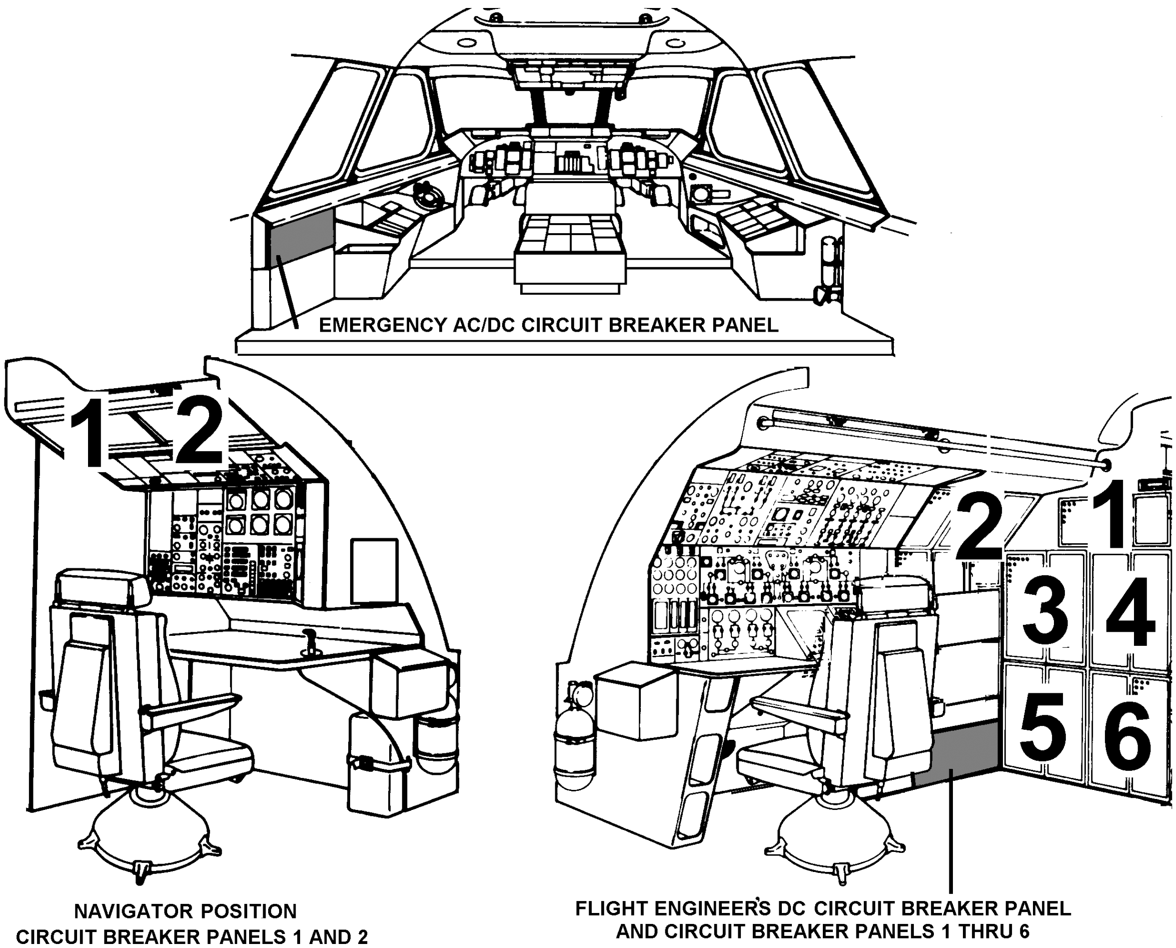




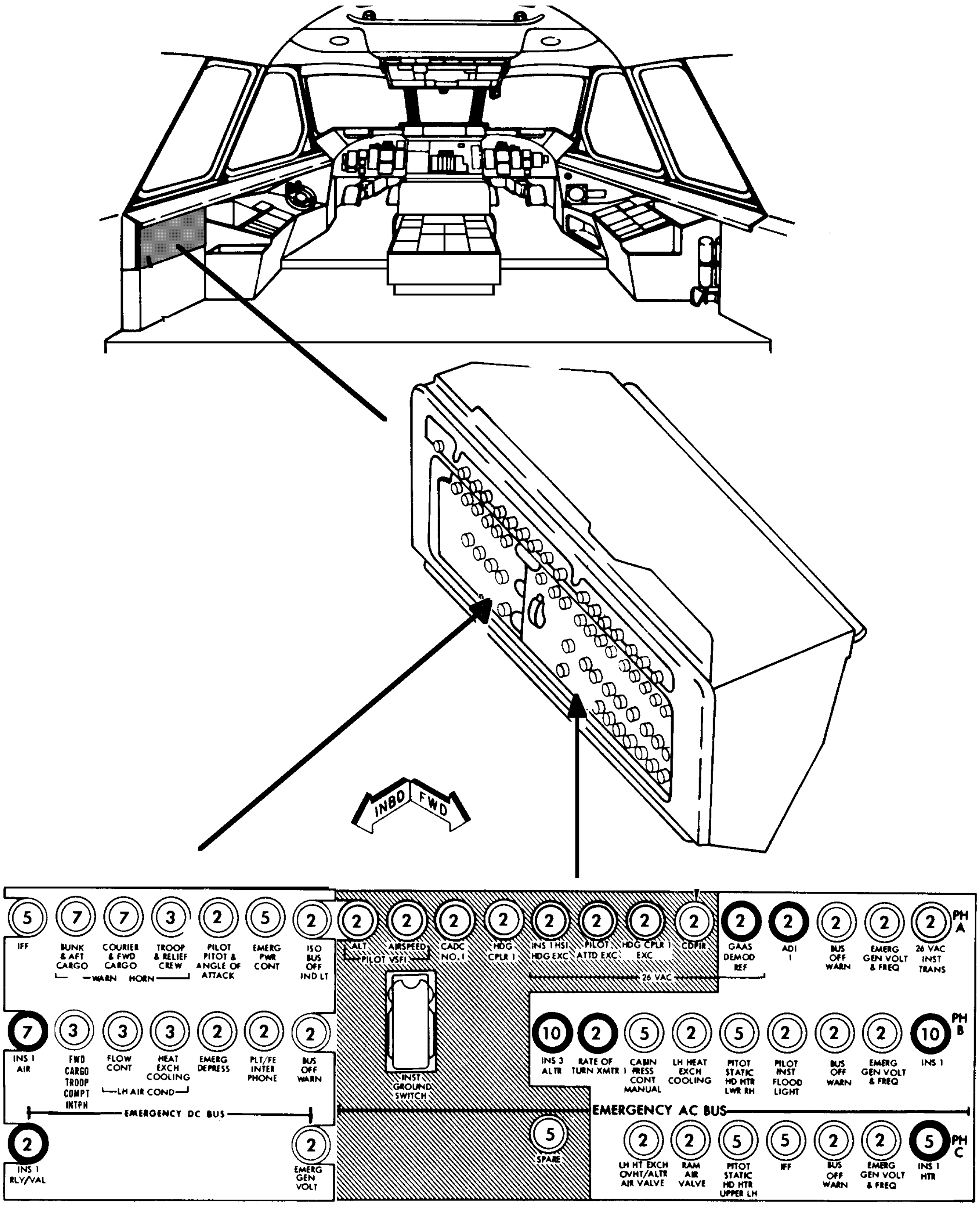
Interphone external connections



External power receptacle



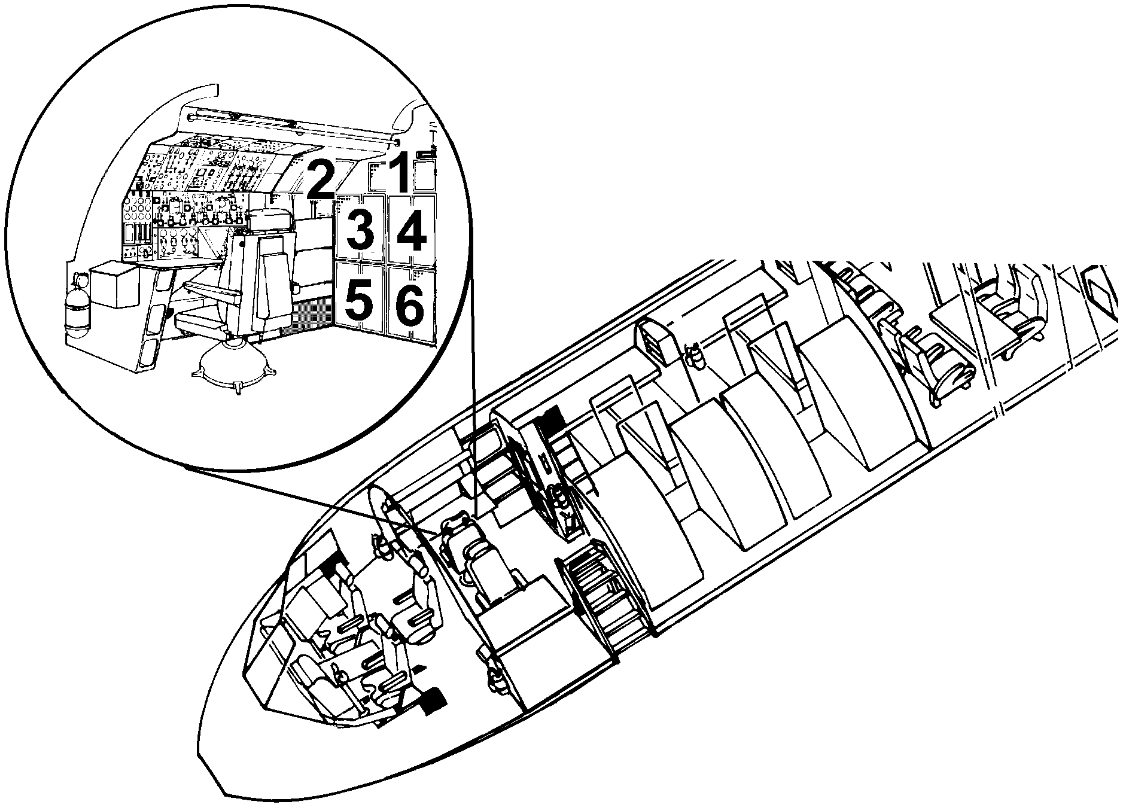
Circuit breaker panel locations

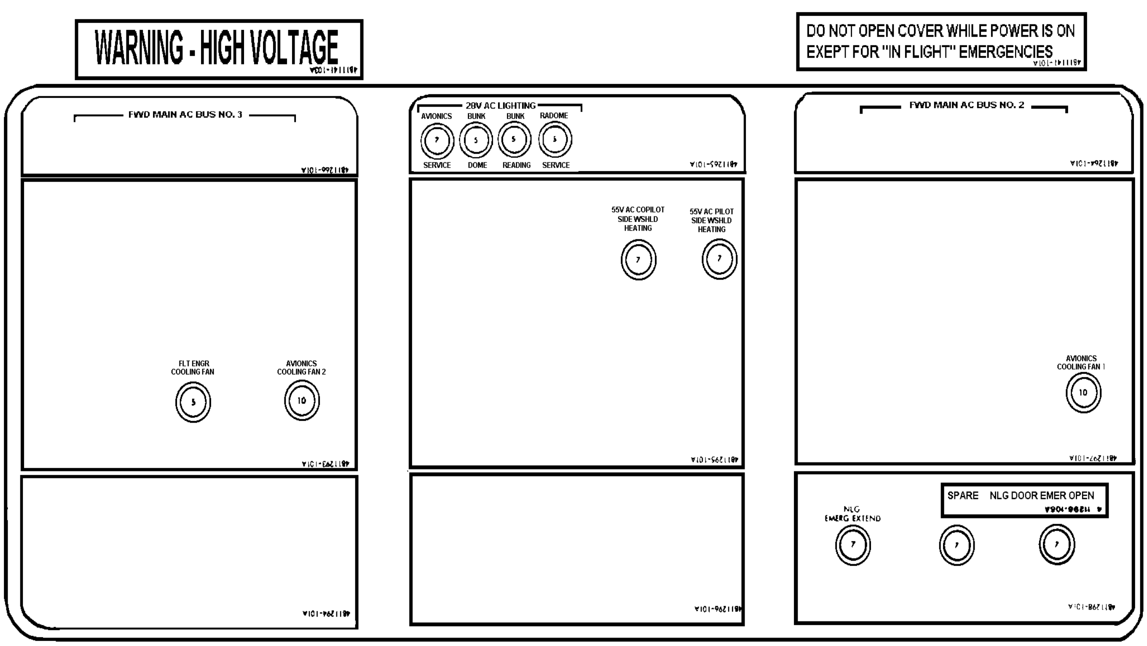


DC BUS CIRCUIT BREAKER PANEL

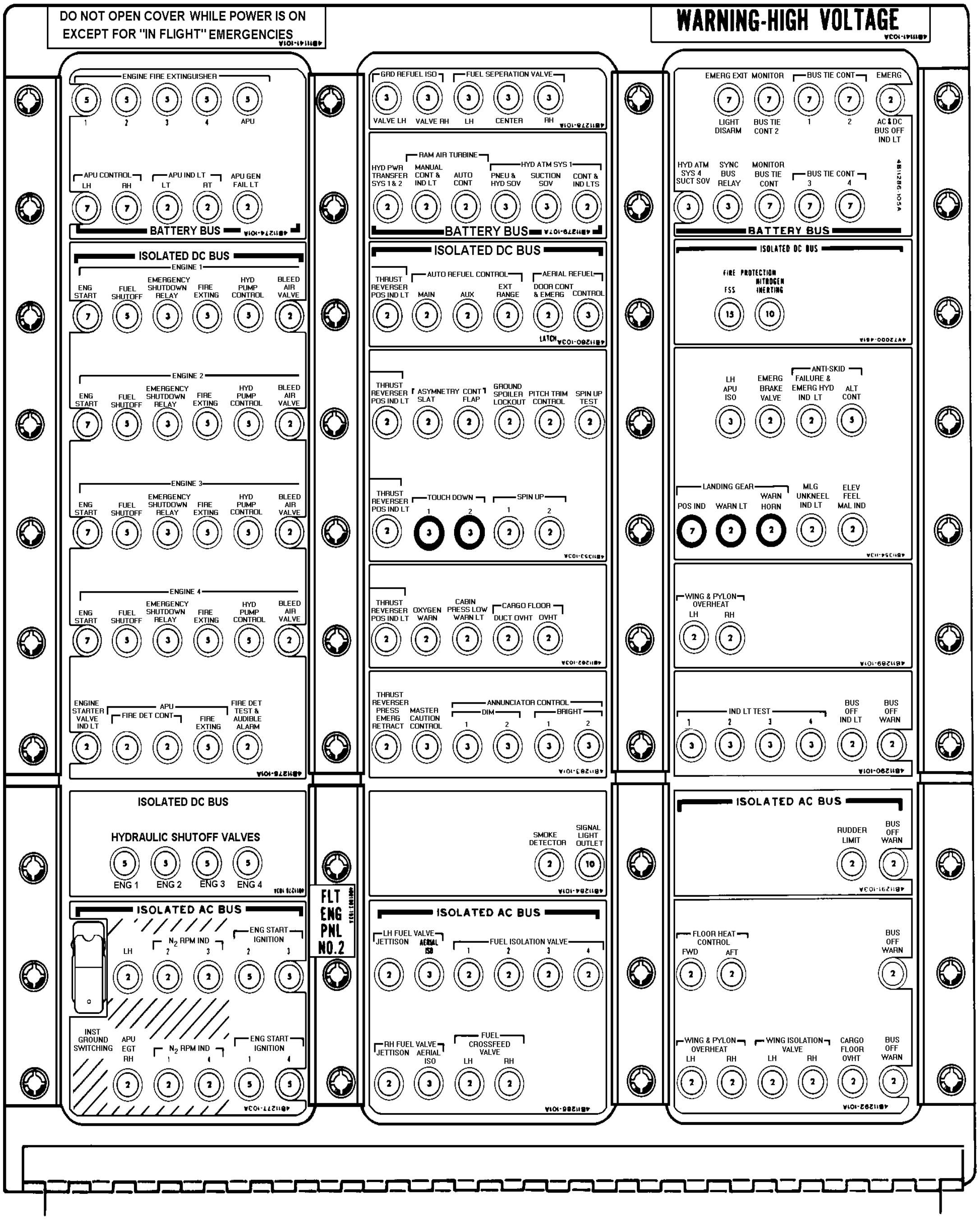
AC BUS CIRCUIT BREAKER PANEL

Flight station AC/DC bus circuit breaker panel

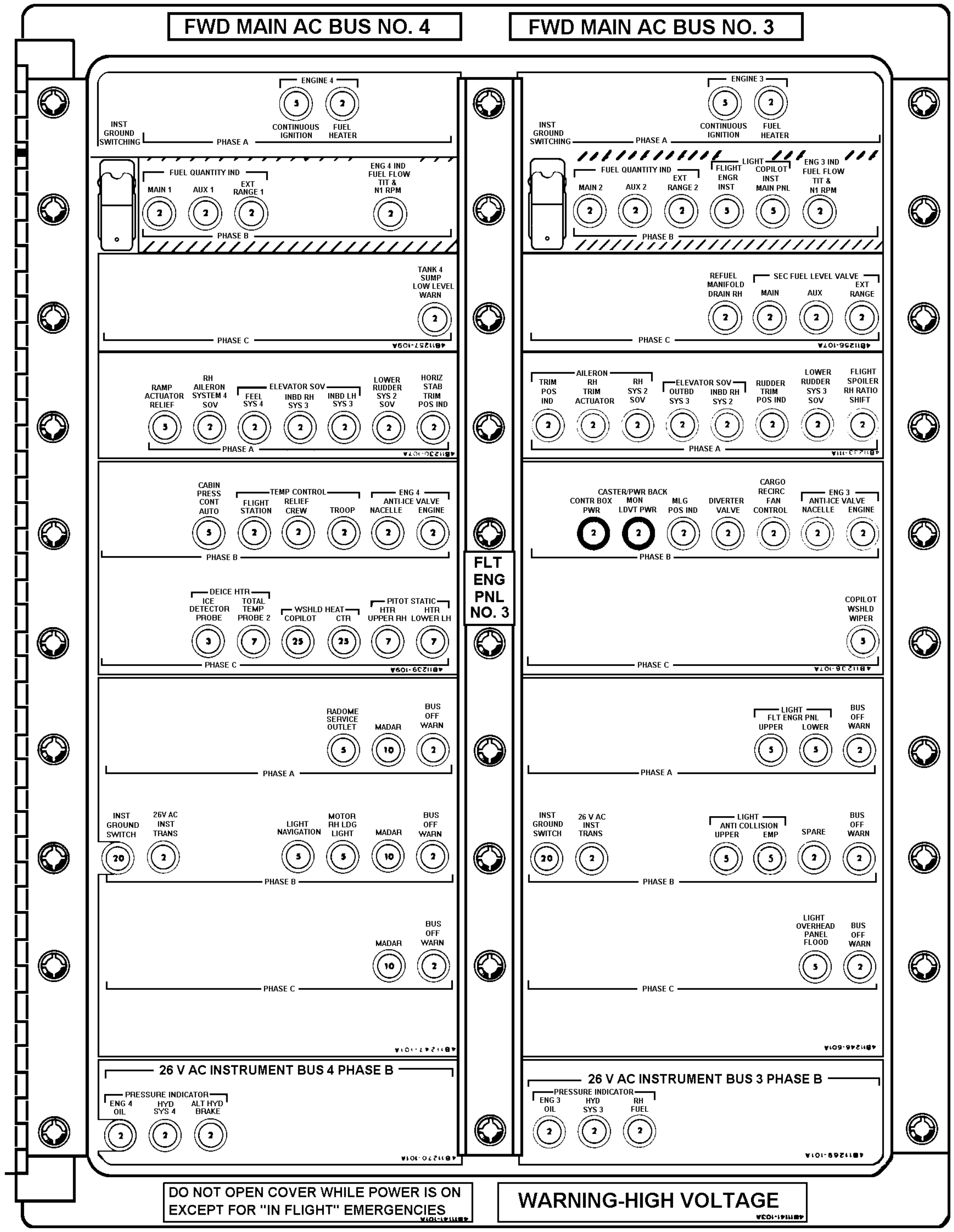




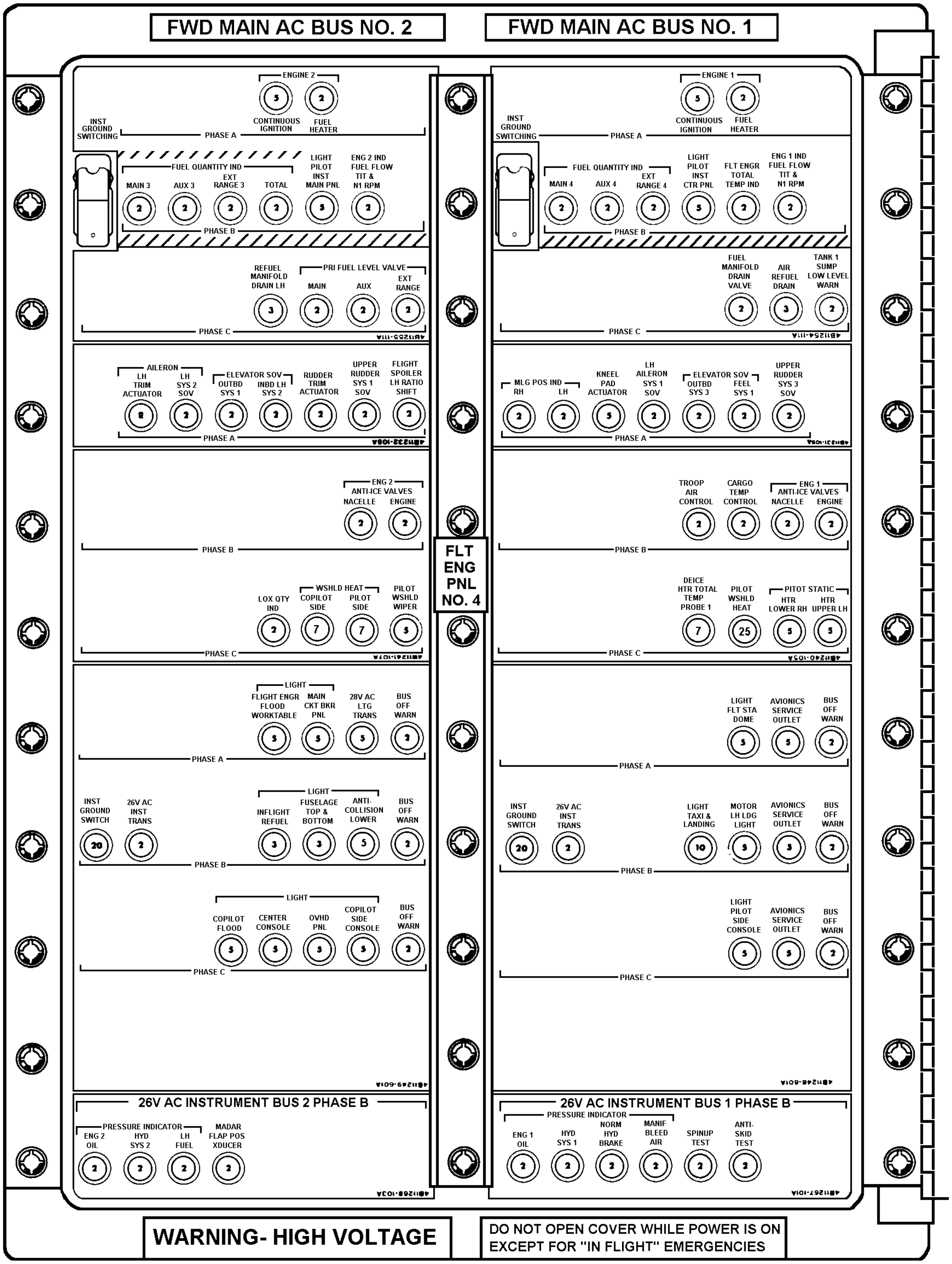
Flight engineer’s circuit breaker panel No. 1



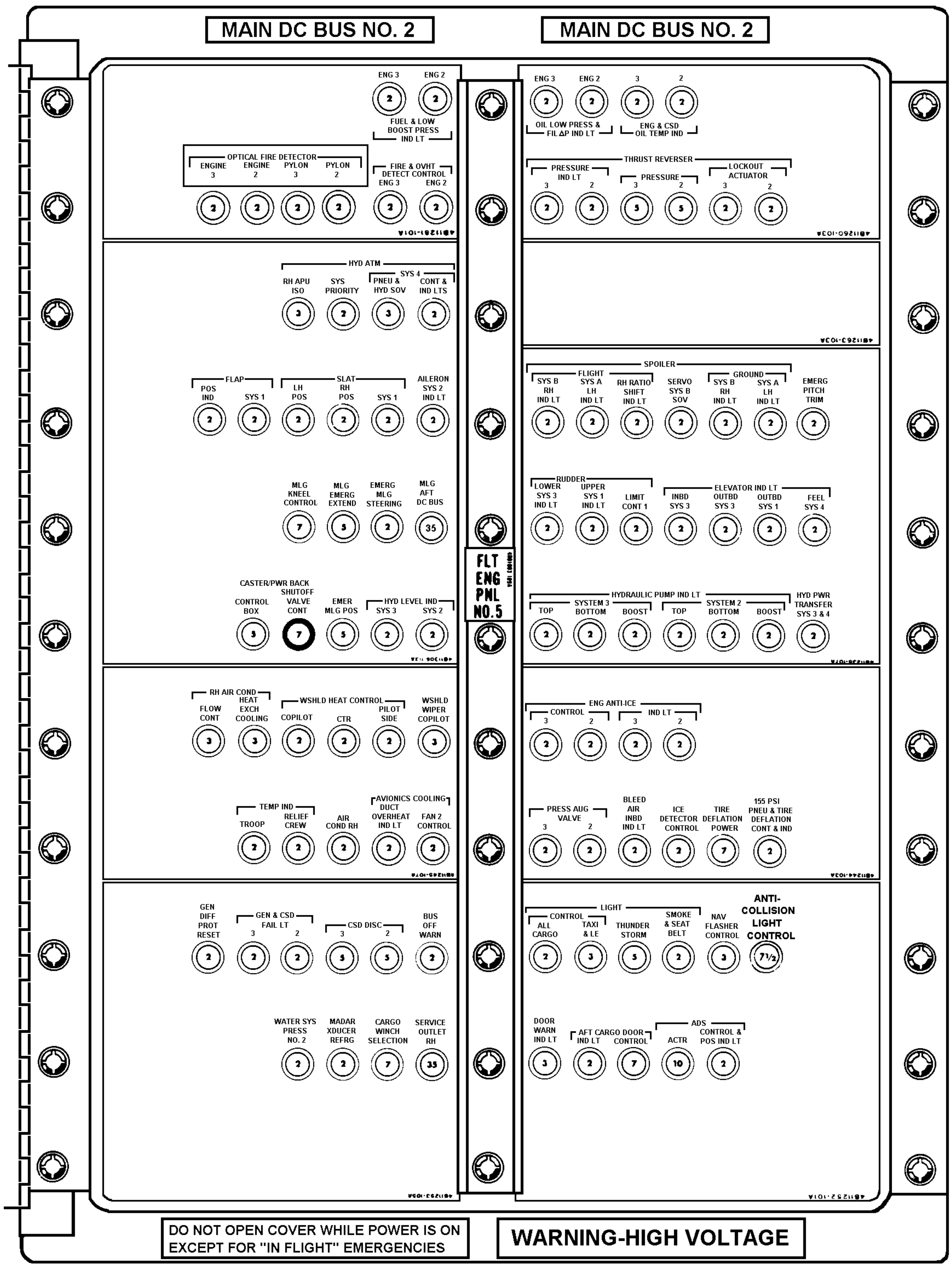
Flight engineer’s circuit breaker panel No. 2



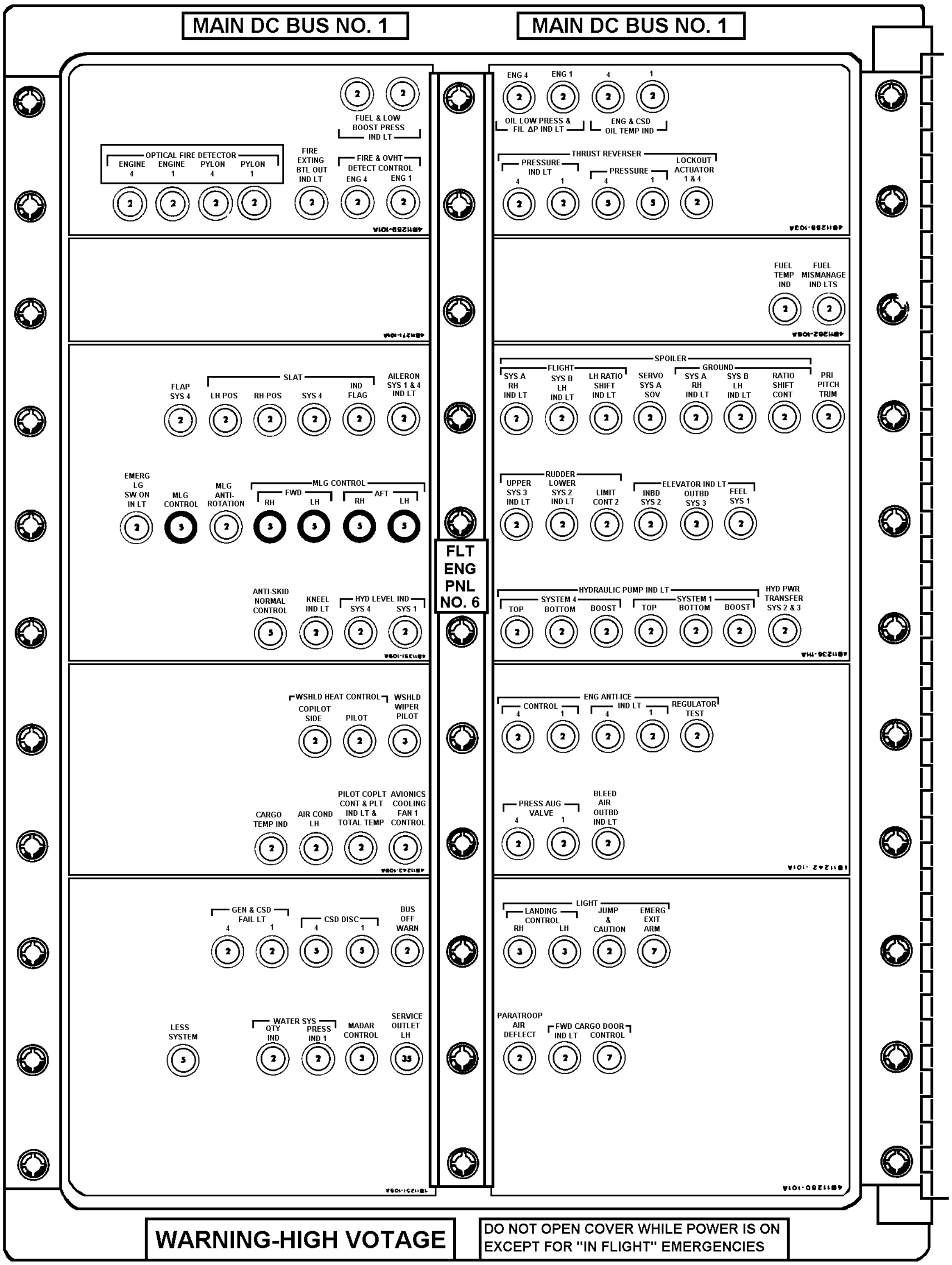
Flight engineer’s circuit breaker panel No. 3



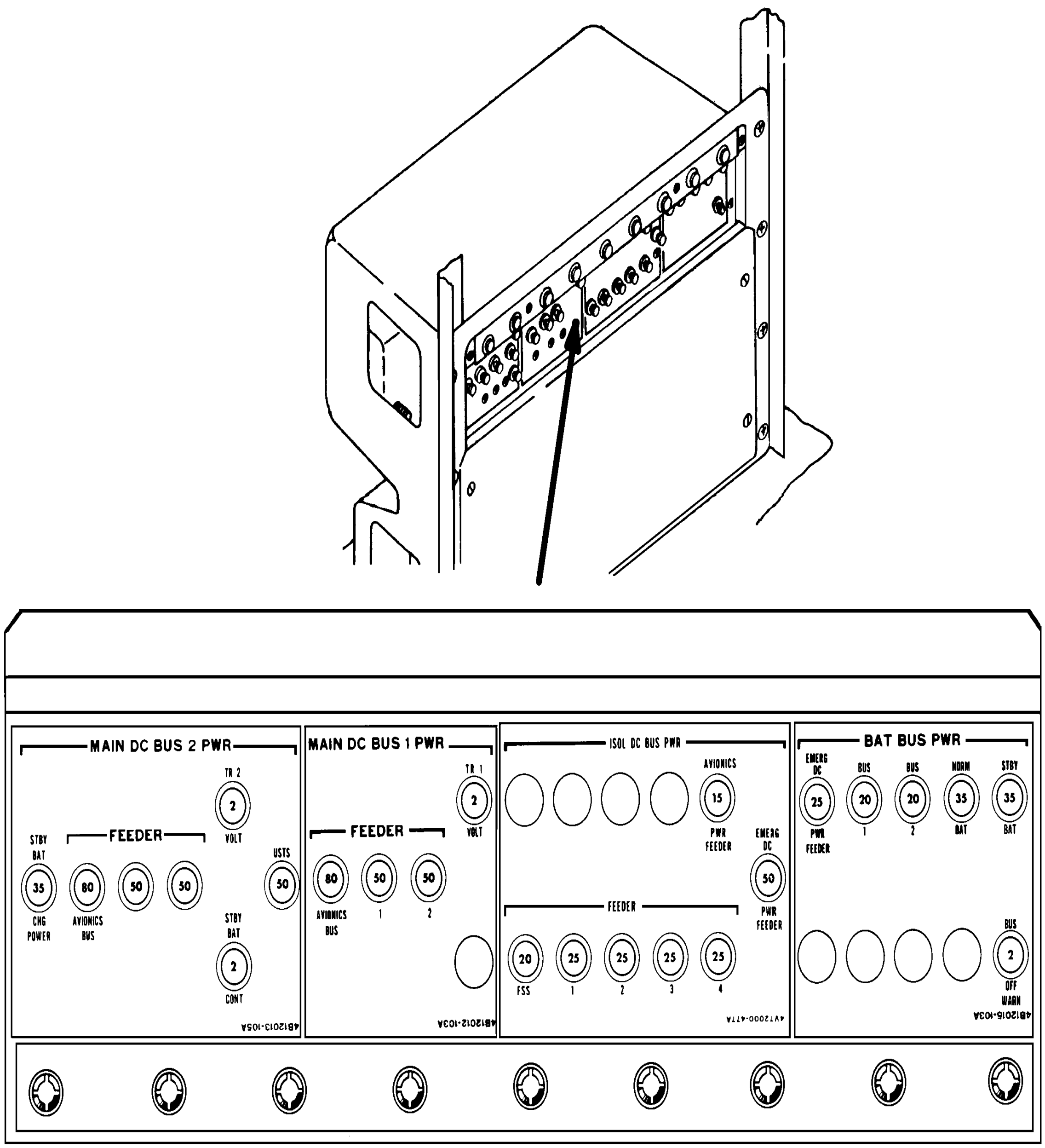
Flight engineer’s circuit breaker panel No. 4



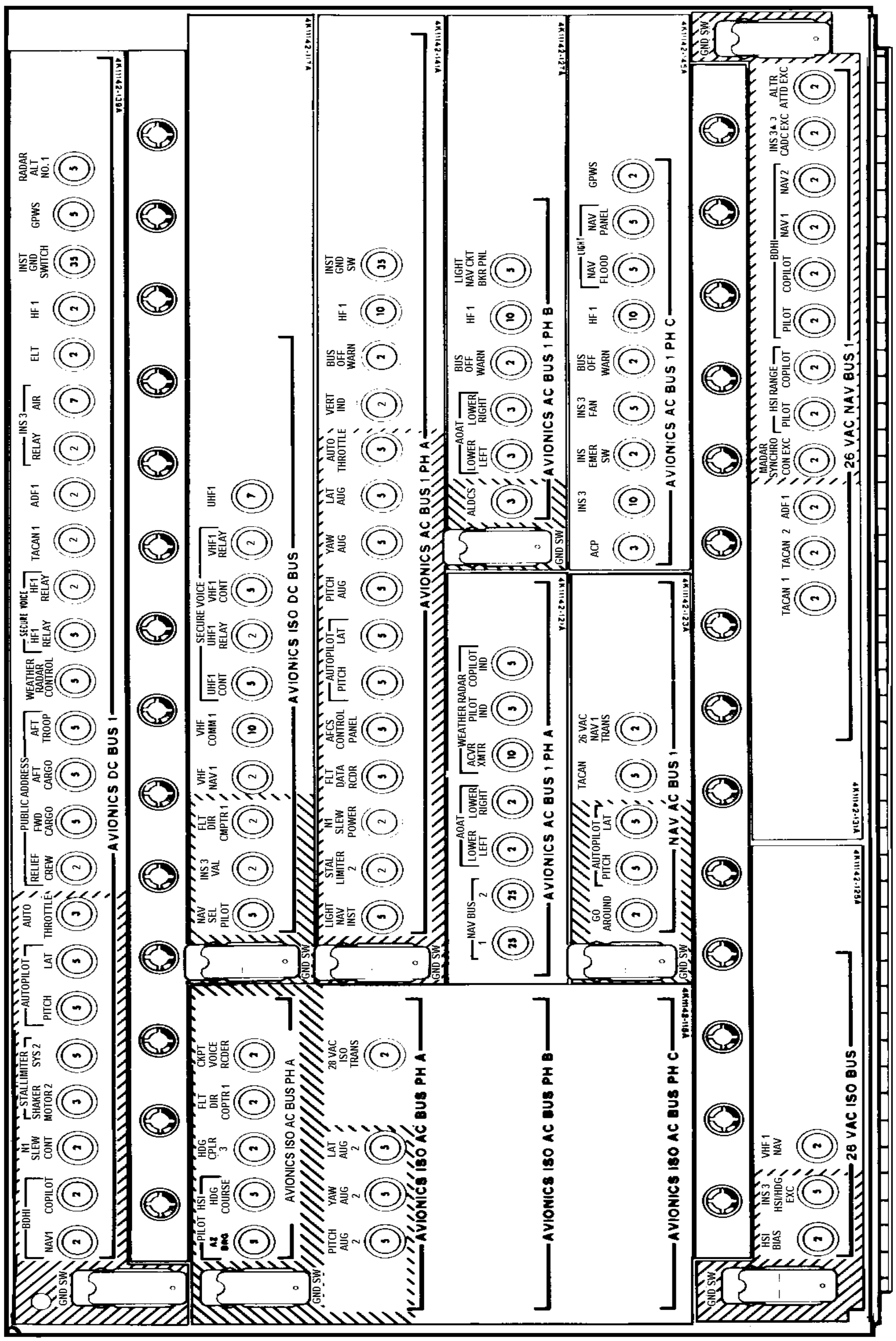
Flight engineer’s circuit breaker panel No. 5



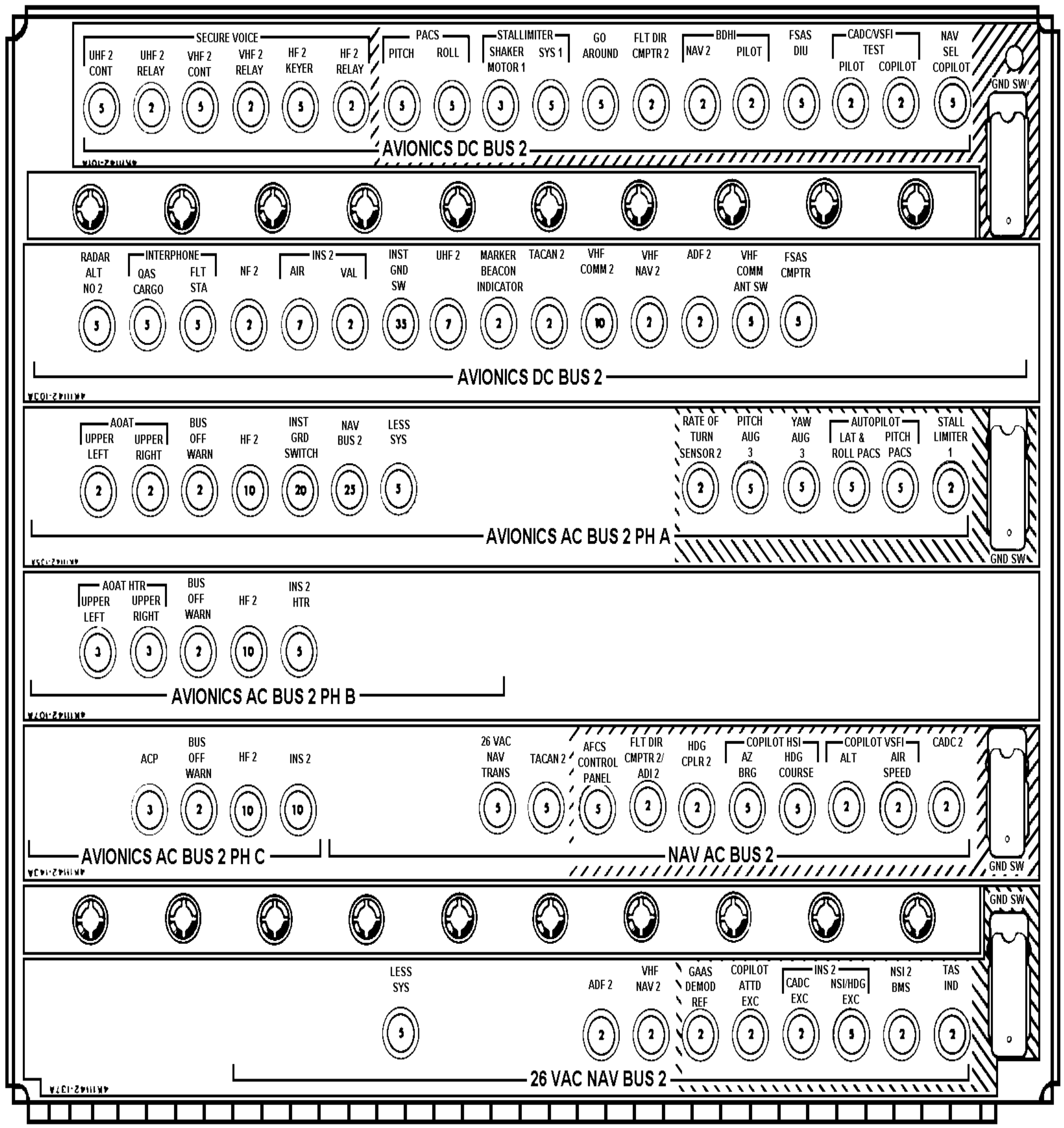
Flight engineer’s circuit breaker panel No. 6



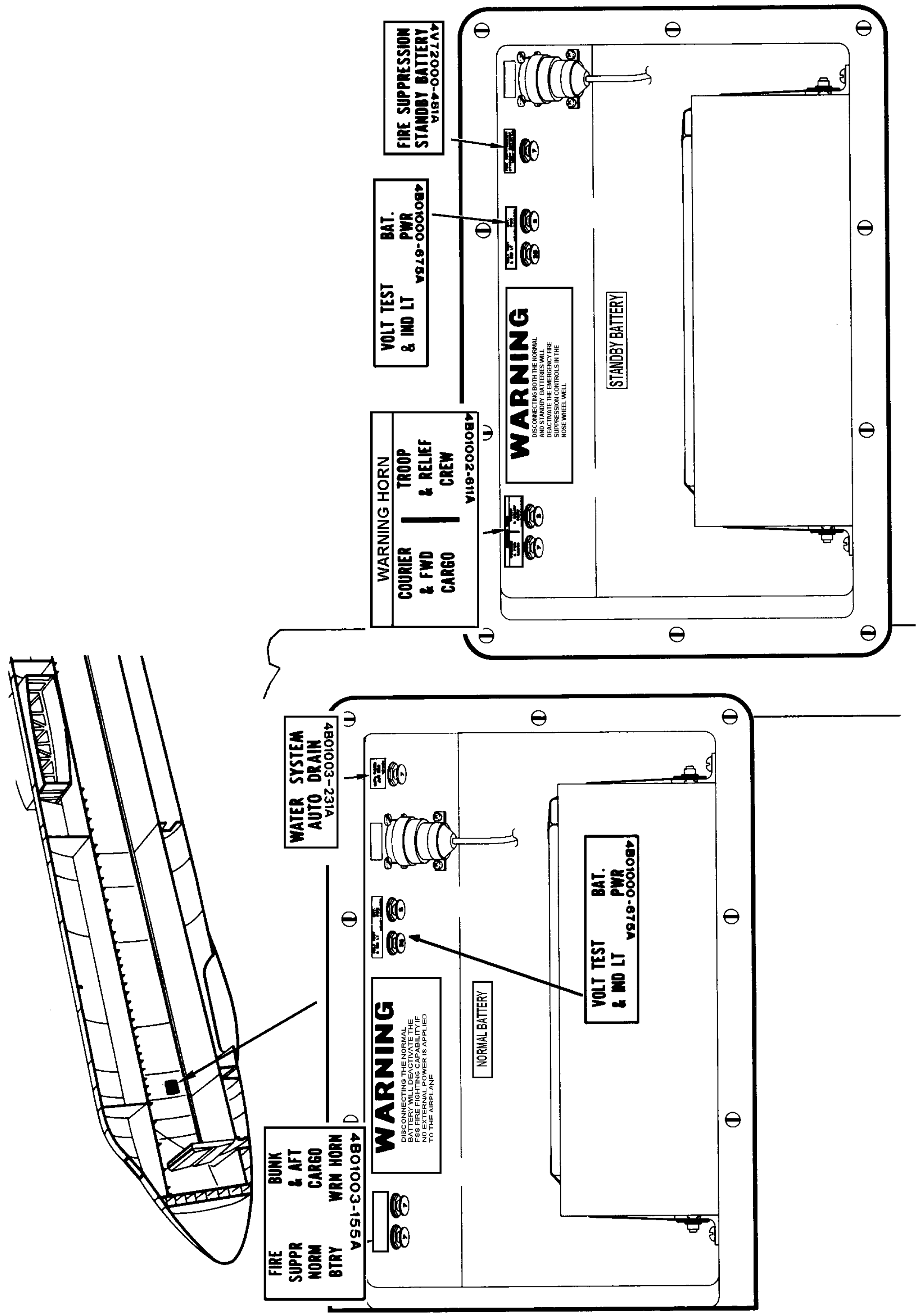
Flight engineer’s DC circuit breaker panel



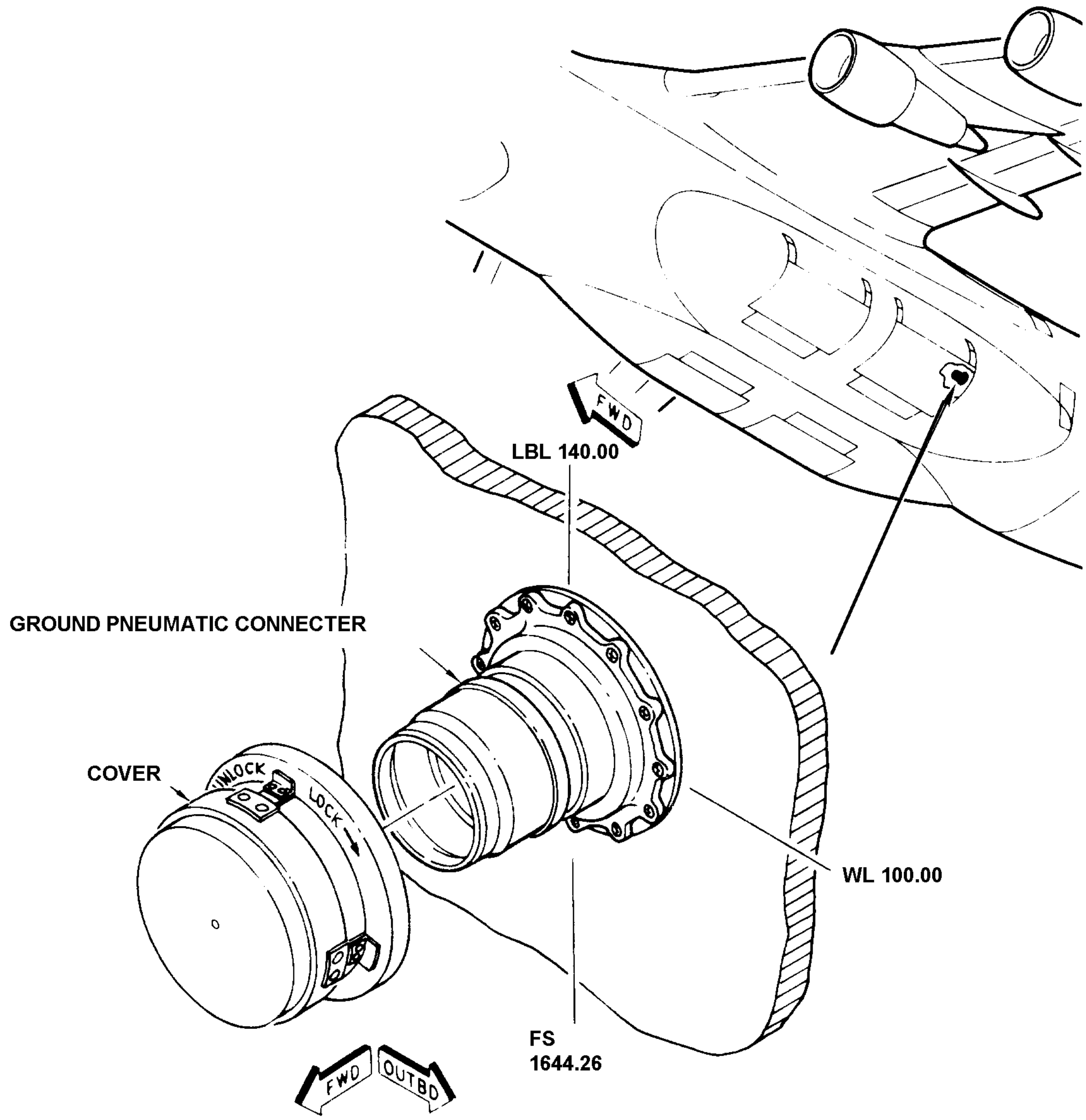
Navigator position circuit breaker panel No. 1



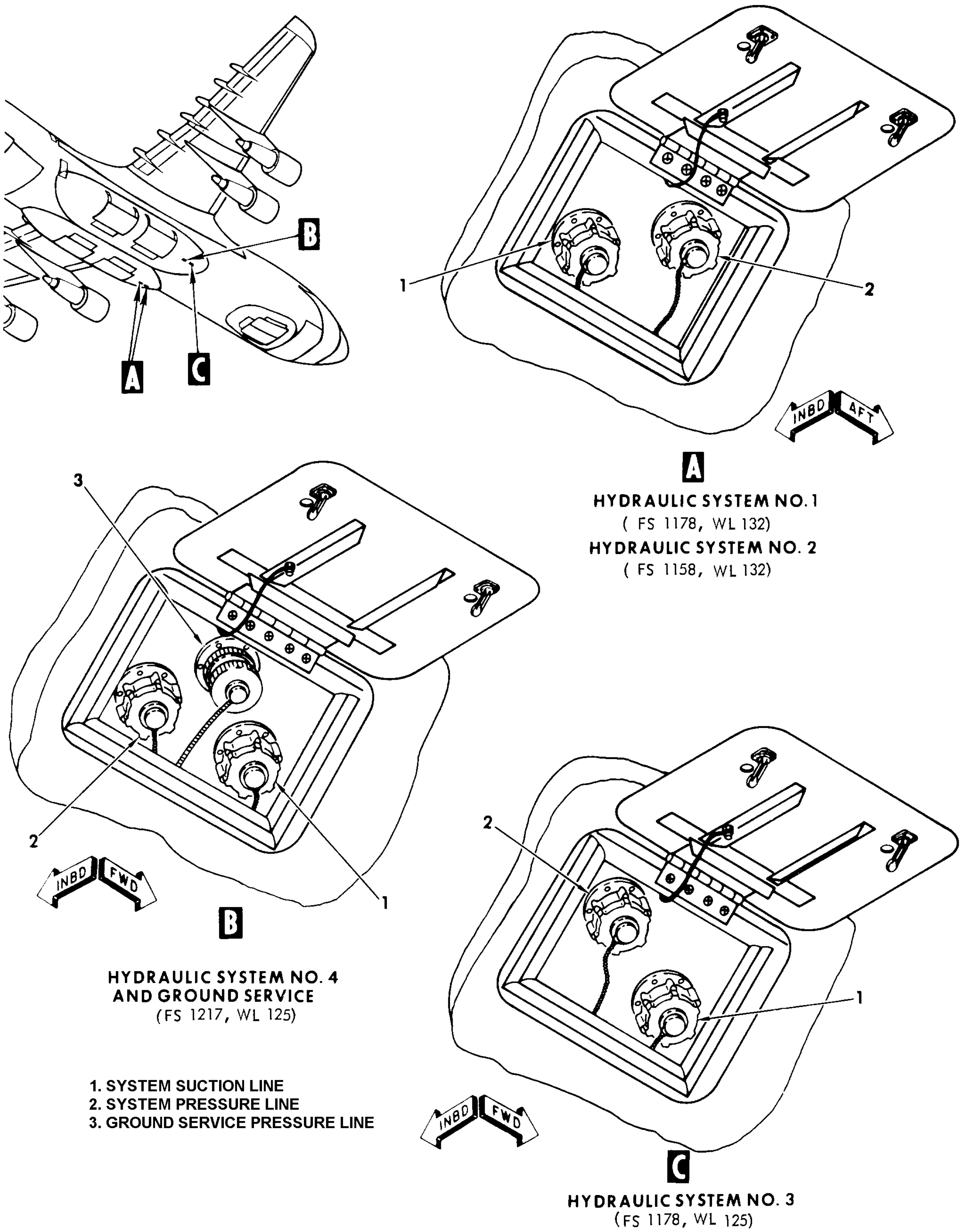
Navigator position circuit breaker panel No. 2



Battery compartment circuit breakers



External pneumatic receptacle



Hydraulic systems ground test connections

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GROUND HANDLING

Emergency Equipment

A knowledge of the locations of oxygen bottles, smoke goggles, fire extinguishers, escape reels, escape ropes, ladders, escape slides and crash axes is important when fighting ground fires. The emergency equipment can aid fire extinguishing attempts and save lives (pages 1-84 and 1-85).

Highly Flammable Areas

The fuel tanks, oil tanks, liquid oxygen (LOX) converters, hydraulic system reservoirs, and accumulators are the most highly flammable areas of the airplane. When working near these areas, extreme care should be taken to prevent conditions that may cause a fire (page 1-86).

Local Fire Access Doors

Access doors are provided for extinguishing local fires in the APU, LOX converters, and engines. The APU access doors are located at the aft end of the MLG wheel pods. The LOX converter access doors are located in the left MLG wheel pod. Access to engine fires is through the engine cowl doors. Each APU and engine contains a fire extinguishing system for extinguishing local fires. The fire extinguishing bottles for the APU are located in the right wheel pod. The fire extinguishing bottles for the engines are located in the No. 2 and No. 3 pylons (page 1-87).

Emergency Entrances and Exits

Emergency entrances on the airplane are numbered, in order, from forward to aft. All escape hatches, service doors, and aft personnel doors open from inside or outside the airplane. Chopping areas on both sides of the airplane are provided for emergency entrance into the airplane. The pilot's and copilot's clear view windows slide rearward from the inside only, providing a means of emergency exit (page 1-89).

Engine and Auxiliary Power Unit (APU) Fire Control Panels

The engine fire extinguishing system control panel is located in the flight station in the upper portion of the instrument panel between the pilot and copilot .

Two APU fire extinguisher panels are provided in the airplane, and a fire in either APU compartment can be extinguished from either panel. One panel is located on the flight engineer's control panel, and the other is located on the loadmaster panel adjacent to the crew entry door (pages 1-90 through 1-94).

Fire Extinguishing Agents

The APU and engine fire extinguisher system agent is dibromodifluoromethane (DB).

Nitrogen is used as a fire extinguishing agent in selected unmanned areas.

On AF66-8303 through AF70-467, bromotrifluoromethane (FE1301) is used as a fire extinguishing agent in specified manned areas.

Portable Fire Extinguishers

Portable fire extinguishers are installed throughout the airplane (pages 1-83 and 1-88).

Portable Fire Fighter Assemblies

Portable fire fighter assemblies are contained onboard the airplane for emergency use. These fire fighter assemblies consist of an oxygen cylinder, a cylinder harness, a regulator, a mask, a mask container, a dynamic microphone, and a cord assembly.

Liquid Nitrogen (LN2) Fire Suppression

Fire fighting capability is provided, utilizing LN2 as a fire extinguishing agent, in the cargo underfloor areas, wing leading edges and pylons, and in the wing root dry bay areas. The protected areas are identified as FSS zones 1 through 12 (page 1-92).

General Towing Information

The C-5 airplane has the capability of being towed on paved ramps and runways at its maximum design gross weight of 769,000 pounds. Surfaces with gradients up to 3 percent may be safely negotiated on support area airfields at the substandard runway gross weight of 571,000 pounds.

The normal method used to tow the airplane on paved ramps and runways is the Nose Landing Gear (NLG) towing method.

NLG Towing Provisions

The airplane towbar assembly is used to tow the airplane by the NLG. The rigidity of the towbar permits the airplane to be either pulled or pushed by the tractor. The towbar contains two special shear bolts that break when an excessive load is applied during towing (pages 1-95 and 1-96).

Parking

If there is a choice, head the airplane into the wind.

Parking Brakes

The MLG brakes may be mechanically set for temporary parking. Never set the parking brakes while they are hot. Allow the brakes to cool for at least 15 minutes before setting them.

Mooring

When the airplane is exposed to high winds while parked, it shall be secured in accordance with the applicable requirements and procedures (page 1-98).

Tie Down

For added security under high wind conditions, the airplane may be tied down to ramp anchors (page 1-99).

Fuselage Jacking Points

Six fuselage jacking points, three on the left side and three on the right side of the airplane at FS 524, 1106, and 1964, are provided for fuselage jacking (page 1-100).

Wing Jacking Points

Four wing jacking points, two on the left wing and two on the right wing are provided for supporting the wing box structure during maintenance inspections and wing repair activity (page 1-101).

NLG Jacking Point

A jacking lug under the piston axle of the shock strut is provided for jacking the nose landing gear (page 1-102).

MLG Jacking Points

Integral jacking pads are located on the underside of each MLG bogie beam to permit jacking of any pair of wheels for wheel and brake maintenance. In addition, a jack pad is located below the shock strut to provide for jacking a deflated strut into the fully compressed position for servicing (page 1-102).

Leveling

A leveling plate is installed in the cargo floor panel assembly as FS 1346 at LBL 18.74. A black plate with a notch for attaching a plumb bob line is installed on the cargo compartment overhead frame (page 1-104).

Protective Covers

The engine inlet cover, fan nozzle cover , and primary nozzle cover are used to prevent the entrance of foreign matter into the engine openings. The generator cooling outlet cover, the pylon nacelle cooling outlet cover and the oil breather exit cover are polyethylene covers used to prevent foreign matter such as rain, sand or dust from entering their respective openings (pages 1-107 through 1-115).

Ground Safety Locks and Pins

The NLG ground safety pin is installed at times when the airplane is on the ground.

The MLG ground safety pins are installed only when maintenance action requires them (page 1-116).

Translating Cowl Safety Pin

The translating cowl safety pins (page 1-117) are used to hold the translating cowl in the stowed position while performing maintenance in the area. The safety pins are installed on each side of each thrust reverser (four pins per thrust reverser) .

Thrust Reverser Actuator Safety Stop

The thrust reverser actuator safety stop locks the thrust reverser in the extended position to prevent accidental actuation during maintenance. The safety stop is placed between the rod and clevis and the face of the actuator cylinder (page 1-117).

Aileron Ground Safety Lock

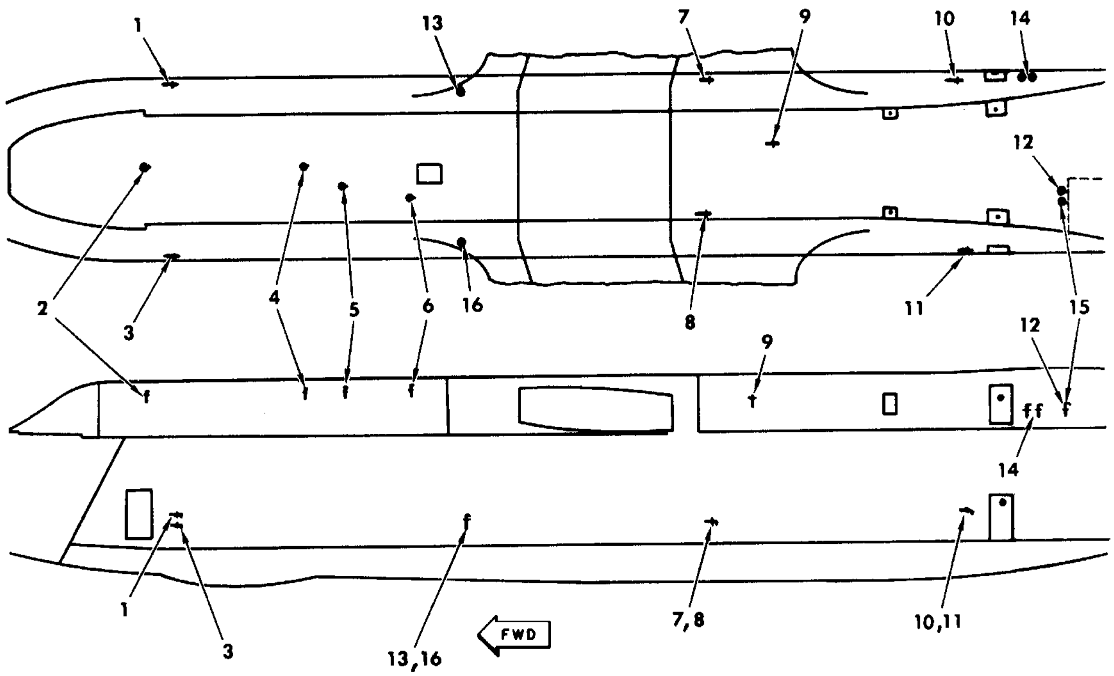
The aileron ground safety lock is used to hold the aileron in place whenever both aileron actuators are to be removed. It must be installed in place of the first actuator removed prior to removing the second actuator (page 1-118).

Horizontal Stabilizer Lock

The horizontal stabilizer lock is used to support and restrain the horizontal stabilizer whenever the pitch trim actuator is removed (page 1-119).

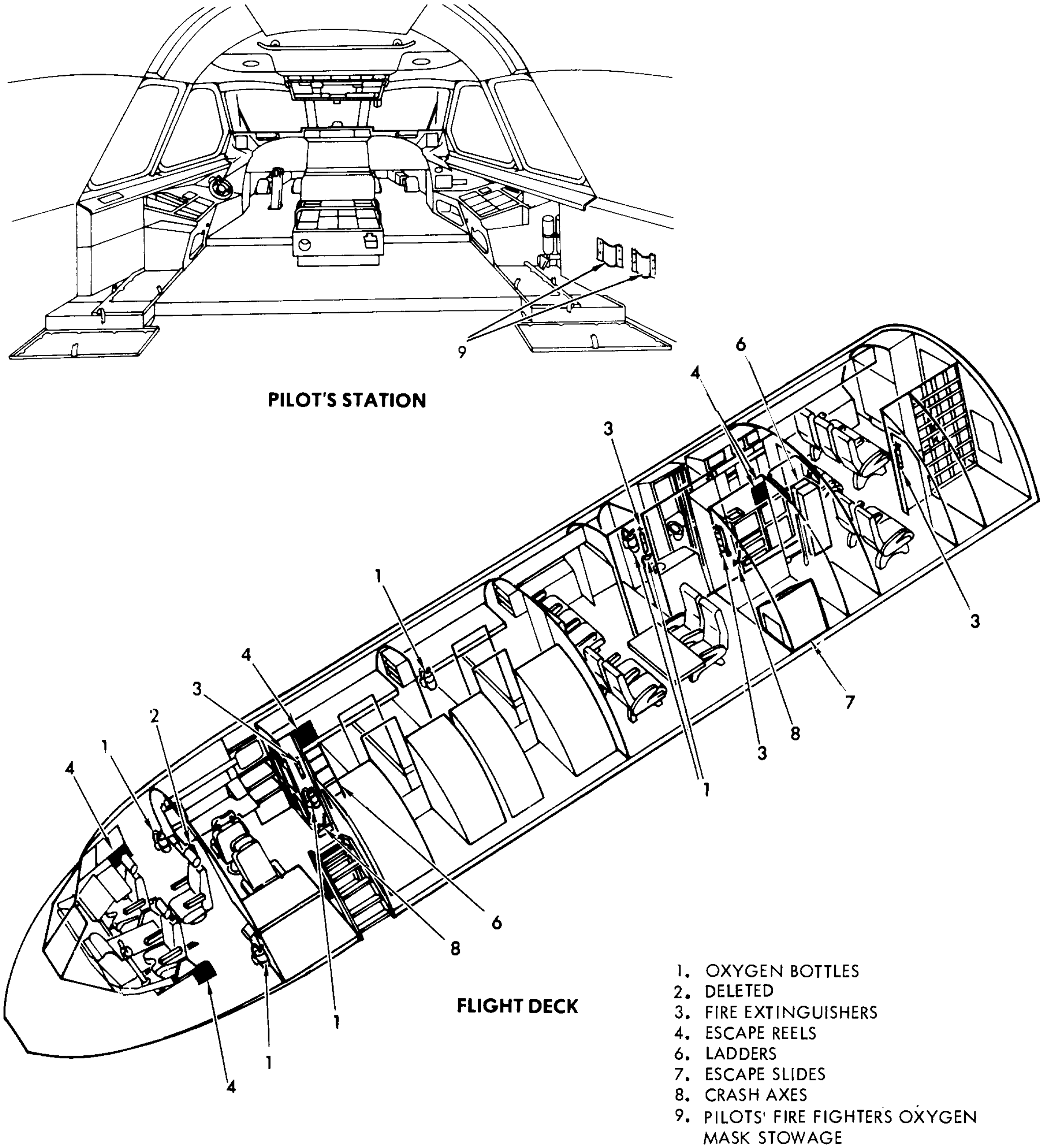
Fan Stopper and Holder

The fan stoppers stop the engine fan from rotating. The fan holders are to hold the fan to prevent wear and to prevent rotation of the fan during engine maintenance (page 1-120).

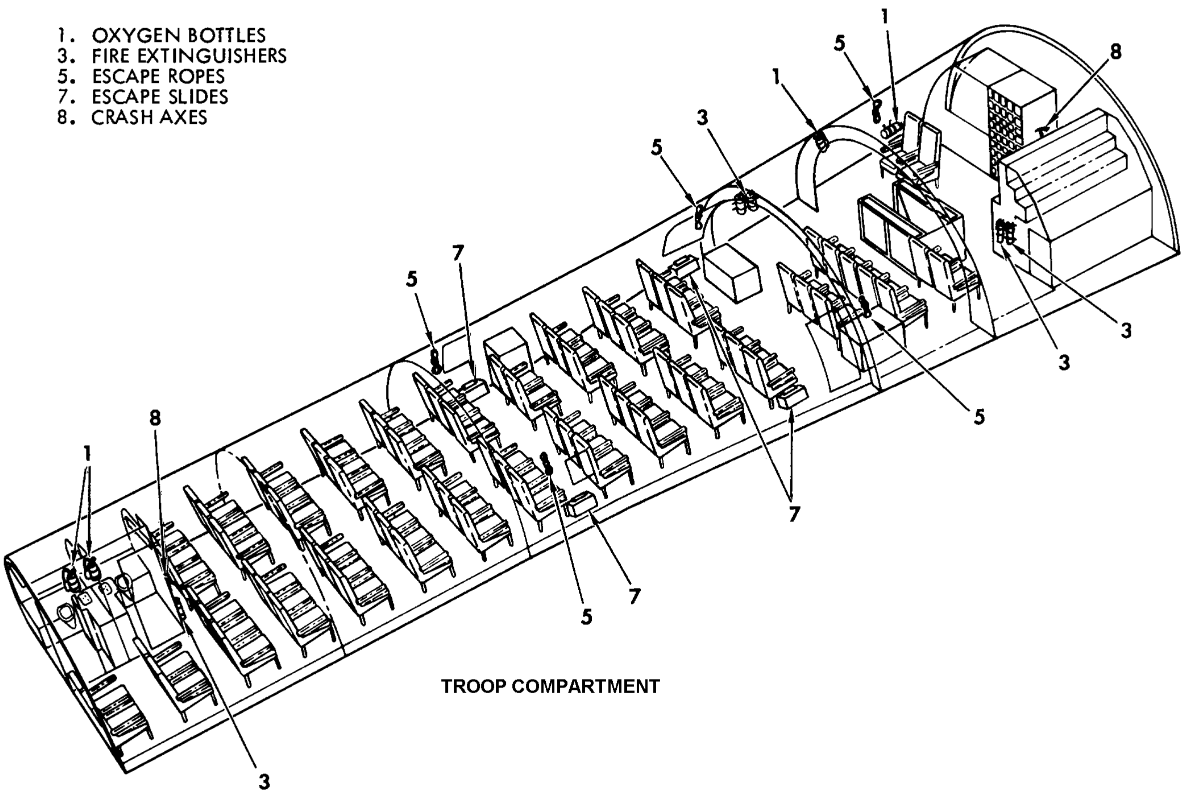


LOCATION OF FIRE EXTINGUISHERS			
FIRE EXTINGUISHER	FS	BL	WL
1	564	140R	180
2	522	6R	367
3	564	140L	160
4	765	6R	376
5	811	20L	382
6	940	35L	379
7	1418	140R	144
8	1418	140L	144
9	1458	6R	330
10	1824	140R	170
11	1824	140L	170
12	2019	32L	325
13	994	170R	213
14	1934	140R	325
15	2019	32L	325
16	994	170L	213

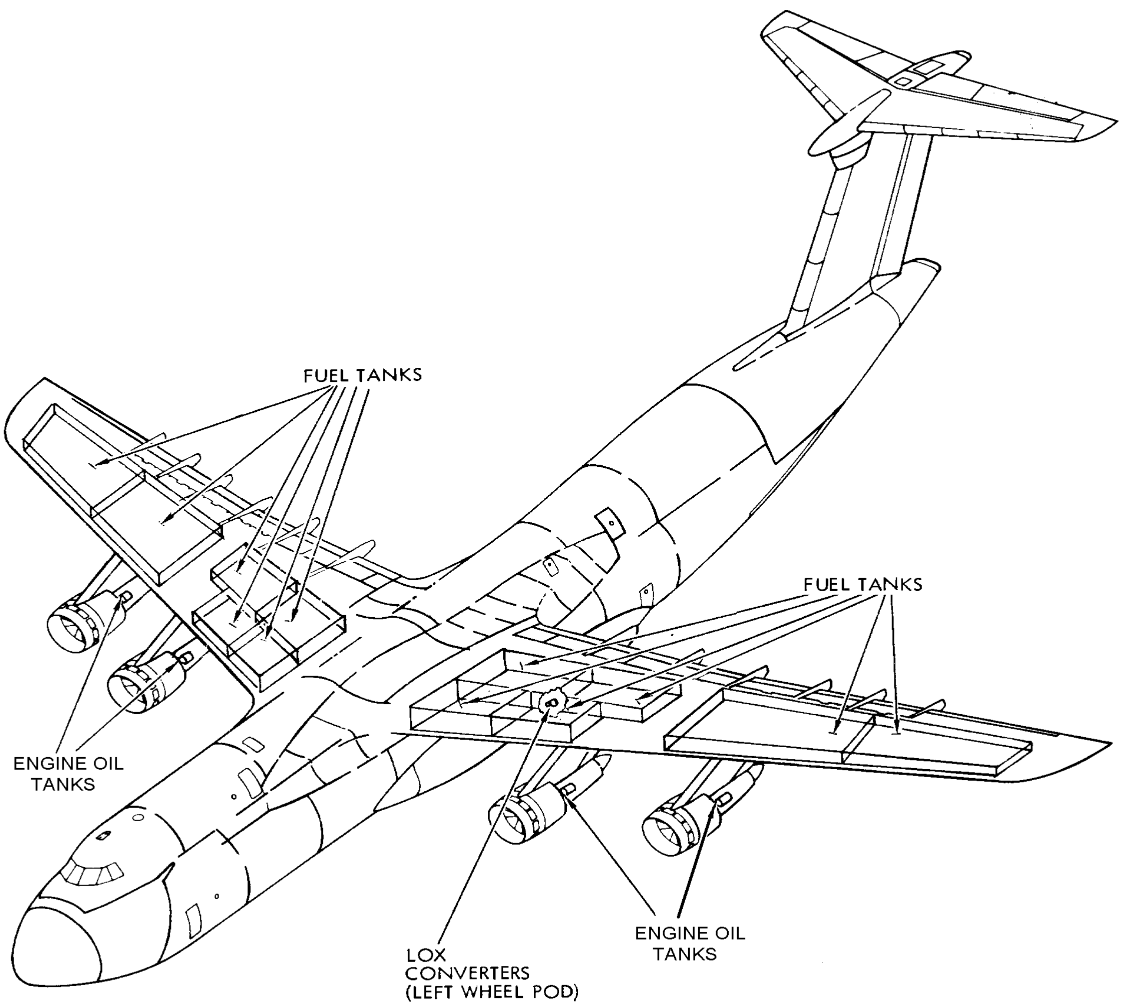
Portable fire extinguisher locations



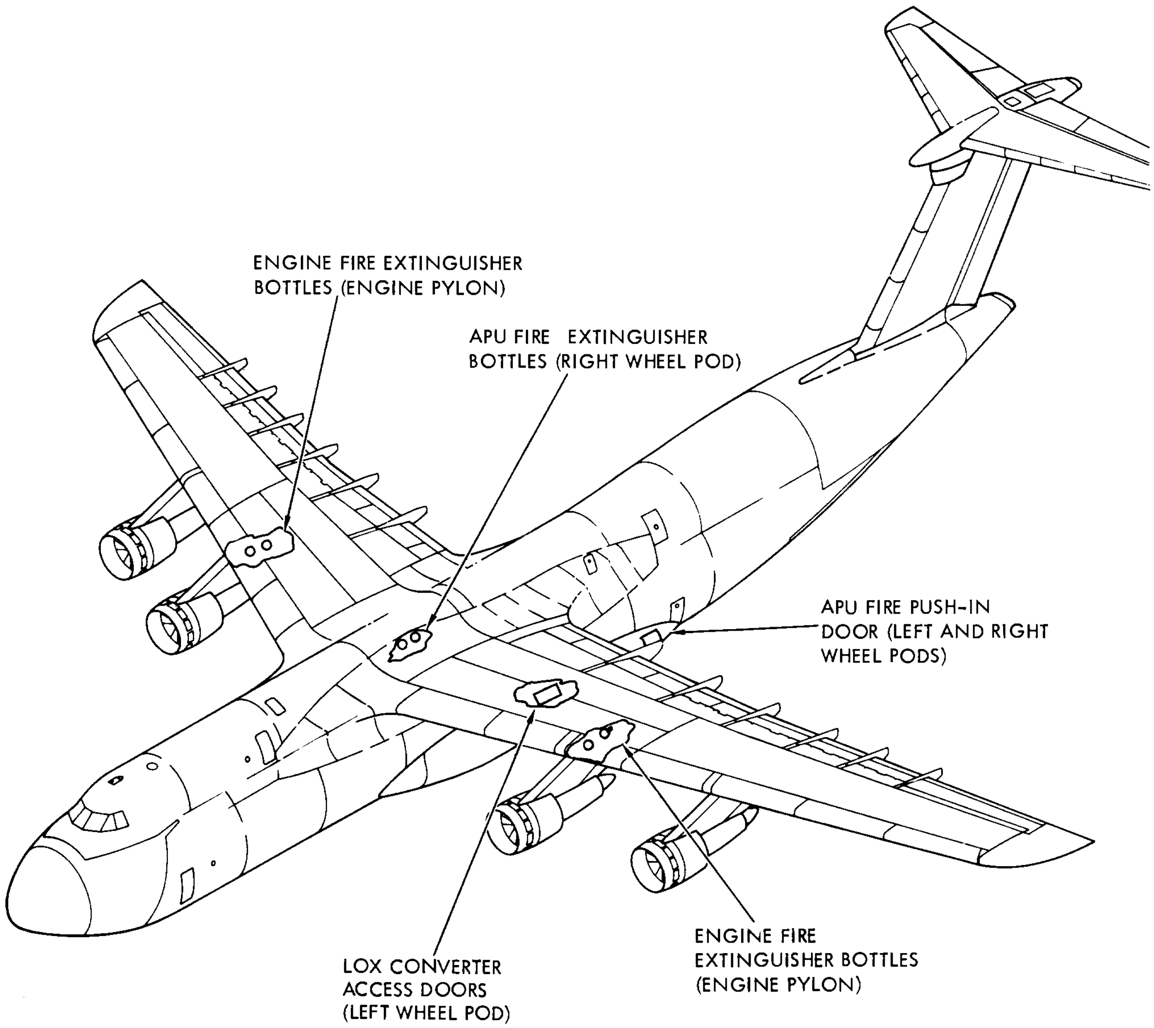
Emergency equipment (1 of 2)



Emergency equipment (2 of 2)

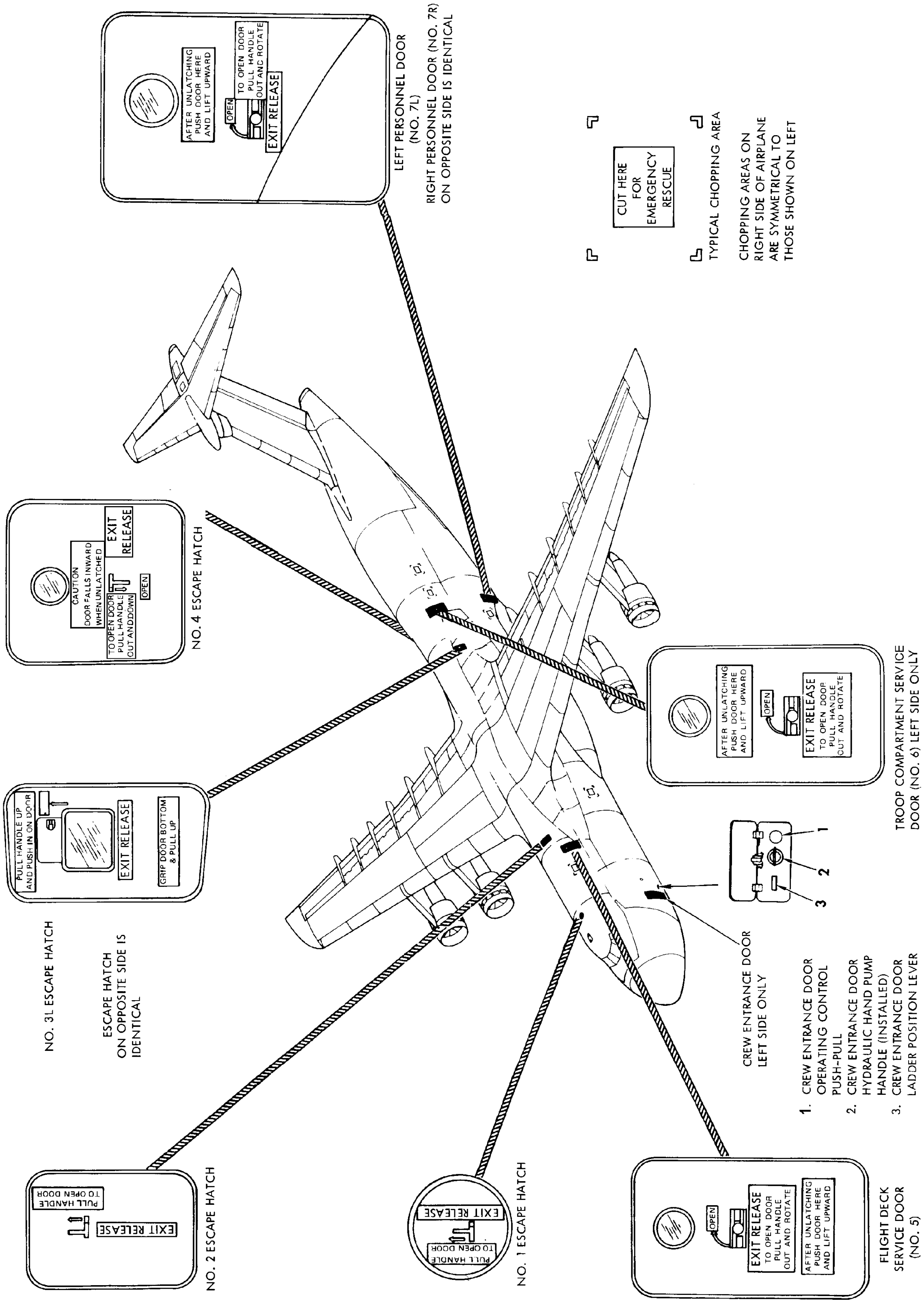


Highly flammable areas

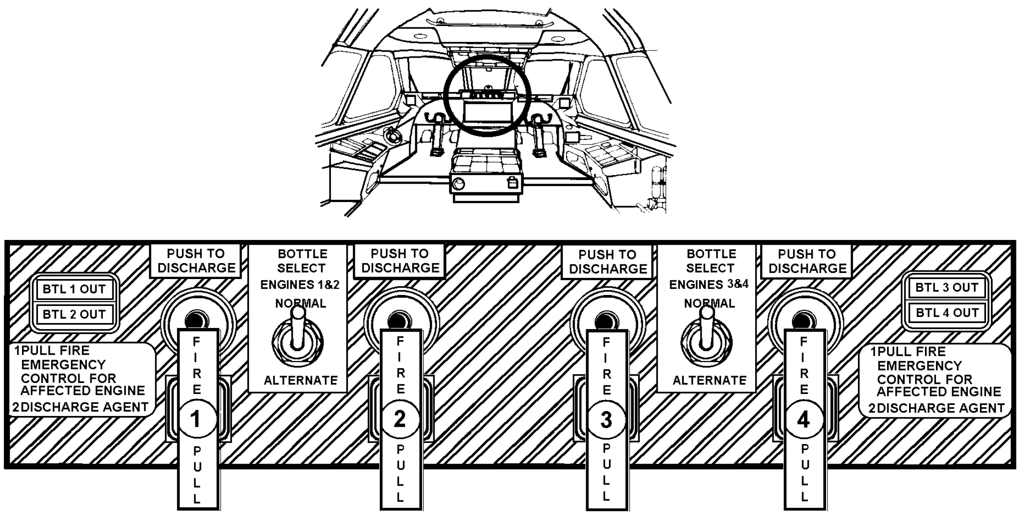


Extinguishers and local fire access doors

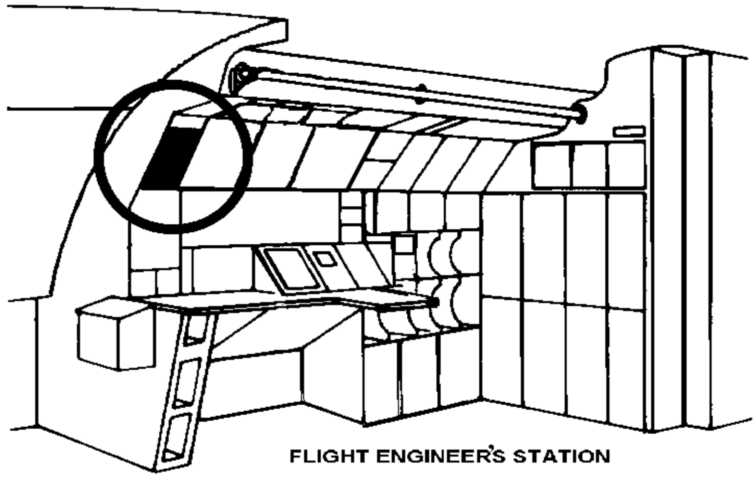
Typical fire ext./oxygen bottle installation

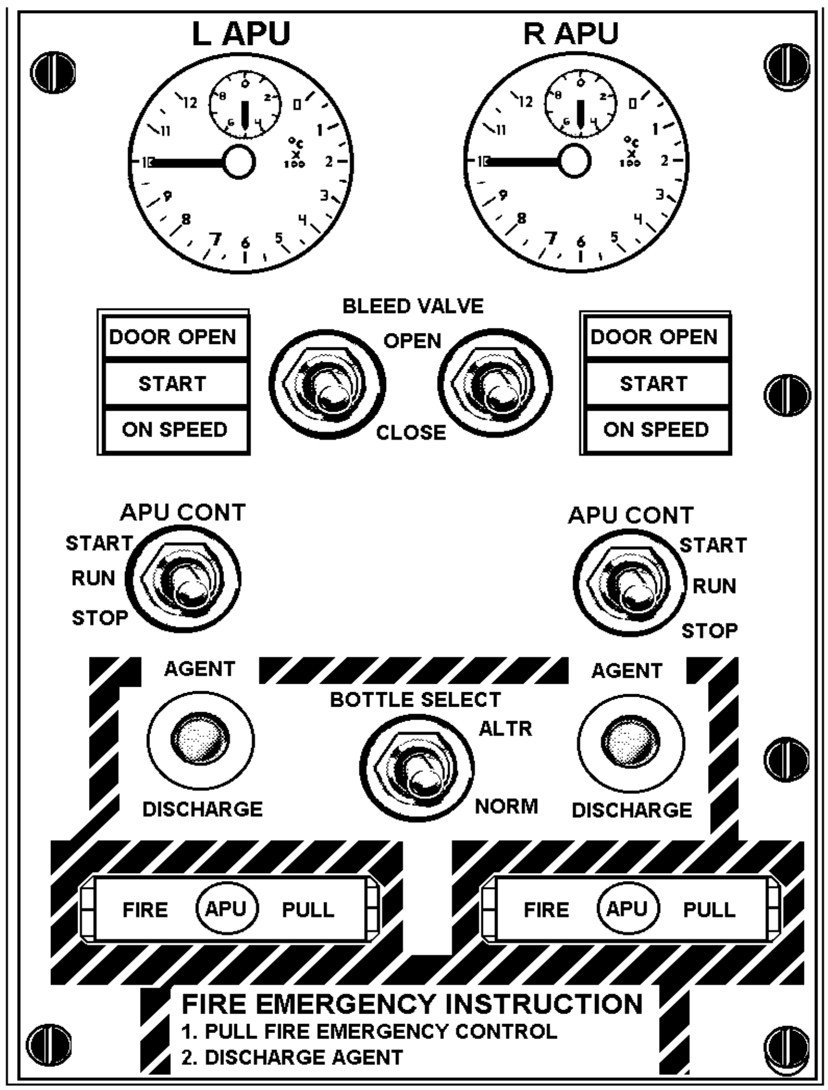


Emergency entrances and exits



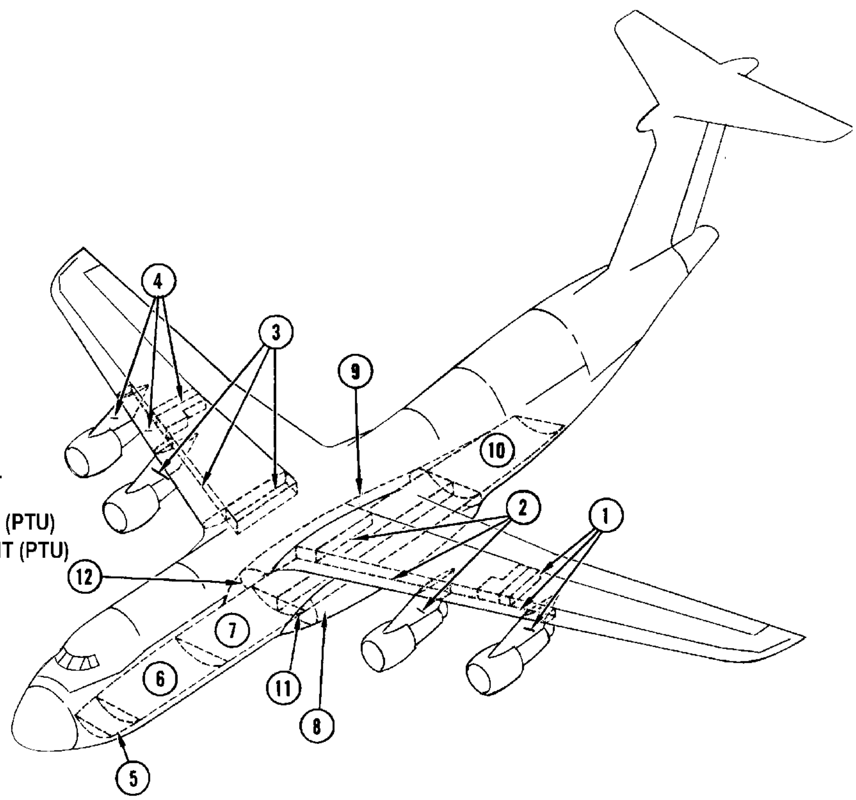
Engine fire extinguisher system control panel



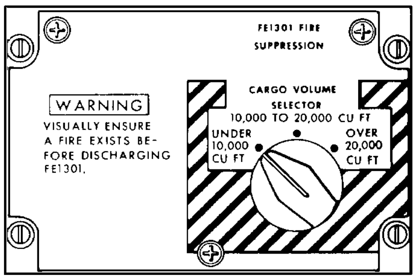


APU fire extinguishing system control panel

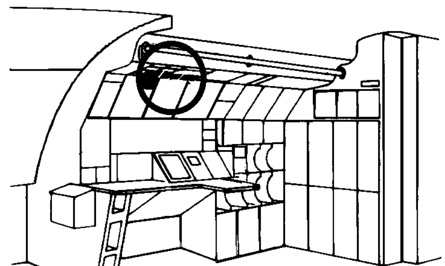
1. LEFT OUTBD WING
2. LEFT INBD WING
3. RIGHT INBD WING
4. RIGHT OUTBD WING
5. NOSE WHEEL WELL
6. UNDERFLOOR FWD
7. UNDERFLOOR MID
8. LEFT MAIN WHEEL WELL
9. RIGHT MAIN WHEEL WELL
10. UNDERFLOOR AFT
11. LEFT POWER TRANSFER UNIT (PTU)
12. RIGHT POWER TRANSFER UNIT (PTU)



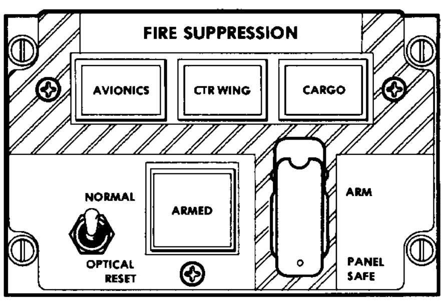
Nitrogen fire suppression system zones



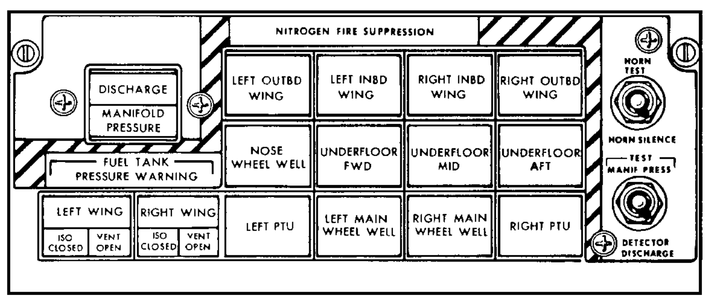
CARGO VOLUME SELECTOR PANEL



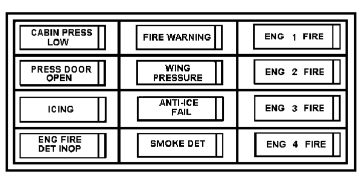
FLIGHT ENGINEER'S STATION



FIRE SUPRESSION (FSS) CONTROL PANEL

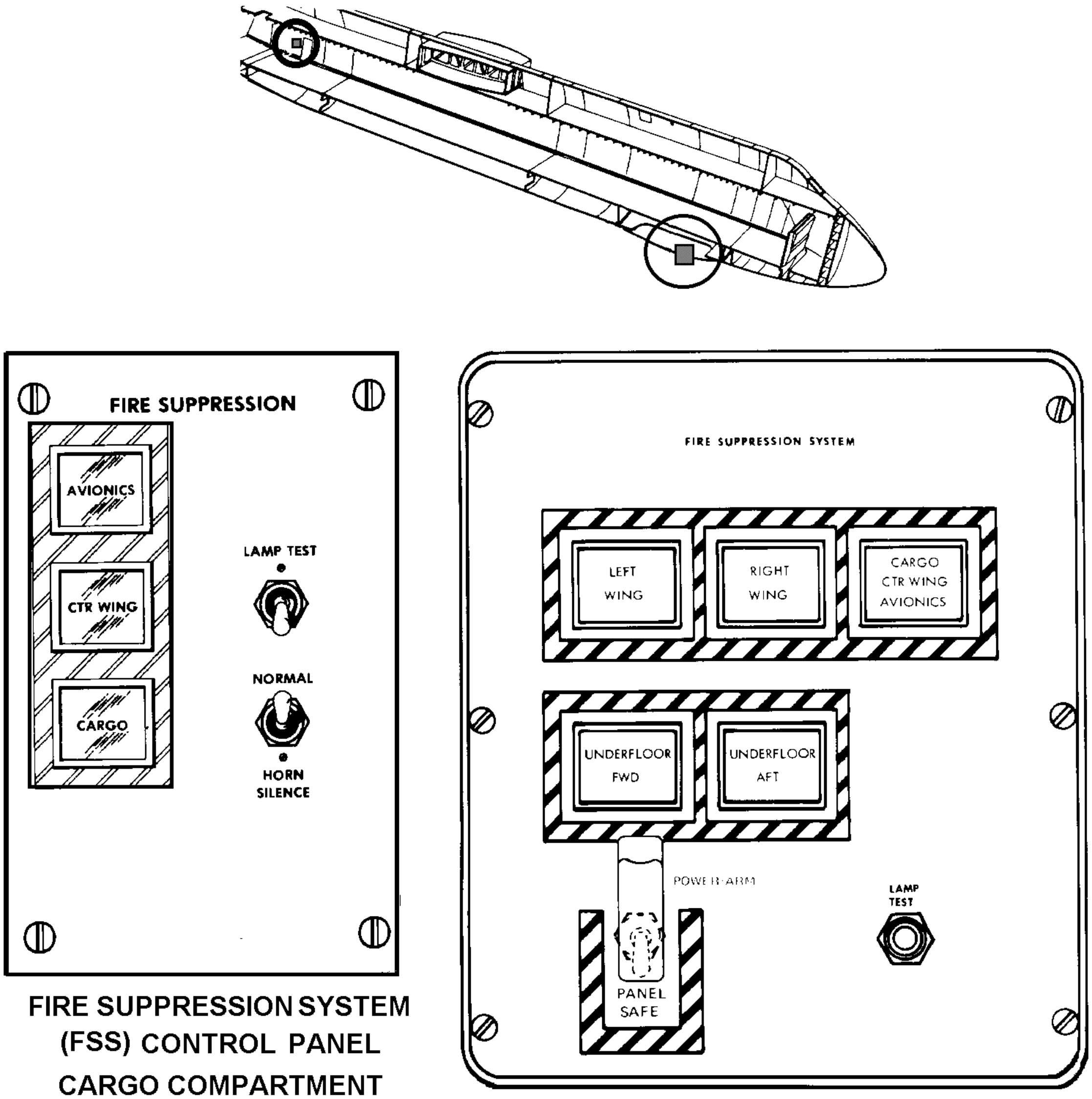


NITROGEN FIRE SUPPRESSION CONTROL AND INDICATOR PANEL



FLIGHT ENGINEER'S ANNUNCIATOR PANEL

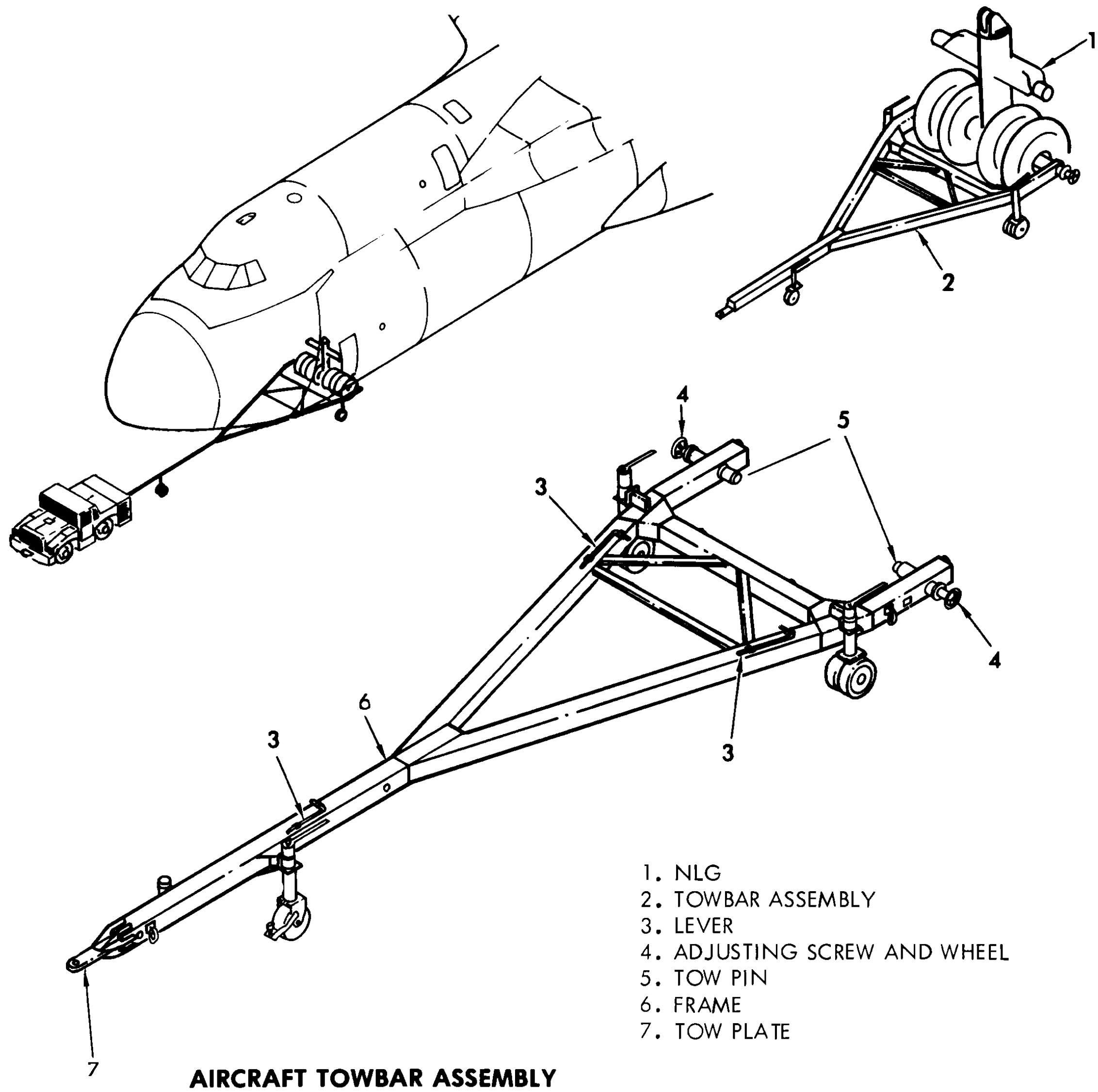
Fire suppression system (FSS) component locations (1 of 2)



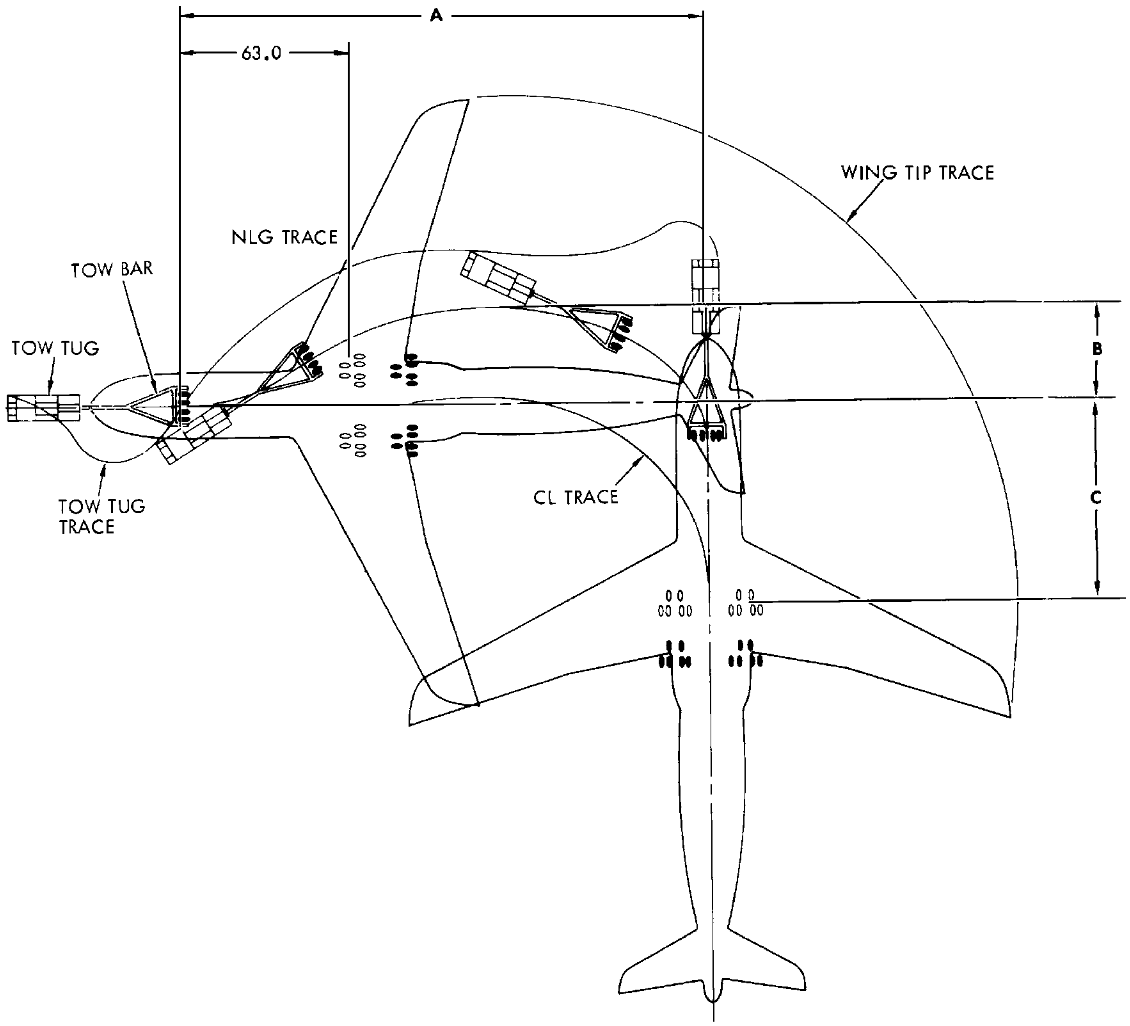
FIRE SUPPRESSION SYSTEM
(FSS) CONTROL PANEL
CARGO COMPARTMENT

NOSE WHEEL WELL NITROGEN AND FE 1301
FIRE SUPPRESSION CONTROL PANEL
NOSE WHEEL WELL

FSS component locations (2 of 2)



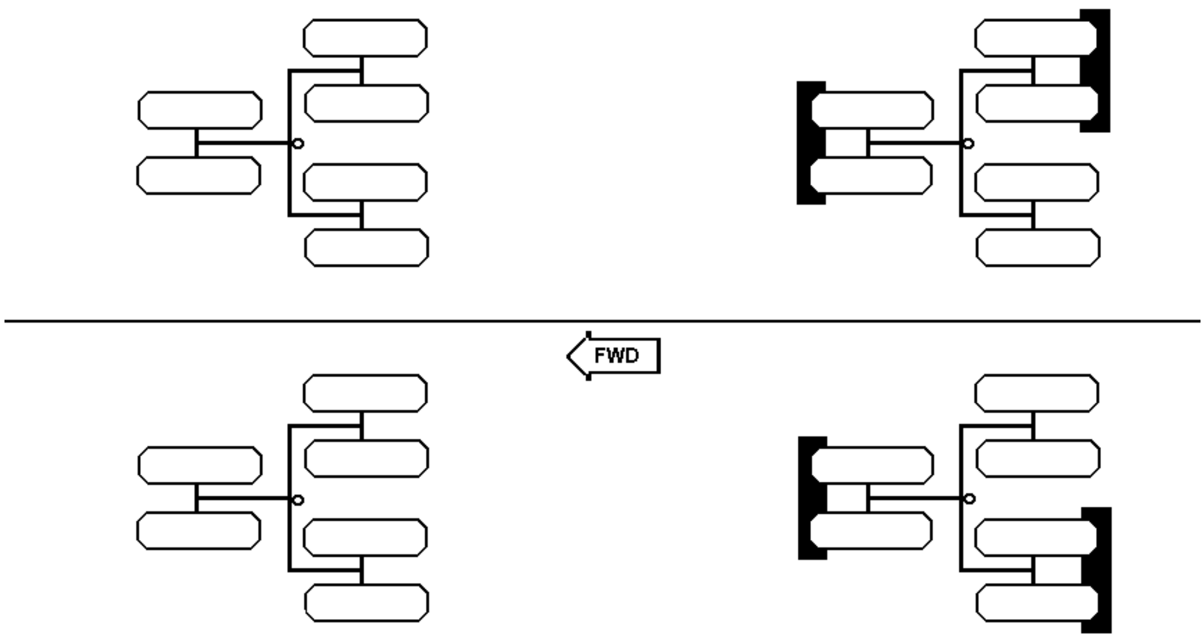
Nose landing gear towing provisions



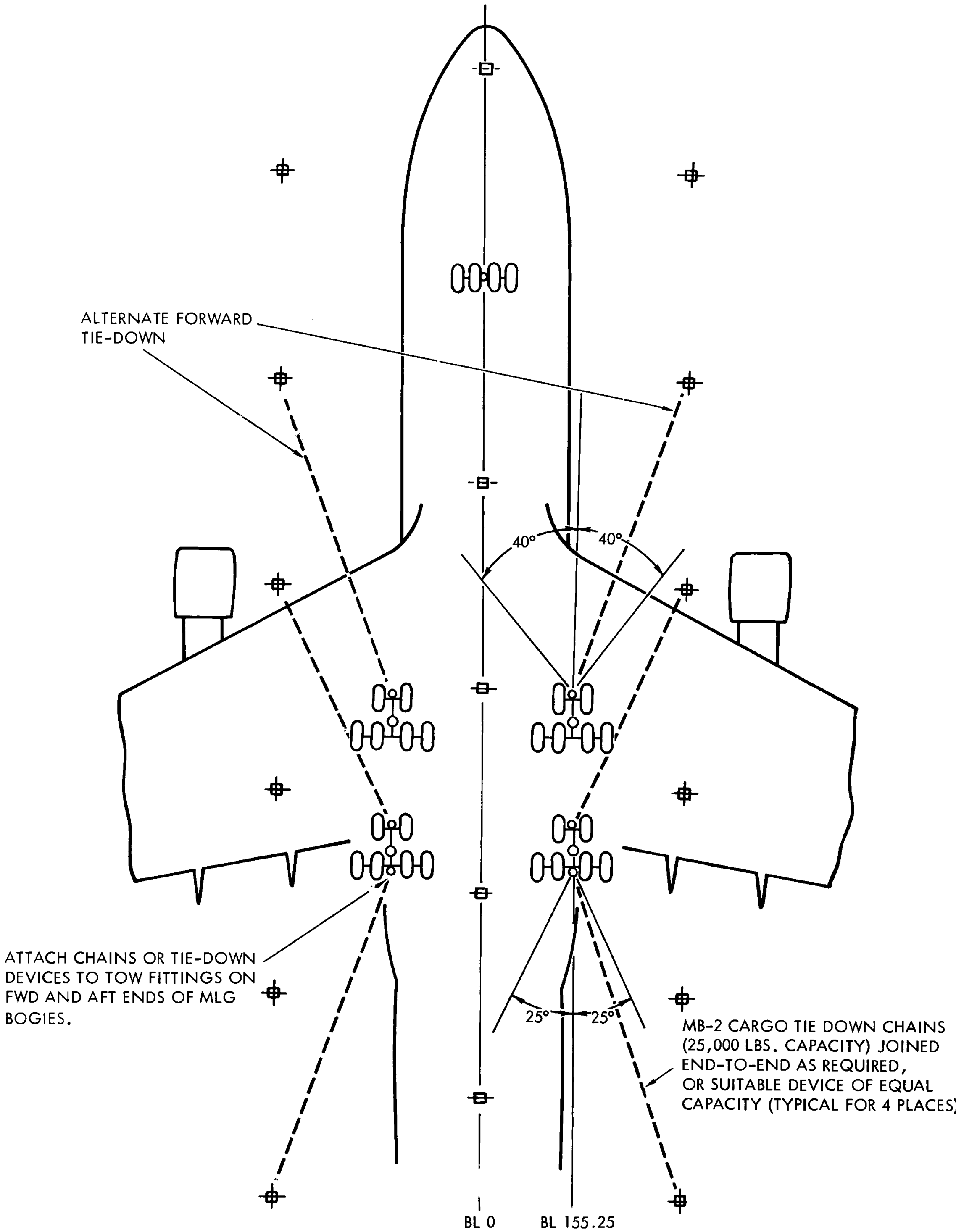
TOWING MODE	MAX NLG ANGLE	TOW DIRECTION	A (FEET)	B (FEET)	C (FEET)
FWD AND AFT MLG UNKNEELED AT 0 DEGREE POSITION	45 DEGREES	FORWARD	178.7	28.3	96.7
		REARWARD	183.0	30.5	80.5
FWD MLG UNKNEELED AFT MLG CASTERED	45 DEGREES	FORWARD	144.0	23.0	92.7
	60 DEGREES	FORWARD	142.2	35.5	74.6
FWD MLG KNEELED AFT MLG UNKNEELED AT 0 DEGREE POSITION	45 DEGREES	FORWARD	176.0	37.0	85.0
		REARWARD	192.0	35.0	75.0
	60 DEGREES	FORWARD	164.5	54.0	55.0
		REARWARD	164.5	48.5	52.0

THE TRACE OF THE OUTBOARD HORIZONTAL STABILIZER MAY GO OUTSIDE THE WING TIP TRACE BY APPROXIMATELY 12.0 FT IN THIS TOWING MODE

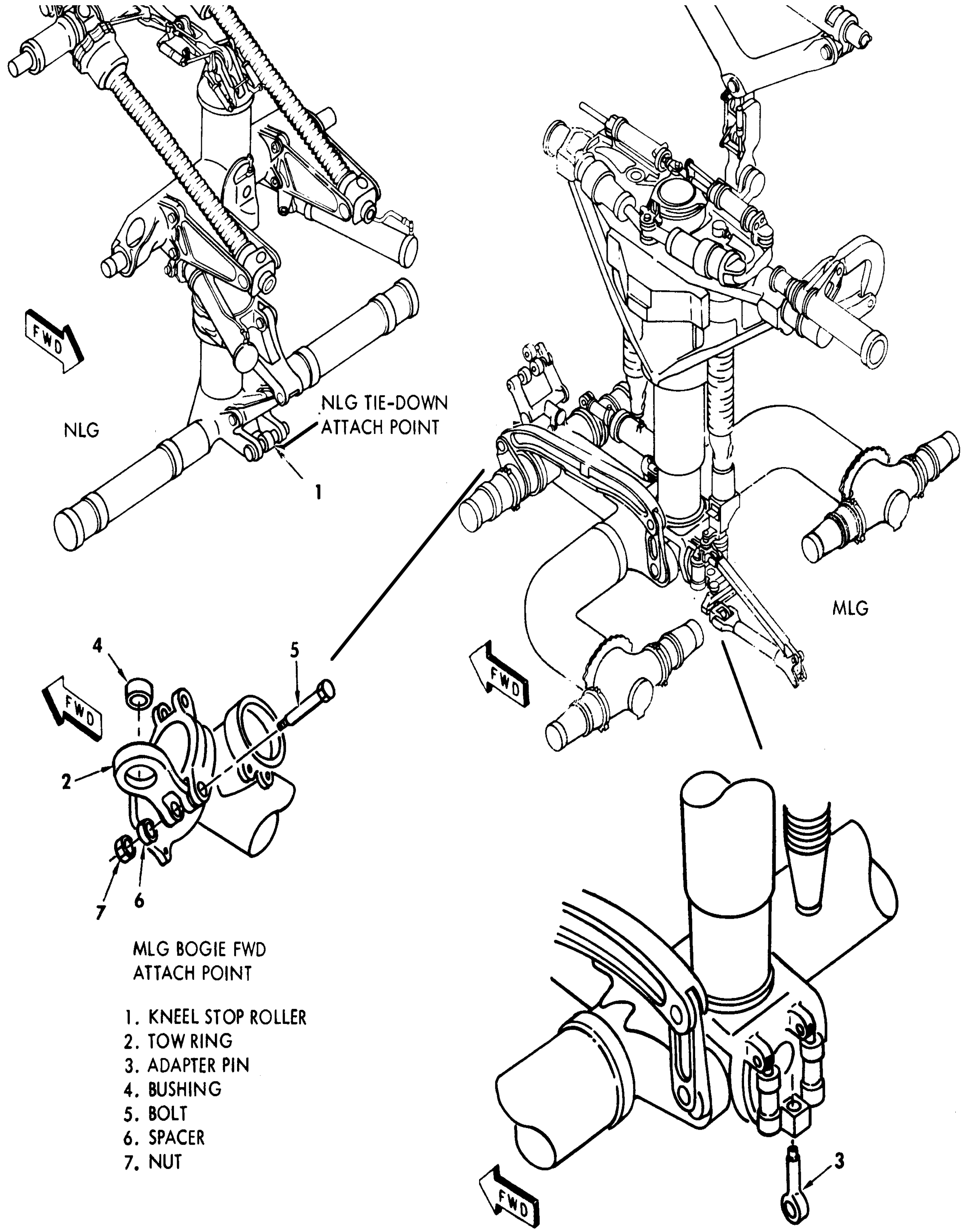
Towing clearance patterns



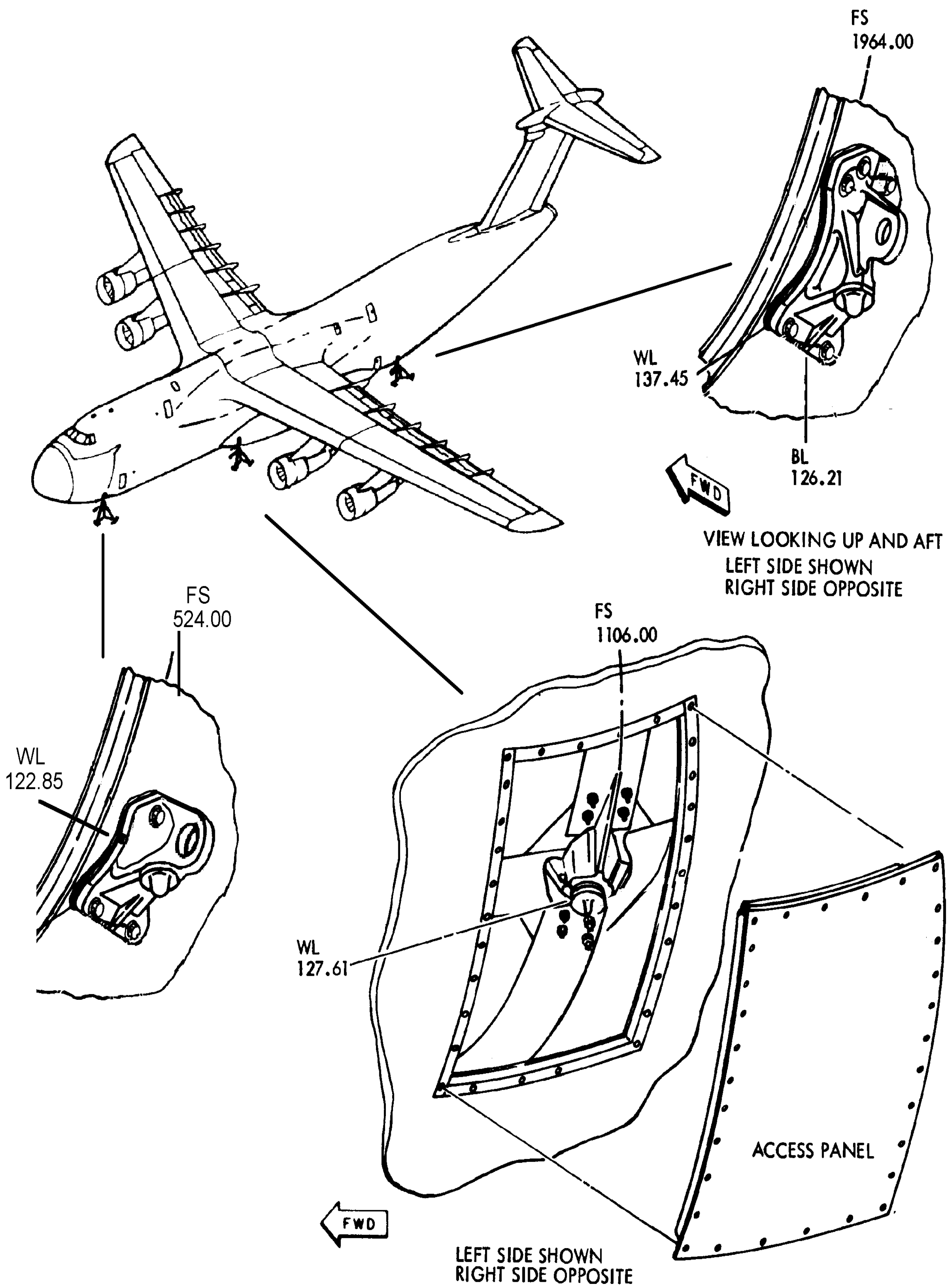
Airplane chock locations



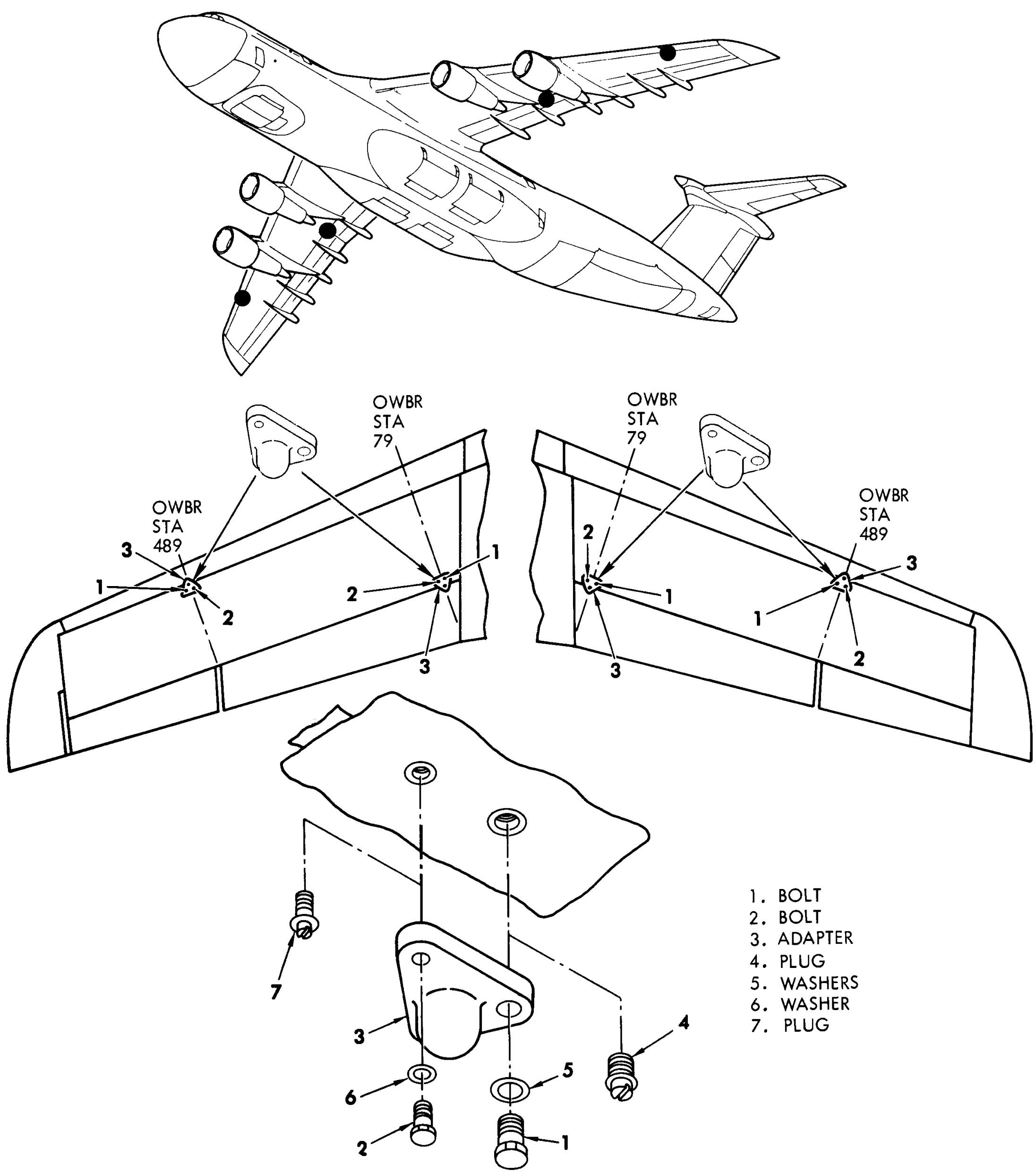
Airplane tie-down (1 of 2)



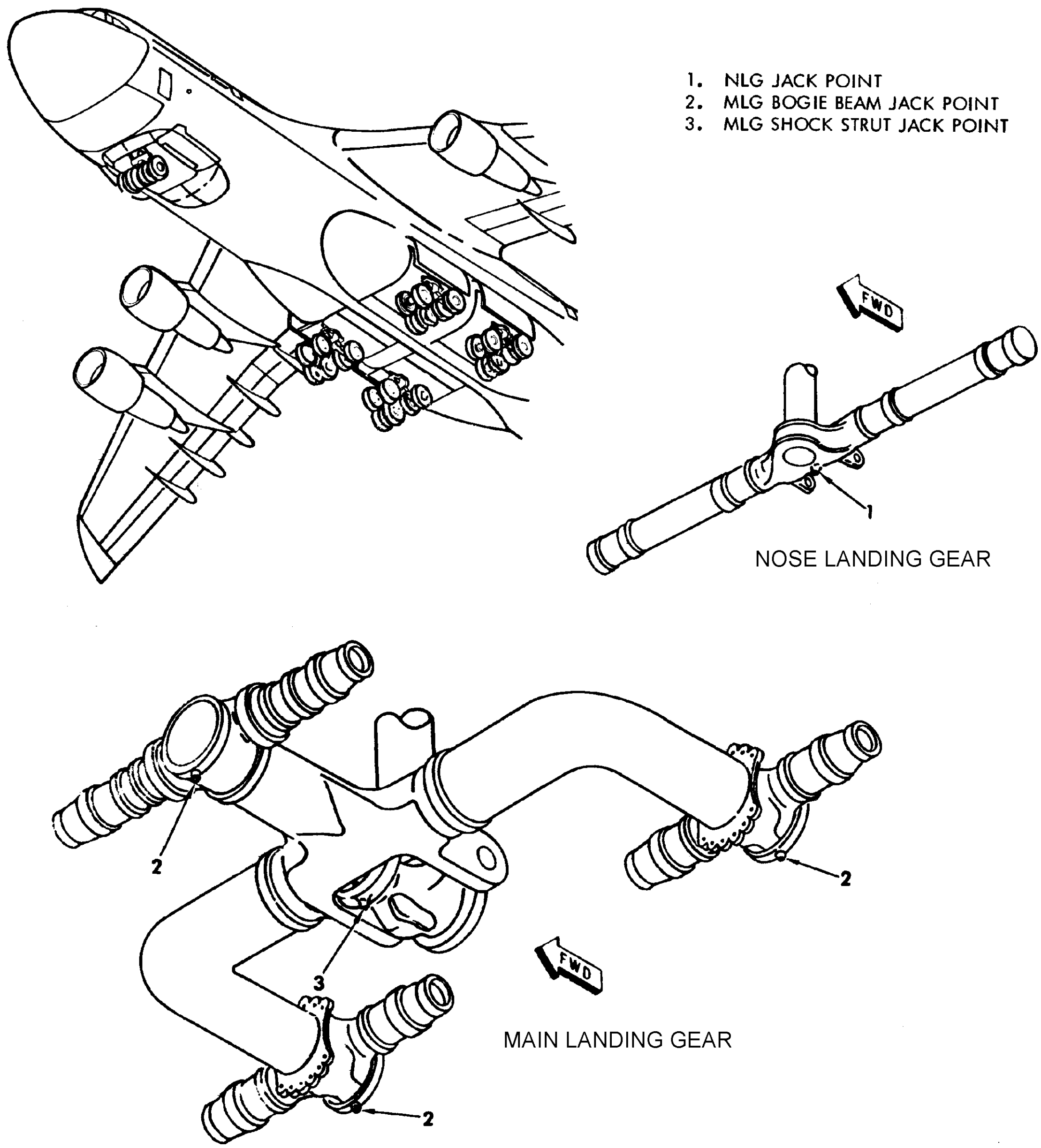
Airplane tie-down (2 of 2)



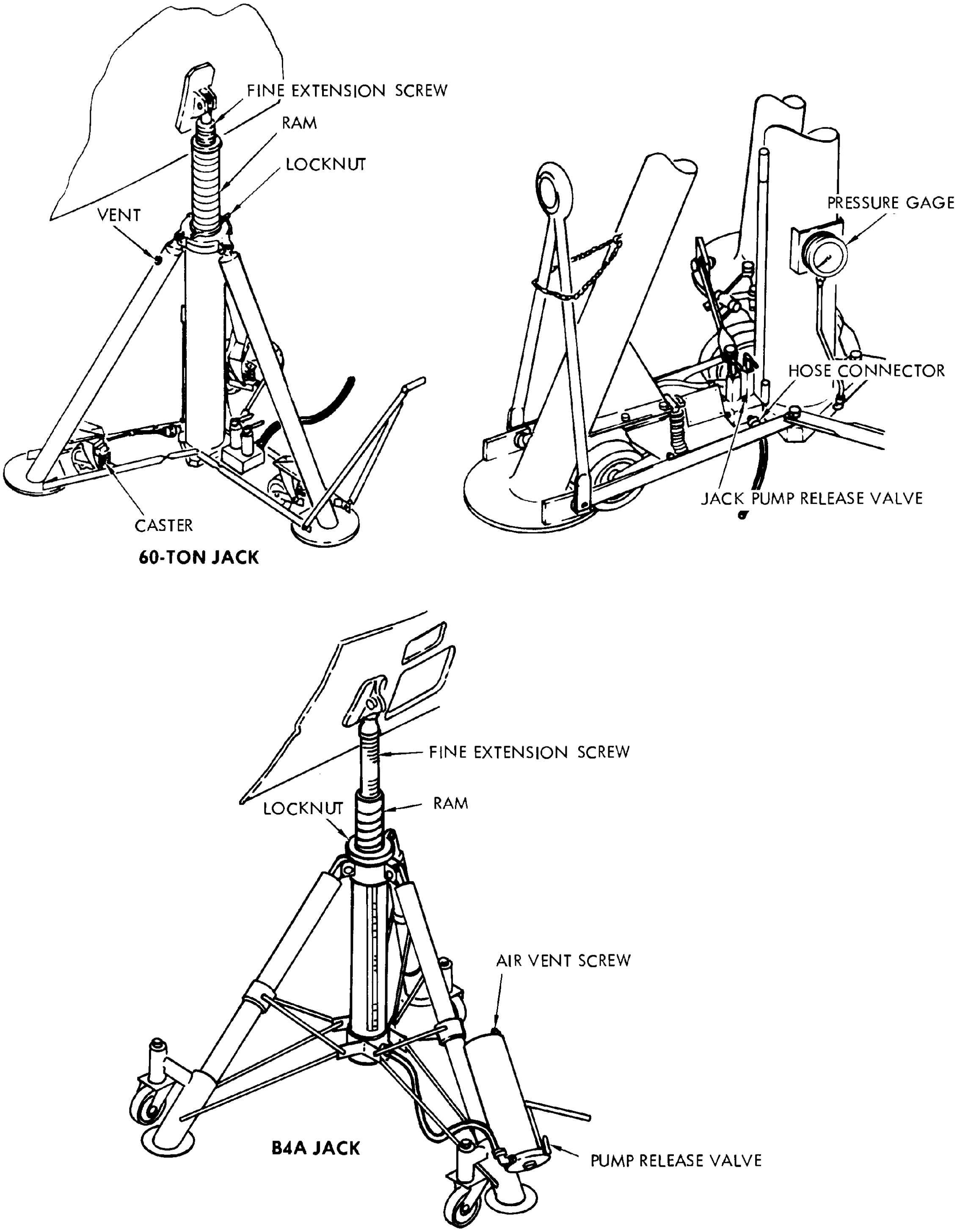
Fuselage jacking points



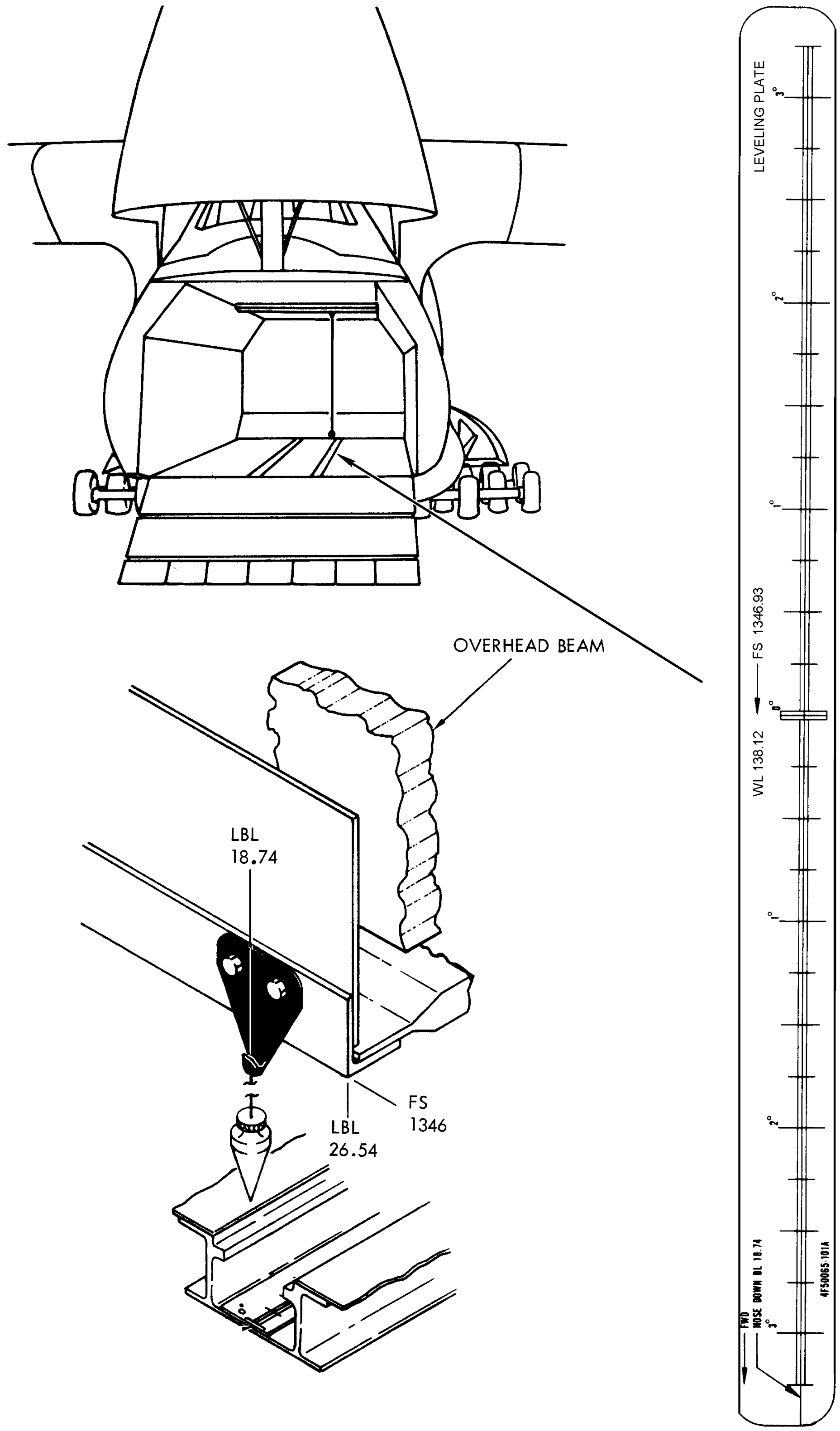
Wing jacking points



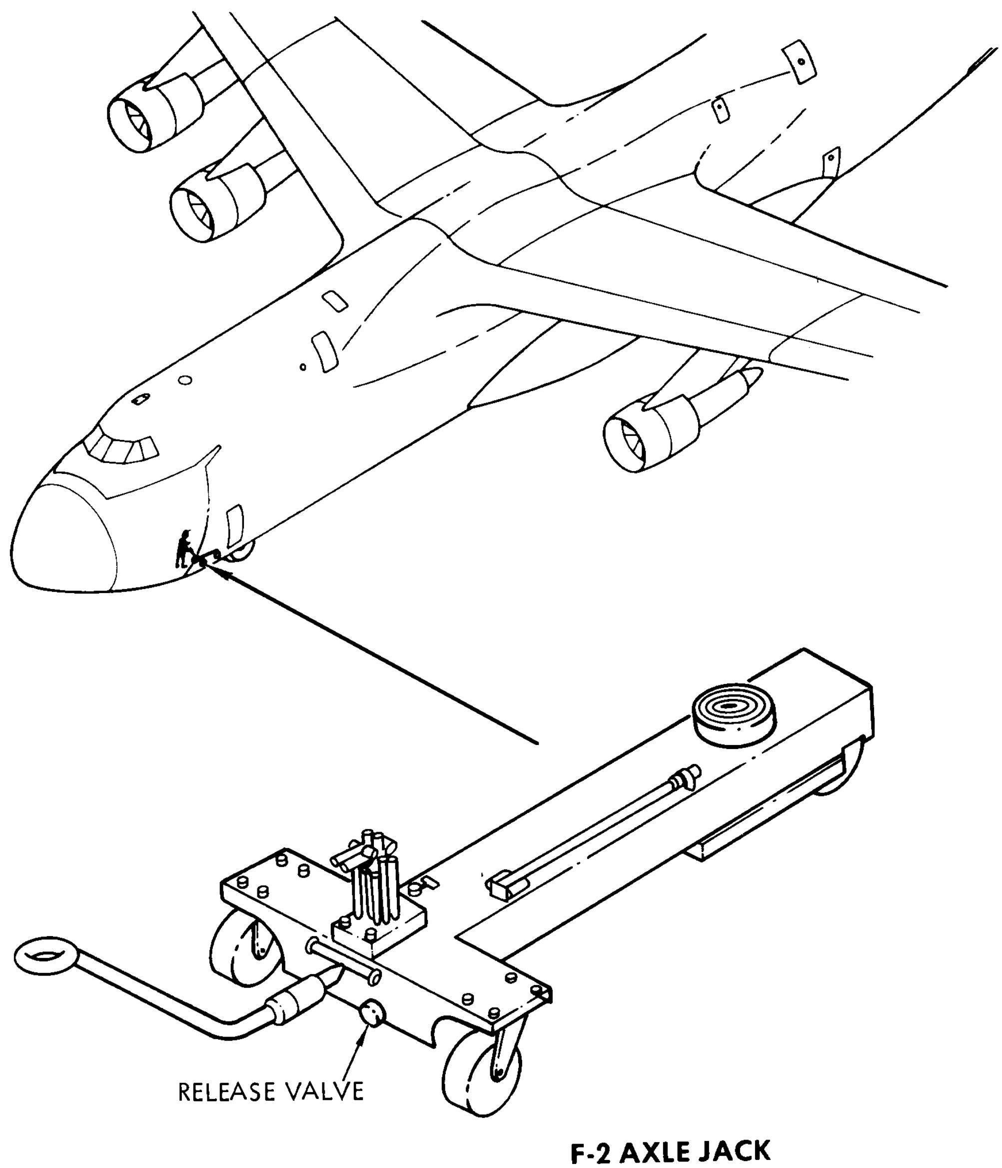
Landing gear jacking points



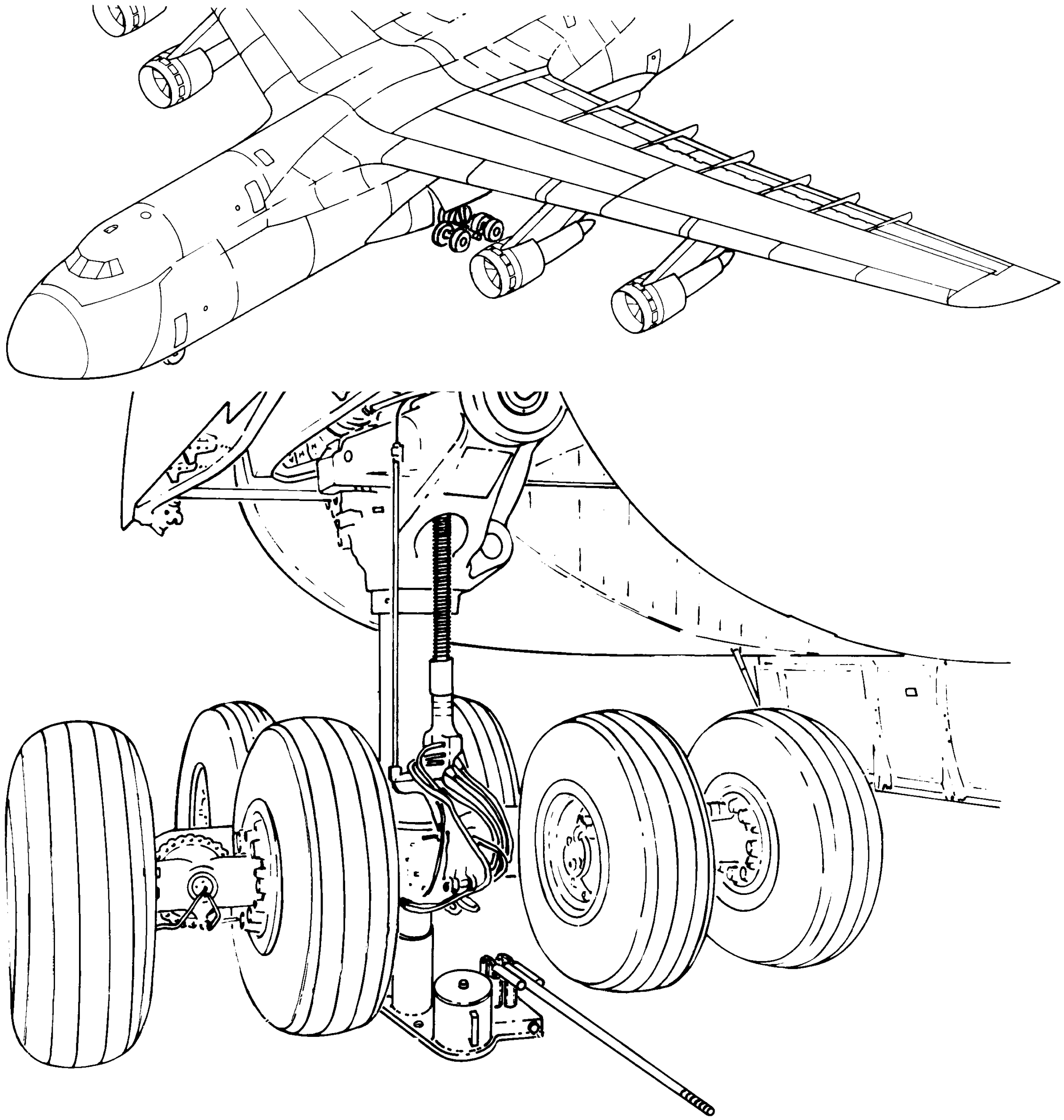
Fuselage jacking equipment



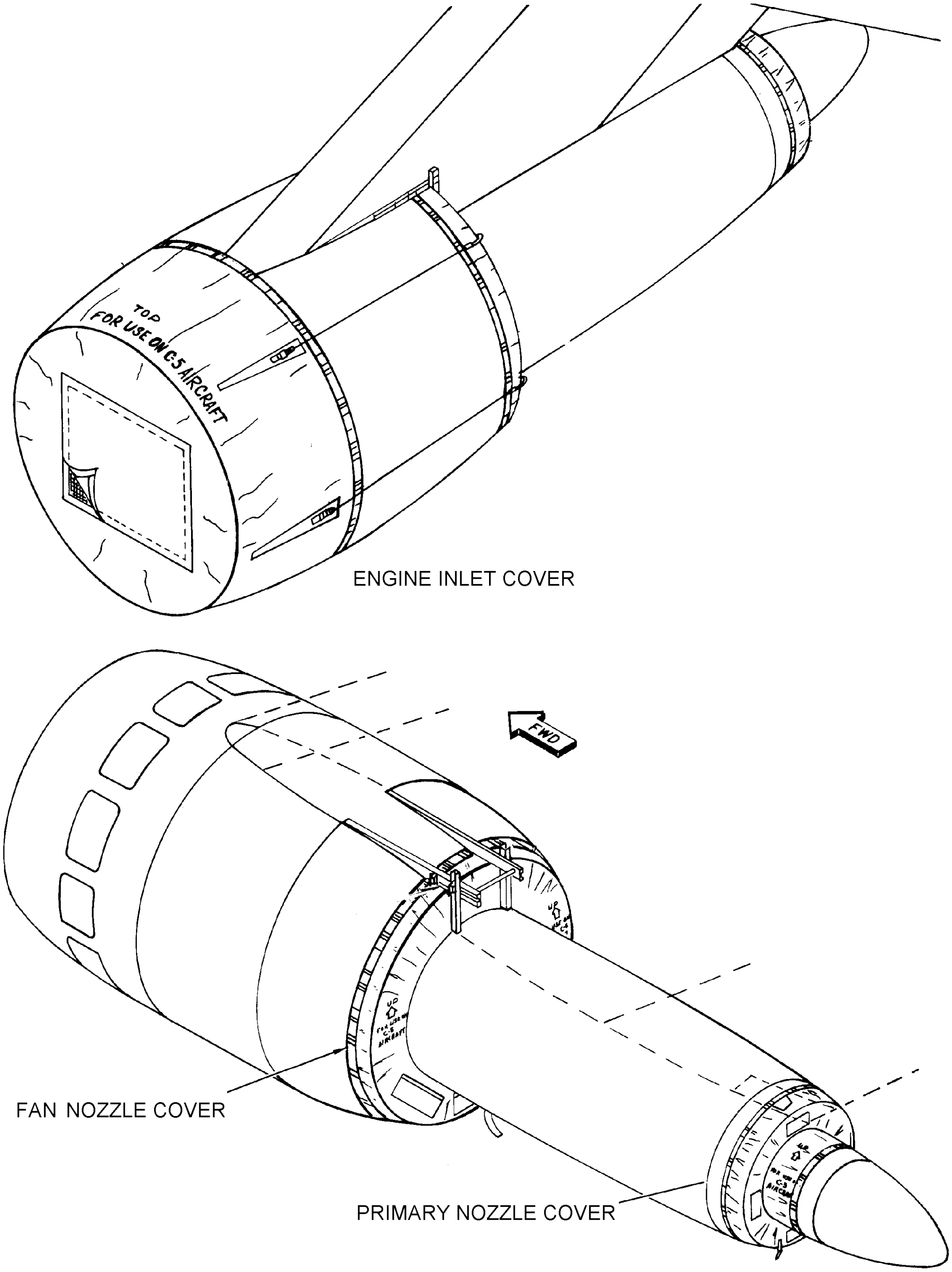
Internal leveling provisions



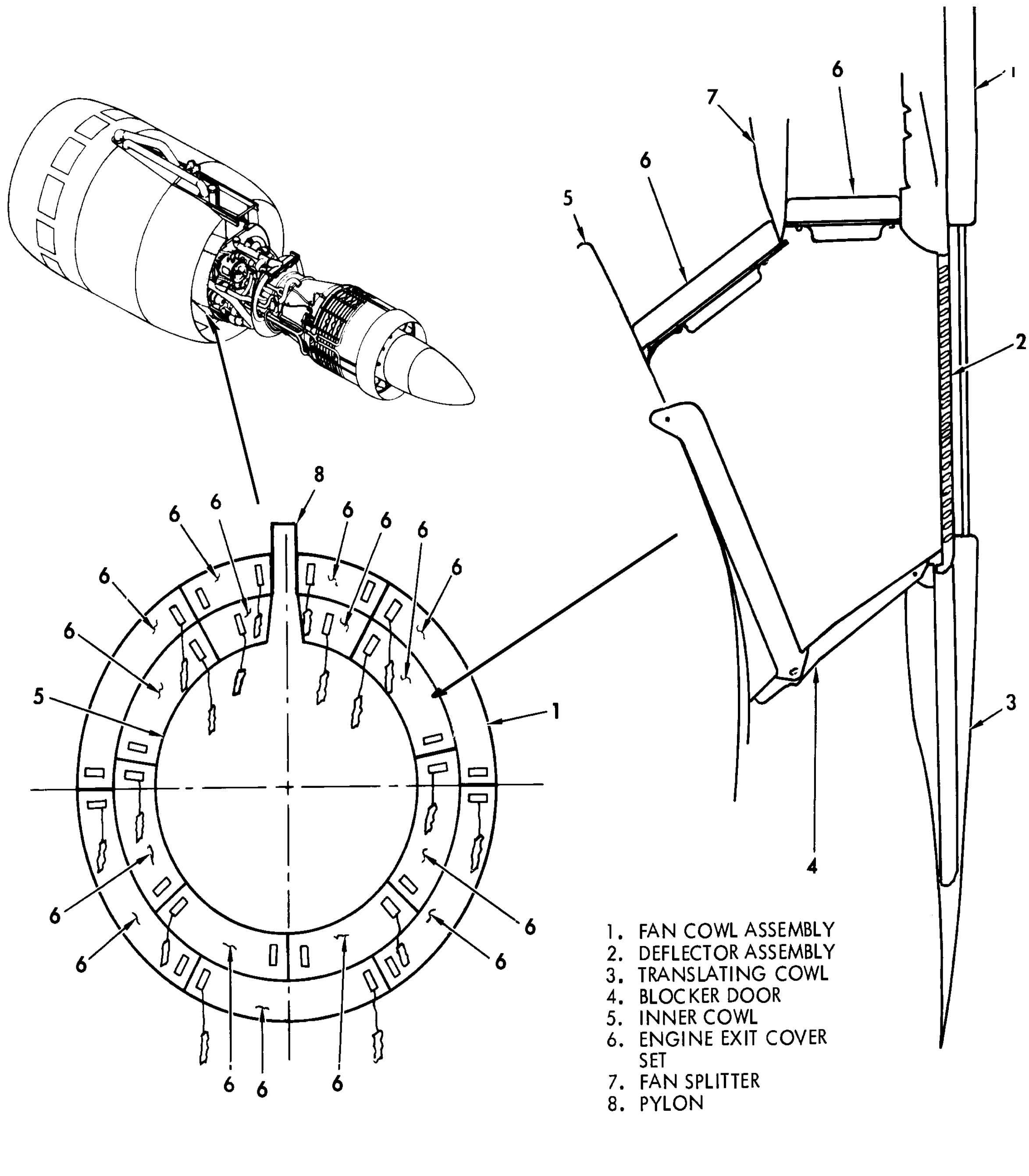
Nose landing gear jacking equipment



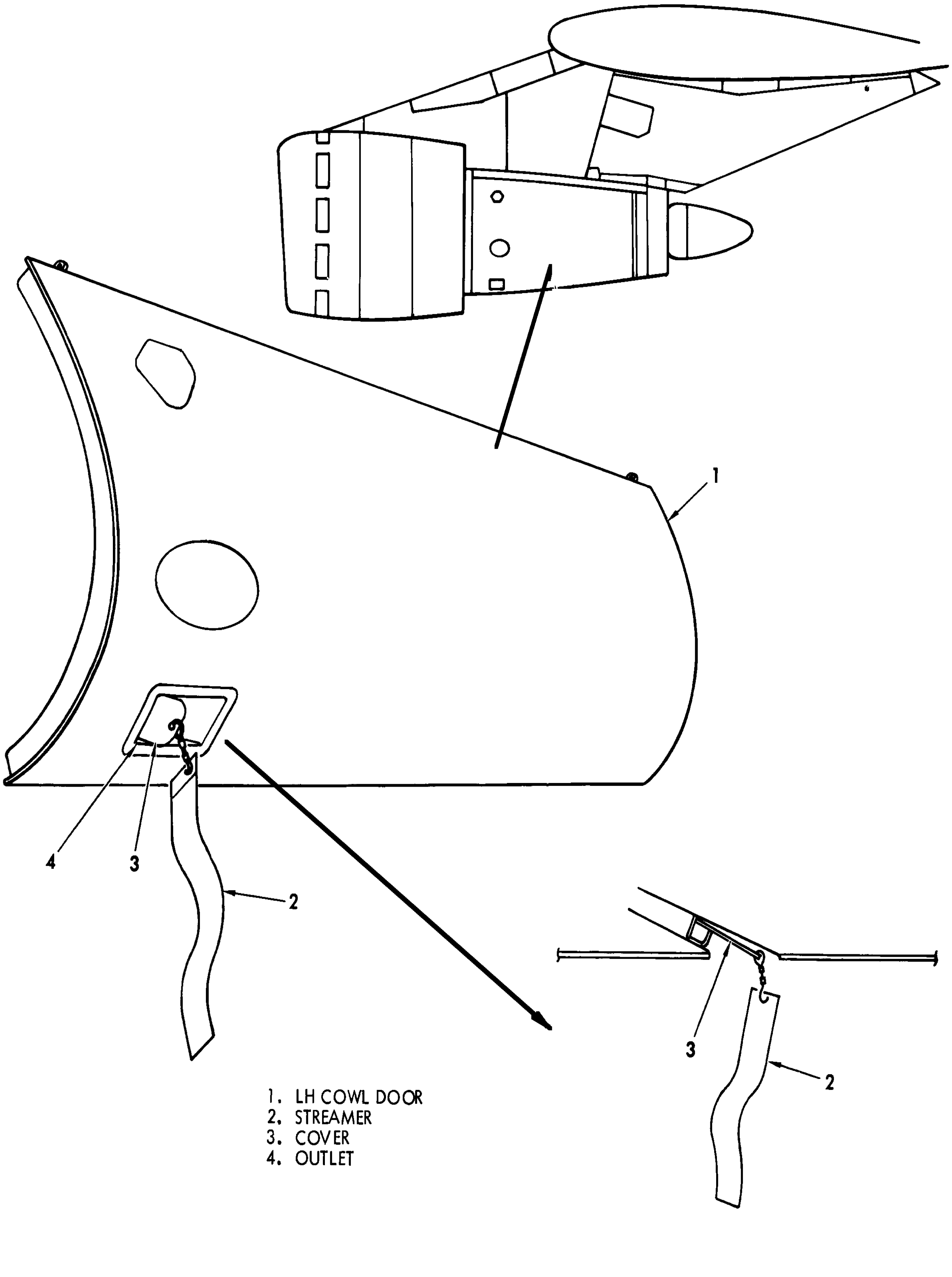
Main landing gear strut jacking equipment layout



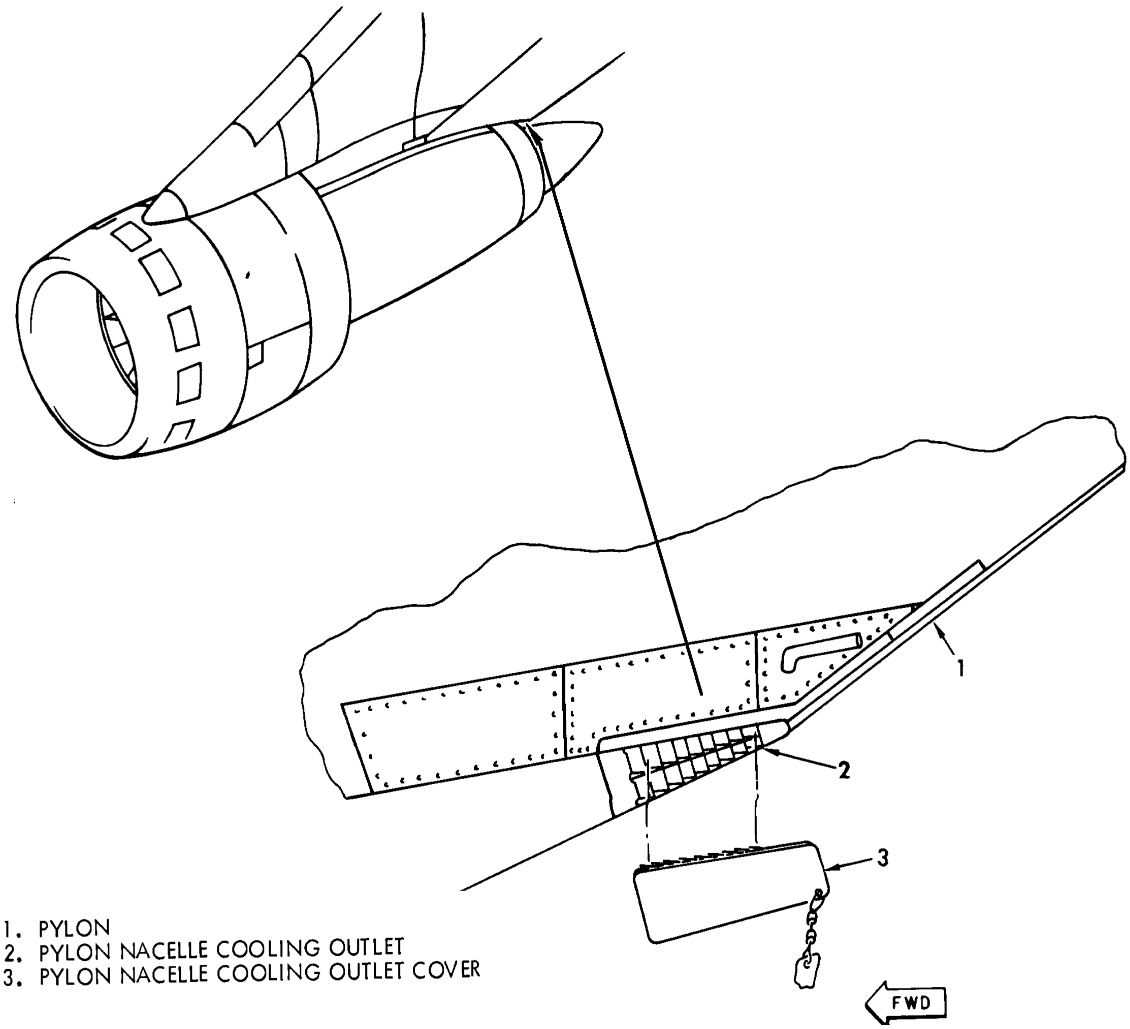
Engine protective covers



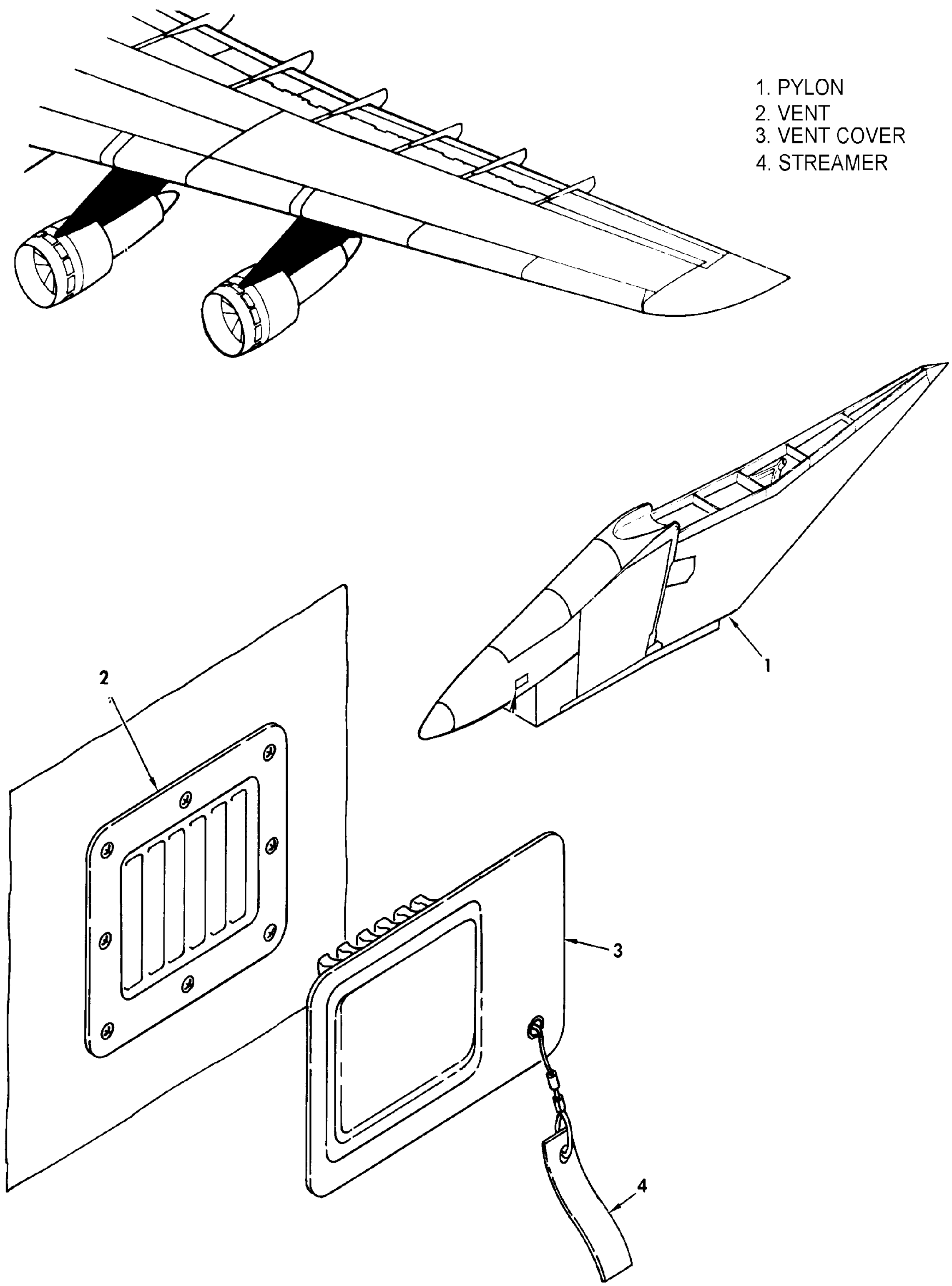
Engine fan exit cover set



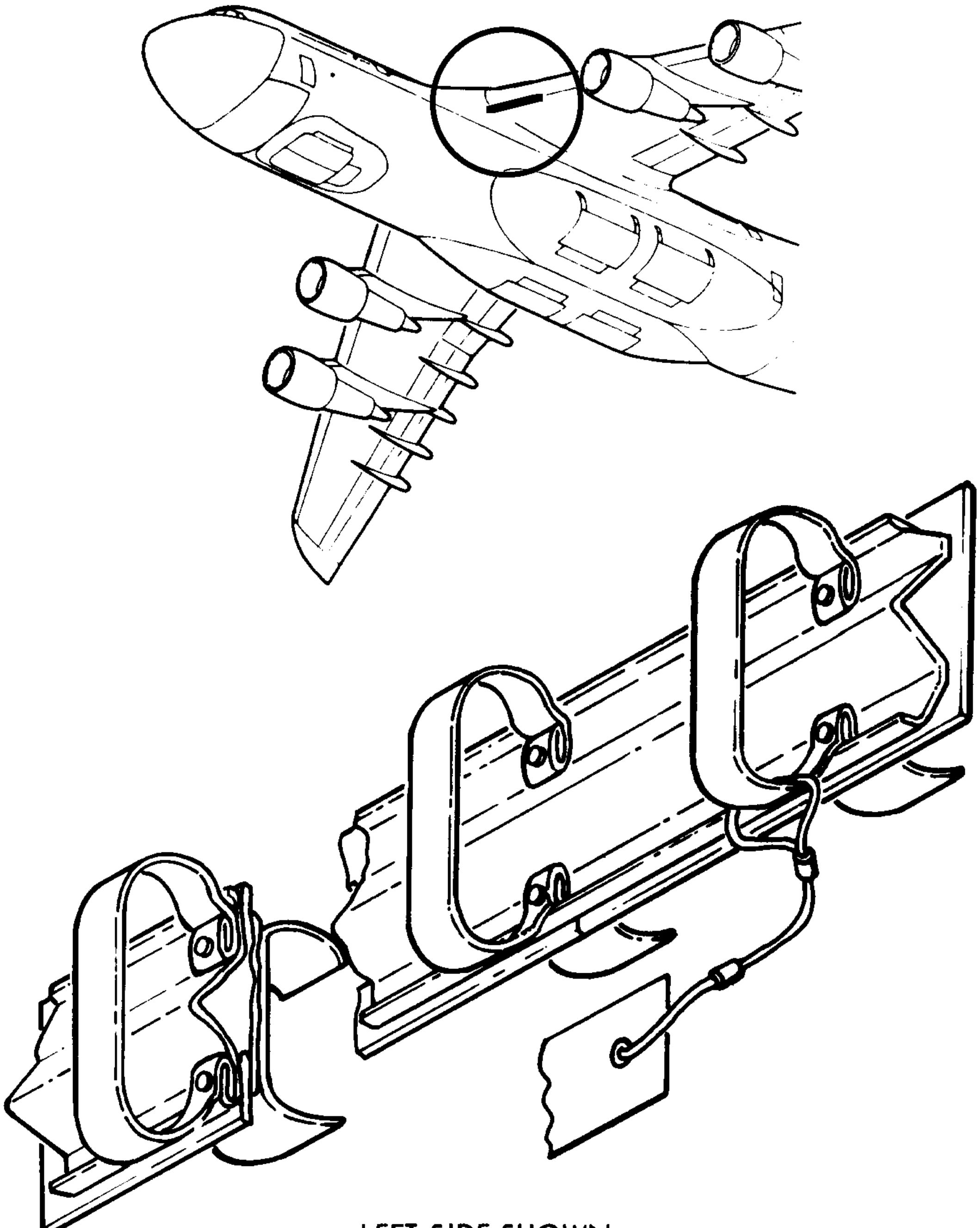
Generator cooling outlet cover



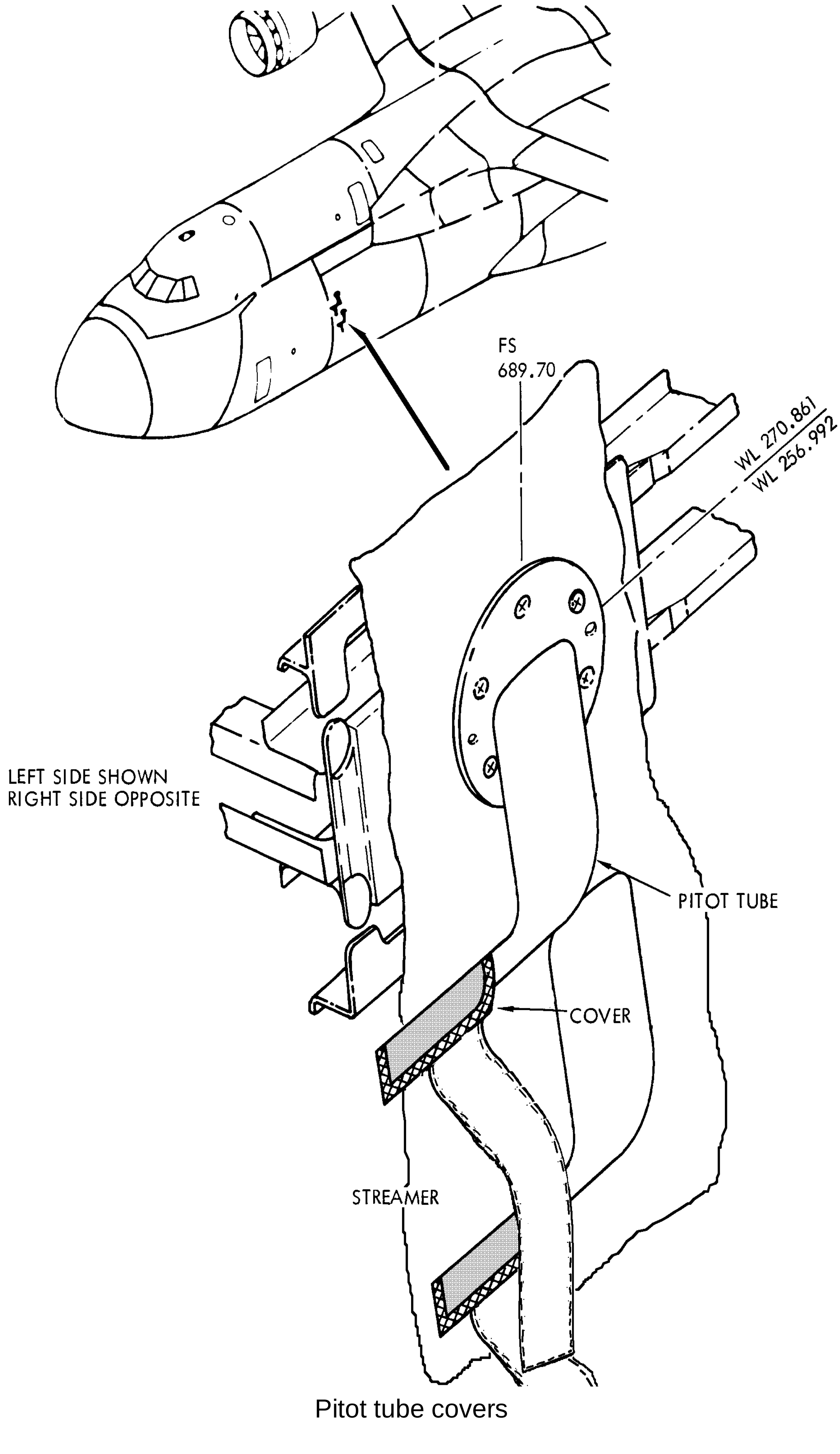
Pylon nacelle cooling outlet cover



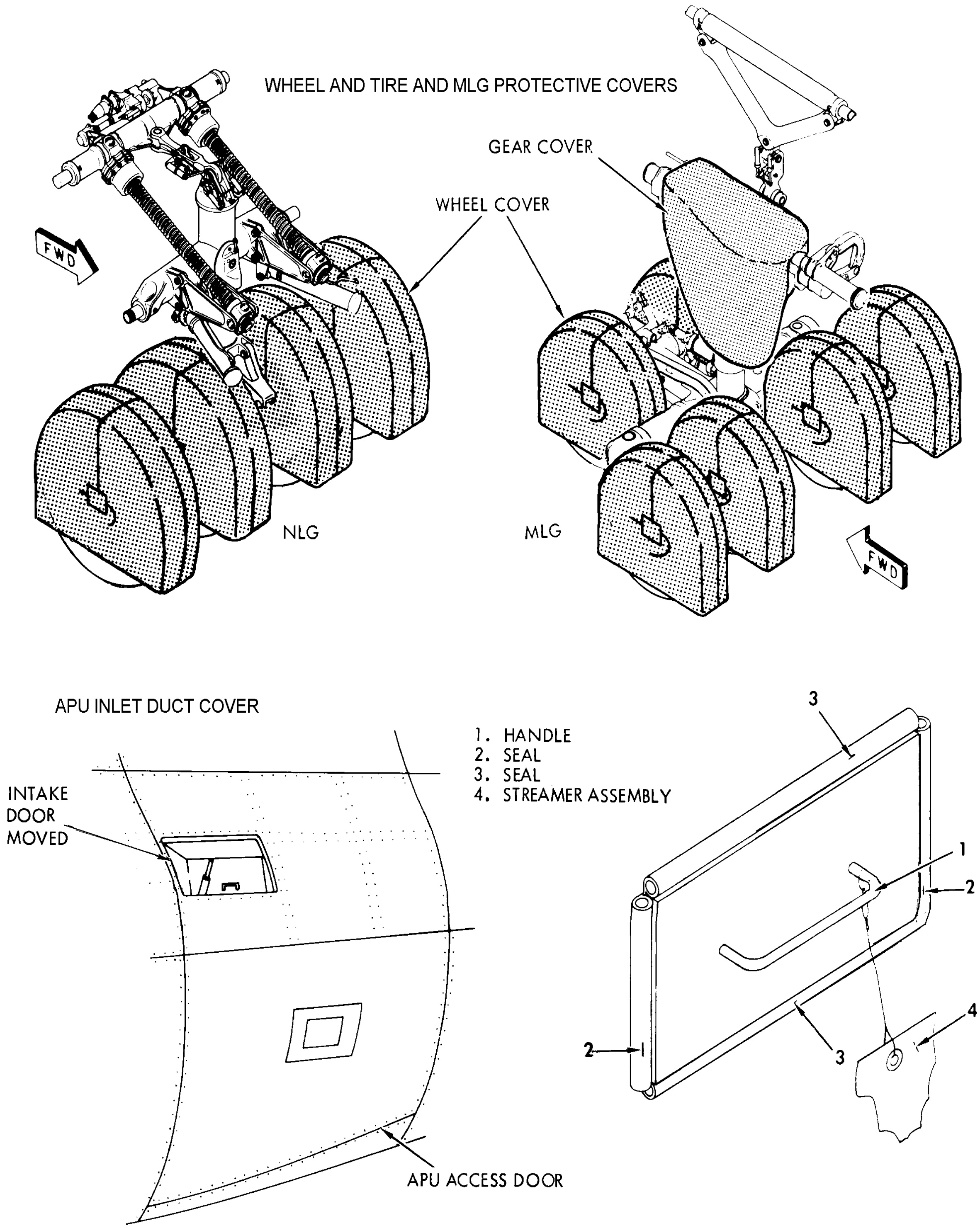
Oil breather exit cover



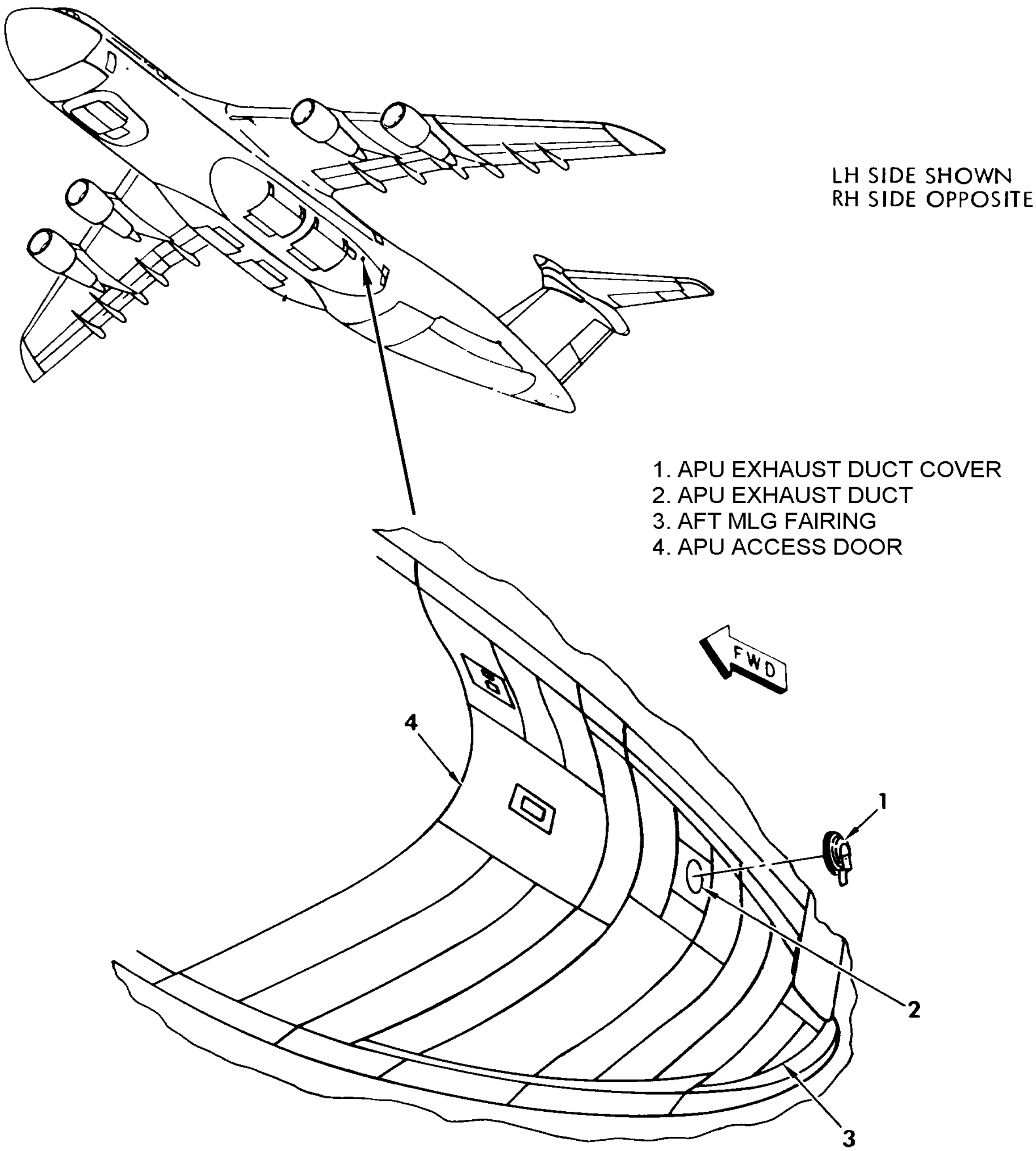
Ram air inlet cover



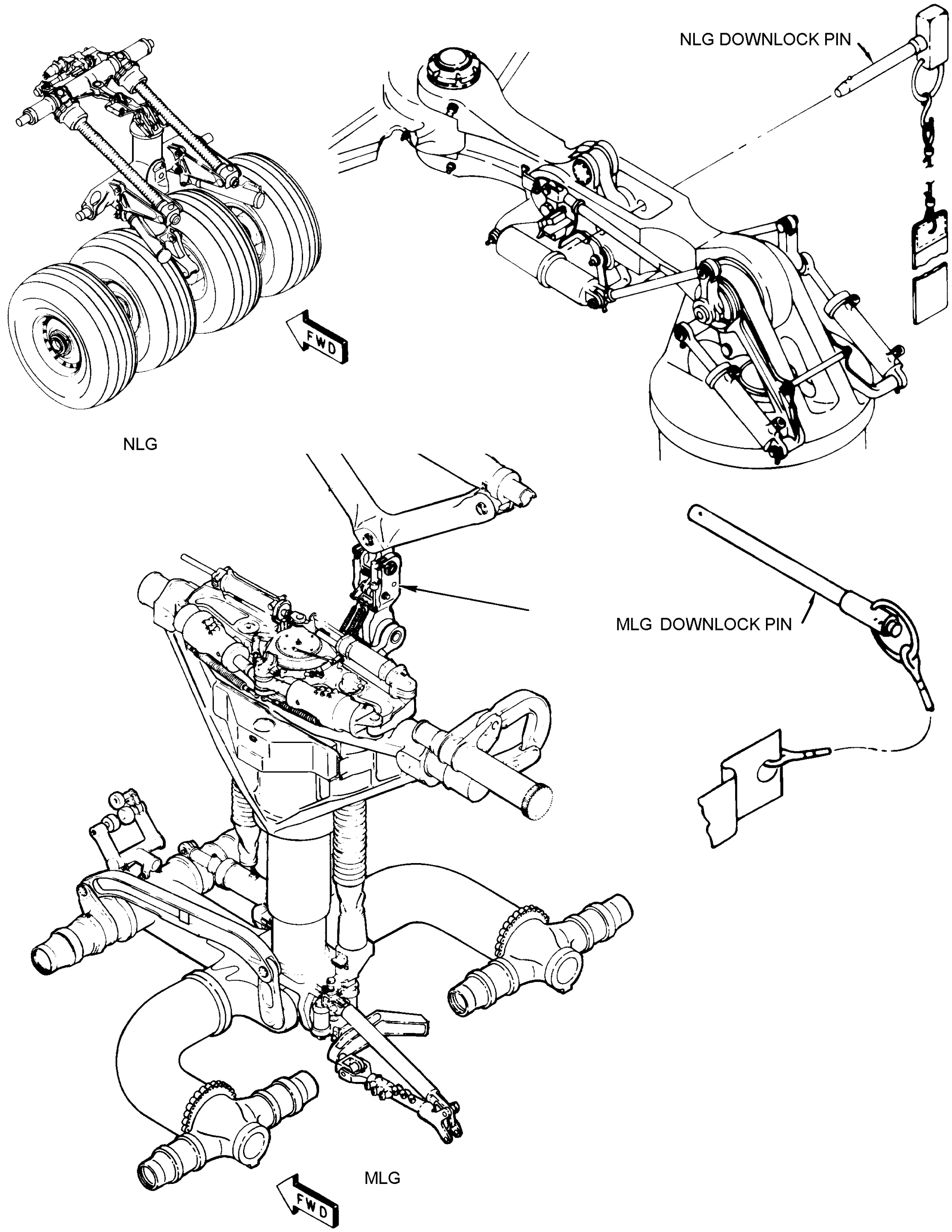
Pitot tube covers



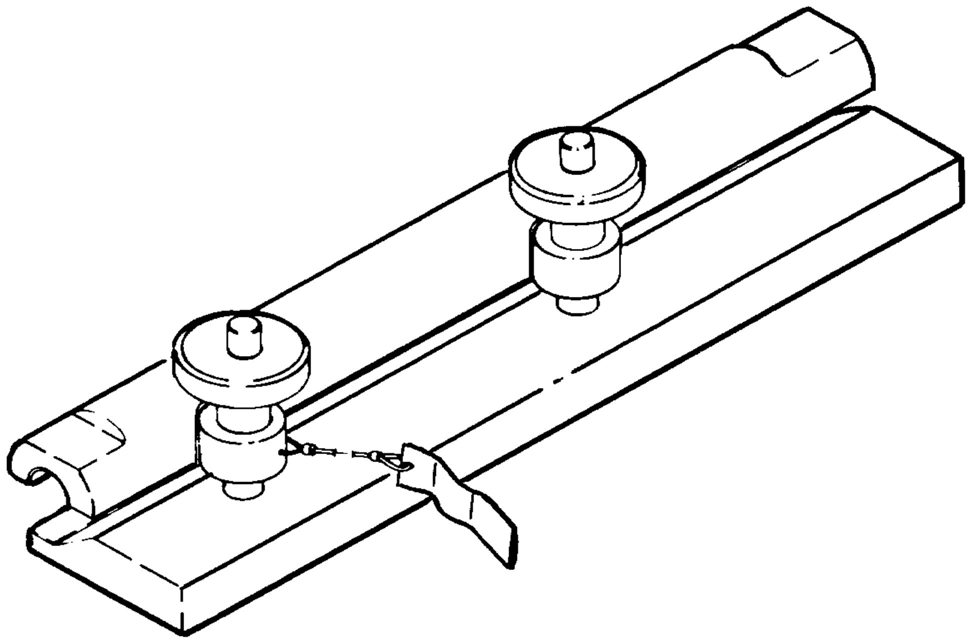
Wheel and tire and APU protective covers



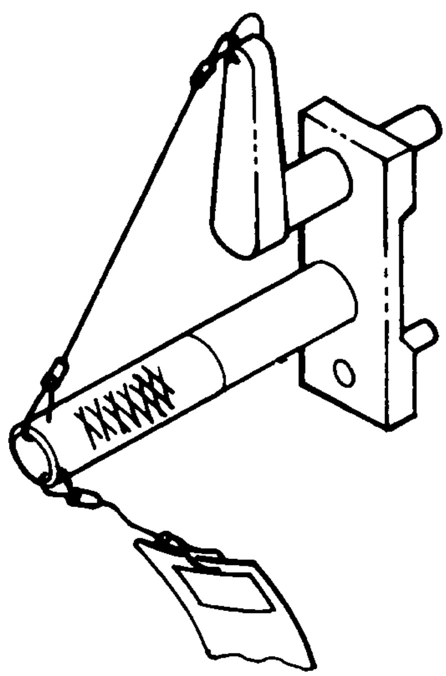
APU exhaust duct cover



Landing gear ground safety pins

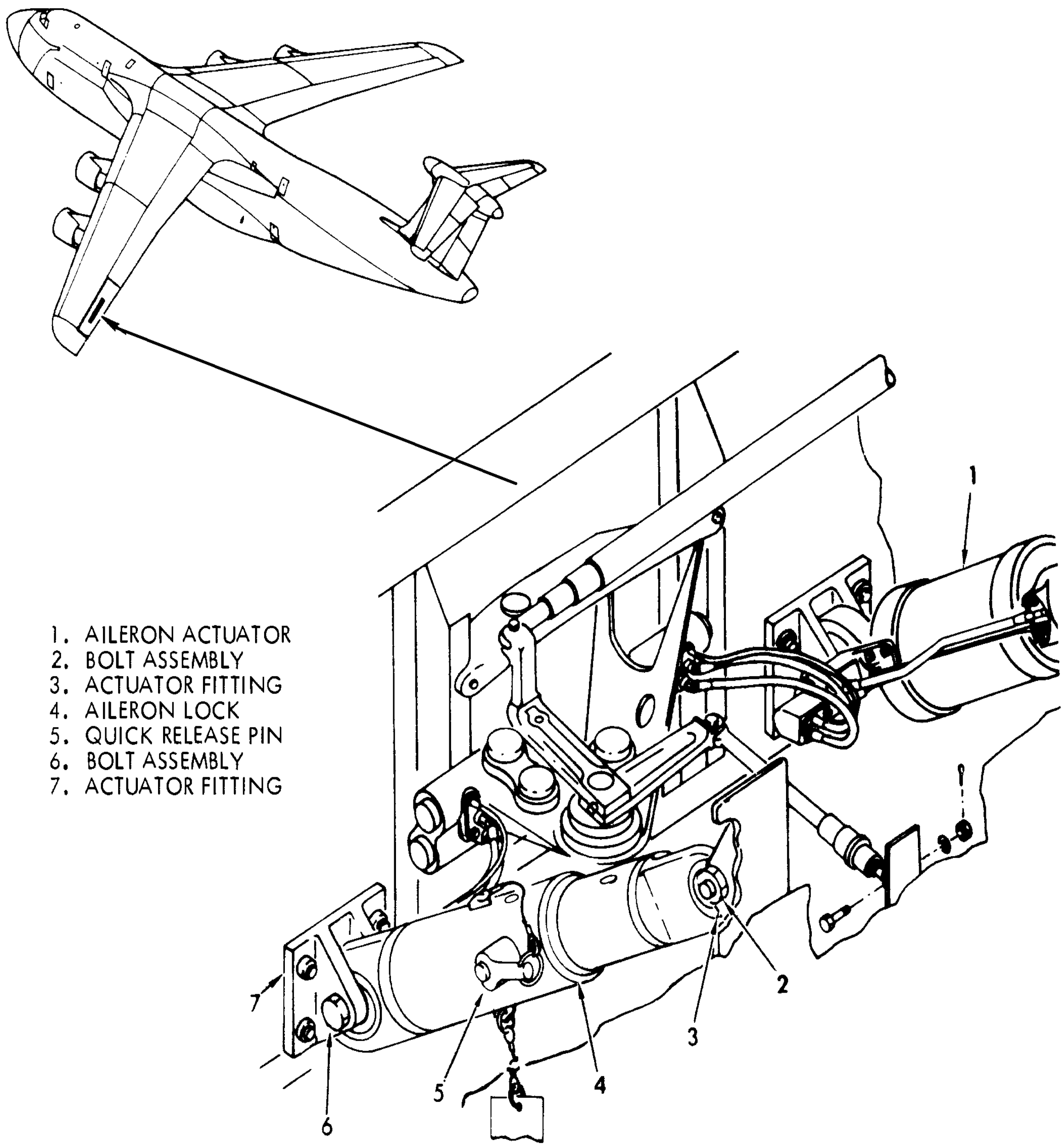


THRUST REVERSER ACTUATOR SAFETY STOP

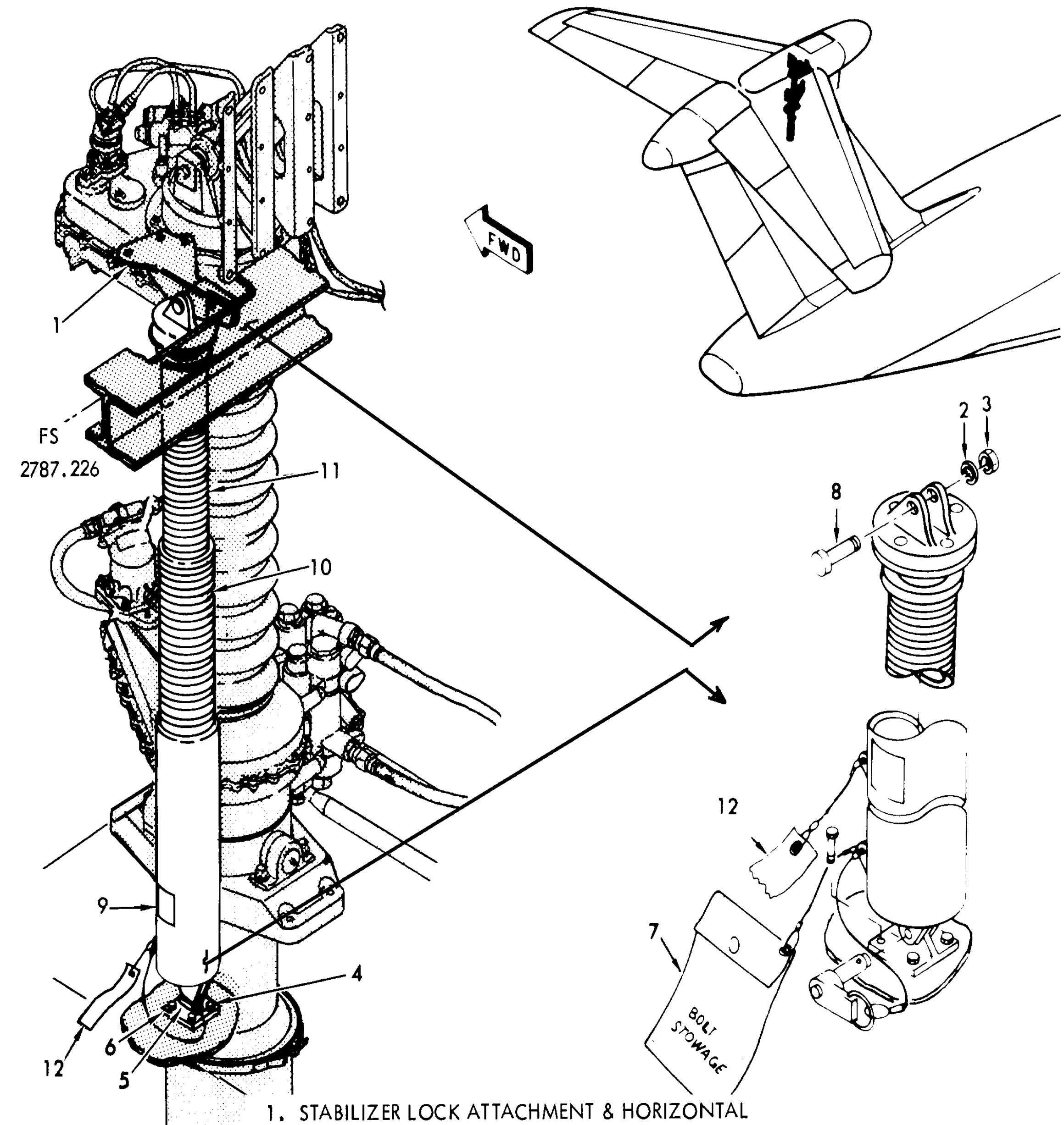


TRANSLATING COWL SAFETY PIN

Thrust reverser ground safety mechanisms

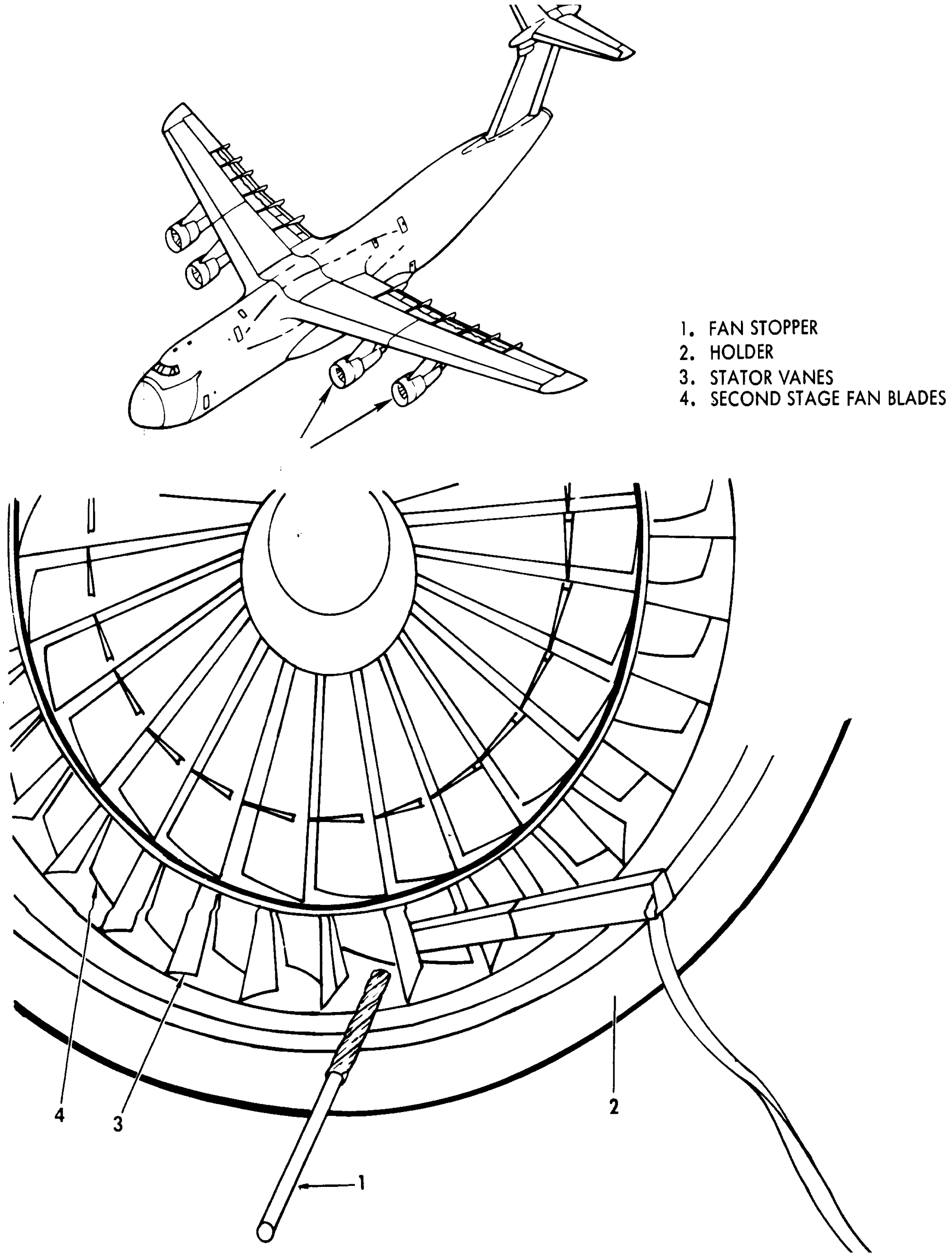


Aileron ground safety lock installation

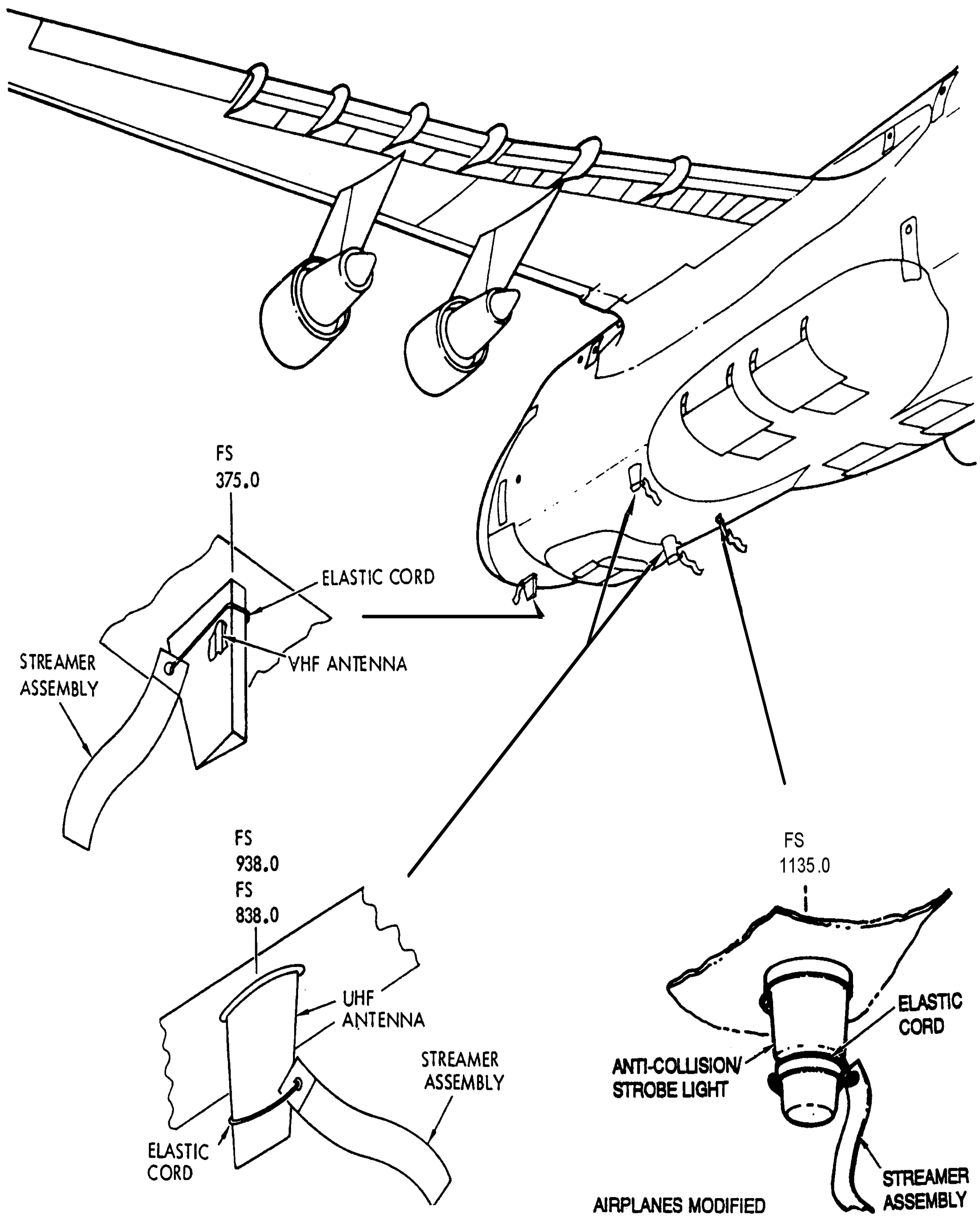


1. STABILIZER LOCK ATTACHMENT & HORIZONTAL STABILIZER
2. WASHER
3. NUT
4. BOLT
5. PIN
6. EYE END
7. BOLT STOWAGE BAG
8. BOLT
9. HORIZONTAL STABILIZER LOCK (BARREL NO. 1)
10. HORIZONTAL STABILIZER LOCK (BARREL NO. 2)
11. HORIZONTAL STABILIZER LOCK (BARREL NO. 3)
12. SAFETY STREAMER

Horizontal stabilizer lock installation



Fan stopper and holder



Warning streamers

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SERVICING

Fuel System

Two methods are available for fuel system servicing. Single point refueling (SPR) and defueling, using the SPR adapters. Over-wing refueling and defueling, of the main tanks through the filler ports in the upper wing surface.

Certain maintenance conditions may require defueling through the jettison system, or suction defueling the main tanks by attaching a suction unit to the engine feed line at the pylon quick-disconnect points.

The primary fuel is JP-8 and the twelve integral wing tank capacities are as follows:

Main tanks 1 and 4 - 23,826 lbs per tank
Main tanks 2 and 3 - 25,337 lbs per tank
Aux tanks 1 and 4 - 30,970 lbs per tank
Aux tanks 2 and 3 - 31,600 lbs per tank
Ext Range tanks 1 and 4 - 27,244 lbs per tank
Ext. Range tanks 2 and 3 - 27,273 lbs per tank

Condensate drain valves are installed in the lower surface of the wing to inspect the fuel for contaminates and/or drain water from the fuel tank sumps after servicing.

Hydraulic System

Two methods are available for hydraulic servicing.

A ground fill connection in the right main landing gear fairing is provided for external ground servicing.

A hand pump and fluid receptacle are provided in the No. 3 service center for inflight or remote site servicing.

A selector valve is used to direct the fluid to the desired reservoirs. Before filling the reservoir system, pressure is reduced to zero and all accumulators must be properly precharged.

Reservoir capacities are approximately as follows:

- No. 1 hydraulic system - The reservoir capacity is 16 gallons and the refill capacity is 5.5 gallons.
- No. 2 hydraulic system - The reservoir capacity is 10.3 gallons and the refill capacity is 2.8 gallons.
- No. 3 hydraulic system - The reservoir capacity is 10.1 gallons and the refill capacity is 2.6 gallons.
- No. 4 hydraulic system - The reservoir capacity is 13.2 gallons and the refill capacity is 3.6 gallons.

Shock Struts

The shock struts are serviced with hydraulic fluid and dry air or nitrogen.

Tires

Tire pressures are checked with a 0 to 400 psi gage. The tires are serviced with dry air or nitrogen.

Parking Brake Accumulator

The parking brake accumulator is located on the right side of the cargo compartment, and is serviced with dry air or nitrogen.

Bogie Positioner

A bogie positioner is located on each of the four main landing gear bogie beams. The positioner is on the forward and inboard side of the bogies inboard of the shock strut assembly and is serviced with dry air or nitrogen.

Main Landing Gear (MLG) Door Actuating System

The gearbox and motor assembly for each of the four main landing gear doors is serviced with specification MIL-L-7808 oil. The unit is serviced through the lower sight gage port and should be filled to overflowing. Modified landing gear gearboxes have a sight gage and a fill port and is serviced to the midway point of the sight gage.

Nose Landing Gear (NLG) System

The gearbox and motor assembly for the nose landing gear is serviced with specification MIL-L-7808 oil. The gearboxes have a sight gage and a fill port and are serviced to the midway point of the sight gage.

Oxygen System

The aircraft oxygen system is serviced with liquid oxygen (LOX). Two high pressure LOX converters located in the left main landing gear pod fairing store the liquid oxygen at its boiling point of -297 degrees F.

Engine Oil Tank

Service or replenish oil as it is used. The oil tanks are serviced with MIL-L-7808 oil. The filler cap is equipped with a dipstick to indicate the level of the oil.

Constant Speed Drive

Replenish the oil when it shows below the green band on the sight gage. The constant speed drive (CSD) is serviced using a high pressure service cart containing MIL-L-7808 oil.

Engine Starter

Service with MIL-L-7808 when the oil is below the filler opening.

Auxiliary Power Unit

An auxiliary power unit (APU) is located in each of the main landing gear wheel well fairings. An inspection/service door is contained within the APU access door on the aft side of the main landing gear wheel well fairings to facilitate servicing the APU with MIL-L-7808 oil.

Air Turbine Motor

Two air turbine motors (ATMs)are installed in the aircraft, one in each APU compartment. The ATMs are serviced with MIL-L-7808 oil. The filler cap is equipped with a dipstick to indicate the level of the oil.

Auxiliary Power Unit Start Accumulator

The APU start accumulators are located in the vicinity of the APUs, one on each side in the cargo compartment. They are normally precharged with dry air or nitrogen to 1450 psi at 70 degrees F. Hydraulic system pressure must be zero before charging the accumulators.

Ram Air Turbine

Emergency hydraulic power is supplied by a Ram Air Turbine (RAT) driven hydraulic pump located in the left MLG wheel pod. The RAT system accumulator is located in the No. 2 hydraulic service center and is serviced with dry air or nitrogen.

Pitot Static System

Normal servicing of the pitot static systems consist of periodically draining moisture from the system to ensure proper operation. Drain boxes are located on each side of the cargo compartment about 75 inches above the catwalk in the forward end of the cargo compartment. Each box contains six drain bottles, a colored indicator float is provided in each bottle to give a positive indication of the amount of water collected.

Thirteen additional drain fittings with drain plugs are provided in the aircraft to completely drain the systems. Four drain plugs are located beneath the flight station floor. Access to these drain plugs is gained from the cargo compartment.

Crew Lavatory

The crew lavatory is installed on the right side of the aircraft just aft of the relief crew seats and forward of the galley. A toilet servicing vehicle is required for draining and charging the waste tank, and a water service vehicle is required to fill the water storage tanks.

Troop Lavatory

The troop compartment lavatory consists of two separate units installed on the forward right side of the troop compartment. A toilet servicing vehicle is required for draining and charging the waste tanks, and a water servicing vehicle is required to fill the water storage tanks.

Escape Slides

Pneumatically inflated escape slides are used to provide emergency egress from the aircraft. The escape slide reservoirs are normally charged to between 2750 and 3500 psi with clean dry air or nitrogen.

Batteries

Two 24-volt, 5 ampere-hour, Ni-Cad batteries are located on the right side the forward fuselage cargo area. When electrical capacity is lost, the batteries should be removed from the aircraft and sent to the battery shop for servicing. Remove the batteries from the aircraft at the prescribed intervals. Do not attempt to service the batteries on the aircraft.

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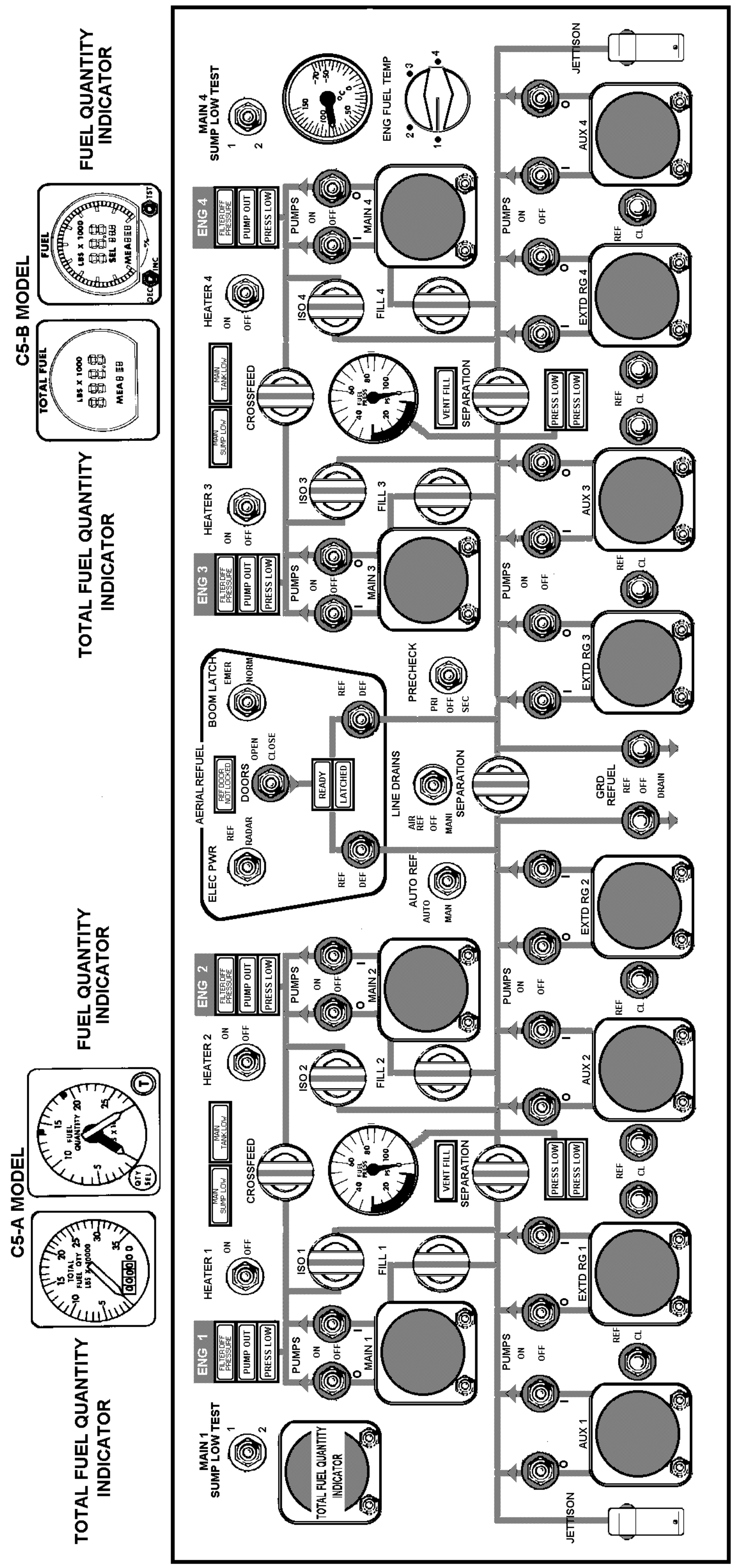
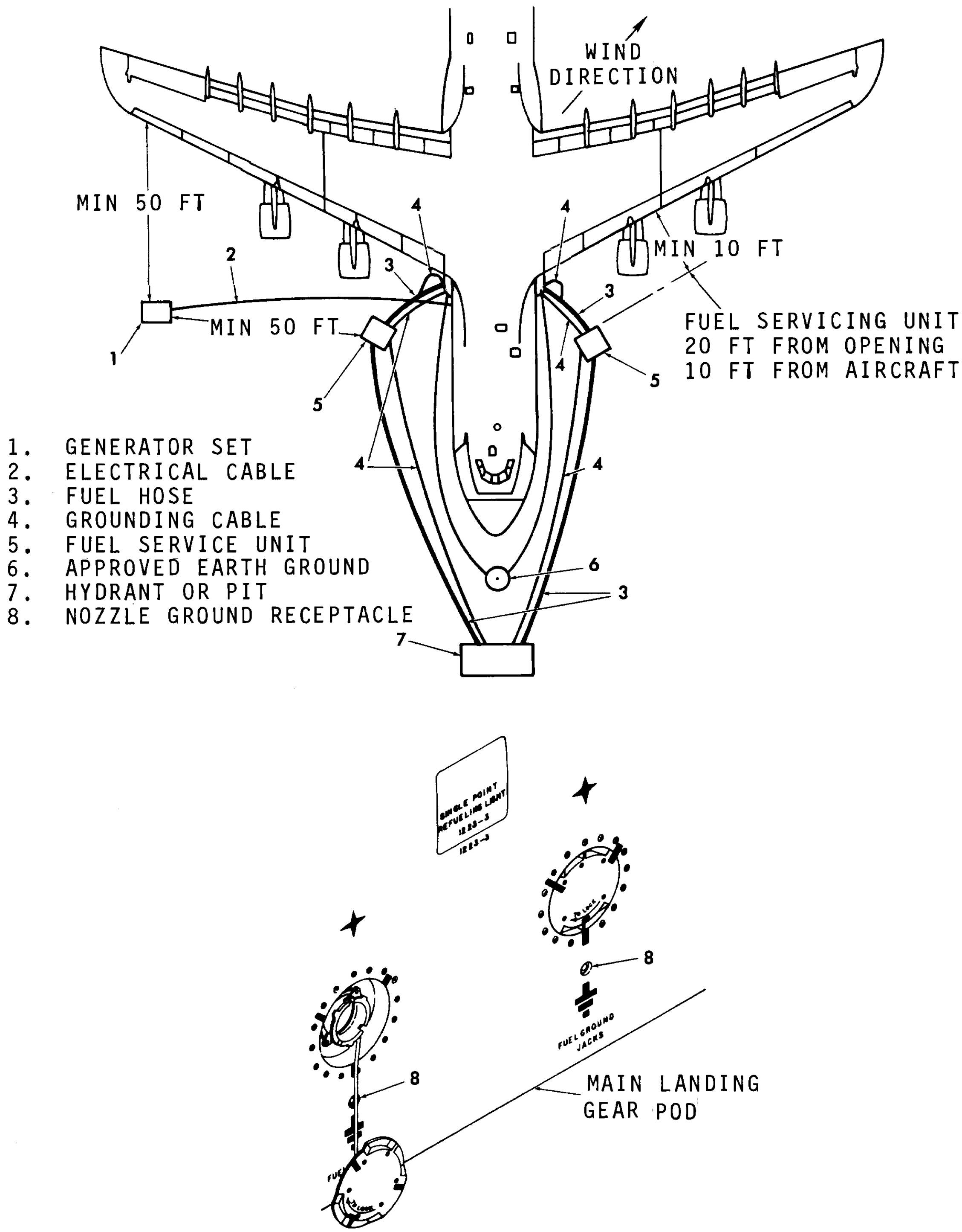
UNIT	SERVICE WITH	CAPACITY	CONNECTION LOCATIONS	REMARKS
Fuel	Primary JP-8 Alternates JP-5, Jet A, Jet A-1, Jet B	49.000 gal - original wing 51,154 gal - C5B and modified wing	Two refueling adapters in the forward section of the left and right main landing gear pods.	The adapters are for pressure refueling, 55 psi with a flow rate of 600 gpm each, for a total of 2400 gpm.
Engine	MIL-L-7808 Oil	Each engine tank 9.1 gal.	Inboard engine filler - located in nacelle at fuselage station 1194. Outboard engine filler - located at fuselage station 1333.	Filler cap for gravity refill - one in each engine nacelle. Fill to full mark on dipstick.
Constant Speed Drive	MIL-L-7808 Oil	Each CSD - 3 quarts.	Inboard engine filler - located in nacelle at fuselage station 1181. Outboard engine filler - located at fuselage station 1316.	Fill connection for pressure refill - one in each engine nacelle. Sight gauge on CSD.
Auxiliary Power Unit	MIL-L-7808 Oil	Each APU tank - 0.5 gal.	One APU tank filler is located in the right and left aft main landing gear pods.	Filler cap for gravity refill. Sight gage on APU.
ATM	MIL-L-7808 Oil	Each ATM - 1.5 pints.	ATM below each APU.	Filler cap for gravity refill. Cap has dipstick attatched.
Oxygen - Crew and Upper Aft Troop Compartment	Liquid Oxygen per MIL-O-27210, Grade B Type II	100 Liters (one 75 liter - converter and one 25 liter)	In the left main gear pod at fuselage station 1450.	Service with regulated pressure 30 psi.
Galley	Potable water	Approx. 50 gallons on C5 B	Serviced at panel located in the forward left MLG wheel well.	Fill to overflow.
Main Engines - Ground Start	Pressurized Air	N.A.	One in left main landing gear pod, FS 1700.	Needed only when APUs inoperative. Standard MA-1A ground cart, or equivalent.
Electrical Current	3-phase - 400-cycle 115/200 4 wire Y connected.	80 KVA ground cart.	FS 974, WL 100, RBL 70	N.A.
Hydraulic	MIL-H-83282	290 gallons approximately.	Service panel, FS 1210, right-hand landing gear pod.	Fluid is filtered through a 5 micron filter at each reservoir.
Fire Suppression System	Liquid nitrogen (LN_2)	750 pounds each Dewar (220 gallons total)	Service panel FS 1478, right-hand landing gear pod.	Two Dewars, one each side of fuselage at wing root.
Air conditioning Turbo Compressor (not modified)	MIL-L-7808	275 cc each turbine.	Remove plug at turbine for gravity feed.	Turbines located left and right sides of environmental compartment.
Main Landing Gear Main Gearboxes	MIL-L-7808		Sight gage plug on each gearbox, remove plug and fill to overflow. Modified gearboxes have fill plug and sight gage, fill to mid way point on gage.	
Nose Landing Gear Main Gearboxes	MIL-L-7808		Fill plug on gearbox in forward wheel well. Fill to mid way point on gage.	

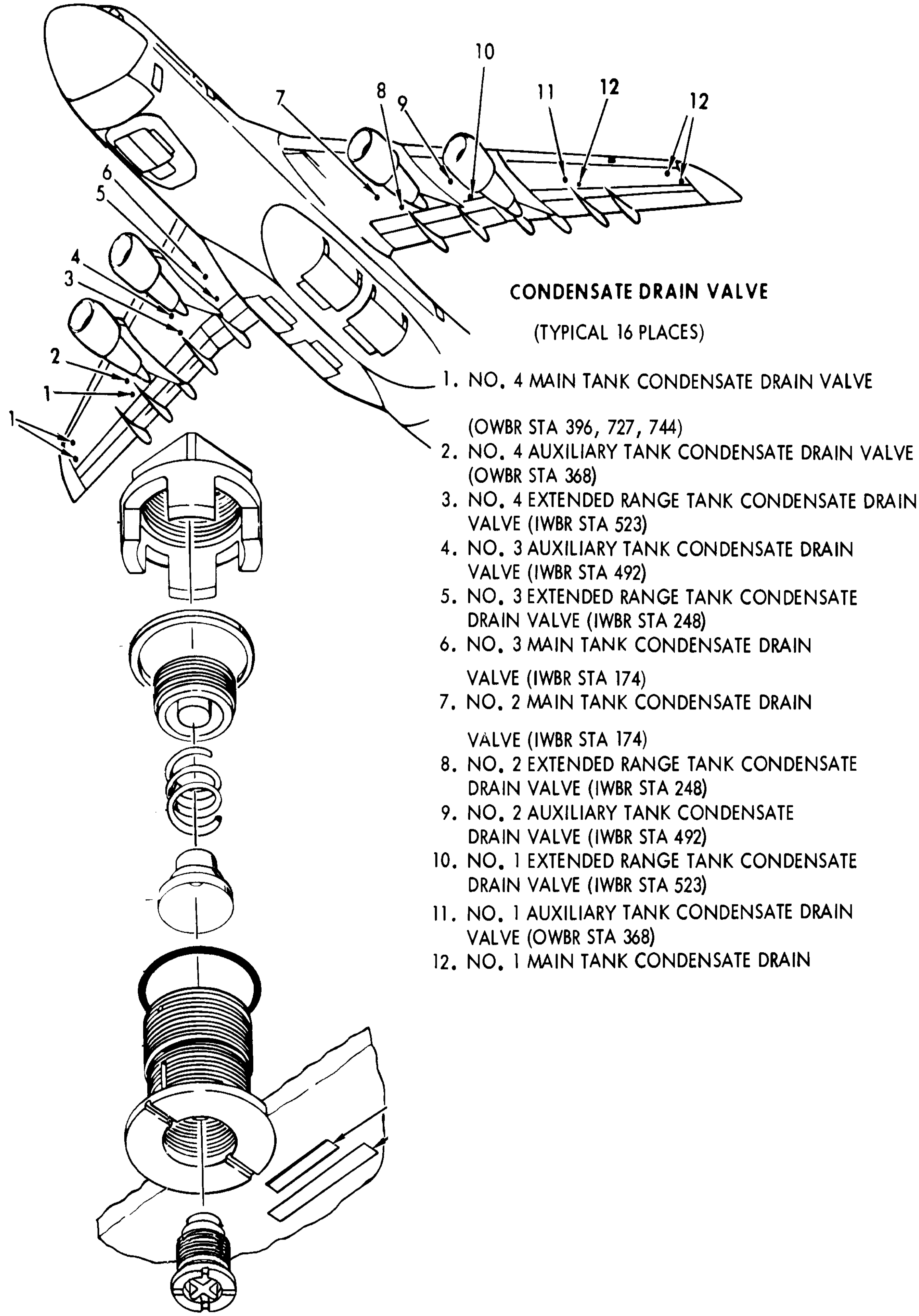
Servicing table



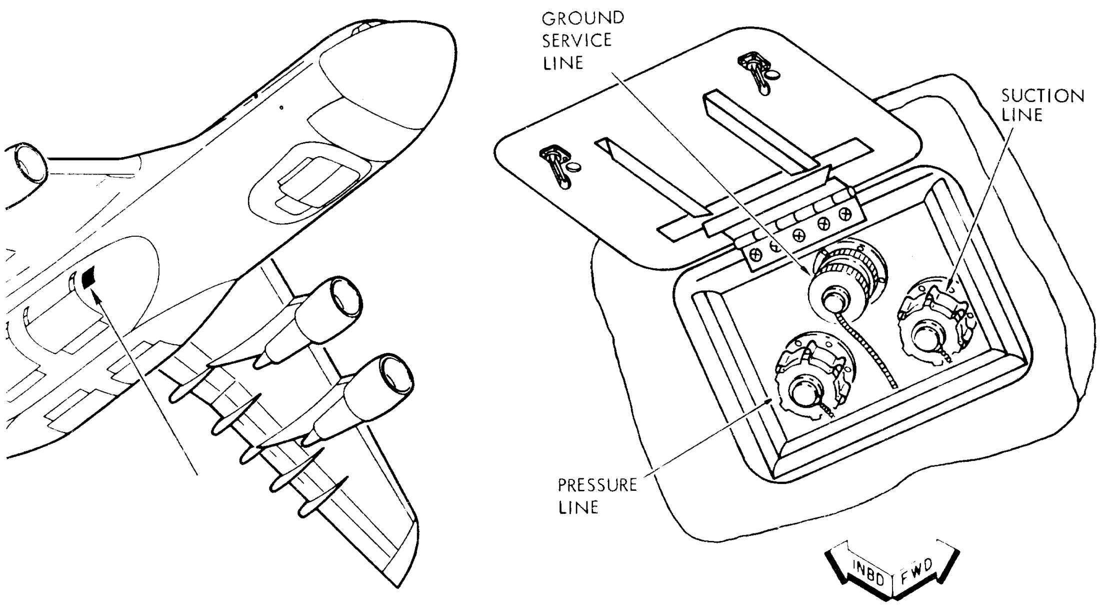
Flight engineer’s fuel management panel



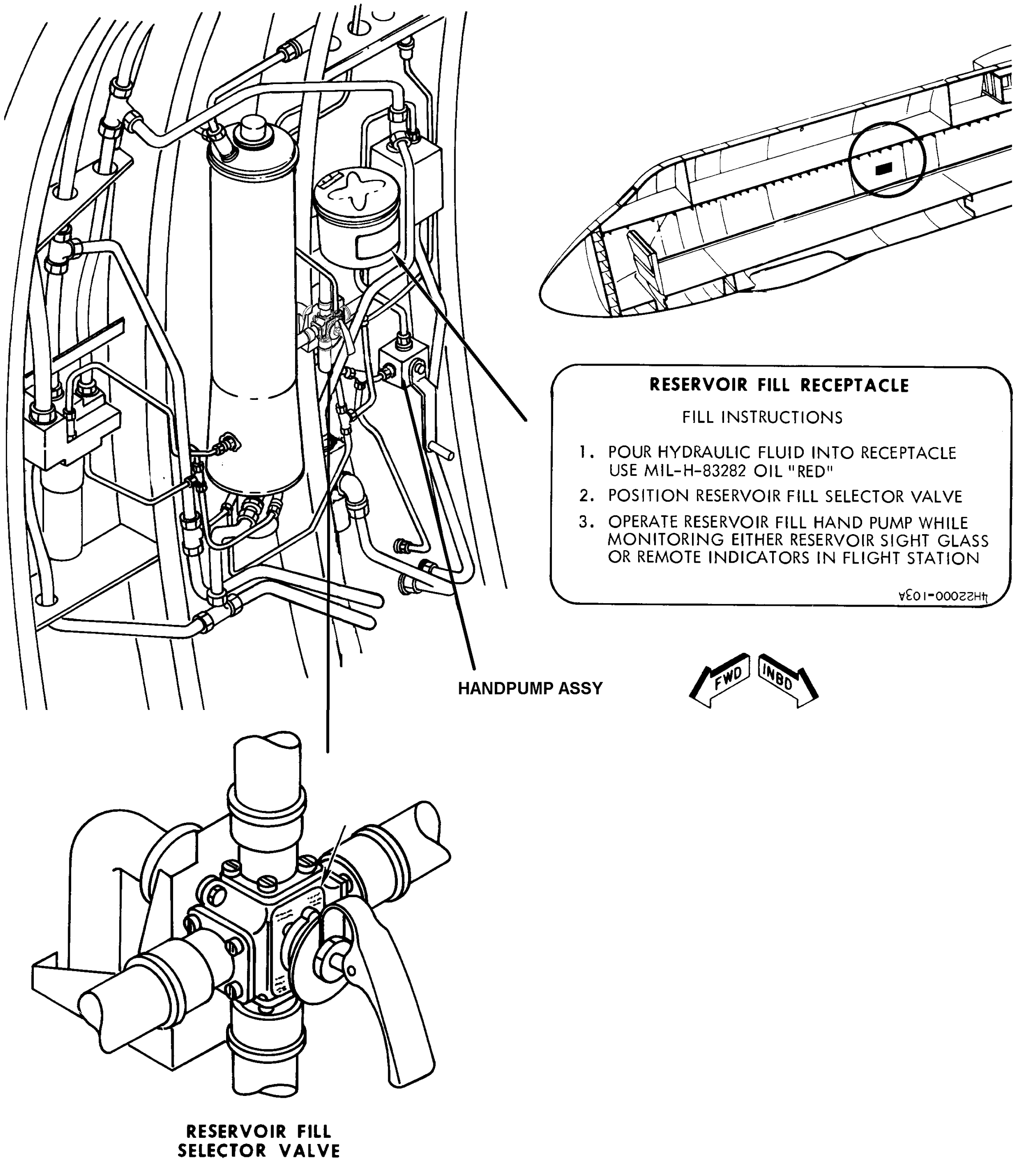
Single point refuel hookup



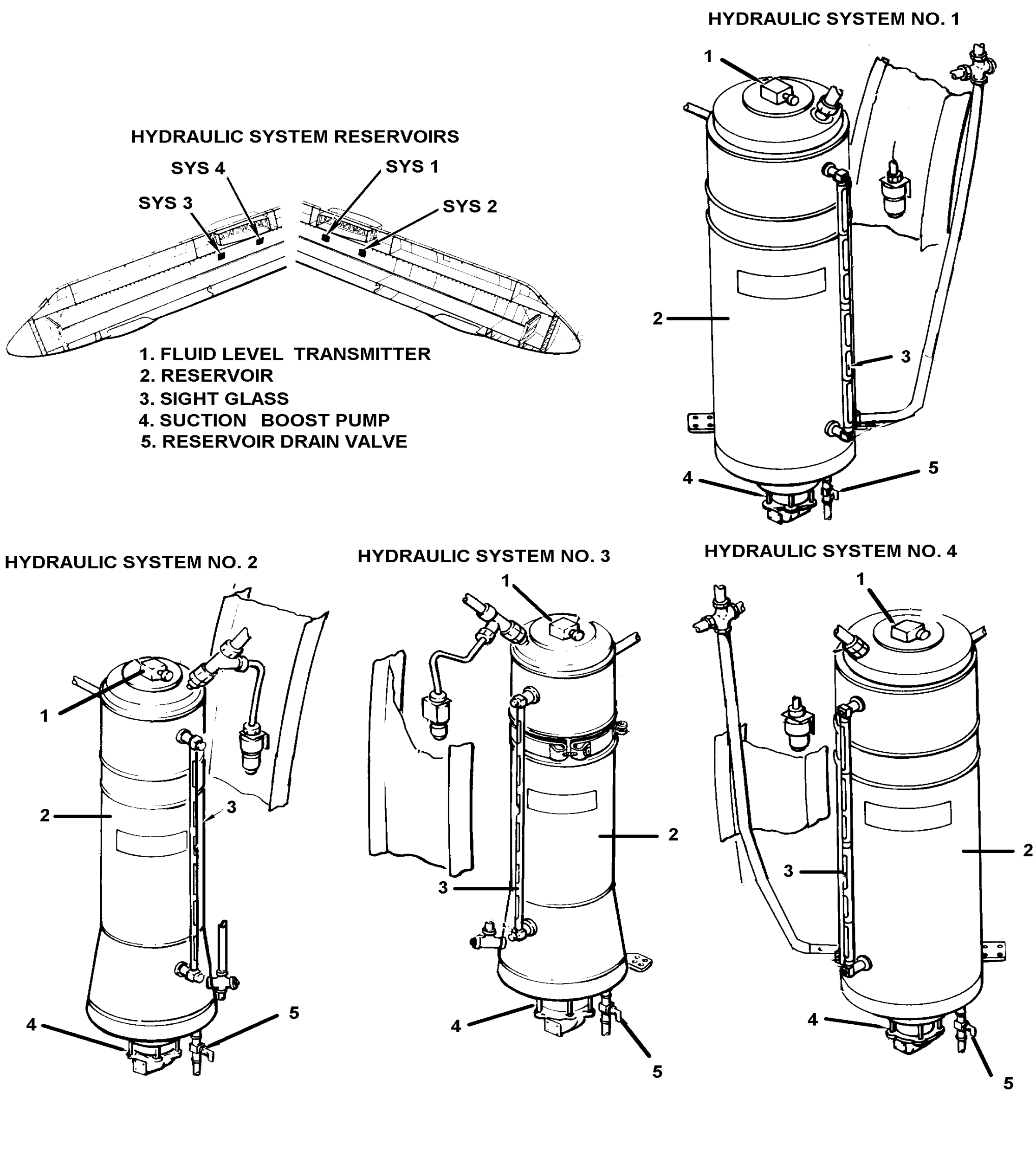
Condensate drain valve



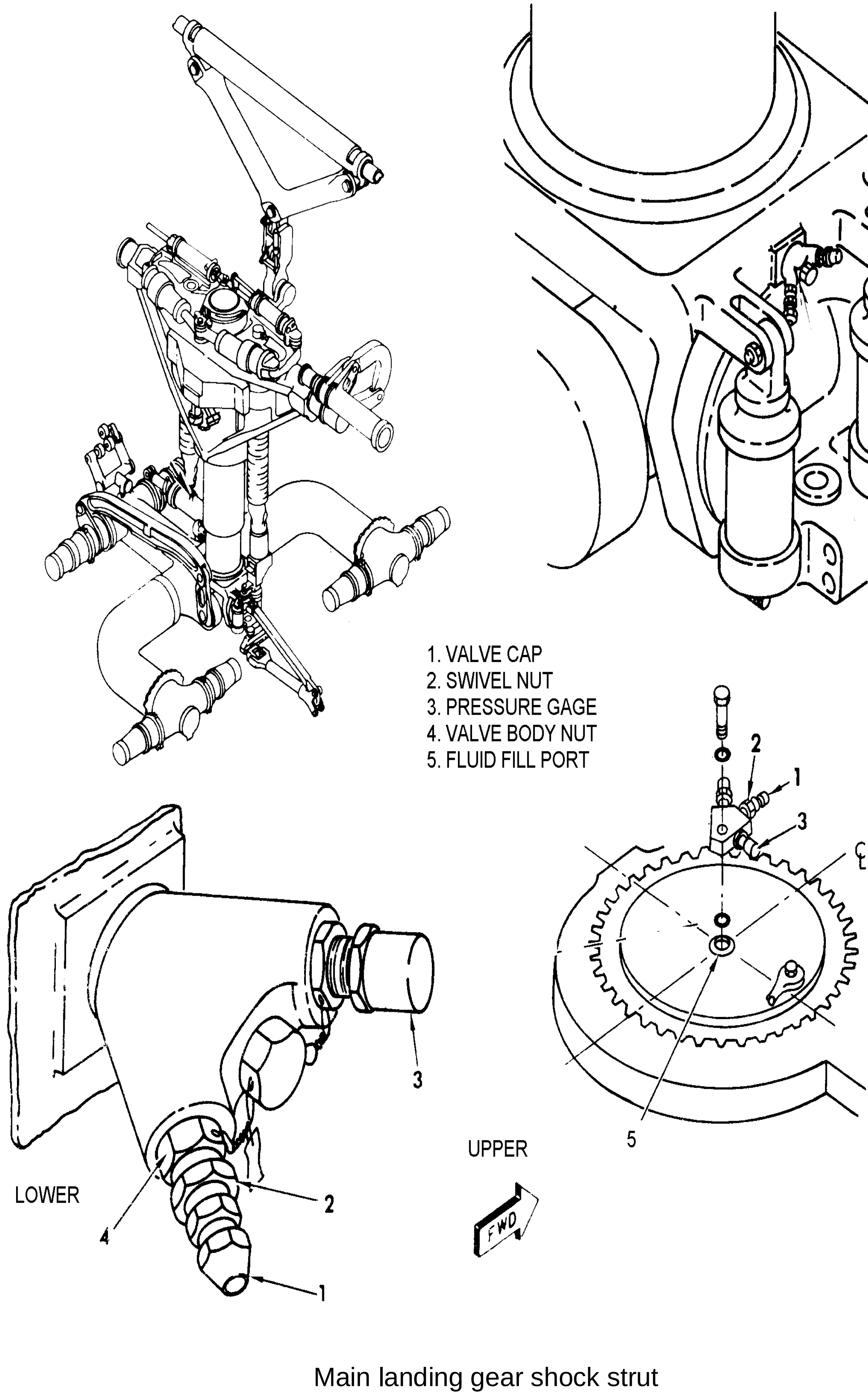
No. 4 Hydraulic system external connections



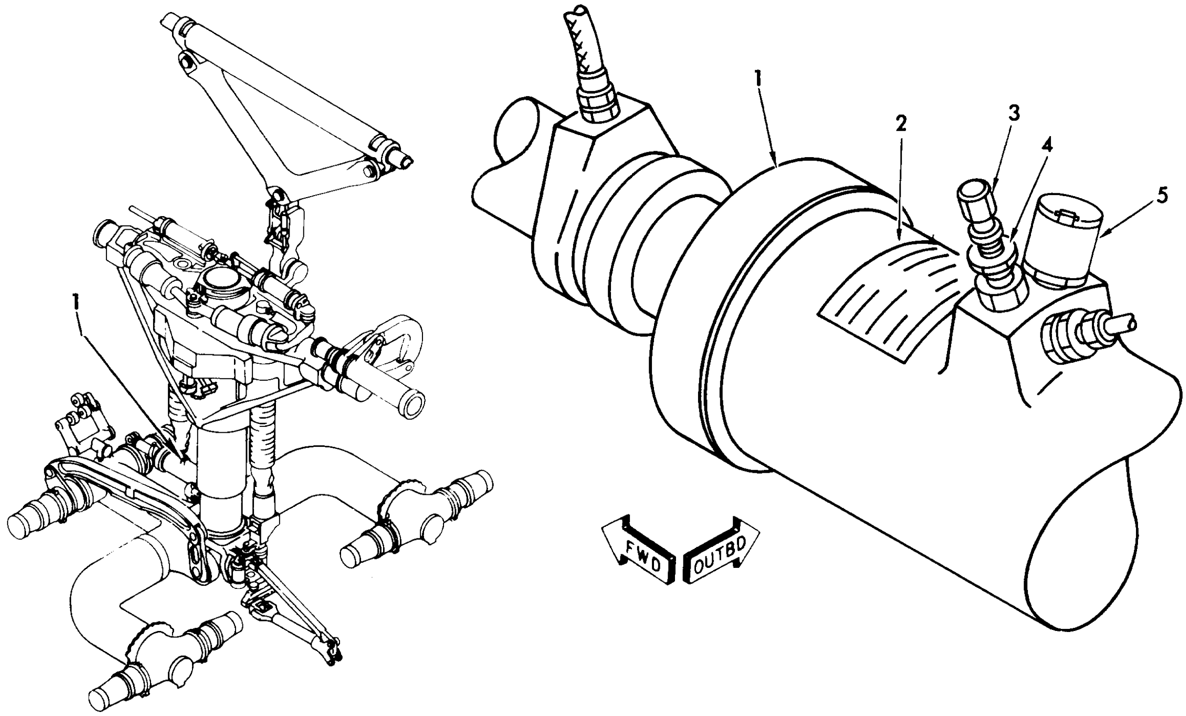
No. 3 Hydraulic system service center



Hydraulic system reservoirs



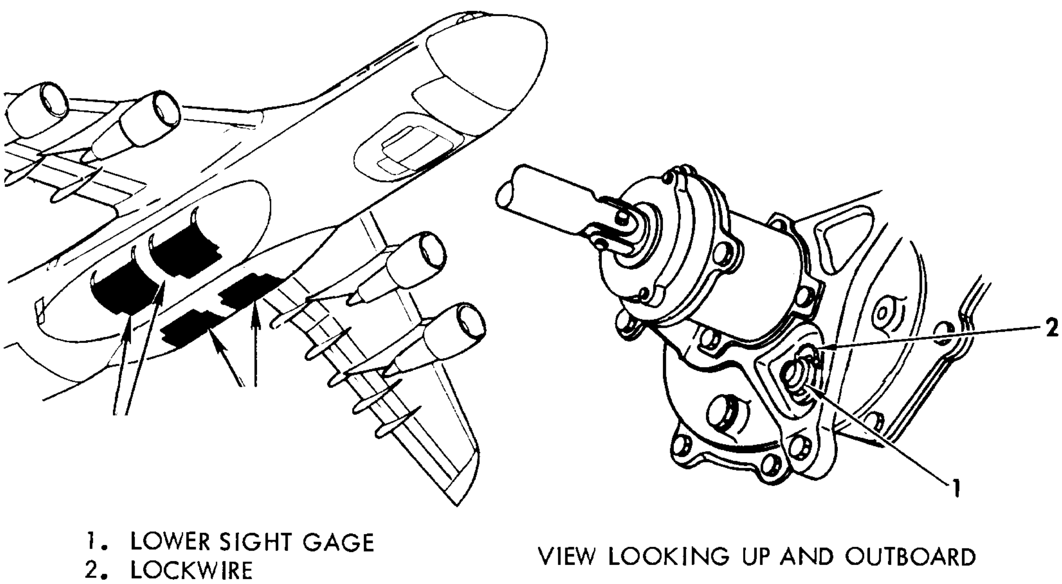
Main landing gear shock strut



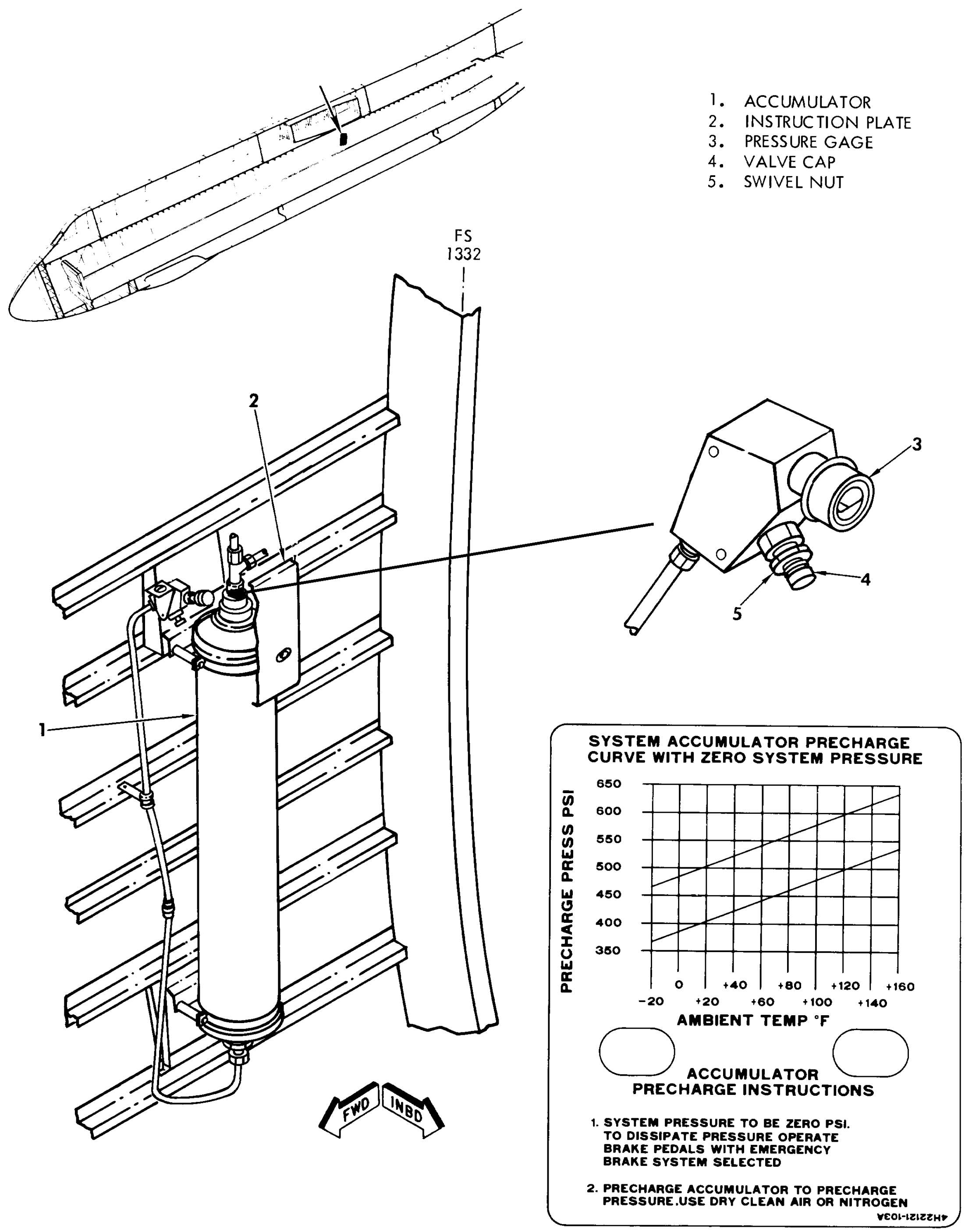
		TEMP °F	PRESS PSIG
DESIGNATION	4G11011-101		
SERIAL NO.			
PART NO.	4G11011-101D	-50	760
DESIGN CODE	98897	-20	820
STOCK NO.		+10	875
CYL ASSY-P POSITIONER MLG BOGIE		+40	930
CONTRACT	AF33(657)-15053	+70	990
MFR CODE		+100	1045
MFR BY		+130	1105

1. POSITION CYLINDER
2. IDENTIFICATION PLATE
3. VALVE CAP
4. SWIVEL NUT
5. PRESSURE GAGE

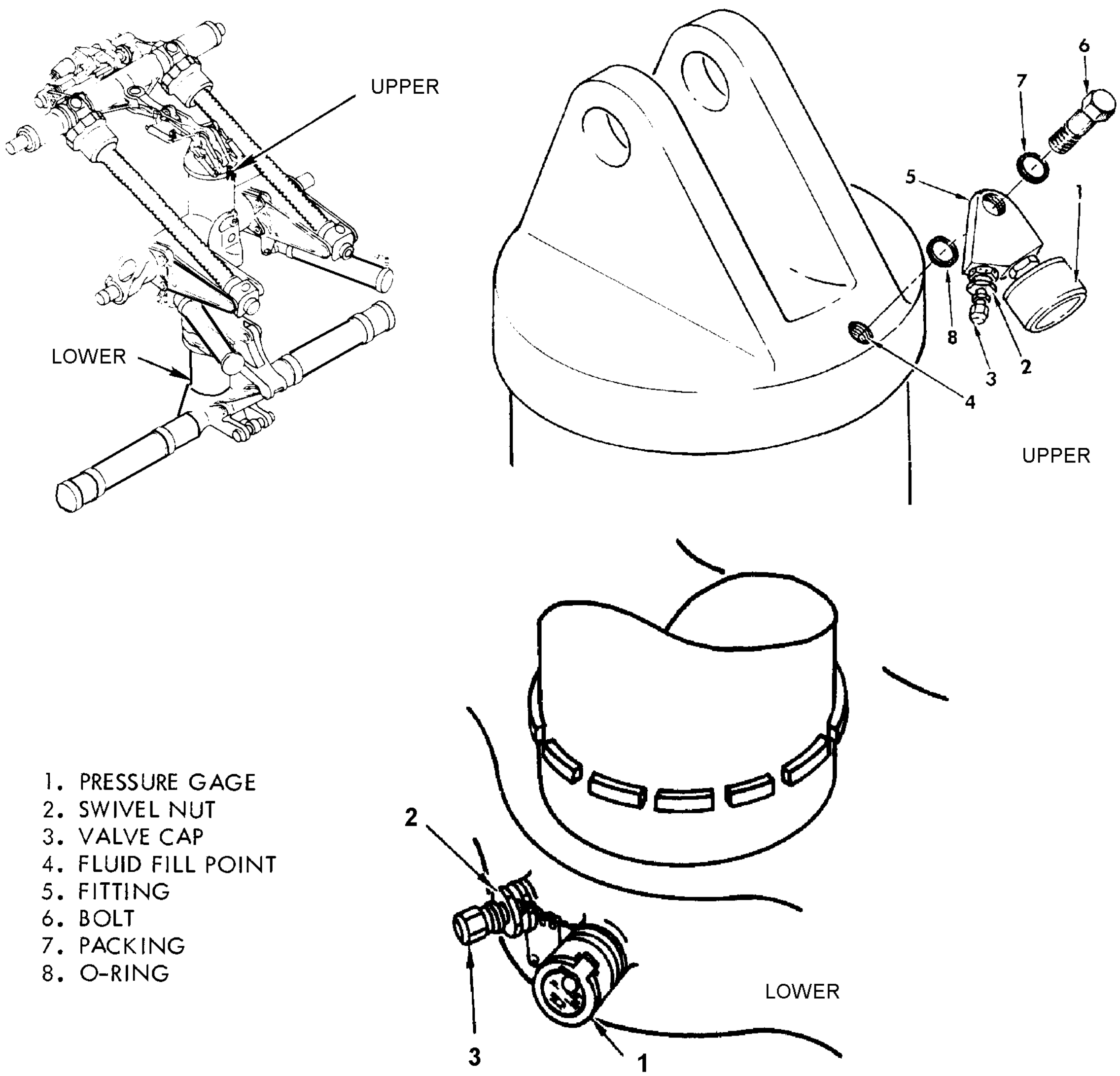
MLG bogie pitch positioner



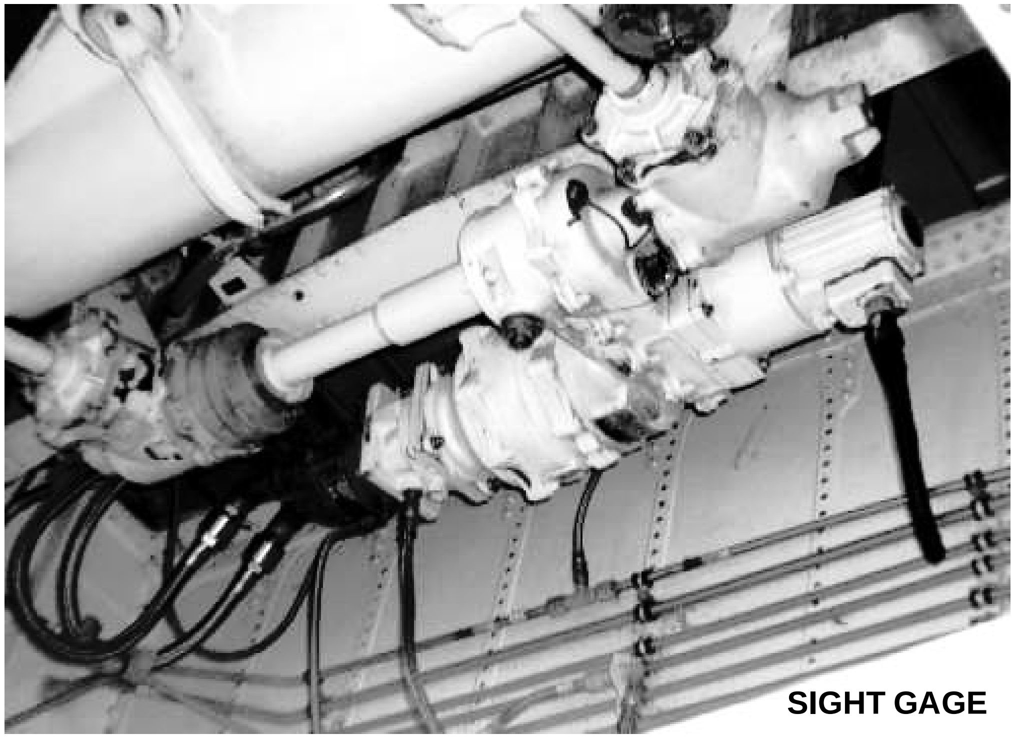
MLG and door actuation gearboxes



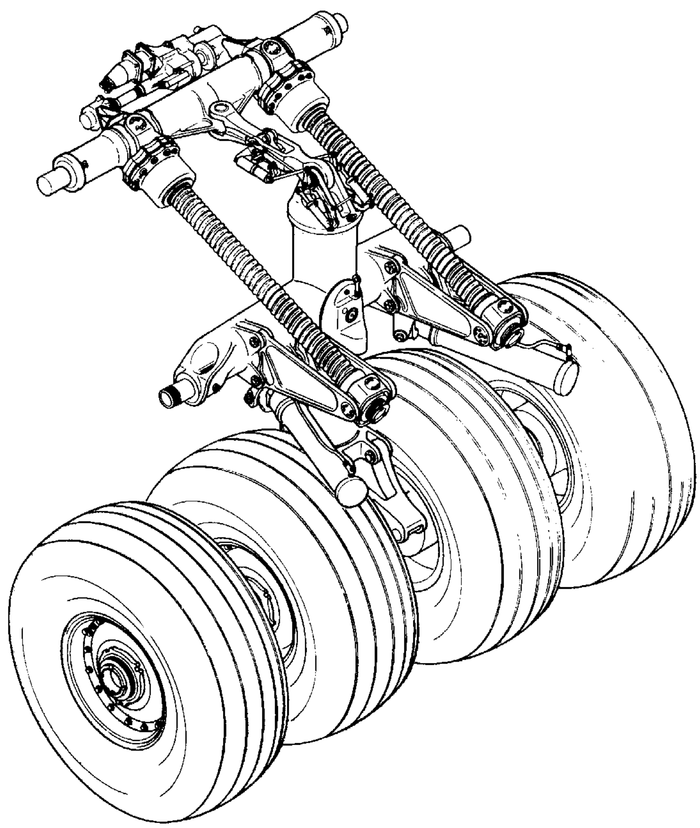
Parking brake accumulator



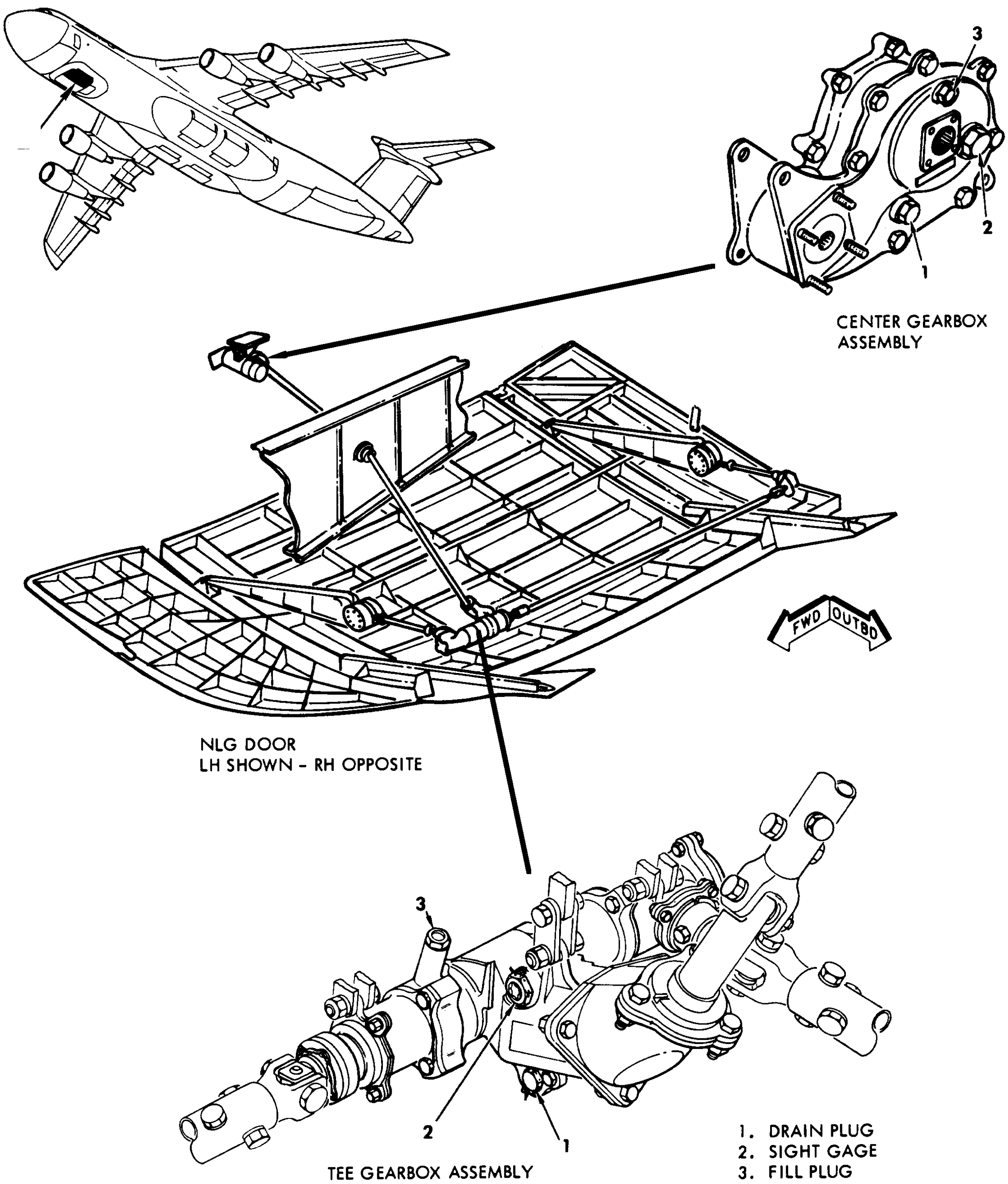
Nose landing gear strut



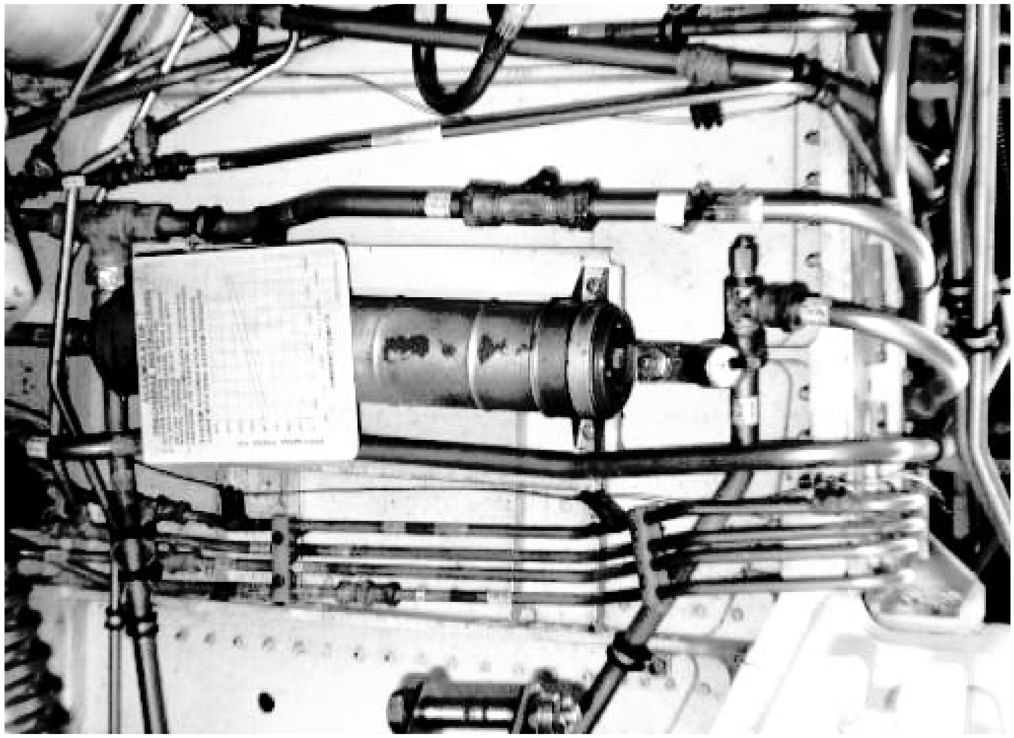
NLG overhead gearbox and brake assy

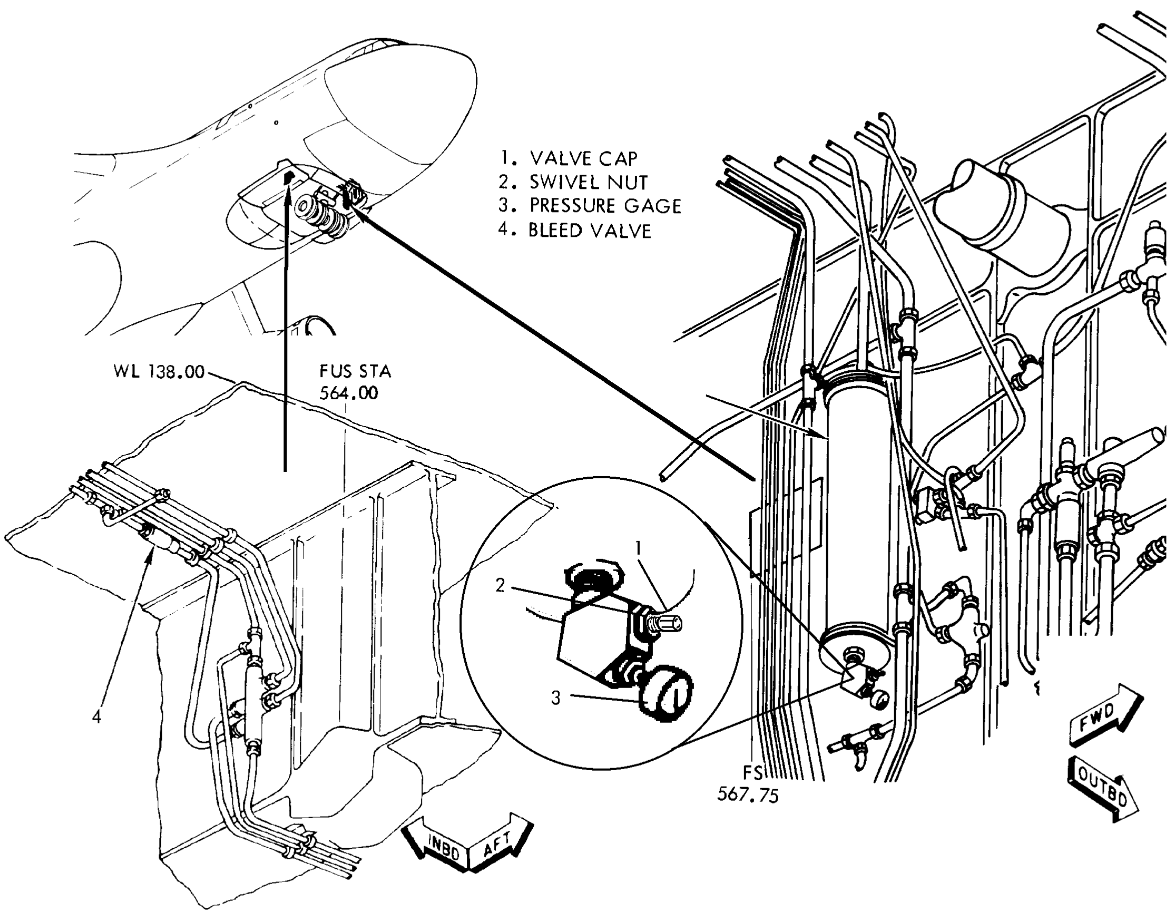


NLG retraction mechanism

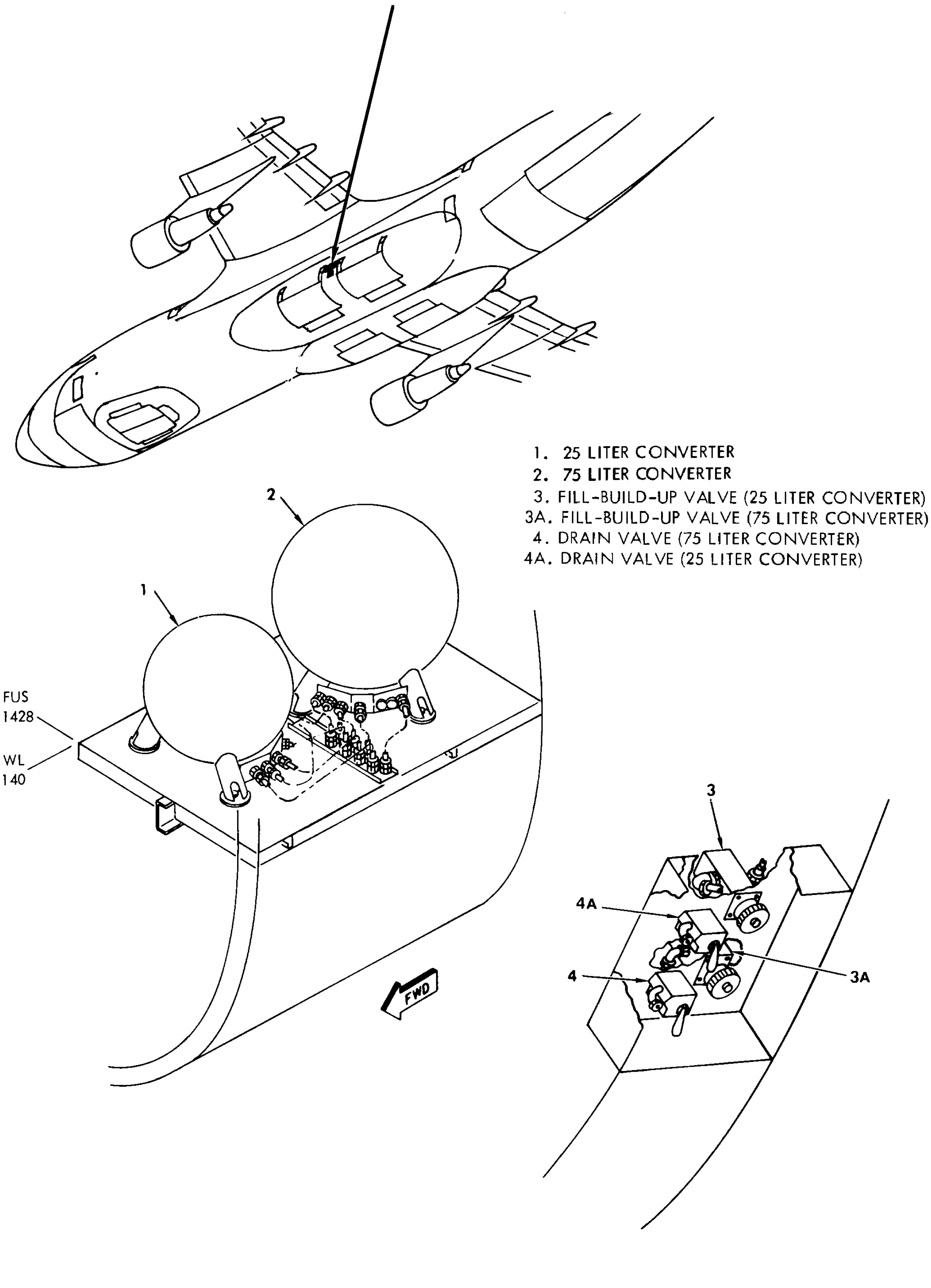


NLG door actuation system

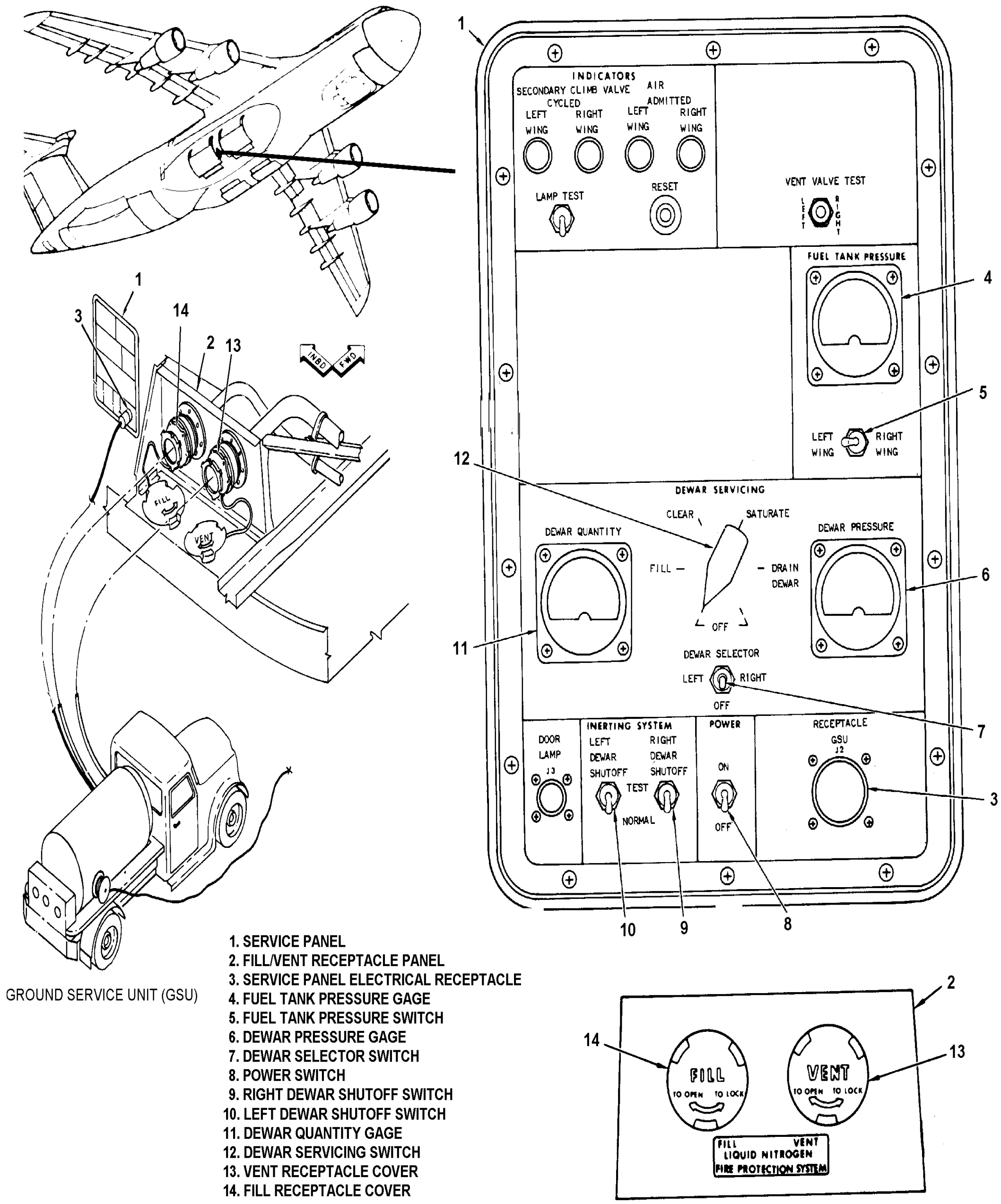




Nose landing gear steering accumulator

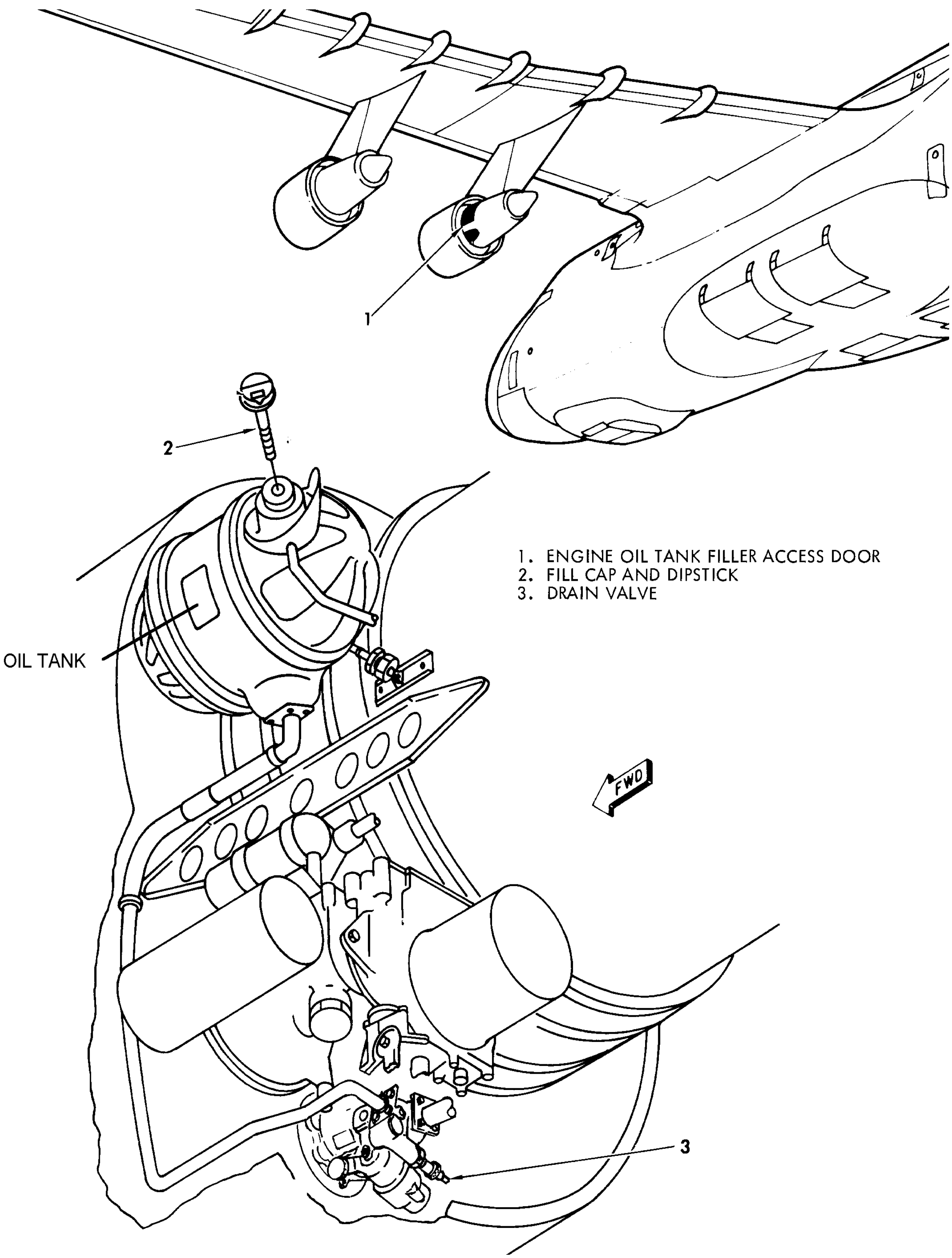


Oxygen system converters

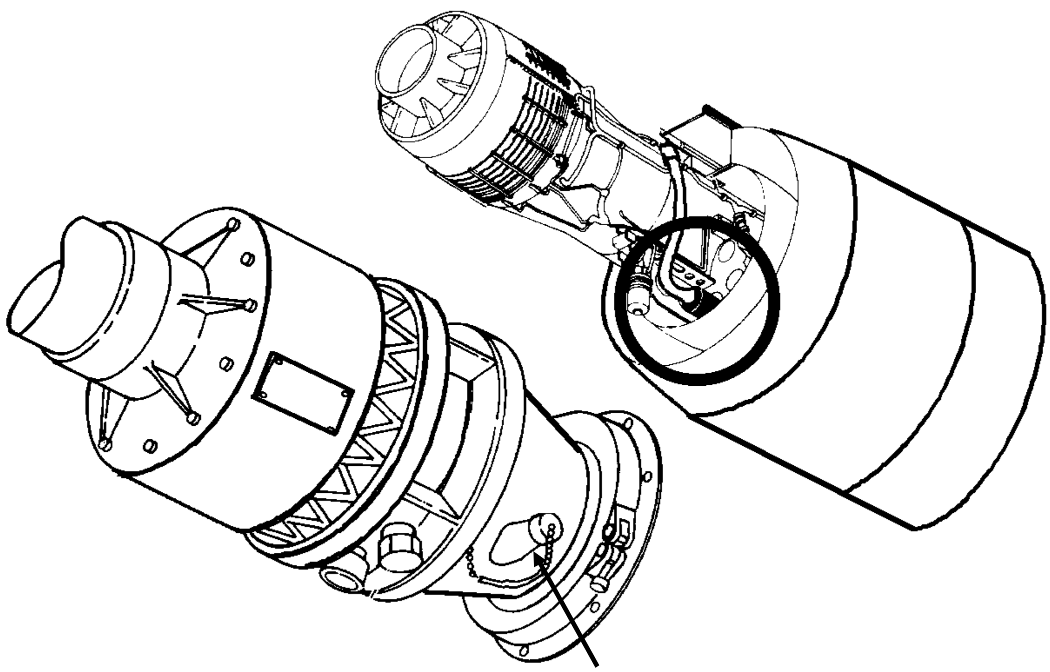


1. SERVICE PANEL
2. FILL/VENT RECEPTACLE PANEL
3. SERVICE PANEL ELECTRICAL RECEPTACLE
4. FUEL TANK PRESSURE GAGE
5. FUEL TANK PRESSURE SWITCH
6. DEWAR PRESSURE GAGE
7. DEWAR SELECTOR SWITCH
8. POWER SWITCH
9. RIGHT DEWAR SHUTOFF SWITCH
10. LEFT DEWAR SHUTOFF SWITCH
11. DEWAR QUANTITY GAGE
12. DEWAR SERVICING SWITCH
13. VENT RECEPTACLE COVER
14. FILL RECEPTACLE COVER

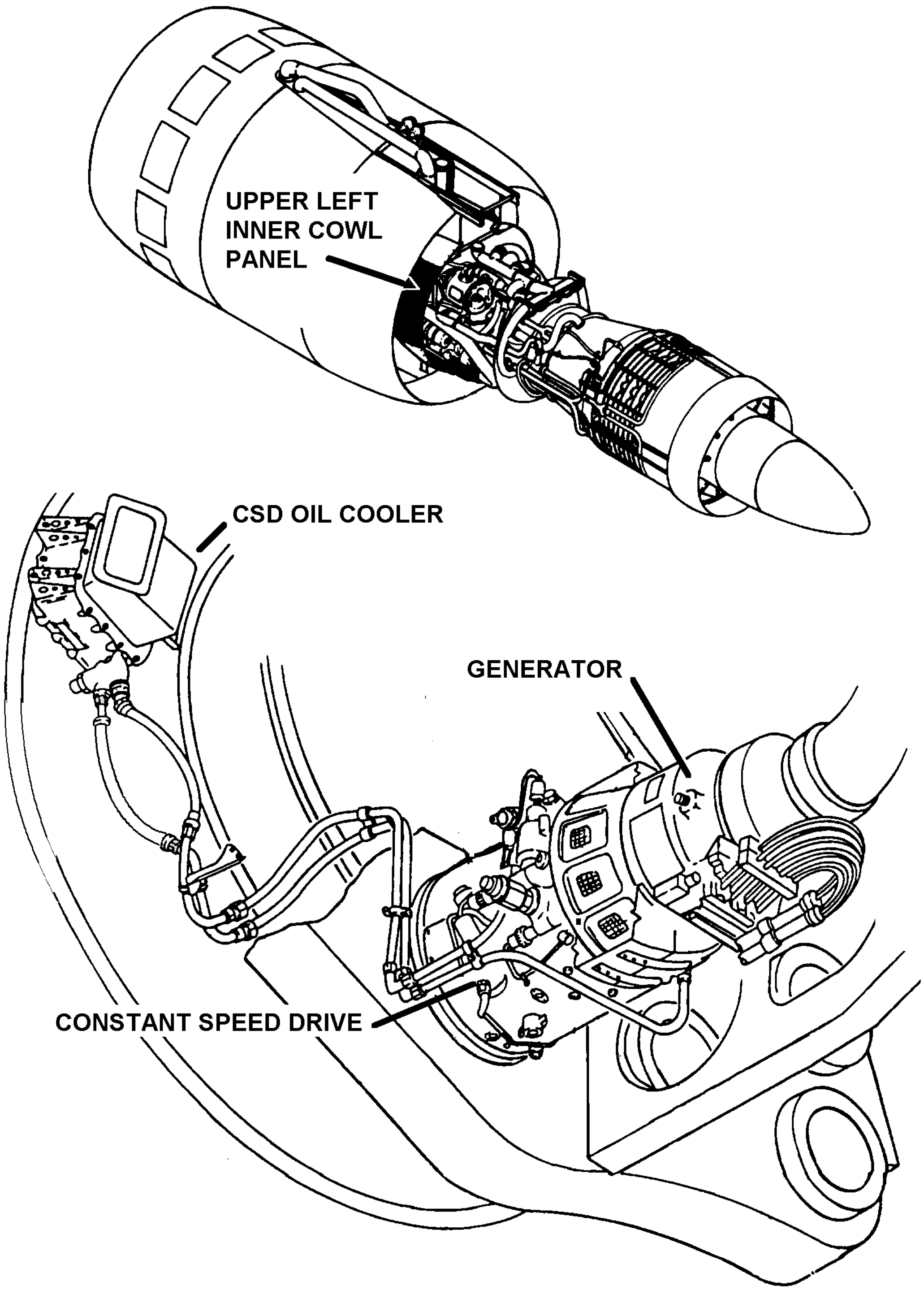
Nitrogen system servicing



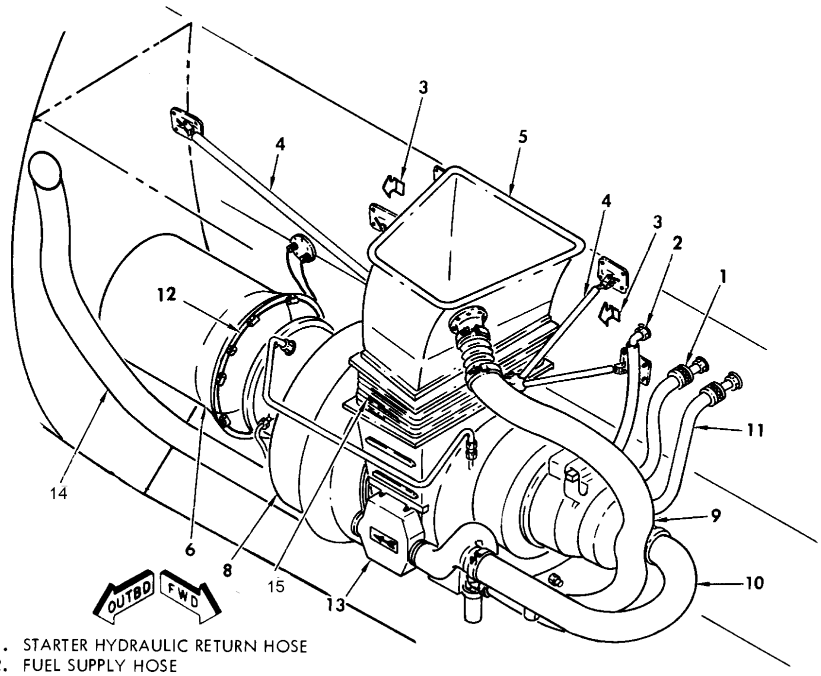
Engine oil tank servicing



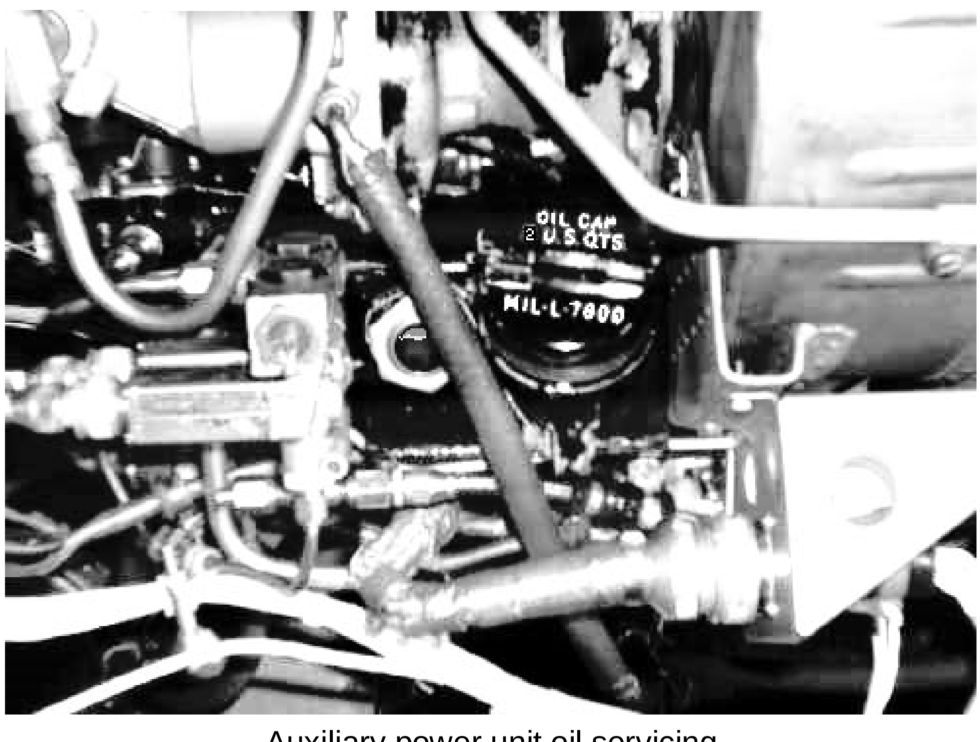
Engine starter



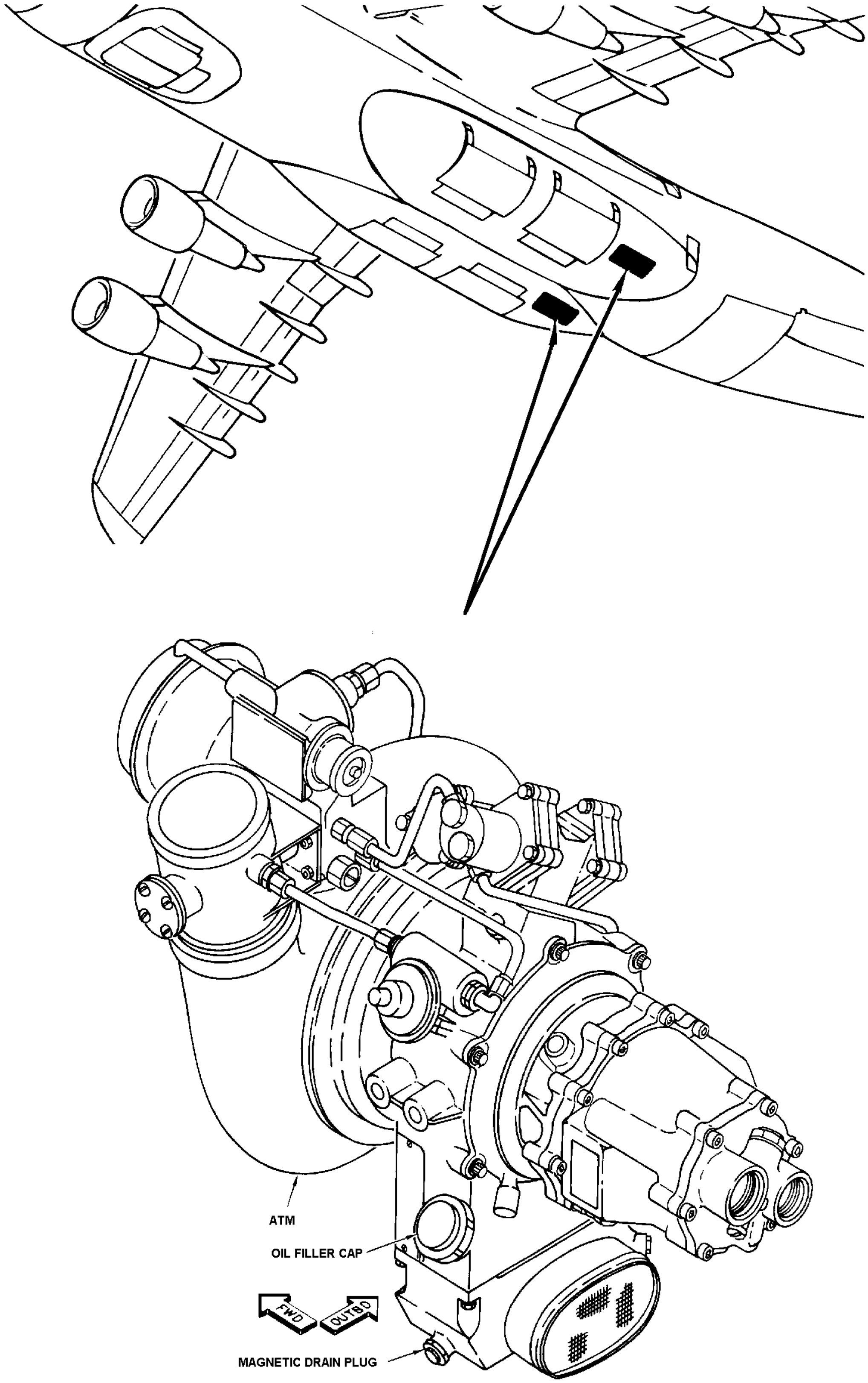
Engine constant speed drive and generator



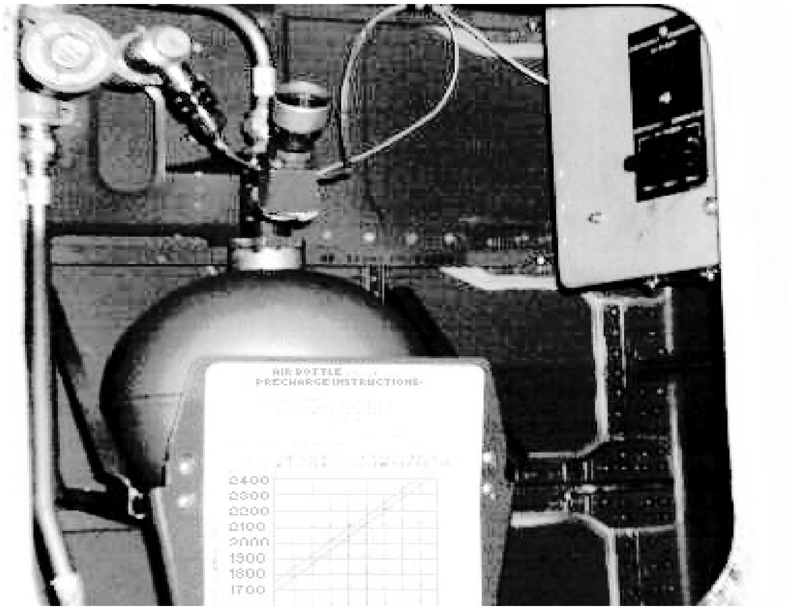
1. STARTER HYDRAULIC RETURN HOSE
2. FUEL SUPPLY HOSE
3. HOISTING UNIT CONNECTION
4. MOUNT ASSEMBLY
5. AIR INLET DUCT
6. EXHAUST DUCT
8. AUXILIARY POWER UNIT
9. COOLING AIR SUPPLY DUCT
10. GENERATOR COOLING AIR DUCT
11. STARTER HYDRAULIC PRESSURE HOSE
12. FIRE DETECTION SENSING ELEMENT
13. OIL COOLER
14. AIR TURBINE MOTOR EXHAUST DUCT
15. PLENUM FLEX DUCT

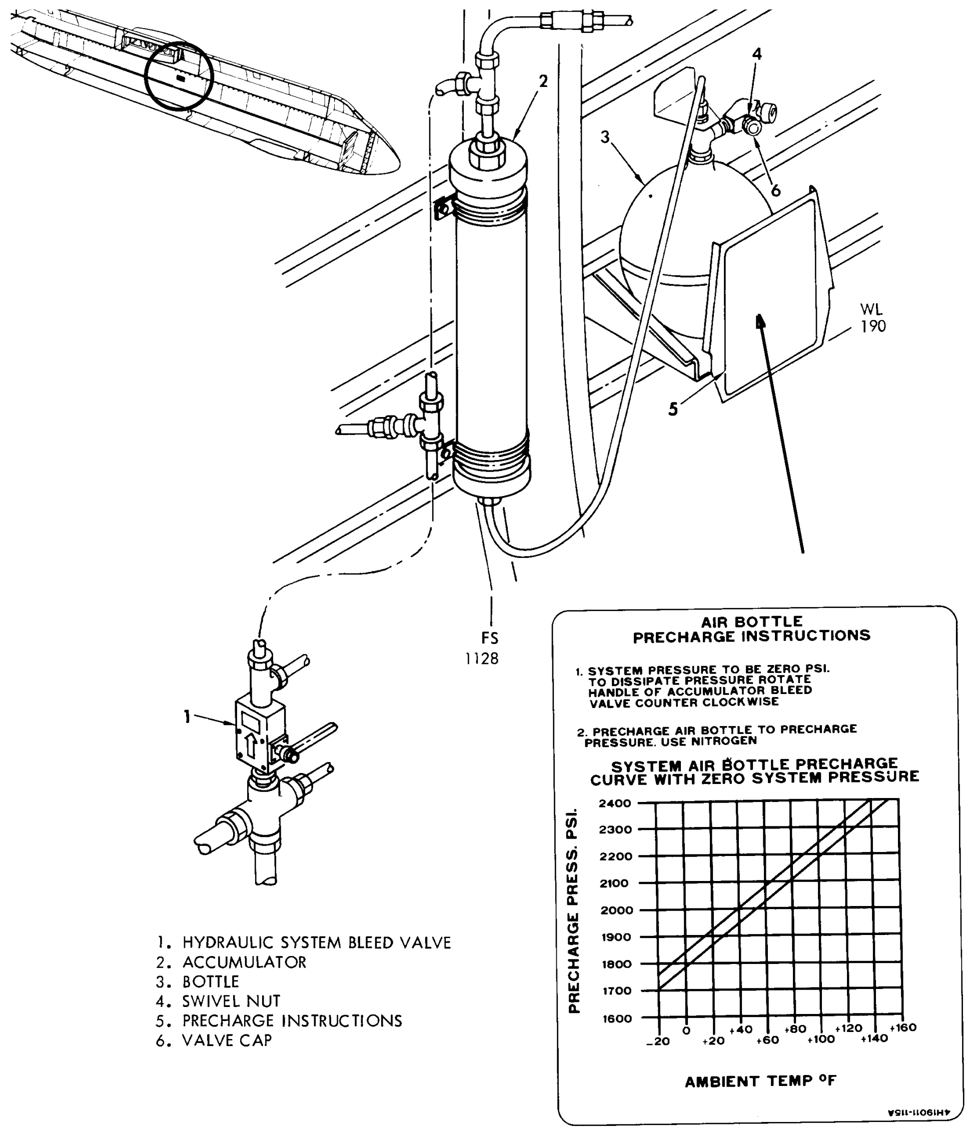


Auxiliary power unit oil servicing



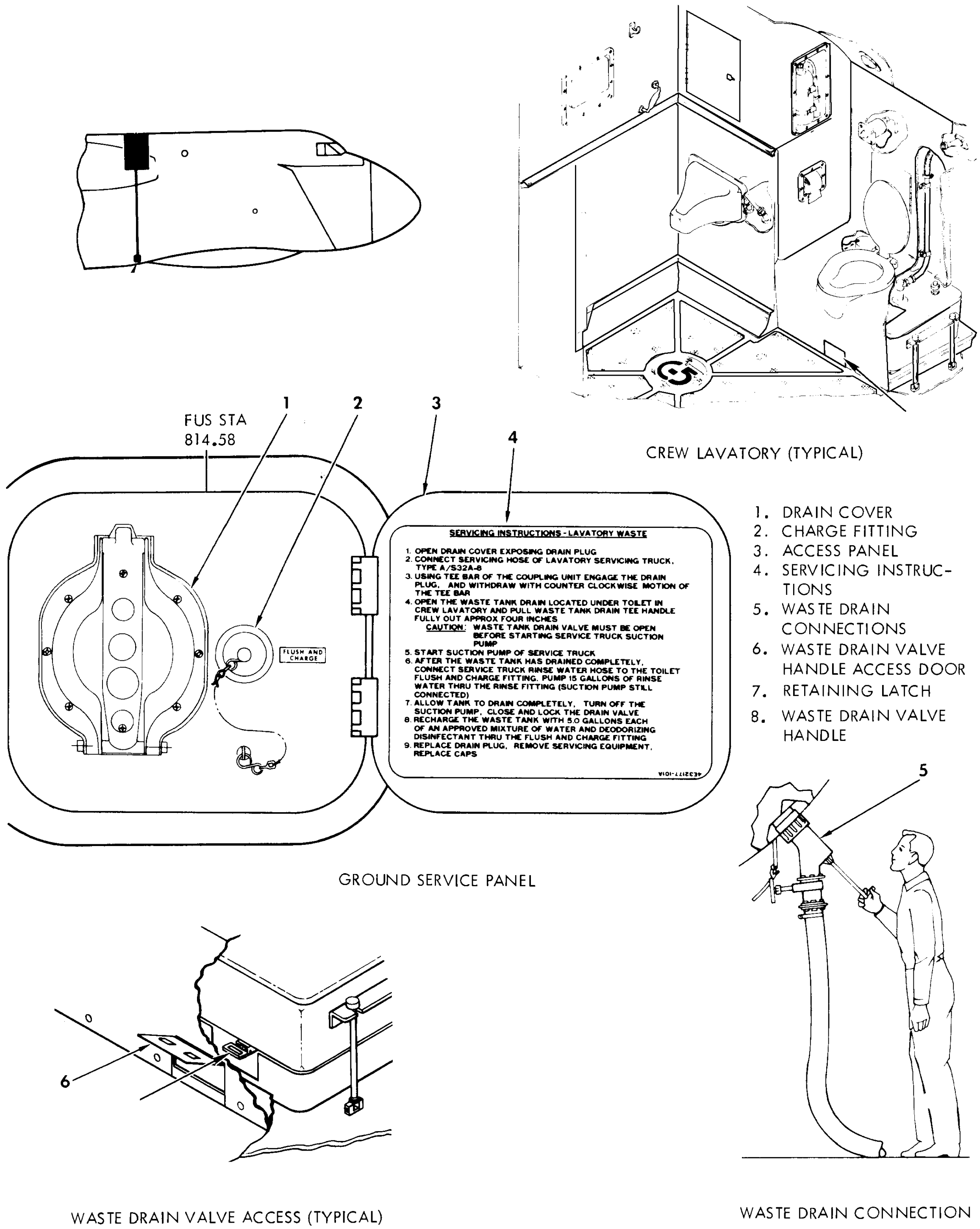
Air turbine motor servicing





Ram air turbine (RAT) accumulator

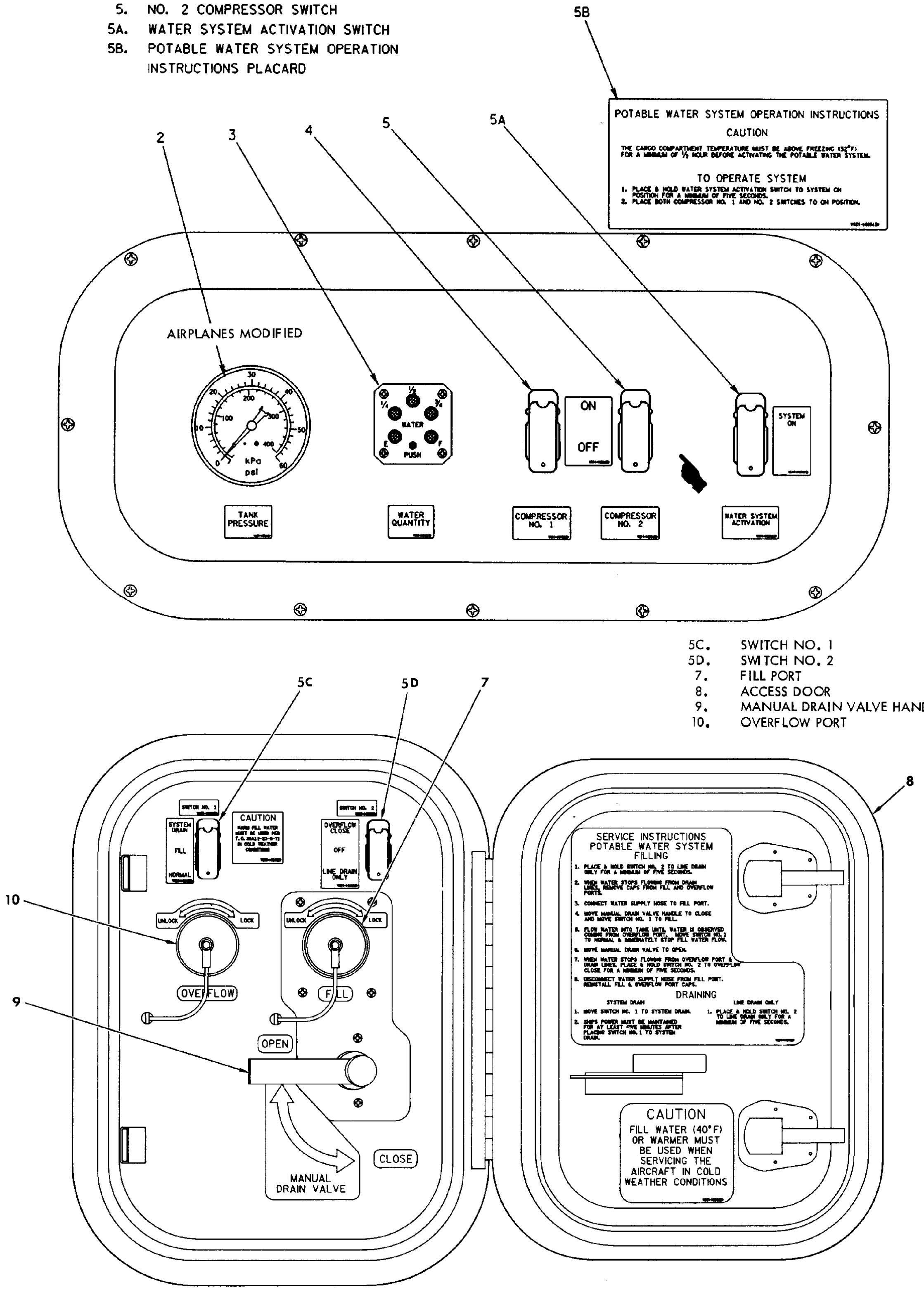
Pitot static system drain bottles



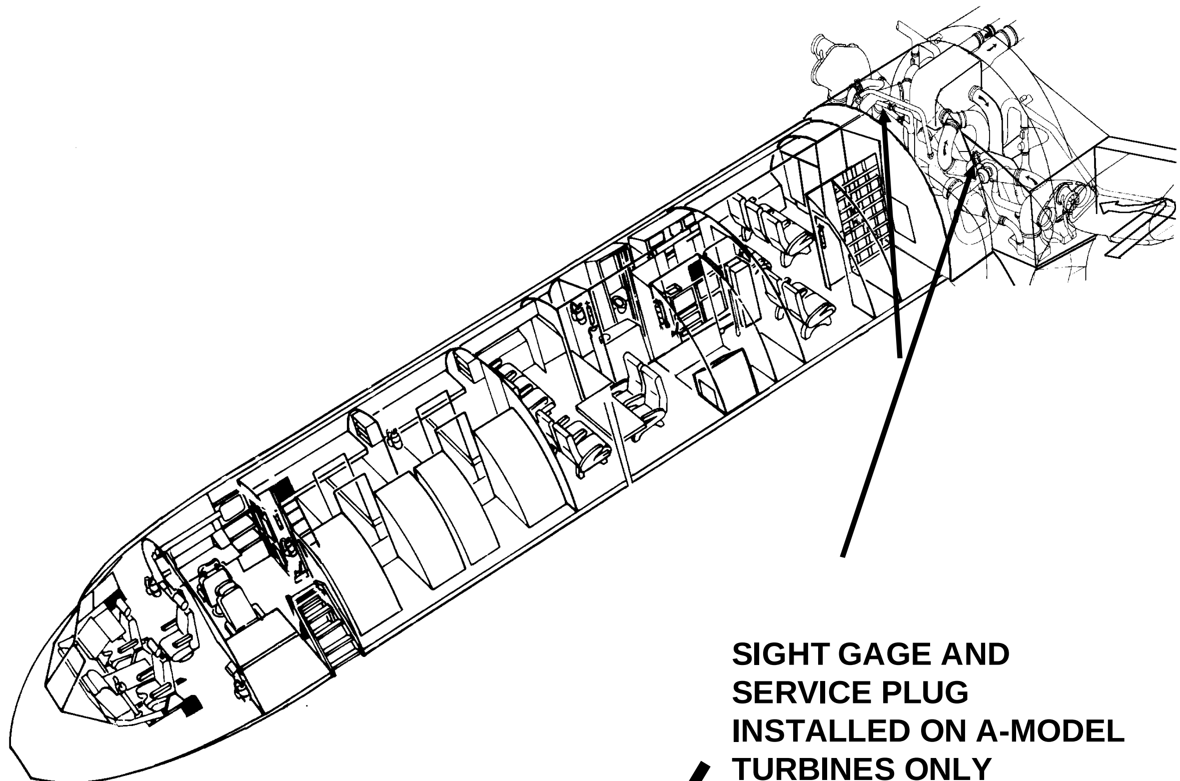
Lavatory servicing

2. WATER TANK PRESSURE GAUGE
3. WATER QUANTITY INDICATOR
4. NO. 1 COMPRESSOR SWITCH
5. NO. 2 COMPRESSOR SWITCH
5A. WATER SYSTEM ACTIVATION SWITCH
5B. POTABLE WATER SYSTEM OPERATION INSTRUCTIONS PLACARD

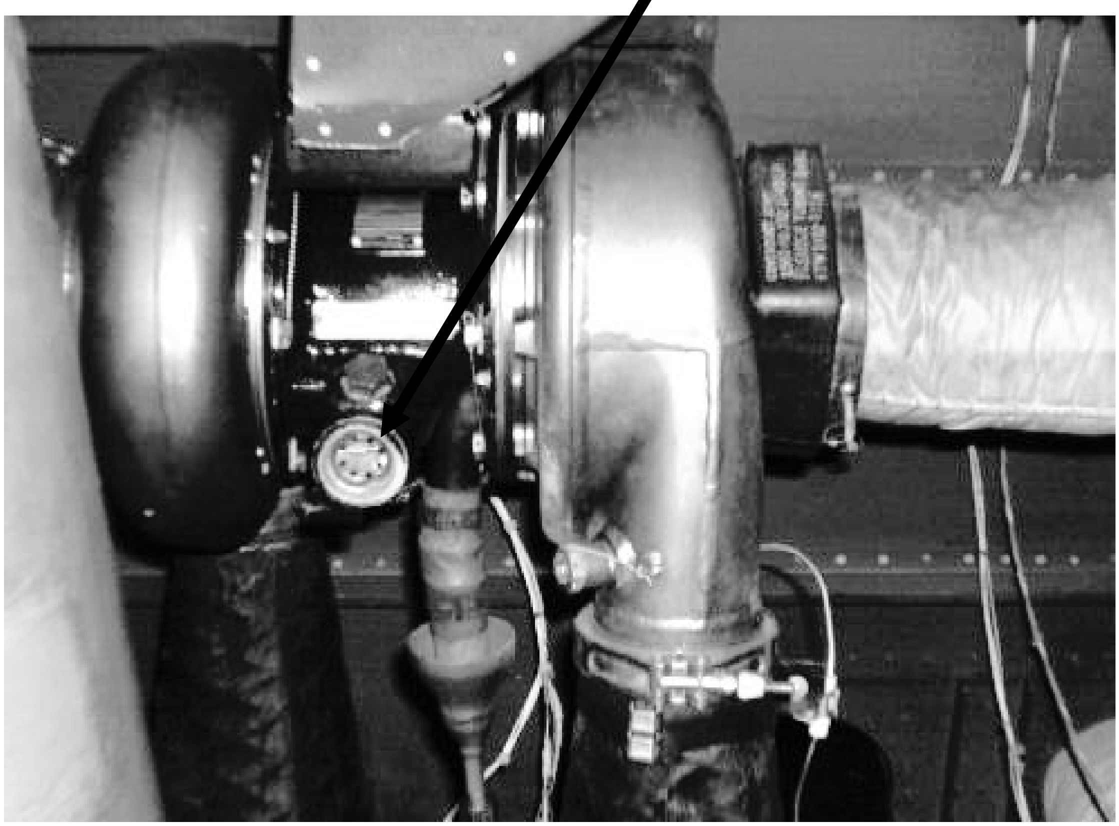
5C. SWITCH NO. 1
5D. SWITCH NO. 2
7. FILL PORT
8. ACCESS DOOR
9. MANUAL DRAIN VALVE HANDLE
10. OVERFLOW PORT



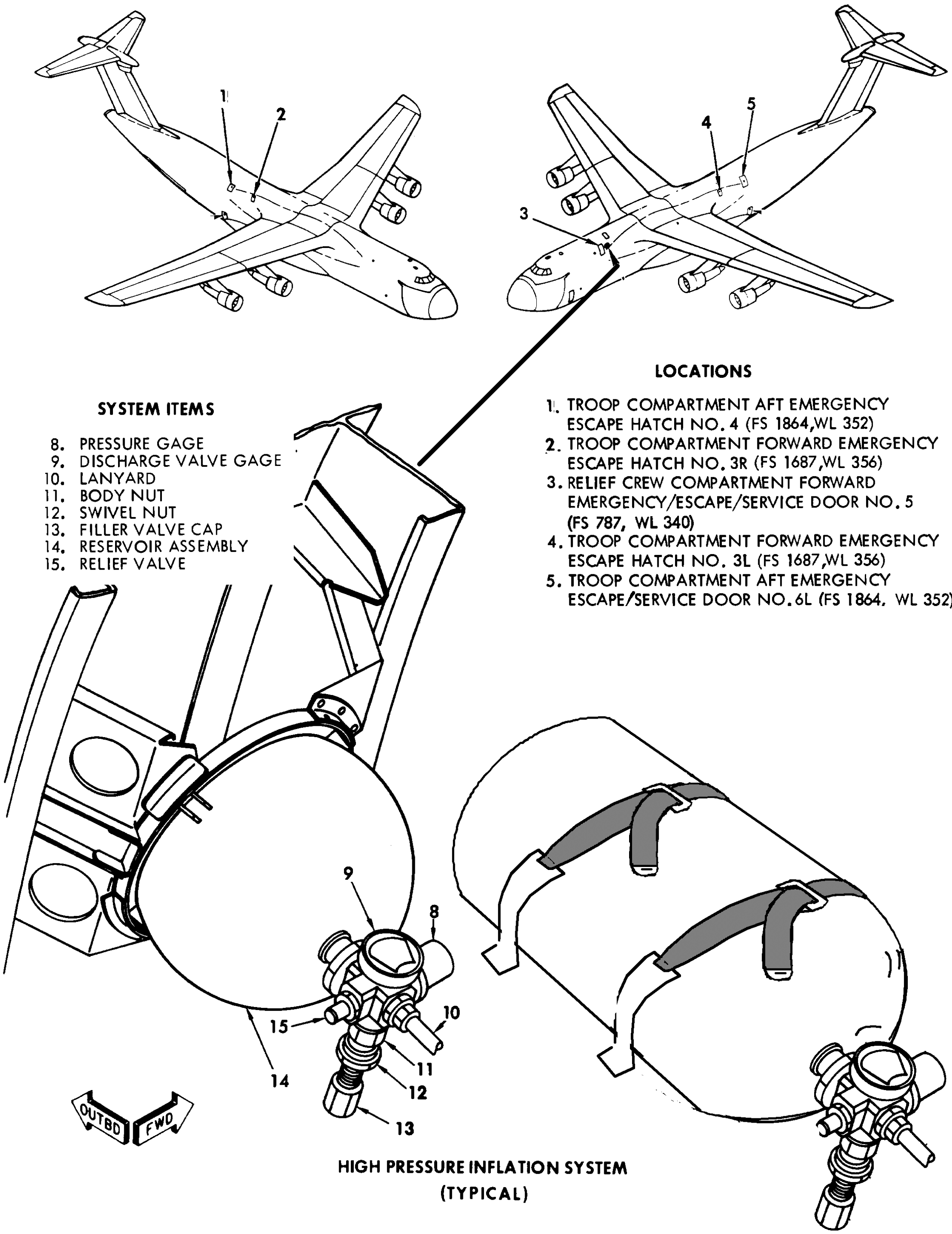
Potable water servicing provisions



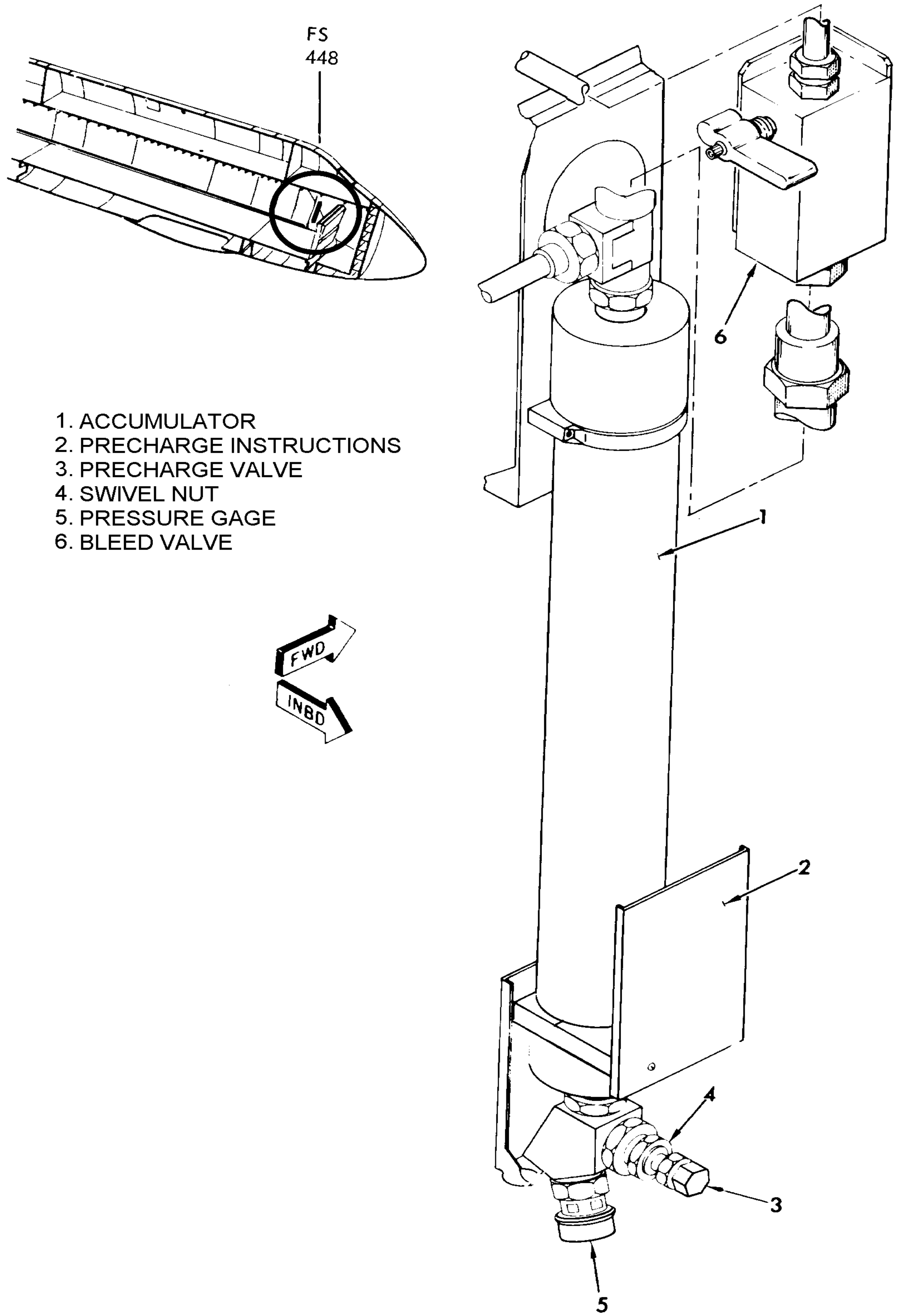
SIGHT GAGE AND SERVICE PLUG INSTALLED ON A-MODEL TURBINES ONLY



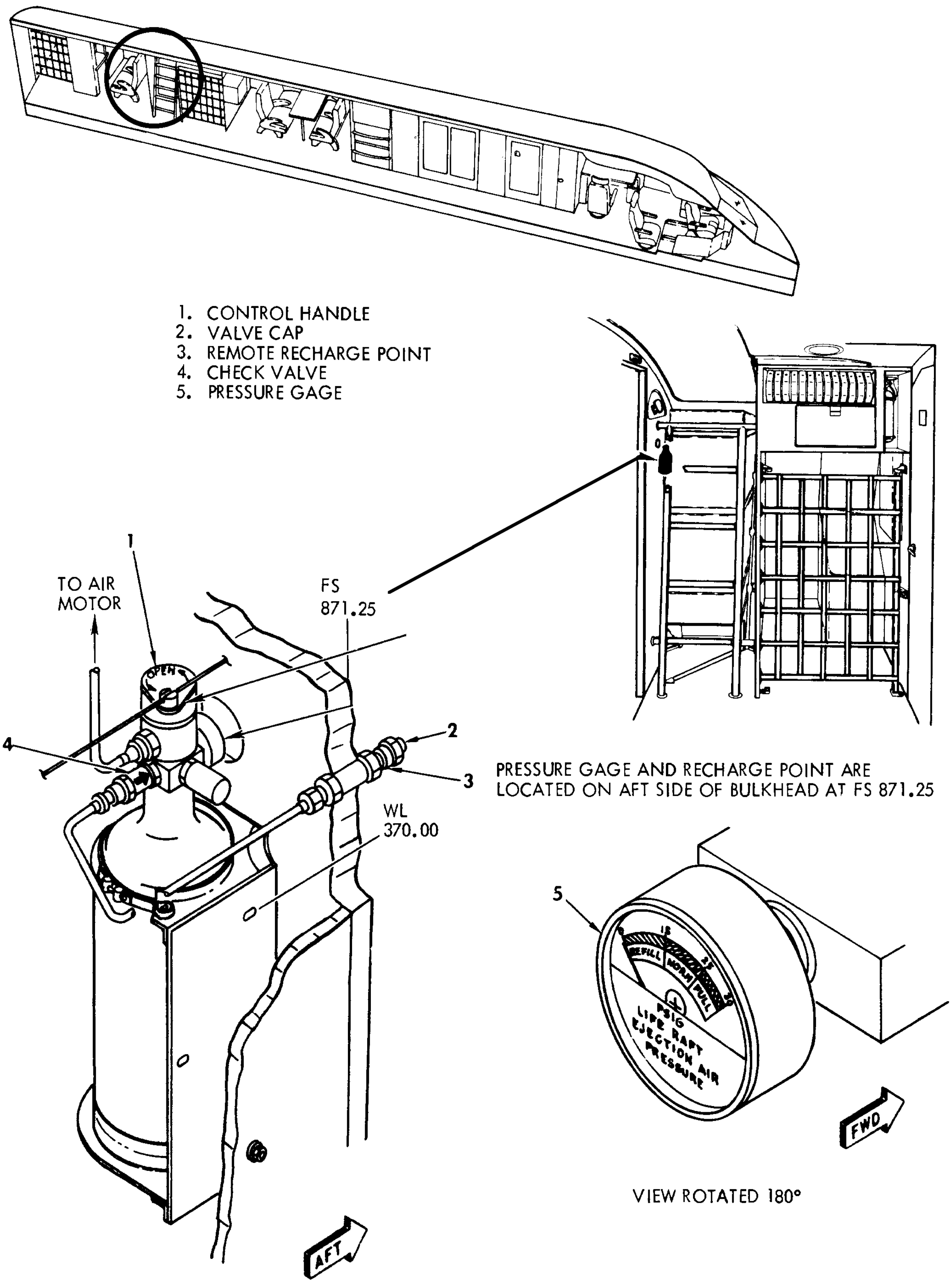
Cooling turbine (not modified)



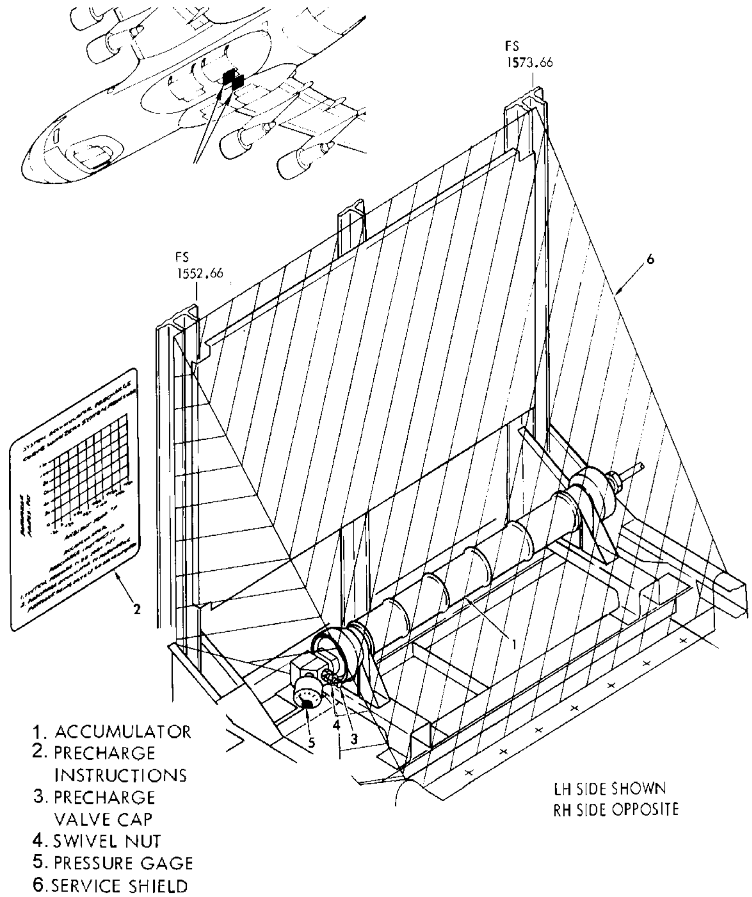
Escape slide service bottle locations

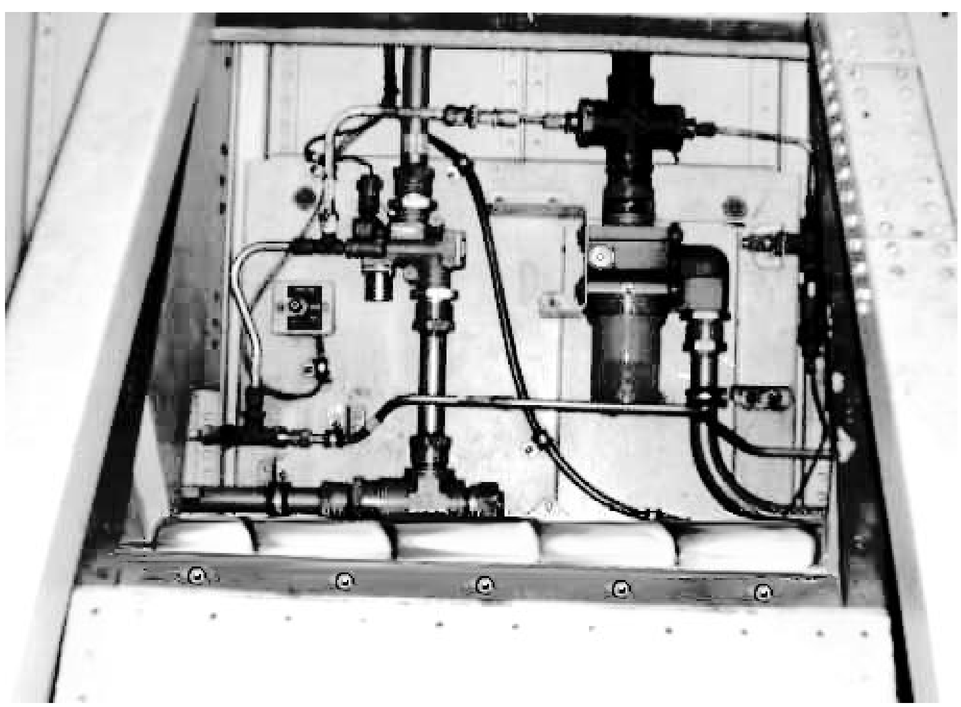


Crew door accumulator



Relief crew life raft ejection bottle





Air turbine motor (ATM) accumulator

BLANK

GENERAL LUBRICATION INFORMATION

Clean all lubricated surfaces to make sure they are free from moisture, solvents, and other contaminants. Never apply a lubricant over a rusted or corroded surface. Take adequate precautions during the handling of highly finished surfaces to prevent contamination by body moisture or other agents. Never heat or melt a lubricating grease to aid application.

Solid Film Dry Lubricants

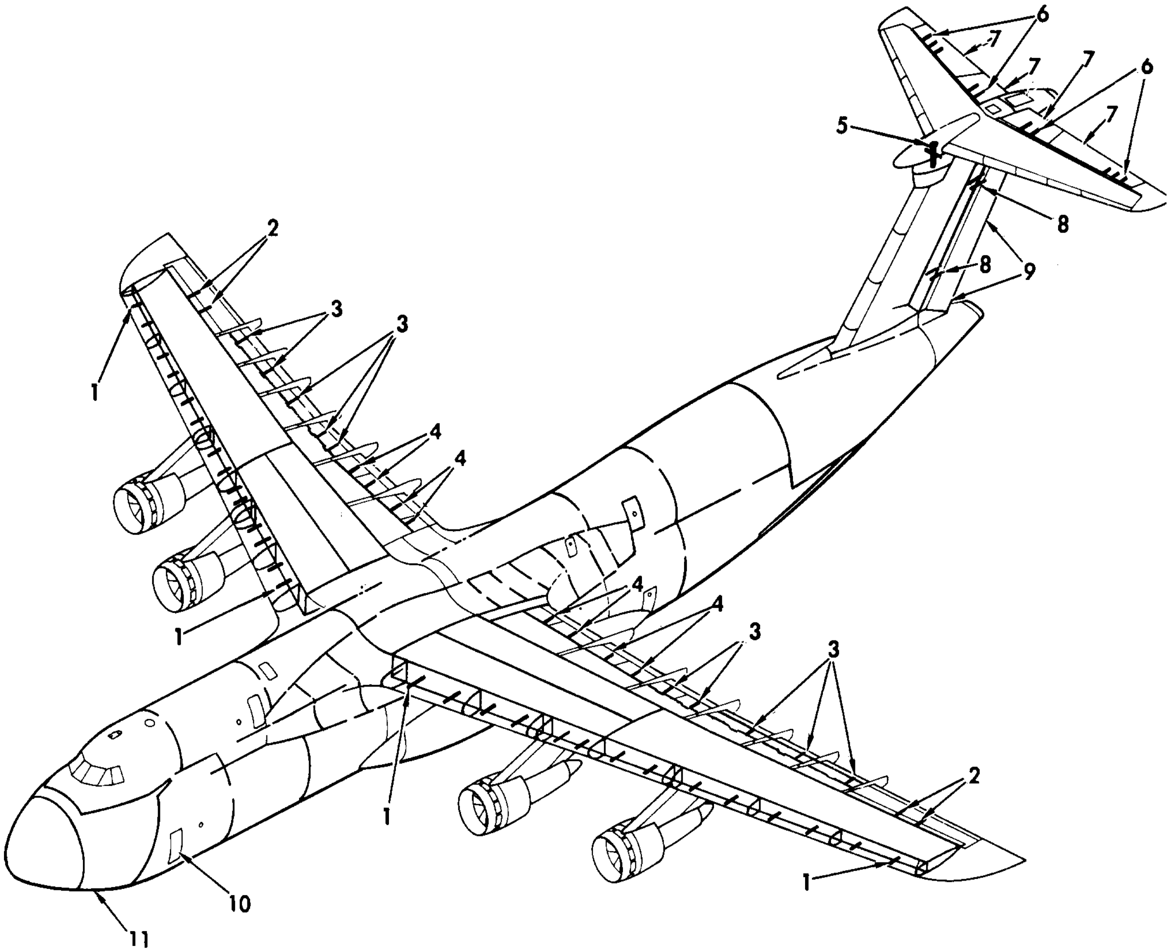
Solid film dry lubricants are used to lubricate parts and areas susceptible to wear caused by dust, grit, or metal particles which adhere to exposed oil and grease. Dry film lubricant can be identified by the characteristic dark gray color which will rub off slightly and leave a graphite mark on paper or cloth. Solid film dry lubricants are applied during manufacture by a heat cure process. Specification MIL-L-46010 heat-cured solid film lubricant is used on slat and flap guide tracks, main landing gear guide tracks, door latches, latch pins, bolts, hinges, hinge pins, etc., to reduce wear and prevent seizing and galling of parts where wet lubricant is objectionable. Specification MIL-L-46147 air drying solid film lubricant is used on parts which cannot withstand cure temperatures greater than 300 degrees F such as plastic parts and some aluminum alloys. When the solid film lubricant is damaged or worn through, it can be repaired by applying Specification MIL-L-46147 air drying solid film lubricant.

Preservative Compounds

Preservative compounds are used on fittings, hinges, hinge supports, actuator rods, springs, bushings, etc., for general purpose corrosion prevention. Specification MIL-C-16173 hard film lubricant is used on external surfaces of such parts where drying by solvent evaporation can be accomplished.

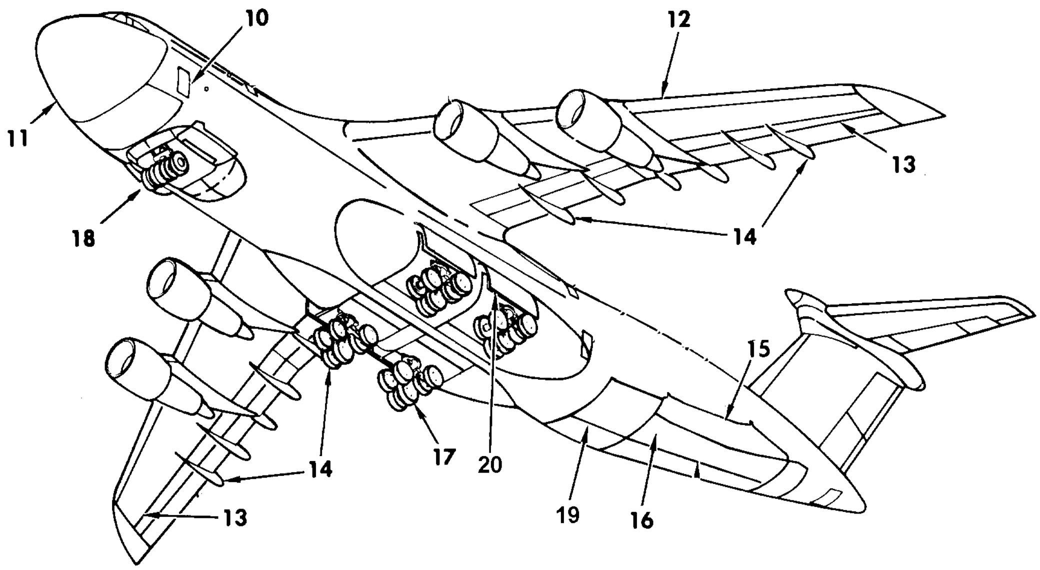
One-time Lubrication

Synthetic base grease containing a gelling agent is used on seals, etc., which are removed and replaced during maintenance operations.



INDEX NUMBER	NOMENCLATURE
1	LEADING EDGE SLAT SYSTEM ACTUATOR LUBRICATION
2	AILERON SERVO LUBRICATION
3	FLIGHT SPOILER SERVO LUBRICATION
4	GROUND SPOILER ACTUATOR LUBRICATION
5	PITCH TRIM ACTUATOR LUBRICATION
6	ELEVATOR SERVO LUBRICATION
7	ELEVATOR STRUCTURE LUBRICATION
8	RUDDER SERVO LUBRICATION
9	RUDDER STRUCTURE LUBRICATION
10	CREW DOOR LUBRICATION
11	VISOR DOOR LUBRICATION

Airplane lubrication index (1 of 3)



INDEX NUMBER	NOMENCLATURE
12	WING LEADING EDGE STRUCTURE LUBRICATION
13	WING TRAILING EDGE STRUCTURE LUBRICATION
14	TRAILING EDGE FLAP ACTUATOR LUBRICATION
15	AFT CARGO SIDE DOOR LUBRICATION
16	AFT CARGO CENTER DOOR LUBRICATION
17	MLG LUBRICATION
18	NLG LUBRICATION
19	AFT RAMP LUBRICATION
20	MLG DOOR OUTBOARD ACTUATOR LUBRICATION

Airplane lubrication index (2 of 3)

TABLE OF LUBRICANTS

SYMBOL	NATO NUMBER	SPECIFICATION	TYPE OF LUBRICANT
GMD	G-353	MIL-G-21164	MOLYBDENUM DISULFIDE GREASE (LOW AND HIGH TEMPERATURE)
GIA	G-354	MIL-G-23827	GREASE, AIRCRAFT AND INSTRUMENT, GEAR AND ACTUATOR SCREW
WTR	G-395	MIL-G-81322	GREASE, AIRCRAFT, GENERAL PURPOSE, WIDE TEMPERATURE RANGE
BRH	G-372	MIL-G-25013	GREASE, AIRCRAFT, BALL AND ROLLER BEARING
△1 OHA	△2 H-537	MIL-H-83282	HYDRAULIC FLUID, FIRE RESISTANT, SYNTHETIC, HYDROCARBON BASE, AIRCRAFT
△1	0-156	MIL-L-23699	LUBRICATING OIL, AIRCRAFT TURBINE ENGINES, SYNTHETIC BASE
△1 OGP	△2 0-142	MIL-L-7870	LUBRICATING OIL, GENERAL PURPOSE, (LOW TEMPERATURE)
△1	△2	GE SPEC A50TF79	SOLID FILM LUBRICANT MOLY-DISULFIDE (COMMERCIAL NAME - SPRAY-KOTE; VENDOR-DOW CORNING CORP., MIDLAND, MICHIGAN; FMC-71984)
PL - SPECIAL	0-190	VV-L-800	LUBRICATING OIL, GENERAL PURPOSE PRESERVATIVE, (WATER DISPLACING, LOW TEMPERATURE
GOB	G-366	MIL-G-25537	GREASE, AIRCRAFT, HELICOPTER OSCILLATING BEARINGS
OAI	0-147	MIL-L-6085	LUBRICATION OIL, INSTRUMENT, AIRCRAFT, LOW VOLATILITY
LGT	0-148	MIL-L-7808	LUBRICATING OIL, AIRCRAFT TURBINE ENGINE, SYNTHETIC BASE
△1	△2	MIL-L-46147	SOLID FILM LUBRICANT (SPRAY/AIR DRY) NSN 9150-00-168-2000
△1	△2	MIXTURE	THIS LUBRICANT CONSISTS OF A MIXTURE OF 5 PARTS OF SPECIFICATION MIL-G-23827 GREASE AND I PART SPECIFICATION MIL-L-7808 LUBRICATING OIL

△1 SYMBOL NOT LISTED IN MIL-HDBK-275A DATED 29 JUNE 1976.

△2 NATO NUMBERS NOT LISTED IN MIL-HDBK-275A DATED 29 JUNE 1976.

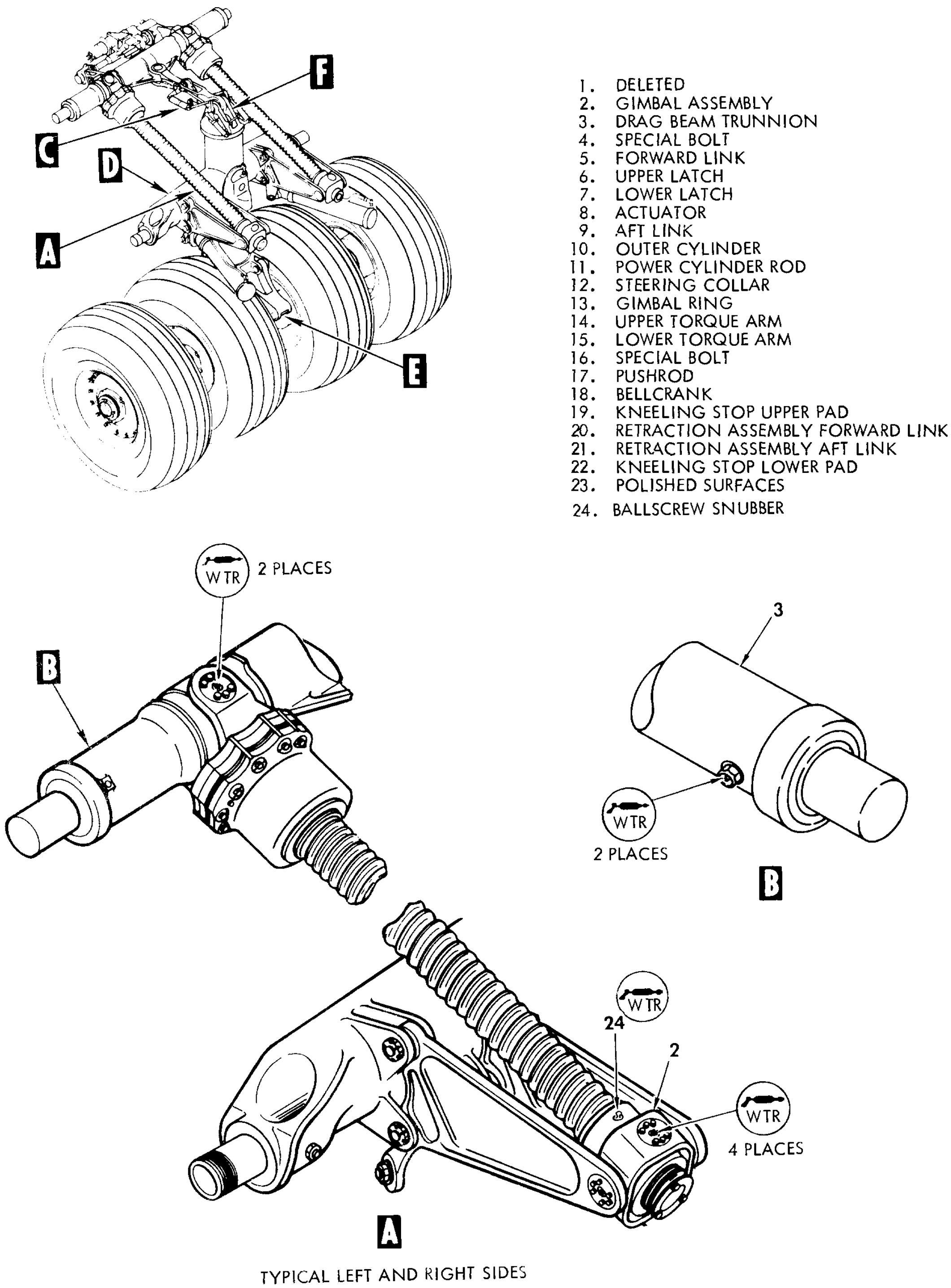
APPLICATION SYMBOLS

HAND   BRUSH   OIL CAN   SPRAY CAN   GREASE GUN

LUBRICATION APPLICATION

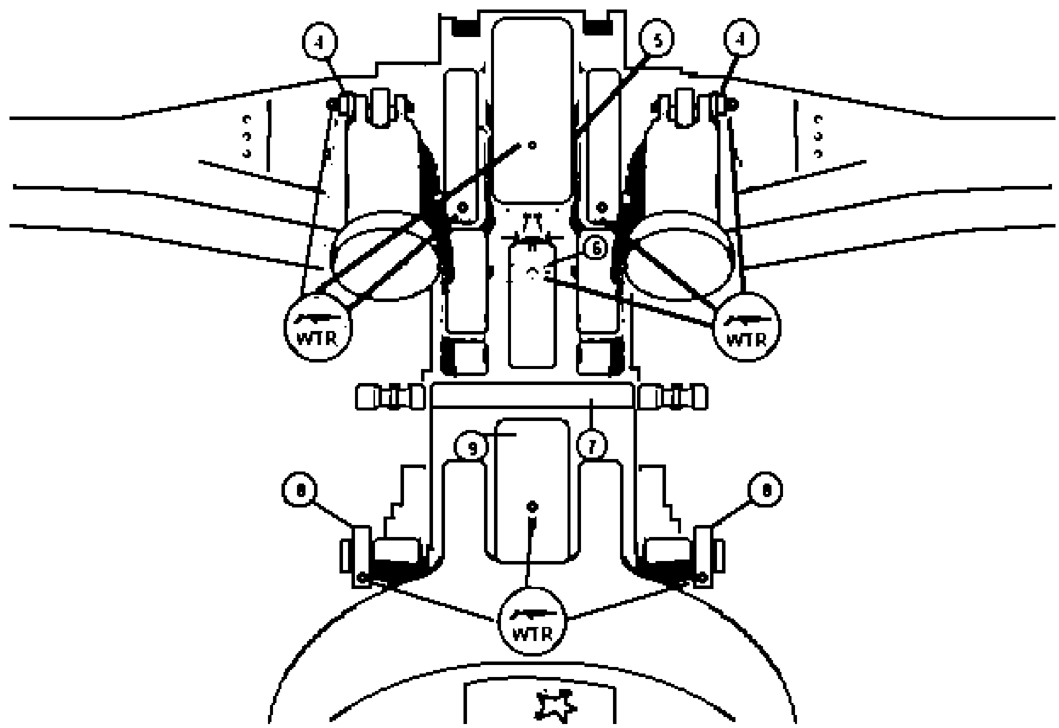
1. CLEAN AND DRY GREASE GUNS AND OIL CANS BEFORE FILLING.
2. WASH DIRTY BRUSHES IN FEDERAL SPECIFICATION P-D-680, TYPE II SOLVENT AND DRY THOROUGHLY BEFORE USE.
3. USE ONLY LUBRICANTS WHICH ARE PERFECTLY CLEAN.
4. WIPE GREASE FITTINGS, OIL HOLES, ETC., WITH CLEAN DRY CLOTHS BEFORE LUBRICATING.
5. REMOVE DIRT OR RUST FROM SURFACES TO BE LUBRICATED.
6. WORK MOVING PARTS, IF PRACTICAL, TO ASSURE THOROUGH LUBRICATION.
7. FORCE GREASE INTO FITTINGS UNTIL OLD GREASE IS EXTRUDED, UNLESS OTHERWISE NOTED IN THIS SECTION.
8. FILL OIL HOLES TO NEAR FULL, ADDING OIL UNTIL THE LEVEL DOES NOT DROP. CONTROLLABLE - TYPE SQUIRT OIL CANS ARE RECOMMENDED FOR OIL APPLICATION.
9. AFTER ANY LUBRICATION, CLEAN SURPLUS LUBRICANT FROM ALL BUT THE ACTUAL WORKING SURFACES.
10. BEFORE APPLYING A BRUSH OR SPRAY-ON TYPE LUBRICANT, CLEAN SURFACES THOROUGHLY WITH FEDERAL SPECIFICATION P-D-680, TYPE II SOLVENT FOR A GOOD ADHESION.
11. USE ALEMITE NO. 6304-B HYDRAULIC COUPLER ON GREASE GUNS WHEN ADDING LUBRICANT TO MS15000 THROUGH MS15006 GREASE FITTINGS.
12. USE MS24203-1 ADAPTER, OR STEWART WARNER NO. 314150 ADAPTER ON GREASE GUN WHEN ADDING LUBRICANT THROUGH NAS516-1 GREASE FITTINGS.
13. UNLESS NOTED, USE A PNEUMATIC POWERED GREASE GUN (LUBRICATING UNIT NSN 4930-00-849-7800 OR EQUIVALENT).
14. FLIGHT CONTROL PIVOT POINTS NOT HAVING GREASE FITTINGS SHOULD BE LIBERALLY OILED USING FEDERAL SPECIFICATION VV-L-800 IN AN OIL CAN.

Airplane lubrication index (3 of 3)



Nose landing gear lubrication (1 of 3)

C



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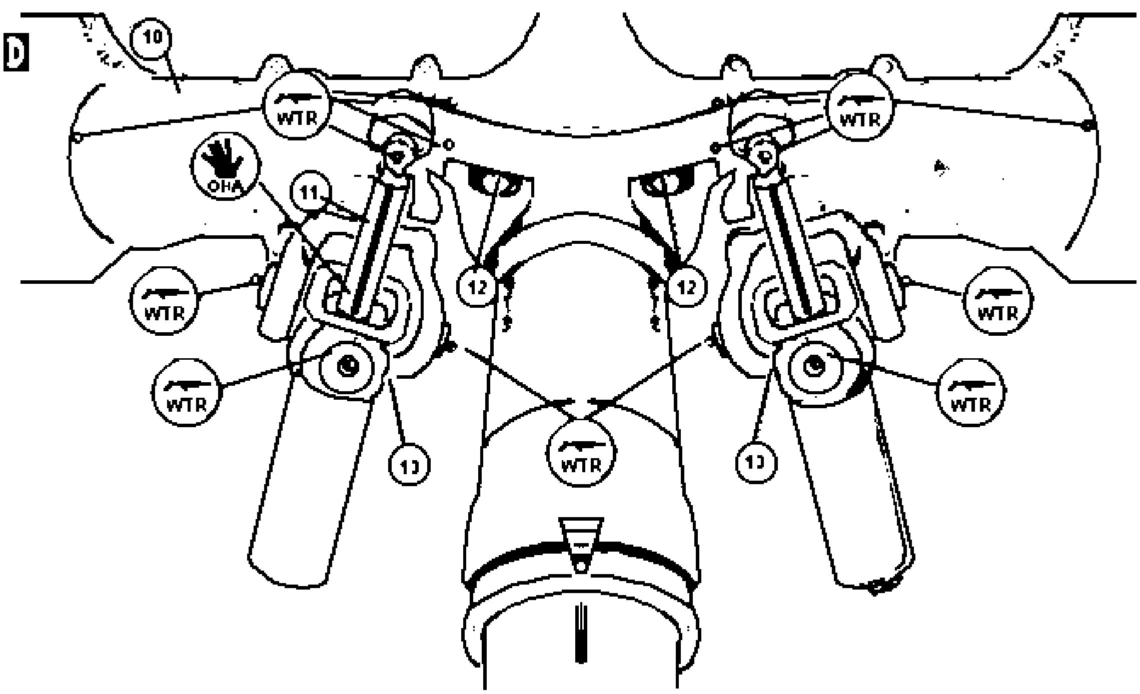
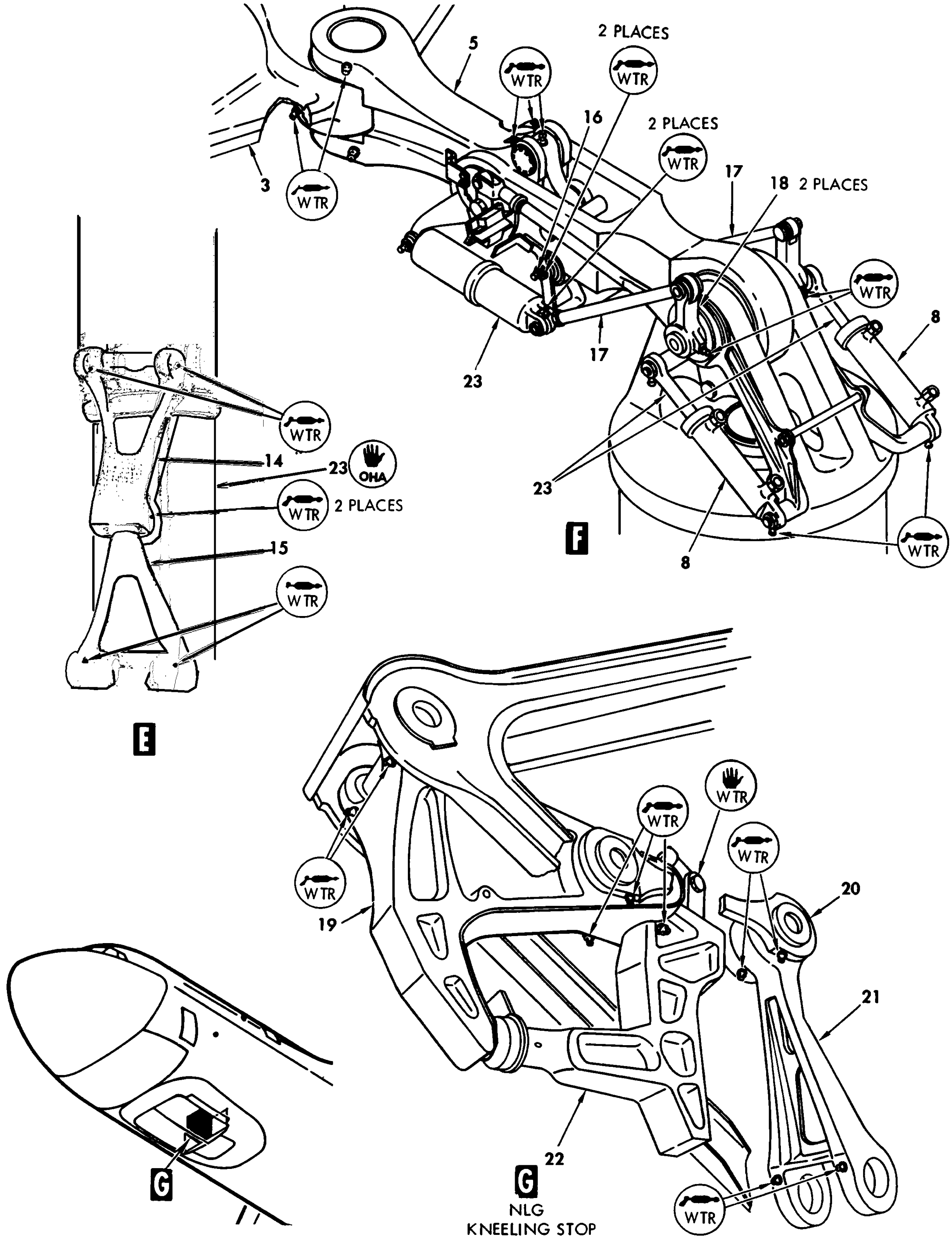
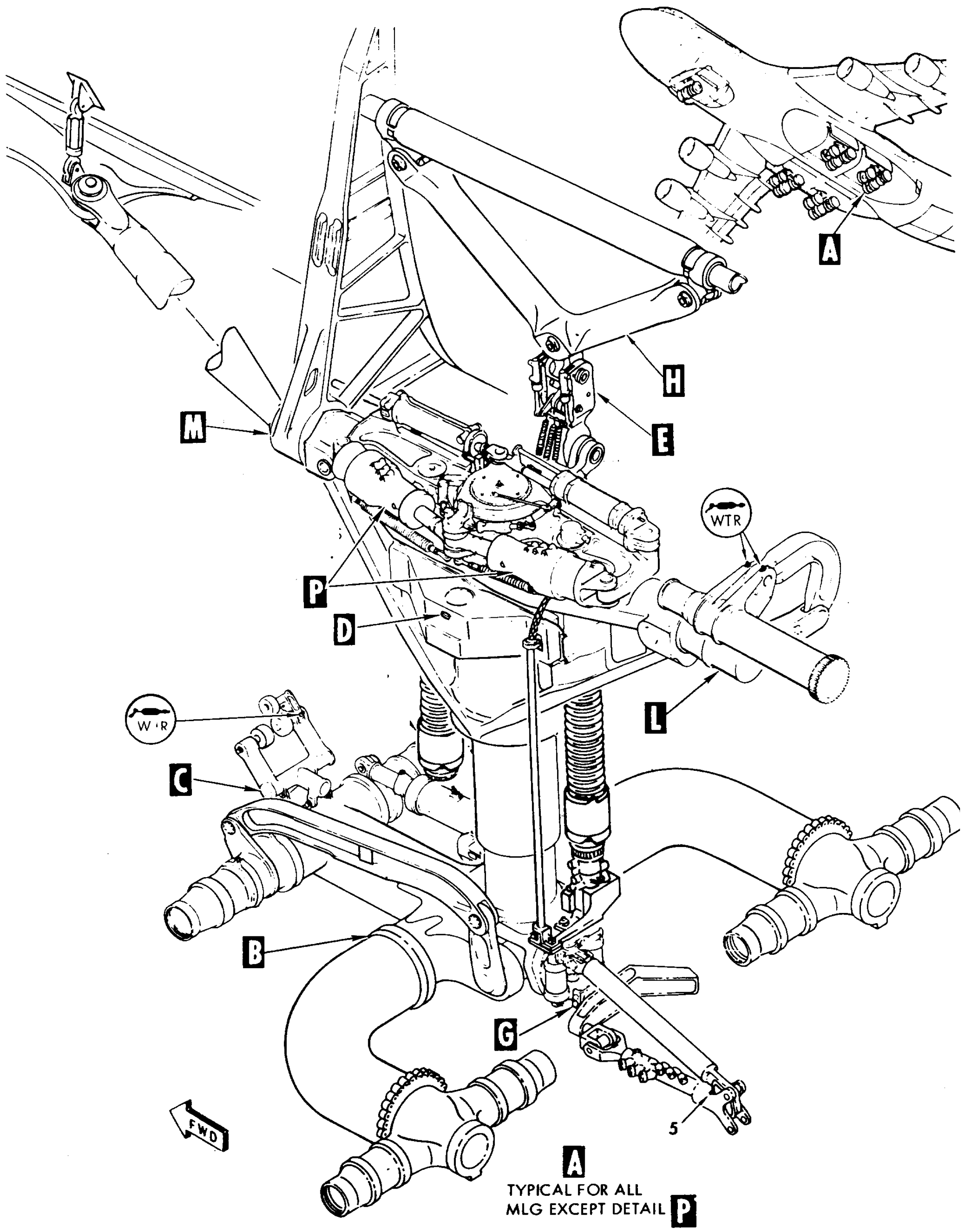


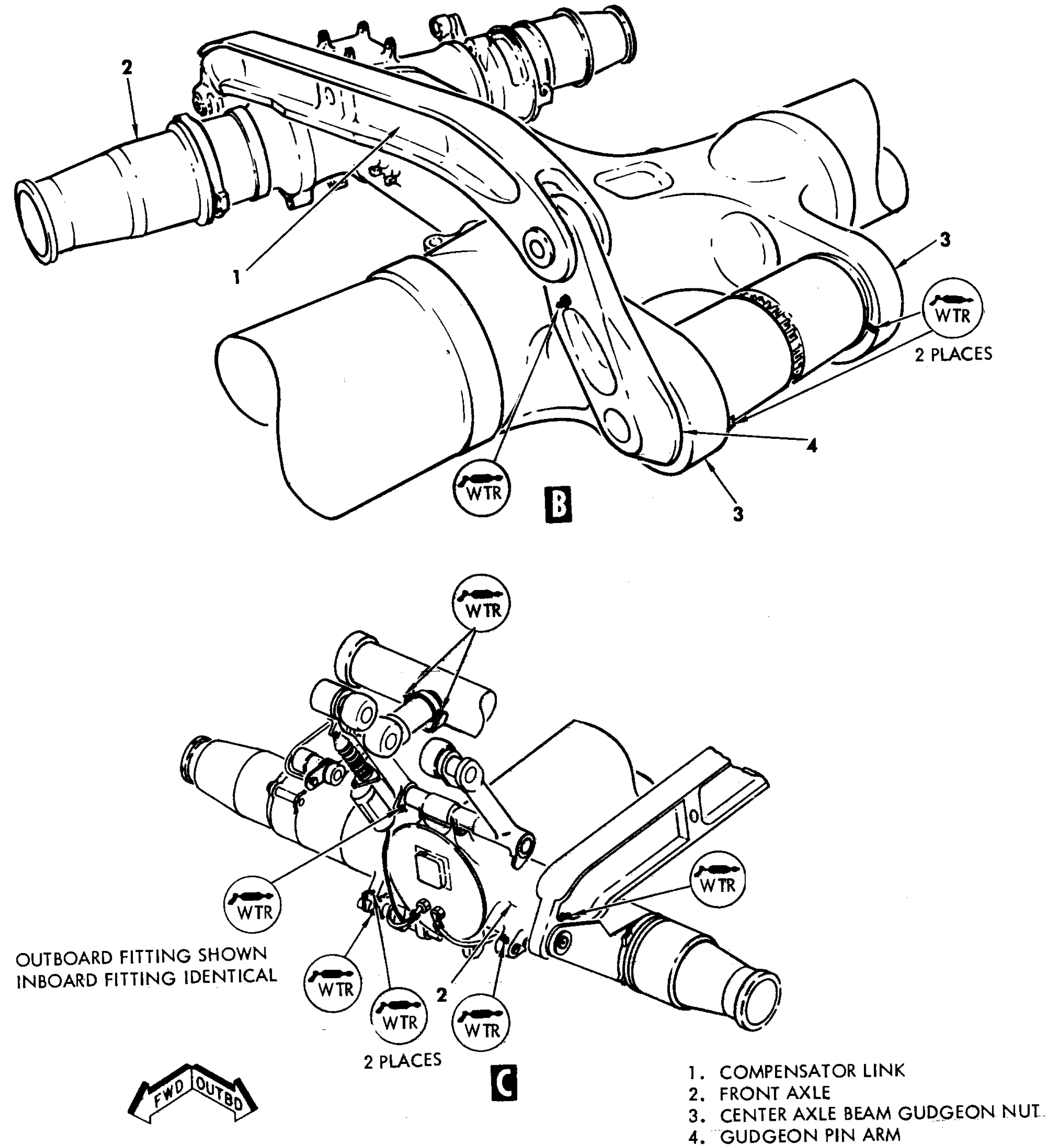
Nose landing gear lubrication (2 of 3)



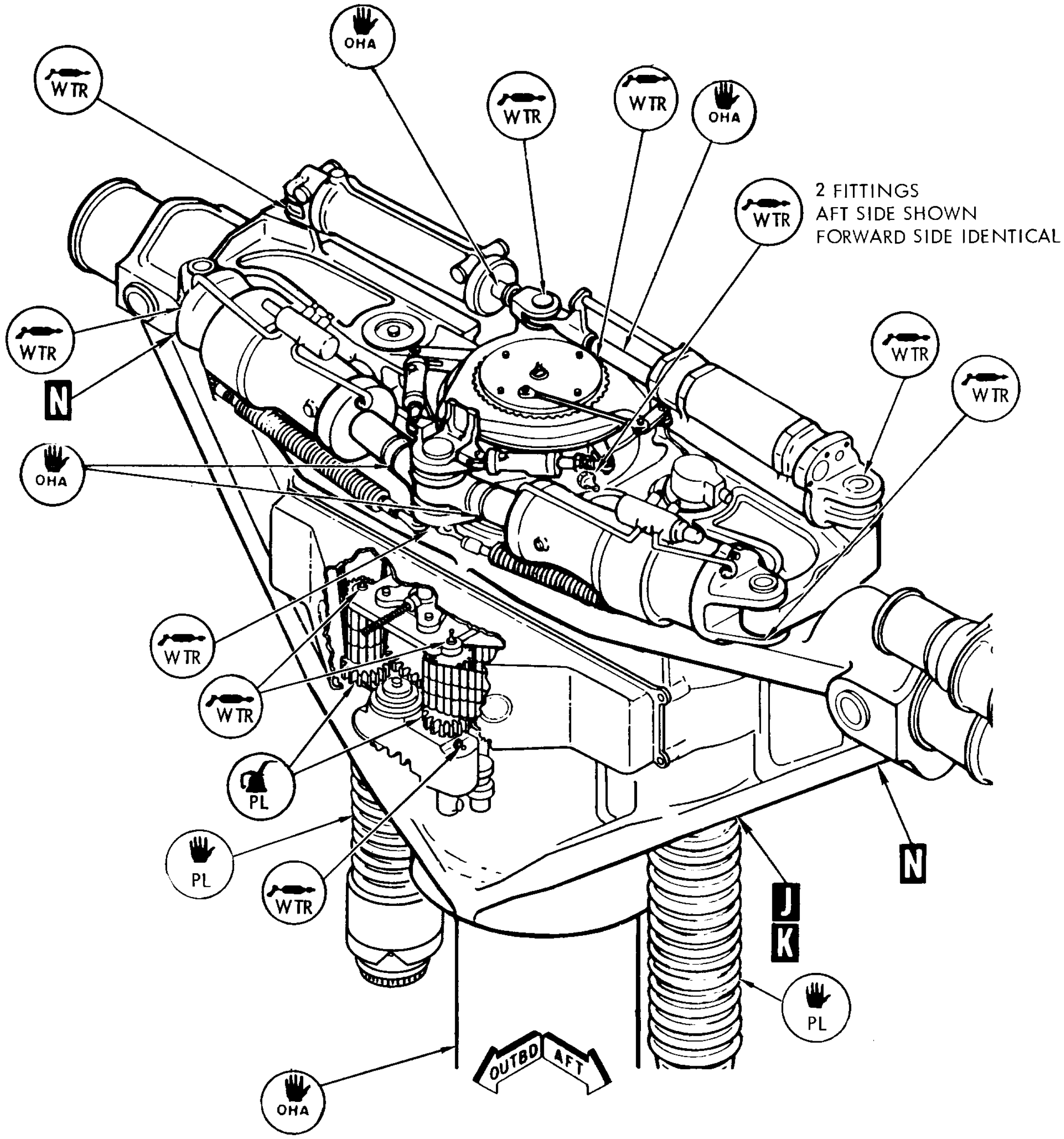
Nose landing gear lubrication (3 of 3)



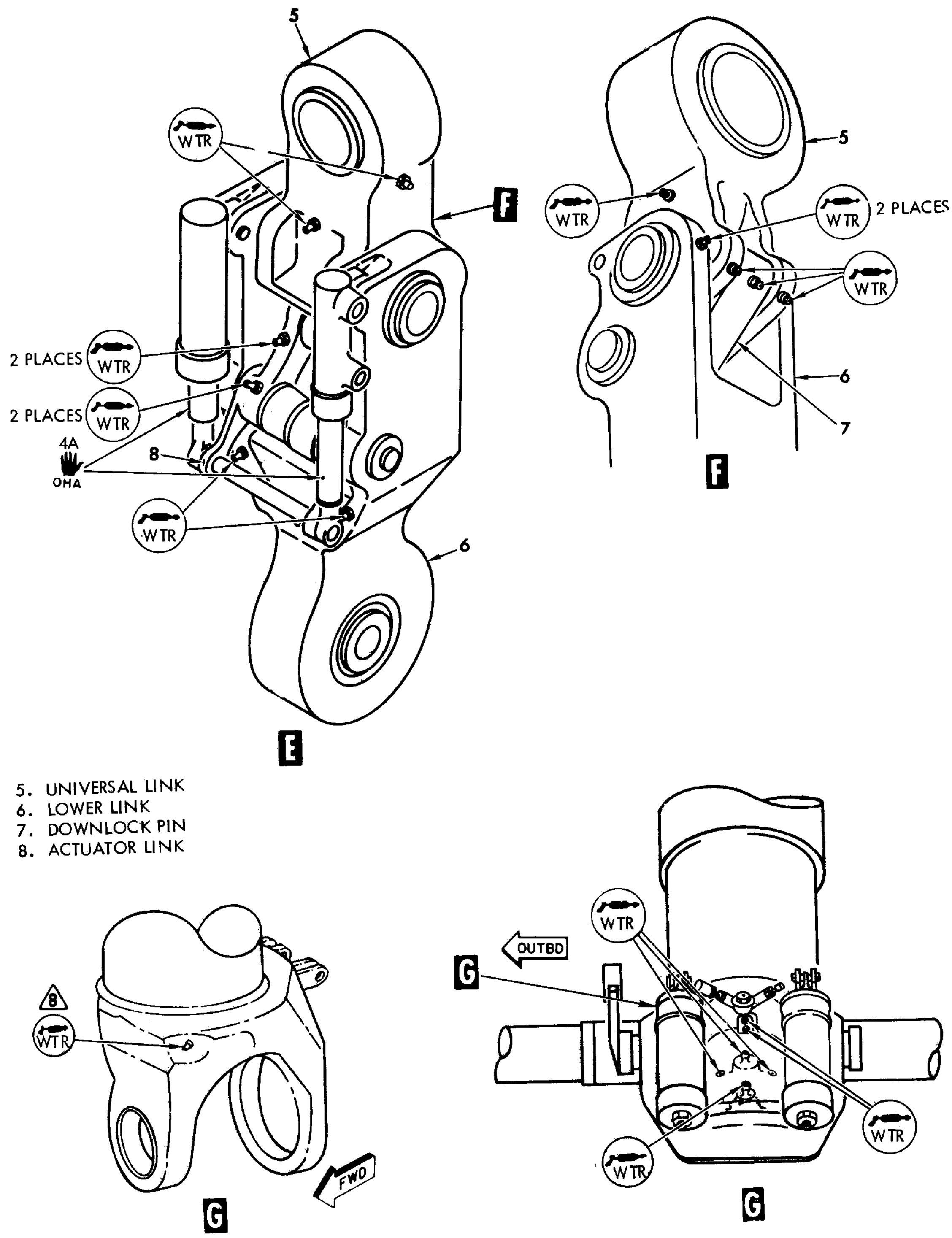
Main landing gear lubrication (1 of 7)



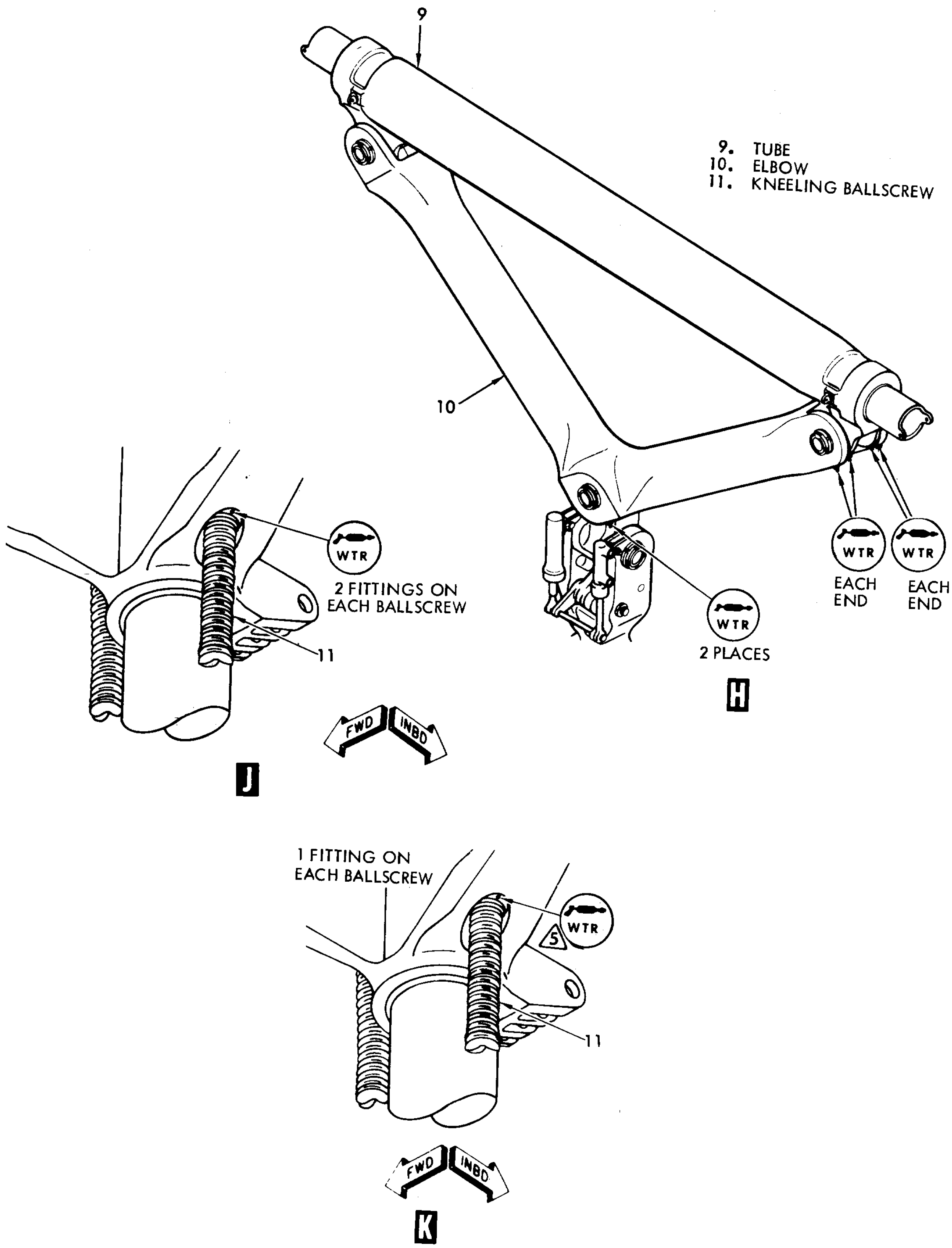
Main landing gear lubrication (2 of 7)



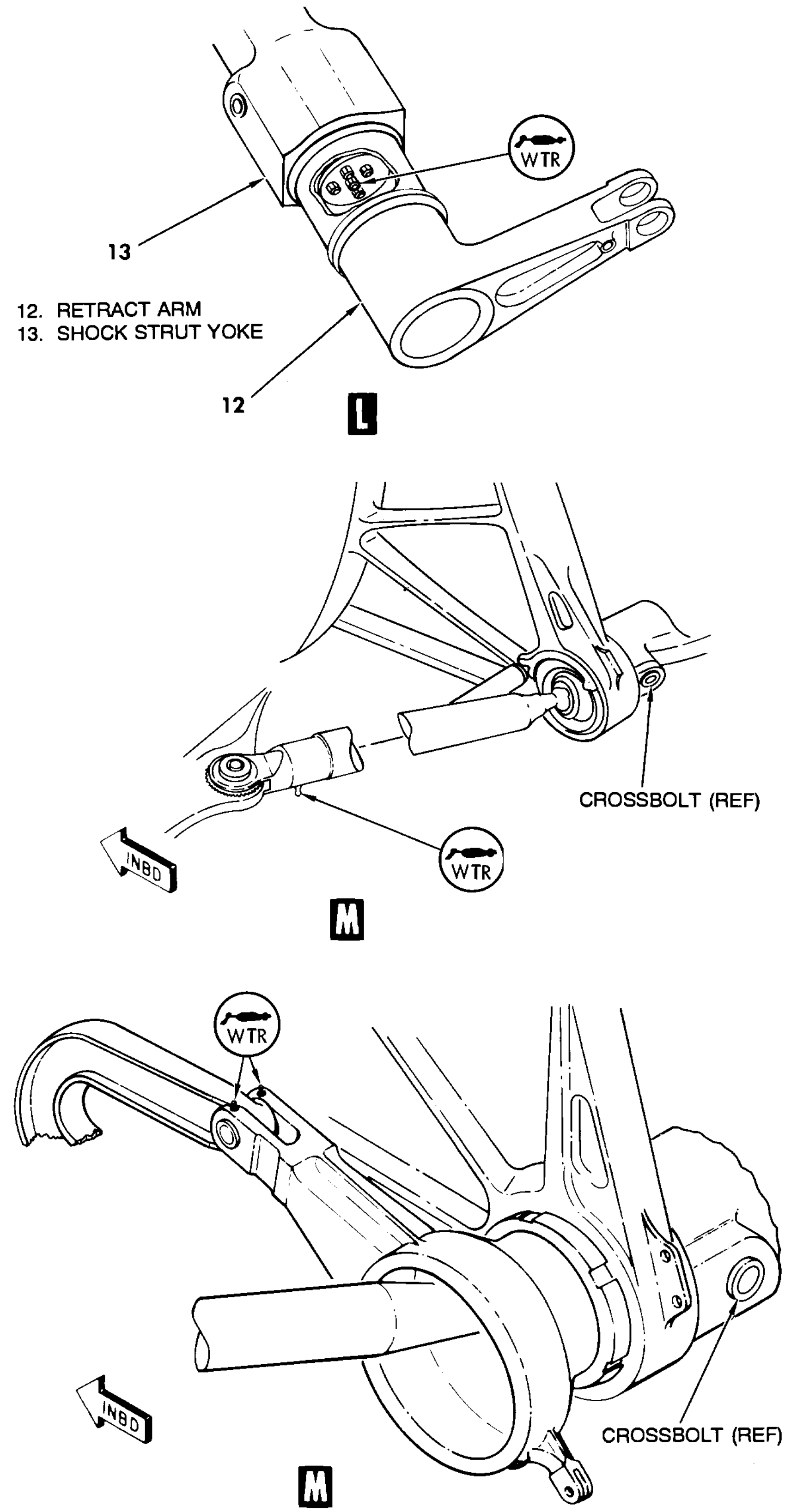
Main landing gear lubrication (3 of 7)



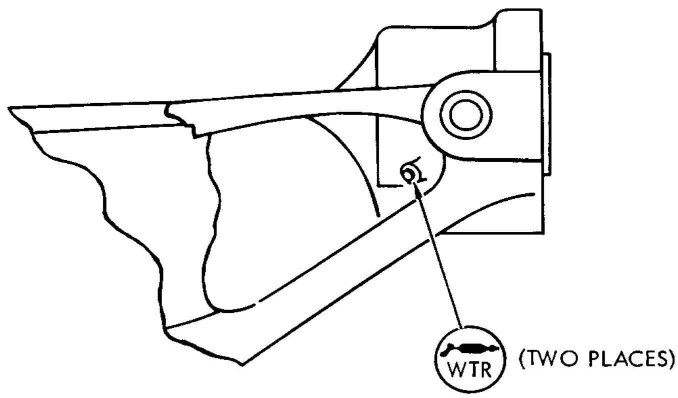
Main landing gear lubrication (4 of 7)



Main landing gear lubrication (5 of 7)

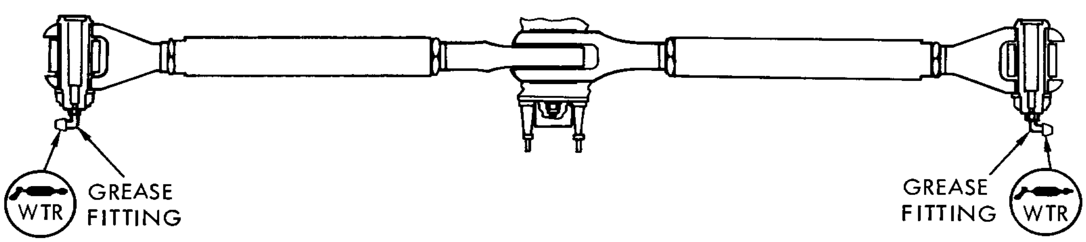


Main landing gear lubrication (6 of 7)



N

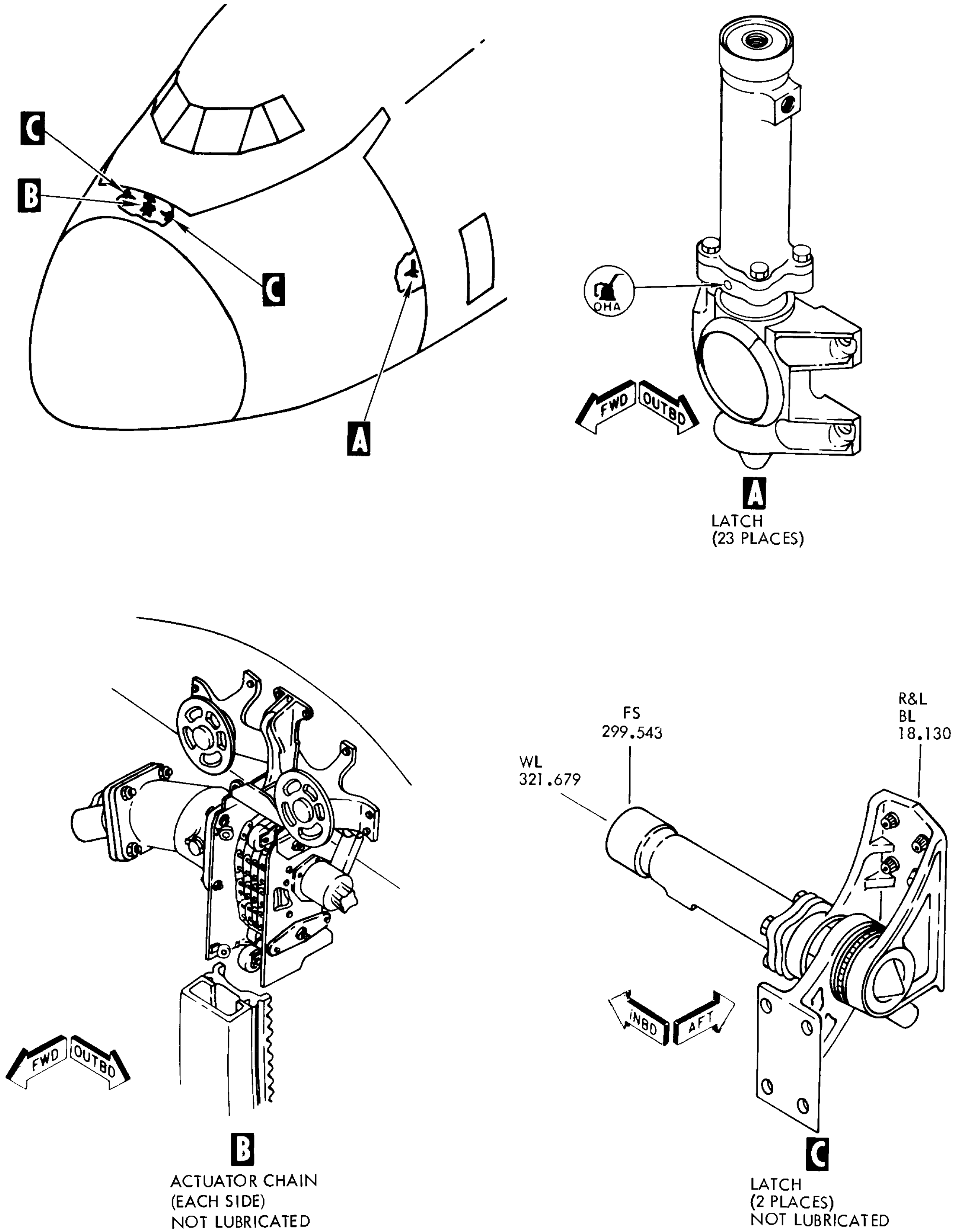
AFT END SHOWN
FWD END SIMILAR



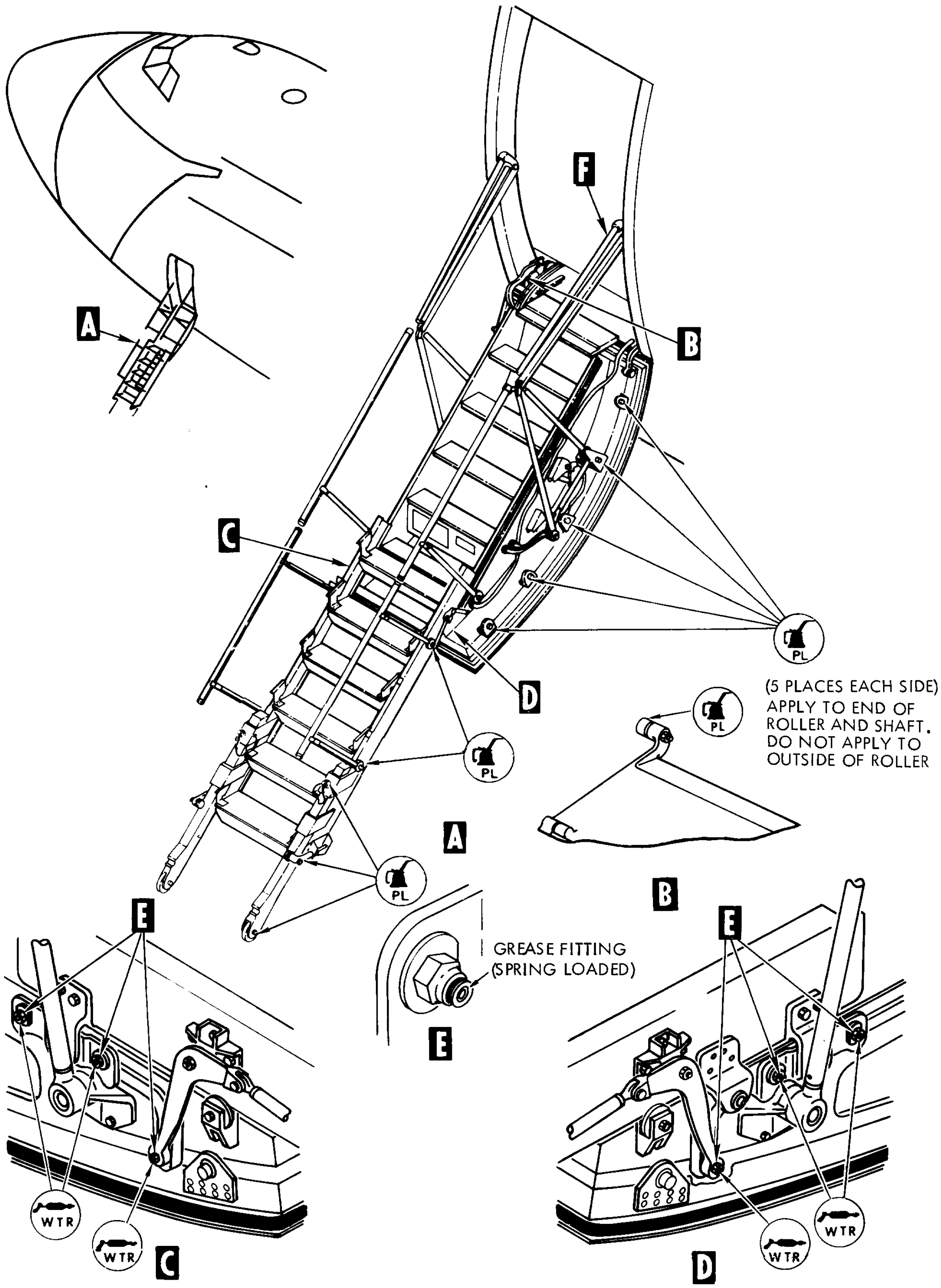
P

FORWARD MLG

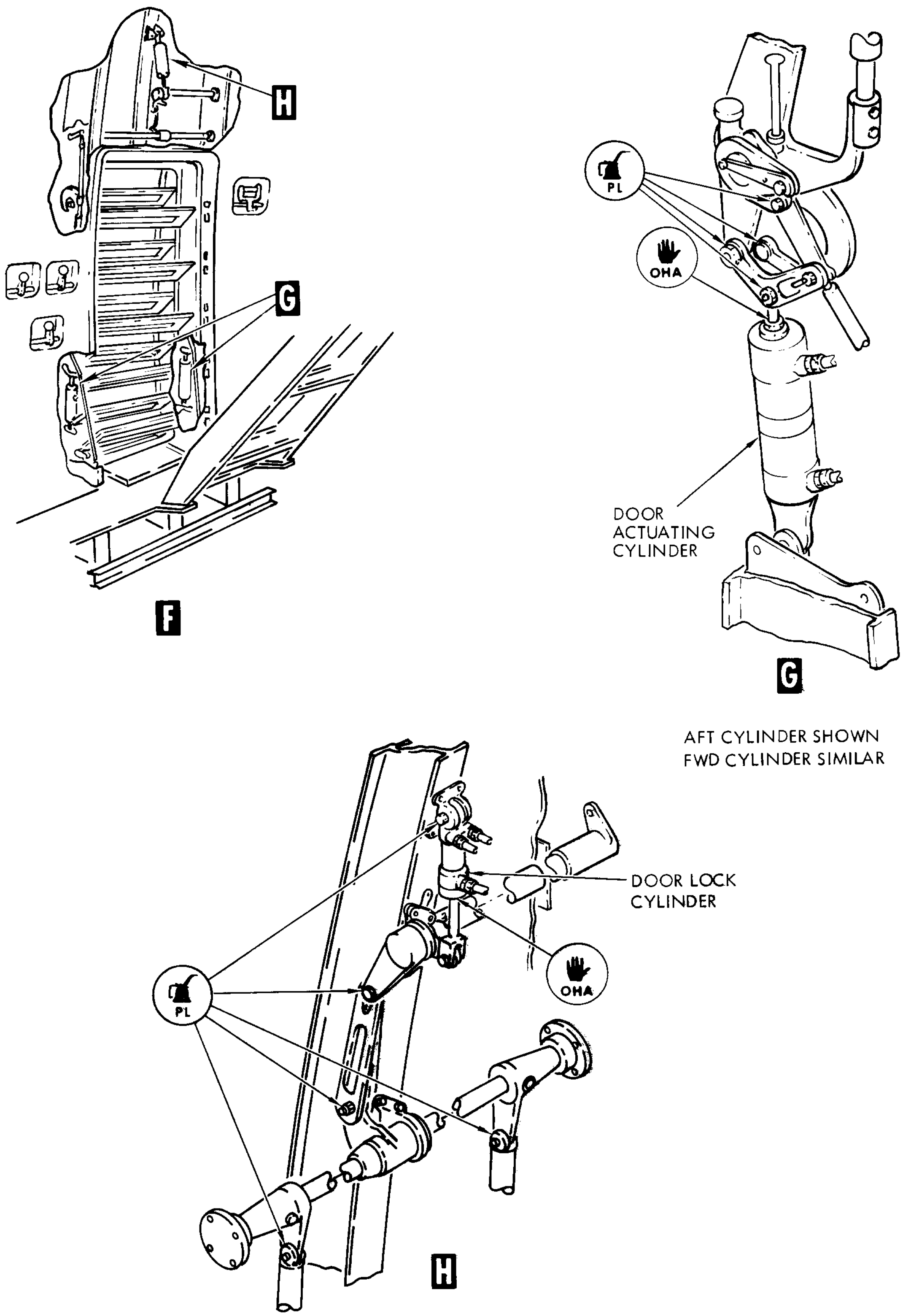
Main landing gear lubrication (7 of 7)



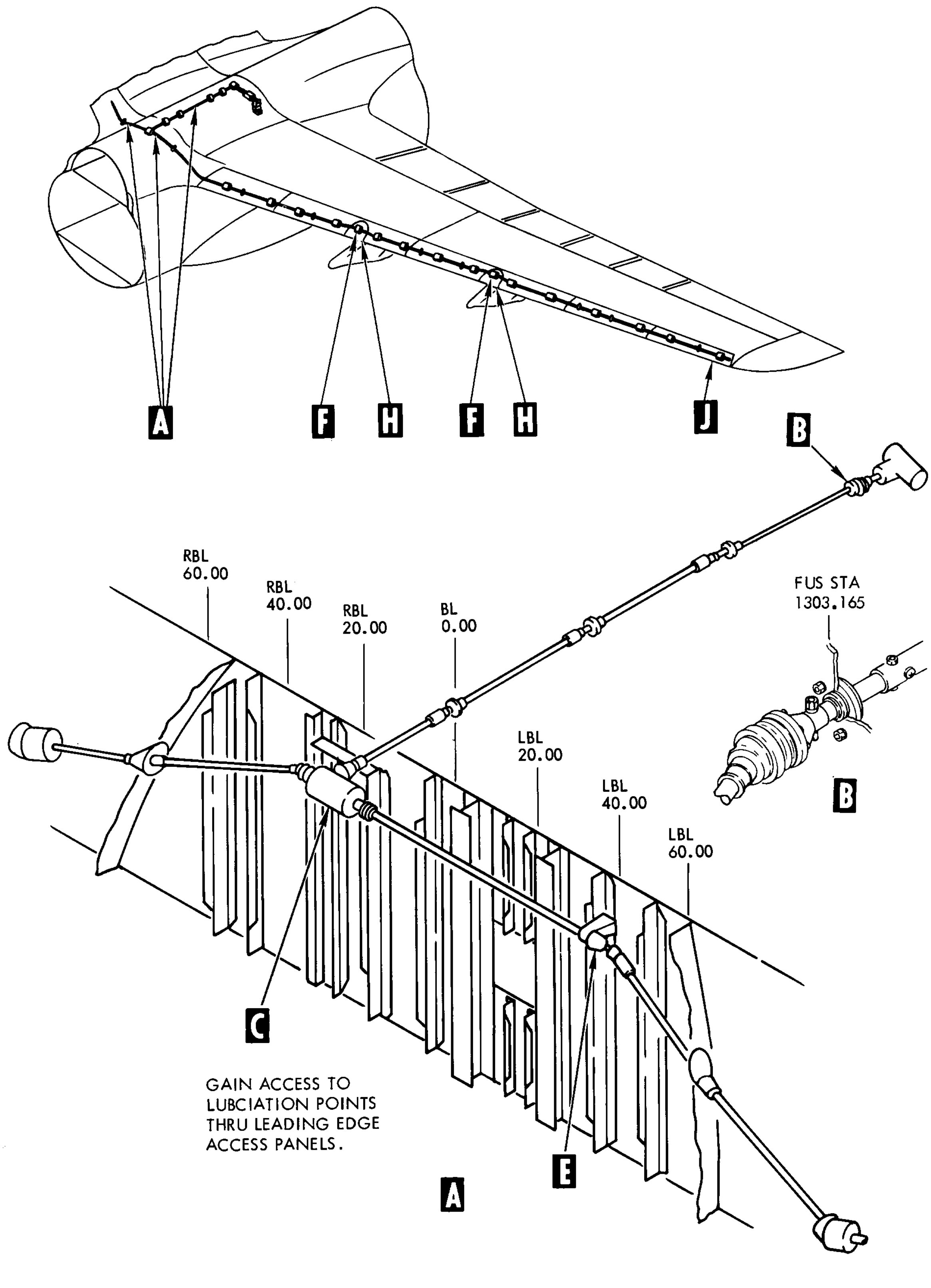
Visor door lubrication



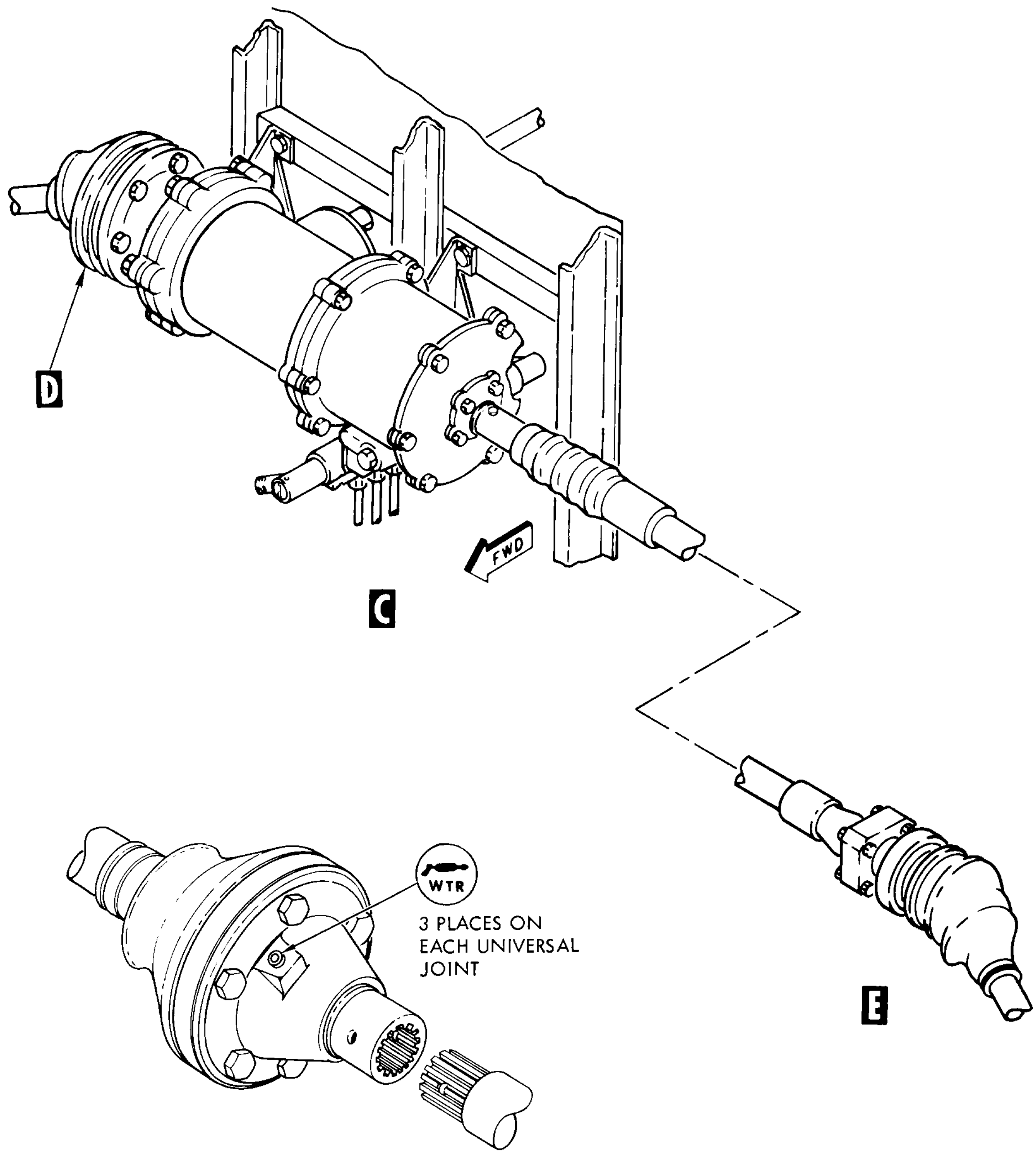
Crew entry door lubrication (1 of 2)



Crew entry door lubrication (2 of 2)

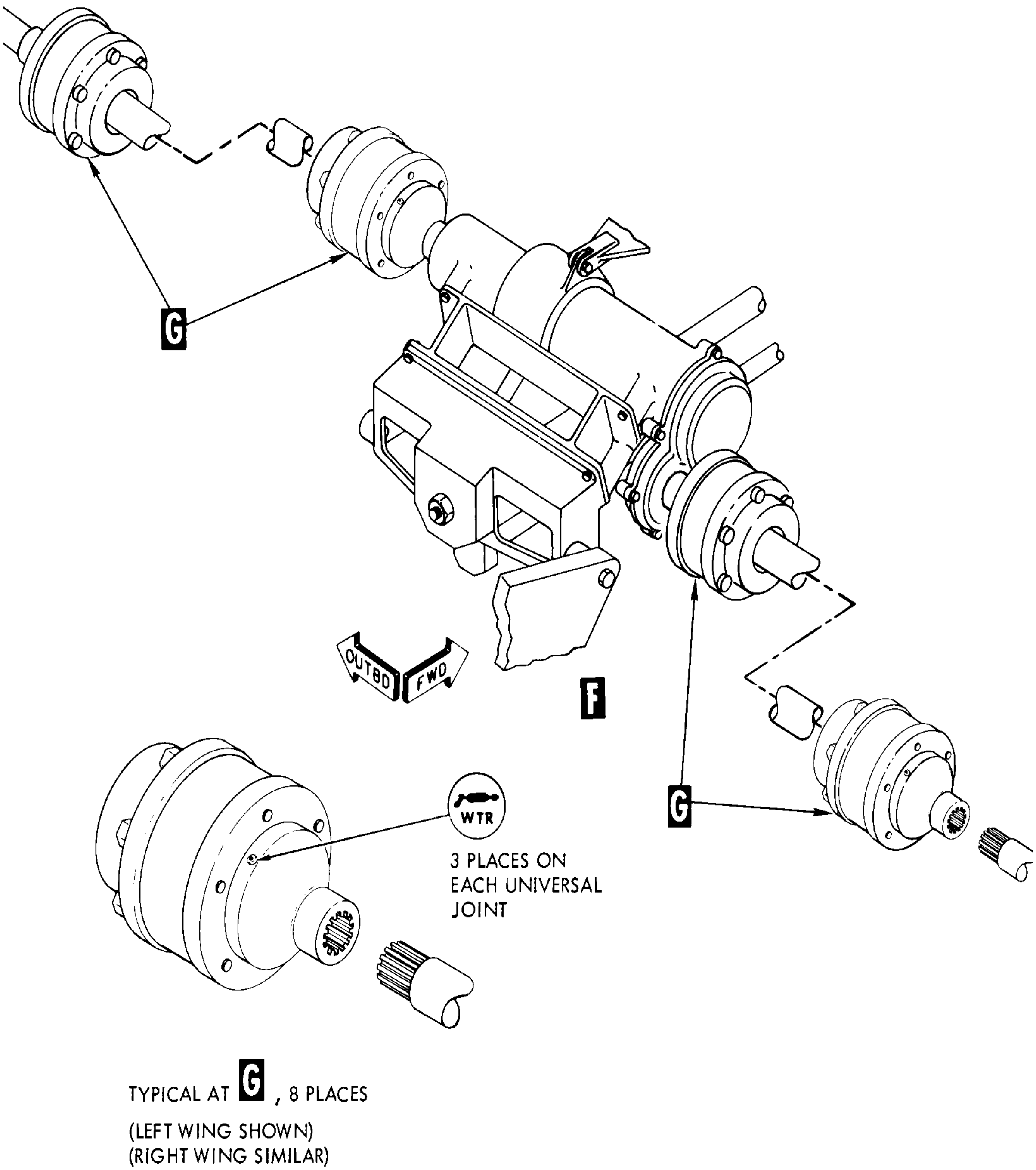


Wing leading edge slat drive system lubrication (1 of 4)

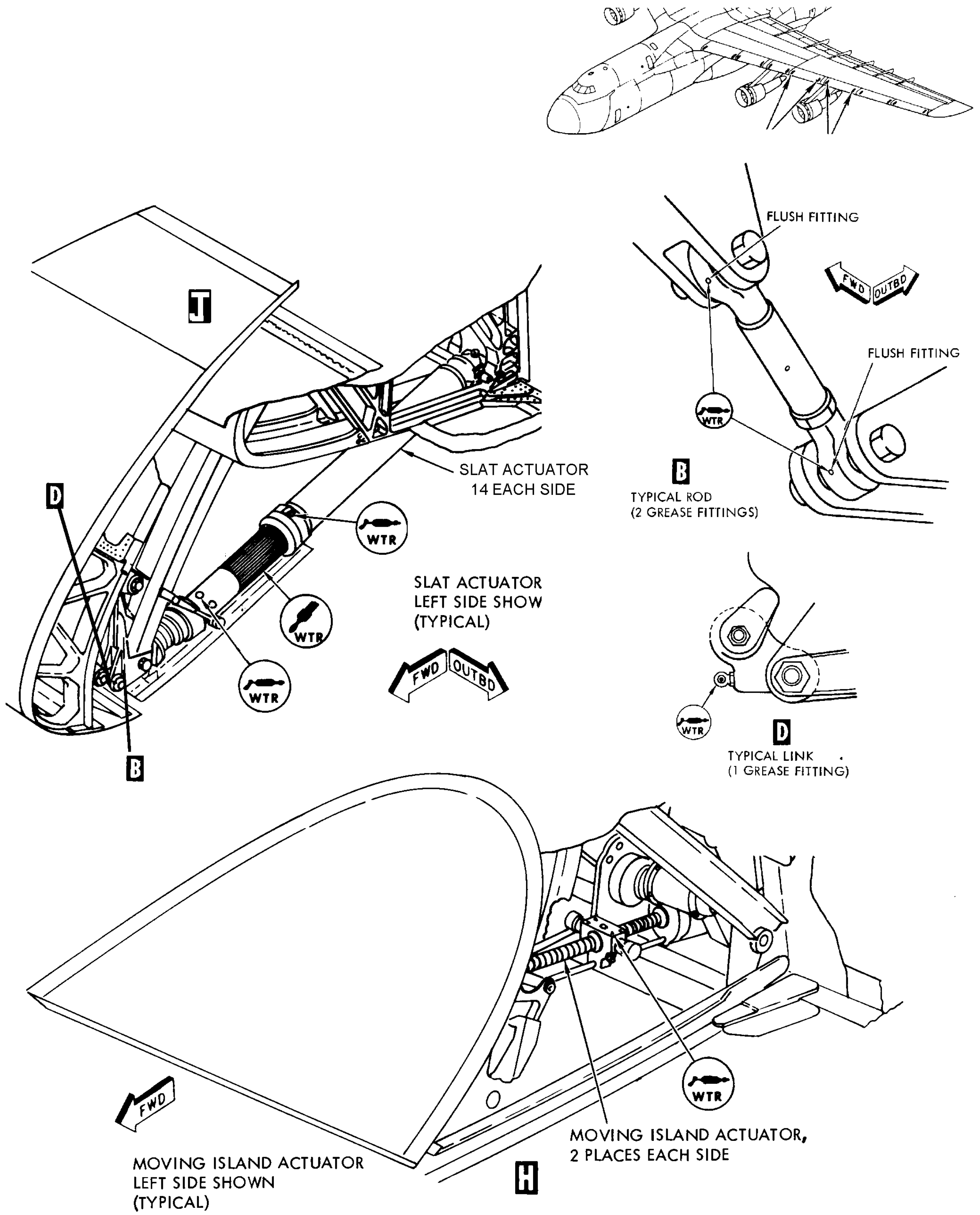


TYPICAL AT B, D AND E

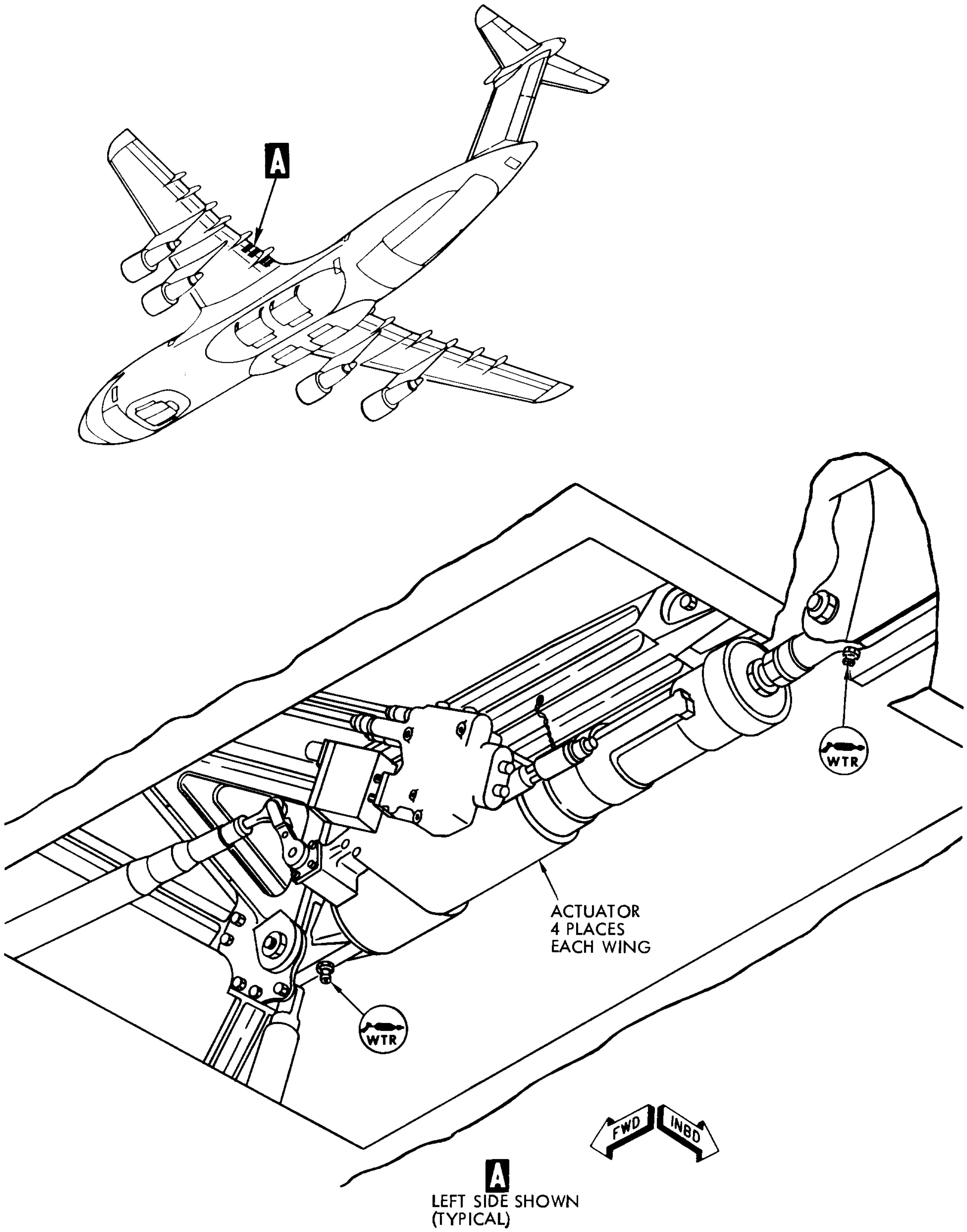
Wing leading edge slat drive system lubrication (2 of 4)



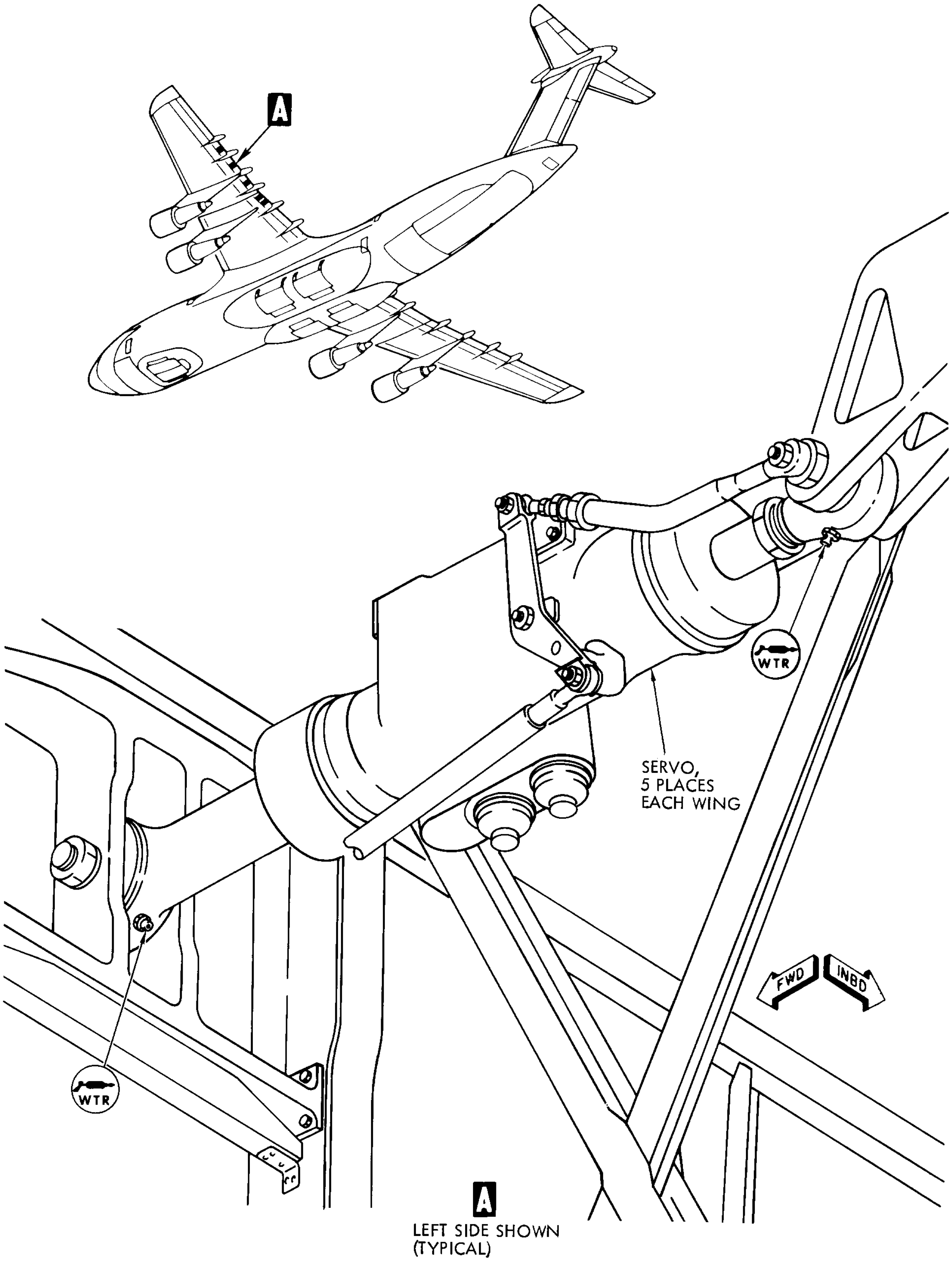
Wing leading edge slat drive system lubrication (3 of 4)



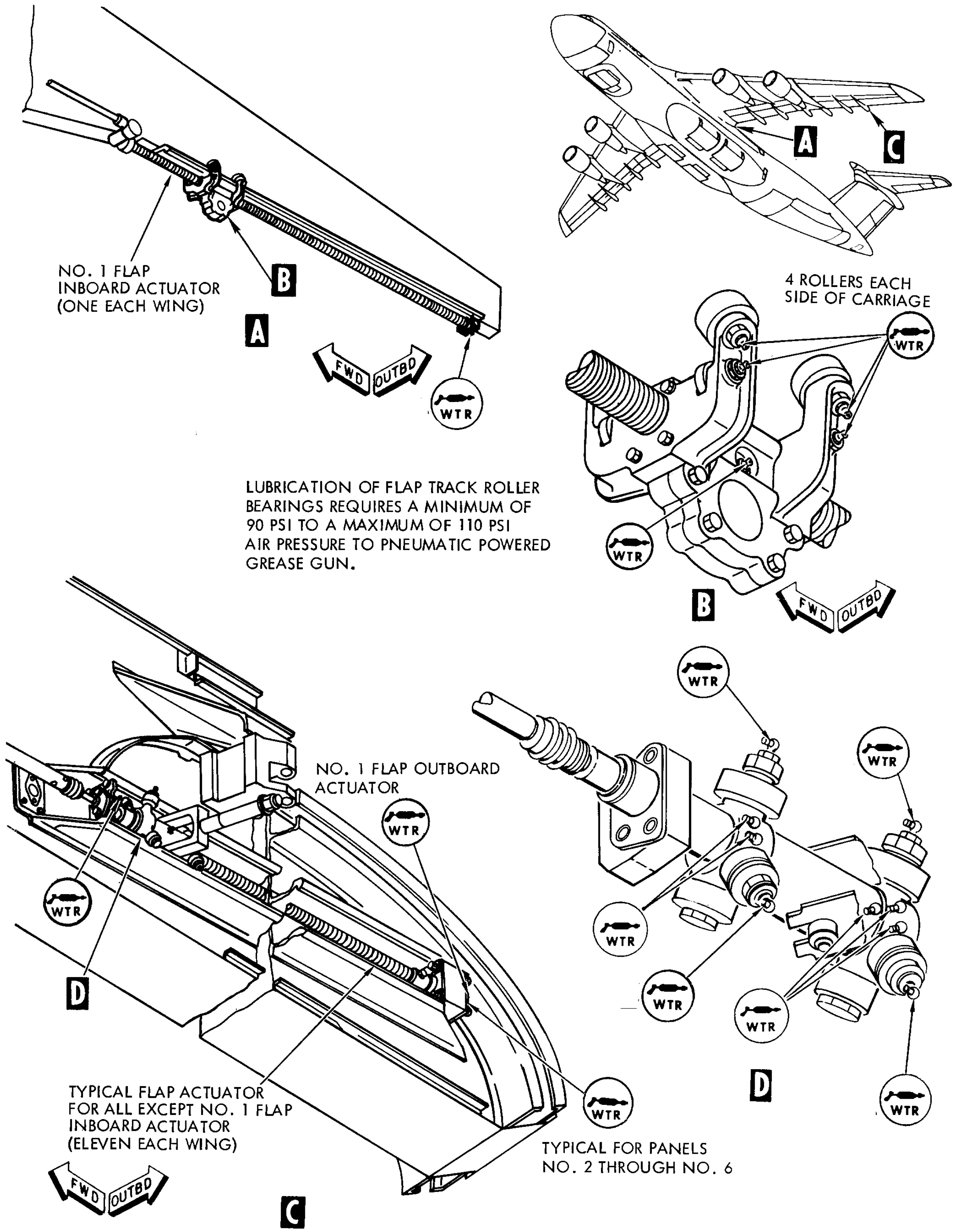
Wing leading edge slat drive system lubrication (4 of 4)



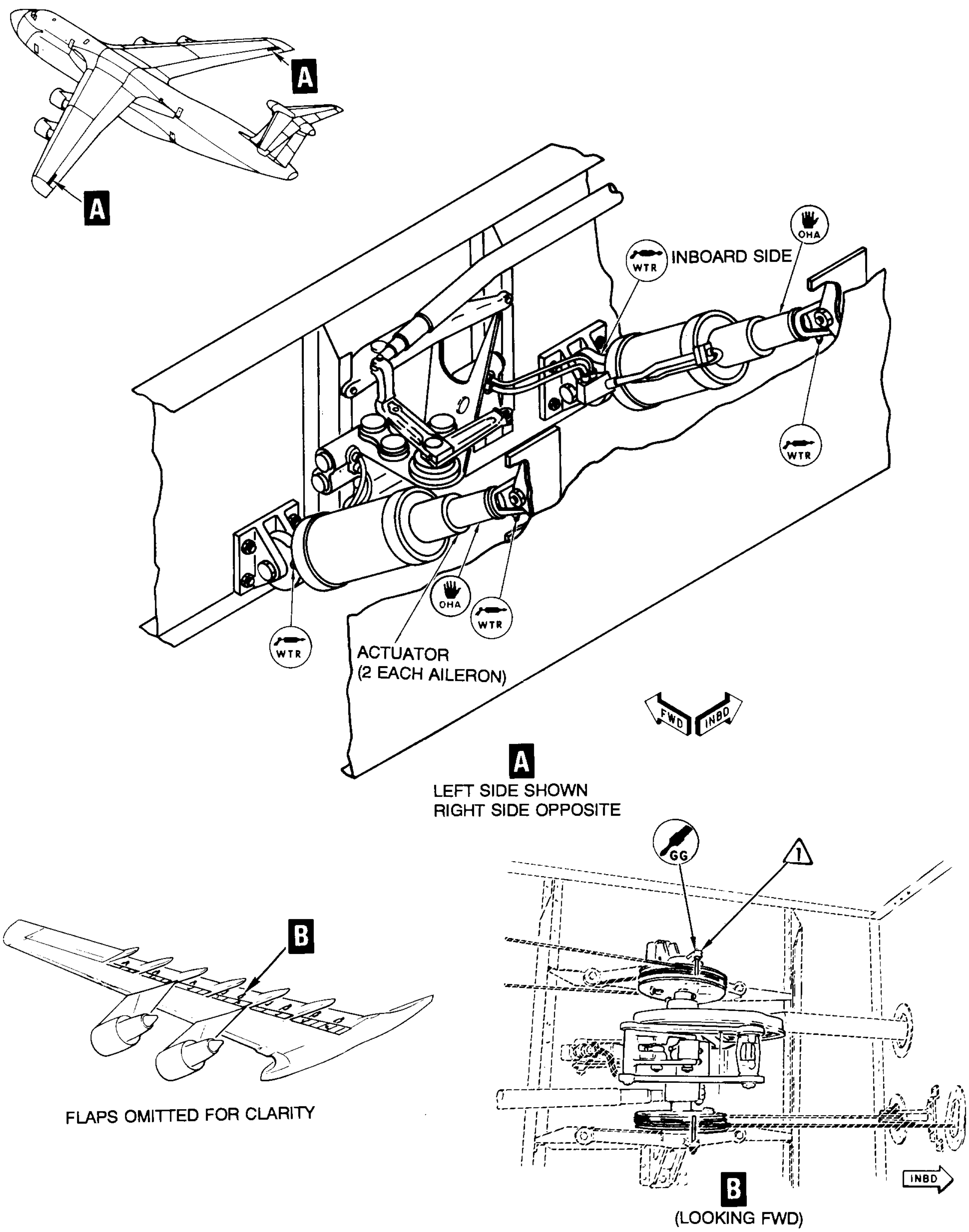
Ground spoiler actuator lubrication



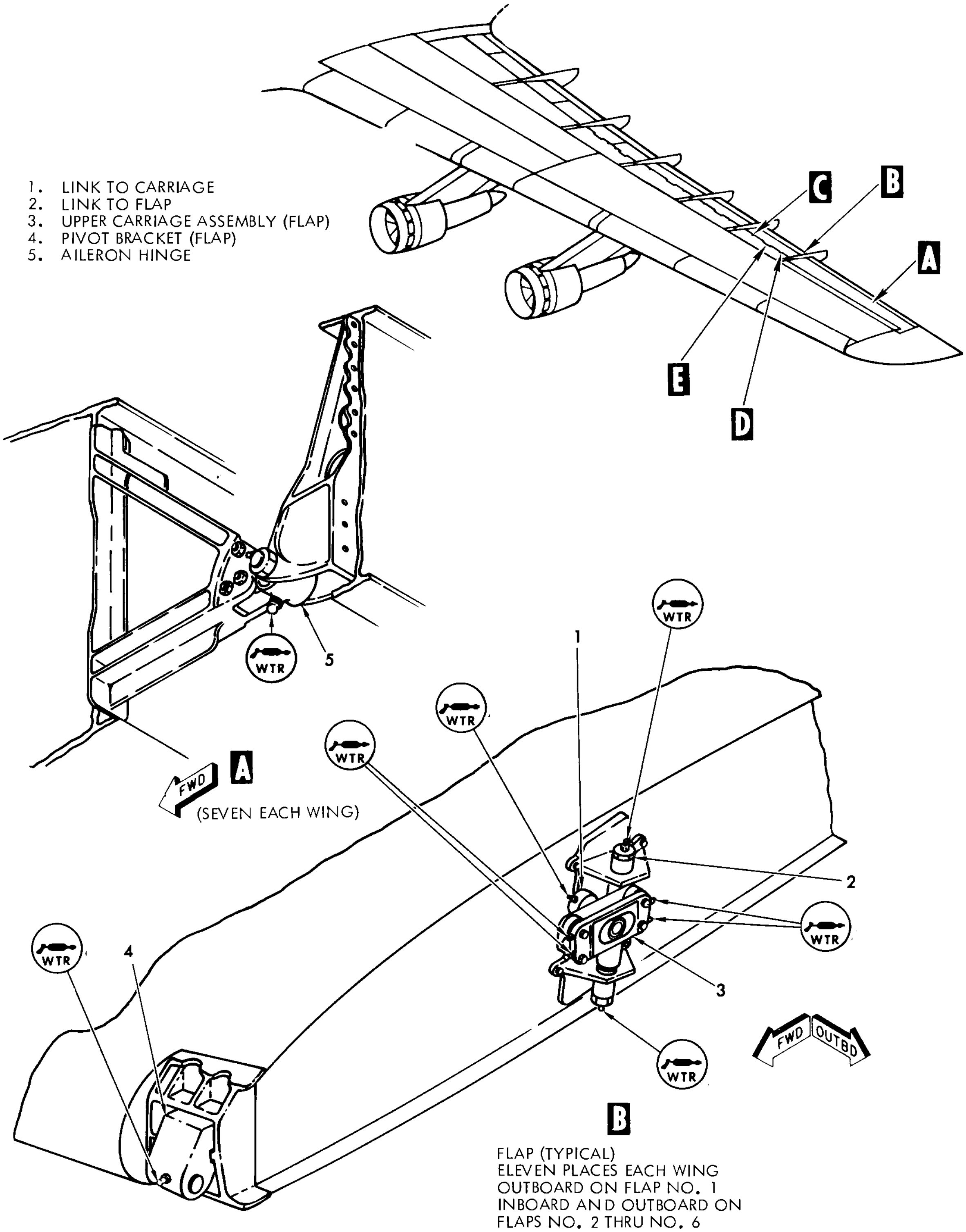
Flight spoiler actuator lubrication



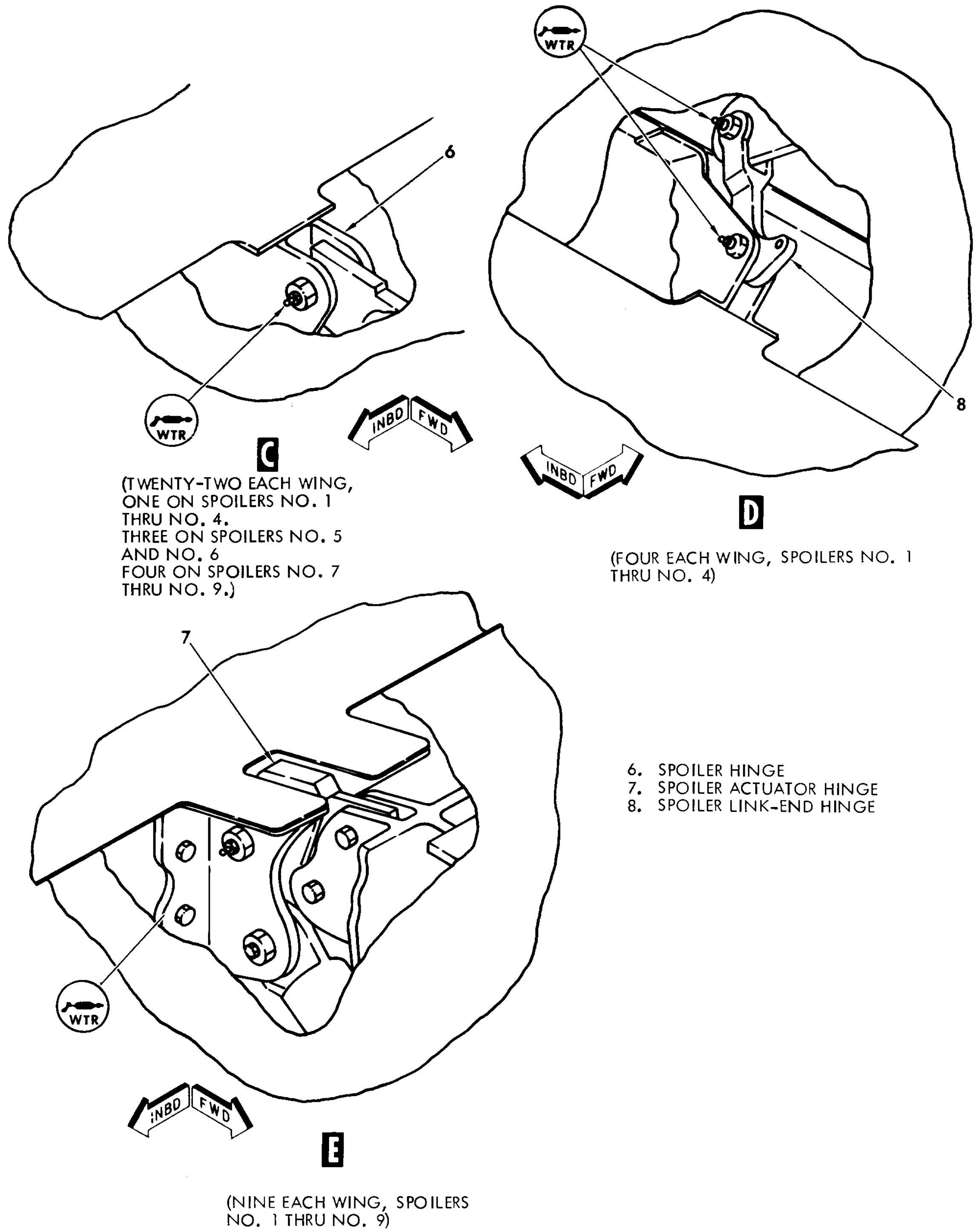
Wing trailing edge flap actuator lubrication



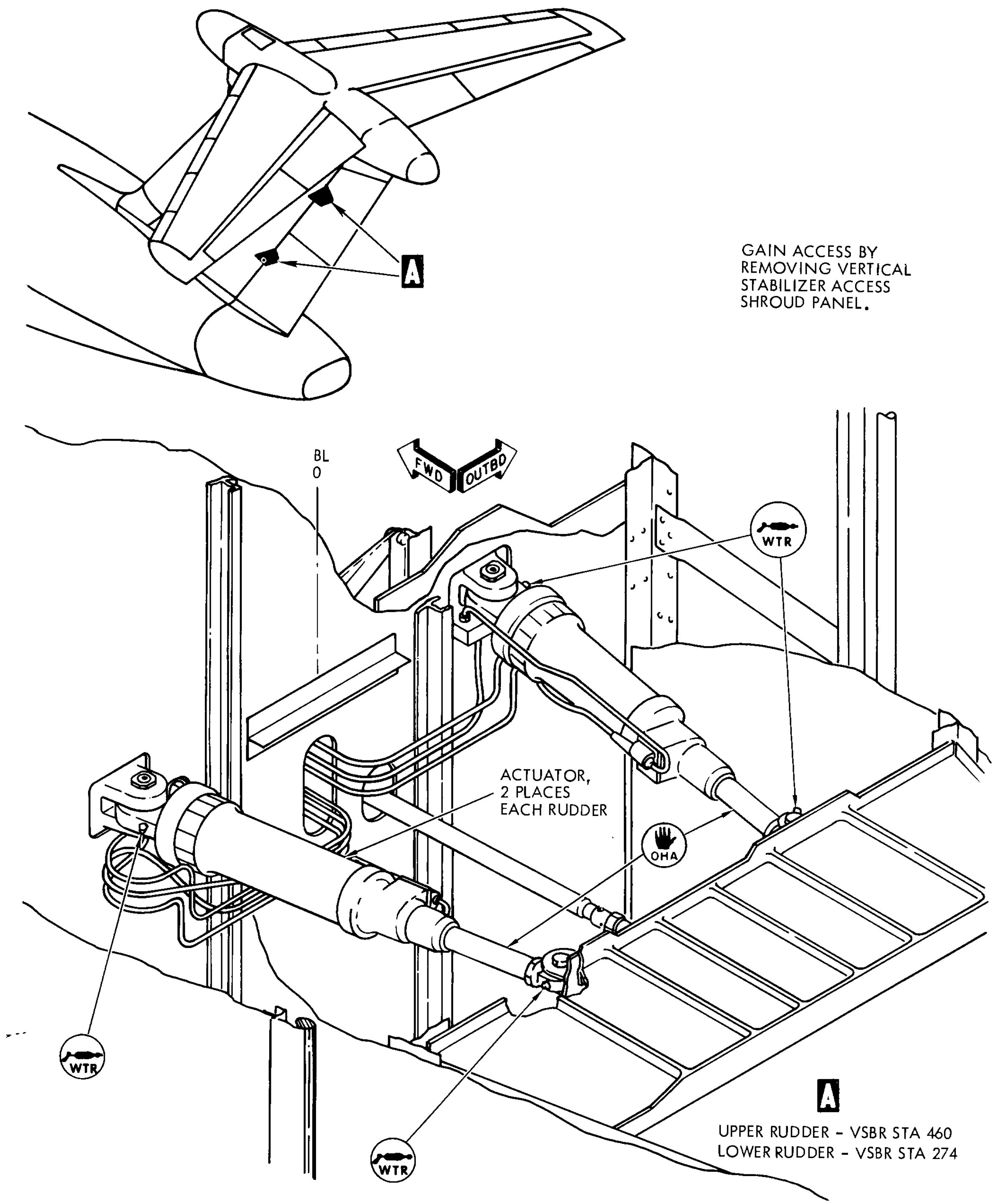
Aileron servo lubrication



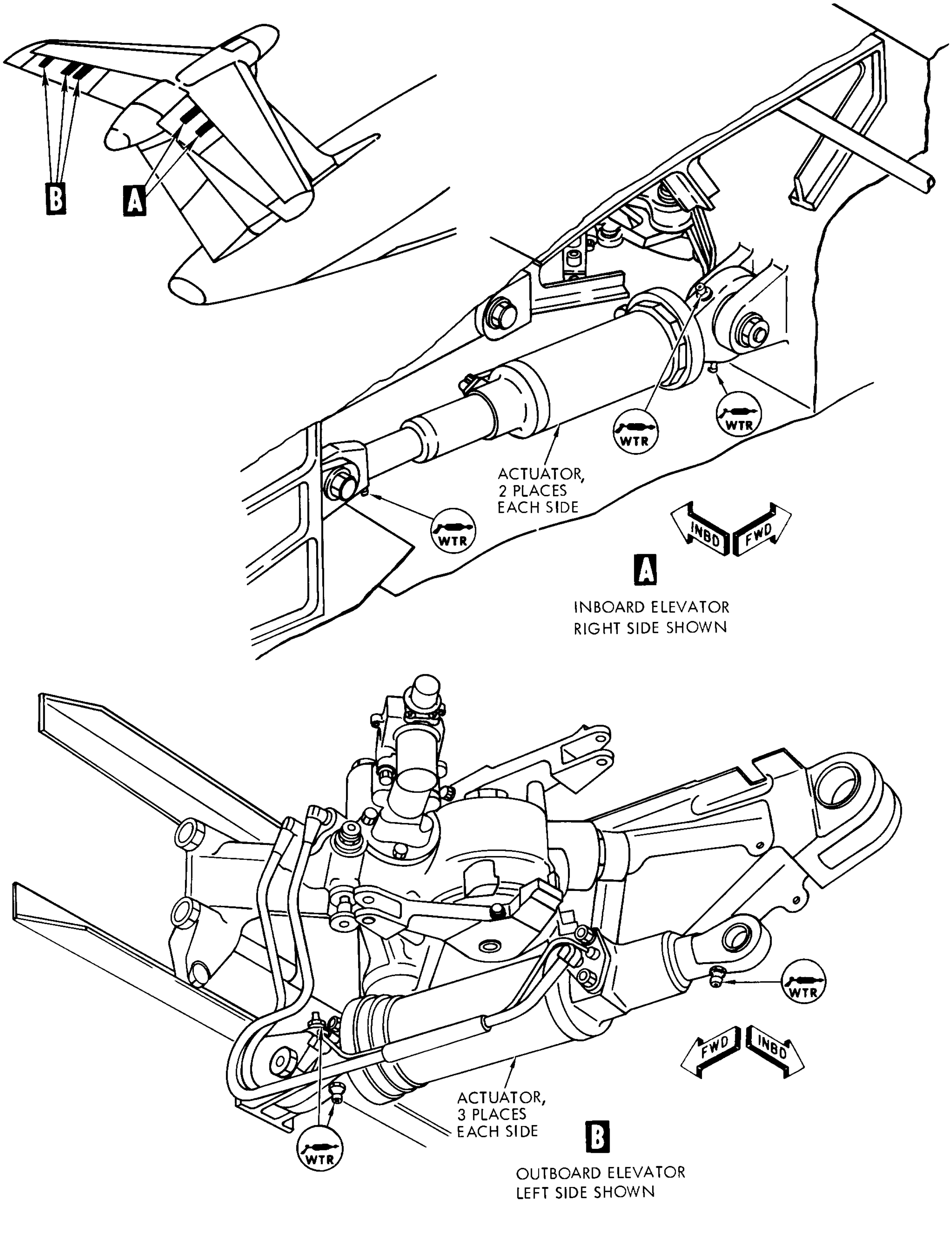
Wing trailing edge structure lubrication (1 of 2)



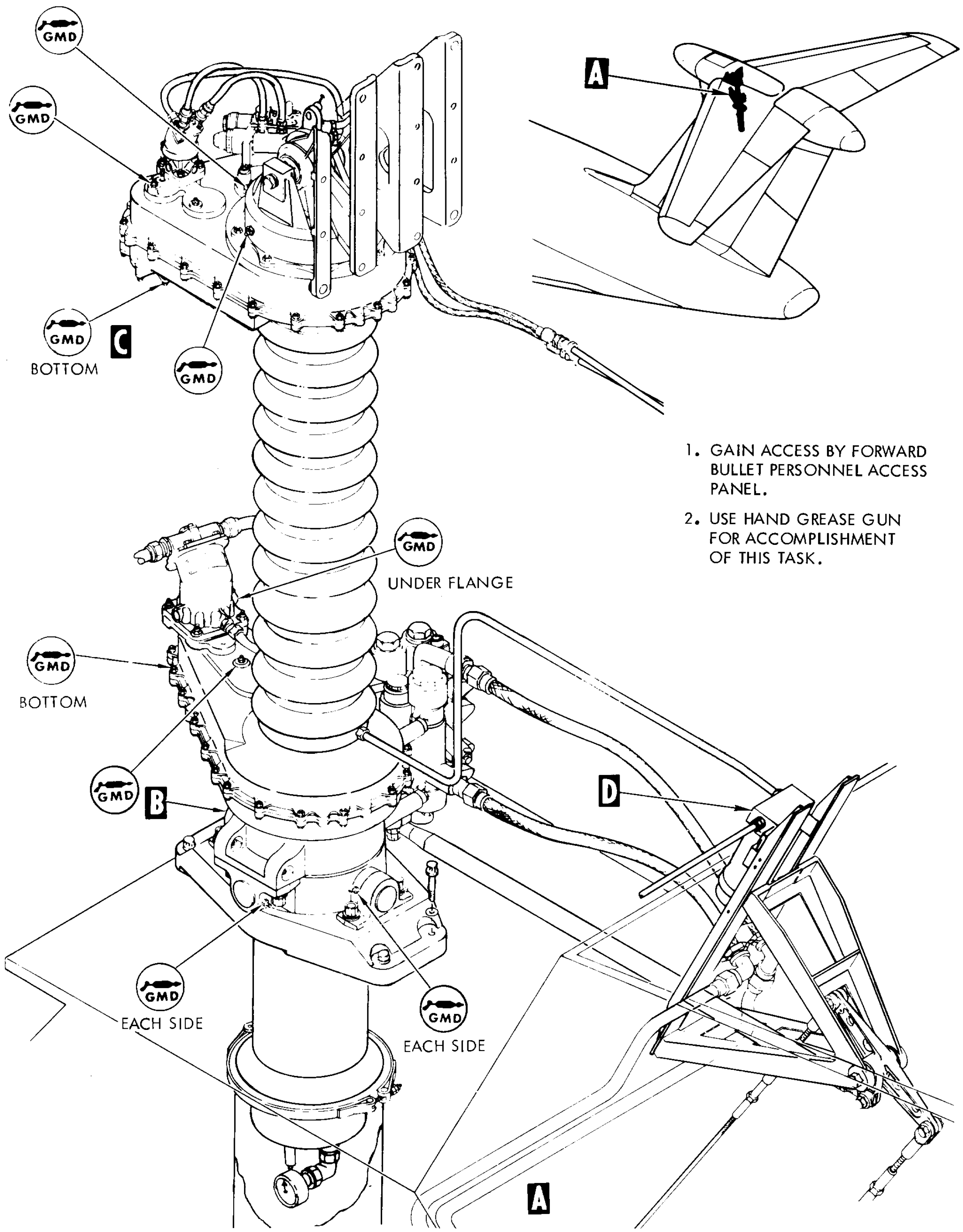
Wing trailing edge structure lubrication (2 of 2)



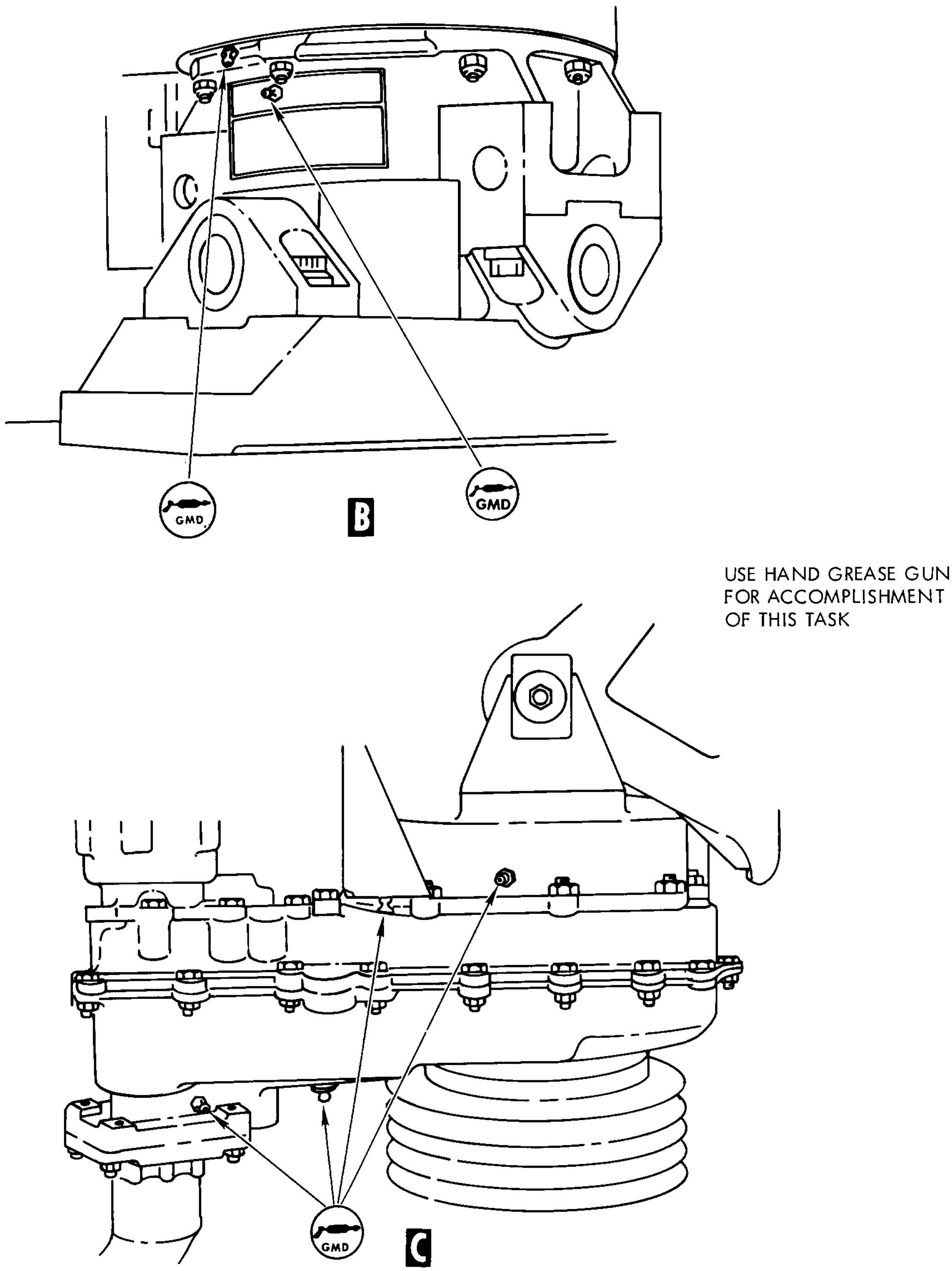
Rudder servo lubrication



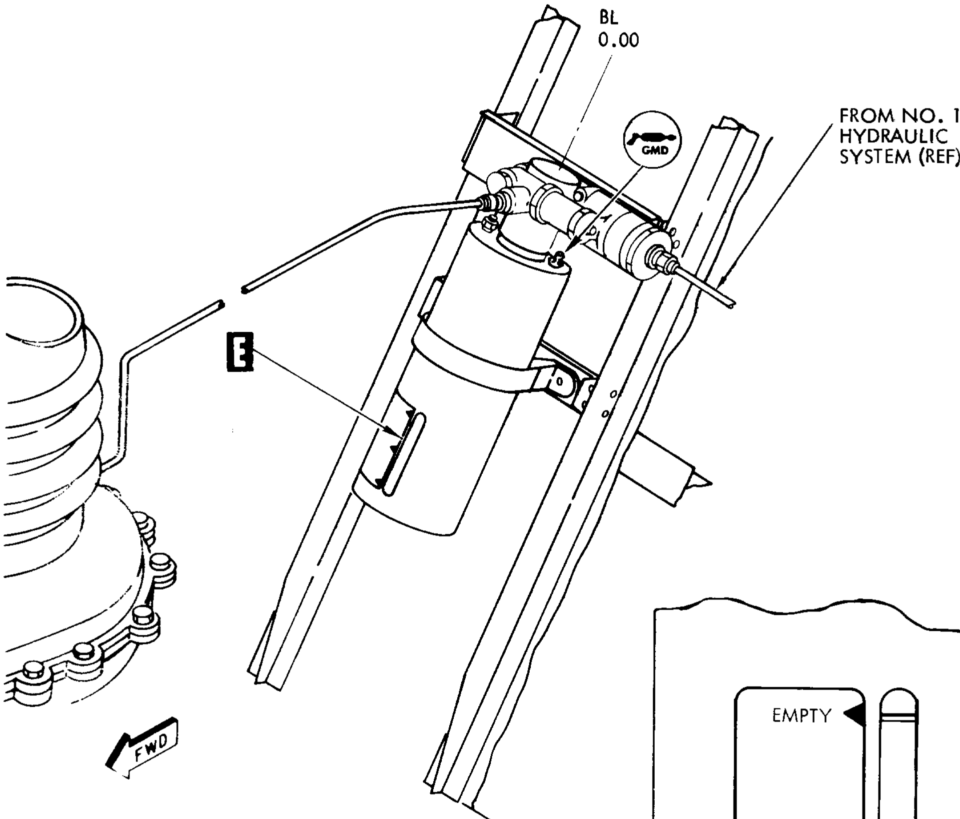
Elevator servo lubrication



Pitch trim actuator lubrication (1 of 3)



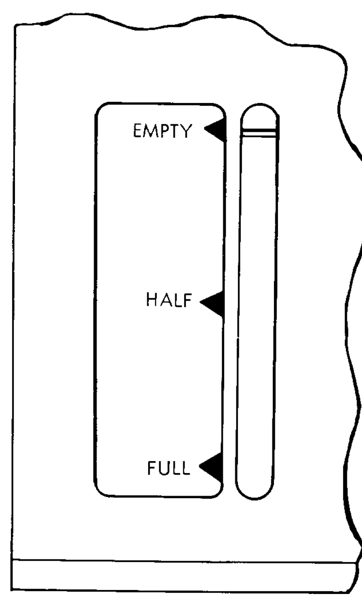
Pitch trim actuator lubrication (2 of 3)



D

PITCH TRIM ACTUATOR GREASER

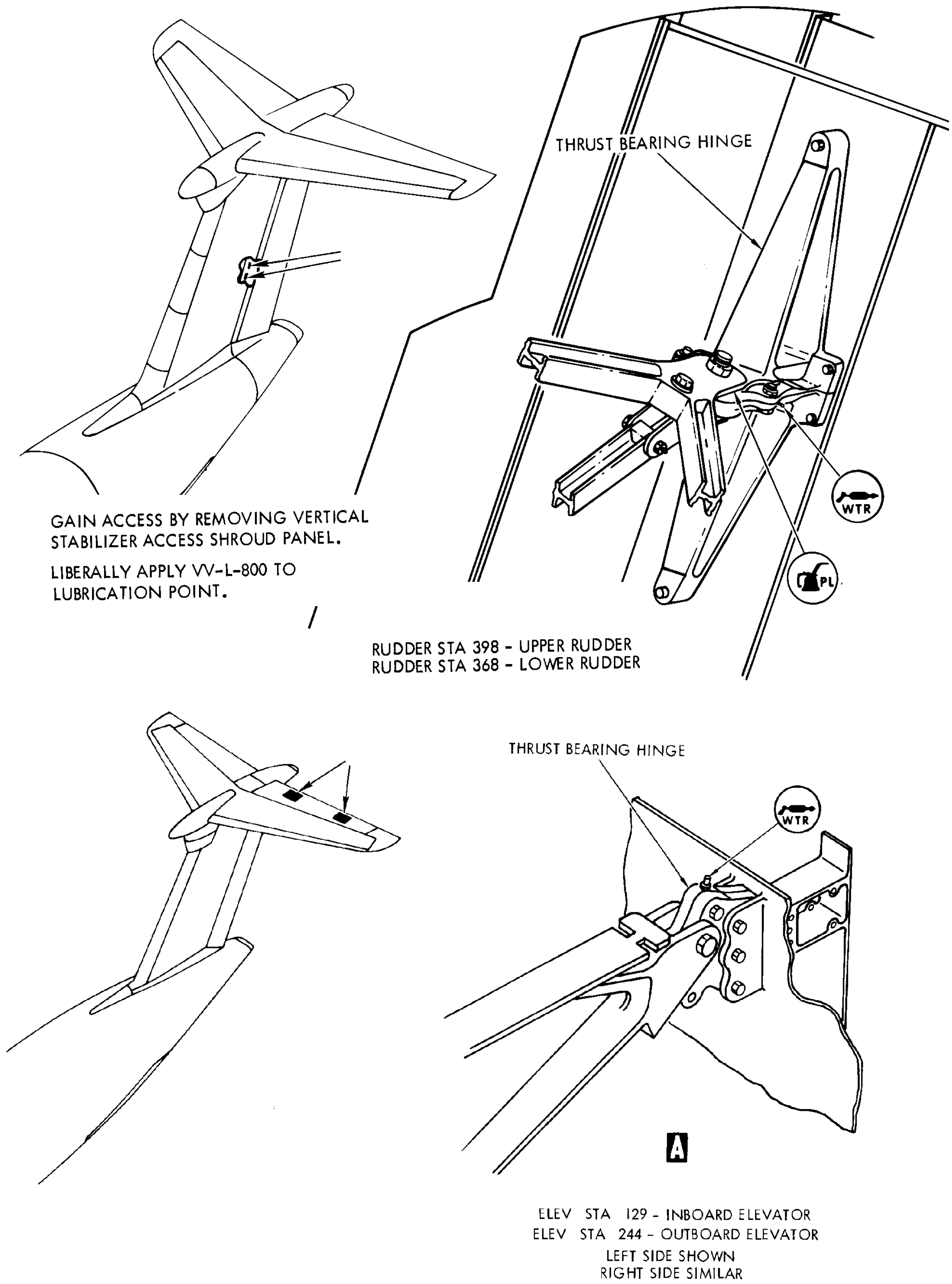
USE HAND GREASE GUN
FOR ACCOMPLISHMENT
OF THIS TASK.



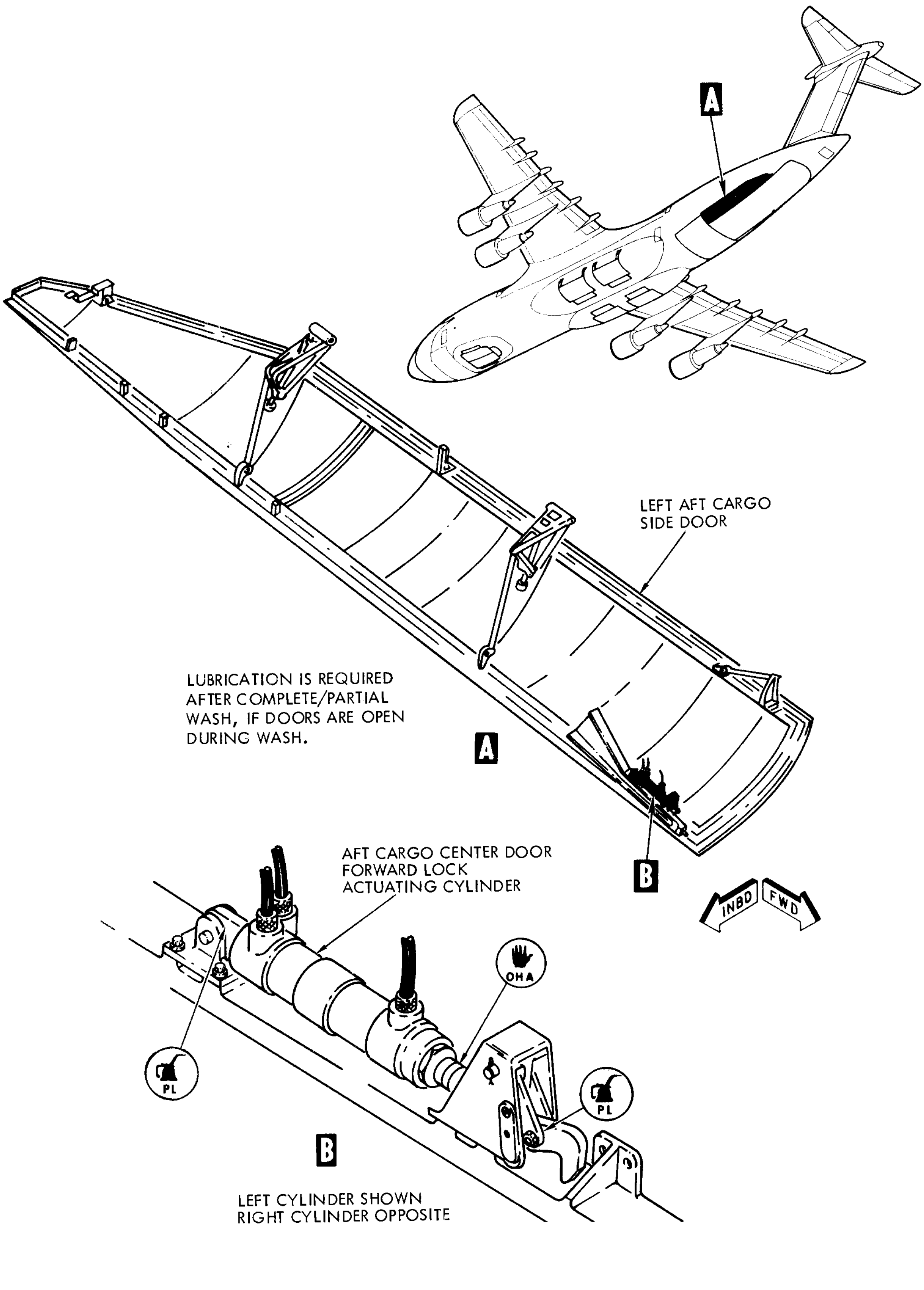
INDICATOR
SIGHT GAGE

E

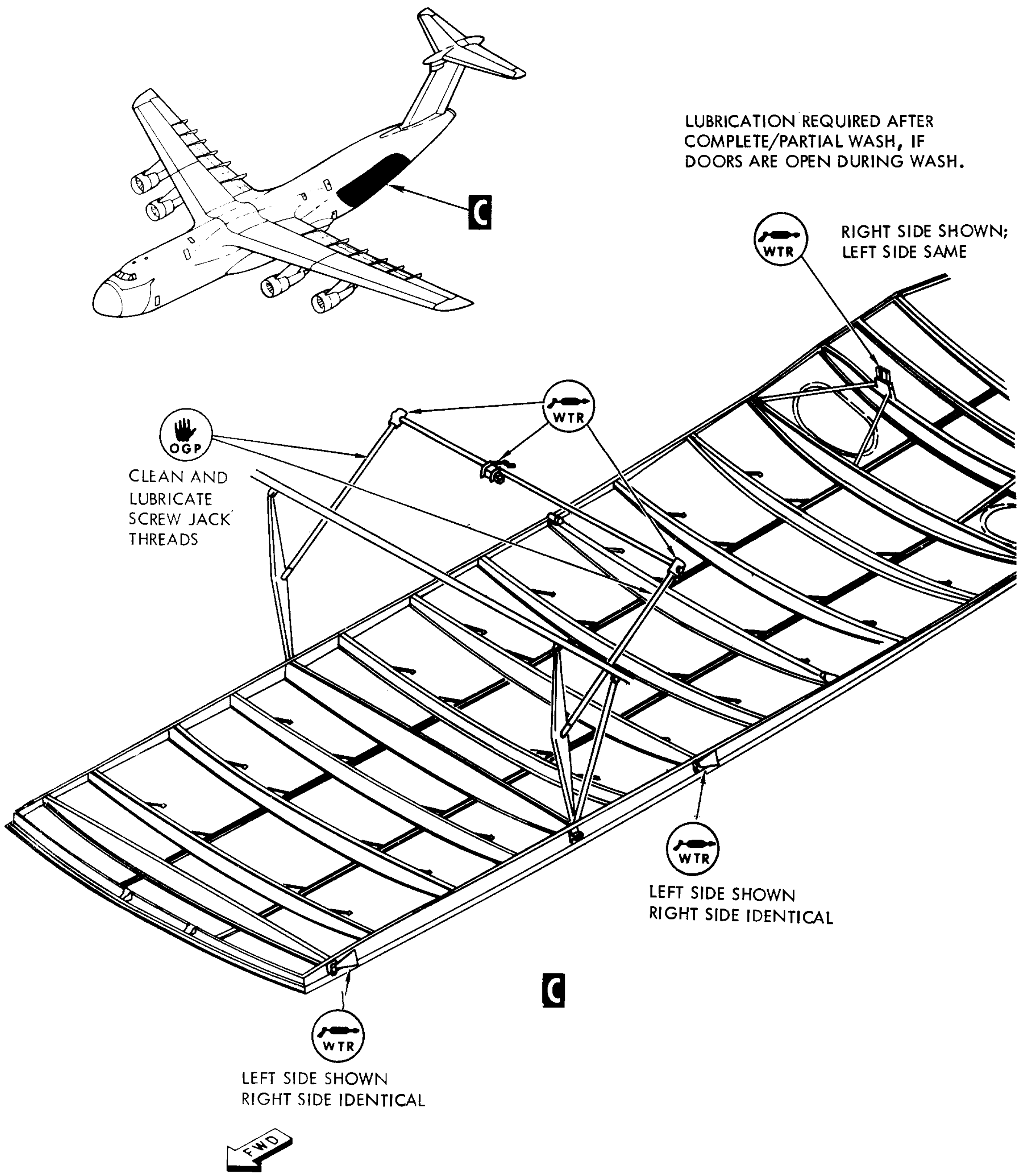
Pitch trim actuator lubrication (3 of 3)



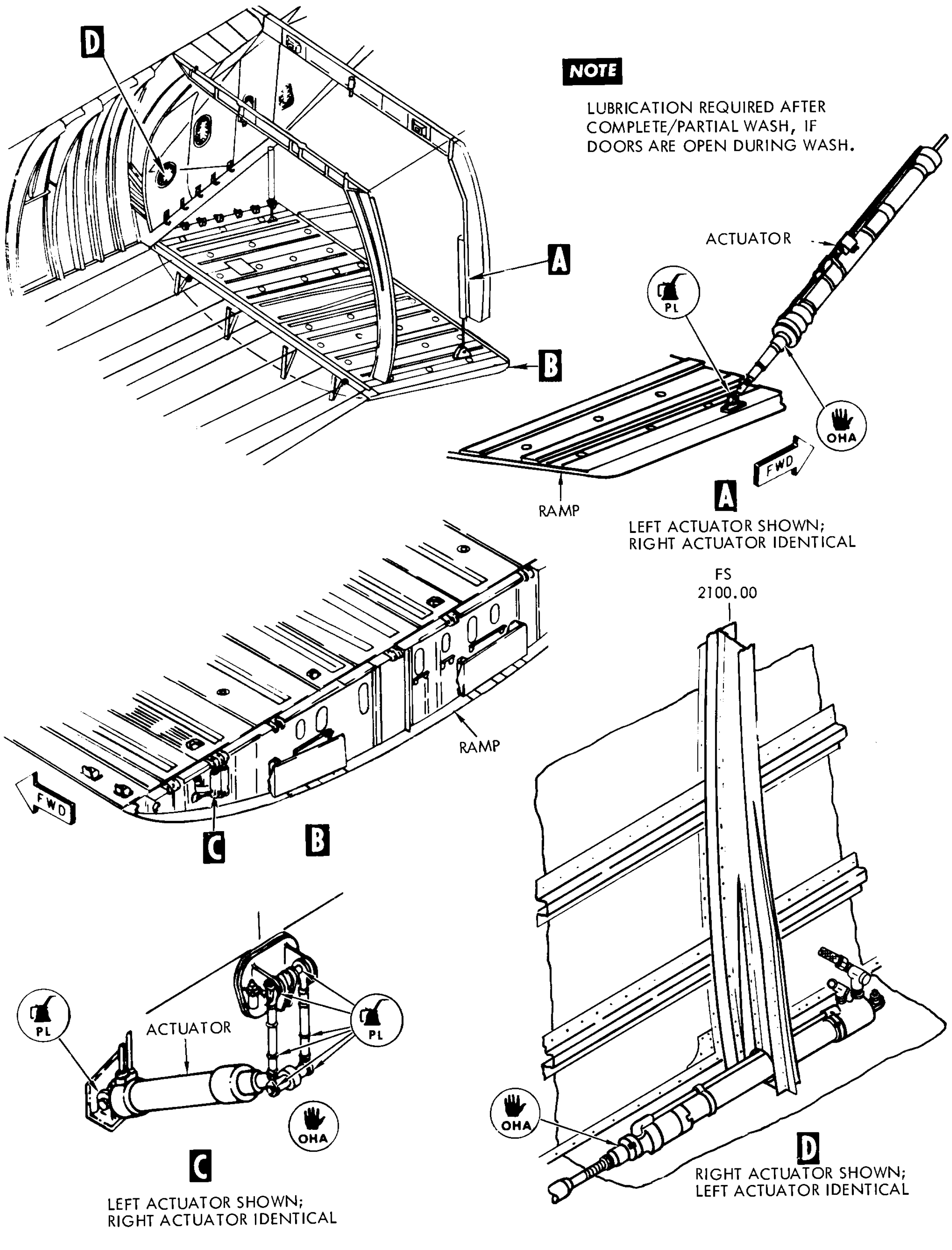
Rudder and elevator structure lubrication



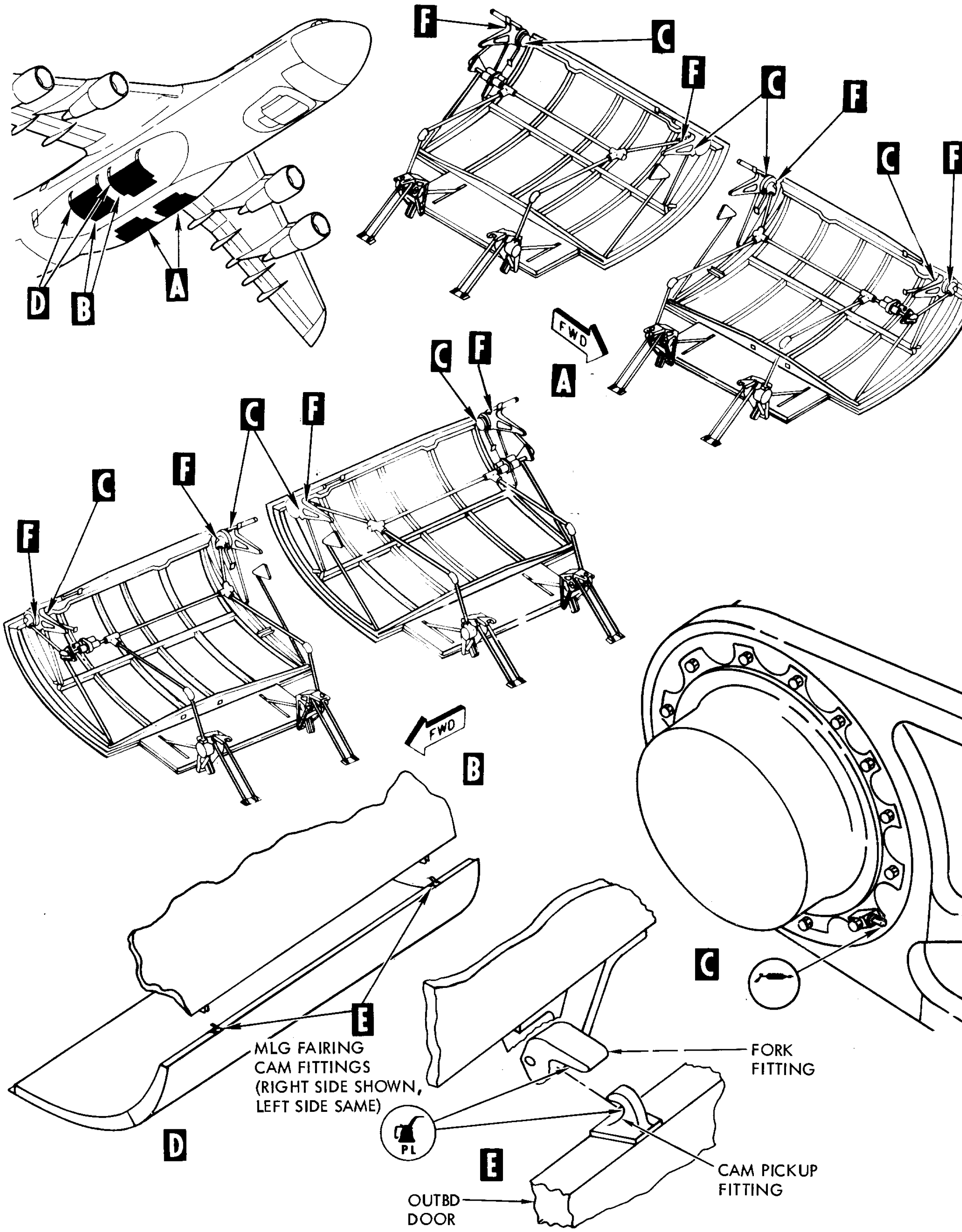
Aft cargo center door lubrication (1 of 2)



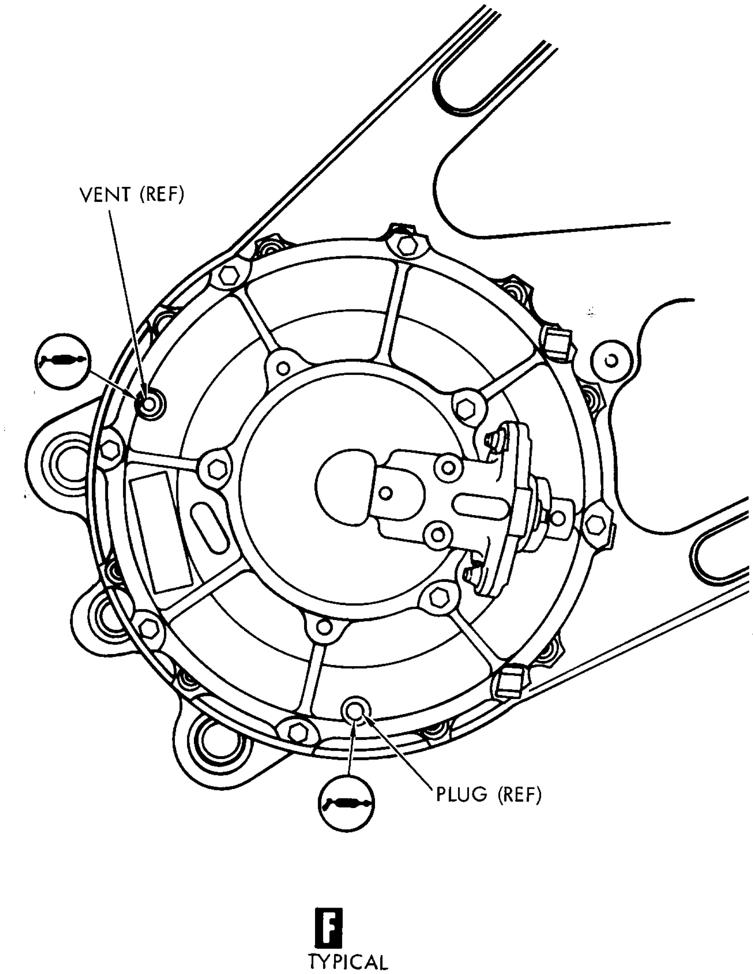
Aft cargo center door lubrication (2 of 2)



Aft ramp lubrication



Main landing gear outboard door lubrication (1 of 2)



WARNING

SOME OF THE PETROLEUM AND SYNTHETIC TYPE HYDRAULIC OILS/FLUIDS OFTEN CONTAIN TRICRESYL PHOSPHATE (TCP) AS ADDITIVES, WHICH IS READILY ABSORBED BY THE SKIN AND IS TOXIC. ANY PORTION OF THE BODY THAT COMES IN CONTACT WITH THESE OILS/FLUIDS SHOULD BE CLEANED AS SOON AS POSSIBLE. IF SKIN OR EYE CONTACT CAN BE ANTICIPATED, APPROPRIATE PROTECTIVE EQUIPMENT WILL BE WORN.

Main landing gear outboard door lubrication (2 of 2)

BLANK

BLANK

AIRFRAME DESCRIPTION AND EQUIPMENT

Type of Construction

The fuselage airframe is a symmetrical, two-lobed structure of semi-monocoque design. Skins, stringers, and frames are used to form the upper and lower lobe airframe structures. A fore and aft floor forms the boundary between the upper and lower lobes.

Materials of Construction

The prime materials of construction are aluminum alloy sheet and extrusion, aluminum alloy forgings, and honey-comb panels faced with aluminum alloy. Some steel and titanium materials are used in construction of the fuselage. Fiberglass-reinforced plastic materials are used in a large number of airframe components such as fairings.

Basic Arrangement

The fuselage upper lobe is divided into the following compartments:

- Flight station
- Relief crew
- Troop/courier
- Environmental
- Troop
- Torque deck (Hayloft)
- Center wing box beam
- Aft center wing section
- Forward underfloor
- Aft underfloor

An aisle is provided from the flight station to the environmental compartment door. The center wing section separates the environmental compartment from the troop compartment. No aisle or passageway is provided between these two compartments.

The fuselage lower lobe forms the cargo compartment.

Pressurization Envelope

The pressurized area of the fuselage begins at the visor door pressure bulkhead located at FS 303. The pressurized area extends aft through both fuselage lobes. The aft fuselage pressure bulkhead FS 2101, pressure door and aft ramp floor panels form the aft end of the fuselage pressurized area.

Flight Station

The flight station is located in the fuselage upper lobe. It extends from FS 303 to 524. The flight station stair is used to enter the flight station through the flight station entry stairwell folding door.

Relief Crew Compartment

The relief crew compartment extends from FS 524 to 872 and is located in the fuselage upper lobe.

Troop/Courier Compartment

The troop/courier compartment extends from FS 872 to 992 and is located in the fuselage upper lobe.

Troop Compartment

The troop compartment extends from FS 1383 to 2100 and is located in the fuselage upper lobe. The troop interior access stair can be used to enter the troop compartment from the cargo compartment.

Cargo Compartment

The cargo compartment is located in the fuselage lower lobe and extends from the canted bulkhead at FS 393 to the aft ramp and pressure door intersection at FS 2131. The visor door and forward ramp form the closure for the forward end of the cargo compartment area. The aft ramp, pressure door, and cargo doors form the closure for the cargo compartment aft end. The cargo compartment area covered in this section extends from FS 507 to 1976.

Floor Panels

The cargo compartment floor extends from FS 507 to FS station 1976. The floor panels are fixed to the underfloor structure and are not removable for maintenance except for two floor panels located in the forward end of the cargo compartment.

Walkways

Walkways are provided on each side of the cargo compartment between FS 524 to 1844. The walkway continues across the aft personnel doors. Walkway panels are fabricated of aluminum honeycomb sandwich material.

Floor Panel and Underfloor Drain Valves

Drain valves are installed in the cargo compartment floor and in the fuselage underfloor bilge areas . Drain valves are provided to drain fluid spillage and fluids collected during loading operation. The valve closes the drain hole during fuselage pressurization, and opens upon depressurization.

Fuselage Windshields

The seven windshields located in the flight station compartment are identified as follows:

- Center windshield
- Pilot’s and copilot’s side windshields
- Pilot’s and copilot’s clear vision windshields (sliding window)
- Pilot’s and copilot’s main windshields

Center and main windshields are fabricated of three tempered glass plies laminated with a layer of polyvinyl butral between each glass ply.

Clear Vision Windshields (Sliding Windows)

The clear vision windshields (sliding windows) can be opened and closed as required for maintenance and egress. In the closed position, the clear vision windshield is locked by the latch and striker bars, locking pin, and actuating mechanism.

Windshield Anti-icing, De-icing, Defog, and Defrost System

The seven windshields located in flight station are equipped for heating to control fogging, frosting, and icing conditions. A windshield wiper system is provided for rain removal.

Nose Landing Gear Inspection Fiber Scope

A NLG inspection fiber scope is installed in the left forward part of the cargo compartment near FS 564 and WL 155. The fiber scope is used primarily in flight to visually observe if the NLG is down and locked.

Main Landing Gear Inspection Windows

Visual inspection of MLG bay areas or the MLG's for the down and locked condition can be accomplished during pressurized flight by looking through the "see through" window panes.

Fuselage Scanning Windows

Scanning windows are provided in the fuselage for observation of the airplane exterior airframe during flight. Two scanning windows are located in the relief crew compartment. Left and right scanning windows are located at FS 734 and WL 355. Four scanning windows are located in the cargo compartment. Left and right scanning windows are located at FS 574 and 1427. All four windows are located along WL 215.

Window shades are installed on the fuselage scanning windows. These shades prevent inadvertent activation of the optical flame detectors by strong sunlight.

Service Doors and Hatches

Service doors and hatches located in the fuselage are given in the following list:

- Avionics equipment compartment doors
- Crew bunk area stowage cabinet doors
- Environmental compartment door
- Pressure doors
- Aft fuselage access doors
- Fuselage afterbody maintenance door
- IFR door
- Troop/courier compartment floor access hatch
- Crew bunk compartment doors

Avionics Equipment Compartment Doors

Two full-size compartment doors are located in the left-hand forward part of the relief crew compartment for access to the avionics equipment compartment. The doors are equipped with conventional latch handles and latch assemblies. The doors open inward toward the aisle.

Crew Bunk Area Stowage Cabinet Doors

A stowage cabinet and door is located in each bunk compartment. The door to the stowage cabinet is located between the lower bunks in the outboard end of the compartment.

Environmental Compartment Door

The environmental compartment door is located at FS 992 in the aft troop/courier compartment partition. The door is provided for access to environmental equipment located within the environmental compartment.

Crew Bunk Compartment Door

Two sliding doors isolate two crew rest area compartments from the aisle traffic. The doors are opened and closed by sliding a latch (aft or forward) and pushing the door to the desired position.

Pressure Doors

Access to the doors is through the MLG wheel well. The doors provide access to the underfloor structure forward of FS 1268 and aft of FS 1638. The doors are attached to the bulkhead with quick-release fasteners.

On AF83-1285 and up, two hatches, located at FS 844 and FS 1824 on the fuselage belly centerline, provide access to the bilge area.

Aft Fuselage Emergency Access Doors

Two aft fuselage emergency access doors are located in the FS 2101 pressure bulkhead. The doors are hinged to open forward into the aft end of the troop compartment. The doors provide access to the airframe structure aft of FS 2101, and negative pressure relief as required to the troop compartment. The diaphragm-type door is provided with a bulb seal for pressure and environmental sealing. A guard is provided for the doors to protect personnel in the troop compartment from injury during opening of the doors for negative pressure relief.

Fuselage Afterbody Maintenance Door

A maintenance access door is located in the fuselage afterbody from FS 2276 to 2815. The door is provided for access to fuselage afterbody frame and station-keeping equipment system avionics equipment located in the fuselage afterbody. The door hinges upward after quick release fasteners are released. The door is provided with screened openings to allow for negative and positive pressure relief.

In Flight Refueling (IFR) Door

An IFR door is located in the forward fuselage upper airframe structure between FS 437 and 469. The door is centered on RBL 8.4. The door is provided to cover the IFR slipway pan which houses the IFR receptacle.

Courier Compartment Floor Access Hatch

An access hatch is located in the courier compartment floor between FS 944 and 954 and to the left side of butt line 0. The hatch is set aside to expose the hatch opening in the floor. A rope ladder is stowed under the floor, adjacent to the hatch opening, for descent to or ascent from the cargo compartment floor.

Fuselage Interior Trim

The flight station, relief crew, troop/courier, troop, and cargo compartment interiors are finished with trim panels. Close-out trim panels are used to provide and eye-pleasing appearance to the interior areas of the airplane and to cover insulation batts, plumbing, wiring, and system equipment. The trim panels are removable and are installed in various sizes to provide easy access to system equipment located behind the panels.

Fuselage Thermal and Sound Proofing Insulation

Thermal and soundproofing insulation batts and blankets are installed in the flight station, relief crew troop/courier, troop, and cargo compartments between the trim panels and fuselage skin. The insulation batts and blankets provide compartment thermal insulation and sound absorption.

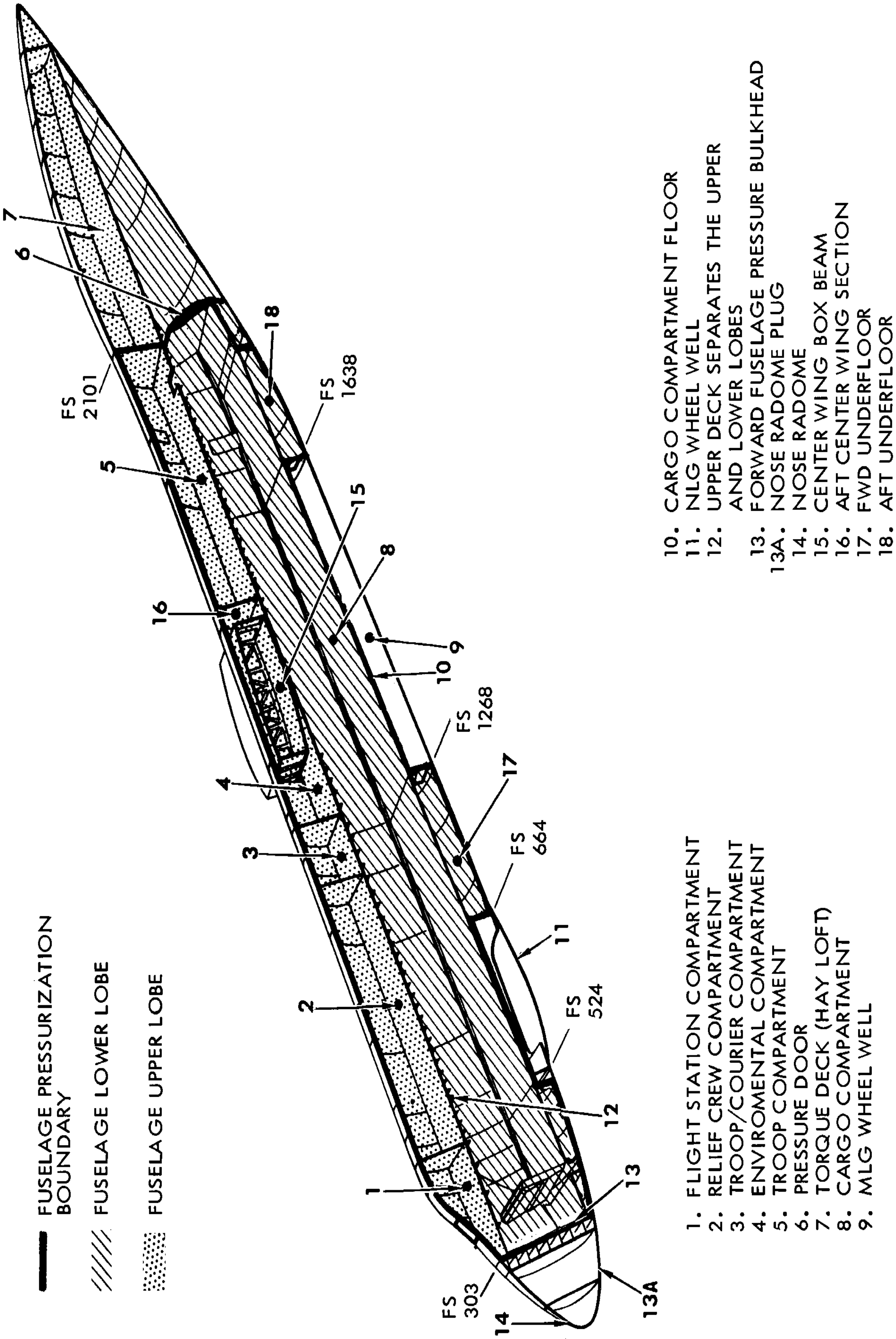
Fuselage Radomes

The nose and station-keeping equipment radomes are located on the fuselage.

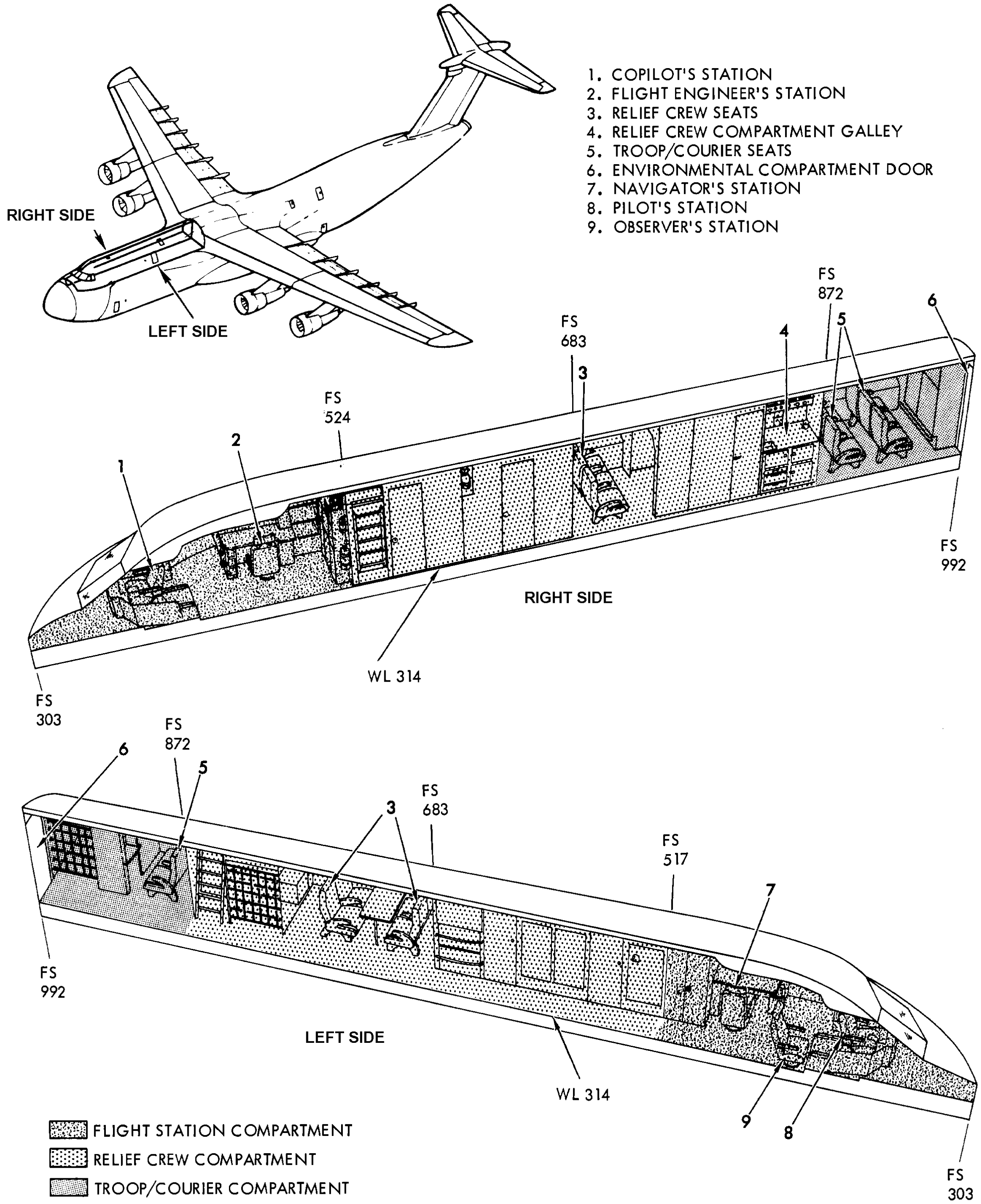
The nose radome is located on front of the fuselage and is attached to the nose radome plug at FS 197. The nose radome covers avionics equipment located in front of the visor door pressure bulkhead. The station-keeping equipment radome is on the aft end of the fuselage afterbody. This radome is attached to the afterbody at FS 2900. This radome is used to house avionics equipment which is installed inside the radome.

Fuselage Vents

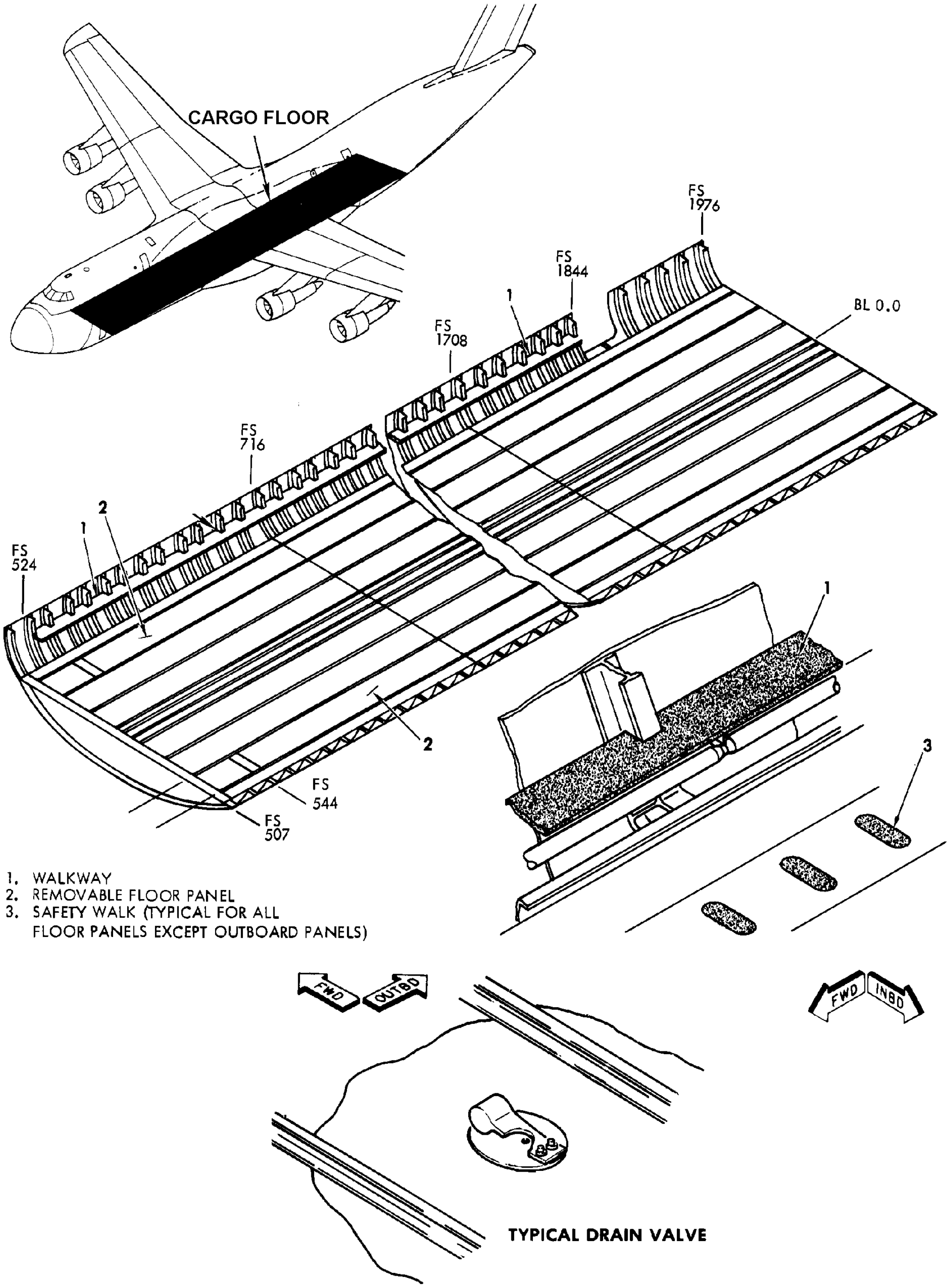
Seven vents are provided in the cargo compartment for overboard venting of fumes and vapors. There are three cryogenic vents located on the left side and four cargo vents located on the right side. Each vent is equipped with a sealing plug which must be installed when vent is not in use.



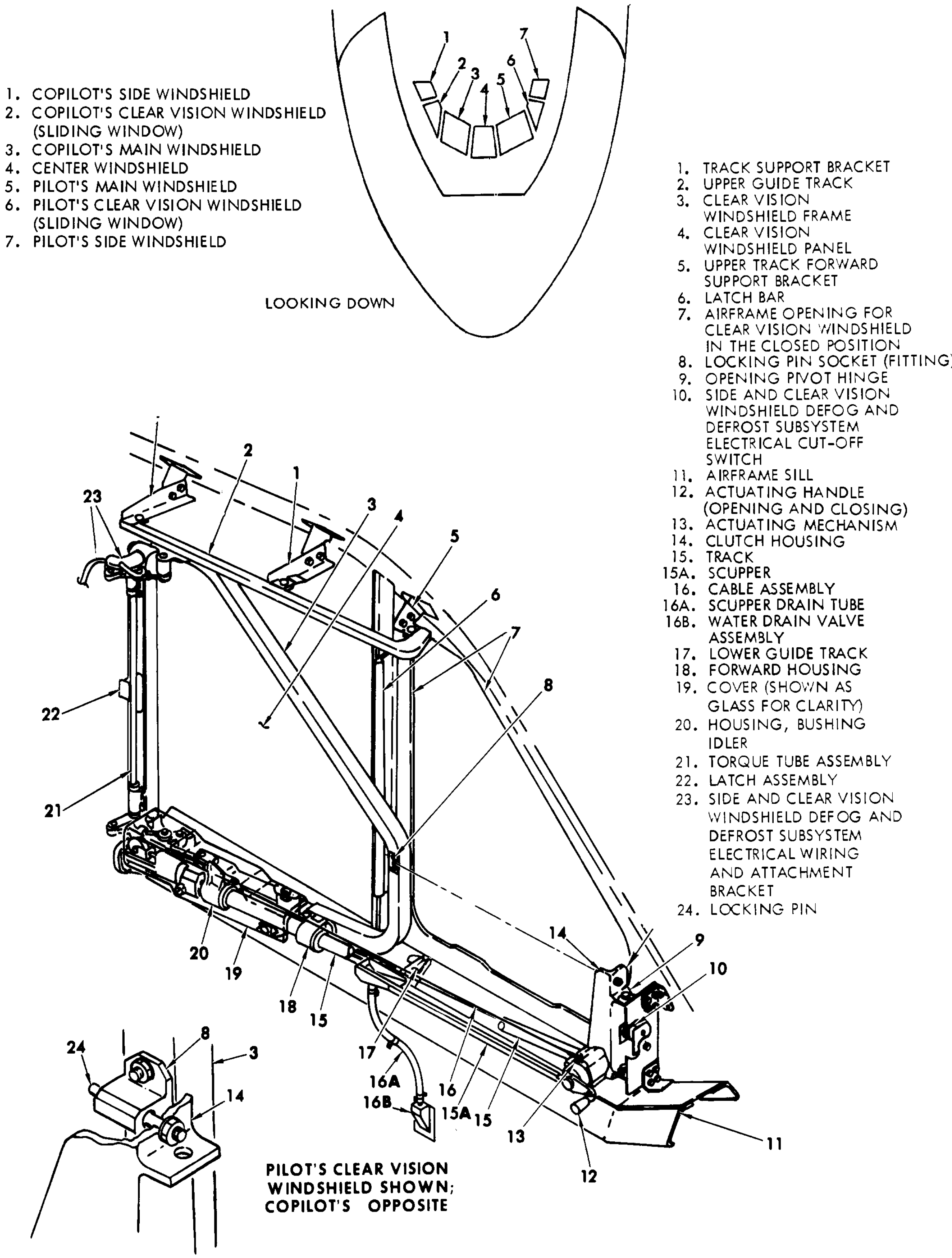
Fuselage basic arrangement and pressurization envelope



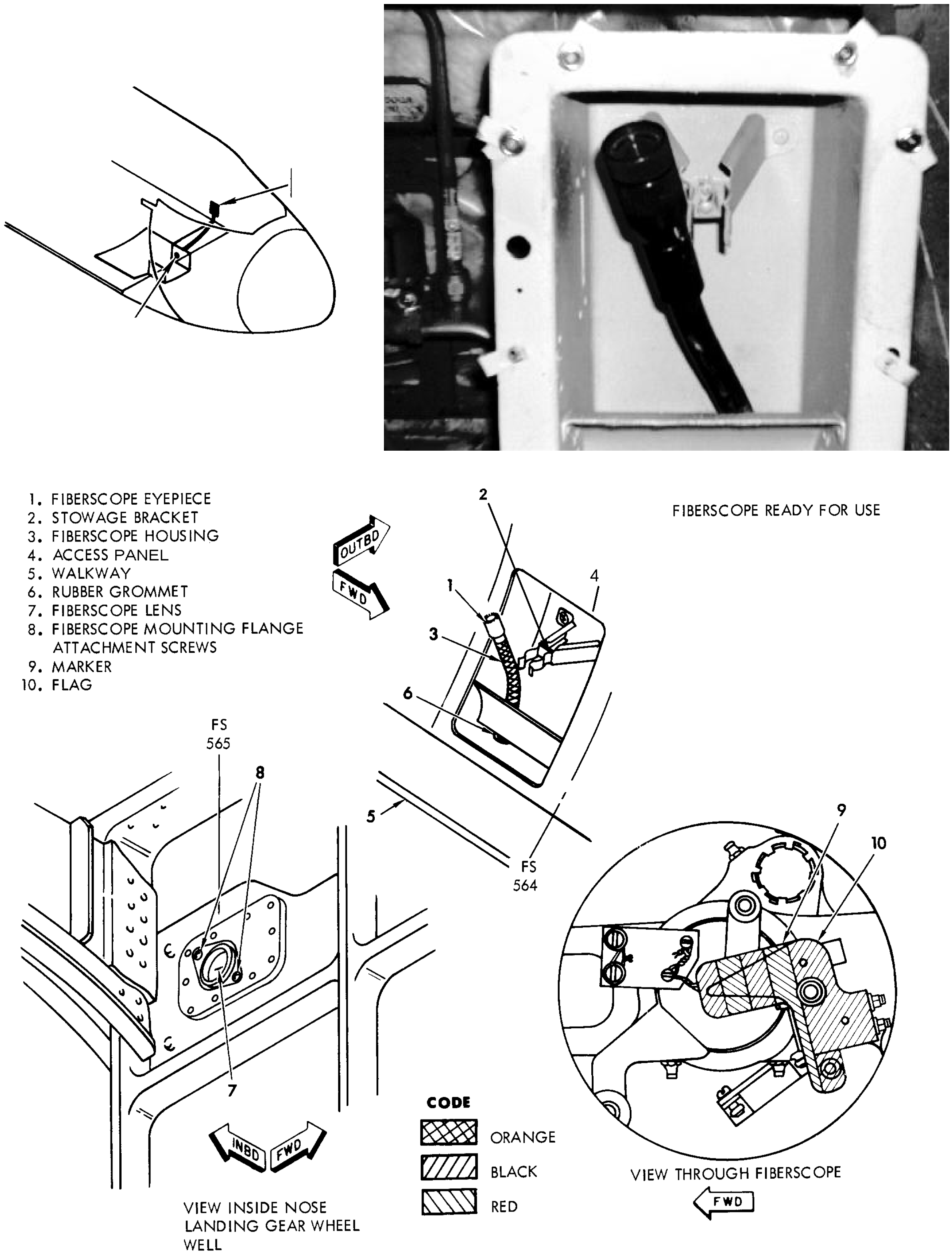
Flight station, relief crew, and troop/courier compartments



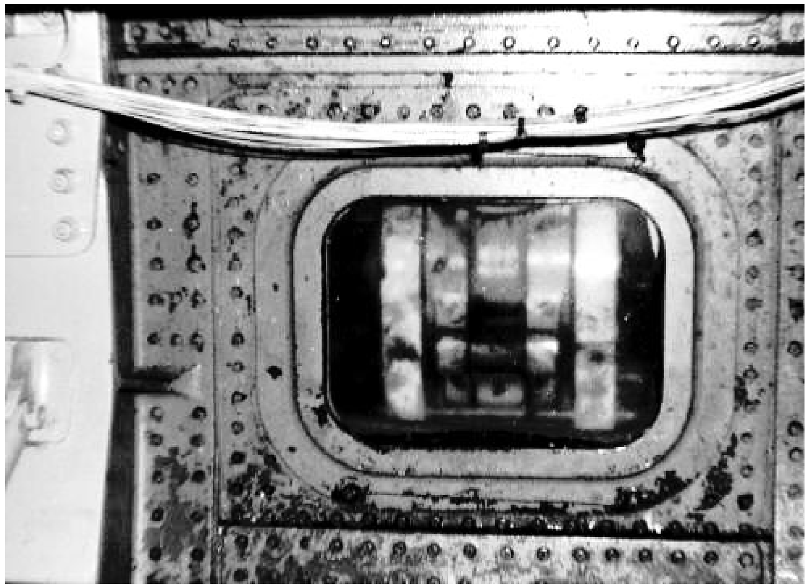
Cargo compartment walkways and floor panels

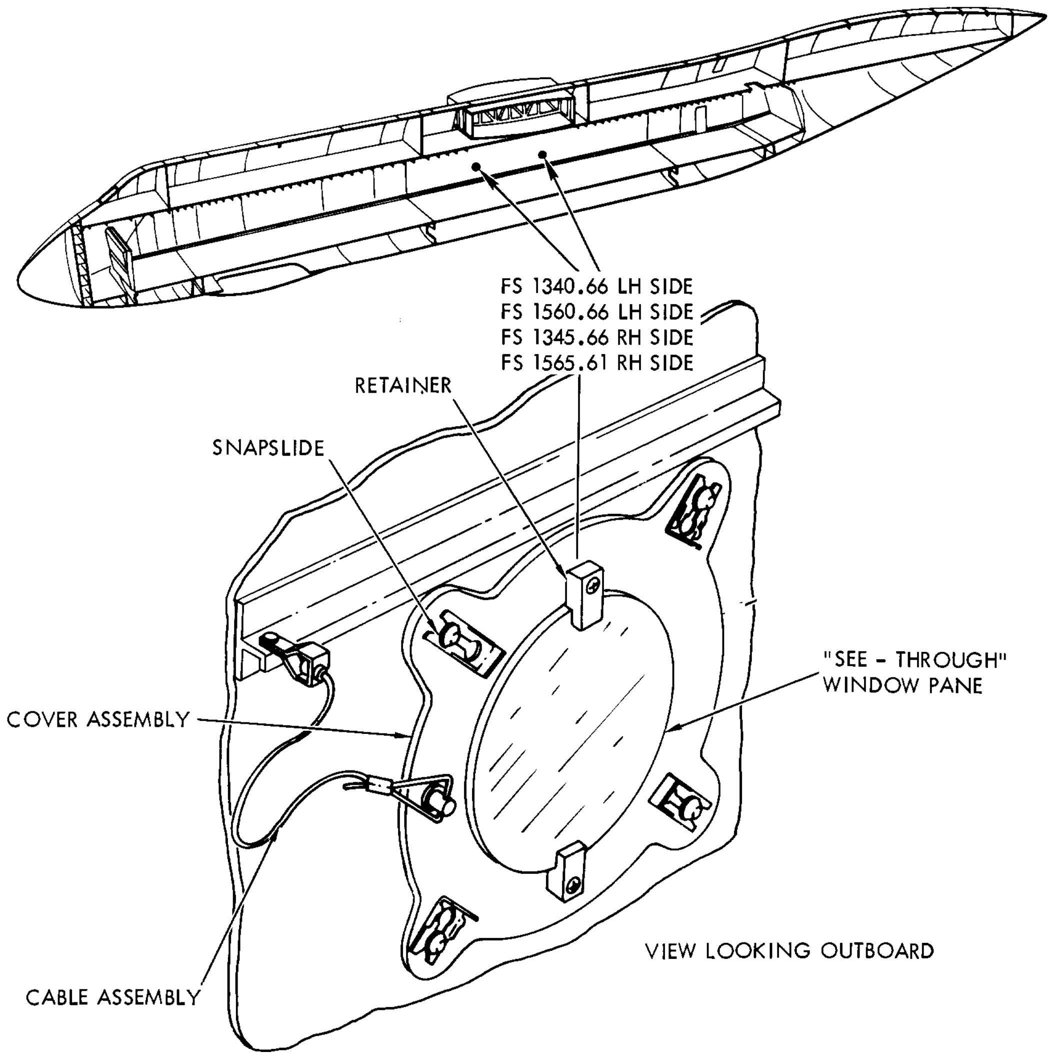


Flight station windows

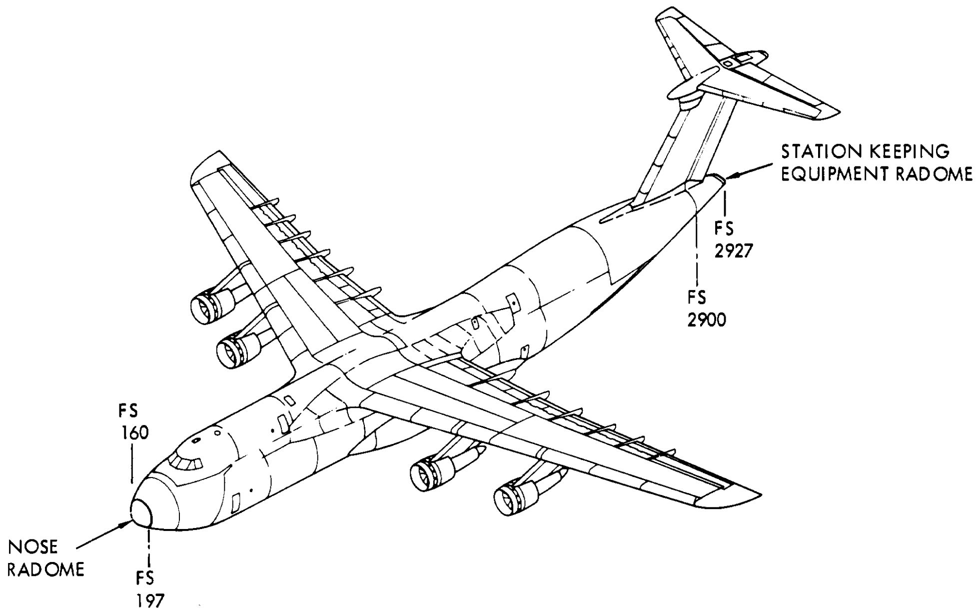


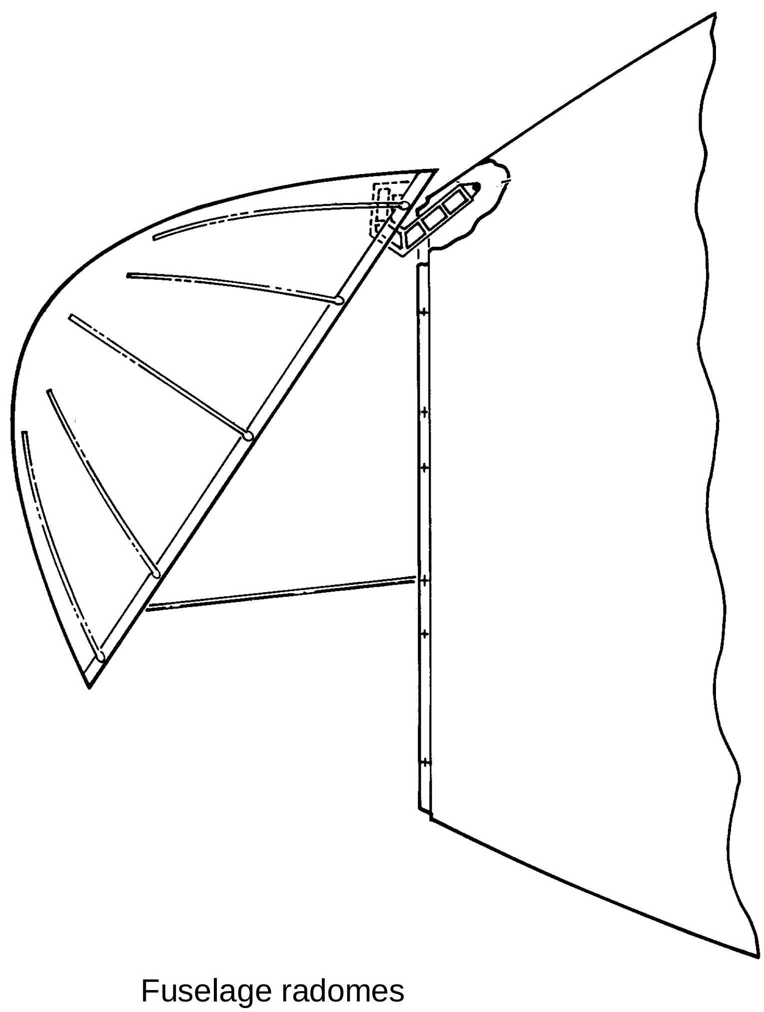
Nose landing gear inspection fiber optic scope



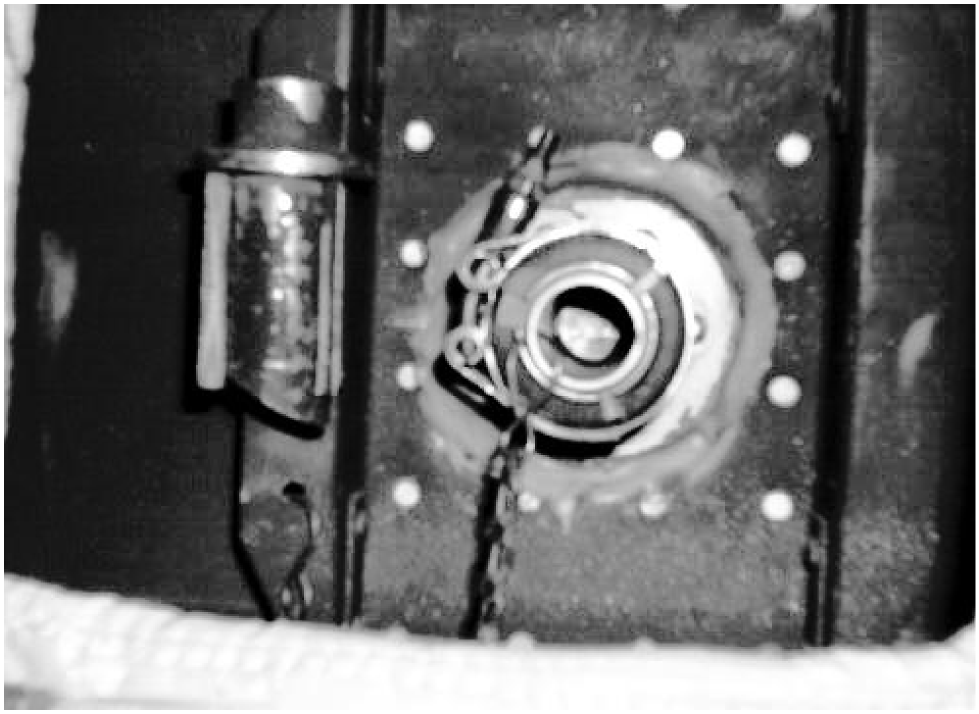


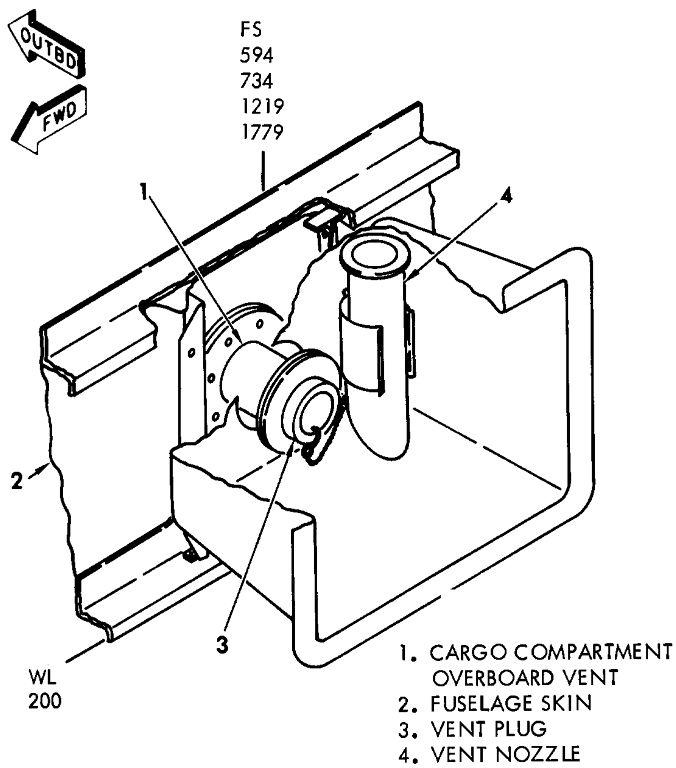
Main landing gear inspection window



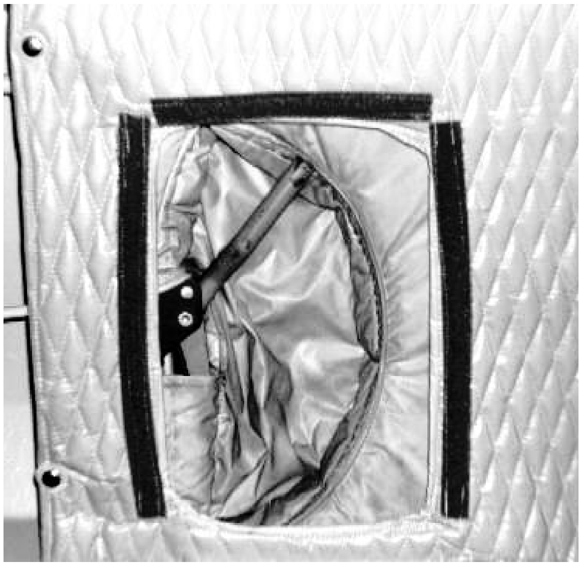


Fuselage radomes

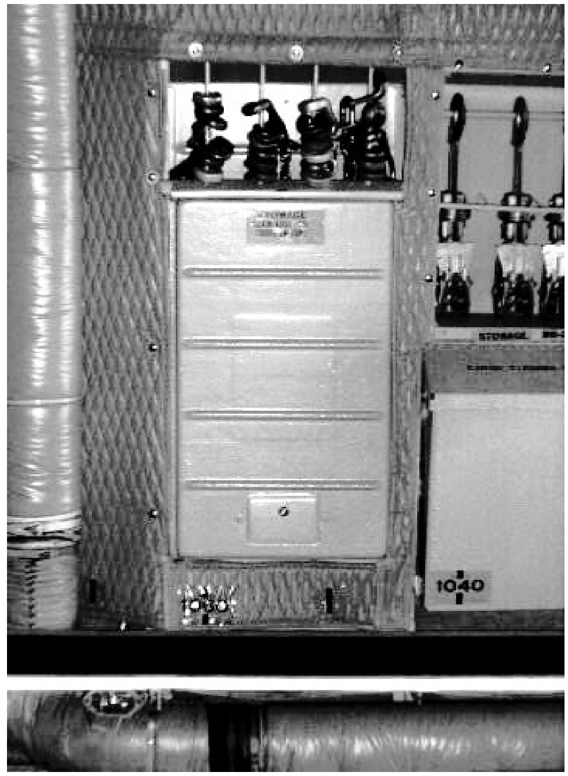




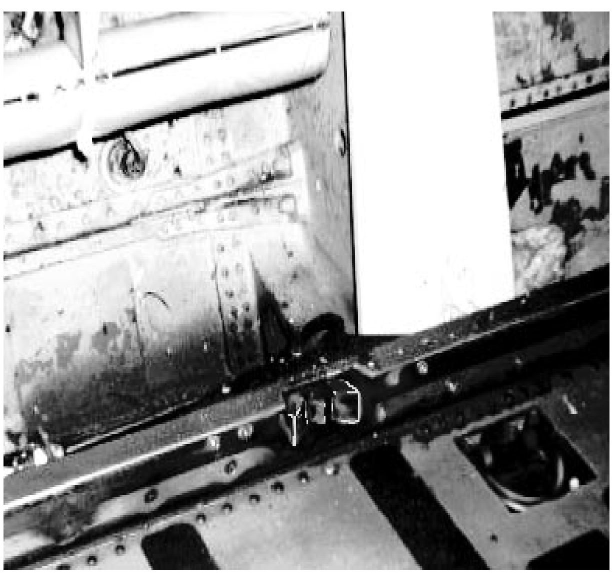
Cargo compartment vents



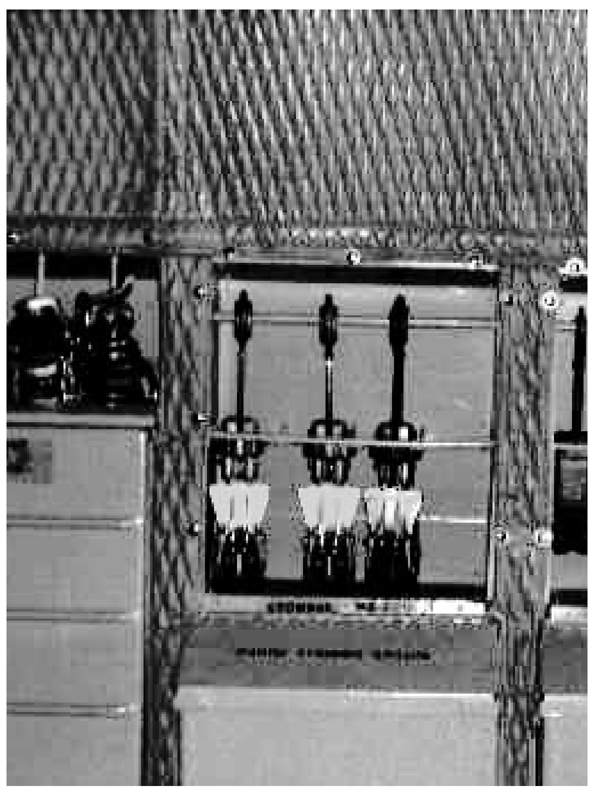
Typical detent lock handle



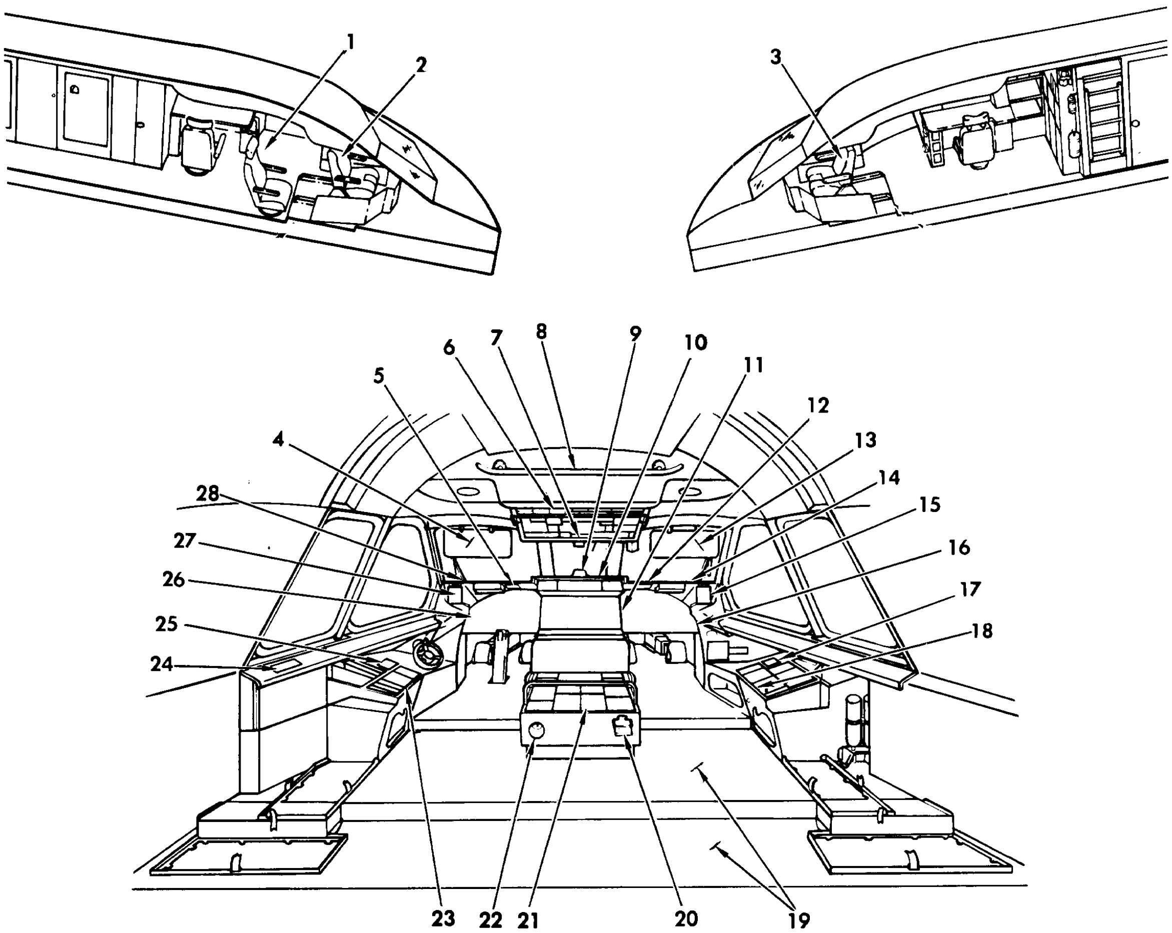
Typical tie-down chain storage



Typical detent lock



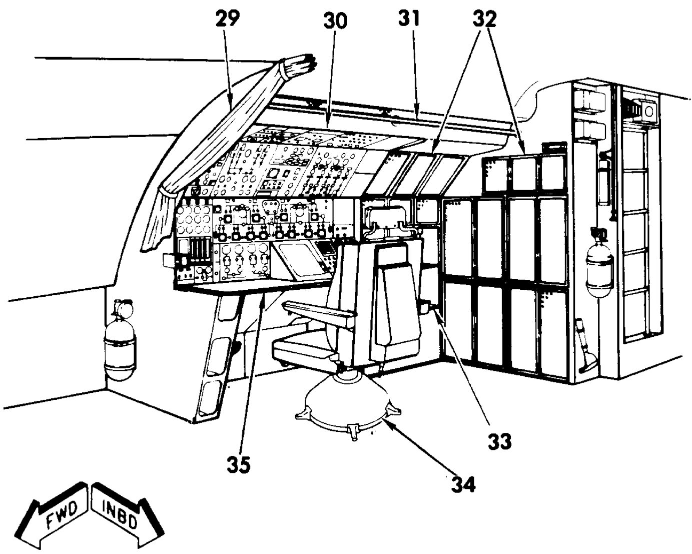
Typical tie-down device storage



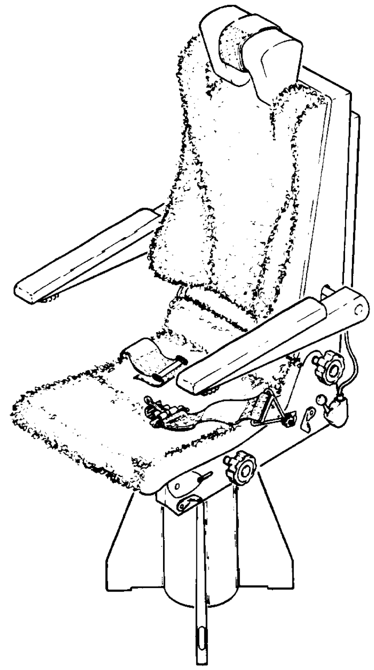
PILOT'S AND COPILOT'S STATION-LOOKING FORWARD

1. OBSERVER'S SEAT
2. PILOT'S SEAT
3. COPILOT'S SEAT
4. PILOT'S SUN VISOR
5. PILOT'S UHF FREQUENCY CARD HOLDER
6. PILOT AND COPILOT FORWARD OVERHEAD CONTROL PANEL
7. STANDBY MAGNETIC COMPASS
8. FLIGHT STATION HAND RAIL
9. MIKE HOLDER
10. CENTER GLARE SHIELD
11. CENTER INSTRUMENT PANEL
12. COPILOT'S UHF FREQUENCY CARD HOLDER
13. COPILOT'S SUN VISOR
14. COPILOT'S GLARE SHIELD
15. COPILOT'S GLARE SHIELD LET DOWN CHART HOLDER
16. COPILOT'S MAIN INSTRUMENT PANEL
17. COPILOT'S ASHTRAY
18. COPILOT'S SIDE CONSOLE
19. FLIGHT STATION COMPARTMENT FLOOR
20. CUP HOLDER
21. CENTER CONSOLE
22. ASH TRAY
23. PILOT'S SIDE CONSOLE
24. AIRPLANE IDENTIFICATION PLATE
25. PILOT'S ASH TRAY
26. PILOT'S MAIN INSTRUMENT PANEL
27. PILOT'S GLARE SHIELD LET DOWN CHART HOLDER
28. PILOT'S GLARE SHIELD

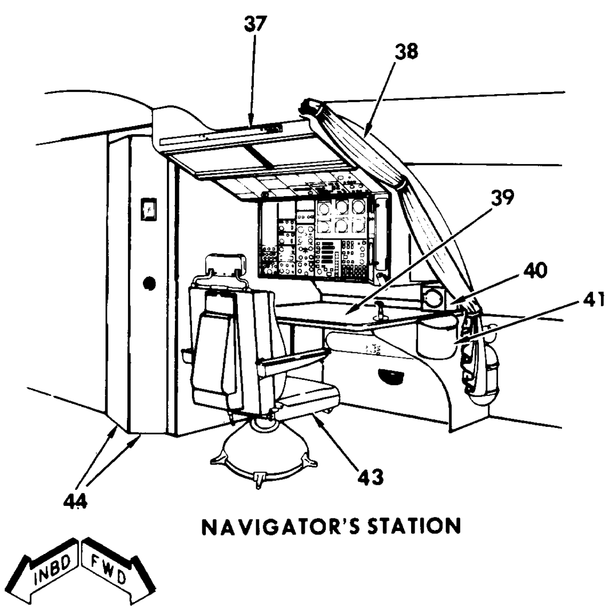
Flight station arrangement (1 of 2)



FLIGHT ENGINEER'S STATION



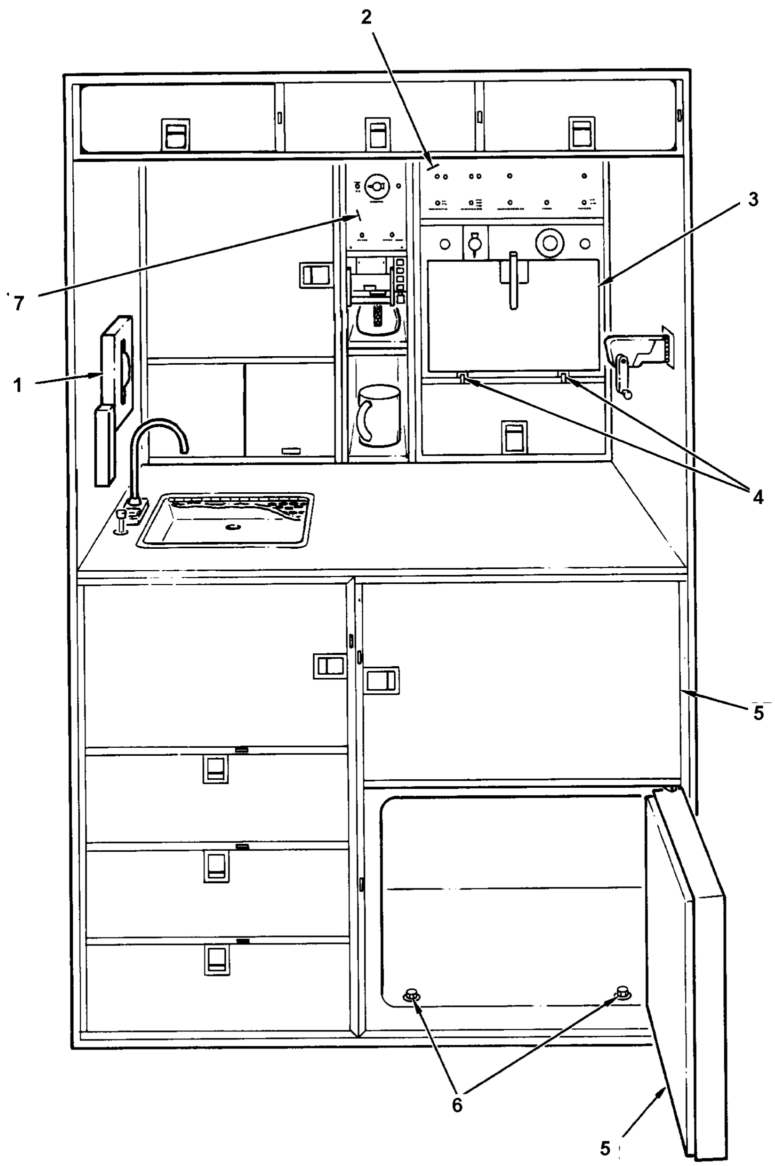
SEAT ASSEMBLY



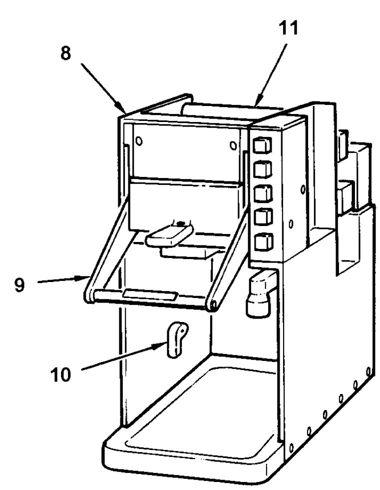
NAVIGATOR'S STATION

29. CREW STATION BLACK-OUT CUTRAIN (FLIGHT ENGINEER'S SIDE)
30. FLIGHT ENGINEER'S CONSOLE
31. FLIGHT STATION HAND RAIL
32. CIRCUIT BREAKER PANELS
33. BOOKCASE AND STRAPS
34. FLIGHT ENGINEER'S SEAT
35. FLIGHT ENGINEER'S TABLE
36. DELETED
37. NAVIGATOR'S CONSOLE
38. CREW STATION BLACK-OUT CURTAIN (NAVIGATOR'S SIDE)
39. NAVIGATOR'S TABLE
40. HOOD STOWAGE CONTAINER
41. WASTE CONTAINER
42. DELETED
43. NAVIGATOR'S SEAT
44. FLIGHT STATION ENTRY FOLDING DOOR

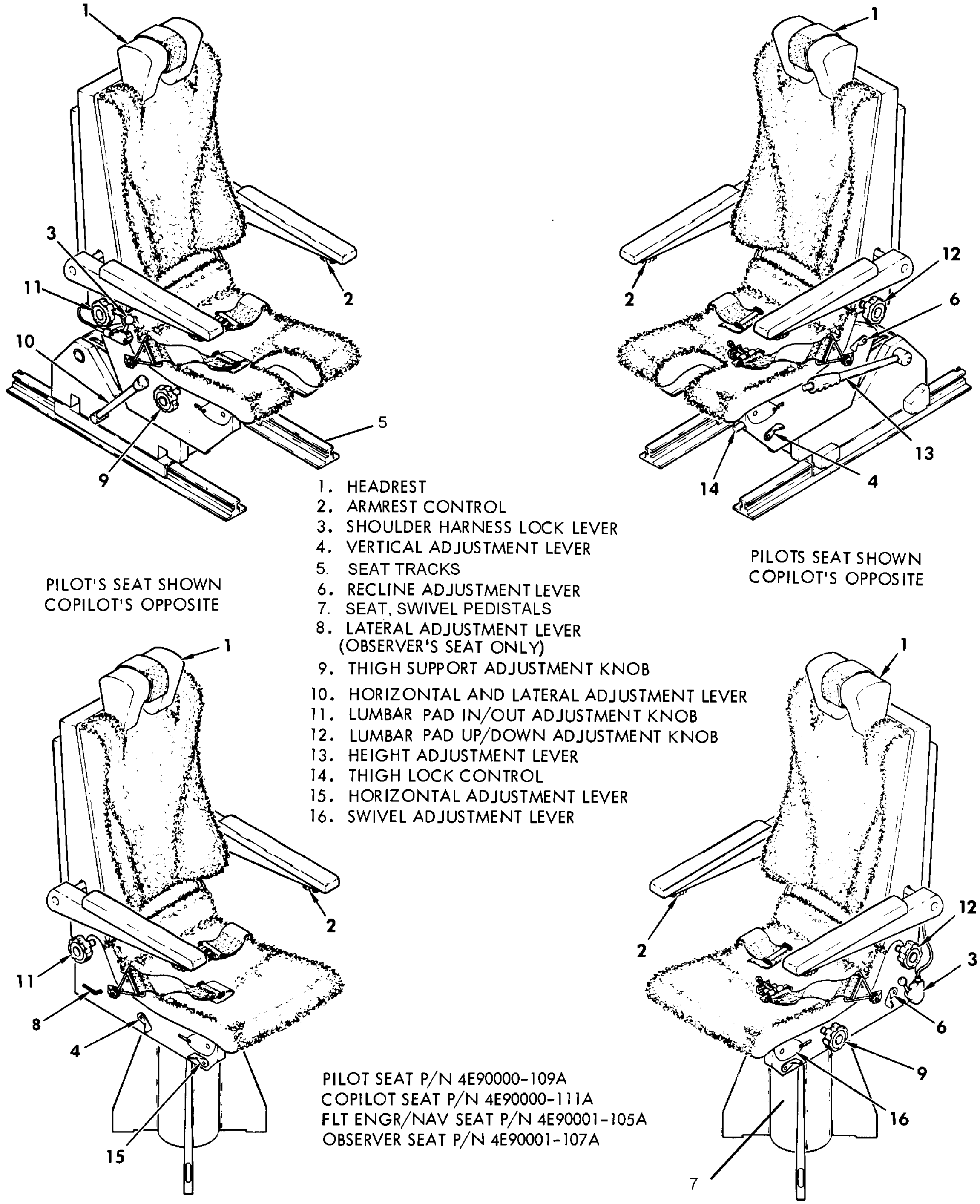
Flight station arrangement (2 of 2)



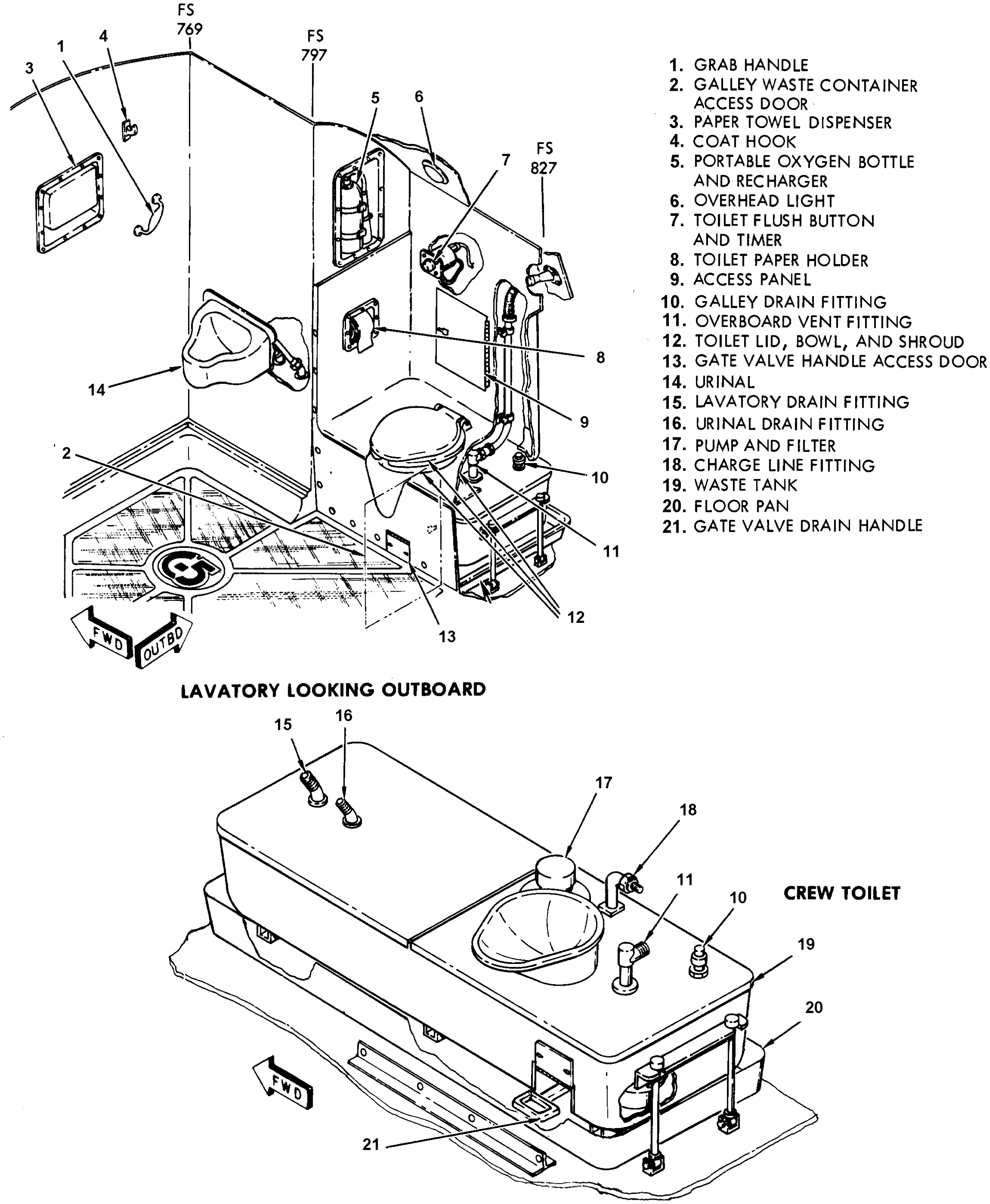
1. PAPER TOWEL DISPENSER
2. GALLEY CONTROL PANEL
3. OVEN
4. OVEN RETAINING STOP (2)
5. REFRIGERATOR
6. RETAINING BOLT (2)
7. HOT CUP TIMER
8. COFFEE MAKER
9. BREW HANDLE
10. LATCHING HANDLE
11. CARRYING HANDLE



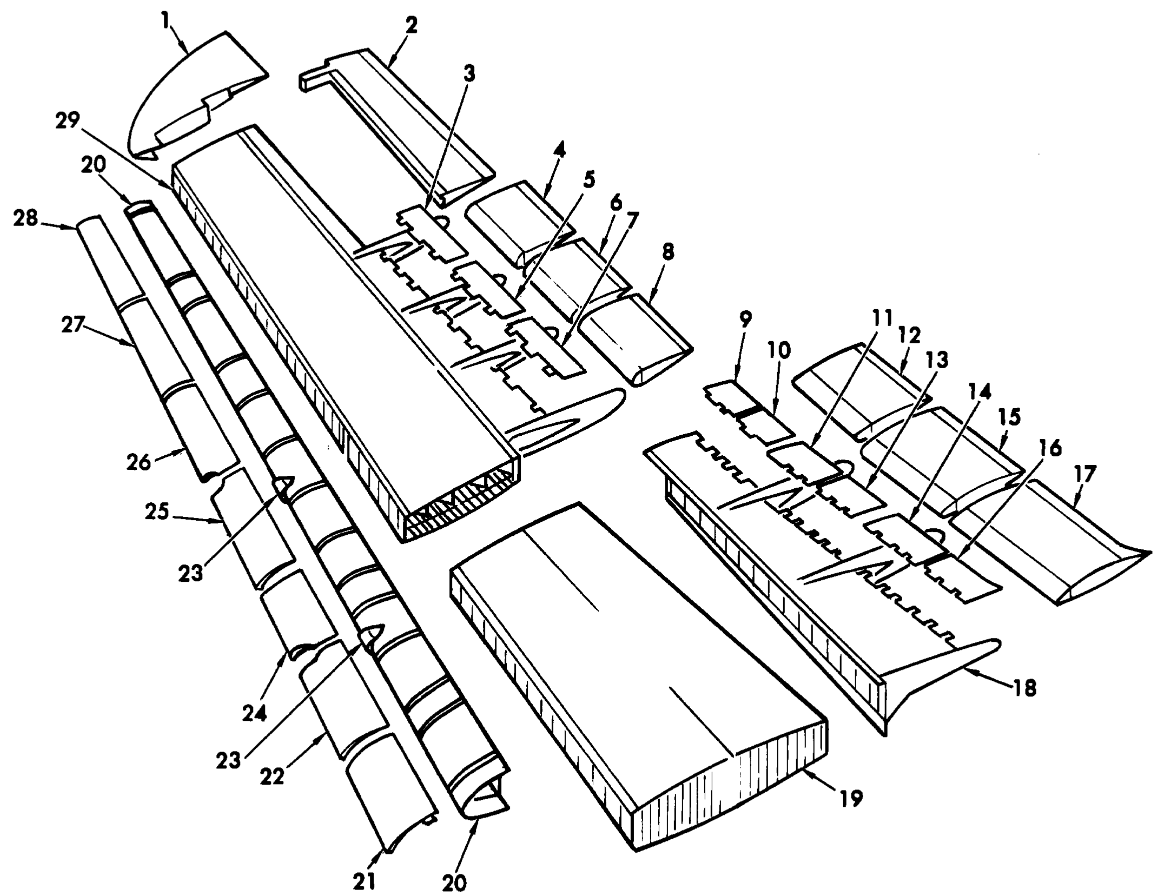
Typical galley arrangement



Flight station crew seats adjustment



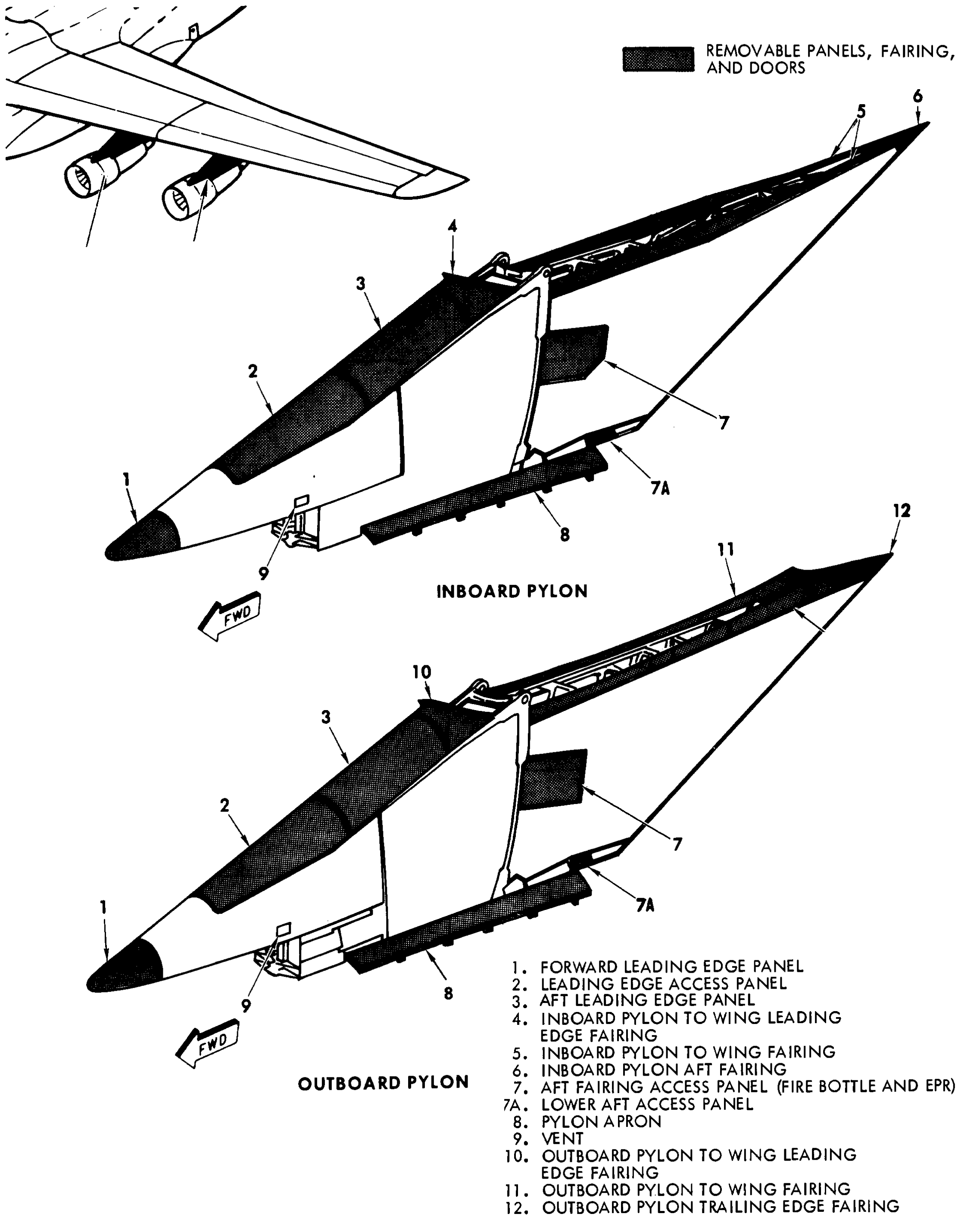
Relief crew compartment lavatory



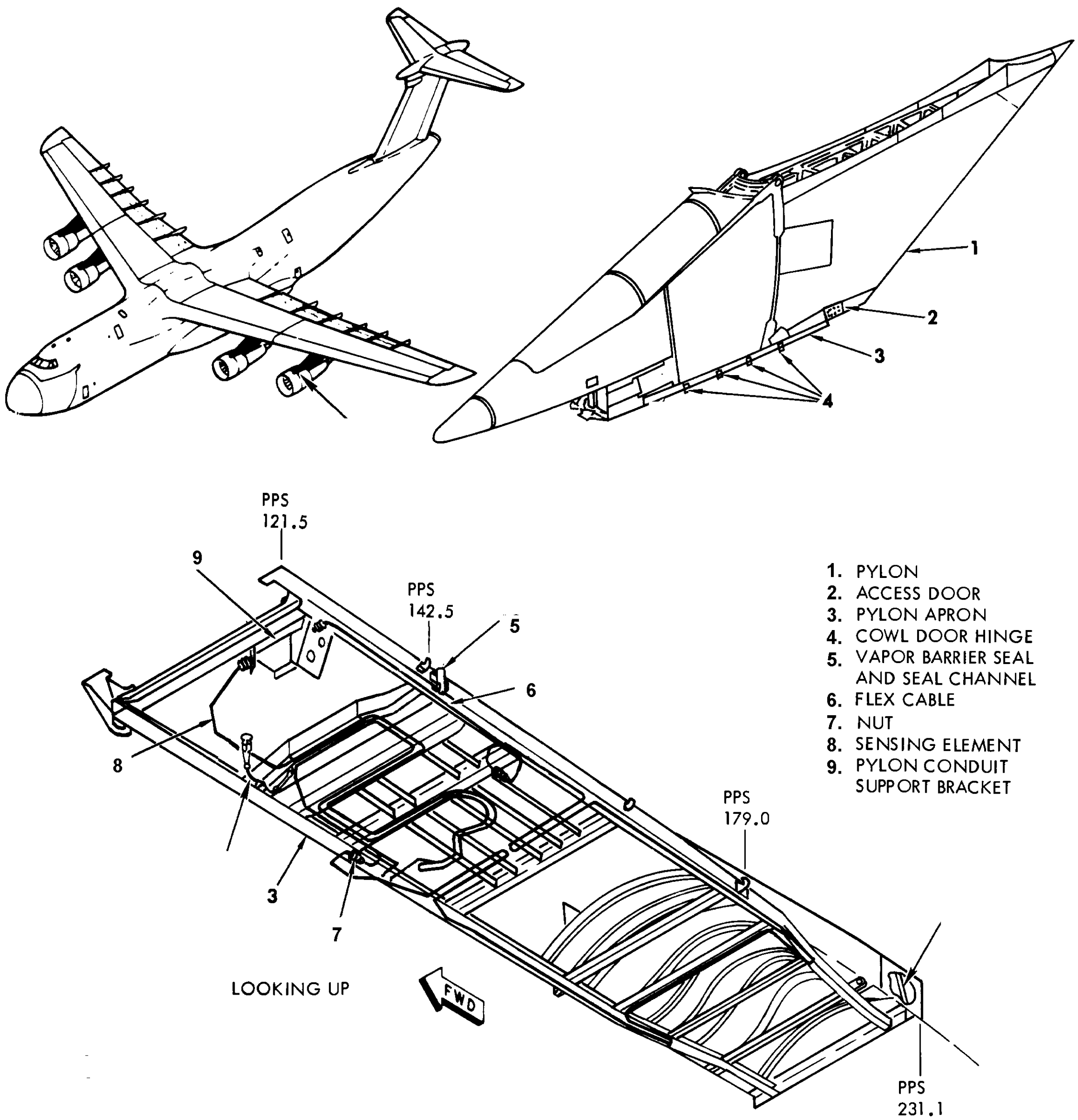
(RIGHT WING SHOWN, LEFT WING OPPOSITE)

1. WING TIP
2. AILERON
3. SPOILER NO. 9
4. TRAILING EDGE FLAP NO. 6
5. SPOILER NO. 8
6. TRAILING EDGE FLAP NO. 5
7. SPOILER NO. 7
8. TRAILING EDGE FLAP NO. 4
9. SPOILER NO. 6
10. SPOILER NO. 5
11. SPOILER NO. 4
12. TRAILING EDGE FLAP NO. 3
13. SPOILER NO. 3
14. SPOILER NO. 2
15. TRAILING EDGE FLAP NO. 2
16. SPOILER NO. 1
17. TRAILING EDGE FLAP NO. 1
18. FIXED TRAILING EDGE AIRFRAME
19. INNER WING FIXED AIRFRAME
20. FIXED LEADING EDGE
21. LEADING EDGE SLAT NO. 1
22. LEADING EDGE SLAT NO. 2
23. MOVING ISLAND
24. LEADING EDGE SLAT NO. 3
25. LEADING EDGE SLAT NO. 4
26. LEADING EDGE SLAT NO. 5
27. LEADING EDGE SLAT NO. 6
28. LEADING EDGE SLAT NO. 7
29. OUTER WING FIXED AIRFRAME

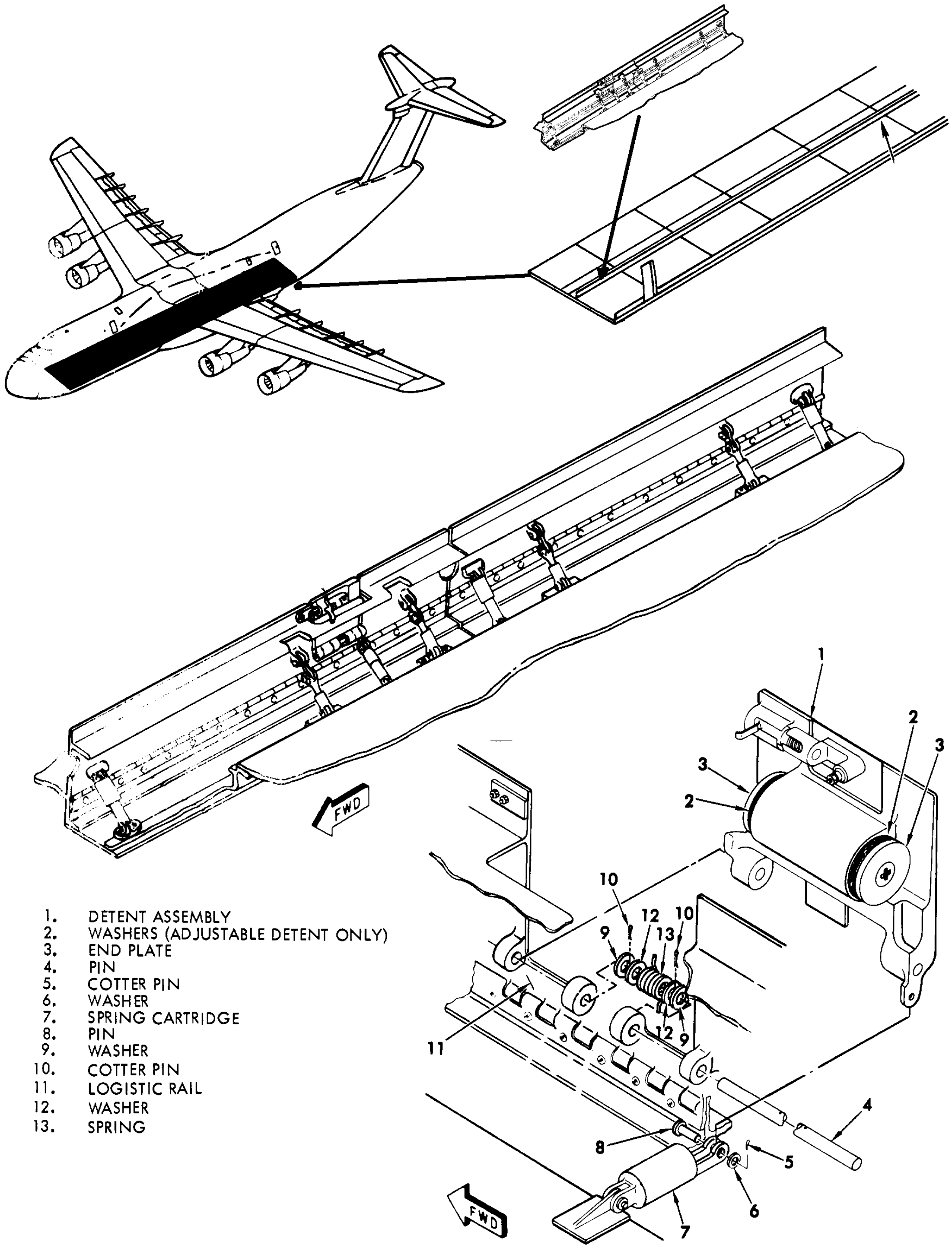
Wing component locations



Pylon and component locations

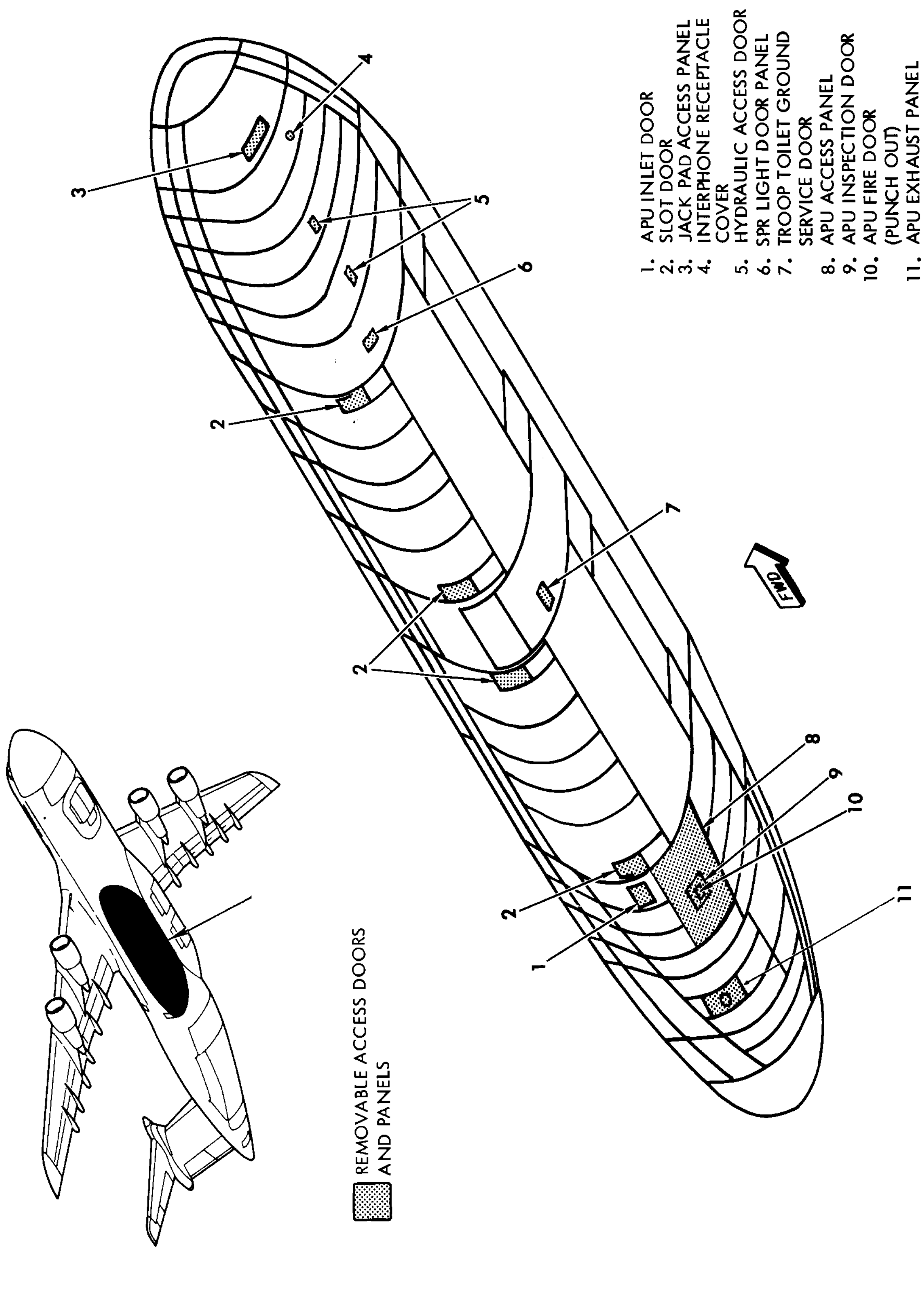

1
2
3
4
PPS
121.5
9
PPS
142.5
5
6
8
3
7
PPS
179.0
LOOKING UP
FWD
PPS
231.1
1. PYLON
2. ACCESS DOOR
3. PYLON APRON
4. COWL DOOR HINGE
5. VAPOR BARRIER SEAL
AND SEAL CHANNEL
6. FLEX CABLE
7. NUT
8. SENSING ELEMENT
9. PYLON CONDUIT
SUPPORT BRACKET

Pylon apron

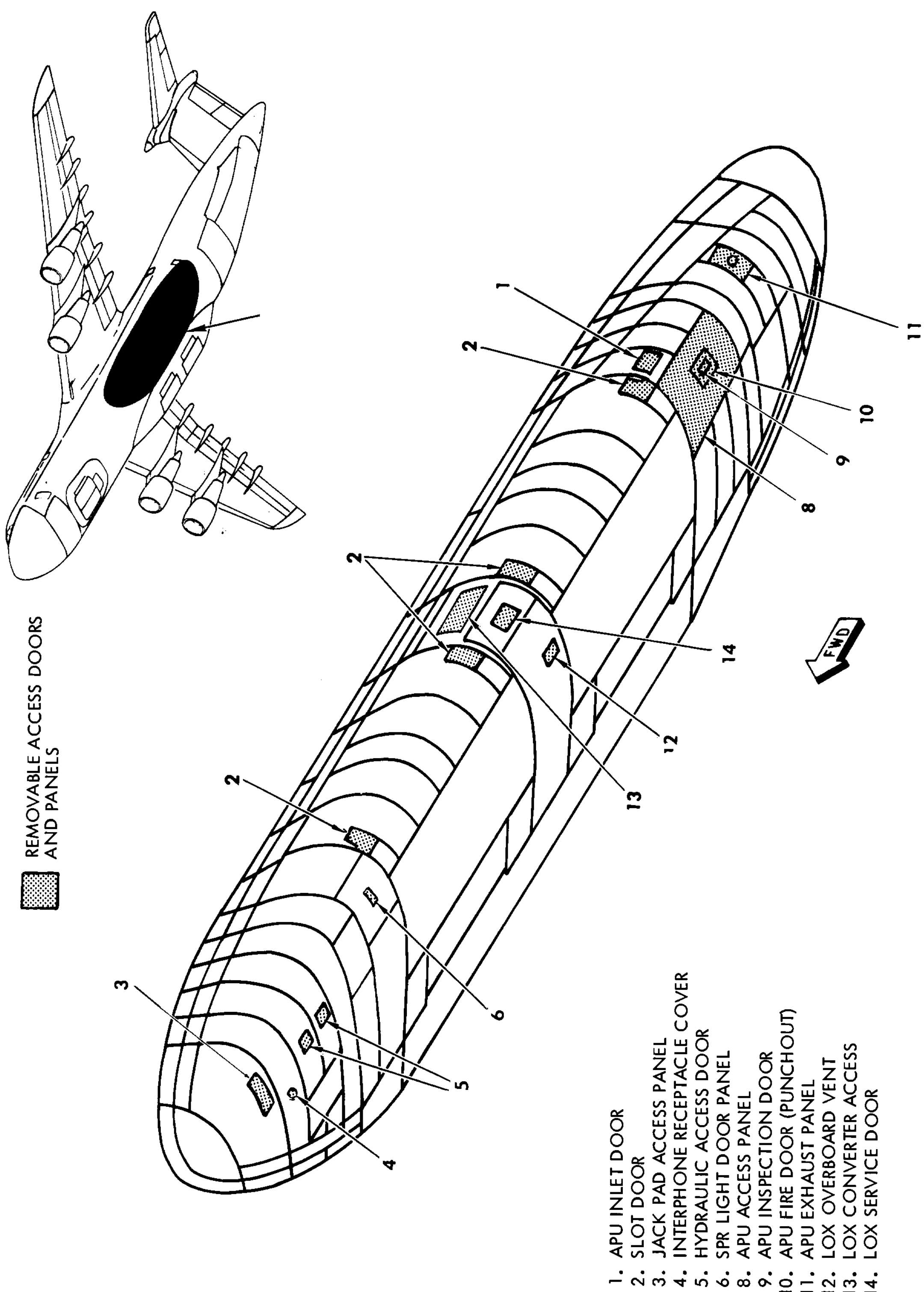


1. DETENT ASSEMBLY
2. WASHERS (ADJUSTABLE DETENT ONLY)
3. END PLATE
4. PIN
5. COTTER PIN
6. WASHER
7. SPRING CARTRIDGE
8. PIN
9. WASHER
10. COTTER PIN
11. LOGISTIC RAIL
12. WASHER
13. SPRING

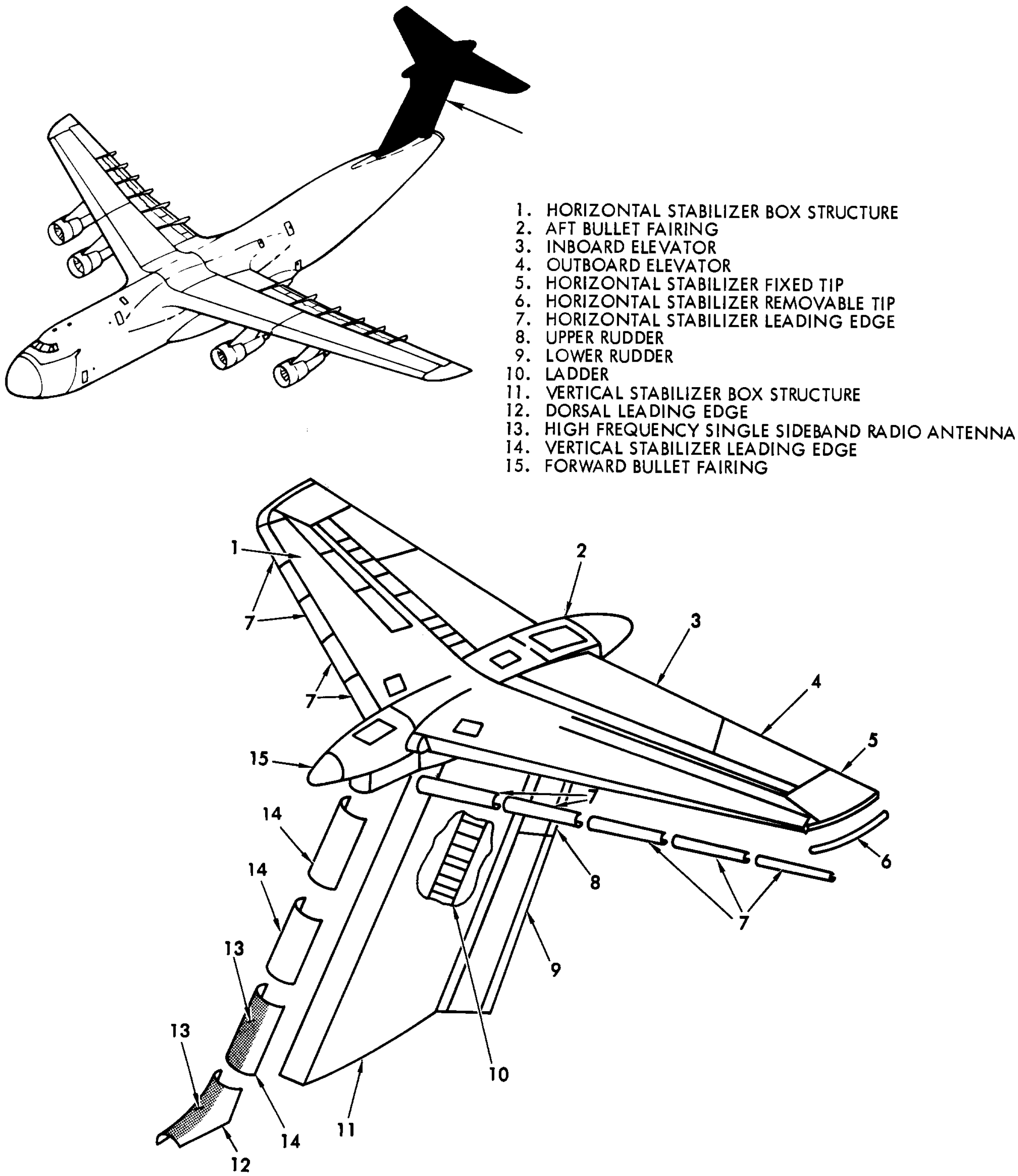
Logistic rails and detent assembly



Main landing gear pods components locations (1 of 2)



Main landing gear pods components locations (2 of 2)



Empennage components locations

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PNEUDRAULIC SYSTEMS

The airplane is equipped with four independent hydraulic systems, each of which operates at 3,000 PSI. The four systems are numbered according to the engine from which they receive their primary power. Systems No. 1 and No. 4 act as utility systems, while systems No. 2 and No. 3 supply power for primary flight controls. Two engine driven pumps in each of the four systems are the primary sources of power. Individual hydraulic systems can also be powered as follows: power transfer units are provided between systems No. 1 and No. 2; No. 2 and No. 3; and No. 3 and No. 4. An emergency auxiliary ram air system is also available should power be lost by all four engines. An air turbine motor pump system provides auxiliary power to hydraulic systems No. 1 and No. 4 by using bleed air from the auxiliary power units, or in the case of an emergency, from the engine bleed air system. Filter assemblies are incorporated in all four hydraulic systems. All filter assemblies in the power generation system contain differential pressure indicators. These popout buttons warn of impending filter clogging.

Hydraulic System No. 1

System No.1 supplies hydraulic power to the nose landing gear system, aft main landing gear system, aft loading system, left APU starting system, thrust reverser No. 1, thrust reverser No. 2 emergency retract, flight controls, alternate forward main landing gear rotation, and alternate brake system. On AF83-1285 and up, system No.1 also supplies primary hydraulic power to operate the forward winch, and secondary hydraulic power to operate the aft winch. In an emergency, system No. 1 also supplies power to the system No. 2 through the power transfer unit (PTU). The air turbine motor (ATM) supplies hydraulic power for ground check-out of the hydraulic system. External connections for pressurizing the system from a ground test stand are located on the forward surface of the left wheel well pod. Hydraulic system No. 1 also operates the three-way hydraulic solenoid valve of the fire suppression system.

Hydraulic System No. 2

System No. 2 supplies power to the flight controls, thrust reverser No.2 and emergency generator. In an emergency, system No. 2 can also supply power to systems No.1 and No.3 through the PTUs. If an inflight failure of both inboard and either outboard engines and/or generators occurs, the ram air turbine (RAT) deploys to provide hydraulic pressure to system No.2. External connections for pressurizing the systems from a ground test stand are located on the forward surface of the left wheel well pod.

Hydraulic System No. 3

System No.3 supplies hydraulic power to the flight controls and the No.3 thrust reverser. In an emergency, system No. 3 can also supply power to systems No.2 and No.4 through the PTUs. If an inflight failure of both inboard and either outboard engines and/or generators occurs, the RAT deploys to provide hydraulic pressure to system No. 2. External connections for pressurizing the system from a ground test stand are located on the forward surface of the right wheel well pod.

Hydraulic System No. 4

System No.4 supplies hydraulic power to the forward main landing gear system, right APU starting system, thrust reverser No. 4, thrust reverser No.3 emergency retract, flight controls, aerial refueling, forward loading system, crew entry door system, normal brakes, alternate nose landing gear system, and alternate aft main landing gear rotation. On AF83-1285 and up system No. 4 supplies primary hydraulic power to operate the aft winch and secondary hydraulic power to operate the forward winch. In an emergency, system No. 4 can also supply power to system No. 3 through the PTU. The ATM supplies hydraulic power for ground checkout of the hydraulic system. External connections for pressurizing the system from a ground test stand are located on the forward surface of the right wheel well pod.

Service Centers

Service centers for each of the four hydraulic systems are located in the cargo compartment and are readily accessible both in flight and on the ground. They serve as the main control centers for their respective systems. These systems are monitored and controlled from the hydraulic control panel at the flight engineer's station. The service center major components consist of a reservoir, fluid level transmitter, suction boost pump, service center manifold, pressure transmitter, return filter assembly, high pressure filter assembly, and power transfer manifold assembly.

Hydraulic Control Panel

Hydraulic controls and indicators for the four hydraulic systems are on a panel at the flight engineer's station. Gages on the panel indicate the reservoir fluid level for each system. Each of the 2 engine pumps per system has a two-position switch for pump depressurization.

Reservoirs

Each hydraulic system contains a cylindrical, non-pressurized reservoir. Each reservoir has a fluid level sight gage installed on the side for servicing purposes. A fluid level transmitter is installed in each reservoir to provide a remote reading of the quantity of fluid in the reservoir.

Reservoirs in the four hydraulic systems can be individually filled by a servicing system located at service center No. 3. The system consists of a filler receptacle, low pressure hand pump, and a fill selector valve. Hydraulic fluid placed in the filler receptacle is directed to a particular reservoir by prepositioning and depressing the fill selector valve handle and manually operating the low pressure hand pump.

Ram Air Turbine (RAT) Emergency Hydraulic Power

A RAT is provided to supply pressure to system No. 2 for limited flight control use in the event of a multiple engine failure. The RAT, which is located in the forward portion of the left main landing gear pod, consists of a pressure regulator and a six-bladed turbine which drives a fixed displacement hydraulic pump rated at 32 gallons per minute (GPM).

Ground Test Connections

Each of the four hydraulic systems in the airplane has ground connections which include a suction and pressure line. All external connections are quick disconnect fittings. Access to the disconnect fittings is provided through doors in each main landing gear pod.

Hydraulic Fluid Cooling

The hydraulic fluid cooler installation consists of a cooler and a control valve for each hydraulic system. A check valve is installed in the return line from each cooler to prevent fuel from flowing into the hydraulic systems in the event of cooler line rupture within the fuel tank. The coolers for hydraulic systems No. 1 and No. 2 are located in the No.2 main fuel tank. For hydraulic systems No. 3 and No. 4, the coolers are located in the No.3 main fuel tank. Hydraulic fluid from the pump case drain is circulated through the cooler then to the return system. Fluid return temperature is maintained between 130 F and 150 F by the control valves which act as pressure relief units also.

Engine-Driven Pumps

Each system contains two hydraulic pumps. The pumps are identical and completely interchangeable from one position to another. Each engine-driven pump can produce 40 GPM at idle,60 GPM at cruise, and 64 GPM at takeoff at 3,000 PSI. Both pumps are located on the aft, right side of the accessory drive gearbox. A QAD (quick attach-detach) coupling is used to secure each pump.

Suction Line Shutoff Valves

A motor-operated shutoff valve in the common suction line to the engine-driven pumps at the nacelle firewall moves to closed position when the engine fire handle, located in the flight control station, is pulled. This isolates the flow of hydraulic fluid from the suction line into the pylon and engine compartments.

Hydraulic Motor-Driven Suction Boost Pump

A suction boost pump on the lower end of each system reservoir supplies inlet pressure and flow of fluid to the engine-driven pumps during engine operations. This unit consists of a centrifugal pump integrated with an axial piston hydraulic motor creating a pressure of 75 PSI with a flow rate of 20 GPM. When a no-flow condition exists, the pump pressure will rise to approximately 110 PSI at which time the boost pump relief valve opens, creating a flow through the reservoir and back to the pump.

Electric Motor-Driven Suction Boost Pump

Two electrically driven suction boost pumps are located at service centers No.1 and No.4. These pumps are connected in series with the hydraulic suction boost pumps to provide adequate inlet pressures to the ATM and engine-driven hydraulic pumps during operation.

Hydraulic Filter Assembly

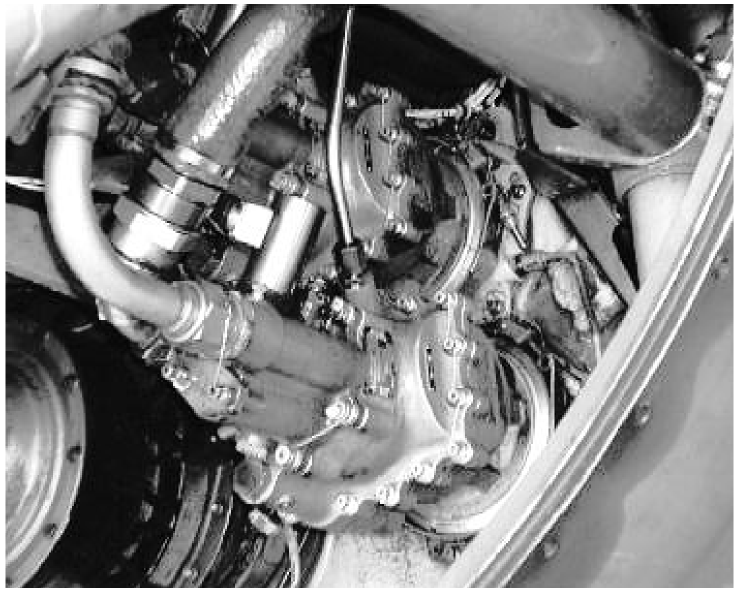
A hydraulic filter assembly down-stream from the engine-driven hydraulic pump contains two replaceable filter elements. The elements will filter out contaminants larger than 15 microns in size. A check valve in each assembly half on the down-stream side of each element prevents reverse flow if only one pump is operating.

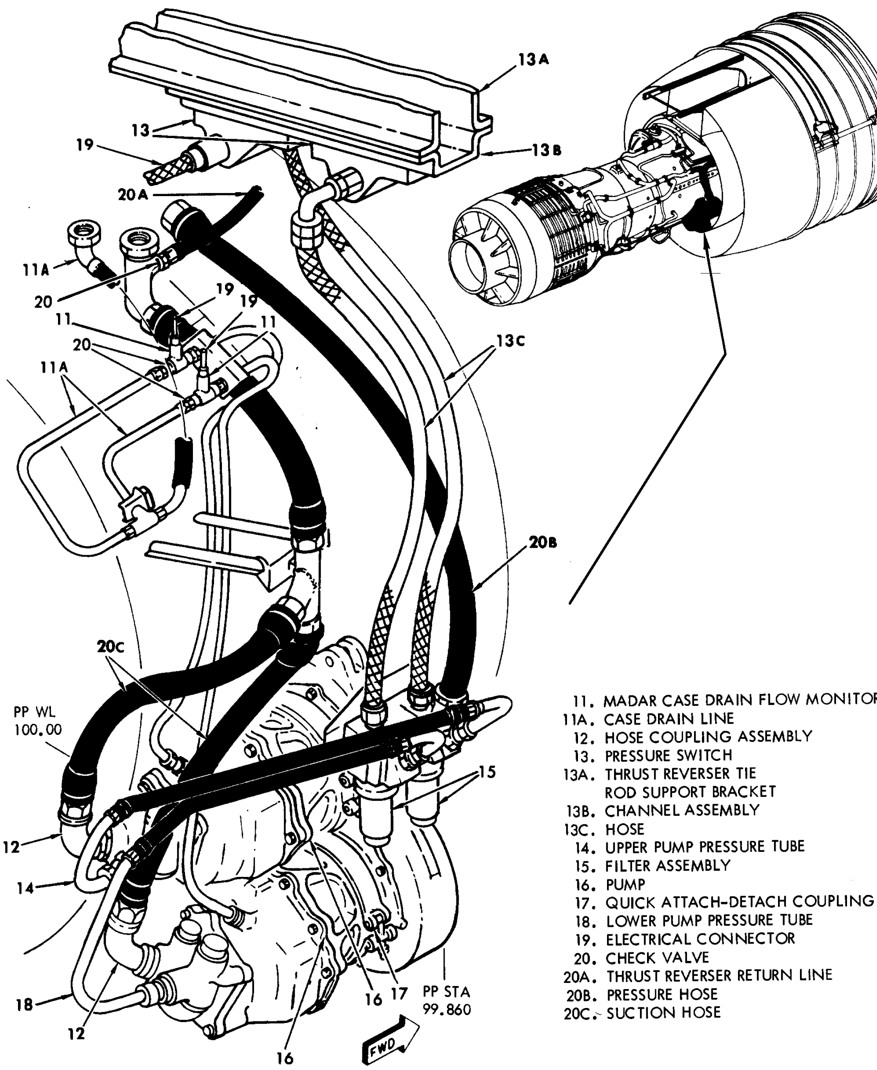
Hydraulic Power Transfer Units (PTUs)

Three PTU's are used to enable the transfer of power from a lightly loaded hydraulic system to a heavily loaded system, thereby making more efficient use of the total hydraulic power capabilities. The units may also be used to pressurize a system that is unpressurized due to engine or hydraulic pump failure as long as fluid remains in the system. These units allow a pump (engine or ATM driven) to supply power to an adjacent hydraulic system without fluid connection between the systems. These units are installed between hydraulic systems No. 1 and No. 2, between systems No. 3 and No. 4, and between systems No. 2 and No.3. The PTU is reversible and is basically two constant displacement motors connected together by a common shaft. The motors are plumbed into separate systems. When the pressure decreases in one system, the respective motor functions are as a pump driven by the motor in the other system.

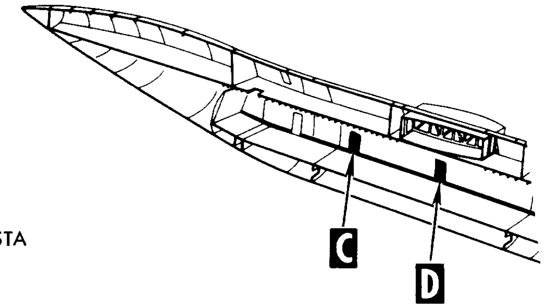
Air Turbine Motor (ATM)

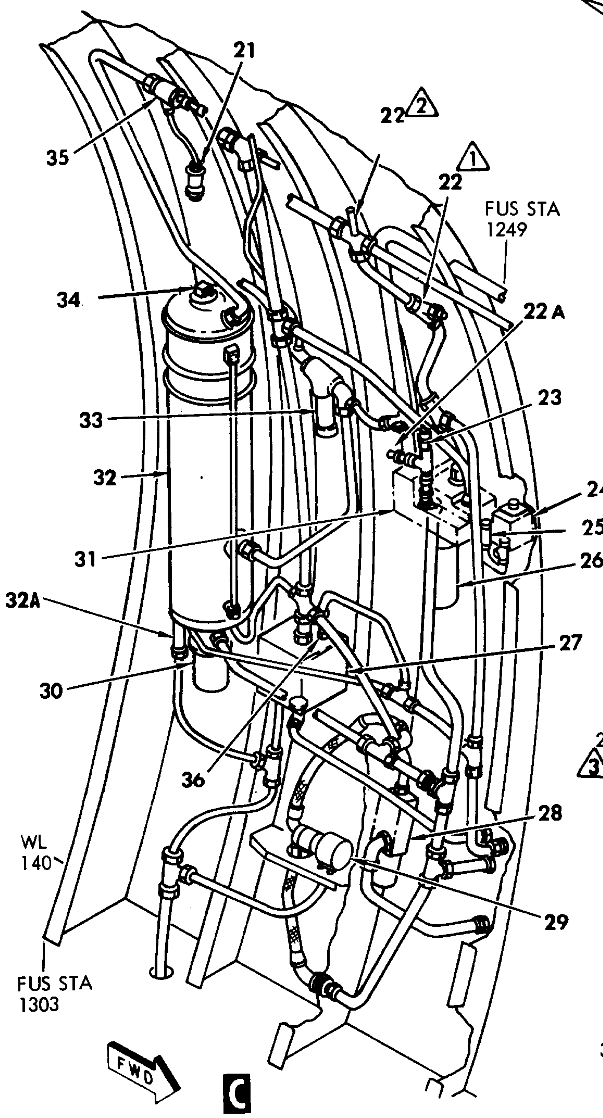
The airplane is equipped with two ATMs, each driving a 40 GPM, pressure compensated, variable displacement, 3,000 PSI (+ 150) hydraulic pump. The left-hand pump is in the No. 1 hydraulic system and the right-hand pump is in the No.4 hydraulic system. The No. 2 and No. 3 hydraulic systems can be pressurized by the ATMs through use of the power transfer packages. The ATMs provide auxiliary hydraulic power for ground operations, systems checkout, and operation of the suction boost pump during engine starting. The ATM turbine section consists of an inlet shutoff valve, a turbine scroll, a turbine wheel, and a variable area nozzle assembly. During normal operation, turbine speed is approximately 38,200 RPM.





Engine-driven hydraulic pumps (typical all four engines)





HYDRAULIC SERVICE CENTER NO. 1

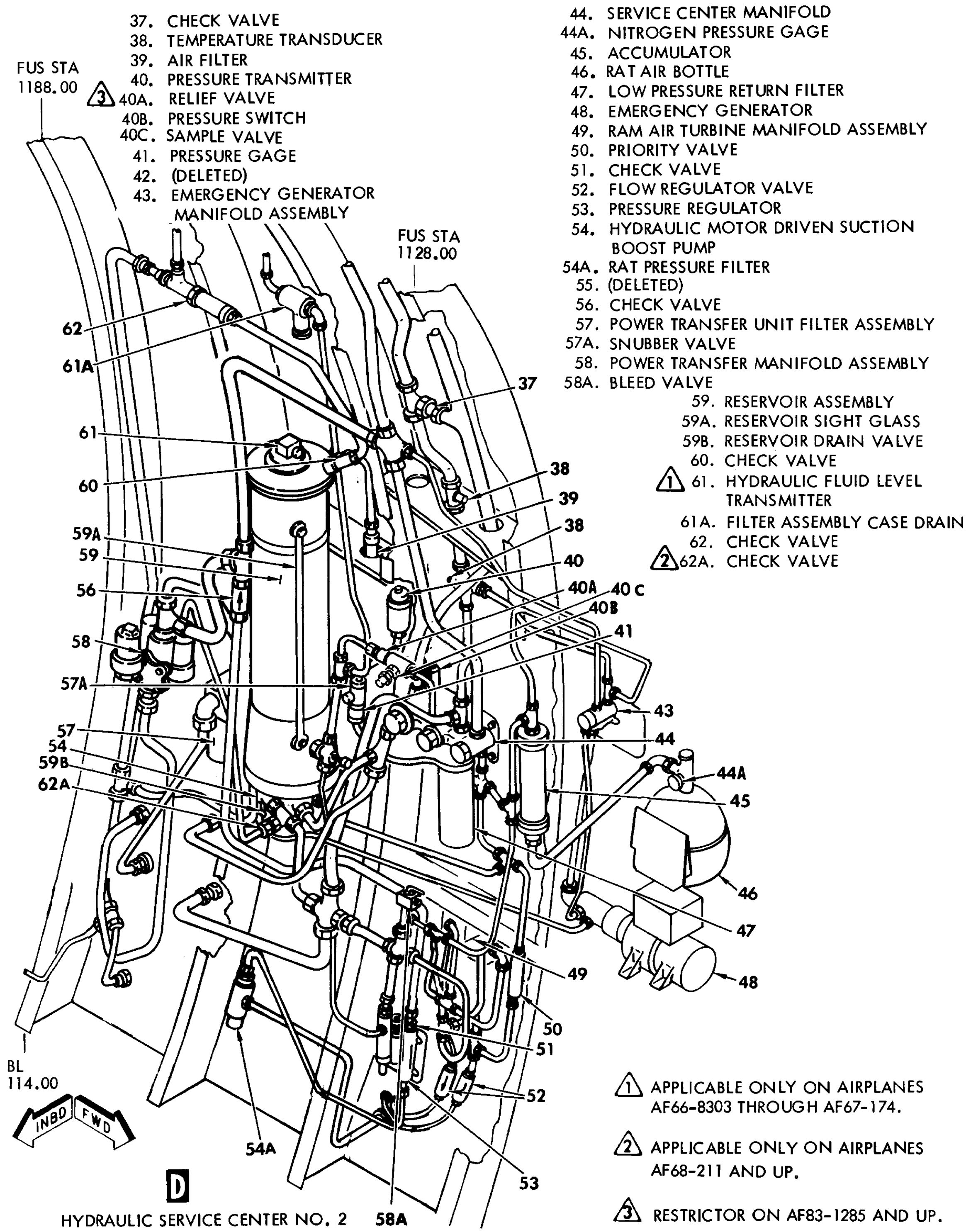
21. AIR FILTER
22. TEMPERATURE TRANSDUCER
22A. SAMPLE VALVE
3 23. RELIEF VALVE
24. PRESSURE TRANSMITTER
25. GAGE
26. LOW PRESSURE RETURN FILTER
27. POWER TRANSFER MANIFOLD ASSY
28. POWER TRANSFER FILTER
29. ELECTRICALLY DRIVEN SUCTION BOOST PUMP
30. HYDRAULIC MOTOR DRIVEN SUCTION BOOST PUMP
31. SERVICE CENTER MANIFOLD ASSY
32. RESERVOIR ASSEMBLY
32A. RESERVOIR DRAIN VALVE
33. FILTER BRAKE RETURN/CASE DRAIN
34. HYDRAULIC FLUID LEVER TRANSMITTER
35. CHECK VALVE
36. CHECK VALVE

1 APPLICABLE ONLY ON AIRPLANES AF66-8303 THROUGH AF67-174.

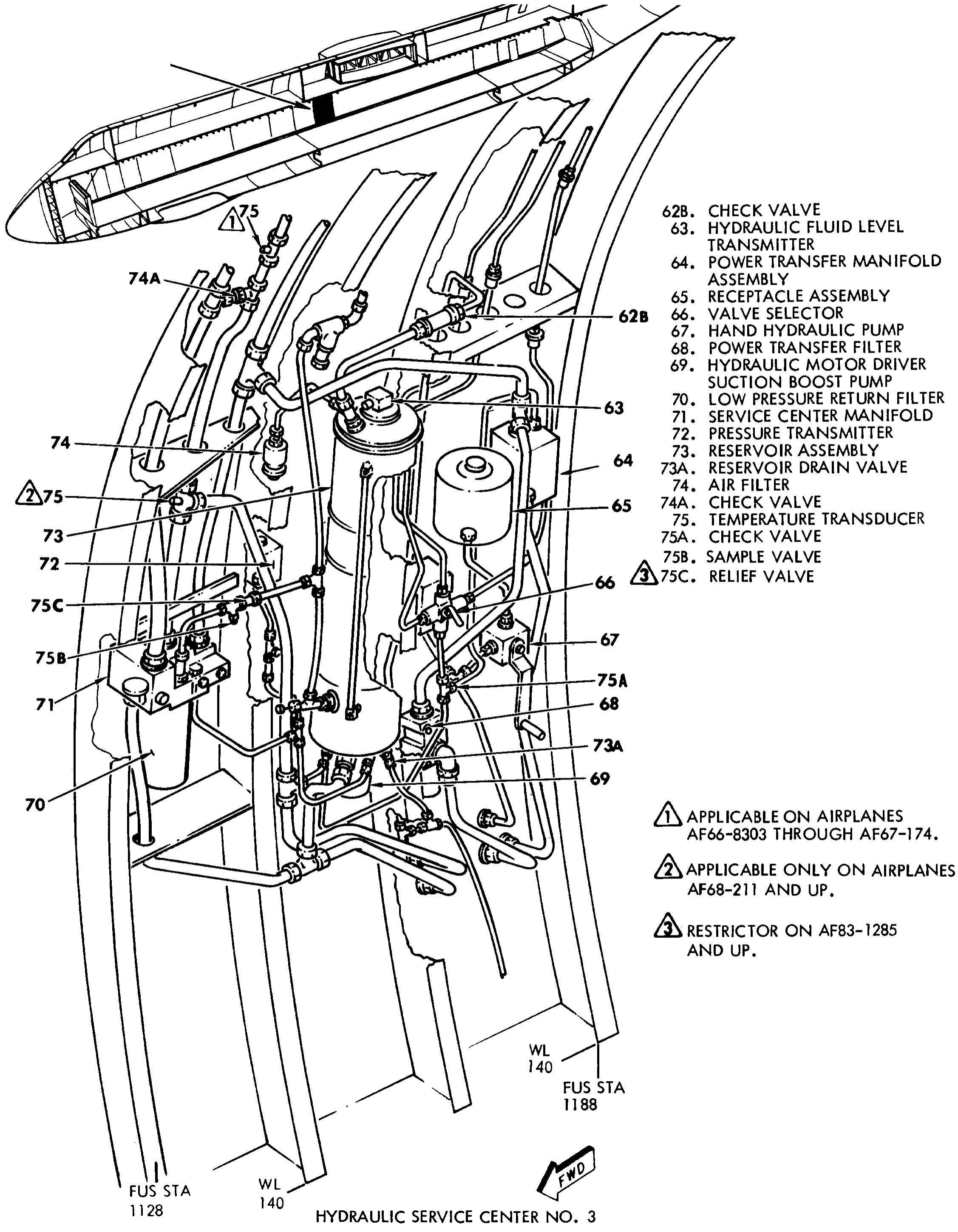
2 APPLICABLE ONLY ON AIRPLANES AF68-211 AND UP.

3 RESTRICTOR ON AF83-1285 AND UP.

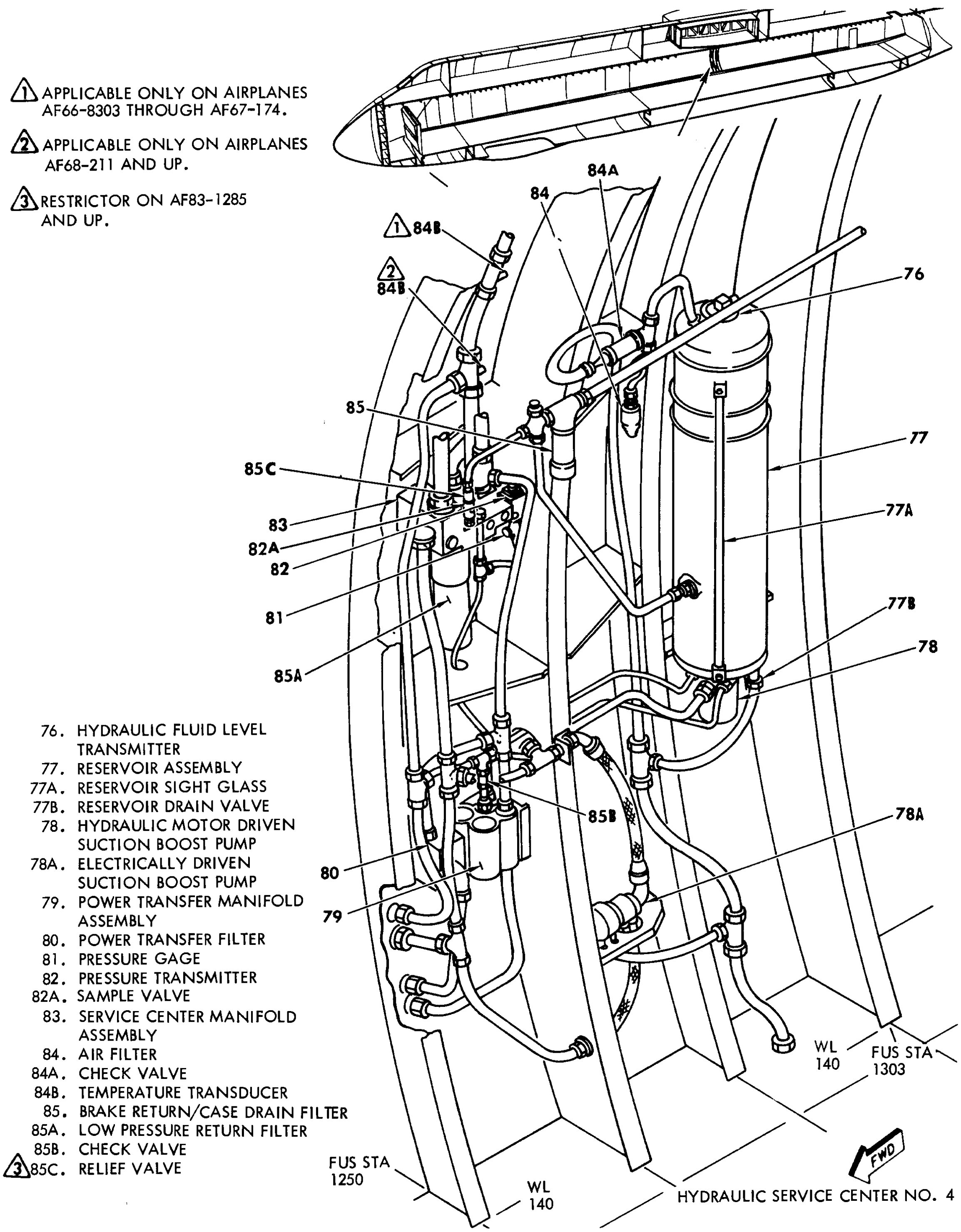
Hydraulic service center No. 1



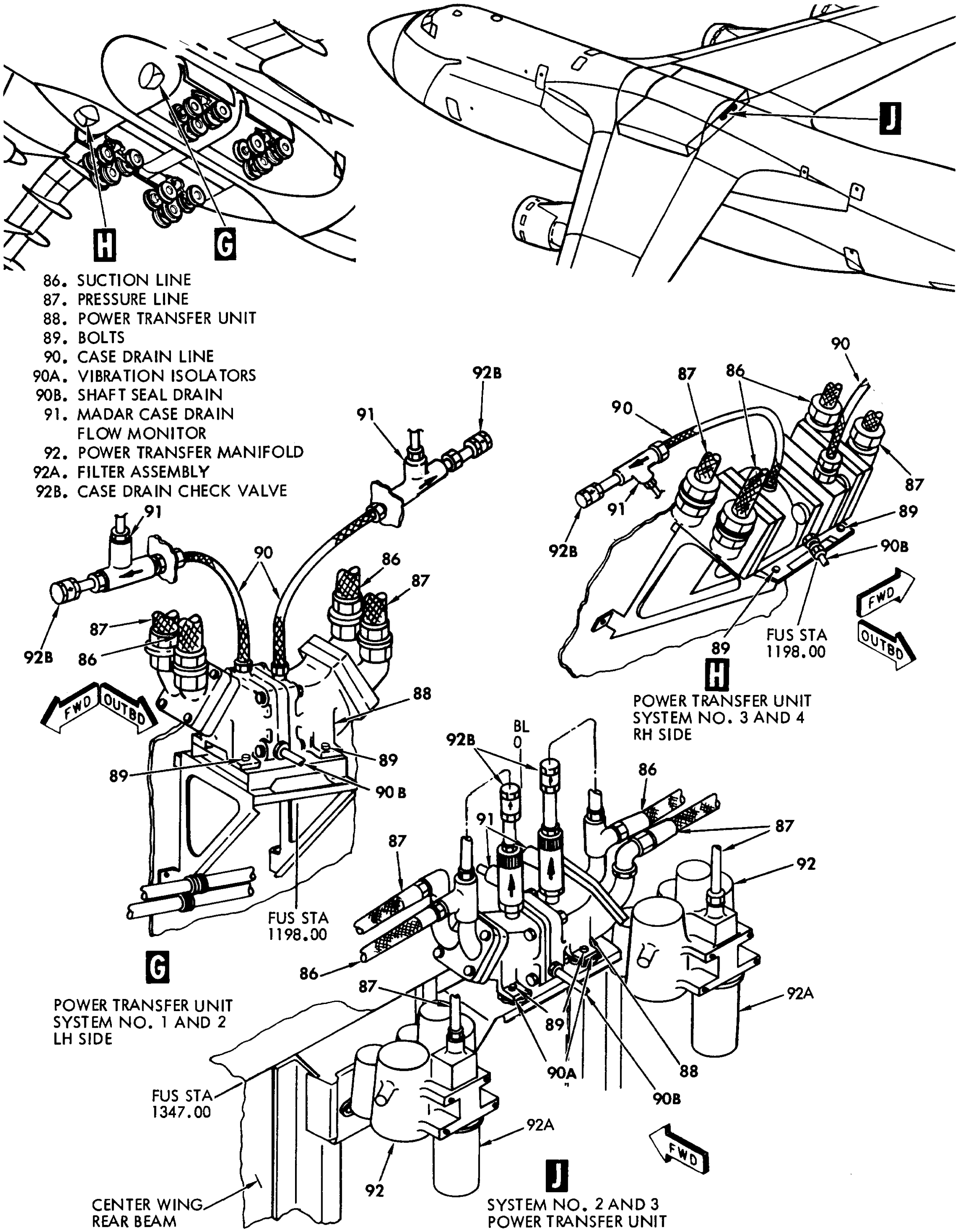
Hydraulic service center No. 2



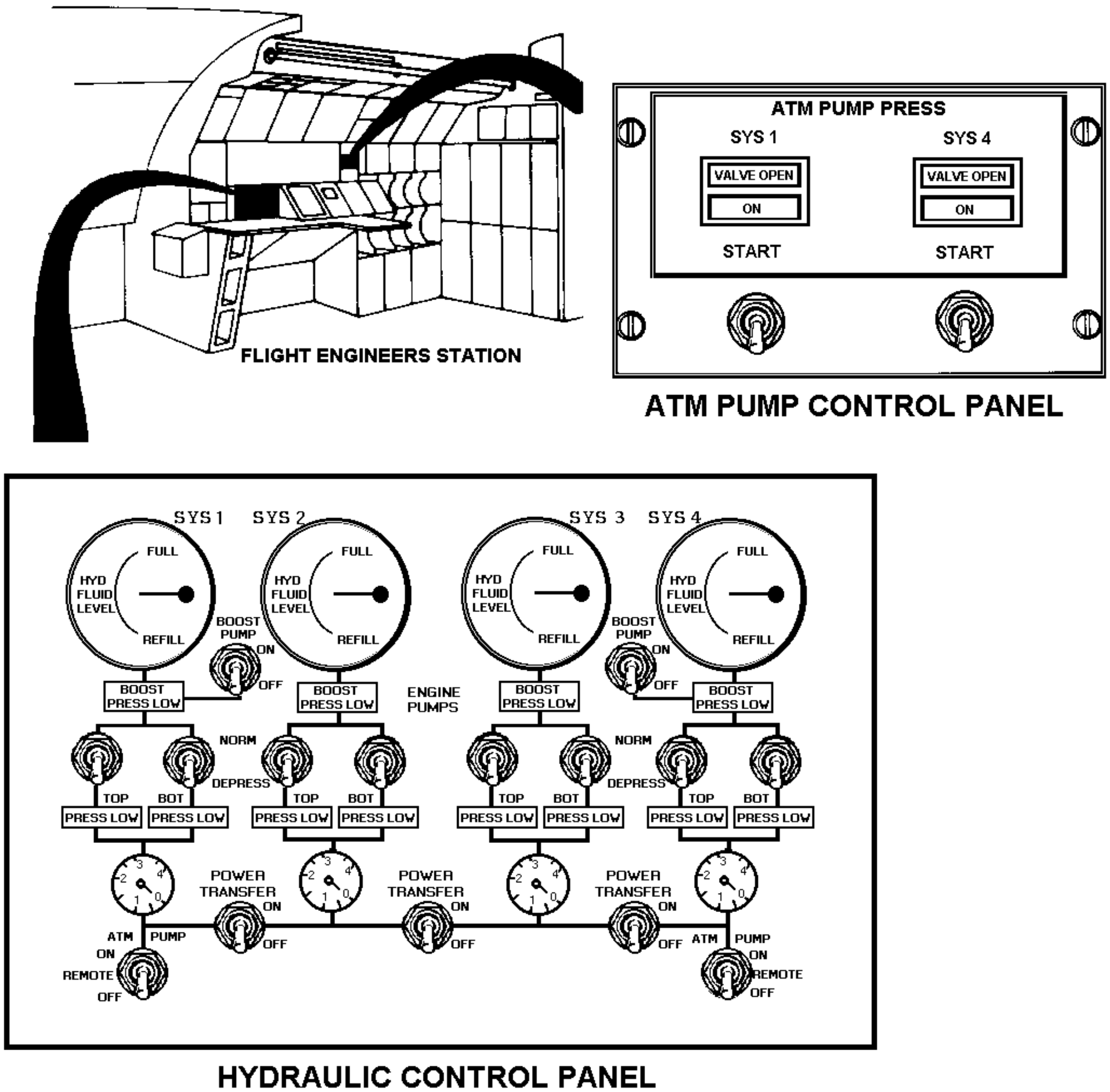
Hydraulic service center No. 3



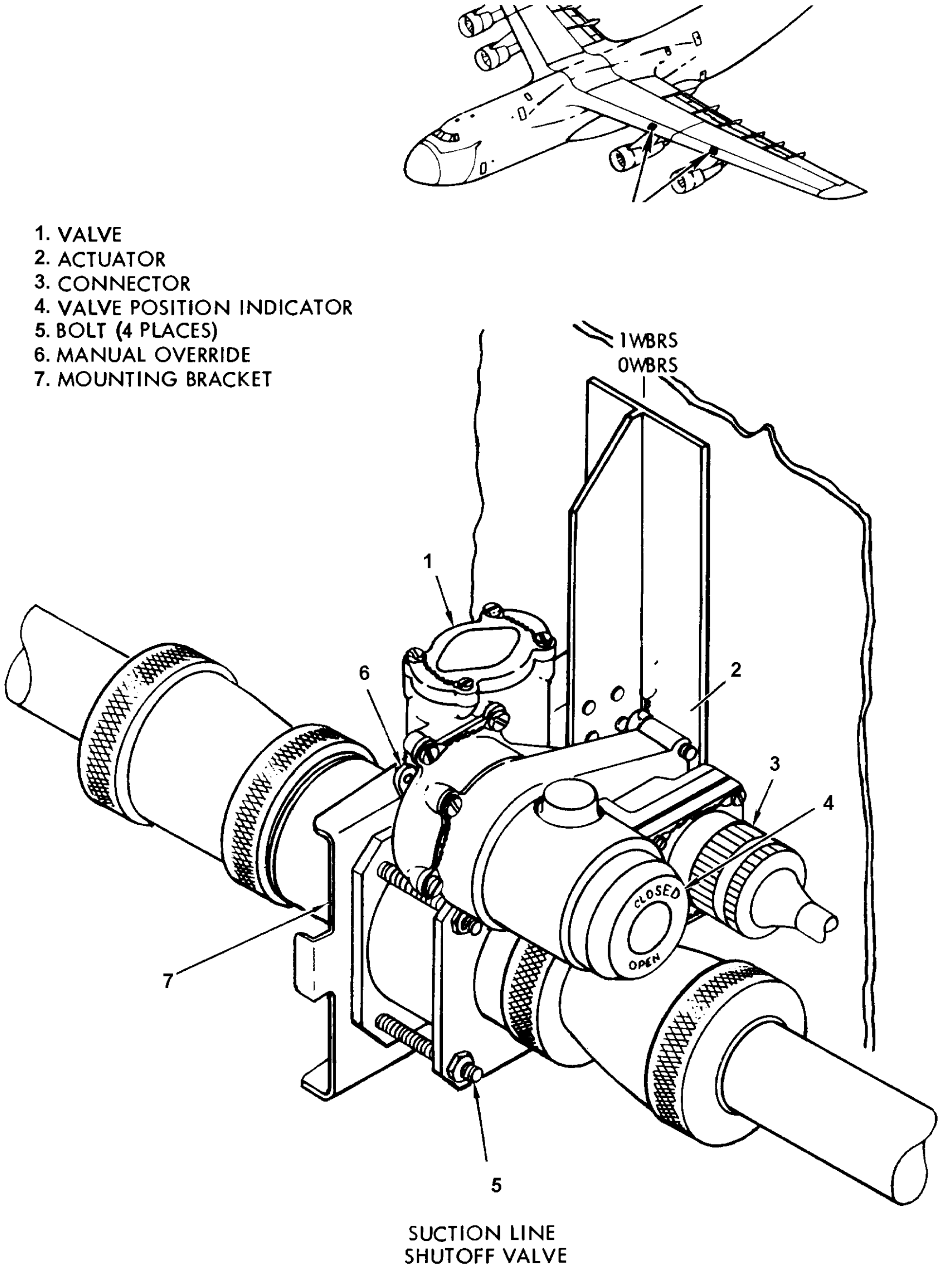
Hydraulic service center No. 4



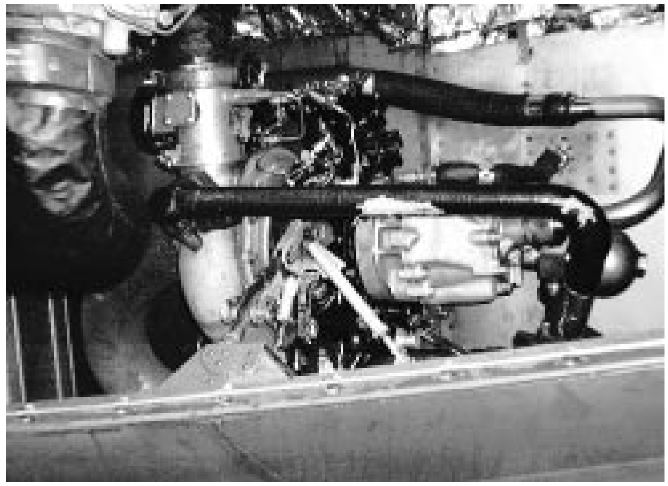
Power transfer units (PTUs)

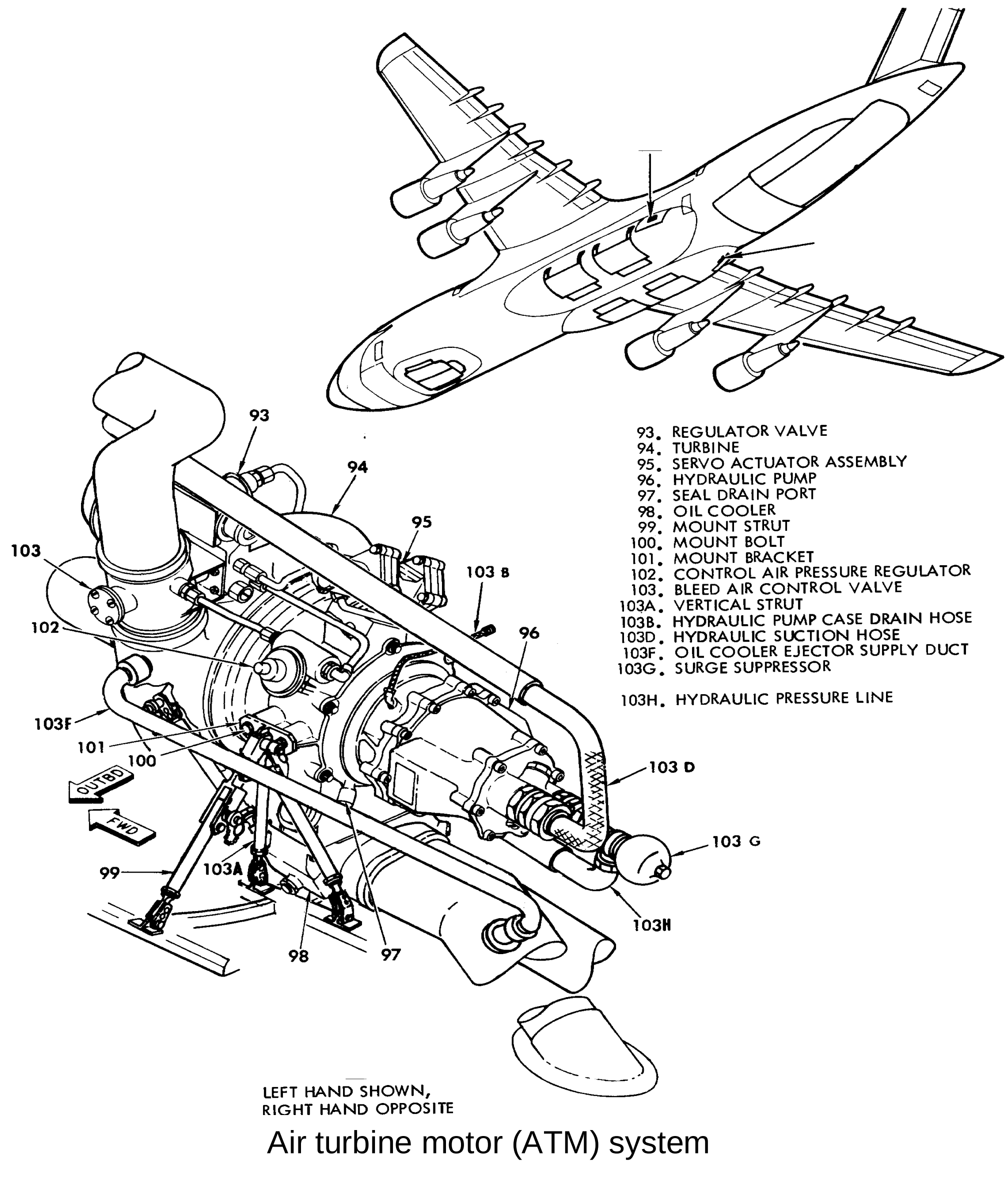


Flight engineer’s hydraulic system control panels

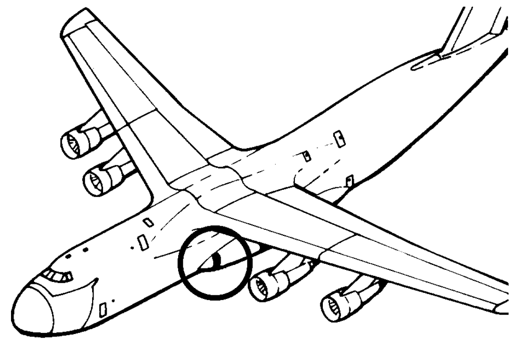


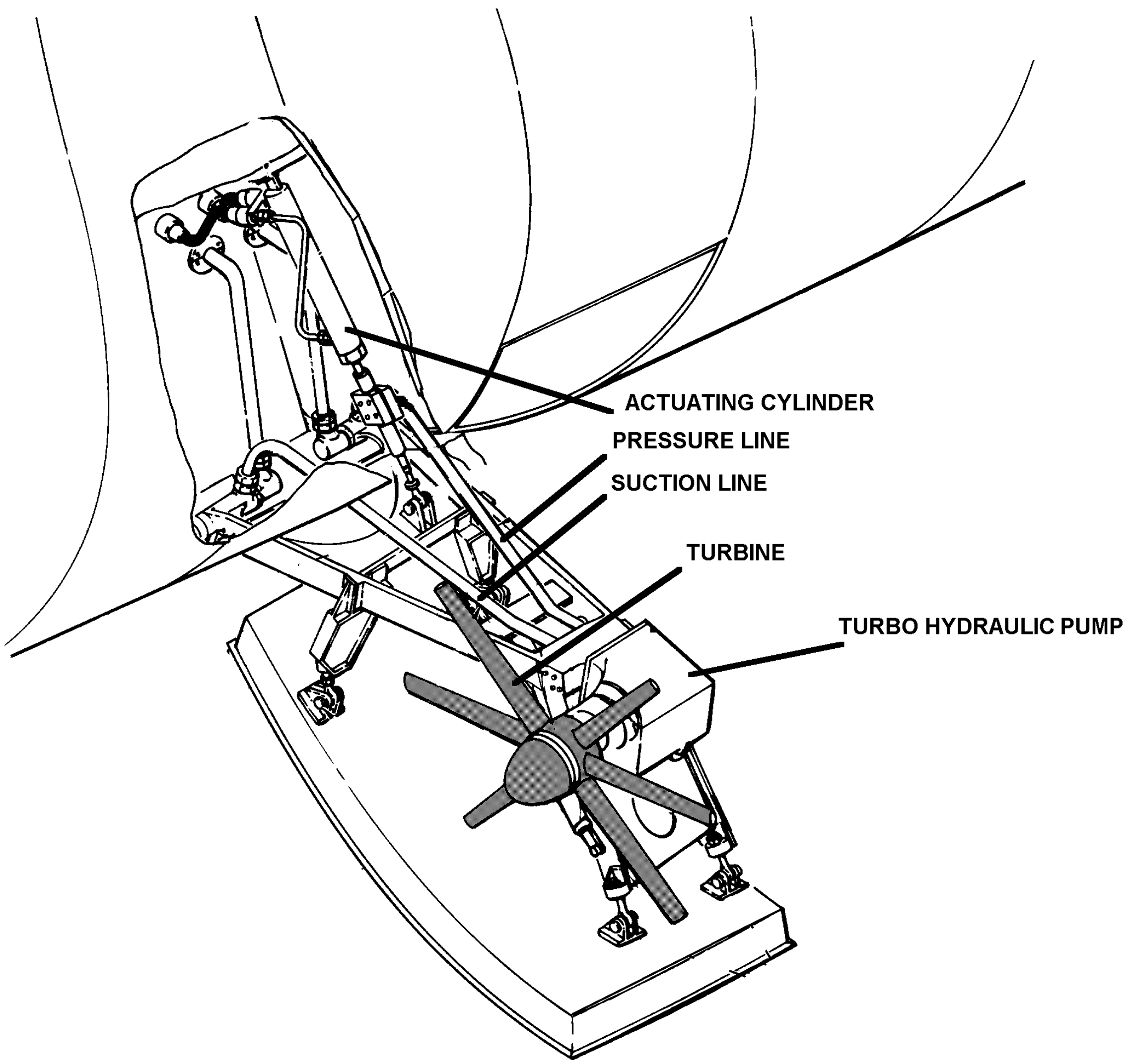
Suction line shutoff valve



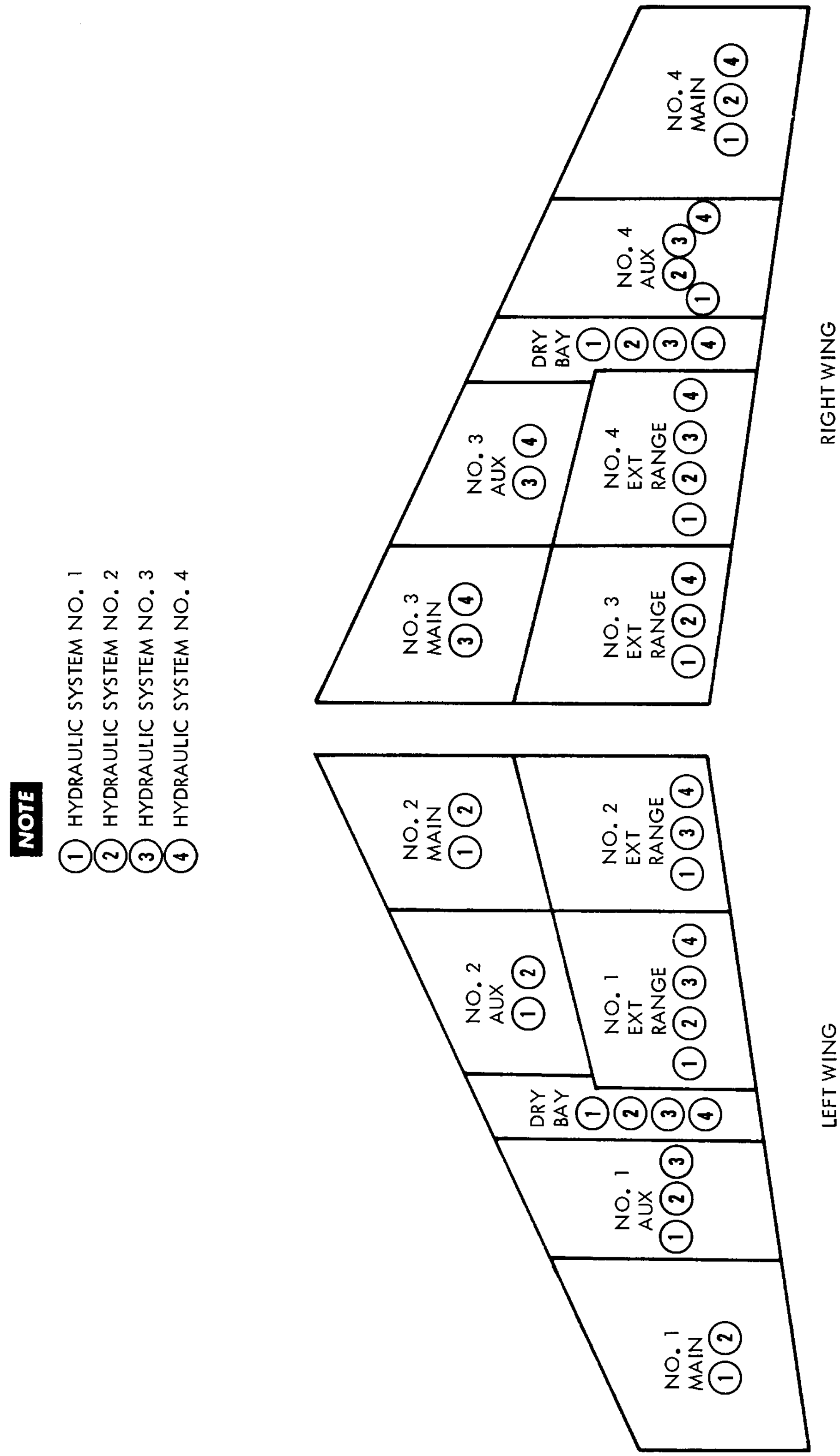


Air turbine motor (ATM) system

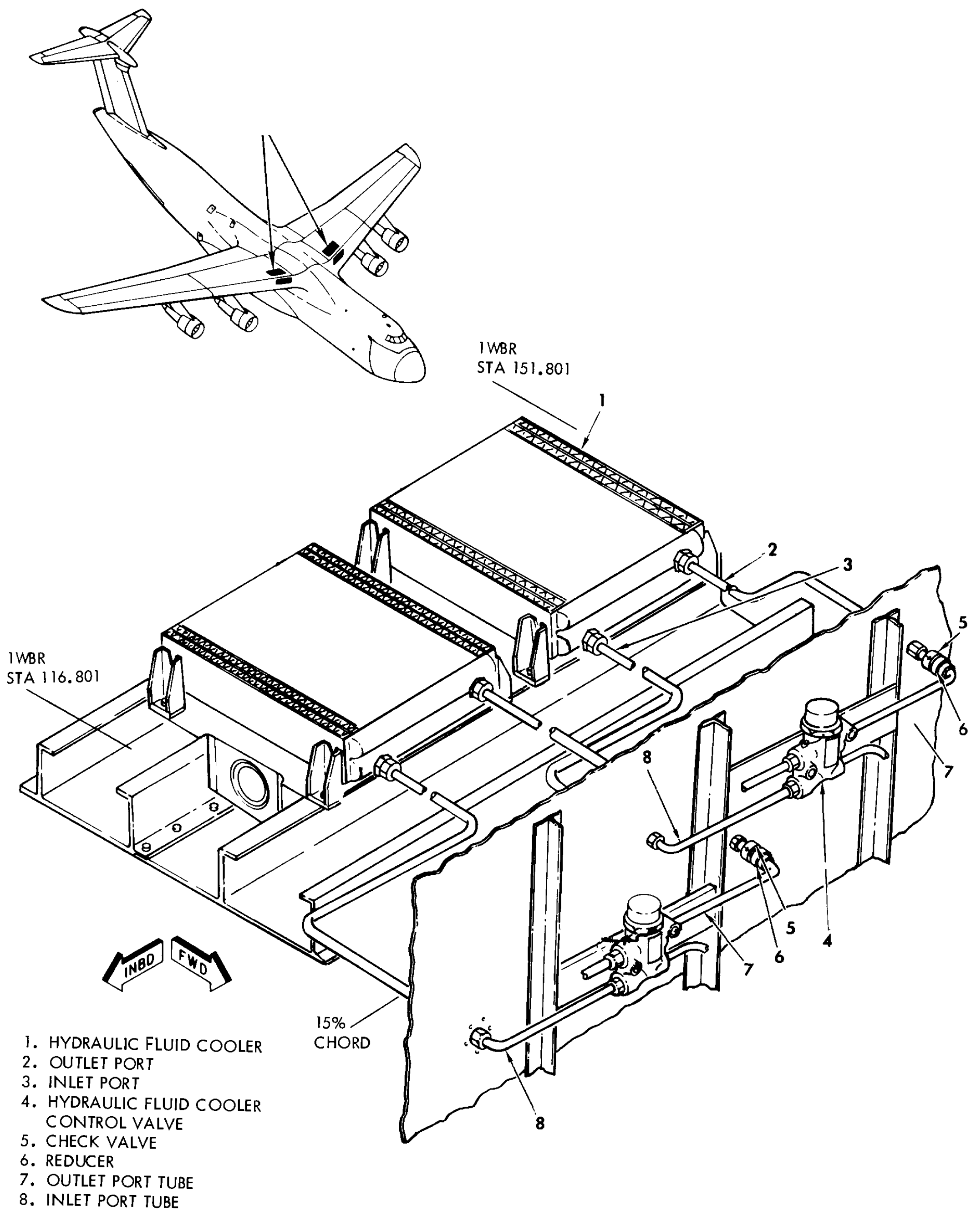




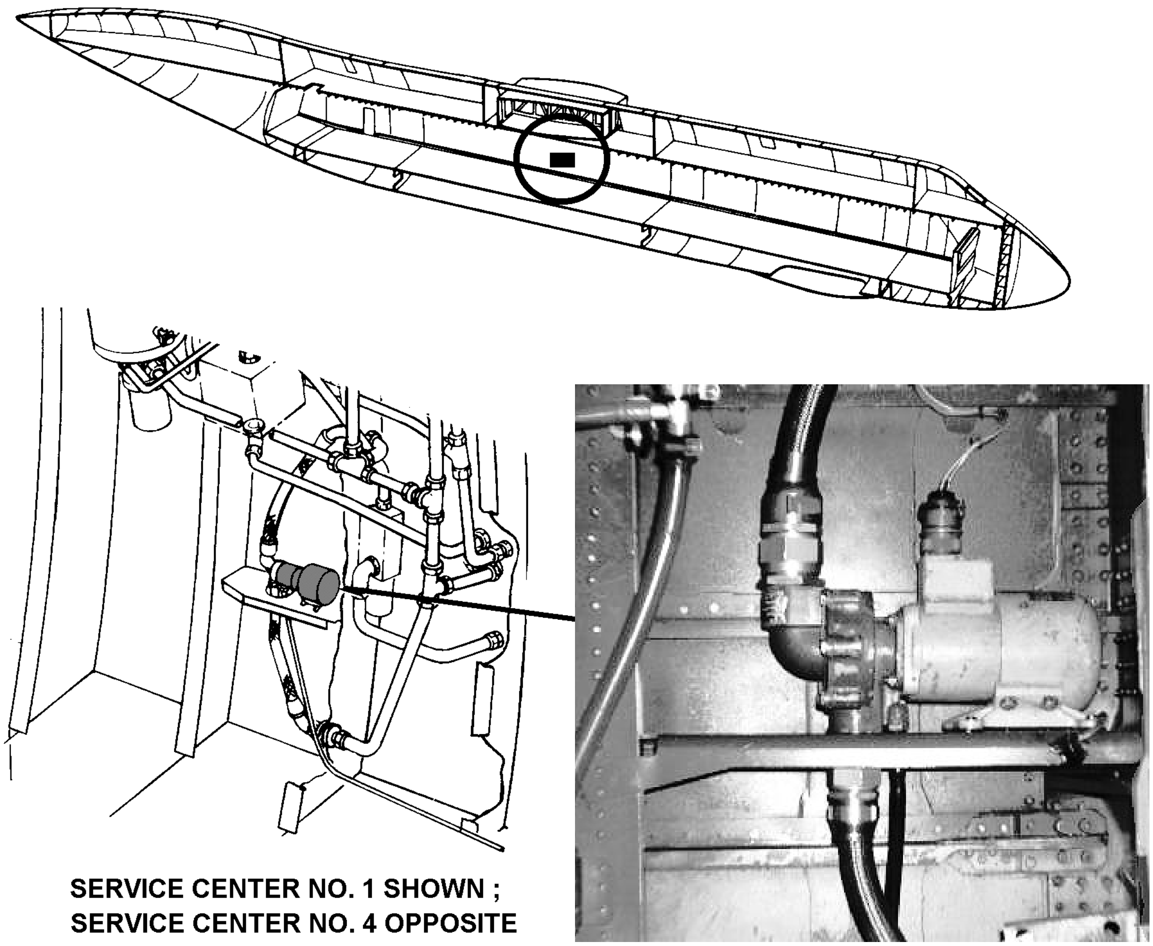
Ram air turbine (RAT) emergency power system



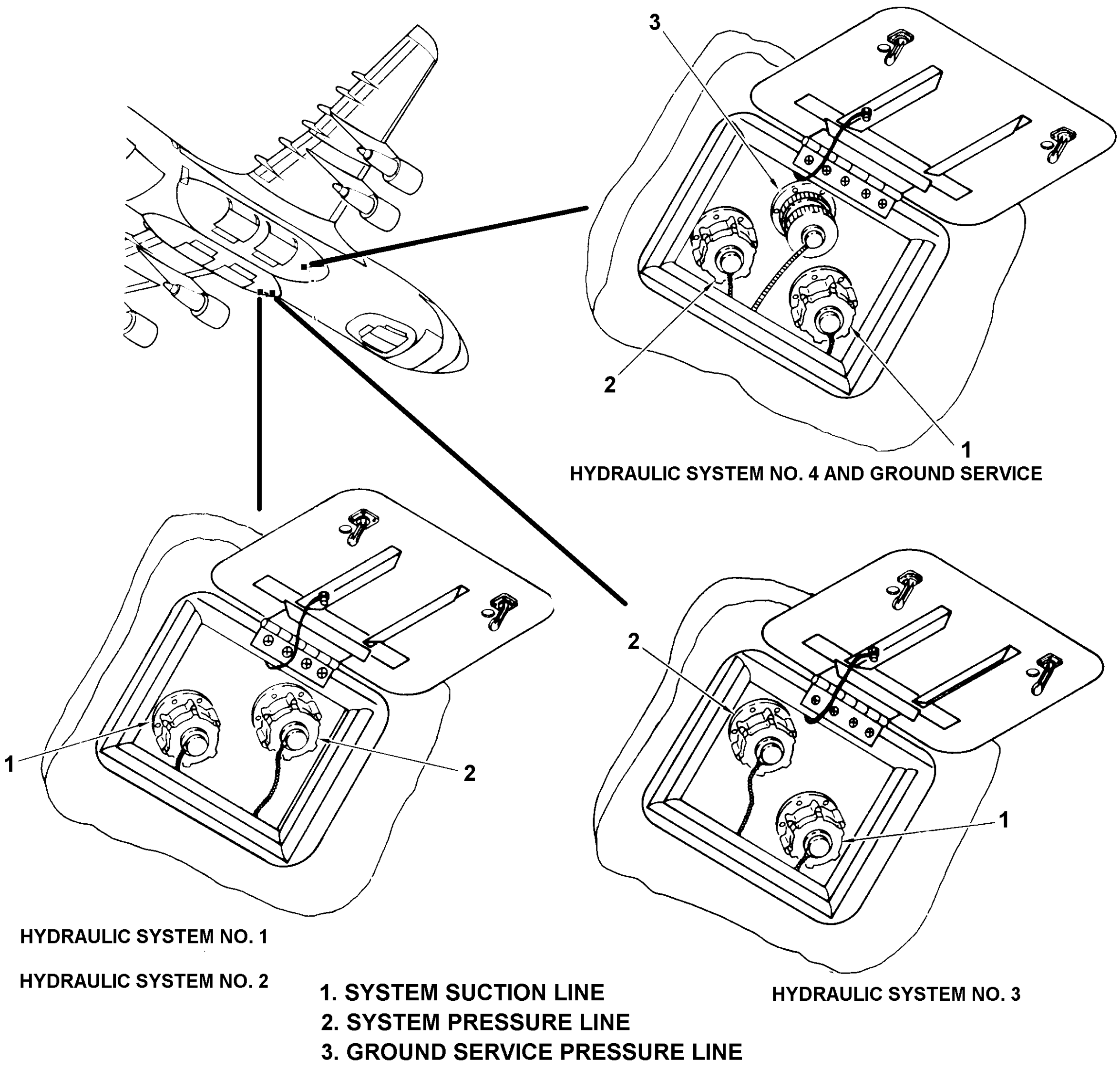
Routing of hydraulic tubing through fuel tanks and dry bays



Hydraulic fluid cooling system



Electric suction boost pump installation



Hydraulic systems ground test connections

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POWER PLANT

The engine used on the C-5 airplane is a TF39-GE-1 series turbofan engine which develops a static thrust, at sea level and 89.5 degrees F, of 41,100 pounds.

Each engine is enclosed in a nacelle and suspended below the wing by a pylon. The external structural components of the nacelle consist of the inlet cowl, fan cowl panels, inner cowl panels, the thrust reverser translating cowl, the cowl doors, the exhaust nozzle, and the exhaust plugs. The internal components are the forward and aft engine mounts, the heat shield, the pylon splitter, and the vapor barrier. The inlet cowl is bolted to the front flange of the engine fan frame. The cowl directs air into the fan, and reduces drag as a result of the aerodynamic design. The portion of the engine from the inner cowl panels to the exhaust nozzle is enclosed by two cowl doors. These doors, when closed, provide an aerodynamic contour to the component section of the nacelle and also protect the components from damage. Each door is hinged to the pylon apron; therefore, the doors do not have to be removed to replace an engine.

Engine Sections

Fan Section

The fan section comprises the first two compressor stages (N1) and performs the function of supercharging the engine by increasing the pressure of the air entering the remaining compressor stages. The second stage of the fan section is approximately twice the diameter of the first stage. This difference in diameter reduces the hub-to-tip pressure rise of the air entering the compressor and results in a more equal airflow which is desirable for optimum operation.

Compressor Section

The compressor section, excluding the fan stages, (N2) consists of fifteen stator vanes and one stage of outlet guide vanes. This compressor develops a pressure ratio of 16.8 to 1 from the first to the last stage of the compressor. The compressor stator consists of one stage of inlet guide vanes and sixteen stator vane stages. The inlet guide vanes and the first six stator stages are variable. By changing the position of these stages, the angle at which the air impinges on the remaining compressor stages can be adjusted to produce optimum operating conditions. Movement of the adjustable vanes is controlled automatically by signals from the fuel control. Movement is actually accomplished through an actuator mounted on the left and right sides of the compressor frame. These actuators are coupled to vane actuating beams which are, in turn, connected to the inlet guide vanes and the first six stator vanes of the compressor. A variable vane angle transducer is connected to the actuating beam on the right-hand side of the engine and provides a signal to the Malfunction Dectection, Analysis, and Recording System (MADARS) unit as to the operation and position of the vanes.

Combustion Section

The combustion section is located within the compressor rear frame just forward of the high pressure turbine rotor. The combustion section contains a combustor, 30 fuel nozzles, and 2 spark igniters. The combustor contains an inlet diffuser to provide uniform airflow over wide variations of inlet flow conditions. The fuel nozzles are installed around the combustor in ten clusters, each having three nozzles. A swirl cup is located at the tip of each fuel nozzle to provide flame stabilization and the correct fuel to air mixture. Metered fuel flows into the combustor through the fuel nozzles and is ignited. Energy produced by this combustion drives both the high pressure and the low pressure turbine rotors.

Turbine Section

The turbine section consists of the high pressure turbine and the low pressure turbine. The high pressure turbine is located within the compressor rear frame just aft of the combustion section. The high pressure turbine includes the high pressure turbine rotor, and the first and second stage high pressure turbine nozzles. The low pressure turbine is located just aft of the high pressure turbine rotor and includes the turbine mid-frame, low pressure turbine rotor and stator, and the turbine rear frame.

Exhaust Section

The exhaust section consists of an exhaust nozzle, forward exhaust plug, and aft exhaust plug. These components are mounted on the turbine rear frame and serve to increase the engine exhaust gas velocity. Thrust is further increased by the fan plug formed by the core engine cowl doors.

Accessory Drive Section

The accessory drive section consists of an inlet gearbox, a transfer gearbox and an aft transfer gearbox. The inlet gearbox is mounted on the engine front frame and is driven by the compressor shaft. A radial shaft transfers power from the inlet gearbox to the transfer gearbox which is mounted on the bottom of the fan frame. Power from the transfer gearbox is transmitted by a horizontal drive shaft to the aft transfer gearbox, which provides mounting pads for two hydraulic pumps, the starter, constant speed drive, lube and scavenge pump, fuel pump, air oil separator, and forward scavenge pump. The fuel control is mounted on the fuel pump and the N2 tachometer generator is mounted on the lube and scavenge pump.

Engine Indicators

RPM Indicators

The two RPM indicators located on the pilot's center instrument panel and the flight engineer's console indicate the speed of the fan (N1) and the compressor (N2) for all four engines. The N1 indicators monitor engine fan rotor speed, and the N2 indicators monitor engine compressor speed. The indicators are calibrated from 0 to 110 percent RPM.

Engine Pressure Ratio Indicators (C-5A Models Not Modified)

Engine power is defined in terms of the ratio of the low pressure turbine inlet total pressure to fan inlet total pressure. This engine pressure ratio (EPR) is displayed by tape-type indicators located on both the pilot's center instrument panel and the flight engineer's console.

Turbine Inlet Temperature Indicators

The temperature of the gases at the low pressure turbine inlet of each engine is shown on the turbine inlet temperature (TIT- tape-type indicators located on the pilot's center instrument panel and the flight engineer's console. The indicators are calibrated from 0 to 1000 degrees centigrade and receive power from the main AC bus.

Tachometer Generators

The engine incorporates a fan tachometer generator (N1) and a compressor tachometer generator (N2). The N1 tachometer generator is located in the low pressure turbine section of the engine and detects fan rotor speed. The N2 tachometer generator is mounted on the lube and scavenge pump and detects compressor speed. Signals generated by these tachometer generators are used to drive RPM indicators located on the pilots center instrument panel and the flight engineer's console.

Vibration Transducers

Vibration transducers and amplifiers are mounted in the engine and wing area, and use the MADAR system as an indicating device. The engine vibration sensing system uses integral cable-type transducers mounted on the 16th stage manifold flange and the rear turbine frame. The transducers are capable of measuring vibration from many sources such as engine core rotor and fan rotor unbalance.

Engine Systems

Engine Oil System

Each engine has an independent, self-contained oil system to provide lubrication for the seven engine bearings, the transfer gearbox, and the inlet gearbox. Oil in the lubrication system conforms to Specification MIL-L-7808 or MIL-23699. Each system is composed of a pressure, scavenge, supply, and vent subsystem. Instrumentation is furnished at the flight engineer's station to monitor oil pressure and temperature. A low warning light is furnished at the pilot's station.

Engine Fuel System

The engine fuel system supplies fuel to the combustion chamber, at the proper pressure and flow rate, to develop the correct thrust for each throttle position. Each engine has an independent fuel system; therefore, a malfunction of a component on one engine will not adversely affect the operation of the other three engines.

The engine fuel system consists of the following primary components: a fuel inlet line, an engine-driven pump, a heater, a filter, a fuel control, a fuel flow transmitter, a fuel oil cooler, a pressurizing and drain valve, and the fuel nozzles. In addition to the primary components, instrumentation is provided in both the pilot's and flight engineer's stations to permit monitoring of the fuel system operation.

Engine Controls System

The engine controls system furnishes the pilot and copilot with a means of regulating the power developed by the engines from the flight station. Engine power is adjusted by movement of the power lever on the engine fuel control. In order to obtain this movement, a linkage consisting of throttle levers, pushrods, cables, and pulleys are utilized to transmit the motion imparted to the throttle levers by the pilot or copilot to the power lever. Cable tension regulators are used to maintain the proper cable tension.

Engine Starter System

A separate engine starter system is furnished for each engine. The purpose of the system is to provide rotational torque to the engine in order to gain ignition speed, and then to further assist the engine in gaining sustaining speed after ignition occurs. The starter system consists of a pneumatic starter, starter control valve, an ignition system, and pneumatic ducting. A source of electrical and pneumatic power is required to start an engine. This power may be supplied by another operating engine, one or both of the onboard auxiliary power units, or pneumatic power carts. The auxiliary power units, however, are the primary source of power for starting the engines.

Cooling and Anti-Icing Systems

The nacelle is divided into a forward and aft compartment by the vertical vapor barrier. All of the engine-driven accessories and components that require cooling are located within the forward compartment. Engine fan air is used as the cooling medium.

Compressor bleed air is utilized to protect the forward portions of the engine and nacelle from the effects of icing. The engine anti-icing system employs sixteenth stage compressor bleed air to prevent the formation of ice on the fan inlet guide vanes. The nacelle anti-icing system normally uses eighth stage compressor bleed air for protection of the lip and forward portion of the nacelle inlet cowl. However, under certain operating conditions, the primary air supply must be supplemented by sixteenth stage air in order for the system to function properly. The anti-icing systems may be controlled manually by switches on the flight engineer's panel, or automatically by employing the airplane ice detector system.

Switches and indicators for the engine and nacelle anti-icing systems are located on the flight engineer's anti-icing systems control panel, the environmental control panel, and the annunciator panel.

Constant Speed Drive

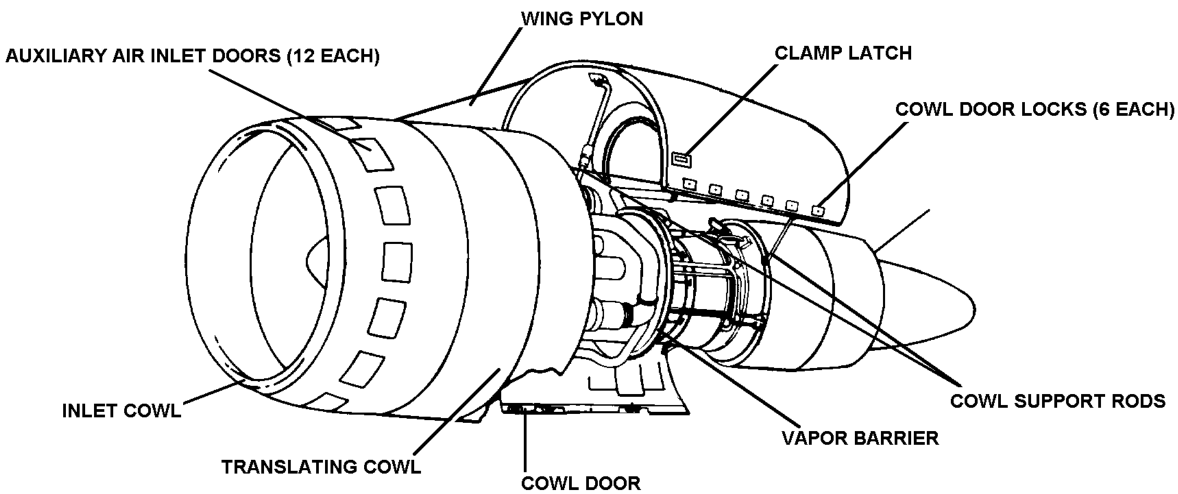
The purpose of the constant speed drive is to change the variable speed on an engine-driven out-put shaft to a constant shaft speed of 8,000 revolutions per minute. This constant shaft speed is used to drive a 60/80 KVA 400 Hz generator, which is mated with the constant speed drive. The constant speed drive/generator assembly is installed on the aft side of the engine aft transfer gearbox. In addition to the constant speed drive, the components of the system include a load controller, an air/oil cooler, a quick attach-detach fitting, and instrumentation to permit the flight crew to monitor the system operation. The generator, which is driven by the constant speed drive, is not a component of this system.

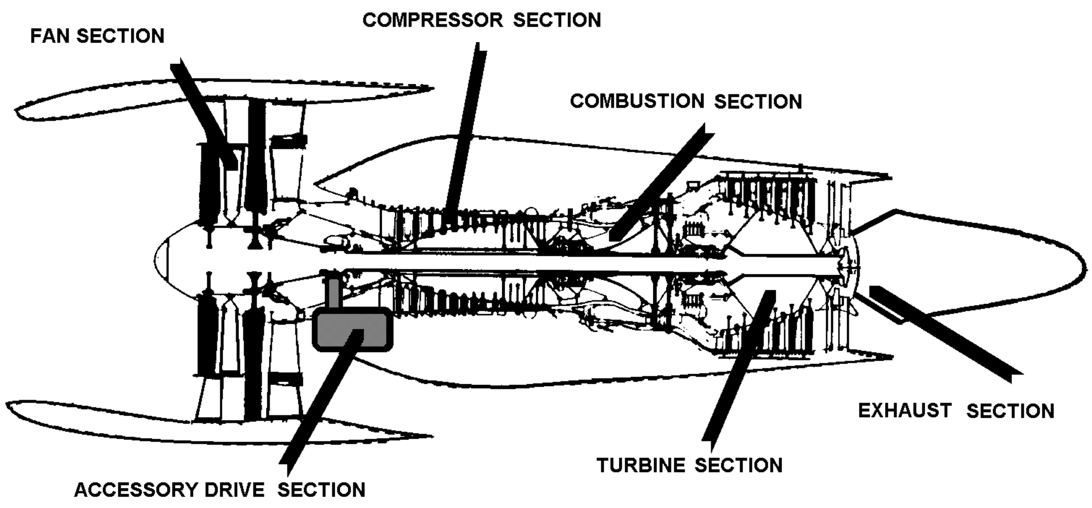
Thrust Reverser System

A two-position, fixed cascade-type thrust reverser is installed aft of the fan case on each engine. The thrust reversers may be deployed while on the ground and while in flight. In flight, reverse thrust is restricted to the inboard engines and then only at idle power. The thrust reversers are actuated by hydraulic power supplied by the airplane hydraulic systems. Operation of each thrust reverser is independent of the other three so that a malfunction of one thrust reverser system has no adverse effect upon the other systems. In addition, the inboard thrust reversers are connected to the hydraulic supply system for the outboard thrust reversers. This provides an emergency source of power to retract the inboard thrust reversers in flight, if necessary. Reverse thrust is actually achieved by positioning blocker doors in the fan air flow path. These doors divert the engine fan air through the cascades toward the front of the engine and produce the desired reverse thrust. For forward thrust operations, the blocker doors are fared into the translating cowl structure.

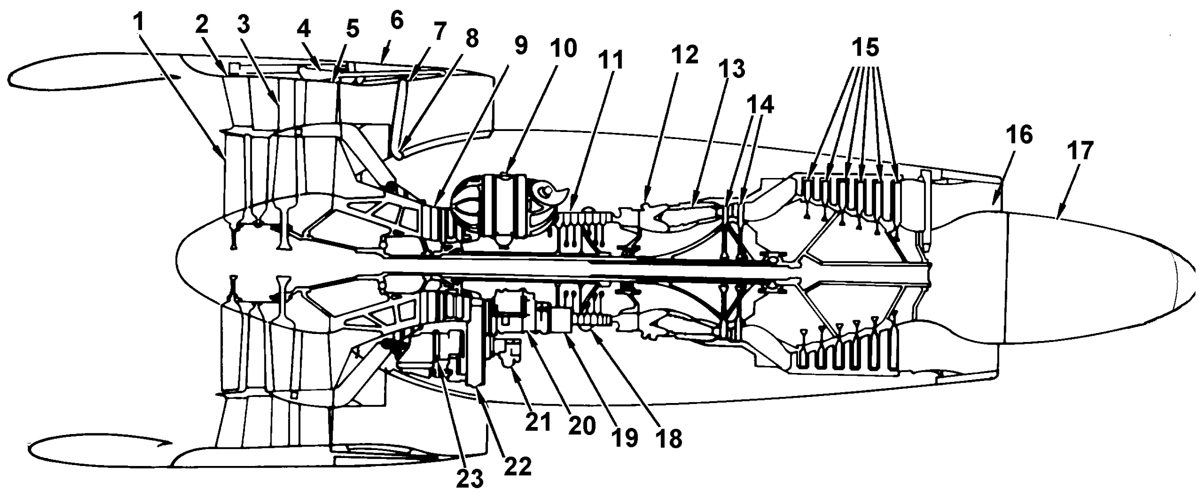
Engine Emergency Shutdown System

The engine emergency shutdown system provides a means of deactivating an engine and all its systems by a single action. Shutdown is initiated by pulling out the FIRE PULL handle on the engine emergency shutdown control panel. When the handle is pulled the pylon manual shutoff valve on the wing front beam is mechanically operated to shut off fuel at the wing, an electrical actuator shuts off fuel at the fuel control valve, the engine ignition is grounded, the starter system is deenergized, the generator is deenergized, the hydraulic system is depressurized, the hydraulic suction line shutoff valve is closed, the thrust reverser shutoff valve is closed, and the bleed air shut off valve is closed.



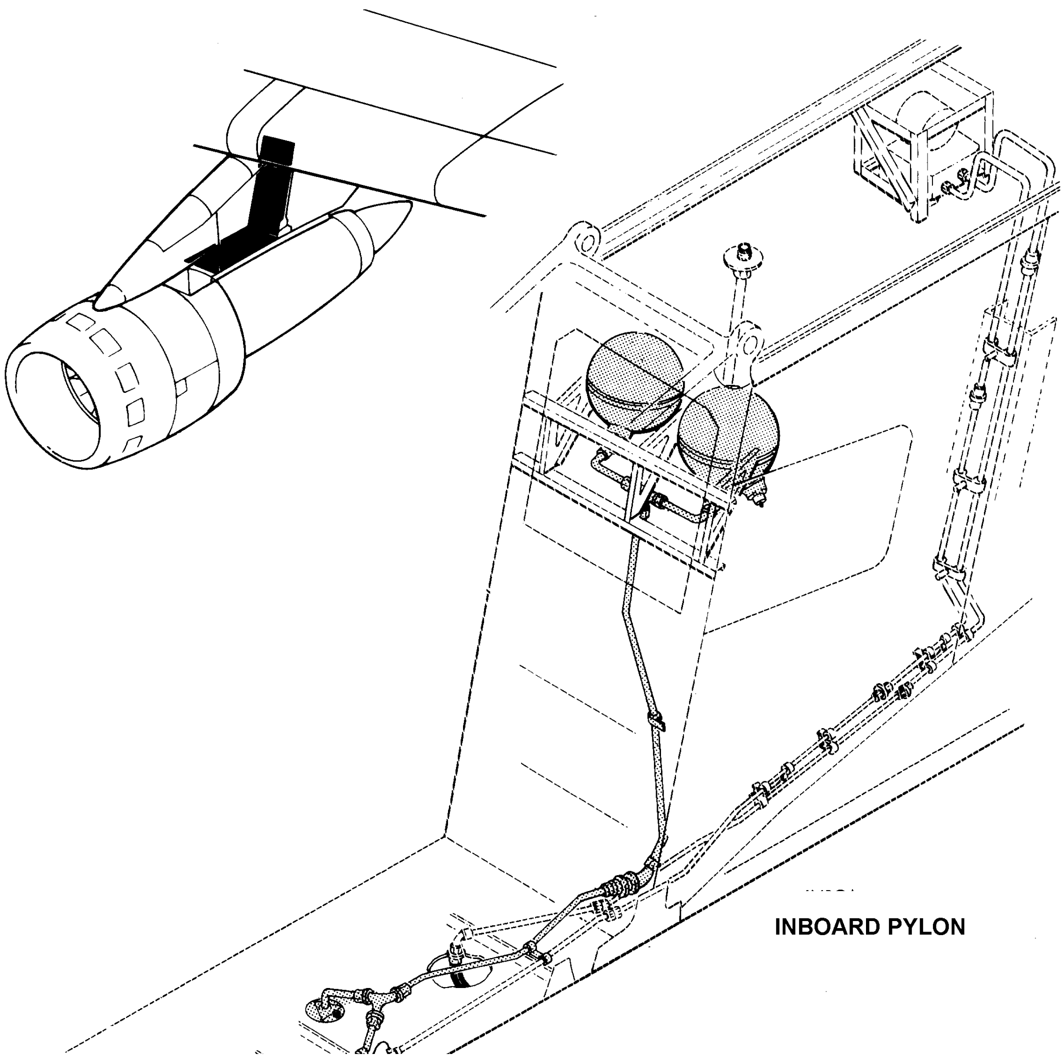


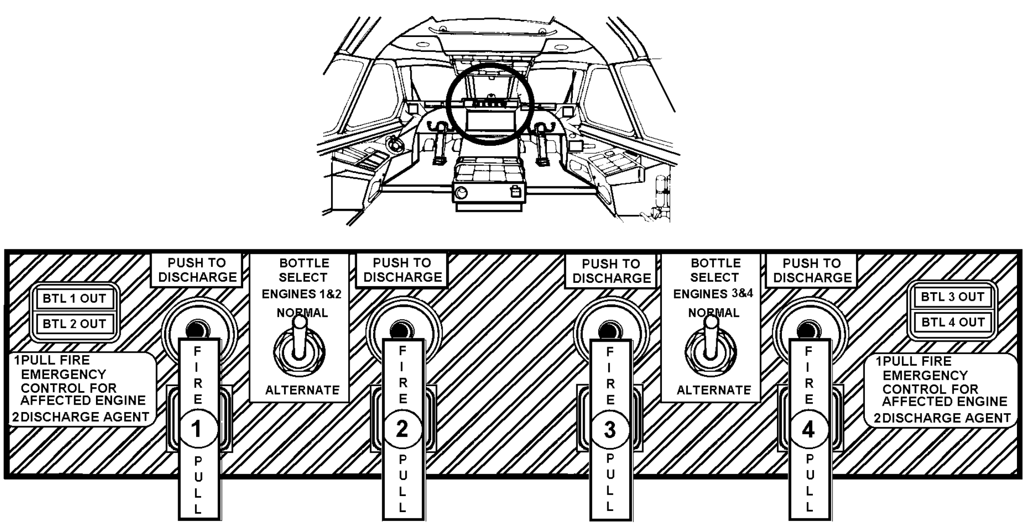
Engine structures and sections (typical)



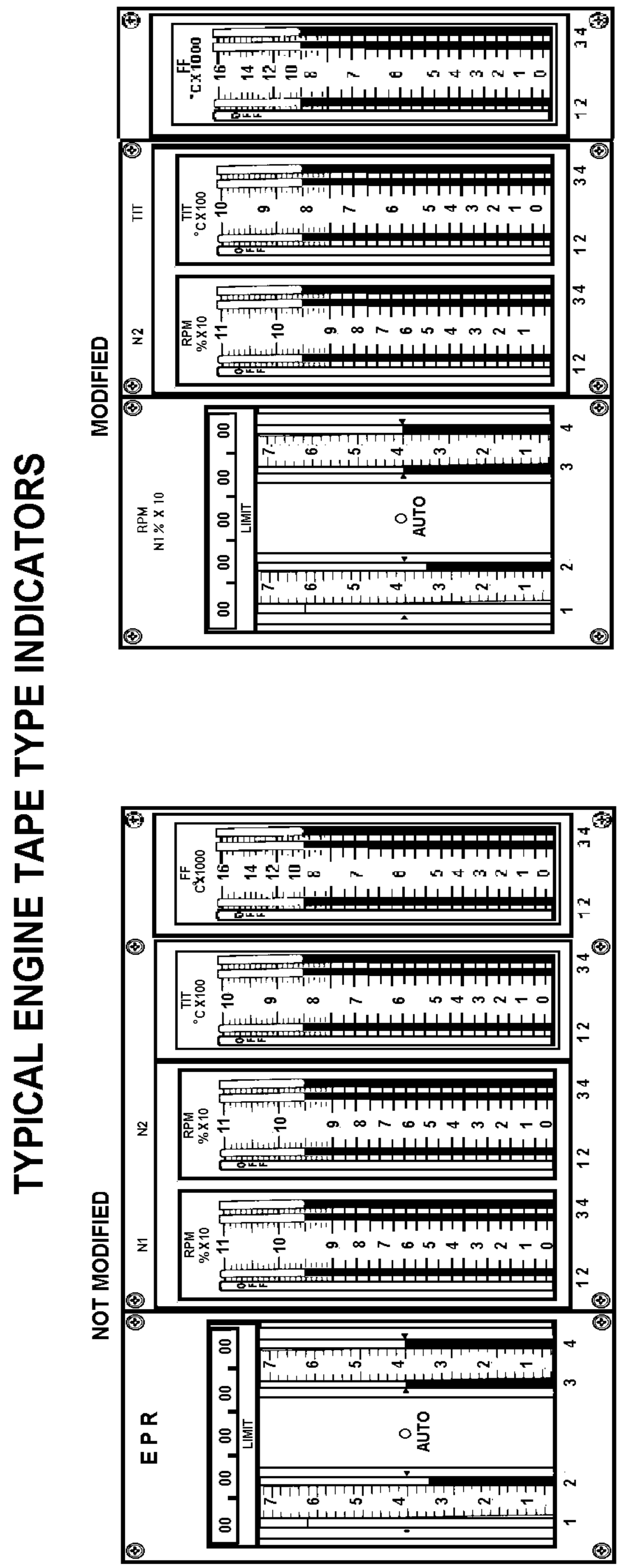
1. FIRST STAGE FAN
2. FAN INLET GUIDE VANE
3. SECOND STAGE FAN
4. TRANSLATING COWL ACTUATOR
5. FAN AIR EXIT VANE
6. TRANSLATING COWL
7. BLOCKER DOOR
8. BLOCKER LINK
9. HIGH PRESSURE COMPRESSOR INLET GUIDE VANE
10. ENGINE OIL TANK
11. HIGH PRESSURE COMPRESSOR
12. FUEL NOZZLE
13. COMBUSTION CHAMBER
14. HIGH PRESSURE TURBINE
15. LOW PRESSURE TURBINE
16. EXHAUST NOZZLE
17. EXHAUST PLUG
18. 13 STAGE BLEED AIR
19. FUEL CONTROL
20. FUEL PUMP
21. LUBE AND SCAVENGE PUMP
22. ACCESSORY DRIVE GEARBOX
23. TRANSFER GEAR BOX

Typical engine arrangement

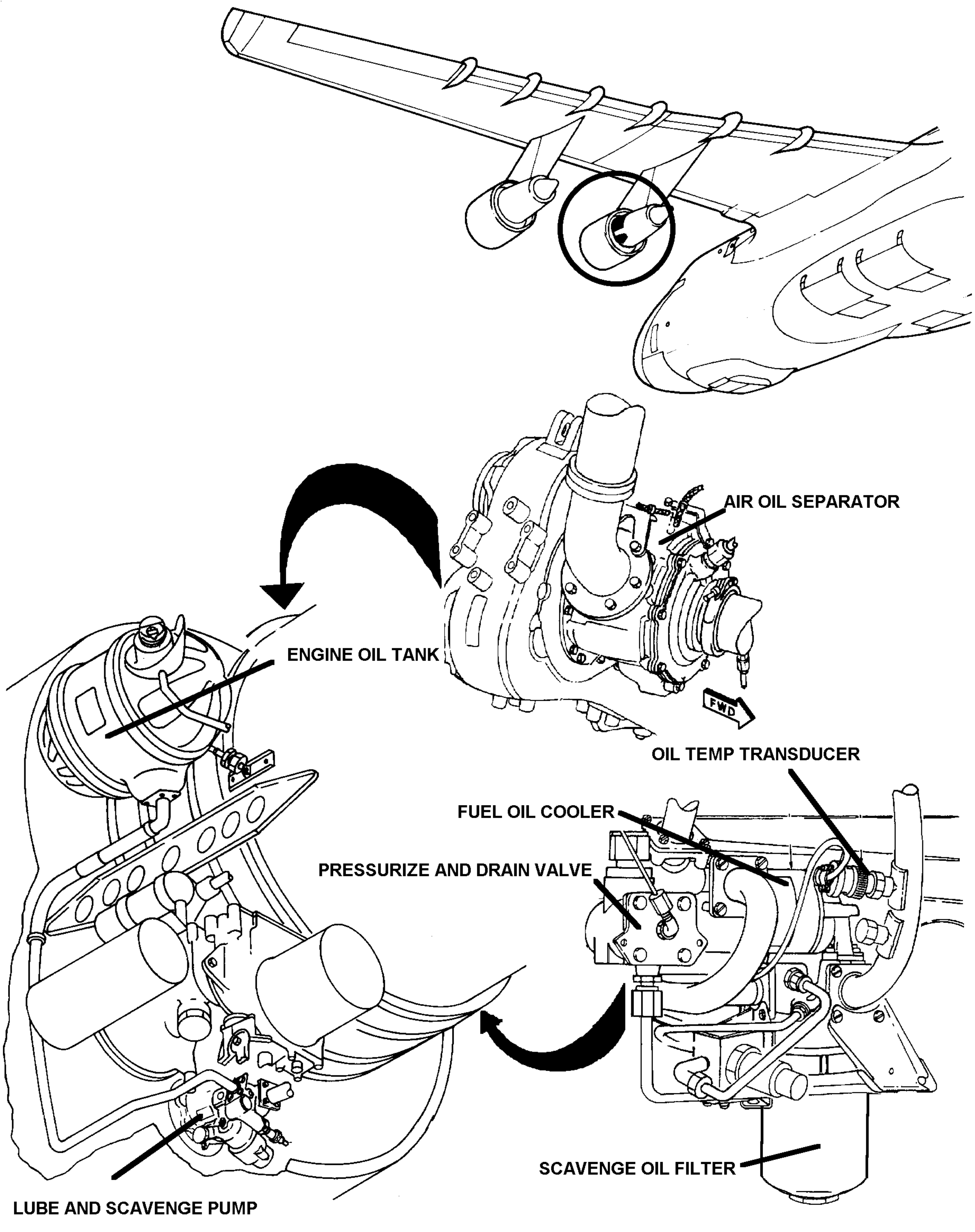




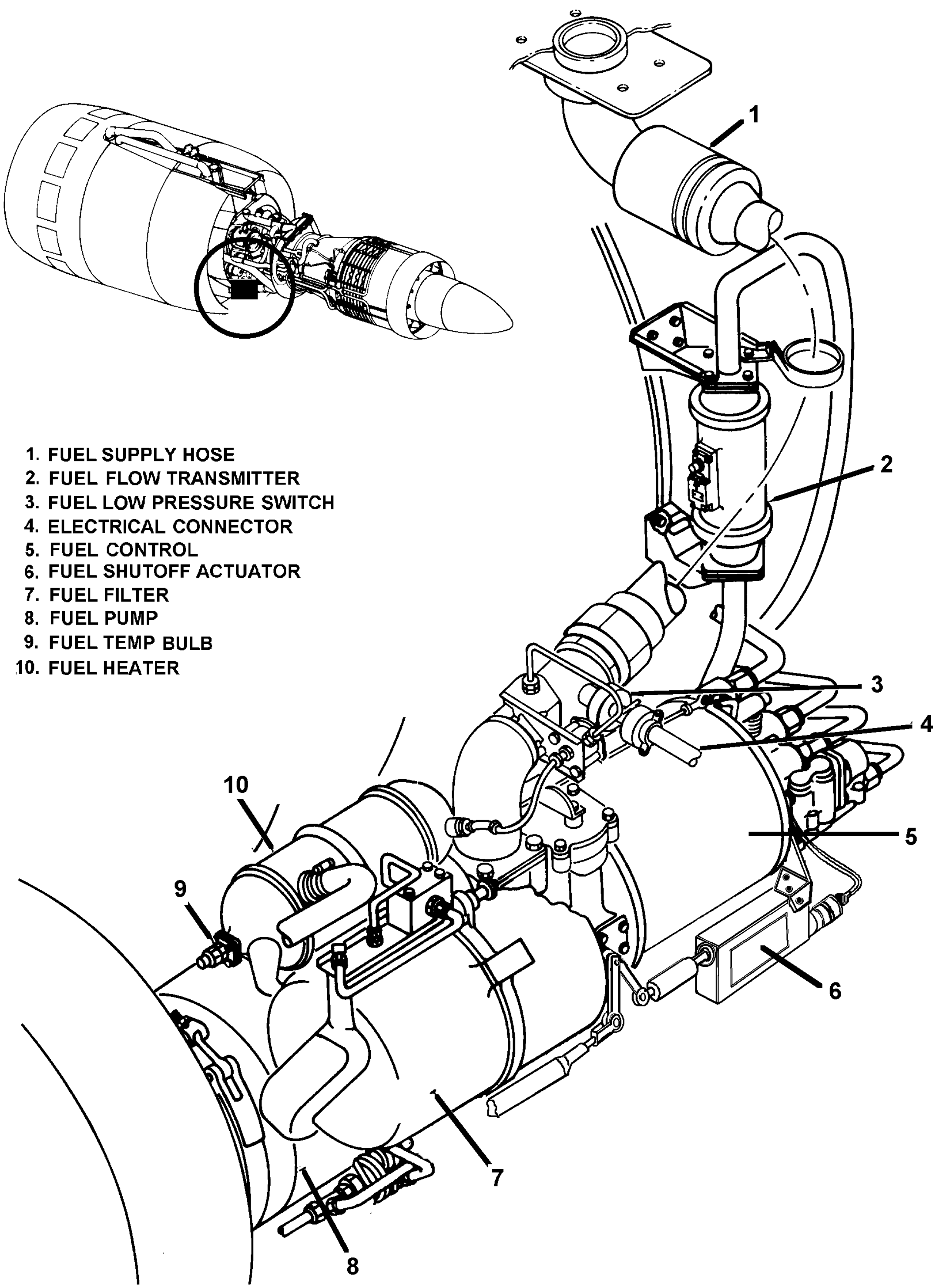
Engine emergency shutdown T-handles and pylon fire bottles



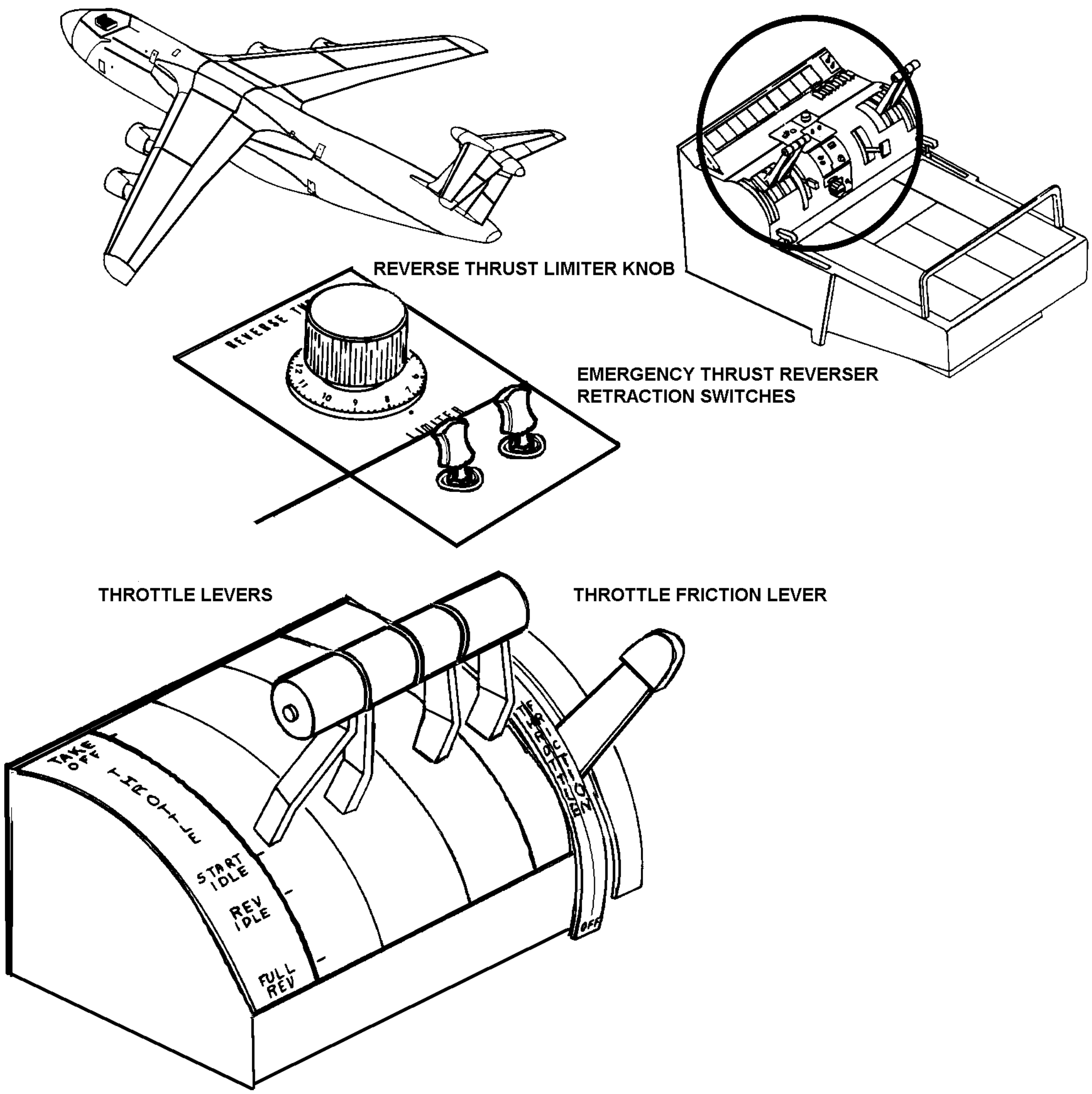
Engine indicators (typical)



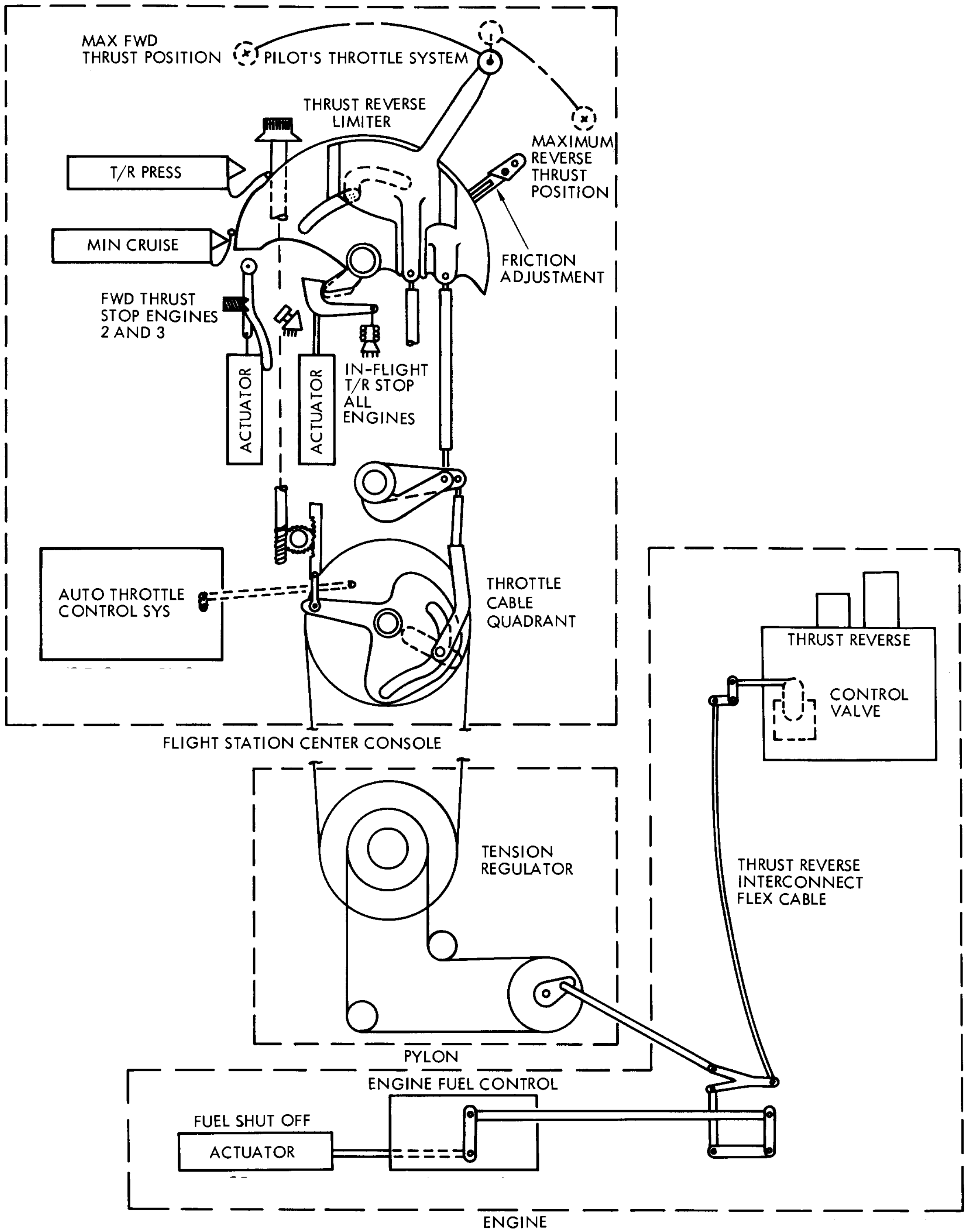
Engine oil system components



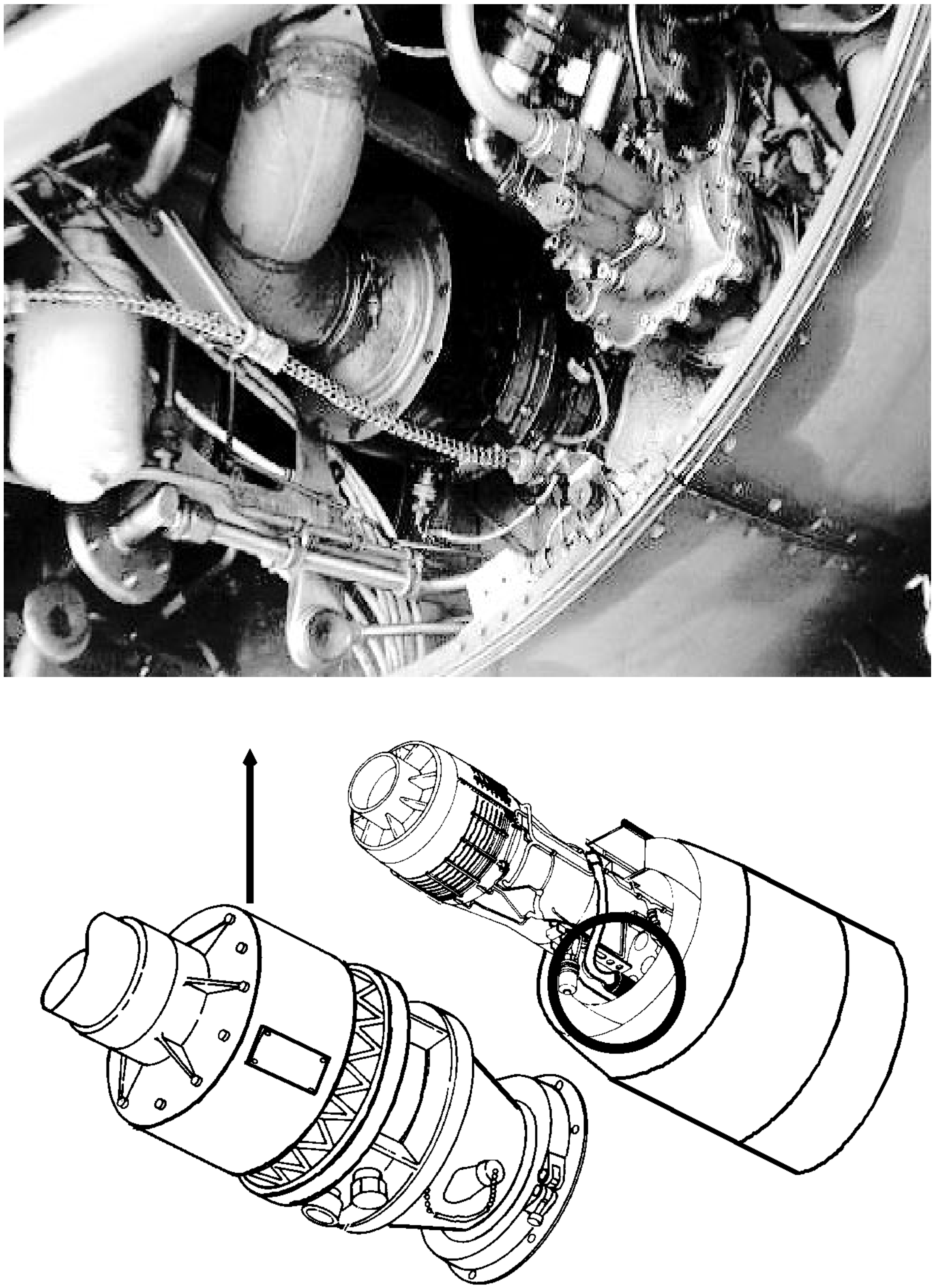
Engine fuel system components



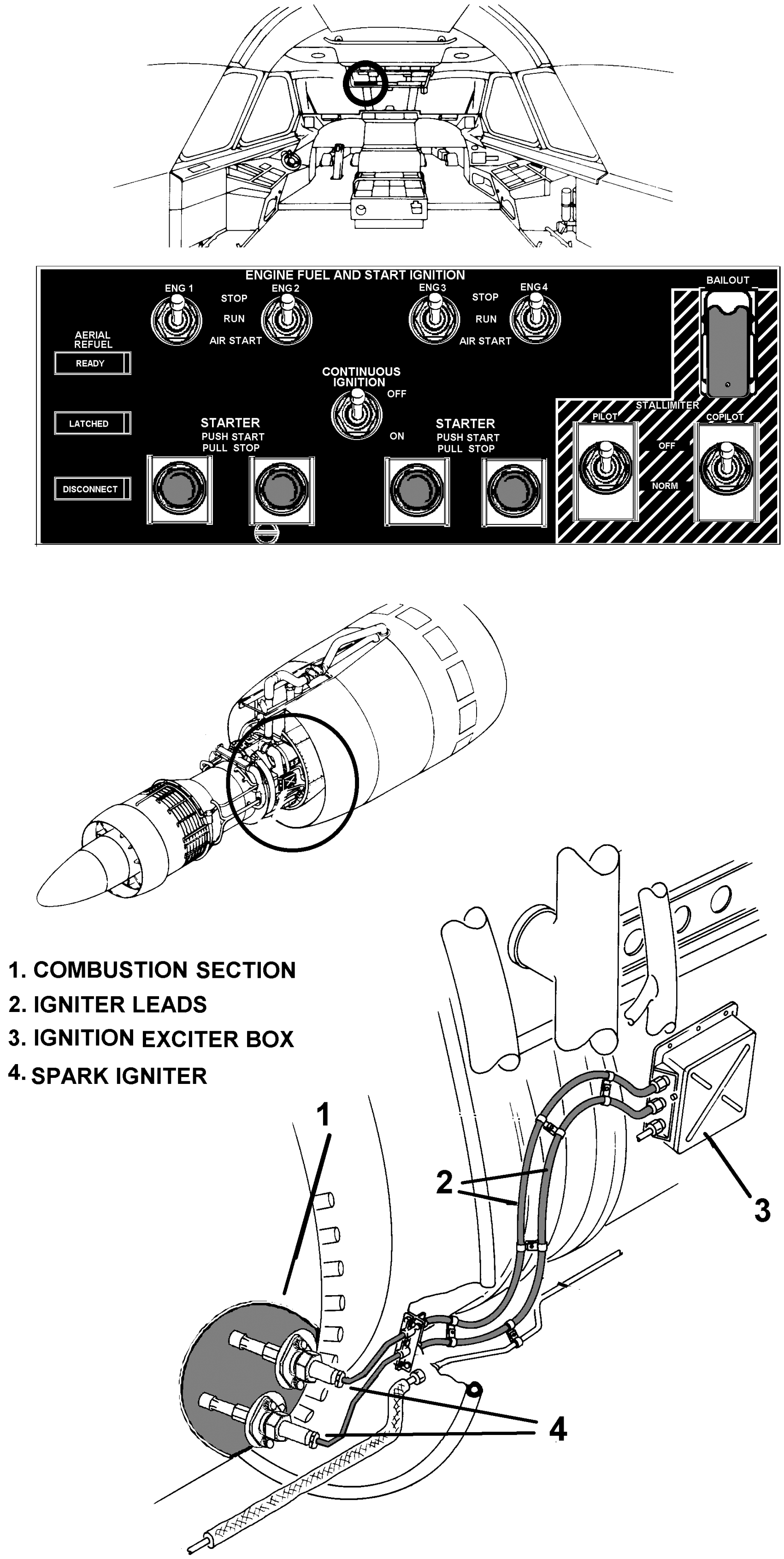
Engine throttle controls



Engine control system diagram



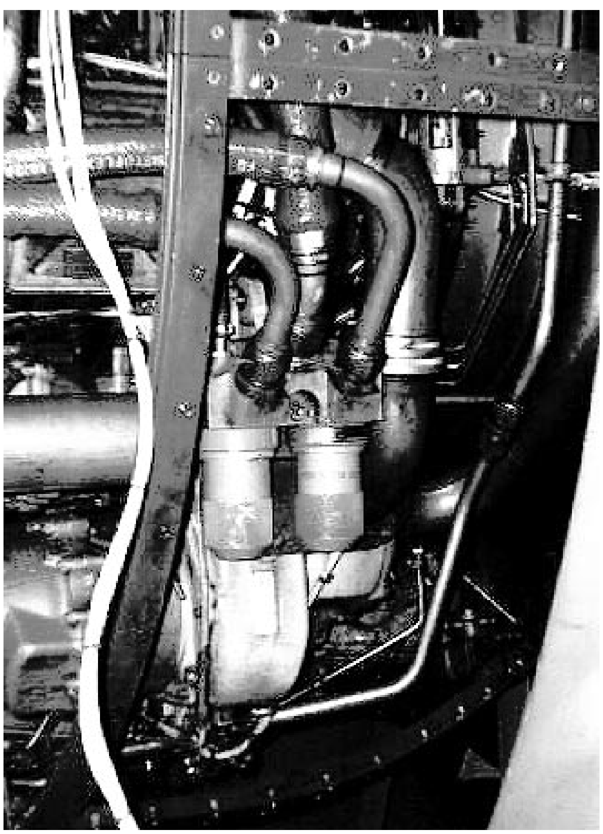
Engine starter



Engine starter system components

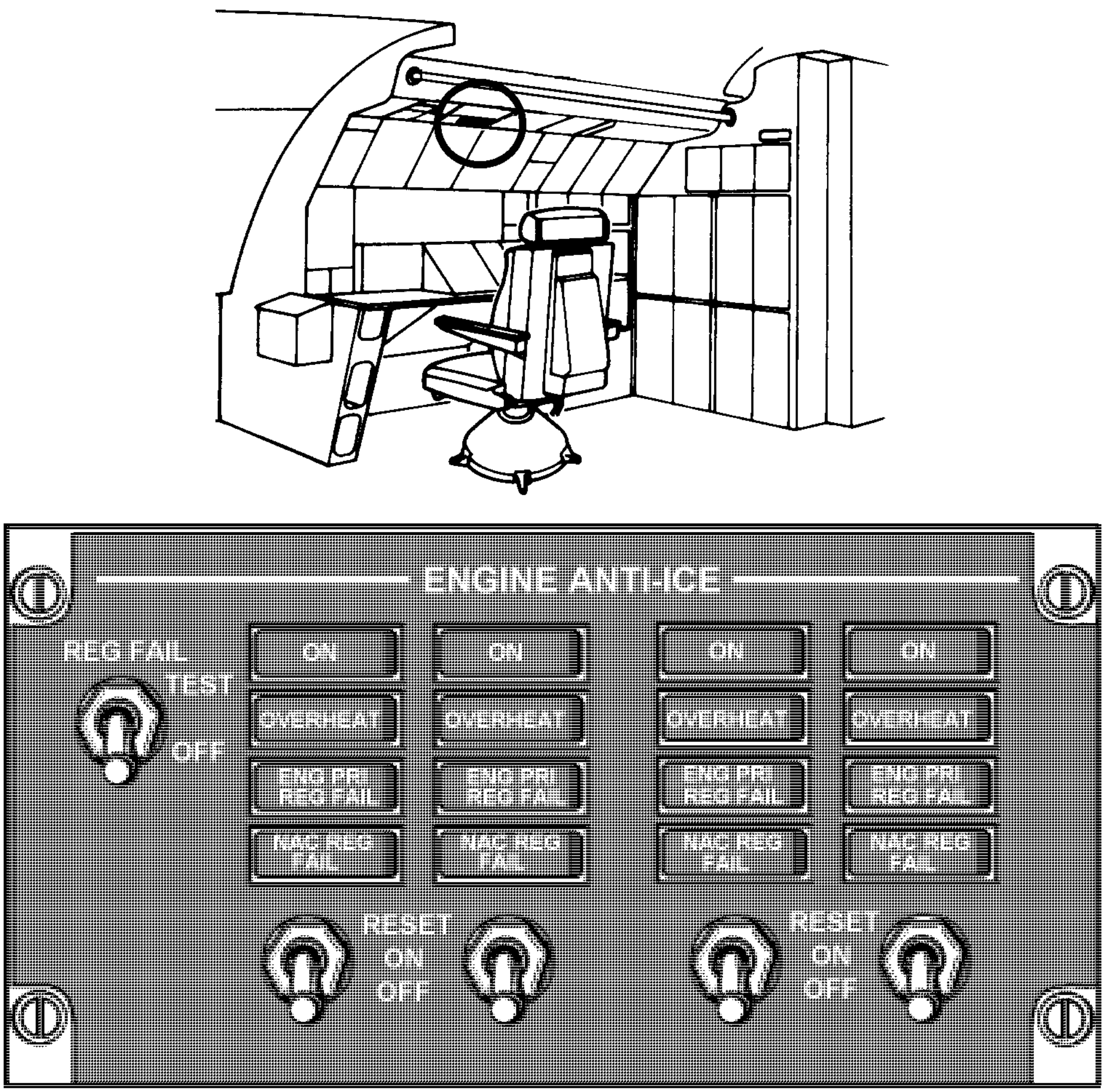
Fuel flow transmitter

Engine driven hydraulic pumps

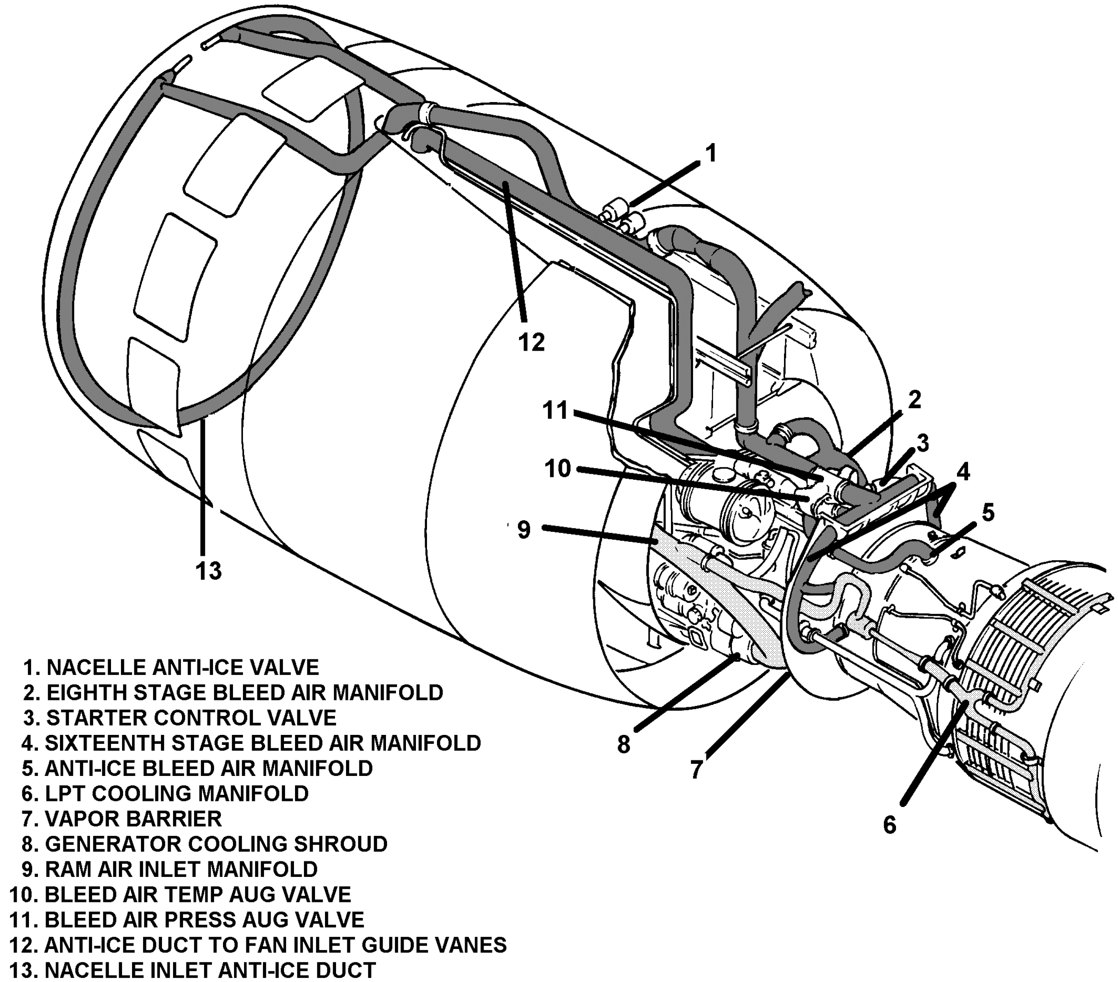


Engine hydraulic pump filters

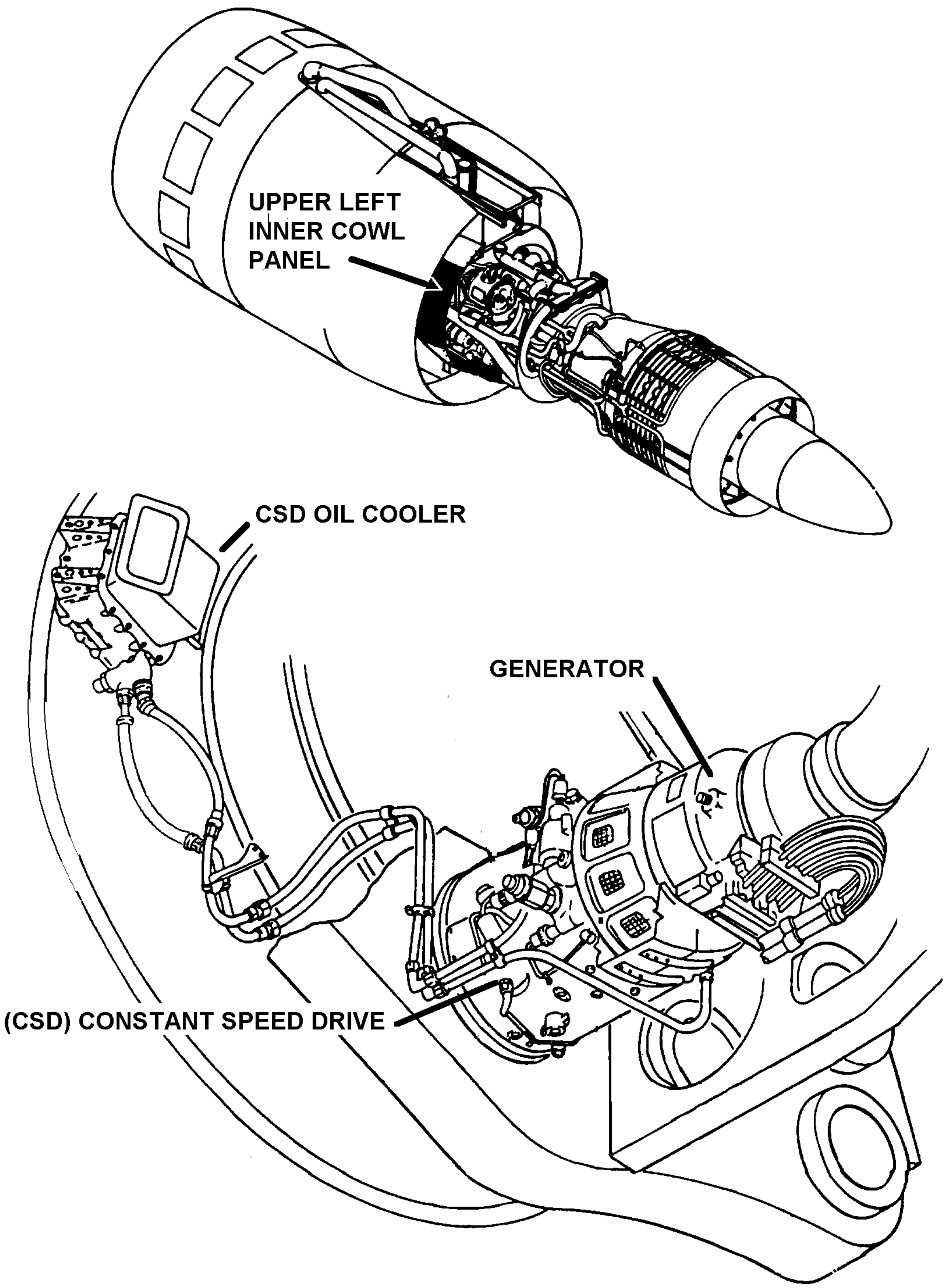
Nozzle cluster and spark igniter



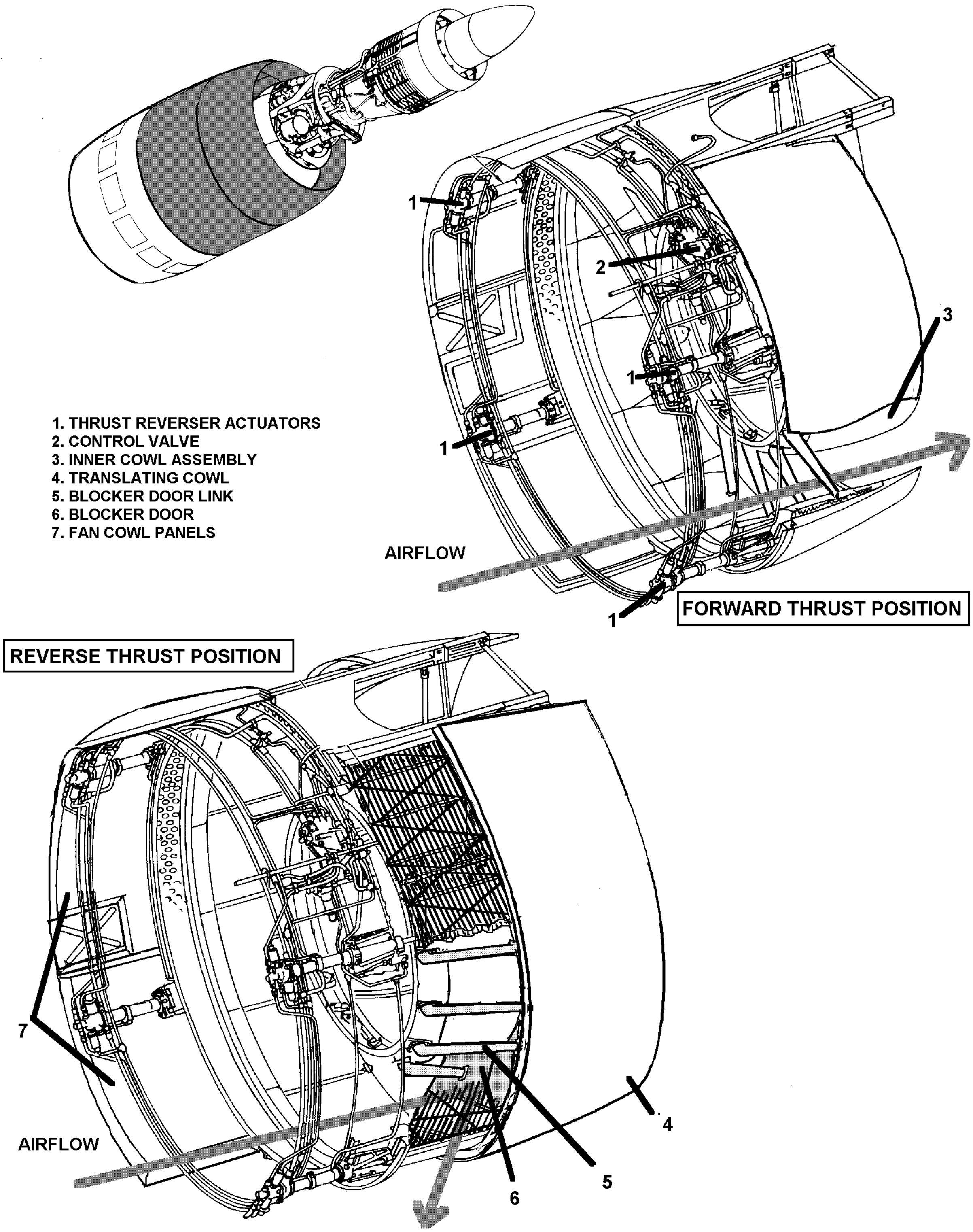
Flight engineer’s engine anti-ice control panel



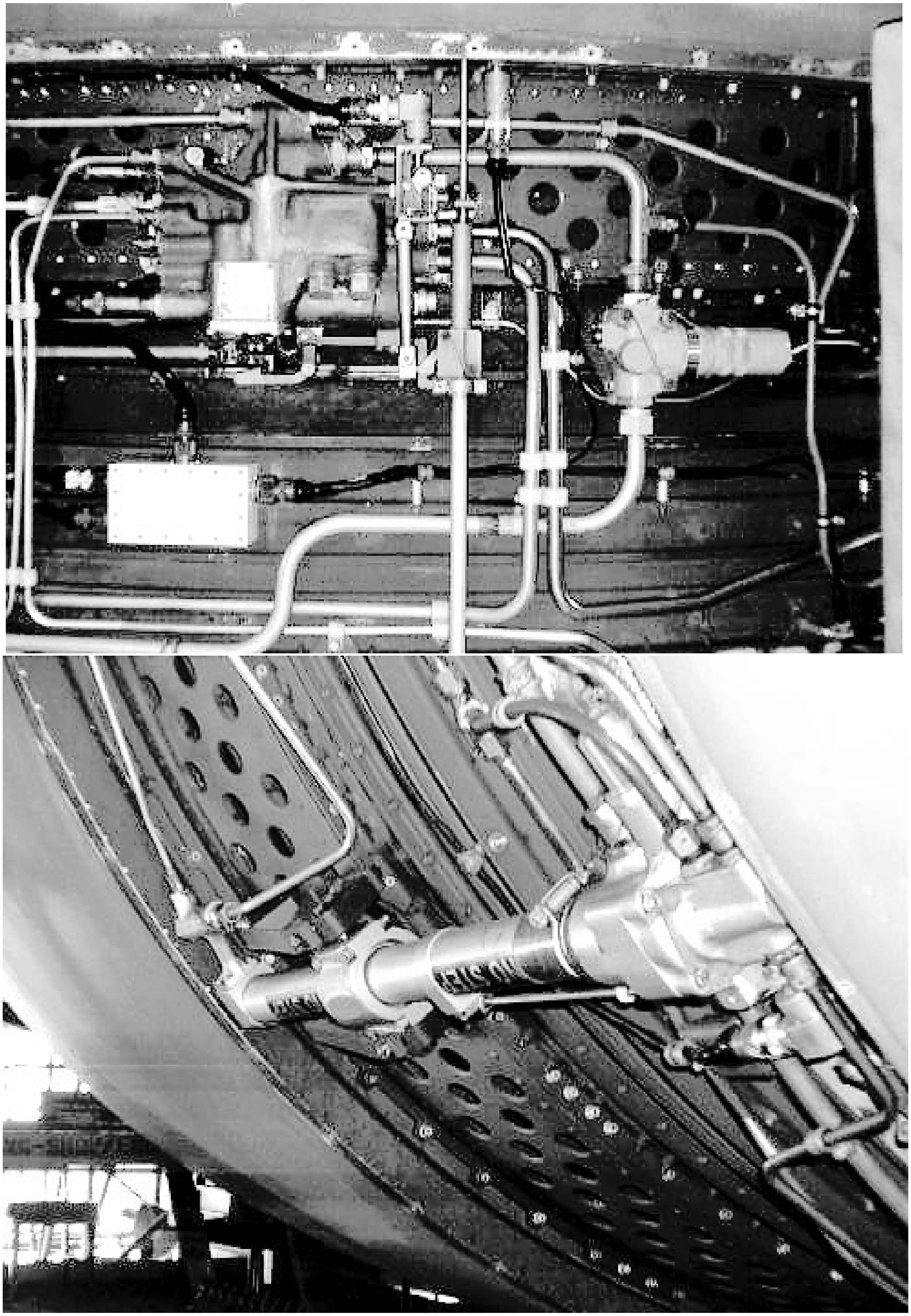
Engine cooling and anti-icing system components



Engine constant speed drive (CSD) and generator



Engine thrust reverser system components



Thrust reverser control manifold and actuator (typical)

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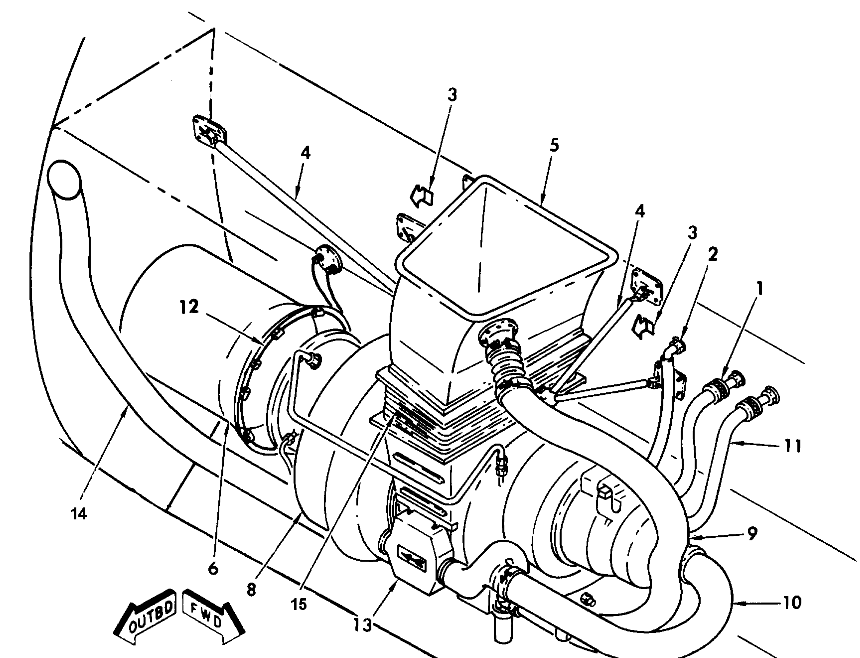
AUXILIARY POWER SYSTEM

Two auxiliary power units (APUs) are installed on the C-5 airplane. Each unit supplies shaft power for running a 60/80 KVA generator, and provides pneumatic power for air conditioning, engine starting, and hydraulic power when the airplane is on the ground. One APU is installed in the left main landing gear pod. The other unit is installed in the right main landing gear pod. Both units are isolated in a compartment aft of the landing gear bay. Either unit will supply a sufficient amount of electrical and pneumatic power to perform any single normal ground operation at a reduced rate. The APUs are intended for ground operation only; however, in the event of a four engine out condition, the unit may be operated in flight to provide pneumatic power to restart the engines. The accessories are mounted on the underside of the APU to facilitate maintenance and accessibility.

The APU is a gas turbine engine. The unit has an integral oil system and interfaces with the airplane fuel, hydraulic cooling, electrical, and fire systems. The APU operates on airplane fuel which is supplied by gravity from the main inboard fuel tanks. The APU fuel components are a fuel filter, fuel control, a shutoff valve, a flow divider, fuel nozzles, and an annular combustor. The lubrication components are an oil pressure pump, an oil filter, a low oil pressure switch, an oil cooler, and a turbine scavenge pump. A magnetic drain plug is installed in the bottom of the oil reservoir to provide an indication of oil contamination. A mounting pad is provided on the APU for attachment of the hydraulic starter. An integral cooling fan provides cooling air for the oil cooler and the generator. The APU has an integral permanent magnet generator which provides a self-contained electrical power service for ignition and control.

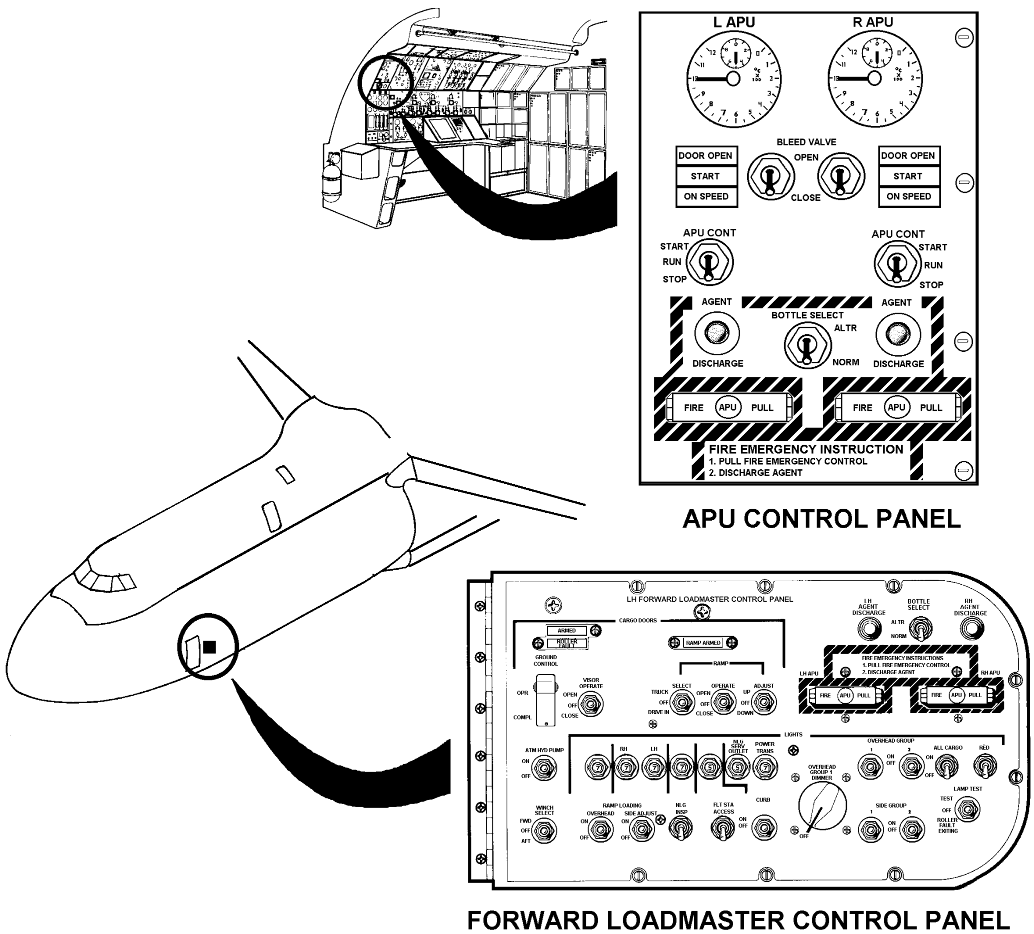
Auxiliary Power Unit (APU) Emergency Shutdown System

The APU emergency shutdown system provides a means of deactivating an APU and all its systems by a single action. Shutdown is initiated by pulling out the APU FIRE PULL handle on either the flight engineer's APU control panel or the loadmaster's forward control panel. When the handle is pulled, electrically operated valves shut off fuel at the wing rear beam and inside the fuselage at the APU compartment, the APU electrical system is deenergized, the APU generator is deenergized, and the APU inlet door is closed.



1. STARTER HYDRAULIC RETURN HOSE
2. FUEL SUPPLY HOSE
3. HOISTING UNIT CONNECTION
4. MOUNT ASSEMBLY
5. AIR INLET DUCT
6. EXHAUST DUCT
8. AUXILIARY POWER UNIT
9. COOLING AIR SUPPLY DUCT
10. GENERATOR COOLING AIR DUCT
11. STARTER HYDRAULIC PRESSURE HOSE
12. FIRE DETECTION SENSING ELEMENT
13. OIL COOLER
14. AIR TURBINE MOTOR EXHAUST DUCT
15. PLENUM FLEX DUCT

Auxiliary power unit and components



Auxiliary power unit emergency shutdown T-handles

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FUEL SYSTEM

The C-5 fuel system consists of twelve integral wing tanks, system functional and control components, and associated plumbing. All interfacing structure is sealed to prevent fuel leakage. The primary fuel used in the C-5 is JP8 (commercial Jet A1). The engines will perform satisfactorily using alternate fuels JP5, Commercial Jet A (equivalent of JP5), and Commercial Jet B. There are four main fuel tanks, four auxiliary tanks, and four extended range tanks. Dry bay areas are provided in each wing to gain access to tanks, and various fuel and vent lines.

A scavenge system is incorporated to provide continuous inflight water removal. A water condensate drain valve is installed at the tank low point to drain water during ground operations. The fuel tanks are pressurized through the vent system to a specified pressure above ambient.

The entire fuel system is interconnected by a fuel manifold and is controlled through a fuel management panel. The fuel feed system plumbing consists of feed lines, crossfeed lines, a wing fuel manifold, ejector lines, and refueling adapters. Ground pressure refueling is normally accomplished through the single point refueling (SPR) adapter. The airplane may also be refueled through over the wing filler openings on the upper wing surfaces. The C-5 aerial refuel system incorporates an aerial refueling receiver system suitable for flying boom type refueling. A fuel jettison system is installed to reduce landing weight and/or to get rid of unneeded fuel in an emergency.

Fuel Tanks

The No. 1 and No. 4 main fuel tanks are respectively the left and right outer most fuel tanks on the airplane. A 275 gallon surge box in each outboard main fuel tank encloses fuel boost pumps. Both outboard main fuel tanks also contain vent tanks with a capacity of 100 gallons, in their aft inboard corner. When the fuel boost pumps are in operation, the vent tanks are emptied by a scavenge system which transfers fuel collected in the vent tank to the outboard main fuel tank. For normal flight operation fuel is supplied to the main tank for each engine. For emergency operation fuel may be furnished directly to the engine without being transferred to the main tanks.

The left and right inboard main fuel tanks are designated No. 2 and No. 3, respectively. A 205 gallon surge box in each of these tanks contains a 30-gallon subsump tank which encloses the fuel boost pumps. Heat exchangers are located in these tanks. Hydraulic oil coolers, although not part of the fuel system, are located in the inboard main fuel tanks. Two coolers are located in the No. 2 main fuel tank, and two are located in the No. 3 main fuel tank.

The No. 1 and No. 4 auxiliary fuel tanks are the outboard auxiliary tanks located just inboard of No. 1 and No. 4 main fuel tanks . They are located adjacent to and inboard of the two outboard main fuel tanks, between the front and rear wing beams. Each has fuel boost pumps enclosed in a 50-gallon surge box and a scavenge system that collects fuel from the low areas in each tank and keeps the sump tank full of fuel until the tank is completely empty.

The inboard auxiliary fuel tanks, No. 2 and No. 3, are located between the front and mid wing beams, beside the dry bay and the inboard main fuel tanks. Each tank also contains a 50-gallon surge box. They give approximately 5 minutes of pump fuel at engine cruise power fuel consumption rate, permitting ejectors or jet pumps, to scavenge completely the residual fuel in the tanks. The fuel boost pumps are housed in a 30-gallon subsump tank enclosed in the surge box.

The outboard extended range fuel tanks are located behind the mid wing beam, aft of the No. 2 and No. 3 auxiliary fuel tanks, in the left and right wing respectively.

The inboard extended range fuel tanks, No. 2 and No. 3, are located behind the mid-wing beam directly behind No. 2 and No. 3 main fuel tanks, in the left and right wing, respectively. Each tank contains fuel boost pumps enclosed in 50-gallon surge boxes. Surge Boxes Surge boxes are located in the fuel tanks to assure an uninterrupted flow of fuel to the engines during abnormal operating conditions.

Scavenge Jet Pumps

Scavenge jet pumps operate on the venturi principle. Fuel from the boost pumps flows through the venturi-shaped ejectors and causes a suction at the pickup port of the ejector. This suction scavenges the desired area, to reduce the quantity of unavailable fuel, and to mix any water condensate with the fuel so that the engine does not receive an excessive amount of water at one time. The main fuel manifold drains into the vent box at the completion of fuel transfer operations, and the vent box is scavenged by a jet pump operating from the outboard main tank boost pump bleed flow. All fuel scavenged from the vent system is returned to the outboard main fuel tanks .

Condensate Drain Valve

Eight condensate drain valves are installed in the lower surface of each wing. Two valves are installed in the No. 1 and No. 4 main fuel tanks and one valve is installed in each of the other fuel tanks. An additional valve is installed in the vent box of the No. 1 and No. 4 main fuel tanks. The valves are installed at the low point of each tank when the airplane is on the ground. Moving the poppet upward allows the tanks to drain through the valve. These are used in draining water and fuel from the tank.

Fuel Boost Pumps

The fuel boost pump consists of two removable pumping elements and a common discharge housing, forming an integral unit. Both identical pumping units can be independently operated and will function either individually or in unison. Each of the twelve fuel tanks contains one of these dual units. The 24 boost pumps provide fuel under pressure to the engines, and also may be used for transferring fuel throughout the fuel supply subsystem. They may also be used for jettisoning fuel, defueling, or for operating the scavenge and water purge ejectors or jet pumps.

An inlet shutoff valve is installed in the input fuel line of each fuel boost pump. These shutoff valves are used to restrict gravity fuel flow to fuel boost pump elements when the elements are to be removed from the airplane for maintenance. As a result, the fuel boost pump elements may be removed without defueling. The fuel boost pump inlet shutoff valves are actuated automatically upon removing a pump element from the fuel boost pump housing.

Gravity Fuel Feed

The fuel system is capable of gravity feed to the engine fuel pump in the event of failure of the main fuel tank boost pumps, or the airplane loses all electrical power. Fuel can be supplied to the engine pump inlet in the amount and at the pressure required for engine operation from sea level to an altitude of 6,000 feet. In this event, fuel may also be supplied to the auxiliary power units by gravity flow from the sumps in the inboard main fuel tanks.

Crossfeed Valves

Crossfeeding of fuel between the tanks and engines in each wing is provided for by three valves in the dry bay of each wing: the left separation valve and No. 1 and No. 2 isolation valves in the left wing, and the right separation valve and No. 3 and No. 4 isolation valves in the right wing. These valves allow fuel to be supplied under pressure from a main tank to either the inboard or outboard engines in each wing. Control of these valves is by positioning the CROSSFEED and ISO switches on the flight engineer's fuel management panel.

Fuel Level Control Valve

Each of the 12 integral fuel tanks contains a fuel level control valve to stop the flow of fuel into the tank when the level reaches a specified height. The fuel level control valve has dual systems, primary and secondary, which operate independently of one another. The valve senses fuel level with floats, and the solenoids provide electromechanical means of lifting the floats to open and close the primary and/or secondary valve.

APU Fuel Feed

Fuel is supplied to the auxiliary power units by gravity flow from the sumps in the inboard main tanks. The controls for the APU are located at the flight engineer's station, to the left and above the fuel management panel.

Fuel Vent Lines

The fuel tanks in each wing are vented by a common system which serves all tanks on one side of the airplane. This venting system also prevents inter tank transfer or overboard spillage of fuel during flight or ground maneuvers. Each of the fuel tanks is vented by a vent line with an upturned bell mouth inlet near the inboard tank end. The inlets are immediately below the upper surface of the wing skin. Opposite ends of the vent lines discharge into the vent boxes or their interconnecting lines. The vent system terminates in a 100-gallon vent box in each outboard main wing tank. The vent box vents to atmosphere only when the tank pressure exceeds a preset tolerance above or below the ambient atmospheric pressure.

Fuel Management Panel

With the exception of the manual fire shutoff valves and the APU shutoff valve, all fuel system functions are controlled from the fuel management panel. The panel is located at the flight engineer's station .

Fuel Mismanagement Warning

The fuel mismanagement warning system provides a warning to the flight crew when undesirable fuel loading distributions exist in the outboard wing fuel tanks due to improper management of fuel usage which could affect flight characteristics.

Fuel Quantity Indicators

There are 12 fuel quantity indicators located on the flight engineer's fuel management panel. The indicators show the amount of fuel in pounds remaining in each of the 12 fuel tanks in thousands of pounds.

Total Fuel Quantity Indicator

A total fuel quantity indicator provides a single display of the total fuel remaining in the tanks. Each of the 12 fuel quantity indicators supply fuel quantity data to the total fuel quantity indicator. The total fuel quantity indicator sums each indicator and displays the total fuel quantity (in thousands of pounds) remaining in all of the remaining fuel tanks.

Single Point Refueling Receptacle Assembly

Refueling is normally accomplished through the single point refueling (SPR) receptacles located in the fairing forward of the main landing gear wheel wells. Removal of caps in the fairing exposes the receptacles.

Aerial Refueling System

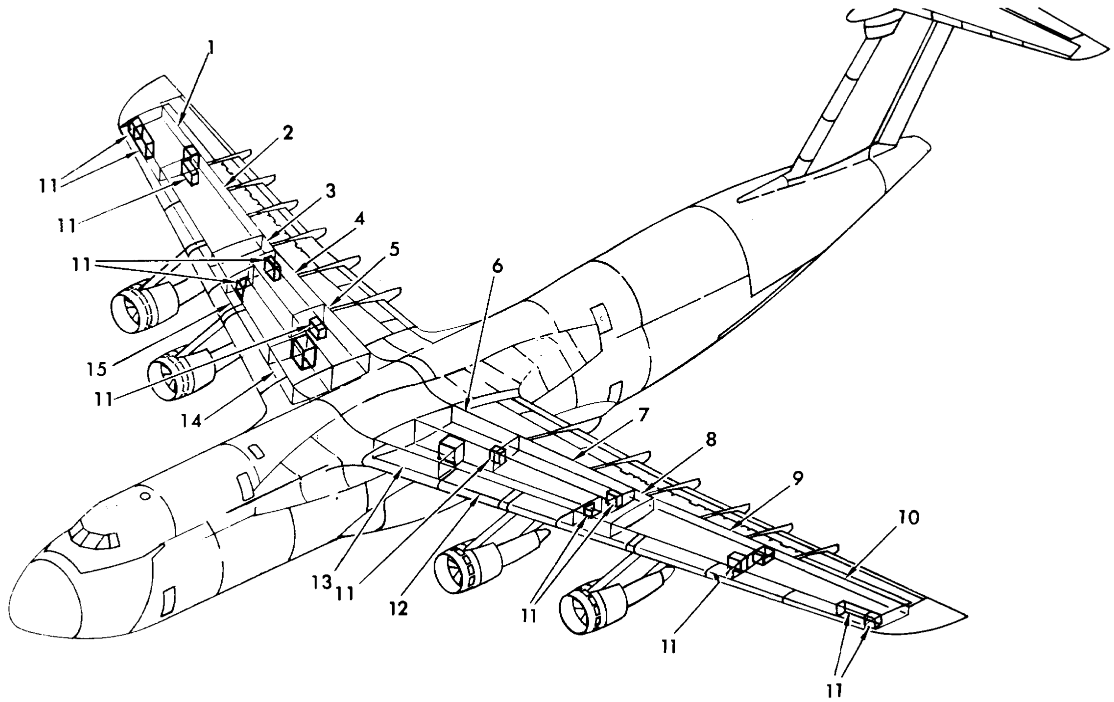
The aerial refueling system consists of a boom-type receptacle, a 4-inch refuel line which splits into 3-inch lines located on each side of the center separation valve to the crossfeed manifold, a refuel line drain pump and valve, two motorized shutoff valves, and associated control indicating and warning circuitry. A hydraulically operated slipway door with manual override open permits access of the tanker boom nozzle to the receptacle. The aerial refuel manifold is connected to the receptacle.

Aerial Refueling Door

An aerial refueling door is located in the forward fuselage upper airframe structure, centered above the flight engineer and navigator stations.

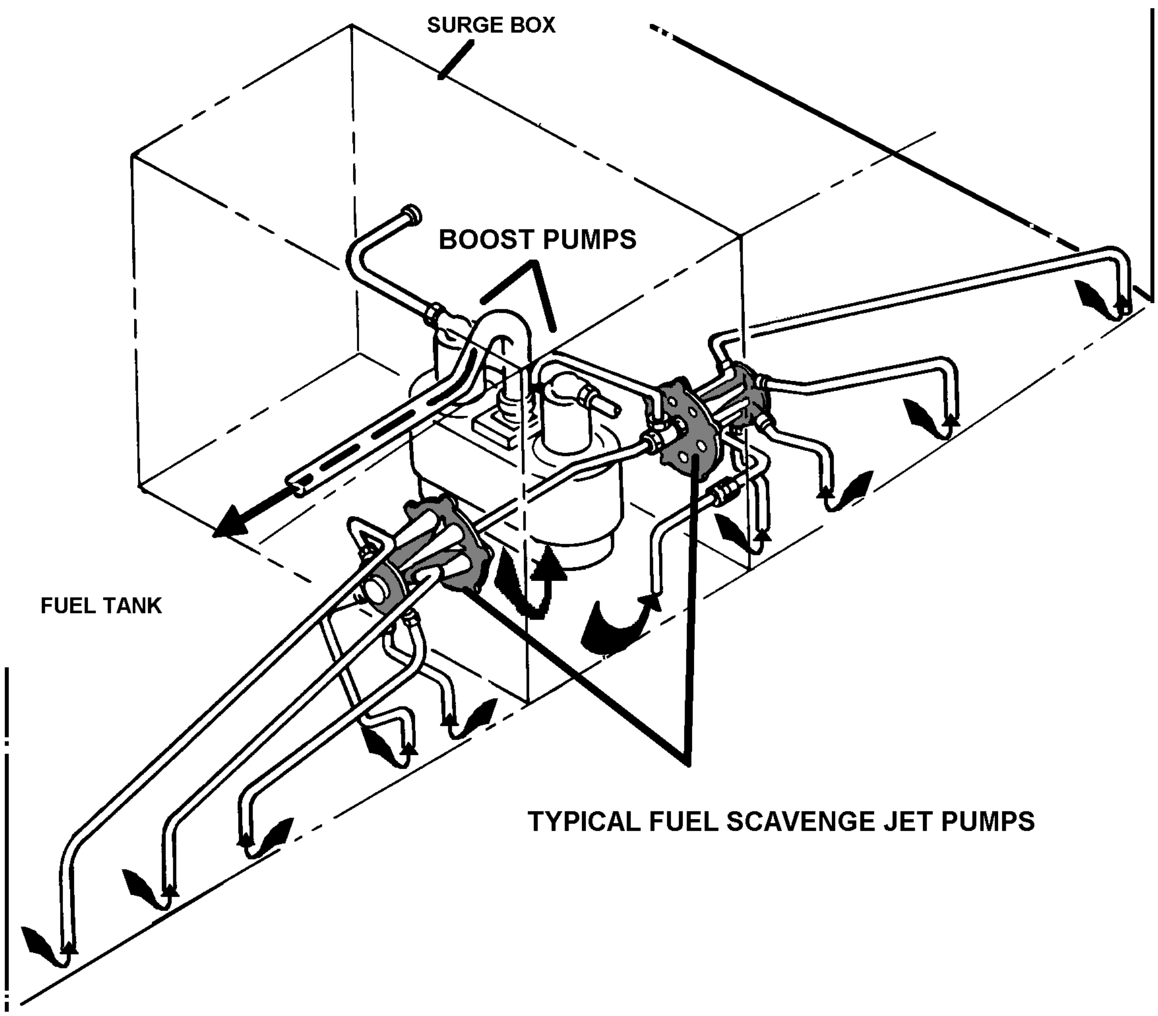
Jettison System

A fuel jettison mast and shutoff valve are mounted in the trailing edge of the wing, outboard of the flaps on each side of the airplane. The mast is an extension of the main fuel manifold. Jettisoning is accomplished by opening the jettison and side separation valves and operating all fuel boost pumps in the auxiliary and extended range fuel tanks. The JETTISON switches are guarded switches and are located at the two lower corners of the flight engineer's fuel management panel. The boost pumps are capable of providing the required jettison rate. Although the normal jettison procedure for reaching gross landing weight does not require jettison of the main tank fuel, it is possible to jettison from the main fuel tanks for ditching operations. Location of the jettison mast assures fuel discharge will clear all parts of the airplane and no fuel fumes will enter any portion of the airplane to create a hazard.

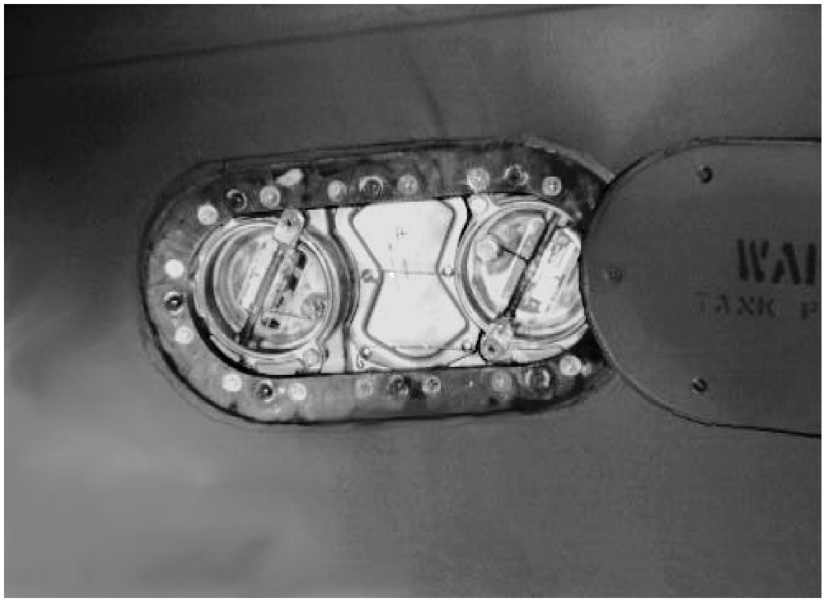


1. NO. 4 MAIN TANK - 3,666 GALLON CAPACITY (OWBR 368 TO 762)
2. NO. 4 AUXILIARY TANK - 4,765 GALLON CAPACITY (OWBR STA 79 TO 368)
3. DRY BAY (IWBR STA 492 TO OWBR STA 79)
4. NO. 4 EXTENDED RANGE TANK - 4,191 GALLON CAPACITY (IWBR STA 248 TO 523)
5. NO. 3 EXTENDED RANGE TANK - 4,196 GALLON CAPACITY (IWBR STA 79 TO 248)
6. NO. 2 EXTENDED RANGE TANK - 4,196 GALLON CAPACITY (IWBR STA 79 TO 248)
7. NO. 1 EXTENDED RANGE TANK - 4,191 GALLON CAPACITY (IWBR STA 248 TO 523)
8. DRY BAY (IWBR STA 492 TO OWBR STA 79)
9. NO. 1 AUXILIARY TANK - 4,765 GALLON CAPACITY (OWBR STA 79 TO 368)
10. NO. 1 MAIN TANK - 3,666 GALLON CAPACITY (OWBR 368 TO 762)
11. SURGE BOX
12. NO. 2 AUXILIARY TANK - 4,861 GALLON CAPACITY (IWBR STA 186 TO 492)
13. NO. 2 MAIN TANK - 3,898 GALLON CAPACITY (IWBR STA 0 TO 186)
14. NO. 3 MAIN TANK - 3,898 GALLON CAPACITY (IWBR STA 0 TO 186)
15. NO. 3 AUXILIARY TANK -4,861 GALLON CAPACITY (IWBR STA 186 TO 492)

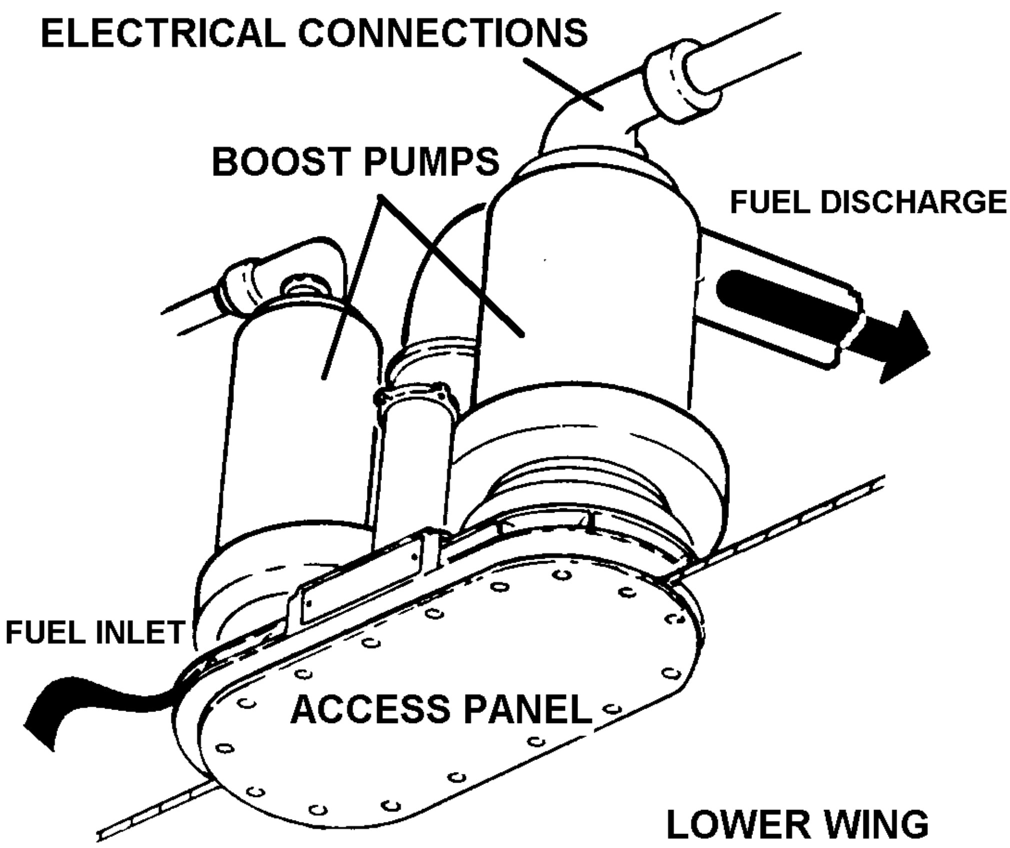
Fuel tank locations



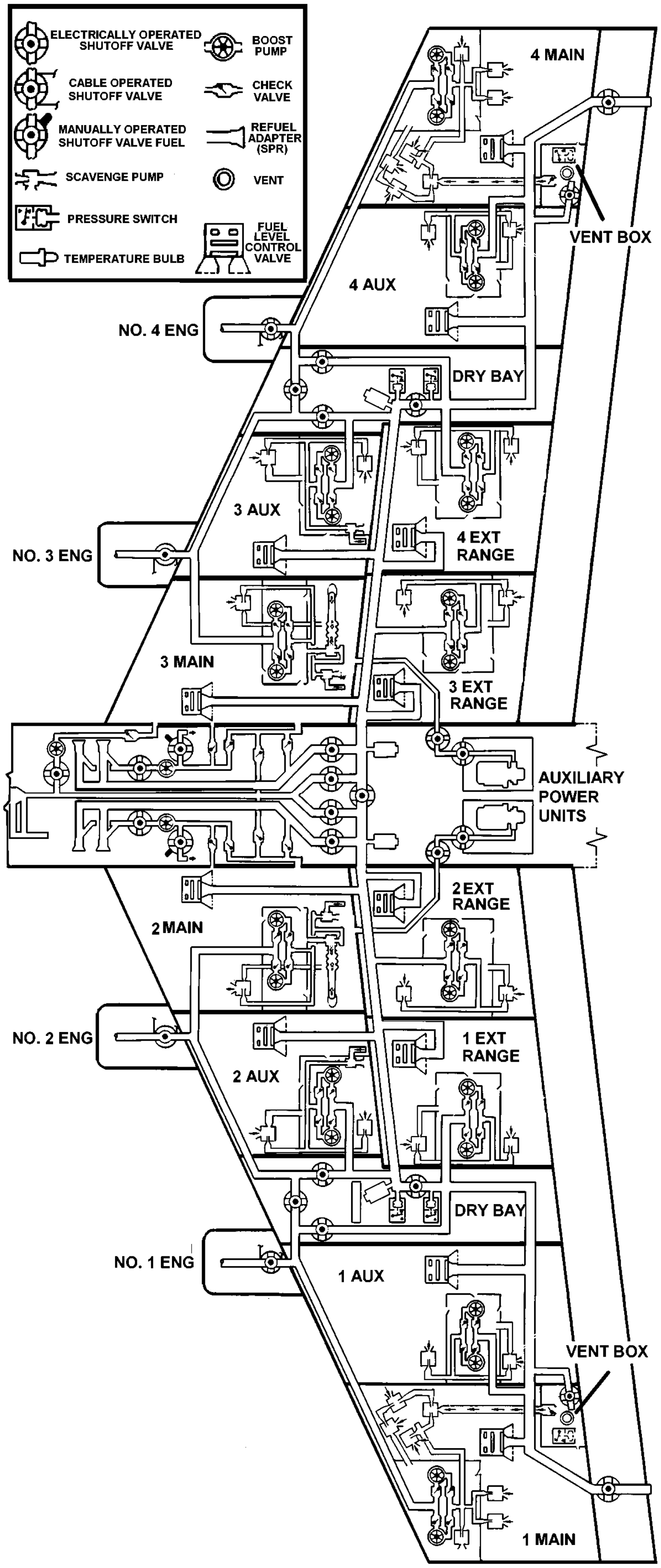
Fuel scavenge jet pumps



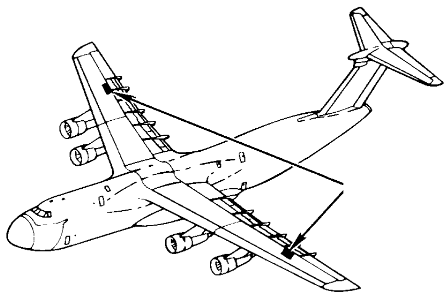
Boost pumps (lower wing)



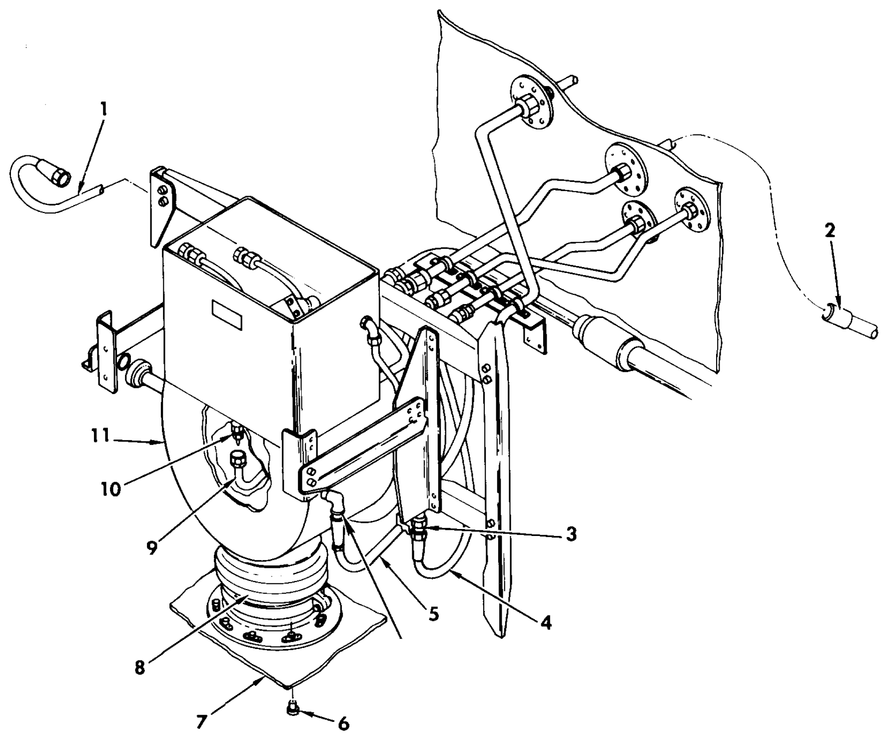
Boost pump unit



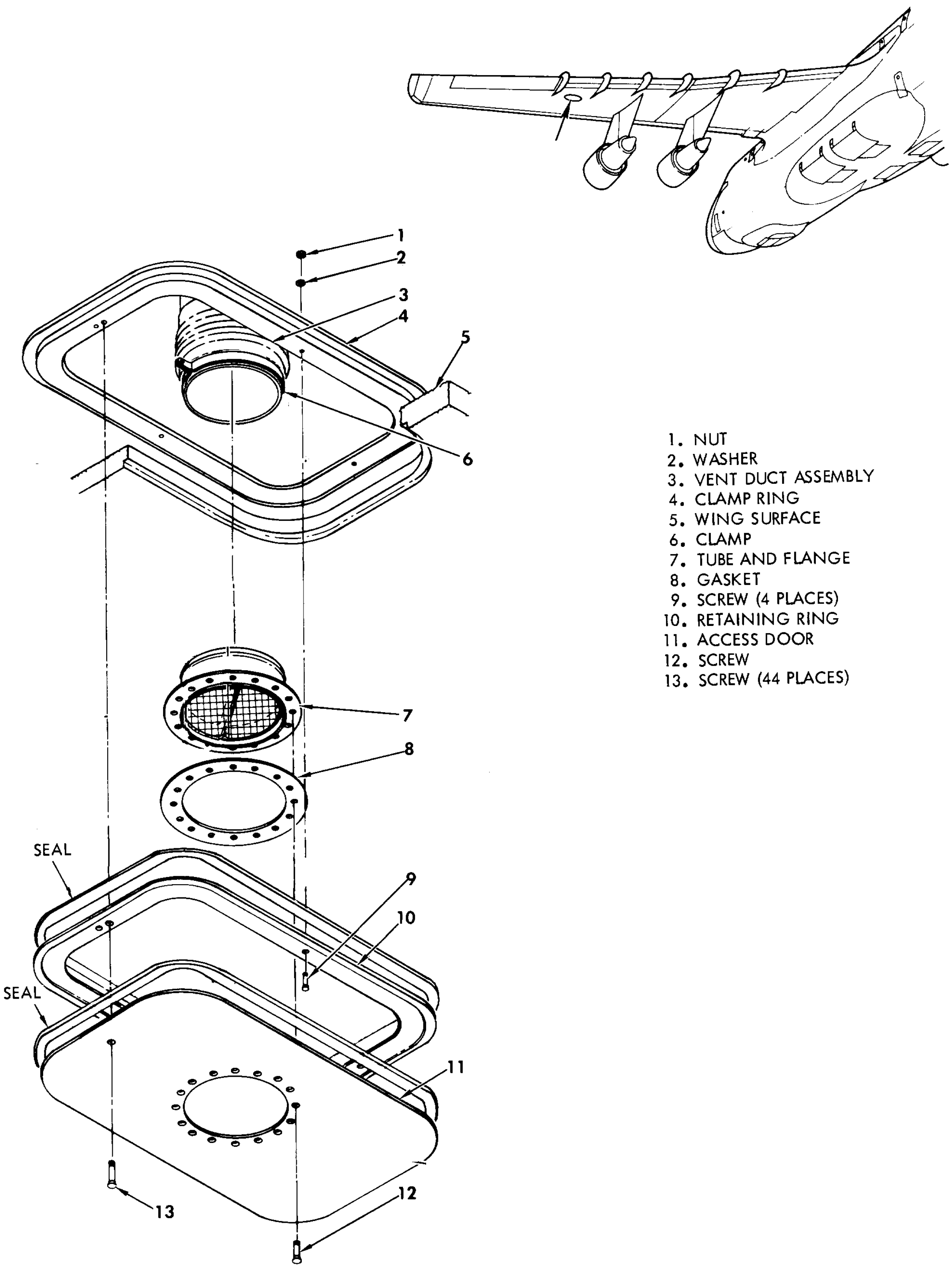
Fuel system components



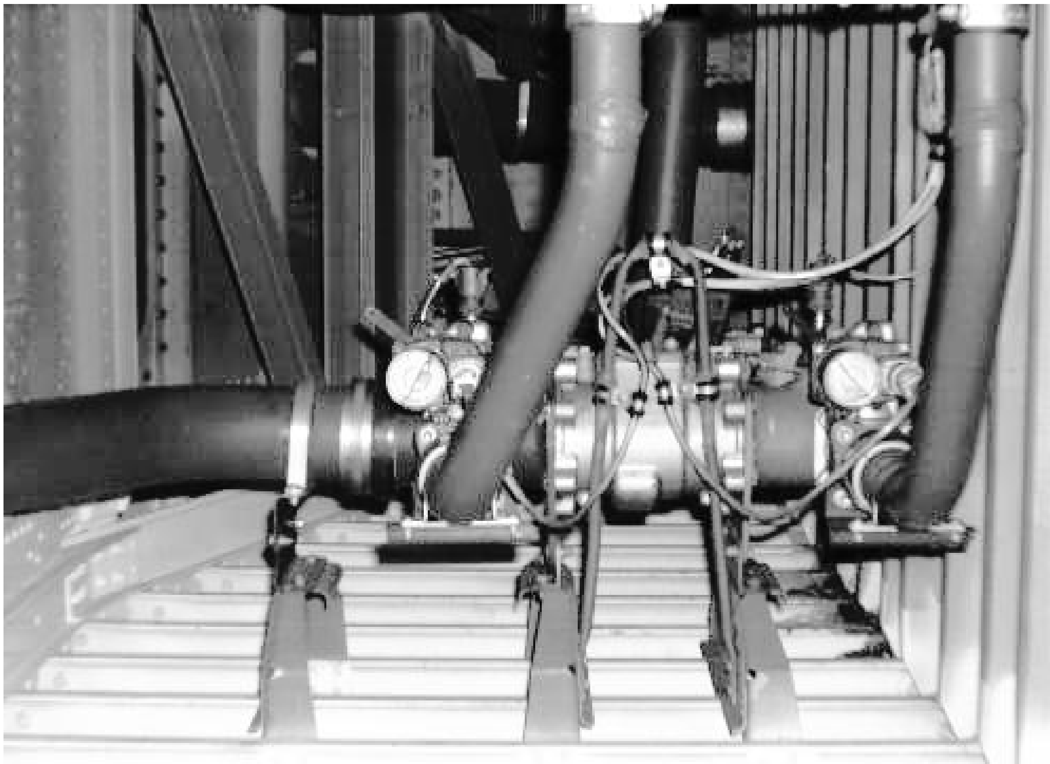
1. ELECTRICAL CONDUIT HOSE
2. ELECTRICAL SPLICE
3. HYDRAULIC QUICK DISCONNECT
4. HYDRAULIC RETURN HOSE
5. PRESSURE SENSE HOSE
6. SCREW
7. VENT BOX ACCESS PANEL
8. VENT DUCT ASSEMBLY
9. HYDRAULIC PRESSURE HOSE
10. HYDRAULIC QUICK DISCONNECT
11. VENT VALVE



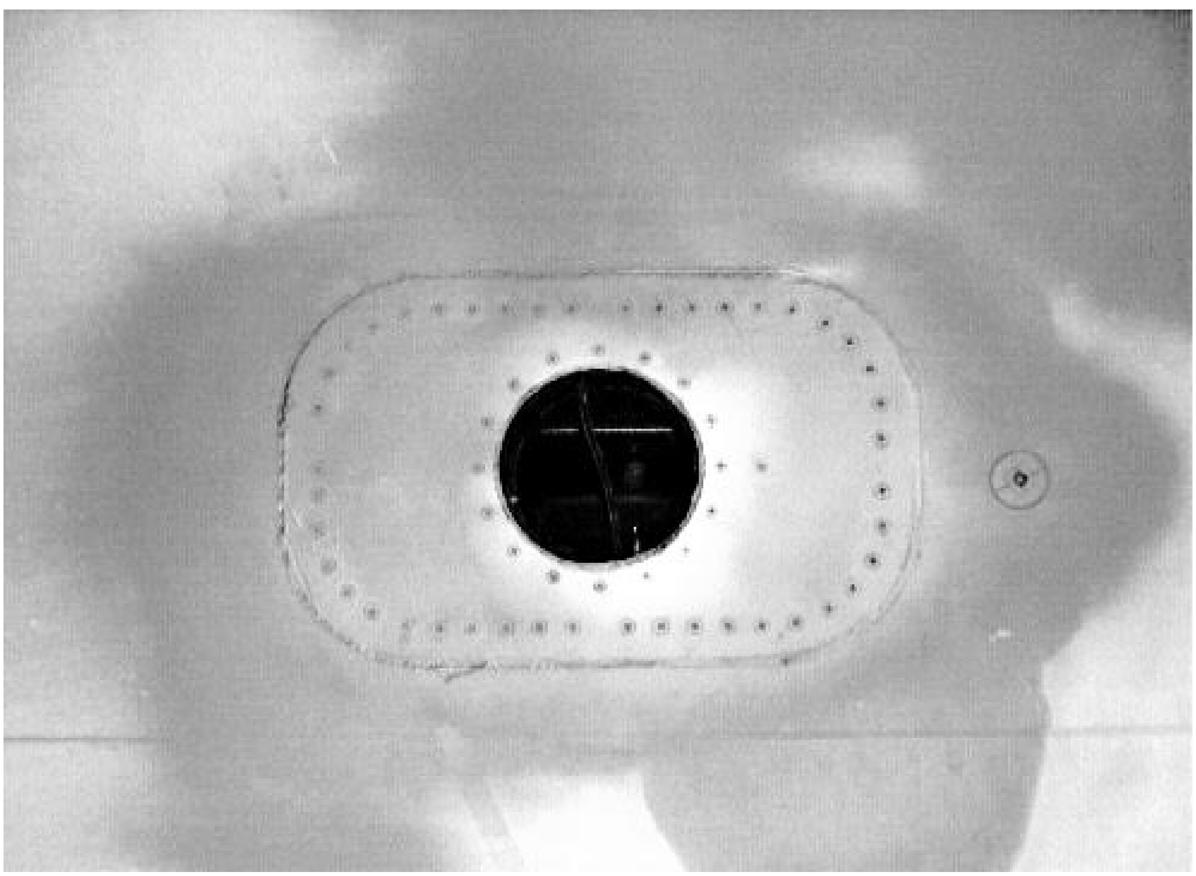
Vent box assembly



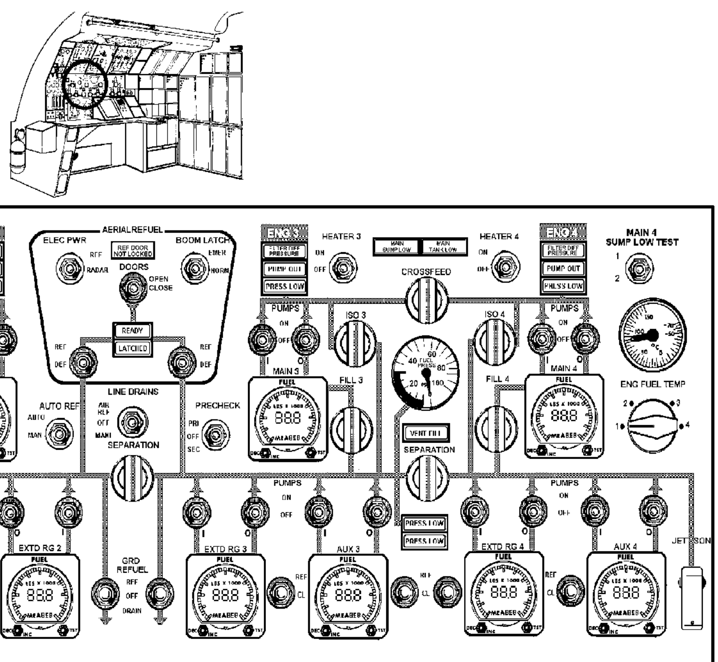
Vent duct assembly



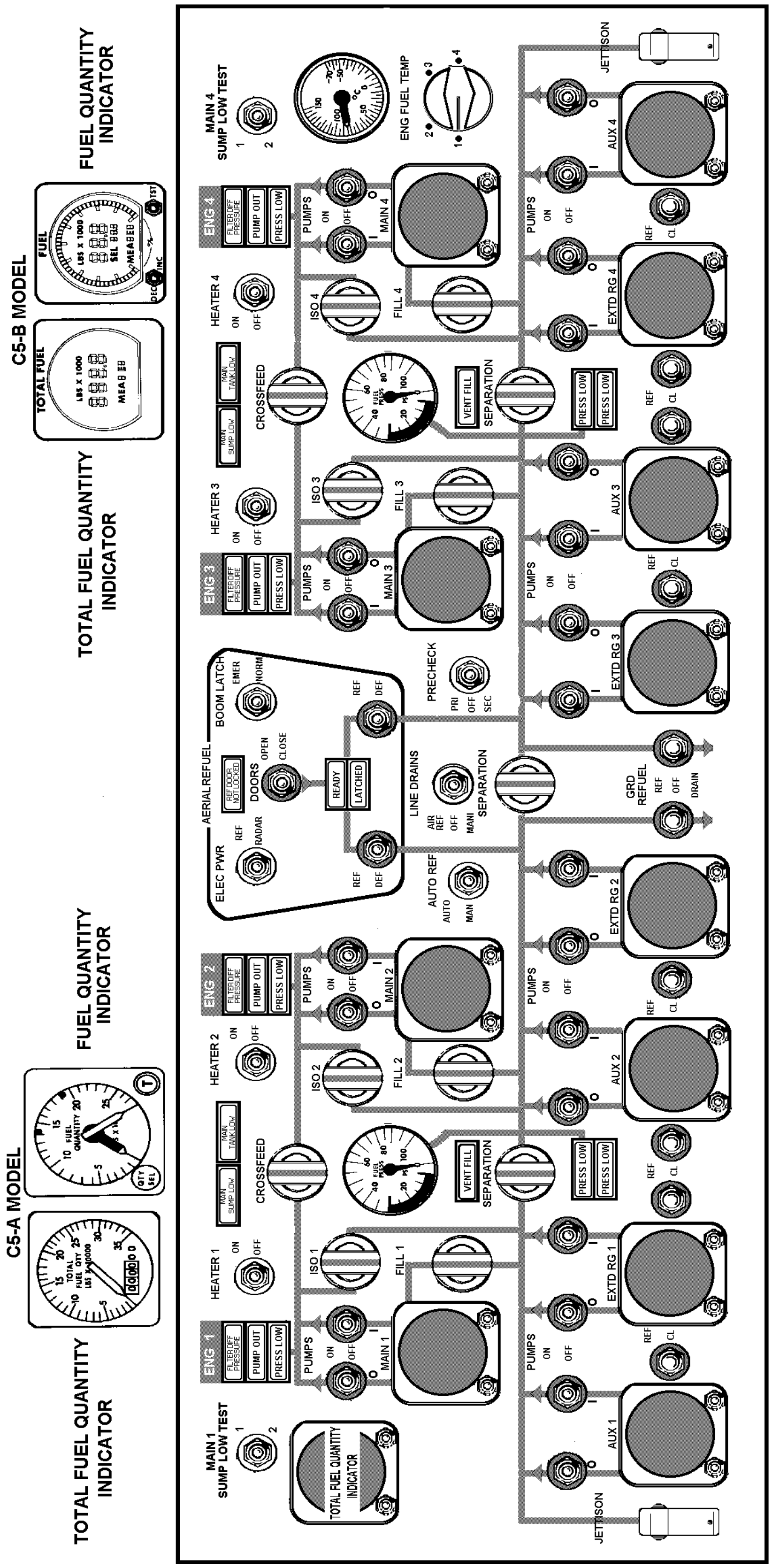
View of dry bay isolation and crossfeed valves



Wing vent (lower wing)

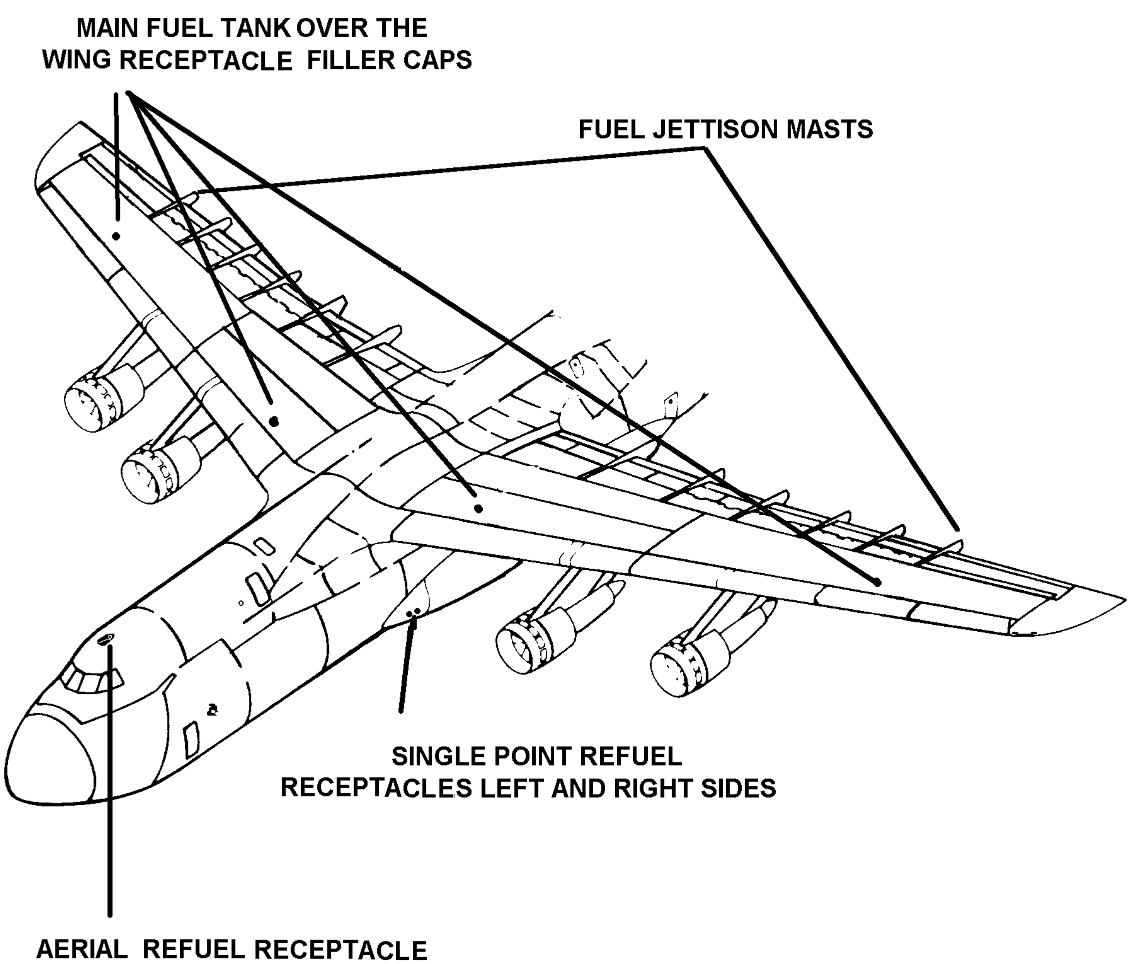


Flight engineer’s fuel management panel

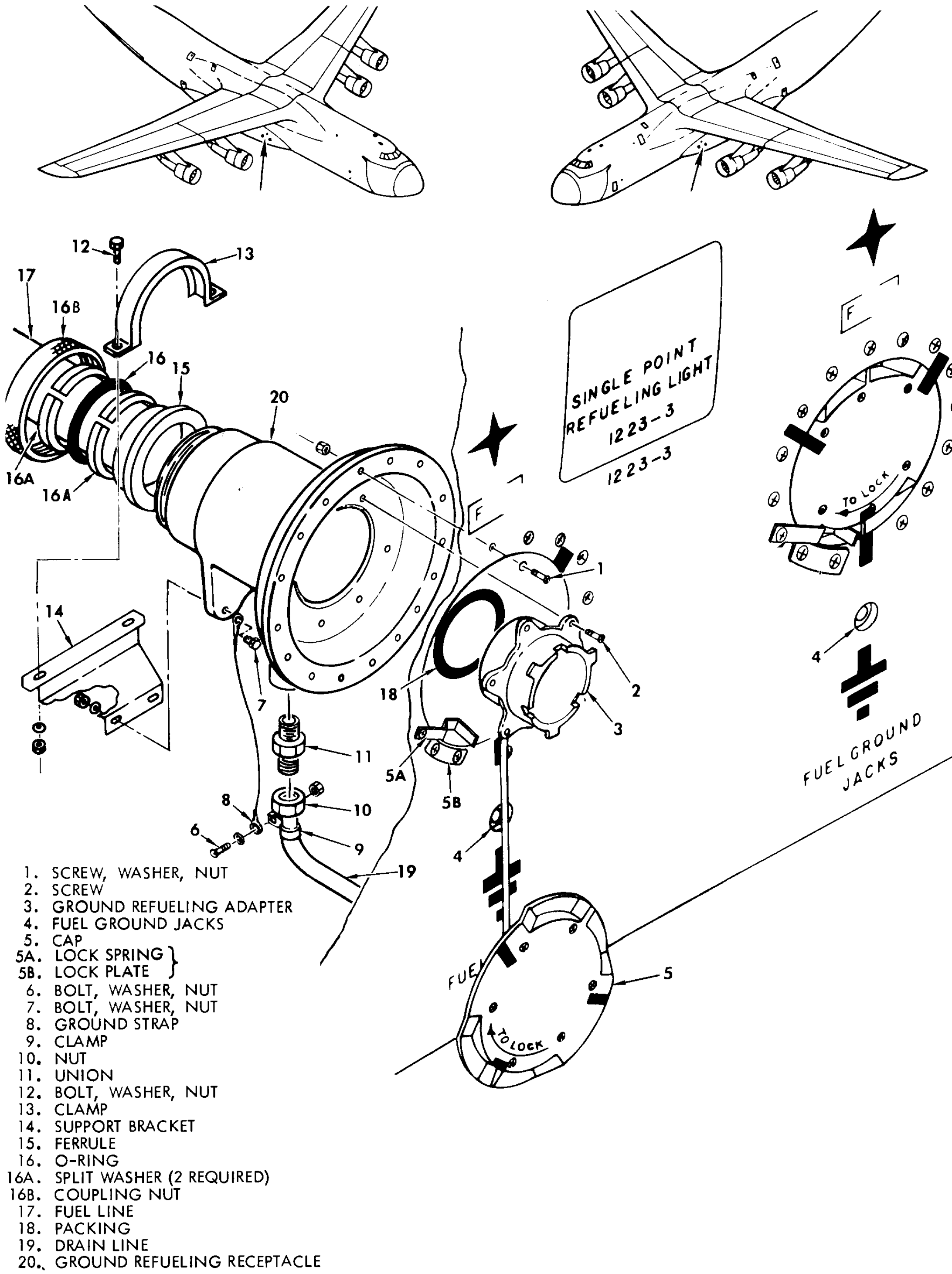


Fuel quantity indicators

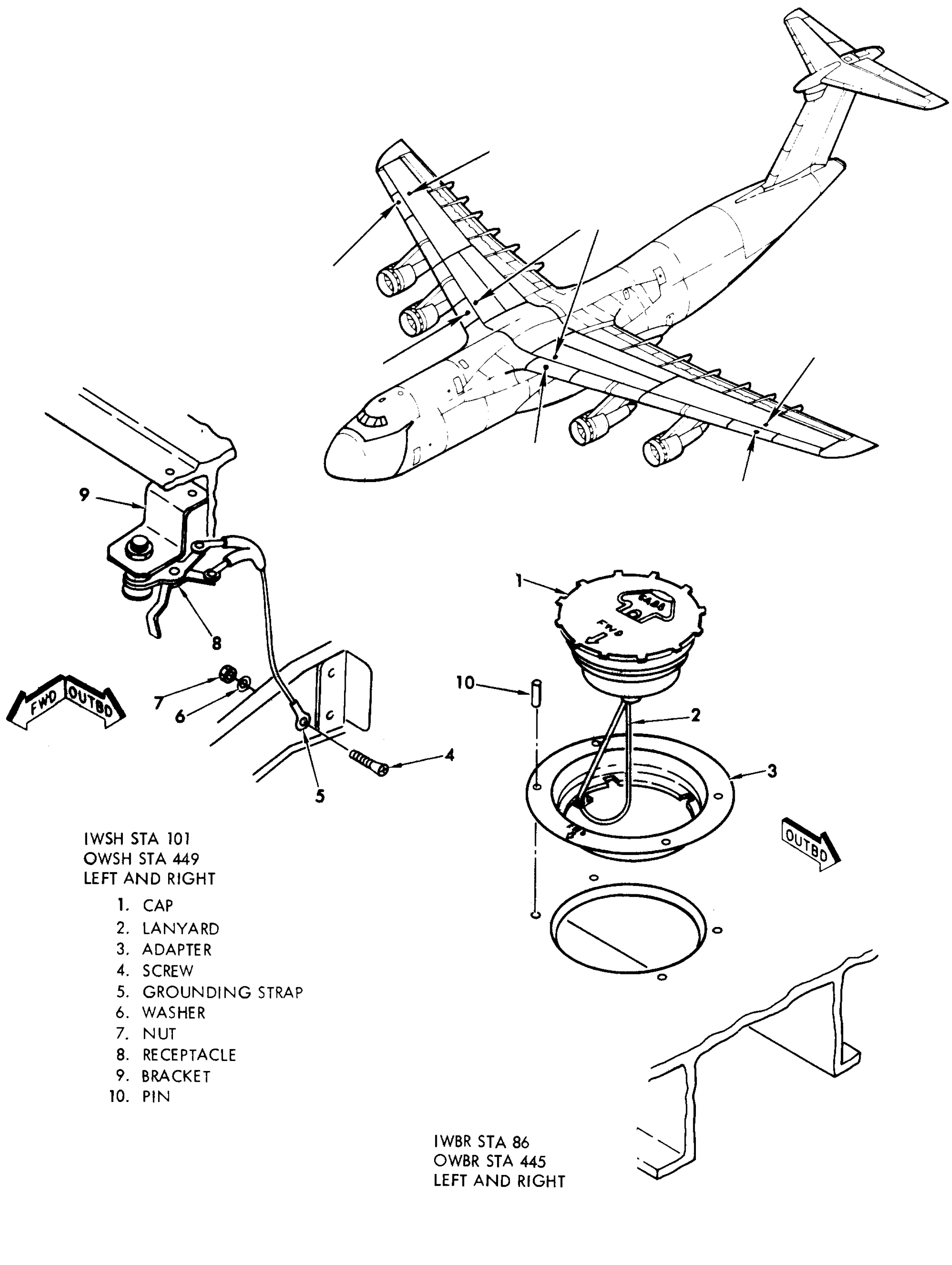
Jettison mast



Fuel service points and jettison mast



Single point refueling receptacles



Main tank filler caps

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INSTRUMENTS

The navigation instrumentation computes, processes, and displays navigation and attitude information to enable the pilot/copilot/navigator to maintain desired course or flight path. The pilot and copilot panels consist of identical navigation instrumentation units which are electrically isolated. The navigation instrumentation displays the magnetic heading, radio bearing, distance to station, course deviation, selected course and heading to or from a station, horizontal and vertical steering attitude (roll and pitch), vertical displacement (altitude), rate of turn, speed command, glideslope, localizer, slip, crab angle, and altitude.

Navigation Instruments

Navigation instrumentation is composed of the following components:

a. Flight Station - Pilot's and Copilot's panels

- Peripheral Command Indicator (PCI) - units (AF66-8303 through AF70-467 not modified)
- Bearing Distance Heading Indicator (BDHI) Selector Panel - 2 units
- Bearing Distance Heading Indicator (BDHI) - 2 units
- Attitude Director Indicator (ADI) - 2 units
- Navigation Selector Panel - 2 units
- Auxiliary Navigation Selector Panel - 2 units
- Horizontal Situation Indicator (HSI) (AN/ AQU-4/A) - 2 units
- Compass, Magnetic Standby (AN/AQA- 3/A) - 1 unit
- Remote Horizontal Situation (HSI) Indicator Panel - 2 units

b. Avionics Compartment

- Flight Director Computer (FDC)- units
- Rate-of-turn Gyroscope - 2 units

c. Flight Station - Navigator's Panel (Work Area 1)

- Bearing Distance Heading Indicator (BDHI) - 2 units
- BDHI Selector Panel - 1 unit

Flight Director Computer (FDC)

The FDC receives data from various equipment throughout the airplane. Some of this data is switched through the FDC for instrument display and some is used for FDC computations of command signals that are displayed by the ADI. Both FDCs are located in the avionics rack.

Attitude Director Indicator (ADI)

The attitude director indicator displays airplane pitch and roll, flight director computer command, vertical displacement, speed commands, crab angle, rate-of-turn, and sideslip.

Peripheral Command Indicator (PCI) (AF66-8303 Through AF70-467 Not Modified

The peripheral command indicator permits the pilot to view flight director commands using his peripheral vision. The PCI repeats the pitch and roll commands of the ADI. When the enable/validity signal from the FDC is not available, or when the PCI is switched off, the PCI is inactive and the shutter covers the display. The enable/validity signal is only available when both pitch and roll channels of the FDC are operating and valid.

Navigation Selector Panel (NSP)

The navigation selector panel selects the flight director computer mode and provides for FDC self test initiation. A FAULT annunciator associated with the FDC self test operation will remain illuminated following the test cycle, if a fault is detected. All pushbuttons except HDG and FLT DIR TEST are mechanically interlocked. All pushbuttons except FLT DIR TEST contain replaceable internal lamps. Push-button and annunciator lighting is controlled by a dimming knob on the NSP.

Auxiliary Navigation Selector Panel

The auxiliary navigation selector panel (ANSP) contains mode switches for selecting FDS Altitude Hold and VOR Cruise modes. The switches are momentary push tape with illuminated legend. The mode enable legend (ALT HOLD or VOR CRS) portion of the switch must be illuminated before the mode can be engaged. Engagement of the mode is completed with the release of the switch. Engagement of a mode is indicated by illumination of the ON legend of the switch.

Horizontal Situation Indicator (HSI)

The horizontal situation indicator displays heading, course deviation, desired course and heading, bearing, to-from, and range. A failure flag indicates that the course deviation display is not valid and an OFF flag indicates loss of power to the HSI.

Remote Horizontal Situation Indicator Panel

The remote horizontal situation indicator (RHSI) provides the pilot/copilot an alternate means of setting up the heading marker and course on the HSIs. When the HSI REMOTE/NORMAL switch is in the REMOTE position, remote control is provided by RHSI HDG SET and CSE SET knobs. When the I-NAV mode is selected, the HSI course is controlled directly from the selected INS. The RHSI CSE SET and the HSI COURSE SET control knobs are deactivated.

Bearing Distance Heading Indicator (BDHI)

The bearing distance heading indicators display airplane/magnetic heading, magnetic bearing to VOR and/or TACAN navigation aids, relative bearing to ADF navigation aids, and distance. The BDHI OFF warning flag indicates a heading malfunction has occurred.

Bearing Distance Heading Indicator Selector Panels

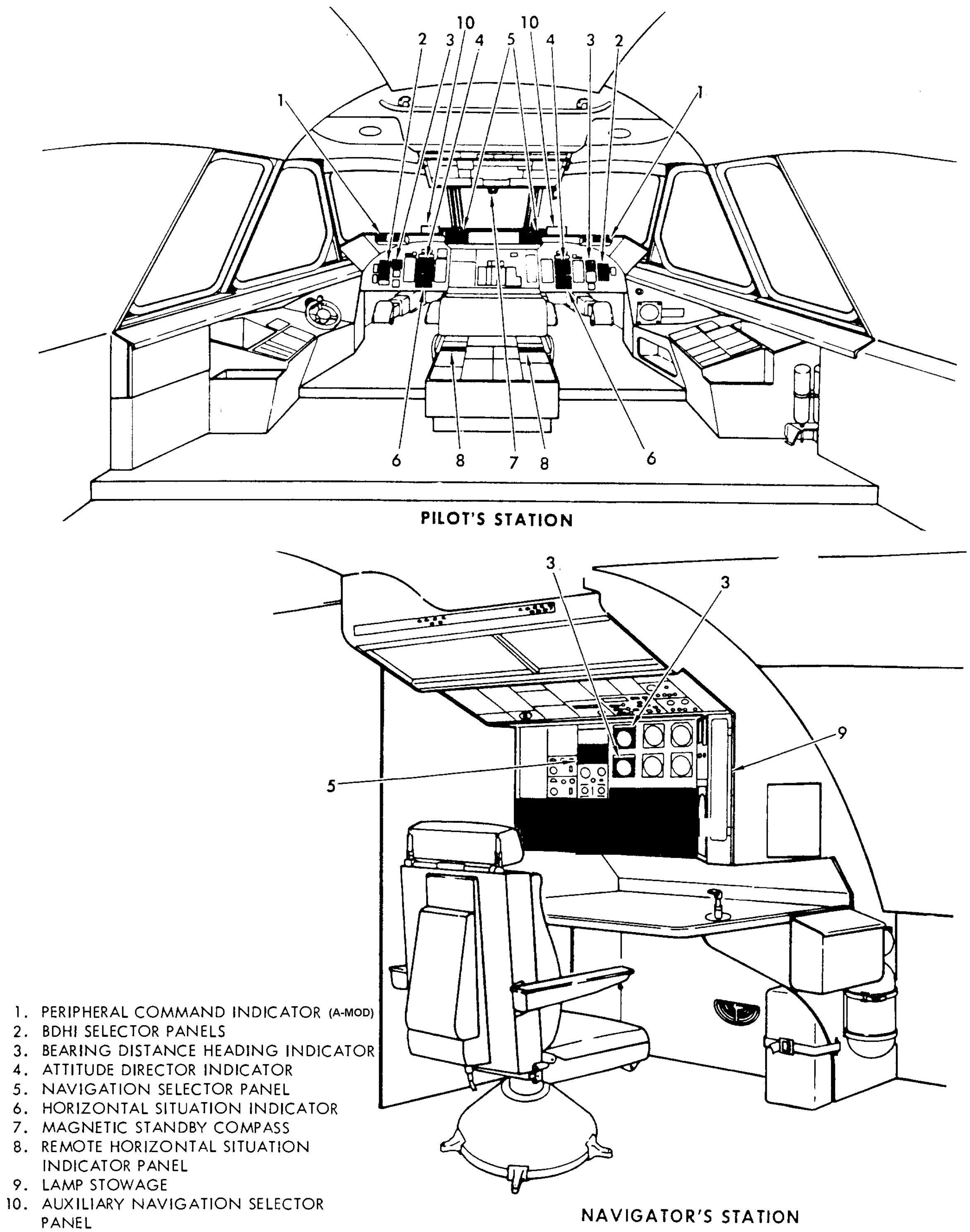
The bearing distance heading indicator selector panels permit bearing display to be selected from automatic direction finder (ADF), VHF omni-range (VOR), and TACAN.

Rate-of-turn Gyro

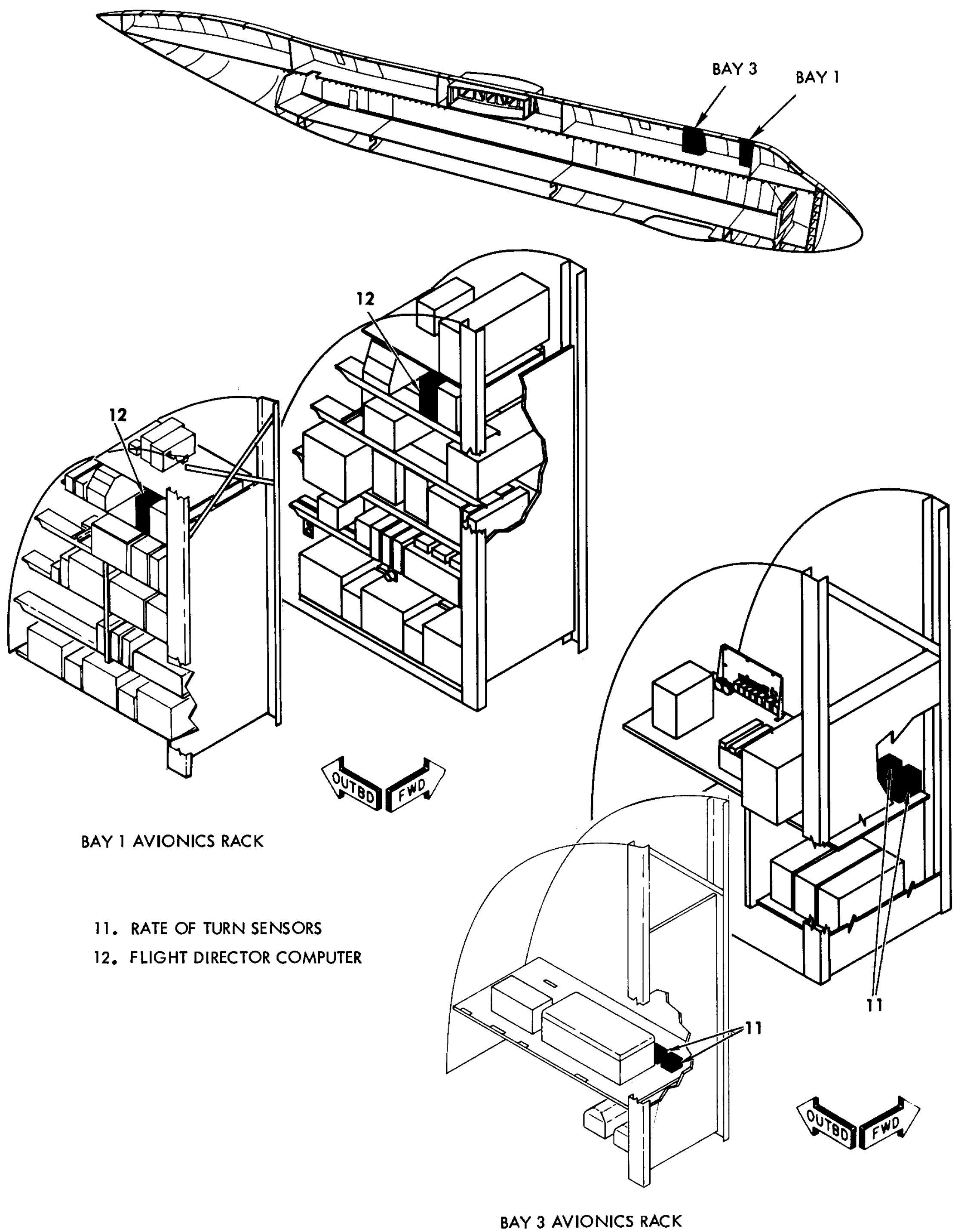
The rate-of-turn gyro (RTG) provides rate-of-turn signals to the turn indicator in the attitude director indicator (ADI). The rate-of-turn gyros are located in the avionics compartment.

Magnetic Standby Compass

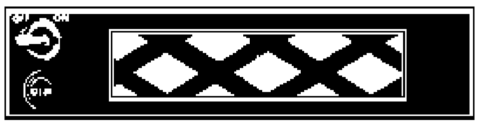
The magnetic standby compass, located forward of the pilot's overhead panels on the airplane centerline, continuously indicates heading in reference to the earth's magnetic field.



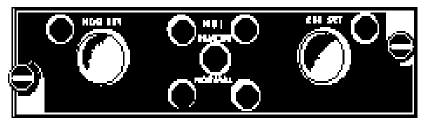
Navigation instrument locations



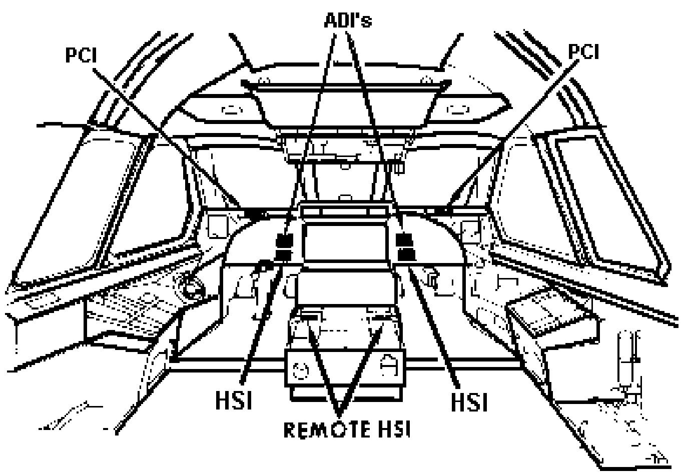
Navigation instrument components

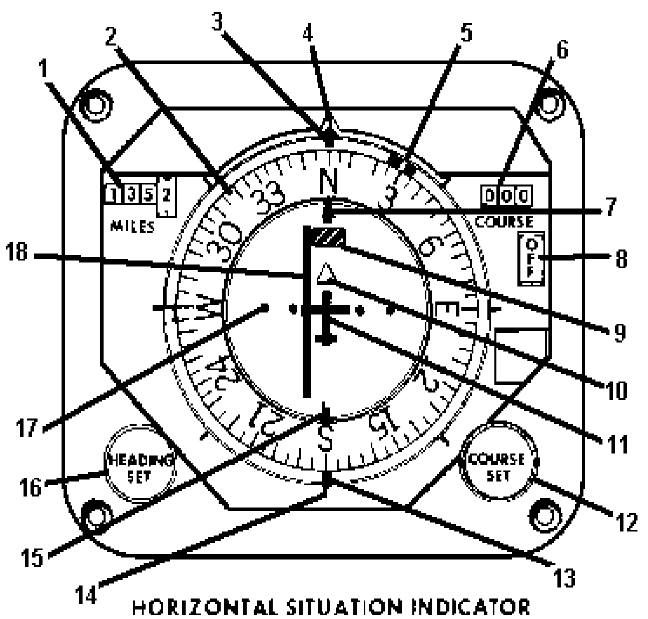


PERIPHERAL COMMAND INDICATOR
(PCI)
A-MODEL NOT MODIFIED



REMOTE HSI HEADING AND COURSE SELECTOR PANEL

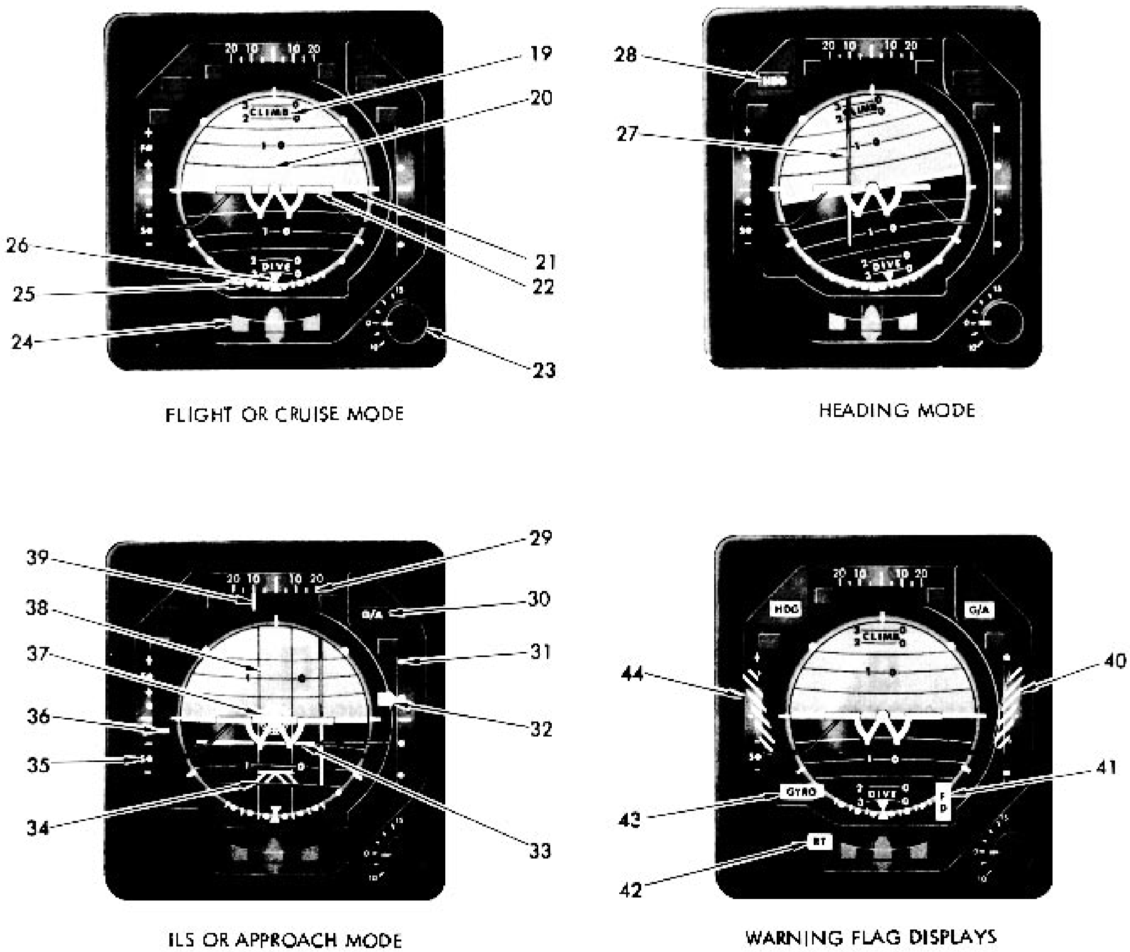




HORIZONTAL SITUATION INDICATOR
(HSI)

1. RANGE INDICATOR AND WARNING FLAG
2. COMPASS CARD
3. BEARING POINTER (HEAD)
4. UPPER LUBBER LINE (HEAD)
5. HEADING MARKER
6. COURSE SELECTOR WINDOW
7. COURSE ARROW (HEAD)
8. POWER OFF WARNING FLAG
9. DEVIATION WARNING FLAG
10. TO-FROM INDICATOR
11. AIRCRAFT SYMBOL
12. COURSE SET KNOB
13. BEARING POINTER (TAIL)
14. LOWER LUBBER LINE (TAIL)
15. COURSE ARROW (TAIL)
16. HEADING SET KNOB
17. COURSE DEVIATION SCALE
18. COURSE DEVIATION INDICATOR

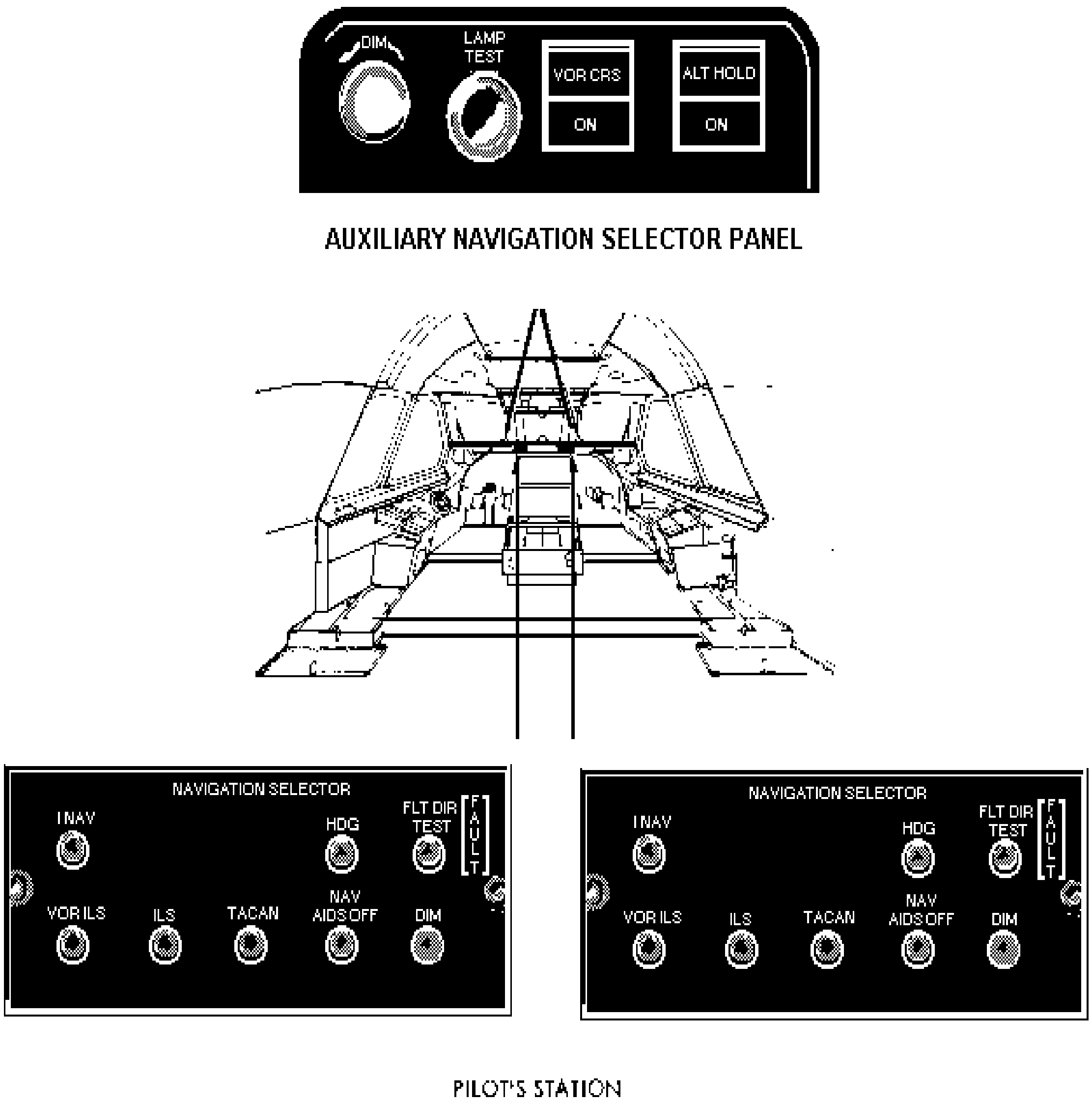
Horizontal situation indicator (HSI) and control panels



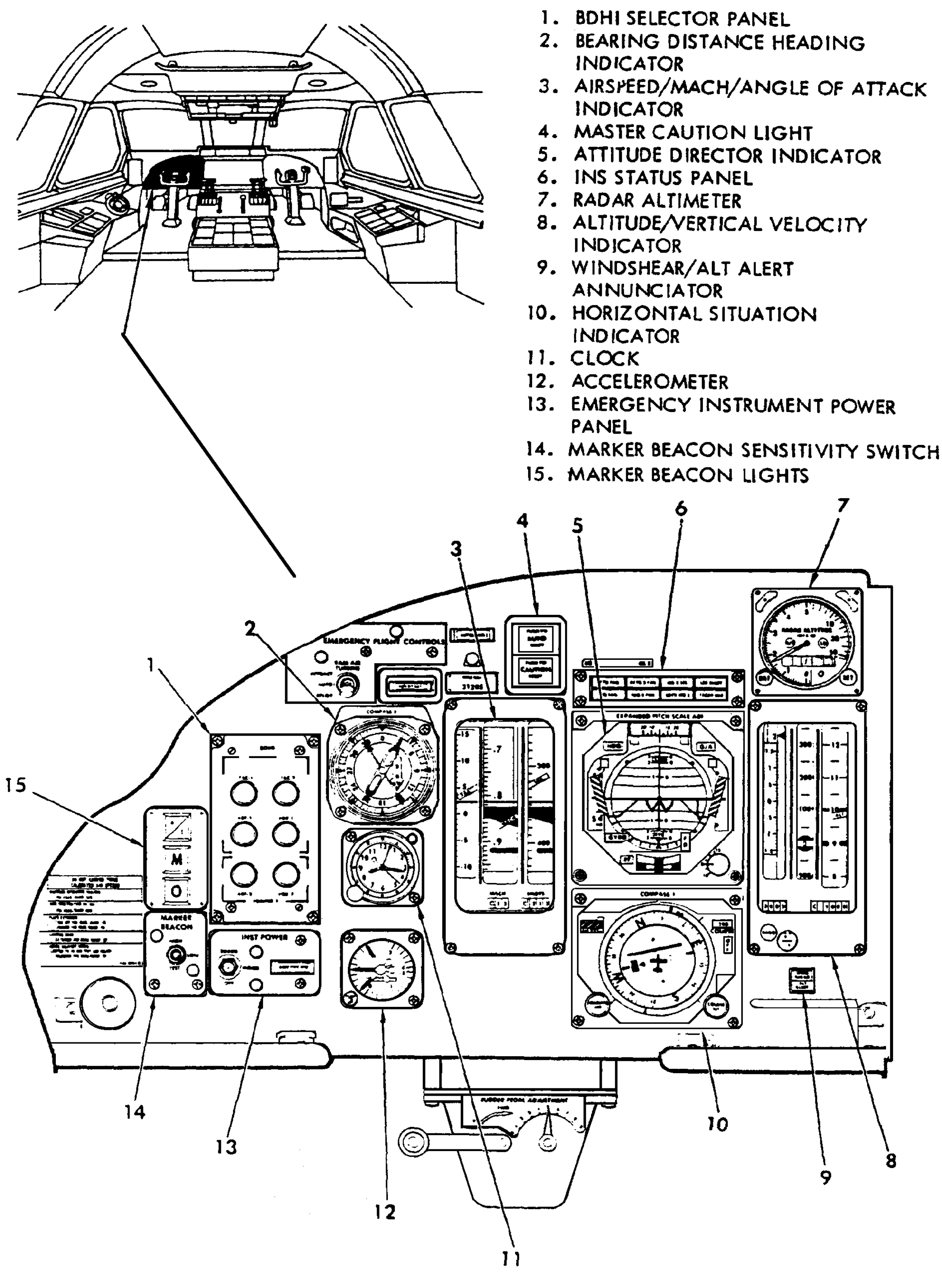
ATTITUDE DIRECTOR INDICATOR

19. ATTITUDE SPHERE
20. PITCH REFERENCE SCALE
21. HORIZON LINE
22. MINIATURE AIRPLANE
23. PITCH TRIM KNOB
24. TURN AND SLIP INDICATOR
25. BANK SCALE
26. BANK POINTER
27. BANK STEERING BAR
28. HEADING MODE LIGHT
29. CRAB ANGLE SCALE
30. GO-AROUND MODE LIGHT
31. VERTICAL DEVIATION SCALE
32. VERTICAL DEVIATION POINTER
33. PITCH STEERING BAR
34. RUNWAY SYMBOL
35. SPEED DEVIATION SCALE
36. SPEED DEVIATION POINTER
37. ILS APPROACH BULLSEYE
38. APPROACH MODE JUMPERS
39. CRAB ANGLE POINTER
40. VERTICAL DEVIATION WARNING FLAG
41. FLIGHT DIRECTOR WARNING FLAG
42. RATE-OF-TURN WARNING FLAG
43. GYRO WARNING FLAG
44. SPEED DEVIATION WARNING FLAG

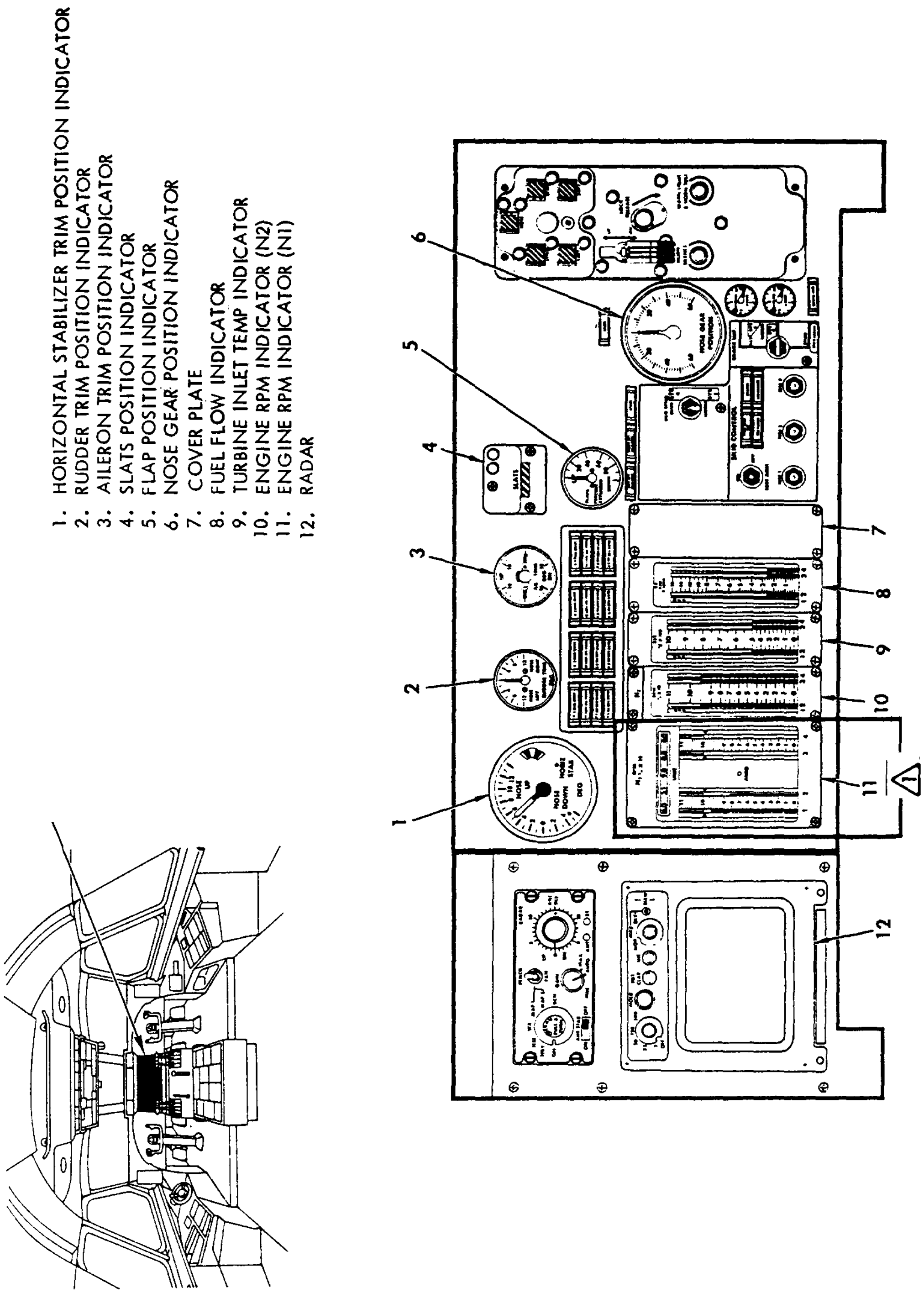
Attitude director indicator (ADI)



Navigation selector panels

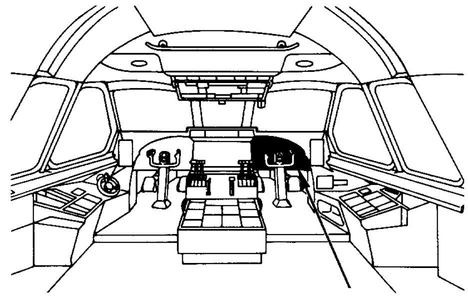


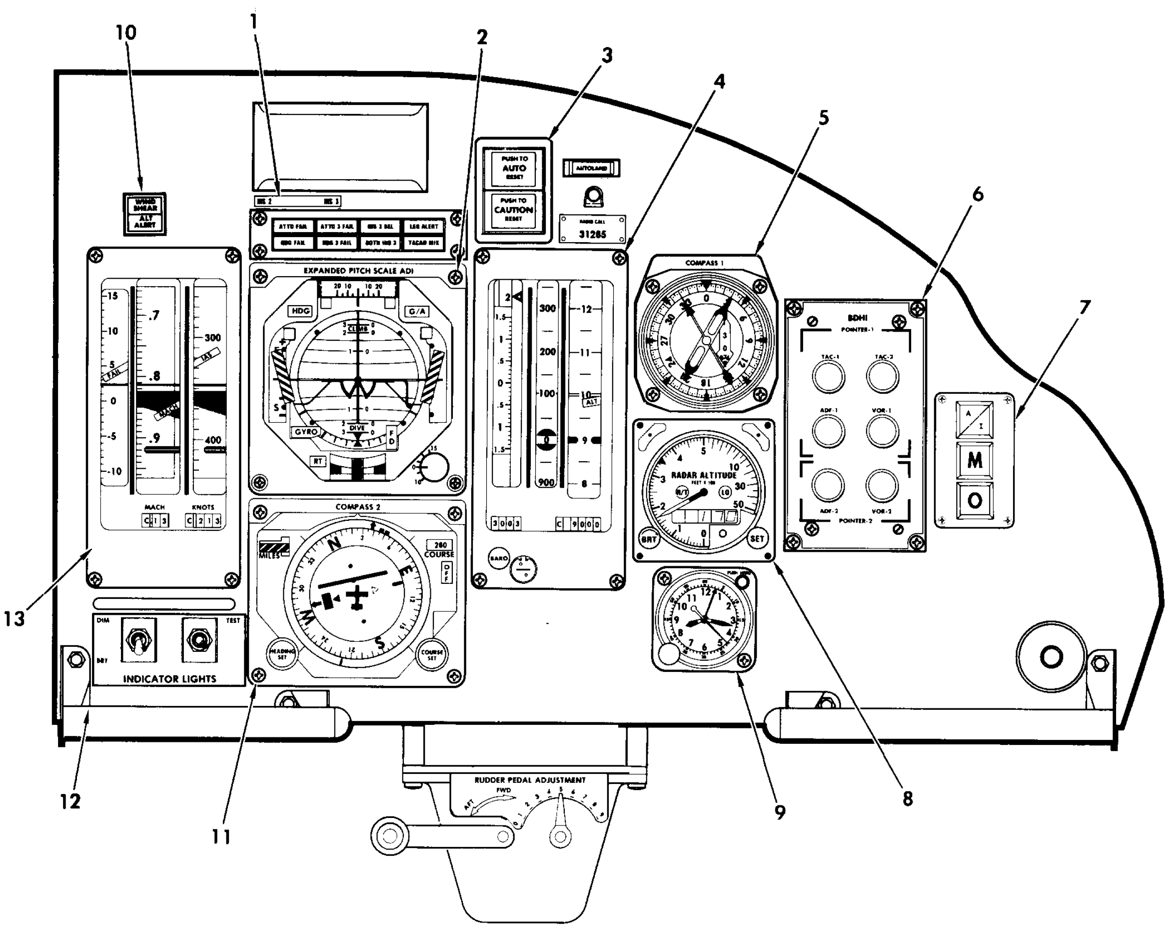
Pilot’s main instrument panel



Pilots' center instrument panel

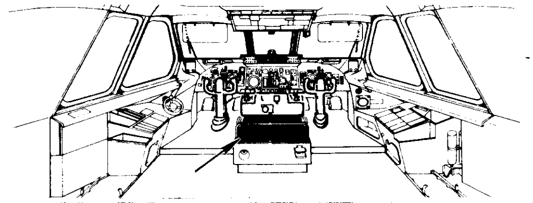
1. INS STATUS PANEL
2. ATTITUDE DIRECTOR INDICATOR
3. MASTER CAUTION LIGHT
4. ALTITUDE/VERTICAL VELOCITY INDICATOR
5. BEARING HEADING DISTANCE INDICATOR
6. BDHI SELECTOR PANEL
7. MARKER BEACON LIGHTS
8. RADAR ALTIMETER
9. CLOCK
10. WINDSHEAR/ALT ALERT INDICATOR
11. HORIZONTAL SITUATION INDICATOR
12. INDICATOR LIGHTS DIMMING AND TEST SWITCH
13. AIRSPEED/MACH/ANGLE OF ATTACK INDICATOR

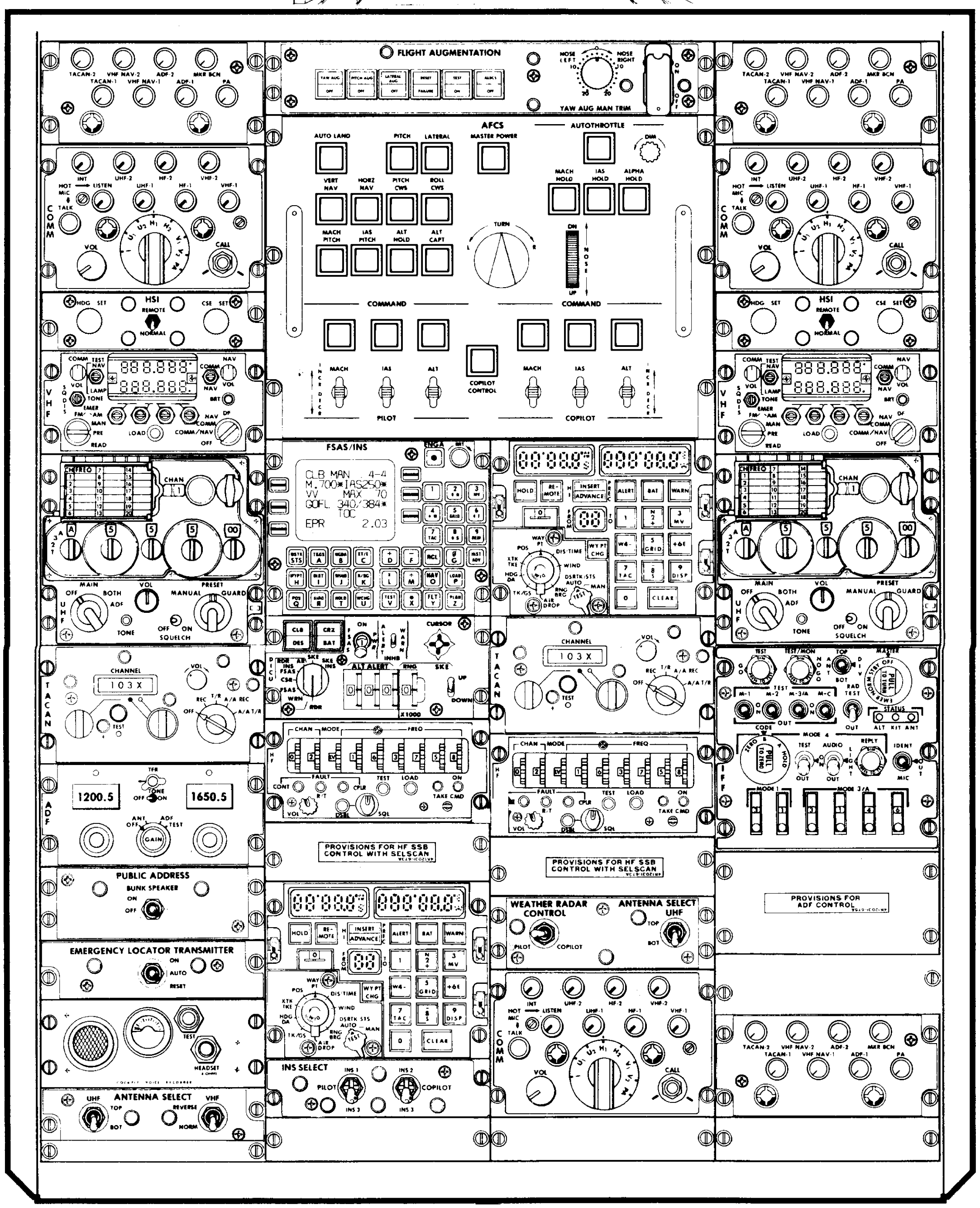




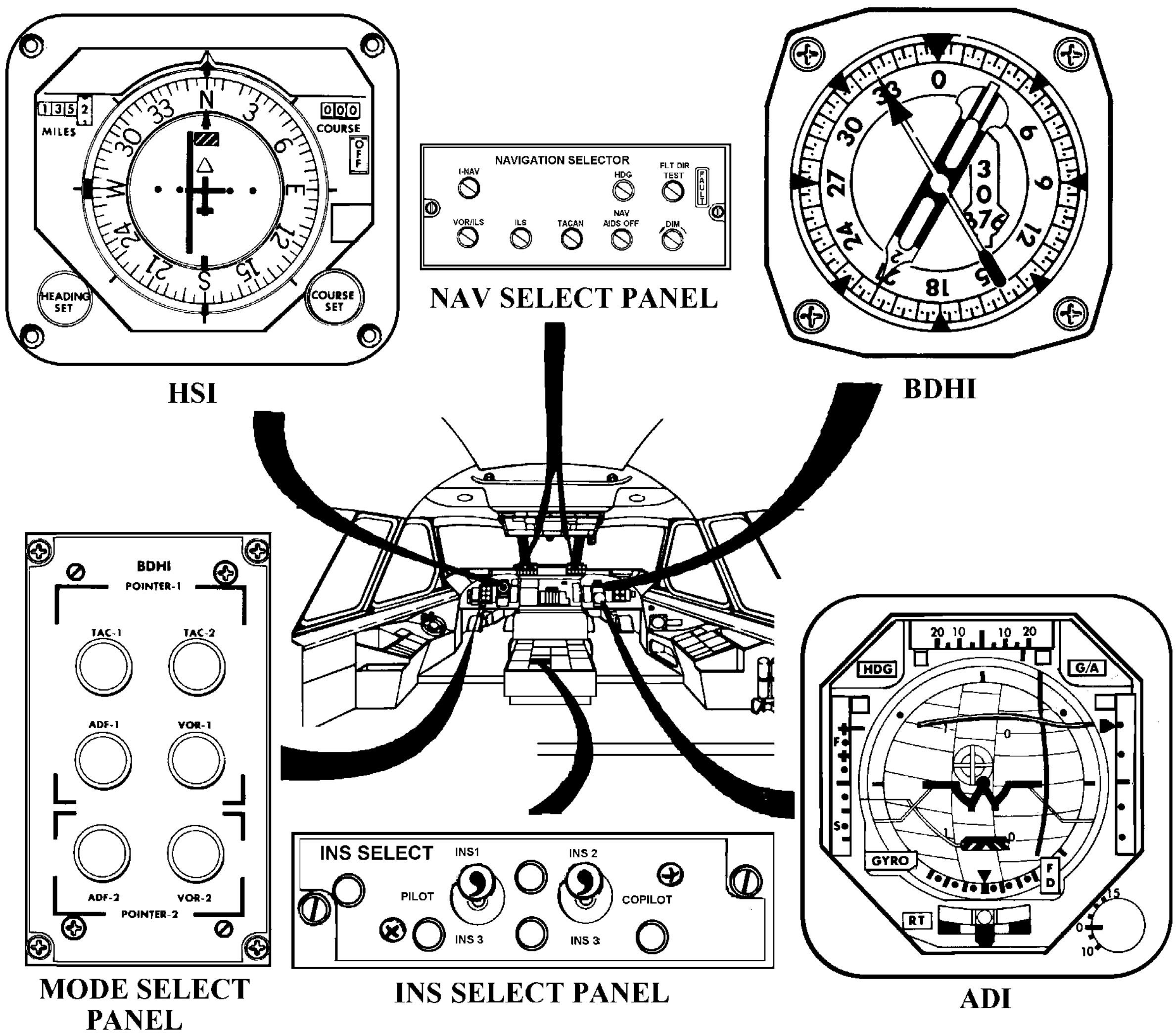
COPILOT'S INSTRUMENT PANEL

Co-pilot’s main instrument panel

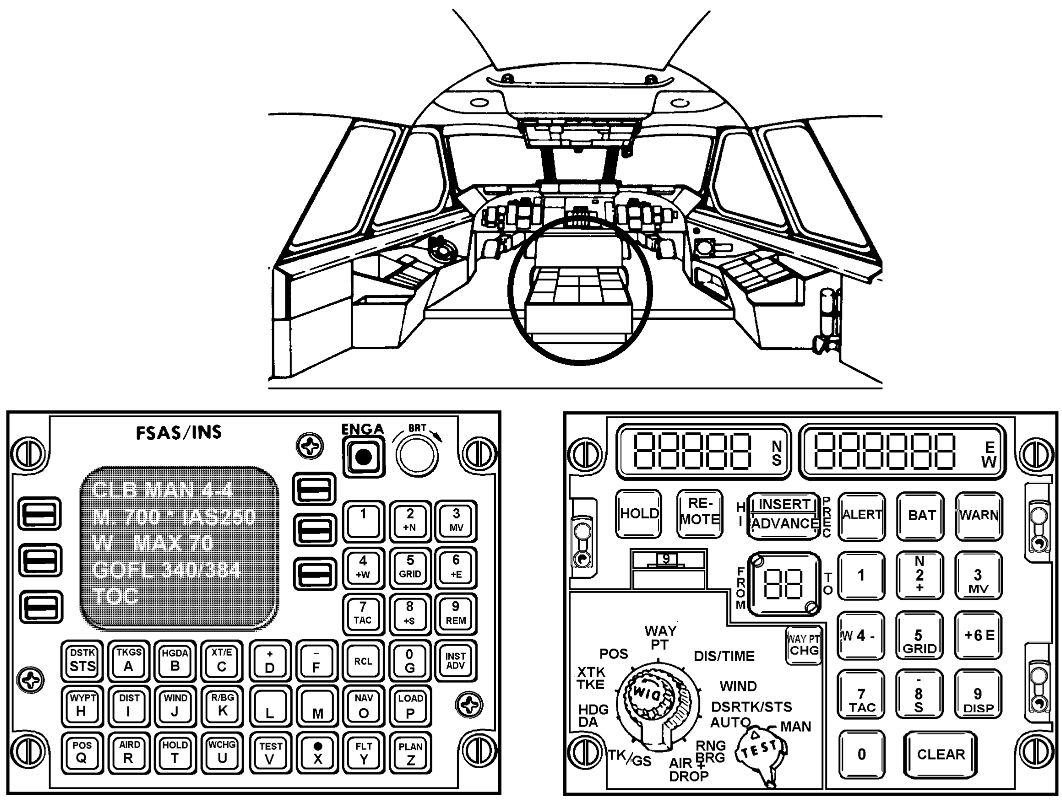




Pilot’s center console panel



Navigation instruments locations



FSAS/INS CDU **INS CDU**

Navigation control units

Air Data System

There are three subsystems in the Air Data System as follows: Central Air Data System (CADS), Pitot Static System, and Total Air Temperature Indicating System. The CADS provides the pilot, copilot, and navigator with the following instrument indications: mach number, altitude, airspeed, and vertical speed. The CADS also provides signals to various other subsystems. The pitot static system provides the variable feel unit, cabin differential pressure gauge, cabin pressure control box, navigator's altimeter, indicated airspeed indicators, central air data computer (CADC) No.1, and CADC No.2 with static and pitot pressure. The total air temperature indicating system provides copilot, flight engineer, and CADS with ram air temperature signals.

The CADCs interface with other systems as follows:

CADC No. 1

- Altitude Verticle Scale Flight Instruments (VSFI) - pilot
- Airspeed VSFI - pilot
- TAS Indicator - navigator
- Annunciator Panel
- Selective Identification Beacon
- Flight Director
- Automatic Flight Control System
- Crash Data Position Indicator Recorder (AF66-8303 through AF70-467 not modified by T.O. lC-SA-2013)
- Ground Proximity Warning System (AF66-8303 through AF70-467 modified by T.O. 1C-5A-2013 and AF83-1285 and up)
- Inertial Navigation System
- Active Lift Distribution Control System
- Fuel Savings Advisory System
- MADARS
- Rudder Limit Control System
- Landing Gear Warning
- Stallimiter System
- Air Conditioning System
- Pitot Static System
- Total Air Temperature System

The CADCs interface with other subsystems as follows:

CADC No. 2

- Altitude VSFI - copilot
- Airspeed VSFI - copilot
- True Airspeed Indicator - navigator
- Annunciator Panel
- Vertical Velocity Indicator - navigator
- Flight Director
- Automatic Flight Control System
- Inertial Navigation System
- Active Lift Distribution Control System
- Fuel Savings Advisory System

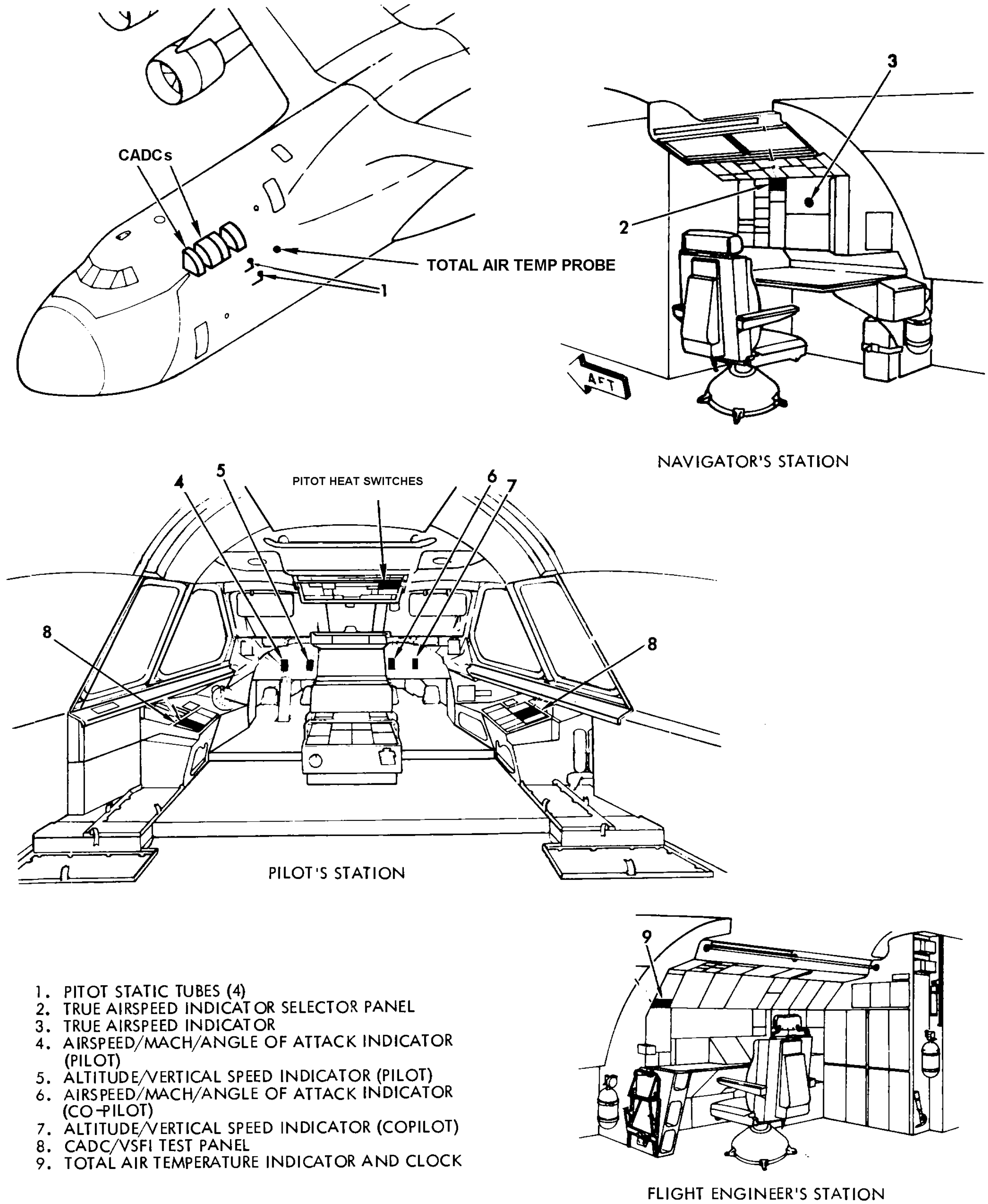
- MADARS
- Rudder Limit Control System
- Landing Gear Warning
- Stallimiter System
- Air Conditioning System
- Pitot Static System
- Total Air Temperature System

The CADS consists of the following components.

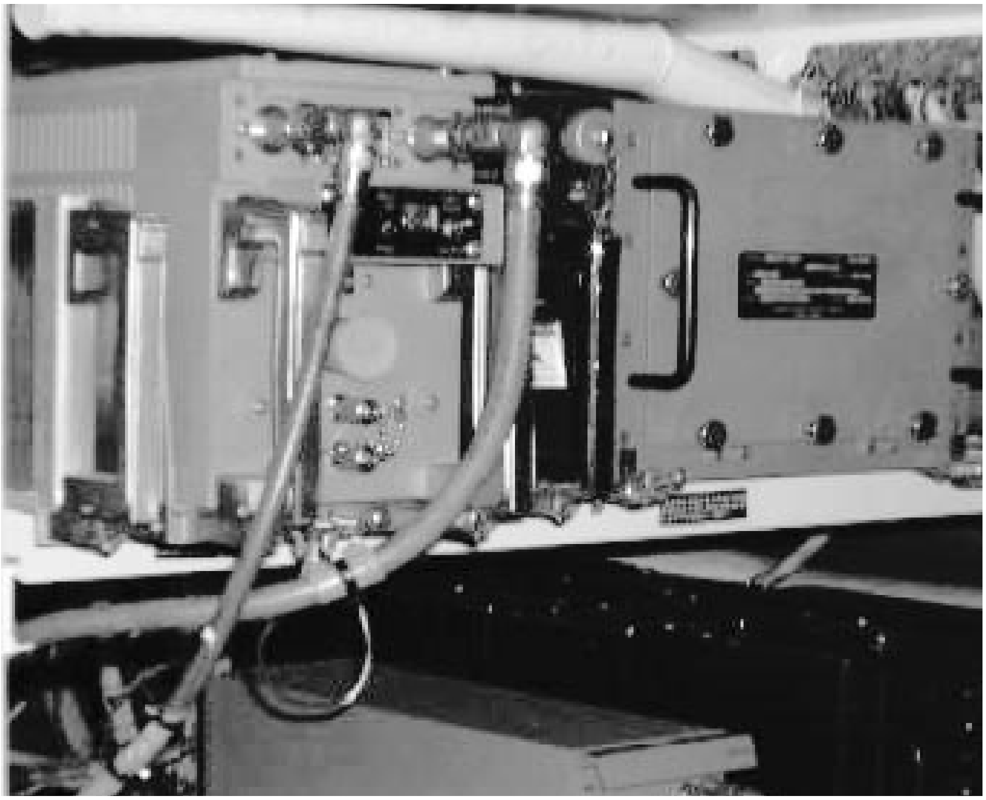
- Central Air Data Computer-2
- Airspeed VSFI -2
- Altitude VSFI-2
- True Airspeed Indicator -1
- Vertical Velocity Indicator-1
- CADC/VSFI Test Panel -2
- TAS Indicator Selector Panel-1

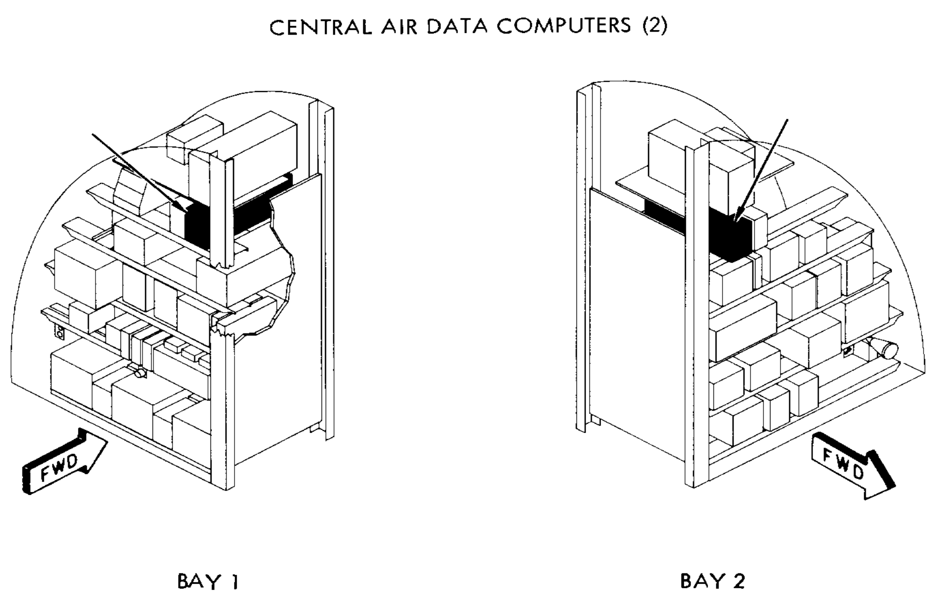
Central Air Data Computer

The CADC is a real-time, bus-oriented, microprocessor-based digital computer. Inputs are received representing air data, airplane identification, and airplane system status. The CADC computes related air data functions, selects the specific computed air data applicable to the airplane identified and transmits that selected air data to the associated airplane system.

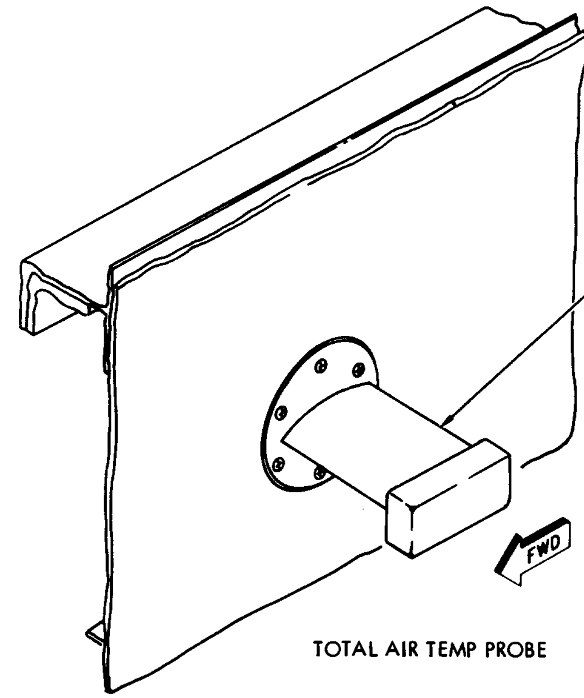


Air data system instrument locations

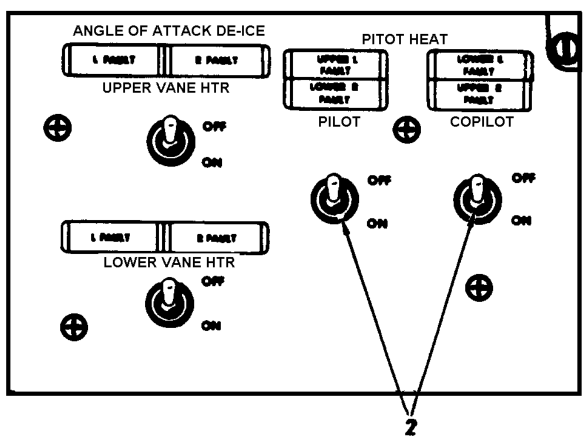




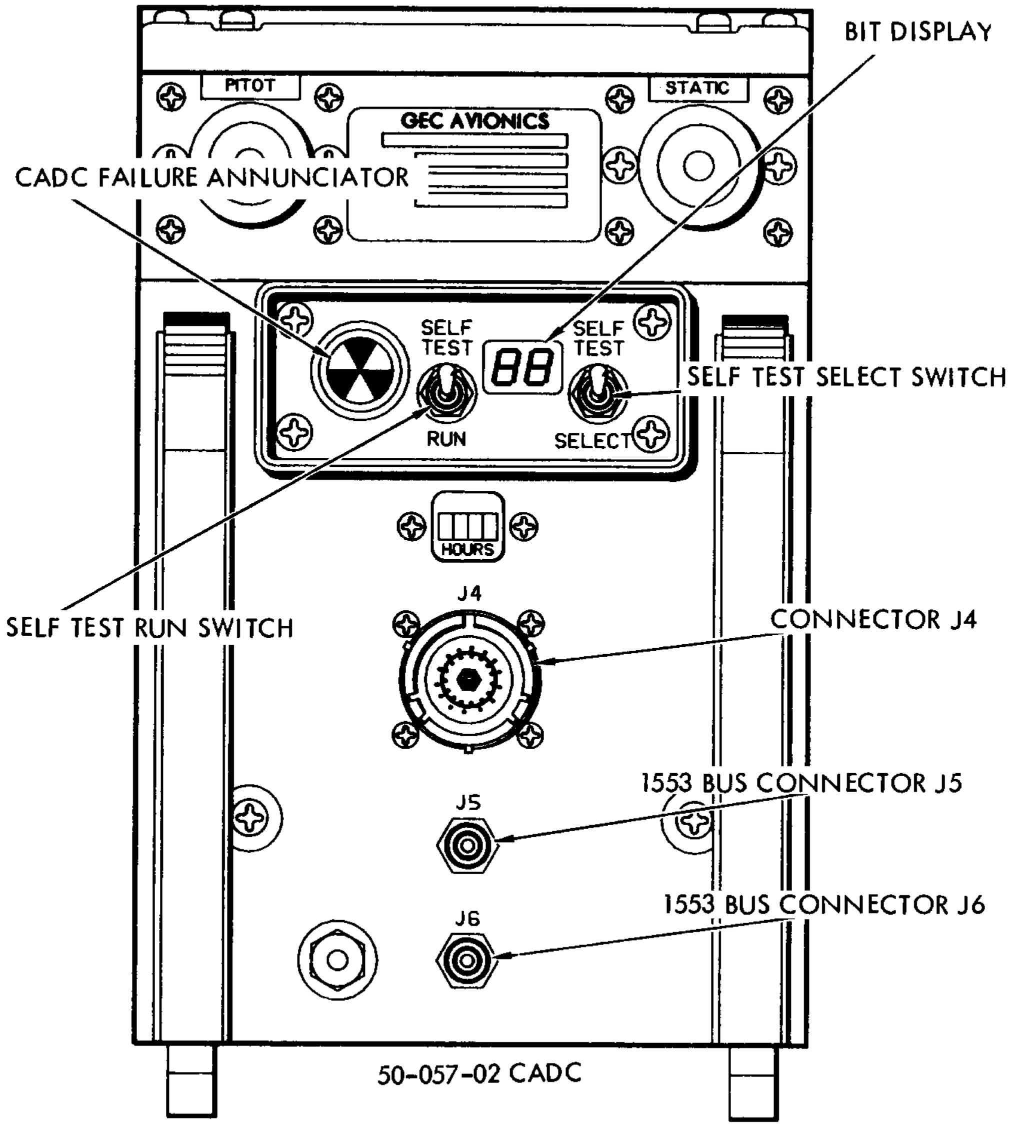
Central air data computer locations



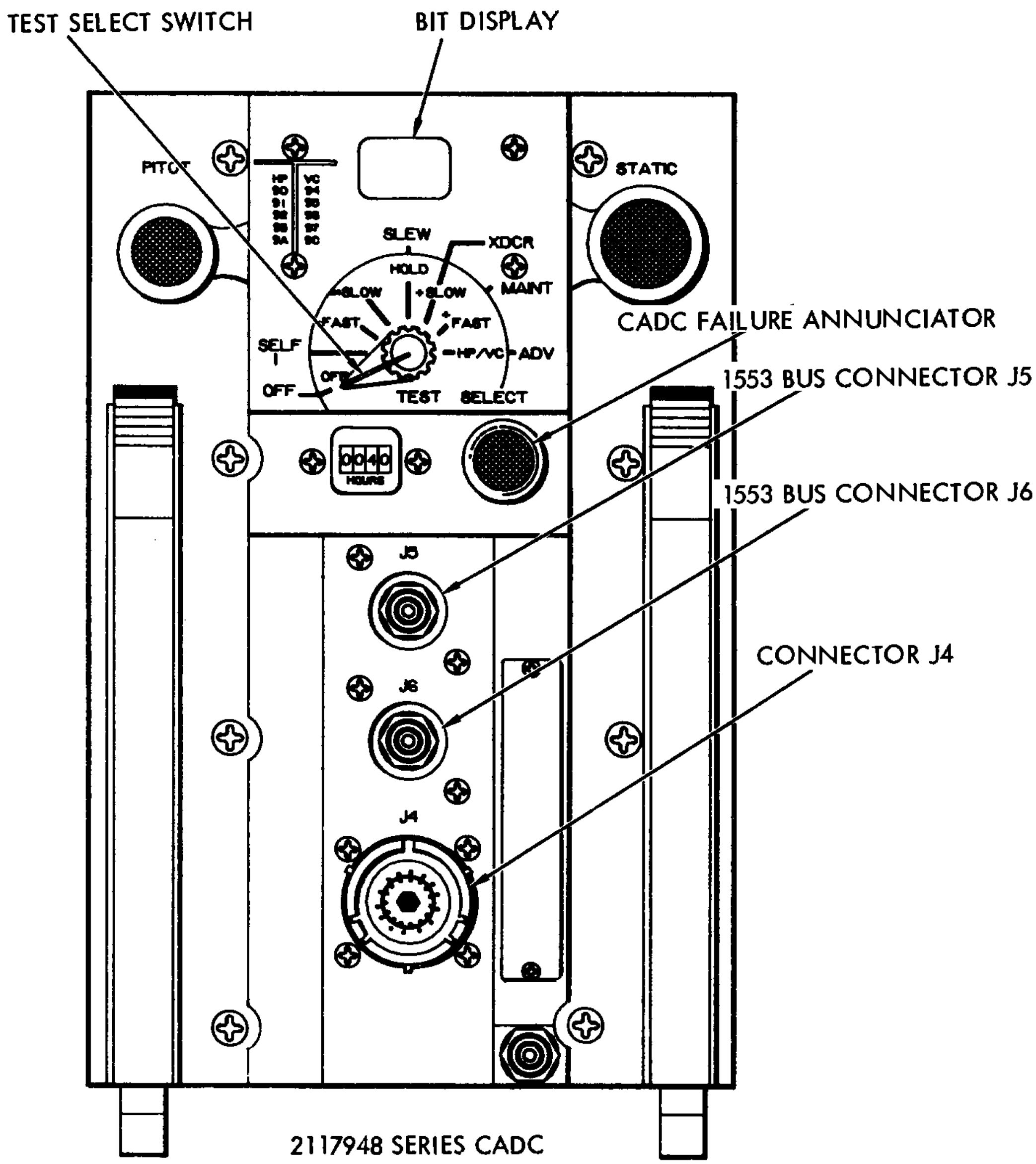
1. TOTAL AIR TEMP PROBE (2)
2. PITOT HEATER SWITCHES (2)



Total air temperature probe



Central air data computer 50-057-02



Central air data computer 2117948

Pitot Static System

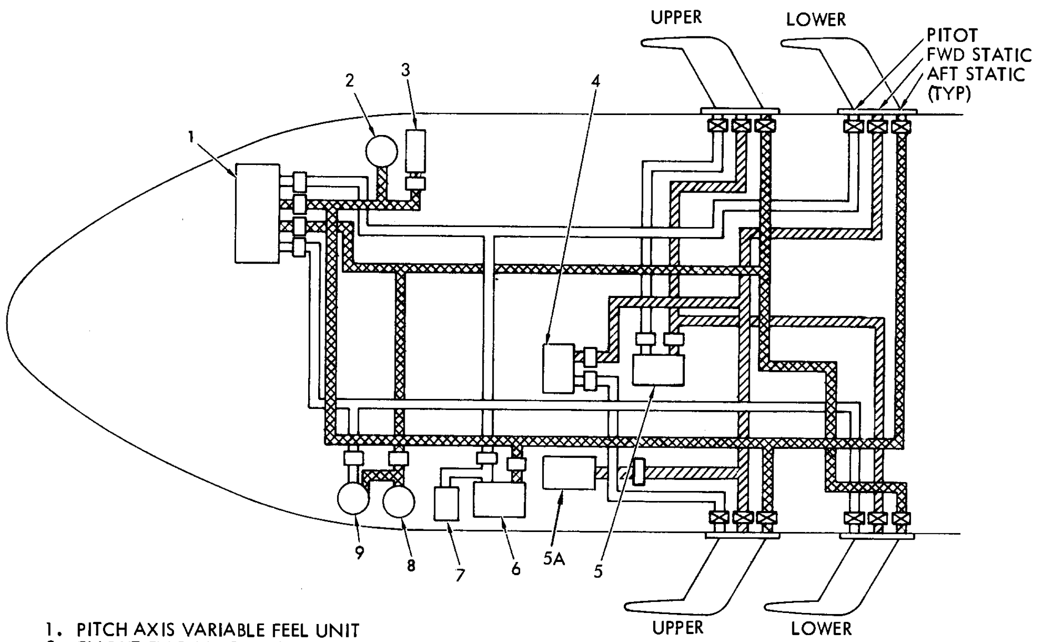
The pitot static system obtains both static air pressure and pitot air pressure from the air surrounding the airplane. The system then transmits this pressure through air pressure lines to various other systems. Some systems, for example the pressure altimeters, use only static air pressure while others, for example, the central air data system, use both pressures.

Pitot Static Tubes

Two pitot static tubes (lower and upper) are installed on each side of the airplane. Each tube has a nozzle which measures pitot pressure and small ports in the sides to measure static pressure. The static pressure input from the lower pitot static tube is connected to the static pressure input from the upper (opposite side) pitot static tube to compensate for pressure differentials occurring during airplane maneuvers. Heater elements are installed in each pitot static tube for deicing purposes. Each tube has a heater in the mast portion and one in the head portion (two heaters for each tube).

Drain Provisions

One drain box is located on each side of the airplane. The drain boxes house bottle-capped lines which are connected to the pitot static system plumbing and allow drainage of moisture into the bottles. The bottles thus accumulate moisture occurring in the lines, and are emptied periodically. In addition to the two drain boxes, drain plugs are installed at other low points in the system plumbing. There are 25 low drain points, 12 of which are the clear plastic bottles.



1. PITCH AXIS VARIABLE FEEL UNIT
2. FLIGHT ENGINEER'S CABIN DIFFERENTIAL PRESSURE GAGE
3. CABIN PRESSURE CONTROL BOX
4. CADC NO. 1
5. CADC NO. 2

⚠2 5A. BAROMETRIC ALTITUDE RATE COMPUTER

⚠1 6. VHG FLIGHT RECORDER

⚠1 7. MADAR ABSOLUTE PRESSURE TRANSDUCER

8. NAVIGATOR'S PRESSURE ALTIMETER
9. NAVIGATOR'S INDICATED AIRSPEED (IAS) INDICATOR

DRAIN PLUG (13)

PITOT PRESSURE LINE

CADC STATIC PRESSURE LINE

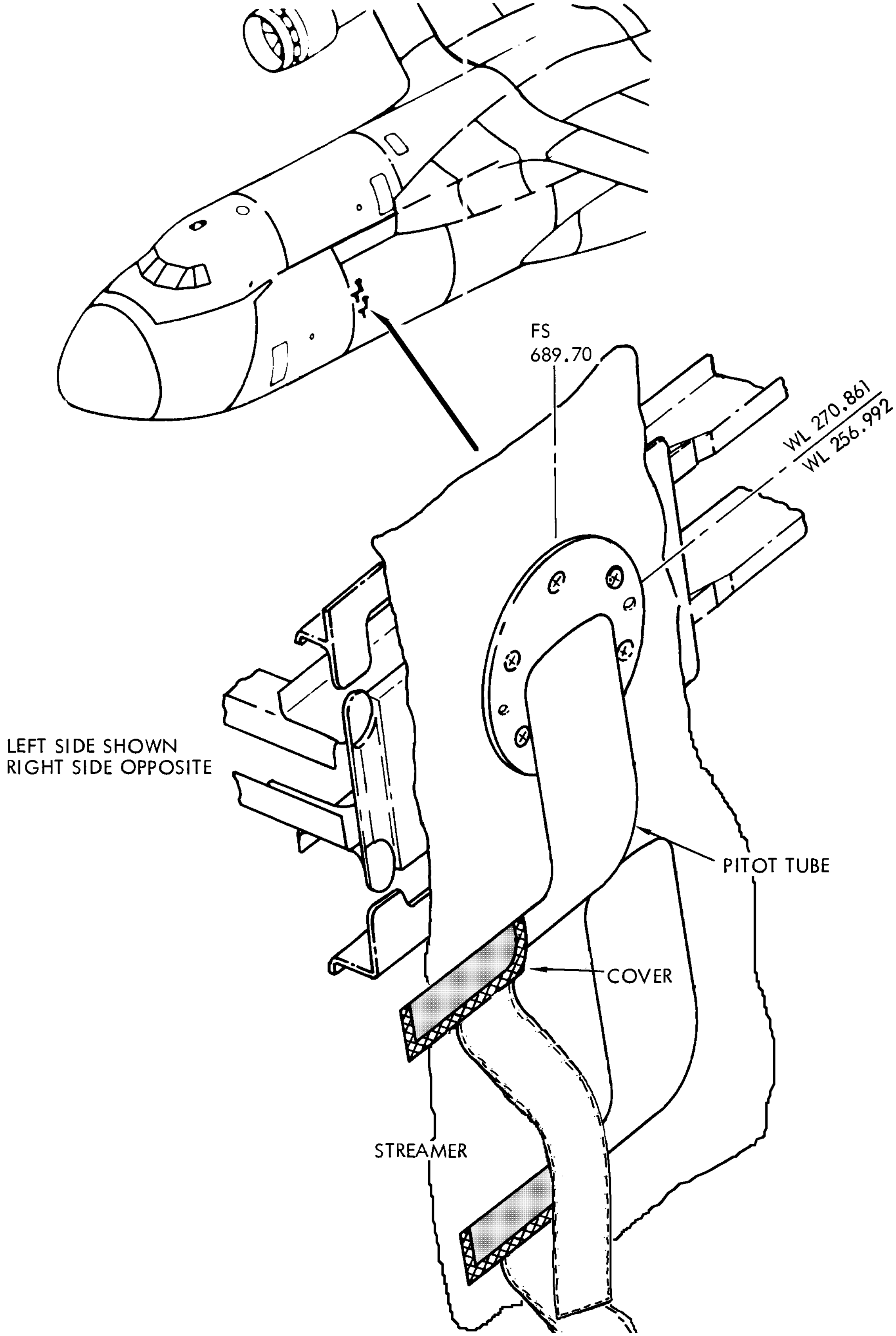
STATIC PRESSURE LINE

DRAIN BOTTLE (12)

⚠1 AF66-8303 THROUGH AF70-467 NOT MODIFIED BY T.O. 1C-5A-2013.

⚠2 AF66-8303 THROUGH AF70-467.

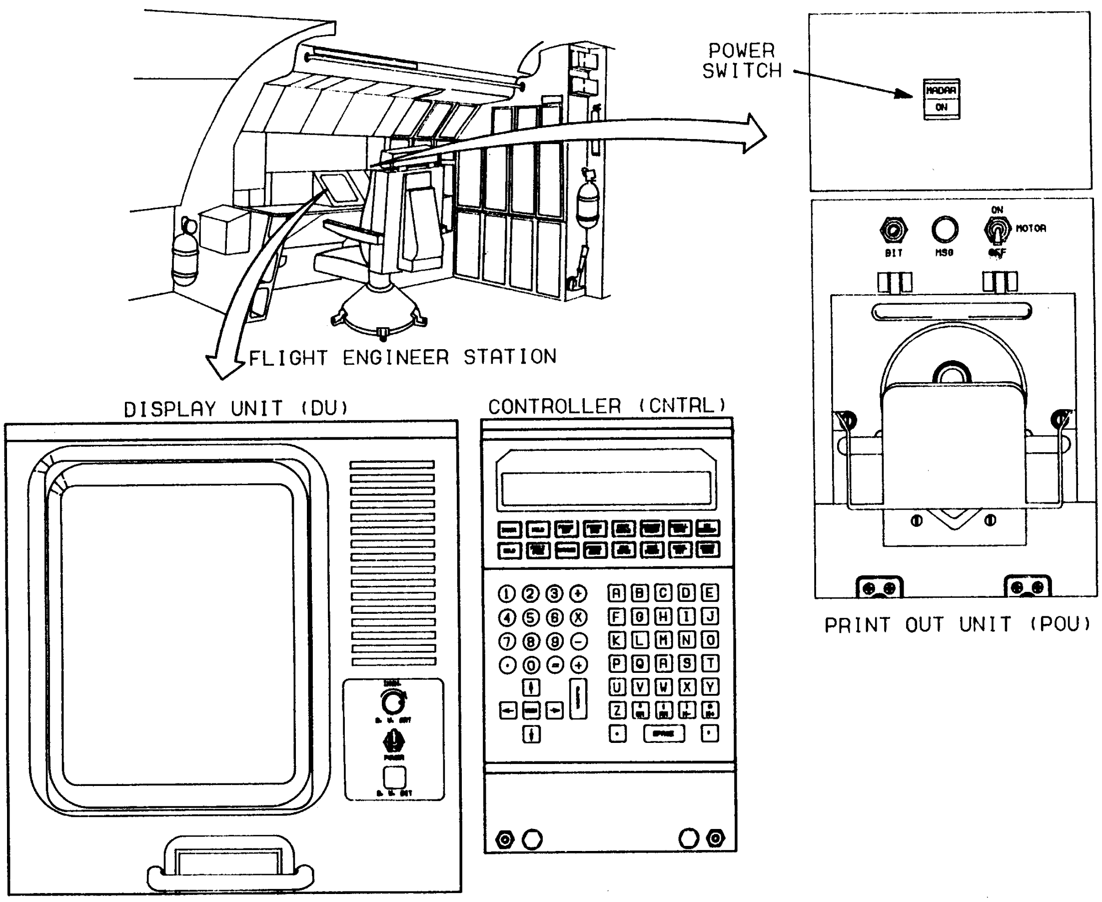
Pitot static system diagram


FS
689.70
WL 270.861
WL 256.992
LEFT SIDE SHOWN
RIGHT SIDE OPPOSITE
PITOT TUBE
COVER
STREAMER

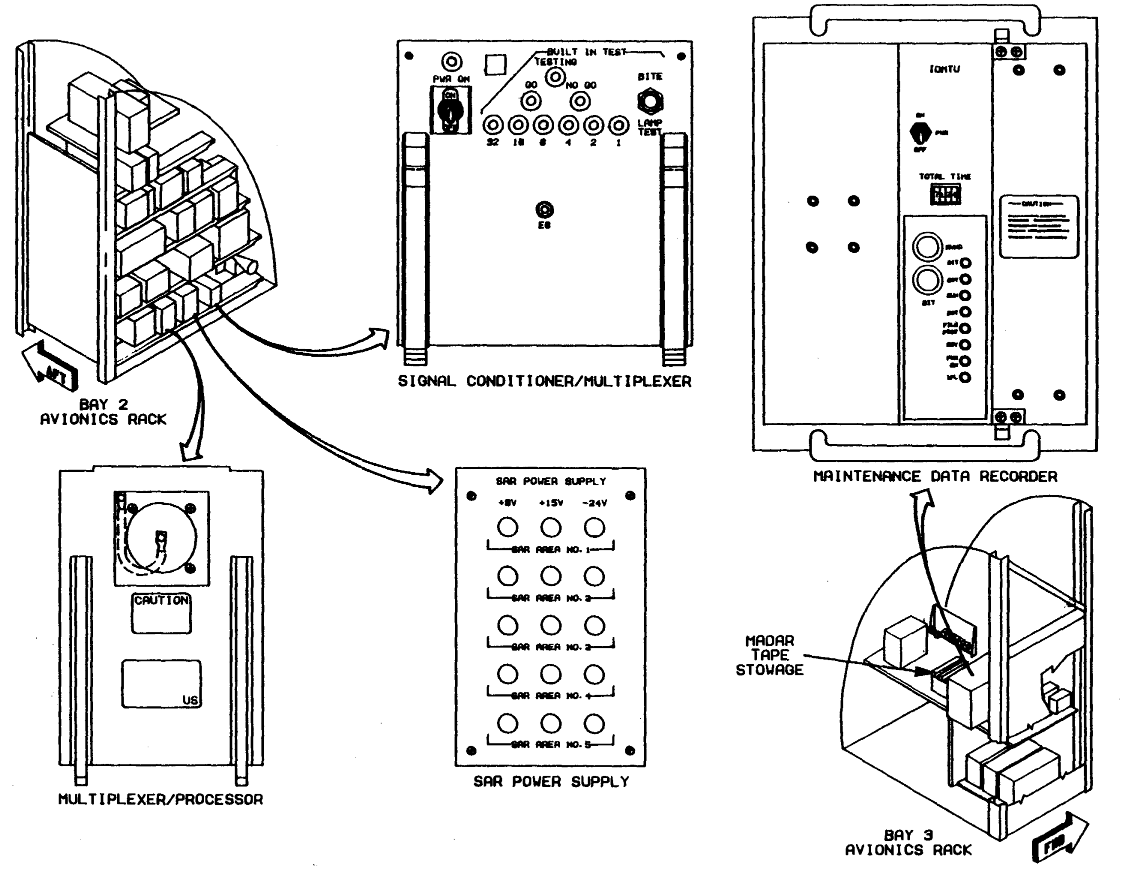
Pitot tubes

Malfunction Detection, Analysis, and Recording System (MADARS)

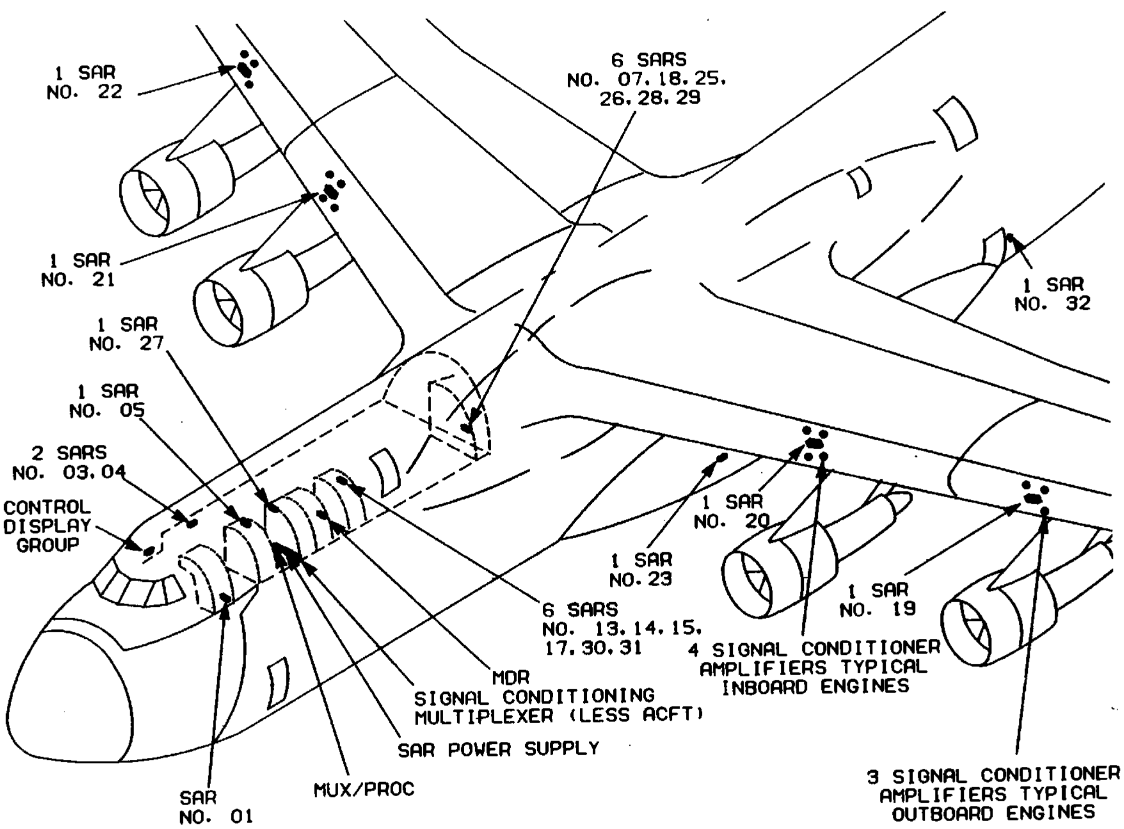
The MADARS consists of components located in various parts of the airplane to access, amplify/condition, display, and record monitored airplane system parameters. The system also enables the operator to perform inflight troubleshooting to aid ground maintenance personnel in correcting flight-reported problems.



MADAR components (1 of 3)



MADAR components (2 of 3)



MADAR components (3 of 3)

BLANK

BLANK

ELECTRICAL SYSTEMS

Primary electrical power is supplied by four engine-driven generators equipped with constant speed drive units. The generators operate in parallel to supply 3-phase, 115/200-volt grounded neutral power to four forward main AC busses, four aft main AC busses, and two monitor AC busses. Each set of forward and aft main busses is associated with an individual generator; the two monitor AC busses are associated with generators No. 2 and No. 3. A tie bus is provided for parallel operation; however, the busses associated with each generator are supplied with power from their associated generators independent of the tie bus during non-parallel operation.

AC Power System

AC Power Generation and Control

Alternating current (115/200 VAC) is supplied by four main 60/80 KVA (kilovolt amperes), engine-driven generators operating in parallel, and two 60/80 KVA auxiliary power unit generators. Four engine-driven CSDs (constant speed drive) units drive the four main generators. The right and left APU (auxiliary power unit) turbines drive the auxiliary generators. The APU power may be selected from either of the two generators. Emergency AC (115/200 volts) and DC (28 volts) power is provided by a hydraulic motor-driven emergency AC/DC generator. The emergency AC/DC generator has an output capacity of 3.9 KVA. AC power is 115/200 volts,3-phase,380/420 Hz. An external power receptacle is located at fuselage station 947.0, right side for use when an external power source is required.

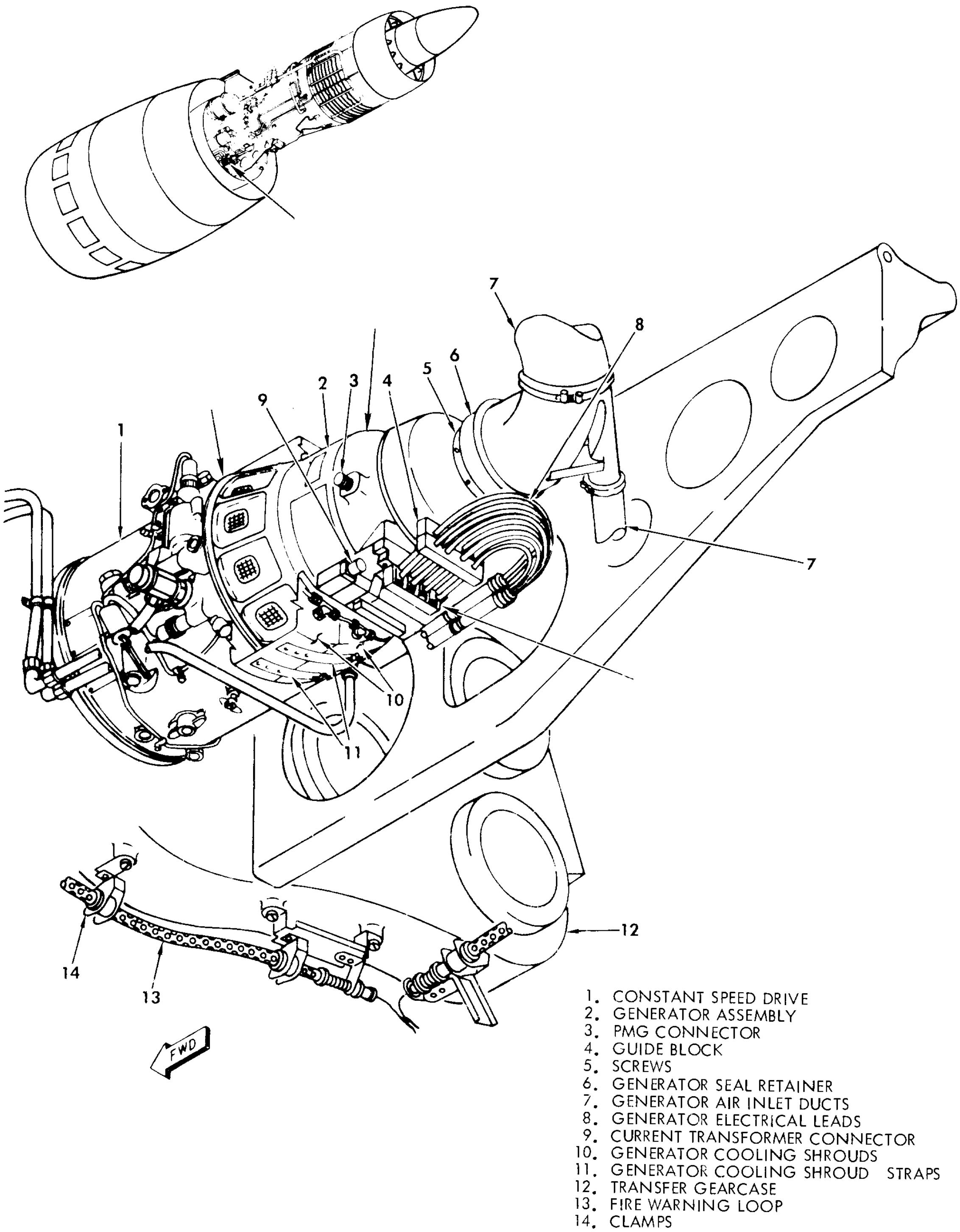
Each main generator is controlled by individual ON-OFF-TEST switches on the flight engineer’s AC SYSTEM control panel. Each bus tie contactor is controlled by GRD TRANS-NORM OPEN switches located on the AC SYSTEM control panel.

Constant Speed Drive (CSD)

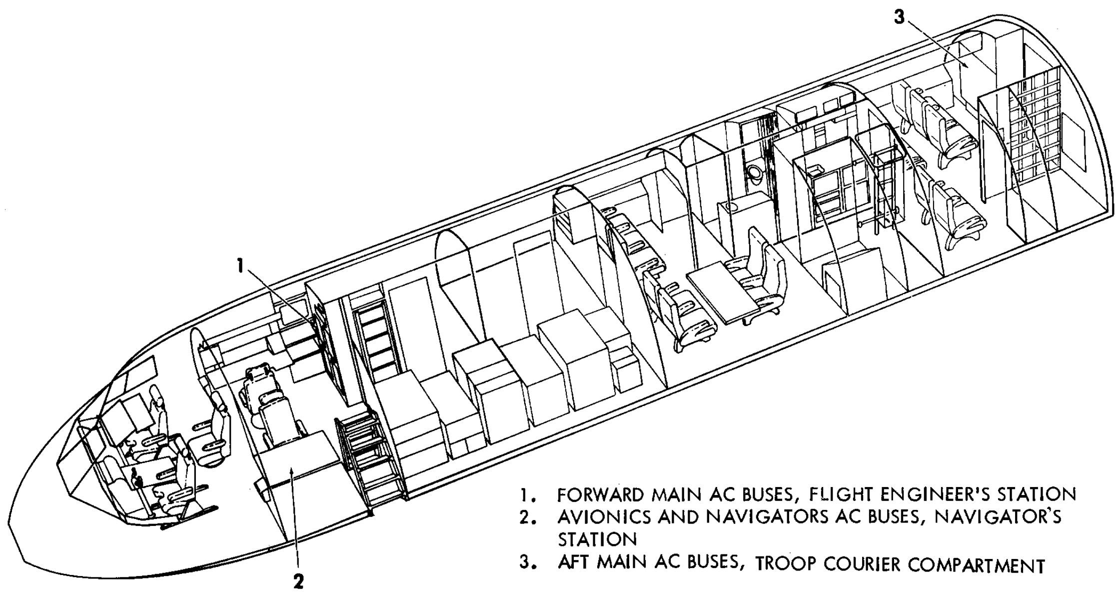
A CSD unit is mounted on the accessory section of each main engine. The CSD mechanically couples to and drives the related main AC generator. Each unit converts a variable input speed from the engine into a constant 8,000 RPM output in order to maintain a generator frequency output of 400 Hz under changing electrical loads. Each CSD contains an oil reservoir. An externally mounted oil-to-air heat exchanger cools the oil. A disconnect switch, an oil temperature indicator, and a CSD FAIL warning light for each CSD is provided on the flight engineer’s AC SYSTEM control panel.

Auxiliary Power Unit Driven Generators

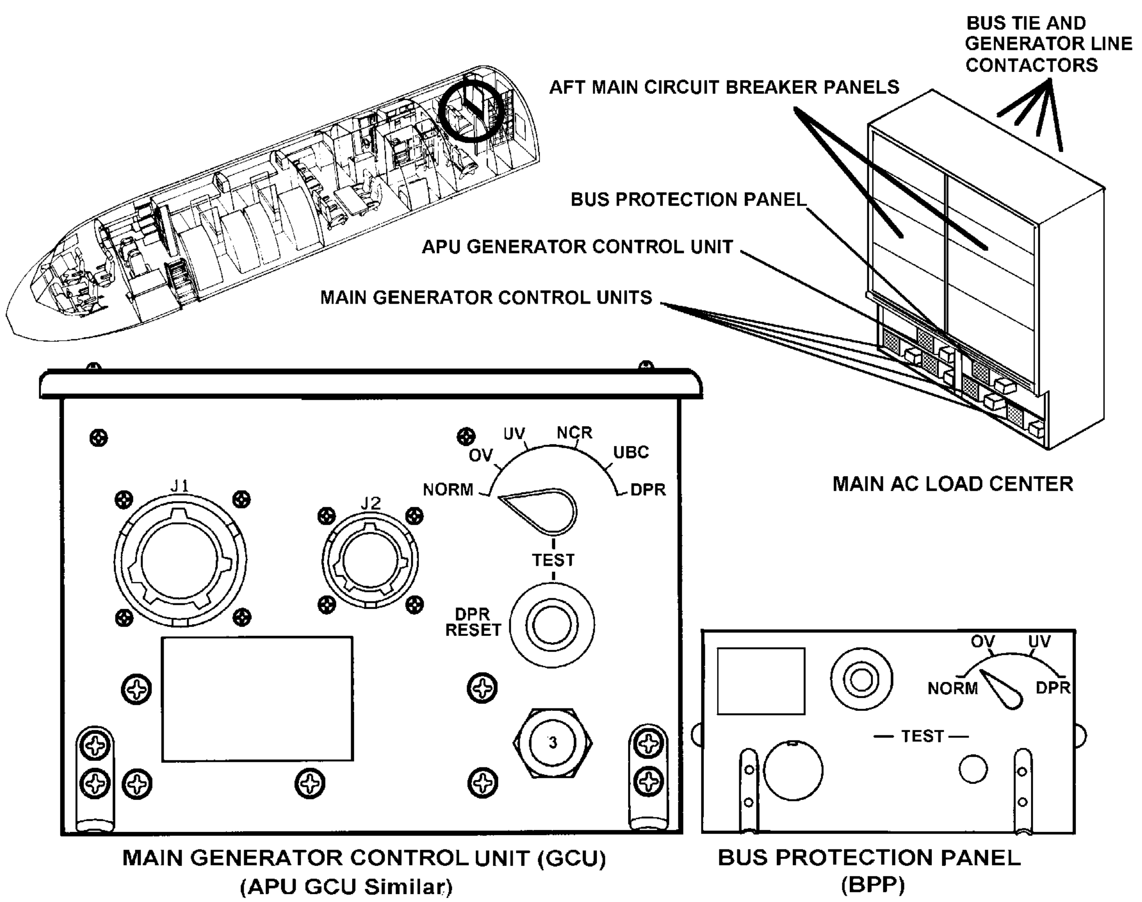
Two 60/80 KVA generators driven by the right and left auxiliary power units, furnish auxiliary 115/200-volt, 3-phase grounded neutral, constant frequency, AC power for ground or air use. The generators supply power to the tie bus but may be operated individually. The APU driven generators are the same type generators as the main AC generators.



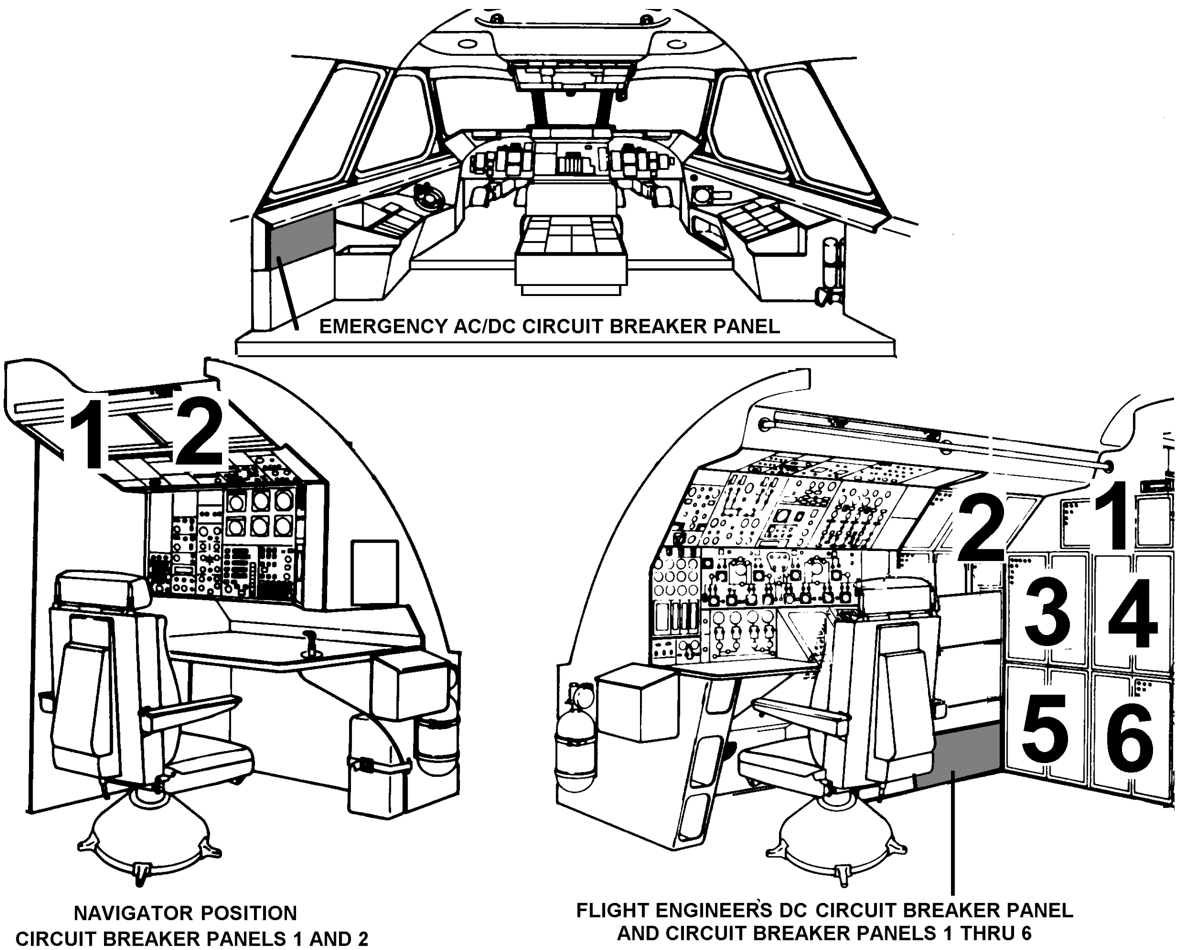
Engine generator and constant speed drive (CSD)



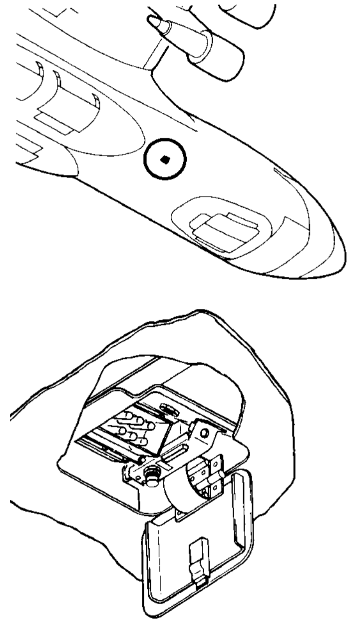
AC Bus Locator



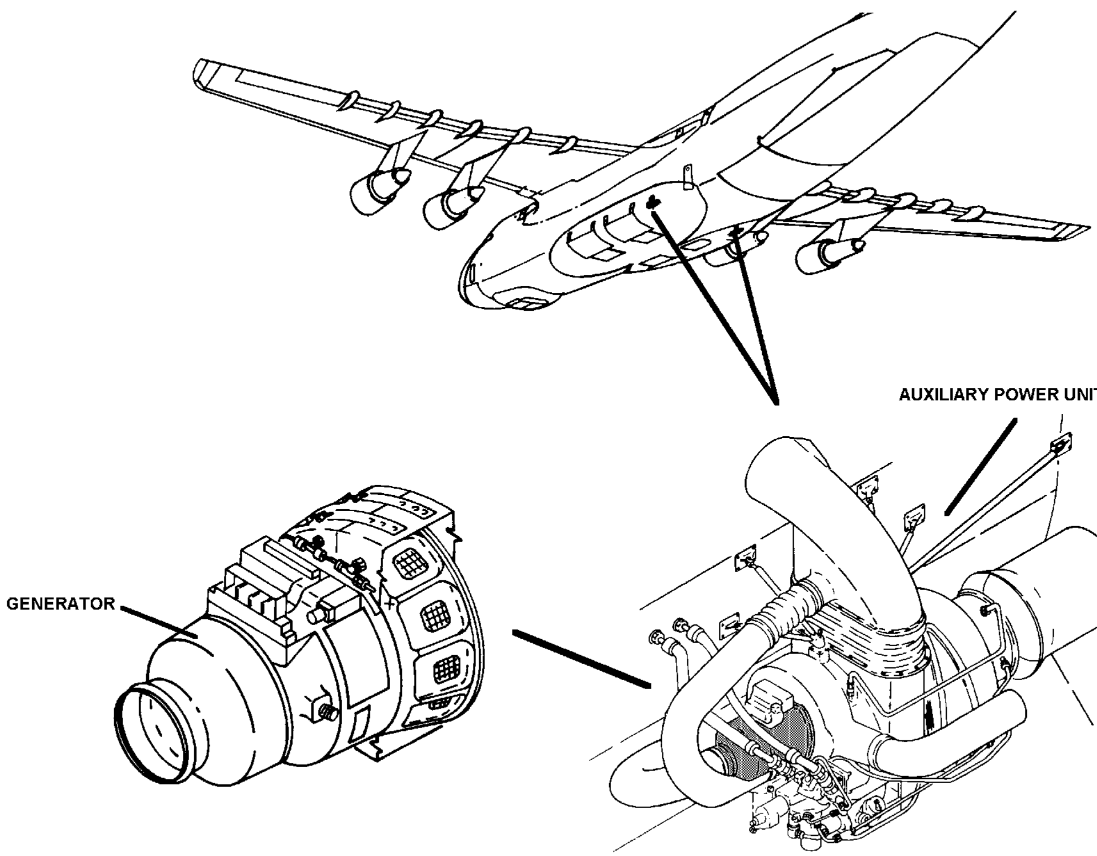
AC bus locations and generator control components



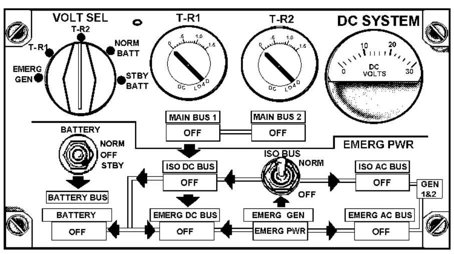
Circuit breaker panels



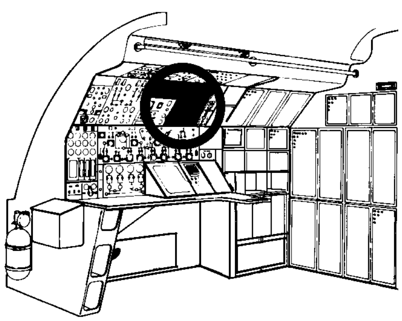
External power receptacle



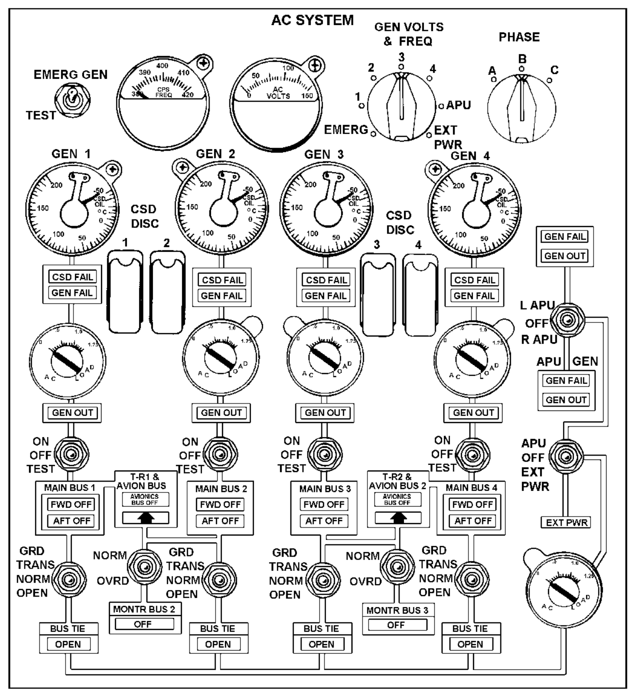
Auxiliary power unit generator



DC SYSTEM CONTROL PANEL



FLIGHT ENGINEER'S STATION



AC SYSTEM CONTROL PANEL

Flight engineer’s electrical system control panels

DC Power System

Secondary electrical power is supplied by two, 200-ampere transformer rectifiers that convert 3-phase, 115/200 VAC power into a nominal output of 28 VDC. The transformer rectifiers supply main DC busses No. 1 and No. 2 through individual reverse current relays. A current limiter connects the two busses together to provide parallel operation of the transformer rectifiers and to isolate the busses from each other, in event of a fault of either one.

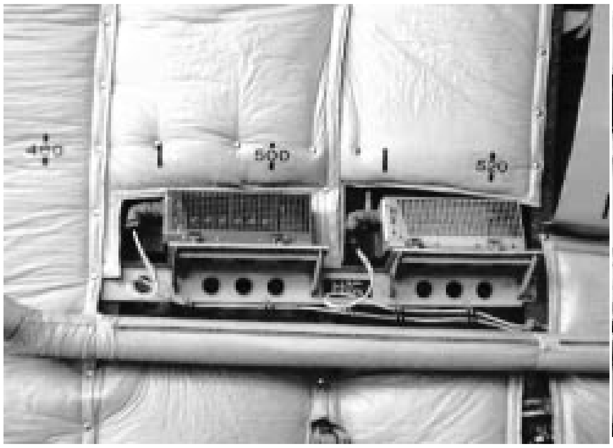
The main DC power system consists of two power transfer relays (considered as part of the AC system), two transformer-rectifier units, two reverse current relays and two main DC busses. Two main avionics busses, one isolated DC avionics bus, and one isolated DC bus are normally supplied power from the main DC bus. The FSS fire suppression system main DC circuit breaker is also normally supplied power from the main DC bus. Charging power for the batteries and the battery bus is also normally supplied by the main DC busses. System monitoring is accomplished by two loadmeters and one voltmeter located on the flight engineer's electrical control panel.

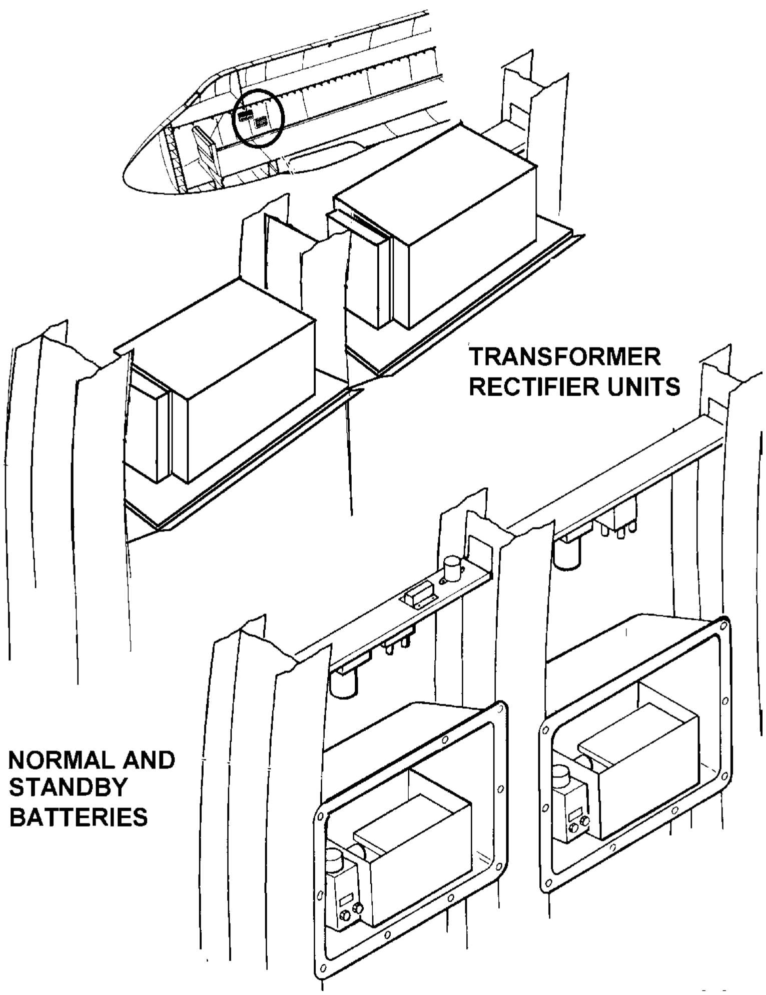
The 115/200 VAC, 3-phase, 400-Hz power is supplied from the AC electrical power system through power transfer relays 1 and 2 to transformer rectifiers 1 and 2 respectively. The AC is converted to a nominal output of 28 VDC. Normally, main AC bus 1 or alternately AC bus 2 supplies power to power transfer relay 1, and normally main AC bus 4 and alternately AC bus 3 supplies power to power transfer relay 2.

Transformer rectifiers 1 and 2 supply main DC busses 1 and 2, respectively, through individual reverse current relays. A current limiter connects the two busses together to provide for parallel operation of the transformer-rectifiers and to isolate the busses from each other in the event of a fault on either one. Two DC LOAD meters located on the flight engineer's panel monitor the DC load on each bus and display the load in percentage of available power (i.e., 1.0 on loadmeter equals full load).

The battery system consists of two batteries, two battery relays, and a standby battery reverse current relay. The reverse current relay for the normal battery is located in the DC load center. One of the batteries is designated as the normal battery and the other as the standby battery. The battery power and use are controlled by a switch on the flight engineer's electrical control panel.

In normal operation, the normal battery relay and the standby battery reverse current relay are energized, connecting the normal battery to the battery bus and the standby battery to the main DC bus. The normal battery is also connected to the nose wheel well panel. Since the battery bus is normally connected to the main DC busses, both batteries are normally on charge. In standby, the standby battery is connected to the battery bus and the normal battery is disconnected from the battery bus. During standby operation, the standby battery reverse current relay is de-energized, disconnecting the standby battery from the main DC bus.





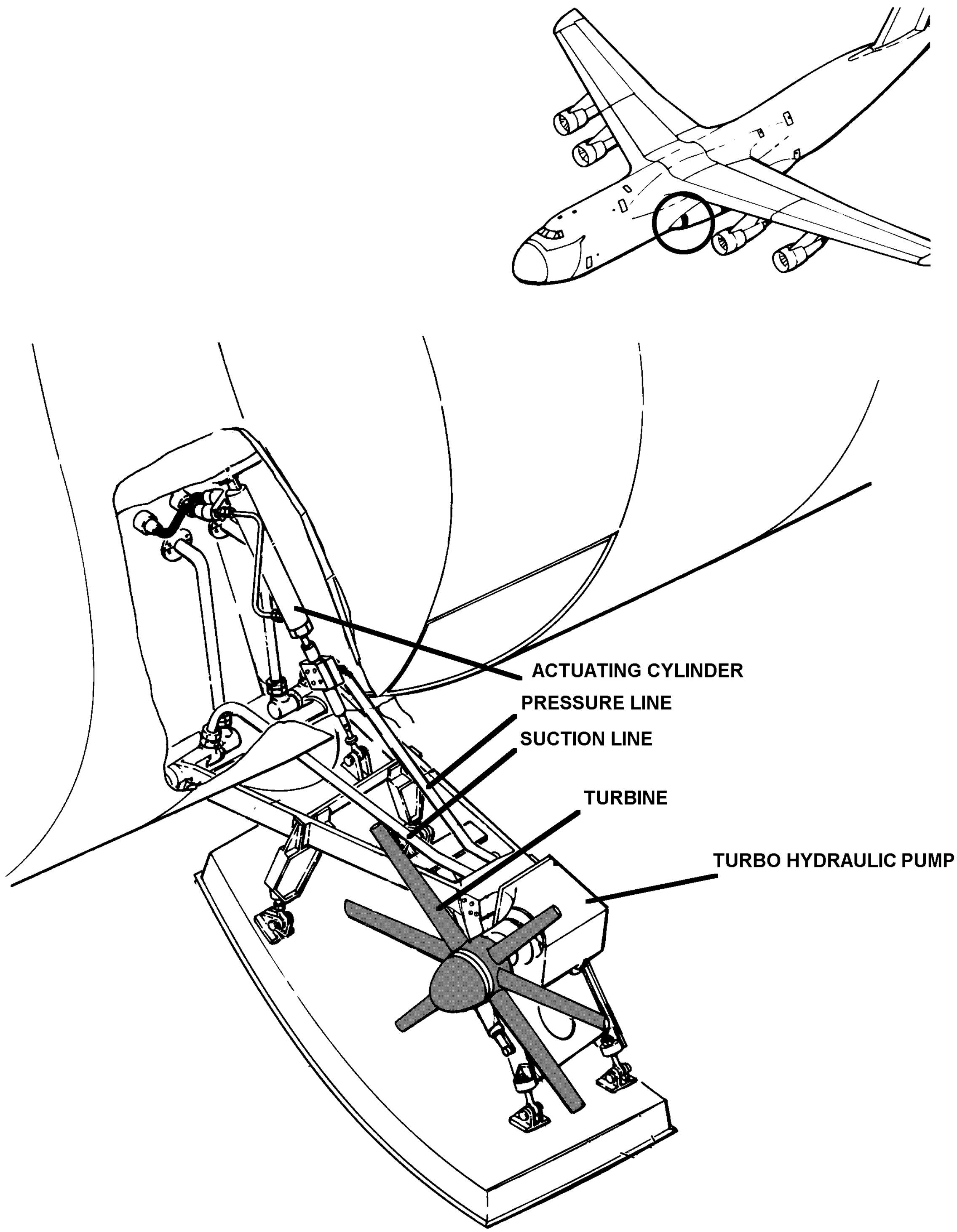
Transformer rectifiers and batteries

Emergency AC/DC Power System

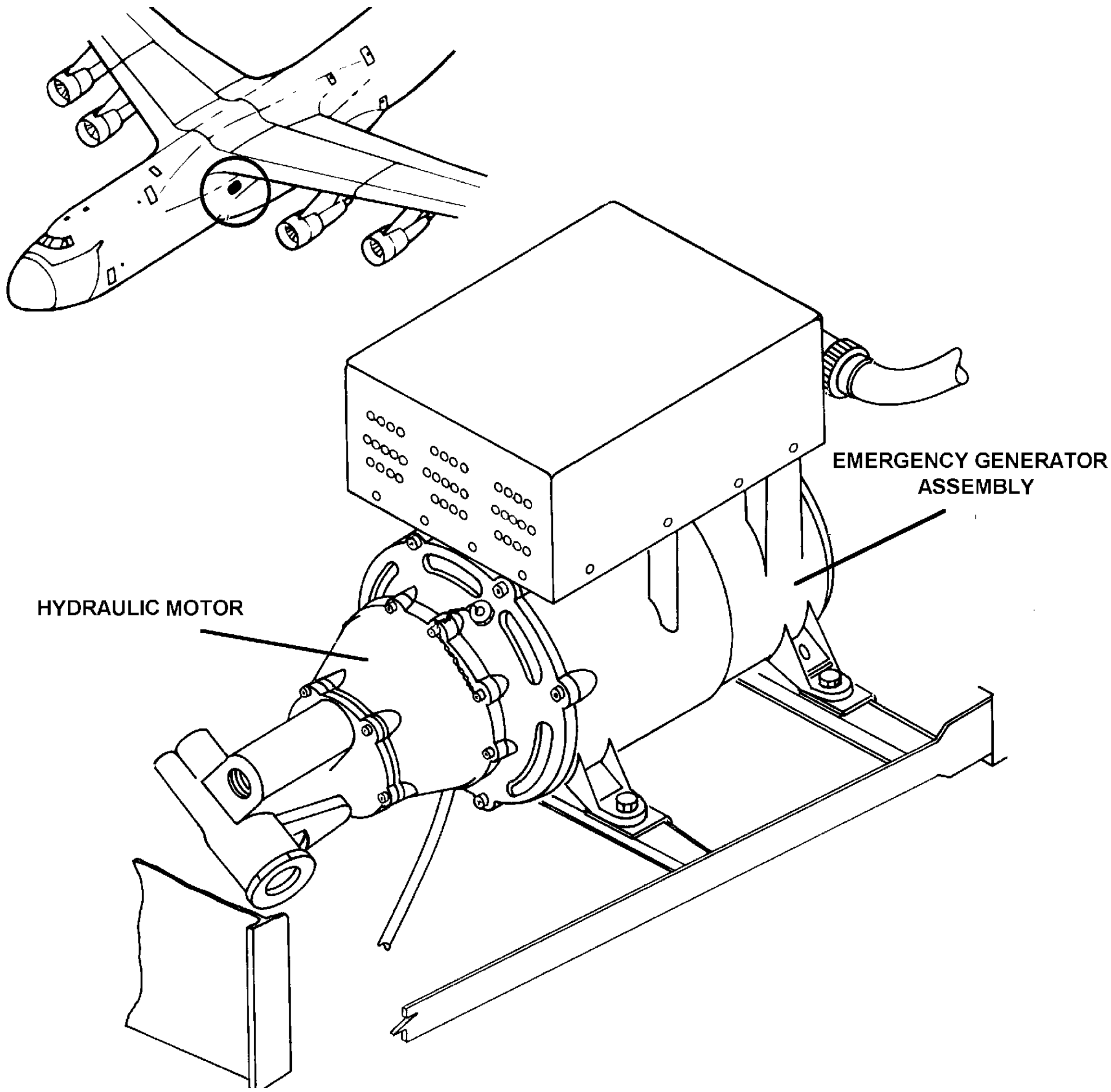
A hydraulic, motor-driven 3.9-kilovolt-ampere, 115/200 VAC and 28 VDC generator system provide emergency electrical power for one set of flight instruments, the landing gear control and actuator, and a minimum amount of navigation and communication equipment. Under normal operation of the system, AC and DC power is automatically supplied by the emergency generator when normal AC and DC power is not available. The emergency generator wiring is isolated from the other wiring in the power system. Wires to the equipment powered from the emergency bus are separated from each other, and from other wiring on the airplane.

Emergency AC/DC Generator

The hydraulic-driven emergency AC/DC generator is installed at fuselage station 1117 on the left hand of the cargo compartment approximately 4 feet above the floor. When normal power fails, the generator automatically provides AC and DC power requirements necessary to maintain operation of the pilot's flight instruments and the minimum warning circuits, control circuits, landing gear, and navigation and communications equipment. Upon de-energization of the 115 VAC emergency bus power relay, the emergency generator is triggered into operation. The emergency bus power relay is normally held energized by power from the main generators through the No.1 power transfer relay. An INSTRUMENT POWER switch on the pilot's main instrument panel allows the pilot to control the generator as required. A EMERG GEN switch on the flight engineer's AC SYSTEM control panel permits testing of the emergency generator output without connecting it to any bus.



Ram air turbine (RAT)



Emergency AC/DC generator

Exterior Lighting System

The exterior lighting systems include landing, terrain, and taxi lights, navigation, inspection and refueling lights; fuselage, anti-collision, and exterior maintenance service lights. The navigation, leading edge, landing, taxi, fuselage, and anti-collision lights are controlled from the forward overhead panel.

Landing and Terrain Lighting

Two retractable landing lights are located in the lower wing surface. These lights provide for the illumination of the runway or ground during low-level flight, take-off, or landing operations at night. Each light operates from a position of full down to full forward and is capable of stopping in any intermediate position. The lights may be extended or retracted at indicated air speeds up to 350 knots. Individual ON-OFF and EXT-OFF-RET switches for each light and a LT EXTENDED indicator light are located on the pilot’s forward overhead LANDING LIGHTS panel.

Inflight Inspection Lighting

The inflight inspection lights are located on each side of the fuselage and forward of the wing. These lights provide for the illumination of the wing leading edge and engine inlets during night flight operations. The inspection lights are turned on with the taxi lights by a single switch on the pilot’s forward overhead LANDING LIGHTS panel.

Navigation Lighting

The navigation light system includes a red light on the left outboard wingtip, a green light on the right outboard wingtip, and a clear light on rear of empennage bullet. Each light assembly has two 6-volt lamps, an autotransformer, and a lens. The lights are used to provide a reference to the airplane’s position and attitude during night operations. The navigation lights are controlled by a STEADY-OFF-FLASH switch on the forward overhead panel.

Taxi Lighting

The taxi lights are located at the nose landing gear and forward end of each main landing gear door. These lights provide forward illumination for the airplane to aid in night taxiing operations. The nose landing gear light bulb has a 400-watt filament for taxiing purposes and a 600 watt filament for landing. The left and right main landing gear door lights consist of two 450-watt bulbs used for taxiing purposes. All of these lights are controlled by ON-OFF switches on the pilot’s forward overhead panel. The taxi lights are energized along with the leading edge inspection lights. Each light assembly includes an autotransformer for 28 VAC operation.

Anti-collision Strobe Lighting

The anti-collision strobe lights are located on the aft bullet of the horizontal stabilizer (empennage). The upper center fuselage, and the lower center fuselage. These lights are provided to visually forewarn other airplanes in the vicinity.

Each anti-collision strobe light assembly consists of a red filter lens and a clear lens over white, xenon arc-discharged flashtubes. Each strobe light (red or white) flashes at the rate of 55 to 65 flashes per minute.

The flashtubes for each anti-collision strobe light are powered by a separate power supply that converts the airplane’s

115 VAC, 400 Hz power to 300 volts, and provides the logic and timing circuits for the lights.

The three strobe lights are controlled by three toggle switches on the anti-collision strobe light panel located on the pilot's forward overhead panel. The white lights function in flight and for test when the airplane is on the ground. The red lights on the upper fuselage and empennage function when the airplane is in flight or on the ground. The red light on the lower fuselage functions in flight and for test when the airplane is on the ground. Touchdown relays No. 9 and No. 10 disable the white lights and the lower fuselage red light when the airplane is on the ground.

Fuselage Lighting

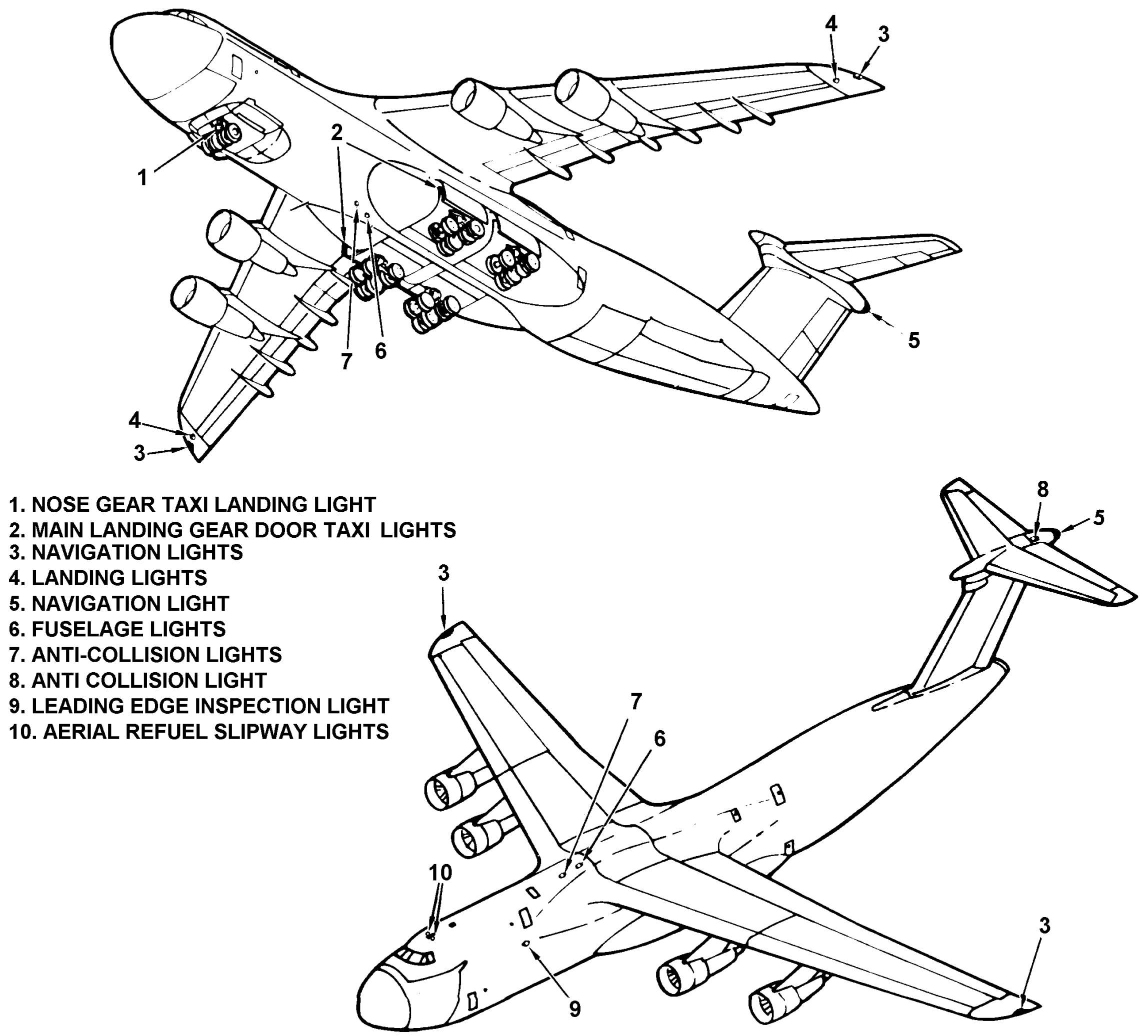
The fuselage lights are located in the wing center section and under the cargo compartment floor, forward of the main landing gear wheel wells. These lights are used in conjunction with other exterior lighting systems to indicate the airplane's position and attitude during night operations. The lights consist of a 28-volt light assembly and an autotransformer at each location. The ON-OFF switch that controls these lights is located on the pilot's forward overhead panel.

Aerial Refueling Lighting

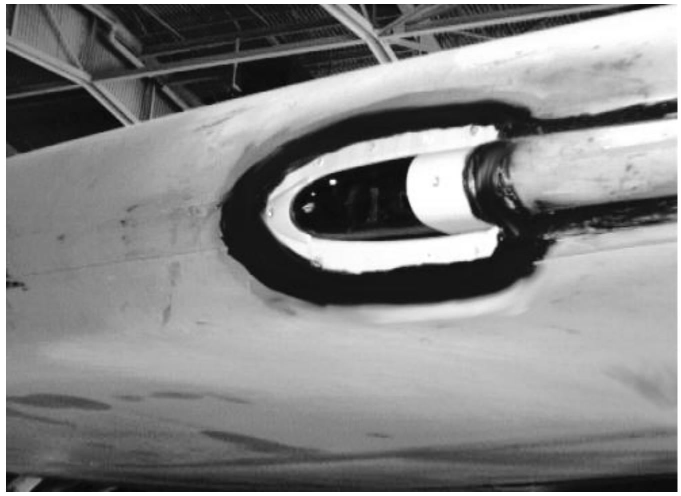
The aerial refueling lights are located on the refueling receptacle. The lights provide illumination of the aerial refueling receptacle for night refueling operations. The lights are shielded to proclude direct light being projected into openings in the tanker or receiver since observations must be made during final hook-up or fuel transfer. The lights consist of two white 28 VAC light assemblies. The transformer/dimmer control located on the aft overhead panel permits the pilot to adjust the lights from full OFF to bright.

Exterior Maintenance and Service Area Lighting

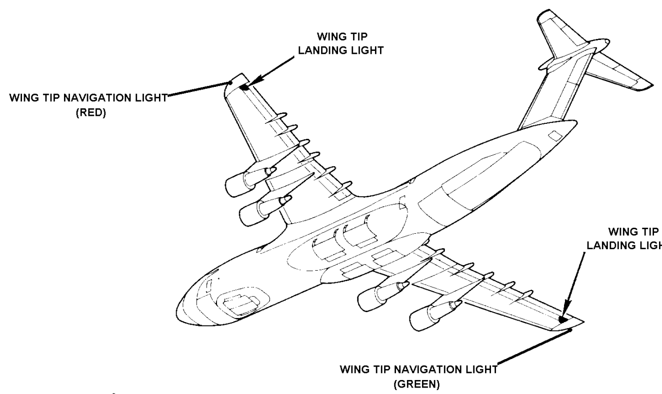
The exterior maintenance and service area lights are located in the main and nose wheel wells, and at fuel servicing points. These lights provide a minimum of 30 foot-candles of illumination at these points. When not in use these two portable lights will be stowed in containers mounted in the right and left main wheel well.

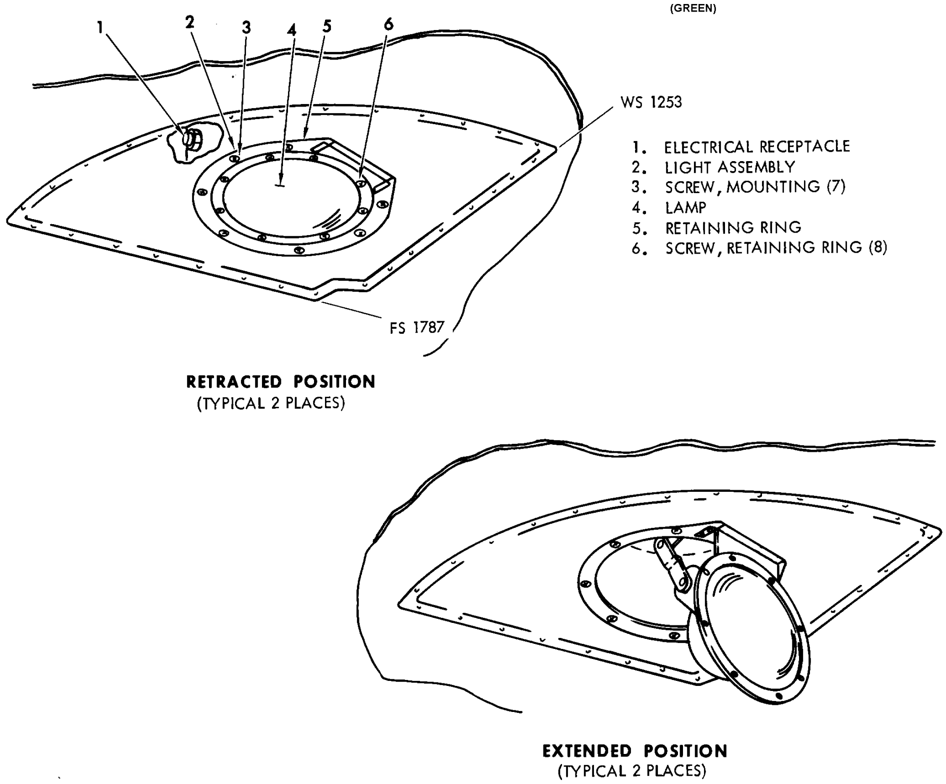


Exterior lighting

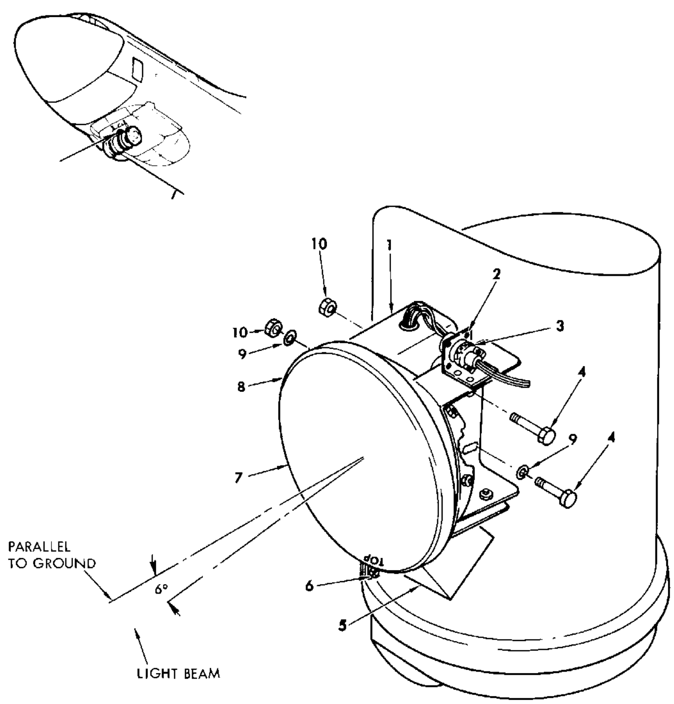


Wing tip navigation light assembly (typical)



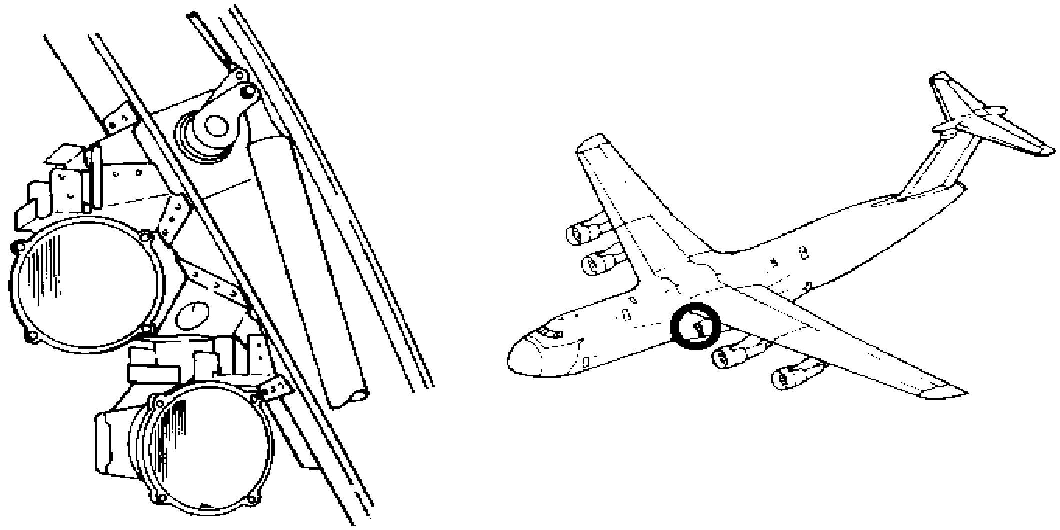


Wing landing light assemblies

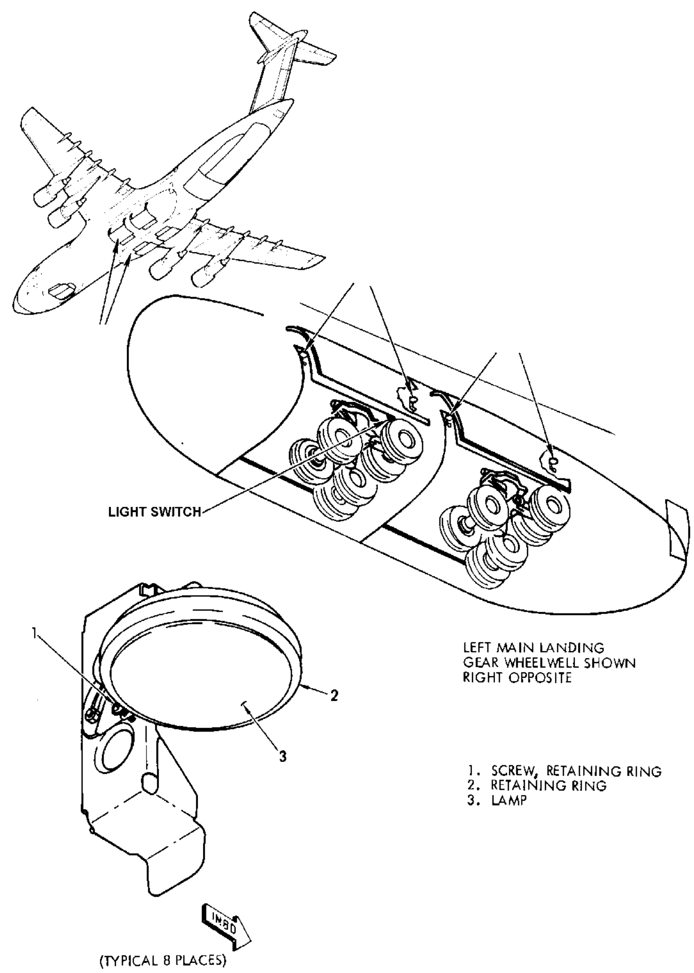


1. LIGHT ASSEMBLY
2. SCREW AND LOCKWASHER, MOUNTING
3. ELECTRICAL CONNECTOR
4. BOLT, MOUNTING
5. TRANSFORMER
6. BOLT, NUT AND WASHER, RETAINING RING
7. LAMP
8. RETAINING RING, LAMP
9. WASHER, MOUNTING
10. NUT, MOUNTING

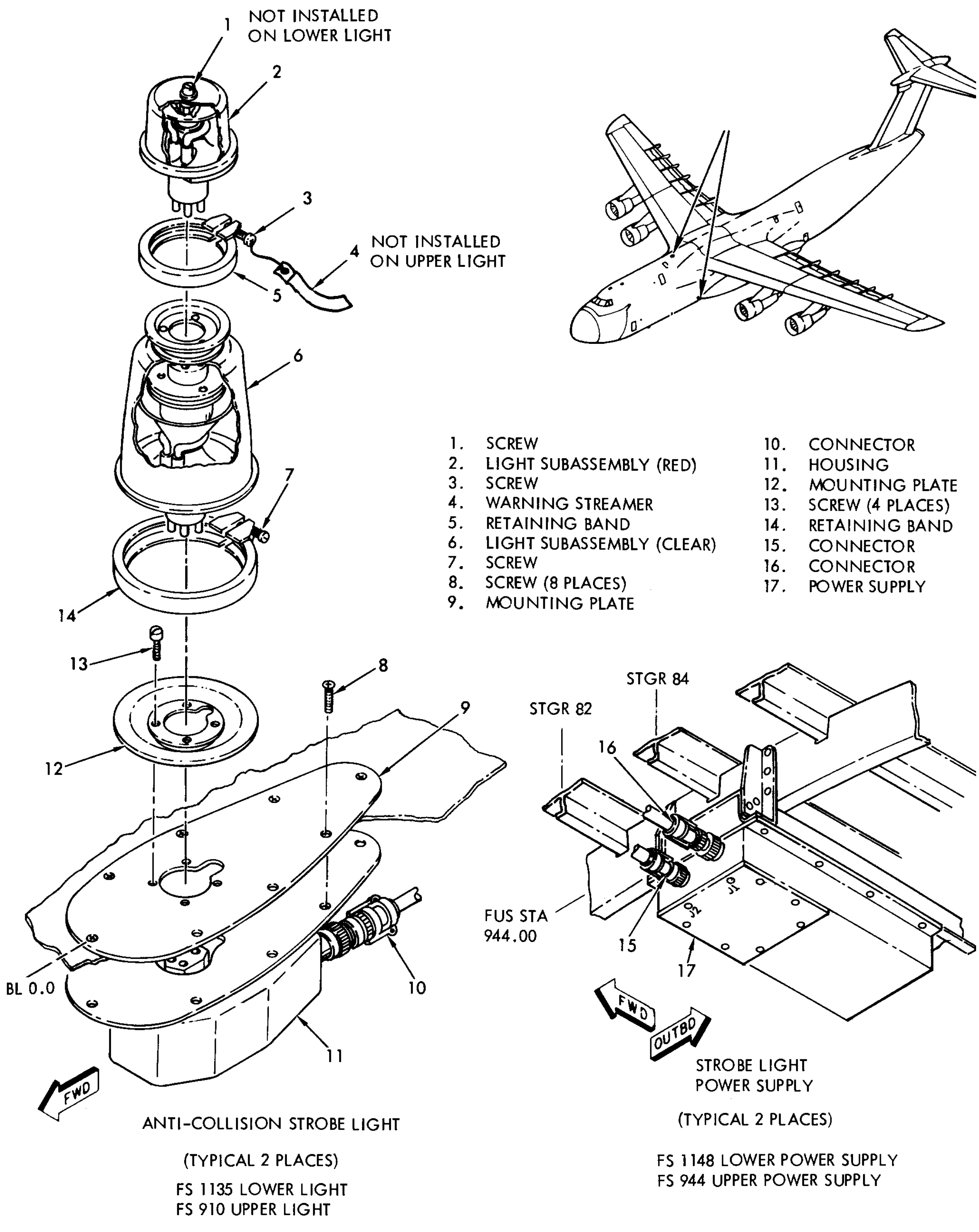
Nose landing gear landing/taxi light assembly



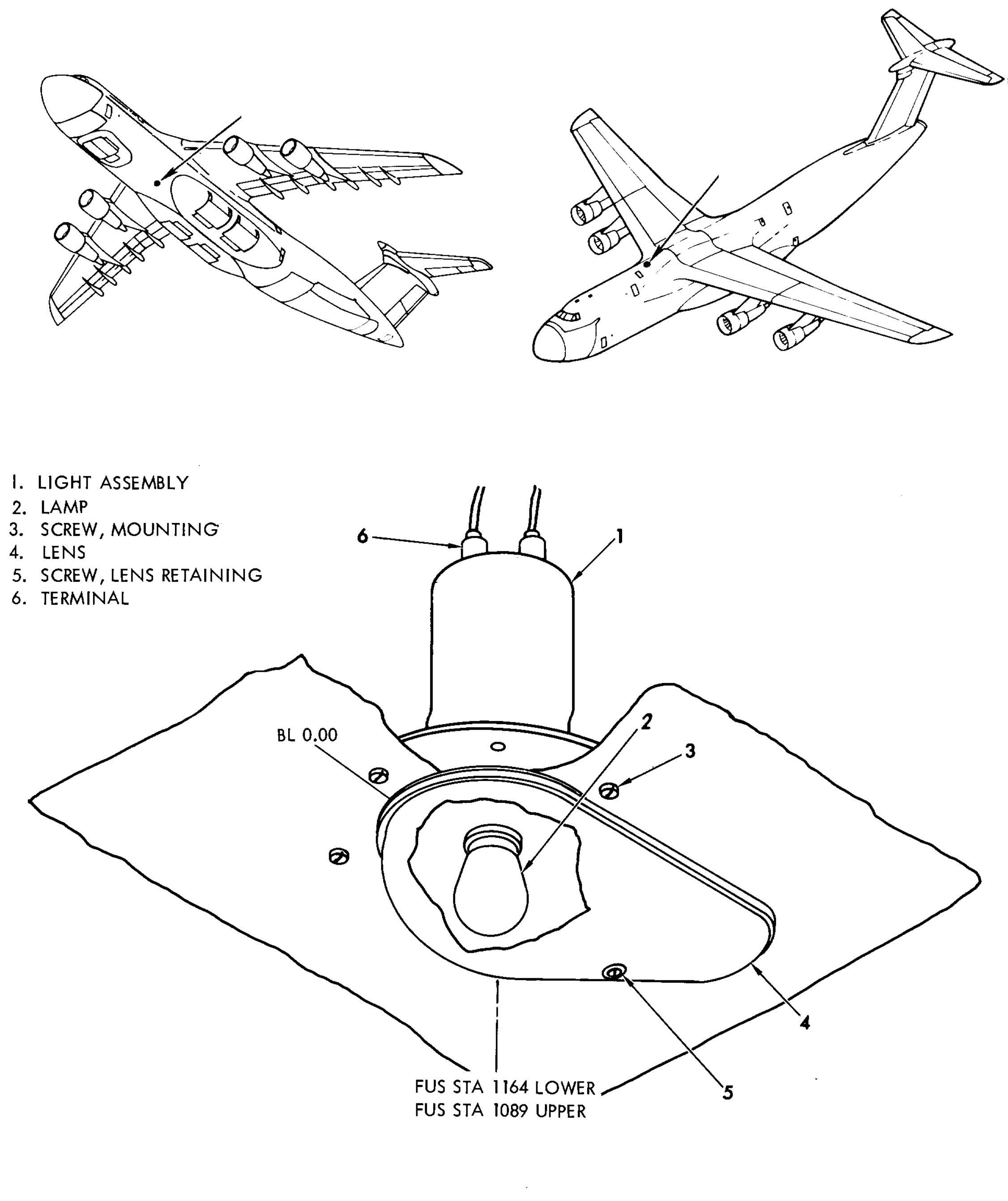
Main landing gear taxi light assemblies



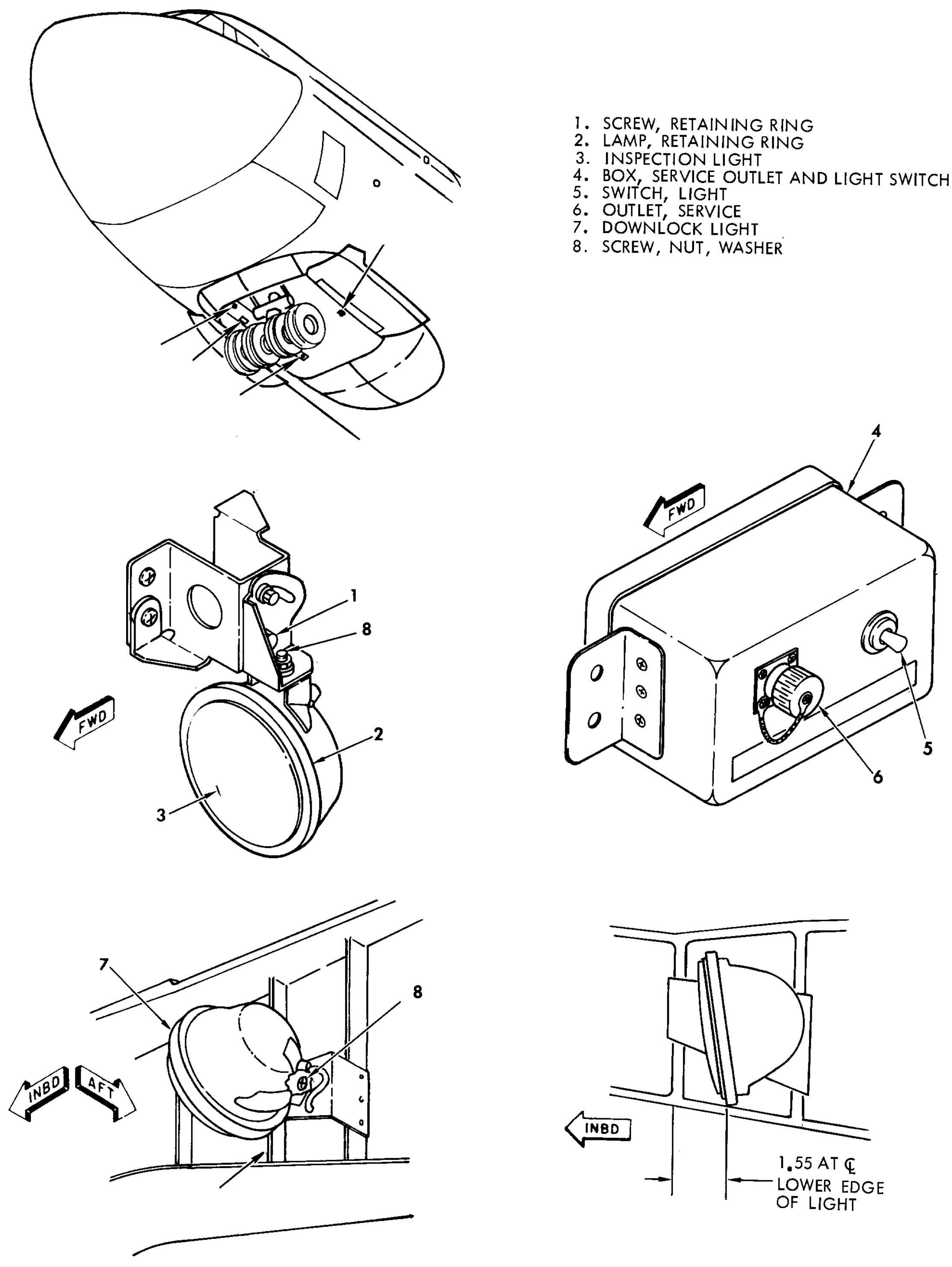
Main landing gear inspection lights



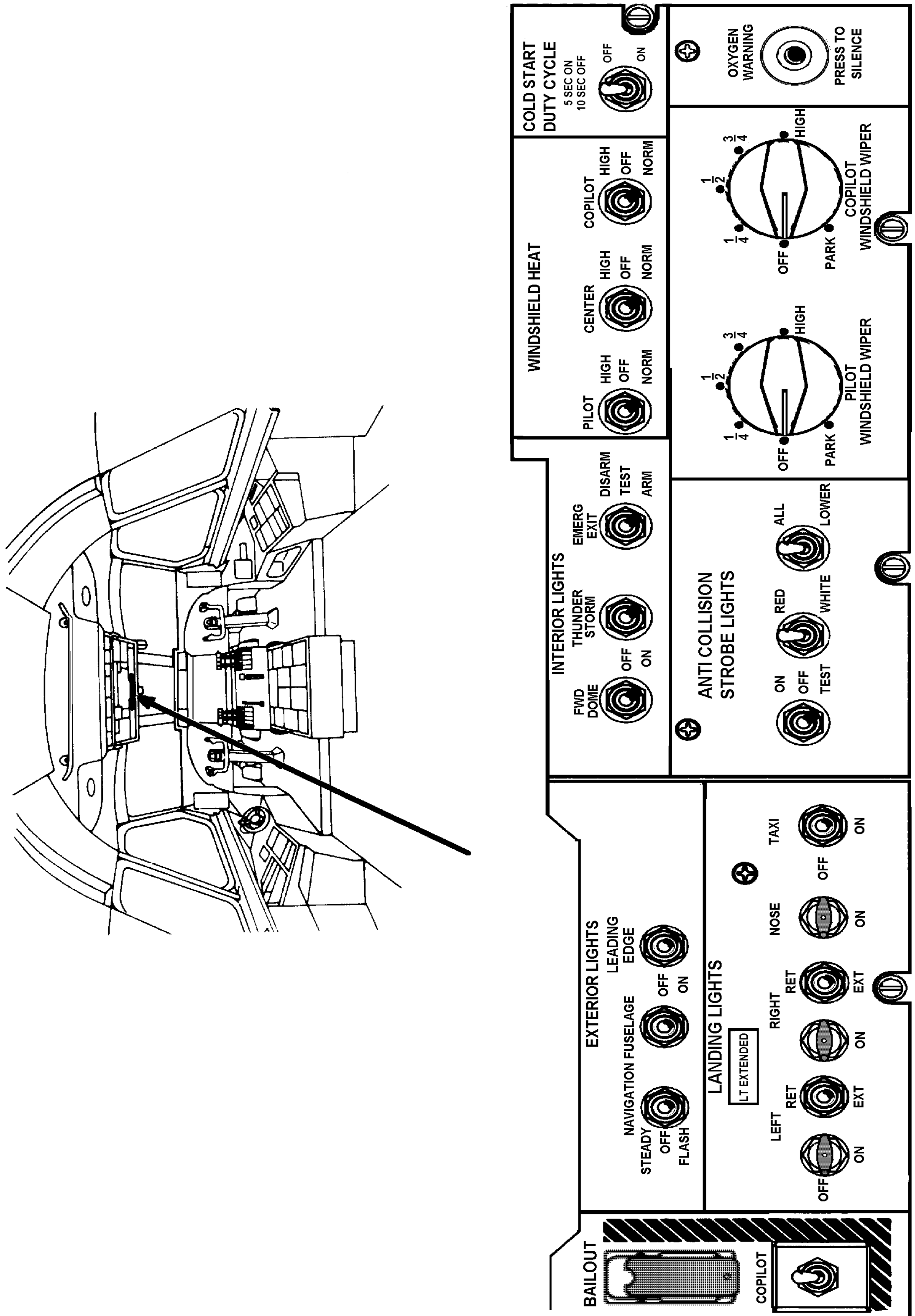
Typical strobe/anti-collision light assembly



Typical fuselage light assembly



Nose landing gear inspection lights and downlock light



Pilot’s exterior lighting control panel

Interior Lighting System

The interior lighting system consists of several individual systems which provide general and special illumination of the cargo, troop, and crew compartment dome lighting, flood and instrument lighting at flight station areas, utility, caution, and advisory lights, entrance and service area lights, and emergency exit lights at troop jump and entrance doors.

Flight Station Lighting

The flight station lighting system includes pilot's and copilot's, navigator's, and flight engineer's station area general illumination lighting.

Instrument and Panel Lighting

The instrument panel lighting system consists of the main instrument panel, overhead panel, navigator's panel and flight engineer's panel lighting. The panels are illuminated with white lights and the intensity of the lights is controlled by an individual dimming control located at each station. Above the main instrument panel is installed a glare shield to prevent undesirable reflections. Special provisions are made for the pilot and copilot to independently adjust the lighting intensity of selected functions on the ADI's (HDG, G/A, and ILS symbols). The controls for these functions are the DIM/BRT eight position wafer switches, which are located on the Flight Station Aft Overhead Lighting Control Panel.

Dome Lighting

There are five dome light fixtures in the flight station; one ON-OFF switch controls the three forward dome lights and one dimming autotransformer controls all five lights. These lights provide illumination of the flight station area. The lights are installed overhead above the pilot's station, above the copilot's station, above the observer's station, and near the flight engineer's and navigator's station.

Flood Lighting

There are 41, 28 VAC floodlights and eight variable autotransformer controls. These lights provided secondary illumination of the primary instrument panels, overhead panel, center console, and the navigator's and engineer's work station panel. The system also operates as part of the thunderstorm lighting system.

Thunderstorm Lighting

The thunderstorm lighting system provides a maximum level of light on the main instrument panel. The thunderstorm lighting consists of a switch and 23 relays. With the switch in the ON position, the flight station dome and caution lights are activated to full intensity, overriding all other dimming controls. The ON-OFF switch is located on the forward overhead panel.

Work Table Lighting

There are three lights for the flight engineer's work table and five lights for the navigator's work table. These lights provide illumination for the flight engineer's and navigator's work table.

Utility Lighting

There is a utility light installed at each of the pilot's, copilot's, navigator's and flight engineer's stations. The utility lights provide a flexible lighting system to augment the other lighting systems used at the flight station. A red or white light in either a spotlight or floodlight is available to suit the operator's needs. Each light assembly can be dimmed from full BRT (bright) to OFF by means of a dimming control. This control is an integral part of the light assembly.

Circuit Breaker Panel Lighting

The circuit breaker panel lighting system consists of individual clear lights recessed within the panel nomenclature and are controlled by a dimming rheostat. Turning the dimming control on the panel from OFF to BRT increases the intensity of the light in the panels.

Passenger and Crew Information Lights

Information lights, to indicate **no smoking,** and **seat-belt fastened** requirements are provided throughout the airplane. The information system is controlled by a switch on the pilot's aft overhead panel.

Indicator Light Test

The indicator light test system provides a means of testing the indicator lights. The test system is controlled by four circuit breakers on the flight engineer's panel and test switch on the navigator's panel, and flight engineer's panel, and copilot's main three instrument panels.

Cargo Compartment Lighting

There are 164 overhead light assemblies mounted in longitudinal rows. Eighteen of these are red lighting fixtures (nine on each side) used for night paratroop jump operations. These lights are controlled by ON/OFF switches located on the loadmaster's panels.

Crew Rest Area Lighting

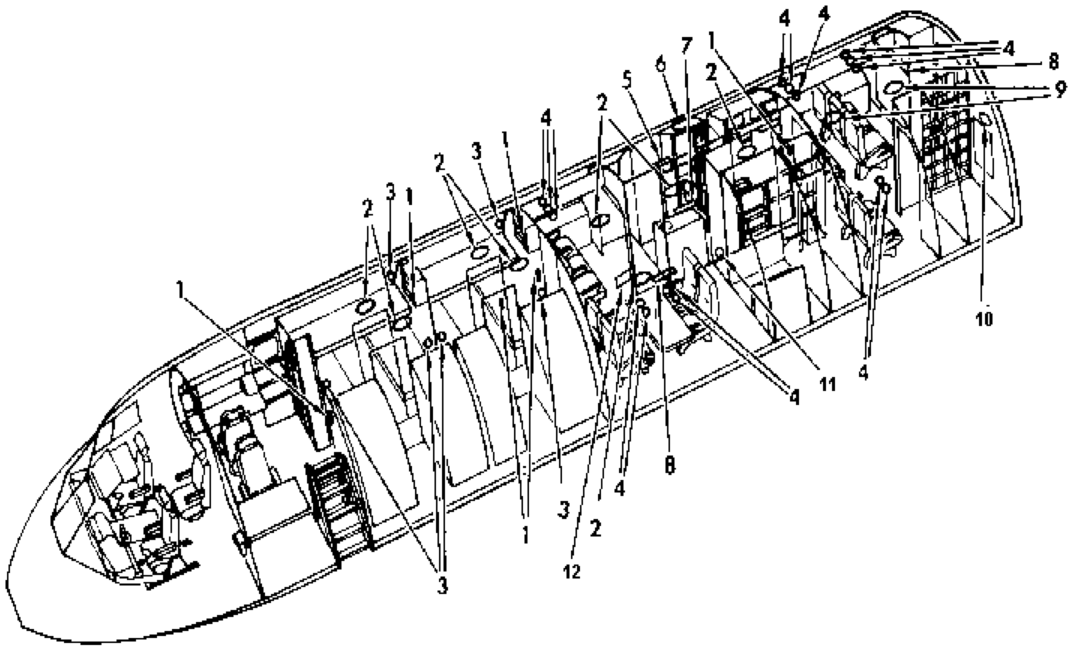
There are 10 dome lights, 21 reading lights, two lavatory lights, and one service door floodlight in the crew rest area. These lights provide general and aisle illumination.

Troop Compartment Lighting

The troop compartment lighting system consists of six dome lights and one stairwell access light in the main troop compartment, and one light in each lavatory. The troop compartment dome lights are controlled by a circuit breaker and dimming rheostat on the troop compartment and lighting control panel. The light intensity can be adjusted from OFF to full BRT by using the dimming control. The stairwell access light is controlled by a circuit breaker on the aft loadmaster control panel.

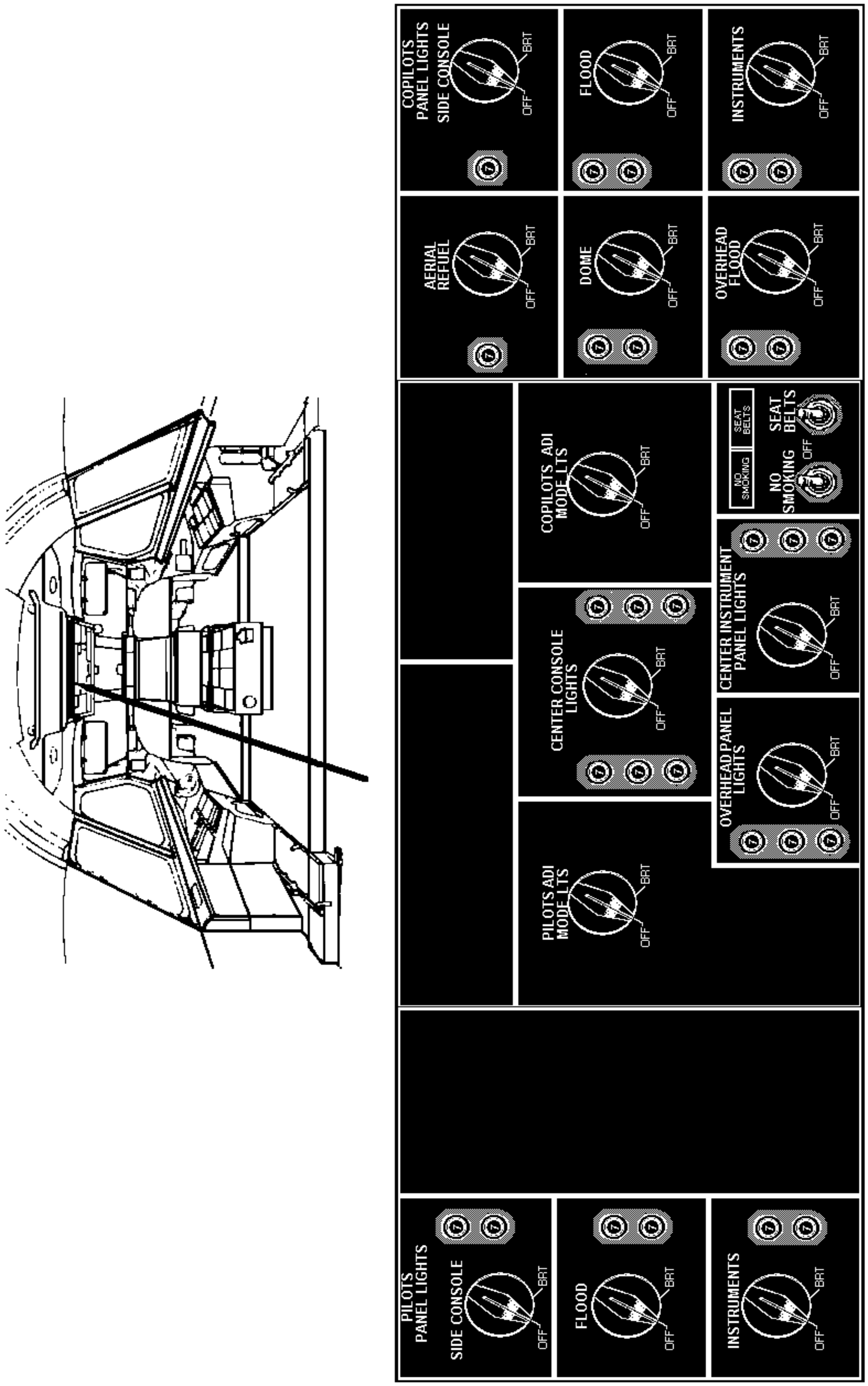
Emergency Exit Lighting

Emergency exit lights are installed adjacent to each emergency exit, each crew door, and each personnel door. The lights operate automatically when the airplane is subjected to excessive shock or when the electrical system is de-energized. The emergency lights are controlled by an ARM-TEST-DISARM switch on the forward overhead panel.

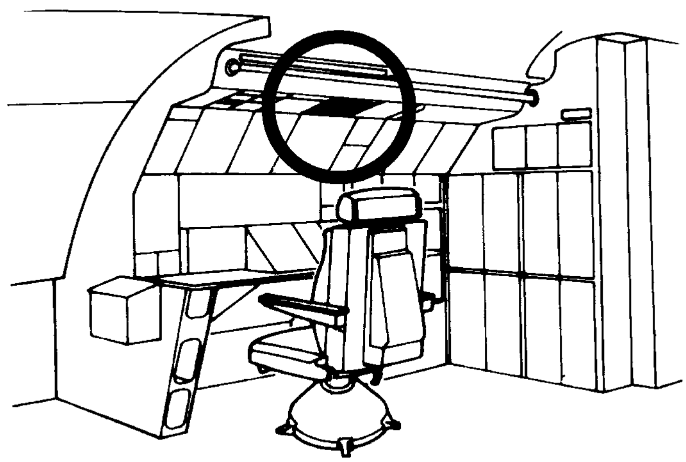


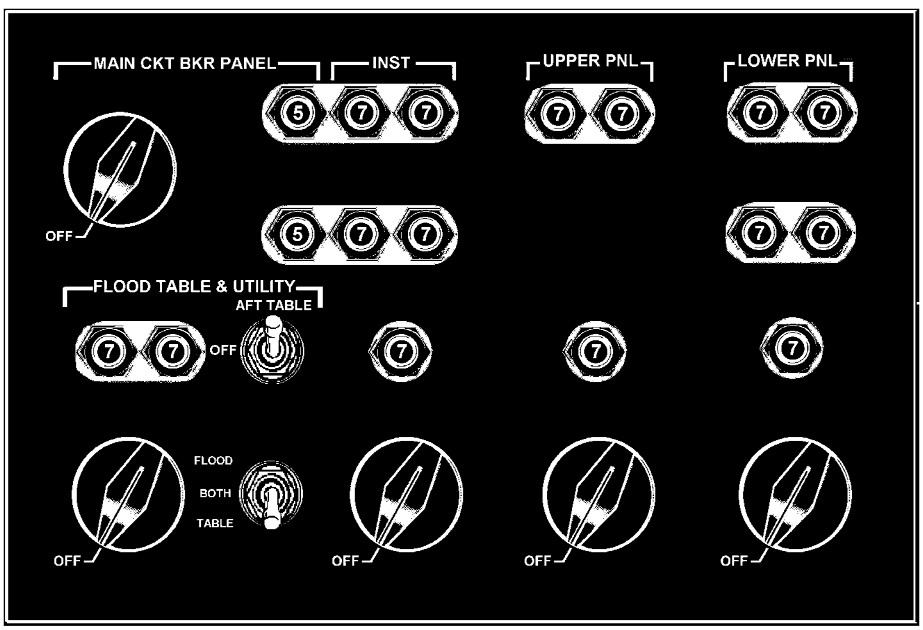
1. LIGHT SWITCH
2. DOME LIGHT CREW REST COMPARTMENT
   (TYPICAL 8 PLACES)
3. READING LIGHTS BUNK AREA (TYPICAL 6 PLACES)
4. READING LIGHTS SEATS (TYPICAL 15 PLACES)
5. LAVATORY LIGHT
6. DOME LIGHT LAVITORY
7. "RETURN TO SEAT" ADVISORY LIGHT (TYPICAL 2 PLACES)
8. "NO SMOKING-FASTEN SEAT BELT "ADVISORY SIGNS
9. DOME LIGHT TROOP COURIER COMPARTMENT (TYPICAL 2 PLACES)
10. BAGGAGE FLOOD LIGHT
11. SERVICE DOOR LIGHT
12. "NO SMOKING-FASTEN SEAT BELT"ADVISORY CHIME

Flight station interior lighting system component locations

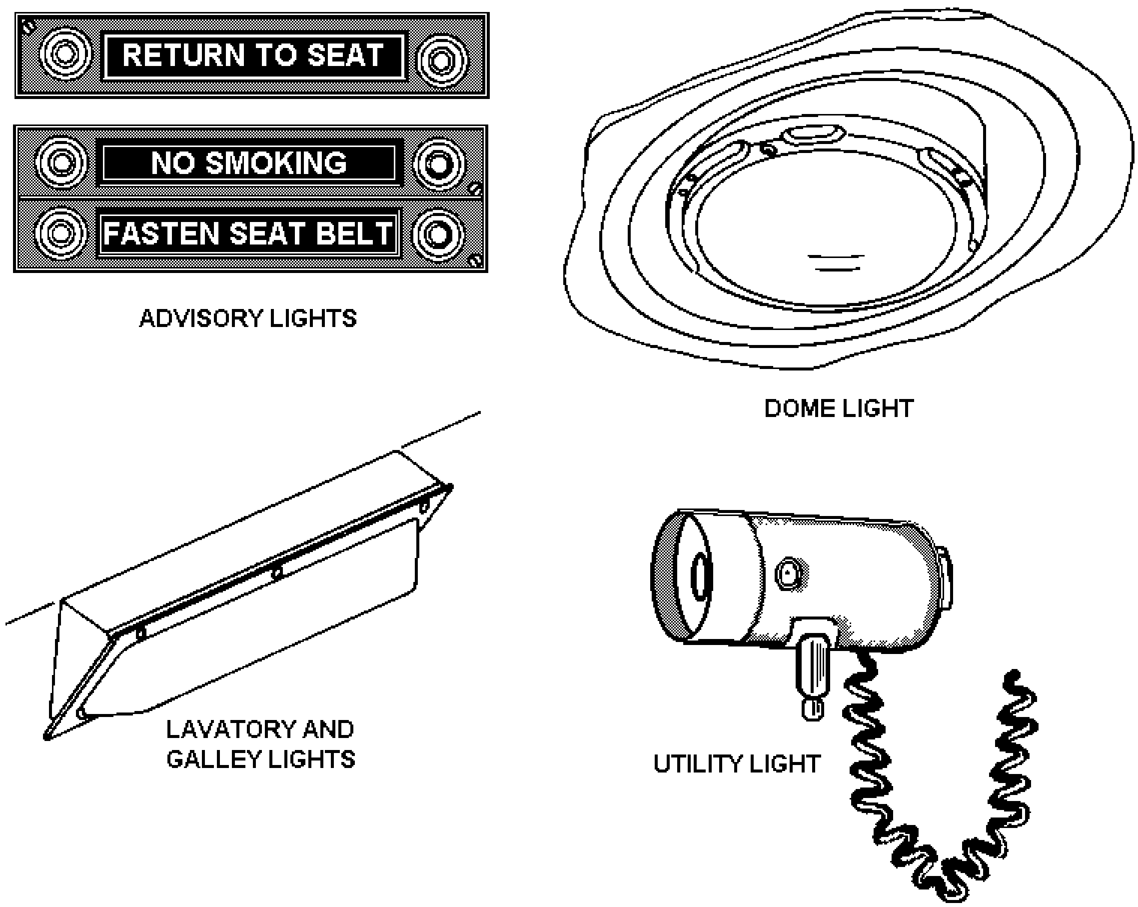


Pilot’s overhead interior lighting system control panel

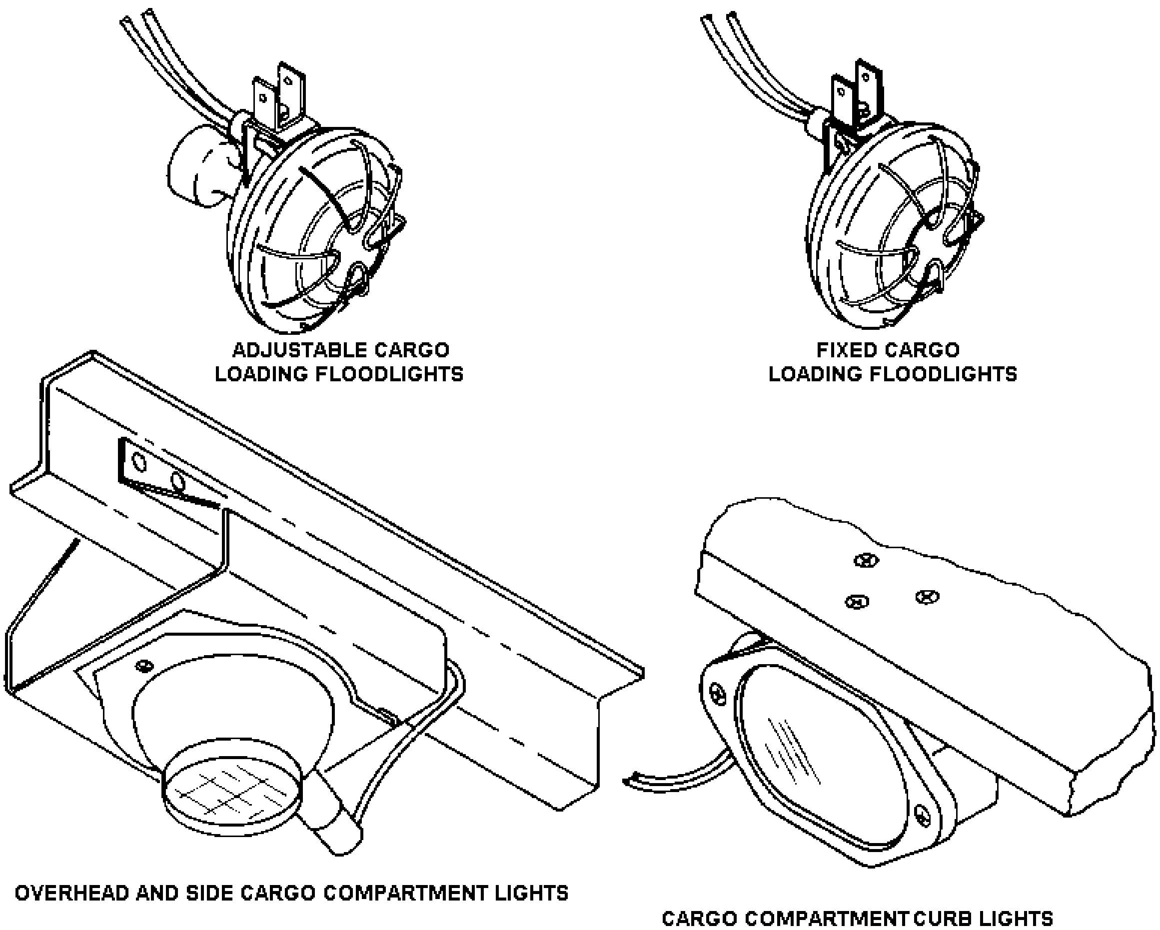

FLIGHT ENGINEERS STATION



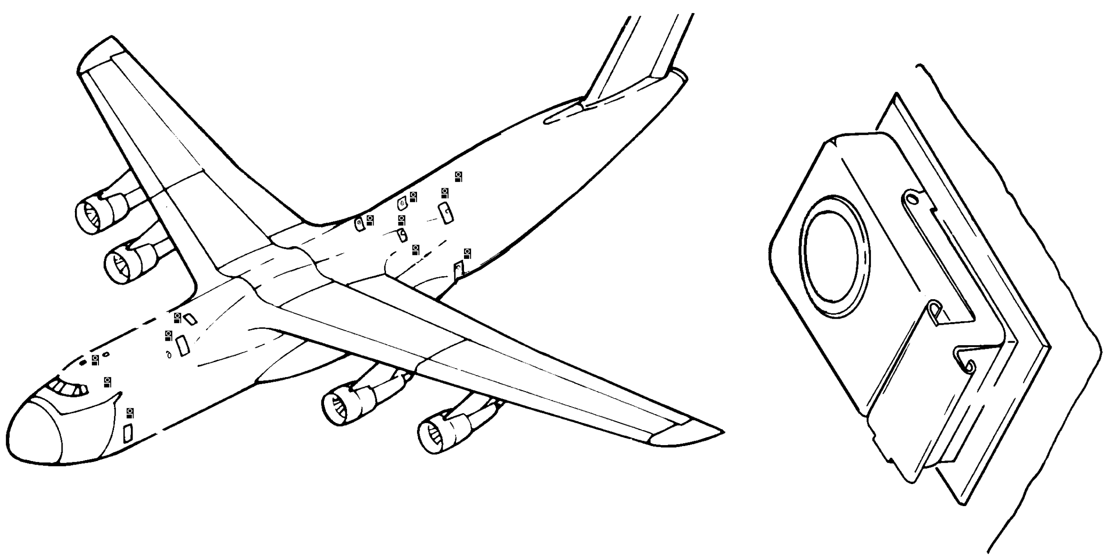
Flight engineer’s station lighting control panel



Typical interior light assemblies



Typical cargo compartment light assemblies



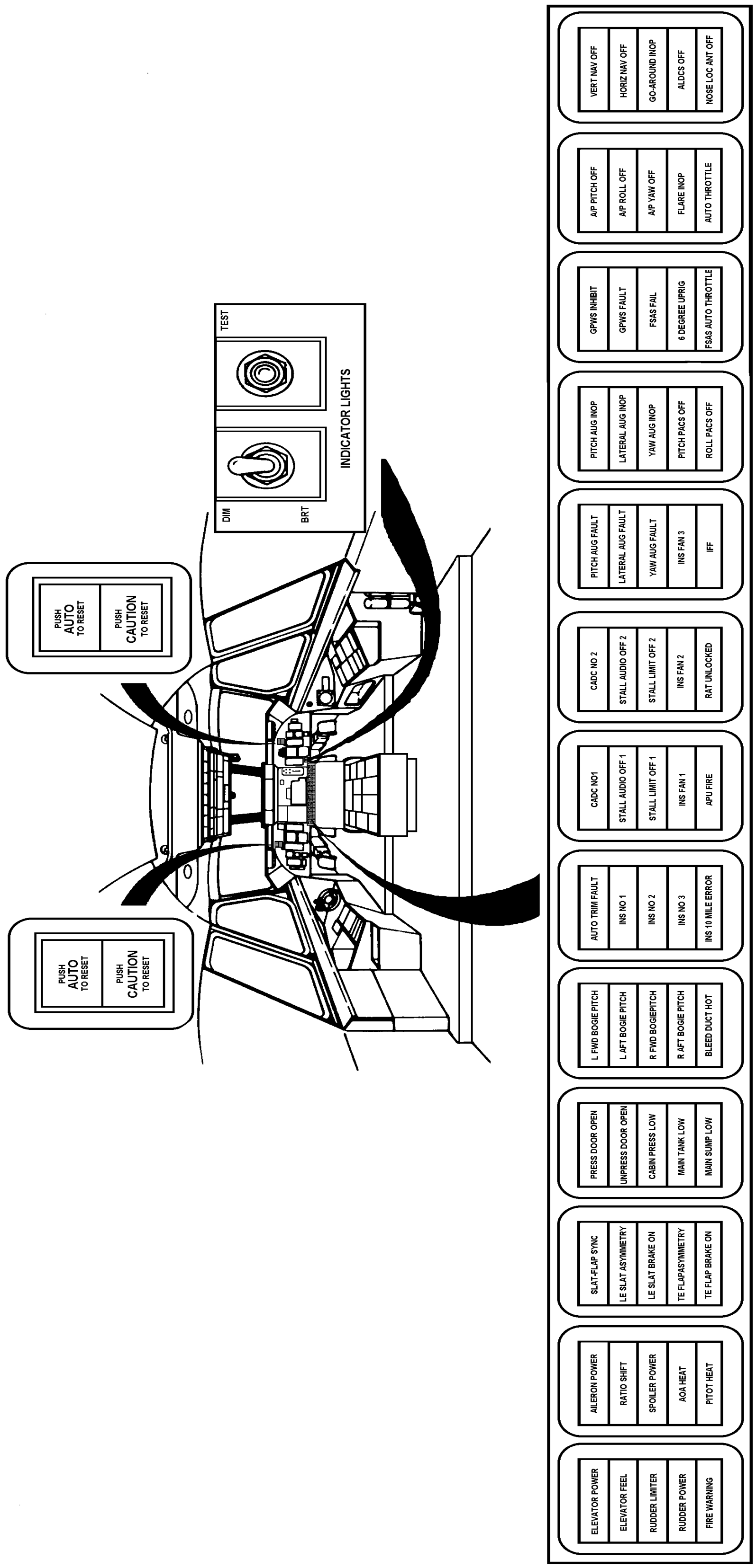
Emergency exit light locations

Master Caution System

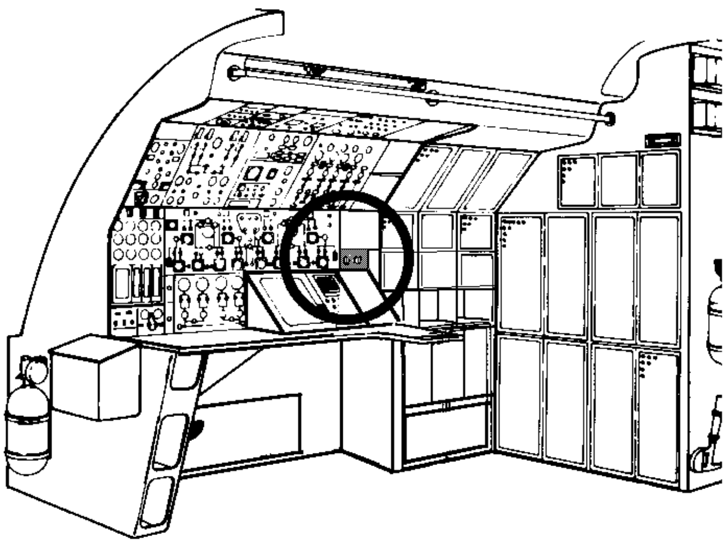
The master caution system shows the pilot or copilot that a particular system or event is or is not functioning properly. This is accomplished by using 13 banks of annunciator lights to indicate the specific events monitored by means of an illuminated legend plate. The annunciator lights due to size and quantity, must be located out of the normal line of vision of the pilot and copilot. Therefore, a master CAUTION light is provided for the pilot and copilot, mounted as close to the normal line of vision as possible. The lights illuminate bold letters reading CAUTION or AUTO in a dual light assembly. They are used to monitor the annunciator lights and to show the pilot when a fault has occurred. When a fault occurs, both the specific CAUTION light on the annunciator panel and the master CAUTION lights go on. The CAUTION lights illuminate for critical systems and the AUTO lights illuminate for autopilot systems.

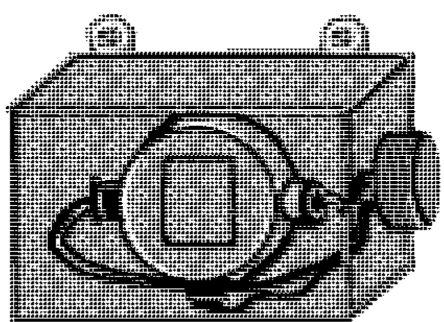
Smoke Detection

The smoke detection system consists of six smoke detector assemblies, a control amplifier, a test selector and control panel assembly, and panel lights and associated wiring.

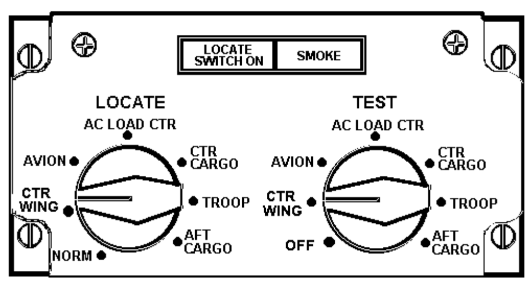


Master caution system light assemblies





TYPICAL SMOKE DETECTOR



SMOKE DETECTION CONTROL PANEL

Typical smoke detector and control panel

BLANK

BLANK

RADIO, COMMUNICATIONS, AND NAVIGATION

Public Address (PA) and Interphone Systems

PA System

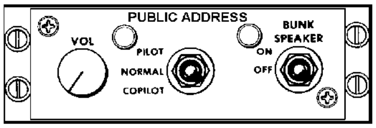
The PA system provides crew contact with the cargo compartment, bunk and relief crew areas, and loading areas adjacent to the airplane.

Interphone System

The interphone system provides the capability for communications between the various stations in the airplane and ground maintenance personnel, and provides for remote control of the cargo loading winch. The system also provides the necessary switching and mixing controls for interfacing with the radio communications and navigation systems.

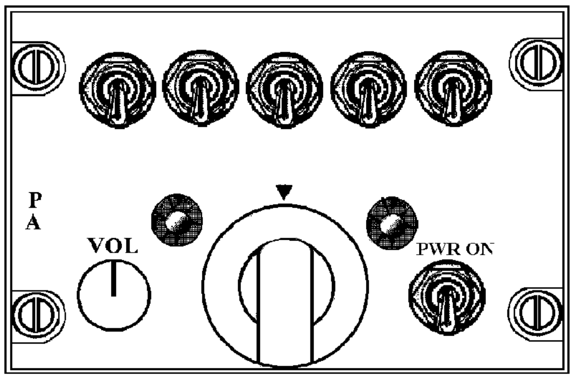
Flight Station Interphone

Interphone equipment at the flight station includes the interphone control panels, monitor panels, and associated microphones, headsets, controls switches, and speakers. There are two fire fighters oxygen masks stowed in containers for use by the pilot and copilot during fire emergencies. These masks contain headsets and microphones which provide communications when connected to the interphone control panel cord assemblies.

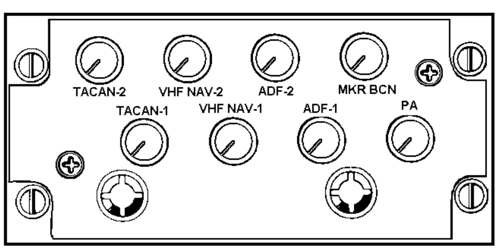


PUBLIC ADDRESS CONTROL PANEL

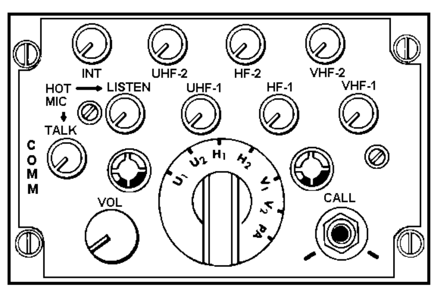
PUBLIC ADDRESS BUNK SPEAKER CONTROL PANEL



PA CONTROL PANEL



MONITOR PANEL



INTERPHONE CONTROL PANEL

Public address and interphone system control panels

HF/SSB-High Frequency Single Side Band Radio

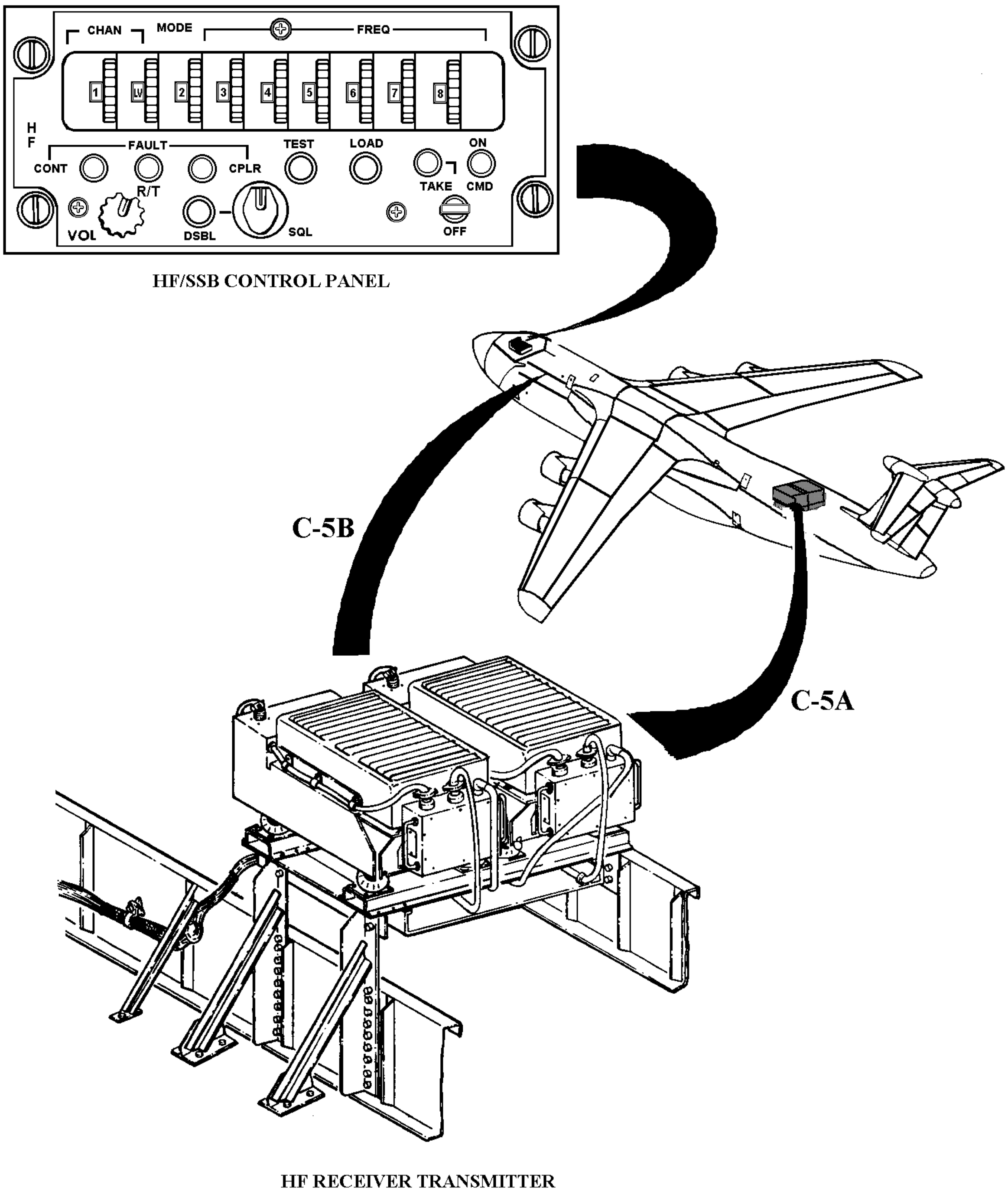
Two AN/ARC-190 HF radio systems, HF No. 1 and HF No. 2 receive and transmit on any one of 280,000 manually selected frequency channels spaced at 100 Hz increments, or any one of 30 preset frequency channels in the HF band (2.0000 to 29.9999 MHz). Modes of operation include upper sideband, lower sideband, amplitude modulation equivalent, continuous wave, and data upper side-band and data lower sideband. Each system consists of a control panel, receiver-transmitter and antenna coupler. The antenna, located in the lower leading edge of the vertical stabilizer is common to both systems. Each system operates from 115 VAC 400 Hz three-phase power and 28 VDC through circuit breakers located on the navigator's circuit breaker panels. HF No. 1 circuit breakers are located on navigator circuit breaker panel No. 1 and HF No. 2 circuit breakers are located on navigator circuit breaker panel No. 2. Reception and transmission on both HF radio systems are routed through the intercommunication system to enable communication on either system from flight crew positions.

Antenna Coupler

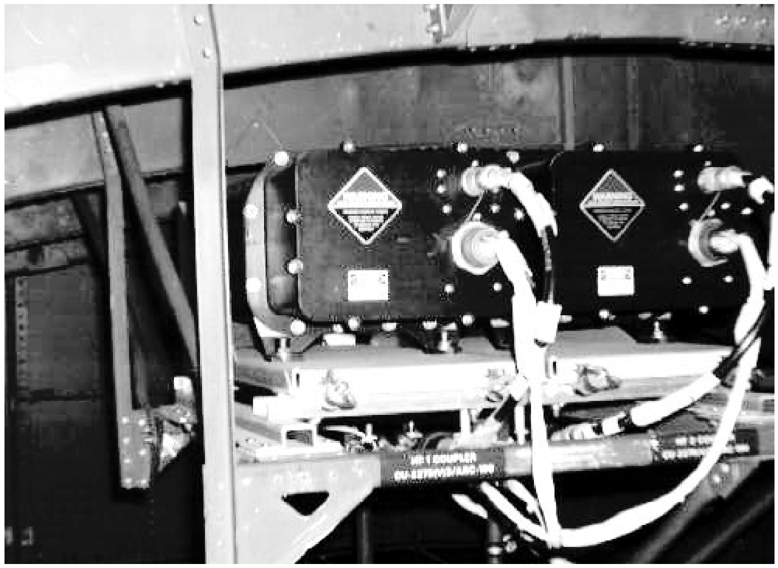
An antenna coupler is provided for each HF radio system. Each coupler consists of a pressurized tuner assembly and a sealed control compartment. The tuner assembly is pressurized to prevent high altitude high-voltage arcing, prevent corrosive materials from entering the assembly and provides a cooling medium. The antenna couplers are digitally tuned, processor-controlled devices that match the impedance of the antenna to that of the selected receiver-transmitter to provide maximum power transfer from the receiver-transmitter to the antenna. The digital impedance matching network consists of fixed coils and capacitors that are switched by high voltage vacuum relays. The couplers are mounted on a supporting rack located in the upper aft compartment below the vertical stabilizer.

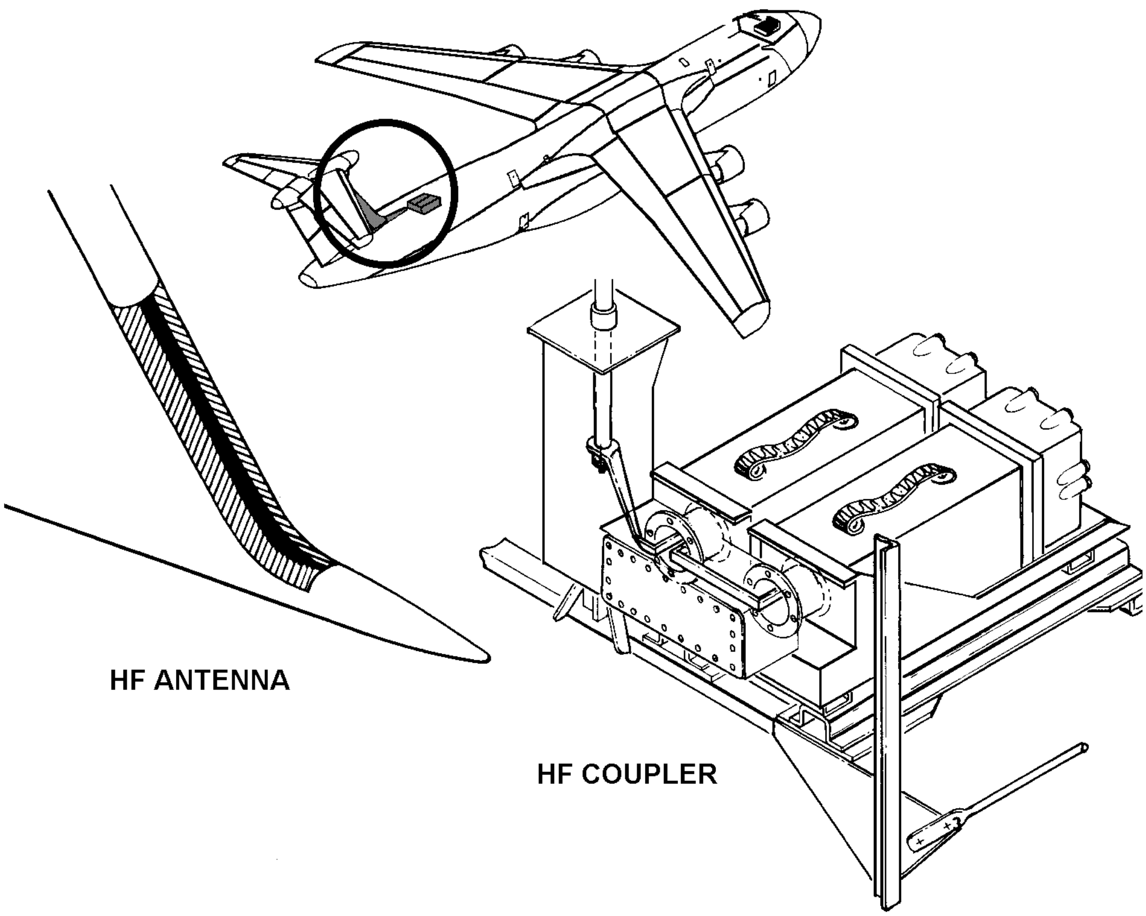
HF/SSB Radio Secure-Voice

Provisions for two identical HF/SSB radio secure voice systems are installed in the airplane. Each system, when installed, is used with an HF radio. The No. 1 system is used with the pilot's No. 1 HF radio, and the No. 2 system is used with the copilot's No. 2 HF radio. Controls are located on the overhead console and on the pilot's and copilot's side consoles.



HF/SSB receiver transmitters and control panel locations





HF radio system antenna and coupler locations

UHF-Ultra High Frequency/VHF-Very High Frequency Radio

Dual VHF radio systems are used for line-of-sight radio-telephone communication. Communication range will vary with altitude. As the altitude of the airplane increases, the line-of-sight range increases The systems provide two-way AM (amplitude modulation) double-sideband transmission and reception.

The antenna for the VHF No. 1 system is located on the visor door. The antenna for VHF No. 2 system is located on the top of the fuselage.

UHF Radio System

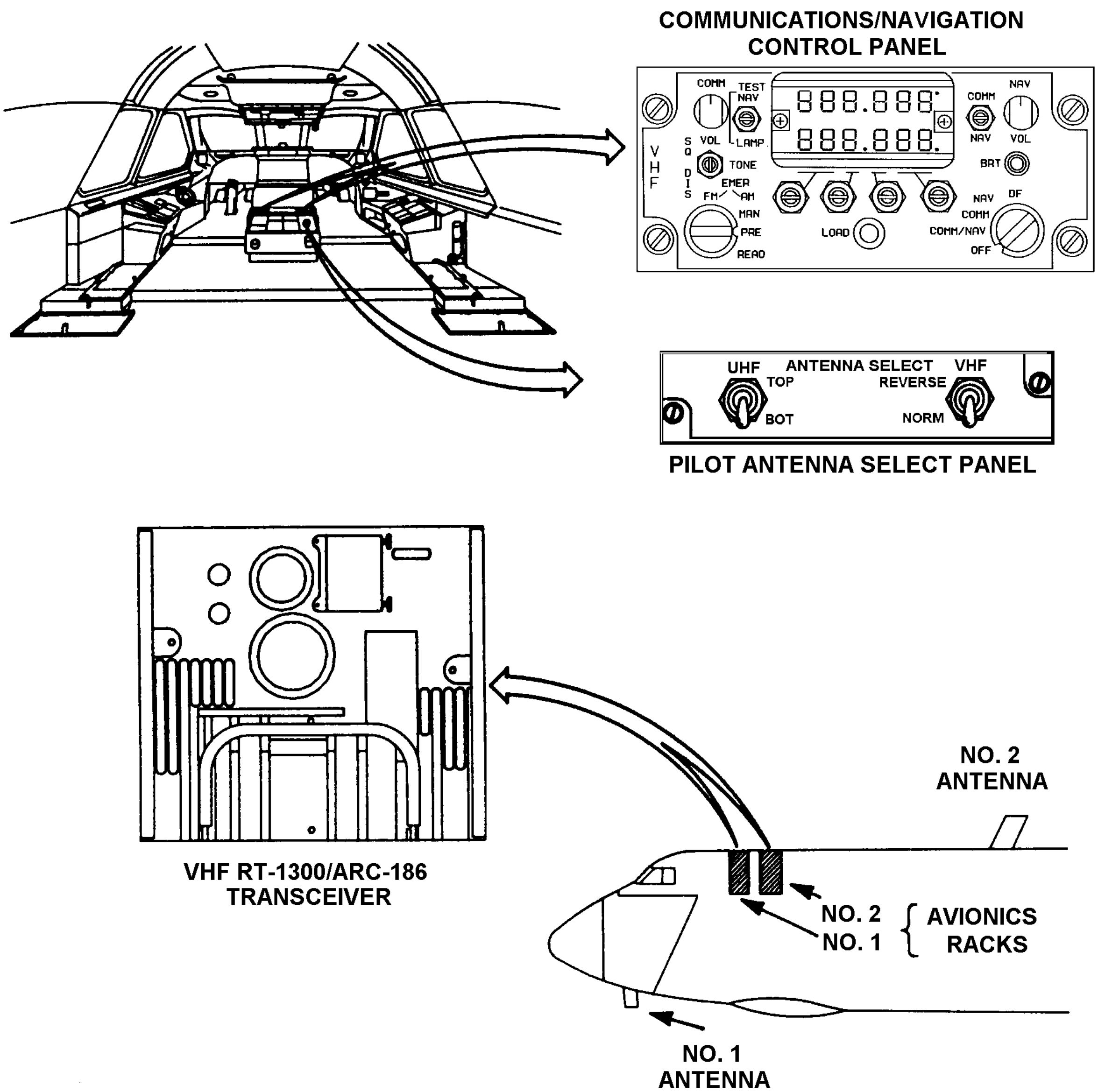
Dual UHF radio systems are used for line-of-sight, radio-telephone communication. The systems are designated UHF No. 1 and UHF No. 2. Communication range varies with altitude. As the altitude of the airplane increases, the line-of-sight range increases. The systems provide two-way, AM (amplitude modulation), double-side-band transmission and reception. The Have Quick UHF radio system has a frequency hopping capability. Frequency hopping is a technique where the frequency being used for communication is rapidly changed many times per second. The frequency hopping is implemented by storing a pattern of the frequencies to be used for a given day within every Have Quick UHF radio and utilizing this pattern according to the time of day. Because the frequency used at a particular instant depends on the precise time of day, both UHF radios of a Have Quick communication link must have clocks, and these clocks must be synchronized. The Universal Coordinated Time (UCT) has been adopted for the Have Quick UHF radio time.

UHF and VHF Radio Secure Voice

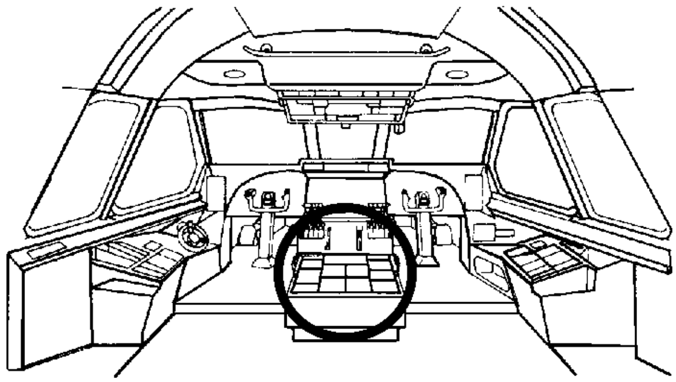
Provisions for two identical UHF radio secure voice systems and two identical VHF radio secure voice systems are installed in the airplane. Each system is used with a UHF or VHF radio. The No. 1 UHF radio secure voice system is used with the (pilot’s) No. 1 UHF radio and the No. 2 UHF radio secure voice system is used with the (copilot’s) No. 2 UHF radio. The No. 1 VHF radio secure voice system is used with the (pilot’s) No. 1 VHF radio and the No. 2 VHF radio secure voice system is used with the (copilot’s) No. 2 VHF radio. Controls are located on the overhead console.

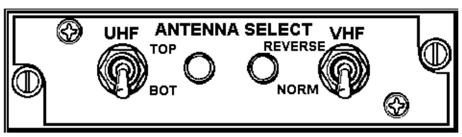
Static Discharger

Sixty-four static dischargers are located at various points along the trailing edges of the wings and empennage. The static dischargers help prevent avionics systems interference by dissipating accumulated static electricity into the atmosphere.

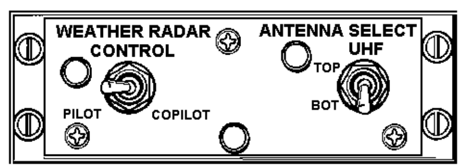


UHF/VHF radio communication components

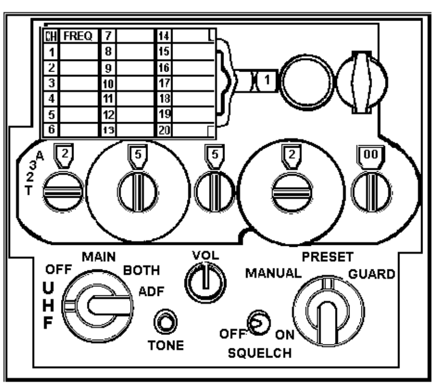




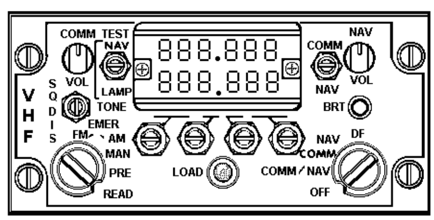
PILOT'S ANTENNA SELECION PANEL



COPILOT'S ANTENNA SELECT AND WEATHER RADAR CONTROL PANEL



UHF RADIO CONTROL PANEL



VHF/NAV CONTROL PANEL

UHF/VHF radio system control panels

CDPIR and Emergency Locator Systems

CDPIR System

The Crash Data Position Indicator Recorder (CDPIR) system (installed on C-5A models) is intended to minimize the time required to locate a downed airplane in the event of a crash and to provide a record of voice transmissions and selected airplane operational data. The recorded information is preserved on a magnetic tape. The recorder is contained in an airfoil that is separable from the airplane. The airfoil also contains a beacon transmitter that transmits on the international distress frequency of 243.0 MHz. Transmission is automatically initiated when the airfoil is separated from the airplane.

ELT System

The Emergency Locator Transmitter (ELT) (installed on C-5B models) serves the same purpose as the CDIPR. The system automatically and simultaneously transmits emergency distress signals on 121.5 and 243.0 MHz in the event of a crash or forced landing. The ELT control panel is located on the pilot's center console. The antenna is mounted on the top surface of the horizontal stabilizer and the transmitter is located within the aft bullet below the antenna. The transmitter is secured to a mount and plate. The control panel enables remote manual control and test of the transmitter.

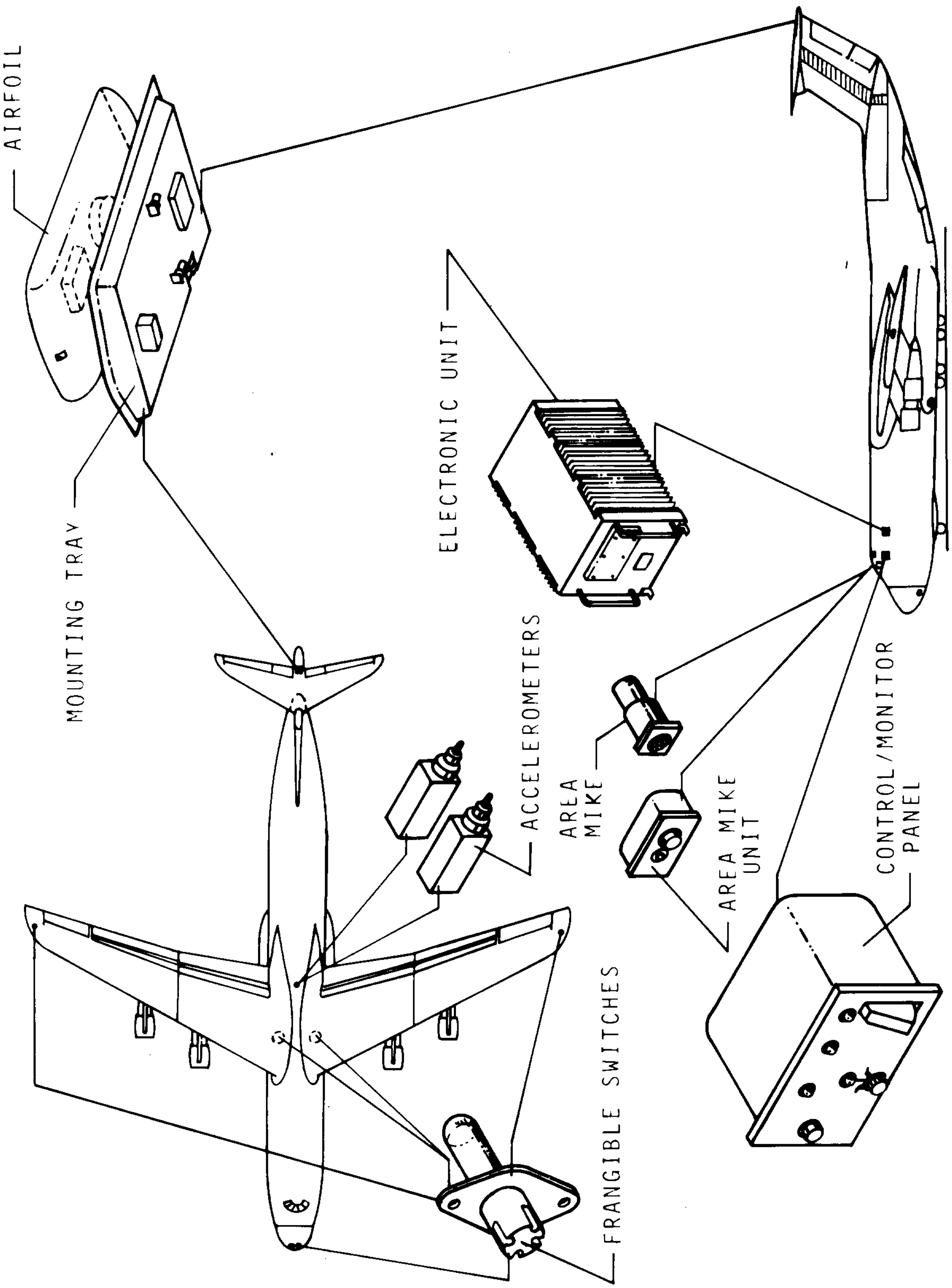
The crash force sensor is subjected to an impulse force of 5g (+ 2, -0) for a minimum of 11 milliseconds. Transmissions will continue for approximately 45 to 50 hours until the lithium battery pack in the transmitter is depleted. The emergency locator transmitter operates independently from the airplane electrical power except for the 28 VDC required to reset the transmitter. 28 VDC power is supplied from avionics DC bus No. 1 on navigator's circuit breaker panel No. 1. The battery used in the transmitter is a hermetically sealed lithium battery pack.

Cockpit Voice Recorder

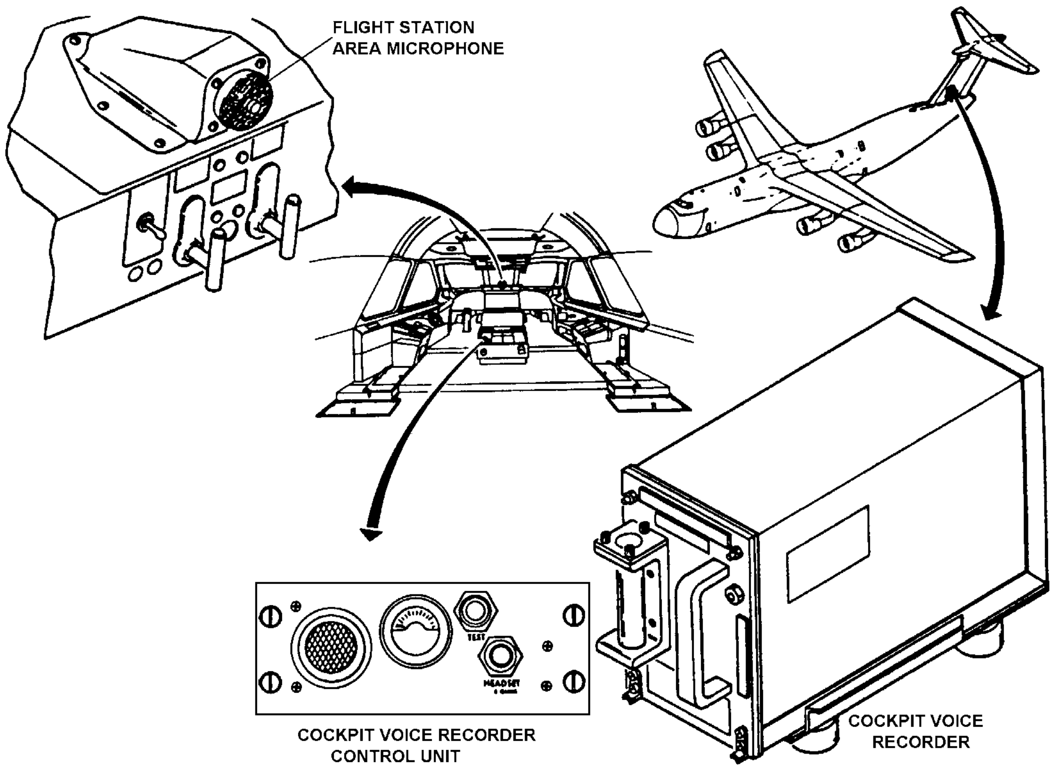
The cockpit voice recorder system is installed in the airplane to monitor and record audio from the flight station. The cockpit voice recorder control unit is located on the pilot's station center console. The flight station area microphone is located above the pilots' center instrument panel. The voice recorder is mounted within the vertical stabilizer on the left side.

Digital Flight Data Recorder

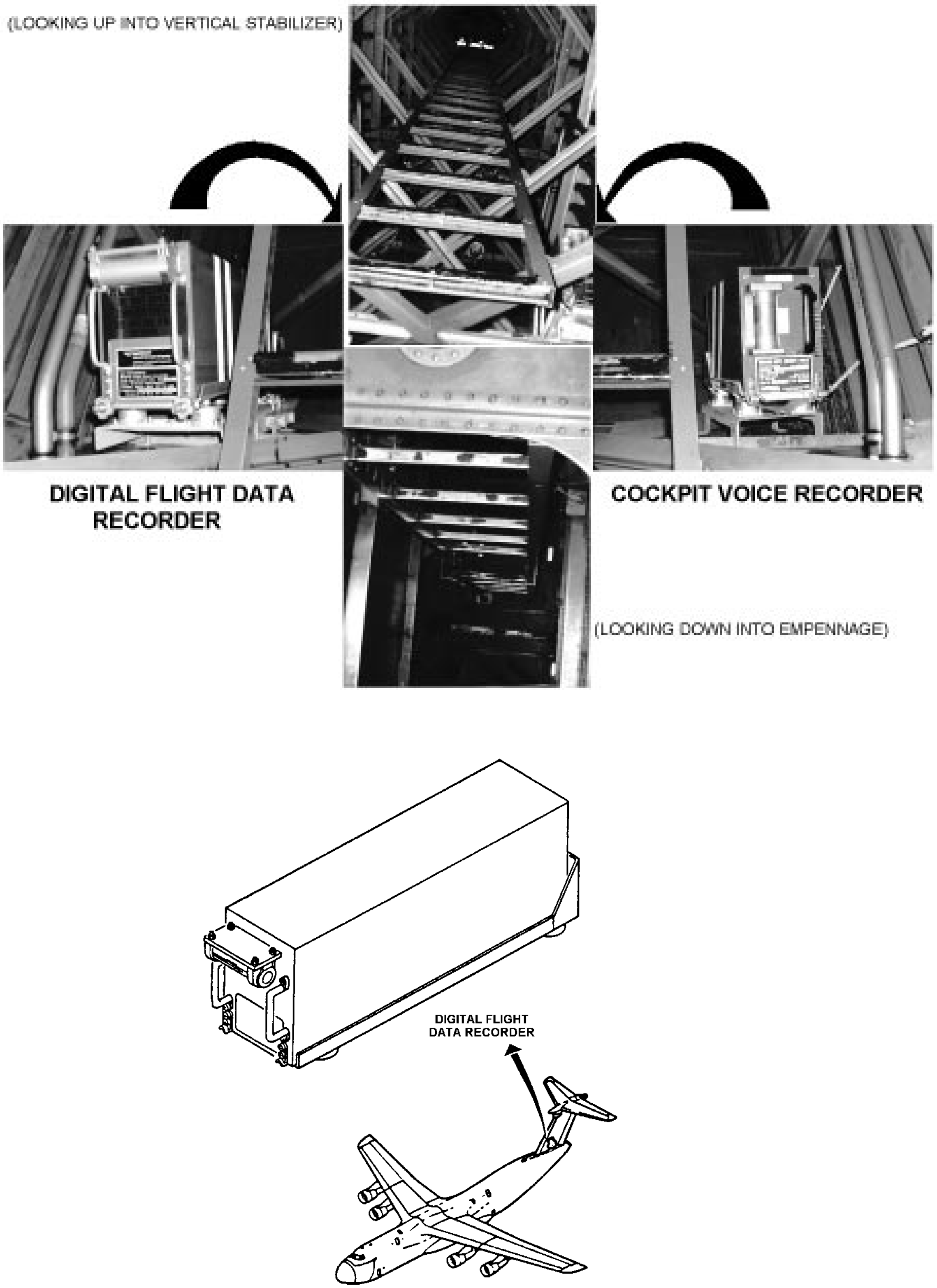
The digital flight data recorder (DFDR) records selected airplane parameters and time. The system consists of a single digital flight data recorder M18A which interfaces with the (MADARS) malfunction detection, analysis, and recording system via the MADARS multiplexer (MUX) processor ARINC 717 data bus. The shock-mounted recorder contains an externally mounted underwater locator beacon. The recorder is located in the vertical stabilizer on the right side. A test playback receptacle is installed in the cargo compartment, just forward of the aft personnel door, at fuselage station 1836, waterline 177.



Crash data position indicator recorder system components



Cockpit voice recorder system components



Digital flight data recorder and cockpit voice recorder

Radio Navigation Systems

VHF Navigation

Two complete VHF navigation systems are used to provide the capability for reception of VHF Omni-Range (VOR) signals, instrument landing system (ILS) signals, localizer (LOC) signals, and glideslope (GS) signals. In addition, the No. 1 system performs the functions of a marker beacon (MB) receiver. The AN/ARN-147 and AN/ ARN-127 are solid-state VHF navigation systems consisting of a remote receiver, a receiver control, and the associated VOR/ILS, GS, and MB antennas. Three independent receivers within the navigation receiver unit are integrated to provide for reception of 200 VOR/LOC channels,40 GS channels, and MB. Audio outputs are provided for station identification and voice reception. The system furnishes relative bearing to the horizontal situation indicators (HSI) and the bearing distance heading indicator(BDHI) of the pilot and copilot. It furnishes guidance information to the flight director, and when activated, operates the marker beacon indicator lamps on the pilot's and copilot's main instrument panel. It also furnishes course, glideslope, and flag information to the HSI and attitude director indicator ADI.

Control Panel

Two dual VHF-Comm/Nav control panels are installed on the center console. The control panel displays will show frequency and/or comm channel number. The top display is for the VHF communication system and the bottom one is for the VHF navigation system. The rest of the system controls consist of the following switches: a COMM/NAV function selector switch, a NAV VOL control, a NAV TEST/LAMP test switch, four slewing switches, a COMM/NAV slew enable switch, and a display brightness control.

VHF/NAV Antenna

The two DMN4-28 VHF navigation antennas are installed in the upper half of the vertical stabilizer. Both VHF navigation systems are connected to the antennas by means of a tee adapter. Both systems can be operated simultaneously on the same or different frequencies with this one antenna.

Glideslope Antenna

The Collins 528-0688-063 glideslope antenna is installed inside the nose radome on the lower bulkhead. This single antenna is used for both glideslope receivers.

Marker Beacon Antenna

The DMN27-IA marker beacon antenna is mounted at FS 934 on the bottom of the airplane fuselage. Vertical antenna patterns permit MB reception in a cone about 150 degrees wide in pitch and 100 degrees wide in roll. There is an approximate 15-degree null directly below the antenna so that a cone of silence exists as the airplane passes directly over the ground station.

Localizer Antenna

The DMN4-20 localizer antenna is mounted on the radome plug at FS 281, WL approximately 294.

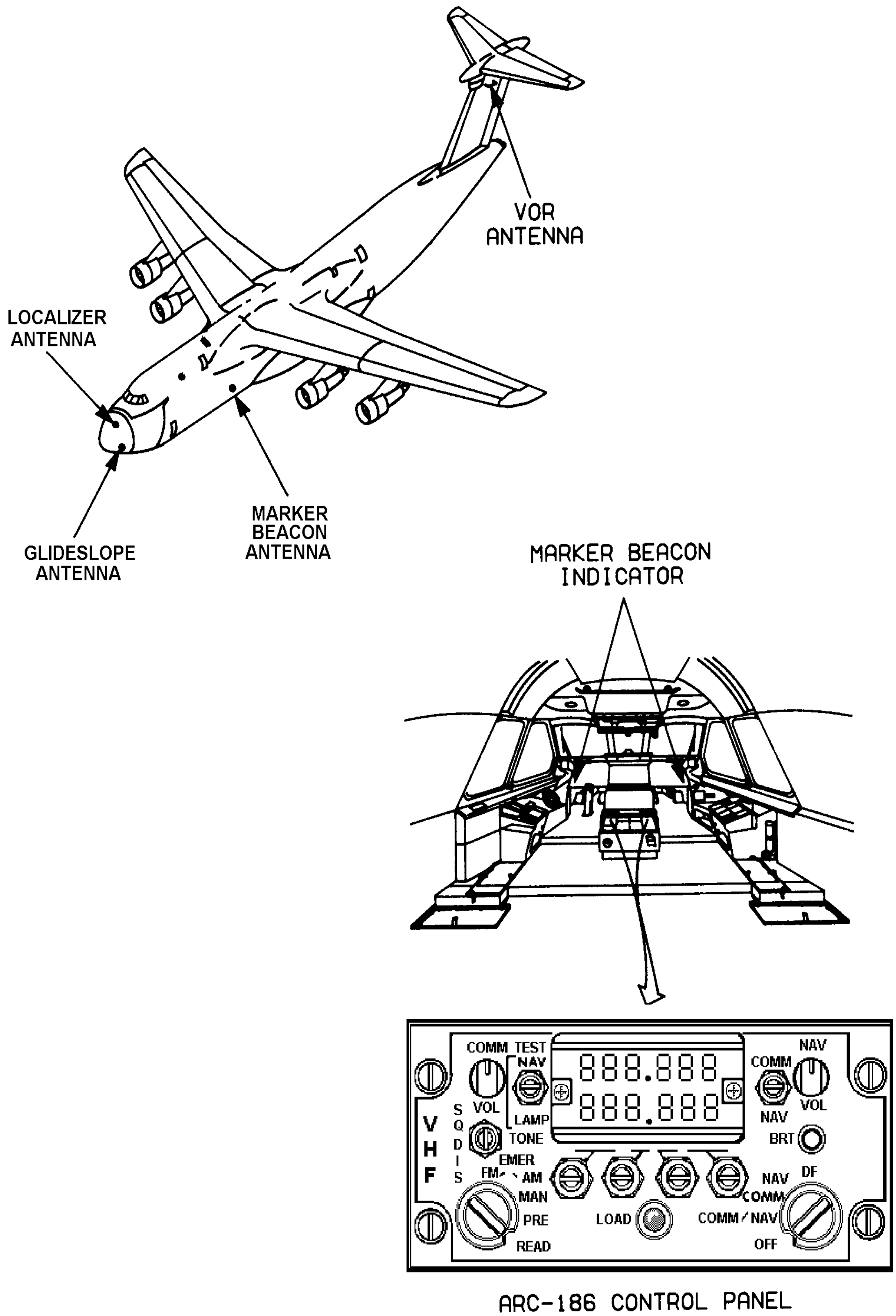
Automatic Direction Finder (ADF) Navigation

The ADF navigation system provides a radio aid to navigation as an automatic direction finder, manual direction finder, aural navigation receiver, and conventional low frequency aural receiver. As an automatic direction finder, the system continuously indicates bearing to any selected radio station and simultaneously provides aural reception of audio transmissions from the station. As a manual direction finder, the system enables the operator to find the bearing to a selected radio station by manually controlling the null direction of a directional antenna. As an aural navigation receiver, the system provides navigation data from low frequency radio ranges. Voice and unmodulated transmissions are received by the system as a conventional low frequency aural receiver.

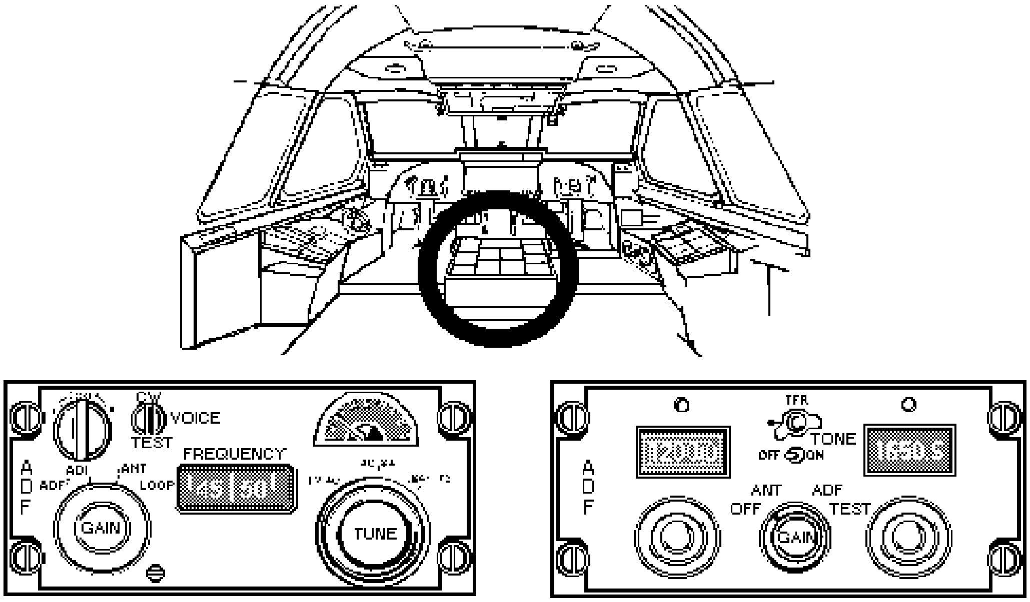
TACAN

The TACAN system is a polar coordinate navigation system, which provides an indication of magnetic bearing and distance from the airplane to a TACAN ground station or suitably equipped cooperating airplane. The TACAN system operates in the UHF frequency range which limits the operating range to line of sight. The maximum operating range is 300 nautical miles and depends on airplane altitude and terrain.

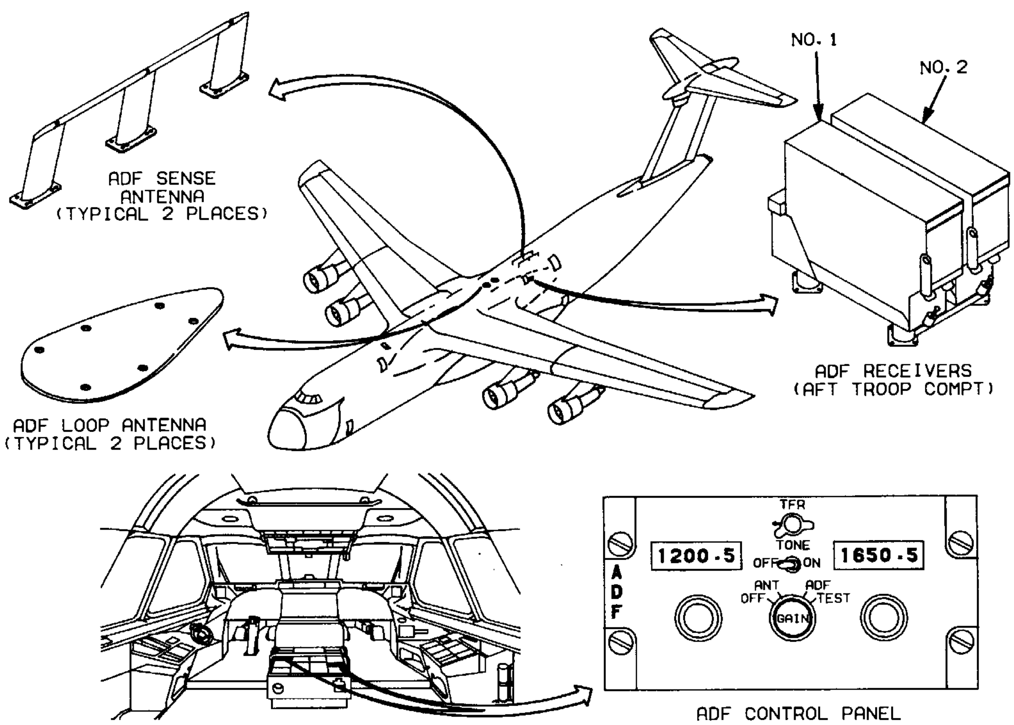
The TACAN system uses two stub-type antennas mounted on top of the airplane and two flush-mounted antennas mounted on the bottom of the airplane. Each system (No. 1 and No. 2) receiver-transmitter is connected to one upper antenna and one lower antenna.



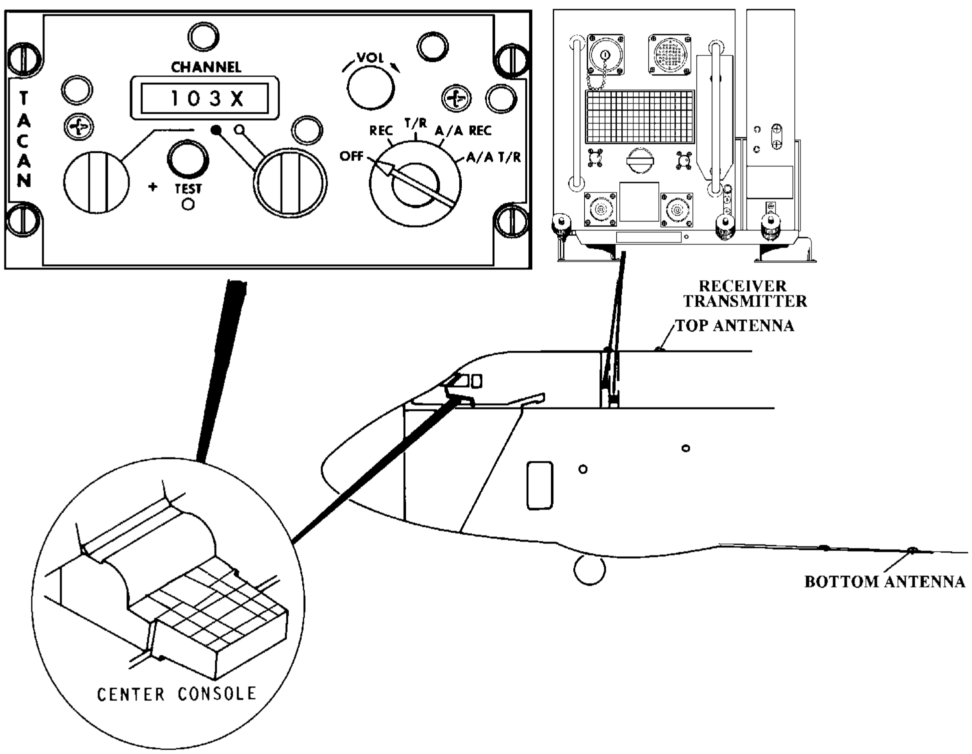
VHF navigation system components



TYPICAL ADF CONTROL PANELS



ADF navigation system components



TACAN system components

Identification Friend/Foe (IFF) System

The IFF system is used to identify that the airplane is friendly when properly interrogated. The interrogation signals can be transmitted from land bases, aboard ships or other airplanes. Pulse coded signals, transmitted from the interrogator, are decoded by the IFF system. If the interrogation code is correct, a coded reply is transmitted. This reply is received, processed, and displayed by the interrogation control center. The display indicates whether the airplane is friend or foe.

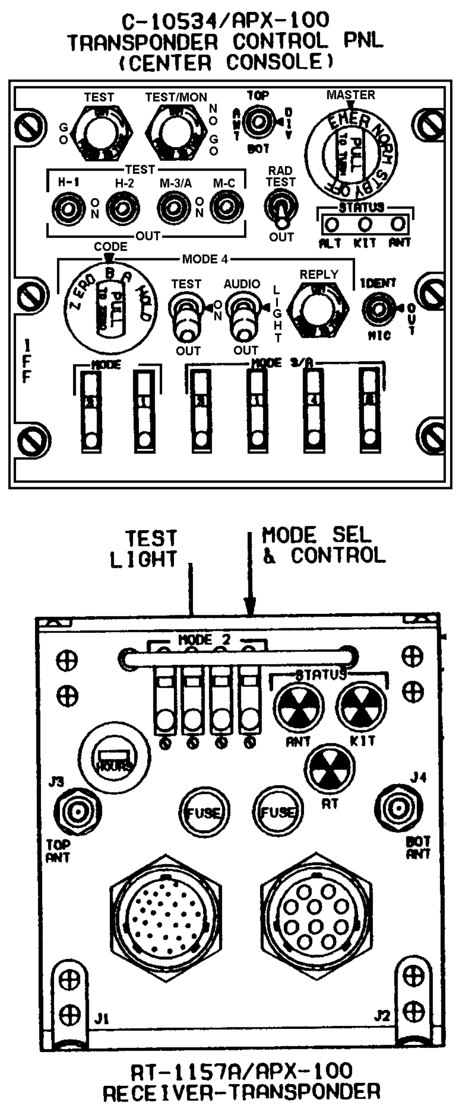
(IFF) System Receiver-Transponder

The receiver-transponder consists of six basic sections; receiver, decoder, coder, transmitter, test, and power supply. The receiver section receives, amplifies, and detects the coded IFF interrogation pulses picked up by the antenna. The resultant video pulses are then applied to the decoder section. If the interrogation pulses contain the proper characteristics for the mode in use, the decoder generates signals to the coder section. The coder then generates a train of reply pulses which is used to modulate the cavity oscillator in the transponder section. The transponder generates an RF coded reply which is radiated back to the interrogating source to complete the identification. The test section provides a visual indication of points critical to fault localization. All necessary voltages are provided by the power supply.

IFF Transponder Computer, KIT-IA/TSEC

Provisions are made for an IFF transponder computer to be installed on the shelf in avionics rack bay 3. The receiver-transmitter can be operated without the computer. When the computer is connected, Mode 4 interrogations bypass the decoder in the receiver-transmitter and are applied directly to the computer. The coded interrogation pulse is decoded in the computer and a coded reply pulse generated which is returned to the receiver-transmitter for transmission to the interrogating source. An IFF light on the center console annunciator panel comes on when Mode 4 interrogations are not properly decoded. (The IFF light does not operate unless the computer is installed.)

IFF kit-1A



IFF system components

Color Weather Radar

The color weather radar system is a multimode X-band radar for use in weather avoidance, ground mapping, beacon interrogation and reception, and navigation. It also incorporates a self-test function. The system operates at a center frequency of 9375 MHz with a power output of 65 kw. Data acquired by the system is displayed in color on the radar indicator to aid the pilot in weather avoidance and navigation. Distance and heading information is also displayed by range and azimuth markers.

The system, functioning as a weather radar, furnishes continuous enroute weather information relative to cloud formation, rainfall rate, thunderstorms, and areas of turbulence and icing conditions by means of radar echos processed and displayed on the radar indicator. The system can furnish enroute weather information to enable the pilot to avoid the turbulence associated with thunderstorms; hence the radar system acts as a path-finder to aid the pilot in selecting a path through the weather.

In addition to its primary purpose of weather mapping, the radar system can be used, day or night, for ground mapping. As a terrain mapping radar, the system defines and displays different types of terrain features. The system is also capable of skin painting C-130 or larger type aircraft for formation flying and also has a beacon navigation mode, which is capable of displaying X-band beacons' identification codes.

Receiver/Transmitter

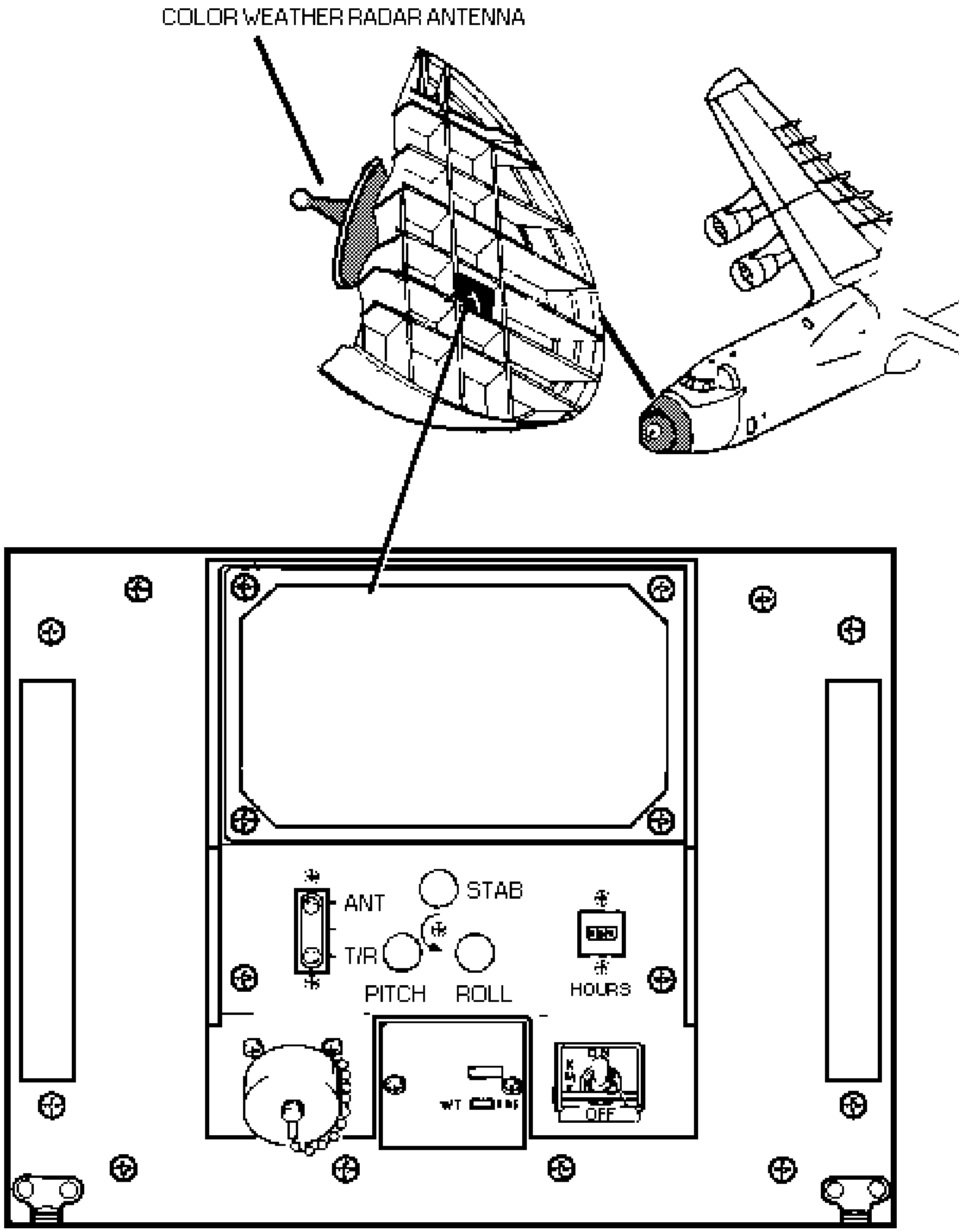
The receiver/transmitter is a lightweight, airborne unit consisting of synchronizer circuit, servoamplifier, and power supply circuits. The unit is housed in a single, full ATR form factor case located behind the visor bulkhead. The front panel of the receiver/transmitter contains a connector for use with the test equipment, fault indicator lamps (ANT, RT), elapsed time indicator, access holes for gain adjustments (STAB, PITCH, ROLL), and a XMTR ON/OFF switch for use in maintenance procedures.

Antenna

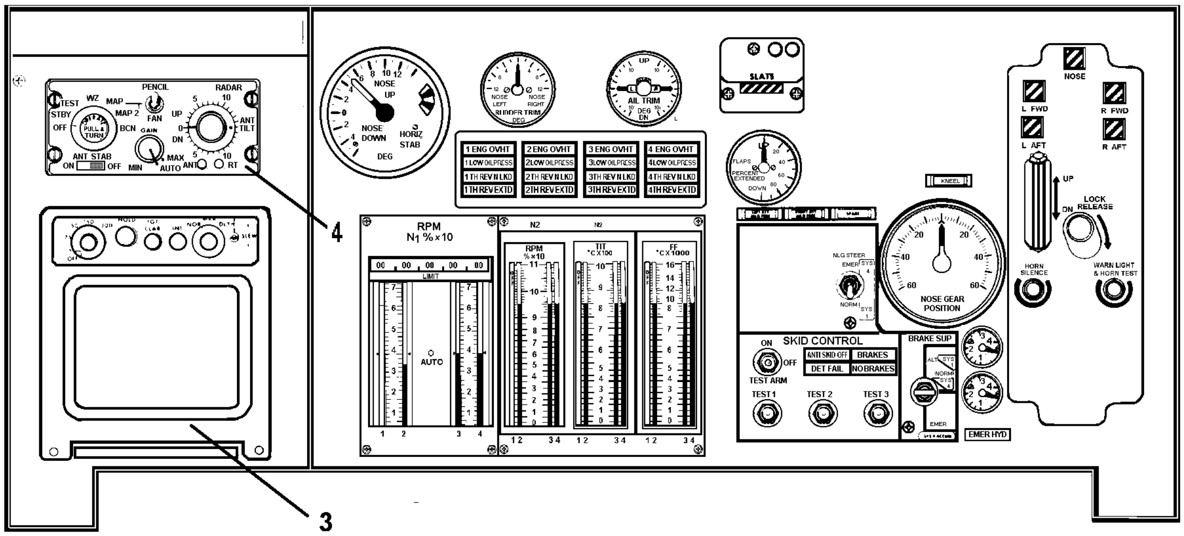
The antenna is an X-band, sector scan weather radar with pitch and roll stabilization about two separate axes. The antenna is used for both transmitting and receiving. It can be manually titled, by the radar control, to any position between 14 degrees above and 14 degrees below the horizontal, zero-degree attitude.

Radar Indicators

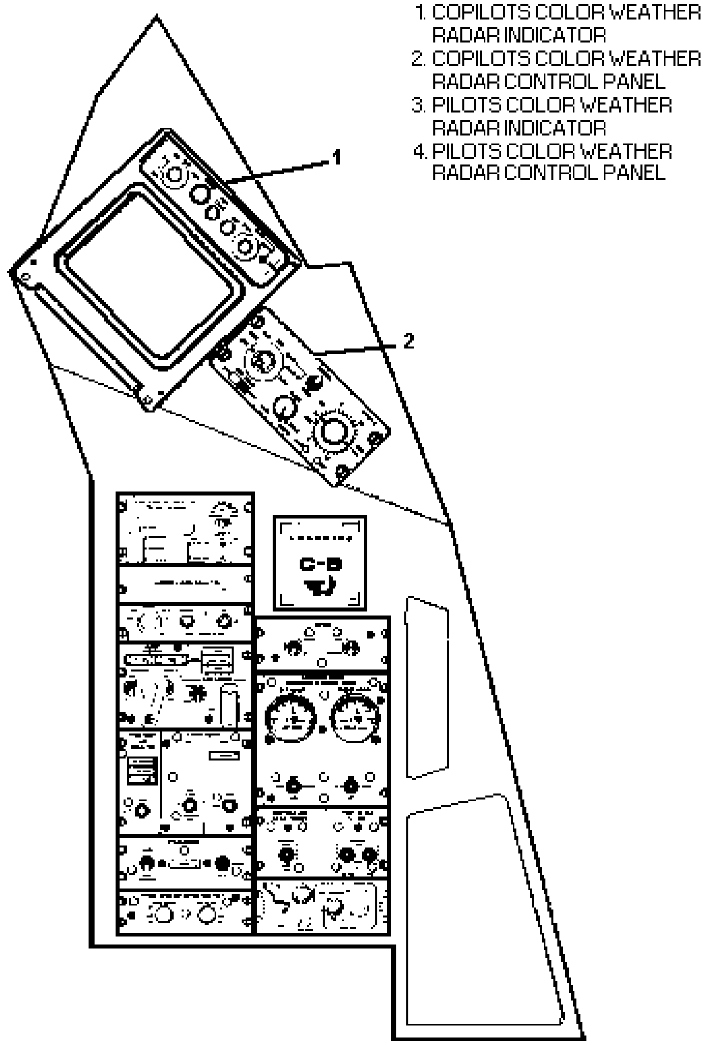
Two radar indicators are installed in the airplane, one at the pilot's station on the pilot's main instrument panel, and one at the copilot's station on the copilot's side console. The radar indicators provide a three-color display of weather and ground targets within the area scanned by the radar antenna. Internally generated range marks and azimuth lines are displayed to assist in determining the range/azimuth bearing of targets, so that significant weather disturbances may be avoided and navigation enhanced by use of the ground mapping information. Additionally, flight parameter data and directional displays, selected on the display interface control unit (DICU) can be displayed on the indicators.



Color weather radar receiver transmitter



Pilots radar indicator on center instrument panel



Radar indicators

Triple (INS) Inertial Navigation System

The triple INS contains three inertial navigation systems each composed of the sensors, computer processing, and monitoring displays required for reliable precision attitude reference and accurate global navigation entirely independent of ground reference signals. System outputs provide smooth, flyable commands to the pilot, copilot, and autopilot. The three INSs and an INS mount assembly consisting of an avionics rack and three INS cooling units (ICU) make up a triple inertial navigation system installation. Each of the INSs consists of a navigation unit (NU), control and display unit (CDU), mode selector unit (MSU), and battery unit (BU).

Navigation Unit (NU)

The three navigation units (NUs) are mounted side-by-side in the prealigned avionics rack on the bottom shelf in avionics compartment bay 1. Mounted between the navigation units are three INS cooling units (ICUs) which provide cooling air for the navigation units. A decal with four temperature-sensitive indicators is affixed to the front panel of each NU. Each indicator is related to a particular temperature (160, 170, 180, 190) and turns irreversibly black when the indicated temperature is exceeded.

The navigation unit senses all airplane movement and produces all INS output signals. The INS has three functional sections which operate together to determine all navigation and attitude output signals. Located in the navigation unit, these sections are the stabilized platform, electronics, and digital computer. The platform, a four-gimbal assembly, is controlled to maintain a vertical and horizontal reference with respect to the earth from which all airplane movement is measured. Gyros, accelerometers, torque motors, synchros, and resolvers are mounted on the platform. These devices, with the electronics, form stabilization and accelerometer loops. The gyros sense platform movement around the pitch and roll axes and generate output signals which are routed to the electronics along with travel-over-the-earth corrections signals from the computer. The electronic outputs drive the torque motors which correct for platform movement. The accelerometers sense acceleration along the pitch and roll axes of the airplane and provide corresponding signals to the computer where they are translated into information required for navigation calculations. In addition to its function in the stabilization and accelerometer loops, the electronics also conditions and distributes input power and controls the temperature of the platform.

Inertial Navigation System (INS) Cooling Unit

Three INS cooling units (ICUs) (part of the INS mount assembly) provide cooling air to the navigation units. The ICUs are mounted on the rack between the navigation units in the avionics compartment bay 1. Two of the ICUs are mounted between NU-1 and NU-2 while the third is mounted between NU-2 and NU- 3. Each ICU consists of an inverter, blower, air sensing switch, blower electronics assembly, and miscellaneous hardware. The inverter receives 28 VDC from either the avionics DC bus or the battery unit and converts the DC to AC for use by the blower. The air sensing switch monitors air flow and causes a lamp to illuminate on the master caution panel when air flow is less than required for NU cooling. The blower electronics assembly contains the necessary electronics elements for control of the inverter and blower.

Control/Display Unit (CDU)

The three control/display units (CDUs) are normally installed in the flight station center console. An optional location for CDU-3 is provided at the navigator's station. Each CDU serves as the communications link between the operator and the navigation unit digital computer. All pertinent navigation data is displayed on the CDU in decimal form. The CDU is also used to insert flight plan data, select waypoints which determine desired track, and monitor system operation and status. The CDU contains a power supply, logic circuits, controls and indicators. The controls and indicators are used to insert information into the computer and to display information contained within the computer. The CDU also displays system operating status.

The Fuel Savings Advisory System (FSAS) CDU display is a cathode ray tube (CRT) with six lines of data up to 13 characters per line. The FSAS CDU displays the same information as the INS CDU left and right data displays. In addition, various special symbols such as greater than, less than, pound sign, asterisk, etc. are displayed. All data selection is accomplished by means of the 41-key keyboard. Data to be loaded into the computer is first loaded into the data display by operating the keyboard. Display of the data allows visual verification of the data before loading the data into the computer.

Mode Selector Unit (MSU)

The three mode selector units (MSUs) are mounted in the pilot's and copilot's side consoles; MSU-1 and MSU-3 in the pilot's side console and MSU-2 in the copilot's side console. An optional location for MSU-3 is provided at the navigator's station. The three MSUs are identical. Each contains a selector and two indicators. The selector provides the pilot/copilot with the means of selecting system modes of operation. The selector has five positions: OFF, STBY, ALIGN, NAV, and ATT. Normally, the STBY and ALIGN positions are used on the ground only, while the NAV and ATT positions are associated with inflight functions.

Inertial Navigation System (INS) Select Panel

The INS select panel is located at the flight station center console. This panel provides the pilot and copilot with a means to select the desired INS system for operation. The panel contains two switches designated for use by the pilot and copilot. The pilot may select either INS 1 or INS 3. The copilot may select either INS 2 or INS 3.

Inertial Navigation System (INS) Status Panel

Two identical INS status panel assemblies are installed in the flight station. One assembly is installed on the pilot's instrument panel, and the other assembly is installed on the copilot's instrument panel. These panel assemblies provide the pilot and copilot with a visual display of system status. Each panel assembly includes annunciator lights for the following functions: INS attitude failure, INS heading failure, INS 3 selected, INS 3 selected by both pilots, TACAN mix, and leg change alert. The INS failure status information that is displayed to the pilot is for INS 1 and INS 3. The INS failure status information that is displayed to the copilot is for INS 2 and INS 3.

Navigation Selector Panel (NSP)

Two identical navigation selector panels are installed above the pilot's center instrument panel and beneath the glare shield. One selector panel is provided for use by the pilot, and the other selector panel is provided for use by the copilot. Each selector panel allows the inertial navigation mode (I-NAV) to be selected. Other modes which may be selected are heading, VOR/ILS, ILS, TACAN, flight director test, and navigation aids off.

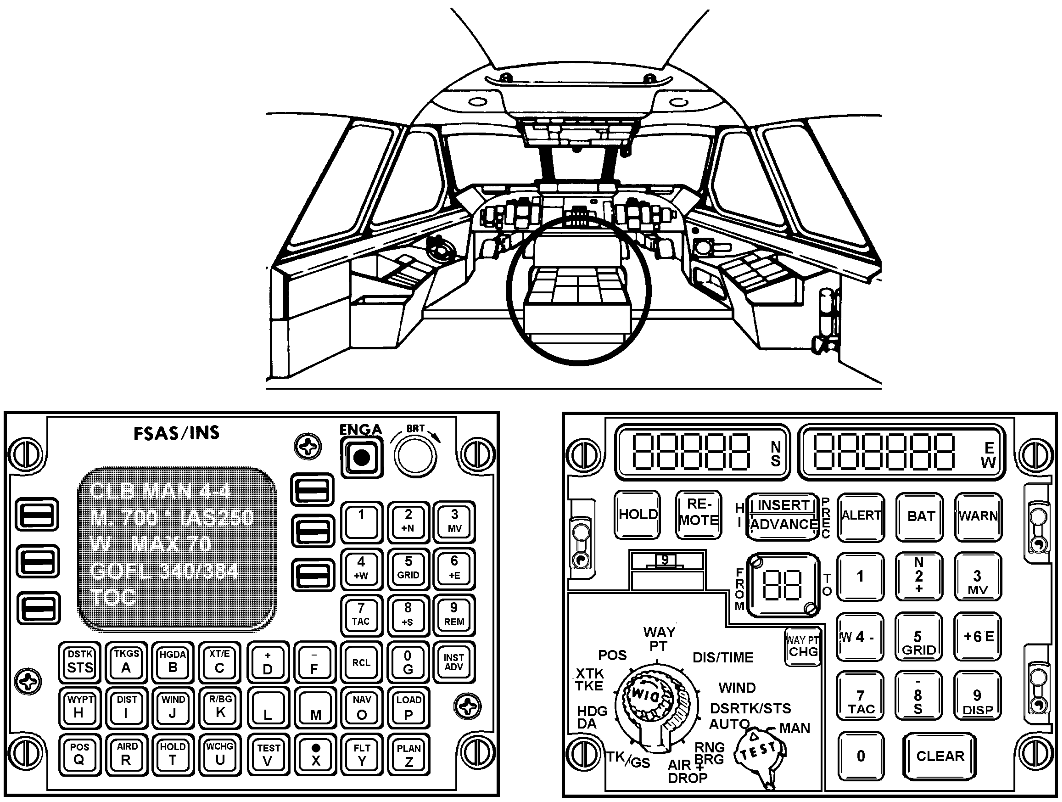
Battery Unit (BU)

The three battery units (BUs) are located on the floor of avionics compartment bay 3. Each BU provides reserve power for the INS should the 115 volt primary input power be interrupted or should it drop below the minimum allowable voltage level. On AF83-1285 and up, each BU also provides power to the MADARS multiplexer processor (MUX/PROX). This power retains the software program loaded into the MUX/PROX complementary metal oxide semiconductor (CMOS) memory. The battery contains 19 nickel-cadmium cells which are connected in series to furnish 28 volts DC. A 20- ampere circuit breaker on the front of the BU protects it from excessive current flow. The BU is connected to the system for a short time (12.8 seconds) during the initial alignment sequence after turn-on to check that it is functioning properly. The BU is automatically charged by a battery charger in the NU when the system is operating on normal power. A fully charged BU can sustain system operation for up to 30 minutes.

Ground Proximity Warning System (GPWS)

The ground proximity warning system (GPWS) provides the pilots with visual and aural warning of any potentially dangerous flight paths relative to the ground. The warning system is activated whenever anyone of the following conditions occur:

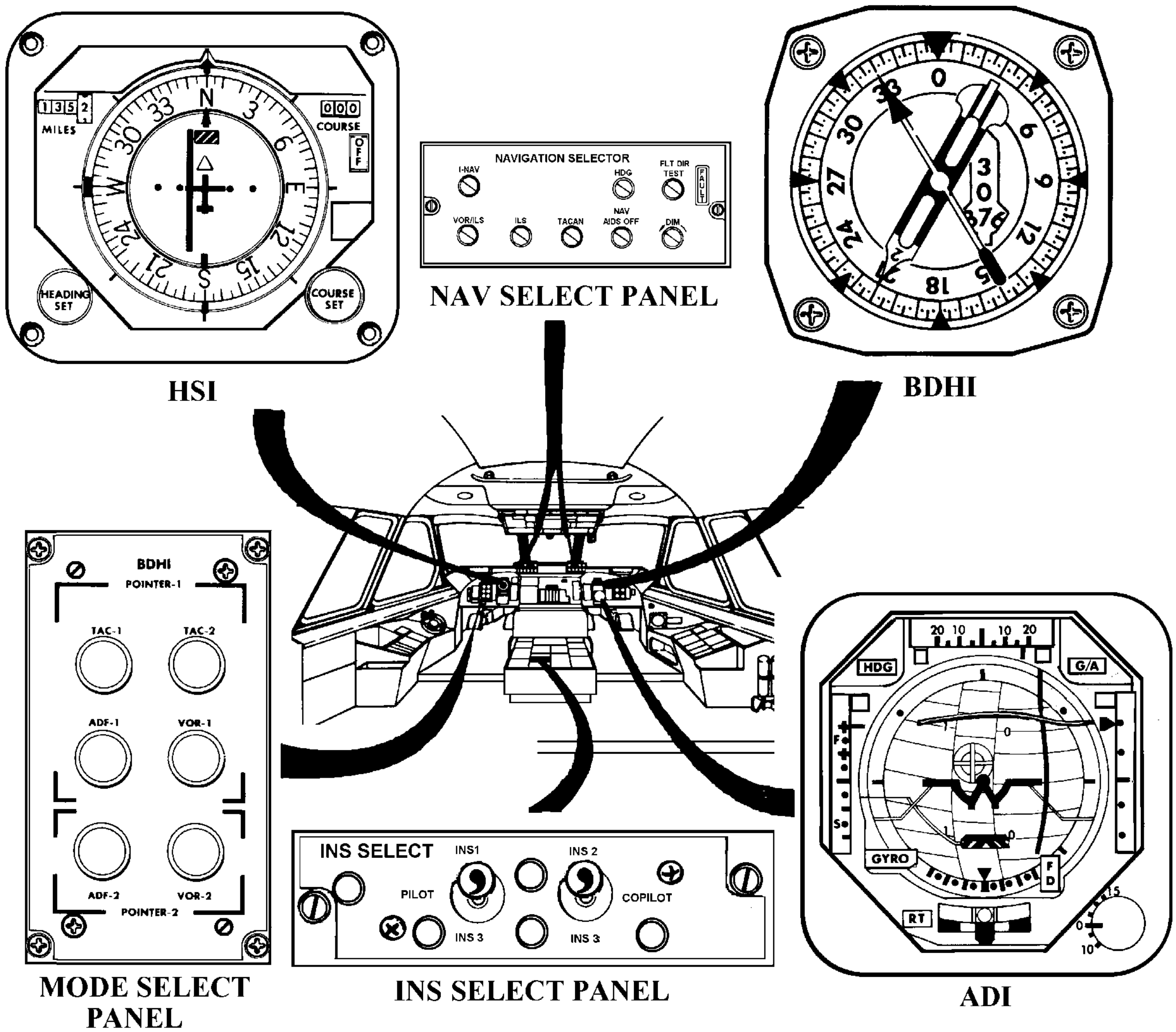
- Excessive rate of descent
- Excessive closure rate to the ground
- Negative climb
- Unsafe configuration
- Excessive deviation below the glideslope



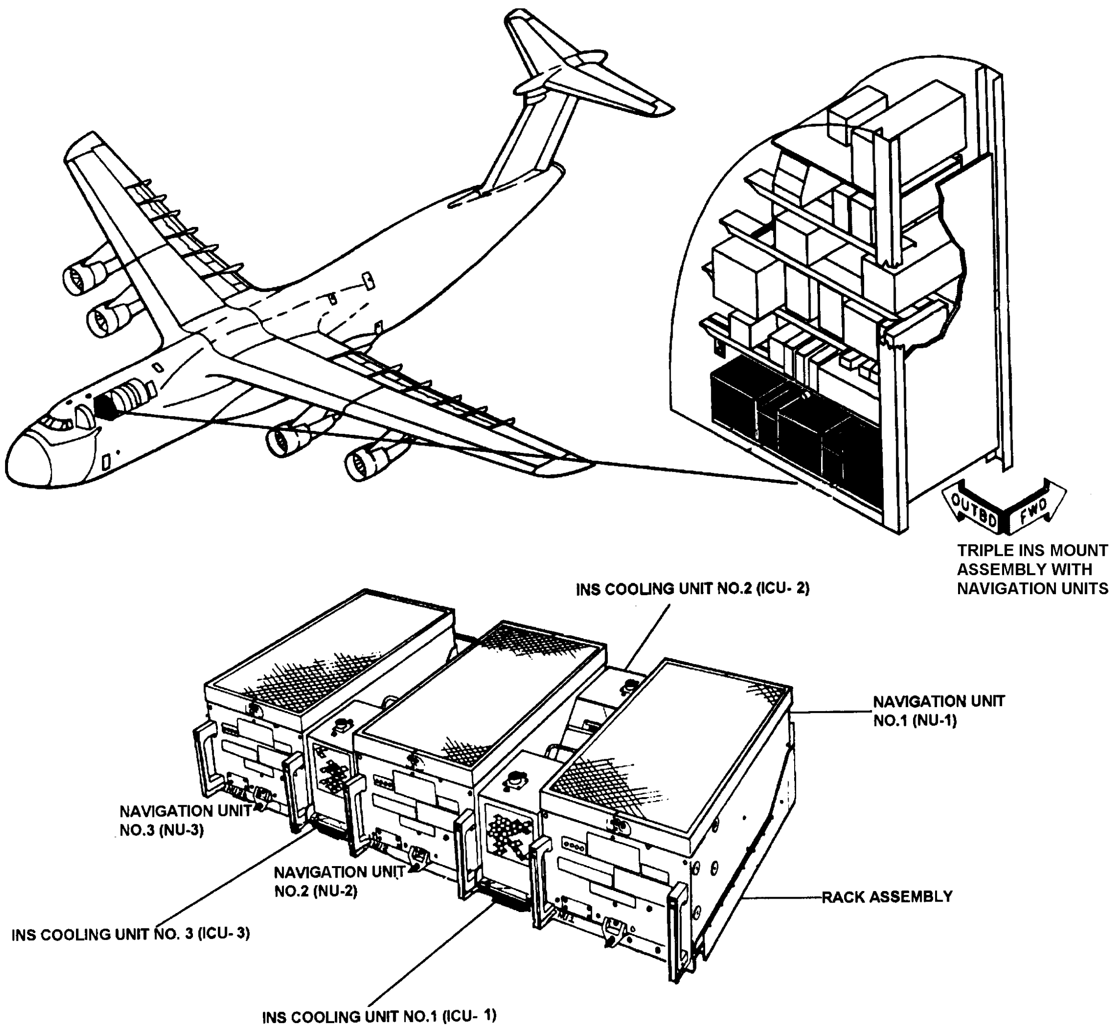
FSAS/INS CDU

INS CDU

INS control panels



Navigation instruments



Triple INS mount with navigation units

Fuel Savings Advisory System (FSAS)

The Fuel Savings Advisory System enables the flight crew to accomplish flight profiles with minimum fuel consumption. Using EPR data, total air temperature data, INS data, altitude and airspeed data, fuel flow data, and the flight crew-inserted desired flight plan data, the system will compute the most efficient flight profile. All inputs and their computed results can be called up and displayed on the FSAS Control Display Unit (CDU). In addition to providing an advisory flight profile, the FSAS provides coupling to the AFCS autopilot and auto-throttle subsystems and provides signals to the Color Weather Radar indicators, GPWS speaker and inter- phone channel, and the pilot's and copilot's wind-shear warning and altitude alert annunciators. The FSAS is also interfaced with INS No. 1 of the Triple Inertial Navigation System through the FSAS CDU to provide control and display of the FSAS-selected INS functions.

Fuel Savings Computer (FSC)

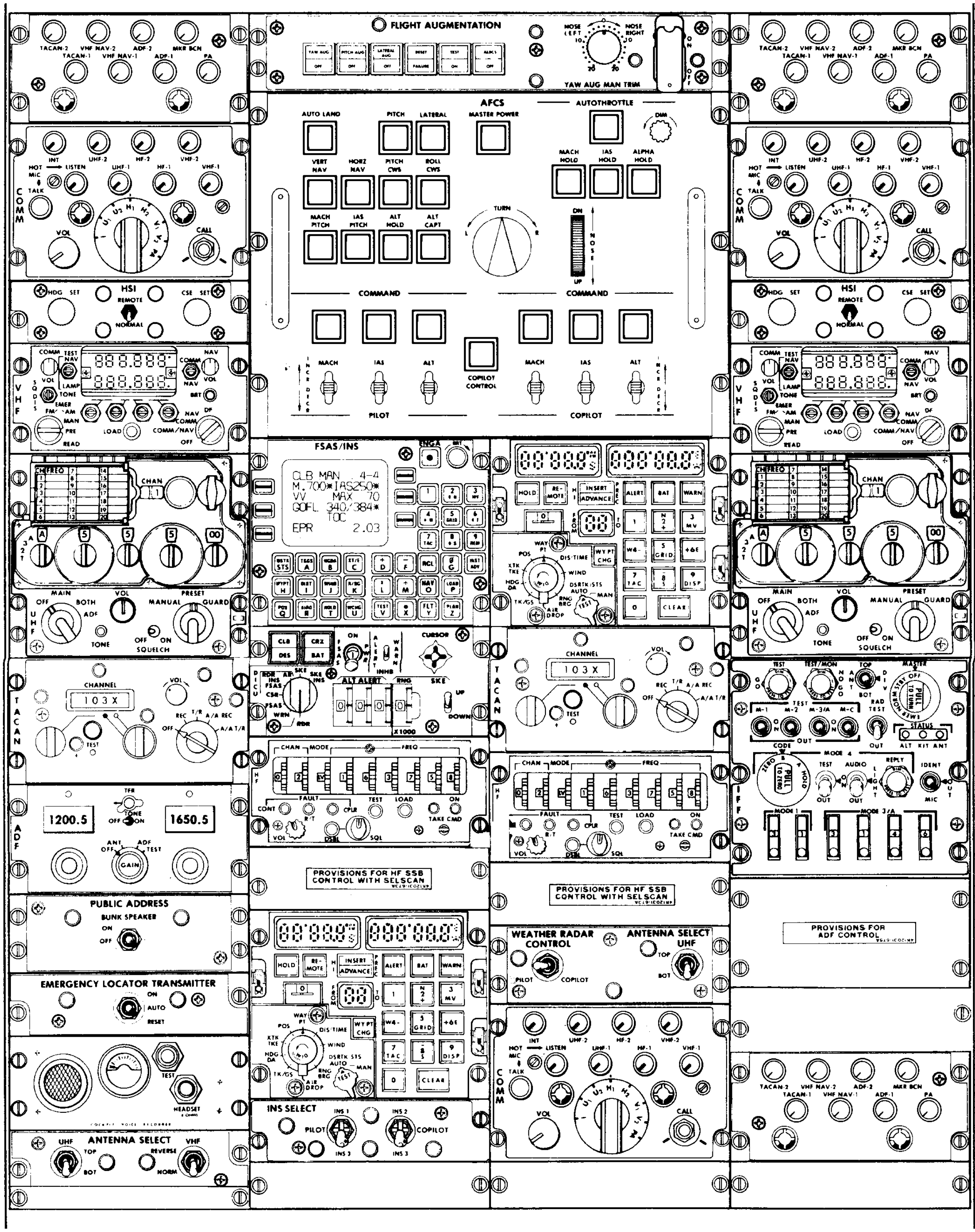
The Fuel Savings Computer (FSC) is a 16-bit, medium-speed, general-purpose digital computer. It contains an analog-to-digital/digital-to-analog signal data conversion system and an integral power supply. The computer continuously monitors, computes, and updates distance between waypoints, engine performance, fuel flow, and airplane environmental conditions. It utilities this information to arrive at optimum flight profiles. In addition, the computer monitors the entire system and internal operation for invalid inputs and outputs and provides an appropriate warning message or flag.

Control Display Unit (CDU)

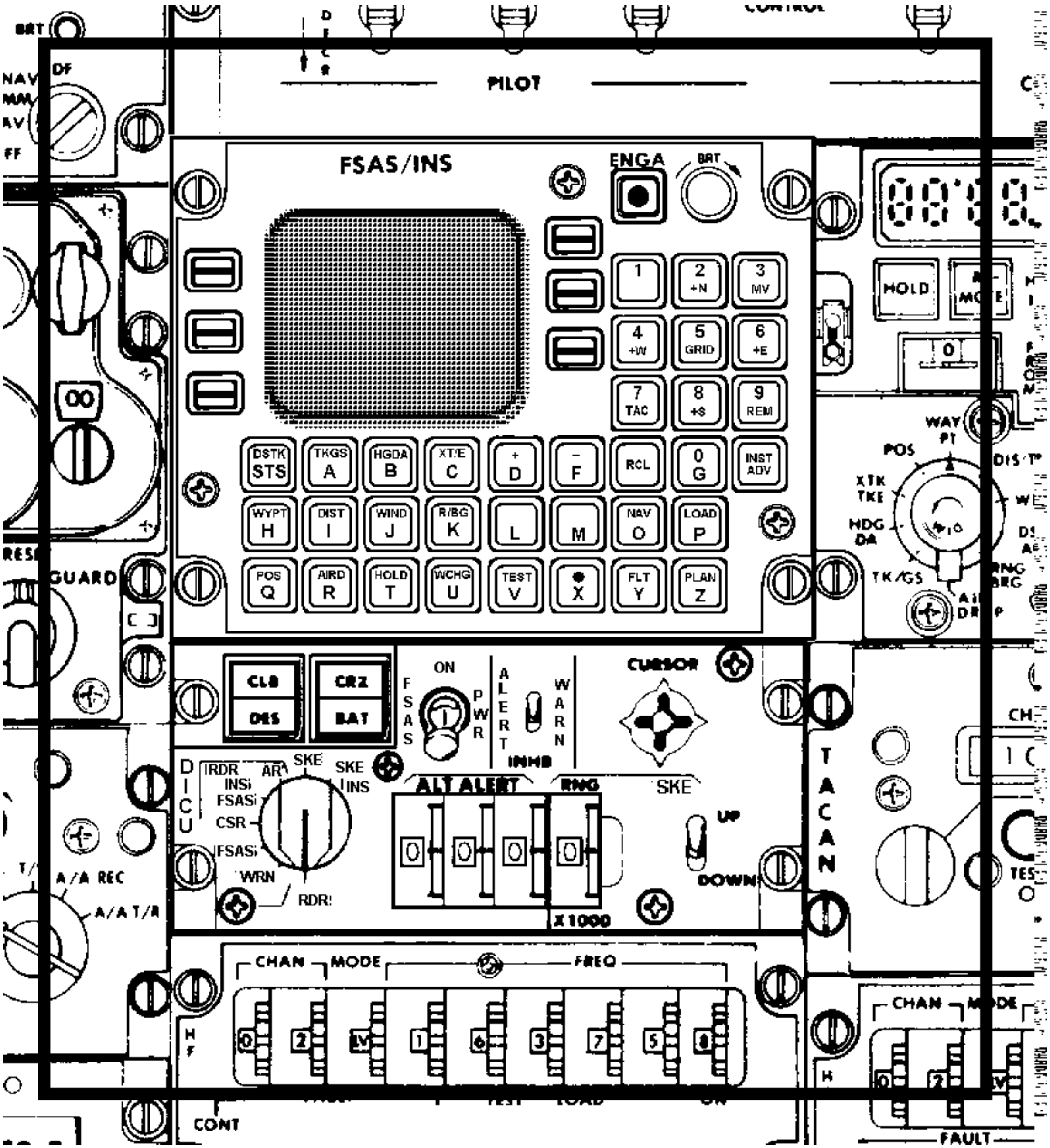
The Control Display Unit (CDU) provides the primary interface between the aircrew, FSAS, and INS No. 1. It serves as a terminal for the FSC and provides full management capability for both the FSAS and INS No. 1. The CDU contains a power supply, logic and control circuits, a keyboard for data entry, and a cathode ray tube (CRT) for the display of data and messages. The CRT displays 6 lines of data with a maximum of 13 characters in each line. The FSAS CDU also serves as the CDU (CDU-1) for INS No. 1.

Display Interface Control Unit (DICU)

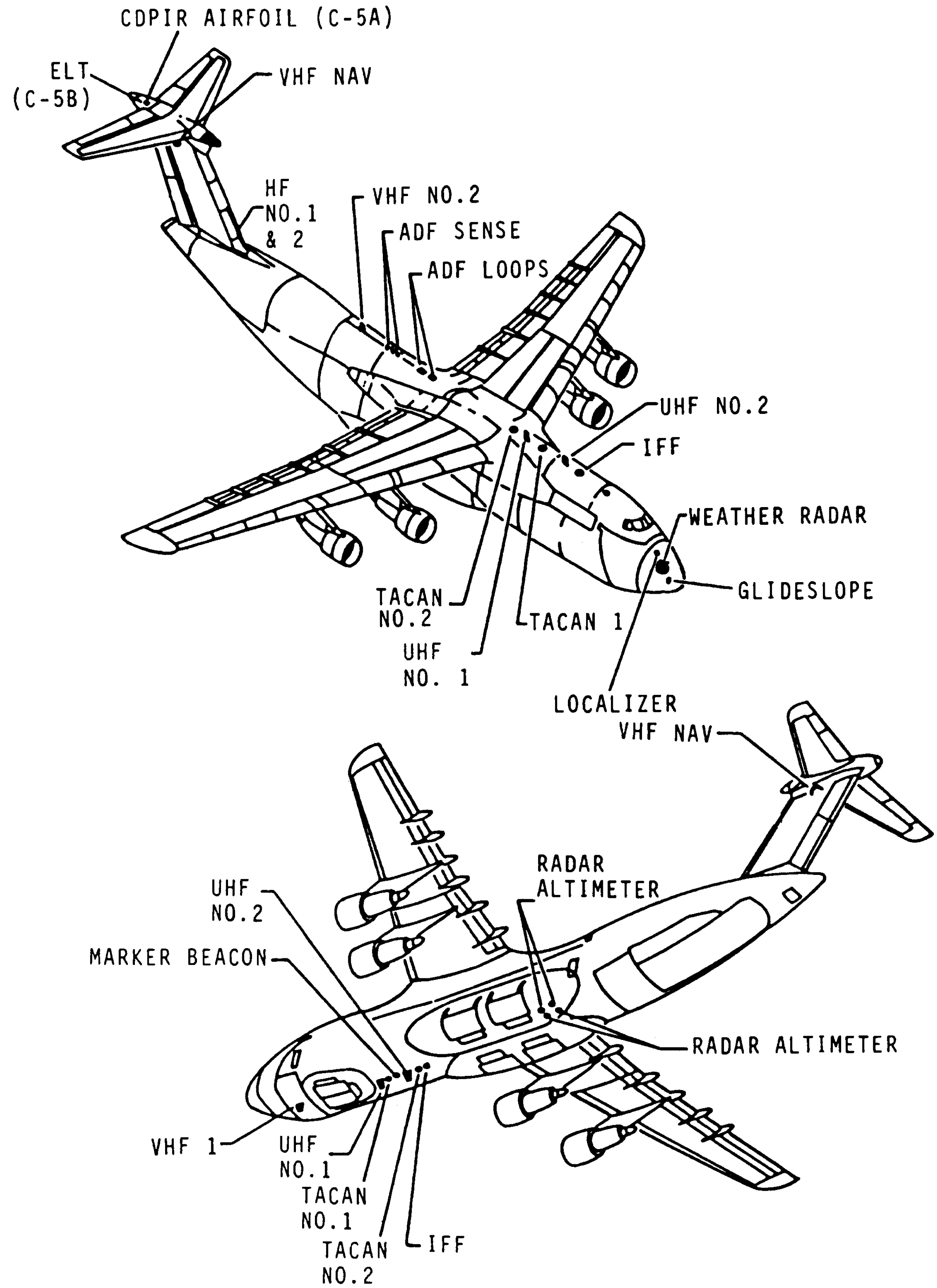
The Display Interface Control Unit (DICU) provides control of the FSAS ac power, selection of altitude alert targets, annunciation of autopilot-coupled FSAS modes, and annunciation of INS No. 1 operation on battery power. The DICU also provides selection and control of FSAS/INS data that can be displayed by Color Weather Radar. The DICU contains three green annunciators (CLB, CRZ, and DES), an amber annunciator (BAT), a pull-on toggle switch (FSAS PWR), a momentary-contact toggle switch (ALERT WARN), a four-position cursor control switch (CURSOR), an eight-position rotary mode selector switch, four thumbwheel selector switches (ALT ALERT and RNG), and a three-position toggle switch (UP/center/DN). In addition, the DICU contains an internal annunciator bright/dim control module.



Pilots' center console layout



FSAS and DICU control panels on pilots’ center console



Communication, navigation system antennas and transmitters

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FLIGHT CONTROLS

The flight control system of the C-5 airplane is comprised of the primary flight controls, the secondary flight controls, the stallimiter system, automatic flight controls, and associated cockpit controls. The functions and operation of the flight control systems covered by this manual are described in general in the following paragraphs.

Primary Flight Controls

The primary flight control system consists of the aileron, elevator, and rudder control system. The control surfaces are of the multisurface concept consisting of outboard ailerons, four elevators and two rudders. Control cable runs are as straight as practical to reduce cable angles and turns. Cable tension regulators are incorporated to maintain adequate tension in the cables under thermal and load changes. Dual hydraulic actuators are located at each aileron, elevator, and rudder surface. Hydraulic power is supplied to the flight controls systems by four separate engine-driven pump-type hydraulic systems. The pilots controls maintain the proper feel during normal operation through the use of springs with positive centering. Torque limited pilot assist cable servo (PACS) units, which reduce breakout forces at the controls, are provided for the aileron and elevator controls.

Aileron System

The roll motion of the airplane is controlled by two conventional ailerons assisted by 10 flight spoiler panels. The 10 flight spoiler panels serve a dual purpose in that they also function as ground spoilers. (The spoiler system will be discussed separately.) Each aileron is operated by a dual hydraulic servo control unit. The aileron servo control unit responds to pilot manual control and inputs from the automatic flight control system. Manual control is accomplished by rotation of the control wheel and transmitted through the aileron cable system to the aileron servo control unit. The pilot's and copilot's aileron controls are two separate systems. The pilot's control wheel is attached to the left forward aileron tension regulator located under the cockpit floor. A closed cable runs from the pilot's quadrant along the rear face of the left wing spar to a final output quadrant located near the aileron. The final output quadrant is connected to the aileron servo manifold by two links. A similar system connects the copilot's control wheel to the right wing final output quadrant. An interconnect rod attached to the pilot's and copilot's forward tension regulators and rear beam quadrant connects the two systems. The aileron servo manifold receives hydraulic power from three hydraulic systems. The combination use of the three systems is such that no single hydraulic failure will abort a mission, and the ailerons will be controllable after the loss of any one hydraulic system.

Aileron Trim Control

Aileron trim control is achieved with the ailerons. (The C-5 airplane has no trim tabs.) The trim actuators trim the aileron actuator valves, deflecting the aileron from the normally faired position.

Elevator System

The elevator control system is used to control the pitch attitude of the airplane. This is accomplished by the use of four separate elevator surfaces hinged at the trailing edge of the horizontal stabilizer. Control column travel forward and aft provides full elevator movement. The elevator surfaces are actuated by full-power hydraulic actuators. Each inboard surface is powered by a dual hydraulic system power control servo unit. Each outboard surface is powered by both a dual and a single hydraulic system servo unit.

Rudder System

The directional control of the airplane is accomplished by the rudder system. The rudder control system consists of an upper and lower rudder surface, pivoted to the trailing edge of the vertical stabilizer. Each rudder is deflected by a dual, irreversible hydraulic servo assembly. Normal maneuvering of the airplane is accomplished by positioning the conventional rudder pedals. Input command at the pedals is transmitted through a single cable system from the flight station to the upper and lower rudder servo input quadrants. Hydraulic power is supplied to the rudder servo assemblies by three separate hydraulic systems, with two connecting to each servo unit. The servo units are supplied power in a manner such that control of the airplane is maintained in the event of the loss of any two hydraulic systems.

Rudder Trim Control

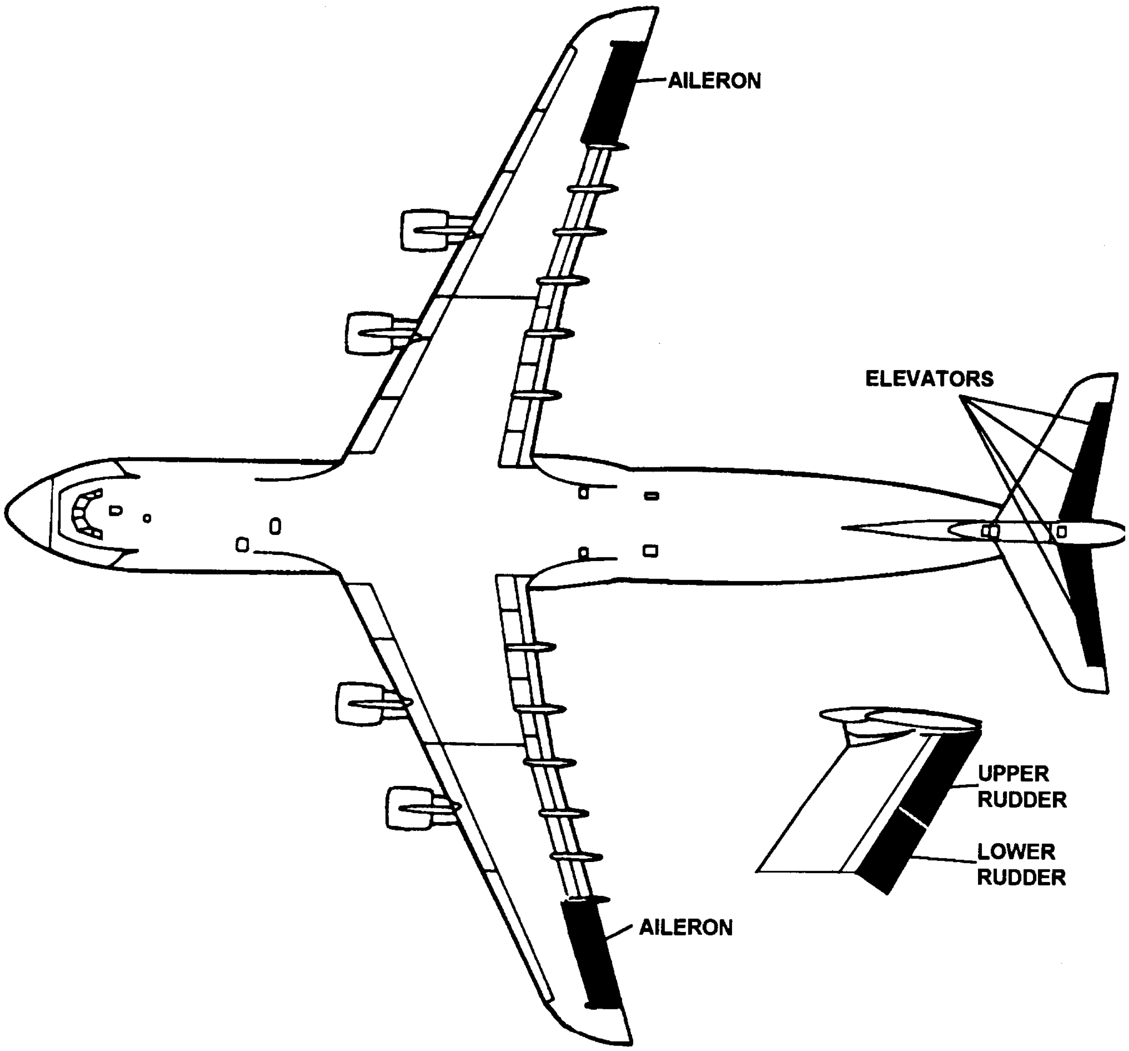
The trim actuator provides a parallel input to the rudder system. The actuator repositions the neutral point of the centering bungee after the rudder pedals have been displaced to a desired trim position. Two rudder trim control switches located on the cockpit center console operate the trim actuator. The upper and lower surfaces are trimmed simultaneously.

Cable Tension Regulators

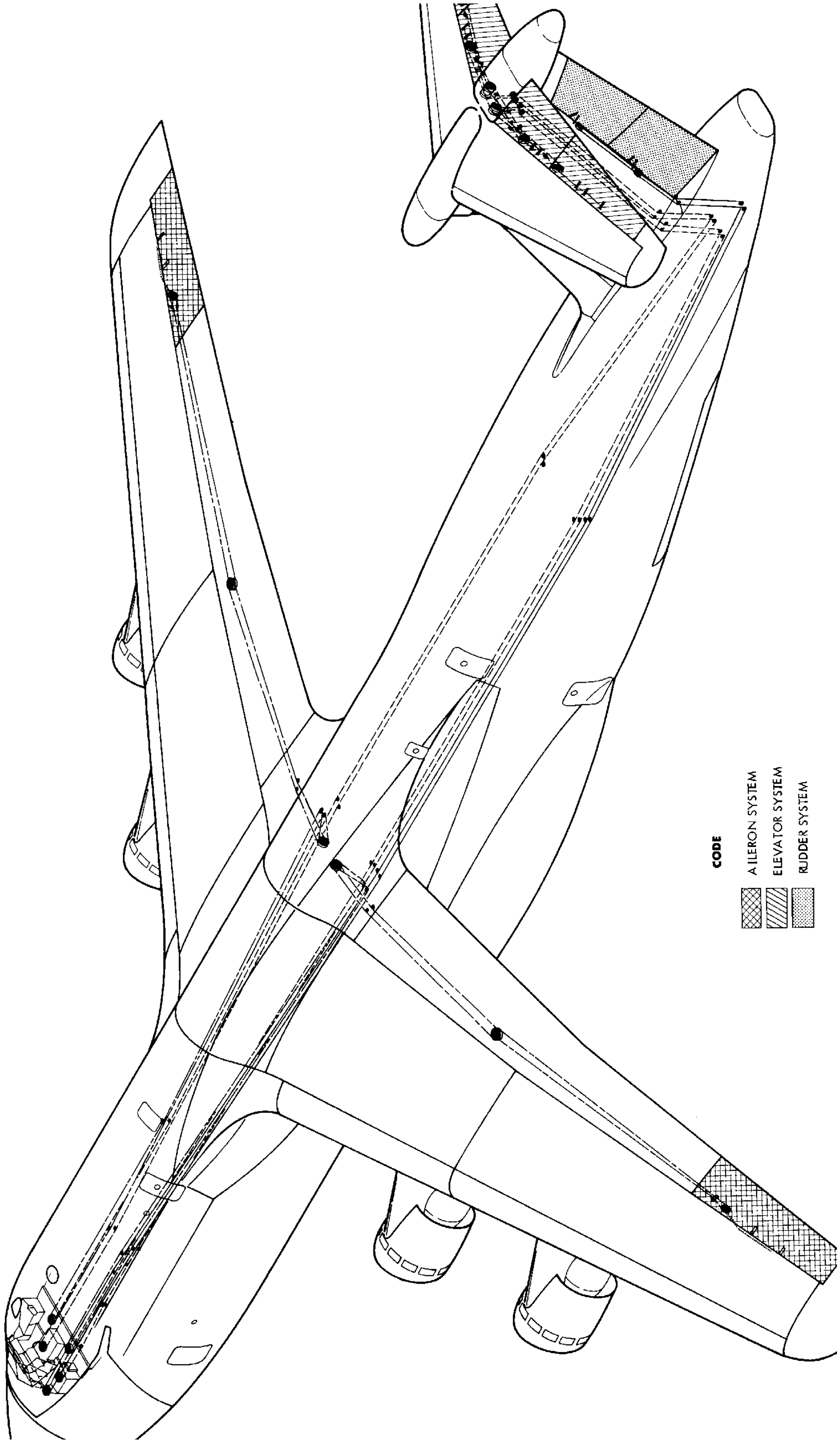
The aileron, elevator, and rudder control systems contain tension regulators which differ slightly in appearance and indicator scale readings but are identical in operation. The main function of the tension regulators is to maintain a constant tension on cables regardless of temperature or structural deflection. The tension regulator does this with moveable sectors connected together on a common shaft by means of springs and interconnections.

Cable Tension Regulator Surge Locks

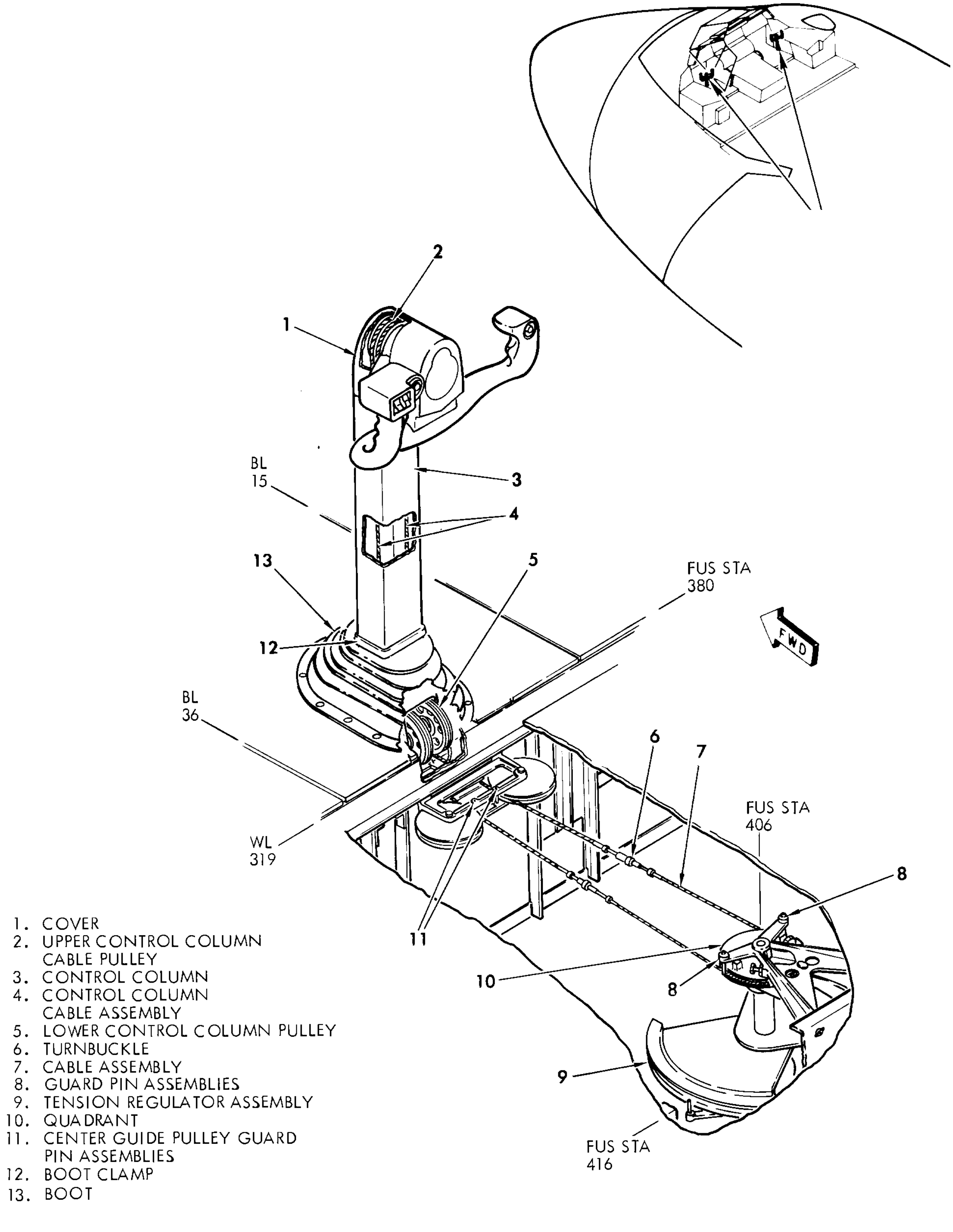
Each tension regulator incorporates a surge lock assembly which locks the sectors together on their shaft in the event a cable breaks. This minimizes sudden control surface travel. For example, if an elevator up control cable were to break, the two sectors of the tension regulator would lock relative to each other. The only input to the elevator system would be that associated with the reduction in tension in the still intact elevator down cable. When a surge lock is inadvertently set, it is evidenced by a spongy control system with excessive lost motion. To reset a surge lock, increase tension on both cables to obtain a tension higher than the rigging tension, and then slowly release tension on the cables.



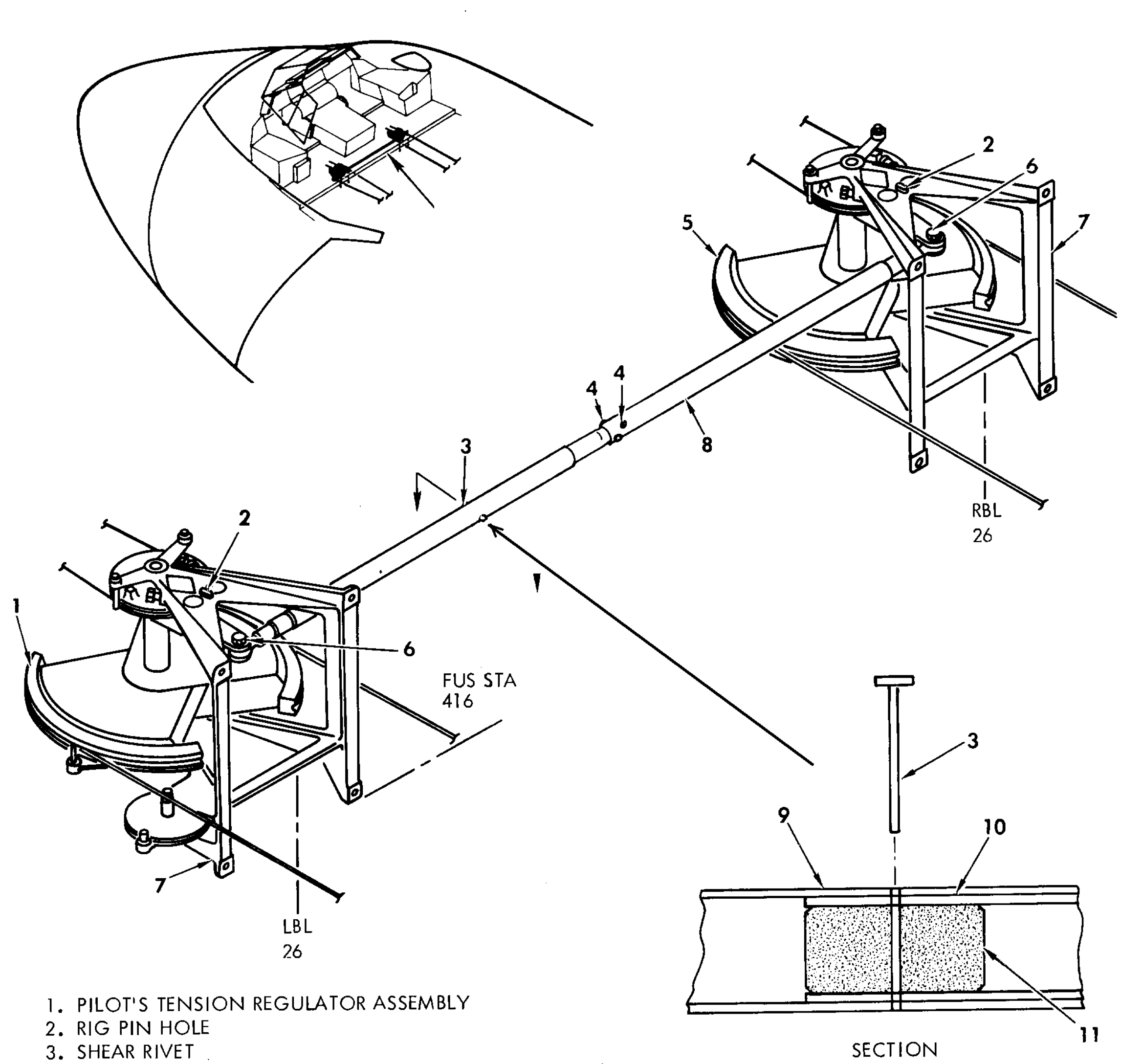
Primary flight controls



Primary flight control cable routing

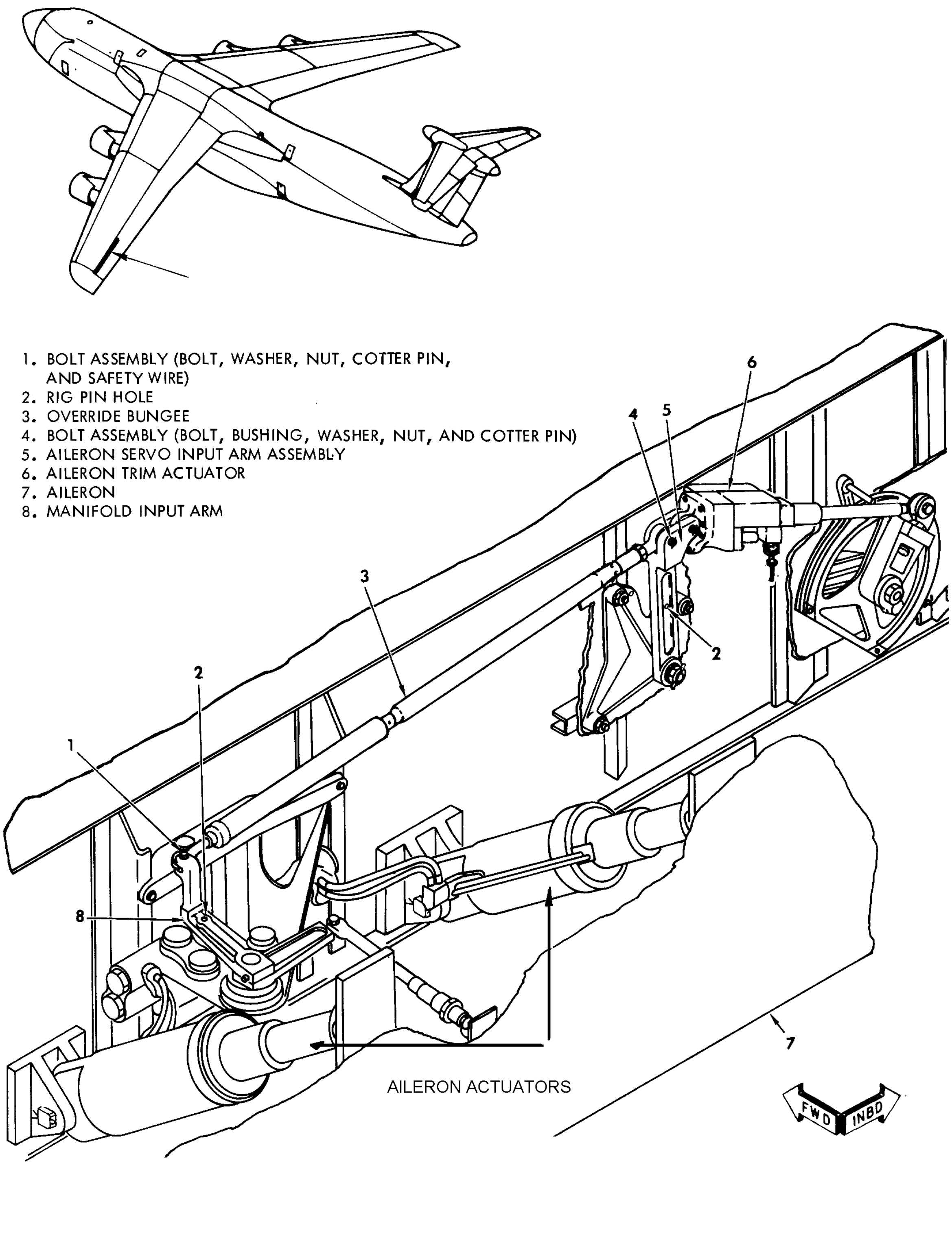


Control column cable routing



1. PILOT'S TENSION REGULATOR ASSEMBLY
2. RIG PIN HOLE
3. SHEAR RIVET
4. SCREW ASSEMBLY (SCREW, WASHER, NUT, COTTER PIN)
5. COPILOT'S TENSION REGULATOR ASSEMBLY
6. BOLT ASSEMBLY (BOLT, WASHER, NUT, COTTER PIN)
7. BRACKET ASSEMBLY
8. INTERCONNECT ROD
9. OUTER TUBE
10. CENTER TUBE SECTION
11. FILLER

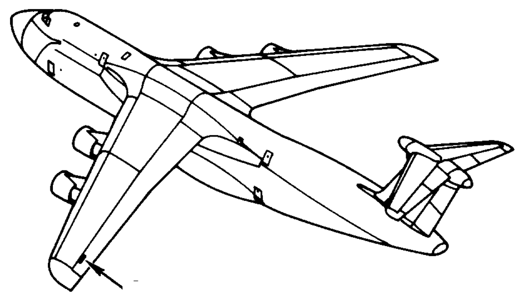
Aileron cable tension regulators

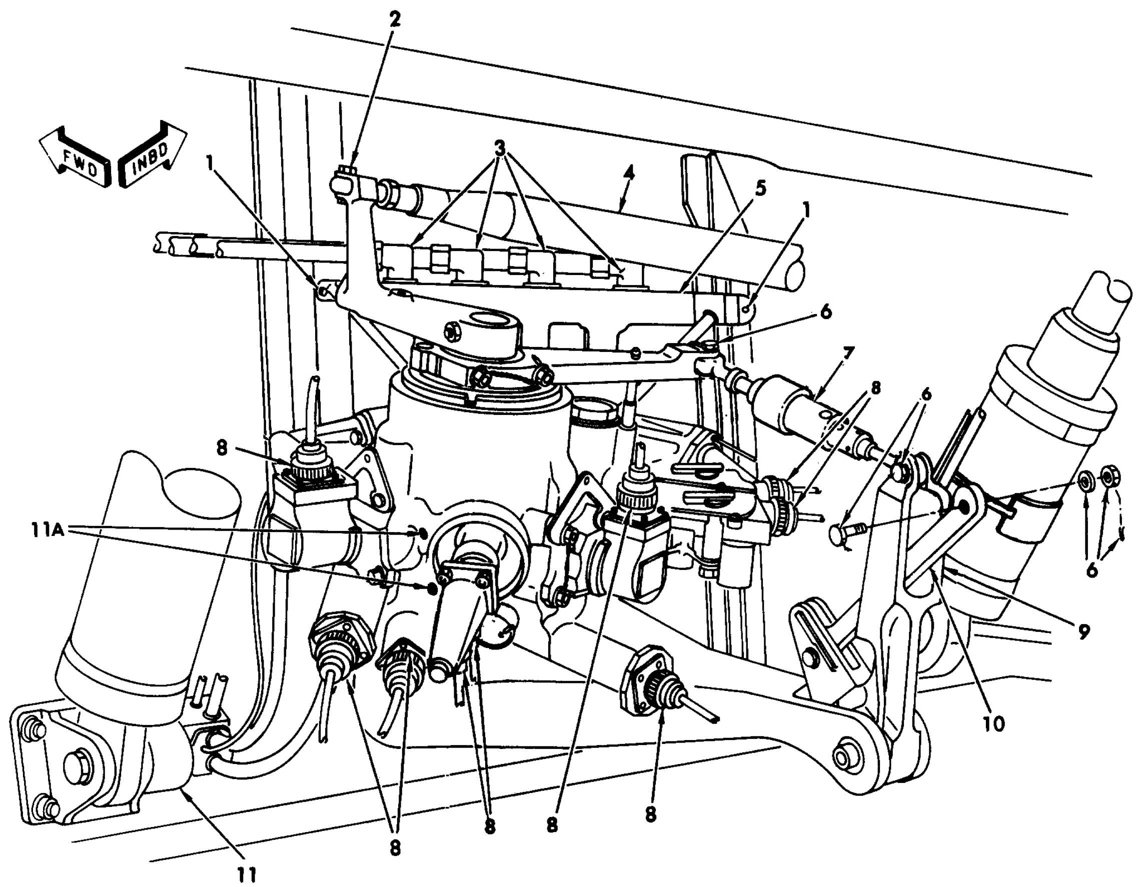


Aileron actuators

1. BOLT, WASHER,AND SAFETY WIRE (4 PLACES)
2. BOLT, NUT, WASHER, AND COTTER PIN
3. ELBOW FITTINGS
4. BUNGEE ROD
5. MANIFOLD
6. BOLT, NUT, WASHER, AND COTTER PIN
7. FEEDBACK BUNGEE ASSEMBLY
8. ELECTRICAL CONNECTORS (TYPICAL 12 PLACES)
9. BELLCRANK
10. LINK (CONNECTS TO AILERON FITTING)
11. ROTARY JOINT (2 PLACES)

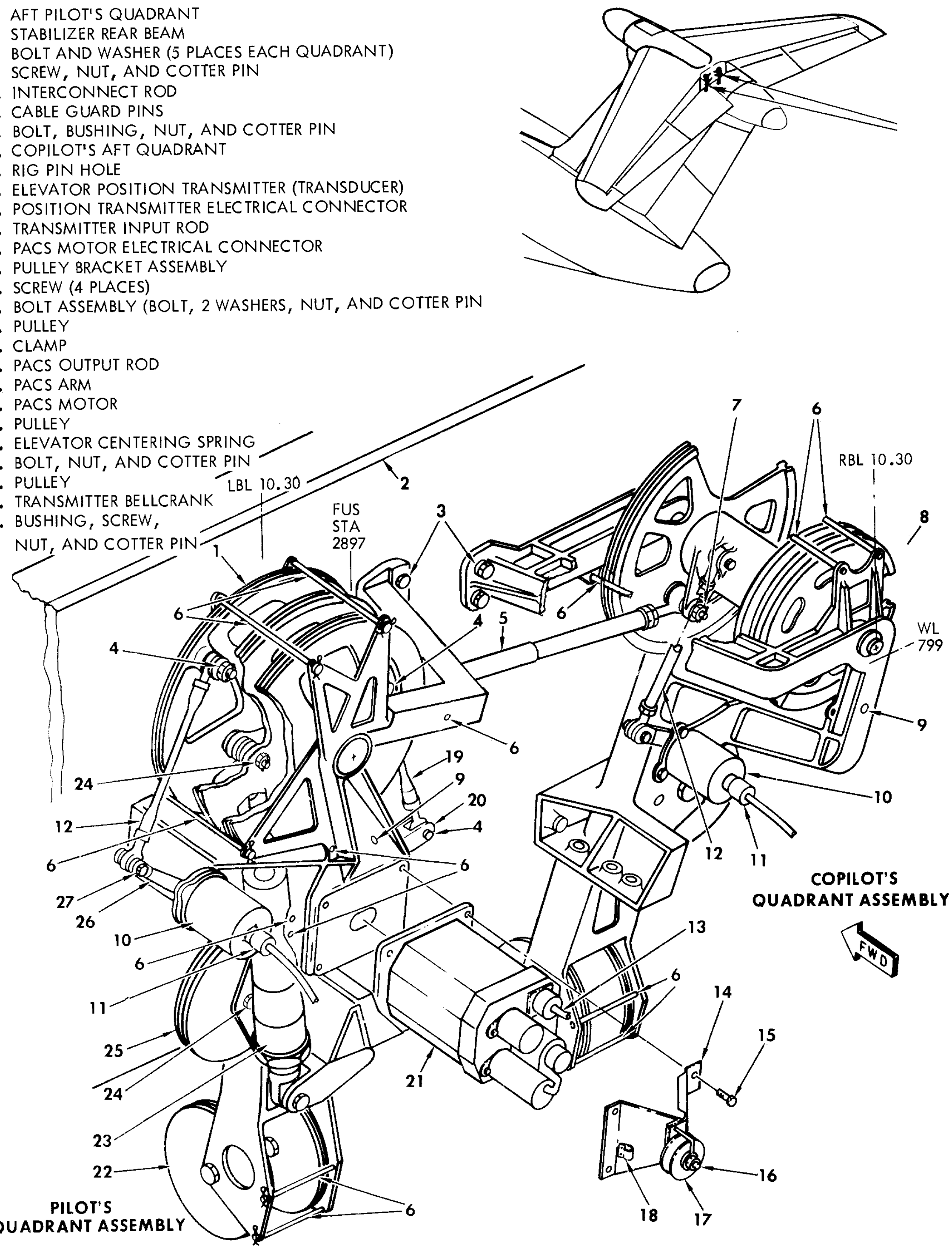
11A. VENT



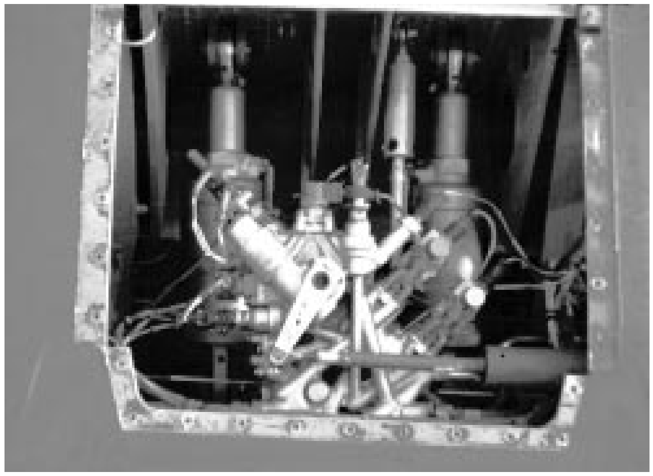


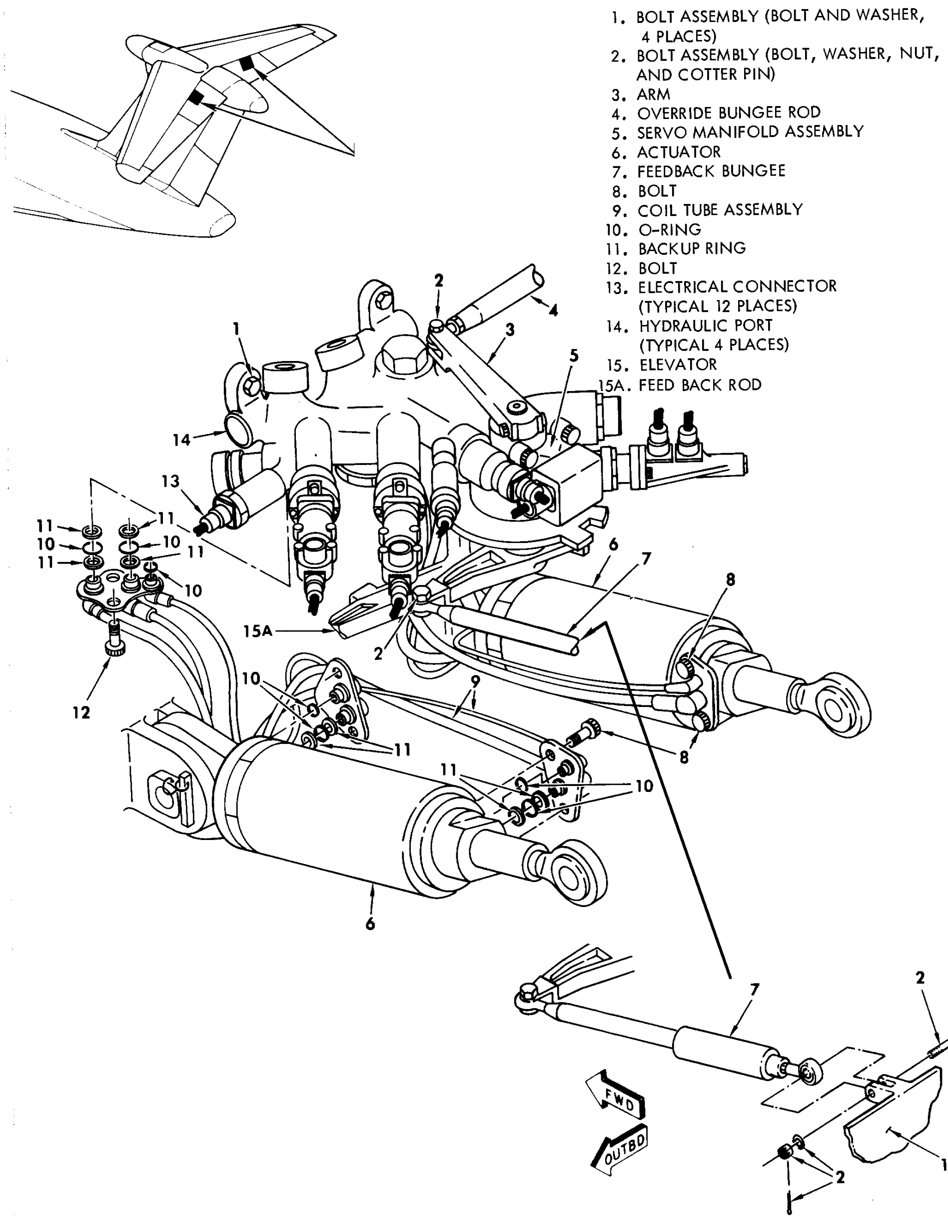
Aileron manifold assembly

1. AFT PILOT'S QUADRANT
2. STABILIZER REAR BEAM
3. BOLT AND WASHER (5 PLACES EACH QUADRANT)
4. SCREW, NUT, AND COTTER PIN
5. INTERCONNECT ROD
6. CABLE GUARD PINS
7. BOLT, BUSHING, NUT, AND COTTER PIN
8. COPILOT'S AFT QUADRANT
9. RIG PIN HOLE
10. ELEVATOR POSITION TRANSMITTER (TRANSDUCER)
11. POSITION TRANSMITTER ELECTRICAL CONNECTOR
12. TRANSMITTER INPUT ROD
13. PACS MOTOR ELECTRICAL CONNECTOR
14. PULLEY BRACKET ASSEMBLY
15. SCREW (4 PLACES)
16. BOLT ASSEMBLY (BOLT, 2 WASHERS, NUT, AND COTTER PIN
17. PULLEY
18. CLAMP
19. PACS OUTPUT ROD
20. PACS ARM
21. PACS MOTOR
22. PULLEY
23. ELEVATOR CENTERING SPRING
24. BOLT, NUT, AND COTTER PIN
25. PULLEY
26. TRANSMITTER BELLCRANK
27. BUSHING, SCREW, NUT, AND COTTER PIN

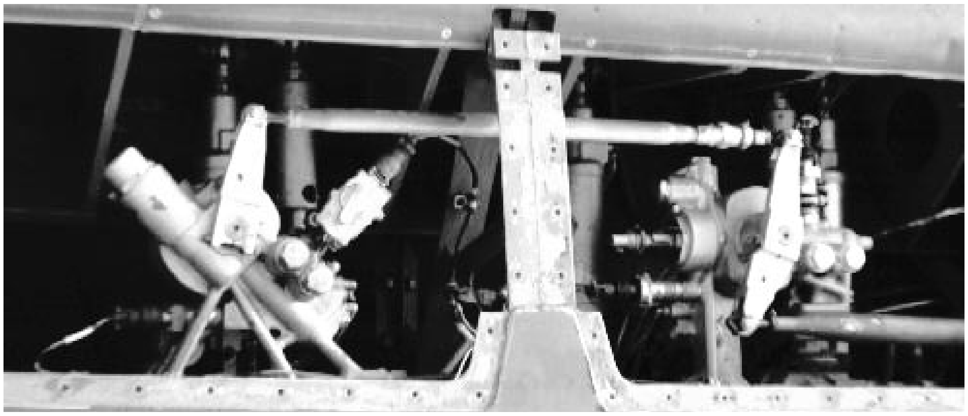


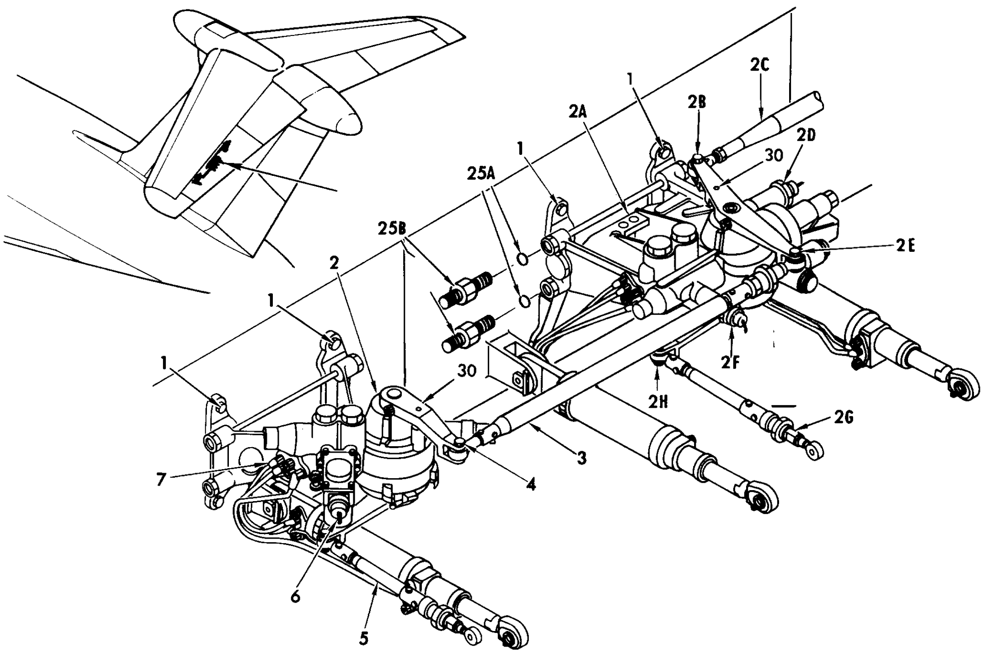
Elevator quadrants



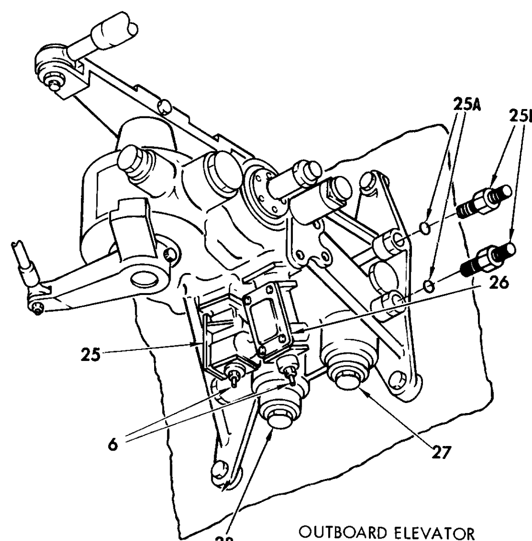


Inboard elevator servo actuators

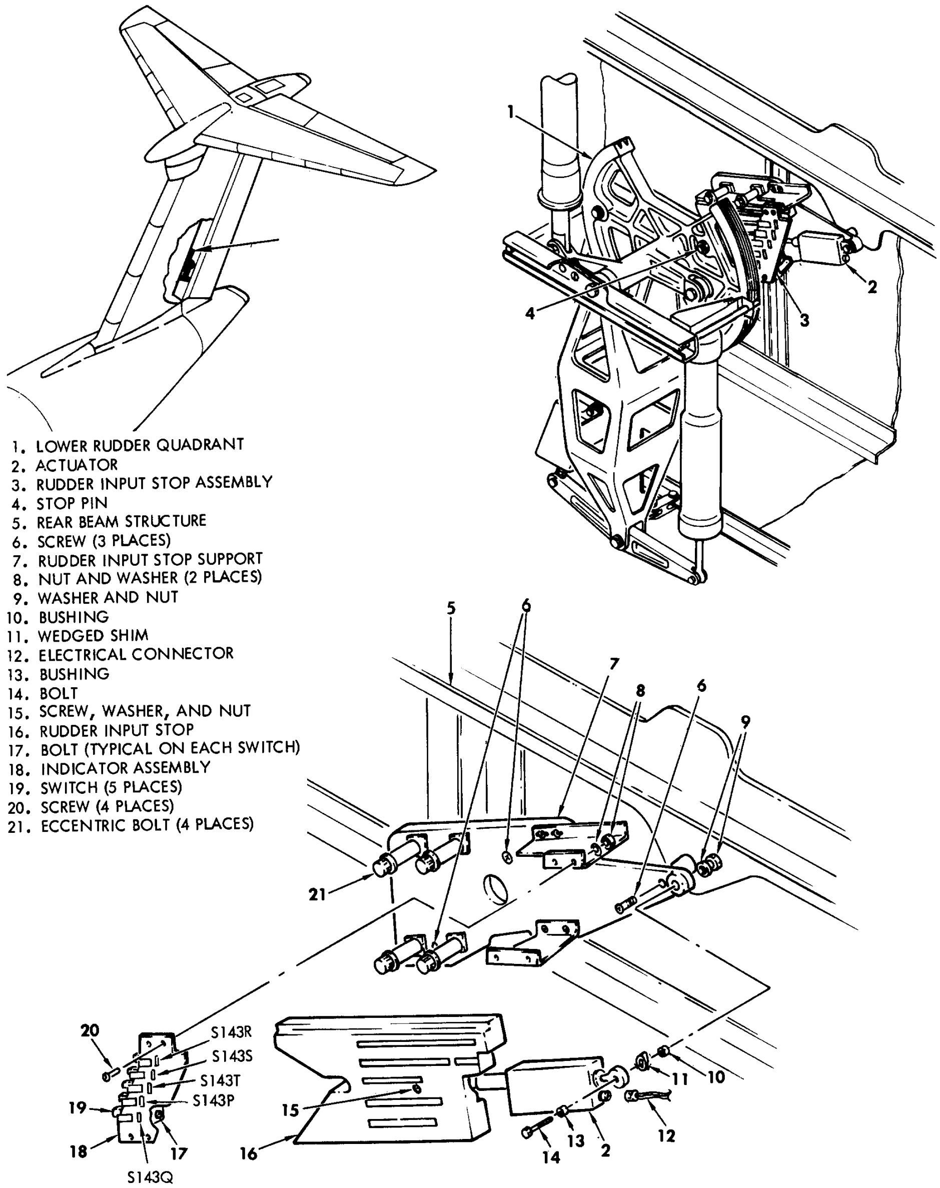




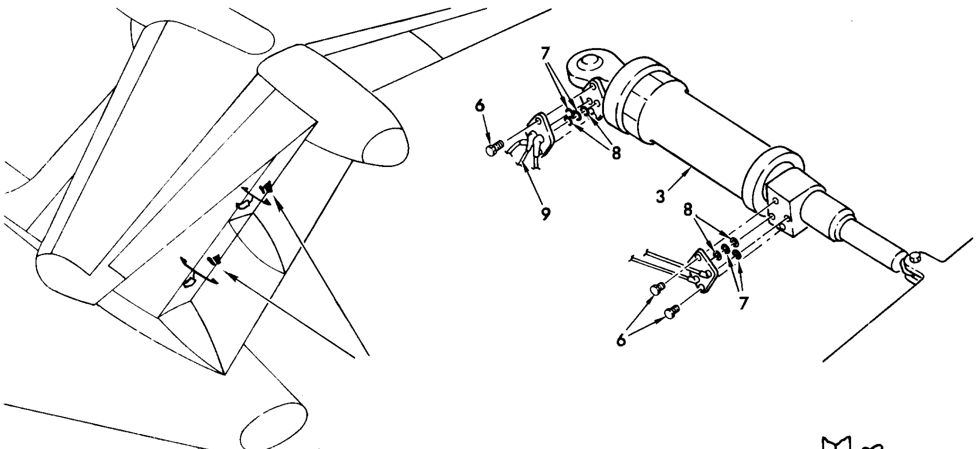
1. ATTACHING HARDWARE (BOLT AND WASHER) (4 PLACES EACH MANIFOLD)
2. OUTBOARD ELEVATOR SERVO ASSEMBLY NO. 2
2A. OUTBOARD ELEVATOR SERVO ASSEMBLY NO. 1
2B. BOLT ASSEMBLY (BOLT, WASHER (2), NUT, COTTER PIN, AND SAFETY WIRE
2C. INPUT ROD
2D. PRESSURE SWITCH (SYSTEM 3)
2E. BOLT ASSEMBLY (BOLT, WASHER, NUT, COTTER PIN, AND SAFETY WIRE
2F. PRESSURE SWITCH (SYSTEM 1)
2G. FEEDBACK BUNGEE
2H. BOLT ASSEMBLY (BOLT, WASHER, NUT, COTTER PIN, AND SAFETY WIRE
3. INPUT INTERCONNECT ROD
4. BOLT ASSEMBLY (BOLT, WASHER, NUT, COTTER PIN, AND SAFETY WIRE
5. FEEDBACK BUNGEE
6. ELECTRICAL CONNECTOR
7. HYDRAULIC CONNECTION
25. BYPASS AND SHUTOFF VALVE DRIVE AND VALVE (SYSTEM 1)
25A. O-RING
25B. UNION
26. BYPASS AND SHUTOFF VALVE DRIVE AND VALVE (SYSTEM 3)
27. FILTER CAP (SYSTEM 3)
28. FILTER CAP (SYSTEM 1)
30. RIG PIN HOLE

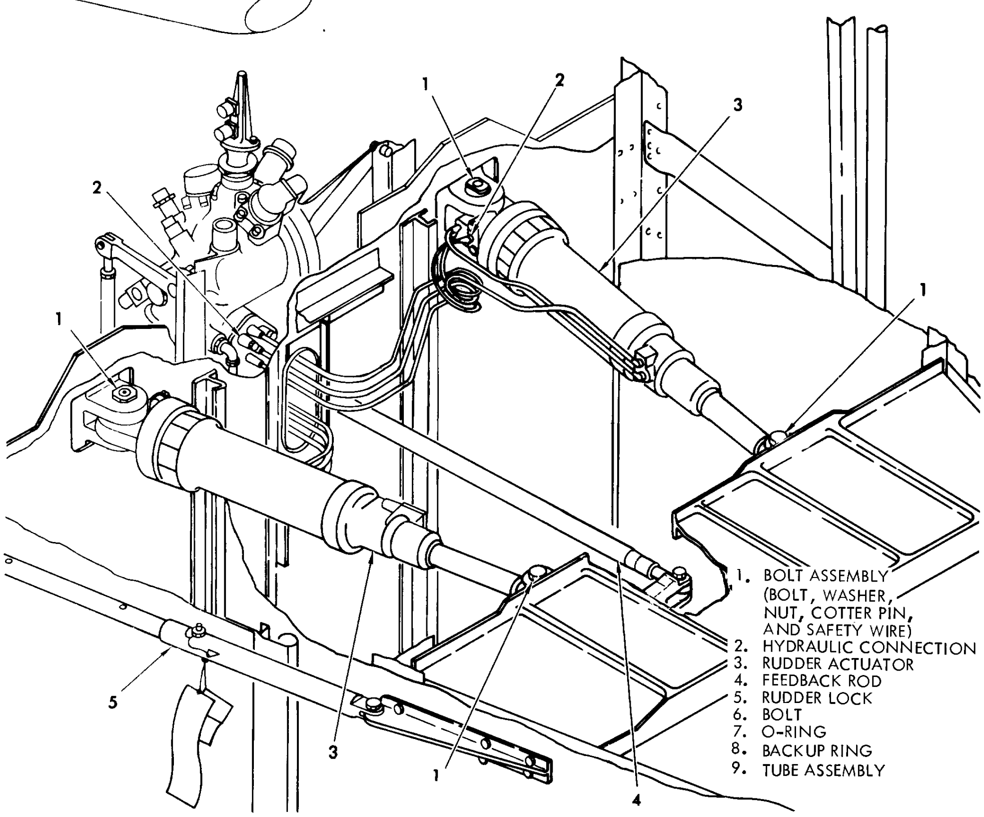


Outboard elevator servo actuators



Lower rudder quadrant and limiter assembly





Rudder actuators

Secondary Flight Controls

The secondary flight controls are composed of the flap system, the slat system, the spoiler system and the pitch trim system. A brief description of each system is covered in the following paragraphs.

Flap System

Twelve wing flaps, six in the trailing edge of each wing, extend to increase the lift of the wings, resulting in greater stability of the airplane at low air speeds. The flaps are controlled by a flap control handle situated on the cockpit center console. The flap handle has four primary positions: up, 40% take-off, 62% take-off and approach, and landing. The flap system is activated by two hydraulic motors, and a gear box for torque power transmission to screwjacks at each flap. The motors are powered by two hydraulic systems, but will operate with one system. A flap asymmetry system is provided to detect asymmetrical conditions between the left and right wing flaps. The system removes hydraulic power and actuates flap brakes located in the wing tips when asymmetry limits are reached.

Slat System

Fourteen leading edge slats are used in conjunction with the flaps during the take-off and landing portion of the flight to increase lift at low speeds. The slats receive power from the flap power package, to a clutch and brake assembly, and a gear box for torque tube power transmission. The flap handle controls the slats. Displacement of the flap handle to the takeoff and approach detent rotates an input quadrant on the flap power package. As the input quadrant passes through an angular displacement of two degrees from the flaps-up position, a switch is actuated, causing electrical power to be removed from solenoid operated control valves in the clutch and brake assembly. The clutch then engages and the brake disengages to provide power for slat deployment. The slats reach the fully-extended position when the flaps reach the 15 degrees position. Asymmetry detection and brakes are also employed in the slat system.

Spoiler System

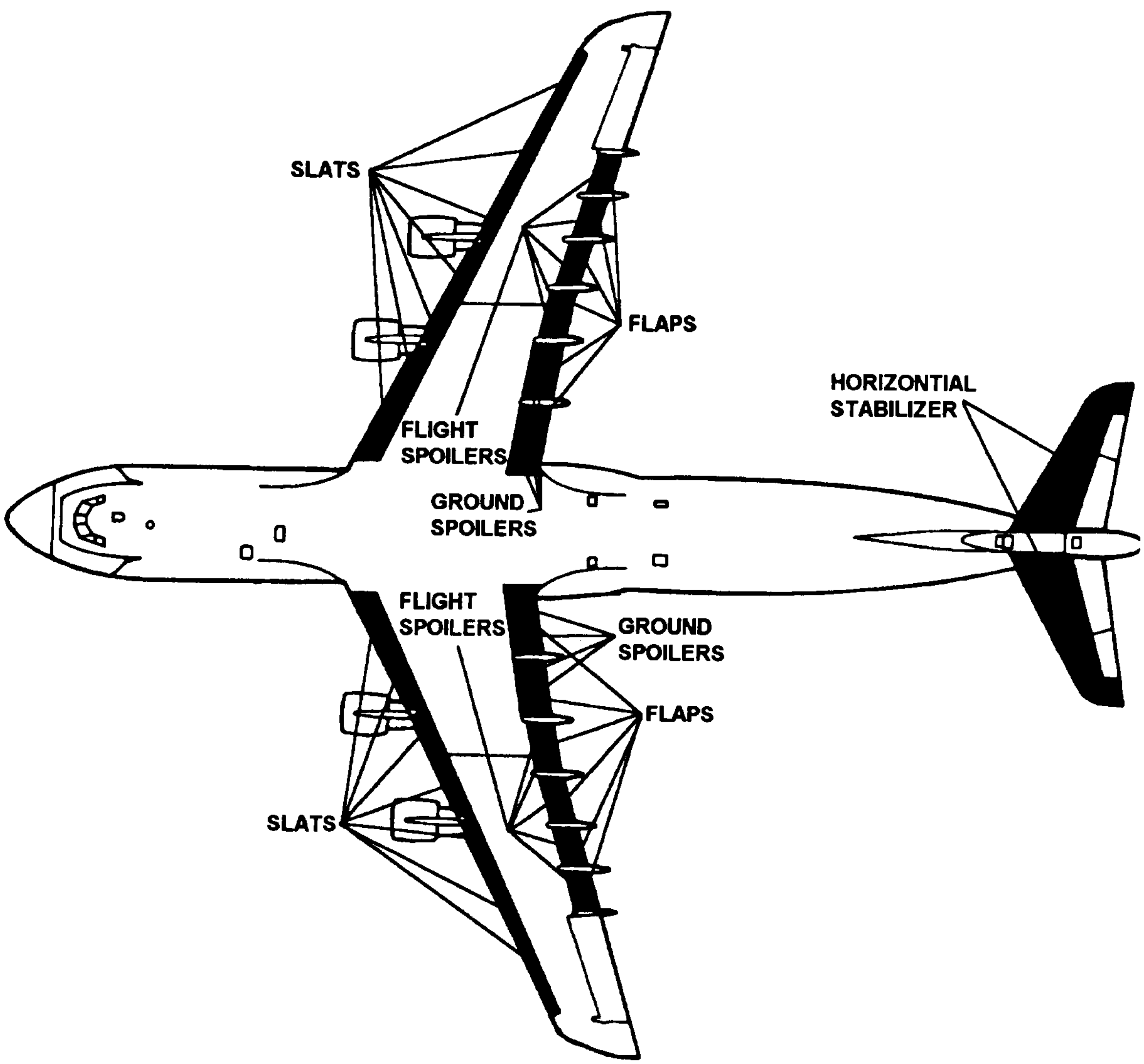
Eighteen spoiler panels are mounted on the upper wing surface near the trailing edge. All eighteen are employed during the landing rollout, to destroy lift. The ten outboard panels serve a dual purpose in that they are used in conjunction with the ailerons during flight for more positive lateral control. A mechanical mixing box in each wing converts the input command from the aileron cable system to a proportional command to the ten flight spoilers. Spoiler control handles, provided at each side of the cockpit center console, connect the panel actuator control valves through a single closed loop cable. An actuator is provided for each spoiler panel. The spoiler system is powered by all four hydraulic systems, and will be controllable after the loss of any two systems. Safety features are incorporated to prevent inadvertent ground spoiler deployment while the airplane is airborne or during take-off. The ground spoiler handle is locked in closed position unless two forward or aft main landing gear struts are compressed or spin up attained on diagonal opposite bogies. The locking feature may be overridden by a manual release handle.

Pitch Trim System

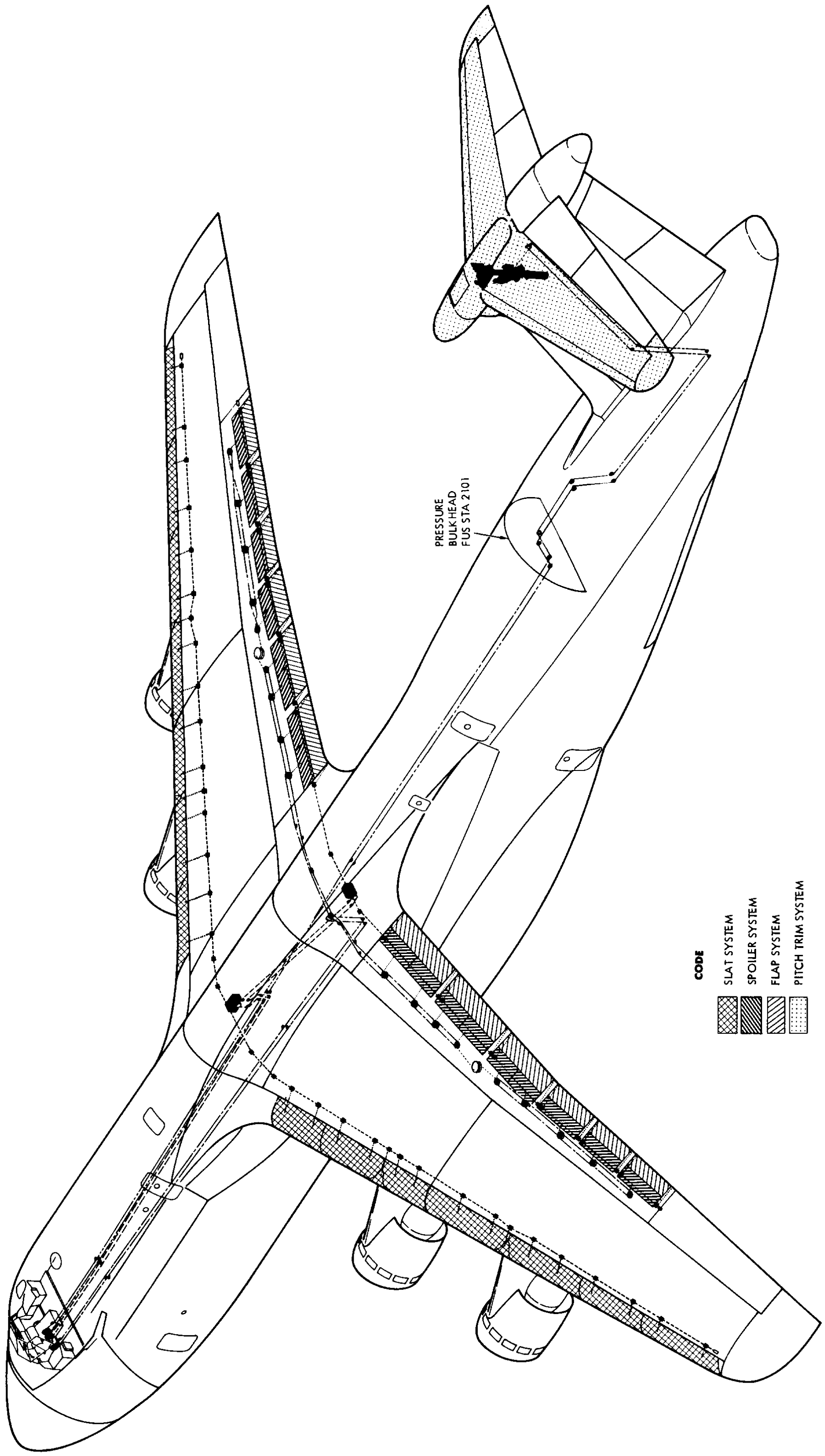
The pitch trim system relieves the pilot of control column load caused by varying loading and flight conditions. The pitch trim control, completely independent of the elevator system, is accomplished by pivoting the horizontal stabilizer about its attachment shafts to raise or lower the leading edge of the stabilizer. The horizontal stabilizer is, therefore, the pitch trim control surface. The system includes the horizontal stabilizer actuator and an input system. The actuator is equipped with an in dependent rotating nut and a rotating screw drive. The actuator stands in a vertical position within the empennage. Pitch trim is achieved by rotating the screw within the nut utilizing the screw drive or rotating the nut using the nut drive. A hydraulic brake device holds one drive while the other is operating. Either mode of operation will cause the actuator to extend or retract. Three means of operating the horizontal stabilizer actuator are provided. They are: switches on the control wheel, a manual lever, and center console switches.

Stallimiter System

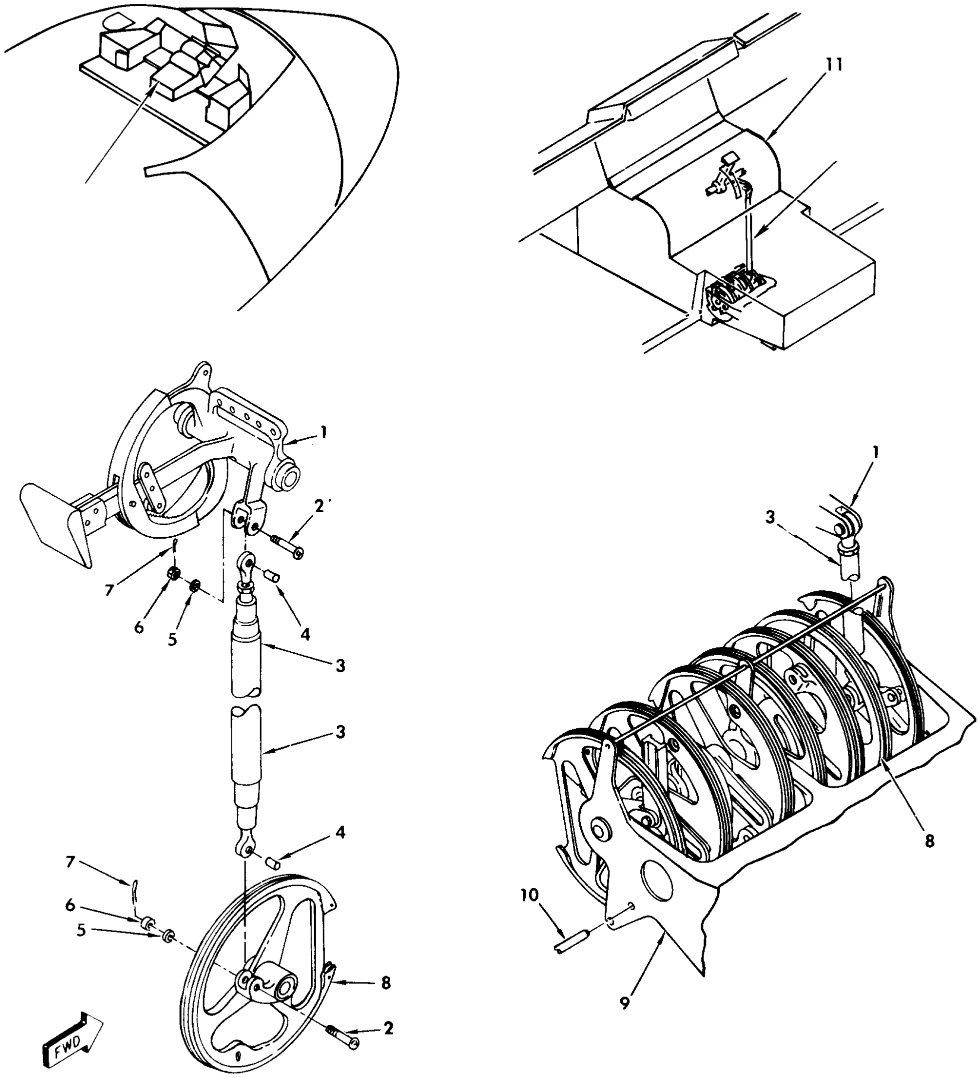
The stallimiter system is composed of a stall warning system. The system computer monitors speed, angle-of-attack and other flight information and determines permissible or nonpermissible flight conditions. When the permissible angle-of-attack has been exceeded, the system warns the pilot and copilot by shaking the control columns and further deviation from permissible angle-of-attack conditions activates an audible warning.



Secondary flight controls

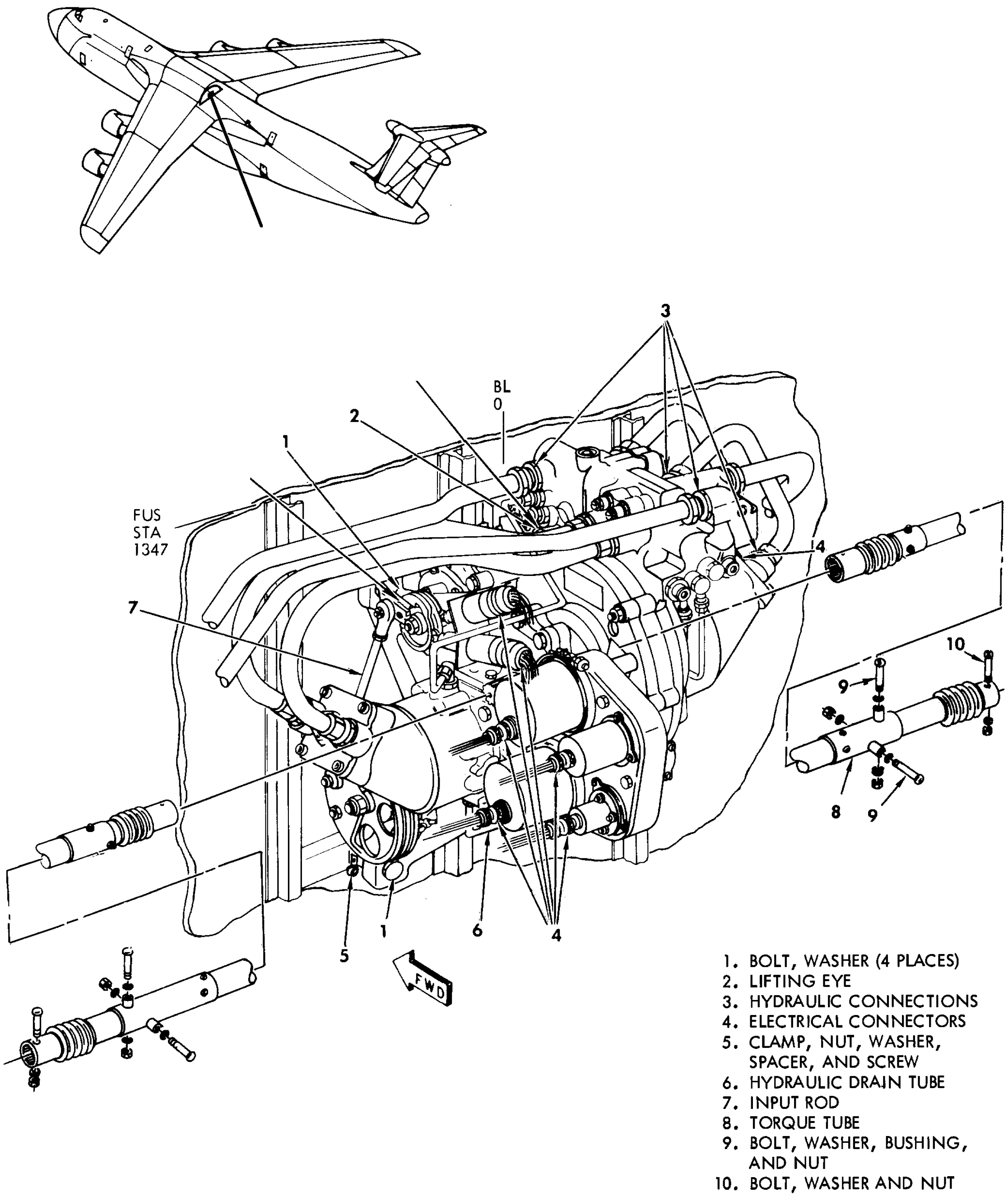


Secondary flight controls cable routing

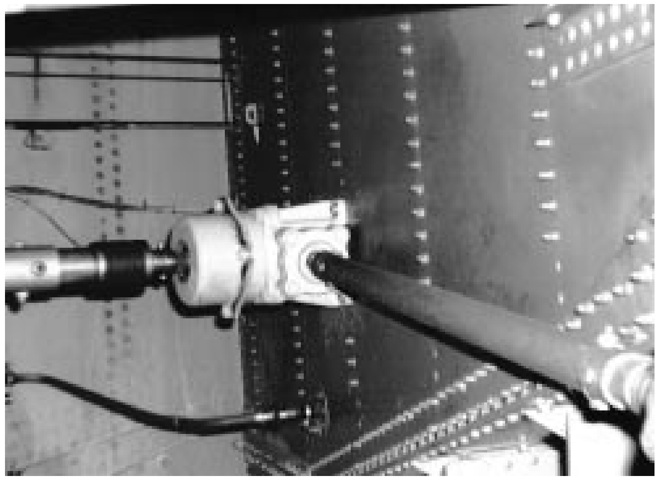


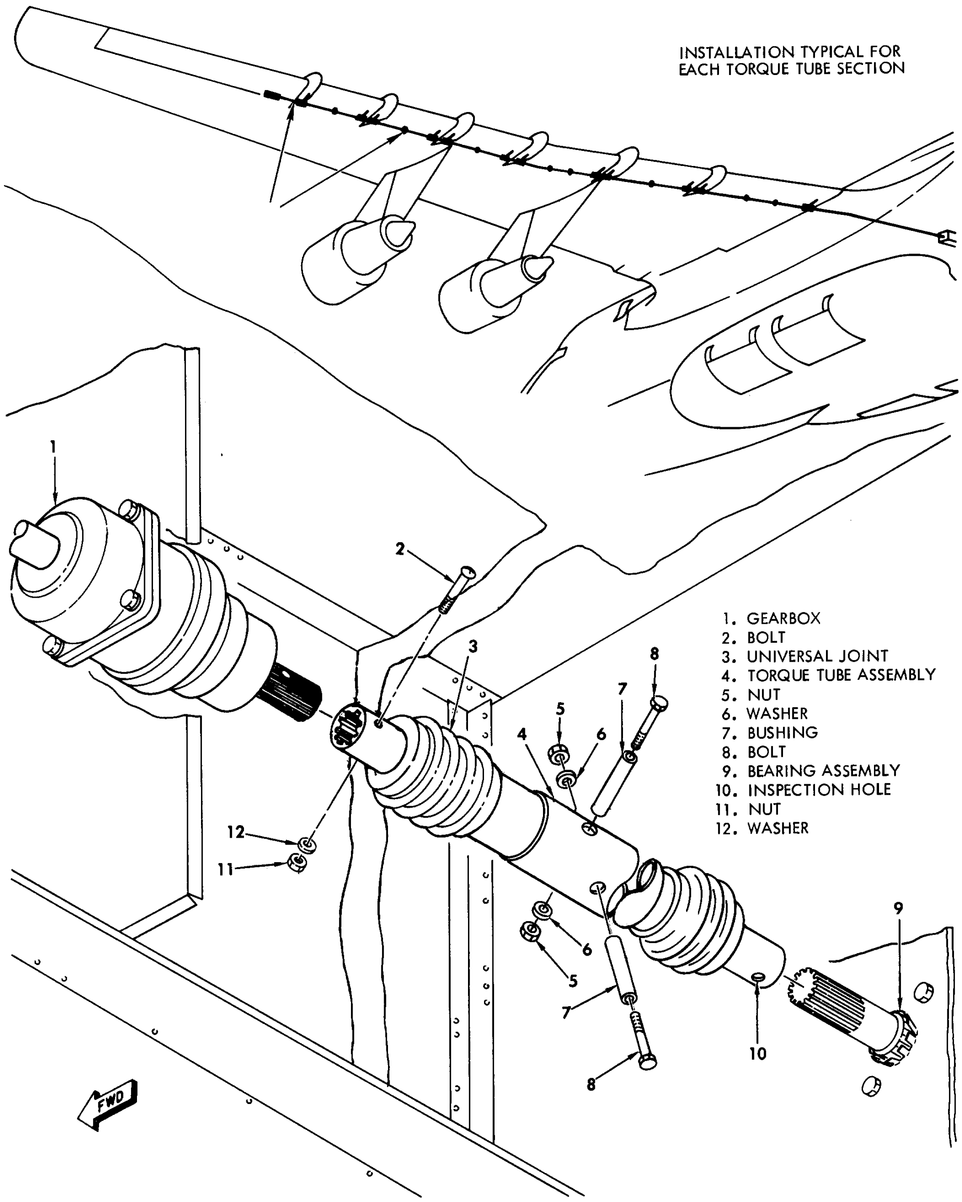
1. FLAP CONTROL LEVER ASSY
2. SCREW
3. FLAP CONTROL INNERCONNECT ROD
4. SPACER
5. WASHER
6. NUT
7. COTTER PIN
8. FLAP CONTROL QUADRANT
9. QUADRANT SUPPORT
10. RIG PIN (4S01049-101A)
11. CENTER CONSOLE

Flap control lever assembly

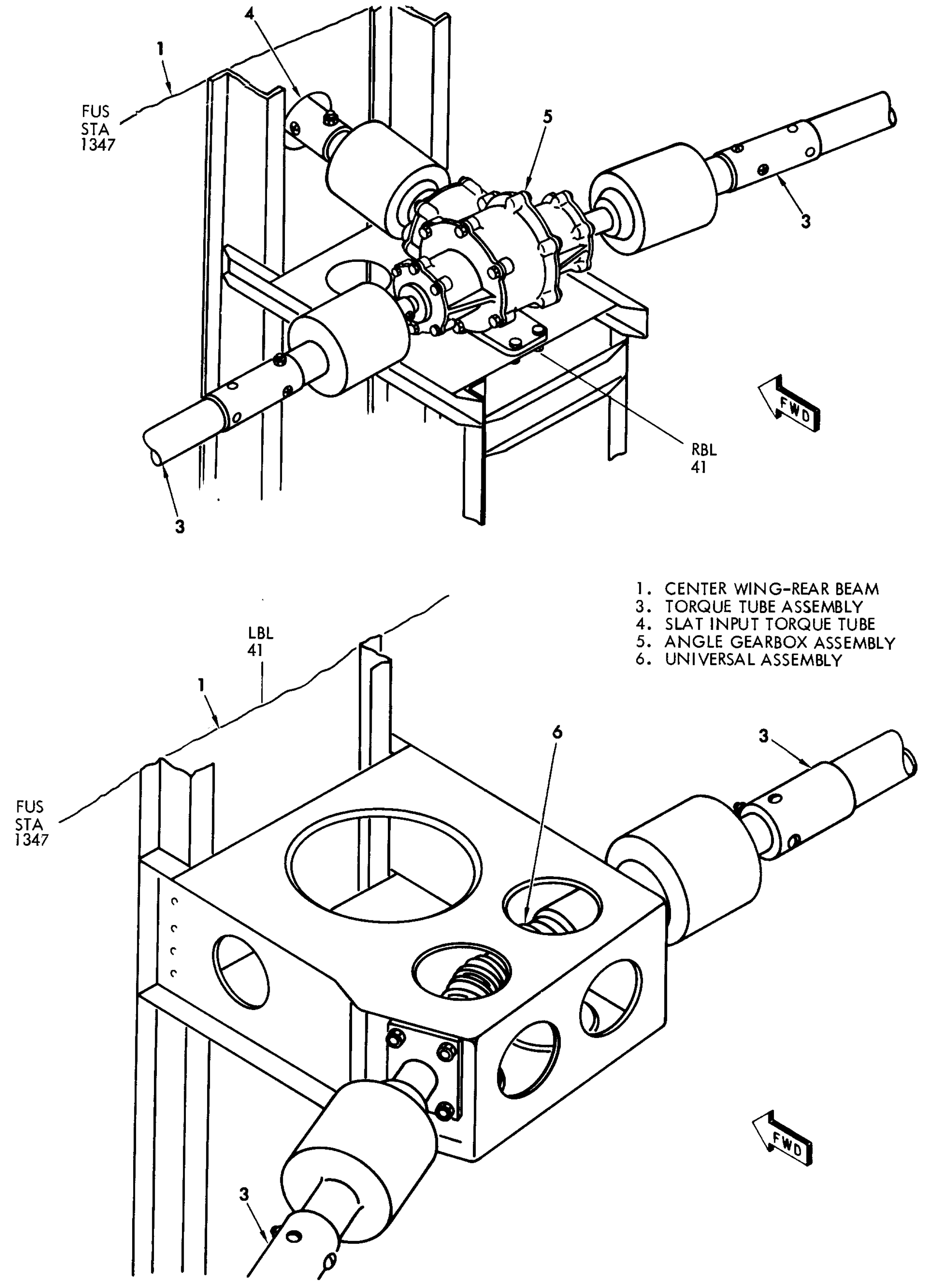


Flap system power package

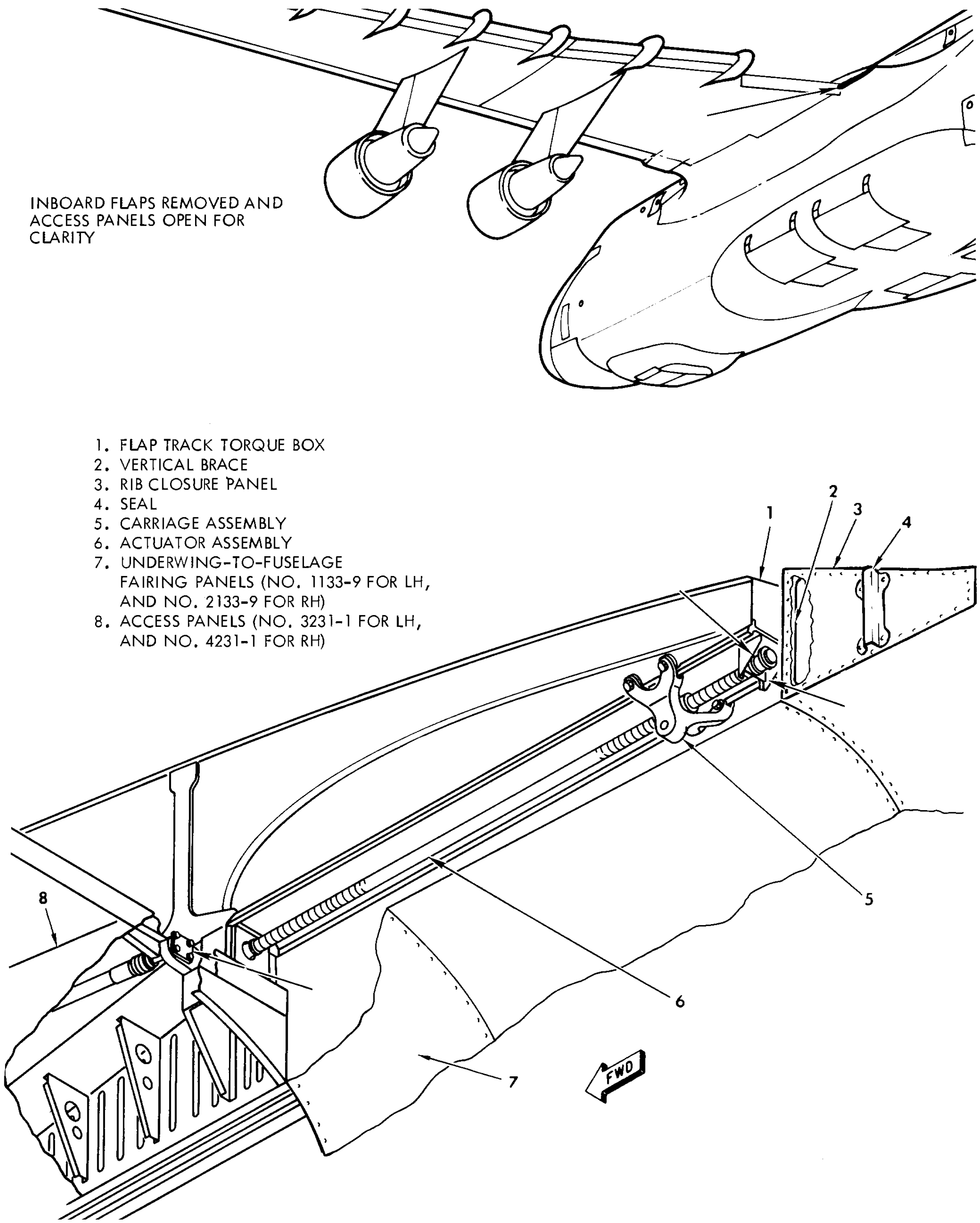




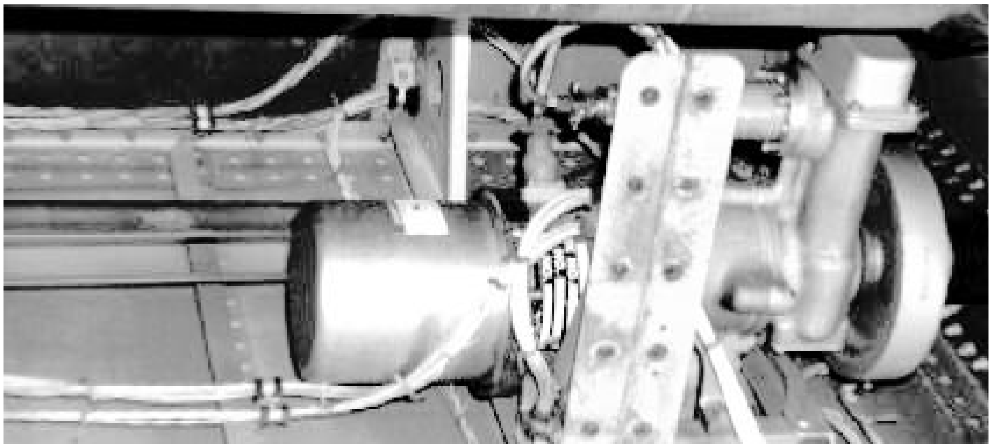
Flap system torque tube assembly (typical)



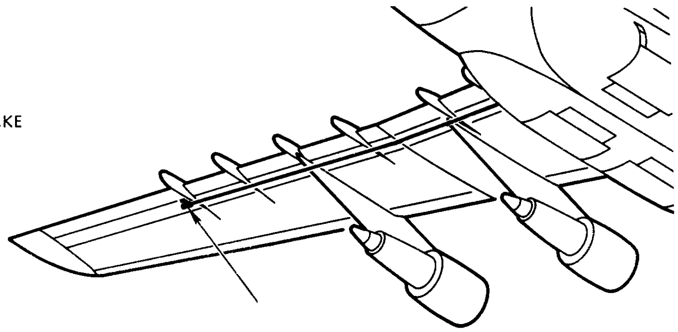
Slat/flap angle gearbox

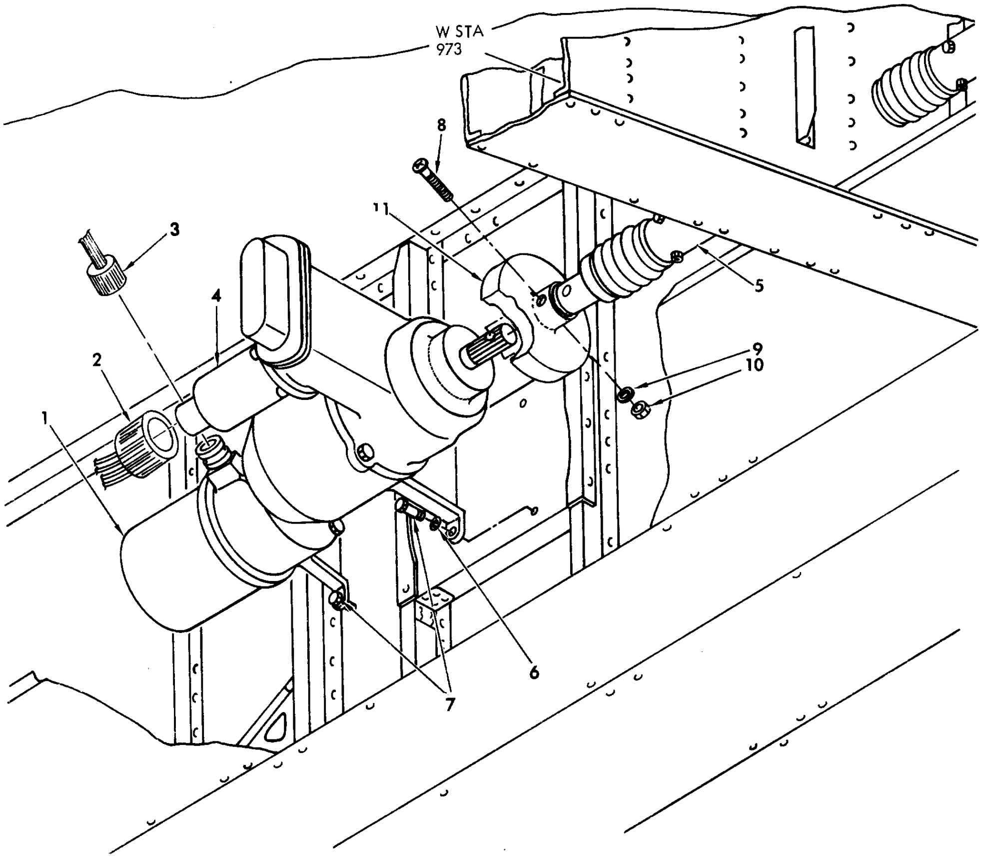


Flap track, carriage, and actuator assembly

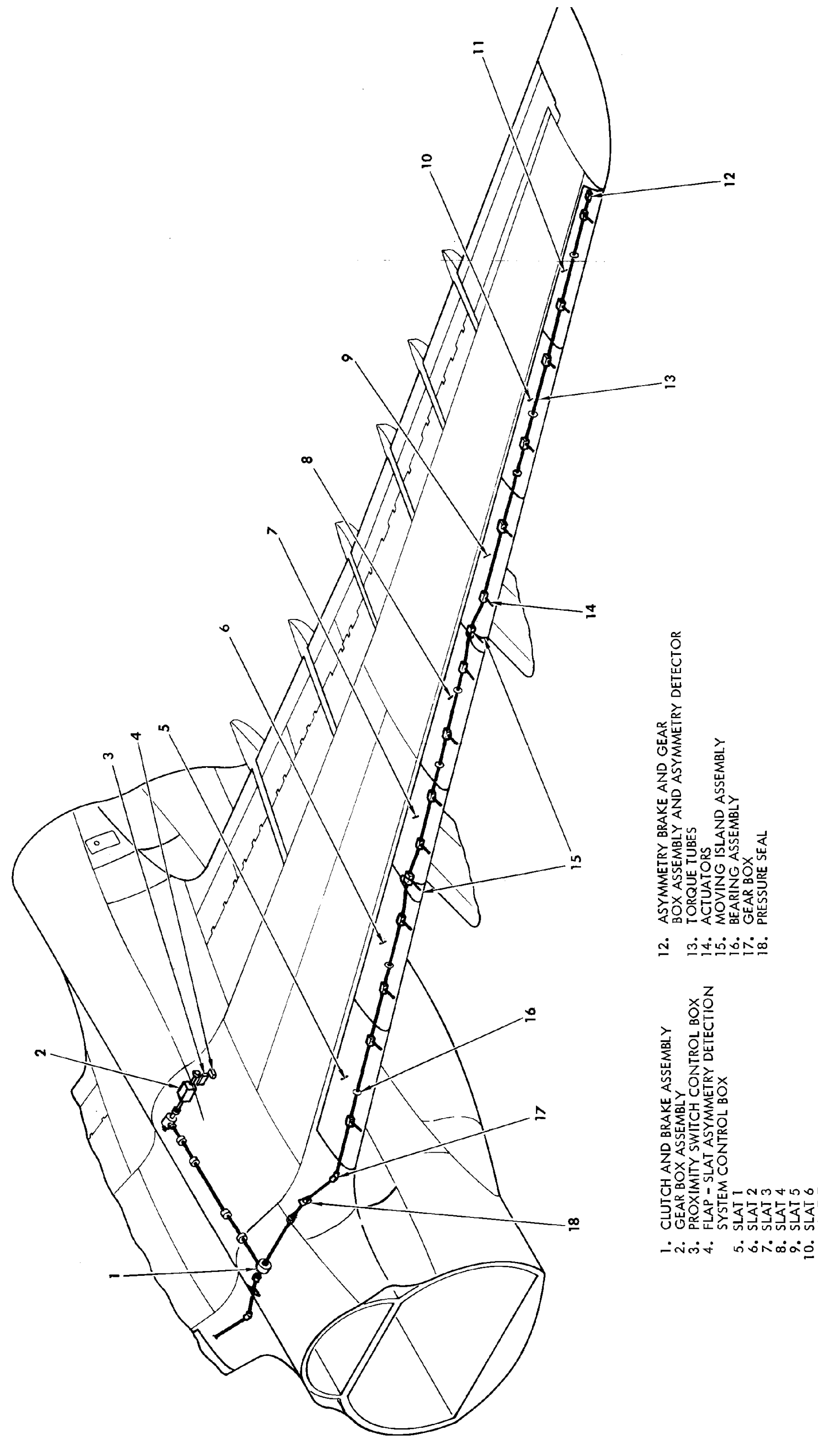


1. ASYMMETRY GEAR BOX AND BRAKE
2. ELECTRICAL CONNECTOR
3. ELECTRICAL CONNECTOR
4. ASYMMETRY DETECTOR
5. TORQUE TUBE
6. WASHER
7. BOLT
8. BOLT
9. WASHER
10. NUT
11. FLYWHEEL

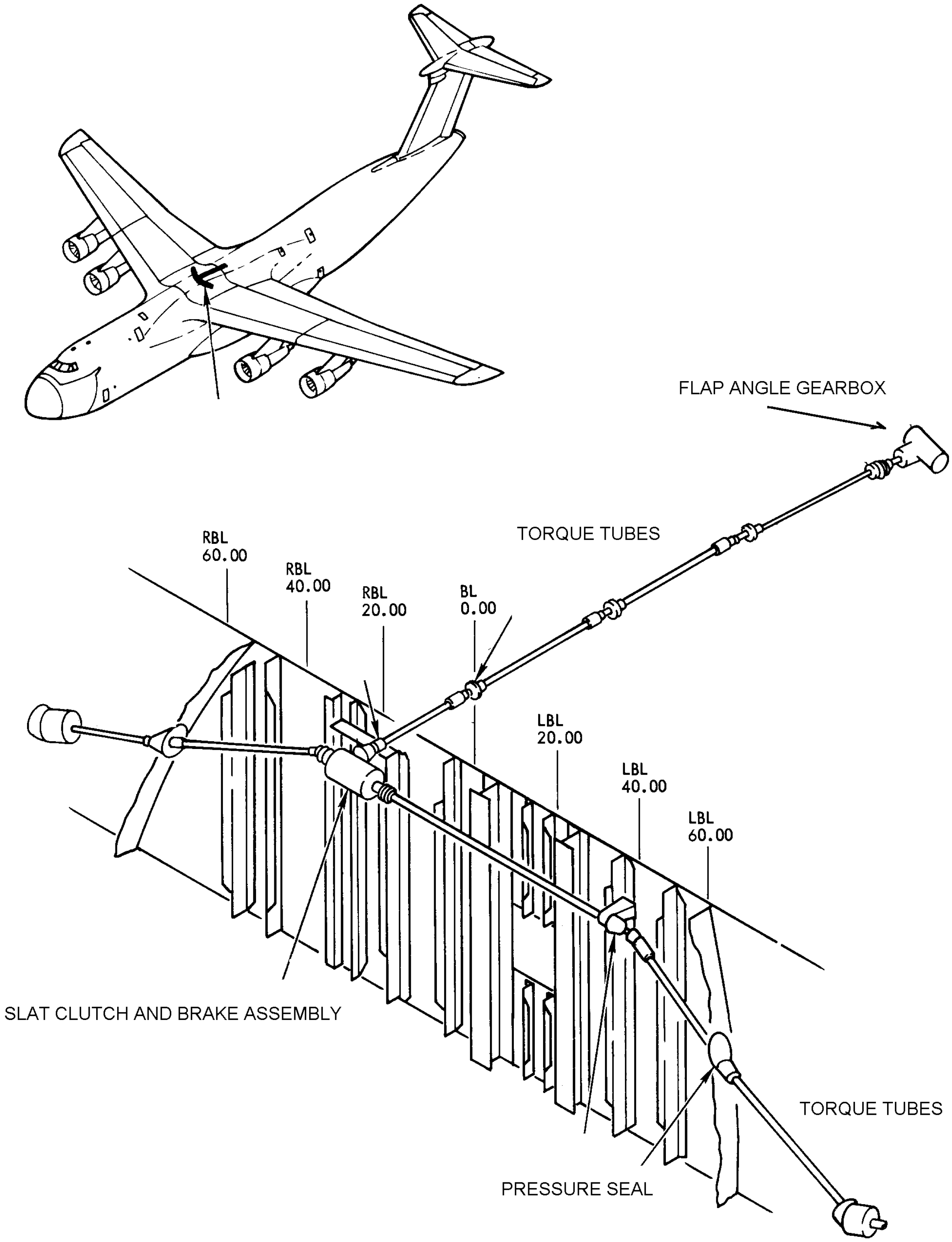




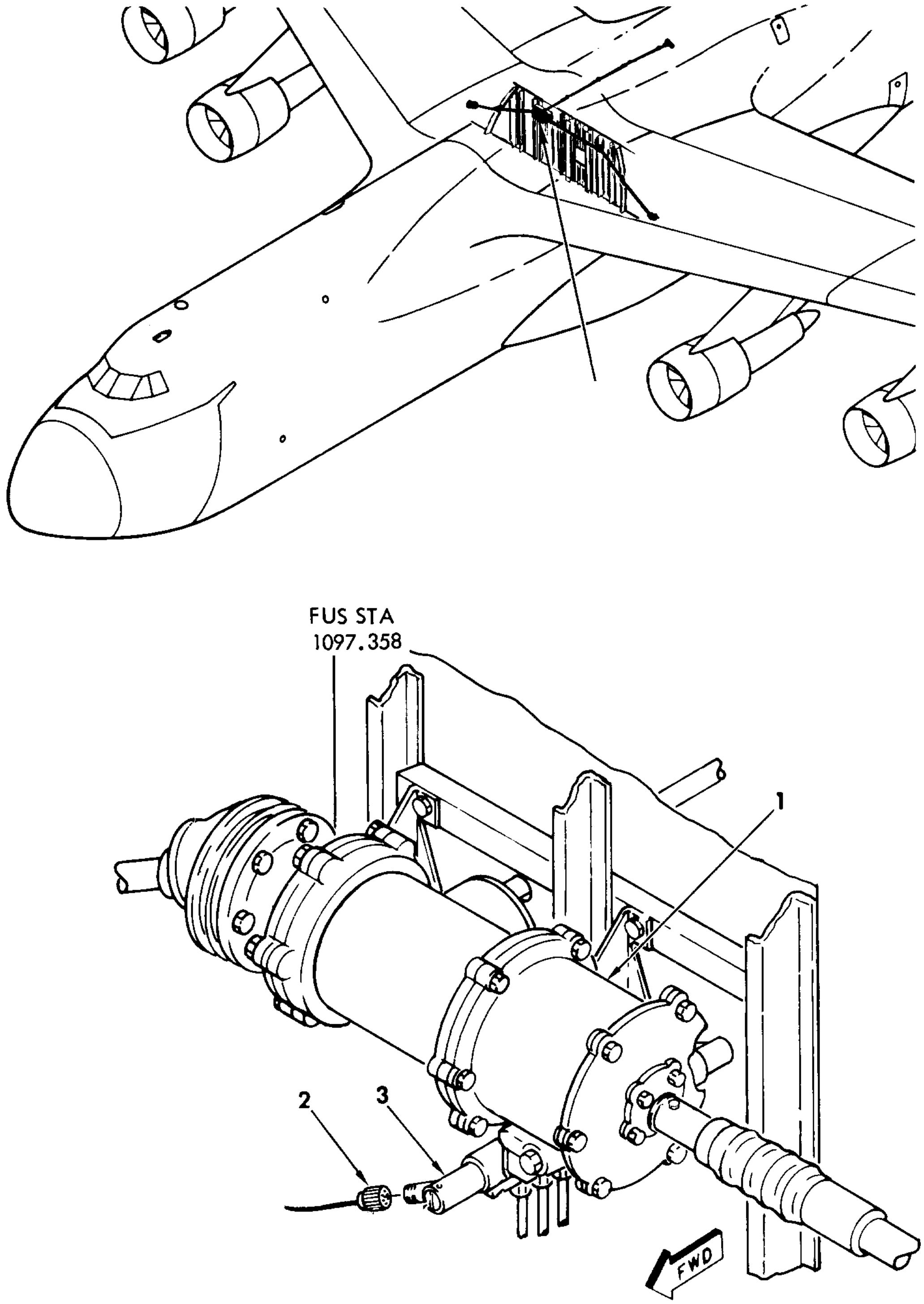
Flap asymmetry detector, gearbox, and brake assembly



Slat drive system

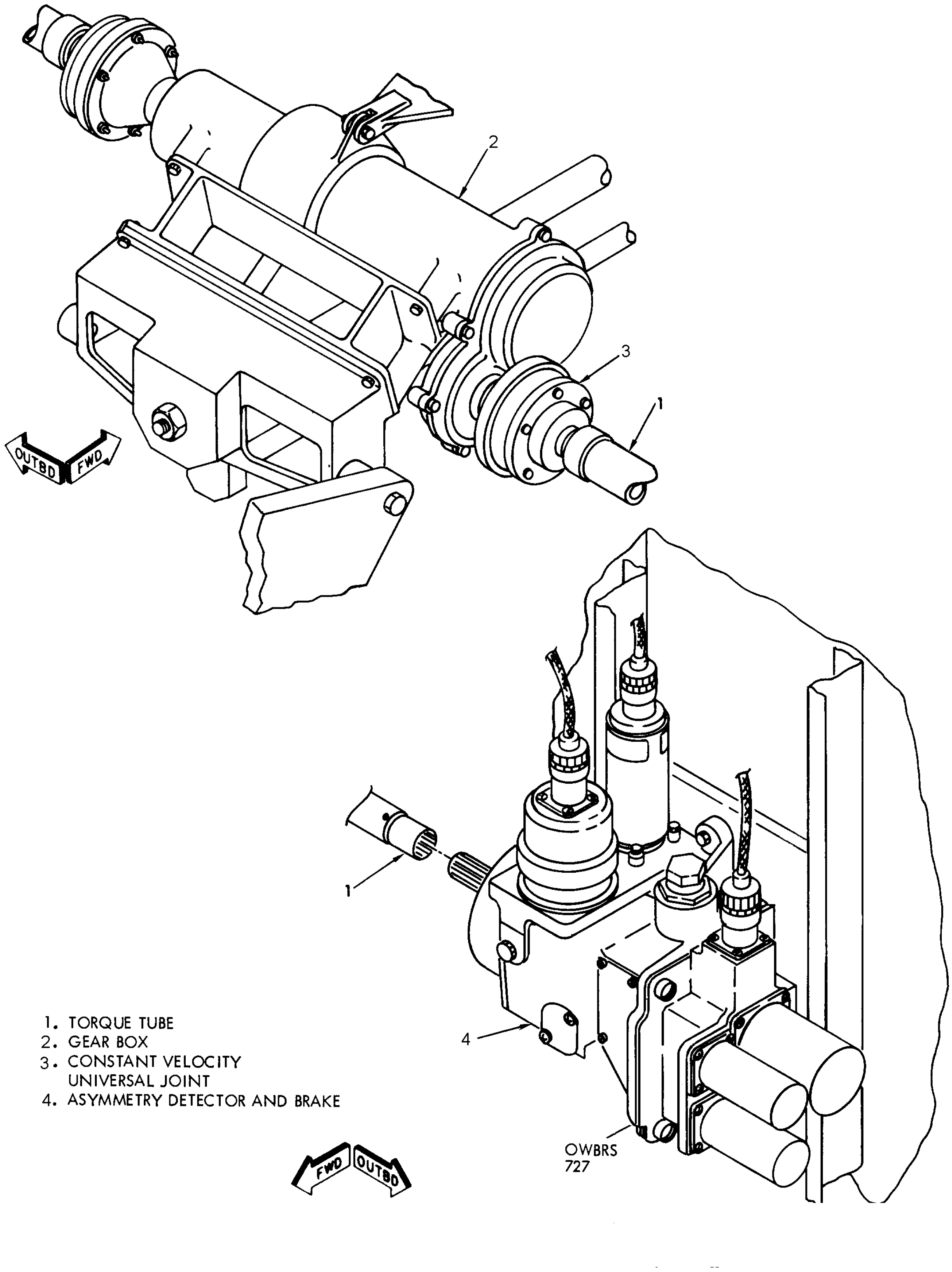


Slat clutch and brake assembly and flap angle gearbox

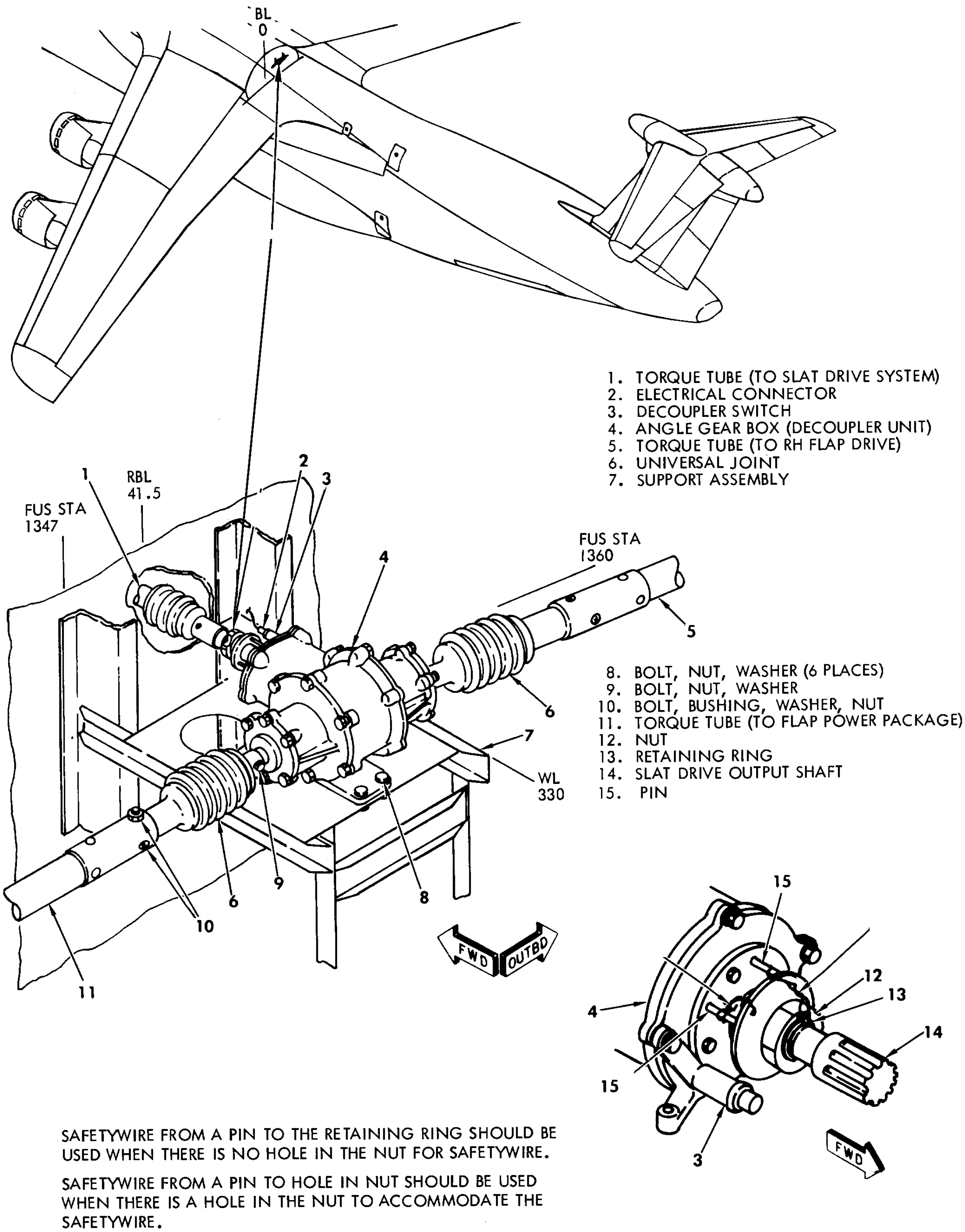


1. SLAT CLUTCH AND BRAKE ASSEMBLY
2. ELECTRICAL CONNECTOR
3. SOLENOID VALVE ASSEMBLY

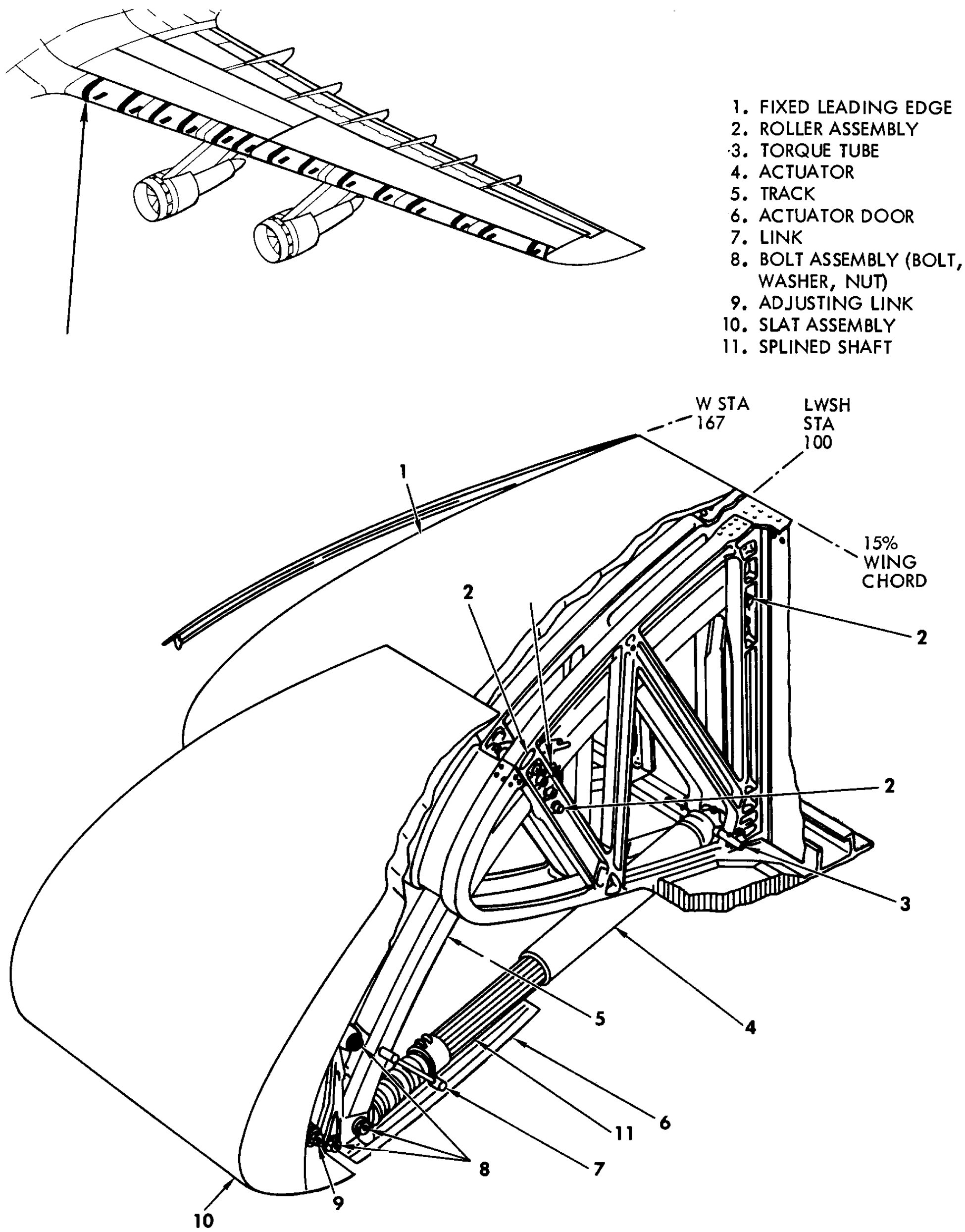
Slat clutch and brake assembly



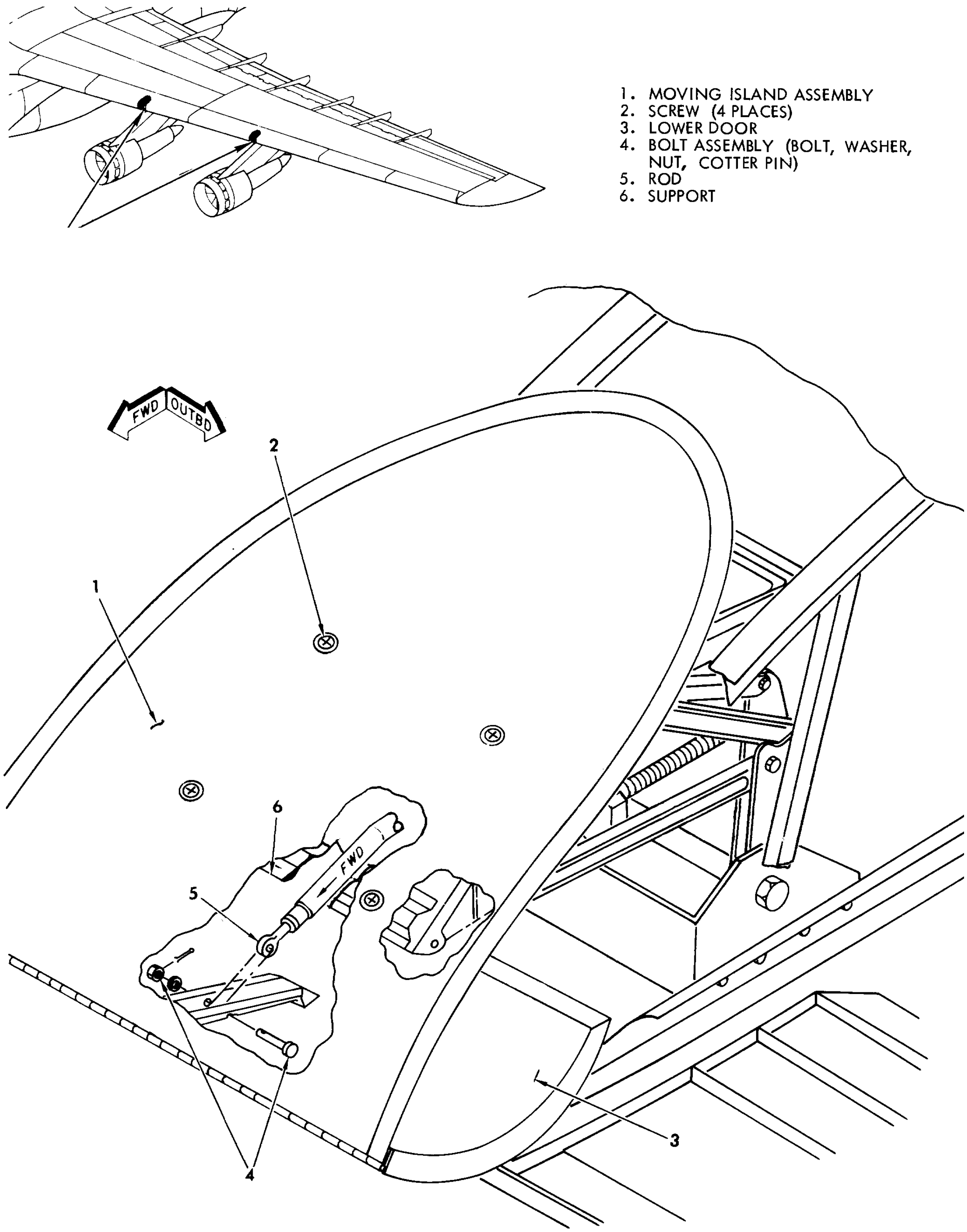
Slat asymmetry brake, gearbox, and detector



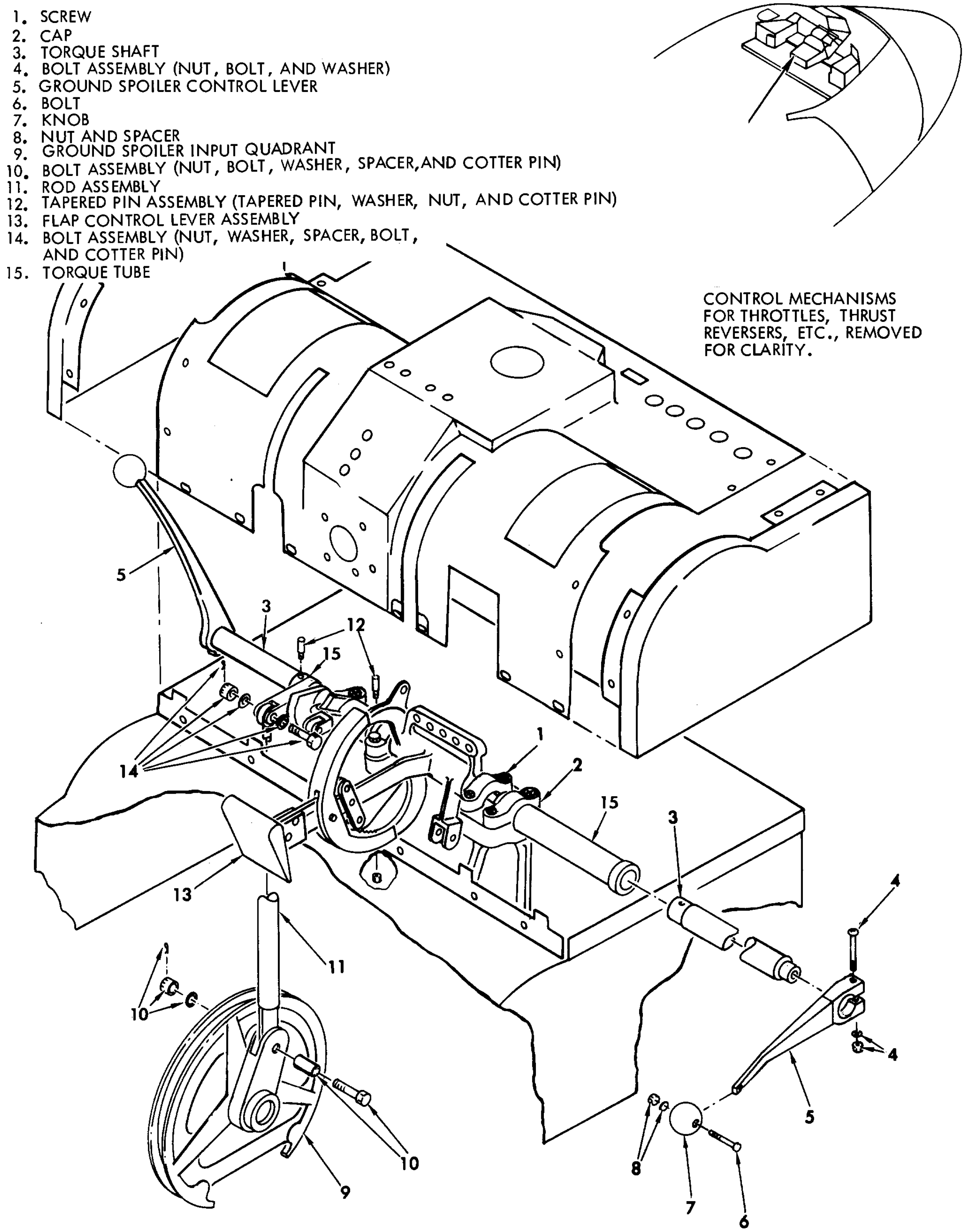
Slat/flap angle gearbox (decoupler unit)



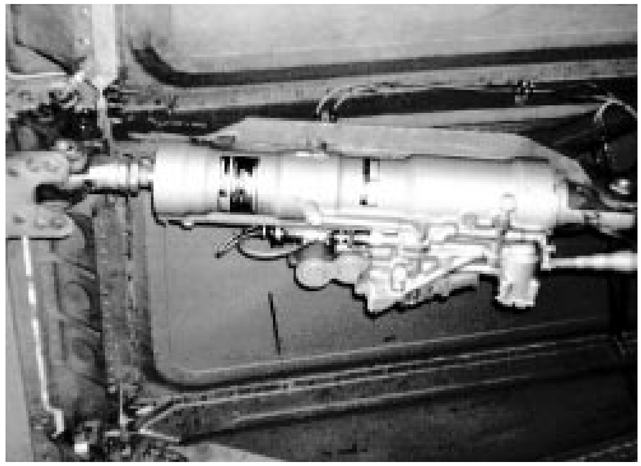
Typical slat track and actuator

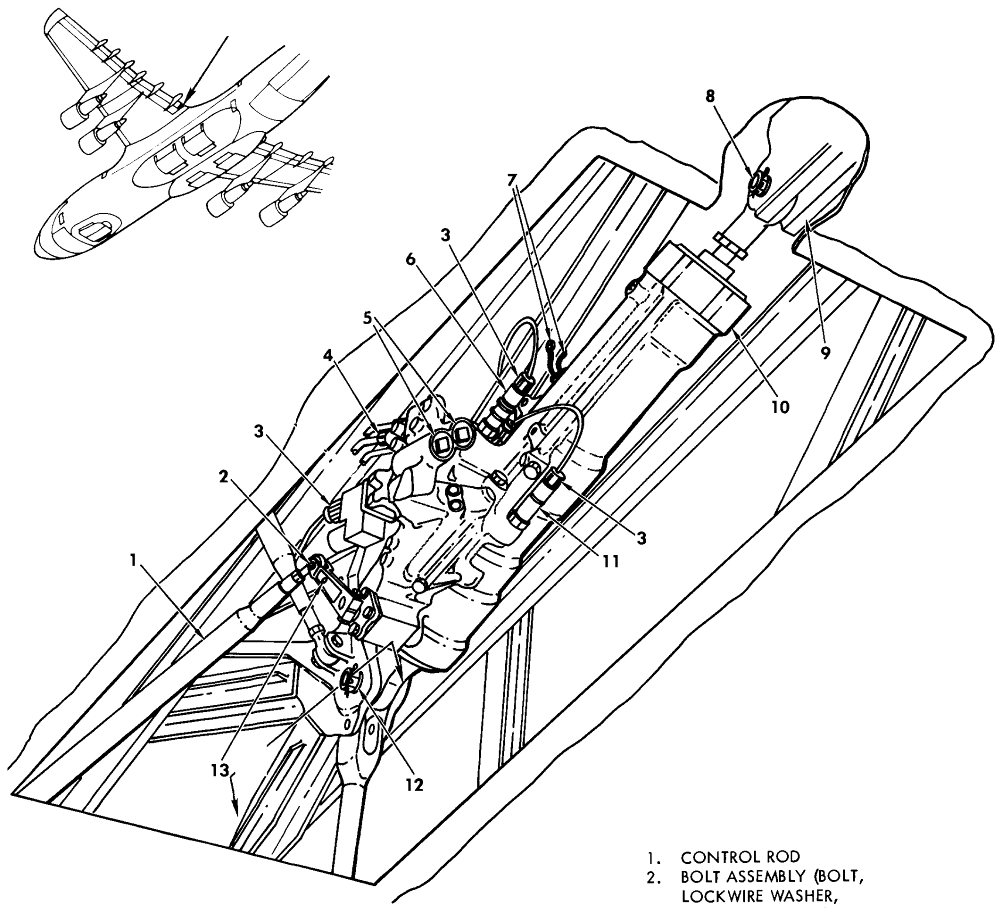


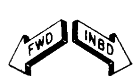
Typical moving island assembly



Ground spoiler control levers

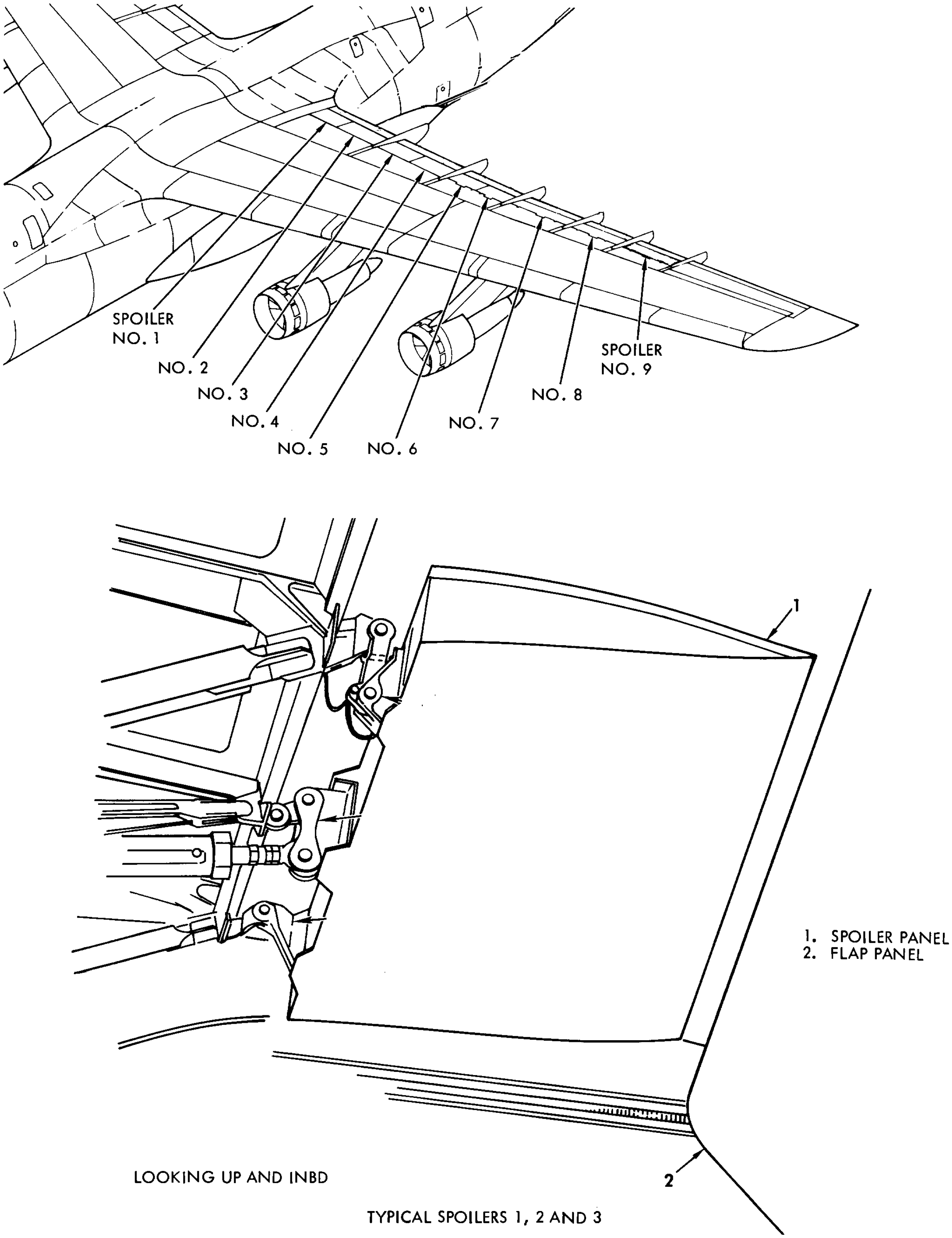




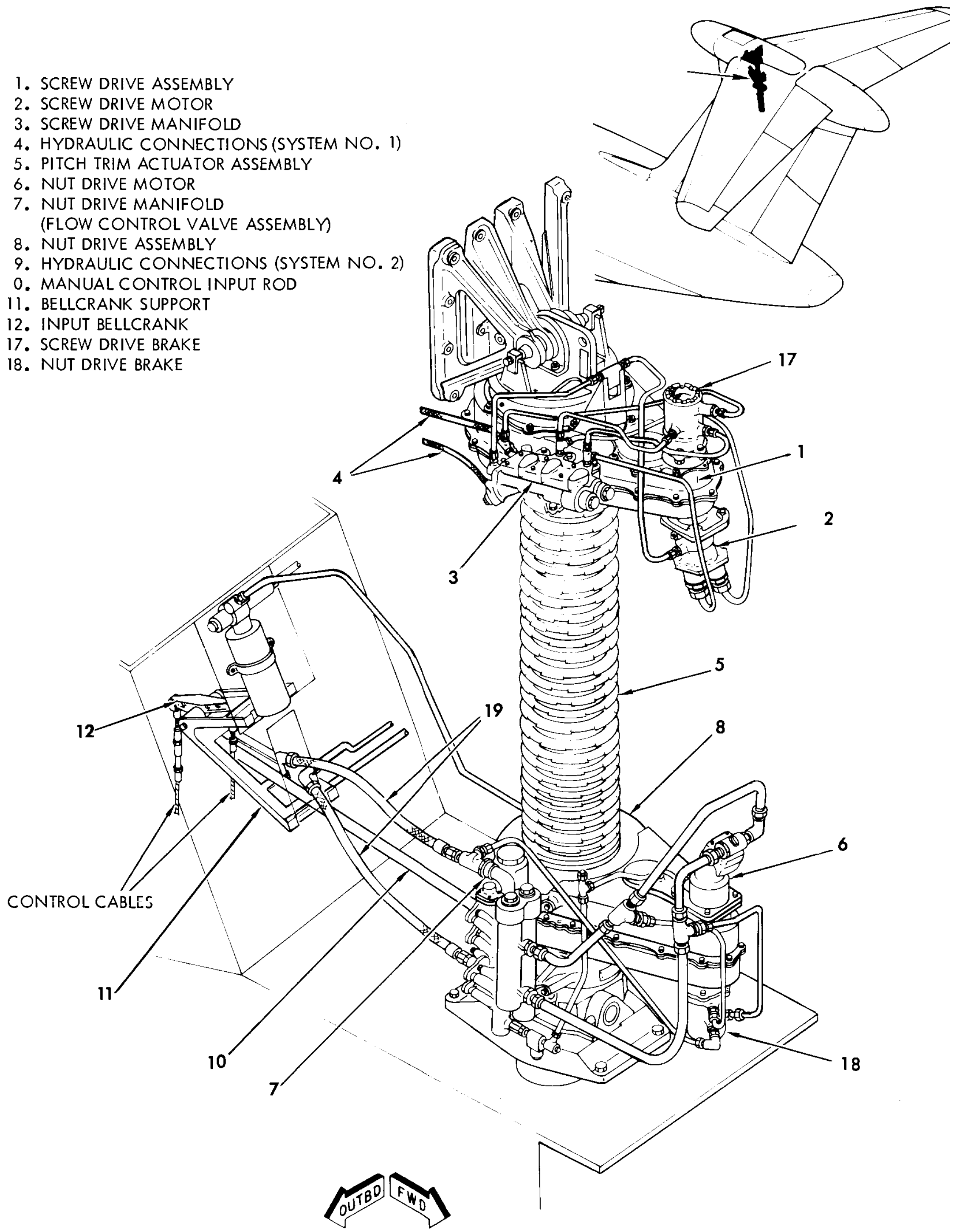


1. CONTROL ROD
2. BOLT ASSEMBLY (BOLT, LOCKWIRE WASHER, NUT, COTTER PIN)
3. ELECTRICAL CONNECTOR
4. HYDRAULIC CONNECTIONS (4 PLACES)
5. FILTER CAPS
6. PRESSURE SWITCH (2J2)
7. BONDING WIRE
8. BOLT ASSEMBLY (BOLT, WASHER NUT, 3 COTTER PINS)
9. SPOILER HINGE
10. ACTUATOR
11. PRESSURE SWITCH (1J2)
12. BOLT ASSEMBLY (BOLT, 2 WASHERS, NUT, 3 COTTER PINS
13. RIGGING PIN HOLE

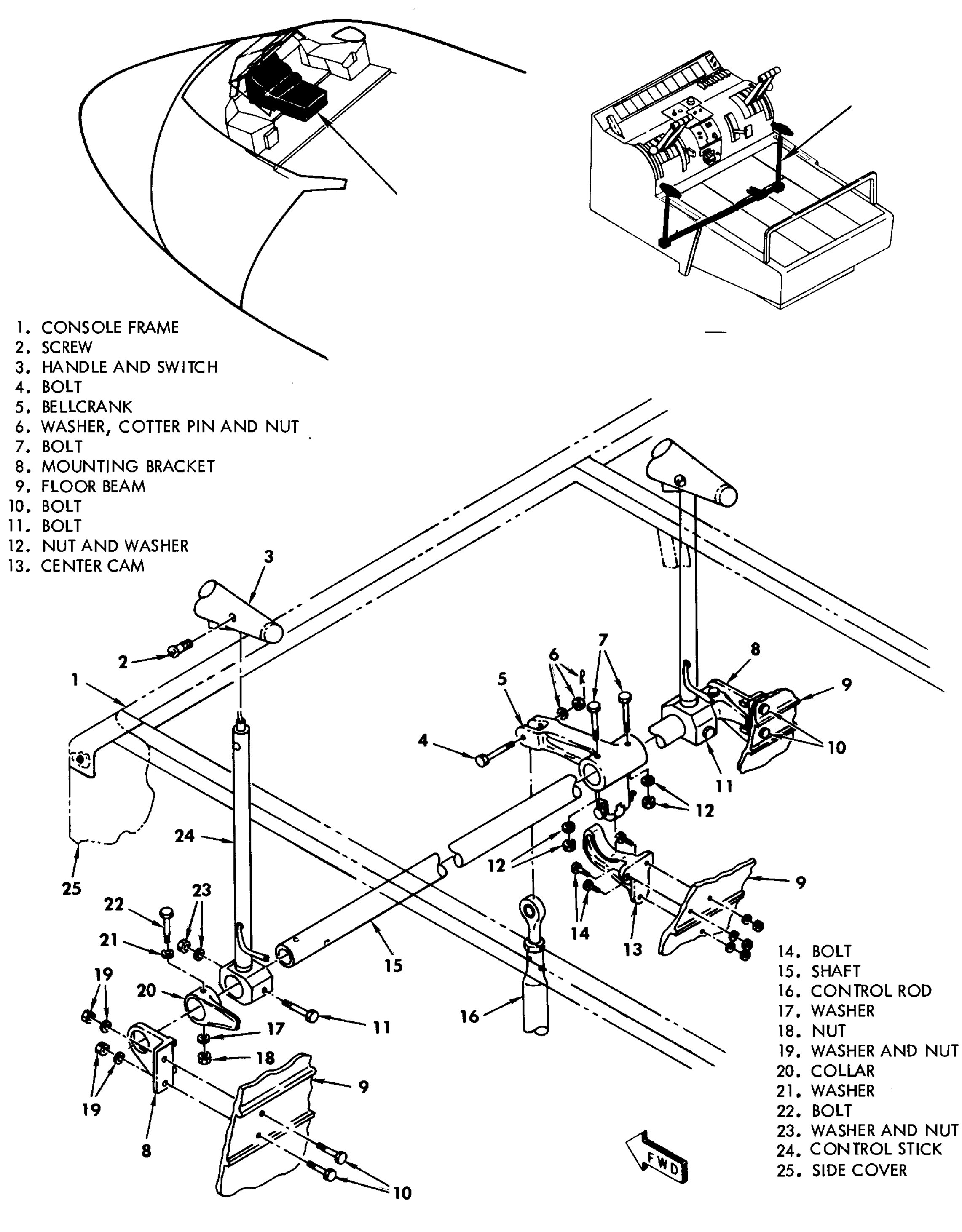
Typical spoiler actuator



Typical spoiler assembly



Pitch trim actuator



Pitch trim control handles

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Automatic Flight Controls

The automatic flight control system contains all the subsystems necessary to automatically control airplane stability, aerodynamic handling characteristics responses, and maintain the pre-established flight direction in all three planes. At any time during an automatic mode of operation, the pilot can take manual control of the airplane. All automatic modes are controlled by independent systems so that a malfunction in one mode will not affect the others. For ground functional testing, the automatic flight controls system (AFCS) has built-in-test equipment (BITE).

Pilot Assist Cable Servo System (PACS)

The Pilot Assist Cable Servo system used in the aileron and elevator control cable runs are similar. These systems are provided to aid the pilot in moving the control surfaces. The application of pilot effort at the wheel will result in the PACS assisting in over-coming the total breakout force. The PACS servos are electromechanical torque motors with a small output torque. Force sensors in each control wheel hub detect pilot effort and transmit a signal which is amplified and transferred to the PACS. The maximum torque of the units is adjusted so that the PACS alone cannot result in surface movement.

Go-around Attitude Subsystem (GAAS)

In addition to providing angle-of-attack information to the VSFI, the GAAS provides the FDC with director commands to perform a manual go-around. At the time go-around is initiated the autopilot will be automatically disengaged. Pressing the go-around button the second time will disengage the go-around mode. The autopilot may be re-engaged during or after the go-around maneuvers.

Angle-of-Attack Subsystem (AOA)

There are four angle-of-attack transducers on the airplane, two on each side of the fuselage. These transducers supply outputs to the stallimiter subsystem, go-around attitude subsystem, and the automatic throttle subsystem. The angle-of-attack transducer is a servoed unit which is actuated by a vane extending into the airstream to measure the angle between local airflow and the fuselage reference line; the output of the transducer is proportional to that angle.

Pitch Augmentation Subsystem

The pitch augmentation subsystem improves the airplane short period natural frequency of oscillation and acts as a damper to elevator movement when necessary. The pitch augmentation subsystem utilizes signals from three pitch rate gyros in the pitch augmentation computer.

Lateral Augmentation Subsystem

The lateral augmentation subsystem provides roll damping and reduces the dutch roll characteristics. The subsystem uses signals from two central air data computers, three INS navigation units, and three roll rate gyros in the yaw/lateral augmentation computer.

Yaw Augmentation Subsystem

The yaw augmentation subsystem, provides stabilization for the lateral directional axis and proper turn coordination needed to reduce sideslip. The subsystem uses signals from the two central air data computers, three INS navigation units, and three yaw rate gyros in the yaw/lateral augmentation computer. The system also accepts rudder commands from the roll-yaw autopilot in the automatic approach and landing modes.

Automatic Throttle Subsystem

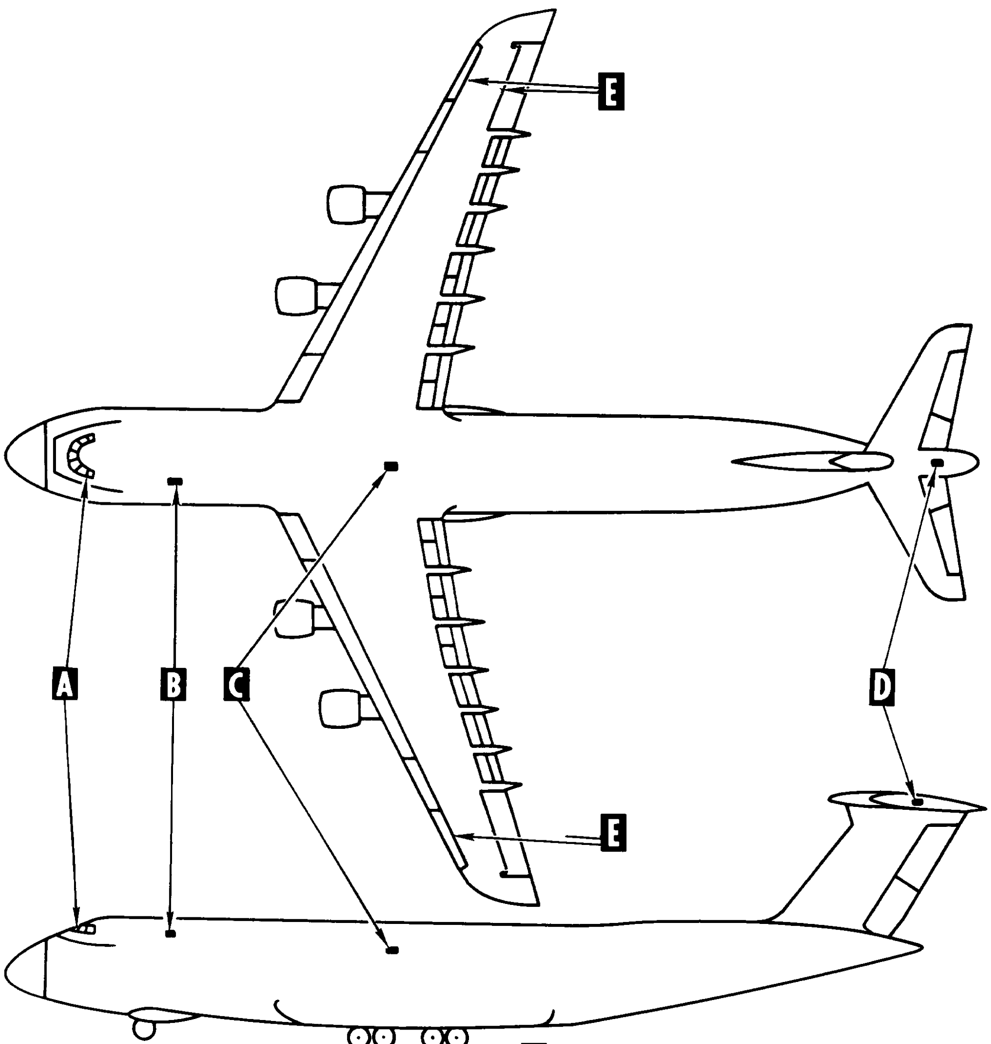
The autothrottle subsystem automatically positions the throttles to control the airplanes airspeed, mach number, or angle of attach. The system is composed of input sensors, computer, and two throttle servo assemblies.

Autopilot Subsystem

The autopilot subsystem for the C-5 airplane controls the pitch and roll axes. Included in the two axes autopilot are the necessary equipment to perform automatic landings and automatic navigation functions in addition to the conventional autopilot mode capabilities. Vertical navigation information from the fuel savings advisory system (FSAS) can be coupled to the pitch autopilot computer. This allows selected FSAS mode control of the airplane through the pitch axis autopilot.

Active Lift Distribution Control Subsystem (ALDCS)

The Active Lift Distribution Control Subsystem provides a means of reducing wing fatigue due to maneuvers and gust loads through regulated aileron and inboard elevator response to wing and fuselage normal acceleration, as well as pitch rate and normal elevator commands. The aileron and inboard elevators are moved by the lateral and pitch augmentation subsystems as a result of ALDCS commands.



A COCKPIT:
CENTER CONSOLE
FLIGHT AUGMENTATION CONTROL PANEL
AFCS CONTROL PANEL
PILOT'S AND COPILOT'S CONTROL COLUMNS
CONTROL WHEEL HUB ASSEMBLY (PILOT)
CONTROL WHEEL HUB ASSEMBLY (COPILOT)
THROTTLE QUADRANT AREA
AUTOMATIC THROTTLE SUBSYSTEM SERVO ASSEMBLY (INBOARD)
AUTOMATIC THROTTLE SUBSYSTEM SERVO ASSEMBLY (OUTBOARD)
COPILOT FLOOR AREA
ELEVATOR SERVO ASSEMBLY

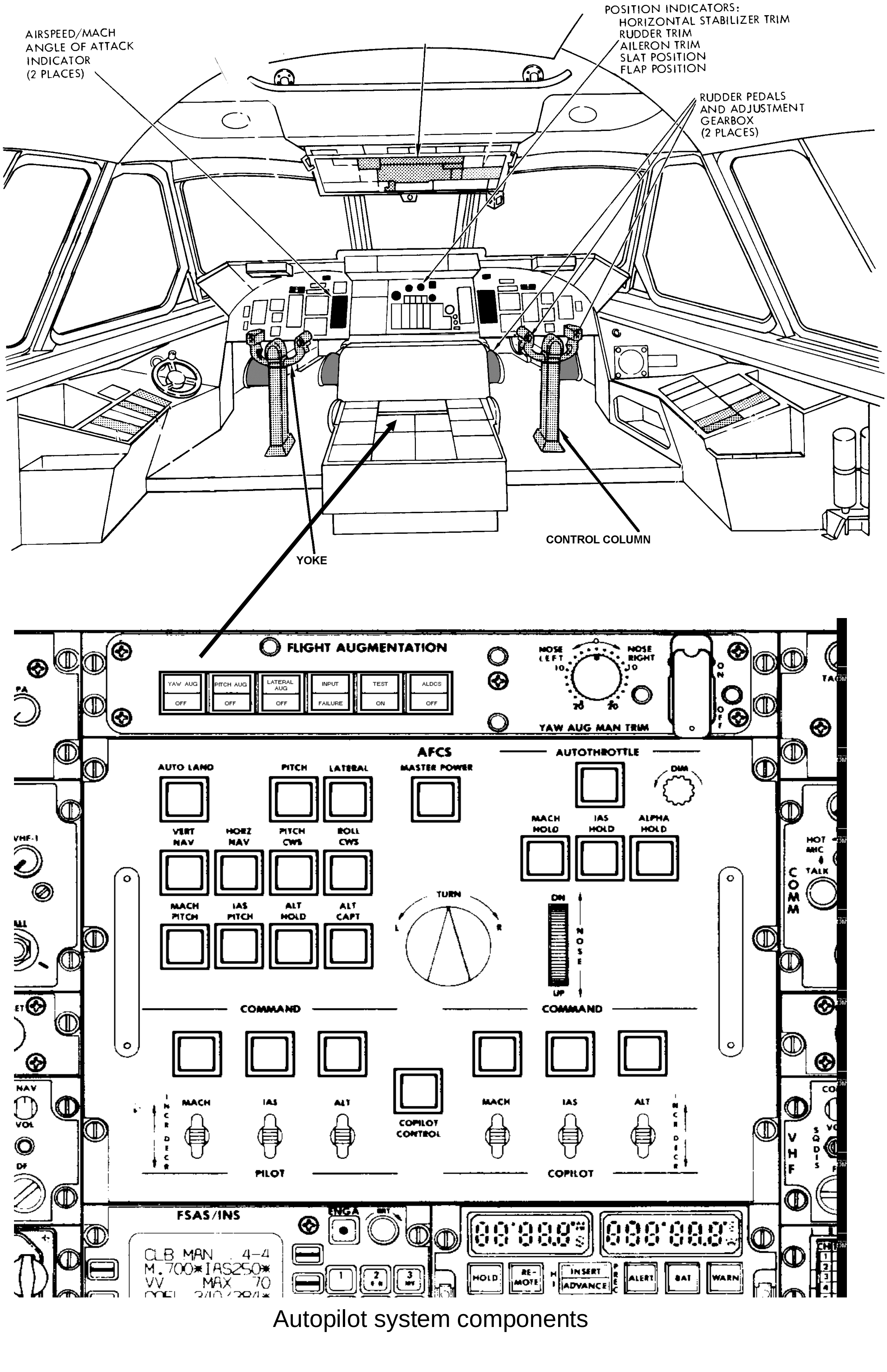
B AVIONICS BAY FOUR:
AFCS ROLL/YAW/PACS COMPUTER
AFCS PITCH/PACS COMPUTER
YAW/LATERAL AUGMENTATION COMPUTER
PITCH AUGMENTATION COMPUTER
AUTO THROTTLE SUBSYSTEM COMPUTER
ALDCS COMPUTER

C REAR BEAM CENTER WING:
AILERON SERVO ASSEMBLY (COPILOT'S CONTROLS)
PACS MOTOR (ROLL) (PILOT'S CONTROLS)
AILERON POSITION TRANSDUCER

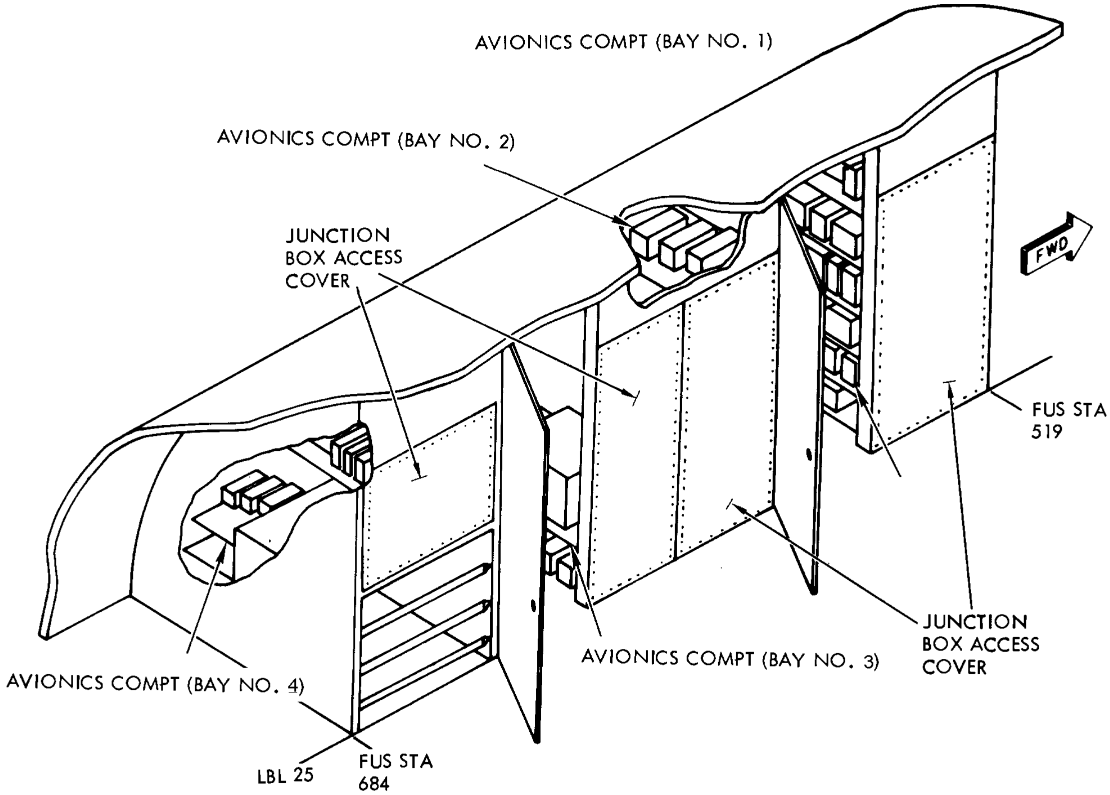
D REAR BEAM HORIZONTAL STABILIZER:
ELEVATOR CABLE POSITION TRANSDUCER
PACS MOTOR (PITCH)

E LEFT AND RIGHT FRONT AND REAR WING BEAM
ALDCS TRANSDUCER (4)

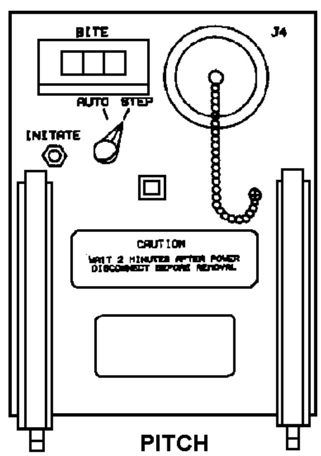
Autopilot system component locations



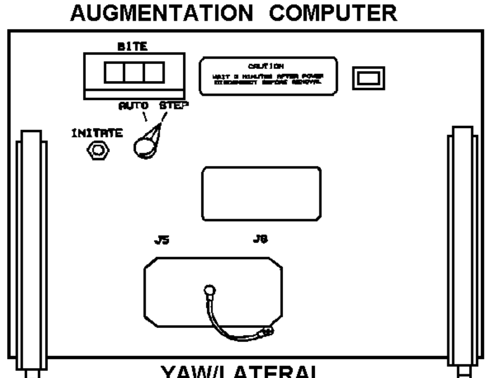
Autopilot system components



AVIONICS COMPARTMENT



PITCH AUGMENTATION COMPUTER



YAW/LATERAL AUGMENTATION COMPUTER

Autopilot computers

Flight Station Controls and Instruments

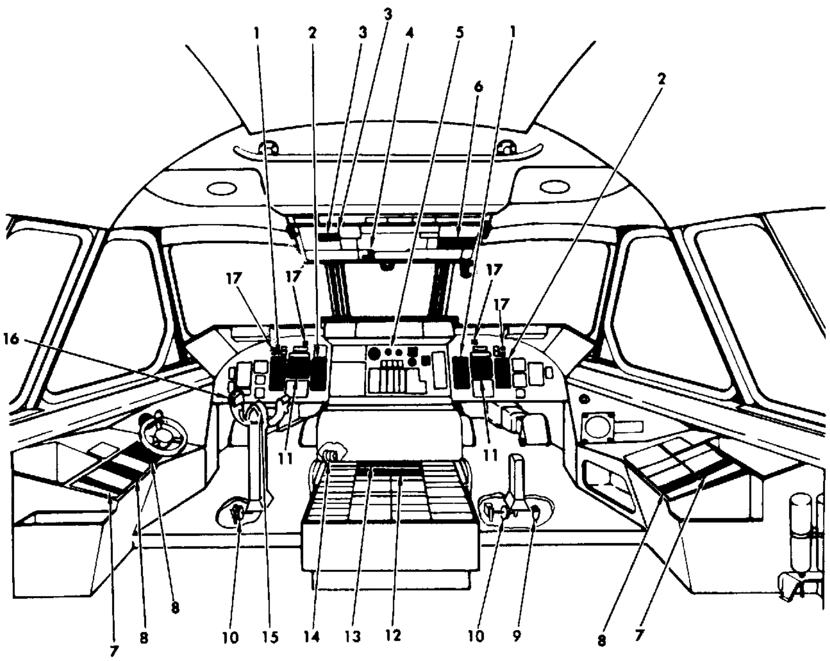
The flight controls, control levers, switches, and indicators used in the control of the primary, secondary, and automatic flight controls of the C-5 airplanes are illustrated in the following section.

Control Wheels

The U-shaped control wheels which control aileron operation are mounted near the top of the control columns. Each control wheel is connected by concealed cables to separate tension regulators beneath the flight deck. The pilot's and copilot's tension regulators are connected by means of an interconnect rod and cranks. This interconnection causes the control wheels and dual control cable system to operate in unison; it allows operation of both control cable systems from either of the control wheels. The pilot's control wheel assembly contains force sensors, pitch trim switches, an autopilot disengage switch, a combination microphone and intercommunication momentary contact switch, go-around switch, and a pitch trim disconnect switch. The co-pilot's control wheel is symmetrically opposite to the pilot's wheel.

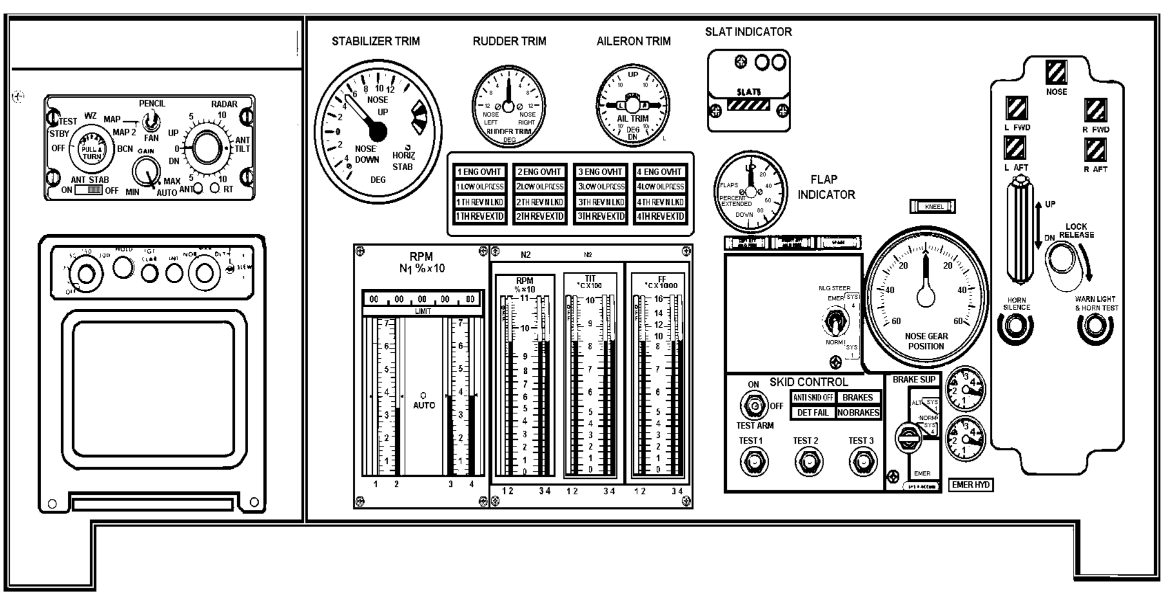
Rudder Control System

The rudder control system incorporates a single cable system from the flight station to the upper and lower rudder servo input quadrants. The rudder pedals which control rudder operation are mounted forward of the pilots and copilot's control columns under the respective main instrument panels. Both the pilot's and copilot's rudder pedals are connected by by an interconnect rod beneath the flight deck. The pilot's lever is connected to a tension regulator and from here two single closed-loop cables connect the tension regulator to the lower rudder input quadrant and the lower input quadrant to the upper input quadrant.

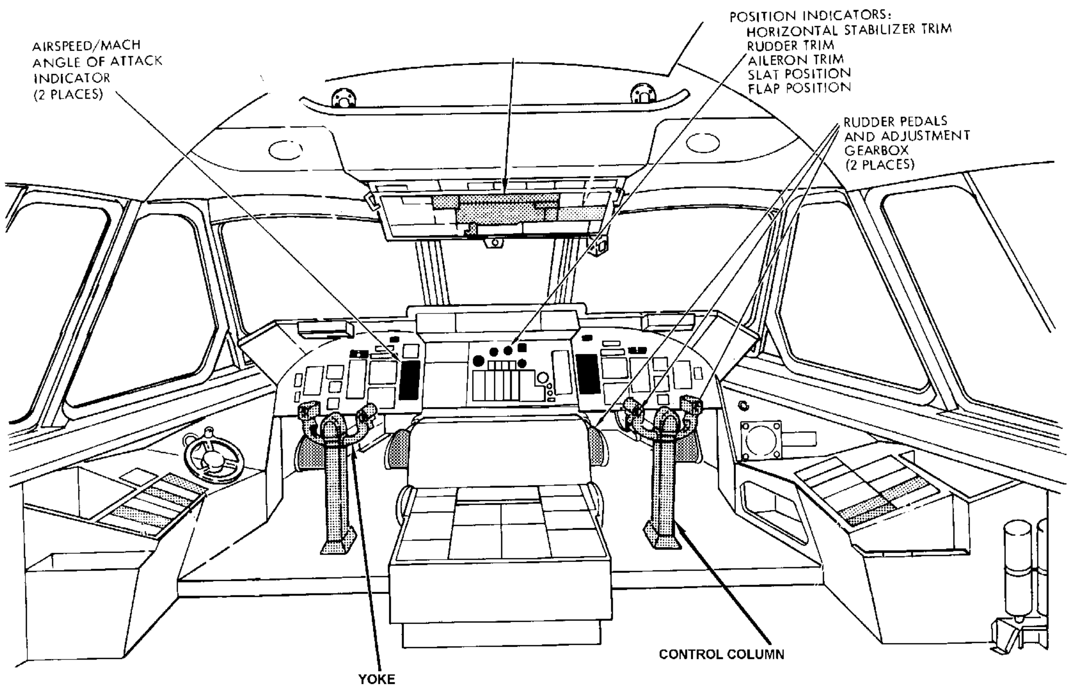


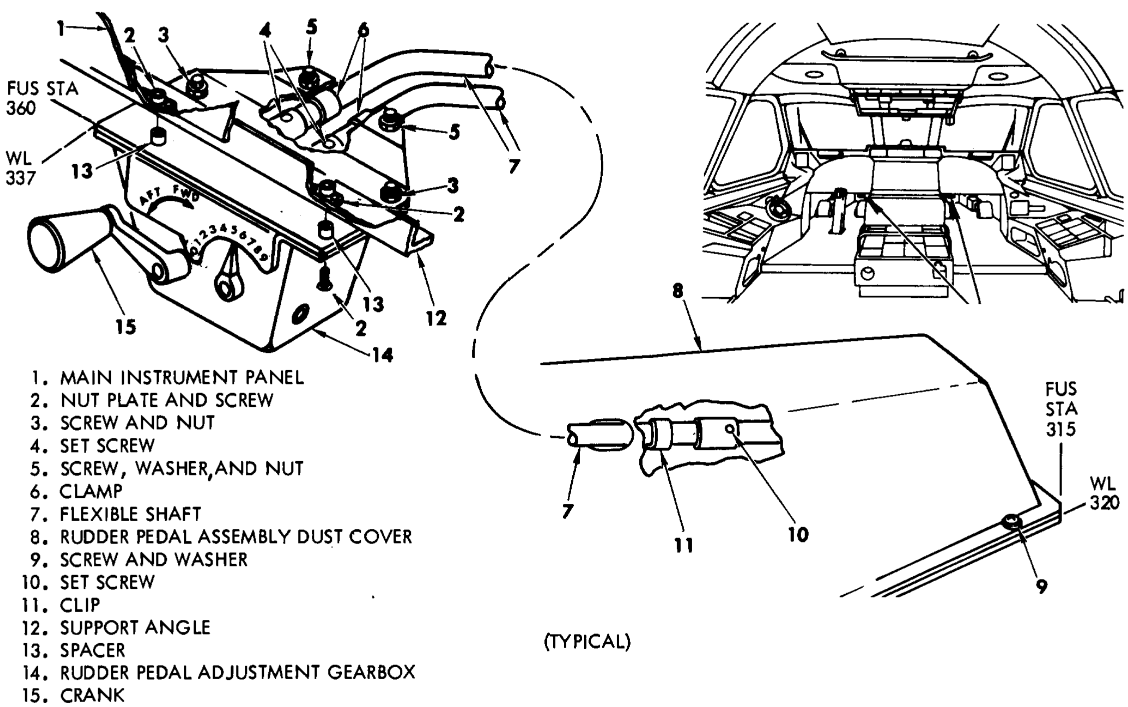
FLIGHT STATION

1. IAS/M/AOA (INDICATED AIRSPEED/MACH/ANGLE OF ATTACK) FLIGHT INSTRUMENT
2. ALT/VS (ALTITUDE/VERTICAL SPEED) FLIGHT INSTRUMENT
3. PACS SWITCH PANEL
4. STALLIMITER SWITCH PANEL
5. POSITION INDICATORS: TRIM, SLAT, FLAP
6. AOAT HEATER SWITCH PANEL
7. CADC TEST PANEL
8. STALLIMITER TEST PANEL
9. ELEVATOR AUTOPILOT SERVO
10. STALLIMITER SHAKER
11. ADI (INST. SYSTEM)
12. AFCS CONTROL PANEL
13. FLIGHT AUGMENTATION PANEL
14. AUTOMATIC THROTTLE SERVO ASSEMBLIES
15. CONTROL WHEEL HUB ASSEMBLY
16. CONTROL WHEEL SWITCHES
17. AUTO LAND LIGHT



Flight station controls and instruments





Flight station controls and instruments

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LANDING GEAR

The C-5 airplane has five retractable landing gears, one nose landing gear and four main landing gears. In addition to the normal functions of supporting the airplane on the ground and braking the landing speed, the landing gears have the following capabilities: nose wheel steering, aft main landing gear caster, and kneeling.

Landing Gear Extension and Retraction

Each MLG consists of a shock strut and bogie assembly. The bogie supports six brakes, wheels, and tires and is attached to the shock strut by a universal joint. The MLG retracts into pods on each side of the airplane during flight. During extension and retraction, the gear and the pod doors move simultaneously, being powered by the same actuation system. Three methods of operation are available: normal, alternate, and emergency. The emergency system will extend the gear only.

Each NLG consists of a shock strut mounting four wheels and tires. The shock strut incorporates internal cams to ensure that the wheels will be in the straight ahead position at landing. The NLG retracts aft into a pod at the bottom of the airplane. Three methods of operation are available: normal, alternate, and emergency. The emergency system will open the doors and extend the gears only.

Landing Gear Control Panel

Landing gear controls are centralized on the center instrument panel at the flight station. Panel controls include a handle which raises and lowers the landing gear, a lock to prevent accidental operation of the gear while the airplane is on the ground, individual indicators to show the condition of each landing gear assembly, HORN SILENCE switch, and WARN LIGHT and HORN TEST switch.

Landing Gear Control Handle

The control handle is a lever with a wheel-shaped knob. Moving the handle to the DN position lowers the landing gear; moving it to the UP position reacts the gear. Two red warning lights in the control handle knob indicate that the landing gear is in operation. The lights come on when the gear is up and the control handle is moved to DN. The light stays on until the NLG downlock locks and the MLG is locked at the zero-degree position. The lights also come on when the gear is down and the control handle is moved to UP. The light stays on until all landing gear doors are closed and locked.

Landing Gear Position Indicators

A separate indicator for each landing gear assembly continuously displays the condition of the landing gear. Indicators are square windows labeled NOSE, L FWD, R FWD, L AFT, and R AFT. Landing gear conditions appear in the windows in a distinctive color pattern for each condition. The color patterns are controlled by relays which are actuated by the landing gear position sensors. Landing gear indications are as follows: When the landing gear is in transit or when system power is off, black-on-white diagonal stripes appear in all five windows. When the landing gear is down and locked, a pair of vertical green wheels on a white background appears in all windows. When the landing gear is in the fully retracted position, a white UP on a black background appears in all windows. When the gear is being extended and the MLG assemblies are oriented 90 degrees to the landing attitude of the airplane, a pair of red horizontal wheels on a white background appears in the four windows associated with the MLG.

The NOSE landing gear indicator will display a pair of red horizontal wheels on a white background when the doors are open and the gear is in transit. Black-on-white diagonal strips will appear when only the doors are in transit.

Warning Horn and Silence Switches

A warning horn on the overhead panel sounds an alarm for a variety of unsafe conditions. With respect to the landing gear, the horn sounds during extension if the landing gear is not in the down-and-locked position and one or more of the throttles are in a minimum cruise setting with airplane speed below 200 knots. The horn also sounds any time the landing gear is not down and locked and the flaps are in a greater-than-the-approach position. Two switches are provided on the landing gear control panel for manual operation of the warning horn. A WARN LIGHT AND HORN TEST button tests the horn and the warning lights on the landing gear control handle. A HORN SILENCE button silences the horn if it is sounding because a throttle(s) is at the minimum cruise setting before the landing gear is in a safe landing condition. However, the HORN SILENCE button will not turn off the horn if it is sounding because the flap control is in the greater-than-the-approach position while the landing gear is not in a safe landing attitude. After the horn has been silenced for one condition, it retains its warning capability for other conditions, and will sound again if needed by other systems.

Emergency Extend Switches

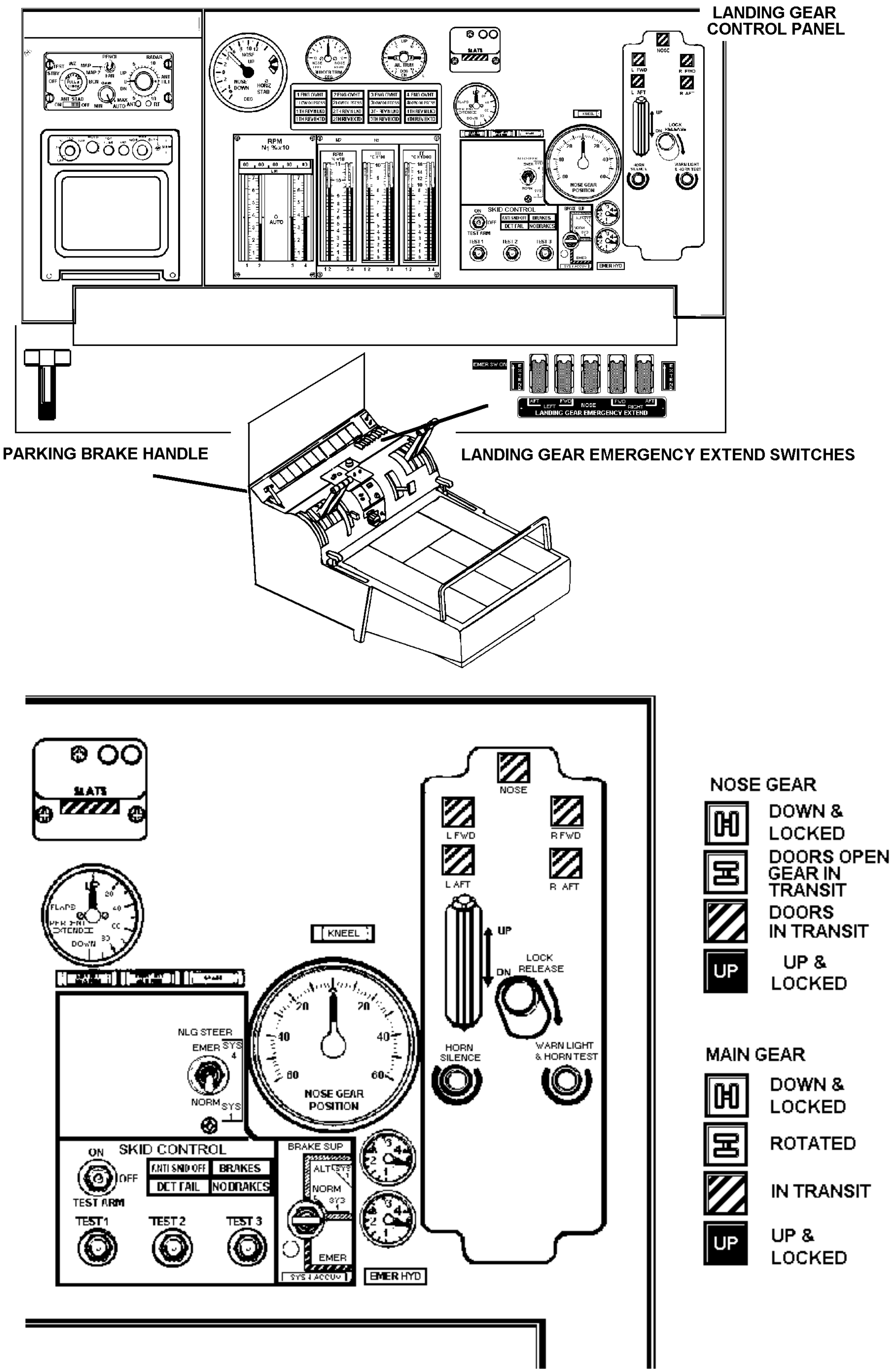
A series of switches on the center console, one for each landing gear assembly, is available for emergency lowering of any assembly that fails to extend by the normal system. A red light to the left of the switches illuminates when either NLG door is open, or when the affected MLG assembly has rotated to the zero-degree position. The light notifies the pilot that gear extension has been completed, and reminds him that landing gear control is in the emergency operation condition.

Main Landing Gear Sequence Control Panel

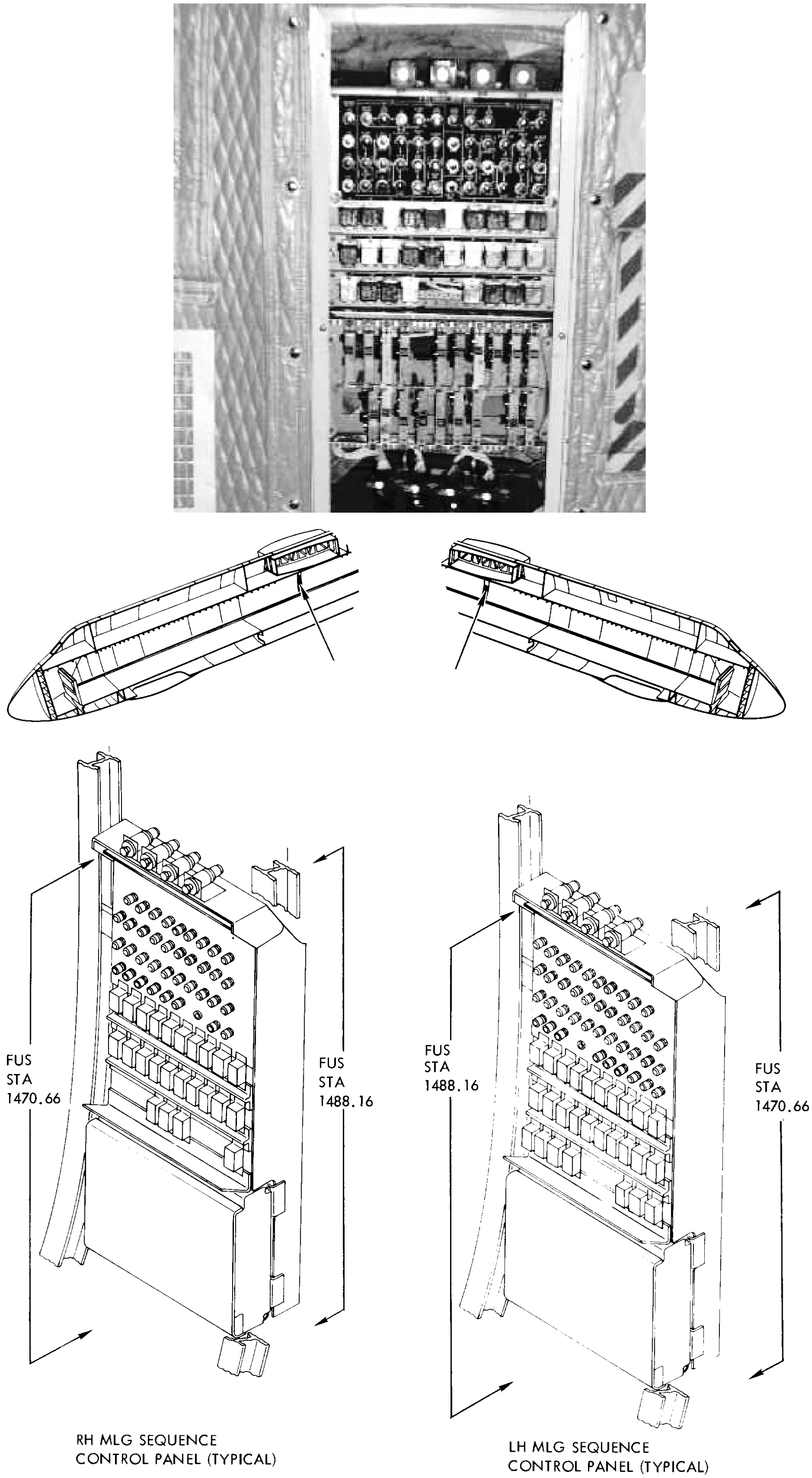
The MLG sequence control panels (one RH and one LH) consist of relays which provide logic command signals. These signals, in turn, control MLG retraction and extension. The control panel receives gear position command signals from the landing gear control handle or from the emergency extend switches in the flight compartment. These signals command the control panel to energize or deenergize relays which control the landing gear control manifolds. The proximity indicating switches provide the control panel with signals which indicate the prerequisite gear and door positions so that retraction and extension may be started. The indicator panel section of the control panel consists of blue and green lights which monitor the functional status of circuits, within the MLG system.

Nose Landing Gear Sequence Control Panel

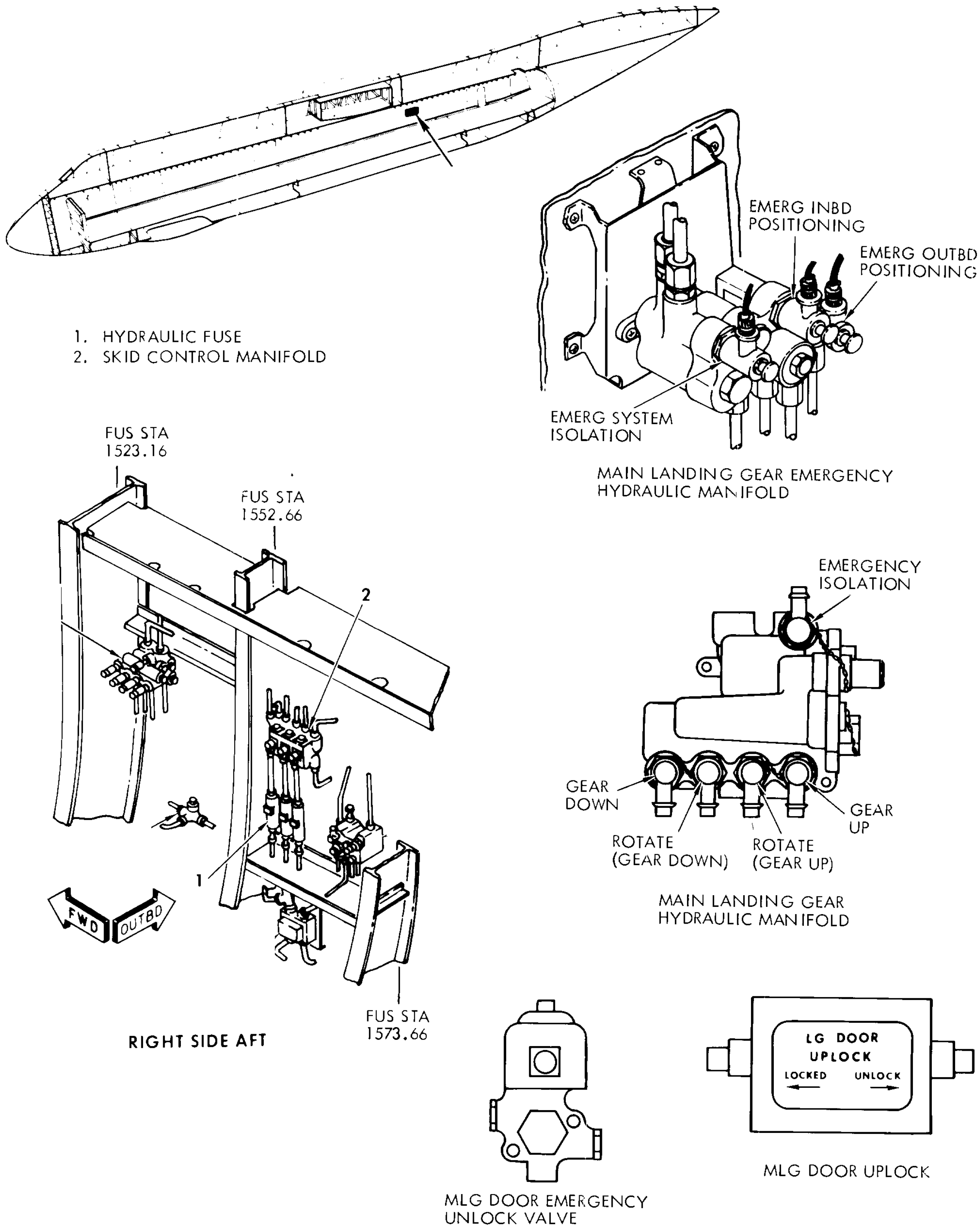
The NLG sequence control panel receives gear position commands signals from the landing gear control handle or from the emergency extend switch located in the flight compartment. These signals command the sequence control panel to energize or deenergize solenoids which control the hydraulic power system. The DOOR OPEN and NLG EXTENSION override switches on the sequence control panel bypass the sequence control relays during emergency extension. These switches are to be used during in flight emergency condition only. The indicator panel section of the control panel consists of blue and green lights which monitor the functional status of circuits within the NLG system.



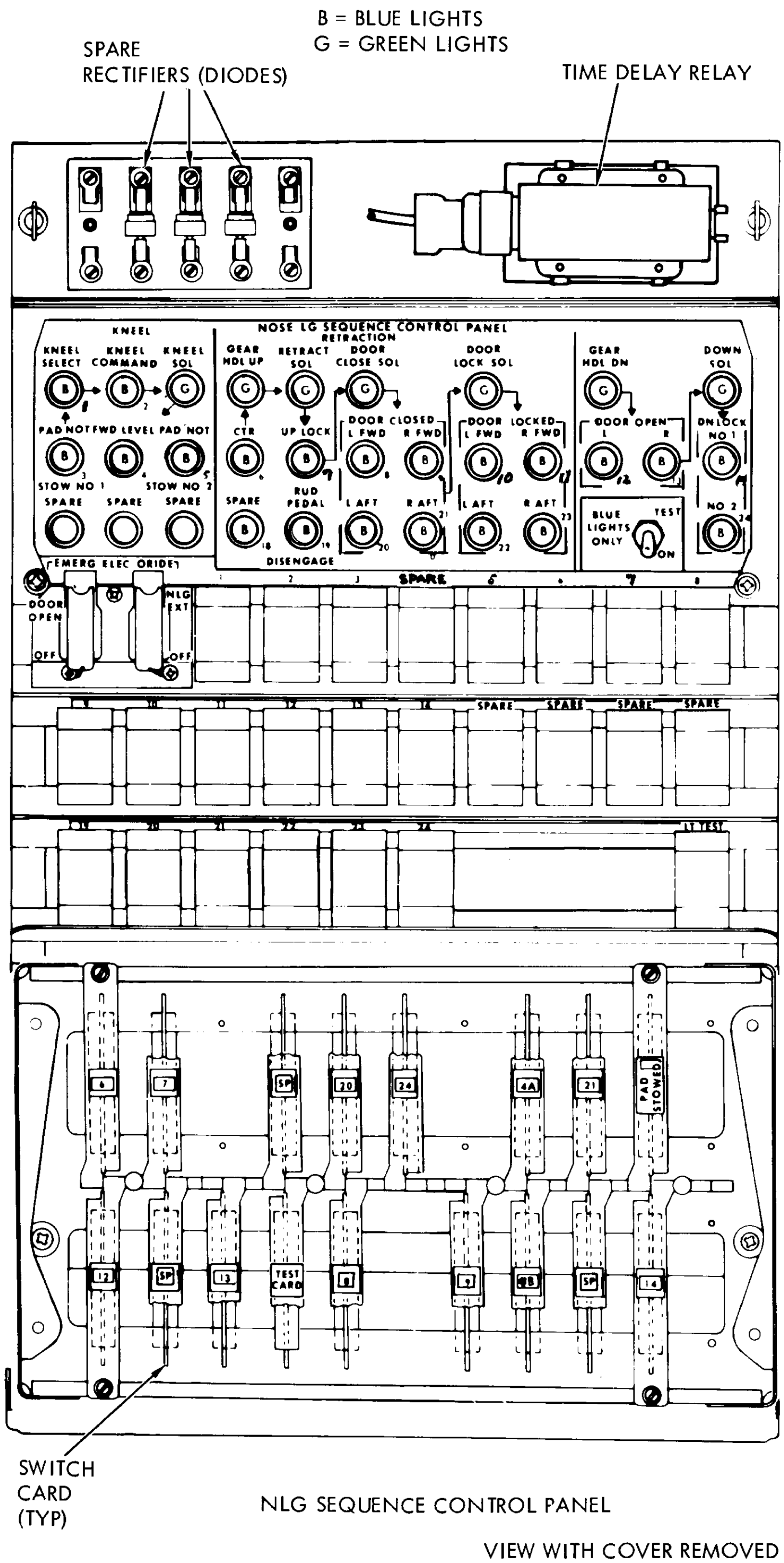
Landing gear controls (center instrument panel)



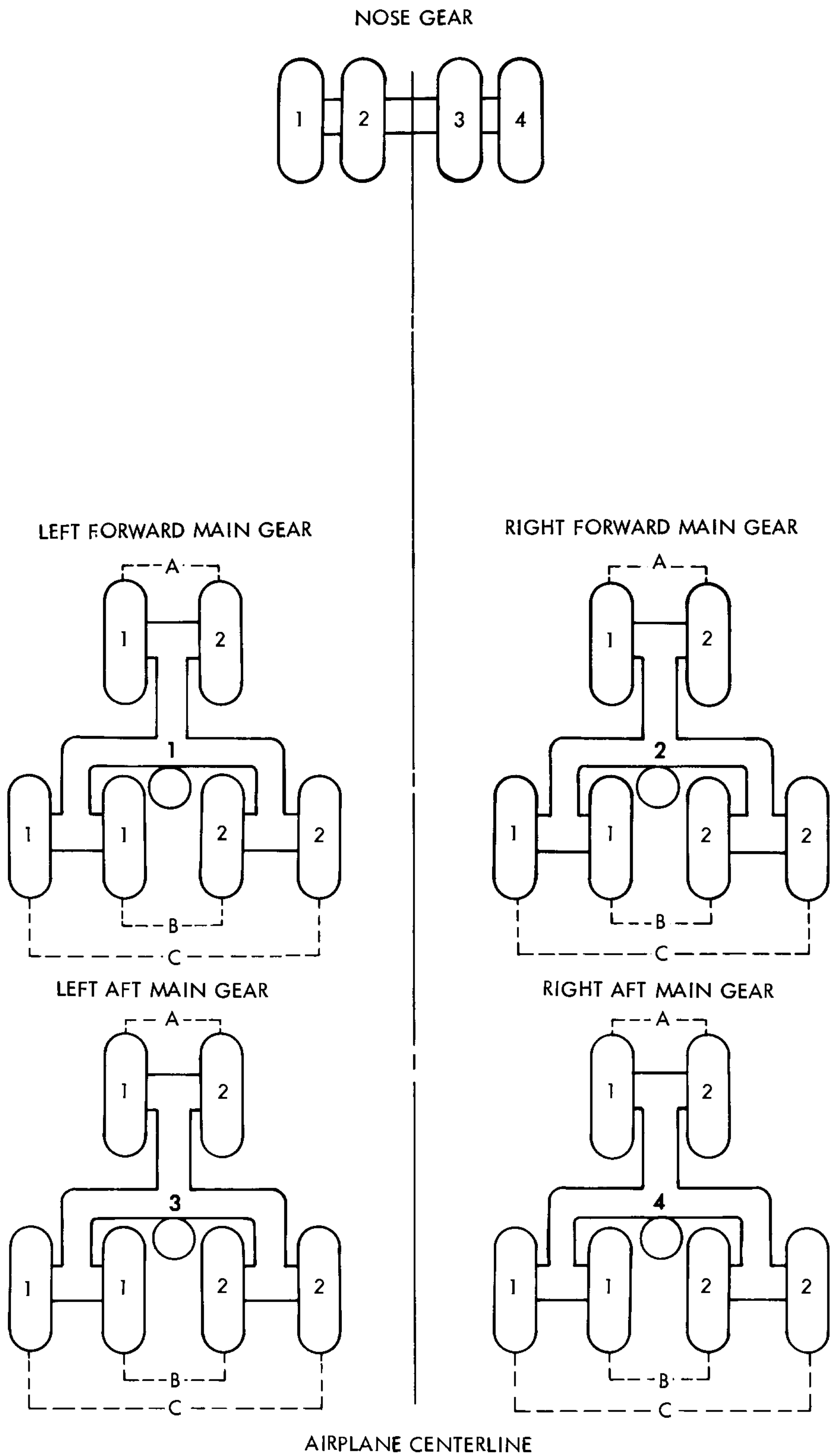
Main landing gear sequence control panels



Main landing gear manual control manifolds



Nose landing gear sequence control panel



Landing gear wheel and tire position identification

Main Landing Gear

Main Landing Gear Shock Strut Assembly

The shock strut is an oleo-pneumatic strut. It consists of an outer cylinder and a piston. The upper part of the shock strut has a primary air chamber which contains hydraulic fluid and a high pressure charge. The lower part of the shock strut contains a higher pressure (secondary) air chamber. The two chambers are separated by a floating piston. A secondary air chamber furnishes additional shock-absorbing capacity during landing and takeoff from unimproved landing strips. The secondary air chamber also limits landing impact loads transmitted to the airplane structure if the airplane lands at an excessive sink rate. The stroke of the strut piston is 25.0 inches.

The upper end of the shock strut outer cylinder is the crosshead. The crosshead contains mounting provisions for the functional components to operate the collar locks and rotate the MLG bogie. The crosshead also provides for attachment of the ballscrews.

Main Landing Gear Rotation Cylinders

Two rotation cylinders are mounted on the landing gear crosshead. One rotation cylinder is for normal operation; the other is for emergency operation. The normal rotation cylinder rotates the bogie assembly 90 degrees during normal retraction and after normal extension. The emergency rotation cylinder, powered by pressure from the APU start accumulator, rotates the bogie assembly to the zero degree position during extension.

Main Landing Gear Collar Lock Cylinders

Two lock cylinders are mounted on the landing gear crosshead. The normal lock cylinder is used to lock and unlock the collar lock and is operated by the hydraulic system operating the gear. The emergency cylinder is used to lock the collar lock during emergency extension and is powered by the APU accumulator. The lock cylinders, when locked, lock the lock actuator collar so that the positioning collar is mechanically linked with the bogie.

Main Landing Gear Bogie Assembly

The bogie assembly attaches the brakes, wheels, and tires to the shock strut. The bogie is attached to the shock strut by a universal joint consisting of a roll pin and a gudgeon. The major components of the bogie assembly are the center axle beam, two aft axle beams, brake torque compensator link, forward axle, pitch positioner cylinder, bogie positioner roller, and the gudgeon. (The roll pin is a shock strut component.)

Main Landing Gear Bogie Positioner Rollers

The bogie positioner rollers mount between lugs on the forward top side of the bogie center axle beam. During retraction of the landing gear, the bogie rotates 90 degrees inboard to retract the forward wheels into the wheel well first. The rollers engage a retraction guide under the cargo floor in the wheel well. The positioner rollers guide the bogie along the retraction guide. The main gear trunnion is continually rotated during retraction. The retraction guide forces the bogie out of its 90-degree relationship with the shock strut and levels the gear during retraction.

Brake Torque Compensator Link

A brake torque compensator link is installed adjacent to the longitudinal arm of the bogie center axle beam. The link is a structural member with fittings at each end. The aft end of the link is anchored to a fixed arm of the gudgeon. The forward end of the link attaches to a lug on the forward axle. When the brakes are applied, brake torque causes the forward wheels to dip and the rear wheels to rise. This movement of the wheels is reacted by the brake torque compensator link.

Pitch Positioner

The pitch positioner is mounted on the inboard side of the center axle beam. It connects to the lugs at the top of the forward axle collar and to a yoke at the transverse member of the bogie assembly. It is a pneumatic centering device to hold the bogie 90 degrees to the shock strut when the landing gear is lowered. During retraction of the landing gear, the pitch positioner causes the forward wheels to approach the wheel well ahead of the aft wheels. After the forward wheels enter the wheel well, rollers on the front of the bogie engage the retraction guide on the fuselage structure. One of these rollers actuates a hydraulic master cylinder to release a lock inside the pitch positioner. This action disconnects the bogie leveling portion of the cylinder to guide the bogie into its retraction position. During landing gear extension, the positioner re-locks when the rollers leave the retraction guide.

Gudgeon

The gudgeon is the bogie component of the universal joint between the bogie assembly and the shock strut. It has an arm that anchors the brake torque compensator link. The gudgeon permits movement of the bogie to allow for uneven ground levels and permits the bogie to rotate during landing gear retraction. The gudgeon is splined where it engages the roll pin so that movement occurs only between the gudgeon and the lugs at the aft end of the center axle beam. The arm of the gudgeon attached to the brake torque compensator link is fixed in relation to the shock strut.

Roll Pin

The roll pin is the shock strut component of the universal joint connecting the bogie assembly and the shock strut. The roll pin permits movement of the bogie to allow for uneven ground levels of the wheels. A transverse bore through the roll pin is splined to give positive locking of the gudgeon. At the aft end of the roll pin, two lugs permit installation of the two roll positioners. A single tow lug is forged between the roll positioner lugs.

Roll Positioner Cylinders

Two roll positioner cylinders are mounted aft of the connecting point between the shock strut and the axle beam. The two cylinders connect to lugs on the shock strut piston and roll pin. The positioners maintain the bogie perpendicular to the shock strut when the wheels are off the ground.

Brake and Skid Control

Six brakes are mounted on the axles of each of the main landing gear bogies. The brakes are the multiple disk type with multiple hydraulic pistons for actuation. The skid control is a fully modulated system with solid state modular control circuit design. It acts as a surveillance unit to control a skid by overriding braking action of the pilot. The skid control system incorporates built-in test equipment (BITE) for on the ground and inflight testing. Three modes of operation are available: normal, alternate, and emergency. The normal and alternate methods have skid control; the emergency system does not. The mode of operation is controlled by the BRAKE SUP (brake supply) switch on the brake system control panel, located on the pilots center instrument panel, copilot's side.

Brake Mechanical Control

The rudder control pedals also function as brake pedals. The right or left landing gear brakes are applied by toe pressure on either the pilot's or copilot's rudder pedals. A series of pushrods and torque tubes transfer rudder pedal toe pressure to a dual brake metering pilot valve. The pilot's left and right brake pedals are connected by linkage to the copilot's left and right brake pedals. The left brake pedals are connected to the left brake control valve; the right brake pedals are connected to the right brake control valve. Thus, depressing one of the left brake pedals operates the 12 brakes on the left side of the airplane, depressing one of the right brake pedals operates the 12 brakes on the right side of the airplane. Full brake pedal travel is approximately 25 degrees.

Parking Brake

The parking brake is a mechanical linkage which locks the pilot's or copilot's brake pedals in the brakes applied position. The parking brake handle is located on the center console, forward and left of the throttle quadrant. The parking brake handle is attached by a cable to a latch mechanism. The latch mechanism holds the two dual brake metering pilot valves in the open position. To operate the parking brake when the engines are shut down, it is necessary to move the brake control panel switch to the EMER position. Depressing the brake pedals will release the parking brake handle after the brakes have been set.

Emergency and Park Brake Accumulator

The emergency and park brake accumulator provides a reserve supply of hydraulic pressure for emergency braking and for the parking brakes. The accumulator is located on the cargo compartment wall adjacent to the right hand forward MLG. The capacity of the accumulator is 400 cubic inches. A direct reading pressure gage and a high pressure air valve are provided for servicing the accumulator.

Seven-port Brake Valve

The valve makes up the lower link of the scissors of each MLG and is mechanically operated by the extension/compression of the strut at takeoff and landing. When the gear is on the ground and the strut compressed to the ground position the valve connects the brake lines from the anti-skid manifold to the wheel brakes. When the strut extends at liftoff, the valve is positioned to block the brake lines from the anti-skid manifold and connect the anti-rotation pressure line to the brakes.

Kneeling

The landing gear is capable of kneeling the airplane in three modes: forward kneeling (nose down), aft kneeling (tail down), and level kneeling. Kneeling the airplane permits truckbed height loading at either the forward end or the aft end, or at both ends simultaneously. Selection of the kneeling mode is made at the kneel control panel on the flight engineer's control panel. The MLG shock struts (outer cylinder) move up and down within their supporting structures approximately the same distance for the three kneeling modes. The different heights of the ends of the cargo floor are controlled by the kneeling position of the NLG. The NLG partially retracts during the forward and level kneel modes and is supported by a kneel stop mechanism in the kneeled position. The NLG remains erect for the aft kneel mode. The NLG is kneeled hydraulically through the normal extension and retraction system. The MLG kneel drive modules are hydraulically driven. Extendable support legs are installed to support the crew entry stair/ladder in the extended position. The support legs are stowed during operation of the crew entry door/stair/ ladder and the crew entry door.

Kneel Control Panel

The kneel control panel on the flight engineer's control panel contains the control switches and indicator lights for the kneeling system. The switches are the KNEEL COMMAND and the KNEEL SELECT switches. The indicating lights indicate when each of the five gears is not unkneeled or kneeled. The nose landing gear indicating lights indicate the position of the gear shift and kneel pads.

Individual Kneel Switches

The individual kneel switches are used to control each gear individually for ground operations. Each gear can be kneeled or unkneeled independently of the other gears. The switches are located in the MLG pod forward of the MLG wheel wells.

Main Landing Gear Permanent Kneeling Collars and Spacers

Permanent kneeling collars, 5.5 inches long for the AFT MLG and 4.0 inches long for the FWD MLG, attach to the lower end of the MLG yokes. Permanent kneeling spacers (rotational stops) are also installed on each MLG ballscrew to stop the drive of the MLG should the electrical system fail to stop the kneeling operation.

Main Landing Gear Temporary Kneeling Collars

Various sized kneeling collars, stowed in the loose equipment lockers located on the right side of the cargo compartment, are provided to maintain the desired position of the airplane in the forward and aft kneeled position. Two 4 inch main landing gear kneeling collars are used if the airplane is to be forward or aft kneeled. For the forward kneel operation, the collars are attached to the aft left and right main gear struts. For the aft kneel operation, the collars are attached to the forward left and right main gear struts. Two 2-3/4 inch collars are also provided for use when aft kneeling the airplane. The collars are placed around the two forward MLG during aft kneeling since the NLG does not partially retract.

Main Landing Gear Position and Emergency Control Panel

The MLG position and emergency control panel on the copilot's side console consists of two bogie position indicators and two emergency control toggle switches. The two indicators, LEFT MLG and RIGHT MLG, have scales graduated 20 degrees outboard and 90 degrees inboard from center of zero degrees. Each indicator has two pointers mounted on concentric shafts, one labeled A (Aft MLG) and the other F (Forward MLG). During caster operation, a feedback signal from the MLG bogie sensors positions the appropriate pointer at the scale setting corresponding to the bogie angle. If the caster/power-back system malfunctions, MLG bogies can be rotated individually by manipulating the two spring-loaded center, toggle-type emergency control switches. Each switch has positions LEFT or RIGHT and is spring loaded to the OFF position. Placing a switch to either LEFT or RIGHT removes the hydraulic block on the normal positioning actuator by applying pilot pressure to open the shutoff valves blocking the cylinder ports and to actuate the bypass valve to interconnect all cylinder ports. The bogie emergency actuator will rotate the bogie in the commanded direction until the switch is released or until the rotation limits of the normal positioning actuators are reached. Hydraulic system No. 4 supplies pressure for aft main gear bogie emergency positioning.

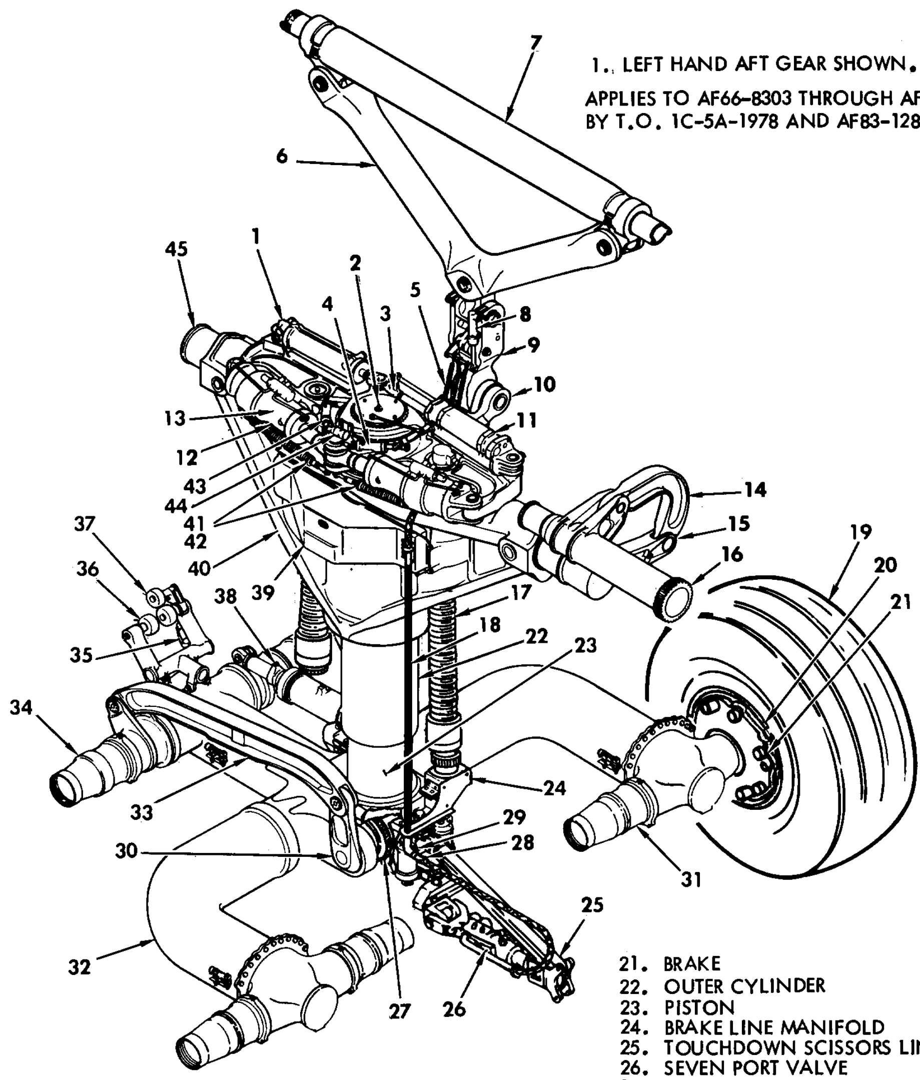
Main Landing Gear Door Systems

There are four outboard doors, four inboard doors, and eight folding slot doors in the MLG door system. The doors enclose the MLG in the fairings when the landing gear is retracted. There are four door locks on each outboard door. The inboard and the slot doors are held closed by drive arms overcenter linkage.

Door Lock and Lock Actuating Mechanism System

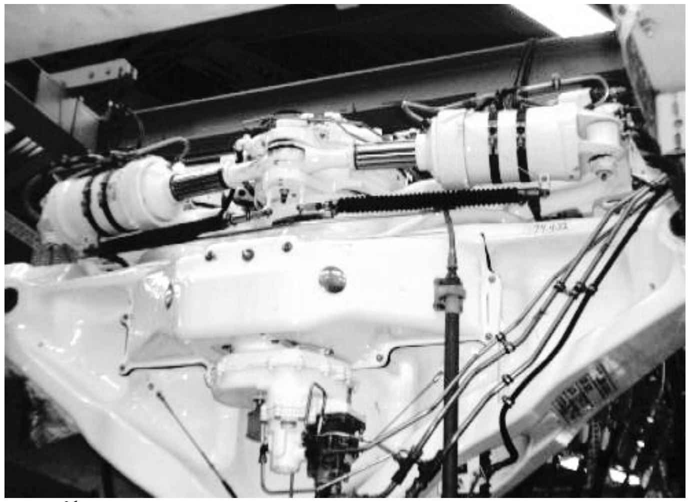
Each MLG door is locked in the closed (gear retracted) position by four overcenter locks. At each end of the door, an internal locking hydraulic cylinder and linkage operates two overcenter locks. A separate independent hydraulic cylinder is provided on each of the four overcenter locks for emergency unlocking. Micro-switches on the internal locking cylinders, and proximity door close targets on the inboard lock assemblies, are described elsewhere in this section.

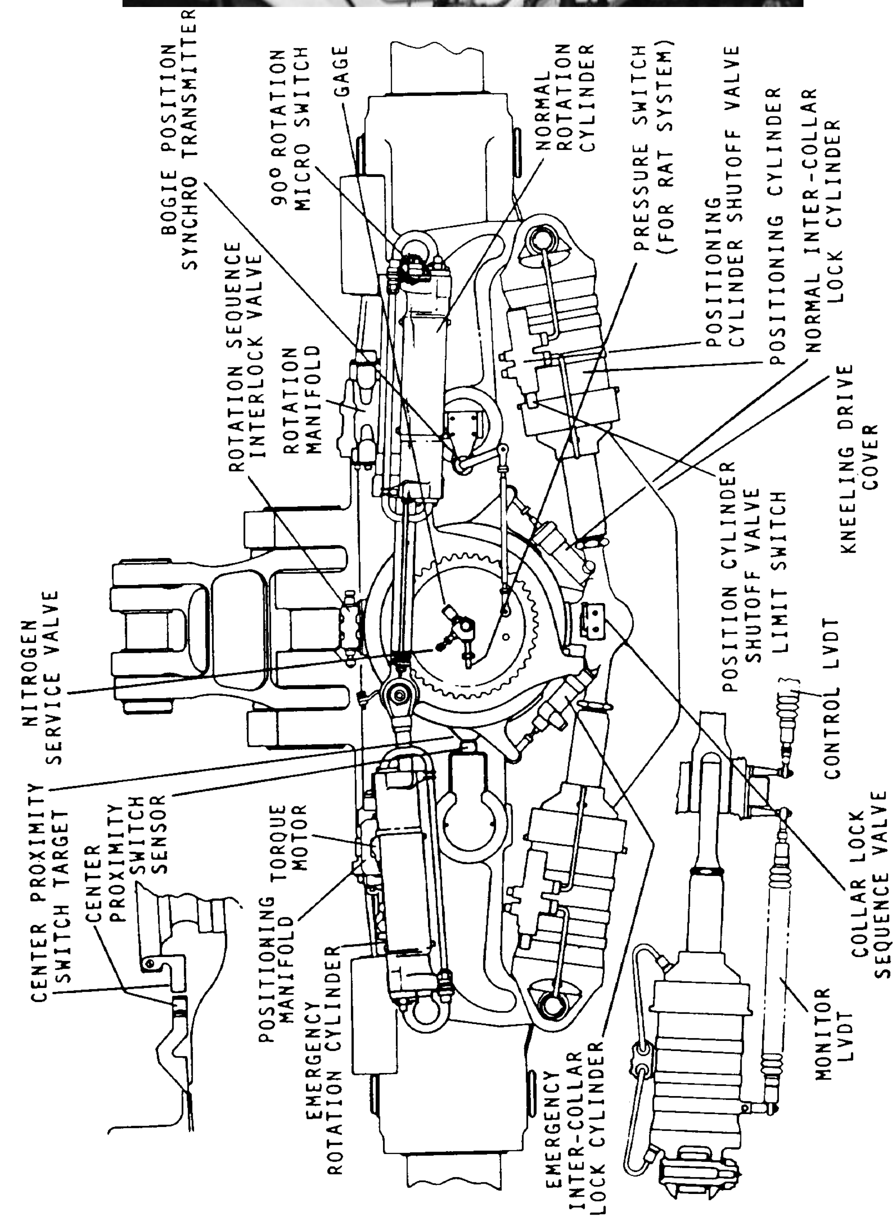
1. LEFT HAND AFT GEAR SHOWN. OTHERS SIMILAR.
APPLIES TO AF66-8303 THROUGH AF70-467 MODIFIED BY T.O. 1C-5A-1978 AND AF83-1285 AND UP.



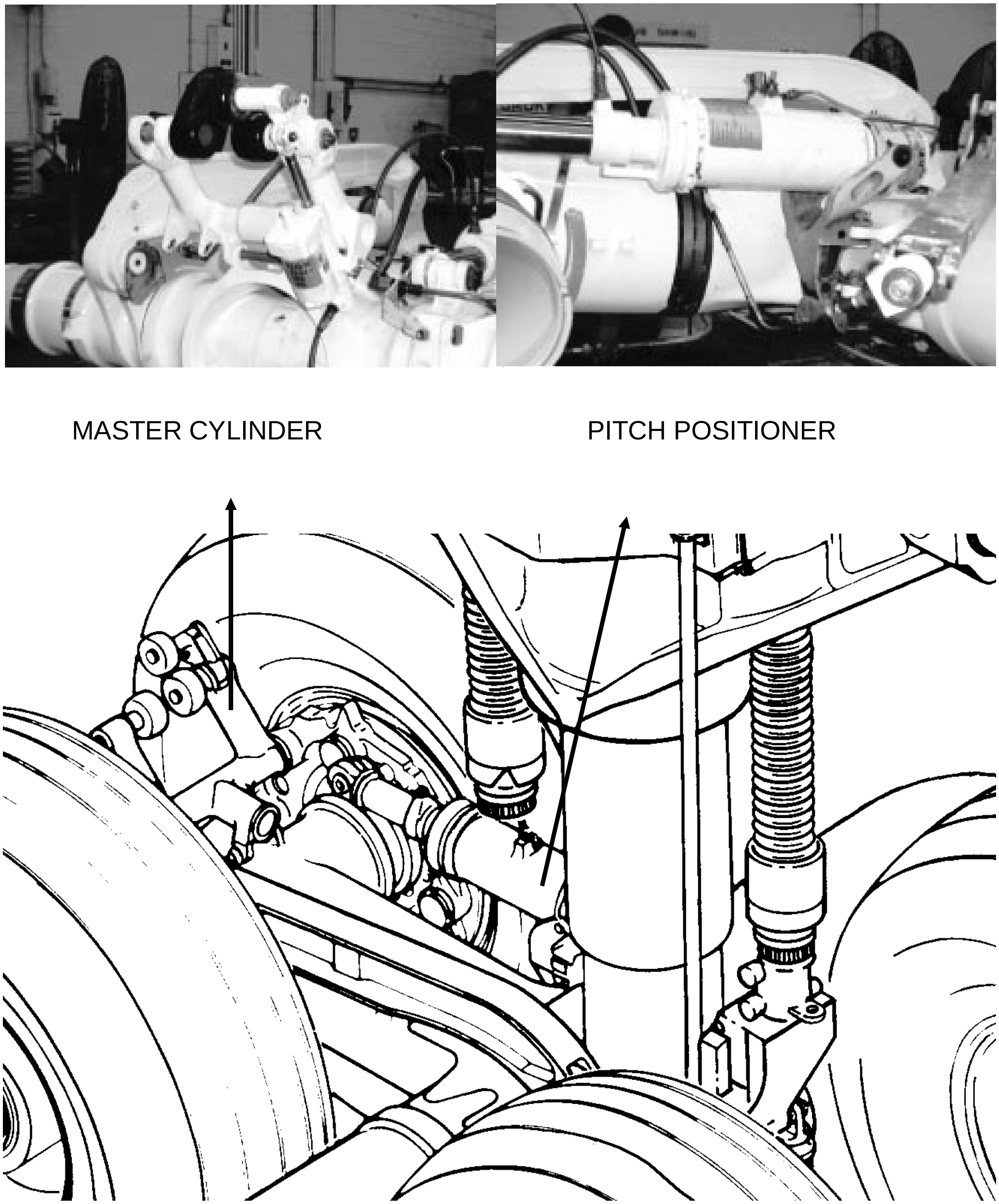
1. ROTATION CYLINDER (EMERGENCY)
2. AIR VALVE (PRIMARY CHAMBER)
3. SEQUENCE INTERLOCK VALVE
4. COLLAR LOCK CYLINDER (NORMAL)
5. SPRINGS
6. SIDE BRACE ELBOW
7. SIDE BRACE TUBE
8. DOWNLOCK ACTUATING CYLINDER
9. SIDE BRACE LINK
10. UPPER AND LOWER SIDE BRACE
11. ROTATION CYLINDER (NORMAL)
12. CROSSWIND POSITIONING CYLINDER
13. CASTER POWER-BACK CYLINDER (AFT GEAR ONLY)
14. RETRACT LINK
15. RETRACT ARM
16. ACTUATION TORQUE TUBE
17. KNEELING BALLSCREW
18. STANDPIPE ASSEMBLY
19. 49 X 17 TIRE
20. WHEEL
21. BRAKE
22. OUTER CYLINDER
23. PISTON
24. BRAKE LINE MANIFOLD
25. TOUCHDOWN SCISSORS LINKAGE
26. SEVEN PORT VALVE
27. ROLL PIN
28. AFT TOW LUG
29. ROLL POSITIONER
30. GUDGEON
31. AFT AXLE
32. BOGIE ASSEMBLY
33. BRAKE TORQUE COMPENSATOR LINK
34. FORWARD AXLE
35. MASTER CYLINDER
36. BOGIE POSITIONER ROLLERS
37. LOCK ROLLER
38. PITCH POSITIONER
39. KNEEL DRIVE CHAIN COVER
40. YOKE ASSEMBLY
41. CROSSWIND POSITION TRANSDUCER
42. CASTER POWER-BACK POSITION TRANSDUCER (AFT GEAR ONLY)
43. COLLAR LOCK CYLINDER (EMERGENCY)
44. COLLAR LOCK SEQUENCE VALVE
45. TRUNNION PIN

Main landing gear assembly (typical)

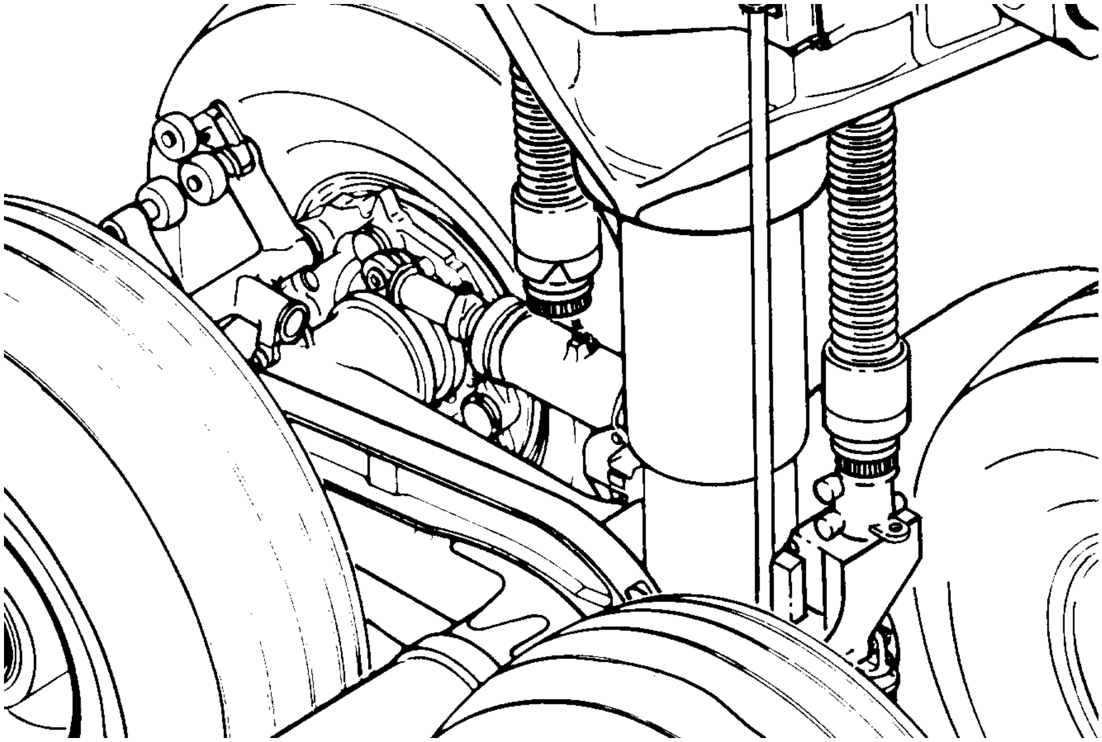




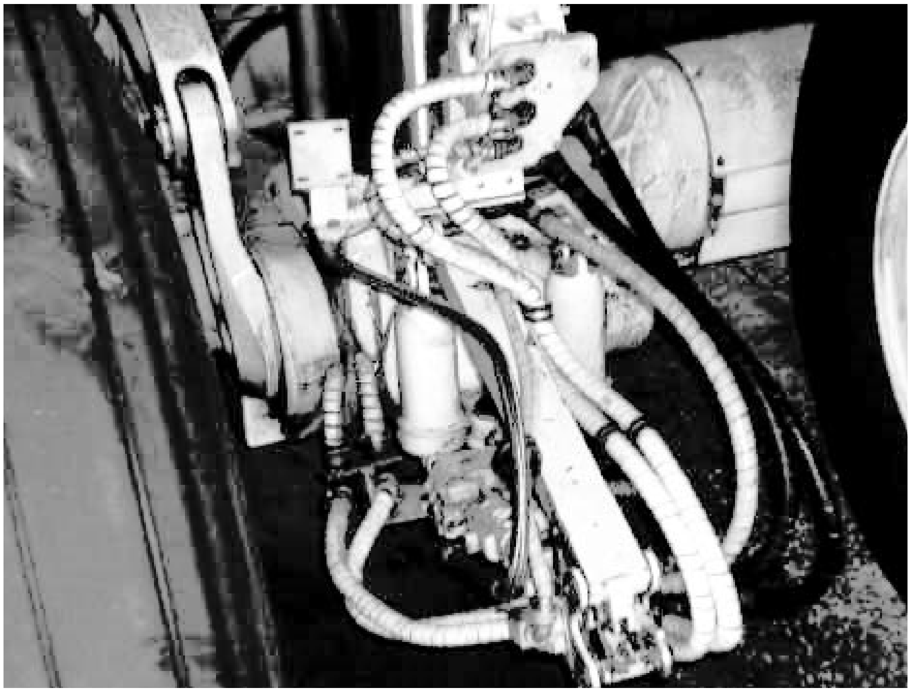
Main landing gear crosshead components

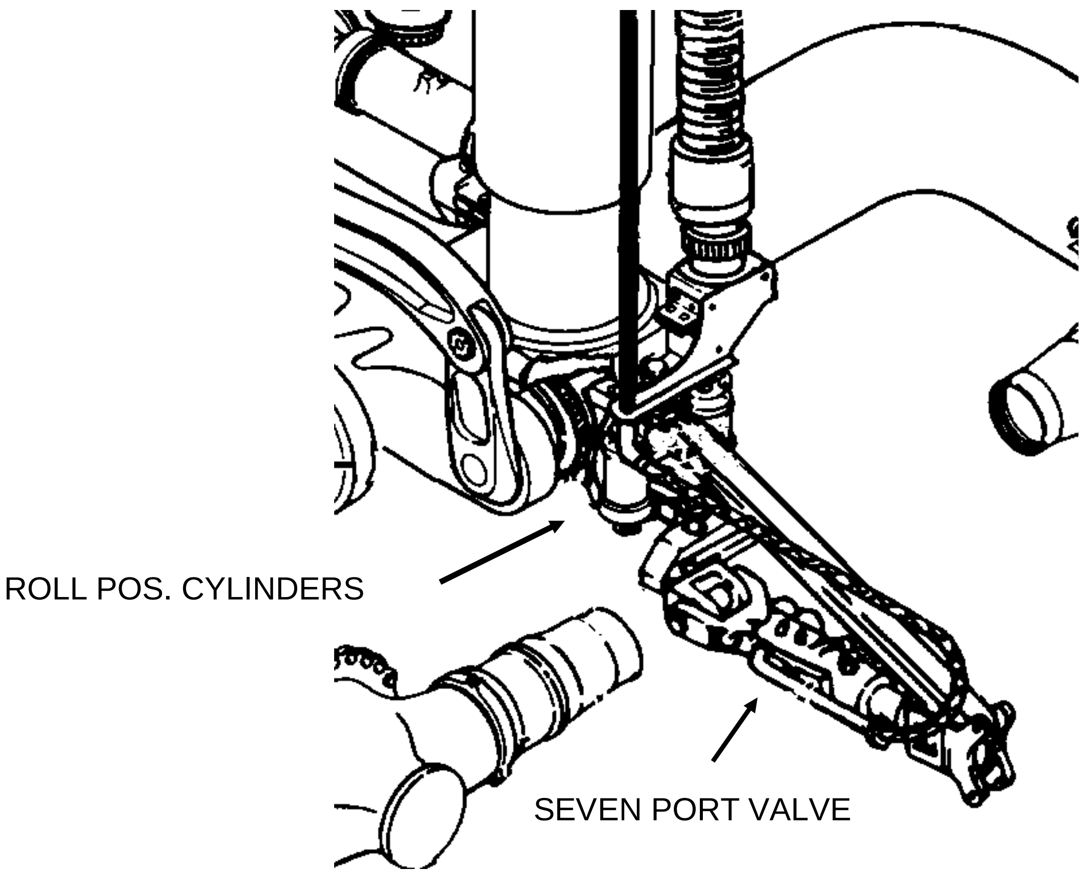


MLG Bogie pitch positioner and master cylinder

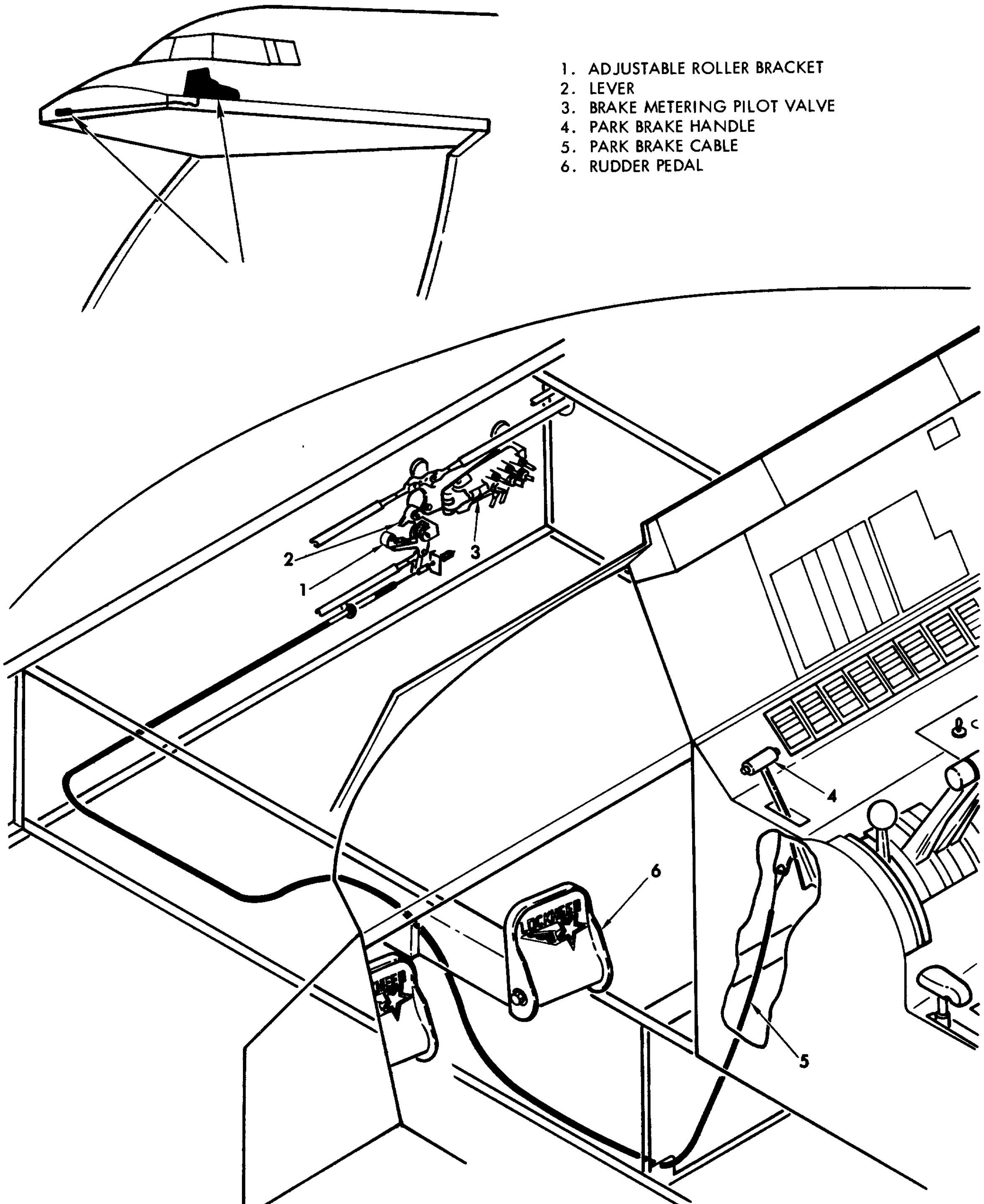


MLG brake torque compensator link

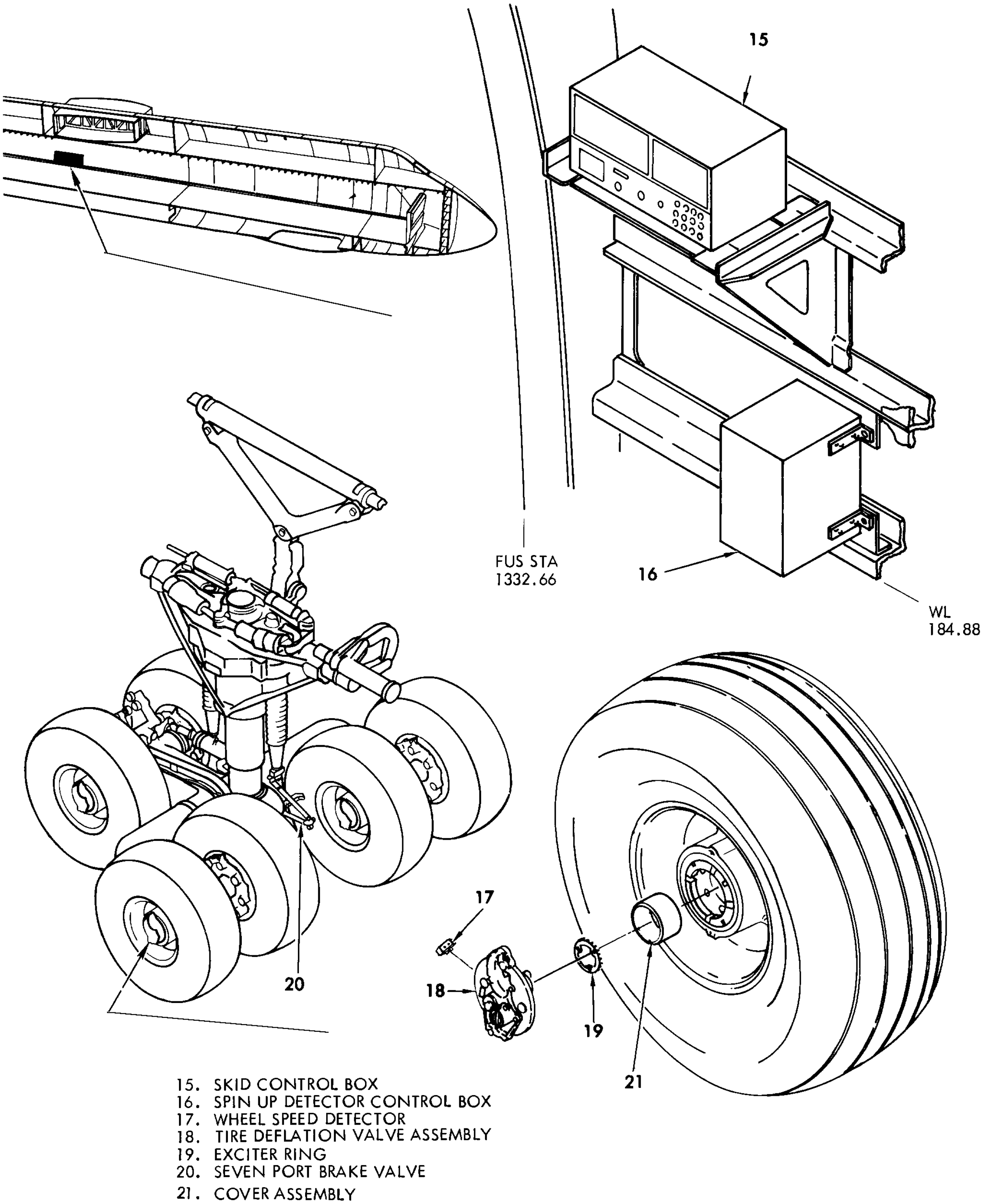




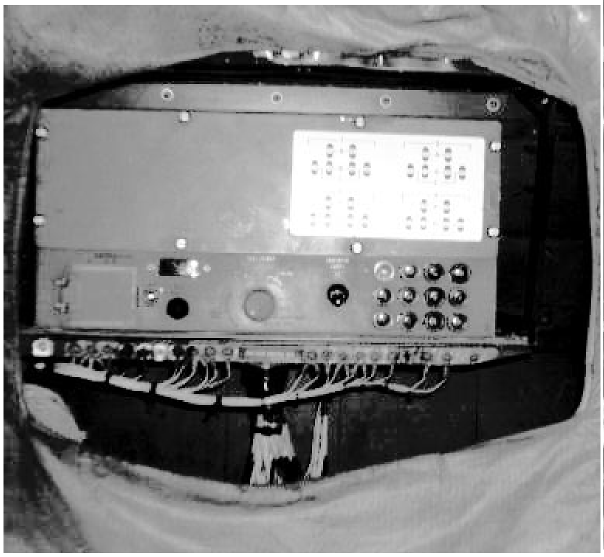
MLG roll position cylinders



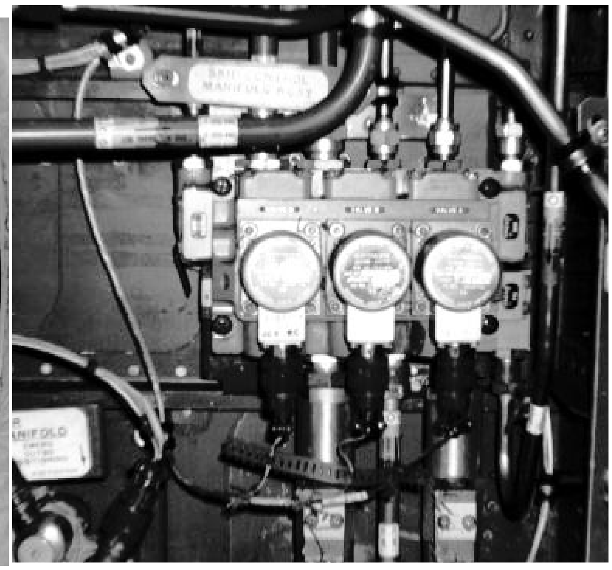
Mechanical parking brake components



MLG brake and skid control components

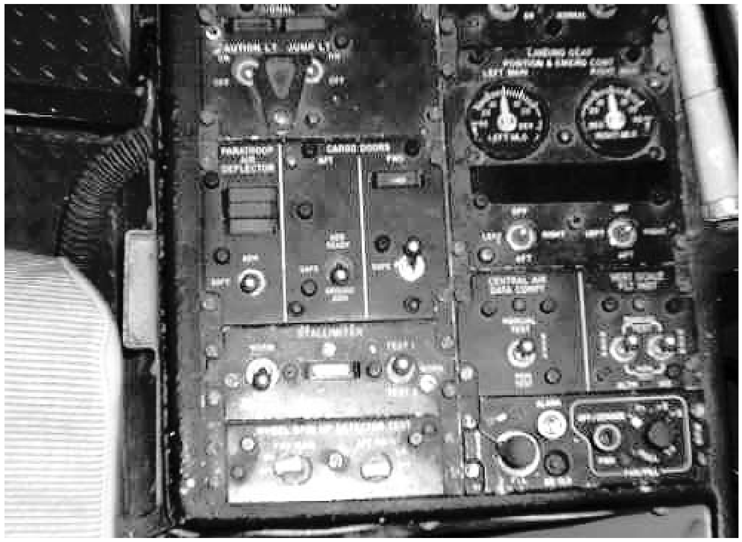


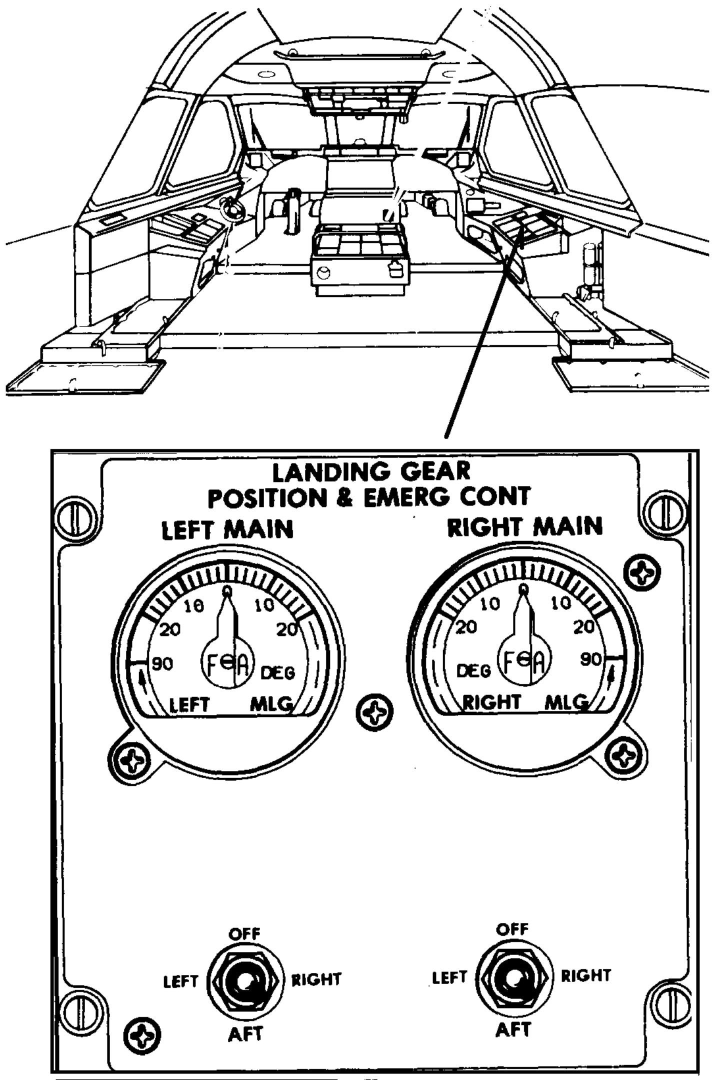
Anti-skid control box



Anti-skid control valves

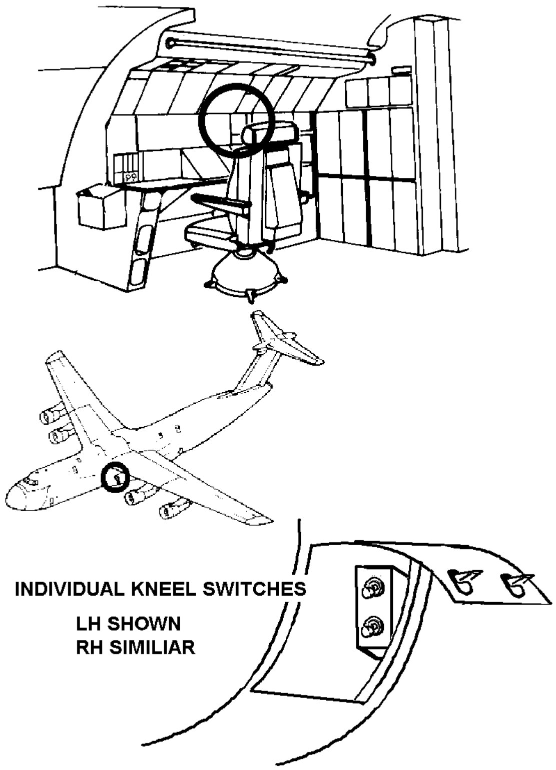
Typical carbon brake assembly

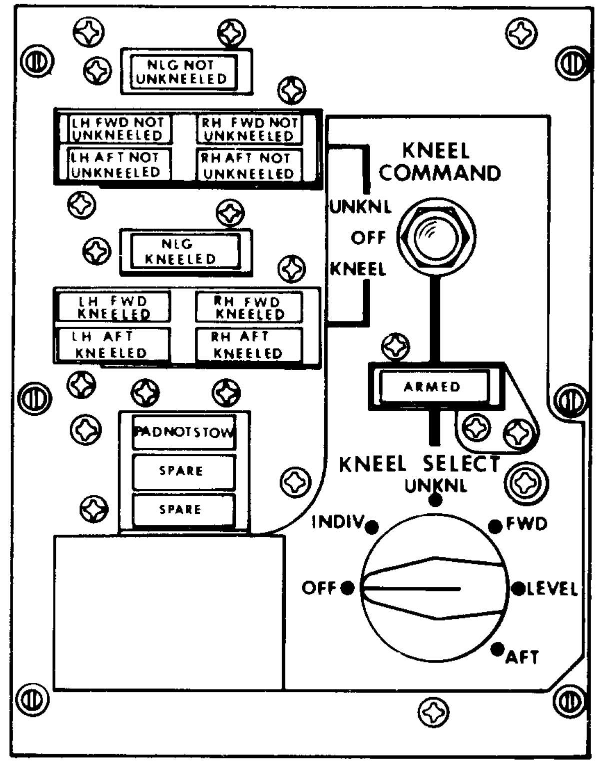




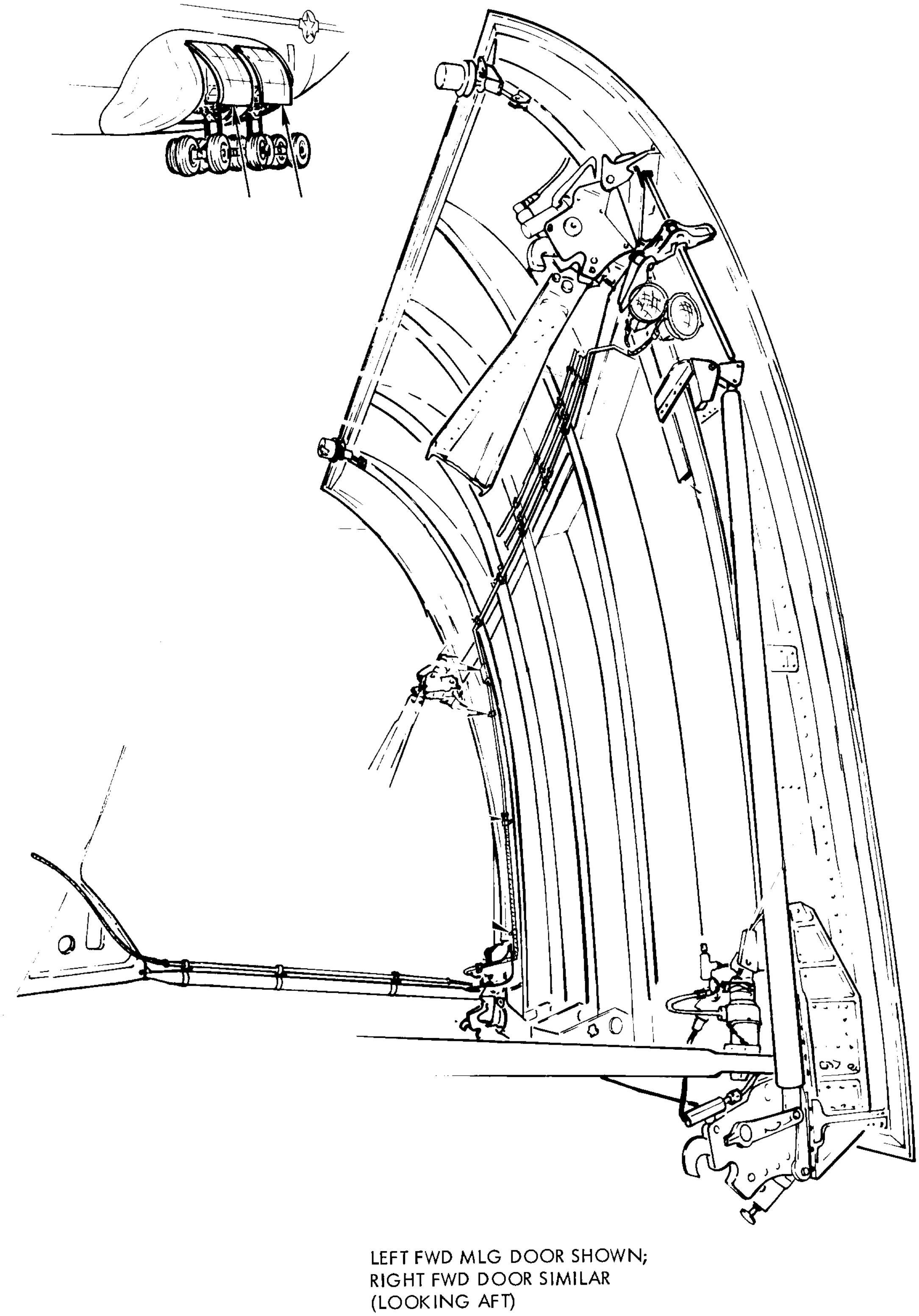
MAIN LANDING GEAR POSITION
AND EMERGENCY CONTROL PANEL

MLG position and emergency control panel

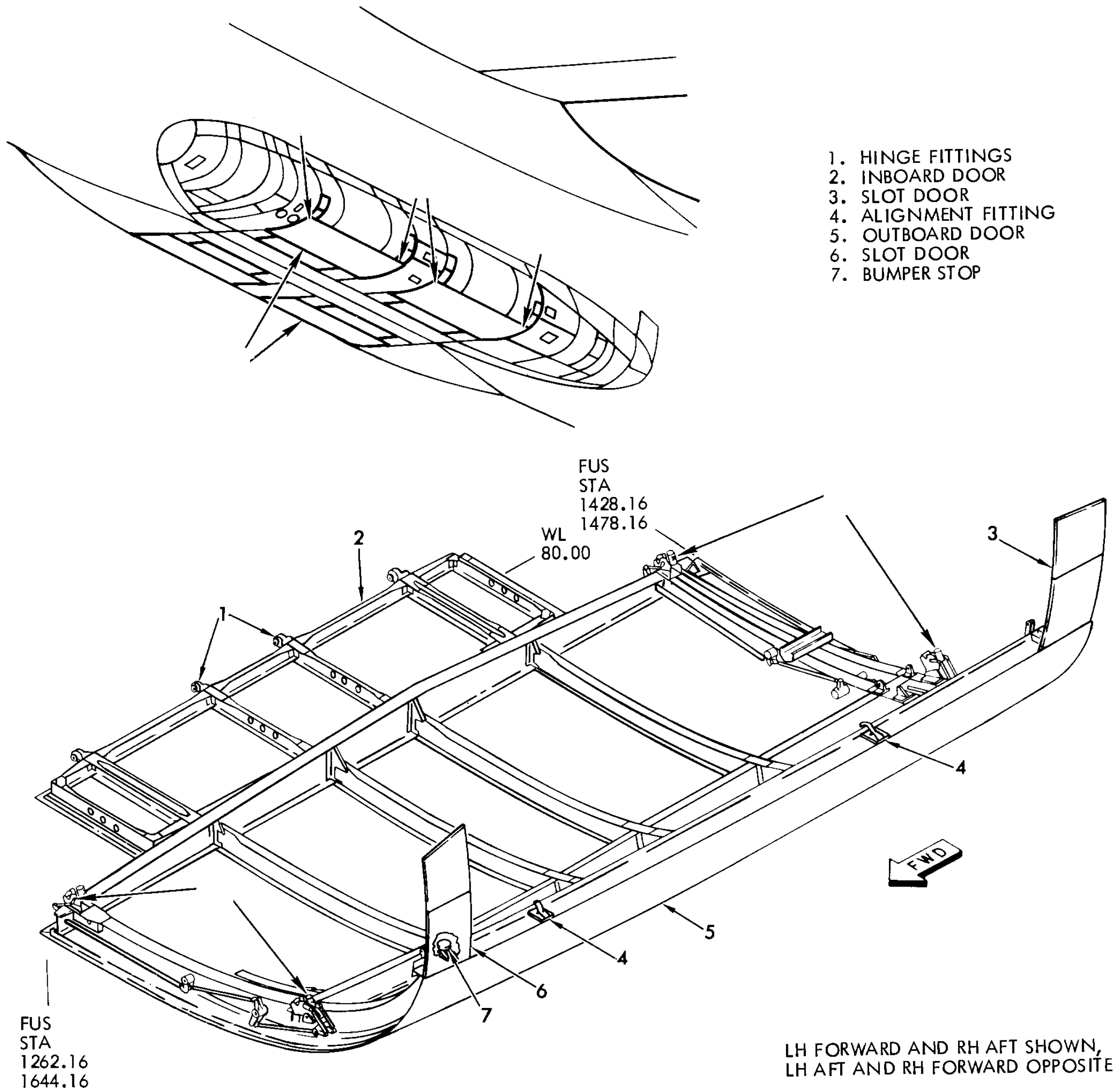




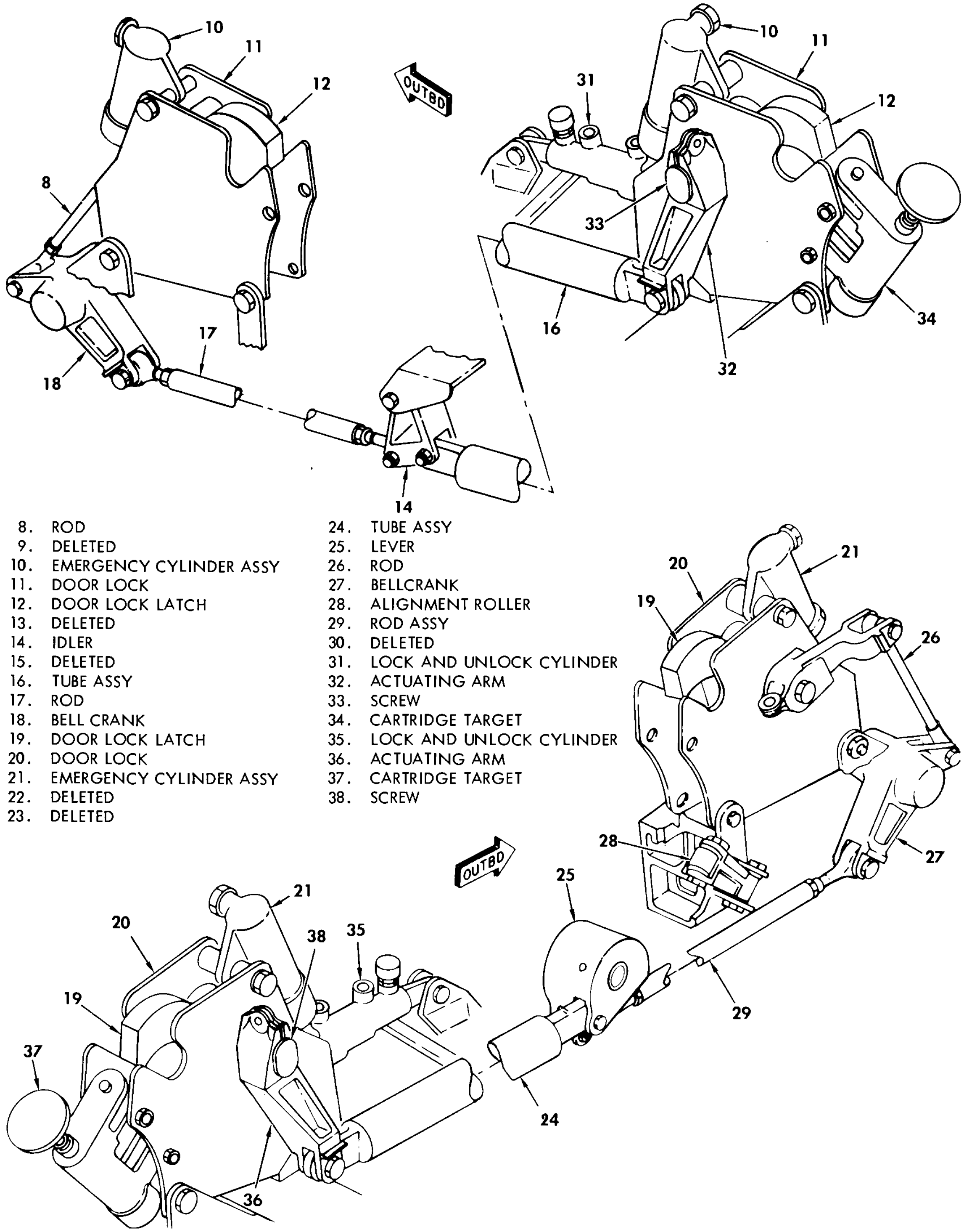
Kneel control panel and individual kneel switches



MLG outboard door assembly (gear extended)



MLG door assembly (gear retracted)



MLG door lock components

Nose Landing Gear

The NLG assembly has four wheels mounted on a single axle. The shock strut which is mounted to the fuselage by means of a trunnion beam, retracts aft about the trunnion beam into a wheel well at the bottom of the forward fuselage section.

A drag brace supports the NLG in both the gear down and gear up positions. The drag brace is attached to lugs at the top of the shock strut and is mounted forward of the shock strut to a drag brace trunnion. During landing gear retraction, the drag brace folds, then extends again and locks in the gear retracted position.

The retraction mechanism consists of dual ballscrew assemblies, drive shafts, a high-low speed ratio gearbox with a brake, a gear shift mechanism, and the ball screw drive assemblies. The NLG normal extension/retraction system is powered by a hydraulic motor for normal actuation. The hydraulic motor is supplied by utility hydraulic system No. 1, with the two aft main landing gears. In the event that the No. 1 hydraulic power system has failed, but there has been no loss of hydraulic fluid, the NLG system can be powered hydraulically from No. 2 hydraulic power system through a power transfer unit (PTU), between the No. 1 and No. 2 hydraulic power systems.

Both NLG doors are opened or closed simultaneously by a single actuation system powered by a hydraulic motor operated by controlled hydraulic flow. The same hydraulic system supplies both the door and gear actuation systems. A series of proximity sensors and pressure sensors sense the relative positions of the door and gear components and signal a control panel. This control panel signals solenoid-operated hydraulic control valves to open or close and automatically sequences the operation of door, door lock, gear, and gear lock actuators after one initial pilot command function. If all hydraulic power is lost, the NLG may be lowered by operating the NOSE LANDING GEAR EMERGENCY EXTEND SWITCH.

Nose Landing Gear Shock Strut Assembly

The NLG shock strut in conjunction with the MLG provides support for the airplane during takeoff, landing, and ground operations. The shock strut is attached to the airframe by two trunnion arms and a drag brace. The shock strut rotates aft about the trunnion arms for retraction. Retraction and extension of the shock strut are accomplished by two ballscrews that mount between the drag brace trunnion and retract arms on the aft side of the shock strut. Nose wheel steering is accomplished by two power steering cylinders mounted in lugs at the base of the retract arms. The steering manifold, pulleys, and cables also mount on the shock strut. During kneeling of the airplane, the NLG partially retracts. A kneeling roller is mounted on the aft side of the shock strut axle. During the forward and level kneeling modes, the kneeling roller rests against the kneeling stop at the aft end of the wheel well to take the side load off the shock strut. The upper part of the shock strut contains hydraulic fluid and a high pressure (primary) air chamber. The lower part of the shock strut contains a higher pressure (secondary) air chamber. The two chambers are separated by a floating piston. The secondary air chamber furnishes additional shock absorbing capacity during landing and takeoff from unimproved landing strips. The secondary air chamber also limits landing impact loads transmitted to the airplane structure if the airplane lands at an excessive sink rate. The stroke of the strut piston is 22.0 inches.

Nose Landing Gear Torque Arm Assembly

Two torque arms control directional alignment of the strut piston, and thus the wheels. The lower torque arm connects to lugs on the strut piston. The upper torque arm connects to lugs on the steering collar. Rotation of the steering collar results in the steering of the nose wheels.

Nose Landing Gear Steering Collar

A steering collar imparts the steering command from the steering power cylinders to the torque arms. The steering power cylinders connect to lugs on the steering collar, which changes the linear action of the power cylinders to rotational motion . At the base of the steering collar is a rig pin fitting assembly. It is employed during rigging of the steering system to zero-degree position. A hole through the fitting permits sighting the steering angle protractor. A channel is machined around the top edge of the steering collar for the steering cable which is used to feed back the actual steering position. A taxi light is mounted on the forward side of the steering collar.

Nose Landing Gear Up/Down Lock Actuators

There are two identical up/down lock actuators installed at the top of the shock strut. One of the actuators is designated as the emergency actuator and serves as a backup for the normal actuator in the event the normal actuator should fail to operate. The up/down lock actuators actuate the latch that holds the drag brace links in the extended position, thus locking the landing gear in both the gear up and gear down position. Two spring cartridges assist the actuators to move the latch into the locked position when the drag brace links reach the fully extended position. The up/down lock actuators overcome the spring pressure to unlock the latch. The actuators are hydraulic cylinders. The piston rod transmits the action to a bellcrank which operates a pushrod to unlock the latch.

Manifolds

The NLG normal control system uses a gear control manifold plus a down lock valve to ensure the down lock linkage remains locked. The emergency control system uses an emergency isolation manifold and a NLG and NLG door emergency unlock manifold. All manifolds are the cartridge module type. All valves used within the manifolds are the cartridge insert type for easy replacement. The control manifold, emergency isolation manifold, and the emergency unlock manifold are located along the left side of the cargo compartment above the nose wheel. The manifolds control the direction and flow of the hydraulic fluid upon command of an electrical signal or a previously sequenced operation.

Nose Landing Gear Door Lock and Lock Actuating Mechanism

Each NLG inboard door has two lock actuation systems, one forward and one aft. Each system consists of a lock and unlock cylinder, two lock assemblies, two emergency unlock cylinders and connecting arms, rods and torque shafts.

Nose Landing Gear Door Lock Assembly

The four door lock assemblies on each inboard nose landing gear door support and position the doors in the closed position. When the doors are closed, these locks latch on rollers attached to adjustable mounts on the wheel well structure. The door lock assembly consists of a hook shaped latch connected through an overcenter linkage to a pivot crank. The pivot crank has splined input-output shafts. Actuating arms are attached to the pivot crank shafts and to push-pull rods operated by the lock and unlock cylinder. An emergency unlock link attached at one end to the latch and the overcenter linkage, and at the other end to the emergency unlock cylinder, opens the latch when the emergency unlock cylinder is actuated. Side plates enclose the lock mechanism, and are used to mount the lock assembly on the door structure. When opened, the latch is held open by hydraulic pressure to the lock and unlock cylinder.

Steering

The NLG can receive steering commands from three different sources. The primary steering command is by the hand steering wheel at the left side of the pilot. Other steering commands are initiated by pilot and copilot rudder pedal movement.

The steering system is used to control the airplane during taxiing. Manipulation of the hand steering wheel or the rudder pedals actuates the hydraulic system for the NLG. The hand steering wheel is the primary control during taxiing, and can rotate the NLG 60 degrees to the right or left of the airplane centerline. Rudder pedal steering, which can be overridden by the steering wheel, has a limited movement of 5 degrees to right or left of neutral. The major components of the steering system are a hand wheel, a sprocket and chain drive, a steering quadrant assembly, a pivot beam, a closed loop cable run, rudder pedals, and associated linkage.

Hand Steering Wheel

The hand steering wheel, at the forward end of the pilot's side console, is the primary control for steering the airplane during ground operation. The steering wheel connects to the steering quadrant through a shaft and a sprocket, and chain drive. Rudder pedal steering disconnect switches are attached to the shaft on a torque arm.

Steering Cylinders

Two steering cylinders on either side of the NLG shock strut under the NLG trunnion are double acting, hydraulically operating assemblies, used to position the NLG during steering. The piston rods are attached to the NLG steering collar and the cylinders are mounted on the NLG trunnions by universal fittings allowing two-way swivel motion.

Nose Landing Gear Strut Extension Indicator

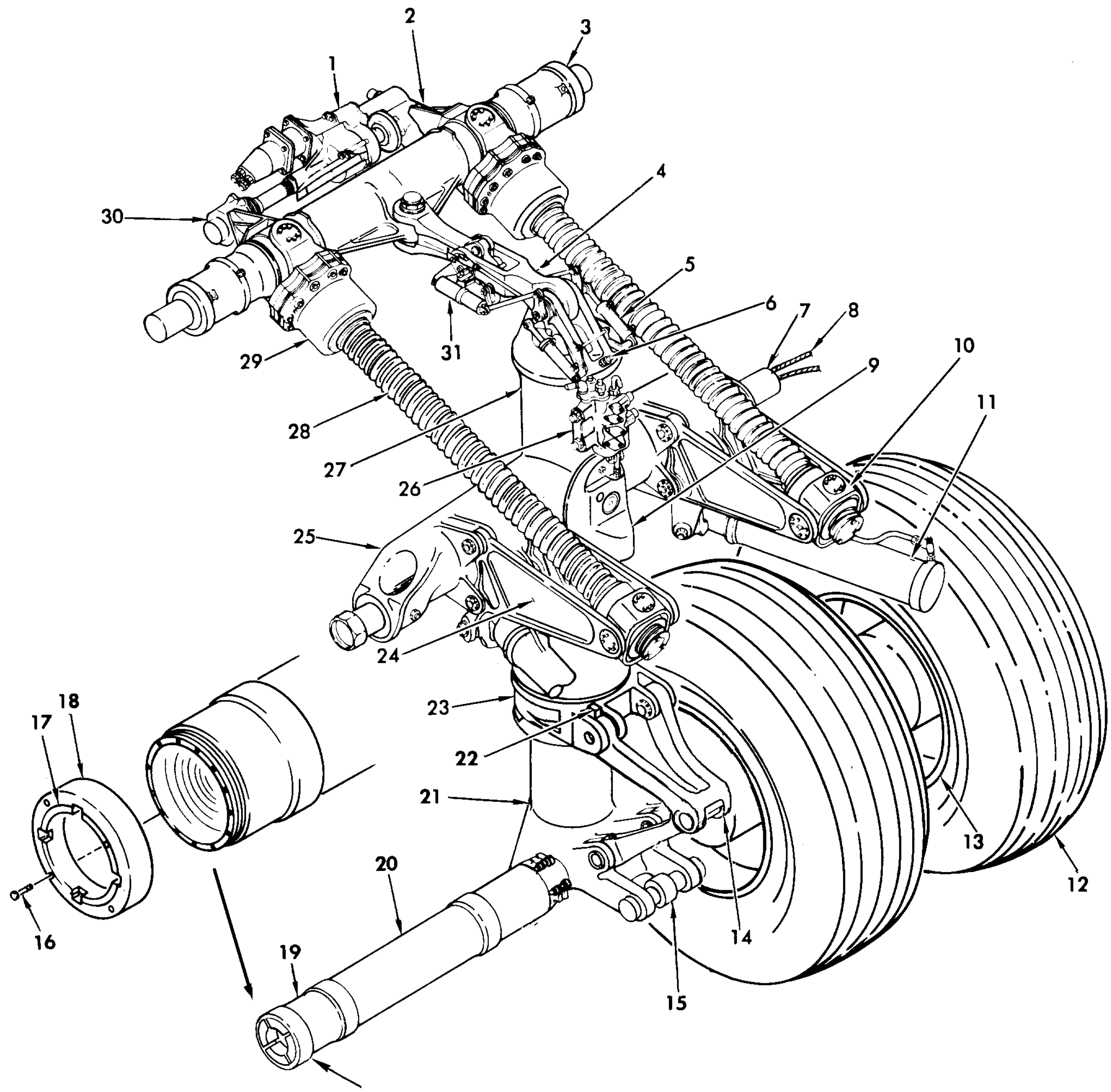
The strut extension indicator located on the NLG upper torque arm provides a visual indication of strut extension. If the pointer is not in the green area the NLG strut is not properly serviced and the NLG must not be kneeled.

Nose Landing Gear Strut Limiter

An extension limiter is installed on the nose landing gear during forward kneeling operations to prevent the strut from over extending and subsequently making improper contact with the kneel stop pad. The strut limiter is attached to crosspins on the steering collar lugs and the piston-axle lugs with quick disconnect pins. The strut limiter may be installed with either end up.

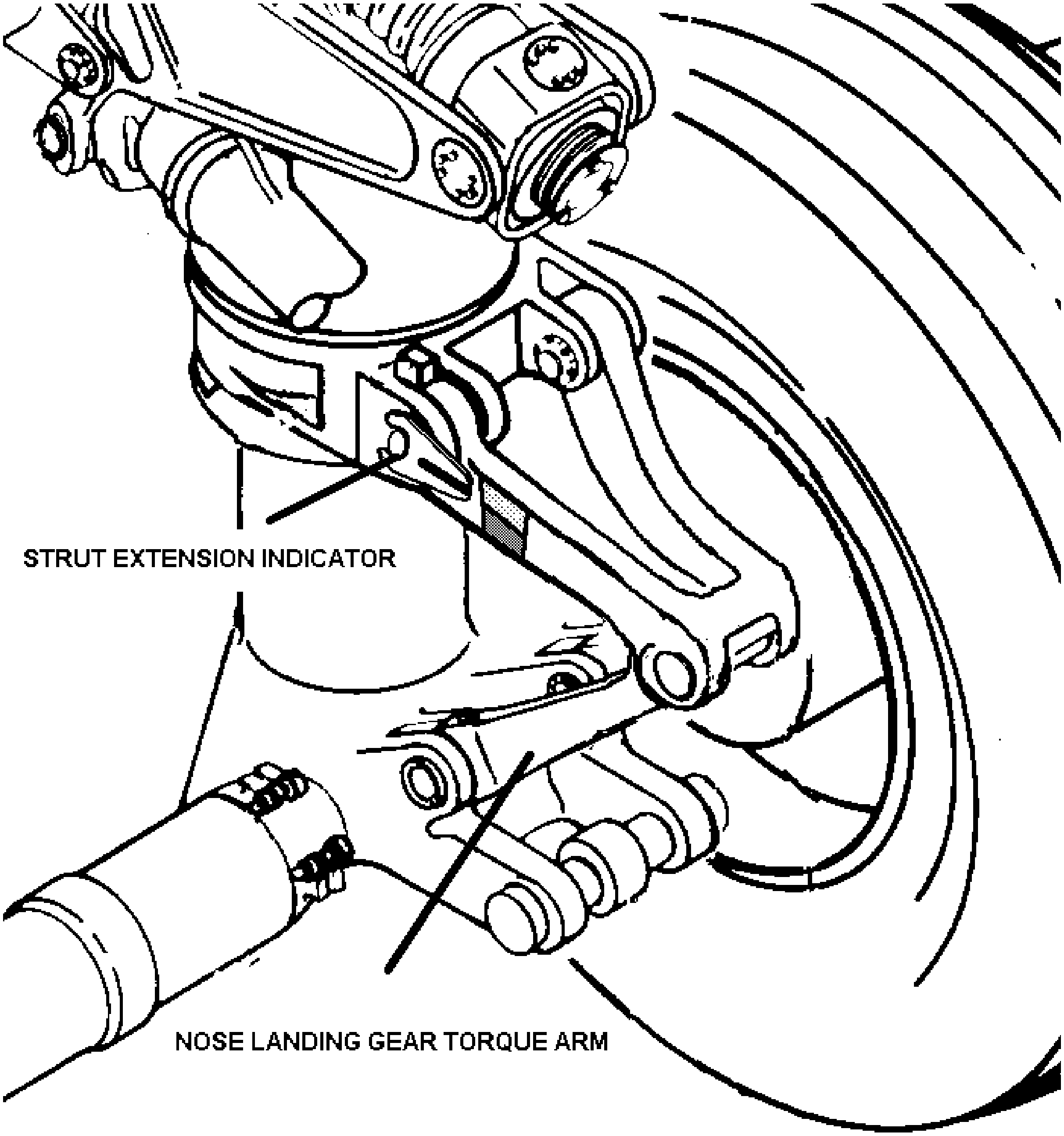
Nose Landing Gear Kneel Door

The NLG kneel door is located behind the NLG wheel well. During kneeling, the folding bulkhead and kneel door hinge upward to provide ground clearance in the kneeled position. The kneel door is locked down during normal airplane operation.

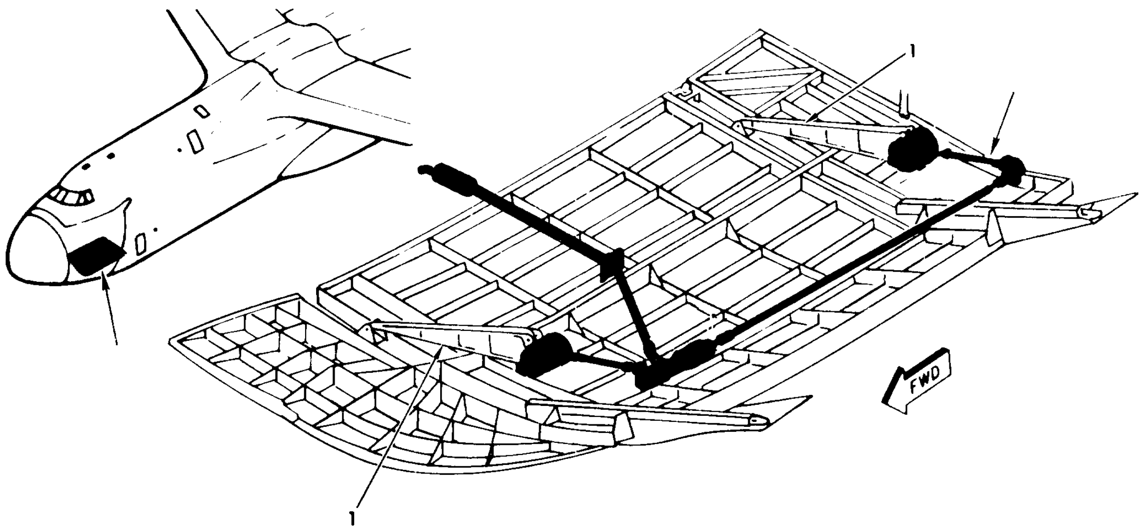


1. GEAR BOX ASSEMBLY
2. RIGHT ANGLE GEAR BOX
3. DRAG BRACE TRUNNION
4. DRAG BRACE ASSEMBLY
5. UP/DOWN LOCK ACTUATOR
6. HIGH PRESSURE AIR VALVE
7. SHOCK STRUT TRUNNION PIN
8. STEERING CABLE
9. STEERING CABLE COVER
10. BALL SCREW NUT
11. STEERING CYLINDER
12. 49 X 17 TIRE
13. WHEEL
14. TORQUE ARMS
15. KNEEL STOP ROLLER
16. BOLT
17. TOWING INTERFACE
18. AXLE NUT
19. SPACER ADAPTER
20. WHEEL SPACER
21. SHOCK STRUT PISTON AXLE
22. KNEEL INTERLOCK SENSOR
23. STEERING COLLAR
24. SHOCK STRUT RETRACT ARM
25. SHOCK STRUT
26. STEERING CONTROL VALVE
27. SHOCK STRUT OUTER CYLINDER
28. EXTENSION AND RETRACTION BALL SCREW
29. BALLSCREW DRIVE ASSEMBLY
30. RIGHT ANGLE GEAR BOX
31. SPRING CAPSULE

Nose landing gear assembly

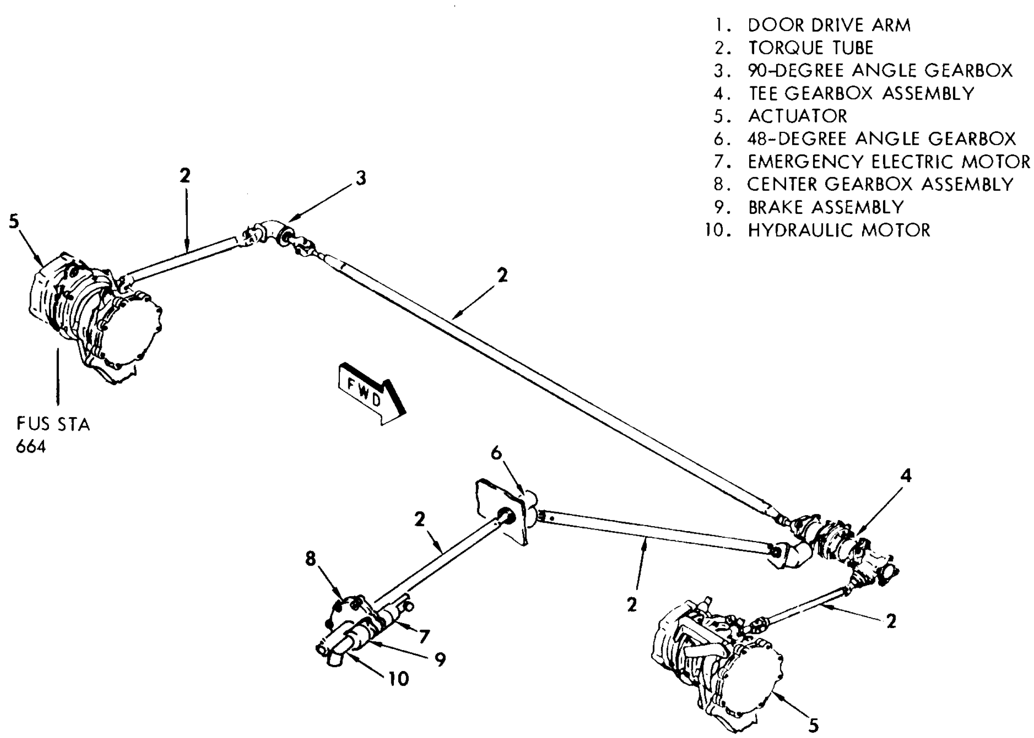


NLG torque arm and strut extension indicator assembly

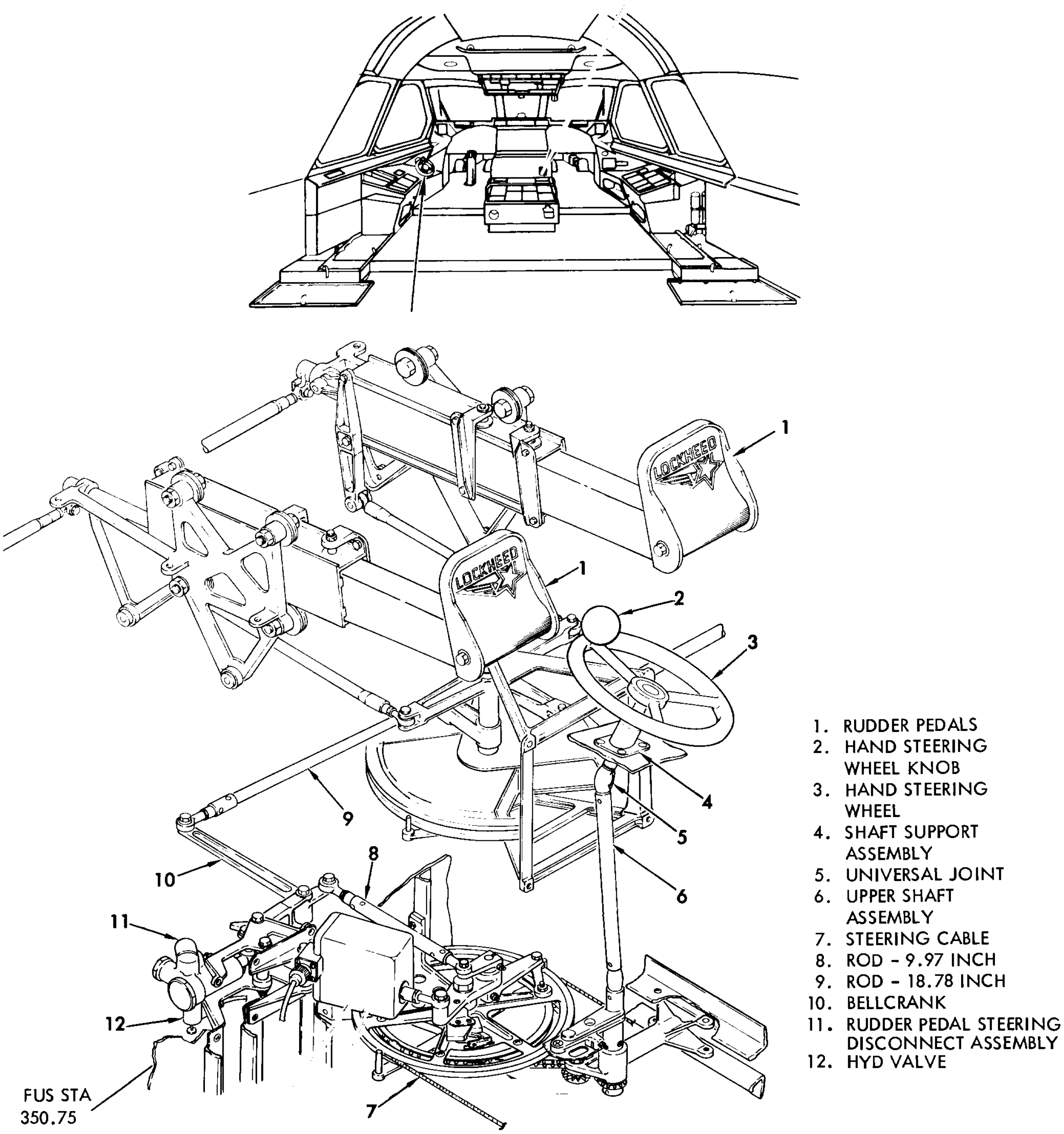


NOSE LANDING GEAR DOOR

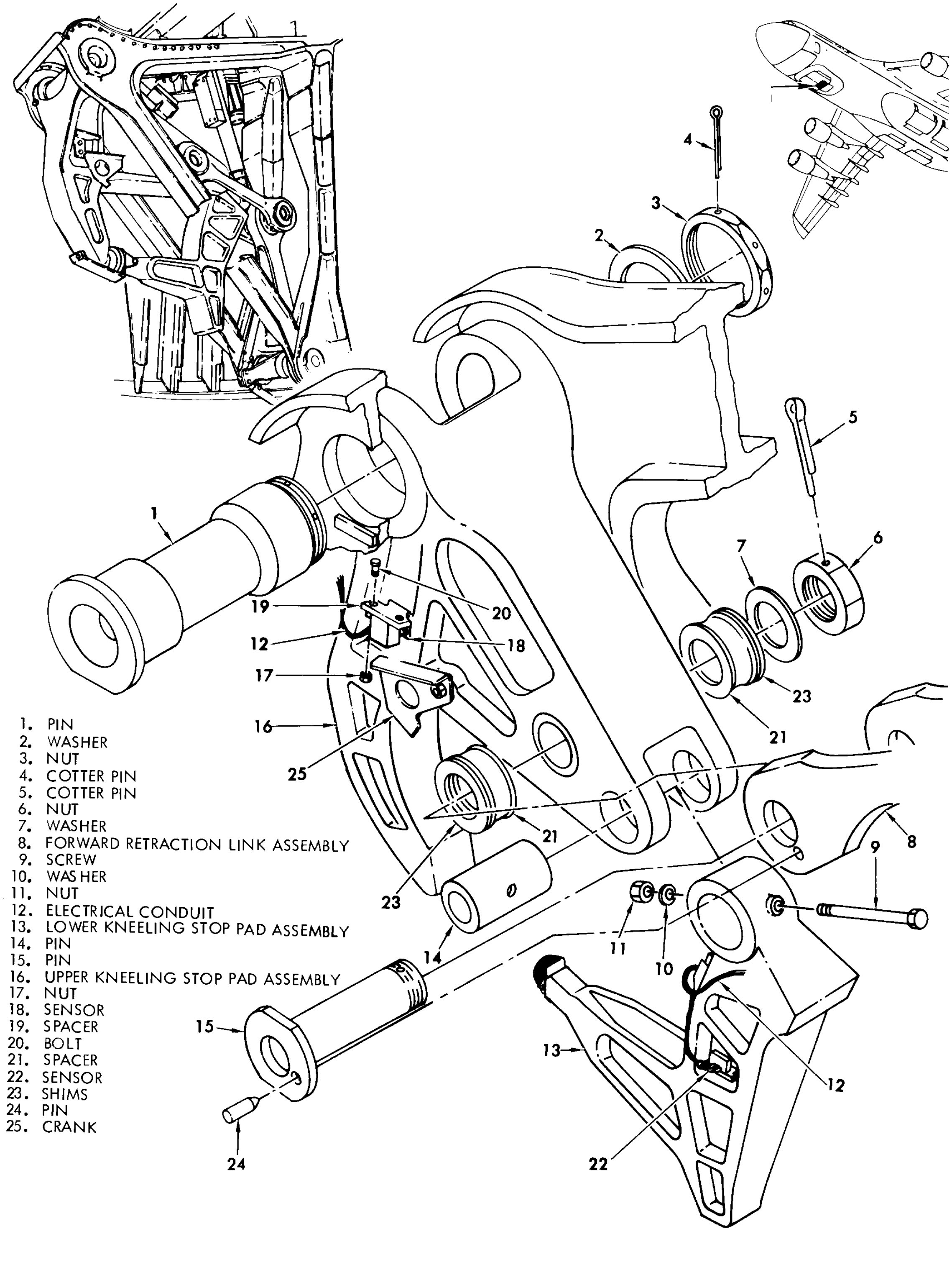
LEFT HAND DOOR SHOWN, RIGHT HAND DOOR SIMILAR



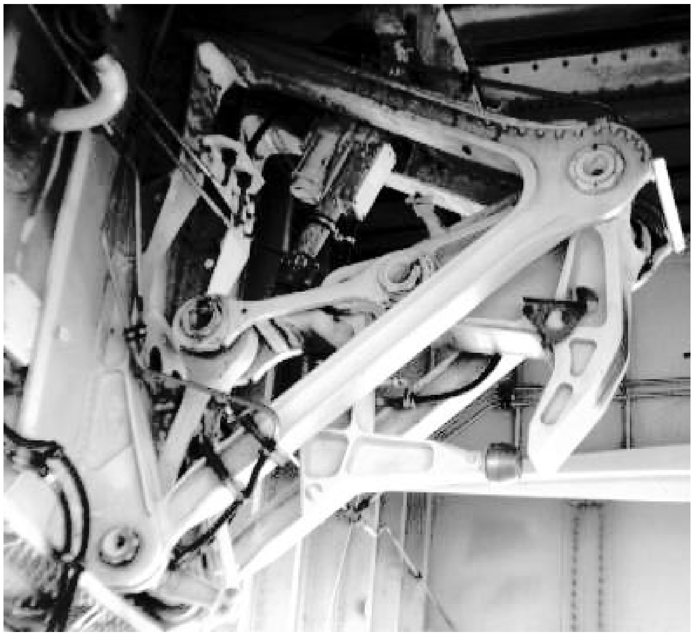
NLG door and lock assembly

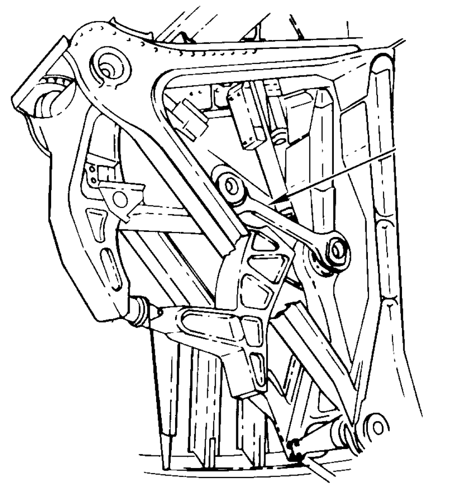


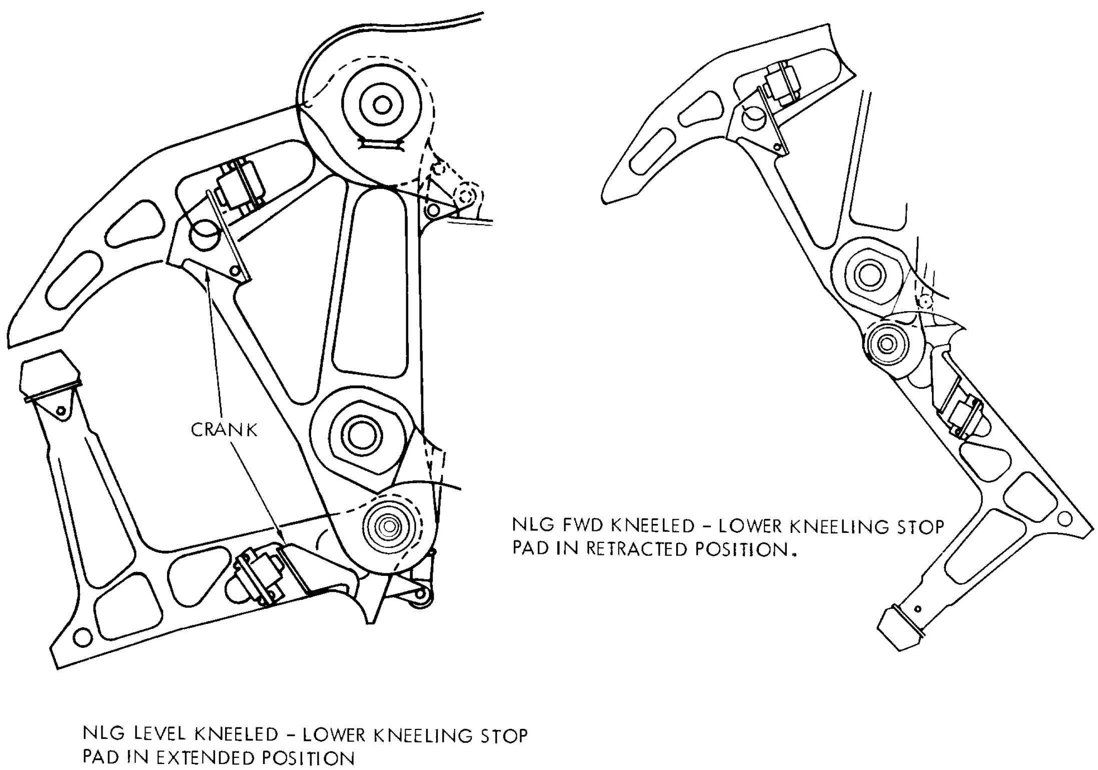
NLG steering system components



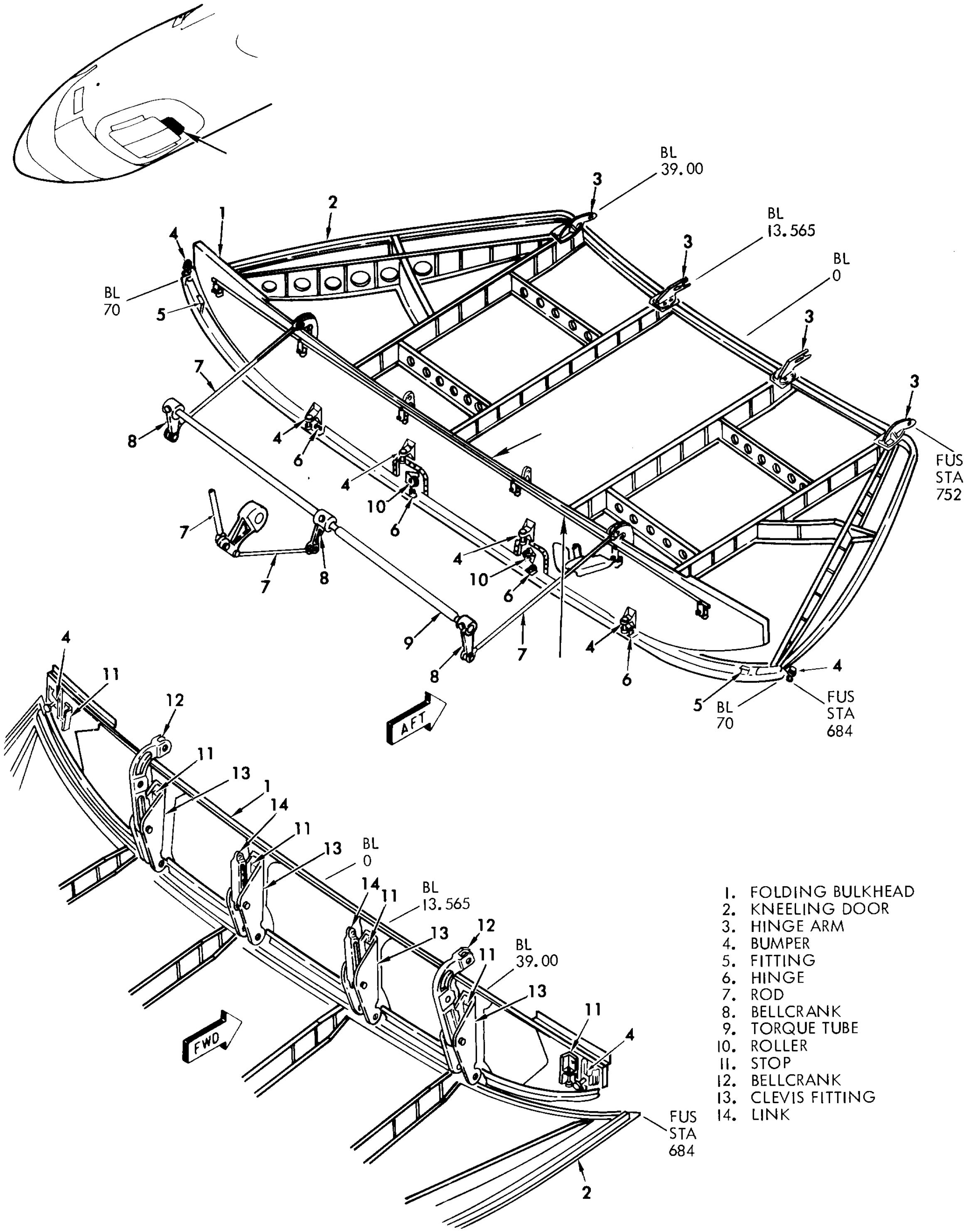
NLG kneel stop pad assembly







NLG kneel stop pad kneel configurations



NLG kneel door and folding bulkhead

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FORWARD AND AFT LOADING SYSTEMS

The forward and aft loading systems provide access to the forward and aft parts of the cargo compartment for loading, off loading, and maintenance actions. The following sections provide information on structural and actuation components, locking provisions, and control and monitor systems.

Visor System

Visor Structure

The visor structure opens and closes the forward end of the cargo compartment. The diameter of the visor is 20 feet at FS 350.0. The structure extends aft from FS 160.0 to FS 514.0 at WL 318.0. The approximate weight of the visor, without the radome, is 5,500 pounds. The arc of rotation from the closed position to the open position is 65.5 degrees. The visor consists of a pressure bulkhead, upper beams, hinge arms and pins, side panels, fairings, access panels, a catwalk, and a visor track and supporting members.

Pressure Bulkhead

The pressure bulkhead acts as the forward-most pressure containment structure in the fuselage. The bulkhead is attached to the visor structure at FS 297.0 and consists of panels, skin strips, beams, frames, and attaching parts. The panels are sheet metal and stringer construction. Removable covers are installed on the aft side to provide access for radar component maintenance. Fittings are provided on the forward side for the installation of radar components. Fifteen latches and 27 shear pins lock the nose radome assembly to the visor structure.

Visor Actuator

The visor actuator is provided with a mounting pad for attachment of the hydraulic motor. The actuator drive unit contains a gear reduction assembly, a planetary gear transmission, and two multiple-disk brakes. The drive unit contains 6 rows of sprockets of 20 teeth each. An idler sprocket is mounted on one end of the unit on a fixed shaft. Two sections of triple-strand roller chain are installed over the main drive sprocket. A second idler sprocket is installed in the other end of the unit in a spring-loaded frame and is used for adjustment of the roller chain. Four back up shoes are installed in the unit. Two adjustable center guide rollers and four adjustable side guide rollers are installed in the unit. The side guide rollers engage mating vee-grooves in the rack to ensure alignment of the unit in the track. The drive unit also contains a roller failure detector system.

Visor Hydraulic Brake

Dual hydraulic-actuated, spring-loaded brakes are used to hold the visor in a static position when hydraulic pressure is removed from the actuator. When the hydraulic motor is pressurized by the No. 4 hydraulic system, hydraulic pistons in the brakes operate to overcome spring compression to release the braking action.

Visor Track and Rack

A curved rack is installed in the track. The rack consists of five interchangeable curved segments secured and positioned by index plates. The track is secured to the visor structure on BL 0.0 with the top located near FS 296.0. The lower end of the track terminates near FS 435.0. Eleven struts secure the track and rack to the visor structure. Two lower rack guides are installed in the fuselage to center and guide the track as the visor nears the closed position. The rack guides are equipped with fore and aft rollers for alignment of the track on BL 0.0.

Visor Snubbing and Shutoff Provisions

The forward loading system hydraulic system is designed to provide a snubbing action to the visor at the top and bottom extremes of travel. The snubbing action is accomplished by mechanically reducing the hydraulic fluid flow rate to the visor actuator motor. This action occurs during the first 4 to 5 inches, and the last 10 to 12 inches of travel of the visor during the opening cycle. During the closing cycle, the snubbing action occurs during the first 10 to 12 inches and the last 4 to 5 inches of travel. The snubbing effect reduces the visor rate of movement and thereby decreases the shock upon stopping.

Visor Locking and Support Provisions

Two types of hydraulically actuated locks are used to secure the visor to the fuselage and ramp when the visor is closed. Support hooks and yokes are used to provide for additional visor support and alignment.

Visor Tongue and Clevis Upper Locks

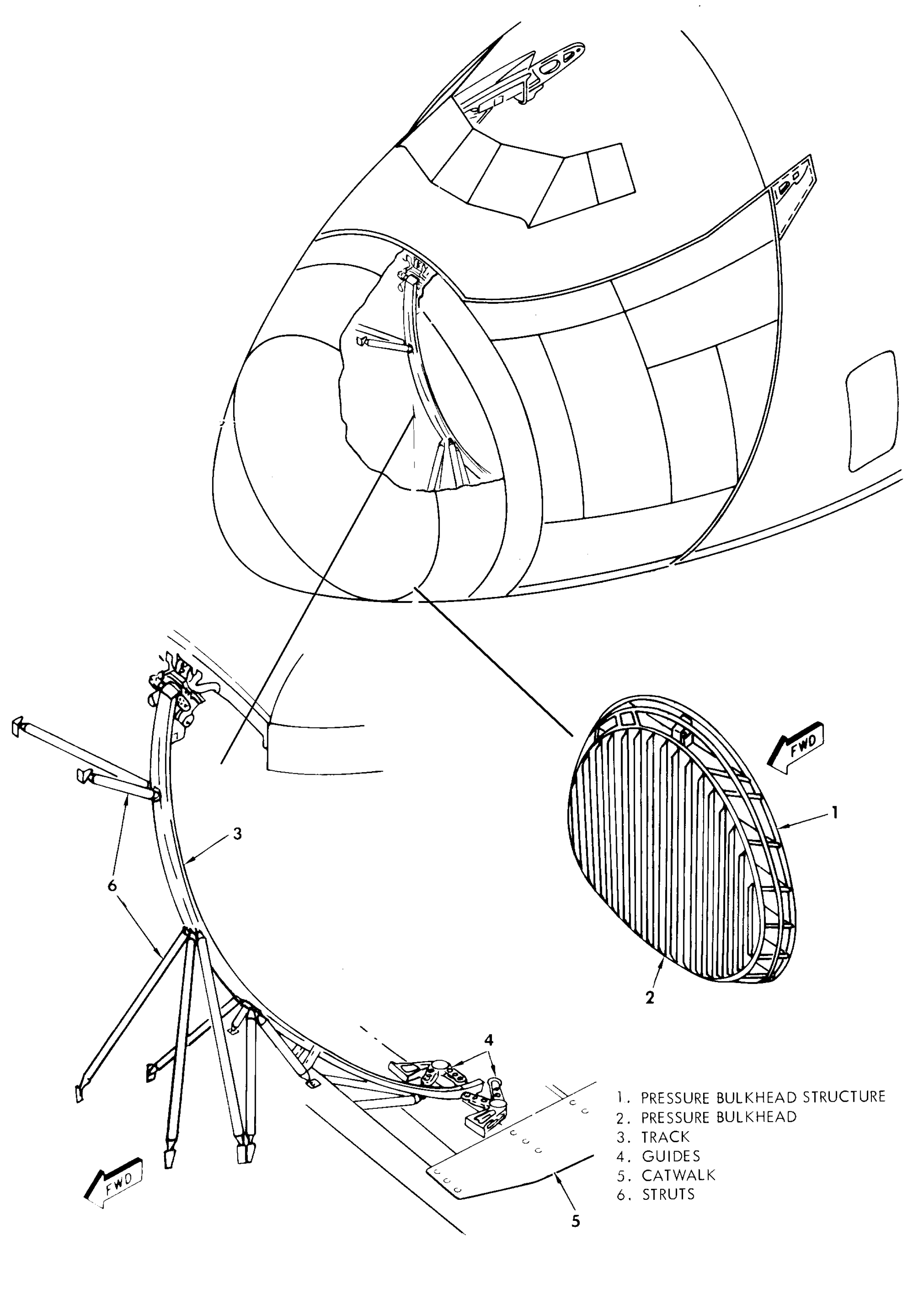
Two tongue and clevis locks secure the forward closeout member of the flight station under-floor structure and the upper-most portion of the visor. The locks are located at FS 299.0, WL 322.0, BL 18.0, left and right. The lock is provided with eccentric bushings for alignment of the visor to aerodynamic contour requirements. When the visor is fully closed, the actuator pin is extended to secure the tongue and clevis fittings.

Visor Receptacle and Pin Locks

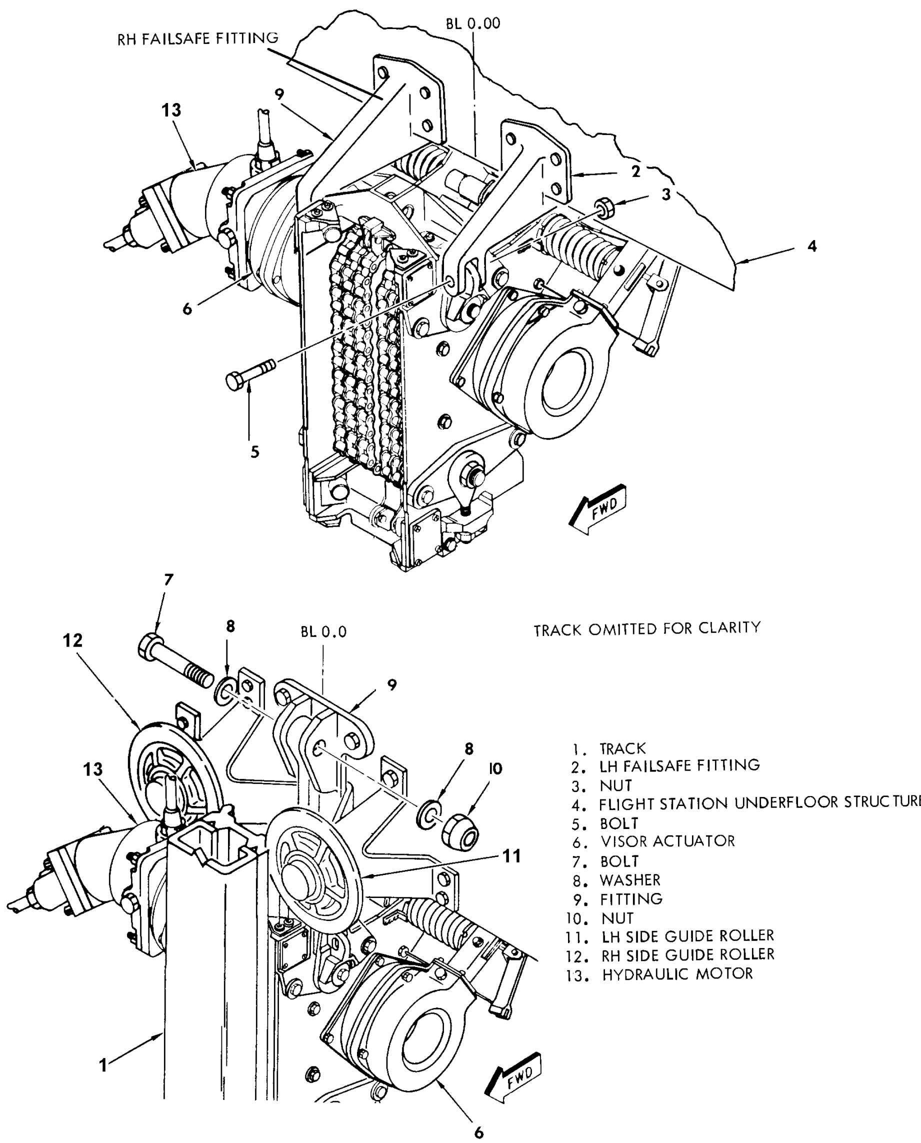
Fourteen receptacle and pin locks are installed on the fuselage No. 1 side panel canted bulkheads and the mating canted closeout members of the visor in a symmetrical pattern. Nine receptacle and pin locks are installed along the interface of the forward closeout member of the ramp and the mating lower closeout member of the visor structure. The two primary parts of the unit, pin and receptacle, are provided as a matched set. The pin has a truncated cone on its contact end; the receptacle has a matching cavity. The pin and receptacle have a transverse hole to accommodate the actuator pin. Eccentric bushings are provided on the pin for adjustment during visor rigging. Each receptacle and pin lock is provided with a limit switch (visor locked) to indicate a locked or not locked condition. The 23 receptacle and pin locks are provided with visual lock indicators to back up the light indications displayed on the forward loadmaster door lock indicating panel.

Visor Actuator Hydraulic Motor

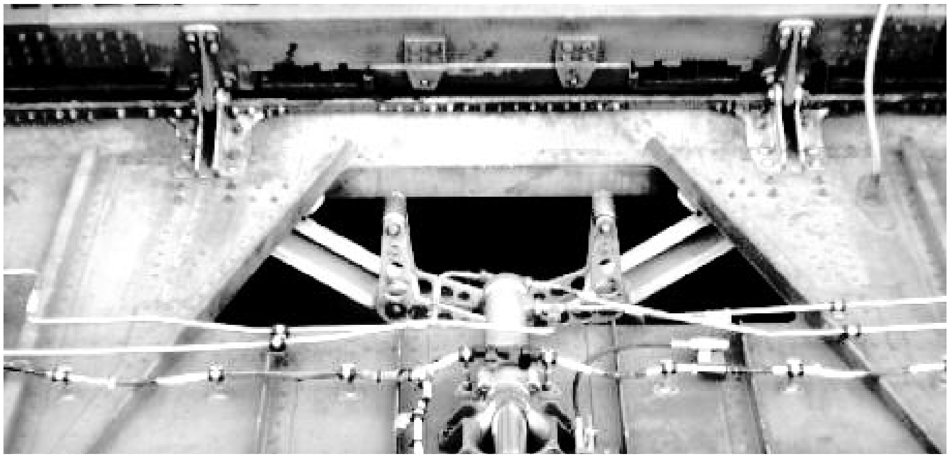
The motor attaches to the visor actuator on a square flange mounting surface. This motor provides input power for the visor actuator to open and close the visor. The motor is of the fixed displacement type that has two ports for clockwise or counterclockwise rotation, a case drain port connected to return and a seal drain port for fluid, that passes beyond the shaft seal. A splined output shaft provides operating torque of 189 inch-pounds. The motor speed is 4,640 RPM for visor closing and 3,280 RPM for visor opening (snubbed rate at either end of opening or closing cycle is 1,080 RPM). This speed is reduced through the 105.377 to 1 planetary gear reduction unit. The chain drive sprocket speed is 31.1 RPM for opening and 44.0 RPM for closing.



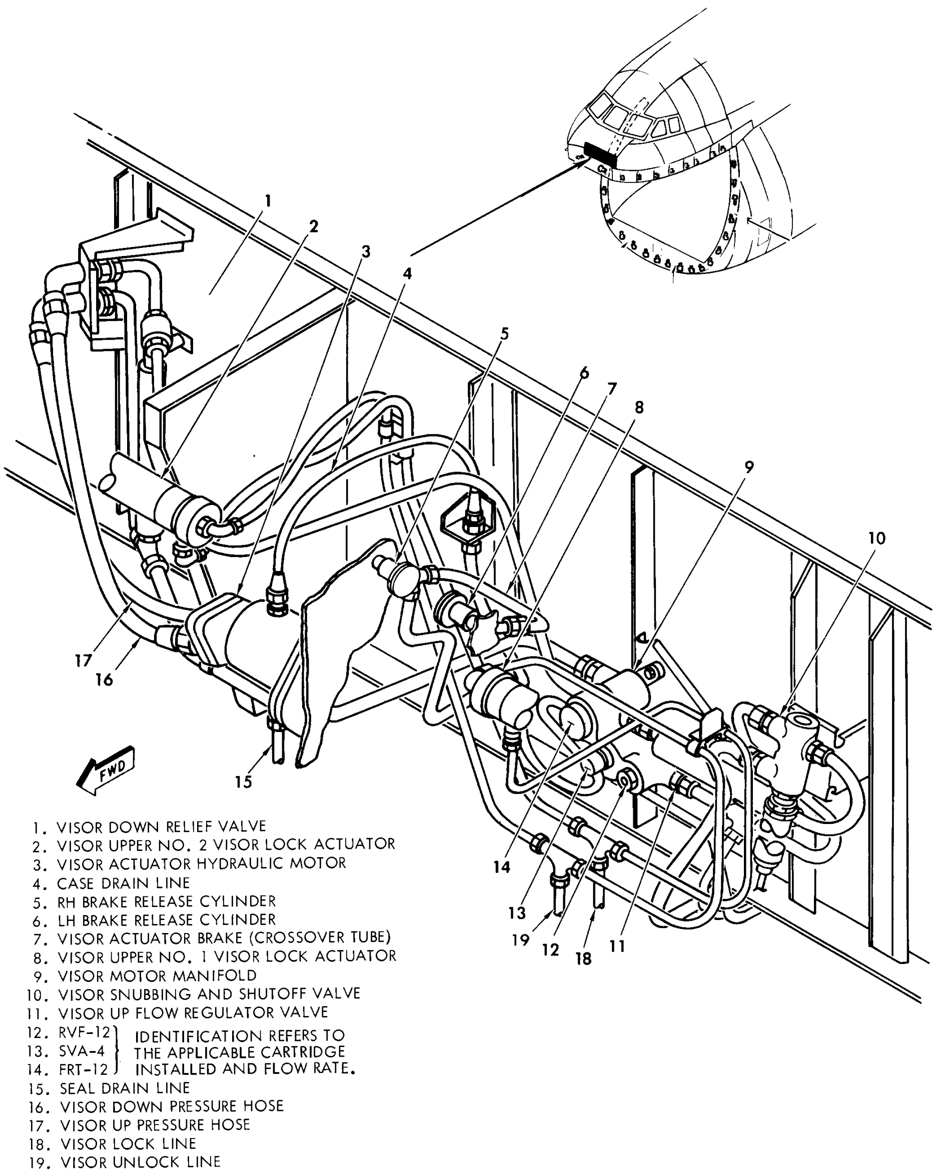
Visor structure



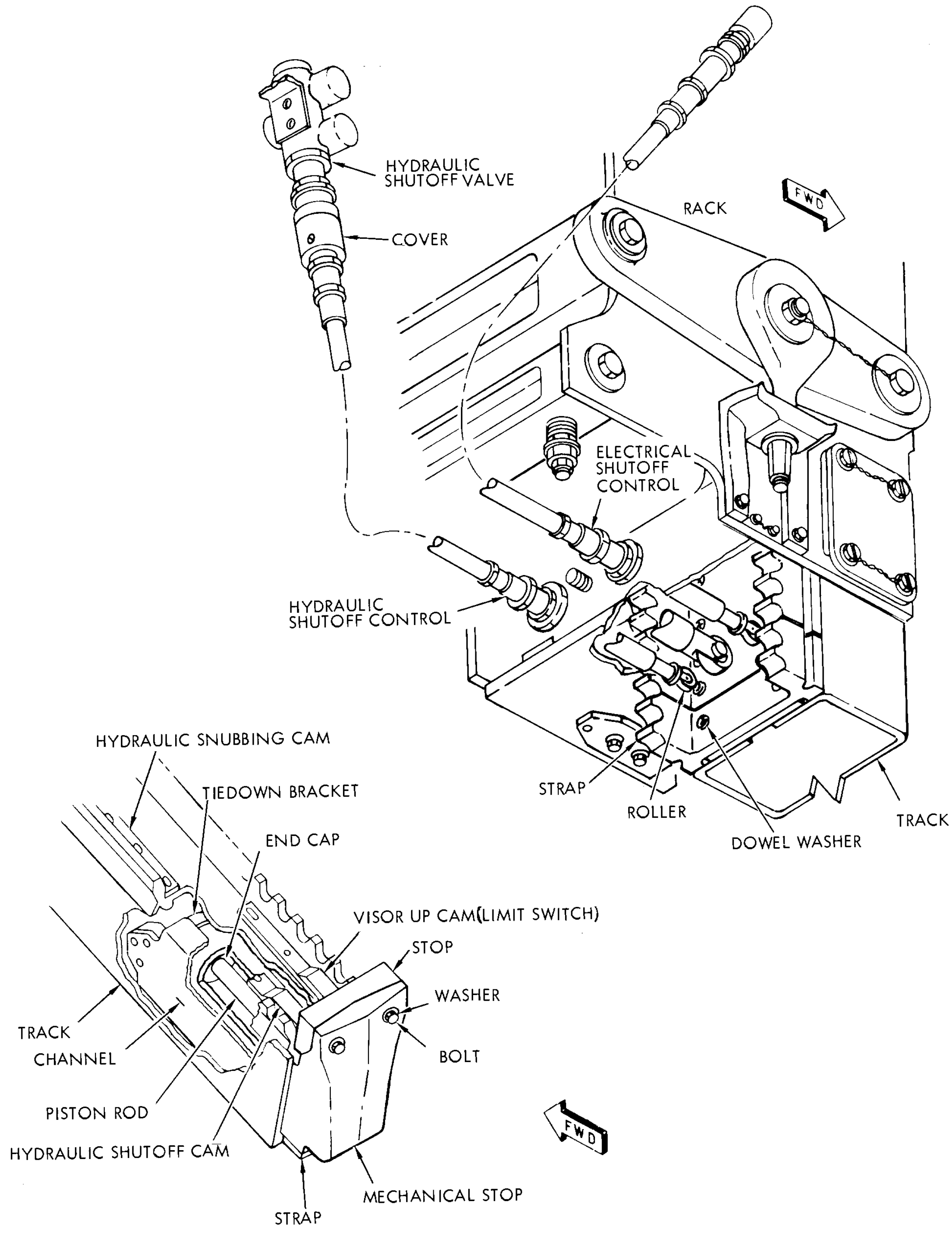
Visor actuator



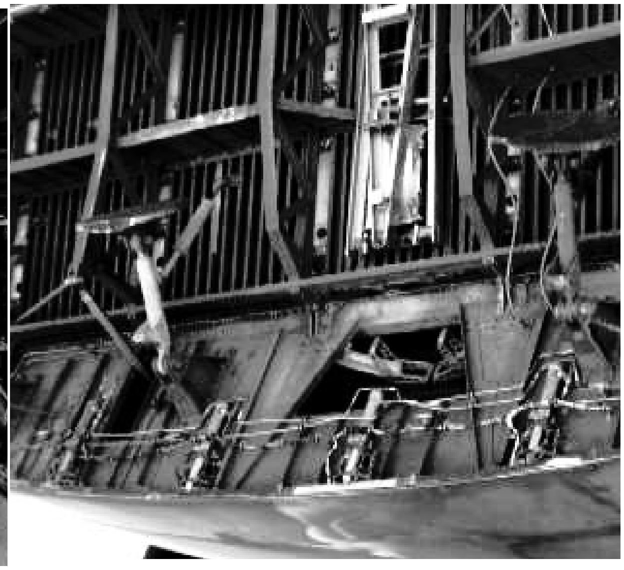
Visor track guide rollers

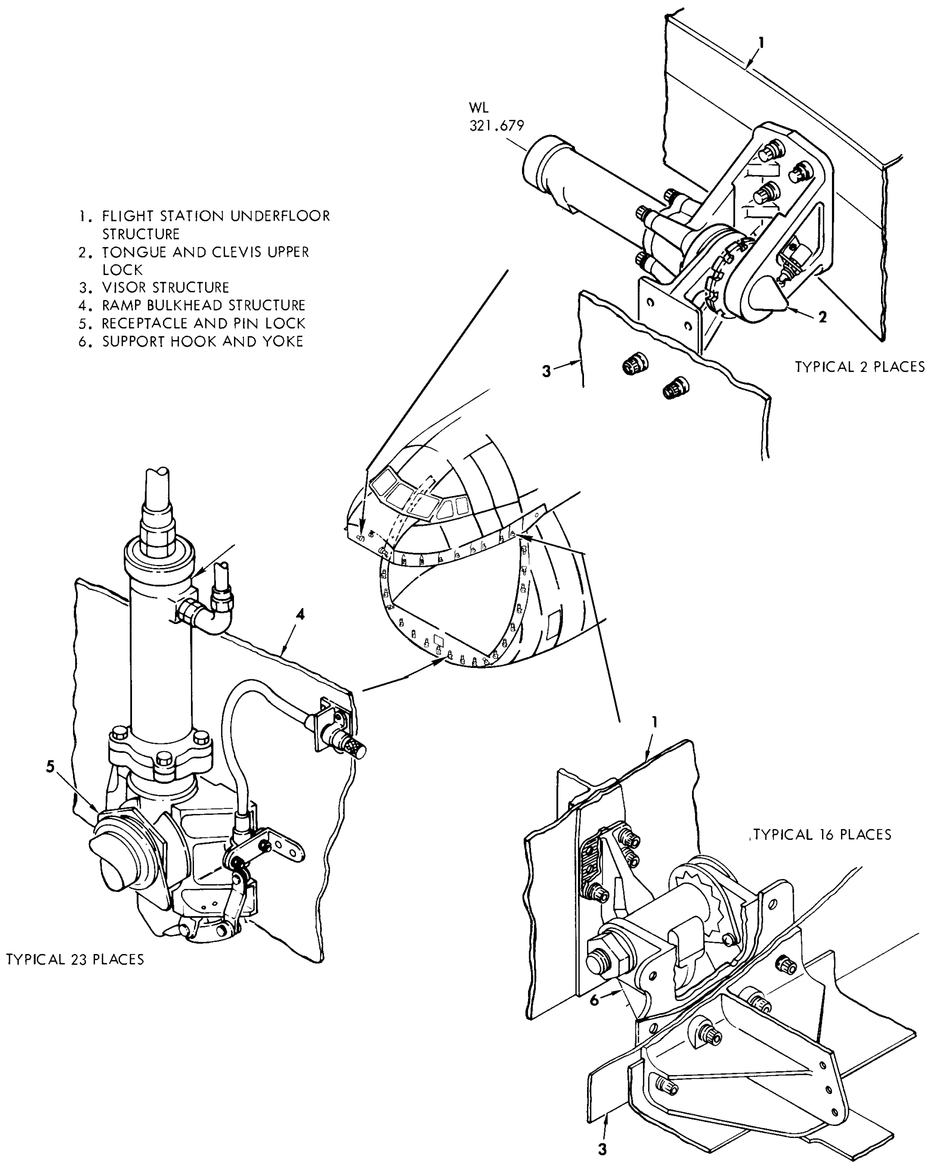


Visor motor manifold and associated components



Visor snubbing and shutoff components





Visor locking and support provisions

Forward Ramp System

The forward ramp system consists of the forward ramp, ramp extension, and seven ramp extension toes. The system contains an actuation system, locking and sealing provisions, and support pads and manually retractable support jacks.

Ramp

The ramp acts as an extension of the cargo compartment floor during loading and offloading. The structure also serves for fuselage pressure containment by the use of sealing provisions, when closed. The ramp is 10 feet long and 19 feet wide with a usable cargo floor area of approximately 175 square feet. The upper surface is provided with cargo tiedown rings. Retractable restraint rails and rollers, and fixed side rails for alignment during loading or offloading. A removable winch access door is provided on the right side of the upper floor surface for access to the winch stowage compartment. Four support pads are installed on the forward closeout structure of the ramp to provide additional support during drive-in loading or offloading.

Winch Access Door

An access door is installed in the upper floor surface of the forward ramp to protect the cargo winch stowage compartment when closed. Bulb seals are installed around the lower periphery of the upper skin to provide weather sealing. A latch-type handle is recessed into the upper skin surface of the winch access door and is held in the recessed position by spring action. The handle is linked to a series of short and long pushrod assemblies which in turn, are connected to bullet- nose pins. When the handle is lifted and turned counter-clockwise, the action of the pushrods retracts the pins from mating holes in the ramp structure so that the door may be removed when the cargo winch is to be used.

Ramp Extension

The ramp extension is hinged to the forward closeout member of the ramp to provide an additional loading platform 8.5 feet long and 19 feet wide. A tapered floor panel which is reversible, is installed on the centerline of the ramp extension. The panel utilizes logistic rails on one side, and is smooth on the opposite side. The panel may be used to provide access to the interior of the visor structure, when closed, for maintenance actions. Supporting, telescoping jacks are installed on the forward underside of the structure to provide support during cargo loading or offloading in the truckbed mode.

Ramp Extension Toes

Seven toes are attached to the forward end of the ramp extension. Each toe is approximately 4.5 feet long and 2.5 feet wide. The toes provide a vehicular drive-in platform 19 feet wide, when deployed.

Ramp Locks

The locks are installed on the left and right fuselage No. 1 side panels and on the upper surface of the ramp floor. The installation consists of four aft-opening, overcenter hooks connected in series with three tie rods. The aft hook is attached to the ramp lock actuator which actuates to lock and unlock the ramp on the left and right sides. Each hook engages an eccentric pin installed in mating angular fittings attached to the upper surface of the ramp. Visual indication of ramp lock condition is provided by a mechanical indicator at each hook position. As a backup to each mechanical indicator, the forward loadmaster door lock indicating panel provides visual display of ramp lock condition. The ramp lock system includes an auxiliary manual locking system. This system contains provisions at each lock for insertion of a 5/8-inch diameter locking pin through fixed side plates and bellcrank assembly. The manual locking pins are inserted after the forward loading system has been fully closed and locked prior to flight to prevent the system from becoming unlocked under abnormal conditions. An eight-pin stowage rack is located near the ramp control manifold for stowing the manual locking pins.

Loadmaster Control Panel

The panel is located in the forward cargo compartment on the left side between FS 524 and 544, between WL 195 and 205. The panel contains the switches for visor and ramp control and circuit breakers and switches for overhead and side cargo lights. A dimmer control is provided. On AF66-8303 through AF70-467 a switch is mounted on the panel for cargo winch selection. Another switch provides control for the ATM-driven hydraulic pump. The panel contains lights to display cargo doors ARMED and RAMP ARMED indications. A ROLLER FAULT light is mounted on the panel to provide a warning indication of failure of the visor actuator side guide rollers.

Loadmaster Door Lock Indicating Panel

The panel is located directly above the forward loadmaster control panel in the left forward section of the cargo compartment. The panel provides display of lock position for the 25 visor lock actuators, for position of the ramp to fuselage locks, for crew door lock condition, for the forward underfloor compartment door lock condition and on AF83-1285 and up for the forward fuselage underfloor bilge access hatch lock condition.

Forward Loading System Hydraulic System

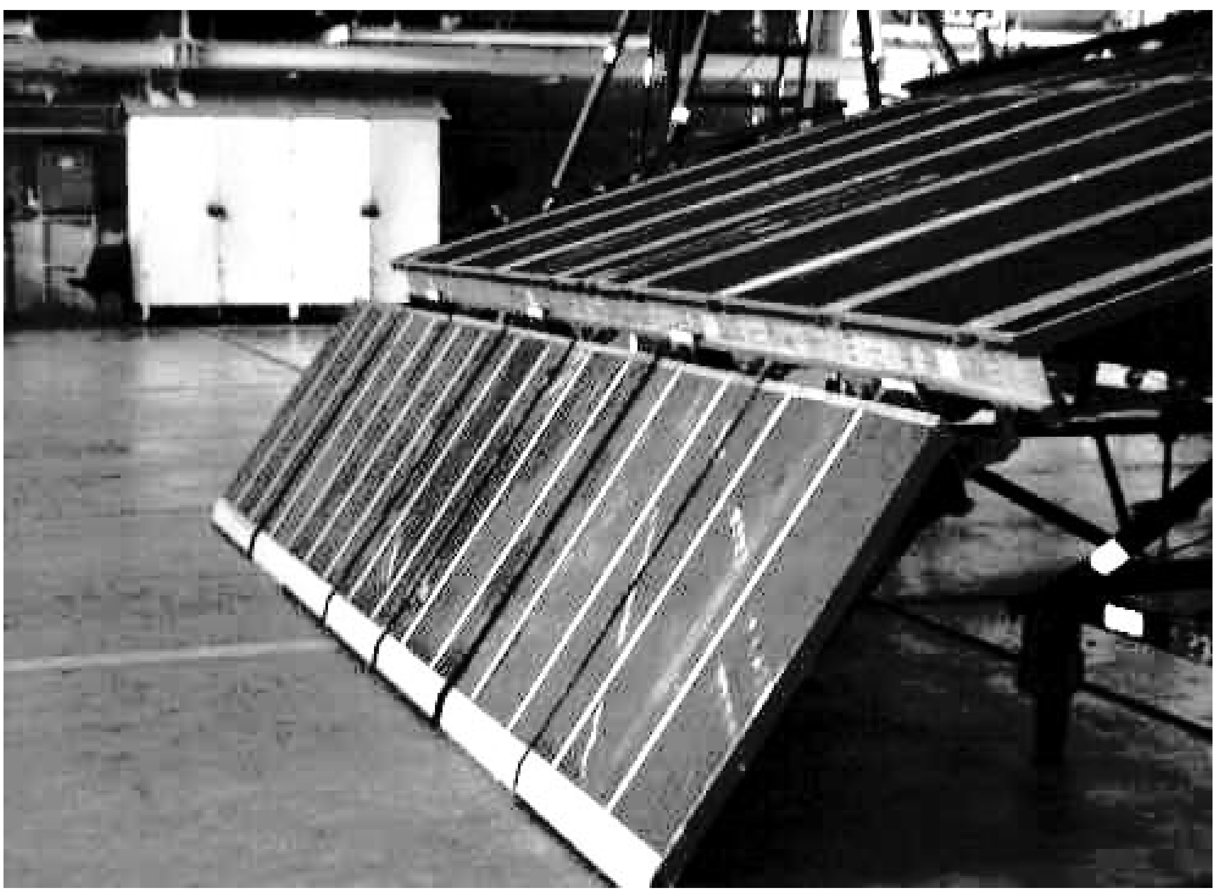
The components of the system utilize electrical and hydraulic power for control, actuation, sequencing, and monitoring. In the automatic mode, both electrical and hydraulic power are utilized for system function. In the manual mode, only hydraulic power is used. The system components are the loading control manifold, ramp control manifold, visor motor manifold, and various in-line check valves, flow regulators, selector valves, relief valves, restrictors, pressure reducers, and shuttle valves.

Loading Control Manifold

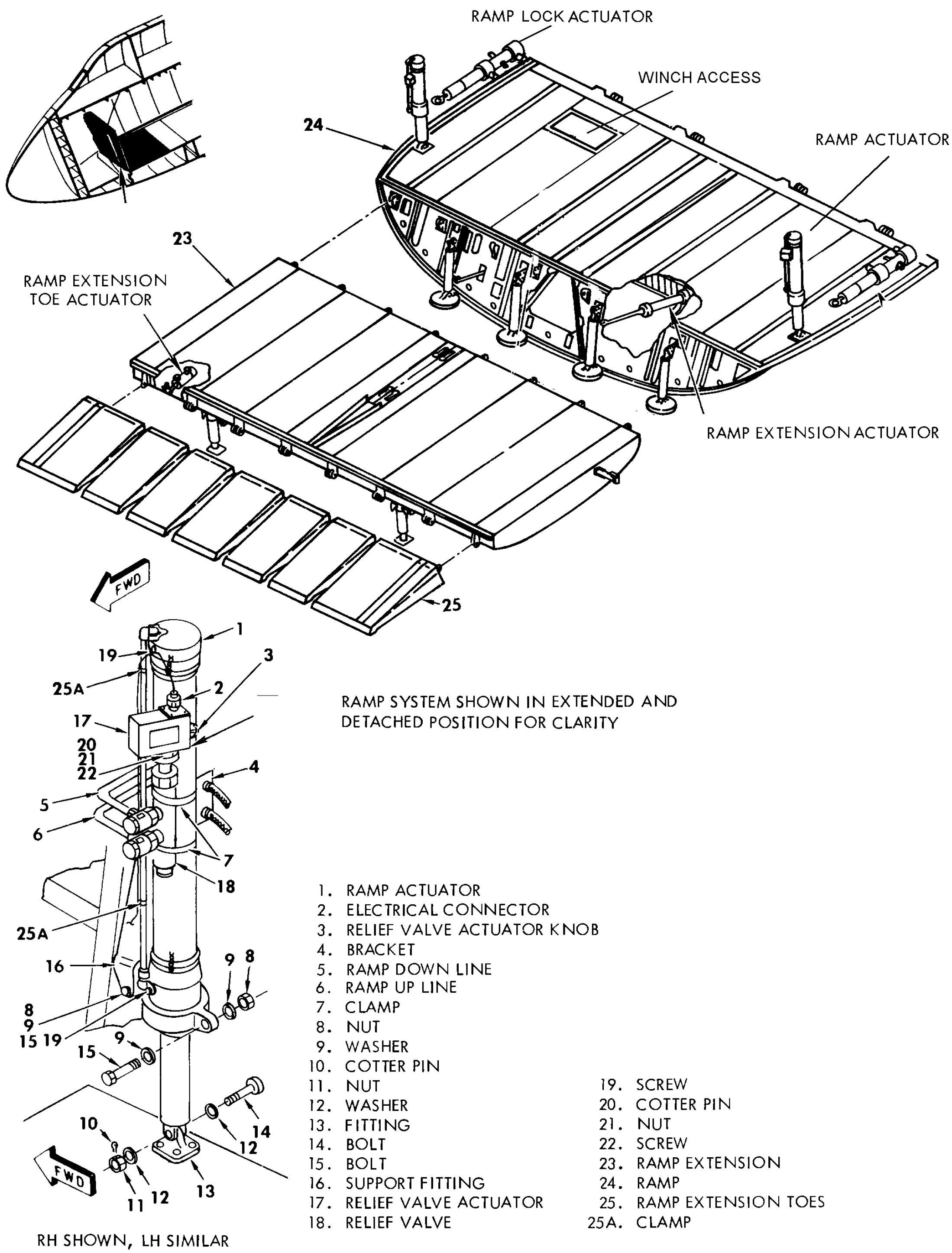
The manifold is located in the left forward section of the cargo compartment near the loadmaster control panel between FS 544 and FS 564. The manifold distributes hydraulic pressure to the actuation components of the forward loading system. The manifold includes solenoid-operated cartridge valves to position directional control selector valves that direct hydraulic power to various actuators for sequencing the visor, ramp, ramp extension, and ramp extension toes. These buttons provide manual control of each valve when the airplane electrical system is de-energized. The manual capability is used for alternate operation and during rigging.

Ramp System Hydraulic Actuation Components

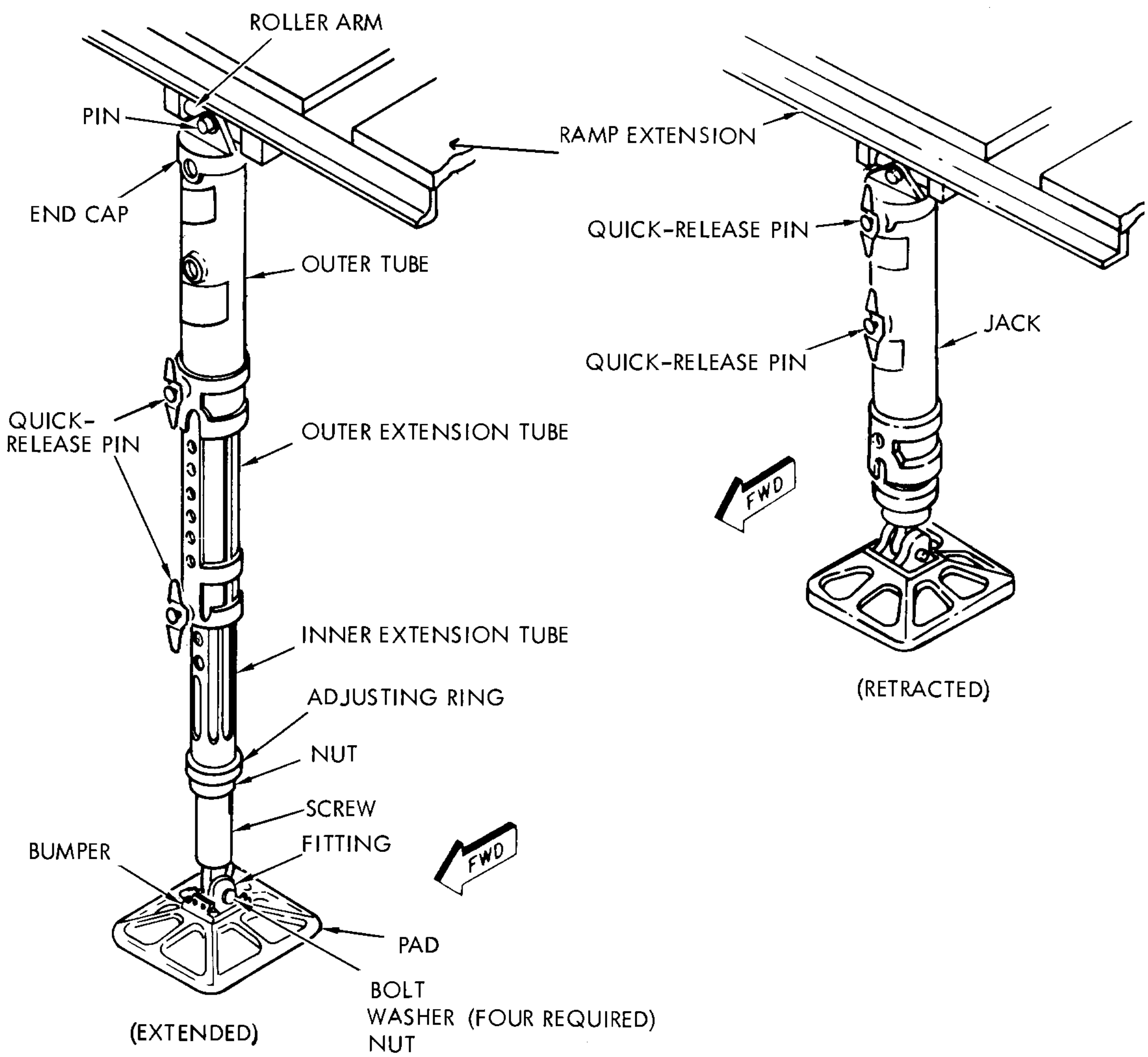
The hydraulic actuation components contained in the ramp system consists of two ramp actuators attached to the left and right sides of the ramp upper floor surface and to the fixed fuselage side panels to raise and lower the ramp. Two ramp extension actuators are attached to the ramp structure and to the ramp extension structure to raise and lower the ramp extension. Each of the seven ramp extension toes are deployed and retracted by individual hydraulic actuators. All actuation components of the ramp system are operated by pressure supplied by the No.4 hydraulic system.



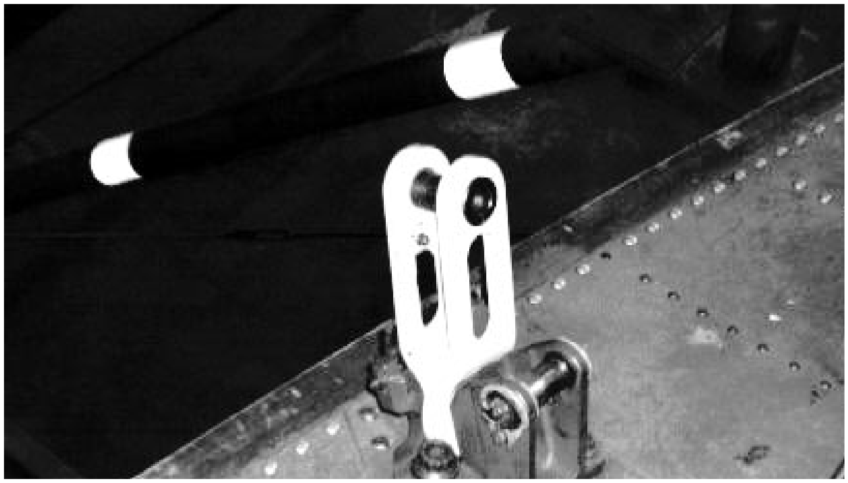
Forward ramp extension ramp toes



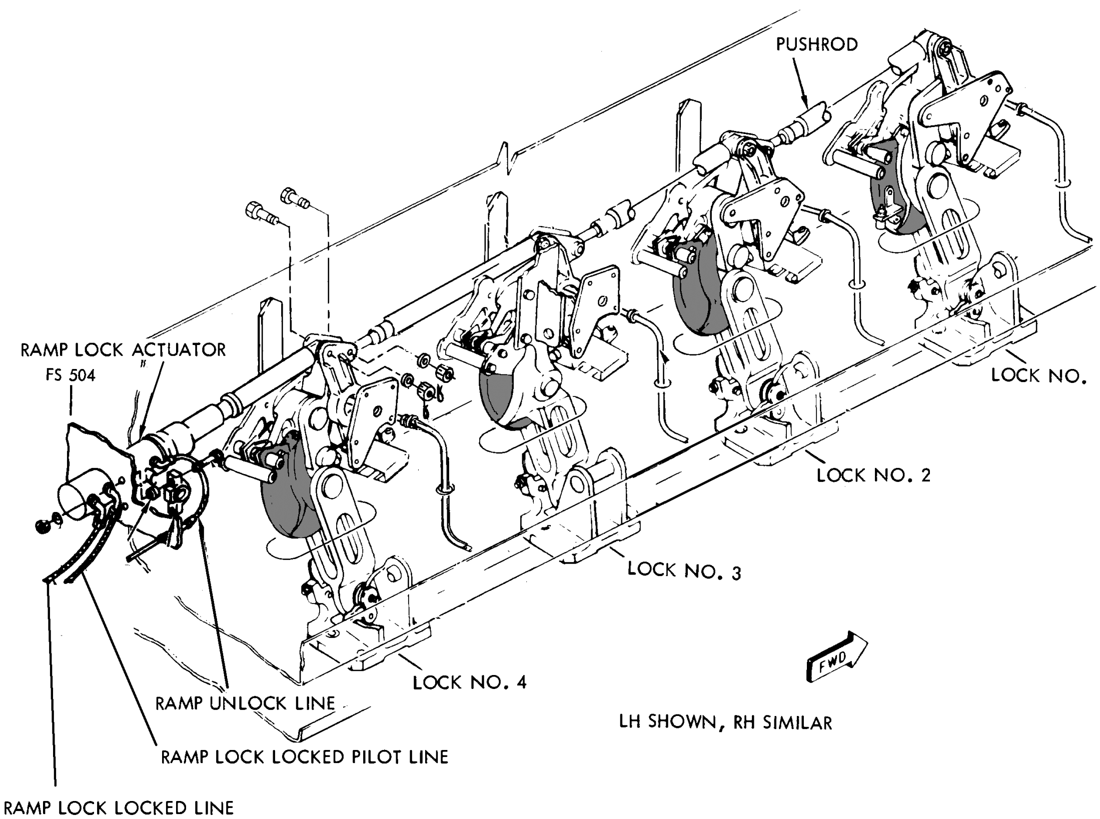
Forward ramp structure and actuation components



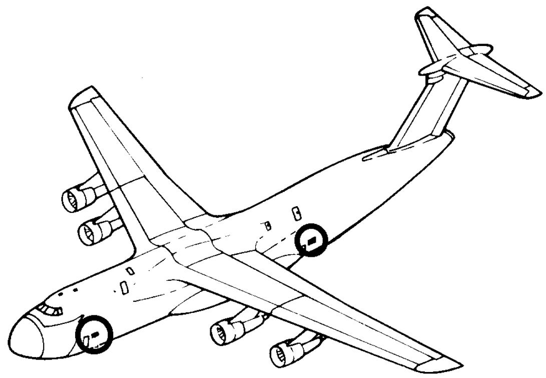
Forward ramp telescopic jacks

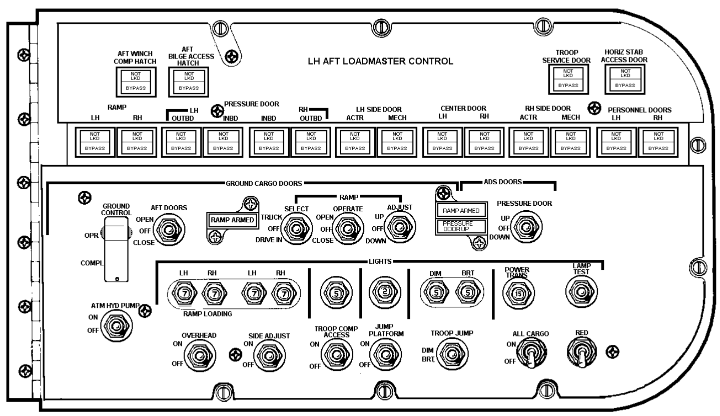


Ramp lock clevis

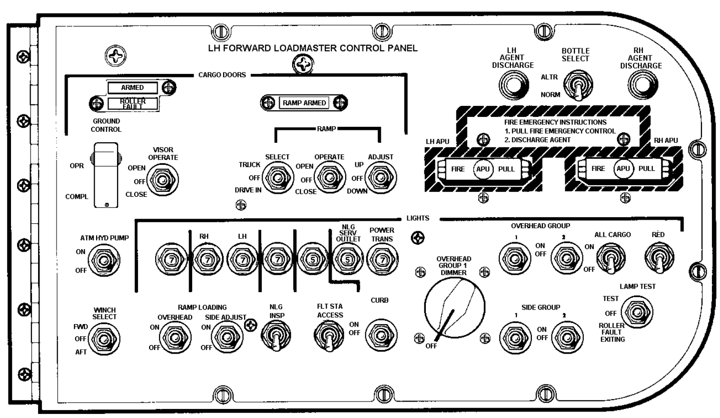


Forward ramp locks



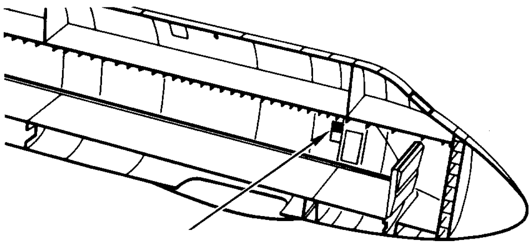


LH AFT LOADMASTER CONTROL PANEL



LH FORWARD LOADMASTER CONTROL PANEL

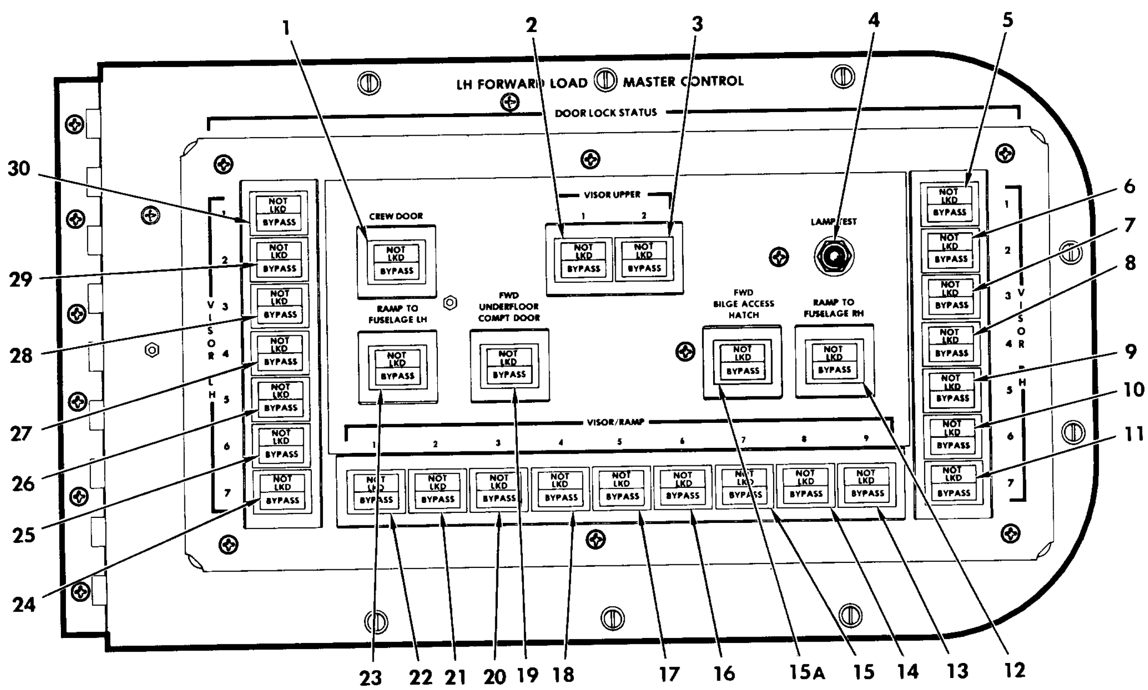
Forward and aft loadmaster control panels



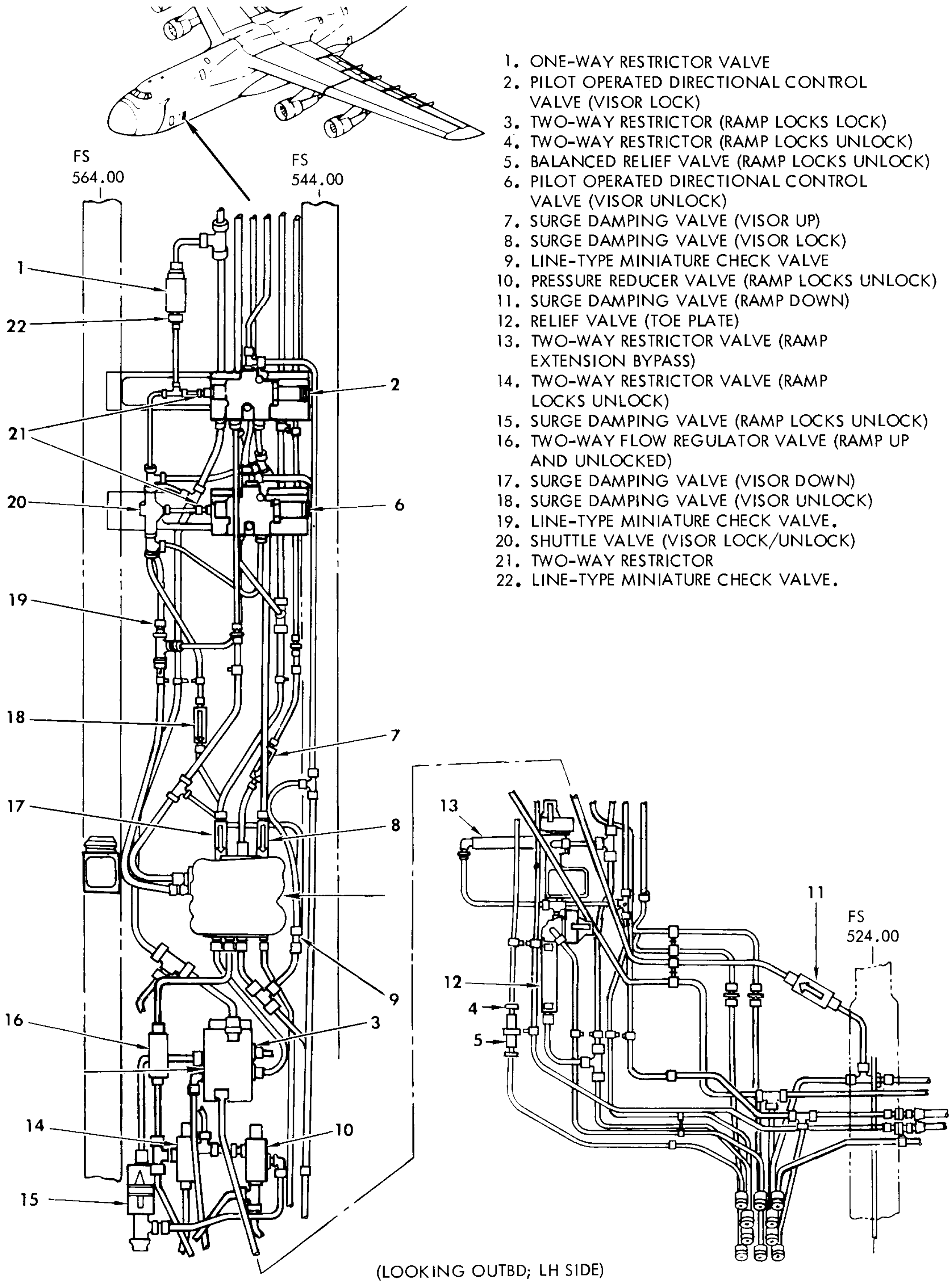
1. CREW DOOR NOT LOCKED SWITCHLIGHT
2. VISOR UPPER NO. 1 NOT LOCKED SWITCHLIGHT
3. VISOR UPPER NO. 2 NOT LOCKED SWITCHLIGHT
4. LAMP TEST SWITCH
5. VISOR RH NO. 1 NOT LOCKED SWITCHLIGHT
6. VISOR RH NO. 2 NOT LOCKED SWITCHLIGHT
7. VISOR RH NO. 3 NOT LOCKED SWITCHLIGHT
8. VISOR RH NO. 4 NOT LOCKED SWITCHLIGHT
9. VISOR RH NO. 5 NOT LOCKED SWITCHLIGHT
10. VISOR RH NO. 6 NOT LOCKED SWITCHLIGHT
11. VISOR RH NO. 7 NOT LOCKED SWITCHLIGHT
12. RAMP TO FUSELAGE RH NOT LOCKED SWITCHLIGHT
13. RAMP NO. 9 NOT LOCKED SWITCHLIGHT
14. RAMP NO. 8 NOT LOCKED SWITCHLIGHT
15. RAMP NO. 7 NOT LOCKED SWITCHLIGHT

15A. FORWARD BILGE ACCESS HATCH NOT LOCKED SWITCHLIGHT

16. RAMP NO. 6 NOT LOCKED SWITCHLIGHT
17. RAMP NO. 5 NOT LOCKED SWITCHLIGHT
18. RAMP NO. 4 NOT LOCKED SWITCHLIGHT
19. FORWARD UNDERFLOOR COMPARTMENT DOOR NOT LOCKED SWITCHLIGHT
20. RAMP NO. 3 NOT LOCKED SWITCHLIGHT
21. RAMP NO. 2 NOT LOCKED SWITCHLIGHT
22. RAMP NO. 1 NOT LOCKED SWITCHLIGHT
23. RAMP TO FUSELAGE LH NOT LOCKED SWITCHLIGHT
24. VISOR LH NO. 7 NOT LOCKED SWITCHLIGHT
25. VISOR LH NO. 6 NOT LOCKED SWITCHLIGHT
26. VISOR LH NO. 5 NOT LOCKED SWITCHLIGHT
27. VISOR LH NO. 4 NOT LOCKED SWITCHLIGHT
28. VISOR LH NO. 3 NOT LOCKED SWITCHLIGHT
29. VISOR LH NO. 2 NOT LOCKED SWITCHLIGHT
30. VISOR LH NO. 1 NOT LOCKED SWITCHLIGHT



Forward loadmaster door lock indicating panel



Forward loading system control manifolds

Aft Ramp System

Aft Ramp

The aft ramp acts as an extension of the cargo compartment floor during loading and offloading. The structure also serves for fuselage pressure containment by the use of sealing provisions, when closed. The ramp is 13.5 feet long and 19 feet wide with a usable cargo floor area of approximately 227 square feet. The upper surface is provided with cargo tiedown rings. retractable restraint rails and rollers, and adjustable side rails for alignment during loading or offloading. A removable winch access door is provided on the right side of the upper floor surface for access to the winch stowage compartment.

Ramp Support Pads

The ramp support pads are located on the aft face of the ramp at BL 56.0 left and right. Each pad consists of a rectangular pad assembly, electro-mechanical linear actuator, and a series of linkage actuation components. The linear actuator is energized through the aft loadmaster control panel after selection of the drive-in loading mode. Power to energize the actuator is supplied from the DC electrical system. Integral limit switches in the actuator open to interrupt the circuit to the internal motor when the actuator reaches the retracted or extended position. A thermal protective device provides overload protection for the actuator motor. The actuation components include a transmission composed of a torque tube, linkages, bellcranks, and spring loaded compression rods which extend and retract to program ramp support pads when pads are being deployed or retracted. Each support pad installation utilizes three limit switches. These limit switches open and close at different positions during drive-in loading. The first limit switch is energized when the pad is in its stowed position and interlocks with the aft door closing operation. The second limit switch is energized when the pad is deployed and signals the ramp to lower. The third limit switch is energized when the pads are on the ground and sequences the pressure door to lower as a ramp extension.

Ramp Lock System

The ramp locks are similar to the forward ramp locks except for the number of hooks. The locks are located between RS 30 and RS 158. The locks consist of seven forward-opening hooks interconnect with tie rods. A hydraulic actuator is connected to a bellcrank attached to the fifth hook. Each hook engages an eccentric pin installed in a yoke attached to each floor bracket on the ramp. Adjustment of the hooks is provided by adjustment of the floor brackets. Visual verification of a locked or unlocked condition is provided by an indicator installed at each hook location. When the hooks have fully engaged the mating eccentric pins in the ramp yokes, the hooks and bellcranks are overcenter and locked, and the orange portion of the visual indicators may be seen. The indicators provide a backup to the electrical display provided on the loadmaster control panel. Three limit switches are installed on each ramp lock installation, left and right. These switches are used to display ramp locked or unlocked condition, and for electrical sequencing of the aft loading system in the automatic mode. The ramp lock system includes an auxiliary manual locking system. The system has provisions at each lock for insertion of a 5/8-inch diameter locking pin through fixed side plates and the bellcrank. The locking pins are inserted after the aft loading system has been fully closed and locked prior to flight to prevent the system from becoming unlocked under abnormal conditions. A 14-pin stowage rack is located near the ramp control manifold for storing the locking pins.

Aft Loadmaster Control Panel

The aft loadmaster control panel is located in the aft left side of the cargo compartment between FS 1884 and 1904. The panel contains the switches for aft door, ramp, and pressure door control, and includes the lock position indicator lights for all aft loading system locks. The panel also contains circuit breakers and switches for cargo compartment lights as well as lights to display ramp armed and ADS doors armed indications.

Aft Loading Control Manifold

There are two aft loading control manifolds in the left aft section of the cargo compartment. They are located at approximately WL 210 between FS 1,924 and 1,964. These manifolds provide the means for distribution of fluid pressure for operation of the actuation components of the system. Each manifold consists of a manifold body and a number of hydraulic cartridge valves. There are 14 solenoid-operated valves which are electrically operated to pressurize system components for operation of the ramp, pressure door, center door, and side doors. Each solenoid-operated valve is provided with a spring-loaded button which provides manual control of the associated component function when the airplane electrical system is de-energized.

Pressure Door

The pressure door serves three purposes. When the ramp is lowered for drive-in loading or offloading, the pressure door is hinged to the aft end of the ramp to become a ramp extension. When the ramp is retracted to the closed position, the pressure door assumes a near-vertical position and serves as the aft pressure bulkhead for the cargo compartment. During truckbed mode the pressure door is attached to the upper hinge and operated to its overhead position and stowed. During air drop the pressure door is attached to the upper hinge, the extraction parachute and its release mechanism is attached, and the door is operated to its overhead position.

Pressure Door Wedge Toes

Three wedge toes are installed on the upper end of the pressure door. When the door is lowered as an extension of the ramp for drive-in loading, the toes are manually extended to provide initial ground contact and support structures. When the pressure door and ramp are closed, the toes are manually released and automatically lock in place behind the pressure door when the door closes. The drive-in floor surface of the toes is provided with non-slip material to aid traction.

Pressure Door Seals

The pressure door when closed, is sealed across the bottom by mechanically actuated seals, at the sides and corners by manually actuated seals, and across the top by fixed seals. The fixed seal is used across the forward edge of the fuselage structure which interfaces with the upper aft edge of the pressure door.

The lower edge seal is mechanically actuated at ramp closure. A handle is provided, on both side walls of the cargo compartment, near the side seals, to latch the seals in the open position during aft loading system operations. When manually opening the seals, the lower corner gusset seal must be opened (retracted) first; then the side seals are opened and latched by the seal retaining handles. The upper corner seals and the lower corner gusset seals are held open by the side seals. Two limit switches are installed (one near each side seal retaining handle) to ensure both side seals are stowed and latched in position prior to operation of the aft door system in the automatic mode. Unless both limit switches are depressed (closed), electrical power is interrupted and automatic mode operation cannot take place.

Pressure Door Uplock System

When the pressure door is raised to the overhead position, the door is secured to the upper hinges and at the aft end by an uplock on each side of the aft fuselage structure. Each uplock consists of a spring-loaded hook, a release cable, and a limit switch. The release cable is connected at the aft end of the uplock actuator which is installed in the overhead fuselage structure. An emergency lever and cable is connected to the forward end of the uplock actuator. The other end of the emergency pull cable terminates at an emergency pull handle located above the aft loadmaster control panel. In the pressure door normal closing mode, hydraulic pressure is supplied to the actuator. This pressure causes the actuator to pull the two overhead cables and disengage the springloaded hooks from the mating striker pins on the aft side of the pressure door. The pressure door uplock hooks may be manually disengaged by pulling the emergency pull handle.

Ramp Asymmetry System

The ramp asymmetry system is a mechanically controlled feedback actuator installation. This installation includes a cable assembly attached to left and right ramp actuators. The cables extend upward from the upper end of the actuator pistons, pass through 36 inches of 0.050-inch diameter flexible conduit connected at the upper ends of the actuators, and then terminate at the feedback mechanism on the servo. The servo is installed on a bracket at WL 310 below the overhead fuselage structure and is located on BL 0.0 and approximate FS 2,091. The servo consists of a servo valve, manifold, spool and sleeve, cam and gear, two control boxes, and backup asymmetry limit switch. The servo valve divides the hydraulic flow between the two ramp actuators so that they move in phase within l/2 inch of each other even though the ramp may be loaded asymmetrically. The servo valve senses the relative positions of the ramp actuators by the motion of the feedback cables and requires no electrical inputs. Any malfunction sufficient to cause the ramp actuators to drive out of phase by more than one inch, will cause the servo valve to go "hard over" and trip the backup asymmetry limit switch, thus shutting down electrical sequencing of the ramp and pressure door. Whenever the ramp operates in any mode, the asymmetry system operates; but the purpose of the asymmetry system is to prevent the ramp from twisting and driving the pressure door into the side structure during drive-in open/close.

Ramp Lock Actuators

Two ramp lock hydraulic actuators are used to lock the ramp to the fuselage. Each actuator consists of a cylinder body, a piston, and a piston rod. The actuators contain internal locks that lock the actuators in the retracted (ramp locks locked) position.

Ramp Actuators

The two ramp hydraulic actuators provide the force to raise and lower the ramp. The actuators are located at FS 2080. The lower clevis end fitting of each actuator is connected to a fitting on the ramp floor. Attached to this clevis, and passing through the center of the actuator, is a control cable which operates the asymmetry system servo mechanism.

Pressure Door Lower Lock Actuators

Two identical pressure door lower lock hydraulic actuators are used to provide the motion for locking the pressure door at the lower hinge to the ramp. The actuators are located at BL 28, left and right, on a bracket attached to the aft bulkhead of the ramp below the floor surface. The lower fixed end of each actuator is attached to the bracket; the upper piston rod end is connected to a bellcrank in the locking mechanism. The rod end of the unit may be turned to provide adjustment during rigging. The actuator consists of a cylinder body, piston, and piston rod. Self-aligning bearings installed in each end of the actuator provide for slight misalignment at assembly.

Pressure Door Uplock Actuator

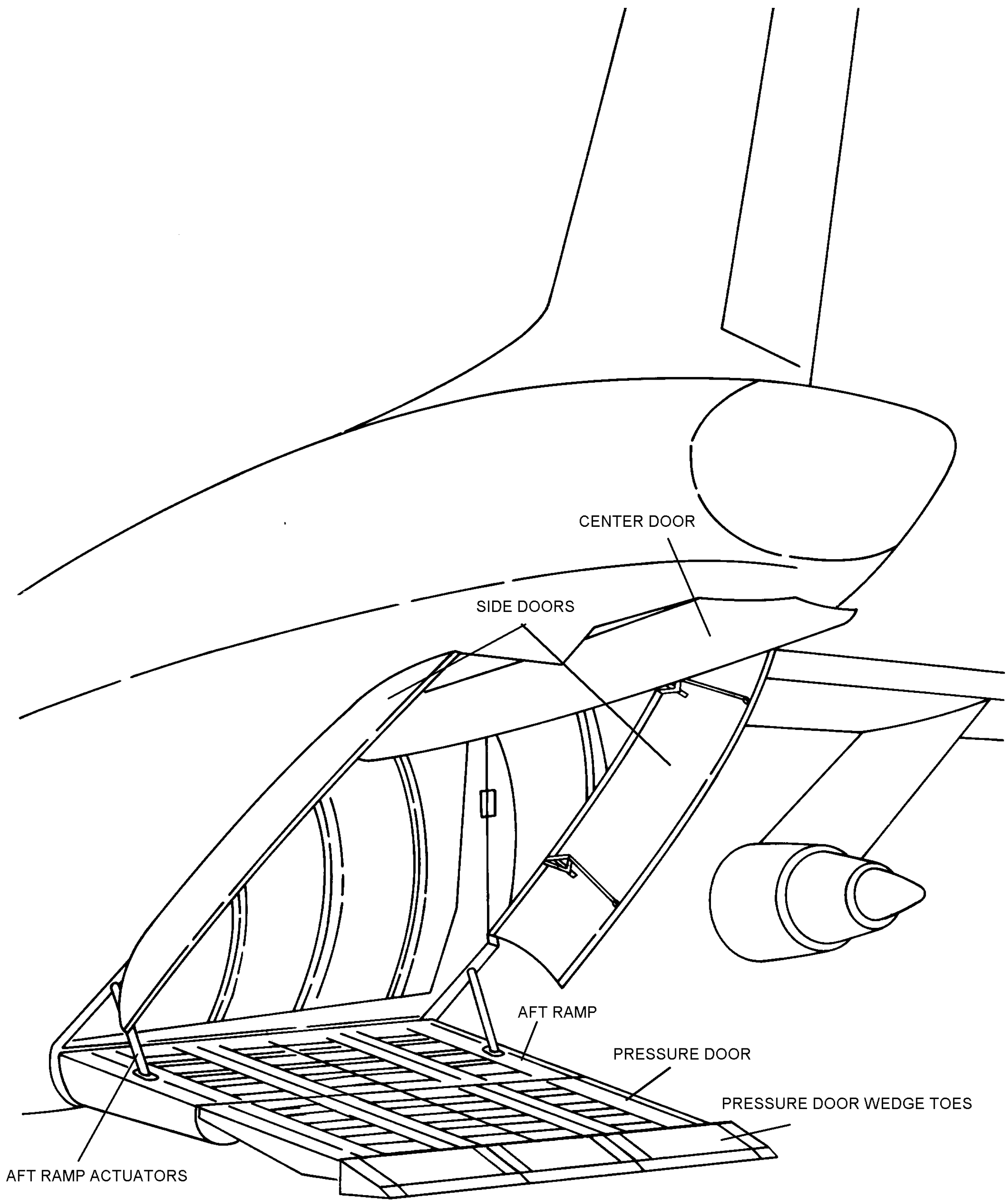
The pressure door uplock actuator consists of a flanged cylinder body, an internal spring, and a dual-action piston. The spring-assisted stroke of the piston rod during extension is approximately 0.750 inch. During retraction, hydraulic pressure must compress the spring, so that extension time is significantly shorter than the retraction rate. The internal spring is compressed by an applied load of 45 pounds with the piston rod extended. The spring is compressed by an applied load of 90 pounds when the piston rod is fully retracted.

Pressure Door Upper Hinge Select Actuators

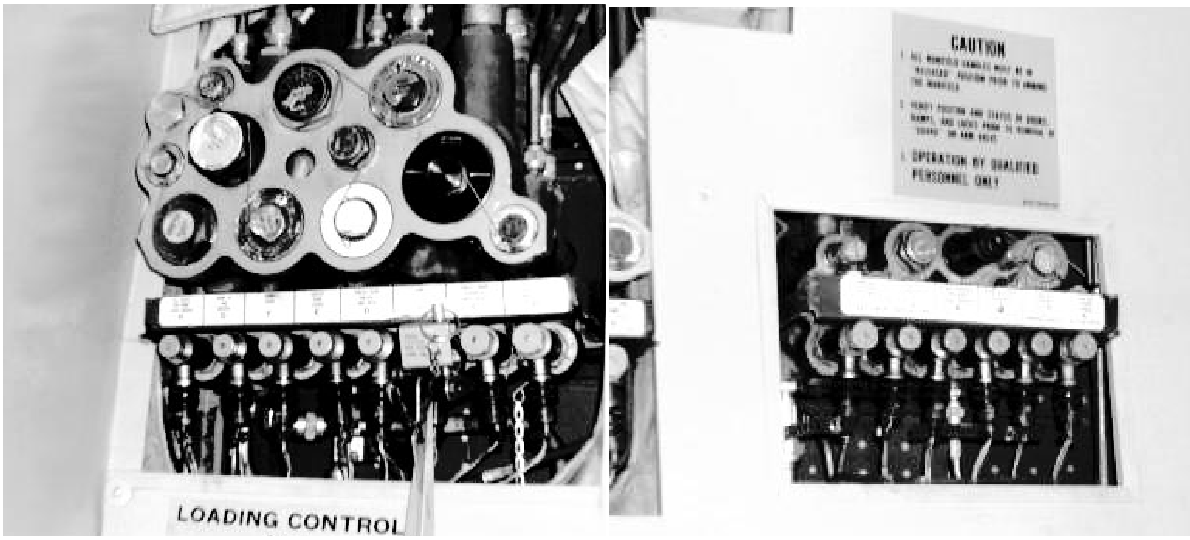
Two identical actuators are used to provide the motion for the locking and unlocking of the upper pressure door hinge. The actuators are located at BL 118, left and right, on the pressure door upper hinge attached to the canted pressure bulkhead. During retraction the piston rod moves a linkage on the hinge to an overcenter position. This motion rotates the inboard hinge fitting, locking the hinge to a wedge fitting on the side of the pressure door. When the piston extends, the hinge then unlocks from the door.

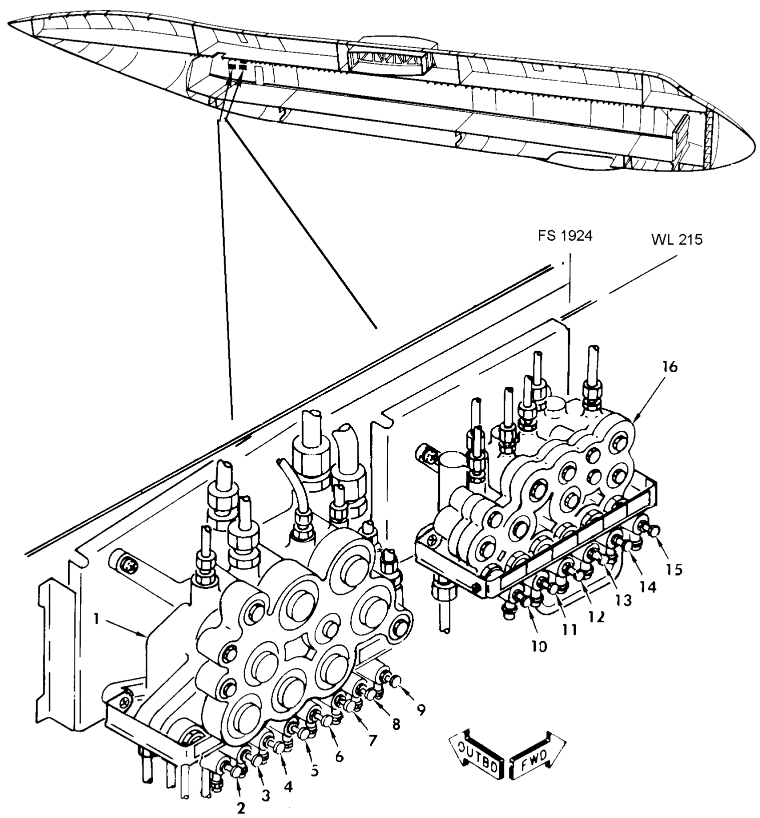
Pressure Door Upper Actuators

Two pressure door upper hydraulic actuators are provided to rotate the pressure door to and from the overhead position. one actuator is located at each of the pressure door upper hinges at FS 2,106, BL 118, left and right and WL 280.



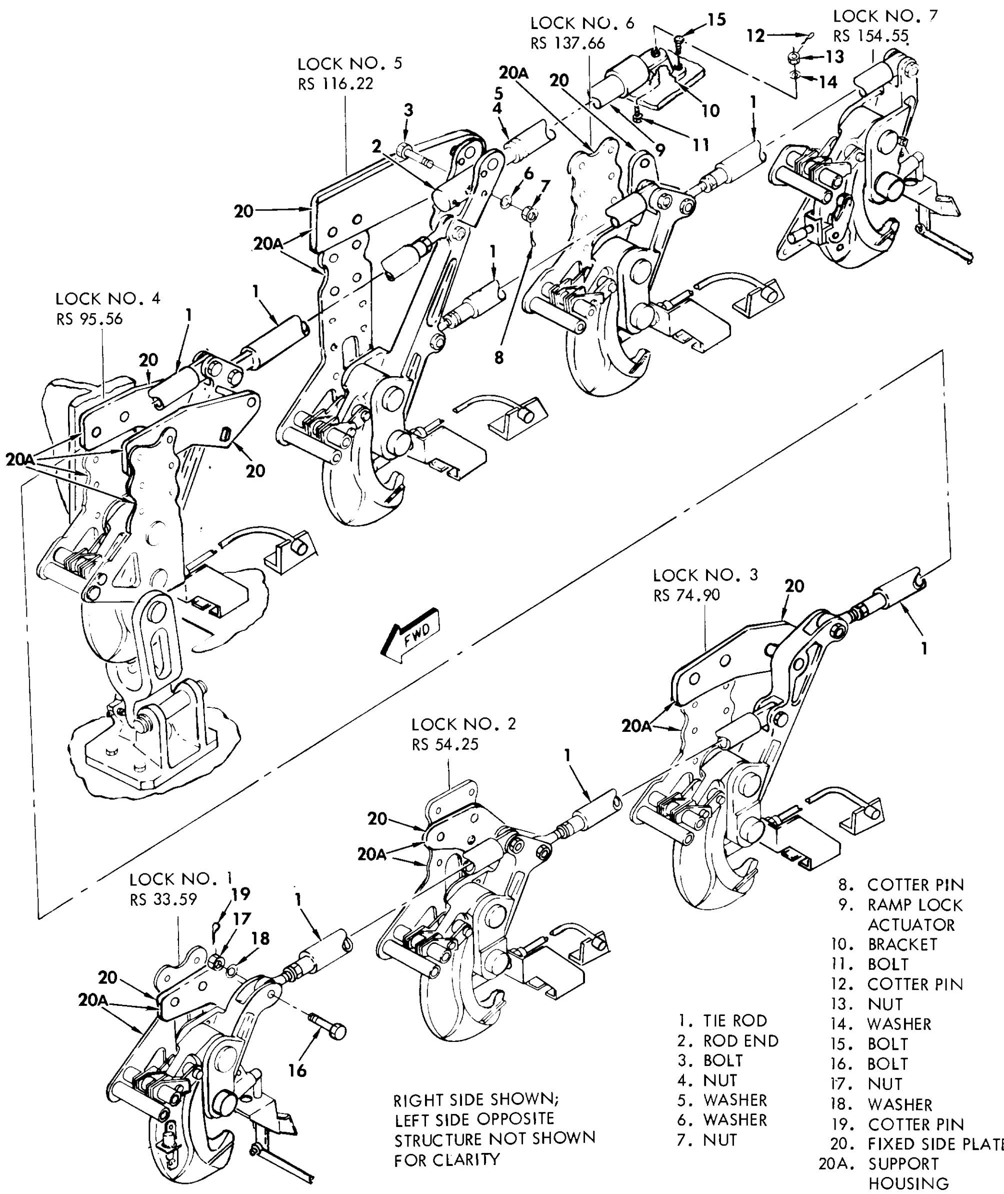
Aft loading system structures



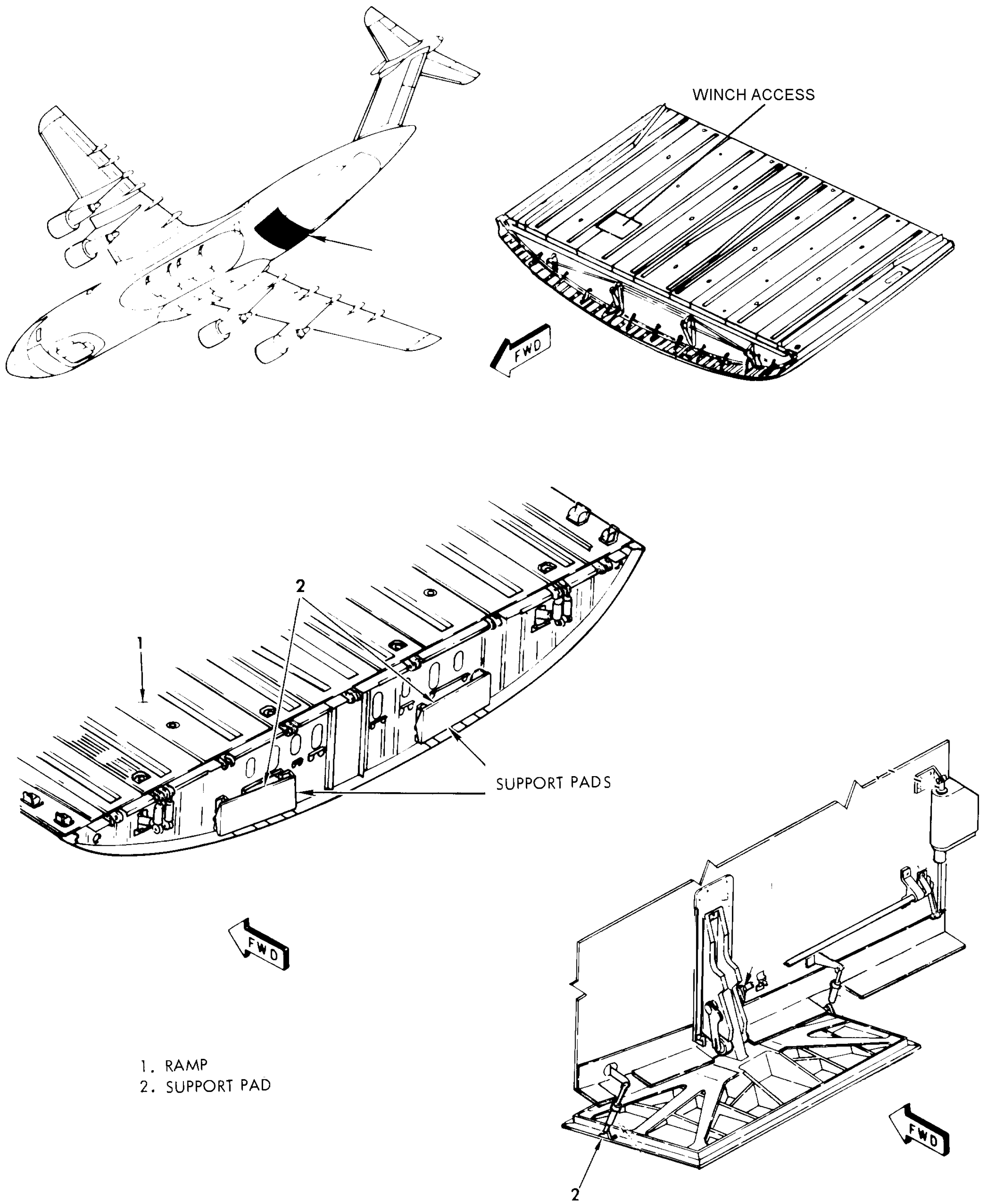


1. LOADING CONTROL MANIFOLD (AFT ASSEMBLY)
2. "ALL DOORS AND RAMP LOCKS LOCKED H" BUTTON
3. "RAMP UP AND UNLOCK G" BUTTON
4. "RAMP DOWN F" BUTTON
5. "CENTER DOOR CLOSED E" BUTTON
6. "CENTER DOOR UNLOCK AND OPEN D" BUTTON
7. "ARM A" BUTTON
8. "PRESS. DOOR OVERHEAD HINGE SELECT C" BUTTON
9. "PRESS. DOOR RAMP HINGE SELECT B" BUTTON
10. "PRESS. DOOR DOWN J" BUTTON
11. "PRESS. DOOR UP I" BUTTON
12. "SIDE DOORS UNLOCK AND OPEN N" BUTTON
13. "SIDE DOORS CLOSE M" BUTTON
14. "PRESS. DOOR CLOSE L" BUTTON
15. "PRESS. DOOR OPEN K" BUTTON
16. LOADING CONTROL MANIFOLD (FWD ASSEMBLY)

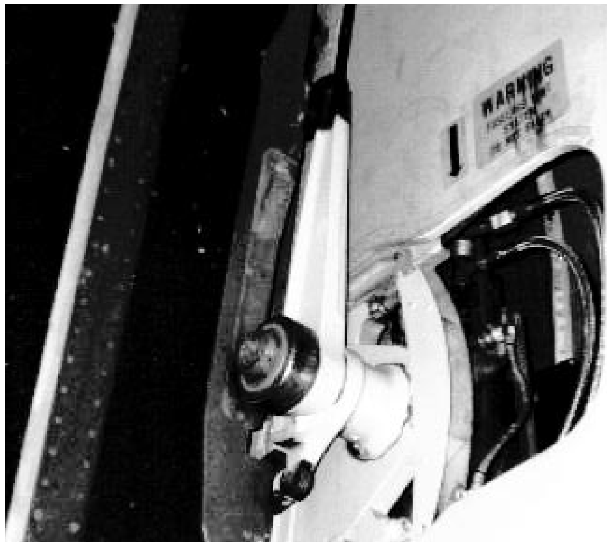
Aft loading system control manifold

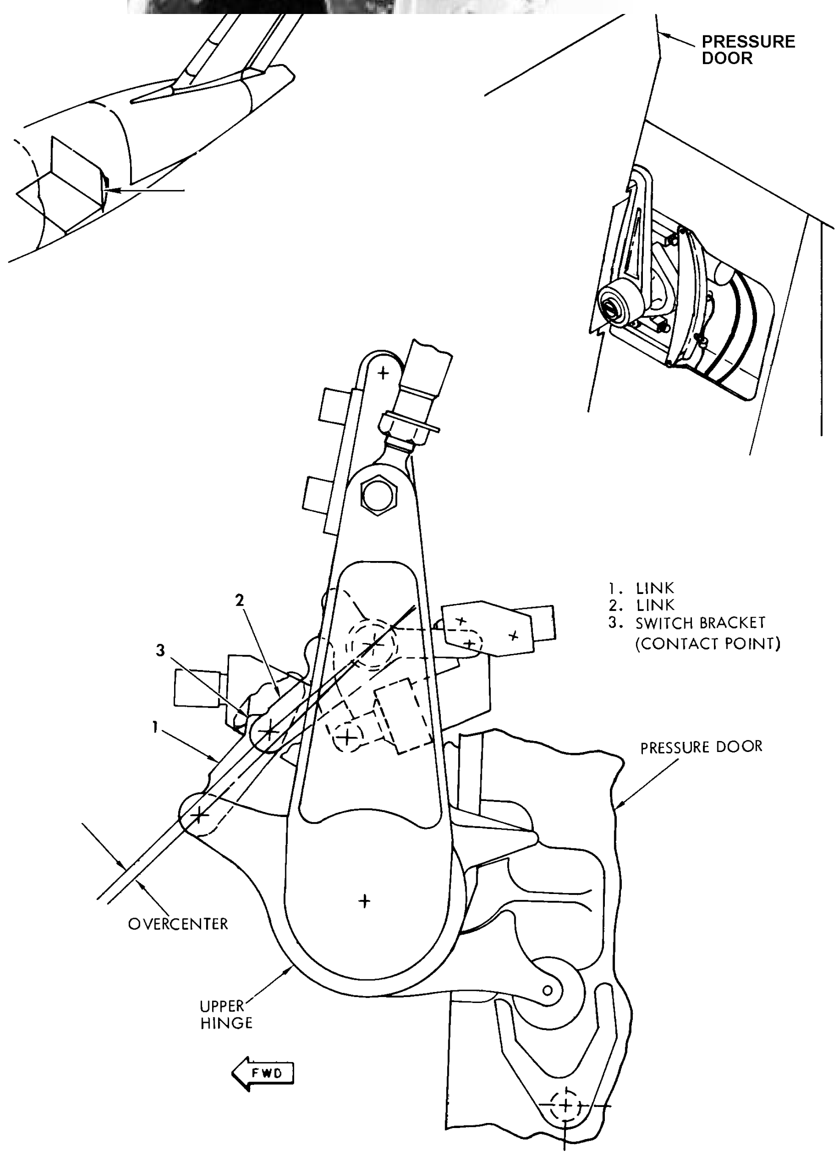


Aft ramp locks



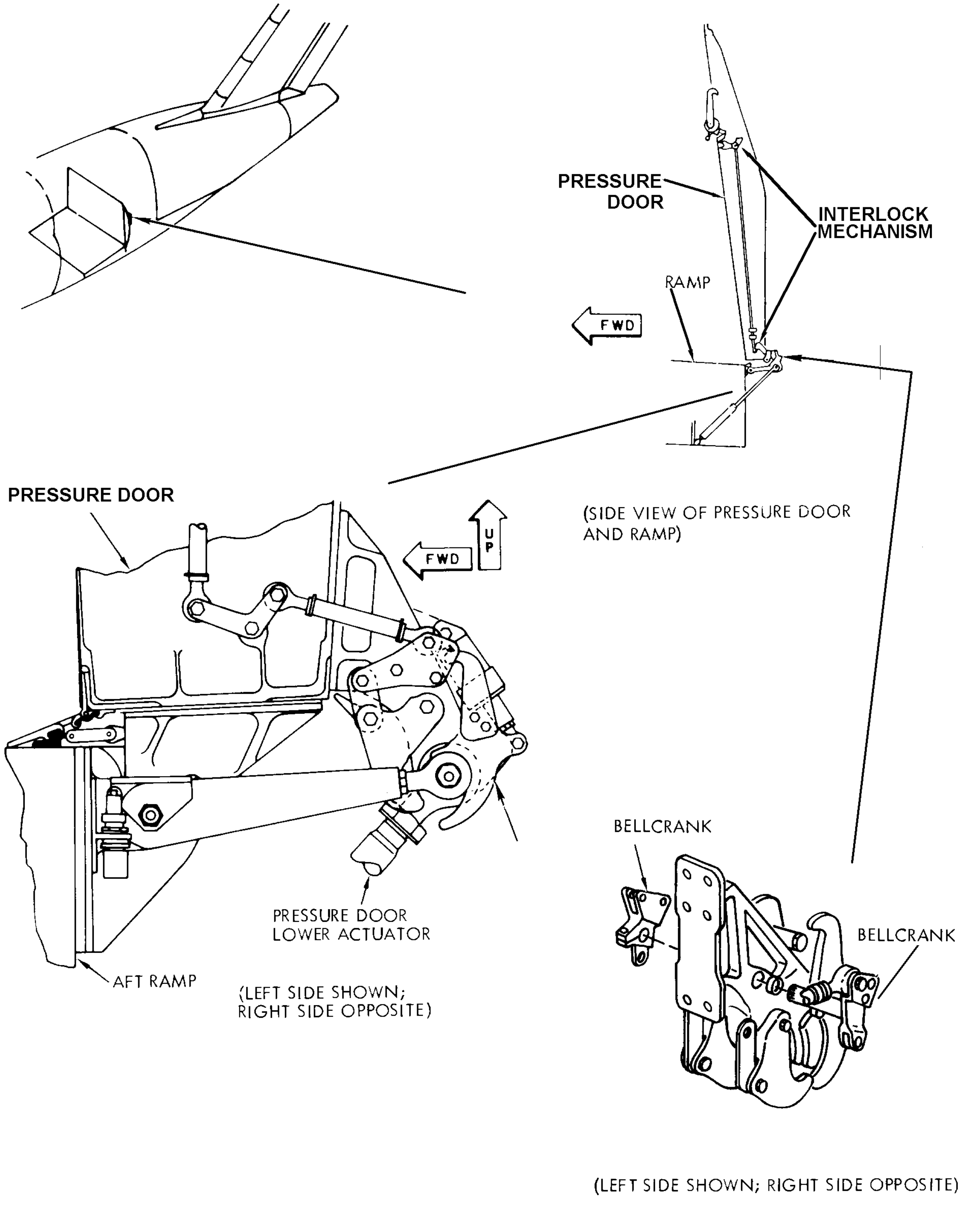
Aft ramp support pads





(LH SHOWN; RH OPPOSITE)
(LOOKING INBD; UPPER HINGE LINKS SHOWN IN OVERCENTER POSITION)

Pressure door upper hinges



Pressure door lower hinge

Aft Center and Side Doors

Center Door

The center door is approximately 47 feet long and 13 feet wide. When the center door, side doors, and pressure door are open, access to the aft end of the cargo compartment is provided through a rectangular opening 19 feet wide and 9-1/2 feet high. The center door is designed to be opened for cargo airdrop, leaving the side doors closed. The forward end of the door is supported by two arms and is actuated by jackscrews. The arms rotate about fixed points in the overhead fuselage structure to lift the forward end of the door up and aft. The aft end of the door is supported by roller carriages which slide aft on tracks attached to the aft fuselage structure. Two guide fittings located on the forward edge of the door engage stop fittings on the ramp when the center door swings down and forward during closure. Three rub posts on each side of the center door prevent the door skin from contacting the side doors during operation. The forward and aft slide blocks on each side of the center door engage tracks on the side door during door closure to provide proper alignment of centering side doors.

Side Doors

There are two side doors in the lower aft section of the fuselage structure. Each door is approximately 38 feet long and 6 feet wide at the widest section. The door is attached to the fuselage structure by two hinge fittings. One hinge is designed to adjust for fuselage deflection. Two forged aluminum actuator arms are attached to the fuselage structure at the outboard edge of the door and are spaced approximately 13 feet apart. Hydraulic actuating cylinders are attached to the actuator arms and provide the motive power for opening and closing the door. Two latches are used to secure the door. A bayonet latch (located on the aft fuselage structure) engages a receptacle attached to the forward edge of the door, and a grab latch (attached to the fuselage) secures the aft edge of the door. Internal mechanical locks on the side door actuators provide additional locking during airdrop. A drag latch is located in the forward track on each side of the side door. The latch serves to lock the center door to the side door in the fully closed position.

Hinge Doors

There are four hinge doors installed in the aft fuselage, left and right. The hinge doors are located above the trim line of the side doors at intervals between FS 2,146 and 2,428. The hinge doors are mechanically linked to the side door hinge actuating components and open and close simultaneously to provide clearance for these components. The hinge doors attach to the fuselage at the upper edge by the use of hinges. Seals are installed along the edge of each hinge door to provide weather protection for the interior of the unpressurized area of the aft fuselage.

Center Door Actuating Mechanism

The center door actuating mechanism is located at FS 2328 on WL 281. The actuating mechanism consists of a hydraulic motor mounted on a speed reducer gear box which drives two drive shafts. The center of the gear box is located 8 inches to the right of BL 0 looking forward. Each drive shaft is constructed with a splined universal joint at each end to compensate for slight misalignment. At the outboard end each drive shaft engages a secondary speed reduction drive box which drives a jackscrew. The jackscrews rotate to drive the center door up and down. The lower ends of the jackscrews terminate in clevis fittings which connect to the driver arms of the center door. Hydraulic pressure drives the motor to rotate the internal reduction gearing of the gear box at a 4:21:1 ratio. The gear box is provided with a handcrank for manual operation. Gear ratio of crank-to-shaft rotation is 2:24:1. A detent pin is provided for handcrank stowage. The handcrank must be stowed for normal operation.

Center Door Forward Drag Latch Actuator

The center door is held in the closed position by locking action of a drag latch pawl in each forward track mounted on the side doors. Linear motion to engage and disengage each drag latch pawl is provided by the drag latch actuator. The actuator consists of a three-port cylinder body, a piston and a clevis-end piston rod. The clevis end of the piston rod may be adjusted for rigging purposes. The ports of the cylinder body are identified as the extension, retraction and sequencing ports. When the piston rod reaches a predetermined point in the cylinder, the sequencing port is opened or closed depending on the direction of piston travel. The two drag latch actuators unlock in series. Upon unlocking, the first unit provides hydraulic pressure through the integral sequencing port to the second unit, which then unlocks. Pressure through the sequencing port of the second unit is then directed downstream to shuttle a cartridge valve which applies hydraulic pressure to open the center door.

Side Door Actuators

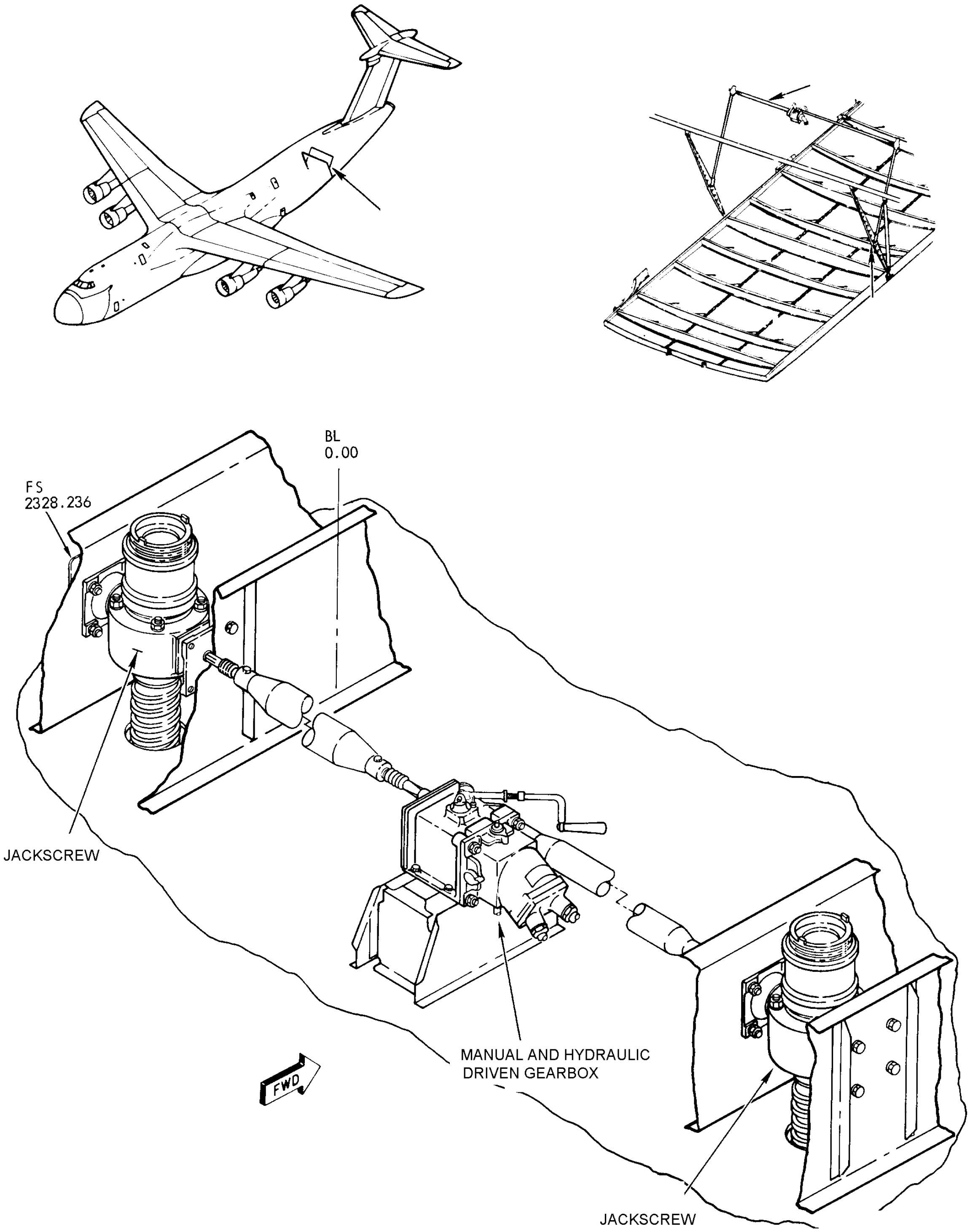
For each door there are two hydraulic actuators used to provide the opening and closing force for the side doors, left and right. The two actuators are similar in design and identical in function. One actuator is attached to the fuselage and to the side door actuating components at canted fuselage station 2273, WL 223. The other is installed at canted fuselage station 2429. The actuators are attached at the cylinder end to a truss and at the piston rod end to a fuselage mounted hinge bracket. During the side door opening cycle movement of the piston rod toward the extended position drives the truss downward. A tubular strut is attached to the truss at the upper end and to the side door at the lower end to complete the actuation linkage.

Side Door Forward Bayonet Lock Actuators

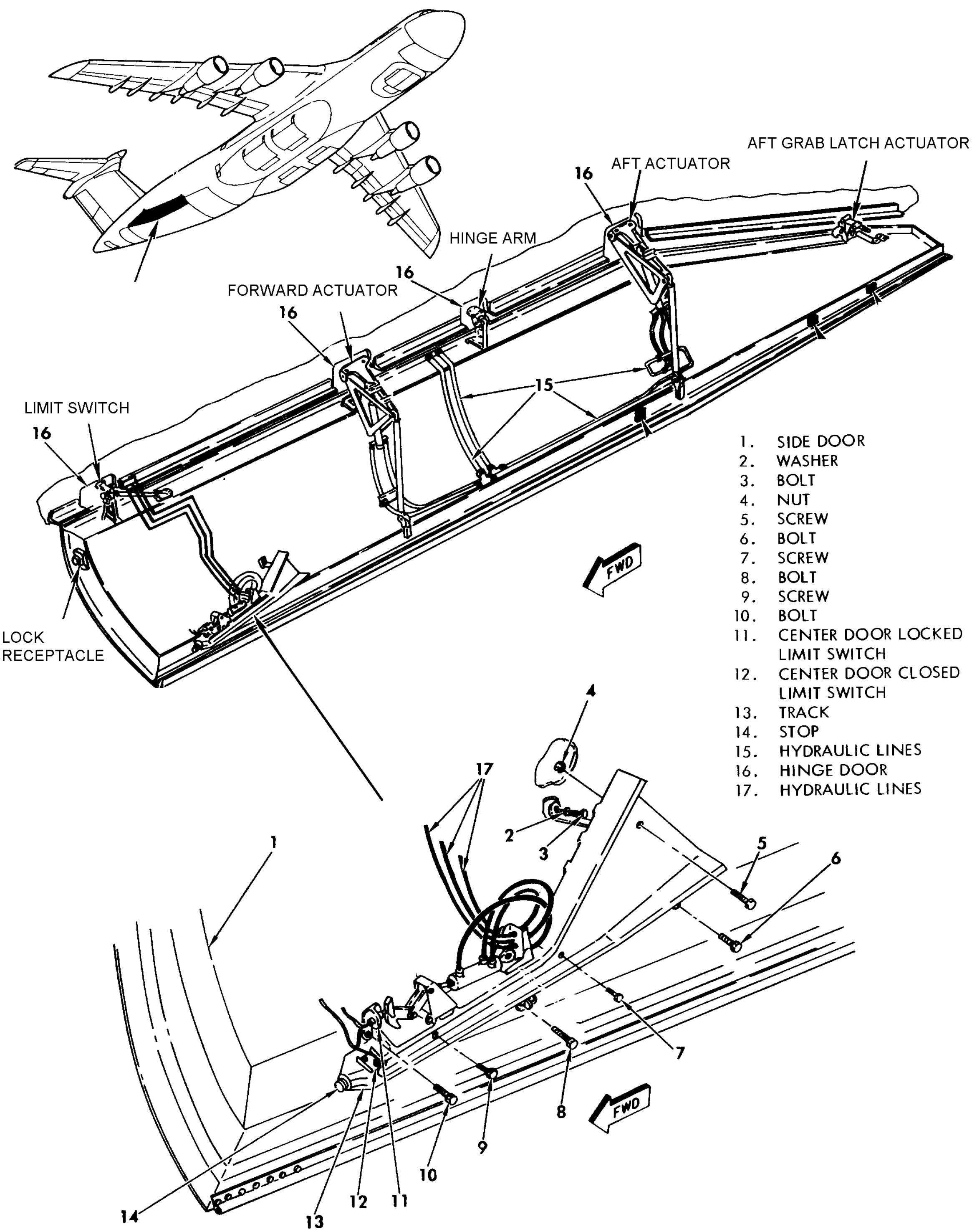
A hydraulic actuator is used to secure the forward edge of each side door. The actuator body terminates in a mounting flange at the rod side of the piston for attachment of the unit to the fixed fuselage structure. When the piston rod extends, the bullet-nose rod which is connected to the piston rod end engages a mating hole in a receptacle on the side door structure. Three ports are incorporated into the design of the actuator body. These ports are identified as the pressure, return. and sequencing, ports. Movement of the piston to a predetermined position opens the sequencing port to allow automatic sequencing of the series-connected components.

Side Door Aft Grab Latch Actuators

The aft end of each side door is secured in the closed position by an aft grab latch. The actuator provides the force for locking and unlocking the latch. The unit is installed at FS 2538.80 left and right. The unit is a three port hydraulic cylinder with piston and piston rod. During extension, the piston rod moves outboard to rotate a clevis up to engage a pin in a bracket which is mounted on the upper frame surface of the side door. The three ports in the cylinder are identified as the pressure, return, and sequencing ports. When the piston reaches a predetermined point during actuation, the sequencing port is opened to permit the four side door forward and aft latch actuators to unlock in series. The first, upon unlocking, sends pressure through the sequencing port to unlock the second. This action is repeated for the third and fourth units until all are unlocked. After the fourth is unlocked, system pressure is applied downstream to shuttle a cartridge valve which actuates to supply pressure to open the side doors.



Center door and actuation components

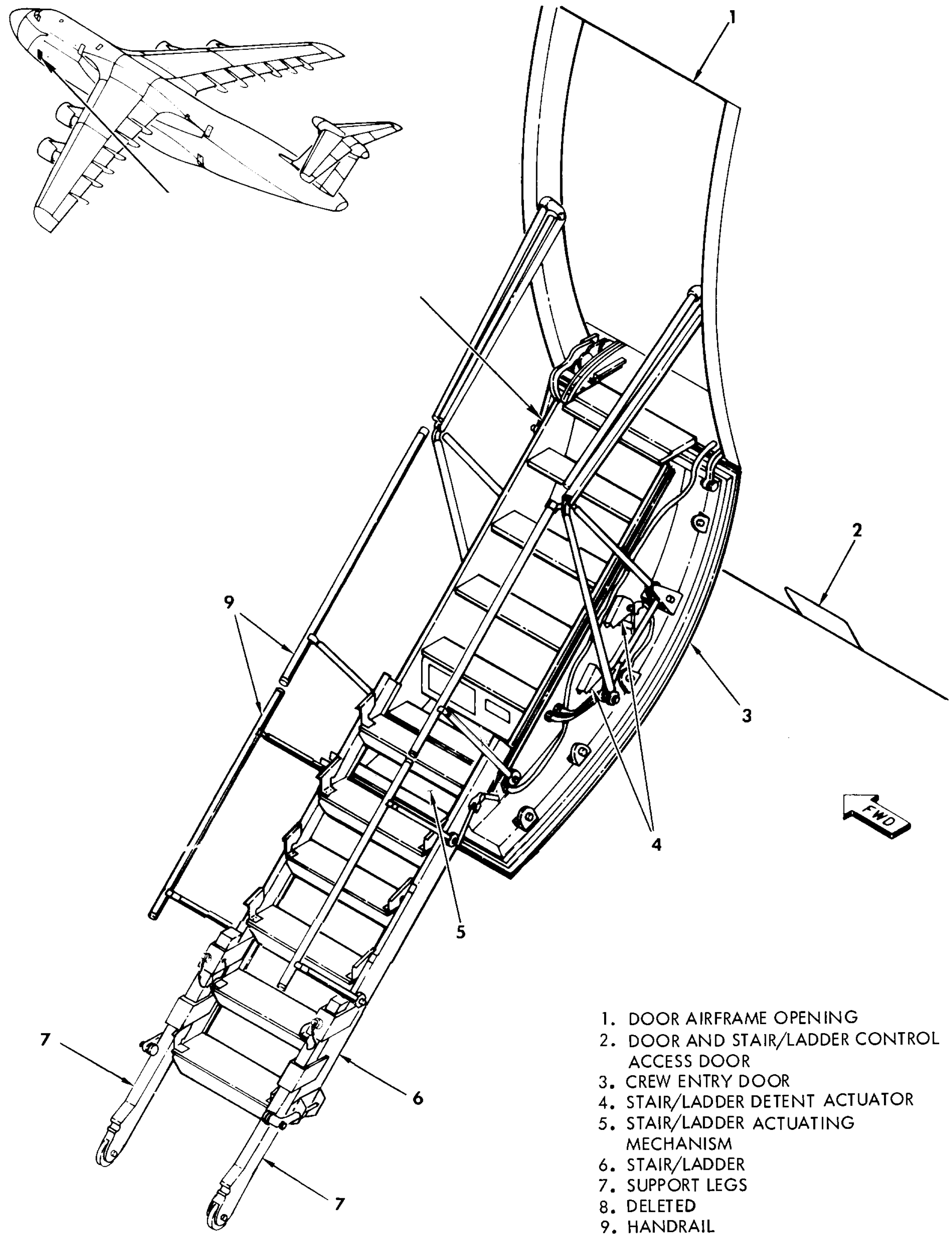


Side door assembly

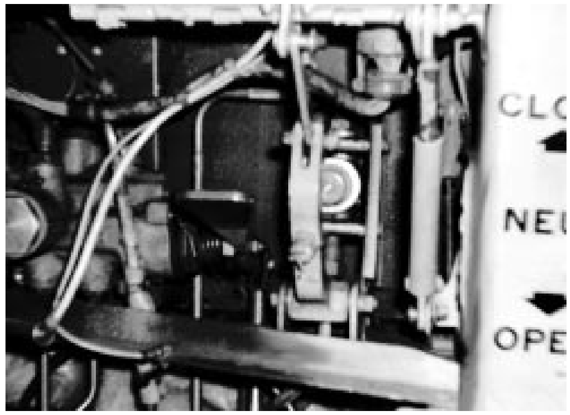
Crew Entry Door and Stair/Ladder

The crew entry door and stair/ladder system provides a means for personnel to enter and leave the airplane. The system consists of the door and stair/ladder, and the hydraulic and mechanical components necessary for the operation of the door and stair/ladder.

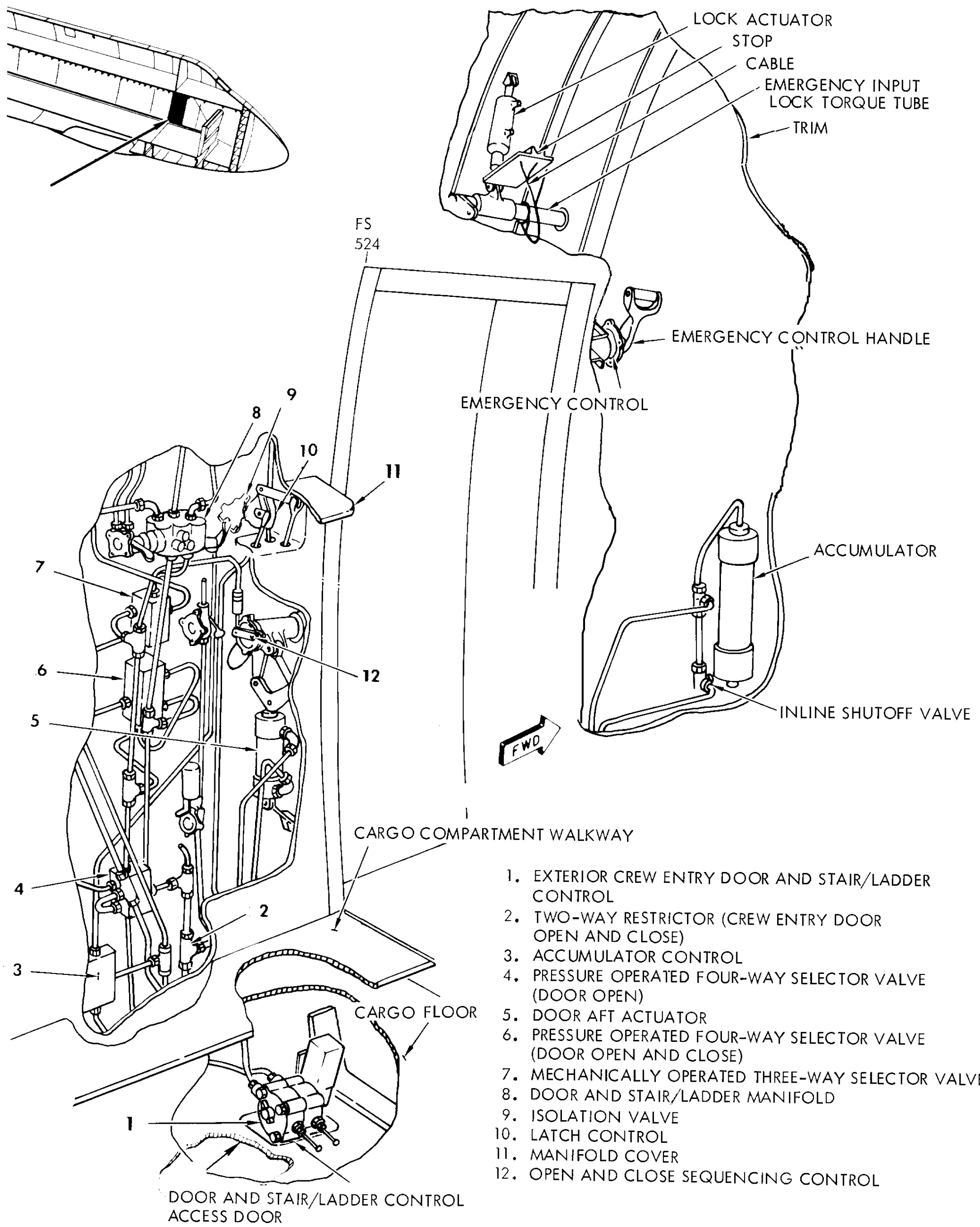
The crew entry door and stair/ladder contains steps that form an integral part of the door structure. A pressurized-type bulb seal is attached to the door edges to seal the door during pressurization of the airplane. The stair/ladder is equipped with rollers that ride in tracks on each side of the crew entry door. This permits the stair/ladder to travel up and down the door during operation of the system. Adjustable support legs are installed to support the door stair/ladder in the fully extended position when the airplane is in the unkneeled mode. Each leg is adjustable to 29 different positions and is held in place by a lock pin. The legs are manually moved to the stowed position, and remain stowed during the door operation. When stowed, the legs position the stair/ladder stop for stair/ ladder retraction and door closing.



Crew entry door assembly



Crew entry door control lever



Crew entry door control system

BLANK

ENVIRONMENTAL CONTROL AND OXYGEN SYSTEMS

The oxygen system provides oxygen to all compartments and stations through a built-in feed system. Portable units are also available for areas where no other oxygen provisions are made. The bleed air, air conditioning, cabin pressurization, avionics equipment cooling, cargo floor heat, fire extinguishing ice detection, and fire suppression systems make up the C-5 environmental control system.

Oxygen System

The oxygen supply system consists of two, (one on AF68-213 and AF68-216) liquid oxygen converter(s) with associated servicing, drain, and check valves. The distribution system consists of heat exchangers, pressure demand regulators, automatic continuous flow regulators, automatic mask presentation units, portable rechargers, and portable units.

The oxygen supply system provides gaseous oxygen to the crew, relief crew, and troop compartment when oxygen is required. Diluter-demand oxygen regulators are provided adjacent to each crew duty station and each bunk for the crew.

Portable oxygen units, of two different types, are provided to furnish oxygen to personnel moving about the fuselage or during an emergency. These portable units are located throughout the airplane in strategic locations.

Liquid Oxygen Converters

A 25-liter converter and a 75-liter converter which are installed in the left main landing gear pod, store liquid oxygen and convert it into gaseous oxygen. The amount of oxygen in the converters is shown on capacitance type indicators located on the flight engineer's instrument panel. The operating oxygen pressure is 305 (+10) PSIG. The converters are connected to a combination fill, build-up and vent valve and to a drain valve, both of which are located in a filler box. The converter is serviced through the combination valve, the operation of which is automatic when coupled to the liquid oxygen service cart hose. The vent valve of the converter is also connected to an overboard vent in the lower skin below the converter compartment.

The 25-liter converter will sustain 20 persons for 5 hours at 25,000 feet. The 75-liter converter will sustain an additional 75 persons for 5 hours at 25,000 feet.

Manual Shutoff

A manual shutoff valve is used to isolate the liquid oxygen supply from the system in the event of a fire or leak downstream. The valve is located adjacent to the converters and access is through the shutoff valve door located on the left side of the cargo compartment at FS 1462.76 and WL 173.34.

Heat Exchangers

Four heat exchangers (two heat exchangers on AF68-213 and AF68-216) are installed in series in the oxygen supply system to elevate the temperature of the supply system gaseous oxygen to ambient temperature. The exchangers are located in the cargo compartment ceiling between the ceiling beams.

Diluter Demand Regulator

There are six regulators in the relief crew bunk compartment, and one at the flight engineer's, copilot's, pilot's, observer's, and navigator's stations. When the emergency toggle lever is set to NORM, diluter lever to NORMAL OXYGEN, and SUPPLY lever to ON, gaseous oxygen is diluted with atmospheric air before flowing to the oxygen mask. As the airplane cabin altitude increases, the regulator air inlet is gradually closed by a bellows and a higher concentration of oxygen flows to the mask under increasing positive pressure. At a cabin altitude of 34,000 feet and above, the air inlet is completely closed and 100 percent oxygen flows to the mask. To attain flow of 100 percent oxygen to the oxygen mask under positive pressure, regardless of cabin altitude, set diluter lever to 100% OXYGEN and emergency toggle lever to EMER.

Continuous Flow Regulator

Two continuous flow regulators, connected in parallel, are mounted on the continuous flow regulator panel in the relief crew compartment. When cabin altitude increases to 13,250 (+750) feet, an altitude pressure sensing valve automatically opens the regulators, and gaseous oxygen flows to outlets in relief crew, troop/courier, and troop compartments. As cabin altitude decreases to 12,250 (+750) feet, the pressure sensing valve automatically closes the regulators, and flow of gaseous oxygen to outlets in relief crew, troop/courier, and troop compartments is cut off. When the regulators are opened manually oxygen will continue to flow to various compartment outlets regardless of cabin altitude.

Automatic Oxygen Mask Presentation Units

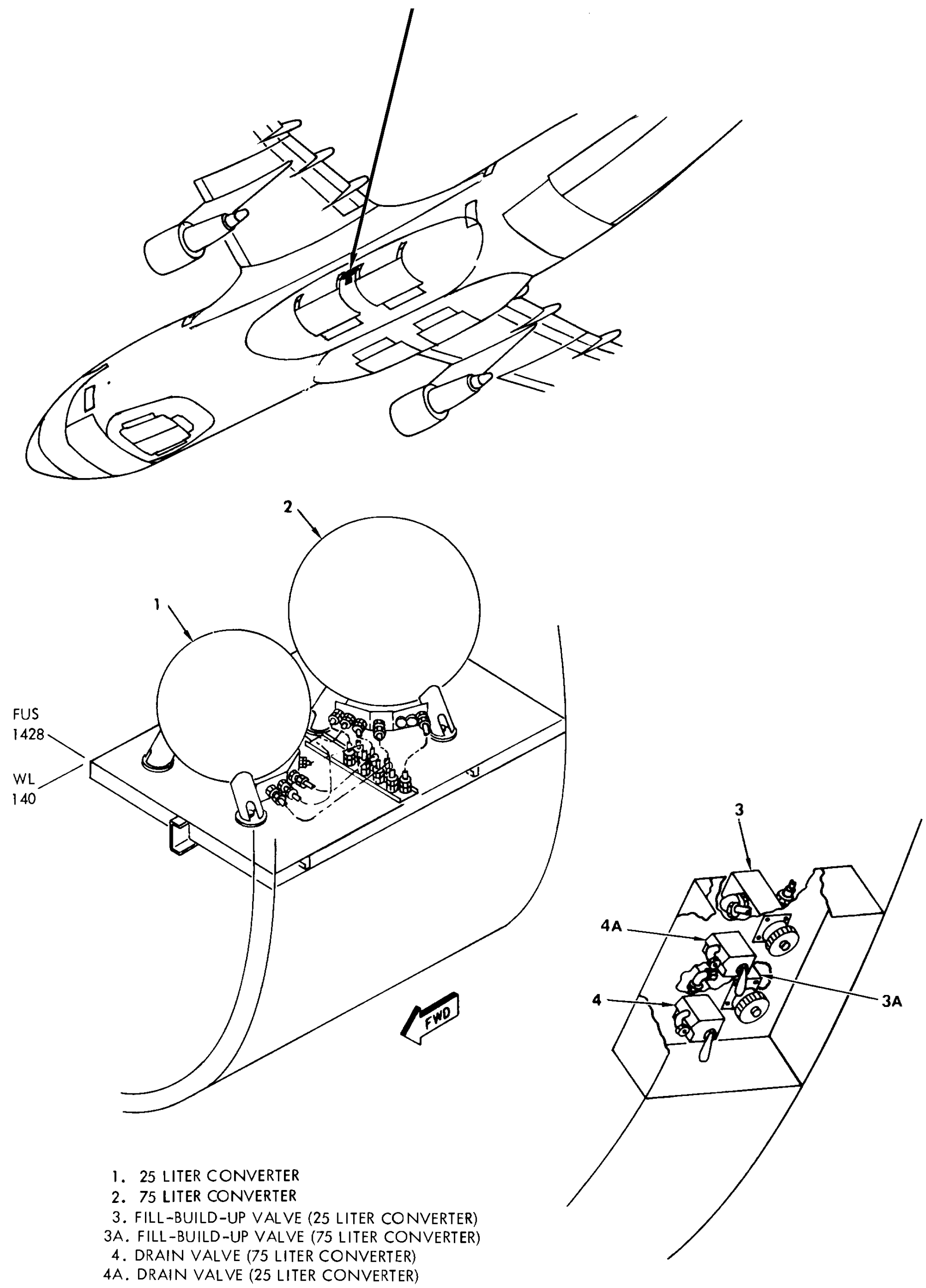
The automatic oxygen mask presentation units located in the overhead modules are connected to service lines from the continuous flow regulator panel in the relief crew compartment. Automatic or manual actuation of the continuous flow regulators allows gaseous oxygen from the liquid oxygen converters to flow to each automatic mask storage container. Oxygen pressure trips the door latch on the manifold assembly, the door opens, and the oxygen masks drop down ready for use by personnel. The lanyard must be pulled to initiate oxygen flow.

Visual and Audio Warning System

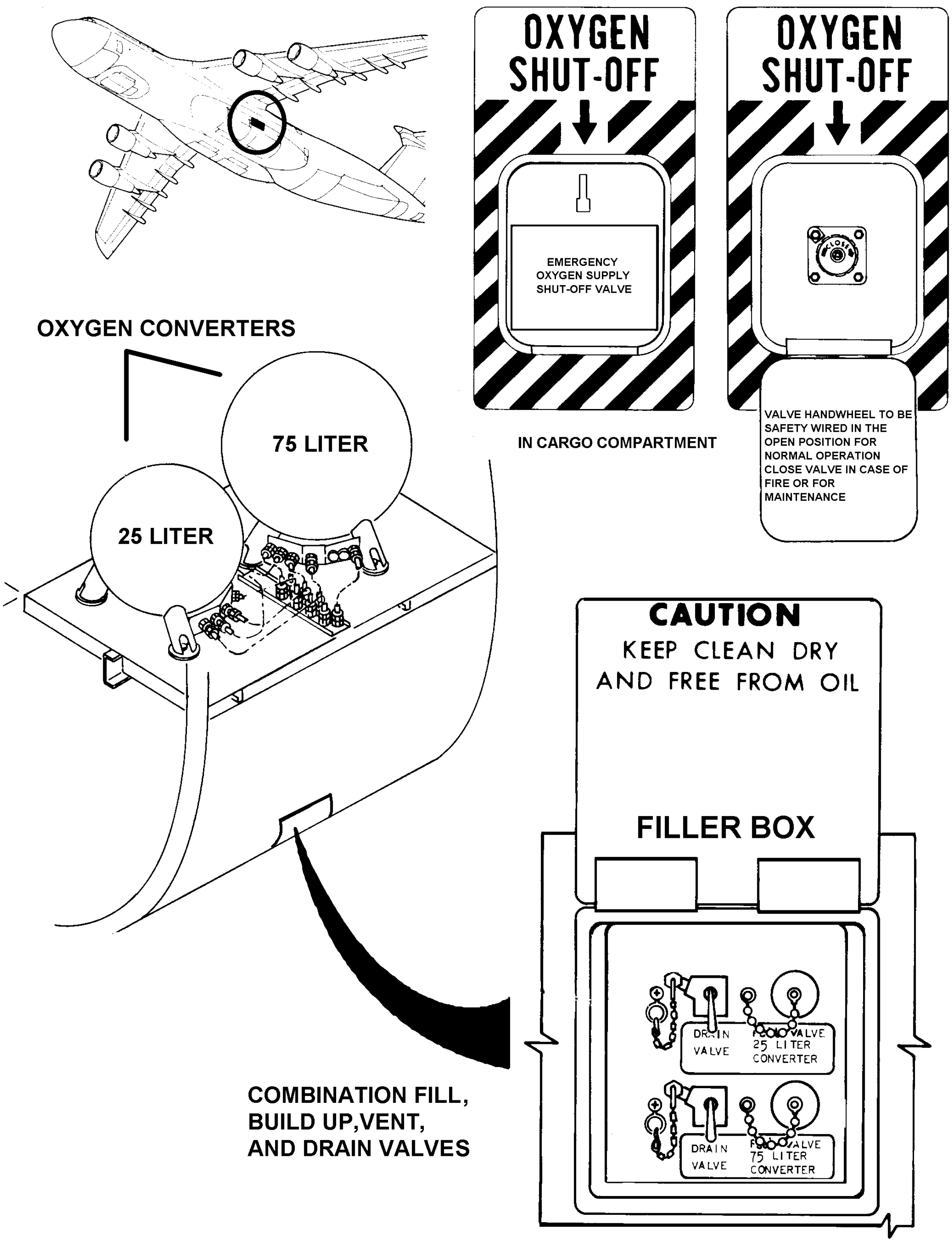
The oxygen warning system is used to alert the passengers and crew of low cabin pressure or of any emergency situation which would necessitate the use of oxygen. The visual and audio warning system of the oxygen system consists of an OXYGEN ON light, warning horns, and horn silence switch. Bright area compartment lights and NO SMOKING signs are also actuated during oxygen warning. A test switch is also incorporated to test the warning system.

Liquid Oxygen Quantity Indicating System

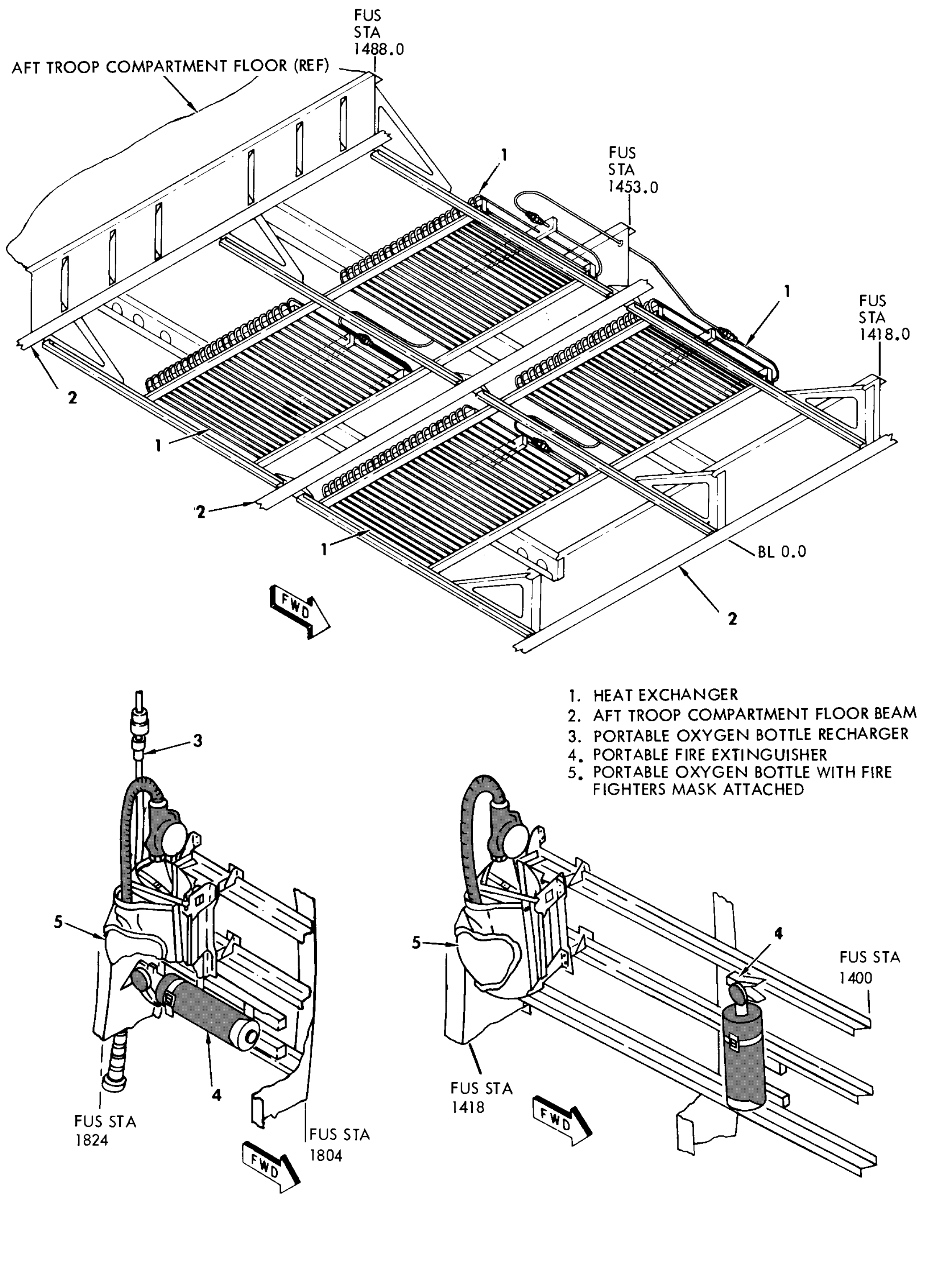
This system consists of a 25-liter indicating system and a 75-liter indicating system (one for each converter). Each system consists of a null balancing capacitance-bridge type servo indicator, a QTY LOW warning light which will illuminate when the liquid oxygen remaining in the corresponding converter is less than 10 percent of its total capacity, and a press-to-test switch. The switch, light, and indicator are located on the flight engineer's panel.



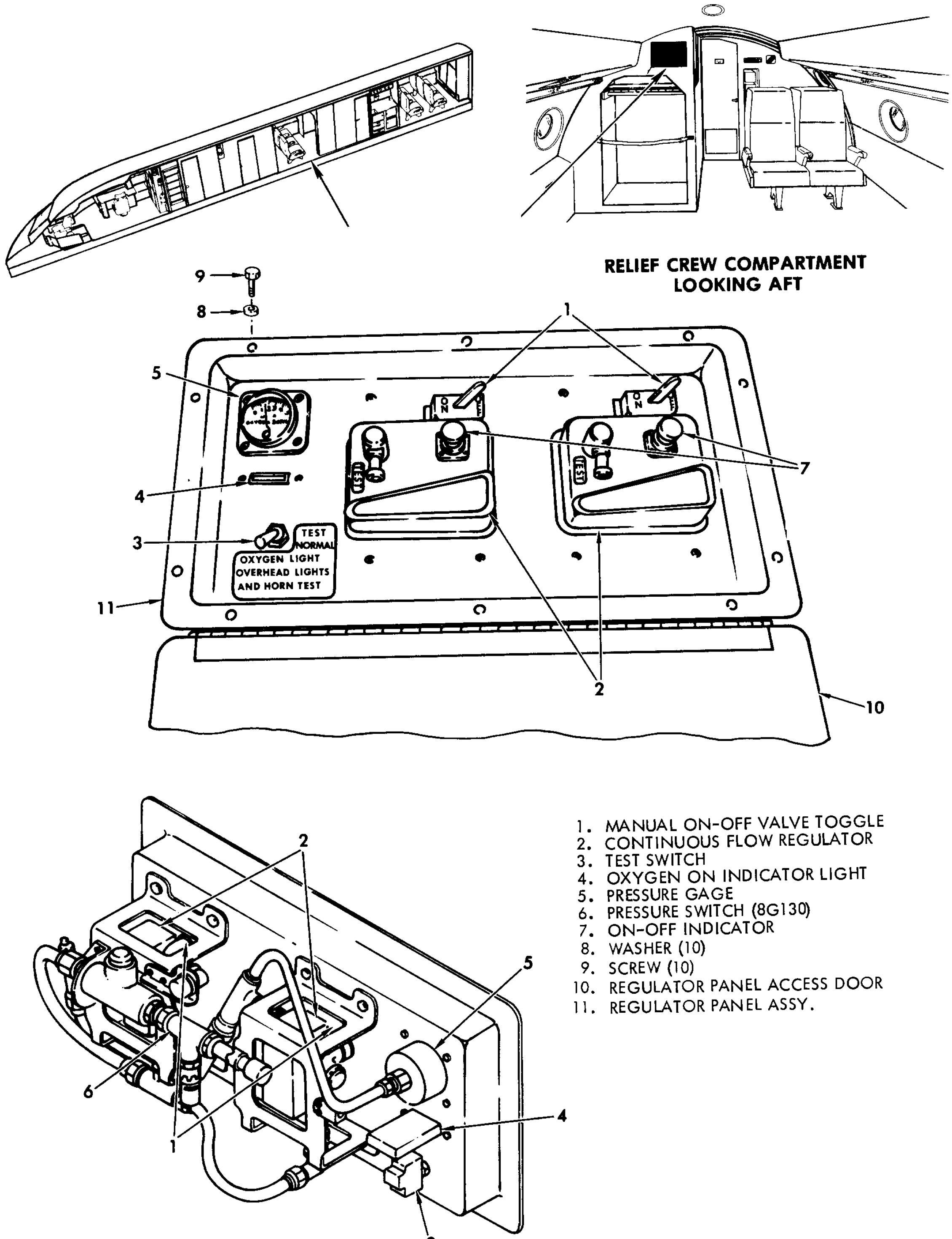
Liquid oxygen converters



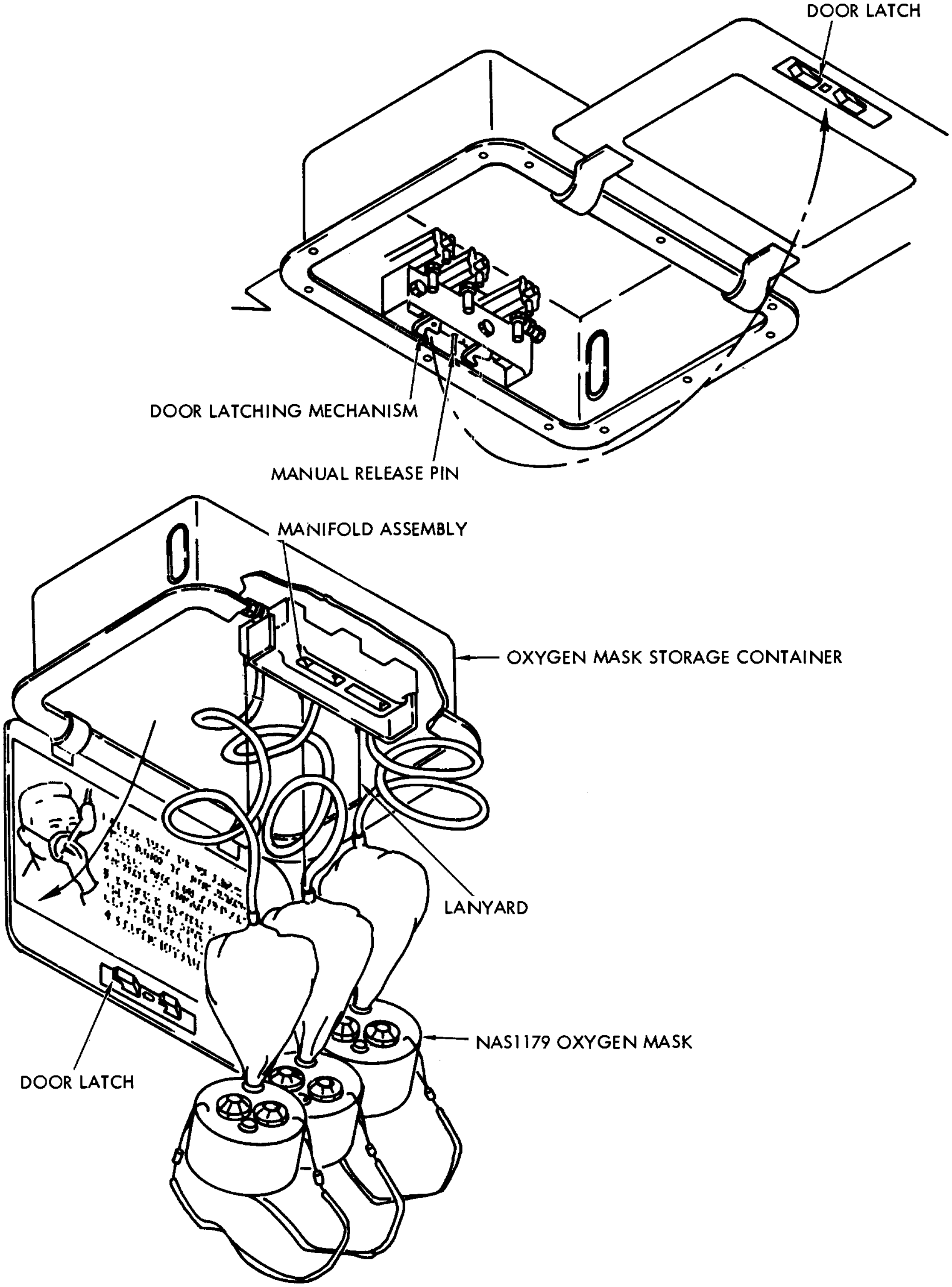
LOX converters, manual shutoff, and combination valves



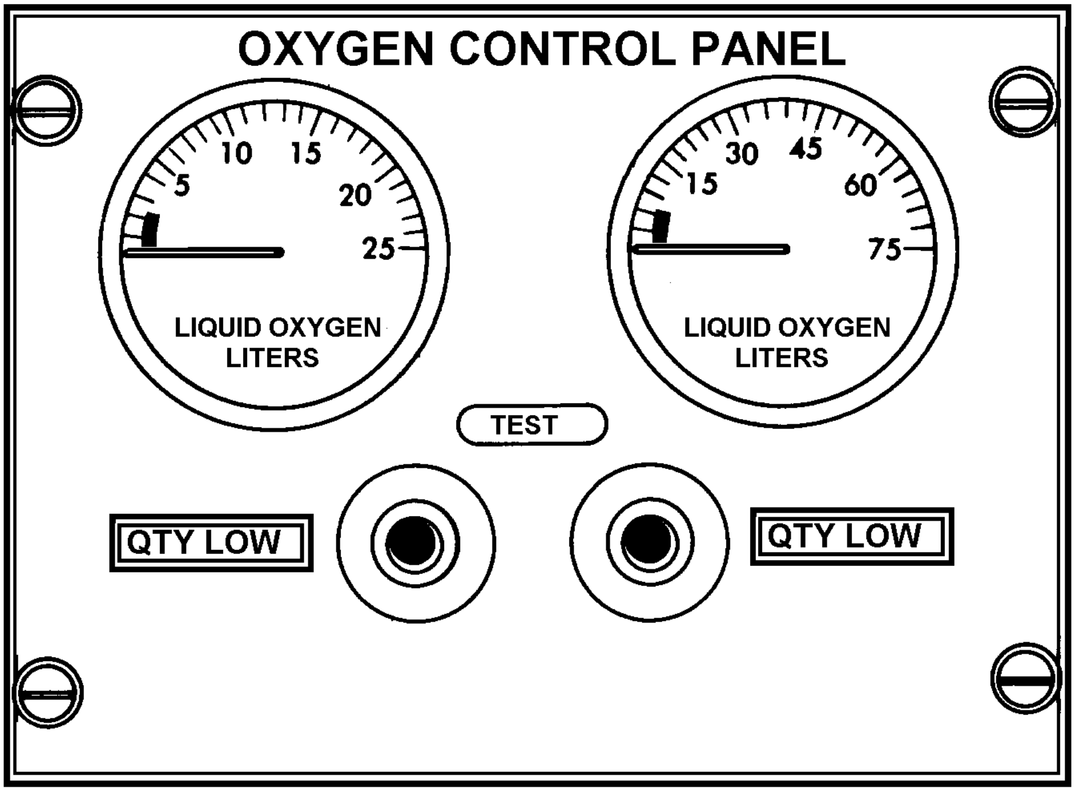
Oxygen supply system heat exchangers

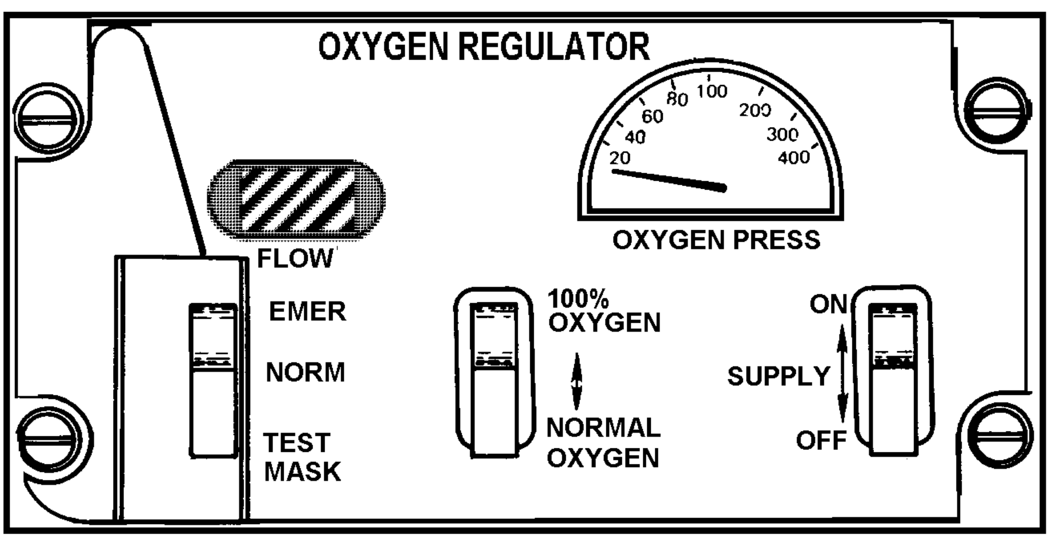


Continuous flow regulators



Automatic oxygen mask presentation unit





LOX quantity indicators and typical diluter demand regulator

Air Conditioning System

The air conditioning system is composed of two parallel units that share the same ducting. Normally, both units operate at the same time, but limited air conditioning can be provided if only one of the units is operative. An air conditioning flow control system provides the proper airflow rate required for pressurization, ventilation, heating, and cooling during all flight and ground operating conditions. Bleed airflow control and shutoff valves provide for control of two flow rates: one for speeds below 0.3 Mach and one above. Each refrigeration unit has a cooling turbine, two heat exchangers, a water separator, check valves, and temperature control valves and sensors. The cooling turbine, with the heat exchangers, cools the bleed air. The temperature controls and valves modulate the flow of hot bypass air around the cooling turbine to attain the required mixed air temperature. The water separator removes excess moisture from the air. The check valves are strategically located to prevent reverse flow and or loss of air in the event of component rupture. The cooling fan provides cooling air to the heat exchangers at airspeeds below Mach 0.3, when slats are extended and during ground operation. Above this speed, ram air is used. The cooling air exit valve modulates the cooling airflow to maintain a temperature of 160F at the primary heat exchanger exit.

During normal operation, one refrigeration unit supplies the flight station, relief crew compartment, and the troop compartment, with a small amount going to the cargo compartment. The other unit supplies air to the cargo compartment. Each unit is capable of providing adequate air to all compartments in the event of a unit's failure. Air temperature is controlled by mixing bleed air from upstream of the primary heat exchanger with air from the water separator. Each compartment has an independent, automatic temperature control with a manual override.

Cooling Turbine and Heat Exchanger

The two cooling turbines together with the heat exchangers provide cool air for air conditioning. The primary heat exchanger precools the bleed air by dissipating heat energy to the cooling air; the cooling turbine adds work energy by additional compressing of the air, thus increasing its temperature again so that more heat energy can be dissipated to the cooling air in the secondary heat exchanger; the temperature and pressure of the air is then reduced by isentropic expansion in the turbine. Each turbine has a thermal switch, set at 585F, that signals the air conditioning flow control and shutoff valve to close, and illuminates an AIR COND OVHT light on the environmental control panel in the event of compressor discharge overheat.

Cooling Fan

The cooling fan provides cooling air for the heat exchangers at airspeeds below Mach 0.3 when slats are extended and during ground operations. Bleed air to drive the cooling fan turbine is extracted from the cross ship manifold, inboard of the inboard pylon on each side of the airplane. Exhaust air from the turbine of the cooling fan is vented overboard through a venturi which limits fan rotor speed. The cooling fans are actuated during flight when a signal from the Central Air Data Computer or slat position switch opens the cooling fan shutoff valves and allows bleed air to enter the fan drive turbine. The fan valve is modulated by the cooling air exit control. It works in sequence with the exit control valve.

Cooling Air Exit Valve

The cooling air exit valve is provided to minimize the drag penalty of the cooling circuit by modulating the cooling air flow. An automatic control system positions the valve to maintain the primary heat exchanger discharge temperature at 160F (71C) or the bleed air flow control schedule, whichever requires the greater amount of cooling air.

Water Separator

Discharge air from the air cycle turbine is passed through a water separator, where excess moisture, condensed by the cooling process, is removed. In the separator, air is passed through a perforated metal cone supporting a woven dacron fabric coalescer bag which collects the water droplets. As the fabric becomes saturated, water is discharged in large drops which are centrifuged out of the air by downstream swirl vanes. The water is drained into the overboard sump while the air passes through the center of the separator into the distribution duct. Hot air, bypassing the turbine compressor, is introduced at the water separator inlet to prevent freezing.

Compartment Temperature Control System

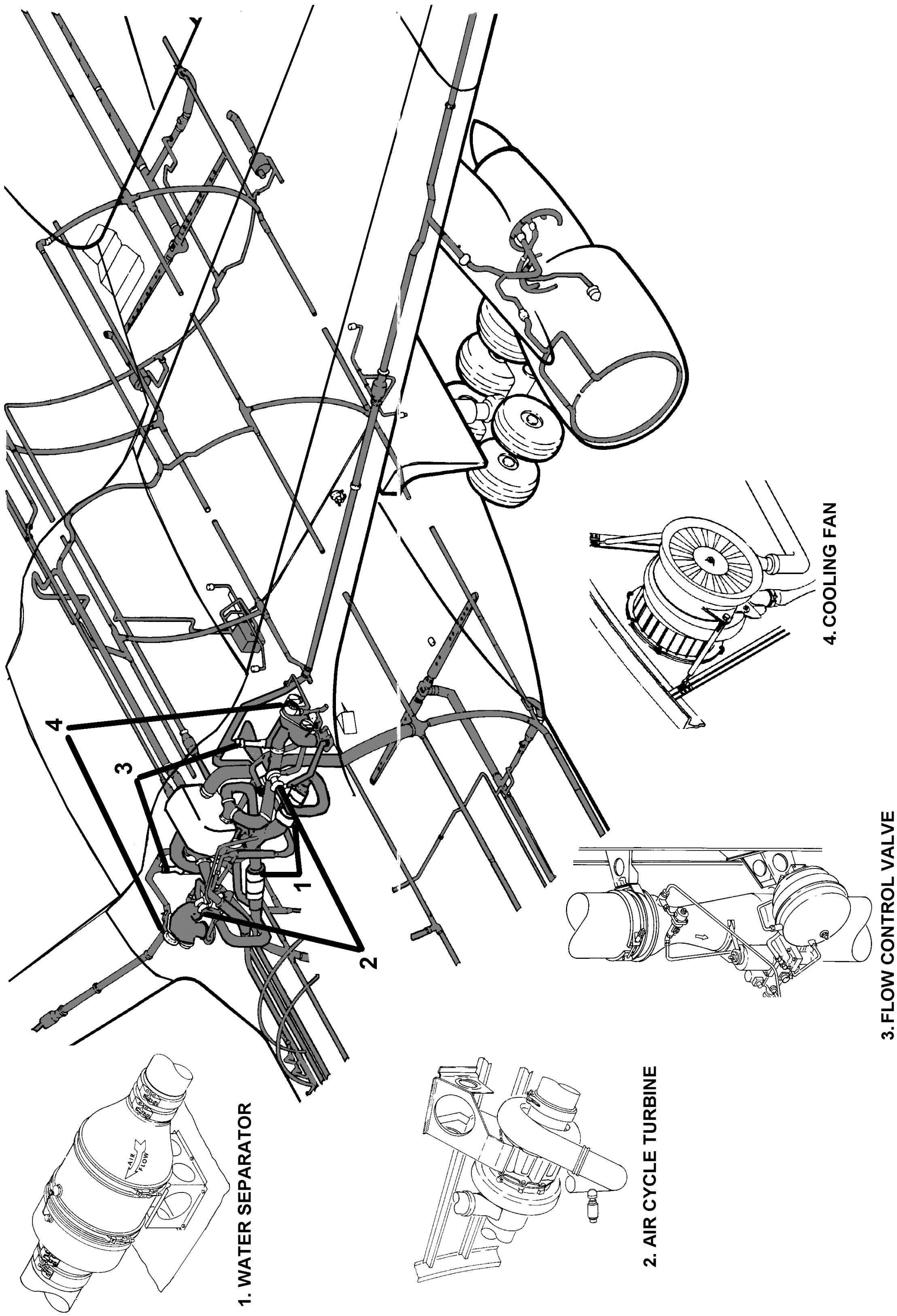
The temperature of each compartment is controlled by mixing bleed air from upstream of the primary heat exchanger with air from the water separator in the proper proportions to maintain the selected compartment temperature.

Compartment Temperature Control Unit

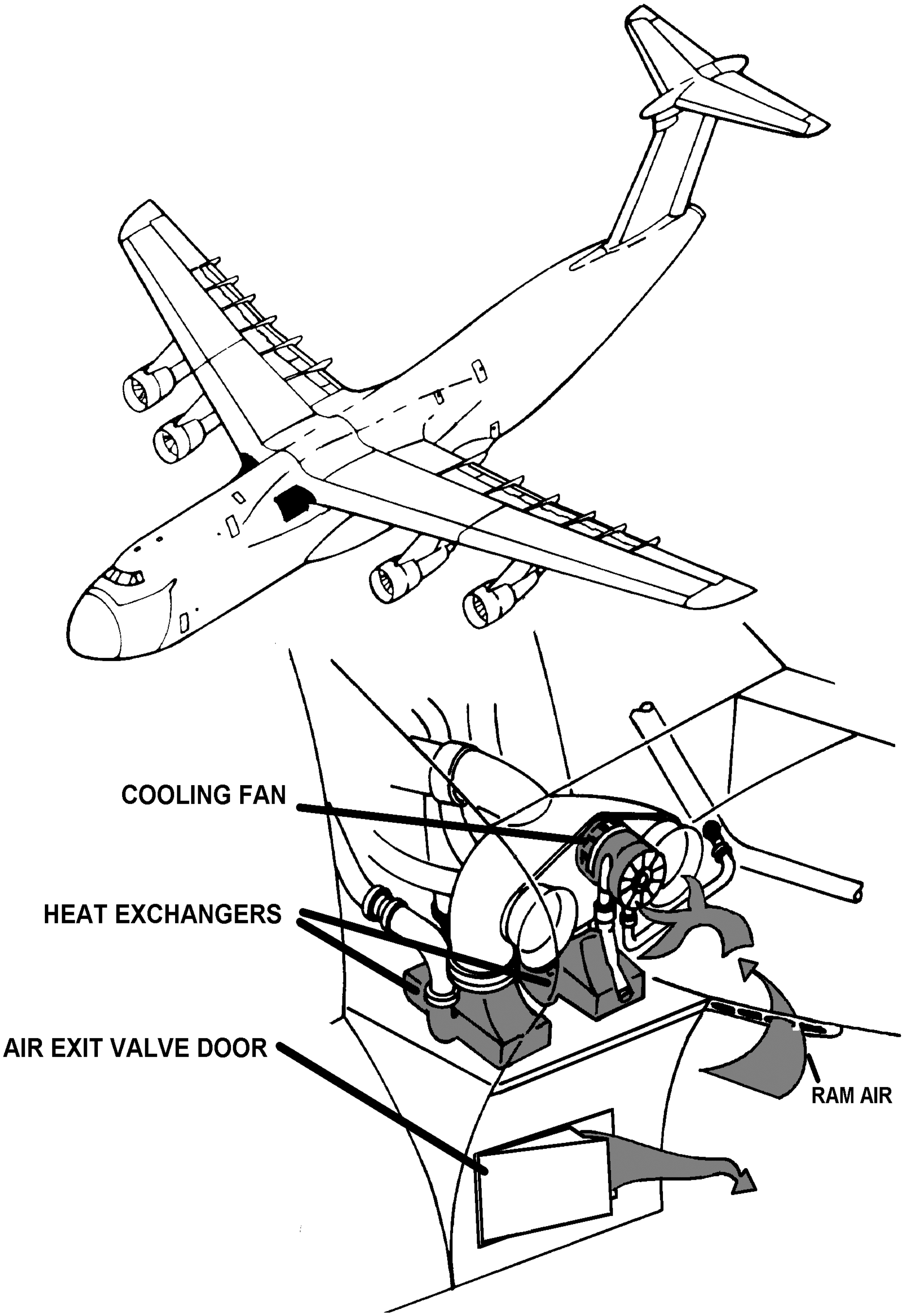
Each compartment is provided with an independent, automatic temperature control network, and a manual override. Each network includes a temperature selector with a range of 40 to 95F, a temperature control mode selector switch, a compartment temperature sensor, duct sensors, an electronic temperature control box, and an AC motor actuated temperature control valve.

Ram Air Ventilation System

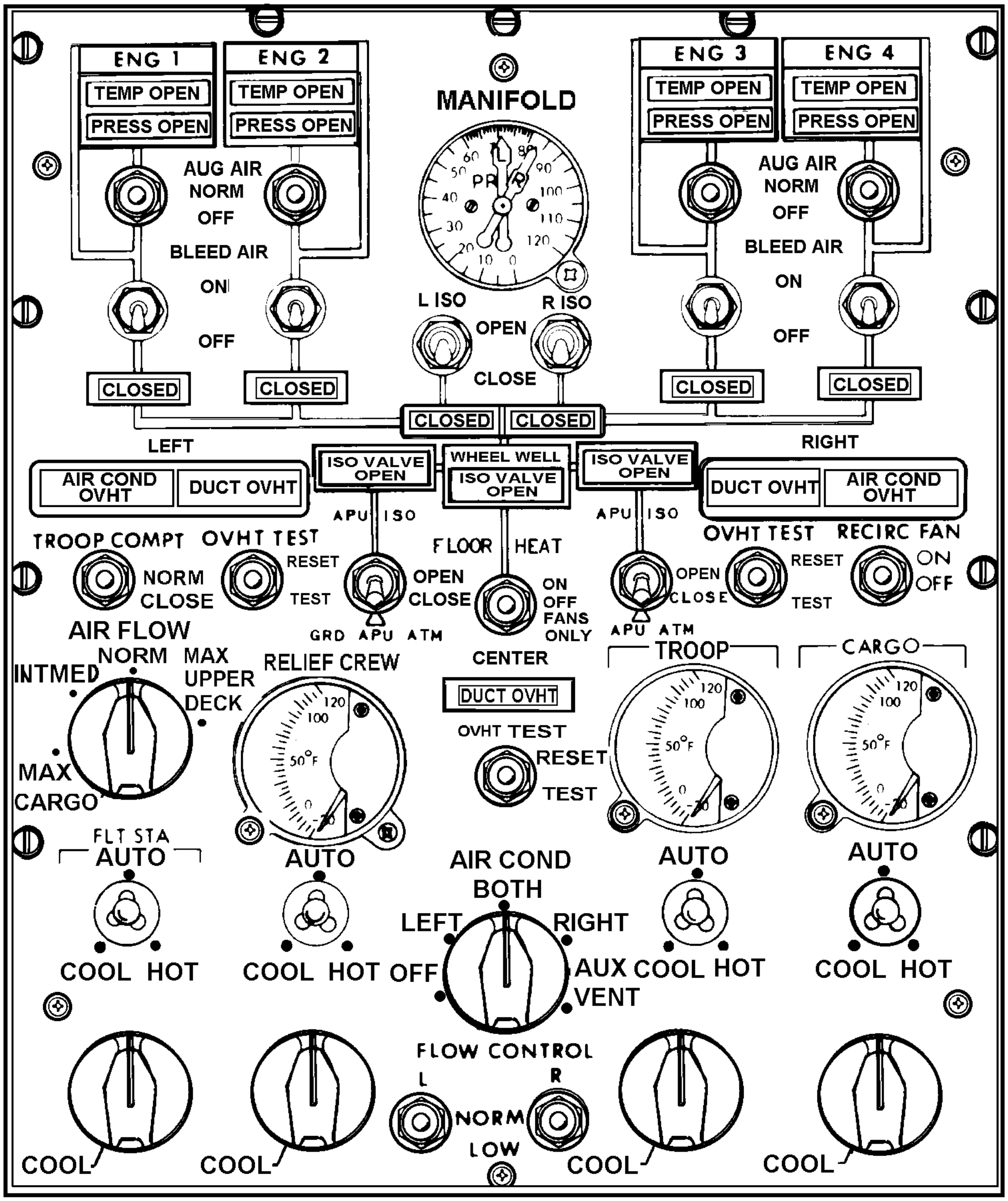
Ram air is taken from the left-hand heat exchanger cooling duct, upstream of the heat exchangers through a 10-inch, AC actuated, butterfly valve. Ram air will flow into the upper deck distribution system when the AIR COND selector switch on the environmental control panel is placed in the AUX VENT position. Auxiliary ventilation is provided on the ground by utilizing bleed air from the APU to drive the left-hand system heat exchanger cooling fan.



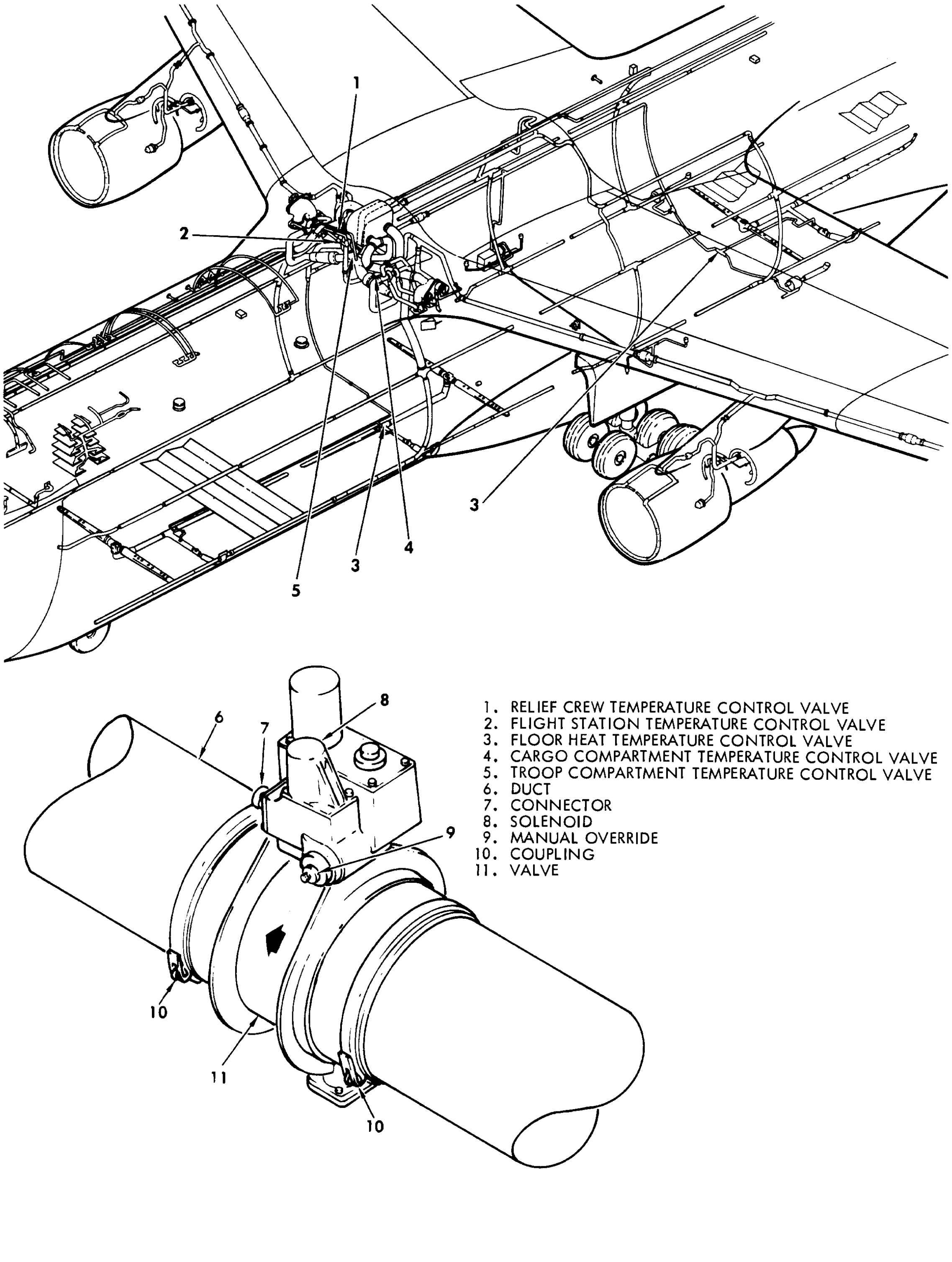
Air conditioning system components



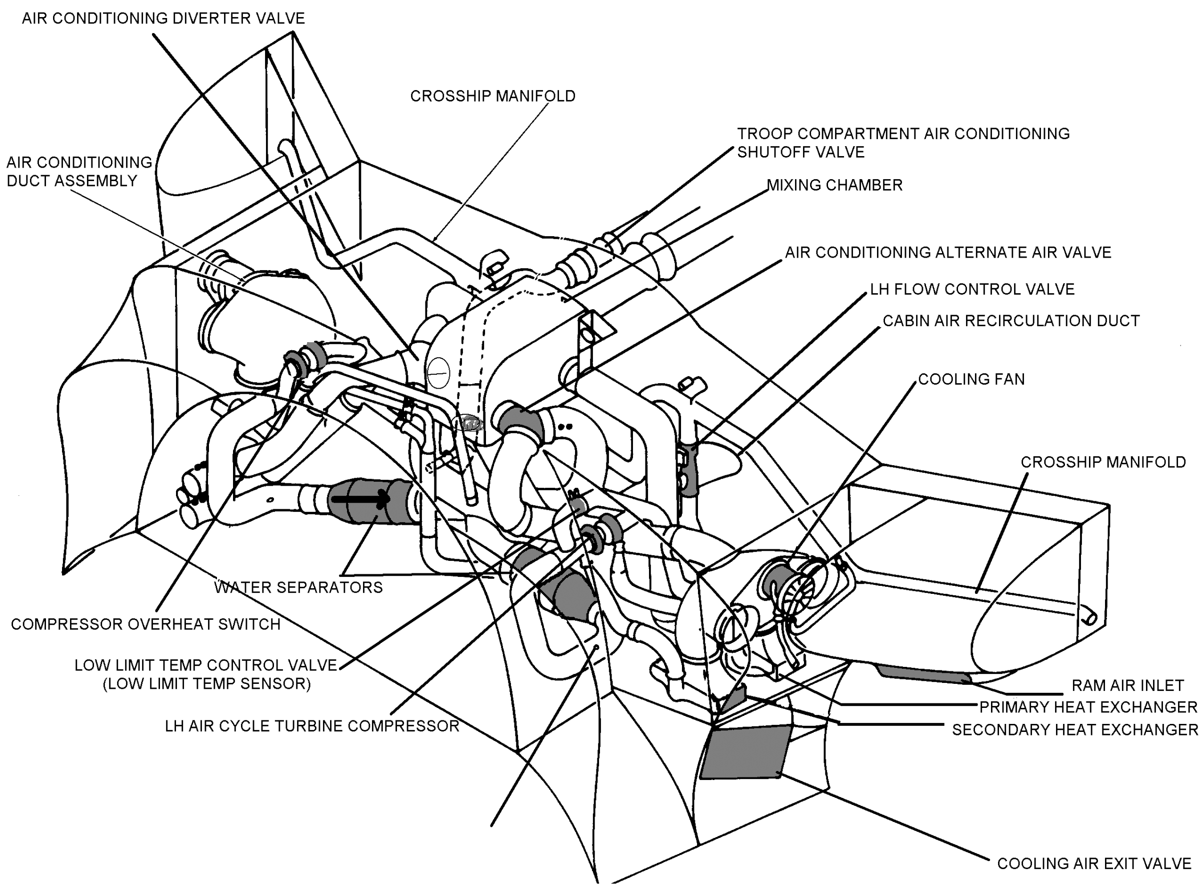
Ram air ventilation



Flight engineer’s environmental control panel



Compartment temperature control valve locations



Environmental control system components

Bleed Air System

Each of the four engines furnishes hot bleed air which is distributed throughout the airplane by a system of ducting. This air powers the environmental control system and the engine and nacelle anti-icing system. The two auxiliary power units (APUs) provide hot bleed air during ground operations to start the engines, and perform all of the functions of the engine hot bleed air except the powering of the engine anti-icing system. The bleed air system is controlled through various valves that allow selection distribution and provide automatic switching in some instances. In addition, a bleed air overheat detection system is provided to permit sensing elements located at critical duct joints and valves throughout the system to signal excessive leakage or area overheat. The bleed air system controls and indicators are located on control panels at the flight engineer 's station.

Bleed Air Pressure Augmenter Valve

The bleed air pressure augmenter valve is a combination pressure regulator and shutoff valve. The valve incorporates a pneumatic sensor for pressure regulation. The valve controls air flow from the sixteenth-stage compressor discharge manifold to the eighth-stage duct as a result of air pressure sensed in the eighth-stage duct. The valve increases the downstream pressure with sixteenth-stage bleed air to maintain differential pressure at 30 (+ 2) PSIG. A switch and light assembly is provided on the flight engineer's environmental control panel for the valve control and valve position indication.

Bleed Air Temperature Augmenter Valve

The bleed air temperature augmenter valve is a combination modulating and shutoff valve. The valve is located between the engine compressor discharge bleed air manifold and the eighth-stage bleed air manifold. The valve is spring loaded to the closed position to provide shutoff operation. The valve is armed when the anti-ice system is turned on and modulates in response to signals from the downstream temperature augmenter sensor to maintain the mixed air temperature at the desired level. A light is provided on the flight engineer's environmental control panel to indicate when the valve is in the open position.

Bleed Air Check Valve

The bleed air check valves are insert type, split flapper valves without return springs. The bleed air check valves prevent reverse flow of air into the eighth-stage ports.

Pylon Bleed Air Shutoff Valves

The pylon bleed air shutoff valve provides the capability to shut off all bleed air flow from the engine into the cross ship manifold and provides automatic pressure and temperature backup for the bleed air augmenter valves. The valve will automatically close in the event of an augmenter valve failure that would allow the pressure upstream of the pylon valve to exceed 100 PSIG.

Plyon Bleed Air Shutoff Valve Temperature Switch

Temperature override is provided by a downstream thermoswitch. The thermoswitch closes the pylon bleed air shutoff valve when failure of the temperature control function in either augmenter valve allows the duct temperature to exceed 650F (343C).

Wing Isolation Valves

The two AC motor actuated wing isolation valves, located in the cross ship manifold, enable the isolation of one wing duct from the other, which allows the airplane to be pressurized in the event of any single failure or malfunction in the bleed air system. Manual override is provided in the event of actuator failure. The valves are controlled by individual OPEN-CLOSE switches located on the environmental control panel and an indicator light illuminates when the valves are closed.

APU Isolation Valve

The two electrically operated APU isolation valves, located inboard behind the left hand and right hand APU compartment firewall, isolate the APUs and ATMs from the engine bleed air systems. The valves will automatically close in the event of a center duct overheat condition, or if the fire handle is pulled on the APU panel or loadmaster forward control panel. The valves are controlled by individual OPEN-CLOSE switches located on the environmental control panel, and an ISO VALVE OPEN indicator light illuminates when the valves are open.

Bleed Air Overheat Detection System

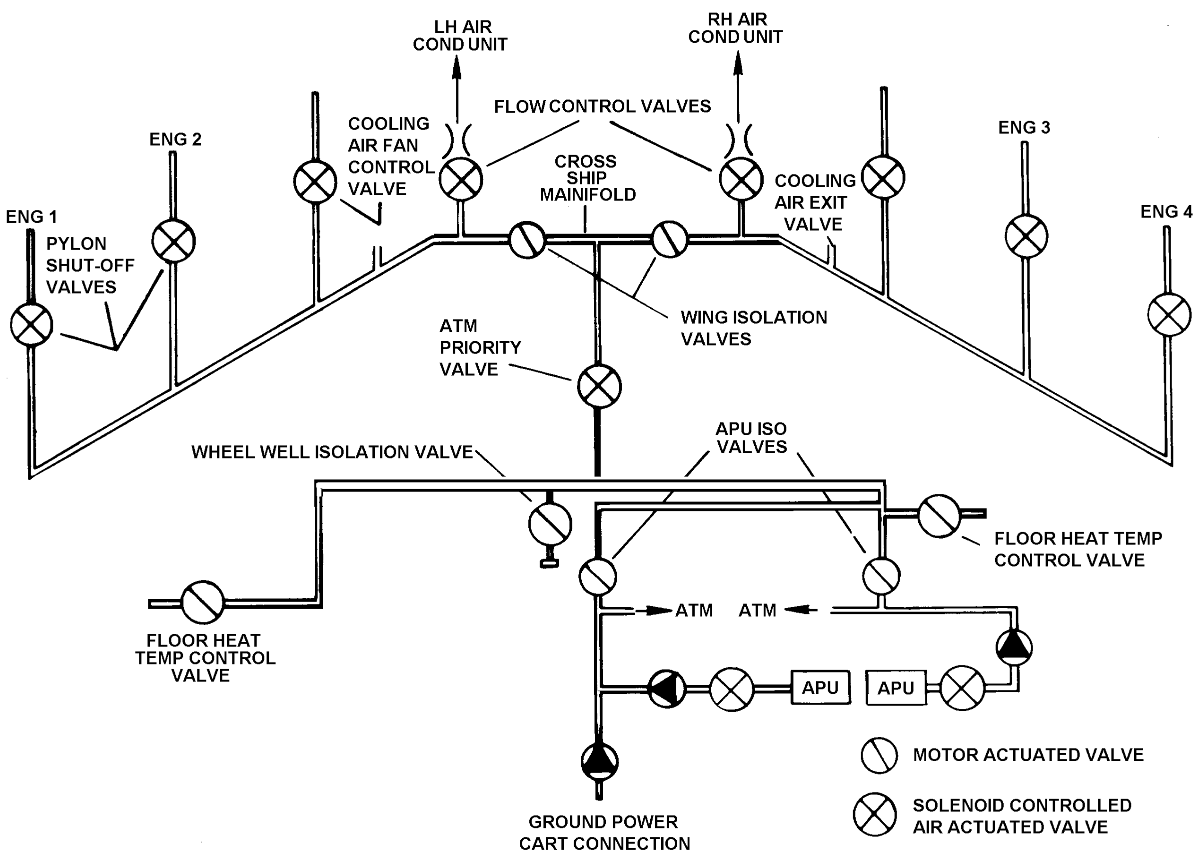
The bleed air overheat detection system is divided into three separate and independent systems designated as the left, right, and center system. The left system monitors the left wing and pylons bleed air ducting, left air conditioning bleed air ducting, primary heat exchanger ducting, refrigeration unit, ducting up to the secondary heat exchanger, and the ducting up to the upper deck temperature control valves. The right system monitors identical components on the right side of the airplane except the ducting that goes to the upper deck temperature control valves. The center system monitors the ducting between the wing isolation valves to the cargo floor temperature control valves, the APU control valves, and the APU isolation valves.

Bleed Air Manifold Pressure Indicating System

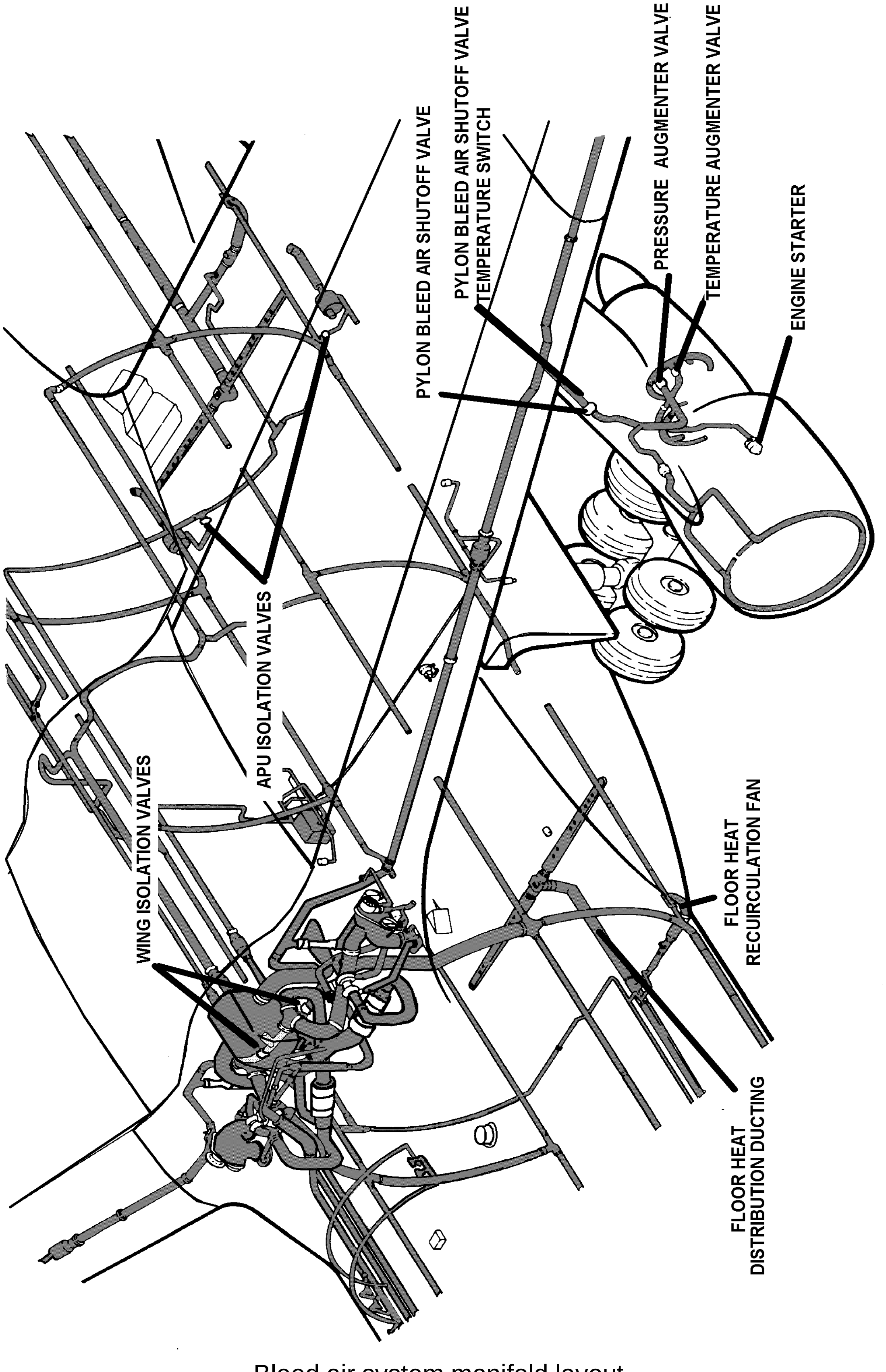
The bleed air manifold pressure indicating system consists of a synchro indicator and two synchro-sensor-transmitters. The sensor-transmitters are located in the cross ship bleed air manifold. The face of the indicator is calibrated to measure pressure from 0 to 120 PSI.

Bleed Air Flow Control and Shutoff Valves

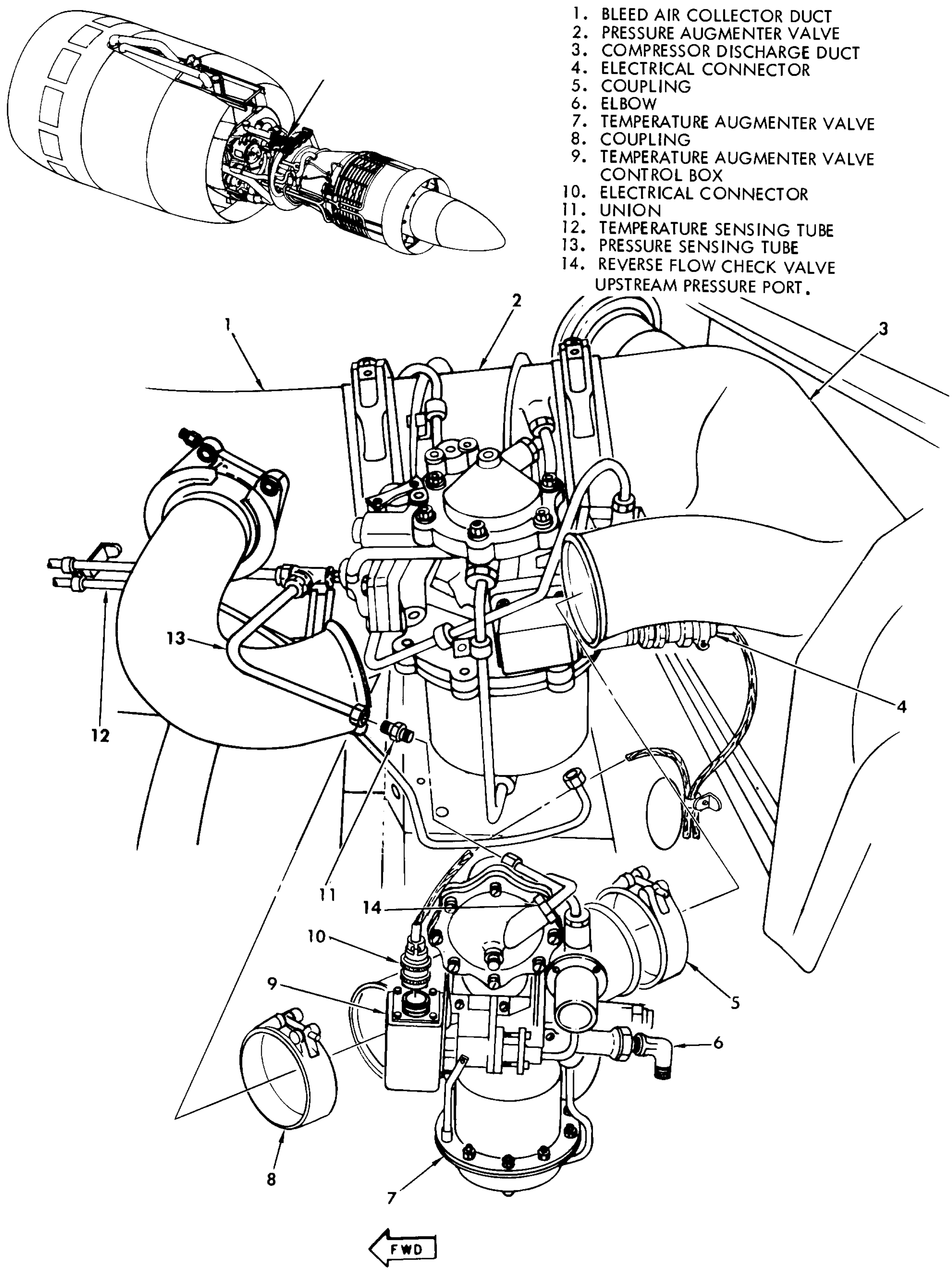
The bleed air flow control and shutoff valves, located between each of the air conditioning units and the cross ship manifold , provide the proper airflow rate required for pressurization, ventilation, heating, and cooling during all conditions of flight and ground operations. The valves have a secondary function of bleed air shutoff for the air conditioning systems. Each valve provides two flow rates which are dependent upon the airplane speed. The high rate is for airspeeds over Mach 0.3 and the lower rate is for all other airspeeds and ground operations.



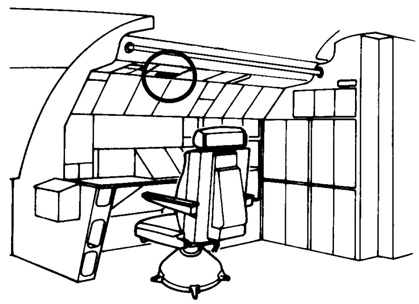
Bleed air system distribution diagram

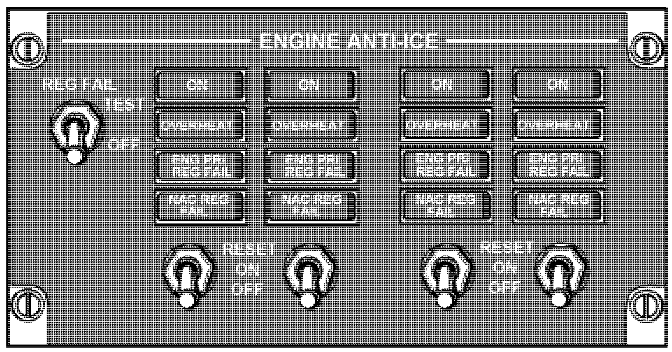


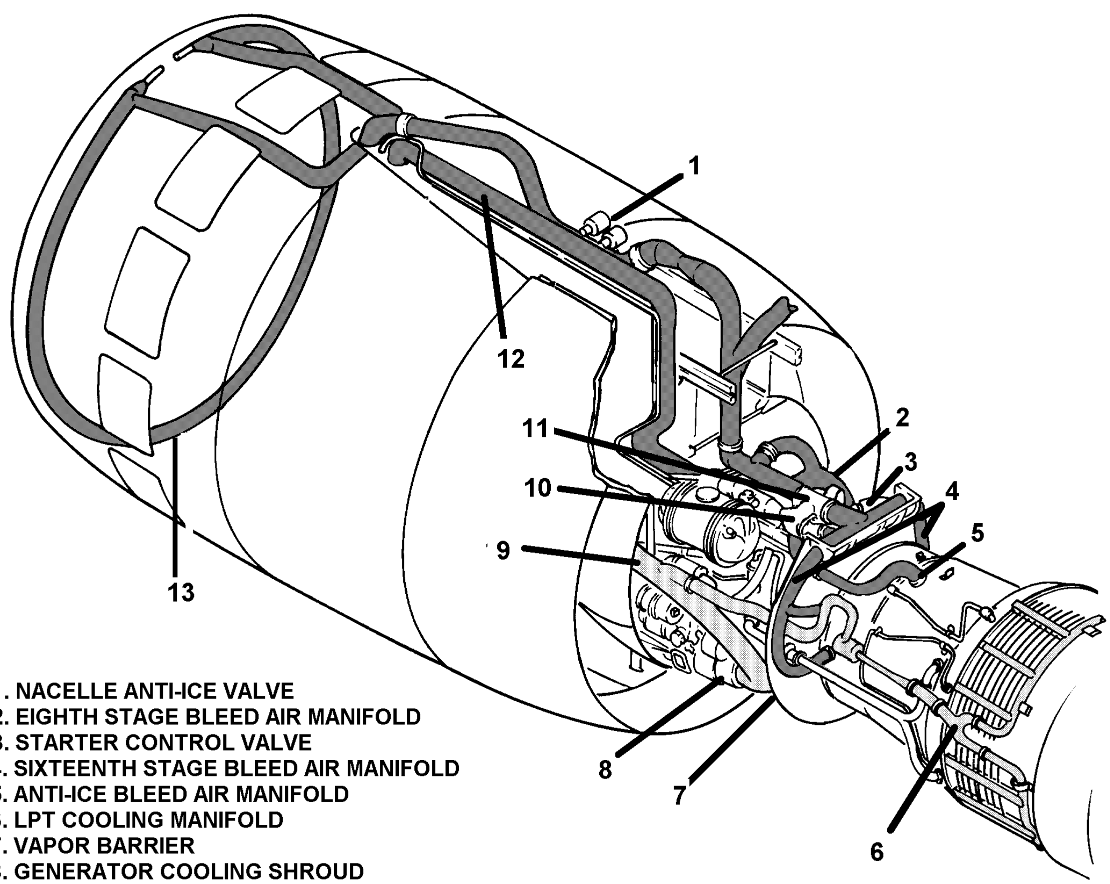
Bleed air system manifold layout



Pressure augmenter and temperature augmenter valves (typical)

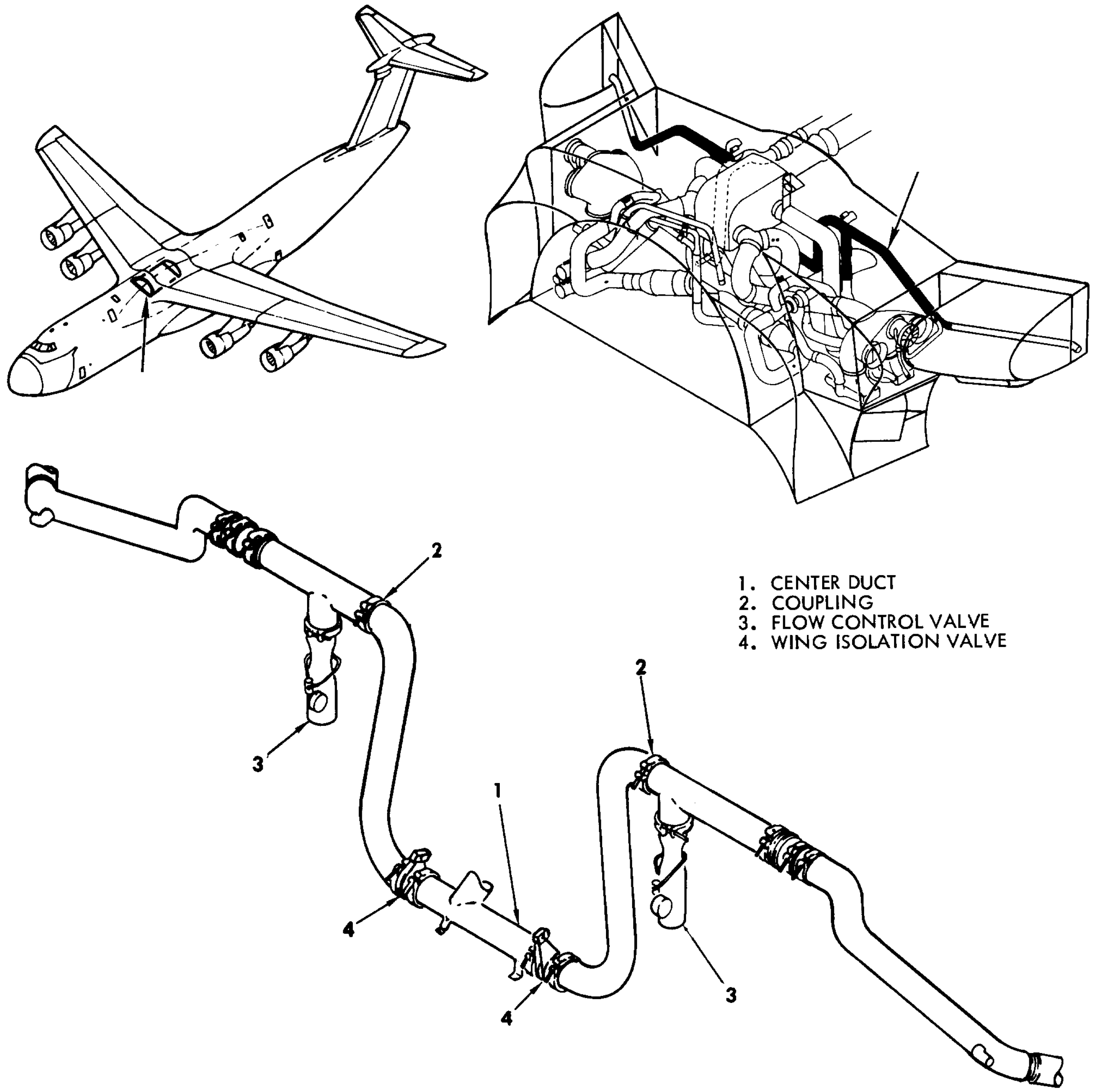




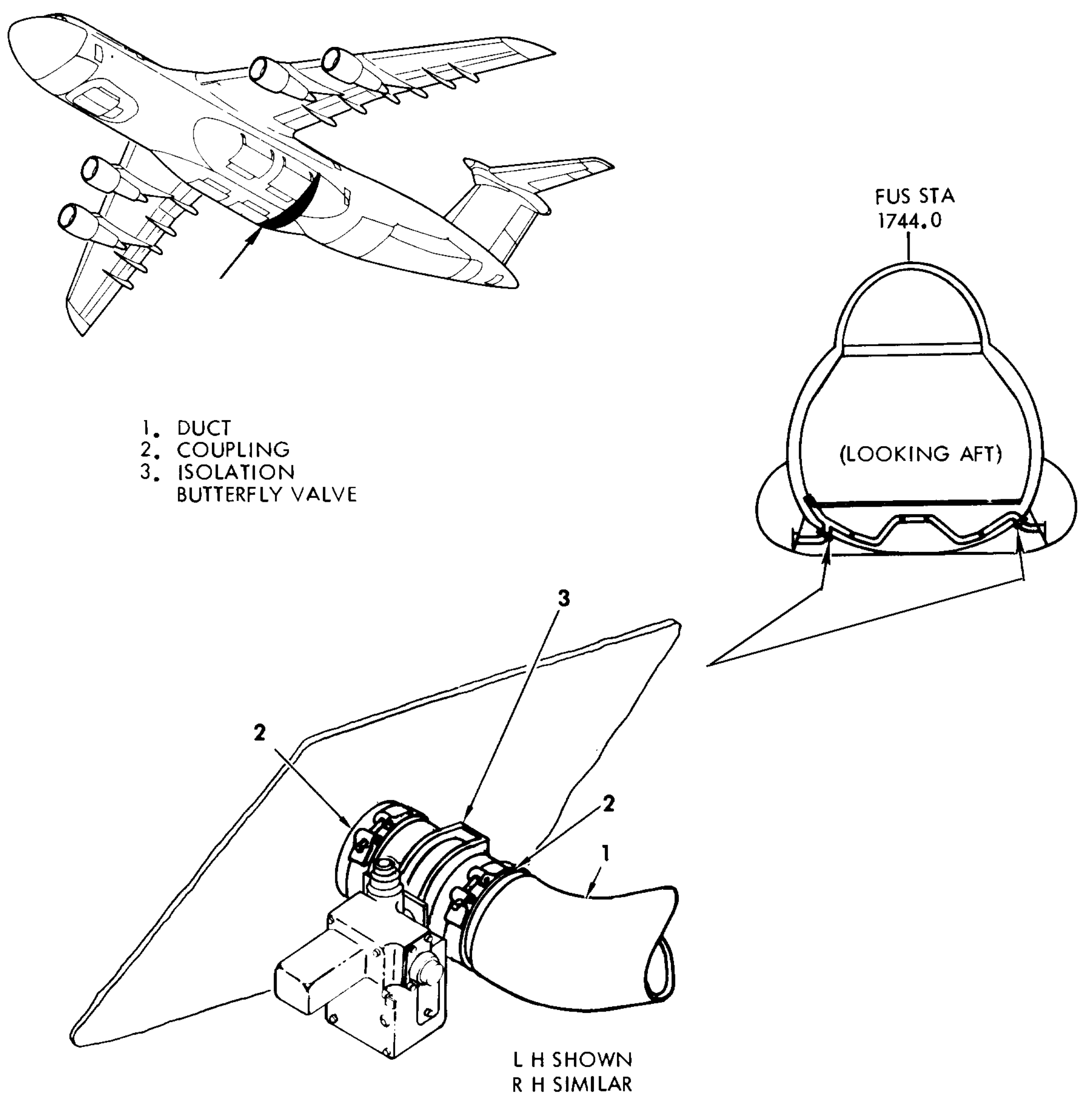


1. NACELLE ANTI-ICE VALVE
2. EIGHTH STAGE BLEED AIR MANIFOLD
3. STARTER CONTROL VALVE
4. SIXTEENTH STAGE BLEED AIR MANIFOLD
5. ANTI-ICE BLEED AIR MANIFOLD
6. LPT COOLING MANIFOLD
7. VAPOR BARRIER
8. GENERATOR COOLING SHROUD
9. RAM AIR INLET MANIFOLD
10. BLEED AIR TEMP AUG VALVE
11. BLEED AIR PRESS AUG VALVE
12. ANTI-ICE DUCT TO FAN INLET GUIDE VANES
13. NACELLE INLET ANTI-ICE DUCT

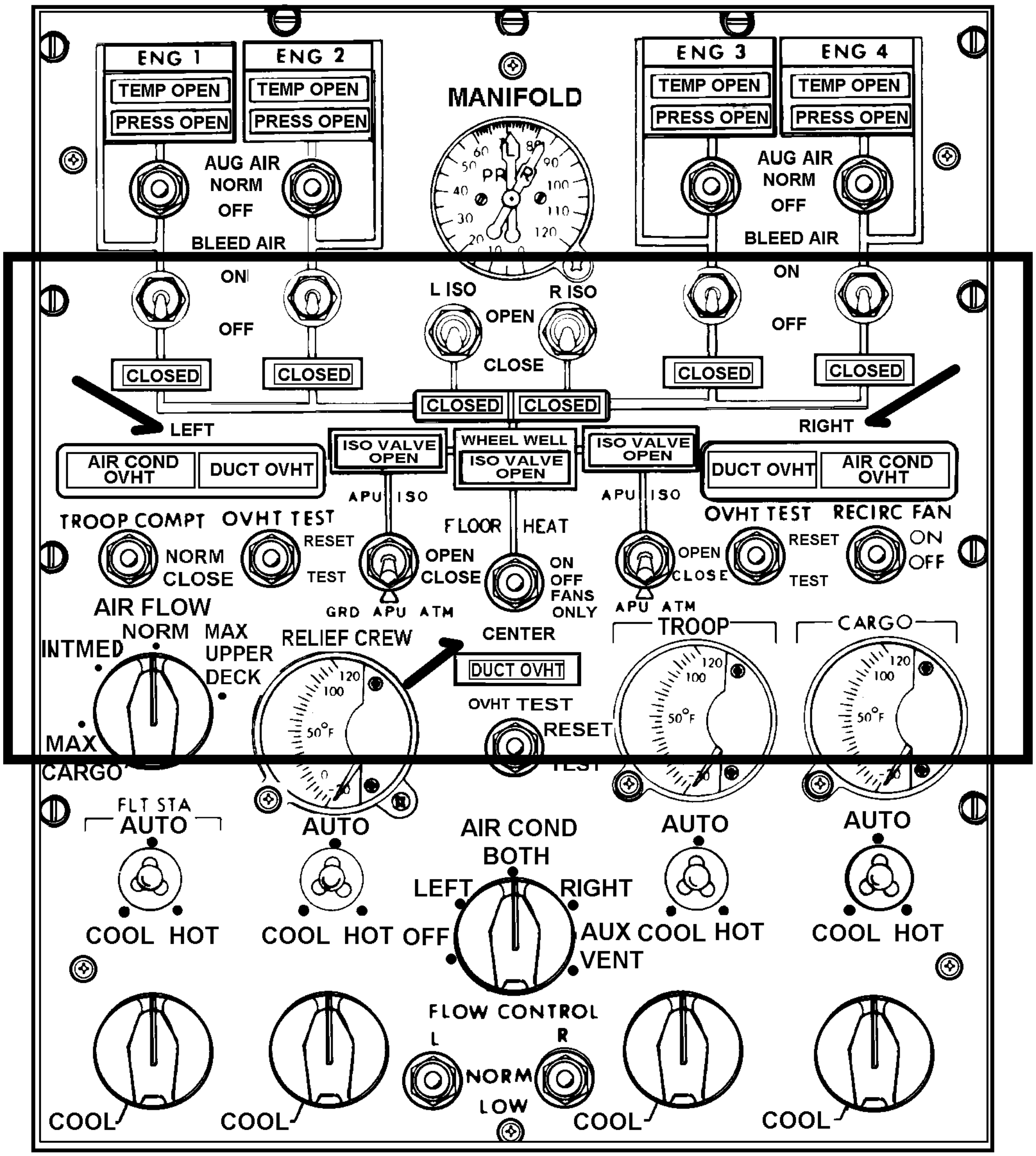
Engine bleed air system components and control panel



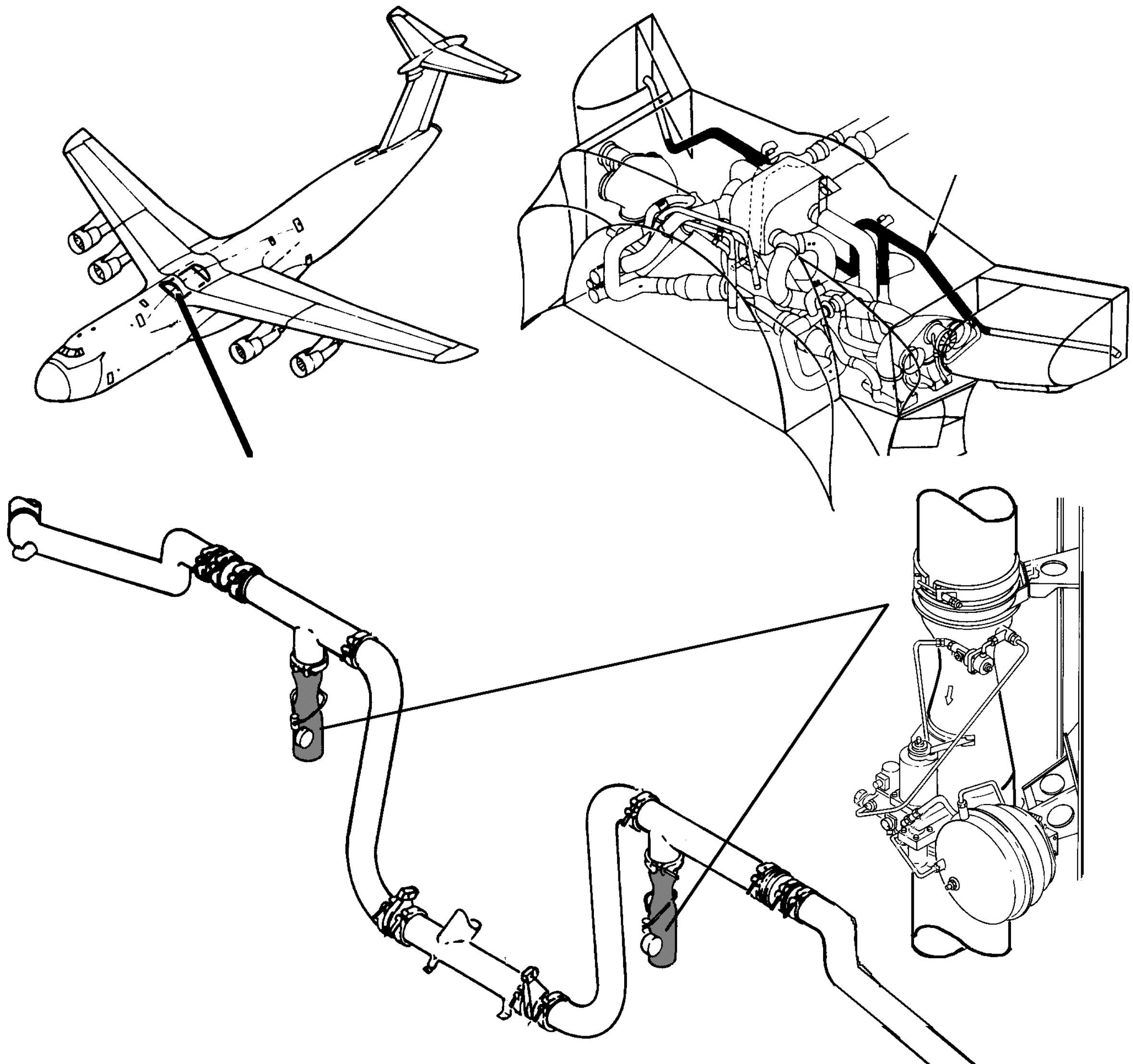
Wing isolation valves and cross ship manifold



APU isolation valves



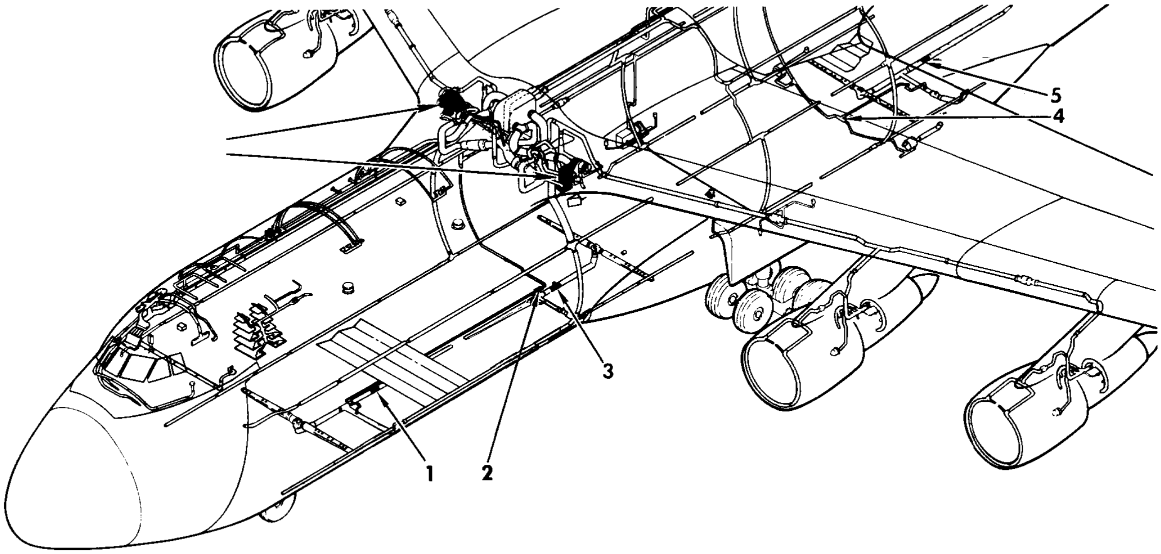
Bleed air overheat detection and control

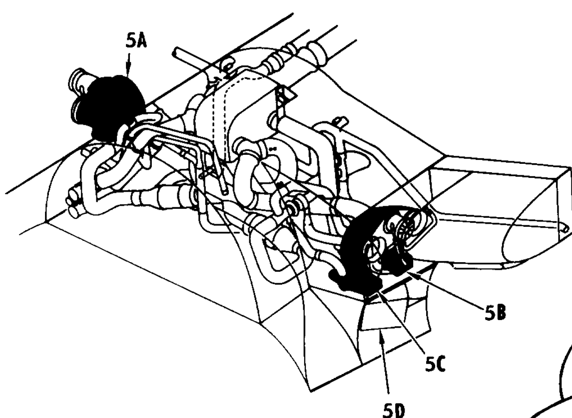


Bleed air flow control and shutoff valves

Cargo Floor Heat System

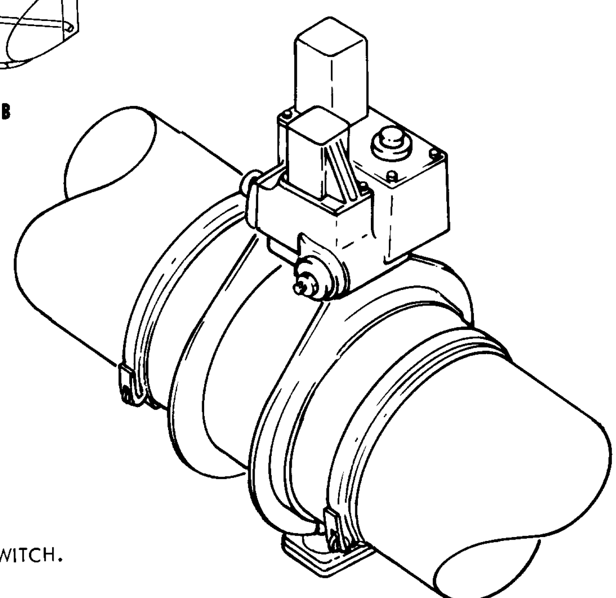
The cargo compartment floor from the forward ramp hinge to the aft ramp hinge is provided with heating facilities for use on the ground or in flight. Heating is accomplished by distributing a mixture of bleed air and recirculated cargo compartment air beneath the floor. The mixed air is channeled under the floor through longitudinal distribution ducts. Some of this air flows to longitudinal air passages in the floor structure in the area of the wheel wells. The remaining air flows through risers into lateral air passages formed by the floor, floor supports, and a fabric isolation panel which directs the hot air against the floor to prevent excessive heat loss to the outer fuselage structure. The air is then discharged into the underfloor space from which it returns to the cargo compartment through air passage holes in the chine. The forward and aft floor heat systems are controlled by a single switch located on the environmental control panel.





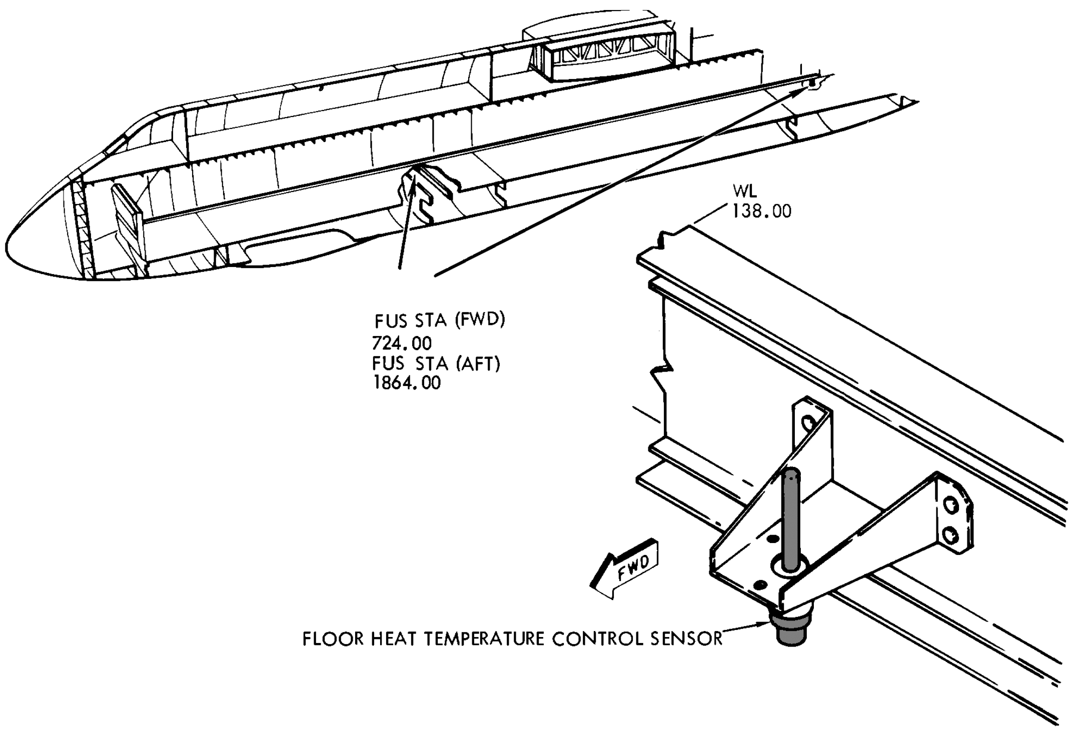
1. FORWARD CARGO COMPARTMENT FLOOR HEAT RATE-OF-CHANGE AND HIGH LIMIT SENSOR, AND FLOOR OVERHEAT SWITCH.
2. FORWARD CARGO COMPARTMENT FLOOR HEAT TEMPERATURE CONTROL VALVE.
3. FORWARD CARGO COMPARTMENT FLOOR HEAT OVERHEAT SWITCH.
4. AFT CARGO COMPARTMENT FLOOR HEAT TEMPERATURE CONTROL VALVE.
5. AFT CARGO COMPARTMENT FLOOR HEAT AND HIGH LIMIT SENSOR, AND FLOOR OVERHEAT SWITCH.

5A. COOLING AIR INLET DUCT.
5B. PRIMARY HEAT EXCHANGER.
5C. SECONDARY HEAT EXCHANGER.
5D. COOLING AIR EXIT VALVE.

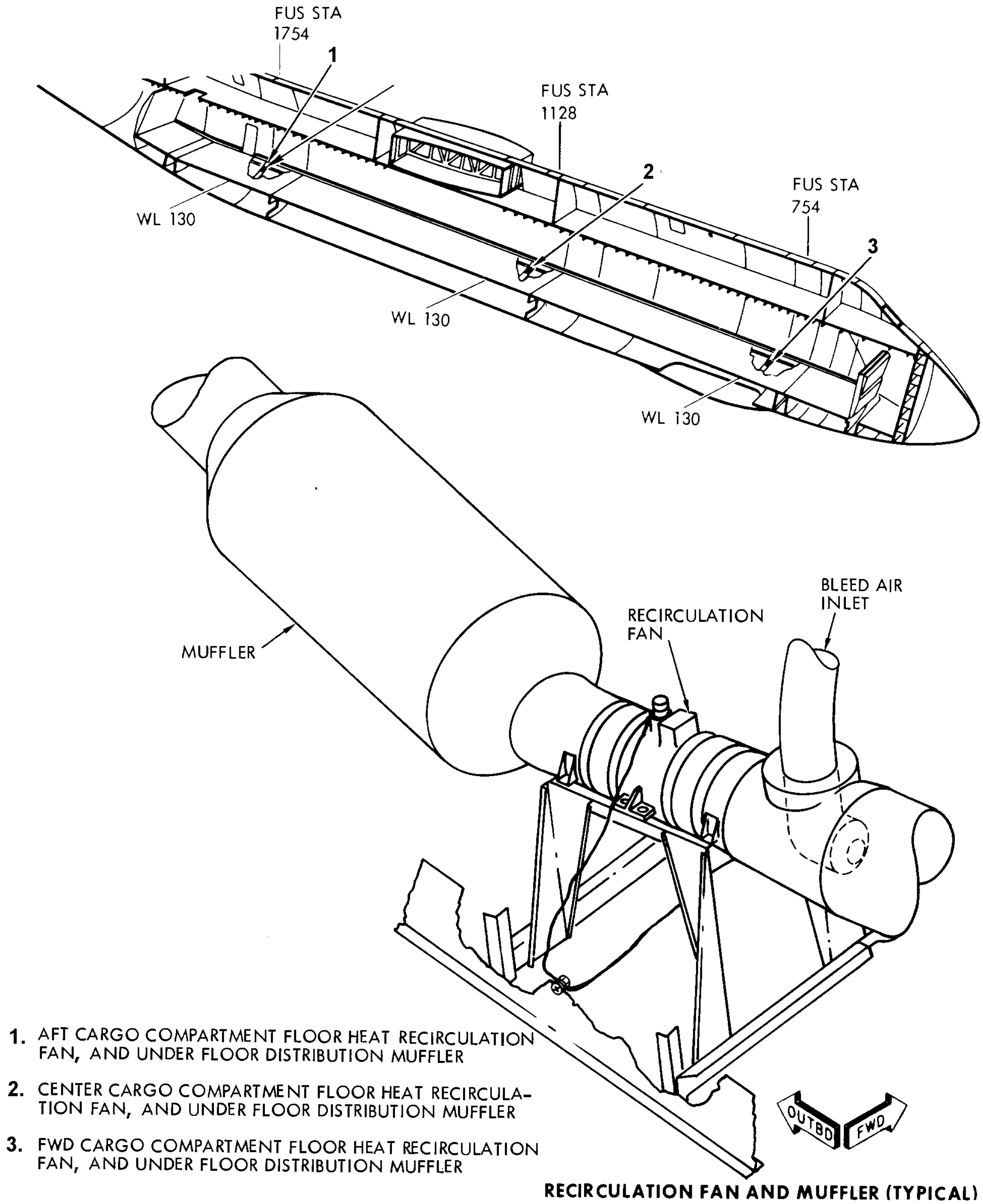


TEMPERATURE CONTROL VALVE (TYPICAL)

Cargo floor heat system diagram



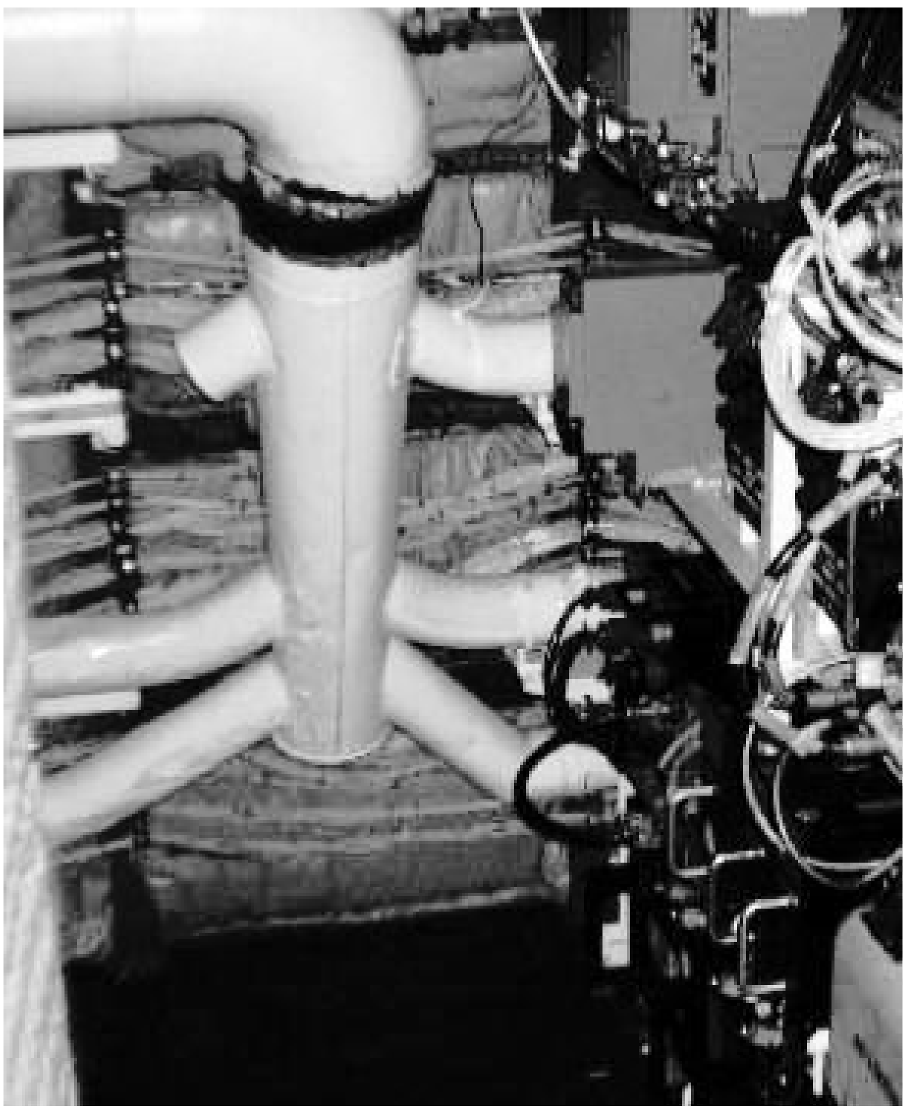
Floor heat system temperature sensors



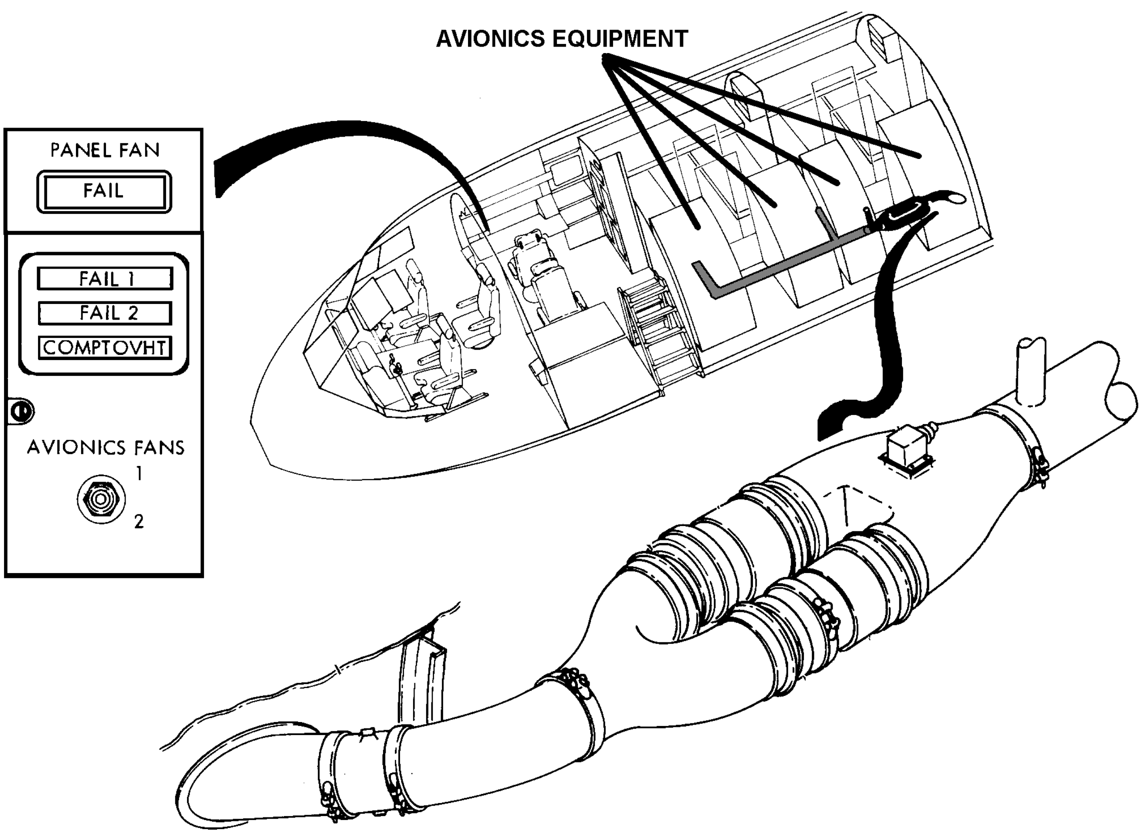
Floor heat recirculation fans

Avionics Equipment Cooling System

Both fan-powered air induction and free air convection are used to cool the electronic equipment, instruments, and circuit breakers to maintain acceptable temperatures around the equipment. The avionics compartment is cooled by an induced air system. The air is drawn through two cooling air inlets into the compartment and exhausted overboard by one of two duct-mounted exhaust fans. Should one fan fail the other automatically assumes the load. The MADAR display equipment is cooled by a fan-induction air system. Ducts also provide airflow around the circuit breaker panel, flight engineer's control panel, and pilot's and copilot's main instrument panels. The avionics equipment cooling system controls and indicators are located at the flight engineer's station adjacent to the hydraulic control panel.



Avionics cooling ducts



Avionics equipment cooling fans

Cabin Pressurization Control System

The cabin pressurization control system regulates pressurization of all occupied compartments and may be operated either automatically or manually. The cabin altitude selector permits selection of cabin altitude, cabin rate-of-climb or descent, landing field elevation, and correction for local barometric conditions. The cabin pressure regulator outflow valve is electrically powered for all modes of operation. The cabin pressurization controls and indicators are located on control panels at the flight engineer's station.

The cabin pressure regulation system consists of outflow valves, safety valves, negative pressure relief doors, control box, manual controller, emergency depressurization switch, cabin altitude selector, and the mode selector switch.

Cabin Negative Pressure Relief Doors

The negative pressure relief doors are located in the aft pressure bulkhead of the troop compartment. These doors are part of the bulkhead structure and are restrained by a spring-loaded latch which automatically releases the doors to vent the cabin if a negative pressure condition exists.

Cabin Pressure Relief Valves

The cabin pressure relief valves are located on the cargo compartment aft pressure bulkhead, one on each side. These valves, which function on differential pressure, are independent of any other airplane system. The valves are programmed to prevent cabin pressure from exceeding 8.7 PSI in the event of failure of the automatic pressurization system or improper manual control settings. Either valve has sufficient flow capacity to regulate the required maximum pressure.

Cabin Altitude And Differential Pressure Indicator

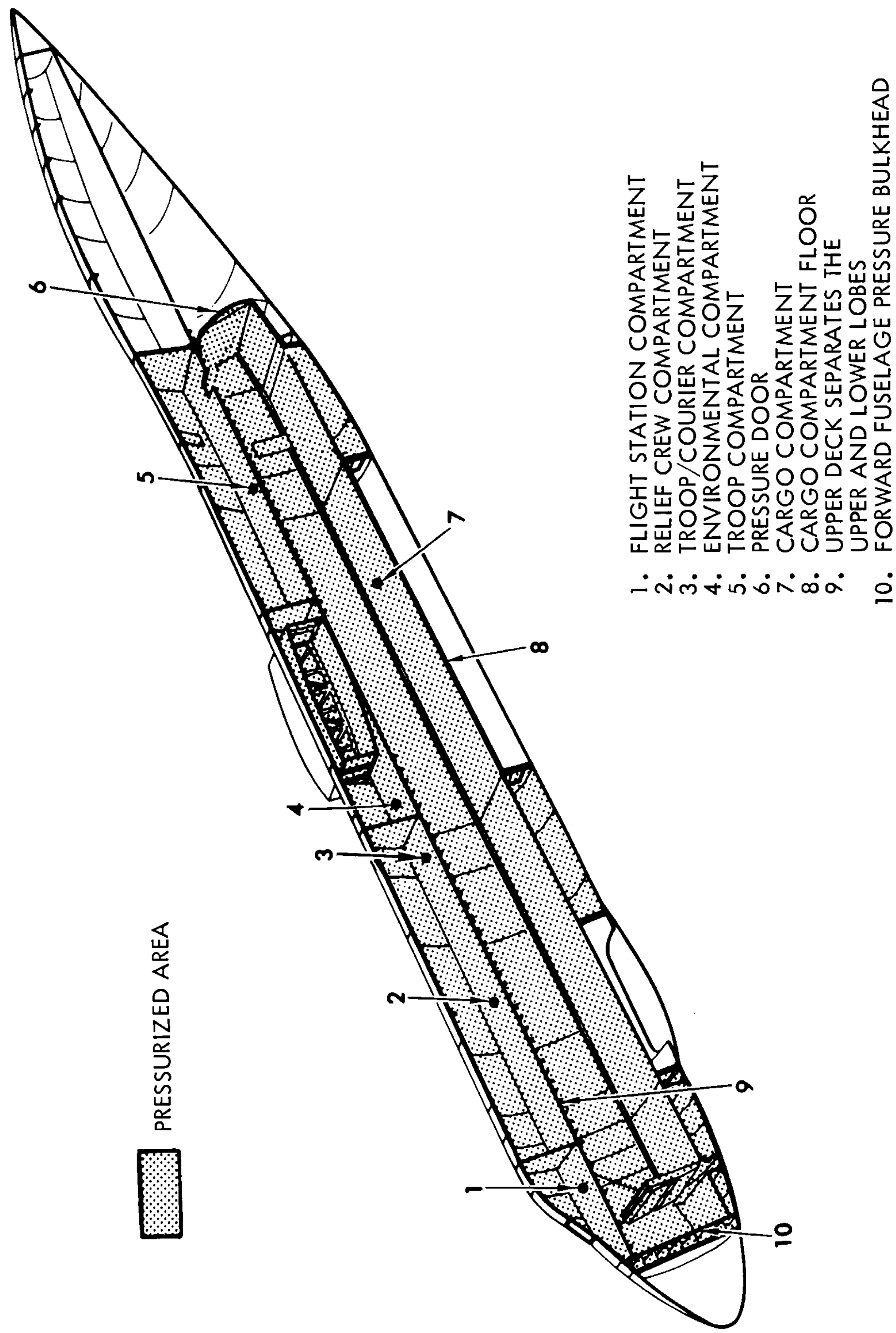
The cabin altitude and differential pressure indicator is an integrally lighted instrument that indicates the cabin pressure altitude and the pressure difference inside and outside of the airplane. There are two scales on the face of the meter. One scale is calibrated to indicate altitudes of from 0 to 50,000 feet. The other scale is calibrated to indicate pressures of from 0 to 10 PSI. The instrument has two pressure ports. One port is connected to the airplane static pressure system. The other port is open to the cabin air. Power for the instrument lighting is obtained from the INSTRUMENT LIGHTING bus in the flight engineer's lighting control panel.

Cabin Altitude Selector

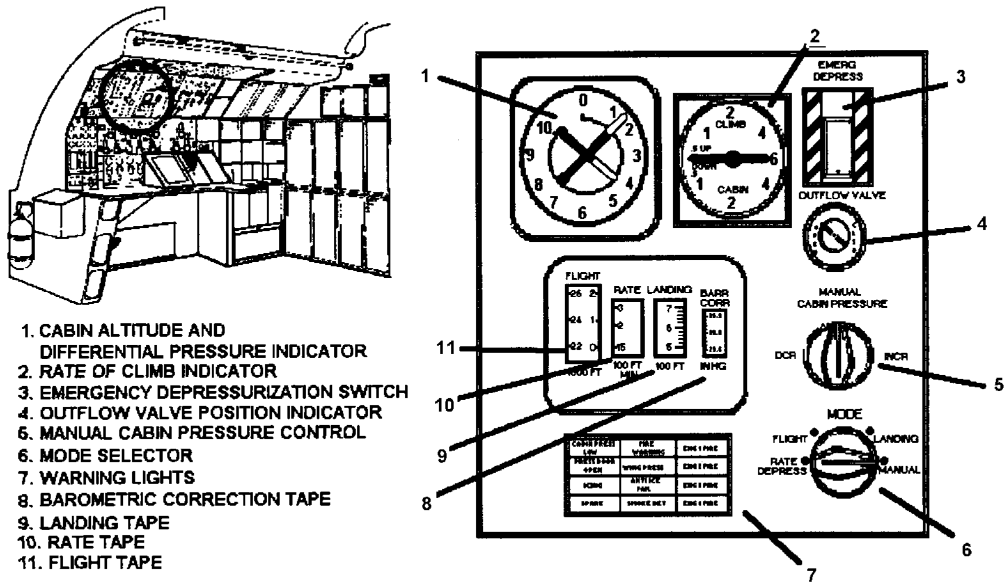
The cabin altitude selector provides the flight engineer with the means to make selections of cabin altitude, cabin rate of climb or descent, landing field elevation, and correction for local barometric conditions at the landing field. The selections are shown on taped displays.

Cabin Pressure Regulator Outflow Valve

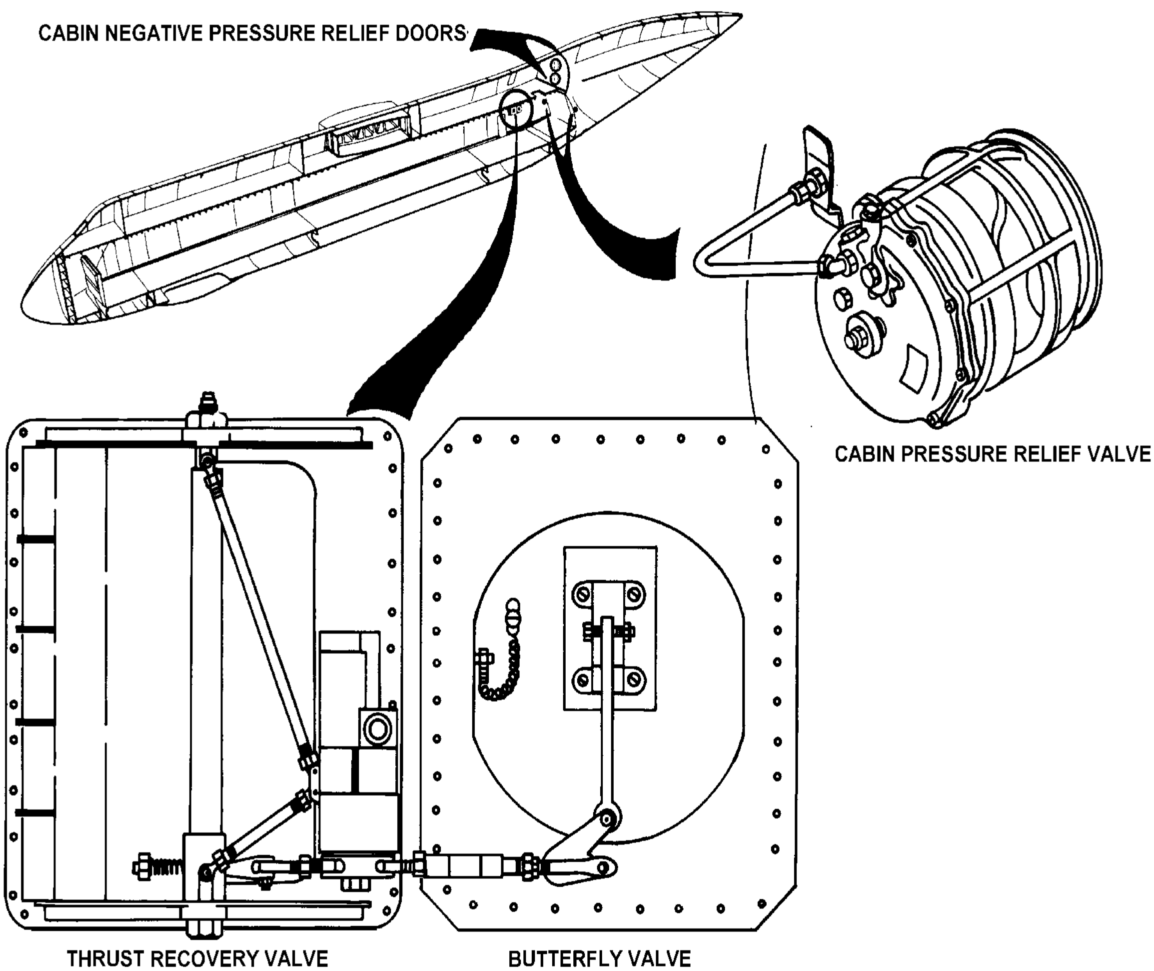
The cabin pressure regulator outflow valve is electrically powered for all modes of operation utilizing two actuators and a single drive mechanism. The valve is divided into two separate sections consisting of a thrust recovery valve and a butterfly valve. The thrust recovery valve controls the overboard flow of cabin air during all normal flight conditions while the butterfly valve is closed. The butterfly valve is opened during ground operation, unpressurized flight, and for emergency depressurization.



Aircraft pressurization envelope



Cabin altitude and differential pressure indicator



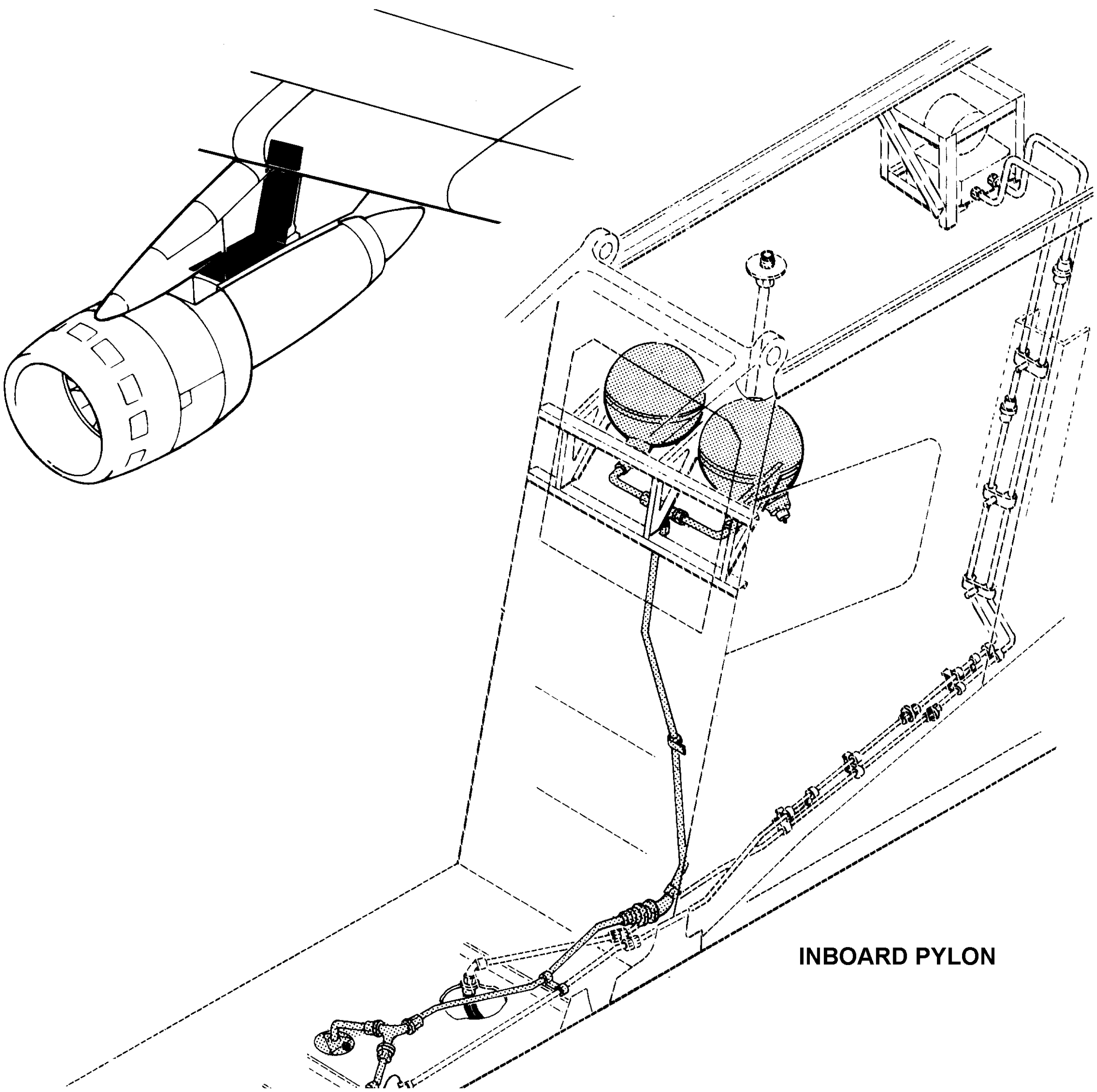
Pressure regulation system components

Engine and APU Fire Extinguishing Systems

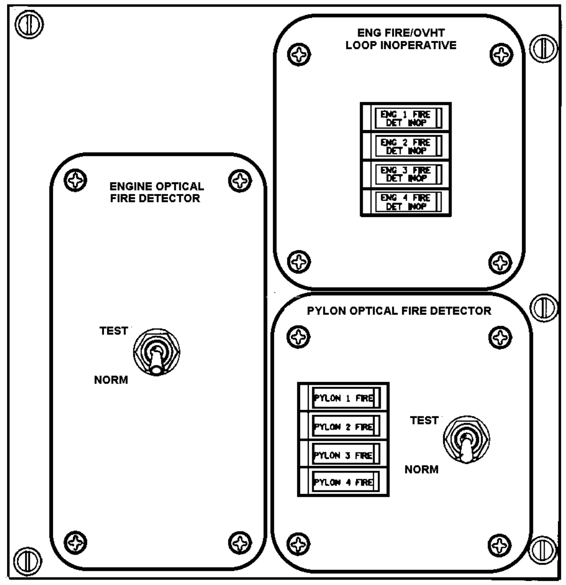
A high-rate-discharge fire extinguishing system is provided, using dibromodifluoromethane (CBr2F2) as the agent. Three identical subsystems are installed, one in each inboard pylon and one at the APU location in the fuselage. Each engine/pylon subsystem serves the two engines on its side of the airplane and provides two discharges to one nacelle, or one discharge to each nacelle. The fire extinguishing agent is piped to the upper forward section of the engine which encloses the high pressure compressor and to the upper aft section which encloses the combustion-turbine section. The agent will flow down and around both sides of the engine. The fire extinguishing agent is contained in four nitrogen pressurized spherical containers two of which are located in the upper portion of each inboard engine pylon. The fire extinguishing system receives 28-volt DC power from two independent sources: the battery bus and the isolated DC bus. Each container has two outlets (each actuated by pyrotechnic squib) and a pressure gage. One outlet of each container is connected to one outlet of the other container so that either container can be discharged into either nacelle.

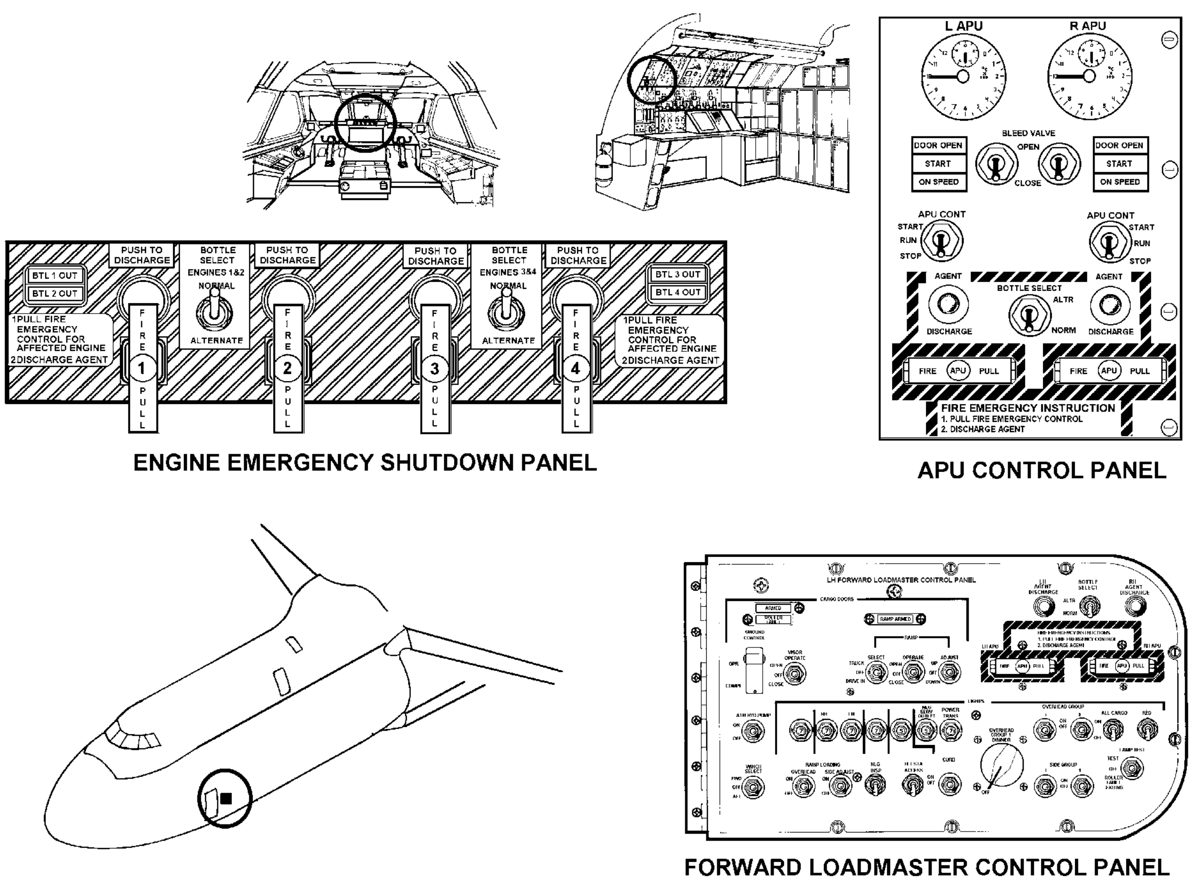
The APU fire extinguishing system is similarly a dual, high-rate-discharge system using two agent containers located in the lower aft corner of the right main landing gear wheel well. The system is capable of discharging one container into each APU compartment, or both containers into one compartment.

The engine and APU fire extinguishing system provides a remote means to put out fires that occur in the engine nacelle and APU compartment. Actuation of the system is accomplished by pulling the fire handle at either the forward left loadmaster's control panel or on the APU control panel and the engine emergency shutdown control panel at the pilot's station. When the handle is pulled the agent discharge switch is exposed. Depressing the switch causes an electrical squib in the pressurized extinguishing agent bottle to discharge the agent. The shuttle valve permits the discharging of the extinguishing agent from more than one bottle if required. Fire warning lights on the pilot's annunciator panel indicates need for actuation of the extinguishing system.



Engine fire extinguishers



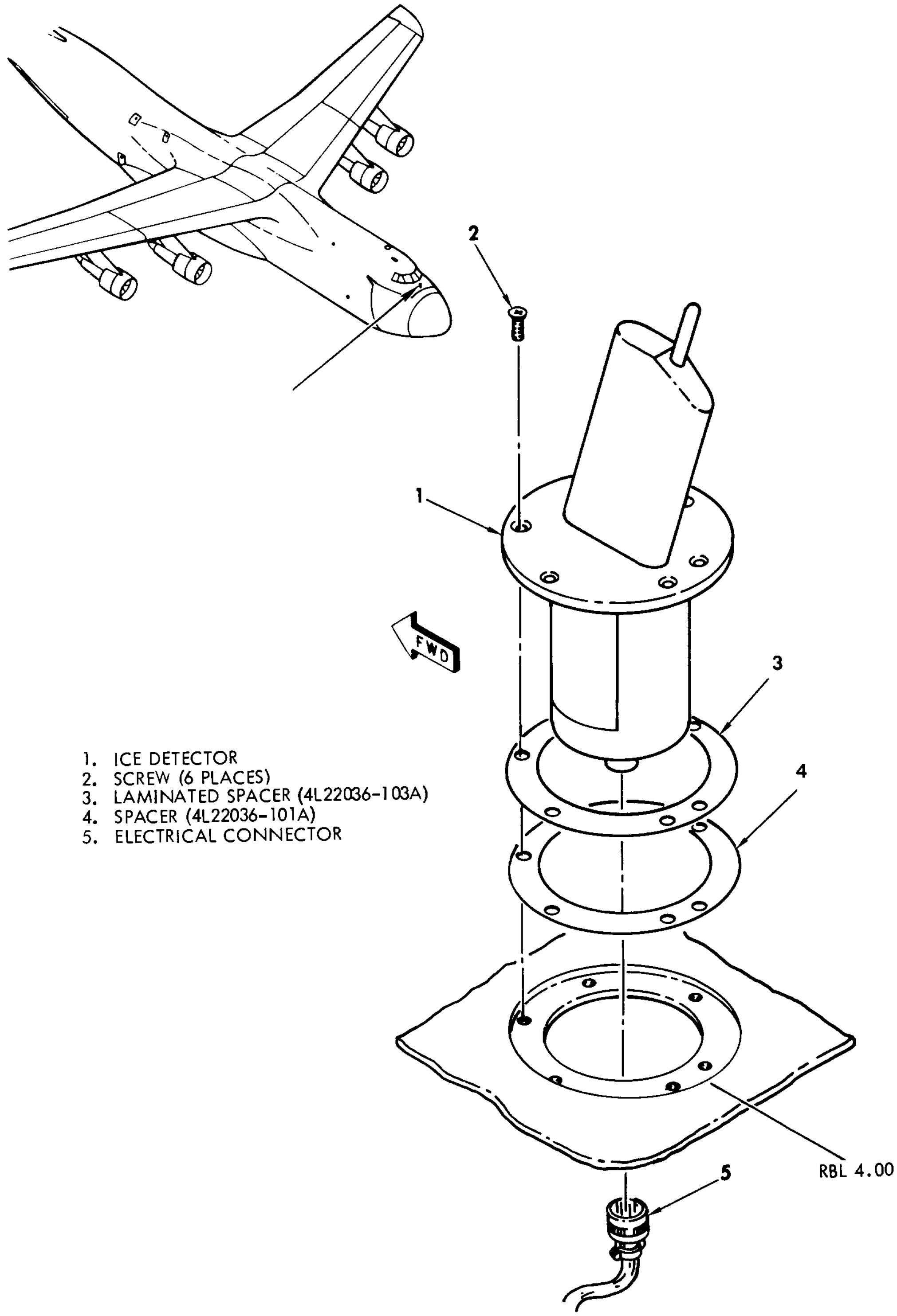


Engine/APU fire extinguishing indication and control panels

Ice Detection System

The ice detection system provides an indication when icing conditions are encountered. The ice detection system consists of an ice detector, control panel, and a warning light. The ice detector is mounted to the skin of the airplane at FS 315.5, WL 335, and RBL 4.0. The ice detector control panel is mounted in the flight engineer's overhead panel. The ICING warning light is located on the cabin altitude and pressurization control panel mounted in the flight engineer's overhead panel. Power to the ice detection system is supplied through flight engineer's circuit breaker panels No. 3 and No. 5.

The ice detector consists of a reference oscillator and an oscillating probe. When the probe starts to ice, the frequency of the two oscillators synchronize providing an output signal to energize the anti-icing system and operate the ICING warning lights. The ice detector panel provides the control for the ice detection system and routes the output signal from the ice detector to the anti-icing system. A heater and control circuit inside the ice detector deices the probe and strut within 10 seconds after encountering ice. Should icing conditions still exist, the ice detector recycles 60 seconds after the last icing signal and continues to recycle until icing signals cease. The ice detection system remains in an armed condition until icing is again encountered.

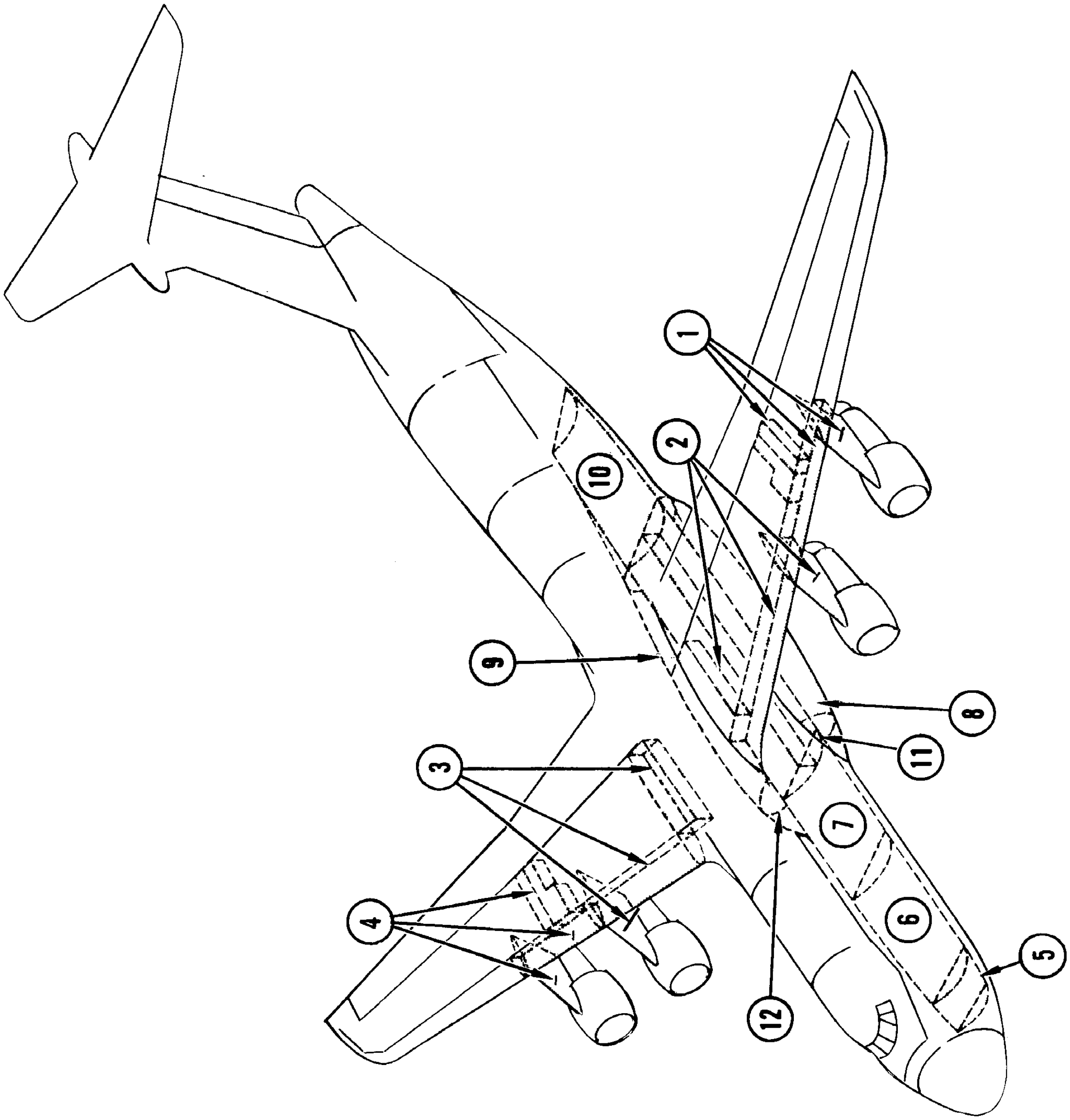


Ice detector assembly (typical)

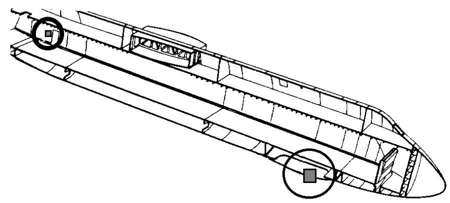
Nitrogen Fire Fighting System

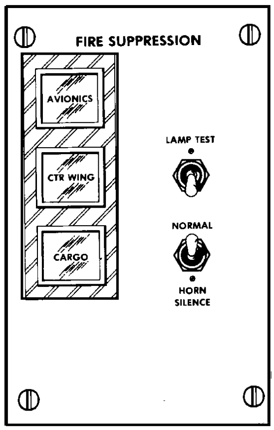
The nitrogen fire fighting system provides the means for suppression and fighting fires in unoccupied areas of the airplane. The fire fighting capability is established through fire fighting valves which spray liquid nitrogen into a designated zone or zones, in which a fire condition had been sensed by continuous thermal sensors (CTS). The nitrogen fire fighting capability is distributed in unoccupied areas of the airplane designated as fire zones 1 through 12. In operation, a fire condition is sensed in one of the unoccupied areas by the CTS in the area. A switch in the CTS responder closes, transmitting a signal to the central processing unit (CPU). Signals are transmitted to the flight engineer's nitrogen fire suppression panel where they cause the appropriate alarm indicator to come on. Signals also are transmitted to the nose wheel well panel where the corresponding alarm indicator lights come on. If the airplane is on the ground, two internal horns will also blow. The ARM/PANEL SAFE switch on the flight engineer's FE1301 fire suppression (AF66-8303 through AF70-467), fire suppression (AF83-1285 and up) panel is placed in the ARM position. If the subsystem is to be activated from the nose wheel well panel, the POWER/ARM/PANEL SAFE switch is placed in the POWER/ARM position. Either of the switches will perform the same function, arm only their respective alarm indicator switches with 28 volts. When an arm switch is activated, an ARMED indicator light on the FE 1301 fire suppression (AF66-8303 through AF7()-467), fire suppression (AF83-1285 and up) panel comes on. When a discharge switch on an armed panel is pressed, both master fire fighting valves will open, charging the nitrogen fire fighting manifold with liquid nitrogen. The zone valve for the zone switch pressed will open and liquid nitrogen will be discharged into the zone area where the excessive temperature was sensed. The amount of nitrogen discharged is electronically determined by circuitry in the flow timer card in the CPU. Both the MANIFOLD PRESSURE and the DISCHARGE lights on the nitrogen fire suppression panel go on to indicate the flow of nitrogen into the zone.

In addition to the above, an optical fire detection system is added to indicate a fire in the forward box structure area of each pylon. This system consists of an optical fire sensor located in each pylon that switches on when a fire is detected. This activates the FIRE WARNING annunciator lights at the pilot's and flight engineer's panels and the PYLON FIRE light at the flight engineer's panel to indicate fire location. Pylons 1, 2, 3, and 4 optical sensors are located in nitrogen fire suppression zones 1, 2, 3, and 4, respectively. Also, any time one or more engines are running, the CPU will automatically discharge nitrogen into zones 1, 2, 3, or 4 when a fire condition is detected by the continuous thermal sensor located in those zones.

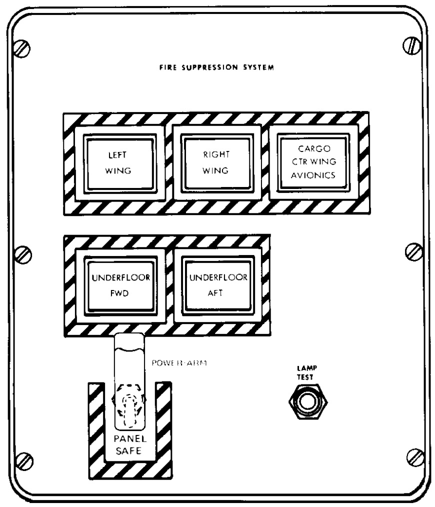


Fire suppression zones

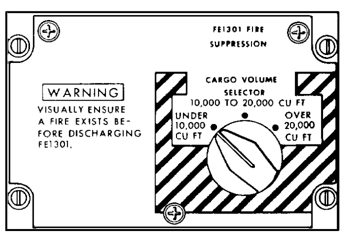




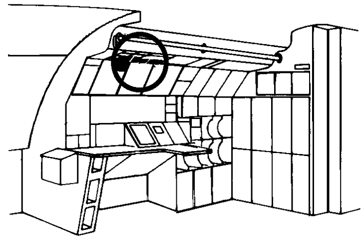
FIRE SUPPRESSION SYSTEM (FSS) CONTROL PANEL CARGO COMPARTMENT



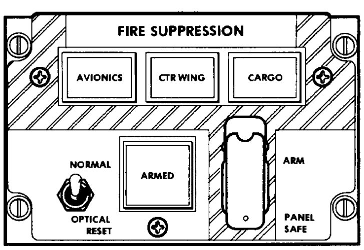
NOSE WHEEL WELL NITROGEN AND FE 1301 FIRE SUPPRESSION CONTROL PANEL NOSE WHEEL WELL



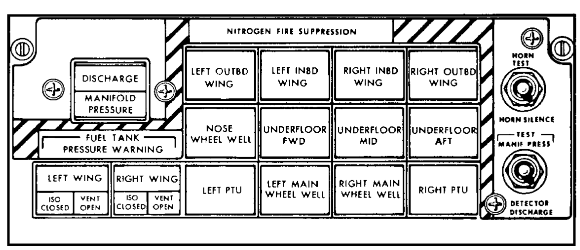
FE 1301 FIRE SUPPRESSION CONTROL PANEL



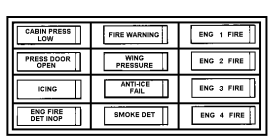
FLIGHT ENGINEERS STATION



FIRE SUPPRESSION SYSTEM (FSS) CONTROL PANEL



NITROGEN FIRE SUPPRESSION CONTROL AND INDICATOR PANEL



FLIGHT ENGINEERS ANNUNCIATOR PANEL

Flight engineer’s FSS controls

Fuel Tank Inerting and Fire Suppression System (FSS)

Storage and Inerting Subsystem

Three distinct functions are performed by the components that comprise the system: (1) the storage of liquid nitrogen; (2) inerting of the fuel tank by: (a) scrubbing process as a result of which oxygen dissolved in the fuel is removed and vented overboard to maintain the oxygen concentration in the fuel tanks under nine percent at all times, and (b) pressurizing the wing tanks with nitrogen to exclude atmospheric air containing oxygen out of the tanks and vent boxes while maintaining a slight positive nitrogen pressure in the fuel tank vapor space.

Dewars

There are two identical dewars, which are pressure vessels, each with a capacity of 110 gallons of liquid nitrogen. One dewar is mounted on each side of the wing center section. Liquid nitrogen is introduced to the dewars through the fill couplings.

Dewar Isolation Valves

A dewar isolation valve is located on each dewar. The isolation valve provides the means to supply nitrogen from a dewar to the scrub and pressurization subsystem. In normal use the operation of the isolation valves is automatic. The valves open and close in response to pressure differentials or by electrical signals. The isolation valves may be opened and closed manually by use of the pressure limiter manual override controls in the cargo compartment crossover, or pneumatically by the pressure limiters via the priority valve. In addition, the isolation valve will close automatically when the dewar pressure falls to a predetermined level, to prevent moisture, air, or fuel vapor from entering the dewar.

Dewar Relief Valves

The dewar relief valves protect the dewars from overpressure. Should the pressure in either dewar exceed 65 PSIG, the dewar relief valve will open, venting the excessive pressure overboard through the overboard vent line. On later model relief valves, a manual override handle is provided as a method to relieve dewar pressure for ground maintenance.

Liquid Nitrogen Service Panel

The service panel, containing controls and indicators pertinent to the inerting and servicing process, is located in the right main landing gear wheel well. The service panel provides the means for electrically interconnecting the C-5 airplane and airplane-installed components of the FSS to the ground service unit (GSU). An interval timing component card is in stalled in the service panel to provide a 4-minute timing interval if the differential pressure (outboard main tanks to vent box) switches or the float switch in the vent boxes in each wing are caused to actuate. The output of the interval timer controls the time the isolation valves are closed.

Inerting System Aspi-scrubbing Function

The aspi-scrubbing function scrubs the fuel during refueling to such a low level of oxygen concentration that no additional scrubbing is required during climb. The fuel coming out of the fuel level control valve is collected by a shroud which is connected to an aspirator by a tube. The aspirator draws nitrogen in from the tank's ullage (which is pressurized from the vent box through the vent lines) and mixes it into the fuel. The ullage is pressurized with nitrogen by the fuel tank pressurization system through the vent system. The fuel will not be inerted (scrubbed) if fuel tanks are not pressurized with nitrogen. The fuel gets scrubbed while passing through the aspirator into a vortex gas separator where the oxygen contaminated nitrogen is separated from the fuel. This gas is directed to a nozzle through which the gas flows into the vent line and overboard. The fuel still swirling flows from the separator into a deswirler then to the bottom of the fuel tank. The fuel entering the tank is scrubbed to approximately five percent oxygen concentration which is low enough that it will not contaminate the ullage at altitude when the fuel releases its remaining dissolved oxygen. The ullage remains below nine percent oxygen concentration level at all times.

Heat Exchanger

Six heat exchangers, three in each wing, are used to gasify the liquid nitrogen prior to entrance into the vent boxes for pressurizing purposes. Each set of three heat exchangers is arranged so that the nitrogen flows through the three in series. The heat exchangers are located in the No. 1 and No. 4 main tanks.

Primary Climb and Dive Valve

A primary climb and dive valve is located in the vent box of each wing. The primary climb and dive valve is physically attached to the secondary climb and dive valve and together they have the nomenclature of vent valve assembly. The function of the primary climb and dive valve is to maintain a slight positive differential pressure in the vent box in order to prevent air from entering the fuel tanks. As the airplane ascends and descends and the pressure differential between the vent box and ambient pressure changes, the primary climb and dive valve maintains the predetermined differential pressure by either venting to the atmosphere in the event of increasing pressure within the fuel tanks, or opening and allowing an inflow of air if the pressure within the fuel tanks becomes less than ambient.

Secondary Climb and Dive Valve

The secondary climb and dive valve is located in the vent box, and is physically integral with the primary climb and dive valve. The secondary climb and dive valve controls vent box pressure in the same manner as the primary climb and dive valve in the event of failure of the latter.

Master Fire Fighting Valves

A master fire fighting valve is mounted on each of the two dewars. Its function is to permit nitrogen to flow from the dewar into the fire fighting manifold upon command by an electrical signal from the CPU. Both valves are operated simultaneously, but either one can supply the necessary amount of liquid nitrogen to the fire fighting valves.

Zone Fire Fighting Valves (1.25-INCH)

There are four 1.25-inch zone fire fighting valves, one each in zones 1, 2, 3, and 4. The valves are pressure operated and solenoid controlled. The solenoids receive an actuating signal from the CPU and remain open for a designated length of time.

Zone Fire Fighting Valves (2.00-INCH)

There are eight 2.00-inch zone fire fighting valves, one each located in zones 5 to 12 inclusive. The function and operation of the valves is the same as described for the 1.25 inch valves.

Nose Wheel Well Fire Suppression System Panel

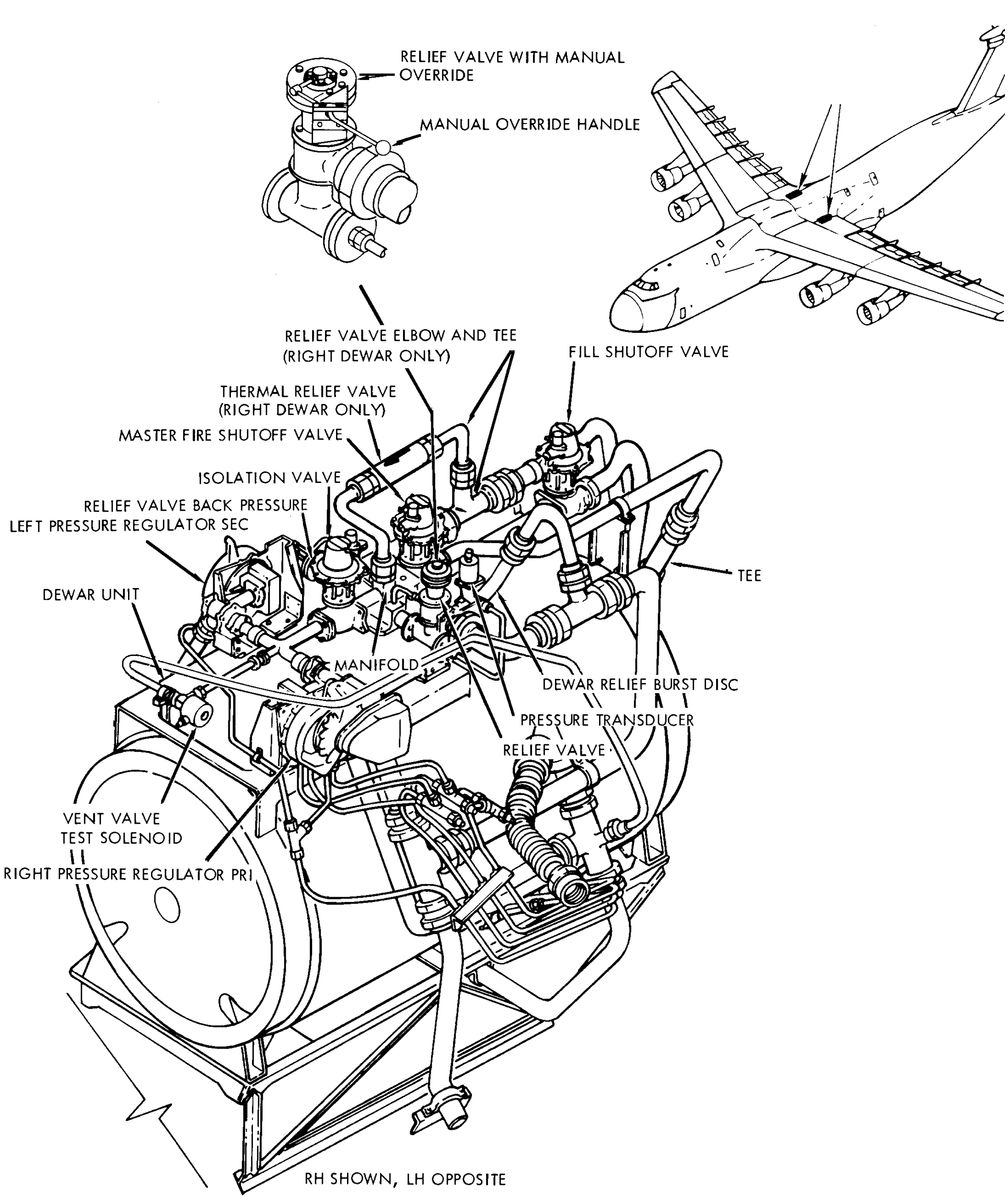
The nose wheel well fire suppression system panel provides one of the means of operating the FSS in the event of a fire when the airplane is on the ground. It also provides the means of operating the FSS from battery power when the airplane is on the ground. Four indicator light switches provide a means of presenting alarms and actuating the nitrogen fire fighting subsystem. If external power is applied, and a serviceable battery is installed, each of four indicator light switches presents an alarm indication that an overheat condition has been sensed in the areas indicated on the switch placard.

FE1301 Fire Fighting System

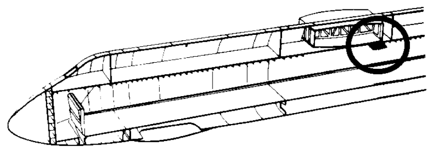
The FE1301 fire fighting provides a means of fighting and suppressing fires in the avionics bay, center wing area, and cargo compartment. The signal is processed in the CPU and actuates the alarm lights indicating the areas where the fire has been sensed. If the signal indicates a true fire exists, alarm lights indicate the areas where the fire has been sensed. FE1301 is then discharged into the indicated areas by actuation of discharge switches which cause fire extinguishers located in the areas to expel FE1301.

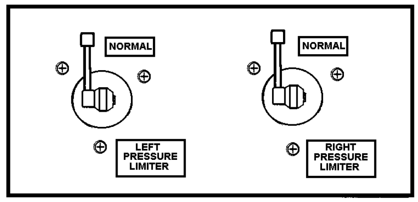
Central Processing Unit (CPU)

The central processing unit (CPU) located in the avionics bay contains a card cage in which nine replaceable component cards are installed. The removable component card consist of a scrub sequencer, signal conditioner, two alarm detectors (zones 1 through 6, and zones 7 through 12), flow timer and horn control, optical latch, power conditioner, squib relay board, and power supply (converter) component card.

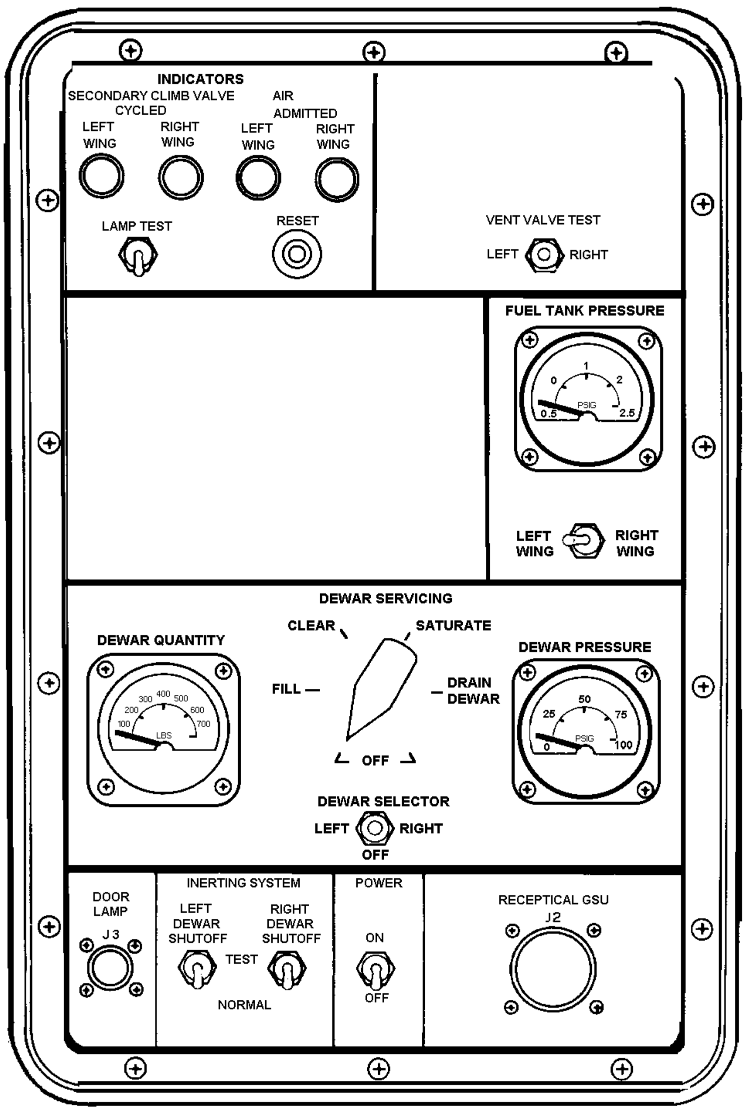


Dewars and associated equipment

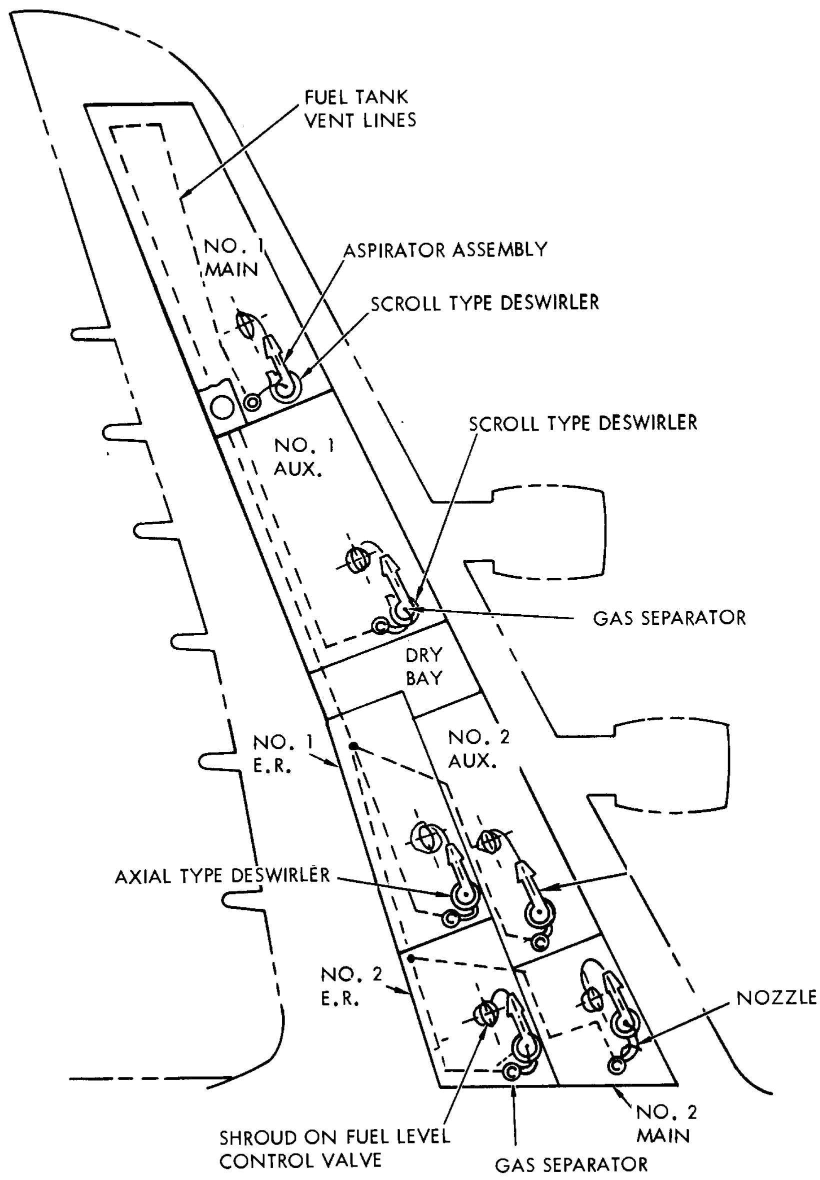




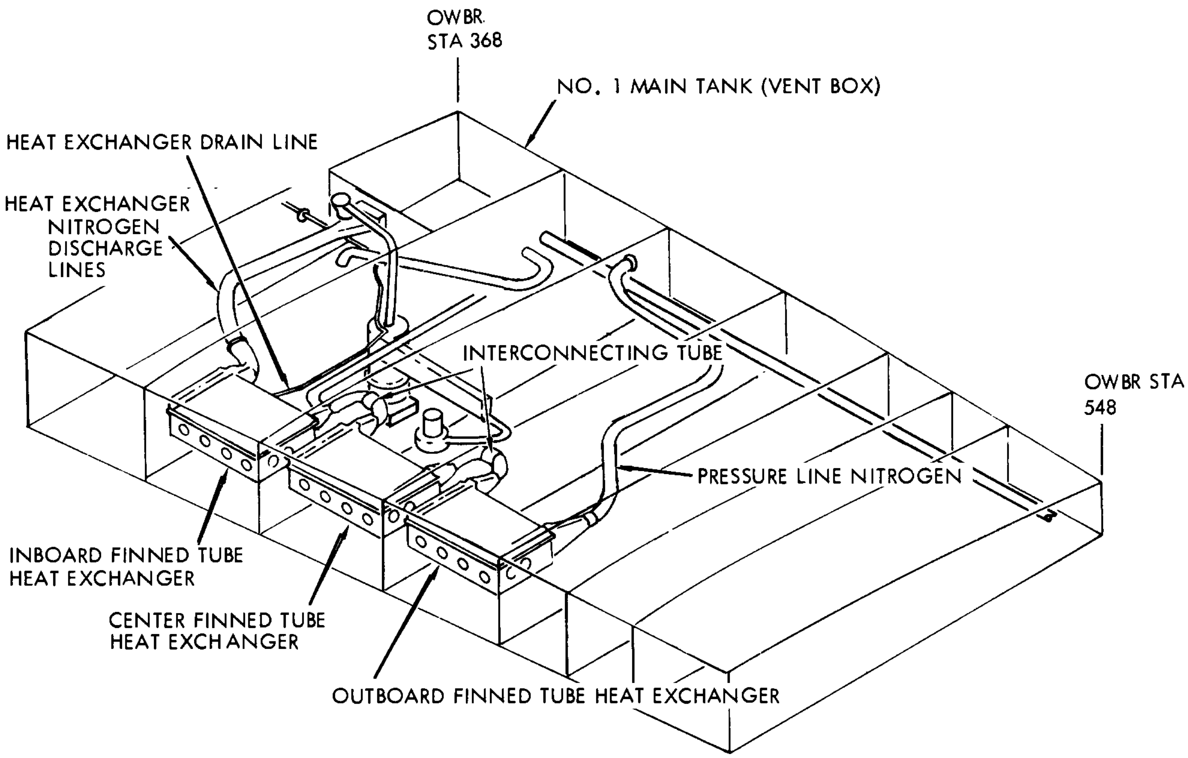
PRESSURE LIMITER PANEL



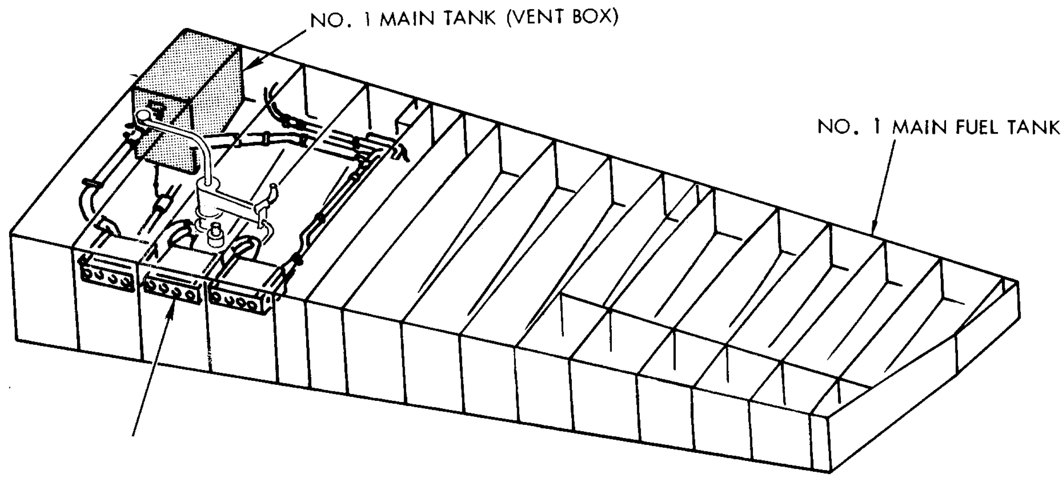
Liquid nitrogen service panel

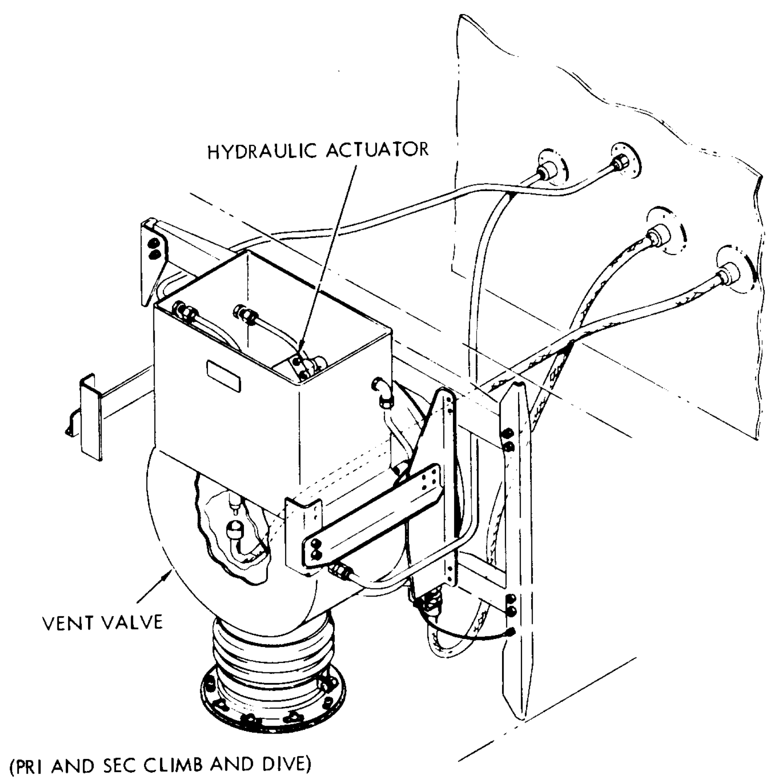


Fuel system inerting components

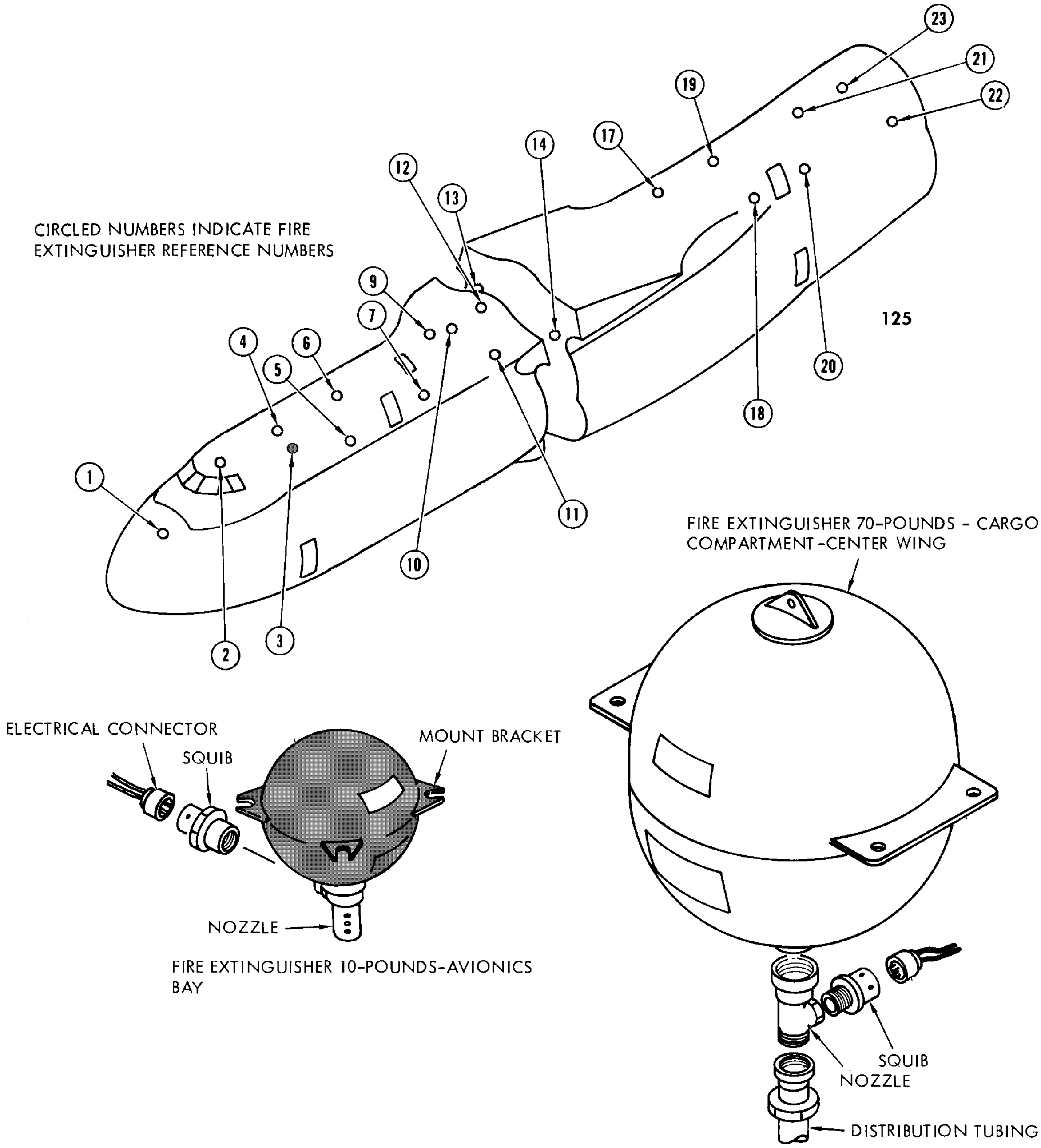


Heat exchangers





Primary and secondary climb and dive valves (vent valve)



FE 1301 fire extinguisher locations

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