HANDBOOK OF INSTRUCTIONS

MODEL XB-29
BOMBARDMENT AIRPLANE

D-3837 BOEING AIRCRAFT CO.

(RESTRICTED)

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SEATTLE, WASHINGTON, U. S. A.

HANDBOOK OF INSTRUCTIONS

FOR THE

MODEL XB-29 BOMBARDMENT AIRPLANE

MANUFACTURED BY

BOEING AIRCRAFT COMPANY

SEATTLE, WASHINGTON



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PART ONE

FOREWORD

Part One of this manual contains flight instructions for operating the XB-29 Bombardment Airplane. The information contained herein is based upon the first experimental airplane and is subject to change.

SECTION I

DESCRIPTION

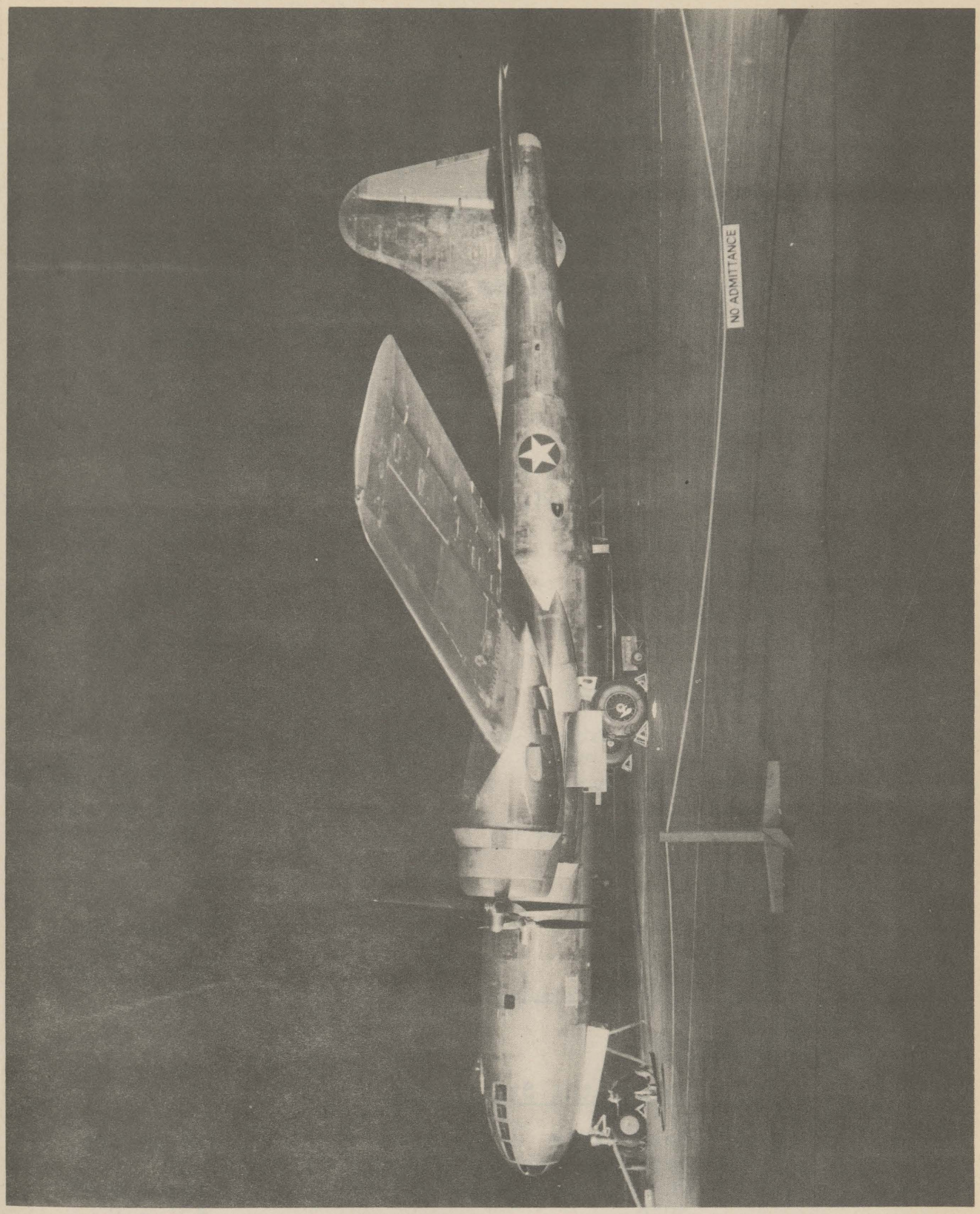


FIG. 1—COMPLETE AIRPLANE LEFT SIDE VIEW

1. Table of Specifications

a. Airplane General

Overall Span	141' - 2.76"
Overall Length	98' - 2"
Overall Height - thrust line level	29' - 6.7"
Overall Height - at rest	27' - 9"
Height, centerline propeller hub - taxi position	9' - 7.5" Inboard 10' - 9.9" Outboard
Clearance - propeller tips - taxi position	13.5" Inboard 27.9" Outboard

b. Wing

Airfoil Section	Boeing 117
Root	22%
Tip	9%
Total Area including ailerons and body	1738.88 sq. ft.
Chord Root	17' - 0"
Chord Tip	7' - 5"
Incidence	4°
Dihedral	4° - 29' - 23"
Sweepback	7° - 1.5'

c. Ailerons (each)

Area aft of hinge centerline (including tabs)	45.9 sq. ft.
Area of Balance	18.7 sq. ft.
Total Area	64.6 sq. ft.
Area of Trim Tabs	6.0 sq. ft.

d. Flaps

Total Area	332 sq. ft.
Chord	4' - 2"
Span (each)	37' - 8.5"
Flap Angle (maximum)	45°

e. Empennage

(1) Horizontal Stabilizer

Total Area	218 sq. ft.
Setting	0°
Chord - maximum	11' - 2.4"
Span	43' - 0"

(2) Elevators

Area aft of hinge centerline (including tabs)	97.2 sq. ft.
Area of Balance	17.8 sq. ft.
Total Area	115 sq. ft.
Area of Trim Tab	5.06 sq. ft.

(3) Vertical Stabilizer

Total Area including dorsal fin	173 sq. ft.
Chord (dorsal fin excluded)	17' - 3.32"
Span	16' - 7.44"

(4) Rudder

Area aft of hinge centerline (including tabs)	47.5 sq. ft.
Area of Balance	17.3 sq. ft.
Area of Trim Tab	6.3 sq. ft.
Total Area - Rudder	64.8 sq. ft.

f. Landing Gear

Distance between centerlines of main landing oleos	28' - 5.6"
Distance between tread on main landing wheels	3' - 1"
Distance between tread on main nose wheels	1' - 8"

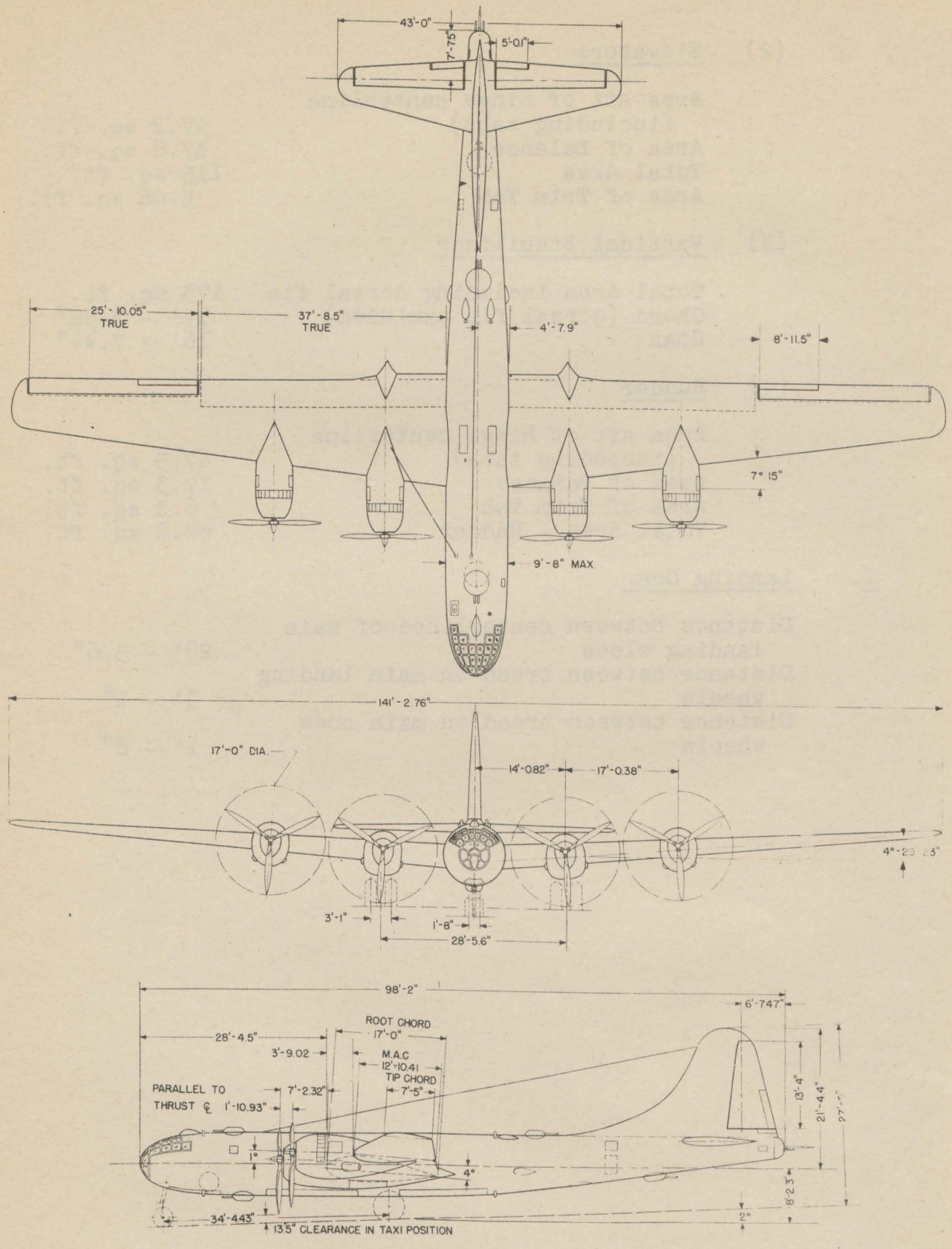


FIG. 2—GENERAL ARRANGEMENT

2. Airplane

a. General

The XB-29 bombardment airplane is a midwing monoplane of all-metal aluminum alloy stressed skin and semi-monocoque type construction. Four R-3350-13 engines are mounted in the nacelles and a retractable tricycle type landing gear is installed in the inboard nacelles and in the nose. Pressurized bulkheads make possible high altitudes to obtain greater speeds. The overall length is 98 ft. 2.0 in.; overall height, taxi position 27 ft. 9.0 in.; overall span 141 ft. 2.76 in.

b. Wing

The wing is a two-beam stressed skin type with an inboard section, two outboard sections and two wing tips. The beams or wing spars and rib sections are of web-type construction.

The inboard wing section includes the two wing flaps and nacelles for the four engines. Each outboard wing section includes an aileron and trim tab.

The wing sections are made up of a leading edge, center wing or wing spar assembly and a trailing edge. The trailing edges include the wing flaps and ailerons.

The inboard wing section is an integral part of the fuselage, while the outboard sections are removable by means of a joint outboard of the outboard nacelle. The leading edge sections of the wing panels are also removable as units.

Flush rivets and butt joints are used almost exclusively.

c. Empennage

The empennage is the conventional type which includes a single fixed horizontal stabilizer, elevator and elevator trim tabs, a fixed vertical stabilizer with a dorsal fin, rudder and rudder trim tab. The rudder may be operated with or without the aid of the hydraulic boost.

d. Fuselage

The fuselage is an all-metal semi-monocoque design with longitudinal and formed circumferential stiffeners and aluminum alloy stressed skin. All exterior surface exclusive of gun blast areas are flush riveted. There are two pressurized compartments connected internally by an open tunnel, making either compartment accessible from the other. The main access doors and emergency exit routes (as shown) are as follows:

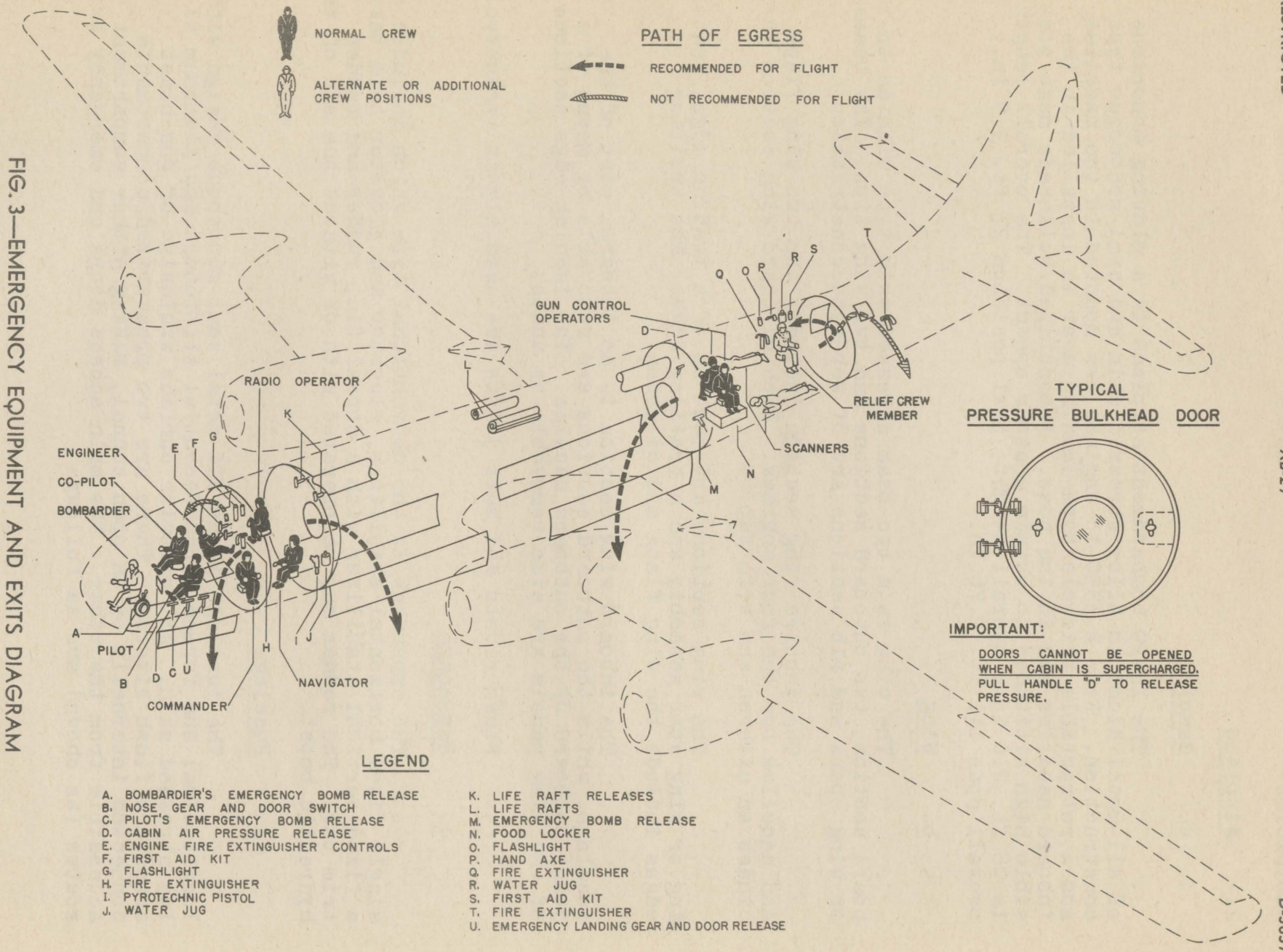


FIG. 3—EMERGENCY EQUIPMENT AND EXITS DIAGRAM

LEGEND

A. BOMBARDIER'S EMERGENCY BOMB RELEASE
B. NOSE GEAR AND DOOR SWITCH
C. PILOT'S EMERGENCY BOMB RELEASE
D. CABIN AIR PRESSURE RELEASE
E. ENGINE FIRE EXTINGUISHER CONTROLS
F. FIRST AID KIT
G. FLASHLIGHT
H. FIRE EXTINGUISHER
I. PYROTECHNIC PISTOL
J. WATER JUG
K. LIFE RAFT RELEASES
L. LIFE RAFTS
M. EMERGENCY BOMB RELEASE
N. FOOD LOCKER
O. FLASHLIGHT
P. HAND AXE
Q. FIRE EXTINGUISHER
R. WATER JUG
S. FIRST AID KIT
T. FIRE EXTINGUISHER
U. EMERGENCY LANDING GEAR AND DOOR RELEASE

(1) Forward Pressurized Compartment

(a) Through hatch in floor and nose wheel well (for normal and emergency entrance and exit).

(b) Door in pressure bulkhead (for emergency exit through bomb bay doors).

(c) Hatch on upper right side by engineer (for emergency exit while on ground).

(2) Rear Pressurized Compartment

(a) Forward door in pressure bulkhead (for emergency exit through bomb bay doors).

(b) Rear door in pressure bulkhead (for emergency exit through main entrance door on right side or emergency exit.

(c) Hatch on upper left side in unsupercharged compartment (for emergency exit while on ground).

(3) All hatches and doors are operable from either side of the door except bomb bay doors, which are operated from the pilot's compartment. The nose wheel doors are mechanically operated by the nose wheel gear and are always locked open with the nose gear in the extended position.

e. Landing Gear

The main alighting gear of the tricycle installation consists of a left and right dual wheel pneuamtic oleo assembly. Each assembly is of single oleo cantilever type, consisting of a strut and oleo assembly, torsion links, drag and retracting strut and dual wheel assembly with 56" tires. The main landing gear wheels are equipped with expander tube hydraulic brakes (Hayes Industries H-14-259). Retraction is accomplished electrically. An auxiliary system is provided for emergency operation, the power being supplied from an emergency power bus. The emergency landing gear switch is operated simultaneously with the nacelle door emergency release handle, which is located to the left of the pilot.

f. Nose Gear

The nose gear operates concurrently with the main landing gear and consists of a single pneumatic oleo, cantilever type, and a dual wheel assembly with 36" smooth contour tires.

The cantilever-type construction consists of a strut and oleo assembly, torsion links, drag and retracting strut and a

terminal assembly for the wheel swivel. The oleo terminal assembly allows the wheel to swivel, and within the limits of 15° on each side of neutral or 30° total, the wheel is self centered by a cam-centerning mechanism. There is a double-action shock absorber located on the top portion of the terminal to prevent nose wheel shimmy while taxiing. A towing lug is provided for attachment of a towing bar for towing. The nose wheel door mechanism is operated mechanically by a lug on the nose wheel oleo.

3. Power Plant

a. Engine

(1) General - Refer to T. O. No. 02-35JA-1

The airplane is powered by four Wright Model R-3350-13 engines. These engines are eighteen cylinder, radial, air-cooled, and are equipped with turbo superchargers. Each engine weighs 2605 pounds. The propeller ratio is .35:1.

(2) Ratings

Takeoff	2200 BHP 2800 RPM 47.5"Hg. MP at sea level
Military Rated Power	2200 BHP 2600 RPM 47.5"Hg. MP, 25000 ft.
Normal Rated Power	2000 BHP 2400 RPM 43.5"Hg. MP, 25000 ft.

(3)

Temperature Limits	Cyl. Head	Oil In
Ground Operation	248°C	95°C
Takeoff Power	248°C	95°C
Military Power	232°C	95°C
Rated Power (One hour)	232°C	85°C
Rated Power (Continuous)	218°C	85°C
70% Rated Power Climb	218°C	85°C
70% Rated Power (Continuous)	205°C	85°C

b. Propellers

The four engines are fitted with Hamilton Standard constant speed, full (fast) feathering propellers. Constant speed control is maintained by a governor, which is operated electrically by switches on the engineer's stand. Button switches are located on the pilot's aisle stand for fast feathering of the propellers.

For propeller deicing refer to Ice Eliminating Equipment.

c. Turbo Superchargers - Refer to T. O. No. 03-10DA-8

Each engine is individually equipped with two Type B-11 General Electric Company exhaust-driven superchargers. Carburetor air is taken off the main air induction system at two points (See Air Induction System). The superchargers are mounted vertically on either side of the nacelle, and exhaust gases from the two exhaust collector rings are carried through stainless steel ducts to each turbo.

A flight hood assembly, which includes an integrally assembled cooling cap for the turbine wheel, is provided for each turbo supercharger. The flight hood assembly is attached by bolts to a support incorporated on the nozzle box section of the turbo supercharger unit. An extension exhaust outlet is also provided. The outlet is attached to the supercharger unit in conjunction with the waste gate valve assembly.

Automatic regulation of the superchargers is accomplished at the waste gates by means of Type A-11 hydraulic regulators, using engine oil as a source of power and exhaust pressure as a means of balance, and thus making each engine an independent unit. One regulator is provided for the two superchargers in each nacelle and is adjusted by a cable control system from the cockpit. Supercharger controls are located at the pilot's, copilot's and engineer's stands.

d. Cowl Flaps (Electric)

Cowl flaps for XB-29 engine nacelles are electrically operated and controlled by four toggle switches on the engineer's switch panel. An electric motor, which operates a flexible shaft and screw jack actuating mechanism, is located in each nacelle. Refer to the cowl flap actuating mechanism for further details.

Cowl flap position will vary according to individual circumstances which govern cooling requirements. Adjust flaps to maintain engine temperatures within the allowable limits and avoid excessive cooling when operating under reduced power or excessive heating during starting and warming up.

CAUTION: Closing the cowl flaps during starting operations does not speed up engine warm-up and is harmful to the engine.

The following instructions indicate normal cowl flap use:

(1) Maximum Allowable Cylinder Head Temperature

(a)	Takeoff and Climb (5 min. max.)	248°C
(b)	High Speed Climb (Continuous)	218°C
(c)	Cruising (Continuous)	205°C

(2) Cowl Flap Settings

(a) Start, Warm-Up and Taxi - OPEN

(b) Takeoff - OPEN

(c) Climb - OPEN or adjust to maintain correct cylinder temperature.

(d) Feathered Engine - CLOSED

(e) Level and Descent - Adjust to main correct cylinder temperature

(f) Landing - Adjust to maintain correct cylinder temperature

(g) Taxi - OPEN

e. Automatic Engine Control

Should engine control cables be severed, three of the controls will automatically assume a predetermined position as follows:

Throttles - Wide Open

Supercharger Regulator - 65% Power Approx.

Supercharger Waste Gate - Full Open

These positions are obtained by individual spring action on each control. The functioning of the automatic control at any unit is entirely independent of all other automatic engine controls.

f. Auxiliary Power Plant

A gasoline-operated auxiliary power plant is located opposite the main entrance door in the rear unpressurized compartment. This power plant generates 5 kilowatts and is a Ruckstell-Burkhardt Model V33X, including a Ruckstell-Burkhardt engine No. 4068 with pulley-type starter and Type P-2 generator. The motor generates 28.5 volts at 3125 RPM.

The current generated by the auxiliary power plant feeds into the main electrical system through an emergency transfer switch (normal position). In the emergency position this switch, located in the battery solenoid shield, transfers the auxiliary power to the emergency bus system for emergency operation of the landing gear and wing flaps. The power plant is used for generating electricity during the starting operation and when the main system is not operating. The auxiliary power plant must be on during takeoff and landing to supply the extra current needed for operation of the landing gear and wing flaps.

g. Fuel System - Refer to Figure

The fuel system is composed of four independent systems, one for each engine. The fuel supply for one engine cannot be used for any other engine except by transfer from one fuel tank to another by means of a fuel transfer system. Each outboard engine is fed from a seven cell tank with a fuel capacity of 1367.5 gallons and 42.5 gallons expansion space. Each inboard engine is fed from a four

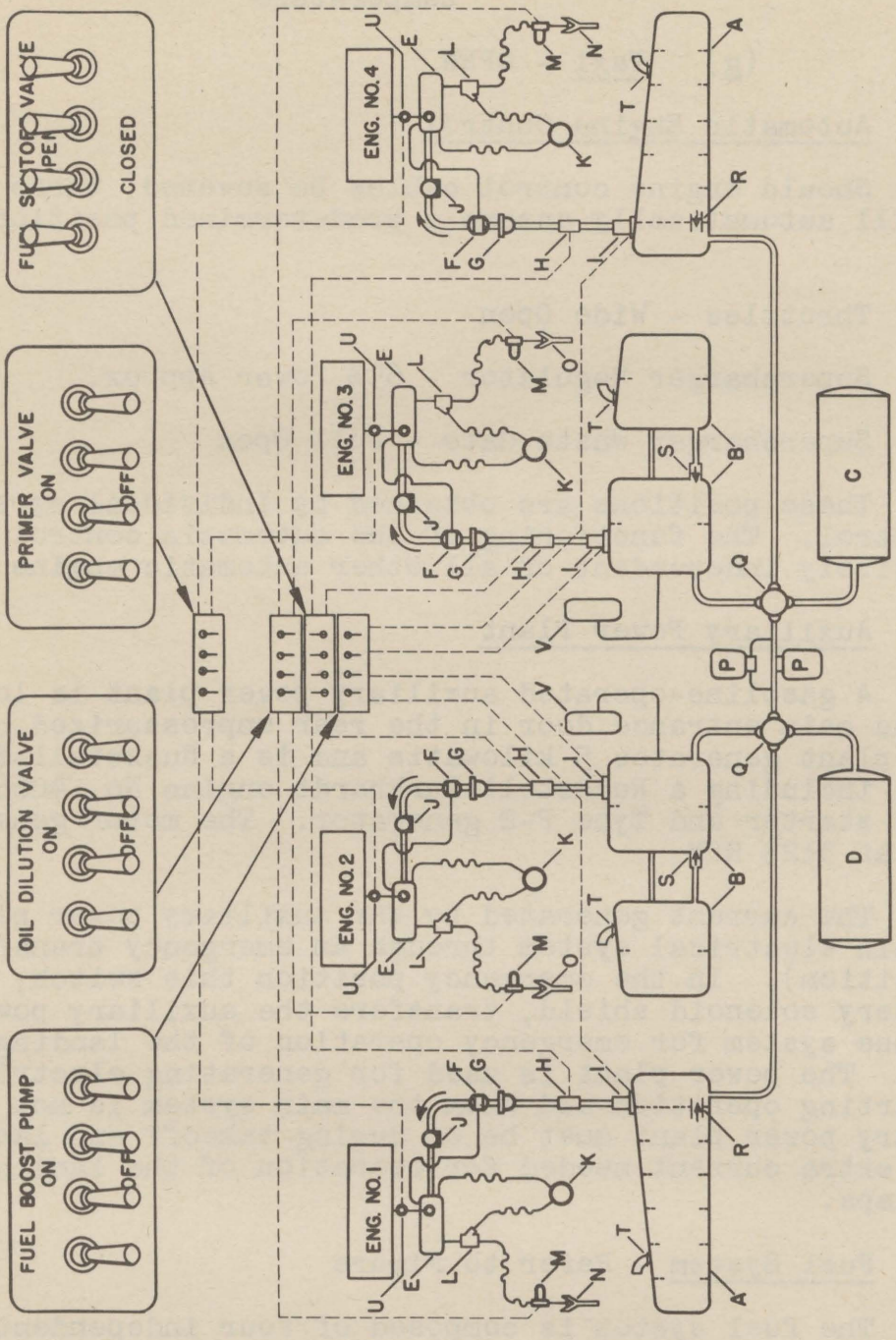


FIG. 4—FUEL SYSTEM FLOW DIAGRAM

FUEL SYSTEM FLOW DIAGRAM LEGEND

LEGEND

	PART	MFGR.	MFGRS. NO.	BAC INST. DWG.
A.	FUEL TANK ASSY. (SELF SEAL, ENG. 1 & 4)	U.S. RUBBER CO.	⌀9-4261	15-7305
B.	FUEL TANK ASSY. (SELF SEAL, ENG. 2 & 3)	U.S. RUBBER CO.	⌀9-4261	15-7305
C.	AUXILIARY BOMB BAY FUEL TANKS (FWD.)	BOEING	15-7234	15-7259
D.	AUXILIARY BOMB BAY FUEL TANKS (AFT)	BOEING	15-7234	15-7260
E.	CARBURETOR	CECO	*58CPB-2	15-8474
F.	ENGINE FUEL PUMP (TYPE G-9)	————	*R-600CWB	15-8474
G.	FUEL STRAINER ASSEMBLY	AERO SUPPLY MFG. CO.	⌀1-17830	6-11196
H.	FUEL SHUT-OFF VALVE ASSY.	GENERAL CONTROLS CO.	⌀3-15358	6-12153
I.	FUEL BOOSTER PUMP ASSY.	PESCO	⌀6-11049	15-7305
J.	FUEL FLOWMETER INST.	PIONEER	⌀1-23284	9-4585
K.	FUEL PRESSURE TRANSMITTER (TYPE C-14)	————	*94-27935	14-2852
L.	OIL DILUTION FITTING	————	*37A3528	15-8474
M.	OIL DILUTION VALVE ASSY.	————	⌀1-23275	15-8474
N.	"Y" OIL DRAIN (OUTBOARD)	BOEING	⌀1-23475	6-11354
O.	"Y" OIL DRAIN (INBOARD)	BOEING	⌀1-23475	6-11353
P.	FUEL TRANSFER PUMP ASSY.	ROMEC	⌀6-11036	15-9065
Q.	TANK SELECTOR VALVE ASSY. (TYPE P6-4)	AERO SUPPLY MFG. CO.	⌀1-17831	15-8067
R.	CHECK VALVE (OUTBOARD)	BOEING	1-23465	15-7305
S.	CHECK VALVE (INBOARD)	BOEING	1-23466	15-7305
T.	FUEL FILLER NECK ASSY.	BOEING	⌀6-10266	15-7305
U.	PRIMER VALVE	CECO	⌀95-28339	15-8474
V.	HEATER	STEWART-WARNER	⌀15-7187	15-7171

——————— ELECTRICAL WIRING

⌀ BOEING SPECIFICATION DRAWING
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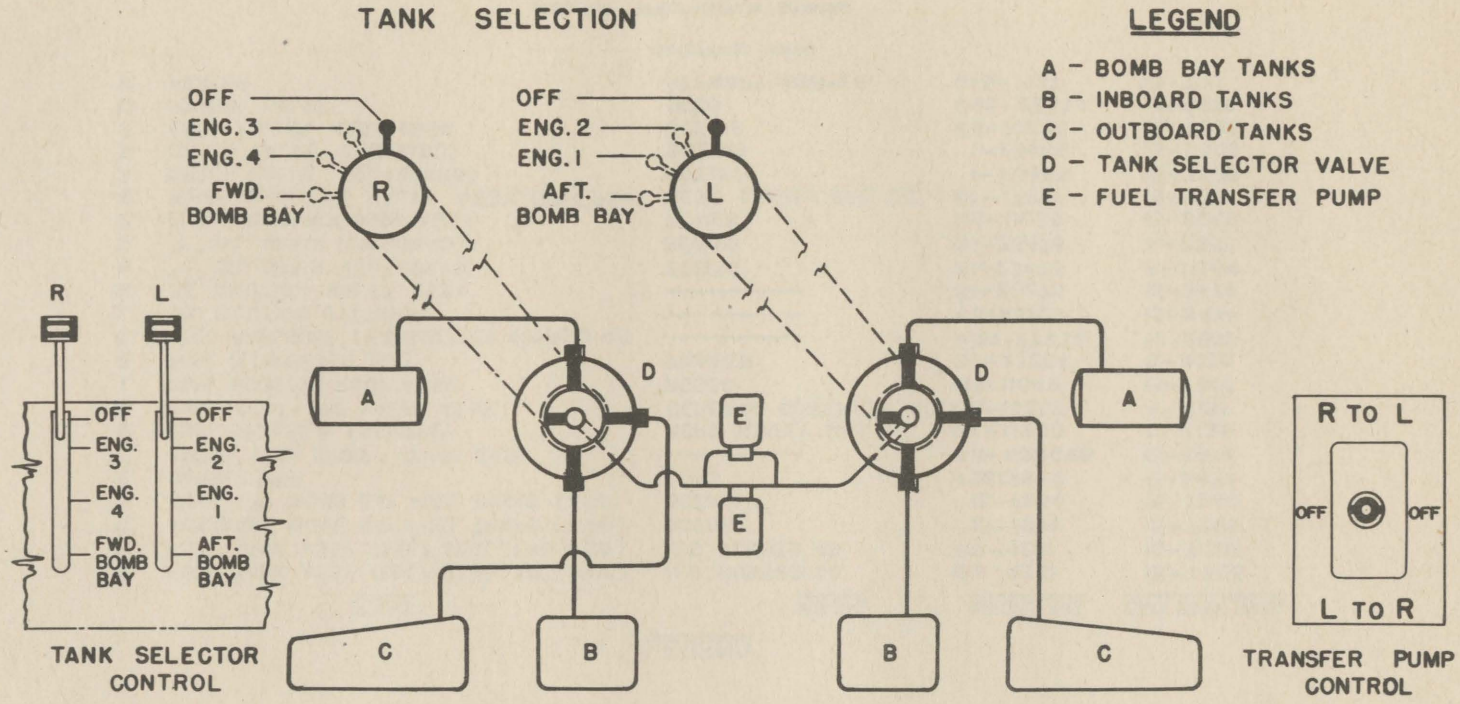
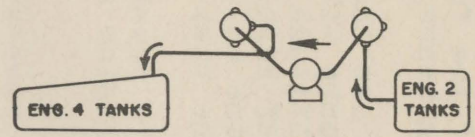
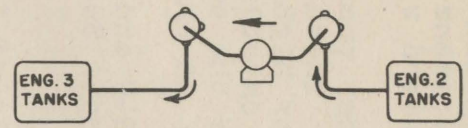
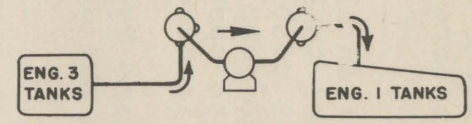
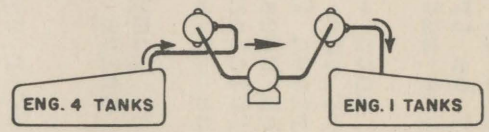
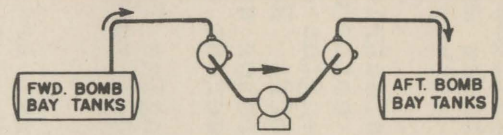
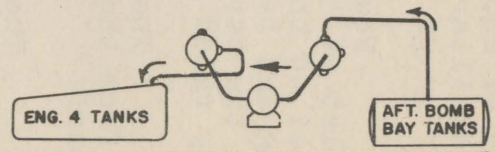


FIG. 5—FUEL TRANSFER OPERATION DIAGRAM

DIRECT TRANSFERS BETWEEN WING TANKS CAN BE MADE ONLY ACROSS THE CENTERLINE OF THE AIRPLANE.

DESIRED TRANSFER	R.H. CONTROL	SWITCH	L.H. CONTROL	FLOW PATTERN
LEFT HAND TO RIGHT HAND TANK. EXAMPLE FROM ENG. NO. 2 TANKS TO ENG. NO. 4 TANKS	ENG. NO. 4 TANKS	L TO R	ENG. NO. 2 TANKS	
LEFT HAND TO LEFT HAND TANK. (TWO TRANSFERS REQUIRED) EXAMPLE FROM ENG. 2 TANKS TO ENG. 1 TANKS BY WAY OF ENG. 3 TANKS.	ENG. NO. 3 TANKS	L TO R	ENG. NO. 2 TANKS	
	ENG. NO. 3 TANKS	R TO L	ENG. NO. 1 TANKS	
RIGHT HAND TO LEFT HAND TANK EXAMPLE FROM ENG. NO. 4 TANKS TO ENG. NO. 1 TANKS	ENG. NO. 4 TANKS	R TO L	ENG. NO. 1 TANKS	
FORWARD BOMB BAY TANKS TO RIGHT HAND TANKS. (TWO TRANSFERS REQUIRED) EXAMPLE FROM FWD. BOMB BAY TANK TO ENG. NO. 4 TANKS BY WAY OF AFT. BOMB BAY TANKS.	FWD. BOMB BAY	R TO L	AFT. BOMB BAY	
	ENG. NO. 4 TANKS	L TO R	AFT. BOMB BAY	

cell tank with a fuel capacity of 1436.5 gallons and 67.5 gallons expansion space. There are four auxiliary fuel tanks with a fuel capacity of 2560 gallons and 80 gallons expansion space. The fuel in the auxiliary tanks may be transferred by means of the fuel transfer pumps to either the outboard or inboard wing tanks.

Four electric motor-driven booster pumps are located in the outlet at the bottom of the fuel tanks. These pumps will provide fuel to the engine-driven fuel pumps for high-altitude flying, starting and takeoff. Each booster pump is capable of supplying fuel to the carburetor sufficient to operate the engine at full military rated power at sea level in case of an engine pump failure.

The engine fuel pumps are Type G-9 and are powered directly from the fuel pump drive on the engine. See Engine Accessory Chart.

The fuel transfer system consists of two reversible electric motor-driven transfer pumps and two tank selector valves located in the fuselage between the bomb bays. The selector valves are cable controlled from the engineer's stand, where the pump motor switch is also accessible. Refer to fuel transfer operation instructions.

The primer is operated by a solenoid valve in the primer line between the carburetor and engine. The priming system is arranged to prime the engine blower case only and is controlled by four separate switches at the engineer's board. Fuel boost pumps must be on to supply fuel to the carburetor before priming.

For oil dilution, fuel is diverted at each engine carburetor to the oil dilution solenoid valve. This valve, when open, admits raw gasoline to the oil inlet line of the engine to reduce the viscosity of the oil in the system. The oil dilution system is used to facilitate starting procedure in cold weather when a temperature below 29°F (-5°C) is expected to prevail at the start. See T. O. No. 02-35JA-1 for use of the Oil Dilution System.

h. Oil System

Each engine is equipped with an oil tank of 85 gallon oil capacity with 5 gallon additional space for expansion. The total of 340 gallons for all four tanks is required for maximum fuel load.

It will be noted in the oil system diagram that the propeller feathering pump receives its oil supply from the "in" line and the oil temperature regulator is on the "out" line. The regulator is provided with a thermostatic valve which by-passes the oil in case of low temperature. A pressure relief valve is also provided to by-pass the regulator in case of excessive pressures. Each oil

tank is equipped with an oil heat accelerator which keeps the oil from circulating through the tank when the oil is cold. An oil dilution system is provided for the purpose of diluting the oil at the end of an engine run so that oil for the next run will flow easily and facilitate starting. See the paragraph on the fuel system.

The cabin superchargers, located on the No. 2 and No. 3 engines, are geared to the engine and use engine oil to control the blower speed. The oil runs through a special oil cooler before returning to the supply tank. Refer to Cabin Supercharger Diagram.

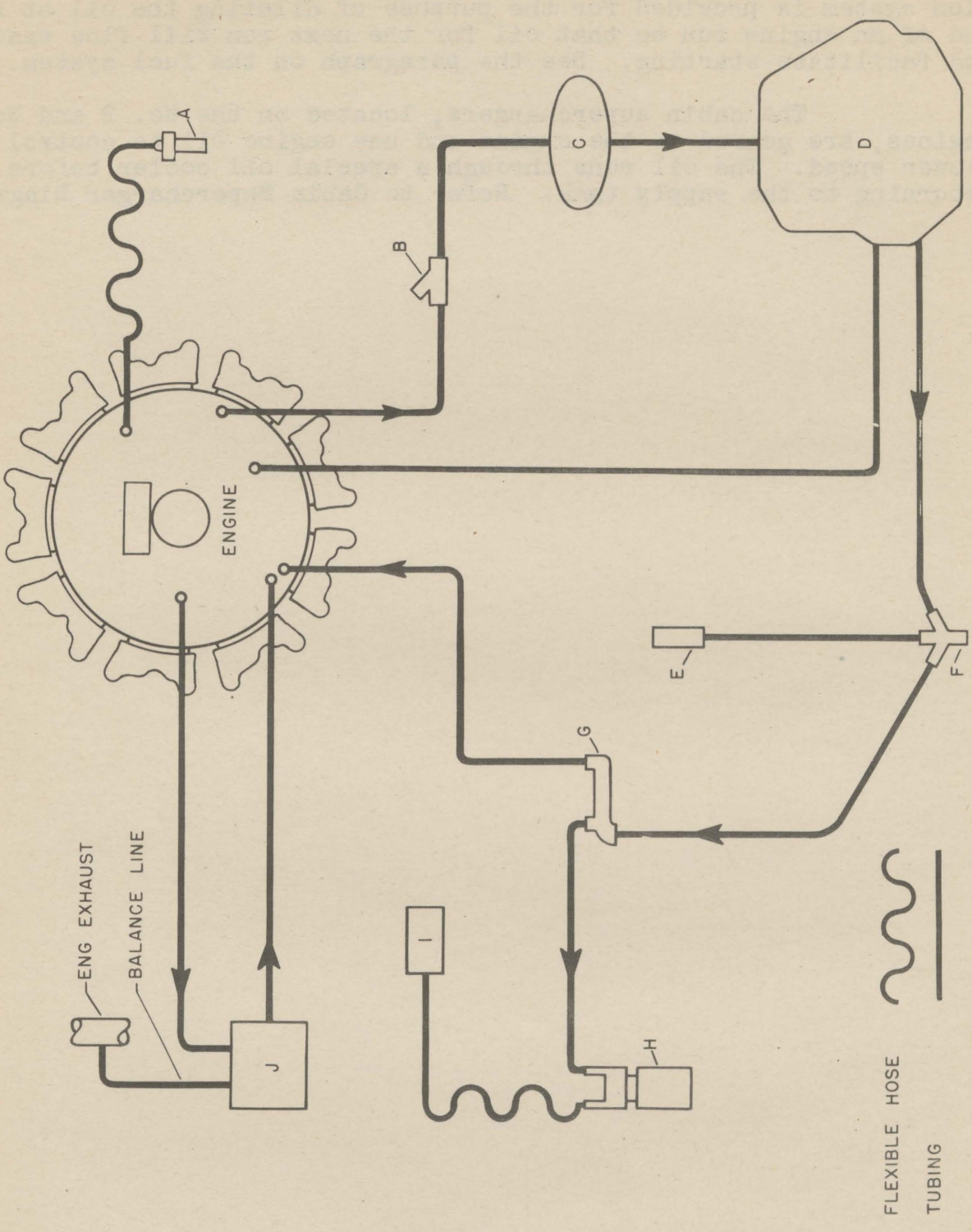


FIG. 6—OIL SYSTEM FLOW DIAGRAM—ENGINES 1 AND 4

OIL SYSTEM FLOW DIAGRAM LEGEND

	NAME	MFGR.	MFGR'S. NO.	BAC INST. DWG.
A.	ENG. OIL PRESS. TRANS. (TYPE B-9)	———	* 94-27934	14-2852
B.	OIL TEMP. BULB (A-24) L.H. (OUTB'D)	BOEING	3-15845	15-7127
	OIL TEMP. BULB (A-24) R.H. (OUTB'D)	BOEING	3-15845	15-7223
C.	ENG. OIL COOLER	AIRESEARCH MFG. CO.	Ø 3-13349	14-3010
D.	OIL TANK	GOODYEAR TIRE & RUBBER	2F1-6-2402	15-8561
E.	OIL DILUTION SOLENOID VALVE	BOEING	1-23275	6-11181
F.	"Y" DRAIN COCK	———	Ø 1-23475	6-11654
G.	MANIFOLD-ENG. OIL DIS.	BOEING	15-11547	15-7223
H.	PROP. FEATHERING PUMP	PESCO	R301-A	6-11115
I.	PROP. GOVERNOR	HAMILTON ST'D. PROP.	3H8-01C	15-8474
J.	TURBO SUPERCHARGER REG.	ECLIPSE	* E-97105	14-3045

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Ø BOEING SPECIFICATION DRAWING

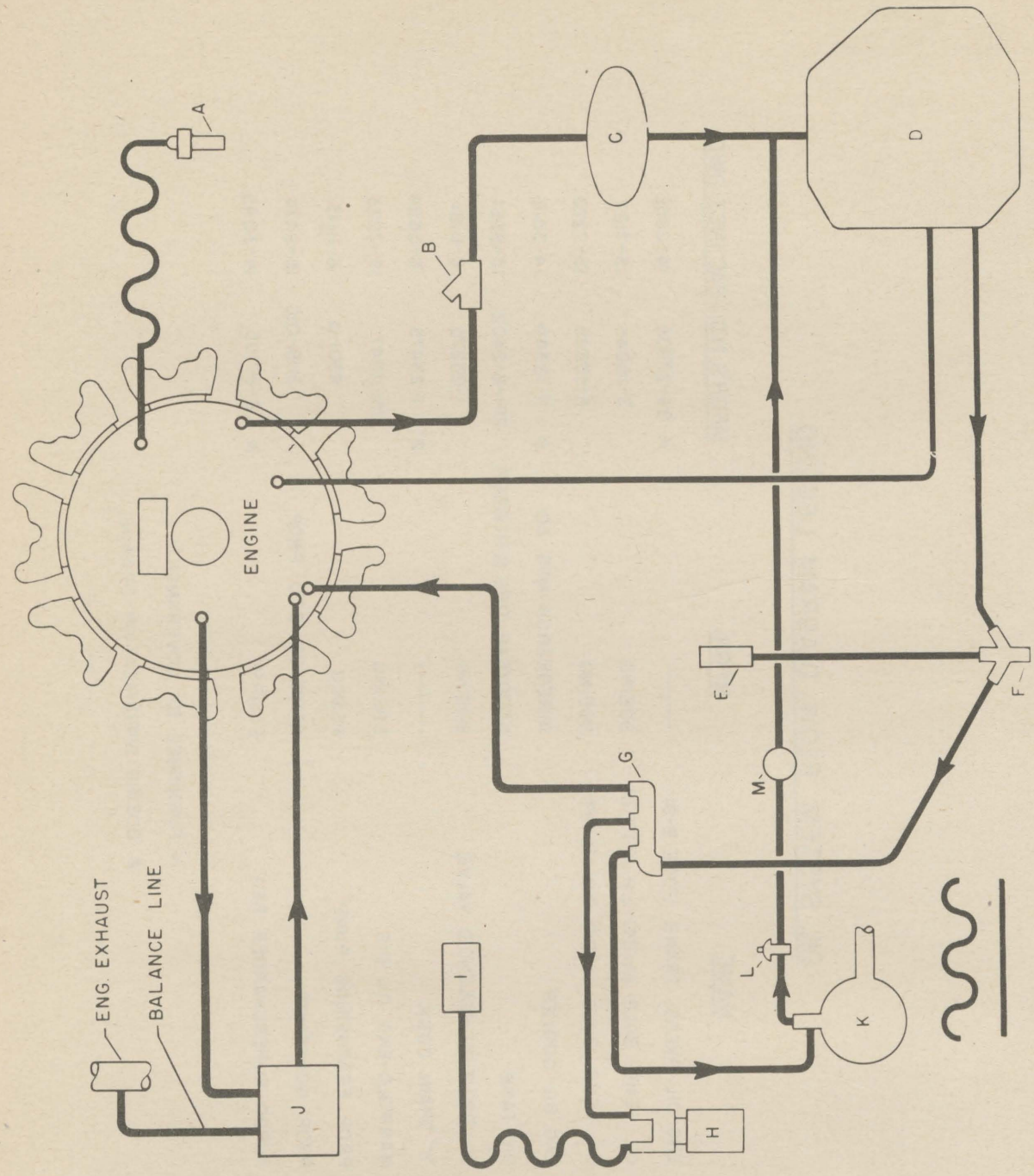


FIG. 7—OIL SYSTEM FLOW DIAGRAM—ENGINES 2 AND 3

OIL SYSTEM FLOW DIAGRAM LEGEND

	NAME	MFGR.	MFGR'S NO.	BAC INST. DWG.
A.	ENG. OIL PRESS. TRANS. (TYPE B-9)	———	* 94-27934	14-2852
B.	OIL TEMP. BULB (A-24) L.H. (INB'D)	BOEING	3-15845	15-7158
	OIL TEMP. BULB (A-24) R.H. (INB'D)	BOEING	3-15845	15-7159
C.	ENG. OIL COOLER	AIRESEARCH MFG. CO.	Ø 3-13349	14-3010
D.	OIL TANK	GOODYEAR TIRE & RUBBER	2F1-6-2376	15-8560
E.	OIL DILUTION SOLENOID VALVE	BOEING	1-23275	6-11181
F.	"Y" DRAIN COCK	———	Ø 1-23475	6-11353
G.	MANIFOLD-ENG. OIL DIS.	BOEING	9-4834	9-4877
H.	PROP. FEATHERING PUMP	PESCO	R301-A	6-11115
I.	PROP. GOVERNOR	HAMILTON ST'D. PROP.	3H8-01C	15-8474
J.	TURBO. SUPERCHARGER REG.	ECLIPSE	* E-97102	14-3044
K.	CABIN SUPCHG. R.H. (INB'D)	ECLIPSE	15-8483	15-7173
	CABIN SUPCHG. L.H. (INB'D)	ECLIPSE	15-8483	15-7174
L.	SUPCHG. OIL FILTER ASSY.	BOEING	1-22019	6-11370
M.	CABIN SUPERCHARGER OIL COOLER	AIRESEARCH MFG. CO.	Ø 3-14804	15-9050

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Ø BOEING SPECIFICATION DRAWING

Controls

a. Location of Controls

(1) Flight Controls

Control	Type	Location
Aileron	Wheels (2)	Pilot and Copilot
Elevator	Columns (2)	Pilot and Copilot
Rudder	Pedals (4)	Pilot and Copilot
Trim Tabs		
Aileron	Wheels (2)	Pilot's & Copilot's Control Stands
Elevator	Wheels (2)	Pilot's & Copilot's Control Stands
Rudder	Wheels (2)	Pilot's & Copilot's Control Stands
Control Surface Lock	Lever	Aisle Stand
Wing Flap	Switch	Aisle Stand
Rudder Boost Valve	Lever	Aisle Stand
A.F.C.E.S.	Control Box	Aisle Stand

(2) Engine Controls

Master (Emergency Ignition)	Switch	Pilot's Auxiliary Stand
	Switch	Engineer's Instrument Panel
Ignition	Switches (4)	Engineer's Instrument Panel
Ignition Booster	Switches (4)	Engineer's Switch Panel

Control	Type	Location
Throttle	Levers (4)	Pilot's Control Stand
	Levers (4)	Copilot's Control Stand
	Levers (4)	Engineer's Control Stand
Throttle Lock	Lever	Pilot's Control Stand
Supercharger	Levers (4)	Pilot's Control Stand
	Levers (4)	Copilot's Control Stand
	Levers (4)	Engineer's Control Stand
Supercharger Lock	Lever	Pilot's Control Stand
Over Control (Throttle & Supercharger)	Lever	Pilot's Control Stand
Mixture	Levers (4)	Engineer's Control Stand
Mixture Lock	Lever	Engineer's Control Stand
Cowl Flap	Switches (4)	Engineer's Switch Panel
Intercooler	Switches (4)	Engineer's Switch Panel
Oil Cooler	Switches (4)	Engineer's Switch Panel
Primer	Switches (4)	Engineer's Switch Panel
Oil Dilution	Switches (4)	Engineer's Switch Panel
Fuel Booster	Switches (4)	Engineer's Switch Panel
	Rheostats (4)	Engineer's Switch Panel
Fuel Shut-Off Valve	Switches (4)	Engineer's Switch Panel

Control	Type	Location
Tank Selector (Fuel Transfer)	Levers (2)	Engineer's Control Stand
Fuel Transfer Pump	Switch	Engineer's Switch Panel
Tank Selector (Quantity Gages)	Knobs (2)	Engineer's Instrument Panel
Propeller		
Pitch	Switches (4)	Engineer's Switch Panel
Emergency Pitch	Knob	Aisle Stand
Feathering	Switches (4)	Aisle Stand
Anti-Icer	Switches	Engineer's Switch Panel
	Rheostats (2)	Engineer's Control Stand
Starter	Push Button	On Portable Starter
Engine Fire Extinguisher Selector	Knob	Engineer's Instrument Panel
Engine Fire Extinguisher Release	Pull Handle (2)	Engineer's Instrument Panel
(3) Hydraulic System Controls		
Brakes	Metering Valves (4)	Rudder Pedals
Emergency Brakes	Levers (2)	Aisle Stand
Parking Brake	Pull Knob	Rudder Stand
Pump (Regulator Override)	Switch	Engineer's Switch Panel
Hand Pump	Pump Handle	Floor, Inboard from Copilot

	Control	Type	Location
	Filler (Emergency System)	Valve	Engineer's Instrument Panel
	Service Shut-Off	Valve	Hydraulic Panel
(4)	Landing Gear Controls		
	Landing Gear Switch	Switch	Aisle Stand
	Emergency Switch and Door Release	Pull Handle	Pilot's Control Stand
	Landing Gear Power Transfer	Switch	Pilot's Control Stand
	Warning Reset	Buttons (4)	Copilot's Control Stand
(5)	Cabin Supercharging Controls		
	Supercharger	Levers (2)	Engineer's Control Stand
	Heating (Heater and Aftercooler)	Switches (2)	Engineer's Switch Panel
	Manual Pressure Relief	Wheel	Under Engineer's Seat
	Emergency Pressure Release	Pull Handle	Pilot's Control Stand
		Pull Handle	Right-Hand Sidewall of rear cabin near forward bulkhead
	Pressure Warning Shut-Off	Switch	Engineer's Switch Panel
(6)	Vacuum System Controls		
	Vacuum Selector	Lever	Engineer's Control Stand
	Emergency Shut-Off	Valve	Front of Navigator's Cabinet
	Camera Vacuum Shut-Off	Valve	Camera Operator's Station

Control	Type	Location
(7) Bomb Controls		
Release	Lever	Bombardier's Control Stand
	Switch	Left of Bombardier's Seat
Interval Release	Knobs and Switch	Bombardier's Instrument Panel
Emergency Release	Wheel	Bombardier's Control Stand
	Pull Handle	Pilot's Control Stand
	Pull Handle	Left-hand side of rear cabin bulkhead near floor
Group Selector	Switches (4)	Bombardier's Instrument Panel
Tank Safety	Switches (2)	On tunnel in each bay
Door	Lever (switches)	Bombardier's Control Stand
Formation Lamp	Switch	Bombardier's Instrument Panel
(8) Turret Controls		
Fire Control Selectors, Charges, etc.	Switches	Forward and aft computers and fire control panels
G.S.A.P. Camera	Control Box	Aft Fire Control Fuse Panel
(9) Radio		
Liaison Set		
Receiver	Direct	Radio Operator's Table
Transmitter	Direct	Radio Operator's Station

Control	Type	Location
Key	Direct	Radio Operator's Table
Monitor	Switch	Radio Compass Relay Shield
Antenna Transfer	Switch	Above Radio Operator's Table
Trailing Antenna Reel	Control Box	Radio Operator's Table
Trailing Antenna Fair-lead Retractor	Lever	Under Radio Operator's Table
Command Radio		
Receivers	Direct	Radio Operator's Station
	Control Box	Cabin Sidewall Pilot's Station
Transmitters	Direct	Radio Operator's Station
	Control Box	Cabin Sidewall Pilot's Station
Radio Compass (and Marker Beacon)	Control Box	Cabin Sidewall Copilot's Station
	Control Box	Radio Operator's Table
Whip Antenna	Handle	Above Engineer's Window
Interphone	Jack Boxes (12)	12 Crew Stations
Microphones	Push Buttons (2)	Pilot's Control Wheels
	Floor Switches (3)	Gunner's Station
	Cord Switches (7)	All other stations
Voice-Range Filters	Switch Boxes (2)	Cabin Sidewalls - Pilots' Stations

	Control	Type	Location
(10)	Lighting		
	Position Lights	Switch	Aisle Stand
	Formation Lights	Rheostat	Aisle Stand
	Landing Lights	Switches (2)	Aisle Stand
	L.G. Spotlights	Switch	Navigator's Table Leg
	Bombardier's Fluorescent Light	Starter-Rheostat	Bombardier's Instrument Panel
	Engineer's Fluorescent Lights	Starter-Rheostat	Adjacent to the Lights
	Pilot's Fluorescent Lights	Starter-Rheostat	Pilot's Auxiliary Panel
	Copilot's Fluorescent Lights	Starter-Rheostat	Copilot's Auxiliary Panel
	Copilot's Compass Lamp	Rheostat	Copilot's Auxiliary Panel
(11)	Miscellaneous Controls		
	Driftmeter	Switch	Navigator's Table Leg
	Battery	Switch	Engineer's Switch Panel
	Generator	Switches (4)	Engineer's Switch Panel
	Generator Selector (Ammeter-Voltmeter)	Knob	Engineer's Instrument Panel
	Inverter Selector	Switch	Engineer's Switch Panel
	Emergency Power Transfer	Switch	Battery Solenoid Shield
	Pitot Heat	Switch	Engineer's Switch Panel

Control	Type	Location
Surface Deicer	Switch	Engineer's Switch Panel
Camera	Switch	Bomber's Panel
	Switch	Camera Operator's Panel
Camera Door Control	Lever	Right of Camera Operator's Seat
Alarm Bell	Switch	Aisle Stand
Phone Call	Switch	Aisle Stand
Life Raft	Pull Handles (2)	Forward Cabin Bulkhead near tunnel
	Release Panels (2)	On Fuselage Forward of Life Raft door

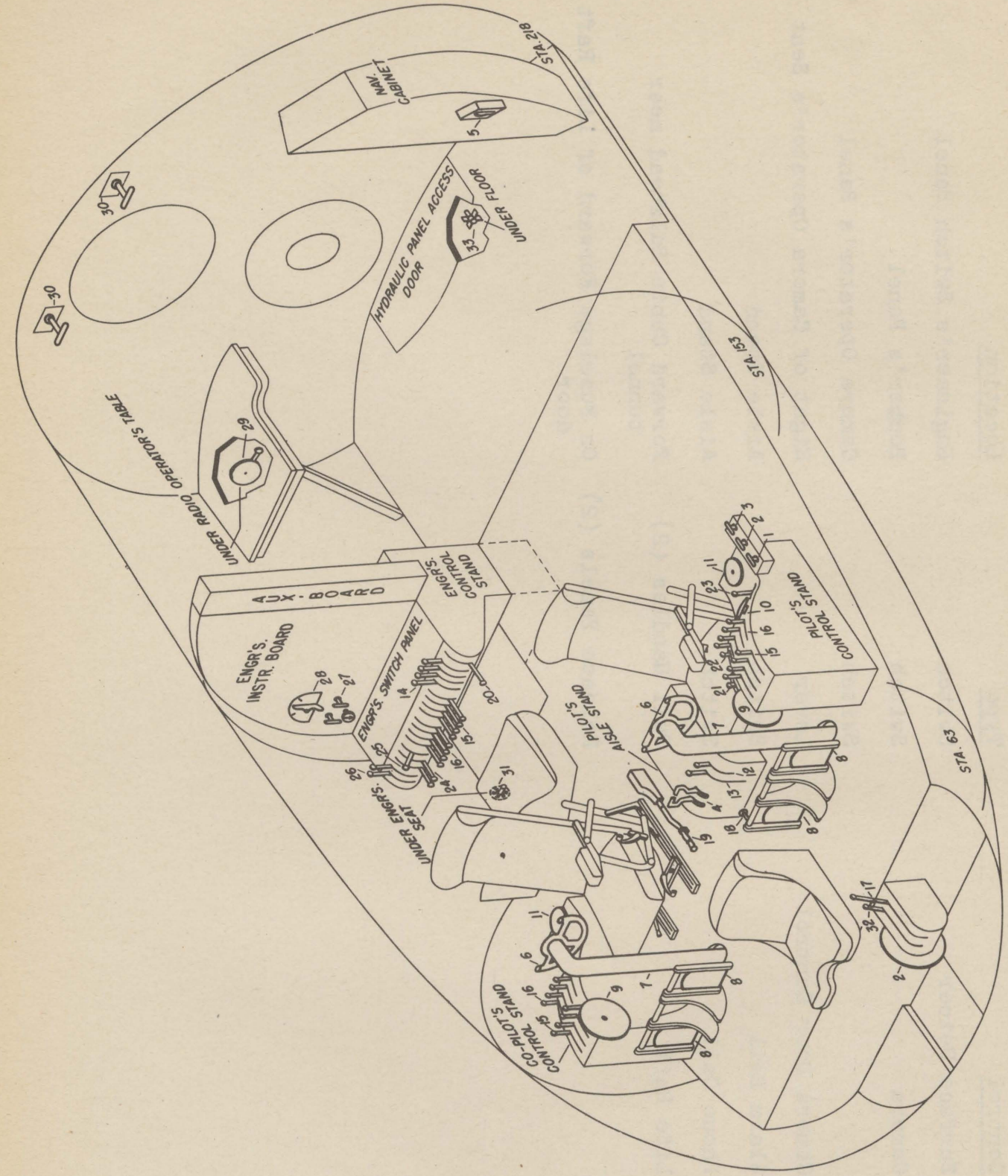


FIG. 8—MANUAL CONTROL LOCATION DIAGRAM

LEGEND

EMERGENCY

1. CABIN AIR PRESSURE RELEASE
2. BOMB RELEASE (2)
3. LANDING GEAR AND DOOR RELEASE
4. METERING BRAKE VALVE
5. VACUUM SHUTOFF VALVE

FLIGHT CONTROLS

6. AILERON
7. ELEVATOR
8. RUDDER AND FOOT BRAKE PEDAL
9. ELEVATOR TRIM TAB
10. AILERON TRIM TAB
11. RUDDER TRIM TAB
12. RUDDER BOOST CONTROL VALVE
13. SURFACE LOCK

ENGINE CONTROLS

14. MIXTURE (4)
15. THROTTLE (4)
16. SUPERCHARGER (4)

OTHER CONTROLS

17. BOMB RELEASE (BOMBARDIER'S)
18. PARKING BRAKES
19. HYDRAULIC HAND PUMP
20. MIXTURE LOCK
21. THROTTLE LOCK
22. SUPERCHARGER LOCK
23. OVERCONTROL (THROTTLE & SUPERCHARGER)
24. CABIN COMPRESSOR (2)
25. VACUUM SELECTOR VALVE
26. TANK SELECTOR (2)
27. FIRE EXTINGUISHER (ENGINE) (2)
28. FILLER VALVE (EMERGENCY HYDRAULIC SYSTEM)
29. TRAILING ANTENNA FAIRLEAD
30. LIFE RAFT (2)
31. PRESSURE RELIEF VALVE (CABIN)
32. BOMB DOOR
33. HYDRAULIC SHUTOFF VALVE (SERVICING)

REAR COMPARTMENT CONTROLS (NOT SHOWN)

1. EMERGENCY BOMB RELEASE AT STA. 646
2. EMERGENCY CABIN AIR PRESSURE RELEASE AT STA. 646
3. CAMERA DOOR CONTROL AT STA. 753
4. COCK SHUTOFF VALVE (CAMERA VACUUM) AT STA. 728.71

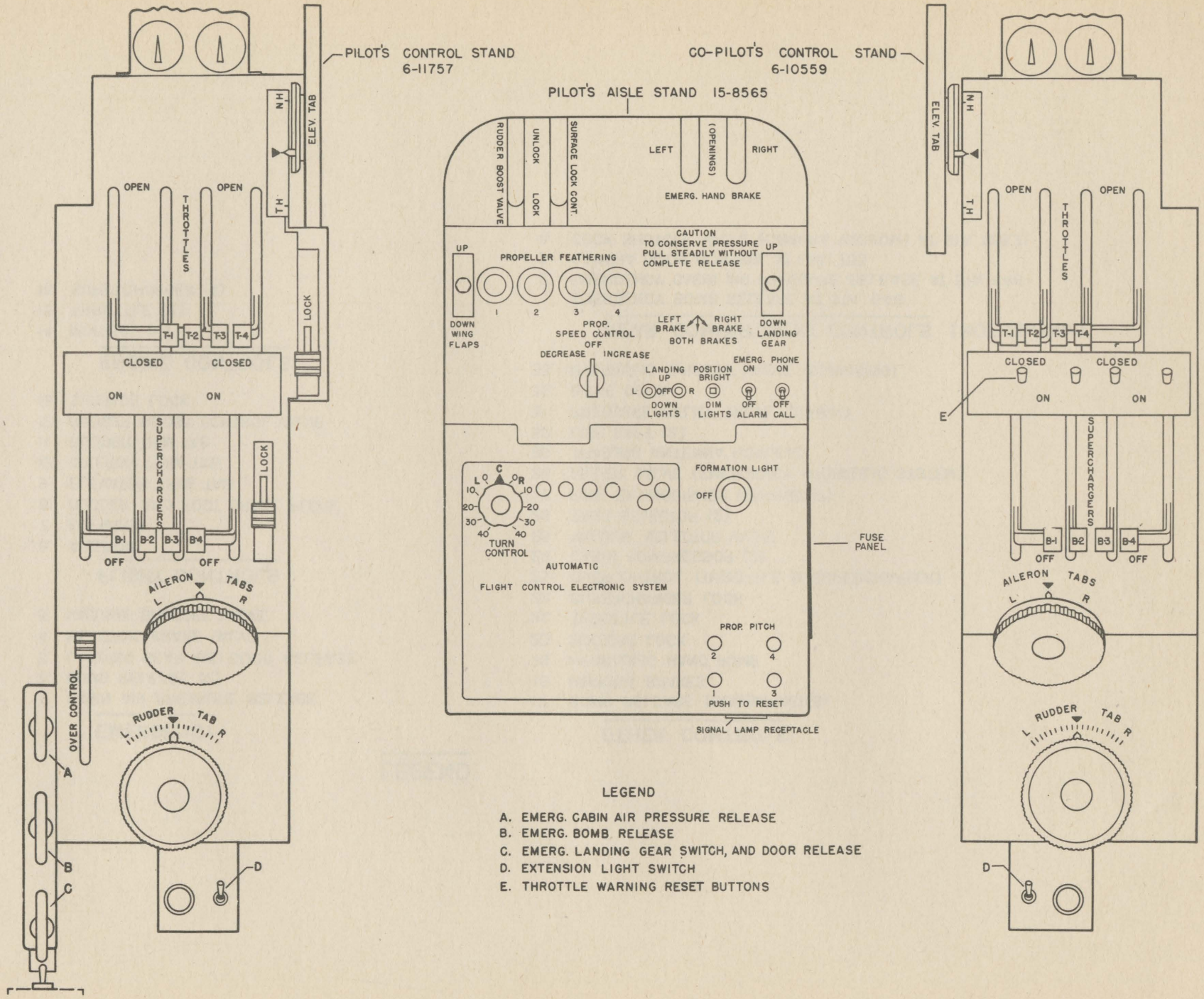
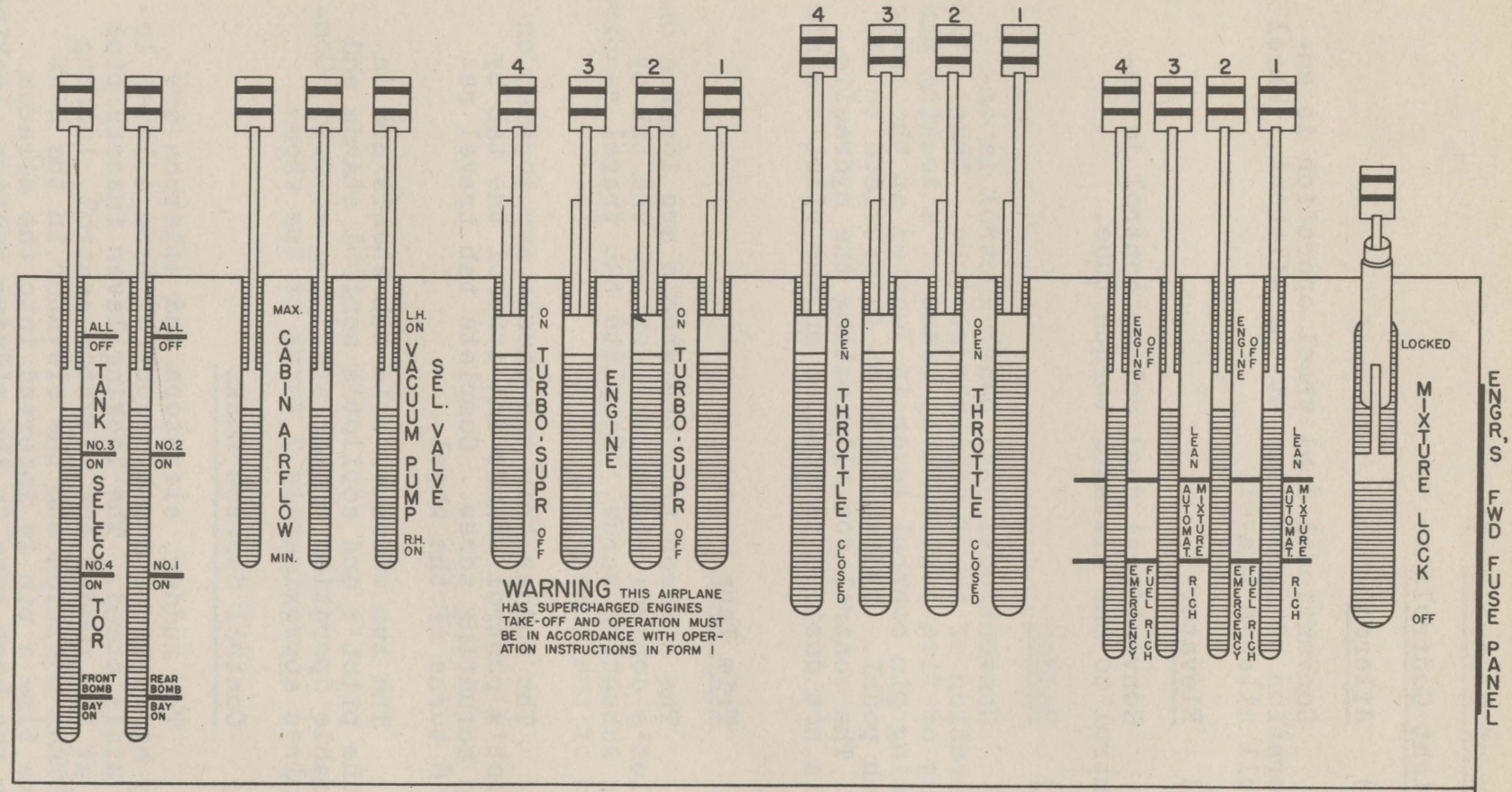


FIG. 9—PILOT'S AND CO-PILOT'S CONTROL STANDS

LEGEND

A. EMERG. CABIN AIR PRESSURE RELEASE
B. EMERG. BOMB RELEASE
C. EMERG. LANDING GEAR SWITCH, AND DOOR RELEASE
D. EXTENSION LIGHT SWITCH
E. THROTTLE WARNING RESET BUTTONS



FRONT VIEW

FIG. 10—ENGINEER'S CONTROL STAND

REFERENCE PRINTS

ANTI-ICER RHEOSTAT – 6-10217
STAND COVER ASSY. – 8-2349
STAND ASSY. – 15-9020
FUSE PANEL – 9-5160

b. Operation of Controls

(1) Flight Controls

(a) Aileron

Conventional dual wheel operation is employed with cable operation of mechanisms at the ailerons. Wheel travel is 180° for full aileron travel.

(b) Elevator

Conventional dual column control is employed with cable control to the elevator torque tube.

(c) Rudder

Conventional dual pedal control is employed with cable operation of the rudder torque tube. Pedal tilt may be adjusted to any of five positions by means of a locking pin and sector. The locking pin control lever is located at the lower outside corner of each pedal. Hydraulic boost is provided to aid in rudder operation. The control for eliminating the hydraulic power boost when it is not desired is located on the pilot's aisle stand.

(d) Trim Tabs

The aileron trim tab wheels are located on the pilot's and copilot's control stands and control the tab by cable operation of an actuating screw. Complete tab travel requires approximately 5 turns of the wheel.

The rudder trim tab wheels are located on the pilot's and copilot's control stands and control the tab by cable operation of an actuating screw. Complete tab travel requires approximately 6 turns of the wheel.

The two elevator trim tab wheels are on the forward ends of the pilot's and copilot's control stands and control the tabs by cable operation of the actuating screws. Complete tab travel requires approximately 7 turns of the wheel.

(e) Control Surface Locks

The rudder, elevators and ailerons are locked simultaneously by means of a cable control from a lever located on the pilot's aisle stand. The locking lever inserts pins into the sector arms at the rudder and elevator control, locking the rudder in the NEUTRAL position and the elevator in the DOWN position. At the same time a pin is inserted into the aileron drum, located between the bomb bays in the midwing section, locking

the aileron in the NEUTRAL position. An interlock between the control surface lock and the throttles prevents the throttles from being moved from the CLOSED position when the control surfaces are locked.

(f) Wing Flaps

An electric motor-driven retracting mechanism operates the wing flaps through two actuating screws on each flap. The motor mechanism is located between the two bomb bays and inside the wing section. The WING FLAP switch on the pilot's aisle stand controls the flap motor through solenoid and limit switches. The limit switches and position transmitter are located on the torque drive shaft near the gear box. The position indicator is located on the copilot's instrument panel and shows the position of the flaps at all times.

Emergency operation is accomplished by using a portable motor to drive the gear box through a torque connection on the top of the center wing section. The receptacle for supplying power to the portable motor is located near the torque connection.

CAUTION: To operate the portable motor from the above mentioned receptacle, either the LANDING GEAR POWER TRANSFER switch (pilot's control stand) or the EMERGENCY CIRCUIT switch (battery solenoid shield) must be in the EMERGENCY position.

(g) Rudder Boost Valve

The rudder boost valve lever, located on the pilot's stand, provides cable control for an ON or OFF position on the rudder boost (by-pass) valve installed between the rudder boost cylinders. Two rudder boost cylinders are located in the rear portion of the aft pressurized compartment, one on each side of the ship, and provide hydraulic boost to aid rudder operation.

The rudder boost valve control, when set in the OFF position, eliminates the hydraulic power boost to the rudder.

(h) A.F.C.E.S.

Controls for operation of this equipment are mounted on the pilot's aisle stand. Telltale lights indicate when servo motors are in operation.

WARNING: Do not engage A.F.C.E.S. motors while any Telltale light is illuminated.

CAUTION: The rudder boost must be off when using the A.F.C.E. System.

(2) Engine Controls

(a) Ignition

1. Master Ignition

Toggle-type emergency ignition switches are provided at the pilot's and engineer's stations. A Type C-7 ignition switch is mounted in the pilot's auxiliary panel and two Type B-5 ignition switches, with linked toggles, are mounted on the engineer's instrument panel. Emergency operation of these switches opens the battery circuit and grounds all magnetos.

2. Ignition

Individual engine control, utilizing either or both circuits of the dual-type magnetos, is accomplished by the rotary levers on the Type B-5 ignition switches on the engineer's panel.

3. Ignition Booster

Ignition booster coils augment the regular magneto ignition during engine starting. Each coil is connected to the "R" circuit of the associated magneto and is controlled by one of four momentary contact IGNITION BOOSTER switches on the engineer's switch panel.

(b) Throttle Control Levers

Throttle control levers are located on the pilot's, copilot's and engineer's stands. They are arranged on the pilot's and copilot's stands in such a way that any one, both inboard, or all four levers may be operated with one hand. A lock is located on the pilot's stand to lock the levers in any position. Also, the inboard throttles alone may be locked, leaving the outboard engine throttles free for maneuvering.

(c) Supercharger Control Levers

Supercharger control levers are located on the pilot's, copilot's and the engineer's control stands. Pulling the levers back sets the superchargers for no boost and pushing them fully forward, which is determined by adjustable stops, gives maximum boost. The use of the locking lever, located on the pilot's control stand beside the supercharger levers, will apply varying degrees of friction to the supercharger control.

(d) Overcontrol Lever

An overcontrol lever is located on the pilot's stand to render the engineer's throttle and supercharger controls inoperative in the event of an emergency.

(e) Mixture Control Levers

The mixture control levers are located on the engineer's control stand. The nameplate indicates four positions, ENGINE OFF, LEAN, AUTOMATIC and EMERGENCY RICH. Intermediate positions between AUTOMATIC LEAN and AUTOMATIC RICH may be secured by applying friction with the locking handle beside the mixture levers.

(f) Cowl Flap

Cowl flaps are electrically operated and controlled by four momentary contact COWL FLAP switches in the engineer's switch panel.

(g) Intercooler

The intercooler exit flap is also electrically operated and controlled by four momentary contact INTERCOOLER FLAP switches in the engineer's switch panel.

(h) Oil Cooler

The oil cooler exit flap is governed automatically by a thermostat or may be set in the OPEN or CLOSED positions at the option of the engineer. Four three-position OIL COOLER FLAP switches in the engineer's switch panel allow choice of operation in the OPEN, CLOSED or AUTO positions.

(i) Primer

The engines (blower cases) are primed by means of solenoid valves operated by four momentary contact ENGINE PRIMER switches in the engineer's switch panel.

(j) Oil Dilution

Solenoid valves allow fuel to enter the engine oil lines for oil dilution in cold weather operation. These valves are controlled by four momentary contact OIL DILUTION switches in the engineer's switch panel.

CAUTION: Do not dilute the oil for more than four minutes.

(k) Fuel Supply

1. Fuel Booster

Electrically-driven fuel boost pumps, located in each wing tank, supply fuel to the engines during take-off, landing and high altitude operation. The pumps are controlled by four FUEL BOOST switches in the engineer's switch panel. The amount of boost pressure may be adjusted by four rheostats, also located in the engineer's switch panel.

2. Fuel Shut-Off

A solenoid-type shut-off valve is located in each engine feed line. The valve is operated by two opposed solenoids, one employed for the closing and the other for the opening action. These valves are controlled by four momentary contact FUEL VALVE switches. Small dots near each switch indicate the direction in which the valve was last actuated. A transparent shield protects the switches against accidental operation.

3. Tank Selector (Fuel Transfer)

Two tank selector valve levers are located at the outboard end of the engineer's control stand. The levers are connected by cables to the selector valves which are located under the midwing section between the bomb bays. Four positions are available on each selector valve to allow transfer of fuel across the centerline of the ship.

4. Fuel Transfer Pump

The two reversible fuel transfer pumps operate in parallel and are controlled by a three pole, double throw FUEL TRANSFER switch in the engineer's switch panel. The pump switch is interlocked by a relay with the tank selector valves.

(l) Tank Selector (Quantity Gages)

On the fuel and oil quantity gages, installed in the engineer's instrument panel, selector knobs are provided to allow choice to be made for indication of the quantities in any of the engine fuel tanks and oil tanks.

(m) Propeller

1. Pitch Control

The propeller governors are individually controlled by four momentary contact PROPELLER RPM switches mounted in the engineer's switch panel. These switches operate in conjunction with amber signal lights in the copilot's and engineer's

instrument panels. The signal lights indicate the limit of governor travel in either direction.

2. Emergency Pitch Control

A four pole, three position gang switch is mounted in the aisle stand and operates all propellers simultaneously. Use of this switch allows the pilot propeller control to override that of the engineer's switches.

3. Feathering

Four red PROPELLER FEATHERING magnetic push button switches are installed in the aisle stand. When operated, the switches are held engaged by the magnetic feature until feathering is complete. Should it be desired to stop the action prior to completion, the buttons may be pulled out manually.

Propeller unfeathering requires that the buttons be manually engaged, since the operation requires oil pressures in excess of that at which the magnetic holding feature ceases to function. The button should be held engaged until the propeller has attained sufficient rotation (200 RPM) for the governor to assume control.

A transparent, hinged guard protects the push buttons from accidental operation.

4. Propeller Anti-Icer

The PROPELLER DEICER switch, mounted in the engineer's switch panel, operates the two propeller anti-icer pumps under the aft pressurized cabin floor. The pumps supply fluid to the inboard and outboard propellers, respectively, and their rates of supply may be varied by means of two rheostats (INBOARD and OUTBOARD) installed in the lower inboard portion of the engineer's control stand.

(n) Starter

Receptacles for operation of the portable starter are mounted in the rear wall of each nacelle wheel well. The control switch is mounted in the motor handle for thumb operation.

(o) Engine Fire Extinguisher

1. Selector (Knob)

The selector (knob) for the engine fire extinguisher is located on the outboard end of the engineer's instrument panel and may be turned to any one of the four engine positions in order to direct the discharge from the CO_2 cylinders to the desired engine extinguisher ring.

2. Release Handles

Two pull handles, one on either side of the selector valve, are provided to control the discharge of the two CO_2 cylinders located at the aft end of the nose wheel well. Do not attempt to distribute the discharge from one bottle to more than one engine, as the capacity of a single bottle will not be sufficient for effective use on either engine in that case.

(3) Hydraulic System Controls

(a) Brakes

Fluid pressure from the airplane hydraulic system is metered to the brakes by means of valves which are operated by tilting the rudder pedals forward. The brakes on the two sets of main landing wheels are independent of each other and may be operated either by the pilot or copilot.

(b) Emergency Brakes (Levers)

The emergency brake system is operated by pulling two control levers on the pilot's aisle stand.

CAUTION: In case of a landing where the emergency system is required, care must be taken not to "meter" the brakes excessively, as this may drain the emergency accumulator until there is not enough brake pressure to stop the plane.

(c) Parking Brake

The PARKING BRAKE handle is located on the pilot's rudder pedal stand and operates the pilot's metering valves. This utilizes the regular braking system; therefore, it is necessary to have hydraulic pressure at the time the parking brake is set. To set parking brakes, operate foot brakes, then pull out the PARKING BRAKE handle. This locks the metering valves in the depressed position.

(d) Pump

The motor-driven hydraulic pump is normally regulated to pressures of from 800 to 1000 PSI. However, a switch has been provided in the engineer's switch panel whereby, at the engineer's option, the regulator contacts may be shorted to allow the pump to run independent of regulator control.

(e) Hand Pump

An Adel hand pump, located at the left of the copilot, is provided for developing system pressure on the ground for parking, and in case of failure of the hydraulic pump motor.

(f) Filler Valve (Emergency System)

The filler valve for the emergency system is located on the engineer's instrument panel. The filler valve should be opened when the regular system is started up to allow the emergency accumulator to be charged. The valve should be closed

when the system pressure is built up. Care must be taken to recharge the system by opening the valve if the emergency system pressure falls below 1000 pounds.

(g) Service Shut-Off Valve

A globe-type shut-off valve for servicing is provided to drain the accumulator pressure back to the supply tank. This valve is accessible under the pilot's compartment floor at Bulkhead 218 on the hydraulic panel.

(4) Landing Gear Controls

(a) Landing Gear Switch

The landing gear is normally controlled by the LANDING GEAR switch, located in the aisle stand. In the DOWN position this switch actuates the nose gear and nacelle door motors together. Transfer-limit switches actuate the main landing gear motors when the nacelle doors are fully open. When set in the UP position, the switch actuates all landing gear together until the landing gear reaches the upper limits, whereupon transfer-limit switches actuate the nacelle door motors.

(b) Landing Gear Power Transfer

A power transfer switch, mounted in the pilot's control stand, will, in the EMERGENCY position, disconnect the power from the normal landing gear operators and connect the emergency power bus to the main power system should operation of the emergency landing gear (and bomb door wing flap) motors with normal power be desired.

(c) Emergency L.G. Switch and Door Releases

The rearmost pull handle on the aft portion of the pilot's control stand is cable connected to release mechanisms on the end of each nacelle door retracting screw. Initial travel of the pull handle releases the nacelle doors. Subsequent travel engages a momentary switch which operates to lower, successively, the nose gear, left main landing gear and right main landing gear. The pull handle must be held pulled out until the lowering operation is complete. The emergency motors may be used to retract the landing gear, in the same order, by holding the emergency gear switch (aft of release handle) depressed (UP position). No means is provided for emergency retraction of the nacelle doors.

CAUTION: To operate the emergency landing gear motors, either the LANDING GEAR POWER TRANSFER switch (pilot's control stand) or the EMERGENCY CIRCUIT switch (battery solenoid shield) must be in the EMERGENCY position.

(d) Warning Reset

Four small plungers, mounted adjacent and to the rear of the throttle levers on the copilot's control stand, operate spacers between the throttle lever cams and the landing gear warning switches. When it is desired to suppress operation of the warning (due to the throttle having been closed while the landing gear was retracted), the plunger for the throttle in question may be depressed, which action disengages the spacer and

allows the switch to open the horn circuit. However, if the throttle lever is then advanced from the CLOSED position, the spacer will snap back into operating position.

(5) Cabin Supercharging Controls

(a) Supercharger

The cabin superchargers, located in each inboard nacelle, are cable controlled by the CABIN SUPERCHARGER CONTROL levers on the engineer's control stand. These levers allow control from minimum flow of 15 pounds per minute to maximum flow of 25 pounds per minute.

(b) Heater and Aftercooler

A thermostat at the engineer's station regulates the heat output from both cabin superchargers by control of the gasoline-operated heater and aftercooler damper motor. Sufficient duct pressure to operate the heater is provided by the duct pressure control regulator, which allows 6" Hg. in the duct - the amount required to operate the heater carburetor. Circuits of the left-hand and right-hand systems are separate and are controlled by two CABIN HEATING switches.

(c) Manual Pressure Relief

In case of failure of the cabin pressure regulators the engineer may manually control the cabin pressure by allowing air to escape through a valve that is located under the outboard end of the engineer's seat. The valve is turned counter-clockwise to release air pressure.

(d) Emergency Pressure Release

In the event of an emergency when the cabin is in the supercharged condition, the cabin air pressure must be lowered to equal outside air pressure before the doors in the pressurized bulkheads may be opened to allow escape from the airplane. Two pressure release valves, located on Bulkhead 834, are provided to instantly release all cabin pressure and are cable controlled by two release handles. One handle is located at the left of the pilot on the pilot's control stand and the other handle is on the right-hand sidewall of the rear pressurized cabin near the forward bulkhead.

(e) Pressure Warning Shut-Off

Should operation with cabin pressure altitudes above that of 12,000 feet be contemplated, the CABIN WARNING switch, mounted in the engineer's switch panel, may be employed to disconnect the cabin pressure warning chimes.

(6) Vacuum System Controls

(a) Vacuum Selector

The vacuum selector lever, located on the engineer's control stand, permits the engineer to select either the right or left inboard engine vacuum pump to supply suction for operating the gyro instruments.

(b) Emergency Shut-Off

An emergency shut-off for the vacuum-operated instruments is located on the front of the navigator's cabinet to prevent loss of cabin pressure in case of damage to the vacuum lines or to the instruments.

(c) Camera Vacuum Shut-Off

A valve for shutting off the camera vacuum is located at the camera operator's station.

(7) Bomb Controls

(a) Release Control

1. Lever

The bomb release control lever operates on a quadrant at the left of the bombardier, and has three possible positions, LOCK, SELECTIVE and SALVO. A pin on the bomb door operating lever intercepts the bomb release control lever and prevents any possibility of the bombs being released when the doors are closed. In the LOCK position the bombs cannot be released either mechanically or electrically.

2. Switch

The bombardier's release switch is mounted on the floor to the left of the bombardier's seat. The switch is of the momentary type and is operable in either direction. A hinged guard on the switch protects against accidental release.

(b) Interval Release

The bomb interval release is installed in the bombardier's instrument panel and provides pulses for either selective or train release of bombs. Controls are provided to vary the number and interval of bombs.

(c) Emergency Release

Three emergency releases are provided to open the bomb doors and release all of the bombs unarmed. The bombardier's emergency release control is a wheel located beside the normal release control on the left of the bombardier's seat. The wheel is revolved approximately 2-1/2 turns clockwise to effect complete release of all bombs. Two pull handles are also supplied. One is located to the left of the pilot on the pilot's control stand and the other handle is in the rear pressurized compartment on Bulkhead 646 on the left side on the communication tunnel. The releases are connected by cables to a bomb control unit mechanism, located on the midwing section between the bomb bays. The bomb control unit first operates the bomb bay emergency release, allowing the doors to open. When the doors are open, an interlock between the doors and the bomb racks allows the bomb control unit to release the bombs. Approximately 30 inches of pull is required to effect complete release.

(d) Group Selector

Four BOMB GROUP SELECTOR switches are mounted in the bombardier's instrument panel by means of which the

bombardier may remove any or all of the bomb groups from the normal (layer) release sequence.

(e) Tank Safety

Two bomb bay fuel TANK SAFETY switches are mounted on the tunnel sidewall, one in each bomb bay. These switches are provided to open the electrieal release circuits as a safety feature when bomb bay tanks are installed.

(f) Door

Two switches, cam operated by the BOMB DOOR lever on the bombardier's control stand, provide for normal extension and retraction of the bomb bay doors.

Provision has been made for use of the portable motor in emergency operation of the bomb bay doors. The motor may be engaged with the screw mechanisms in the right-hand catwalk and the receptacles are located adjacent to the motor engaging chuck.

CAUTION: To operate the portable motor from the above-mentioned receptacles either the LANDING GEAR POWER TRANSFER switch (pilot's control stand) or the EMERGENCY CIRCUIT switch (battery solenoid shield) must be in the EMERGENCY position.

(g) Formation Lamp

The BOMB SIGNAL switch, on the bombardier's instrument panel, allows choice of BRIGHT, OFF and DIM operation of the bomb formation lamp, mounted directly below the rudder trailing edge.

(8) Turret Controls

All controls necessary for remote operation of the turrets are grouped at the gunners' stations.

The gun sight aiming point camera control box is mounted on the aft fire control fuse panel.

(9) Radio

(a) Liaison Set

1. Receiver

The liaison receiver is operated with direct control and is mounted on the radio operator's table.

2. Transmitter

The liaison transmitter is also directly controlled at the radio operator's station. Additional tuning units are stowed under the radio operator's table and near the aft computers.

3. Transmitter Key

The liaison transmitter key is mounted on the radio operator's table aft of the liaison receiver.

4. Monitor Switch

A monitor switch, installed in the radio compass relay shield, permits simultaneous operation of the liaison receiver and transmitter for test purposes.

5. Antenna Transfer

The antenna transfer switch, installed in a shield above the radio operator's table, permits choice of antenna operation employing either the right-hand wing skin or the trailing antenna.

6. Trailing Antenna Reel Control

The antenna reel control box is mounted on the radio operator's table adjacent to the pressure bulkhead and contains the reel motor control switch (knob) and a red signal lamp which will illuminate if the landing gear is lowered while the trailing antenna is extended.

7. Trailing Antenna Fairlead Control

The antenna fairlead control lever, located under the radio operator's table, angularly retracts and extends the antenna fairlead by means of a cable linkage.

(b) Command Radio Set

1. Receivers

Three command radio receivers are mounted on the cabin sidewall above the radio operator's table. Control is available either directly at the radio operator's station, or by means of a remote control box on the cabin sidewall at the pilot's station.

2. Transmitters

Two command radio transmitters are mounted on the cabin sidewall above the radio operator's table. Control, similar to the receivers, is available either directly at the radio operator's station or by means of a remote control box at the pilot's station.

(c) Radio Compass

1. Receiver

Remote control boxes for operation of the radio compass receiver are installed at the copilot's and radio operator's stations.

2. Whip Antenna

The radio compass whip antenna is installed above the engineer's station and may be manually retracted.

(d) Marker Beacon

The marker beacon receiver is automatic in operation and is supplied power from the radio compass receiver.

(e) Interphone

1. Amplifier

The interphone amplifier has no switch and is in operation whenever the power circuits are energized.

2. Jack Boxes

Twelve interphone jack boxes are provided, one at each active station in the pressurized cabins.

3. Microphones

T-30 throat microphones are provided at all stations, control switches being installed in the control

wheels for the pilots and in the floor for the gunners. All other stations are equippped with standard cord-type switches.

4. Voice-Range Filters

Filters, mounted on the cabin sidewalls, allow the pilot and copilot selective attenuation of either the voice or range signals during their simultaneous transmission.

(10) Lighting

(a) Position Lights

The POSITION LIGHTS switch on the pilot's aisle stand permits choice of BRIGHT, OFF and DIM operation.

(b) Formation Lights

The FORMATION LIGHTS rheostat on the pilot's aisle stand allows adjustment of the illumination intensity of the formation lights. The rheostat is provided with an OFF position.

(c) Landing Lights

Two LANDING LIGHTS switches, mounted in the pilot's aisle stand, control motor-driven, retractable landing lights mounted in the left-hand and right-hand wings, respectively. The lamps light automatically when extended.

(d) Landing Gear Spotlights

Spotlights are provided to illuminate all landing gear in the EXTENDED position. These lights are employed in conjunction with the driftmeter for checking the landing gear and are controlled by a momentary contact switch on the navigator's table leg.

(e) Fluorescent Lights

Six fluorescent lights are installed as follows: one for the bombardier's instrument panel, two each for the pilot's and copilot's instrument panels, and three for the engineer's instrument panel. A starter-rheostat controls each light and is provided with OFF, DIM, ON and START positions. To operate, turn the knob to the START position for approximately two seconds. Releasing the knob allows it to snap to the ON position. If desired, the knob now may be turned to the DIM position to reduce the illumination.

(f) Copilot's Compass Lamp

The COMPASS LAMP rheostat installed in the copilot's auxiliary panel varies the illumination of the copilot's magnetic compass.

(11) Miscellaneous Controls

(a) Driftmeter

The driftmeter switch and receptacle are mounted on the navigator's table leg.

(b) Battery

The BATTERY switch in the engineer's switch panel controls the battery disconnect solenoid switch. This switch, however, is wired in series with the master ignition switches and in order to close the solenoid switch the master ignition switches (toggles) must be ON.

(c) Generators

The generators are controlled through the reverse current relays by means of four GENERATOR switches in the engineer's switch panel.

(d) Generator Selector (Ammeter-Voltmeter)

The five-position, AMMETER-VOLTMETER, rotary switch allows a choice of current and voltage indications for any of the four main generators. This switch has also an OFF position.

(e) Inverter Selector

Choice of operation with either of the two inverters as a source of A.C. power is provided by the AUTOSYN INVERTER switch located in the engineer's switch panel. This switch has an OFF position.

(f) Emergency Power Transfer

The emergency power transfer switch installed in the battery solenoid shield (aft of the rear pressurized cabin) transfers the battery and auxiliary power to the emergency power bus for operation of the emergency landing gear, wing flaps and bomb doors.

(g) Pitot Heat

The PITOT switch in the engineer's switch panel controls the operation of the pitot tube heaters.

(h) Surface Deicer

The SURFACE DEICER switch in the engineer's switch panel closes the air unloading valves and actuates the motor-driven distributor switch for progressive operation of the deicer boots.

(i) Camera Switches

Remote control of the vertical camera and associated equipment is provided by CAMERA switches installed in the bombardier's instrument panel and in the camera operator's panel.

(j) Camera Door Control

The CAMERA DOOR CONTROL lever is located on the right side of the camera operator's seat and controls the doors of the vertical camera well by means of cables. The lever is pulled back to open the doors.

(k) Alarm Bell

The EMERGENCY ALARM switch on the pilot's aisle stand operates a warning bell in the aft pressurized cabin.

(l) Phone Call

The PHONE CALL switch on the pilot's aisle stand operates white signal lights at all interphone stations in the aft pressurized cabin.

(m) Life Raft

Pull handles for the two life rafts are located in the forward pressurized compartment, on either side of the communication tunnel. Approximately six inches of pull will release the pins holding the life raft compartment door, and discharge the CO_2 bottle, allowing the raft to inflate. Access to the raft from the outside is gained through an access door forward of the life raft compartment. The life raft may be released through this door by pulling the cable to the raft door and CO_2 bottle or the door may be opened for inspection of the uninflated life raft by first releasing the cable to the CO_2 bottle before pulling the cable to open the door.

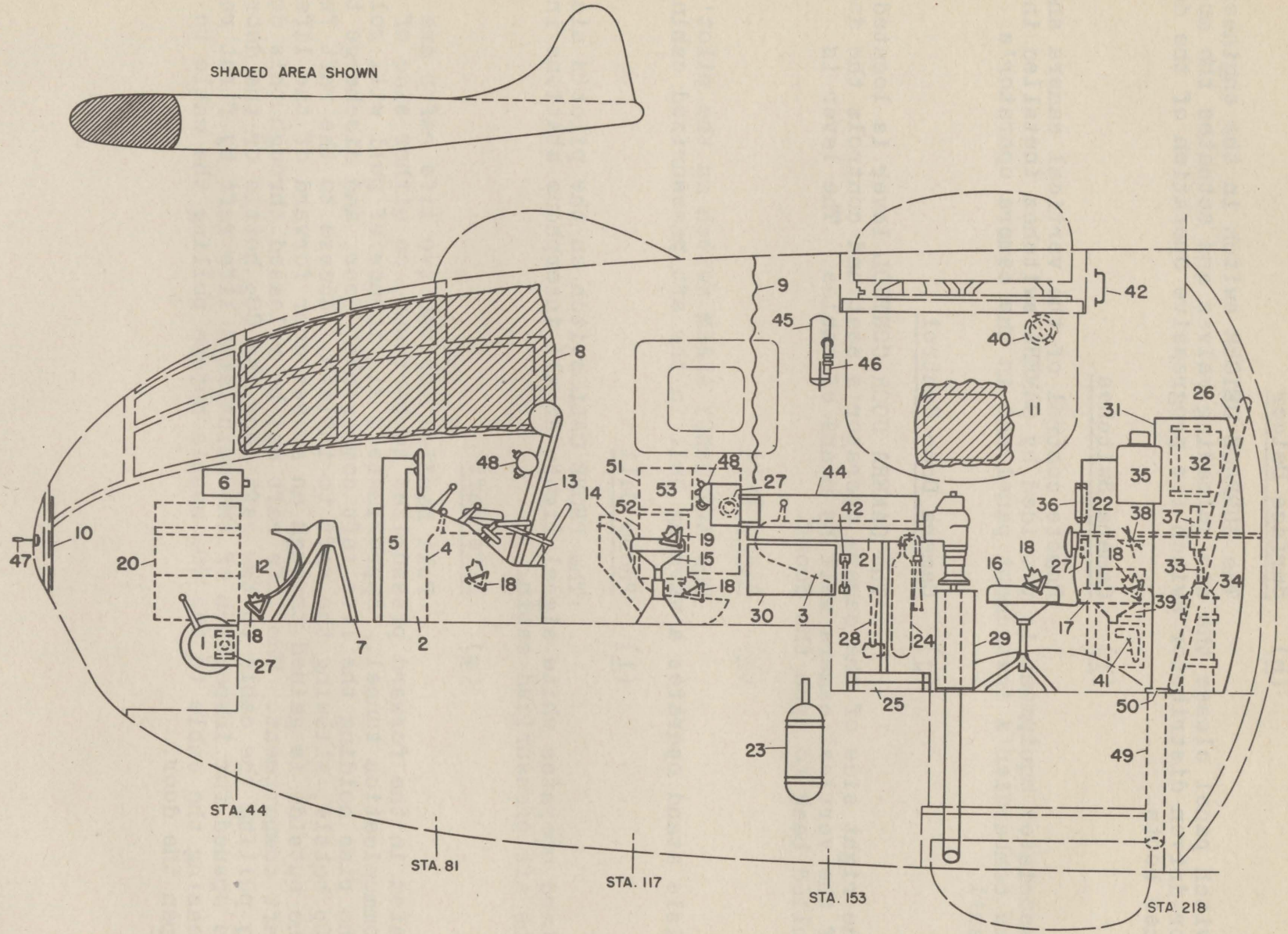


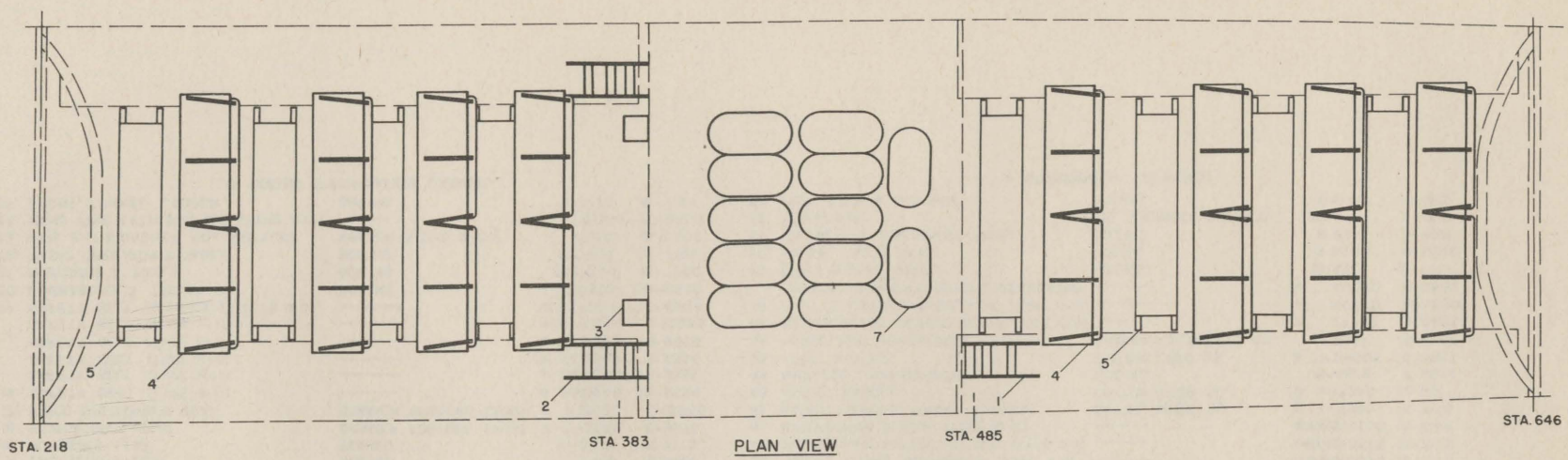
FIG. 11—EQUIPMENT DIAGRAM—SHEET 1

LEGEND

	PART	MFGR.	MFGRS. NO.	BAC. INST.
1.	BOMBARDIER'S CONTROL STAND	BOEING	15-8751	15-8751
2.	PILOT'S CONTROL STAND	BOEING	15-7226	6-17757
	COPILOT'S CONTROL STAND	BOEING	15-7256	6-10559
3.	ENGINEER'S CONTROL STAND	BOEING	15-8802	15-8802
4.	AISLE STAND	BOEING	15-8565	15-8565
5.	CONTROL COLUMN	BOEING	15-7203	15-7203
6.	INTERVALOMETER (TYPE B-3)	FAIRCHILD AERIAL CO.	*75-23	6-11725
7.	RUDDER STAND	BOEING	15-8583	15-8583
8.	BLIND FLYING CURTAIN	G. WOOD, SONS & CO.	Ø 1-23449	15-9697
9.	NIGHT FLYING CURTAIN	G. WOOD, SONS & CO.	Ø 1-23449	15-9698
10.	NOSE CURTAIN	G. WOOD, SONS & CO.	Ø 1-23449	7-1907
11.	NAVIGATOR'S WINDOW CURTAIN	G. WOOD, SONS & CO.	Ø 1-23449	7-1908
12.	BOMBARDIER'S SEAT	BOEING	15-9694	15-9694
13.	PILOT'S SEAT (MODEL 162)	WARREN McARTHUR CORP.	Ø 1-18001	9-3555
	COPILOT'S SEAT (MODEL 162)	WARREN McARTHUR CORP.	Ø 1-18001	9-3555
14.	ENGINEER'S SEAT	BOEING	15-9695	9-3556
15.	GUNNER'S SEAT	BOEING	15-8804	15-7179
16.	NAVIGATOR'S SEAT	CRAMER POSTURE CHAIR	Ø 6-10548	6-9976
17.	RADIO OPERATOR'S SEAT	CRAMER POSTURE CHAIR	Ø 7-1856	6-10965
18.	SAFETY BELT (TYPE B-11)	———	* 34G1646	15-9694
	SAFETY BELT (TYPE B-11)	———	* 34G1646	9-3555
	SAFETY BELT (TYPE B-11)	———	* 34G1646	9-3556
	SAFETY BELT (TYPE B-11)	———	* 34G1646	9-9976
	SAFETY BELT (TYPE B-11)	———	* 34G1646	6-10965
19.	SAFETY BELT (GUNNER'S)(TYPE A-3)	———	* 30-1334	15-8804
20.	BOMBARDIER'S TABLE	BOEING	15-9696	15-9696
21.	NAVIGATOR'S TABLE	BOEING	15-7240	15-7240
22.	RADIO OPERATOR'S TABLE	BOEING	15-7166	15-7166
23.	FIRE EXTINGUISHER CO_2 BOTTLES	WALTER KIDDE & CO.	79307	15-7306
24.	HAND FIRE EXTINGUISHER (TYPE A-17)	———	* 40304	15-9850
25.	FRONT TUNNEL LADDER	BOEING	9-4378	15-7197
26.	FORWARD ENTRANCE LADDER	BOEING	9-5178	15-8858
27.	BOMBARDIER'S ASHTRAY (MODEL 1936)	FORD	Ø 3-15835	3-15844
	ENGINEER'S ASHTRAY (MODEL 1936)	FORD	Ø 3-15835	9-4831
	RADIO OPERATOR'S ASHTRAY (MODEL 1936)	FORD	Ø 3-15835	15-7167
28.	HAND AXE (HUNTER'S TYPE)	———	Ø 1-24578	15-7179
29.	DRIFTMETER (TYPE B-3)	———	*94-27796	15-8891
30.	BOMBSIGHT CASE	———	*39G5609	3-16576
31.	NAVIGATOR'S CABINET	BOEING	15-7126	15-7126
32.	WASTE CUP RECEPTACLE	BOEING	6-11750	6-11750
33.	RELIEF TUBE (EMERGENCY)	———	———	9-5680
34.	RELIEF CONTAINER (EMERGENCY)	———	———	9-5680
35.	WATER JUG (TYPE III)	———	*RR-B-596	9-5680
36.	CUP DISPENSER	LILY-TULIP CUP CORP.	39D3339	3-16311
37.	RELIEF TUBE HORN	———	*33A4739	9-5680
38.	OCTANT (TYPE A-6)	———	*94-27746	15-7179
39.	SIGNAL FLARE CONTAINER (TYPE A-1)	———	*H41D10595	15-7179
40.	PYROTECHNIC PISTOL HOLDER (TYPE A-1)	———	*H41D10378	15-7179
41.	PYROTECHNIC PISTOL (TYPE M-2)	———	*H41D10594	15-7179
42.	ASSIST HANDLE (FRONT TUNNEL)	DAYTON MFGR. CO.	Ø 1-17980	15-7179
43.	ASSIST HANDLE	DAYTON MFGR. CO.	Ø 1-17980	12-601
44.	MAPCASE (NAVIGATOR'S)	BOEING	9-4872	9-4872
45.	FIRST AID KIT	E.D. BULLARD CO.	Ø 1-24806	15-9427
46.	FLASHLIGHT (EVEREADY)	GRAYBAR ELECTRIC CO.	8257	15-9427
47.	THERMOMETER (BOMBARDIER'S) (TYPE C13)	———	* 27328	3-15823
48.	PILOT'S OXYGEN REGULATOR (TYPE A-12)	———	* 40370	6-11530
	FORWARD GUNNER'S OXYGEN REGULATOR	———	* 40370	6-11630
49.	DRIFT SIGNAL CHUTE	BOEING	12-471	12-471
50.	SIGNAL CHUTE SEAL	BOEING	6-11100	6-11100
51.	ENGINEER'S EQUIPMENT PANEL	BOEING	8-2313	9-4831
52.	CLIPBOARD	ZELLERBACK PAPER CO.	20-1	9-4831
53.	FUEL SYSTEM DIAGRAM	BOEING	6-11717	9-4831

Ø BOEING SPECIFICATION DRAWING

* GOVERNMENT FURNISHED



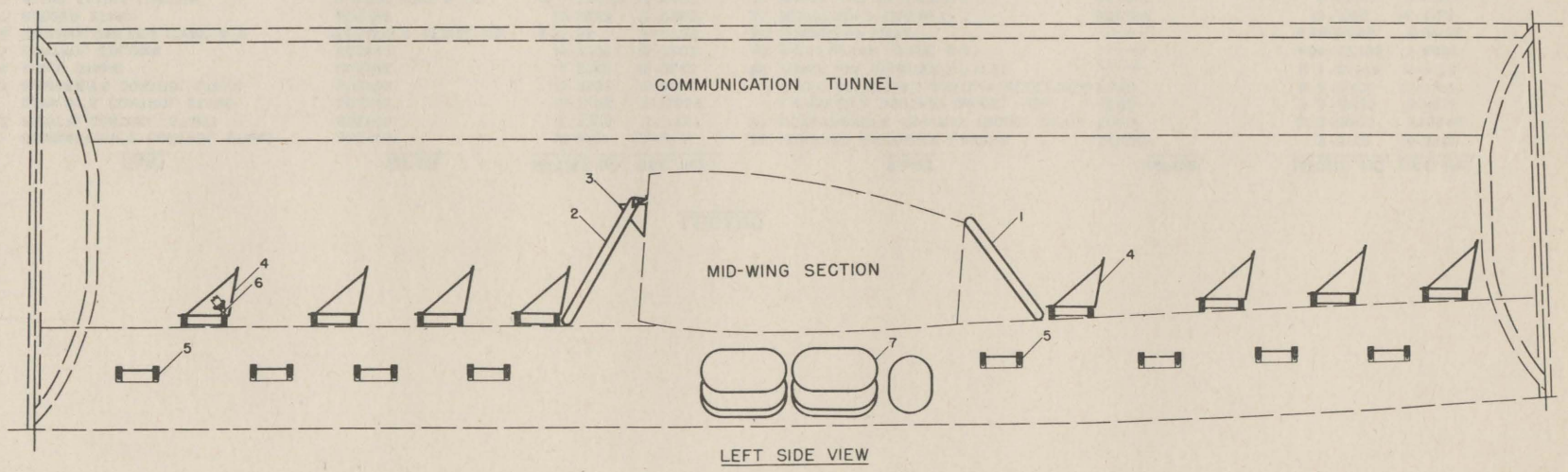
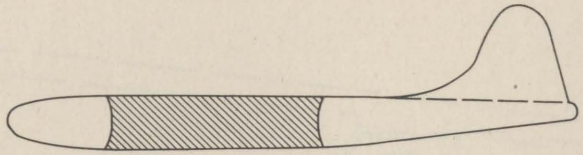


FIG. 12—EQUIPMENT DIAGRAM—SHEET 2



SHADED AREA SHOWN

LEGEND

PART	MFGR.	MFGRS. NO.	B.A.C. INST.
1. LADDER (REAR BOMB BAY)	BOEING	9-5186	15-9836
2. LADDERS (FWD. BOMB BAY)	BOEING	9-5161	15-9835
3. STEPS	BOEING	6-12322	15-9835
4. TROOP SEATS (REMOVEABLE)	BOEING	15-8888	15-8890
5. FOOTRESTS (REMOVEABLE)	BOEING	15-8889	15-8890
6. SAFETY BELTS (32 NO. AE-300)	RUSSELL MFGR. CO.	6-11109	15-8890
7. OXYGEN BOTTLES (12 TYPE G-1)		* 1-24432	14-3015

* GOVERNMENT FURNISHED

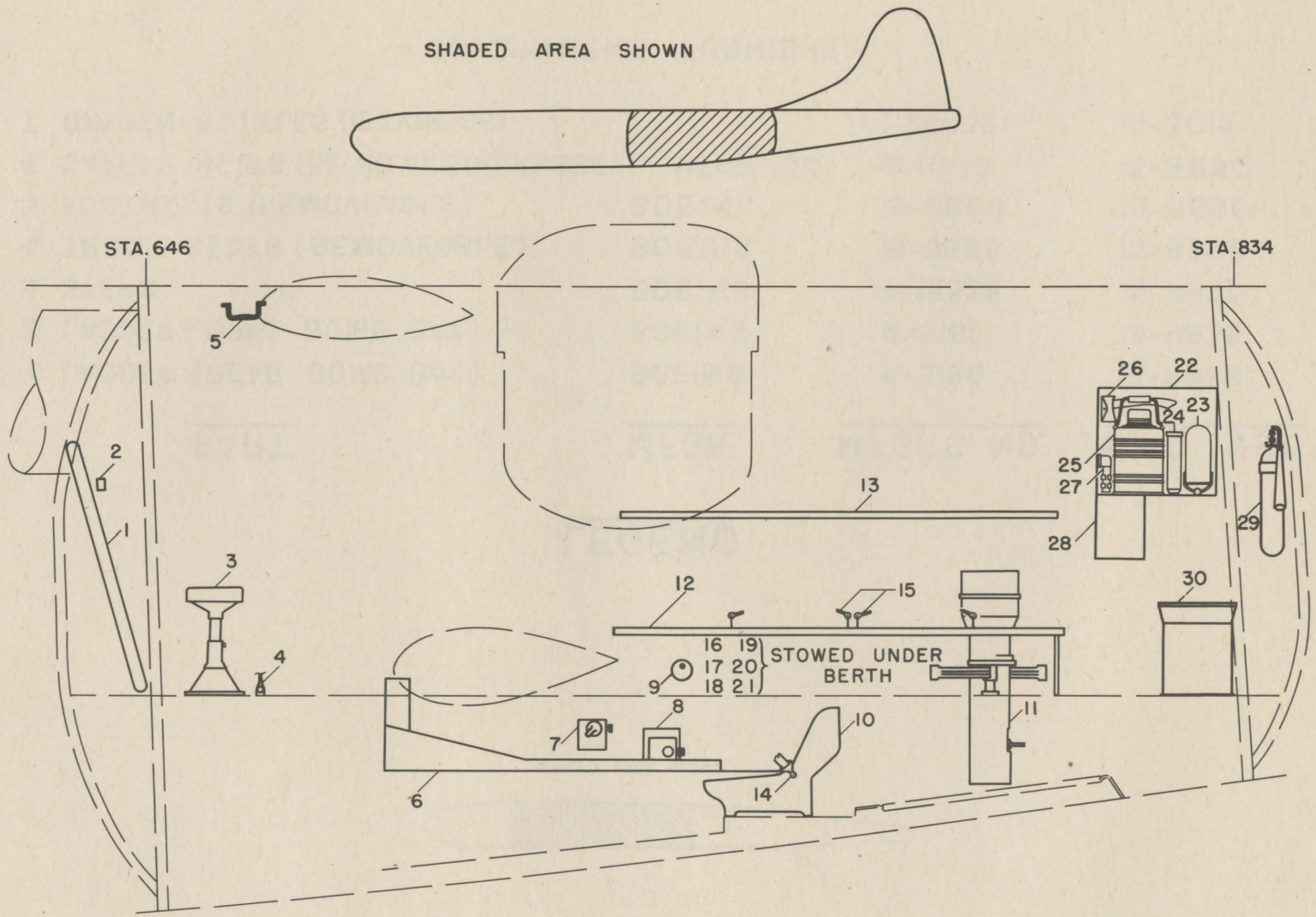


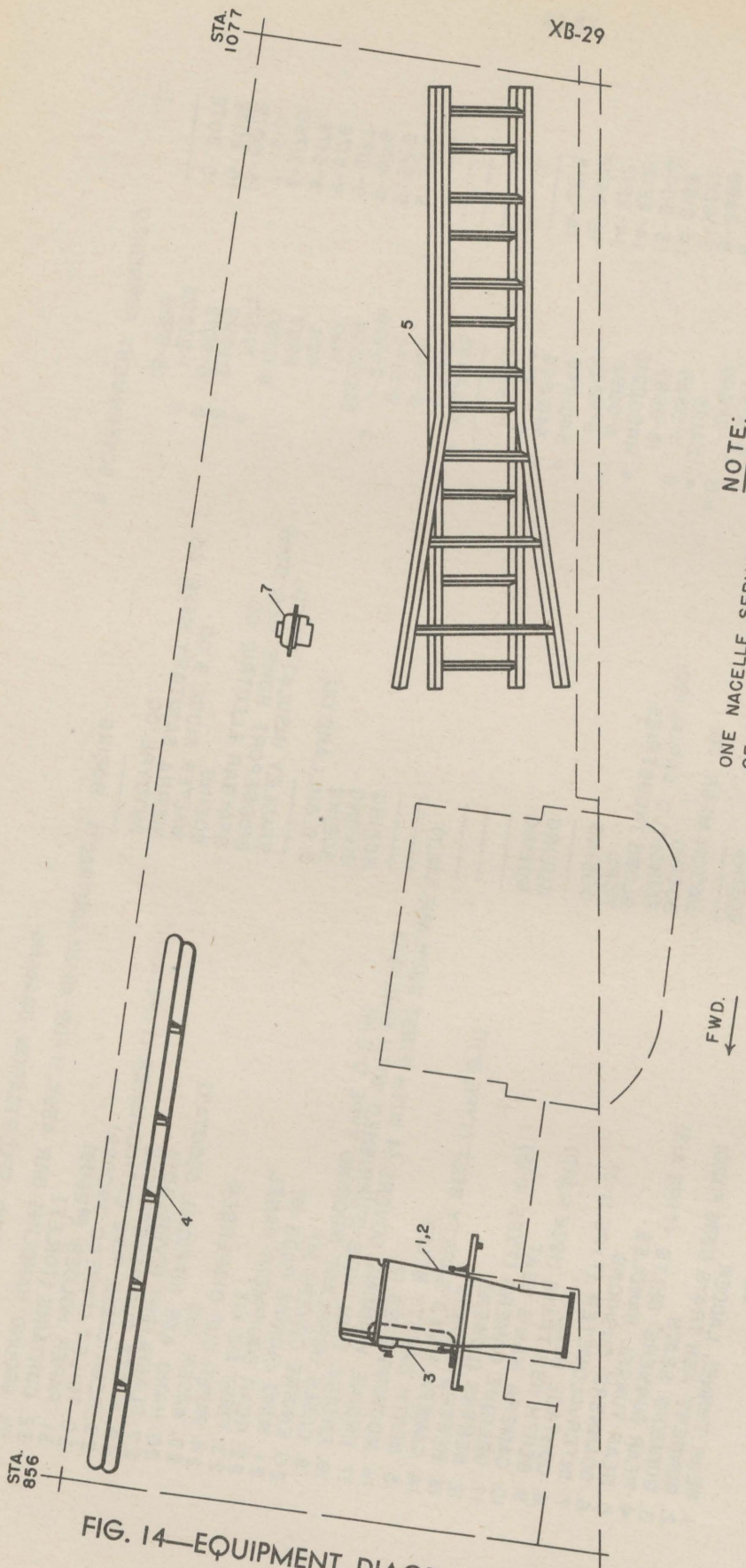
FIG. 13—EQUIPMENT DIAGRAM—SHEET 3

LEGEND

	PART	MFGR.	MFGRS. NO.	BAC. INST.
1.	REAR TUNNEL LADDER	BOEING	6-10276	6-10276
2.	GUNNERS' ASH TRAYS (1936 FORD)	FORD	Ø 3-15835	6-12099
3.	GUNNERS' SEATS	BOEING	15-8804	12-517
4.	REAR GUNNERS' BELTS (TYPE A-3)	———	* 30-1334	6-11631
5.	REAR TUNNEL HANDLES	DAYTON MFGR. CO.	Ø 1-17980	6-11714
6.	SCANNERS' CUSHIONS	BOEING	9-5094	6-11762
7.	INTERVALOMETER (TYPE B-3)	FAIRCHILD AERIAL CO.	*Ø 1-24689	6-11716
8.	CONTROL HEAD	GLOBE INDUSTRIES	* 12A125	9-4888
9.	BERTH ASH TRAYS (1936 FORD)	FORD	Ø 3-15835	3-16261
10.	CAMERA MAN'S SEAT	BOEING	15-9695	14-2188
11.	OBLIQUE CAMERA (TYPE K-15)	———	* H42G2216	15-9044
12.	BERTHS (LOWER)	BOEING	6-9982	14-2212
13.	BERTHS (UPPER)	BOEING	6-9933	14-2212
14.	CAMERA MAN'S SAFETY BELT (TYPE B-11)	———	* 34G1646	15-9695
15.	BERTH SAFETY BELTS	———	* 34G1646	14-2212
16.	MOORING EYES (2)	———	41-6236	———
17.	ENGINE WARMING COVERS (4 WITH FIRST AIRPLANE ONLY)		15-9842	———
18.	ENGINE TOOL KITS (FURNISHED WITH ENGINES)	———	———	———
19.	CASES (AIRPLANE MOORING TYPE D-1) (4)	———	* 36G4465	———
20.	ENGINE COVERS (4)	BOEING	14-3055	———
21.	WING JACKING PADS (4)	BOEING	6-9916	———
22.	REAR EQUIPMENT PANEL	BOEING	9-5176	9-5176
23.	FIRST AID KIT	E.D. BULLARD CO.	Ø 1-24806	9-5176
24.	PAPER CUP DISPENSER	———	39D3339	9-5176
25.	WATER JUG	STANLEY INSULATING CO.	1141G	9-5177
26.	HAND AXE (OFFICIAL SCOUTAX)	BRIDGEPORT HDWE. MFG. CORP.	424	9-5176
27.	FLASHLIGHT (EVEREADY)	GRAYBAR ELECTRIC CO.	8257	9-5176
28.	WASTE CUP RECEPTACLE	BOEING	6-11750	6-11750
29.	REAR CABIN FIRE EXTINGUISHER (TYPE A-17)	WALTER KIDDE & CO.	* 78070	7-1910
30.	TOILET (TYPE CC-390829)	SIERRA SANITARY MFGR. CO.	Ø 3-14319	15-8072
31.	PAPER HOLDER (#2609)	AUTOYRE CO.	Ø 15-8072	15-8072
32.	CURTAINS (TOILET)	———	Ø 1-23205	15-8072
33.	GROUND HANDLING BAR ASSY. (1 FOR XB-29 CONTRACT)	BOEING	15-9829	———

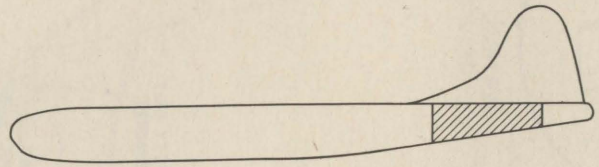
Ø BOEING SPECIFICATION DRAWING

* GOVERNMENT FURNISHED



NOTE:
ONE NACELLE SERVICING LADDER INSTALLED ON EACH SIDE OF AIRPLANE. SERVICING PLATFORM STRAPPED TO LADDER ON RIGHT HAND SIDE IN FOUR PLACES AFTER LADDER IS INSTALLED.

FIG. 14—EQUIPMENT DIAGRAM—SHEET 4



LEGEND

PART	MFGR.	MFGRS. NO.	B.A.C. NO.
1. VERTICAL CAMERA (TYPE A-17)	———	*H42G2400	14-2331
2. VERTICAL CAMERA (TYPE A-18)	———	*H42G2401	14-2331
3. FIRE EXTINGUISHER (TYPE A-2)	———	*SPEC. 85-2	15-9435
4. REAR ENTRANCE LADDER	BOEING	9-4374	15-9718
5. NACELLE SEVICING LADDERS	BOEING	15-8819	15-9690
6. SERVICING PLATFORM (SEE NOTE)	BOEING	9-4386	15-9690
7. REMOTE COMPASS TRANSMITTER	———	*AN5730-3	9-5120

* FURNISHED BY GOVERNMENT

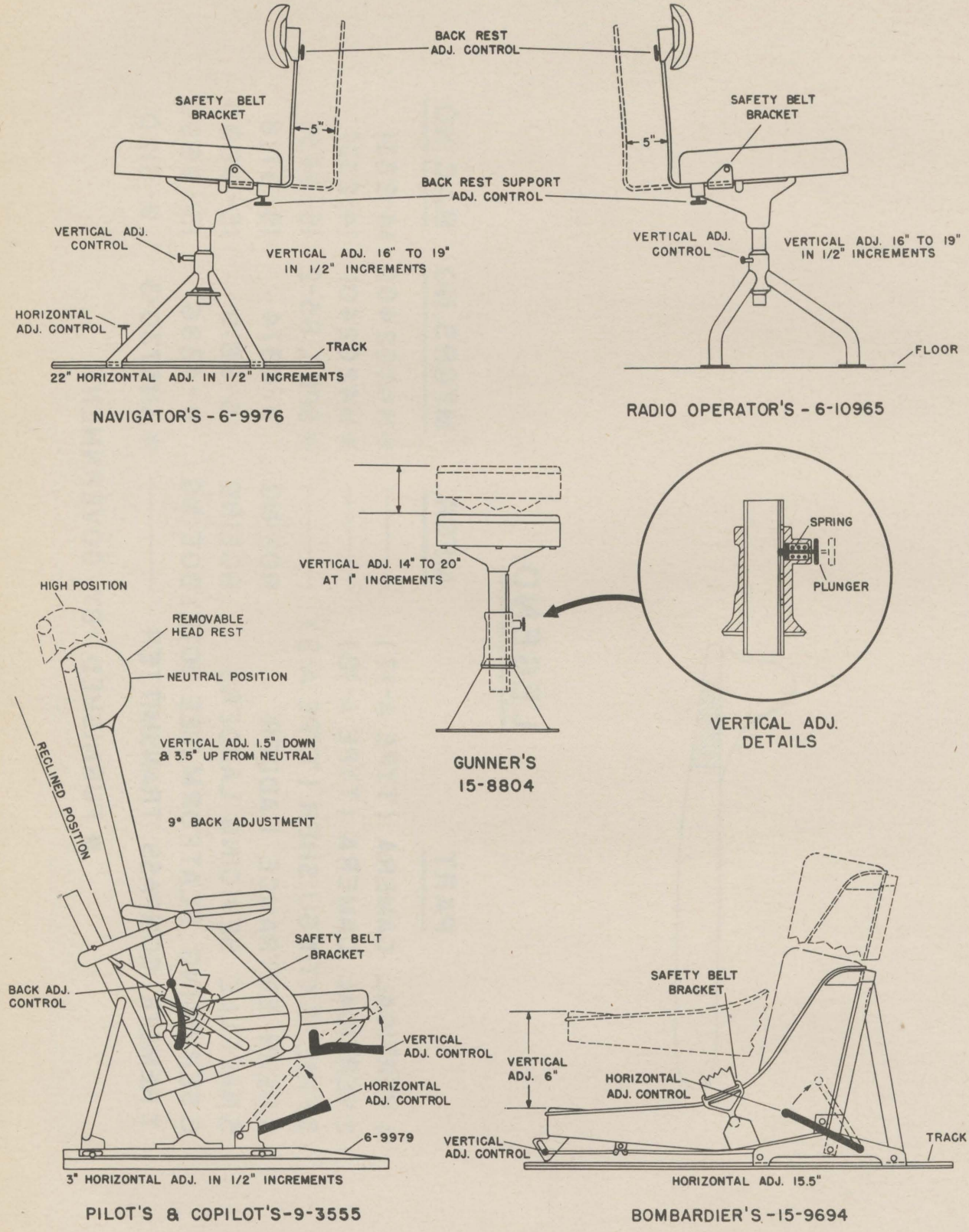


FIG. 15—SEAT ADJUSTMENT DIAGRAM

5. Equipment

a. General

The major fuselage equipment is shown on the diagrams in Part II of this Handbook.

b. Flight Control Equipment

A dual wheel column stirrup system of flight controls is provided. The aileron, elevator and rudder may be locked for parking by operating the surface lock control lever on the pilot's aisle stand.

c. Instruments

Instruments are provided for the bombardier, pilot, co-pilot, navigator and engineer, and may be located by reference to those panel diagrams. Description and function of the various types may be found in the discussion of their associated systems. Markings are of the self-luminous type and are designed to fluoresce under the influence of fluorescent (ultra-violet emitting) radiation. For additional information refer to paragraph(6) i., Instrument Lighting.

d. Hydraulic Equipment

(1) General

The hydraulic system on this airplane operates the brakes and rudder boost as shown in the Hydraulic System Flow Diagram. Operating pressure is between 800 and 1000 PSI.

(a) Service System

The service system is the portion which performs all hydraulic functions for normal operation. Pressure is supplied by an electric motor-driven pump and stored in a cylindrical accumulator installed on a removable panel below the floor forward of Bulkhead 218, and is the source of pressure when the pump is not operating. A pressure regulator automatically maintains pressure in the accumulator from 800 to 1000 PSI. The regulator starts the hydraulic pump at the low pressure (800 ±25 PSI) and breaks the circuit at the higher pressure (1000 ±25 PSI).

The pump, filter, pressure relief valve, shut-off valve for servicing, pressure test connection, check valve and rudder boost shut-off valve are also mounted on the removable hydraulic panel.

(2) Emergency Brake Operation

The emergency brake system consists essentially of an additional accumulator mounted on the right-hand sidewall behind the engineer's instrument panel, charged from the electric-driven pump and made independent of the service system by a shut-off valve which is opened only to charge the emergency system. Two hand-operated brake levers are located on the control stand to the right of the pilot. Operation of these levers will direct pressure from the emergency accumulator to the braking mechanism through auxiliary brake lines. Single action to either left or right-hand brakes is also obtained in operation of the dual control levers.

(3) Ground Operation

A hand pump is provided at the left of the co-pilot's station on the cabin floor and is used only for building up pressure during ground service operations and to supply pressure to the accumulator when the electric pump is not available.

(4) Bleeding Air

Bleeding air from the brake line is accomplished by opening the line at the brakes and applying the brakes (operating rudder pedals) several times. Air is bled from the rudder boost line by disconnecting the lines at the rudder boost cylinders and operating the rudder similar to the above-mentioned brake operation.

e. Cabin Supercharging and Heating Equipment

(1) Cabin Supercharger

The cabin supercharging system consists of two separate units independent of each other and operated by separate compressors. The compressors or blowers are driven by a flexible drive shaft from the engine accessory pads on each inboard engine. By means of differential gearing and an oil brake (pump) the speed of the blower is regulated to keep the cabin pressure constant regardless of the airplane altitude, or engine RPM. The blower speed can be made independent of the varying engine speed by automatic adjustment of the oil restriction from the oil pump.

The superchargers draw air from the air intake duct under the nacelle and direct it through an aftercooler, which is located in the leading edge of the wing between the inboard nacelle and the fuselage. The air passes from the aftercooler through ducts into a Stewart-Warner gas heater and then through a duct inside the fuselage, where it is distributed throughout the ship. Cabin supercharger output is regulated by a venturi located in the duct between the supercharger and the aftercooler.

(a) Pressure Control

Two cabin pressure regulators (Airesearch) for controlling cabin pressure and ventilation are located just aft of Pressure Bulkhead 646 and vent into the aft bomb bay. These regulators come into operation at 8,000 feet or 22.22" Hg. and maintain a cabin pressure equivalent to 8,000 feet altitude until a limiting differential pressure of 13.34" Hg. is reached, which normally occurs around 30,000 feet. This differential pressure will be maintained until the compressor becomes incapable of producing the required pressure rise.

(b) Temperature Control

The temperature of the air entering the cabin is governed by an aftercooler mounted on the outlet side of each compressor, two gasoline heaters mounted one on each side inside the bomb bay, and an automatic temperature control thermostat located on the engineer's board.

The cabin heating switches on the engineer's switch panel, when ON, energize the heaters, heater dampers and aftercooler flaps subject to control by the main thermostat, duct thermostats and duct pressure valve. The temperature control thermostat is designed to maintain a temperature of approximately 65°F inside the cabin.

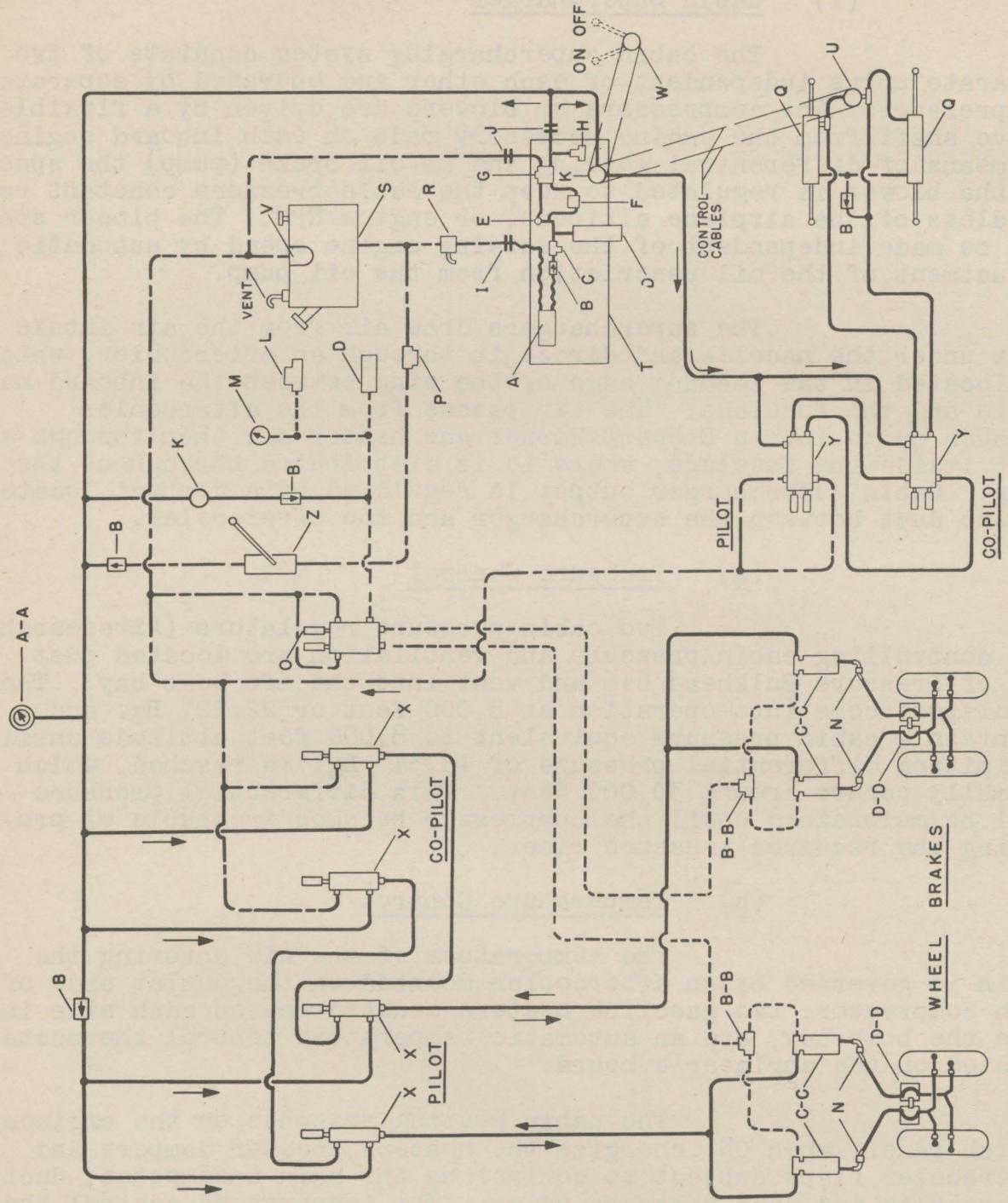


FIG. 16—HYDRAULIC SYSTEM FLOW DIAGRAM

HYDRAULIC SYSTEM FLOW DIAGRAM LEGEND

LEGEND

PART	MFGR.	MFGR. NO.	INST. NO.
A. PUMP-ELECTRIC DRIVEN	PESCO	⊘6-10213	15-8494
B. CHECK VALVE	BENDIX	⊘3-13283	15-8494
C. PRES. TEST CONNECTION	PARKER	⊘3-13277	15-8494
D. ACCUMULATOR	BOEING	9-3569	6-10412
E. SHUT-OFF VALVE-FOR SERVICING	PARKER	⊘3-13285	15-8494
F. FILTER-EXTERNAL CLEANING	PUROLATOR	⊘3-13284	15-8494
G. RELIEF VALVE (1200 P.S.I.) TYPE A-8-12	KENYON	⊘3-13275	15-8494
H. PRESSURE SWITCH CUT-OUT PRES. 1000±25 P.S.I. CUT-IN PRES. 800±25 P.S.I. WARNING PRES. 600±25 P.S.I.	STARBIRD	⊘6-10951	15-8494
I. DISCONNECT FITTING	AEROQUIP	⊘3-14301	15-8494
J. DISCONNECT FITTING	AEROQUIP	⊘3-13278	15-8494
K. SHUT-OFF VALVE	ADEL	⊘3-13281	15-7281
L. EMERG. PRES. WARNING SWITCH (OPERATES BETWEEN 900-925 P.S.I.)	BENDIX	⊘3-13274	6-10518
M. ENGINEER'S EMERGENCY BRAKE PRESSURE GAGE (RANGE 0-2000 P.S.I.) TYPE E-4	———	*94-27922	6-10286
N. BRAKE SWIVEL	BARKO	⊘6-9978	15-7287
O. EMERGENCY HAND OPERATED BRAKE METERING VALVE	BOEING	6-10211	15-8813
P. SUCTION TEST CONNECTION	PARKER	⊘3-13276	15-7283
Q. RUDDER BOOST CYLINDER	BOEING	15-7210	8-2041
R. DRAIN COCK	———	*AN765-3	15-7283
S. SUPPLY TANK-3 GAL.	BOEING	15-7235	6-10195
T. HYDRAULIC PANEL (REMOVABLE AS A UNIT)	BOEING	2-1179	15-8494
U. BY-PASS VALVE	ADEL	⊘3-13281	15-7263
V. EXTERNAL CLEANING FILTER	PUROLATOR	⊘3-13344	6-10195
W. RUDDER BOOSTER CONTROL	BOEING	15-7210	8-2041
X. BRAKE METERING VALVE FOOT OPERATED	BOEING	⊘6-10211	15-8813
Y. RUDDER BOOST METERING VALVE	BOEING	9-3552-3	15-8583
Z. HAND PUMP-CO-PILOT	ADEL	⊘3-13280	15-8582
AA. PRESSURE GAGE-CO-PILOTS	———	*94-27922	6-10286
BB. SAFETY LOCKOUT VALVE	———	⊘3-13279	3-14342 L.H. 3-14343 R.H.
CC. BRAKE RETURN BOOSTER	BOEING	9-3568	3-14342 L.H. 3-14343 R.H.
DD. BRAKE SWIVEL	BOEING	15-8063	15-9074

* GOVERNMENT FURNISHED
⊘ BOEING SPECIFICATION

LINE SYMBOLS
- RUBBER HOSE
- PRESSURE LINE
- SUCTION & RETURN
- EMERGENCY PRESSURE

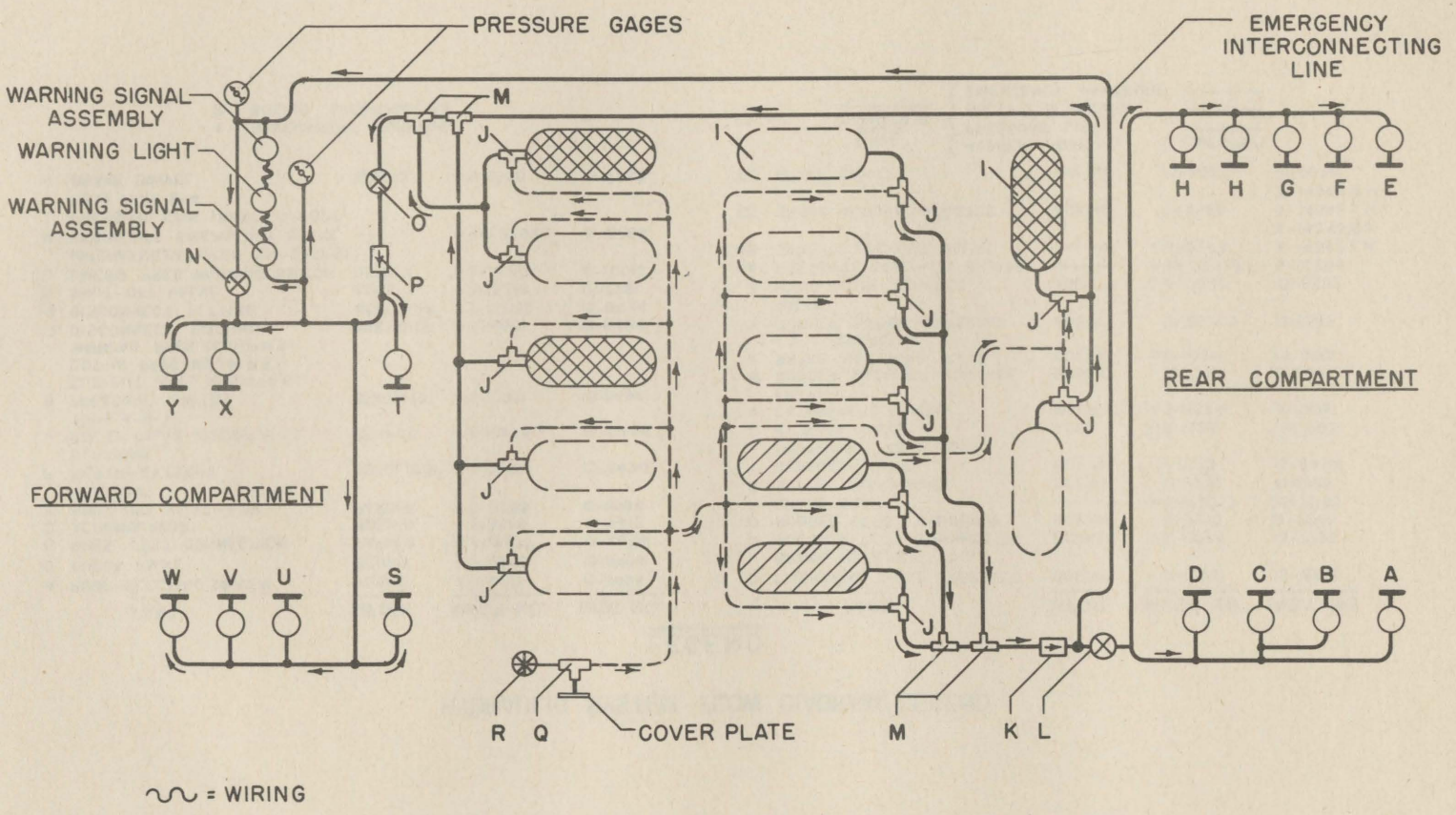


FIG. 17—OXYGEN SYSTEM FLOW DIAGRAM

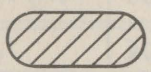
OXYGEN SYSTEM FLOW DIAGRAM LEGEND

LEGEND

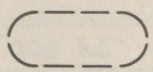
PART	MFGR.	MFGRS. NO.	BAC INST. DWG.
A — RELIEF CREW REGULATOR (TYPE A-12)		*Ø 1-24300	6-11722
B — CAMERA WELL REGULATOR (TYPE A-12)		*Ø 1-24300	6-11624
C — BERTH REGULATOR (TYPE A-12)		*Ø 1-24300	6-11616-1
D — SCANNER'S REGULATOR (TYPE A-12)		*Ø 1-24300	6-11557
E — RELIEF CREW REGULATOR (TYPE A-12)		*Ø 1-24300	6-11722
F — BERTH REGULATOR (TYPE A-12)		*Ø 1-24300	6-11616
G — SCANNER'S REGULATOR (TYPE A-12)		*Ø 1-24300	6-11557-1
H — REAR GUNNER'S REGULATOR (TYPE A-12)		*Ø 1-24300	6-11548
I — OXYGEN BOTTLES (TYPE G-1)		* 1-24432	14-3015
J — DUAL CHECK VALVES (TYPE 1, STYLE B)		AC 40325-A	15-9091
K — CHECK VALVE (TYPE 1, STYLE A)		AC 40325	15-7282
L — LINE SHUT OFF VALVE (TYPE 1)		AC 40386	6-11621
M — DUAL CHECK VALVES (TYPE 1, STYLE D)		AC 40325-A	15-9091
N — EMERGENCY SHUT OFF VALVE (TYPE 1)		* AC 40386	6-11638
O — LINE SHUT OFF VALVE (TYPE 1)		* AC 40386	9-5108
P — CHECK VALVE (TYPE 1, STYLE A)		AC 40325-A	15-7281
Q — RELIEF VALVE (TYPE 1)		* AC 40392	15-9091
R — OXYGEN FILLER VALVE (TYPE 1)	BOEING	1-18006	6-11146
S — NAVIGATOR'S REGULATOR (TYPE A-12)		*Ø 1-24300	6-11536
T — RADIO OPERATOR'S REGULATOR (TYPE A-12)		*Ø 1-24300	15-7167
U — FORWARD GUNNER'S REGULATOR (TYPE A-12)		*Ø 1-24300	6-11630
V — PILOT'S REGULATOR (TYPE A-12)		*Ø 1-24300	6-11530
W — BOMBER'S REGULATOR (TYPE A-12)		*Ø 1-24300	6-11501
X — ENGINEER'S REGULATOR (TYPE A-12)		*Ø 1-24300	9-4831
Y — CO-PILOT'S REGULATOR (TYPE A-12)		*Ø 1-24300	6-11530-1



NORMAL FORWARD COMPARTMENT SYSTEM



NORMAL REAR COMPARTMENT SYSTEM



ALTERNATE LOAD OXYGEN BOTTLES (INSTALLED BY GOVERNMENT)

Ø BOEING SPECIFICATION DRAWING * GOVERNMENT FURNISHED

OXYGEN CONSUMPTION

		CUBIC INCHES PER MIN. CONSUMED (CORRECTED TO SEA LEVEL)				
ALTITUDE		15,000 FT.	25,000 FT.	30,000 FT.	35,000 FT.	40,000 FT.
ALTERNATE CREW — NORMAL CREW	Pilot	98 cu.in/min	117 cu. in/min	202 cu. in/min	159 cu. in/min	128 cu. in/min
	Copilot	98 cu.in/min	117 cu. in/min	202 cu. in/min	159 cu. in/min	128 cu. in/min
	Engineer	98 cu.in/min	117 cu. in/min	202 cu. in/min	159 cu. in/min	128 cu. in/min
	Navigator	98 cu.in/min	117 cu. in/min	202 cu. in/min	159 cu. in/min	128 cu. in/min
	Radio Operator	98 cu.in/min	117 cu. in/min	202 cu. in/min	159 cu. in/min	128 cu. in/min
	Forward Gunner	116 cu.in/min	208 cu. in/min	238 cu. in/min	189 cu. in/min	153 cu. in/min
	Rear Gunner #1	116 cu.in/min	208 cu. in/min	238 cu. in/min	189 cu. in/min	153 cu. in/min
	Rear Gunner #2	116 cu.in/min	208 cu. in/min	238 cu. in/min	189 cu. in/min	153 cu. in/min
	TOTAL	838 cu.in/min	1509 cu.in/min	1724 cu.in/min	1362 cu.in/min	1099 cu.in/min
	Bombardier	98 cu.in/min	117 cu.in/min	202 cu.in/min	159 cu.in/min	128 cu.in/min
	Scanner #1	98 cu.in/min	117 cu.in/min	202 cu.in/min	159 cu.in/min	128 cu.in/min
	Scanner #2	98 cu.in/min	117 cu.in/min	202 cu.in/min	159 cu.in/min	128 cu.in/min
	Relief Man #1	98 cu.in/min	117 cu.in/min	202 cu.in/min	159 cu.in/min	128 cu.in/min
	Relief Man #2	98 cu.in/min	117 cu.in/min	202 cu.in/min	159 cu.in/min	128 cu.in/min
	Camera Man	98 cu.in/min	117 cu.in/min	202 cu.in/min	159 cu.in/min	128 cu.in/min
	TOTAL	1426 cu.in/min	2571 cu.in/min	2936 cu.in/min	2316 cu.in/min	1867 cu.in/min

	APPROXIMATE TIME DURATION OF NORMAL SYSTEM (5 BOTTLES) WITH NORMAL CREW	APPROXIMATE TIME DURATION OF ALTERNATE SYSTEM (12 BOTTLES) WITH NORMAL CREW	APPROXIMATE TIME DURATION OF ALTERNATE SYSTEM (12 BOTTLES) WITH ALTERNATE CREW
15000 Ft.	5.7 Hours	13.6 Hours	8.0 Hours
25000 Ft.	3.2 Hours	7.6 Hours	4.4 Hours
30000 Ft.	2.8 Hours	6.6 Hours	3.9 Hours
35000 Ft.	3.5 Hours	8.4 Hours	4.9 Hours
40000 Ft.	4.3 Hours	10.4 Hours	6.1 Hours

OXYGEN CONSUMPTION

f. Oxygen Equipment

(1) General

A dual low pressure emergency oxygen system with an operating pressure of 300 to 350 pounds is installed to supply fourteen crew members at the various stations. Two auxiliary stations are also provided at the berths in the rear pressure compartment. See Oxygen System Diagram.

(2) Oxygen Cylinders

Oxygen can be stored in twelve Type G-1 cylinders which are located in the fuselage below the wing outer section. The cylinders are connected in two groups and for normal oxygen load there are three cylinders available to the forward compartment and two to the rear compartment. There is an alternate oxygen load which provides four cylinders for the forward compartment and three to the rear compartment.

An emergency oxygen supply line runs between the two pressure compartments and incorporates an emergency shut-off valve, accessible to the engineer.

Oxygen can be drawn in an emergency from either group of oxygen cylinders, in event of damage or exhaustion of the other group, by operating the shut-off valve. Check valves are so located in the system to prevent reverse flow or draining of the system in case an oxygen cylinder is punctured.

A spring-loaded relief valve, set to relieve at 650 PSI, is located in each of the two main supply lines between the shut-off valve and the cylinder group. The relief valve discharges overboard.

(3) Oxygen Regulators

Sixteen regulators are provided at the various stations previously mentioned which automatically meter out the oxygen supply in an emergency according to the amount needed.

(4) Recharging

The valve at the recharging inlet is located on the left-hand side of the body below the wing of the airplane. All cylinders are replenished through an interconnecting filler system equipped with check valves.

g. Fire Extinguisher Equipment

(1) Hand Fire Extinguisher

There are two Type A-17 hand fire extinguishers provided on this airplane. One extinguisher is located in the forward pressurized compartment near the navigator's table and the other is near the rear bulkhead in the aft compartment and on the right-hand side.

Three Type A-2 hand extinguishers are installed near the rear entrance and one in each main wheel well.

See Emergency Equipment and Exits Diagram.

(2) Engine Fire Extinguisher

The fire extinguisher system for four engines is controlled by the engineer by means of a selector valve on the engineer's instrument board and two release handles. Operation of the valve to the selected engine position and pulling either handle will distribute CO_2 around the engine section through a perforated tube. Each release discharges a bottle of CO_2, which is not sufficient for more than one engine. The selector valve should therefore remain in position for a sufficient length of time after each release to fully discharge the bottle. Refer to Pilot Operating Instructions, Section II, for further details.

h. Ice Eliminating Equipment

(1) Surface Deicers

Surface deicer boots are provided on the leading edges of the wings, stabilizer and the dorsal fin. The boots are in three sections of each wing, one section of each stabilizer and one of the dorsal fin. Inflation of the boots is accomplished by exhaust air from three engine-driven vacuum pumps. Deflation of the boots is accomplished by suction from either one of the inboard engine vacuum pumps which exhausts its pressure overboard through the selector valve controlled from the cockpit. The system is so arranged that one inboard pump will furnish the suction for the instruments as well as for the deicers while the other inboard and two outboard pumps provide pressure for inflation.

The two vacuum selector valves permit selection of either one of the inboard vacuum pumps and are controlled by a single control from the cockpit.

Deicer operation is initiated by the operation of the deicer control switch on the engineer's panel. This switch is connected to an electric timer which operates a series of nine solenoid-operated distributor valves, four in each wing and one in the tail.

Due to the great amount of pressure that the vacuum pumps supply to pressure lines when the deicers are off, a relief valve is adjusted to 5.5" Hg. to prevent a collapse of lines in the system.

An emergency vacuum shut-off valve is used to insure the use of instruments in case a part of the deicer vacuum line is severed. It is also used to relieve the vacuum pump when high altitude and pressure within the compartment enable the instruments to operate without the pump.

(2) Propeller Anti-Icers

Propeller anti-icing is accomplished by distribution of an alcohol and glycerin mixture along the leading edges of the propeller blades. From a 24 gallon supply tank, located under the floor near the front bulkhead in the rear pressurized compartment, two electric motor-driven pumps draw the fluid and force it to the slinger rings installed in the propellers. The anti-icers are controlled by two rheostats located on the engineer's instrument board. These rheostats are provided to regulate the speed of the pump motor and are adjusted at the factory. The rheostats will turn the motors off, but a toggle switch has been provided for pump motor ON and OFF positions.

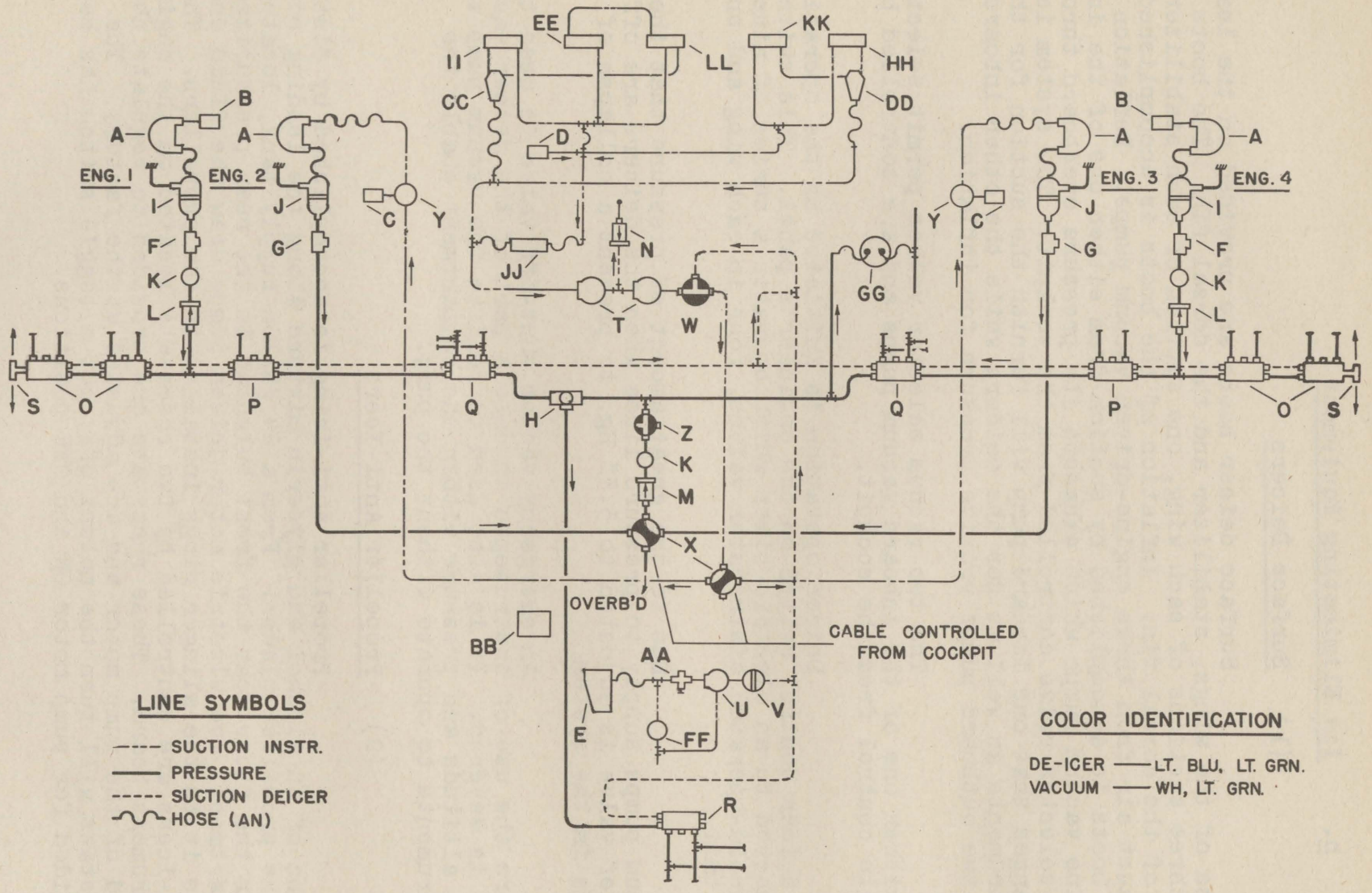


FIG. 18—VACUUM AND DEICER FLOW DIAGRAM

LEGEND

PART	MFG.	MFGR'S. NO.	BAC. INST. DWG.
A. PUMP (TYPE B-8)	PESCO	* 211-J	15-8474
B. AIR FILTER (OUTB'D)	———	* Ø 3-16764	6-12192
C. AIR FILTER (INB'D)	———	* Ø 3-16764	6-12350
D. AIR FILTER (10 C.F.M.)	———	* A.C. 27366	3-16272
E. CAMERA (K-17, K-18)	———	* 75-94,75-92	14-2331
F. PRES. RELIEF VALVE (TYPE B-8 OUTB'D)	PESCO	* 217H	6-12354
G. PRES. RELIEF VALVE (TYPE B-8 INB'D)	PESCO	* 217H	15-7159
H. PRES. RELIEF VALVE (TYPE 1182 MOD. 2)	ECLIPSE	D-108945	15-9017
I. OIL SEPARATOR (TYPE B-8 OUTB'D)	PESCO	* 218T	9-5196
J. OIL SEPARATOR (TYPE B-8 INB'D)	PESCO	* 218T	6-12333
K. OIL SEPARATOR	ECLIPSE	Ø 1-23291	15-9017
L. CHECK VALVE (OUTB'D)	———	27894	9-5196
M. CHECK VALVE	———	27894	15-7286
N. CHECK VALVE (INSTRUMENTS)	———	27894	15-9064
O. DISTRIBUTOR VALVE (SOLENOID)	ECLIPSE	E-101443	9-4878
P. DISTRIBUTOR VALVE (SOLENOID)	ECLIPSE	E-101443	9-4867
Q. DISTRIBUTOR VALVE (SOLENOID)	ECLIPSE	E-101443	15-9062
R. DISTRIBUTOR VALVE (SOLENOID)	ECLIPSE	E-101443	9-4859
S. DE-ICER UNLOADING VALVE (TYPE 1181-1-A)	ECLIPSE	E-107209	9-4878
T. REGULATOR VALVE (4" HG. NO. 2700)	SCHWIEN	Ø 1-21535	15-9064
U. REGULATOR VALVE (2" HG. NO. 2550)	SCHWIEN	Ø 3-16767	9-5135
V. VACUUM SHUTOFF VALVE (CAMERA)	———	Ø 3-15875	9-5135
W. VACUUM SHUTOFF VALVE (EMERGENCY)	———	Ø 3-15437	9-4249
X. SELECTOR VALVES	———	Ø 6-10975	8-2337
Y. VACUUM RELIEF VALVE (TYPE B-8)	PESCO	* Ø 3-16763	15-7266
Z. VALVE (EXTERNAL SOURCE OF AIR PRESSURE)	———	Ø 3-14446	15-9017
AA. VACUUM CONTROL VALVE (INSTRUMENTS)	———	* 38A6133	9-5135
BB. ELECTRIC TIMER	———	Ø 3-15484	6-11756
CC. MANIFOLD	BOEING	3-13662	15-7141
DD. MANIFOLD	BOEING	3-13662	15-7221
EE. SUCTION GAGE (TYPE F-4)	———	* 94-27336	8-2074
FF. SUCTION GAGE (TYPE F-4)	———	* 94-27336	9-5135
GG. AIR PRESSURE GAGE (TYPE G-2)	———	* 94-27924	15-8492
HH. TURN INDICATOR (TYPE AN-5735)	———	* AN-GG-1-496	8-1873
II. TURN INDICATOR (TYPE AN-5735)	———	* AN-GG-1-496	8-2074
JJ. TURN INDICATOR (TYPE AN-5735)	———	* AN-GG-1-496	15-8054
KK. FLIGHT INDICATOR (TYPE AN-5736)	———	* AN-GG-1-506	8-1873
LL. FLIGHT INDICATOR (TYPE AN-5736)	———	* AN-GG-1-506	8-2074

* GOVERNMENT FURNISHED Ø BOEING SPECIFICATION DRAWING

(3) Pitot Heaters

The dual pitot static heads are heated by electrical deicers or heaters in the pitot tubes and controlled from the engineer's switch panel.

i. Life Raft and First Aid Equipment

(1) Automatic Ejector Life Raft

Two automatic ejector type life raft installations are provided, one on each side of the fuselage above the center wing section. The control handles are located in the forward pressurized compartment on either side of the tunnel. Refer to Operation of Controls, Section I, paragraph 4 for further details.

(2) First Aid Kits

Two first aid kits are provided, one in the forward compartment to the left of the radio operator and one in the aft compartment near Bulkhead 834. See Emergency Equipment and Exits Diagram.

j. Photographic Equipment

(1) General

A camera well is located in the rear pressurized compartment and is covered by a hinged hatch. Provisions are made for the installation of the Type K-15 40 inch telephoto spotting camera, for taking oblique photographs. The camera has a 49° movement forward, 59° aft and 31.5° to either side. Skin flush doors are provided for this camera opening.

(2) Camera Lens

Provisions are also made for the vertical installation of any of the following: the single lens tactical mapping camera, Type T-5, and accessories; the single lens high altitude reconnaissance mapping camera, Type K-18, and accessories; and the single lens rapid reconnaissance mapping camera, Type K-17, 6-inch, 12-inch and 24-inch lens cones and accessories. The vertical camera installation is located aft of the rear pressurized compartment and forward of the lower rear turret.

(a) Camera Operation

The vertical camera may be remotely controlled from within the rear pressure cabin. Oblique photographs may be taken through an opening in the right side of the fuselage with the cabin unsupercharged with Types K-18 and K-17 cameras.

Provisions are made for mounting and operating the intervalometer at the camera operator's station in the rear pressurized cabin, and also at the bombardier's station in the forward pressurized cabin.

k. Armament

(1) General

This airplane is provided with two bomb bays which are separate from the pressurized compartments. This enables the bomb doors to be opened at any altitude without affecting the condition of the air within the sealed compartments. The bomb bays are equipped with internal bomb racks (interchangeable) for use with Type B-7 and D-6 shackles. The number, size and type of bombs carried are shown on the bomb loading charts.

Entrance to the bomb bay during flight is through the pressure bulkhead doors to the catwalks on either side. In flight at altitudes above 8000 feet, cabin pressure must be released before entrance can be effected. The catwalk is a truss support for the bomb bay and bomb bay doors and serves as a connection point for the lower end of the bomb racks.

The bomb doors are controlled by the bomber by means of an electric motor-driven retracting mechanism operated from the bomb release handle at the bombardier's station, but may be opened mechanically (in an emergency) with the use of the bombardier's emergency release and rewind control wheel or either of the two emergency pull handles, one at the pilot's station and one in the rear compartment near the bulkhead door.

Two fire control stations are provided in the rear pressurized compartment for controlling the top and bottom rear turrets and the tail turret guns by two fire control operators. A fire control station is provided in the forward pressurized compartment for controlling the top and bottom forward guns by a fire control operator.

(2) Bombing Equipment

(a) Bombardier's Control Panel

The bombardier's control panel is as shown on the diagram and is located on the sidewall at the left of the bombardier. This panel provides instruments and controls used in conjunction with the bombing operation. The panel containing the altimeter, airspeed indicator, clock and compass is shock mounted. A red signal light and rheostat control for operating the bomb release formation light are also located on the bombardier's panel (see electrical system).

(b) Bomb Door and Rack Control

Forward of the pilot's station two control levers are provided to control the doors and bomb racks. An

emergency release and rewind wheel is also installed in conjunction with the control handles.

The bomb door control lever operates switches for controlling the bomb door retracting motor and has two positions, OPEN and CLOSED. It may, however, be operated independently of the bomb release control. The bomb release handle for the bombardier's control and bomb racks is installed in such a way that the lever cannot be placed in SALVO position without engaging the bomb door control lever to open the bomb doors. The release handle has three positions as follows:

1. Lock

In the bomb LOCKED position the bomb racks are locked again t any release of bombs except by means of the emergency release handles (and wheel).

2. Selective

In this position the bomb racks are prepared for single release by manual operation of the bombardier's release switch or by automatic operation through the bomb interval release.

3. Salvo

When placed in the SALVO position, the bombs are all released simultaneously and unarmed.

(c) Bomb Control

Bombs may be released electrically or mechanically. Electric control, which is normal operation, provides automatic or manual control for individual release of the bombs either single (selective) or continuously at predetermined intervals (train).

Mechanical control is always SALVO in that it is released in emergency by either of the two emergency release handles or the bombardier's emergency release and rewind control. This system is independent of the electrical system and is coordinated by the bomb control unit.

1. Bomb Coordinating Unit

The bomb control or coordinating unit for the bomb control system is a means for coordinating the bomb control handle at the bombardier's station with the bomb racks. The unit is made up of two pairs of intermittent gears and an

internal arrangement of differential gears. Control pulleys attached to these gears are cable connected to the controls in the cockpit and to the bomb racks.

(d) Bomb Racks

The bomb racks are of web-type construction with two rails to each rack and are interchangeable to corresponding positions in the bomb bays.

Eight side racks, four in each bay and four center racks in each bay are normally provided for the larger sized bombs. Four extra side racks, two in each bay, are also provided. There are two types of center racks used, those used to carry bombs on both sides and those for carrying on one side. This provision is made to facilitate bomb loading.

1. Bomb Loading

To load the bomb racks the bombardier's control handle must be in the SELECTIVE position. The Type A-2 bomb release units may then be plugged into each active bomb station or station to be loaded on the bomb rack. After attaching release unit, return bombardier's control handle to LOCK position to prevent possibility of an accidental release.

Install the bomb shackles on the bombs and with the aid of the bomb hoisting mechanism proceed to load the stations, starting from the top on each rack. Refer to the Bomb Hoisting Diagrams for further hoisting details.

2. Bomb Hoisting

Special hoisting equipment (furnished by the government) for loading the bomb racks is provided. The hoists are placed at a rack station, one on each side of the bomb bay and in back of the racks which are to be loaded. The hoists used are moved from one set of racks to another and between bomb bays, as only one pair is used and only one bomb rack is loaded at one time.

(e) Bomb Doors

The two doors in each bomb bay are operated by a system of motor-driven retracting screws, two at each end of the bomb bay. Power for this mechanism is furnished through a central gear box, also located at the end of each bomb bay. Torque is applied to the operating shaft extending between the retracting screws from electrically-driven motor units mounted in the aft right-hand side of the forward bomb bay and in the forward right-hand side of the rear bomb bay. Refer to bomb bay door control mechanism.

A bomb door control handle is located in the bombardier's compartment on the left-hand side with the bomb control handle and operates two micro switches for OPEN and CLOSED positions to control the solenoid switches on the bomb door retracting motors. The handle engages a lug on the bomb control handle and prevents it from being moved toward the SELECTIVE position without first opening the bomb doors.

The emergency release system opens the doors directly by means of a cable from the bomb control unit to a pulley on the lower end of the bomb door retracting screw. The pulley operates a cam that forces the two followers apart and allows the lower part of the mechanism to drop free from the screw. Re-engagement of the motor drive is accomplished by rewinding the emergency bomb control mechanism with the bombardier's rewind control for resetting, then electrically operating the retracting screw to the fully extended position, where it automatically engages with the terminal at the end of the piston rod within the screw mechanism.

A mechanical lock, operated by the right door in the forward bomb bay and the left door in the rear bomb bay, prevents use of the bomb release mechanism until the doors are in the OPEN position, thus preventing inadvertent release of any bombs when the doors are closed. A bomb door safety switch is attached to each bomb door and prevents the use of the electrical bomb release circuit until the doors are fully open.

(f) Emergency Release

The emergency release handles are located one to the left of the pilot and the other aft of Bulkhead 646 in the rear pressurized bulkhead. One pull on the release handle will open the bomb doors and release the bombs salvo. The slack cable is rewound by the bombardier's emergency release and rewind control wheel on the bombardier's control stand.

(3) Gunnery Equipment

(a) Power Turrets

Five power-operated gun emplacements are installed on the airplane:

Upper Forward Turret	2 caliber .50 guns
Lower Forward Turret	2 caliber .50 guns
Upper Rear Turret	2 caliber .50 guns
Lower Rear Turret	2 caliber .50 guns
Tail Turret	1 20 Mm. cannon

Facilities for 500 rounds of caliber .50 ammunition are provided at each caliber .50 gun emplacement, except the tail, where provision is made for 1000 rounds of caliber .50 ammunition, and 60 rounds of 20 Mm. cannon ammunition to be carried in the cannon magazine.

The upper and lower forward gun emplacements are power operated and controlled from the forward sighting station. The upper and lower rear and tail gun emplacements are power operated and controlled from the two rear sighting stations.

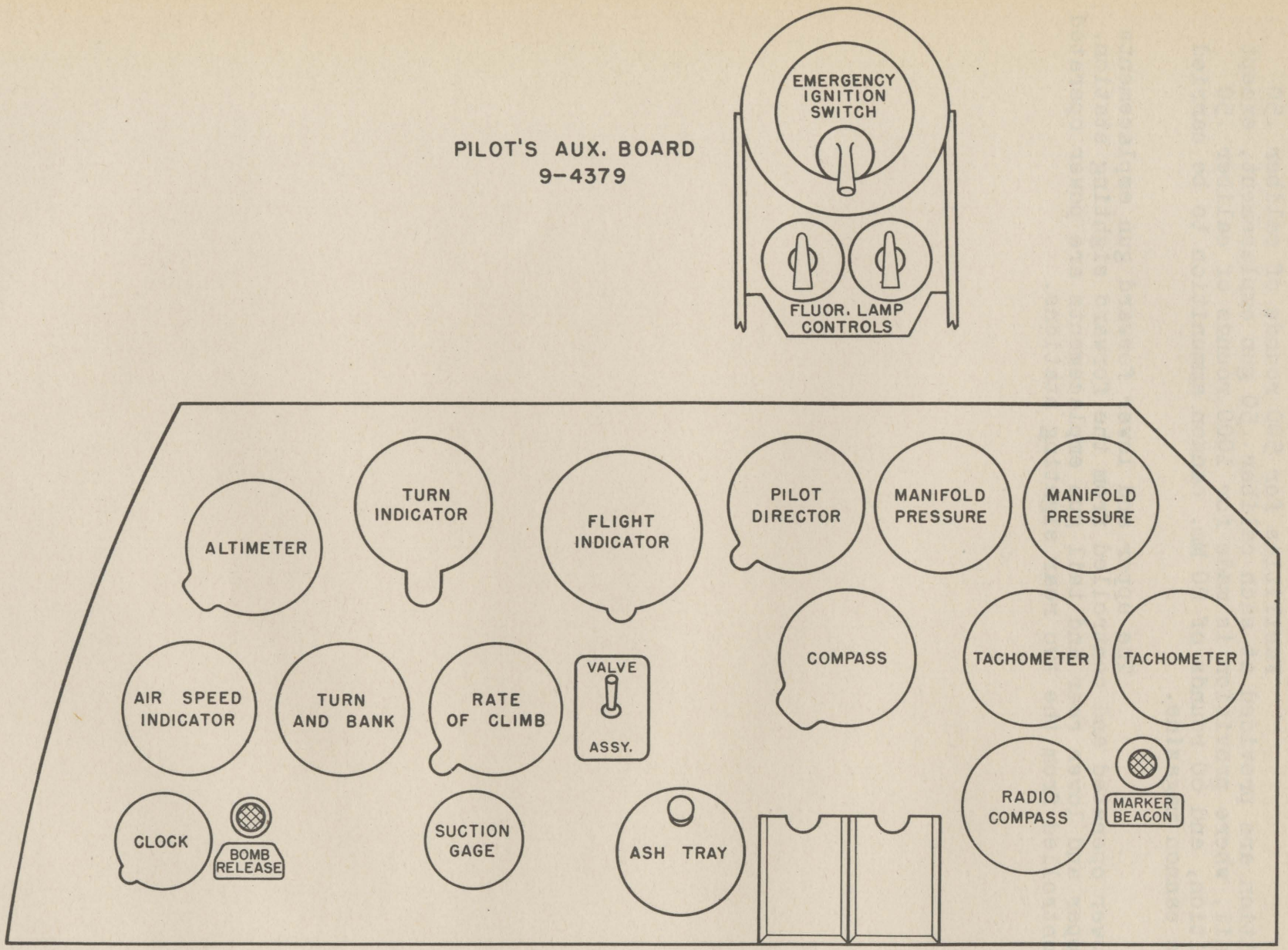


FIG. 19—PILOT'S INSTRUMENT BOARD DIAGRAM

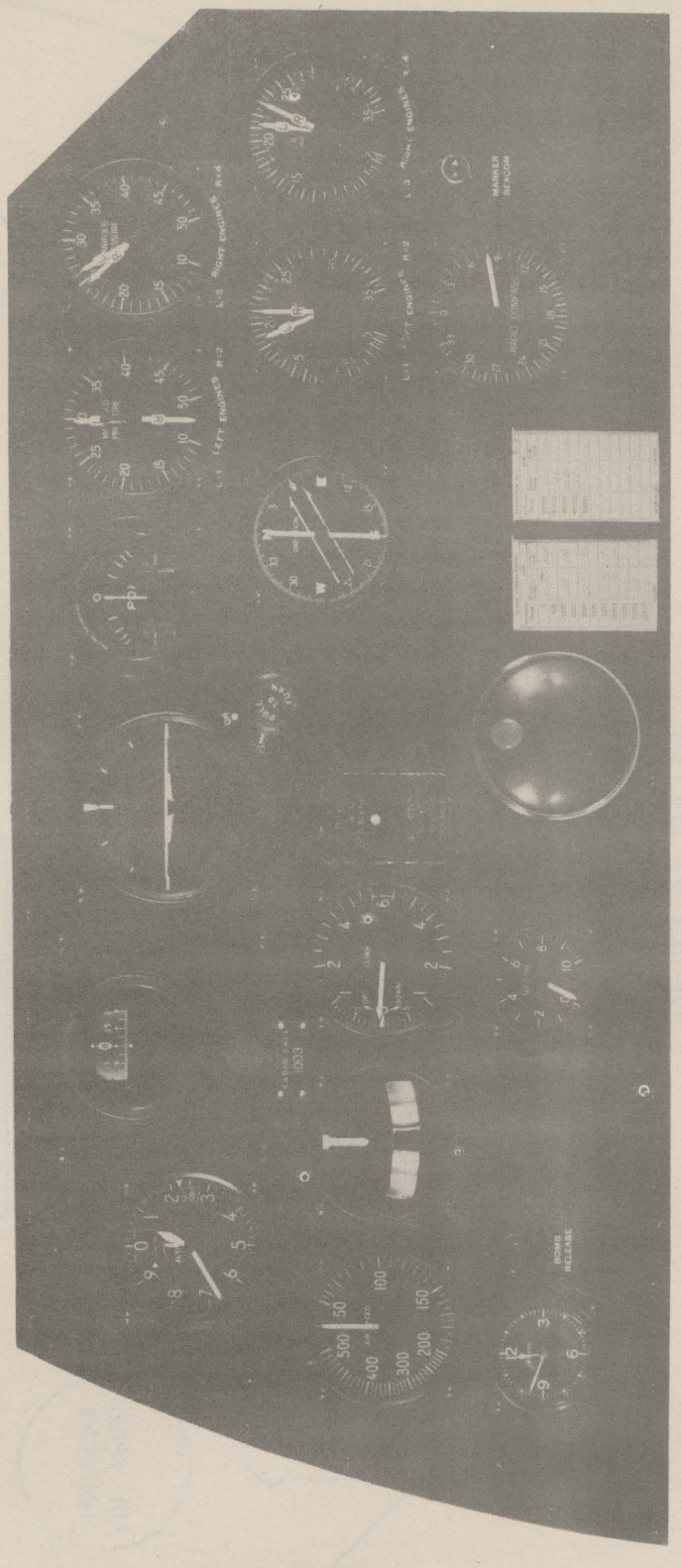
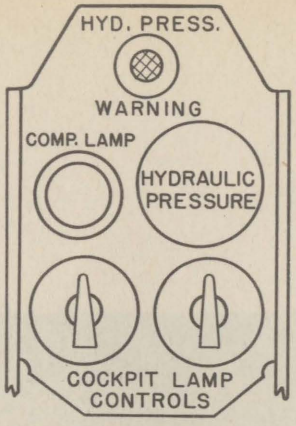
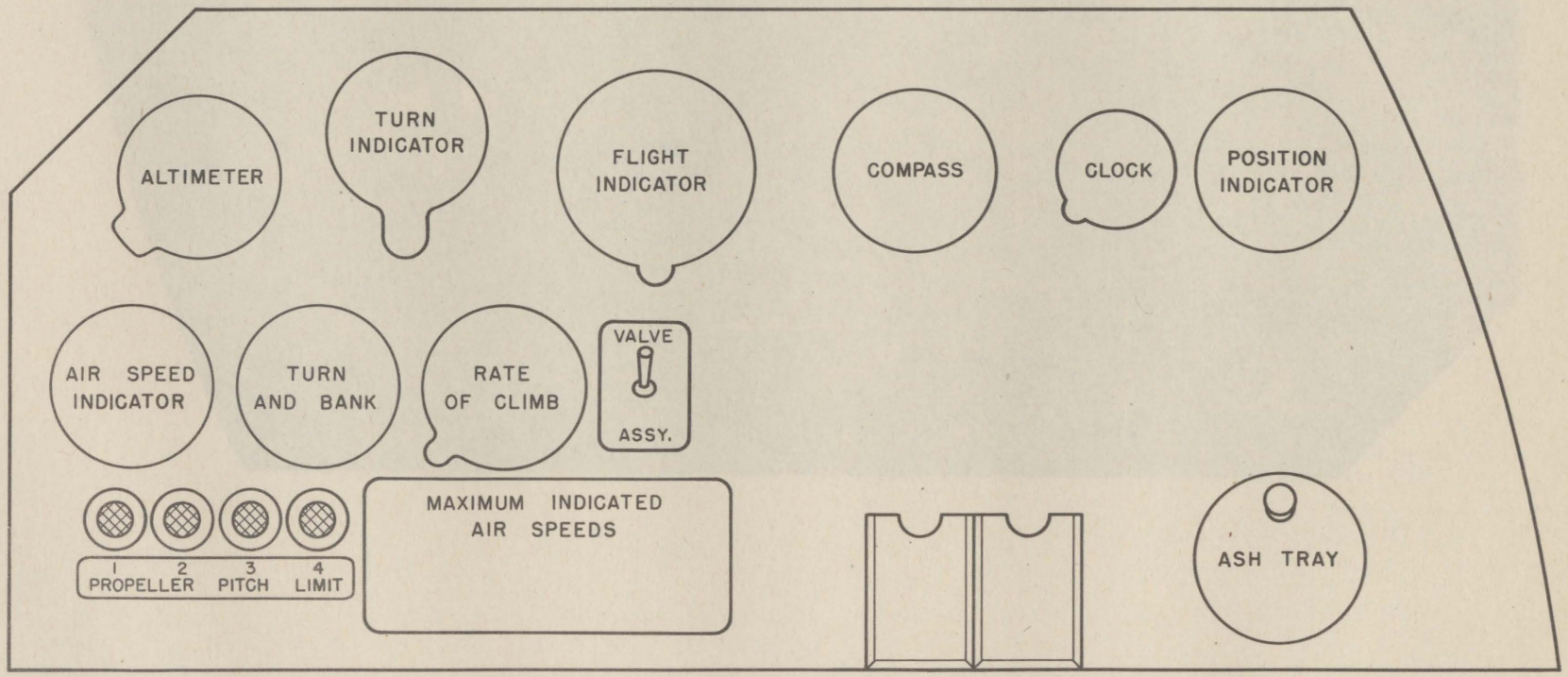


FIG. 20—PILOT'S INSTRUMENT BOARD



CO-PILOT'S AUX. BOARD
6-10286



CO-PILOT'S INSTRUMENT BOARD 8-1873

FIG. 21—CO-PILOT'S INSTRUMENT BOARD DIAGRAM

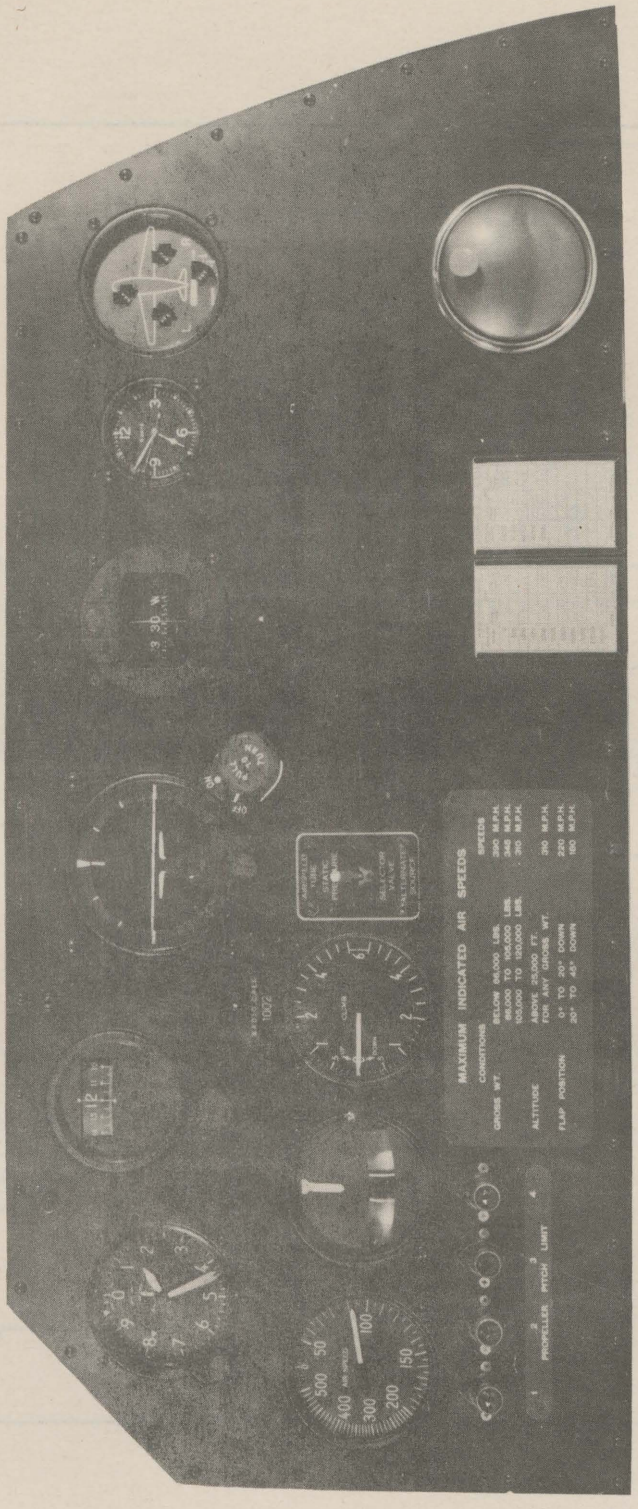
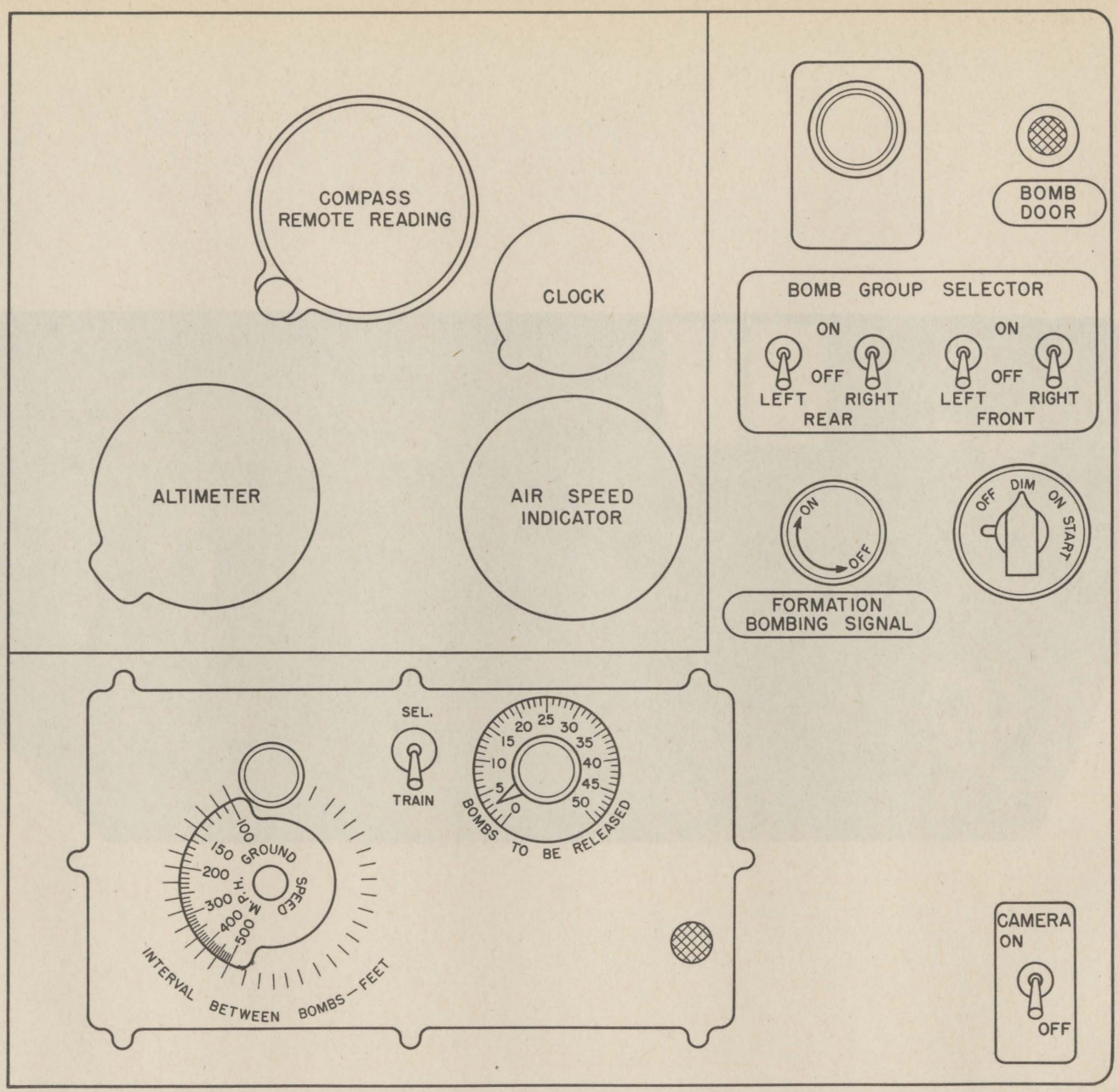


FIG. 22—CO-PILOT'S INSTRUMENT BOARD



BOMBARDIER'S INSTRUMENT BOARD 9-4576

FIG. 23—BOMBARDIER'S INSTRUMENT BOARD DIAGRAM

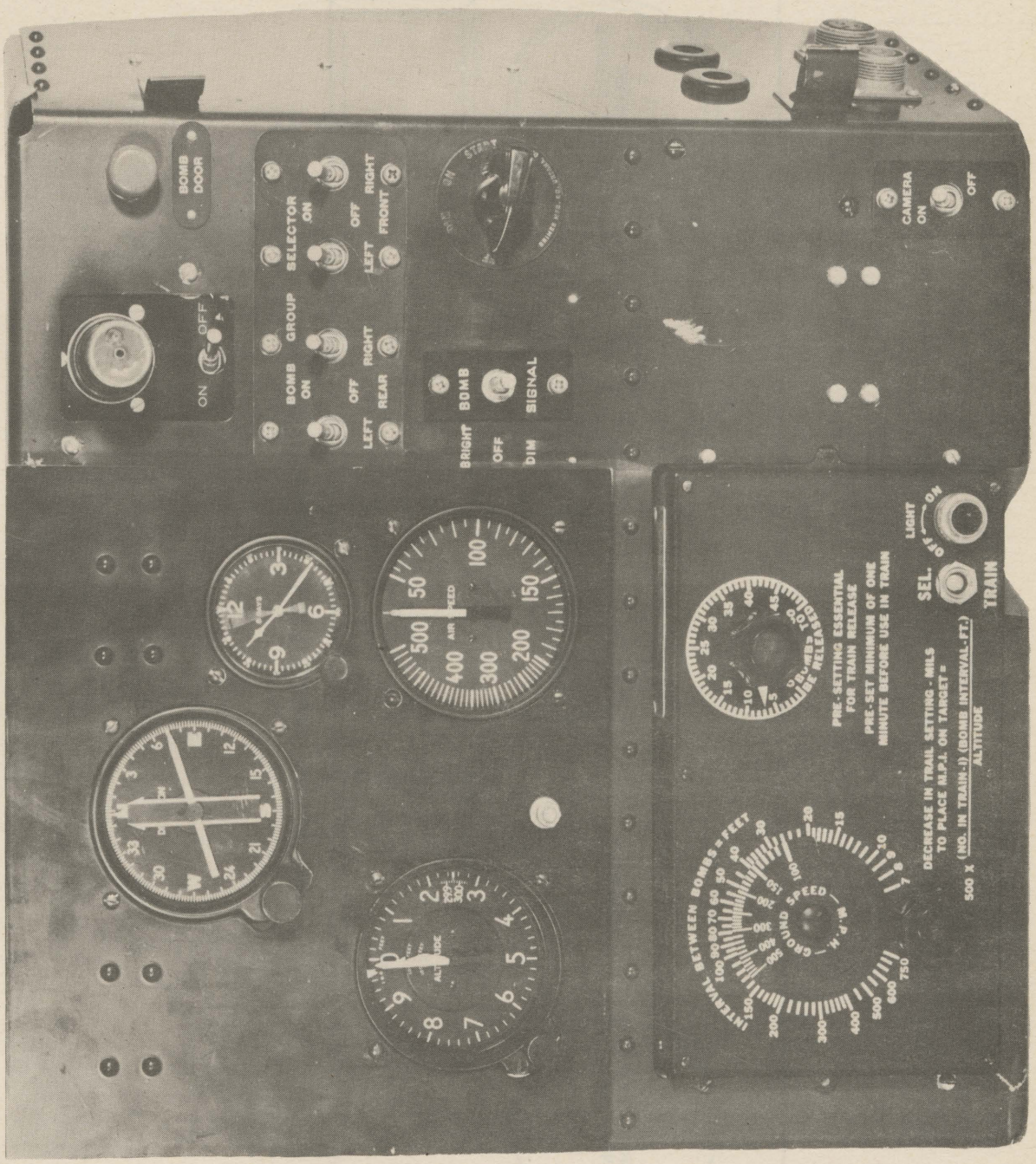


FIG. 24—BOMBARDIER'S INSTRUMENT BOARD

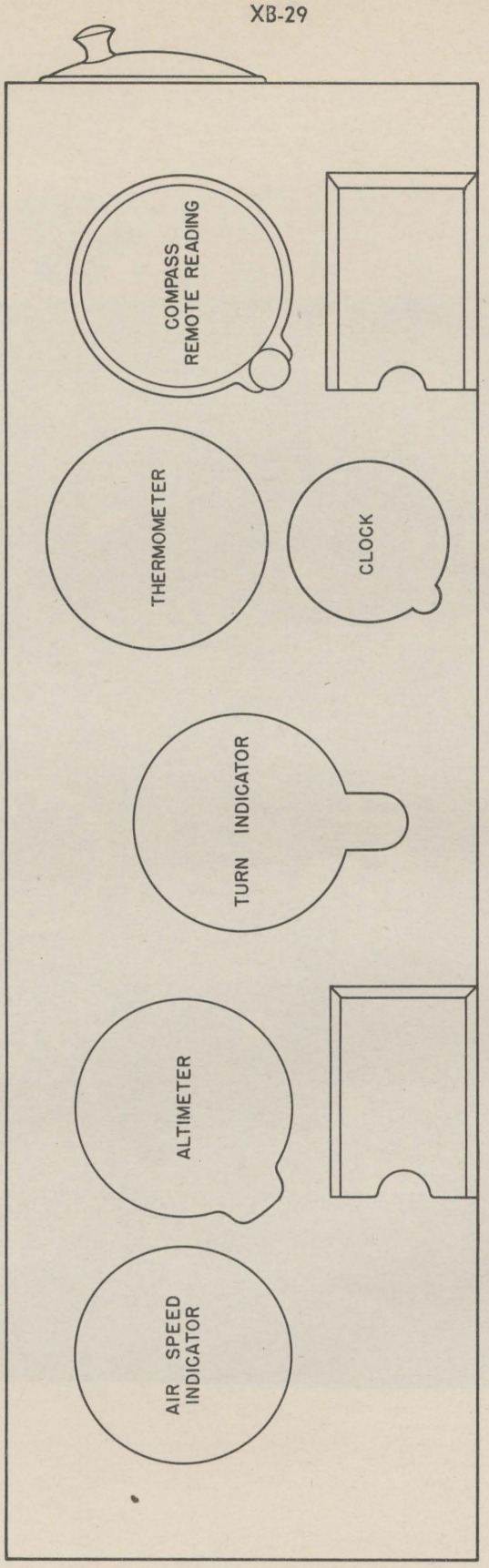


FIG. 25—NAVIGATOR'S INSTRUMENT BOARD DIAGRAM

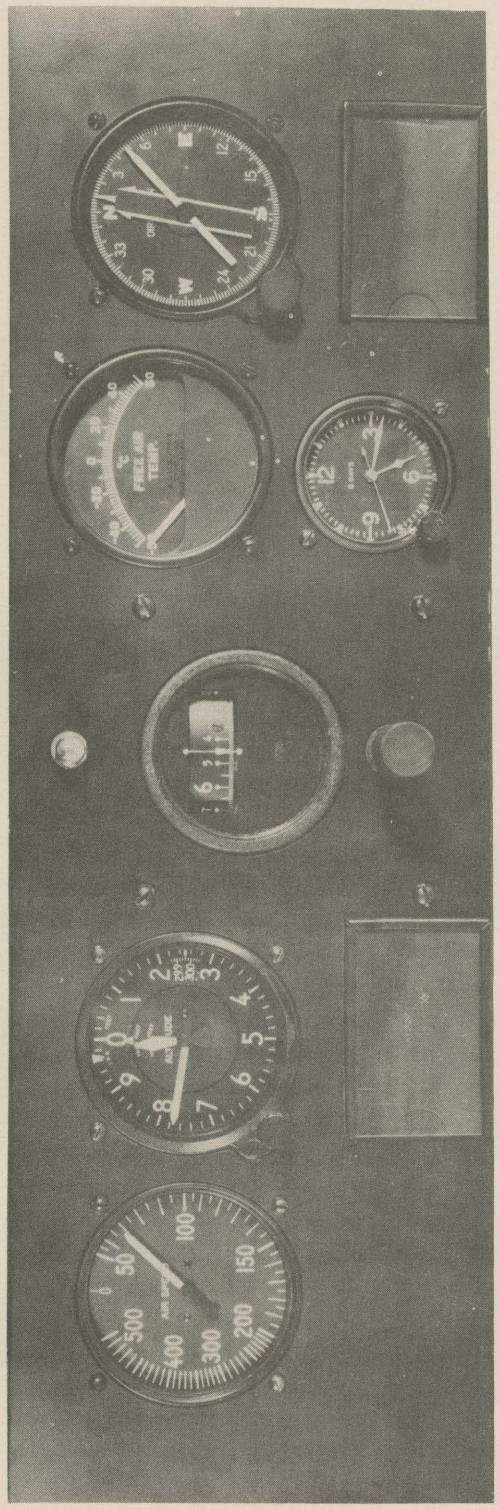
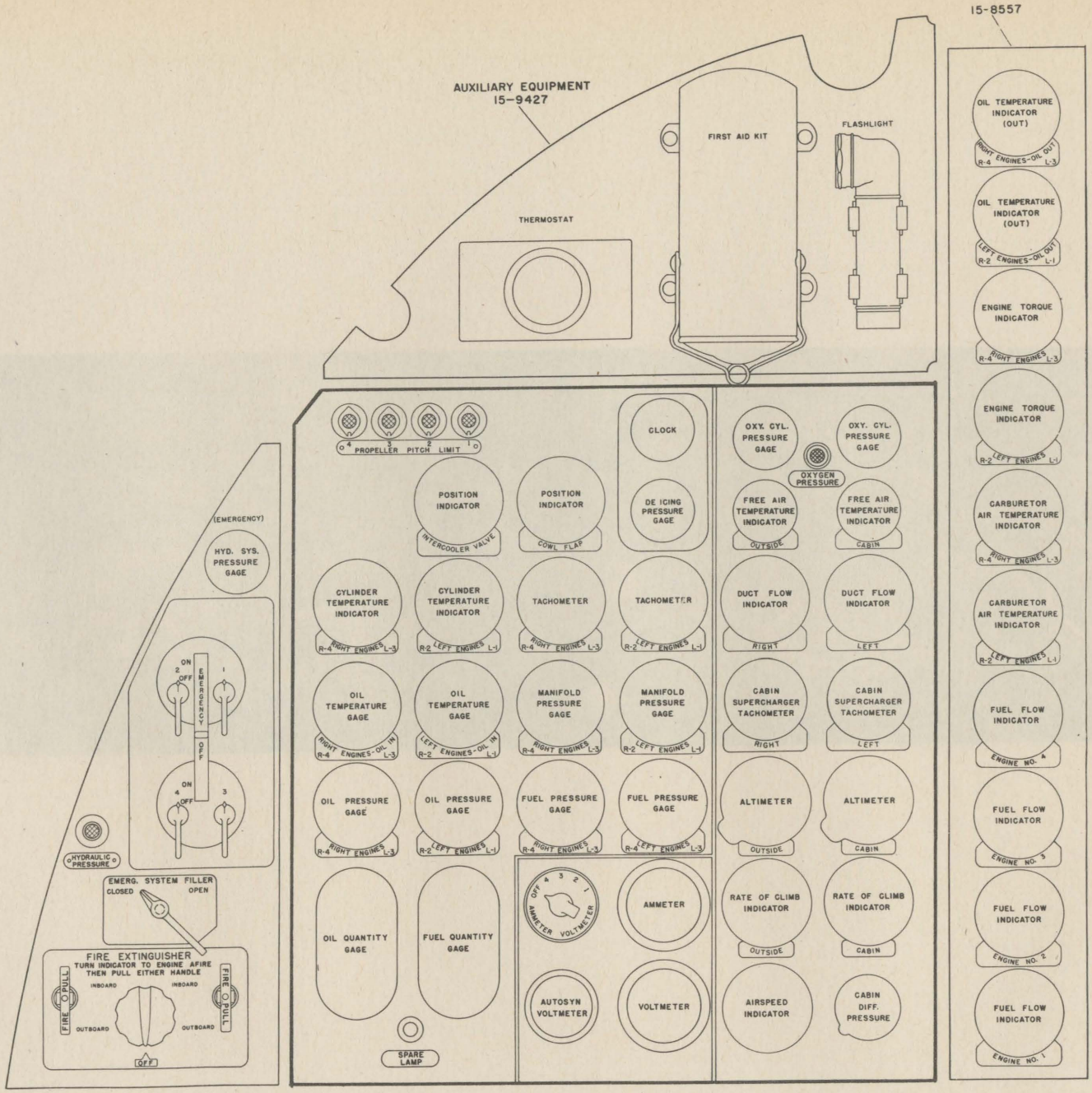


FIG. 26—NAVIGATOR'S INSTRUMENT BOARD



SEE FIG. 29 FOR PHOTOGRAPH

FIG. 27—ENGINEER'S INSTRUMENT BOARD DIAGRAM



FIG. 28—ENGINEER'S INSTRUMENT BOARD

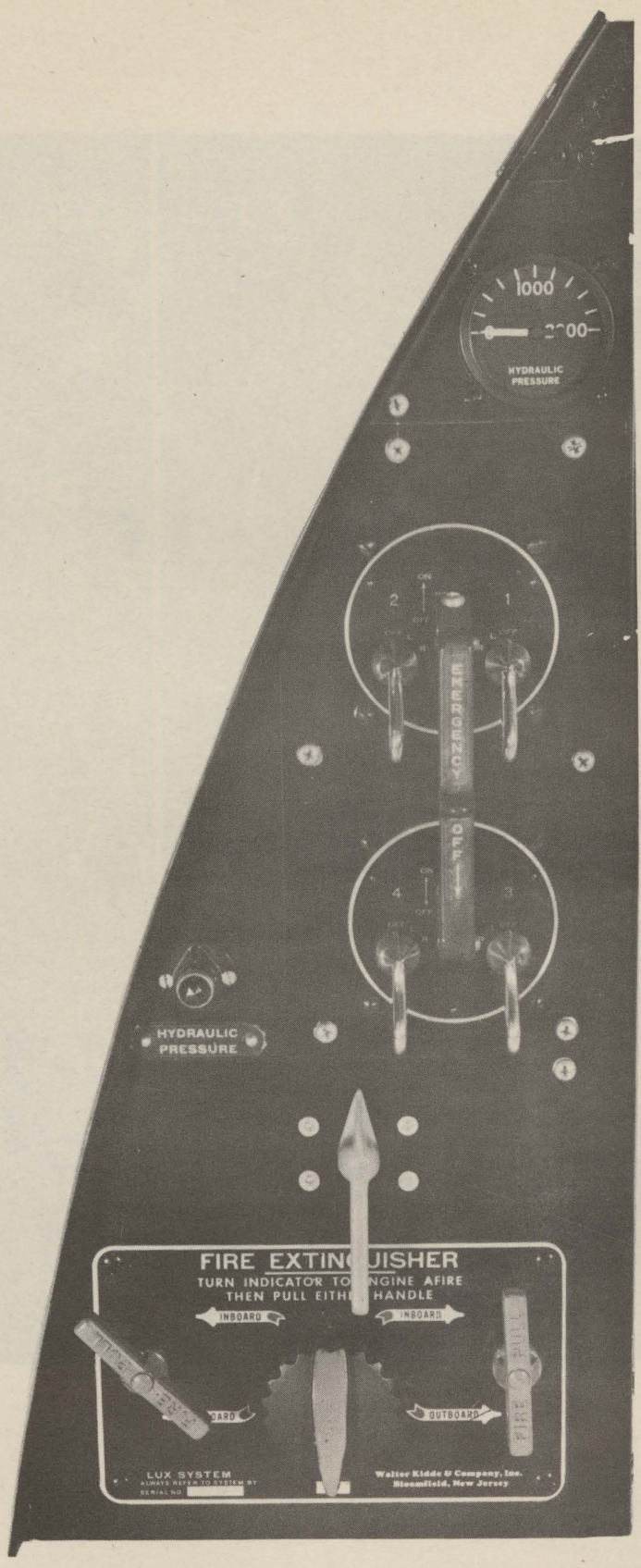


FIG. 29—ENGINEER'S INSTRUMENT BOARD—FIXED PANEL

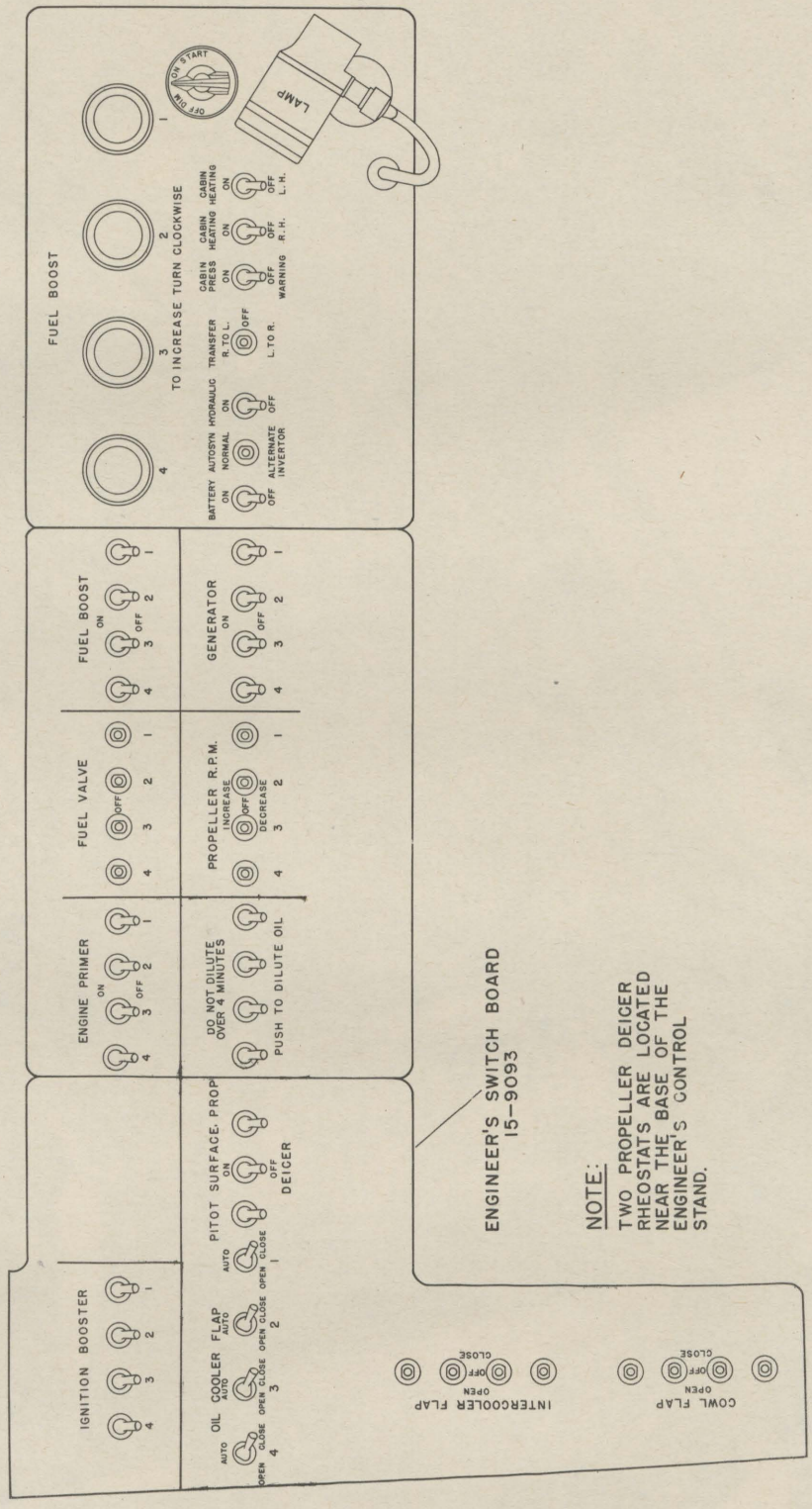
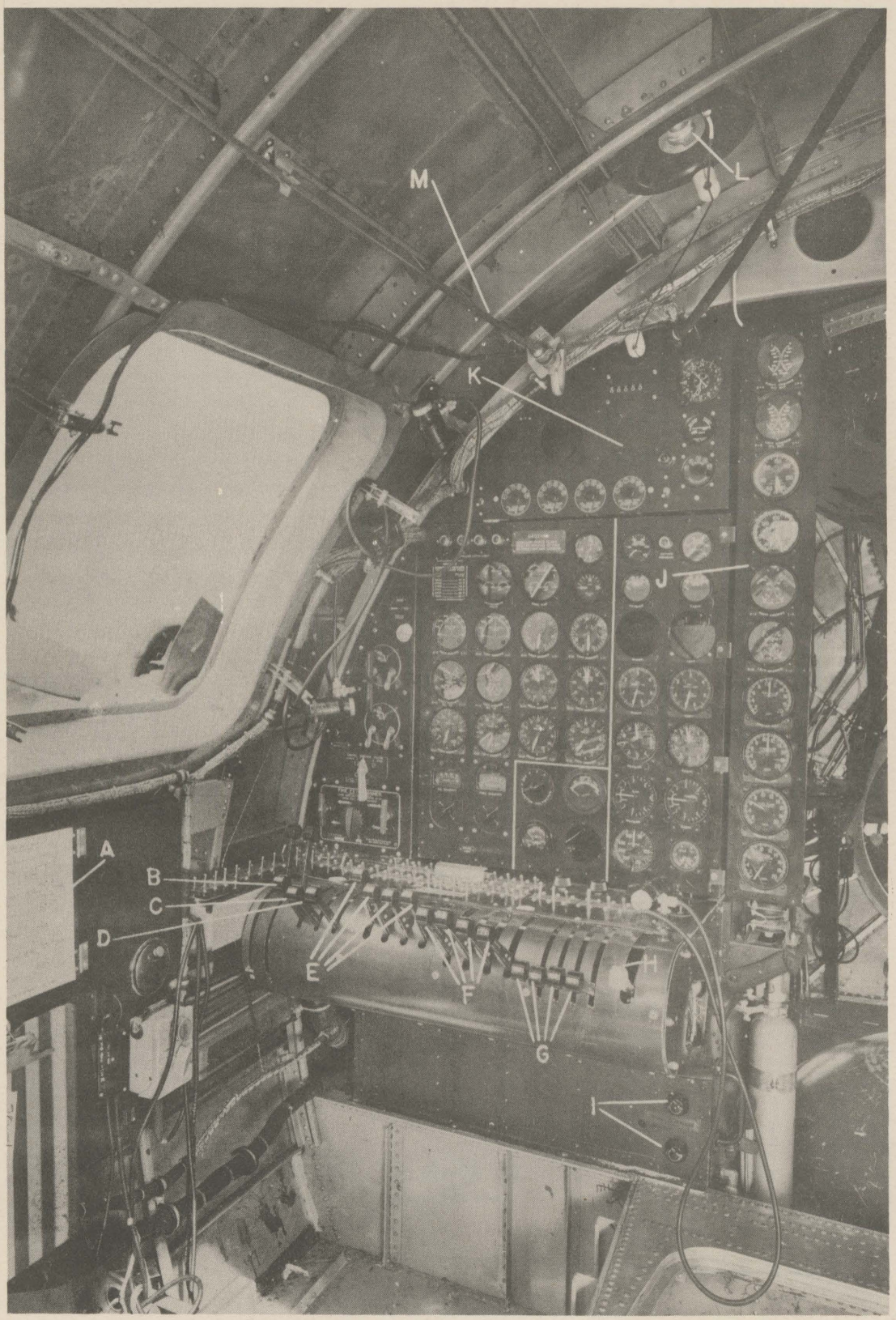
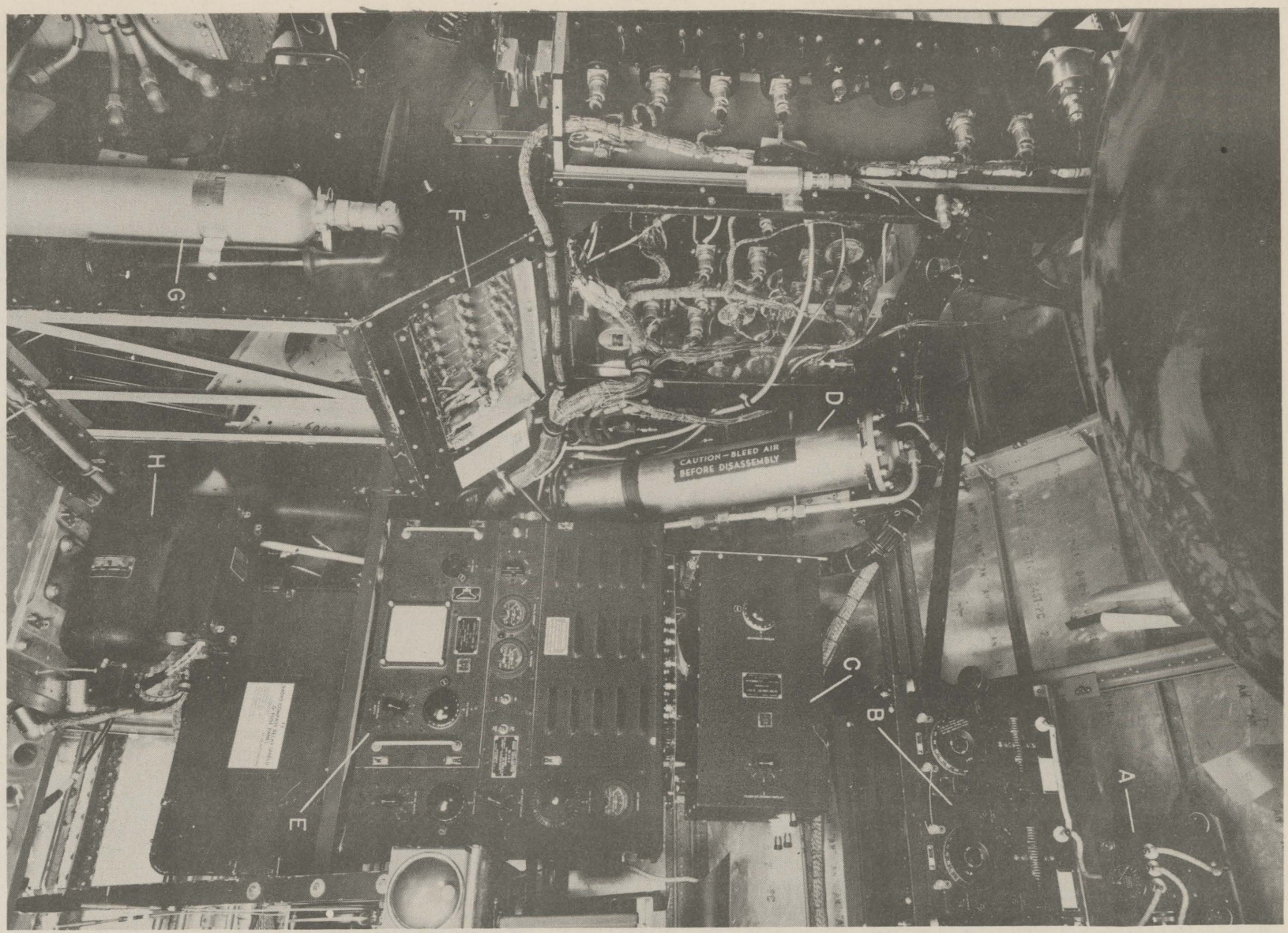


FIG. 30—ENGINEER'S SWITCH PANEL DIAGRAM



A- FUEL TRANSFER OPERATION DIAGRAM
B- TANK SELECTOR
C- CABIN AIR FLOW
D- VACUUM SELECTOR CONTROL
E- SUPERCHARGER CONTROL
F- THROTTLE CONTROL
G- MIXTURE CONTROL
H- MIXTURE LOCK
I- ANTI-ICER RHEOSTAT
J- AUXILIARY BOARD
K- TEST EQUIPMENT
L- WHIP ANTENNA RECEPTACLE
M- WHIP ANTENNA (STOWED)

FIG. 31—ENGINEER'S STATION



A - ANTENNA RELAY
B - COMMAND TRANSMITTERS
C - ANTENNA TUNING UNIT
D - EMERGENCY HYDRAULIC ACCUMULATOR
E - LIAISON TRANSMITTER
F - ENGINEERS FUSE PANEL
G - FIRE EXTINGUISHER
H - LIAISON DYNAMOTOR

FIG. 32—RADIO OPERATOR'S STATION—FORWARD

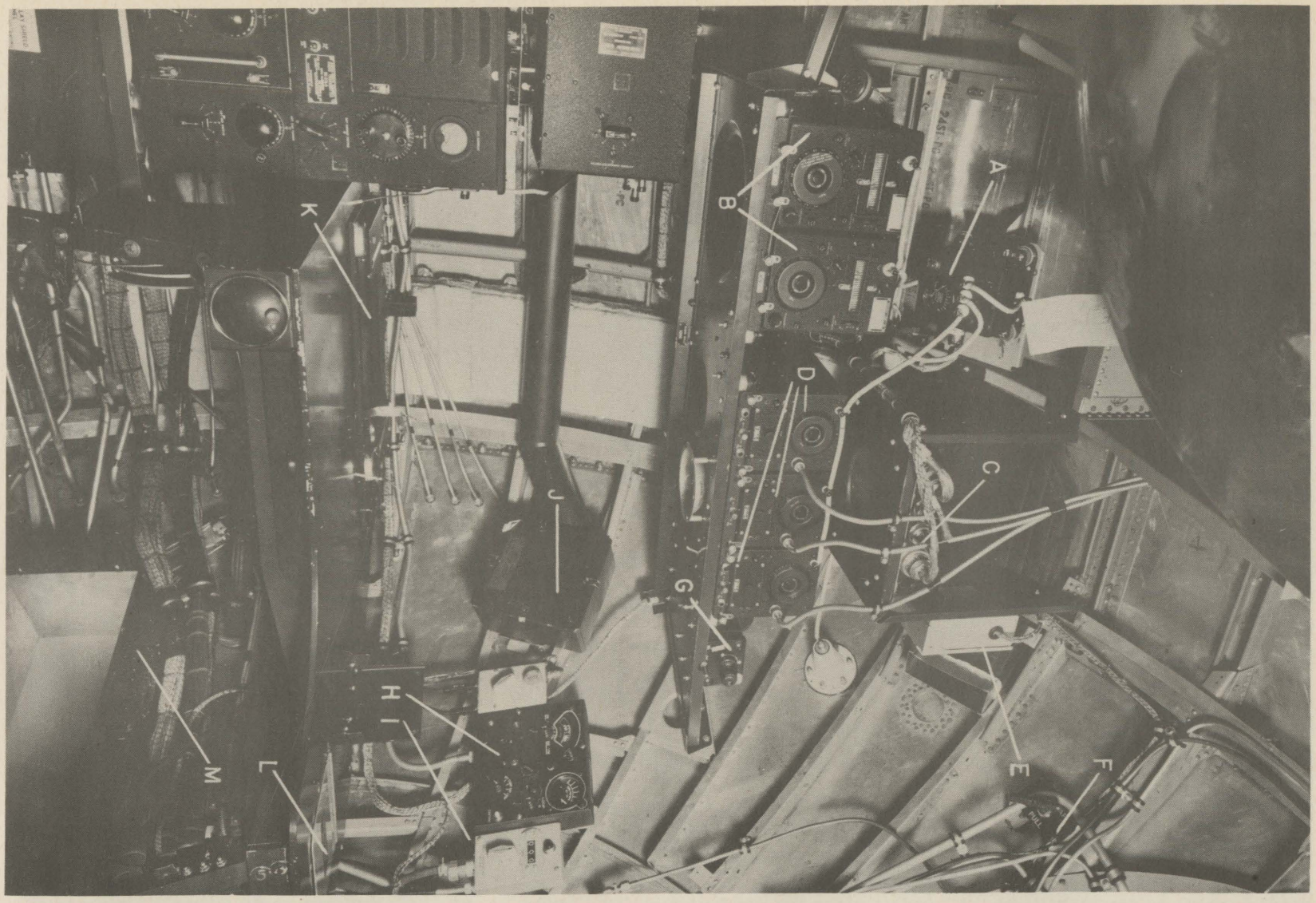


FIG. 33—RADIO OPERATOR'S STATION—AFT

A-ANTENNA RELAY
B-2 COMMAND TRANSMITTERS
C-COMMAND MODULATOR & DYNAMOTOR
D-3 COMMAND RECEIVERS
E-INTERPHONE AMPLIFIER
F-LIFE RAFT RELEASE
G-EXTENSION LIGHT
H-RADIO COMPASS CONTROL
I-ANTENNA REEL CONTROL
J-ANTENNA CHANGE SWITCH
K-LIAISON RECEIVER MOUNT
L-RADIO COMPASS INDICATOR
M-LIAISON TRANSMITTER TUNING UNITS LOCATION

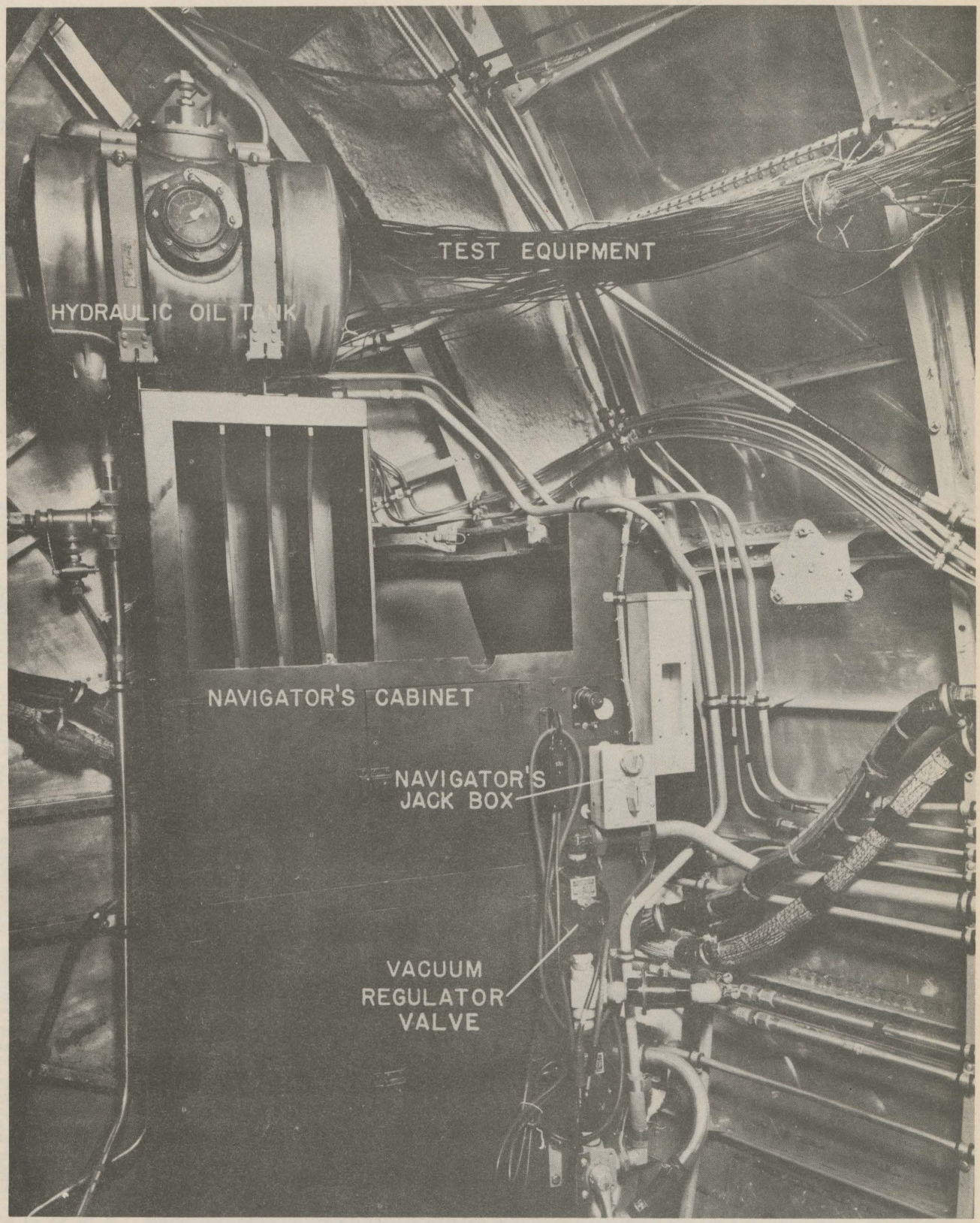


FIG. 34—NAVIGATOR'S STATION—AFT

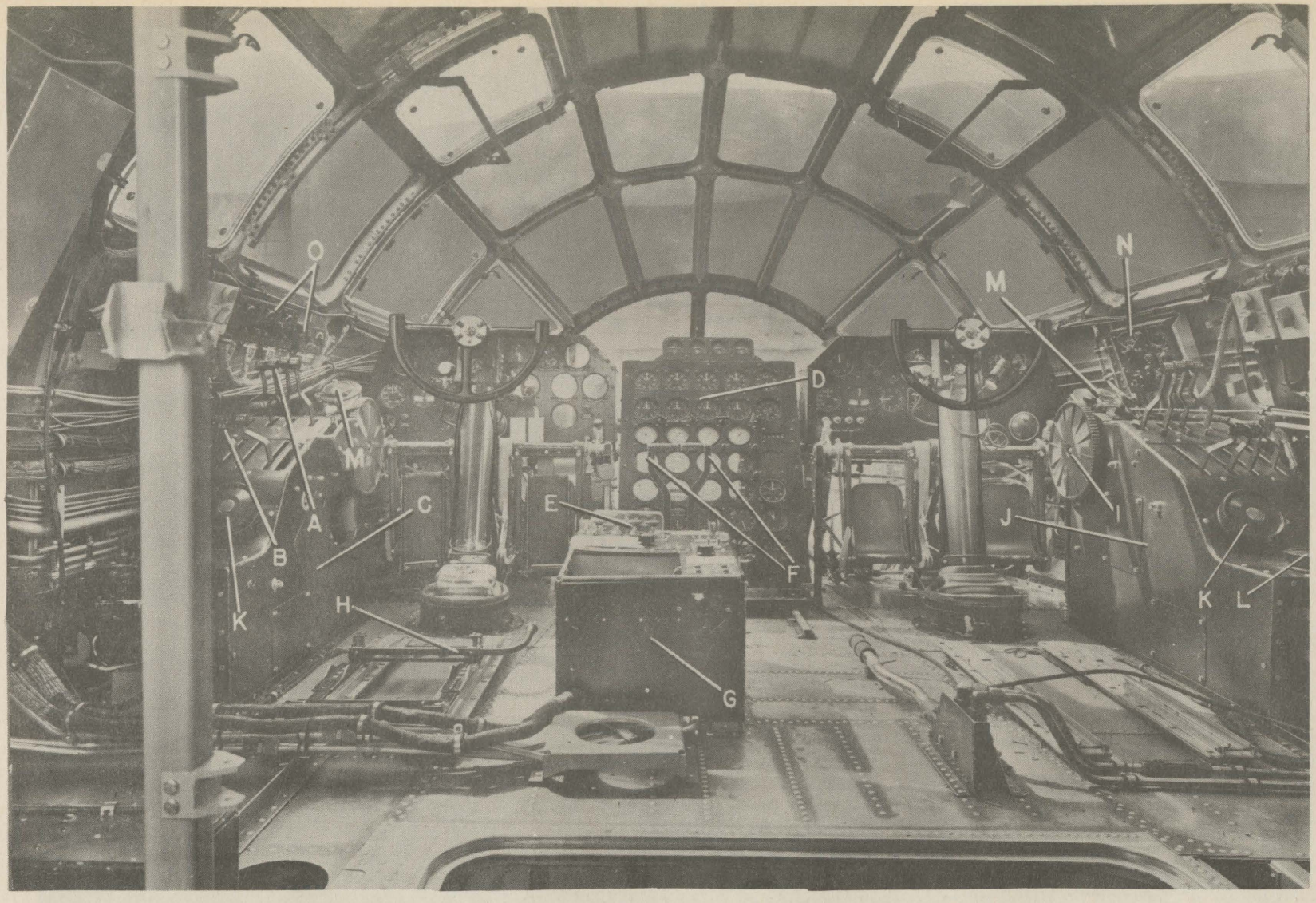


FIG. 35—FORWARD CABIN

A- THROTTLE CONTROLS
B- SUPERCHARGER CONTROLS
C- PILOT'S CONTROL STAND
D- TEST EQUIPMENT
E- PROPELLER FEATHERING CONTROLS
F- EMERGENCY HAND BRAKES
G- AISLE STAND
H- SEAT POSITION CONTROL
I - ELEVATOR TAB CONTROL
J - CO-PILOT'S CONTROL STAND
K- AILERON TAB CONTROL
L- RUDDER
M- AUXILLIARY BOARDS
N- RADIO COMPASS CONTROL
O- COMMAND RADIO CONTROLS

6. Electrical System

a. D.C. Power

(1) General

A nominally 24 volt, direct current, single wire, ground return system is utilized for the operation of the major portion of the electrical equipment in this airplane.

Four 200 ampere Type P-2 engine-driven generators supply current to the distributing system. The generators are regulated and load-equalized. An overdrive feature, incorporated into the generator drive, permits full voltage to be produced when the engines are operating at reduced RPM.

A Type G-1 34 ampere hour 24 volt battery is installed aft of the rear pressurized cabin in an individually vented container.

Battery and generator switches are located at the engineer's station.

(2) Auxiliary Supply

A 200 ampere, gasoline engine-driven, auxiliary power unit is mounted aft of the aft pressurized cabin bulkhead. In normal operation this unit supplies power during starting, take-off and landing.

A switch, installed in the battery solenoid shield (near the auxiliary power unit), transfers the battery and auxiliary power to a separate bus system for emergency operation of the bomb doors, wing flaps and landing gear.

(3) External Power

An external power receptacle is installed in the aft portion of the No. 2 nacelle wheel well.

b. A.C. Power

400 cycle alternating current, at 26 volts for the remote compass and autosyn instruments, and at 115 volts for the radio compass and driftmeter, is furnished by either of two inverters mounted on the tunnel between the bomb bays.

Choice of operation with either of the inverters may be made by a switch on the engineer's switch panel.

c. Electrical Instruments

(1) General

Electrical instruments are used chiefly for remote indication and may be classified into three general groups:

(a) A.C. Instruments

This classification includes all autosyn instruments; i.e. tachometer, manifold pressure, fuel pressure, fuel flow, oil pressure and engine torque indicators. Also included are the remote compass and driftmeter.

(b) D.C. Instruments

The direct current class contains two general types, position instruments and temperature instruments, exclusive of the turn and bank indicators, which are electrically driven.

1. Position Instruments

These instruments are employed for remote indication in applications similar to the autosyns, but where a lesser order of precision may be tolerated; i.e. cowl flap, wing flap and landing gear, intercooler position indicators and fuel and oil quantity indicators.

2. Temperature Instruments

Indications are provided at the engineer's station for oil inlet and outlet, carburetor, cabin and free air temperatures, employing resistance bulbs as the sensitive elements. The navigator is similarly provided with a free air temperature indication.

(c) Self-Generating Instruments

Cylinder head temperature indicators (thermocouples) and cabin supercharger oil pump tachometers are self-generating devices.

d. Ignition

(1) Magnetos

Scintilla dual type magnetos are installed on each engine and are controlled by switches at the engineer's station. For emergency use, master switches are provided at the pilot's and engineer's stations which open the battery circuit and ground all magnetos.

CAUTION: Magneto grounding plugs must be kept connected. Removal of a plug will isolate the magneto in an operable condition independent of switch control.

(2) Boosters

Ignition booster coils mounted in each nacelle are employed for engine starting. Control switches are mounted in the engineer's switch panel.

e. Warning Signals

(1) Cabin Pressure

Chimes in both pressurized cabins operate with cabin air pressures below that of a 12,000 ft. altitude pressure.

(2) Hydraulic Pressure

(a) Main System

An amber light in the engineer's instrument panel indicates low main hydraulic system pressure. (600 PSI)

(b) Emergency System

Low emergency hydraulic pressure (900 PSI) is indicated by an amber light in the copilot's auxiliary panel.

(3) Oxygen Pressure

An amber warning light in the engineer's instrument panel indicates low (100 PSI) pressure in either oxygen system.

(4) Trailing Antenna

The antenna reel control box contains a red warning light and warns the radio operator in event the landing gear is lowered while the trailing antenna is extended.

(5) Landing Gear

Also, in conjunction with the antenna reel warning, a horn sounds if the throttles are closed while the landing gear is retracted. The warning may be reset as many times as desired. Reset buttons are installed in the copilot's control stand.

(6) Alarm Bell

A switch on the pilot's aisle stand operates a warning bell in the aft pressurized cabin.

(7) Phone Call Lights

Also mounted on the pilot's aisle stand, a switch controls white call lights installed in each interphone jack box in the aft pressurized cabin.

f. Electric Motors

(1) General

Control of electric motor-driven mechanisms, generally in conjunction with position indicators or limit lights, is concentrated chiefly in the engineer's switch panel. These mechanisms include cowl flaps, oil cooler (manual or automatic), intercooler, cabin heat (heater and aftercooler flaps), fuel boost, fuel transfer and hydraulic pump.

Controls available at the pilot's station include landing gear (with automatic nacelle doors), and wing flap.

Control of the bomb doors is provided at the bombardier's station.

(2) Starters

Receptacles are provided in the aft portion of each nacelle wheel well for the starting motor power.

(3) Emergency Operation

For emergency operation of the landing gear, duplicate motors and limit switches are provided. They are powered from a separate bus system and controlled through a switch actuated by the emergency nacelle door release.

Emergency operation of the wing flaps and bomb door mechanisms is accomplished by means of the portable motor operating from a receptacle located in the forward bomb bay and connected to the emergency bus system.

Should it be desired to operate the above emergency motors employing the regular bus system, a switch located on the pilot's engine control stand actuates a solenoid, located in the aft bomb bay door motor relay shield, to connect the emergency bus system to the regular bus system. Operation of this switch automatically renders the normal landing gear retracting motors inoperative.

CAUTION: In order to operate the emergency landing gear motors either the LANDING GEAR POWER TRANSFER switch (pilot's control stand) or the EMERGENCY CIRCUIT switch (battery solenoid shield) must be in the EMERGENCY position.

g. Turrets

All turrets are electrically remote-operated with controls grouped for operation with the forward and both aft computers. In addition, control for the gunsight aiming point camera, mounted on the tail turret, is available at the aft computer stations.

Operating current for this equipment is supplied from an inverter near the right-hand aft computer.

h. Bomb Control

(1) General

Normal bomb release (bomb armed) is accomplished electrically. The electrical release system incorporates controls whereby bombs may be released, singly or in train, either automatically by the bombsight, or manually by the bomb release switch.

(2) Interval Release

A bomb interval release unit is employed for train release of bombs. Controls permit variation of the number and interval of bombs in the train. The unit is in operation when its switch is in the SELECTIVE position or when in the TRAIN position with the "number" index displaced from zero.

(3) Bomb Release

Release units are installed at each active bomb station. Units are wired for layer release from bottom to the top of all racks, provided all GROUP SELECTOR switches are closed. Safety switches on each bomb door prevent release of bombs until the doors are fully open.

(4) Signal Lights

While the bomb doors are open a red light on the bombardier's instrument panel and a white bomb formation lamp in the tail are illumined. Bomb release pulses actuate a filter to change the formation light from white to red and also flash an amber light in the pilot's instrument panel.

i. Interior Lighting

(1) Instrument Lighting

(a) Fluorescent Lamps

The instrument lighting has been specially adapted for night flying through the use of self-luminous indices

and scales which also fluoresce under the influence of ultra-violet light. Ultra-violet light is projected upon the bomber's, pilot's, copilot's and engineer's panels by fluorescent lamps equipped with filters to vary or to exclude the accompanying visible radiation.

(b) Spotlights

Adjustable spot lamps at the navigator's, pilot's, copilot's and gunner's stations provide optional instrument illumination.

(c) Table Lights

Additional lamps are provided the bomber, navigator and radio operator to illuminate their tables.

(d) Extension Lamps

Extension lamps for miscellaneous illumination are installed for all personnel in the forward cabin, aft computers and crew (camera well) in the aft cabin and at Stations 900 and 1115 in the tail section.

(e) Individual Lighting

The driftmeter, fuel and oil quantity indicators, and copilot's compass are individually illuminated by self-contained lamps.

(2) Dome Lights

Dome lights are installed throughout the airplane for general illumination, vapor-proof lights being used in the bomb bays. Dome lights in the tail section are operated by two pairs of switches. Station 834 dome light may be operated from either side of the pressure bulkhead, while the other tail section dome lights may be operated from either the rear entrance hatch or near the tail turret.

j. Exterior Lights

(1) Position Lights

Wing tip (red and green) lights and tail (white) lights are controlled by a switch on the pilot's aisle stand. This switch allows a choice of BRIGHT, OFF and DIM positions.

(2) Formation Lights

Nine formation (blue) lamps are provided, three in the upper surface of the fuselage and three in each wing. A

rheostat, with an OFF position, is provided in the pilot's aisle stand to control the illumination.

(3) Landing Lights

An electrically-operated retractable landing light is installed in each wing. The lamps light automatically when extended and are controlled by two switches in the pilot's aisle stand.

(4) Wheel Well Spotlights

Spotlights are provided to illuminate all landing gear in the extended position, during night flying, for a check in conjunction with the driftmeter. The spotlight switch is mounted on the leg of the navigator's table.

k. Propeller Control

(1) Pitch

An electrical means of adjustment of the propeller governors is provided by reversible motors in each nacelle. The motor circuits are individually controlled at the engineer's stand and master gang-controlled at the pilot's aisle stand. Amber signal lamps, mounted on the copilot's and engineer's instrument panels, indicate the end of governor travel in either direction.

(2) Feathering

Feathering is accomplished by means of high pressure engine oil obtained from motor-driven pumps. Magnetic push buttons, installed in the pilot's aisle stand, control the pump motors and, when operated, are held engaged by solenoids until the oil pressure rises to 400 PSI, at which pressure feathering should be complete.

Unfeathering requires higher pressures, which are obtained by manually holding the push button engaged until the propeller has gained sufficient RPM for the governor to assume control.

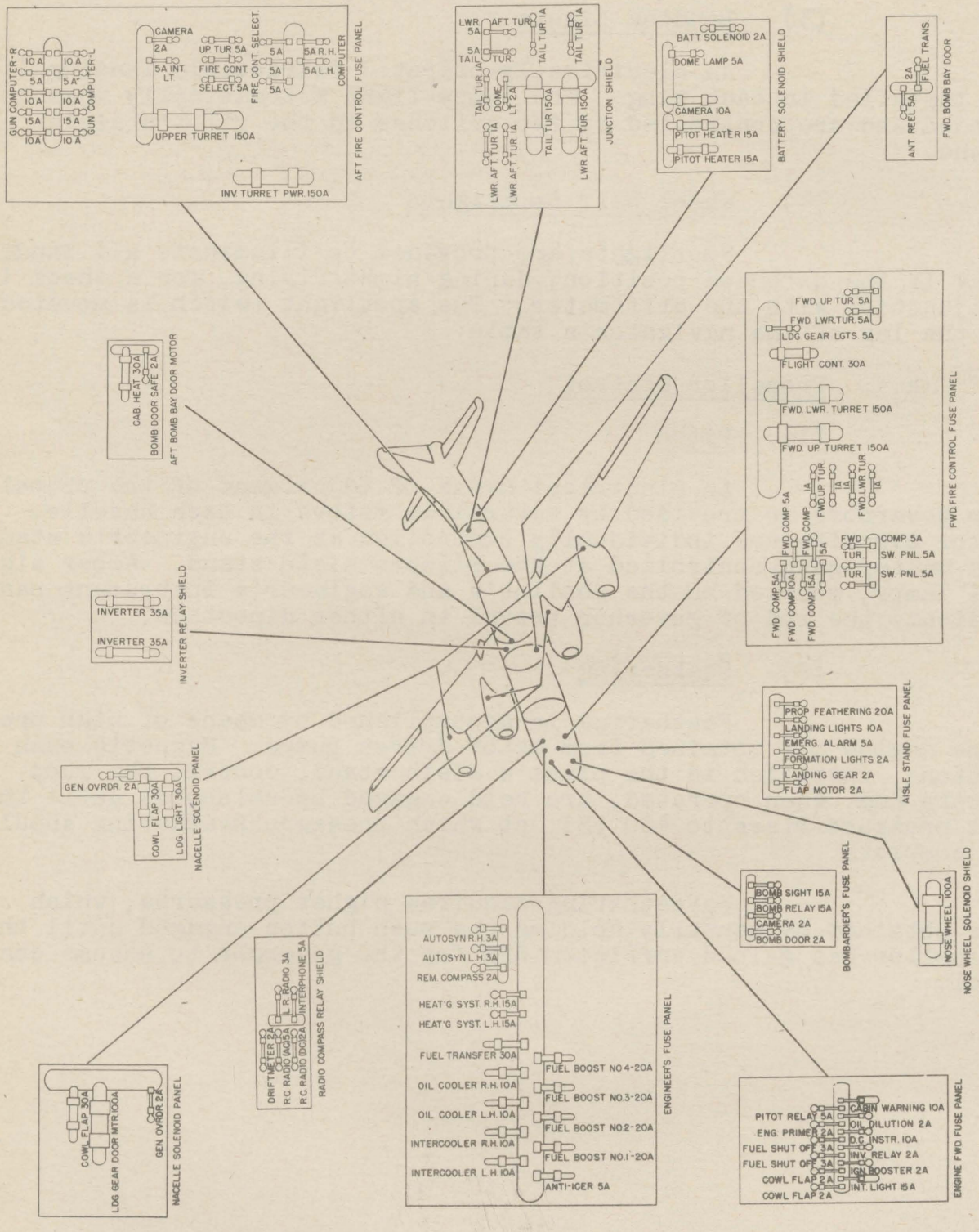


FIG. 36—FUSE LOCATION DIAGRAM

7. Communication System

a. General

The communication system comprises radio and interphone equipment arranged to provide communication with ground stations or with airplanes, intraplane communication among the crew members; reception of weather, range and marker beacon signals; and automatic radio direction finding.

b. Liaison Radio

The liaison radio receiver is mounted on the radio operator's table. The transmitter is mounted on the forward cabin sidewall adjacent to the radio operator's table. The transmitter dynamotor is mounted on the floor aft of the engineer's control stand. Transmitter tuning units are stowed beneath the radio operator's table and in the aft pressurized cabin. An antenna transfer switch allows use of either the wing skin or the trailing antenna for liaison radio operation. The trailing antenna reel and retractable fairlead are installed in the right-hand aft portion of the forward bomb bay. The antenna reel control box is located on the aft part of the radio operator's table. The antenna fairlead control is installed below the table.

The radio set may be operated with either continuous or modulated carrier. Modulation may be accomplished at either the pilot's, copilot's or radio operator's station. All other liaison receiver and transmitter operation, including keying, is locally controlled by the radio operator.

c. Command Radio

Two command radio transmitters, three receivers, the transmitter dynamotor-modulator unit and an antenna transfer relay are mounted on the cabin sidewall above the radio operator's table. The antenna transfer relay couples the operating unit to the antenna which extends from an adjacent feed through insulator to the pitot tube mast atop the vertical fin.

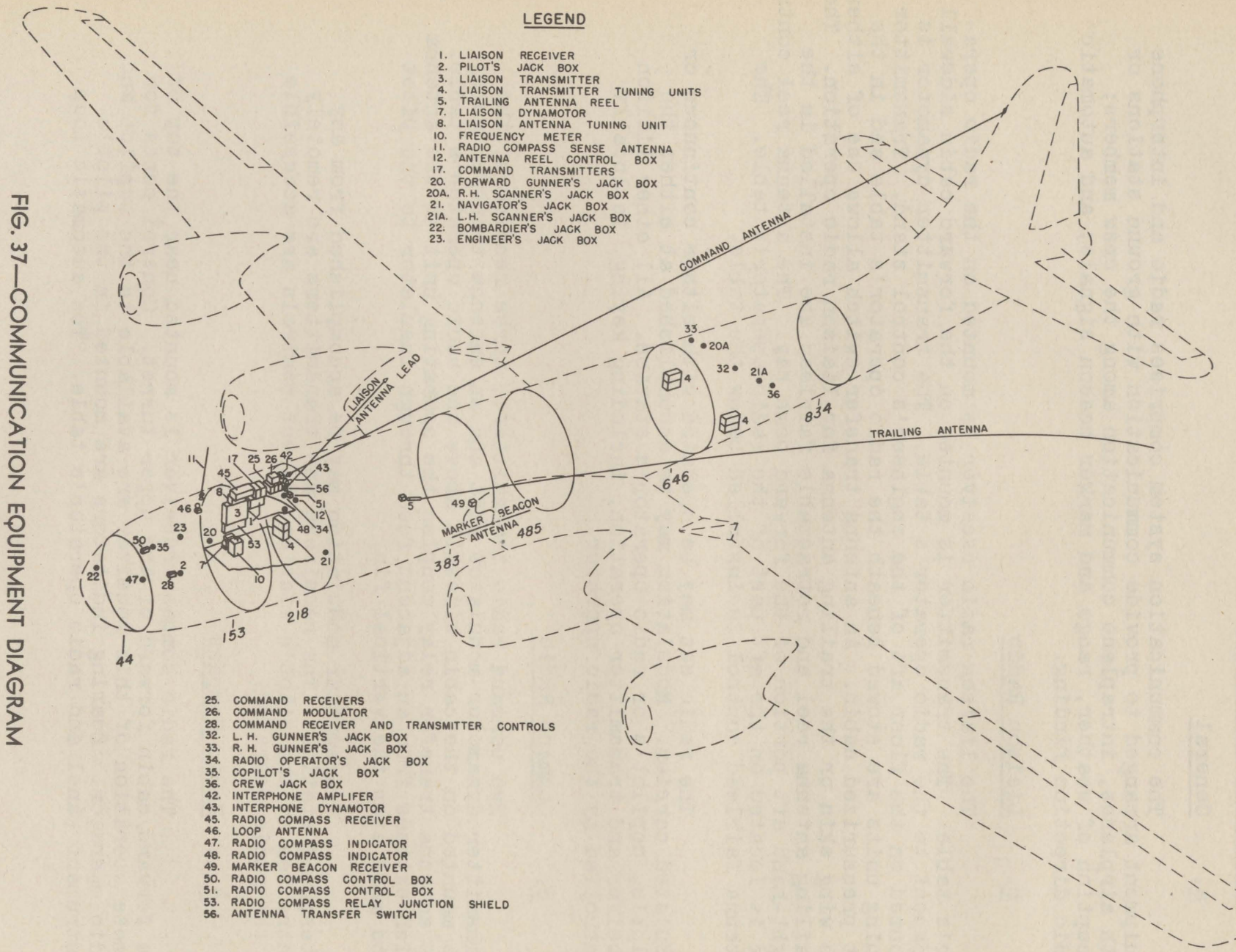
Transmitter modulation may be accomplished from any interphone station. The receivers and transmitters are remotely controlled at the pilot's station; direct controls are accessible to the radio operator.

d. Radio Compass

The radio compass receiver is mounted near the top of the forward cabin forward of the upper turret. Control boxes for remote operation of this receiver are available to the copilot and radio operator. Bearing indicators are mounted in the pilot's instrument panel and radio operator's table. The automatic loop

LEGEND

1. LIAISON RECEIVER
2. PILOT'S JACK BOX
3. LIAISON TRANSMITTER
4. LIAISON TRANSMITTER TUNING UNITS
5. TRAILING ANTENNA REEL
7. LIAISON DYNAMOTOR
8. LIAISON ANTENNA TUNING UNIT
10. FREQUENCY METER
11. RADIO COMPASS SENSE ANTENNA
12. ANTENNA REEL CONTROL BOX
17. COMMAND TRANSMITTERS
20. FORWARD GUNNER'S JACK BOX
20A. R.H. SCANNER'S JACK BOX
21. NAVIGATOR'S JACK BOX
21A. L.H. SCANNER'S JACK BOX
22. BOMBARDIER'S JACK BOX
23. ENGINEER'S JACK BOX



25. COMMAND RECEIVERS
26. COMMAND MODULATOR
28. COMMAND RECEIVER AND TRANSMITTER CONTROLS
32. L. H. GUNNER'S JACK BOX
33. R. H. GUNNER'S JACK BOX
34. RADIO OPERATOR'S JACK BOX
35. COPILOT'S JACK BOX
36. CREW JACK BOX
42. INTERPHONE AMPLIFER
43. INTERPHONE DYNAMOTOR
45. RADIO COMPASS RECEIVER
46. LOOP ANTENNA
47. RADIO COMPASS INDICATOR
48. RADIO COMPASS INDICATOR
49. MARKER BEACON RECEIVER
50. RADIO COMPASS CONTROL BOX
51. RADIO COMPASS CONTROL BOX
53. RADIO COMPASS RELAY JUNCTION SHIELD
56. ANTENNA TRANSFER SWITCH

FIG. 37—COMMUNICATION EQUIPMENT DIAGRAM

antenna is installed in the aft part of the commander's observation dome. The retractable sense antenna is installed above the engineer's station.

e. Marker Beacon

The marker beacon receiver is mounted in the fuselage below the wing center section and employs a small doublet-type antenna, coaxially connected and mounted below the fuselage between the bomb bays. Reception of the marker beacon signal is indicated by an amber light in the pilot's instrument panel.

f. Interphone

The interphone comprises, basically, twelve microphone and headphone jack boxes and a one-stage interphone amplifier. The amplifier and its dynamotor are mounted on the cabin sidewall above the command receivers at the radio operator's station. Jack boxes are available for the following stations: bombardier, pilot, copilot, engineer, navigator, radio operator, forward gunner, left-hand gunner, left-hand observer, right-hand gunner, right-hand observer and crew. Each jack box allows choice of the "call" channel, intercommunication channel or the liaison, command or radio compass outputs. Additionally, the command radio transmitter may be modulated at all stations. Modulation of the liaison transmitter, however, is available at the pilot's, copilot's and radio operator's stations only. Filter sets, designed to permit reception of either voice or range signals during their simultaneous transmission, are available to the pilot and copilot. Type T-30 throat microphones are provided to all stations. Inasmuch as amplifier dynamotor supply circuit contains no switch, the interphone is operable at all times when the battery is in circuit or current is being generated or supplied externally.

g. Fuses

All fuses for the above equipment, exclusive of the antenna reel motor fuse, may be found in the radio compass relay shield (below the liaison transmitter). The antenna reel motor fuse is mounted in the forward bomb bay door motor shield.

SECTION II

PILOT OPERATING INSTRUCTIONS

Before Entering Pilots' Compartment

Pilot	Copilot	Engineer
(1)		
Check Crew Chief's report on tire and oleo pressures for existing gross weight.	No action.	No action.
(2)		
Determine C.G. position. (A C.G. computer and instructions are to be supplied when available.)	No action.	No action.
The weight of crew members in their intended positions is to be included.		
WARNING: PERMISSIBLE C.G. POSITION IS BETWEEN 18 AND 32% MAC.		
(3)		

Note: Normal entrance to the airplane is made through the wheel well hatch in the forward cabin floor.

2. On Entering Pilots' Compartment

Pilot	Copilot	Engineer
(1)		
Check fluorescent instrument lights, position and formation lights, landing lights and signal lamp (if night flying is anticipated).	Set altimeter and make any other necessary instrument adjustment. Check fluorescent lights.	Turn ON battery switch. Check fluorescent instrument lights.

Navigator	Bombardier
Check wheel well spotlight.	Check bomb formation lamp Check fluorescent lights.
(2)	
No action	No action	Check quantity of oxygen, ammunition and fuel (gages calibrated in U.S. gallons).

Recommended Operating Sequences

a. Pre-Starting

Pilot	Copilot	Engineer
(1)		
Make sure emergency ignition switch is ON.	Check crew location - ballast-doors closed.	Make sure emergency ignition switch is ON.
Set parking brakes	Check hydraulic pressure (800 to 1000 PSI).	Turn autosyn inverter ON.
		Direct crew member to start auxiliary power unit and switch ON when warmed up.
		Check fuel and oil quantities and autosyn voltage.
(2)	Note: A crew man is required to engage the portable starter with the engines, this being the only source of power for starting the engines.	Check emergency hydraulic pressure (900 to 1000 PSI). (Hydraulic pressure indicator light turns off at approximately 600 PSI).
Unlock flight controls, open throttle and order combustion chambers cleared as follows:		Open emergency hydraulic system filler valve. Close when system reaches full pressure (warning light turns off at approximately 900 PSI).
WARNING: Ignition plugs at firewalls must be connected to insure proper grounding of magnetos.		IGNITION SWITCHES (4) MUST BE OFF.
		No action.

Pilot	Copilot	Engineer
Direct crew man to operate the portable starter on No. 1 engine (three full turns of propeller are recommended).	Stand by to direct crew man on right-hand side to operate the portable starter on No. 3 engine.	No action.

CAUTION: Care should be taken to run the portable starter only enough to turn the propeller about 1/6 of a revolution at a time. This is to prevent the engine from being damaged if piston comes up against a full combustion chamber.

(3)

Unlock engine controls, check visually and operate through the full range to insure proper movement.	Check operation of right aileron and trim tab.	Open cowl flaps - four switches.
Check rudder boost.		Open intercooler valves - four switches.
		Set oil cooler switch to AUTO - four switches.
		Set turbo supercharger regulators to LOW BOOST position.
		Set propeller governor switch in INCREASE RPM (LOW PITCH) position.

Pilot	Copilot	Engineer
		NOTE: HOLD IN THIS POSITION UNTIL LIMIT LIGHT INDICATES LOW PITCH POSITION.
(4)		
No action.	No action.	Set mixture controls to IDLE CUT-OFF position.

NOTE: To insure against fires and flooding of the lower cylinders never start engine with mixture control in any position other than IDLE CUT-OFF or prime the engine when it is not turning.

(5)		
No action.	Auxiliary external fire extinguisher should be available.	Set fire extinguisher selector valve to engine being started.
(6)		
No action	No action.	Open fuel valves - four switches. Start fuel boosters - four switches. Adjust fuel pressure (four rheostats) to 8 - 10 PSI. Crack throttles slightly (approximately 400 - 600 RPM).
(7)		
No action.	No action.	Signal to Pilot - ready to start.

b. Starting

Pilot	Copilot	Engineer
(1)		
Visually inspect left-hand nacelles, receive Engineer's report and signal - ready to start.	Visually inspect right-hand nacelles and signal - ready to start right-hand engines.	No action.
(2)		
Direct crew man to operate portable starter on No. 1 engine.	No action.	Operate No. 1 primer, ignition and ignition booster switches as follows: a. Set magneto switch to BOTH. b. PRIME when propeller begins to turn. c. IGNITION and IGNITION BOOSTER after one complete revolution of the propeller. d. When engine begins to fire, move mixture control immediately to AUTOMATIC RICH. e. CAUTION: Do not open throttle, as lean mixture and backfire hazard will result. f. Continue to prime as necessary until engine is running smoothly. g. Allow ignition booster switch to return to OFF.

Pilot	Copilot	Engineer
(3)		
No action.	No action.	If oil pressure does not register within 10 seconds, or does not go up to 40 PSI within 30 seconds, stop engine and investigate. When engine is running smoothly, open throttle slowly to give engine speed of 1200 RPM. If fuel pressure remains steady, shut off fuel boosters. If engine stops, move mixture control immediately to IDLE CUT-OFF, cut ignition and repeat procedure as necessary.
(4)		
No action.	No action.	Notify Pilot - No. 1 engine running satisfactorily.
(5)		
Acknowledge - No. 1 engine running satisfactorily, and signal for No. 2 engine to be started. Start same as per No. 1 engine.	Notify Pilot - ready to start right-hand engines (3 and 4).	Notify Pilot - No. 2 engine running satisfactorily.
(6)		
Signal for Engines 3 and 4 to be started.	No action.	Proceed to start Engines 3 and 4 as per Engines 1 and 2.

c. Fire in Nacelles at Engine Start

Pilot	Copilot	Engineer
NOTE: The following procedure is for fire in a single engine and controls mentioned are for the engine affected. Copilot will report fire in right-hand engines to pilot. External fire extinguishers should be manned by a crew member standing by at the start of each engine.		
(1)		
Direct Engineer to stop engine.	Report to Pilot any sign of fire in Nacelle 3 and 4.	Turn mixture control to IDLE CUT-OFF.
(2)		
No action.	No action.	Stop booster pump, close fuel shut-off valve and close cowl flaps.
(3)		
Pilot directs Engineer to set fire extinguisher selector valve and stand by to pull charge.	No action	Set fire extinguisher selector valve at Pilot's command.
(4)		
If fire is not smothered by cowl flaps, direct Engineer to pull fire extinguisher charge.	No action.	Pull first charge at Pilot's command.
(5)		
If second charge is necessary, direct Engineer to pull second charge.	No action.	Pull second charge at Pilot command.

Pilot	Copilot	Engineer
(6)		
Before resuming operations after fire, be sure that CO_2 cylinders are replaced.	No action.	No action.

d. Engine Warm-Up

Pilot	Copilot	Engineer
(1)		
When engines are running smoothly, signal Engineer for an engine warm-up.	No action.	When oil temperature begins to rise, adjust engine speed between 1000 - 1200 RPM with throttles. Turn on generators - four switches.
(2)		
Set altimeter.	No action.	Check oil temperature. Check cowl and intercooler flaps (indicators). Check oil pressure - warm-up to be continued until oil pressure reaches 70 PSI and oil temperature reaches 65°C (149°F). Check voltage and amperage for each generator.
(3)		
A.F.C.E. switches to be OFF.	No action.	When engines are thoroughly warmed, RPM may be increased as required for an instrument check.

Pilot

Copilot

Engineer

CAUTION: 2500 RPM must not be maintained for more than 1/2 minute and the following values must not be exceeded:

Fuel Pressure	18 PSI
Oil Pressure	80 PSI
Oil Temperature	88°C
Cylinder Temp.	205°C (401°F)

e. Emergency Takeoff

Pilot	Copilot	Engineer
(1)		

CAUTION: Do not idle a cold motor faster than 900 RPM because of the possibility of the viscous oil blowing the hose connections loose. FOR EMERGENCY TAKEOFF USE OIL DILUTION FROM TWO TO THREE MINUTES (NOT OVER FOUR MINUTES) OR WHILE TAXIING TO TAKEOFF POSITION.

Check flight controls.	Check hydraulic pressure gage (800 to 1000 PSI).	Fuel boost pumps - ON. Move mixture control to AUTOMATIC RICH. Set turbo supercharger regulators to HIGH BOOST (47.5" Hg. MP).

f. Engine and Accessories Ground Test

Pilot	Copilot	Engineer
(1)		
Signal Engineer to check propeller governor for each engine.	No action.	Check each propeller governor at 1500 RPM by holding control switch (propeller RPM) in DECREASE (HIGH PITCH) position until RPM decreases (approximately to 1100) before letting the switch return to OFF position.
(2)		
Signal Engineer to check ignition.	No action.	With mixture controls in AUTOMATIC RICH check ignition at 1500 - 1600 RPM.
(3)		
Run up each engine individually and adjust supercharger regulator controls for 47.5" Hg. MP or HIGH BOOST at full throttle (2800 RPM). IMPORTANT: This adjustment to be made as quickly as possible and must not exceed 1/2 minute for each engine.	Notify Pilot if hydraulic pressure reading is not satisfactory (800 to 1000 PSI).	Move each cabin compressor control individually and check cabin supercharger tachometer (oil pump). Indicator should show a decrease when control is moved towards HIGH FLOW.
(4)		
Check vacuum gage (approx. 4" Hg.)	No action.	Check emergency hydraulic pressure (800 to 1000 PSI).

Pilot	Copilot	Engineering
(5)		
No action.	No action.	Notify Pilot if any temperature or pressure reading is not satisfactory.

Fuel Press.-	Desired	15 PSI
	Max.	18 PSI
	Min.	15 PSI
Oil Press.-	Desired	70 PSI
	Max.	80 PSI
	Min.	60 PSI
Oil Temp. -	Desired	65°C(149°F)
	Max.	88°C(190°F)
Cyl. Temp.-	Max.	205°C(400°F)

g. Taxiing

Pilot	Copilot	Engineer
(1)		
WARNING: Check visually and operate to insure proper movement.	Check hydraulic system pressure (800 to 1000 PSI).	Notify Pilot if: Cylinder temperature exceeds 205°C. Oil pressure exceeds 70 PSI (or less than 40 PSI for idling engines). Oil inlet temperature exceeds 85°C. Fuel pressure is over 18 PSI or under 15 PSI. Hydraulic pressure is under 800 PSI.
(2)		
Lock inboard throttles to taxi with outboard throttles. CAUTION: DO NOT LOCK BRAKES ON ONE WHEEL TO TURN WHILE TAXIING.	Set trim tabs in NEUTRAL.	Mixture control should be in AUTOMATIC RICH position. Cowl flaps OPEN (adjust to suit cylinder temperature). Intercooler valves OPEN (cold) position - four switches (unless icing conditions prevail).

Pilot	Copilot	Engineer
(3)		
Wing flaps should be up.	No action.	No action.
Contact tower for clearance.		

h. Takeoff

Pilot	Copilot	Engineer
(1) Open throttles slowly to takeoff power (3 to 5 seconds) at 2800 RPM. Apply throttle brake. Turn propeller speed control to INCREASE RPM.	No action.	No action.
(2) When airplane is clear of ground, direct Copilot to retract landing gear.	Retract landing gear at command from Pilot.	No action.
(3) Adjust controls to rated or cruising power for climbing.	No action.	Cylinder head temperature must not exceed 248°C (5 minutes maximum). Oil Press. - Desired 70 PSI Maximum 80 PSI Minimum 60 PSI Oil Temp. - Desired 85°C Maximum 88°C Fuel Press. - Minimum 15 PSI Maximum 18 PSI Set intercooler in OPEN (cold) position unless icing.

i. Climb

Pilot	Copilot	Engineer
(1)		
Reduce manifold pressure by retarding turbo supercharger regulator:	No action.	Set intercooler in OPEN (cold) position unless icing.
CAUTION: Do not close throttles until supercharger regulator control has been brought back to LOW BOOST position.		
(2)		
Reduce RPM as required for climb. (Use override control for INCREASE or DECREASE).	Adjust trim tabs.	Adjust cowl flaps as required to maintain proper cylinder head temperatures.
(3)		
Make visual check of Engines 1 and 2.	Make visual check of Engines 3 and 4.	Mixture - AUTOMATIC RICH.

j. Cruise

Pilot	Copilot	Engineer
(1)		
Order Engineer to adjust engines for cruising condition.	No action.	Adjust engine controls for cruising condition as follows: a. Set mixture controls to AUTOMATIC LEAN. b. Reduce manifold pressure with supercharger regulator. c. Reduce propeller RPM. d. Synchronize manifold pressure with throttles.
(2)		
No action.	No action.	Adjust cowl flaps as required to maintain proper cylinder head temperature.
(3)		
Turn A.F.C.E. switches ON.	Begin flight performance log and make entries.	Stop booster pumps if fuel pressure remains steady.

k. Cruising Climb

Pilot	Copilot	Engineer
(1)		
Order Engineer to adjust engines for cruising climb condition.	No action.	Adjust manifold pressure with supercharger regulator for cruising climb. Set mixture controls to AUTOMATIC RICH.
(2)		
No action.	No action.	Adjust cowl flaps to maintain proper cylinder head temperatures.

1. Fire in Flight

Pilot	Copilot	Engineer
(1)		
Notify Engineer if fire is in Engines 1 or 2.	Notify Engineer if fire is in Engines 3 or 4.	Close cowl flaps of engine affected. Close fuel shut-off valve of engine affected.
(2)		
Continue with throttles unchanged. Order Engineer to set fire extinguisher selector valve and stand by to pull charge.	No action.	Set valve when ordered by pilot and stand by to pull charge.
(3)		
If fire is not extinguished, order Engineer to pull first charge.	No action.	Pull first charge when directed by Pilot.
(4)		
If fire persists, order Engineer to pull second charge.	No action.	Pull second charge when directed by Pilot. CAUTION: If fire occurs in more than one engine, do not attempt to distribute a single charge.

m. Engine Failure During Flight

Feather Propellers

CAUTION: Due to the excessive current resulting, do not attempt feathering of more than one propeller at a time except in an emergency.

Auxiliary Equipment Affected:

Outboard Engines	Inboard Engines
2 Generators	2 Generators
2 Vacuum Pumps	2 Vacuum Pumps
	2 Cabin Compressors

Pilot	Copilot	Engineer
(1)		
Notify Engineer - No. 1 engine to be stopped. Press No. 1 feathering switch. Turn A.F.C.E. master switch off.	No action.	Upon receiving Pilot's signal: a. Move No. 1 mixture control to ENGINE OFF (IDLE CUT-OFF) b. Stop No. 1 booster pump if running above 15,000 feet. c. When propeller stops, turn No. 1 ignition to ENGINE OFF. d. Close cowl flaps.
(2)		
Close throttle	Adjust trim tabs as required.	No action.

Pilot	Copilot	Engineer
(3)		
Turn A.F.C.E. master switch on. If No. 1 engine is not to be restarted, order Engineer to transfer No. 1 engine fuel to other tanks as required.	No action.	Transfer fuel if ordered to do so by Pilot.
(4)		
Notify Engineer - No. 2 engine to be stopped. Proceed as with Engine No. 1	Proceed as with Engine No. 1	Proceed as with Engine No. 1 except: a. Move vacuum selector valve to Engine No. 3 if not previously set to this position. b. Move Engine No. 3 cabin compressor control to MAXIMUM (full on) position.
(5)		
Notify Engineer - No. 3 engine to be stopped. Proceed as with Engine No. 1 and 2.	Proceed as with Engines No. 1 and 2.	Proceed as with Engines No. 1 and 2 except: a. Move vacuum selector valve to Engines No. 2 b. Move Engine No. 2 cabin compressor control to MAXIMUM (full on) position.

Pilot	Copilot	Engineer
Notify Engineer - No. 4 engine to be stopped. Proceed as with Engines 1, 2 and 3.	Proceed as with Engines 1, 2 and 3.	Proceed as with Engine No. 1

Unfeather Propellers

Auxiliary Equipment Affected:

Outboard Engines	Inboard Engines
2 Generators 2 Vacuum Pumps	2 Generators 2 Vacuum Pumps 2 Cabin Compressors

Pilot	Copilot	Engineer
(1) Notify Engineer - No. 1 engine to be restarted. Turn A.F.C.E. master switch off.	No action.	Set No. 1 propeller pitch control to LOW RPM. Set No. 1 intercooler valve to the HOT position (closed). Cowl flaps should be closed.
(2) Crack No. 1 throttle to operate at approximately 1000 RPM.	No action.	Start No. 1 booster (if above 15,000 feet). Check fuel quantity in No. 1 tank. Turn No. 1 ignition to BOTH.
(3) Press No. 1 feathering switch and hold it closed until engine speed reaches 1000 RPM.	No action.	When engine speed reaches 1000 RPM, move No. 1 mixture control from ENGINE OFF to AUTOMATIC RICH.

Pilot	Copilot	Engineer
(4)		
Open throttles slowly to 1200 RPM.	Adjust trim tabs if desired.	No action.
(5)		
Maintain 1200 RPM until notified by Engineer that oil temperature is 85°C (185°F)	No action.	Notify Pilot when oil temperature reaches 85°C. When cylinder head temperature reaches 205°C (400°F), open cowl flaps as required for continuous operation.
(6)		
No action.	No action	Synchronize manifold pressure and RPM with other engines. CAUTION: Power above 15,000 feet must be adjusted with turbo control - full throttle. Adjust carburetor air (intercooler) controls as required.
(7)		
Turn A.F.C.E. master switch on.	Adjust trim tabs as required.	No action.

Pilot	Copilot	Engineer
(8)		
Restart (unfeather) No. 2, 3 and 4 engines same as per No. 1 Engine.	Proceed as with Engine No. 1.	Proceed as with Engine No. 1 except adjust cabin compressor controls on Engine No. 2 and 3 as required.

n. Approach

Pilot	Copilot	Engineer
(1)		
Check C.G. location for landing. Set altimeter.	Set altimeter.	Set mixture controls in AUTOMATIC RICH. Set altimeter.
(2)		
Notify radio operator to retract trailing antenna.	No action.	Open intercooler flaps (four switches) unless icing conditions prevail.
(3)		
Turn A.F.C.E. master switch OFF.	Radio control tower for landing clearance.	No action.
(4)		
Move supercharger controls to full ON and propeller speed control to INCREASE RPM (one control handle).	Check instruments.	Shut off deicer system if operating.
(5)		
Order copilot to extend landing gear.	Extend landing gear when directed by pilot.	Check instruments.
(6)		
Operate brakes. Hydraulic pressure should remain above 800 PSI. If main brakes are inoperative, prepare for emergency landing.	Check hydraulic pressure - should be 800 to 1000 PSI.	Check emergency hydraulic pressure - 900 to 1000 PSI.

Pilot	Copilot	Engineer
(7)		
Close throttles slowly to prevent damage to turbos by after firing.	No action.	Adjust cowl flap to correct cylinder head temperature as required.
(8)		
Lower wing flaps as required below 180 MPH indicated airspeed.	Adjust trim tabs as required when flaps have been lowered.	No action.
(9)		
Order Copilot to call off airspeed as required.	Call off airspeed when directed by Pilot.	No action.

o. Resumption of Flight during Landing Approach

Pilot	Copilot	Engineer
(1)		
Open throttles wide. CAUTION: Do not exceed 47.5" Hg. MP.	No action.	No action.
(2)		
Turn propeller speed control to INCREASE RPM (if control has not previously been set.)	No action.	No action.
(3)		
Raise wing flaps and order Copilot to raise landing gear as for normal takeoff.	Raise landing gear and adjust trim tabs when directed by Pilot.	No action.

p. After Landing

Pilot	Copilot	Engineer
(1)		
Move supercharger controls gradually to OFF position.	No action.	Set cowl flaps to full OPEN.
(2)		
Raise wing flaps	No action.	No action.

q. Stop Engines

Pilot	Copilot	Engineer
(1)		
Idle engines at approximately 600 to 800 RPM until cylinder head temperatures drop below 190°C (342°F).	No action.	No action.
(2)		
If airplane is to remain outside over night or if an engine start is anticipated in temperatures below 30°F, order Engineer to dilute oil (4 min. max.)	No action.	Dilute oil when ordered by Pilot (4 min. max.) Note: During dilution period operate supercharger controls continuously full ON to full OFF in cycles of approximately 10 seconds.
(3)		
Direct Engineer to stop engines with mixture control.	No action.	At Pilot's command increase the engine RPM to 1200 for approximately 30 seconds and then move the mixture control to IDLE CUT-OFF. Turn ignition switches off after engine has stopped.

CAUTION: Do not turn propeller until engine is cold.

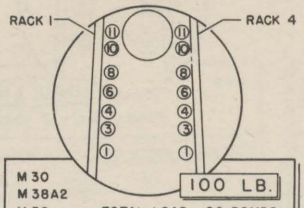
r. Before Leaving Airplane

Pilot	Copilot	Engineer
(1)		
Cut off all switches - radio, deicer, all control and instrument board.	Complete Form 1	Leave cowl flaps in OPEN position. Cut off all switches.

SECTION III

FLYING CHARACTERISTICS

(To be furnished when available)



M 30
M 38A2
M 39
MKIMIII
MKIMIV

100 LB.

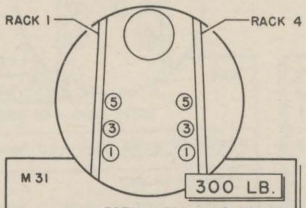
TOTAL LOAD = 20 BOMBS

FORWARD BOMB BAY — 6 BOMBS

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1	1	66°	51°
"	3	56°	37 ¼°
"	4	49 ¼°	30°
"	6	43°	23 ¼°
"	8	37 ½°	19°
"	10	32°	14 ¾°

REAR BOMB BAY — 14 BOMBS

1 & 4	1	65 ¾°	57 ¾°
"	3	55 ¾°	41 ¼°
"	4	49 ¼°	32 ½°
"	6	42 ¾°	25 ¼°
"	8	37 ¼°	20°
"	10	31 ¾°	15 ¼°
"	11	28 ¼°	12 ½°



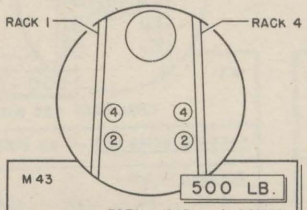
M 31

300 LB.

TOTAL LOAD = 6 BOMBS

REAR BOMB BAY — 6 BOMBS

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 & 4	1	66 ¼°	57°
"	3	56 ¾°	41°
"	5	46 ¾°	28°



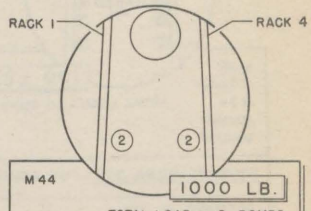
M 43

500 LB.

TOTAL LOAD = 4 BOMBS

REAR BOMB BAY — 6 BOMBS

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 & 4	2	60°	44 ¼°
"	4	48 ¾°	28 ½°



M 44

1000 LB.

TOTAL LOAD = 2 BOMBS

REAR BOMB BAY — 2 BOMBS

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 & 4	2	59 ¼°	34 ¼°

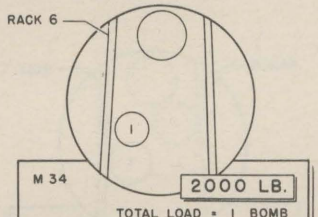
NOTE

FOR MAXIMUM ALLOWABLE AIR SPEED UNDER ALL CONDITIONS OF LOAD AND ALTITUDE SEE AIR SPEED INDICATOR. UNDER NO CONDITIONS SHALL THE MAXIMUM ALLOWABLE INDICATED AIR SPEED BE EXCEEDED.

ANGLES SHOWN ALLOW 10° FOR SAFETY. HOWEVER, UNDER PERFECTLY SMOOTH FLYING CONDITIONS IF IN THE AIRPLANE COMMANDER'S OPINION CONDITIONS WARRANT IT, THESE GIVEN ANGLES MAY NOT BE EXCEEDED BY MORE THAN 5°.

THE GLIDE OR CLIMB ANGLE IS THE ANGLE INCLUDED BETWEEN THE EARTH'S SURFACE AND THE FUSELAGE CENTERLINE.

THE ANGLES LISTED IN THE TABULATION ARE MAXIMUM AT WHICH BOMBS MAY BE RELEASED WITH A 10° CLEARANCE MAINTAINED IN THE BOMB BAY.



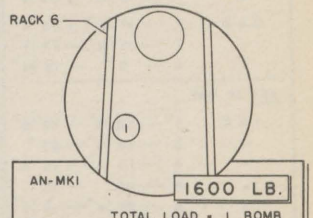
M 34

2000 LB.

TOTAL LOAD = 1 BOMB

REAR BOMB BAY

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
6	1	43°	40°



AN-MKI

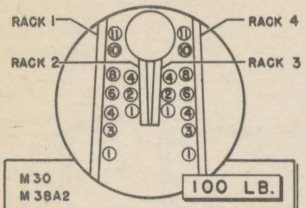
1600 LB.

TOTAL LOAD = 1 BOMB

REAR BOMB BAY

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
6	1	47°	47 ¾°

FIG. 38—BOMB FIXATION CHART—NORMAL LOAD



M30
M38A2
M39
MKIMIII
MKIMIV

100 LB.

TOTAL LOAD - 80 BOMBS

FORWARD BOMB BAY — 40 BOMBS

FORWARD IN BAY

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 a 4	1	38 ½°	50 ¼°
"	3	22 °	22 ¼°
"	4	15 °	13 ¼°
"	6	10 °	27 ¼°
"	8	6 ¾°	25 ½°
"	10	4 °	12 ½°
"	11	2 ½°	7 ¾°
2 a 3	1	16 ½°	50 ¾°
"	2	12 ½°	46 ¼°
"	4	9 ½°	42 °

AFT IN BAY

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 a 4	1	68 ½°	34 ½°
"	3	60 ¼°	20 ½°
"	4	54 ¾°	14 ½°
"	6	48 ¾°	10 °
"	8	43 ½°	7 °
"	10	38 °	4 °
"	11	34 ½°	2 ¾°
2 a 3	1	49 ½°	16 ¾°
"	2	26 ½°	12 ¾°
"	4	15 ½°	9 ½°

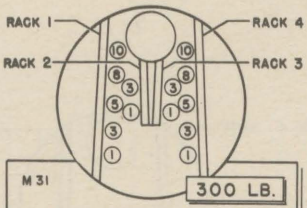
REAR BOMB BAY — 40 BOMBS

FORWARD IN BAY

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 a 4	1	37 ¾°	70 ½°
"	3	21 ½°	62 °
"	4	15 °	56 °
"	6	10 °	50 °
"	8	6 ¾°	44 ½°
"	10	4 °	39 °
"	11	2 ¼°	35 ¼°
2 a 3	1	17 ½°	50 ¼°
"	2	13 ¼°	27 ¼°
"	4	9 °	15 ¾°

AFT IN BAY

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 a 4	1	50 ¼°	42 ¼°
"	3	22 ¼°	23 °
"	4	13 ¼°	15 ¼°
"	6	48 °	10 °
"	8	25 ¼°	6 ½°
"	10	12 ½°	3 ½°
"	11	7 ½°	2 °
2 a 3	1	51 ¾°	17 °
"	2	47 °	12 ¾°
"	4	42 ¾°	9 ½°



M31

300 LB.

TOTAL LOAD - 56 BOMBS

FORWARD BOMB BAY — 28 BOMBS

FORWARD IN BAY

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 a 4	1	40 ½°	48 ¾°
"	3	22 ½°	21 ¾°
"	5	12 ¾°	9 ¾°
"	8	7 °	44 °
"	10	4 °	21 ¾°
2 a 3	1	16 ¾°	50 ½°
"	3	11 °	44 ¼°

AFT IN BAY

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 a 4	1	68 ¼°	34 °
"	3	60 ¼°	20 °
"	5	51 ¾°	12 °
"	8	44 °	6 ½°
"	10	38 ¾°	4 °
2 a 3	1	48 ½°	16 ½°
"	3	20 °	11 ¼°

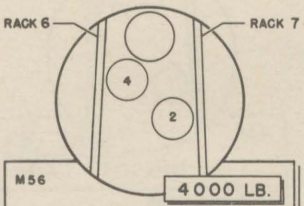
REAR BOMB BAY — 28 BOMBS

FORWARD IN BAY

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 a 4	1	40 °	68 ½°
"	3	22 ¾°	60 ½°
"	5	12 ½°	52 °
"	8	7 °	44 °
"	10	4 °	38 ¾°
2 a 3	1	17 ¾°	46 °
"	3	11 ½°	19 ¼°

AFT IN BAY

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 a 4	1	46 ¾°	41 °
"	3	21 °	22 ¾°
"	5	9 ½°	12 ½°
"	8	44 ¼°	6 ½°
"	10	21 °	3 ½°
2 a 3	1	21 °	17 °
	3	45 °	11 °



M56

4000 LB.

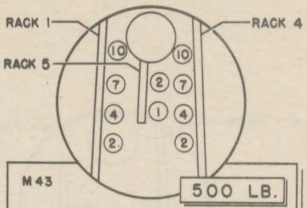
TOTAL LOAD - 4 BOMBS

FORWARD BOMB BAY — 2 BOMBS

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
6	4	4 ¾°	7 ¾°
7	2	21 °	20 ¼°

REAR BOMB BAY — 2 BOMBS

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
6	4	2 ½°	7 ¼°
7	2	22 °	22 ¼°



M43

500 LB.

TOTAL LOAD - 40 BOMBS

FORWARD BOMB BAY — 20 BOMBS

FORWARD IN BAY

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 a 4	2	24 ½°	17 ¼°
"	4	10 ¾°	1 °
"	7	4 ½°	17 ¼°
"	10	1 °	0 °
5	1	11 °	47 ½°
"	2	6 °	40 ½°

AFT IN BAY

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 a 4	2	63 ¼°	19 ¾°
"	4	53 ½°	9 ½°
"	7	45 °	4 ¾°
"	10	37 ½°	½°
5	1	17 ¼°	11 ½°
"	2	1 °	4 °

REAR BOMB BAY — 20 BOMBS

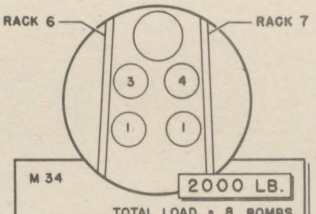
FORWARD IN BAY

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 a 4	2	24 ½°	63 °
"	4	11 ¼°	53 ¼°
"	7	5 ¼°	44 ¾°
"	10	0 °	37 °
5	1	17 °	11 °
"	2	3 ¼°	½°

AFT IN BAY

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 a 4	2	17 ¼°	22 ¼°
"	4	1 °	9 ¾°
"	7	17 ¼°	4 °
"	10	0 °	½°
5	1	49 °	11 ¼°
"	2	41 ½°	5 ¼°

* FOUR STATIONS ONLY ON RACK 6



M34

2000 LB.

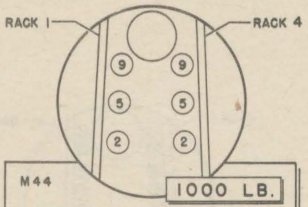
TOTAL LOAD - 8 BOMBS

FORWARD BOMB BAY — 4 BOMBS

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
6 a 7	1	42 ¼°	37 °
6	3	20 ½°	18 ¾°
7	4	20 ½°	18 ¾°

REAR BOMB BAY — 4 BOMBS

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
6 a 7	1	43 °	40 °
6	3	21 °	19 ½°
7	4	21 °	19 ½°



M44

1000 LB.

TOTAL LOAD - 12 BOMBS

FORWARD BOMB BAY — 6 BOMBS

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 a 4	2	59 °	30 ¼°
"	5	44 °	15 ¾°
"	9	33 °	8 ½°

REAR BOMB BAY — 6 BOMBS

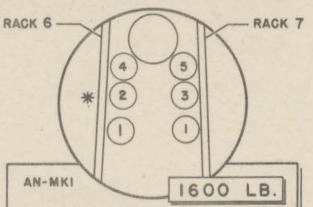
RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 a 4	2	59 ¼°	33 ¼°
"	5	44 ¼°	16 ½°
"	9	33 ½°	8 ½°

NOTE

FOR MAXIMUM ALLOWABLE AIR SPEED UNDER ALL CONDITIONS OF LOAD AND ALTITUDE SEE AIR SPEED INDICATOR, UNDER NO CONDITIONS SHALL THE MAXIMUM ALLOWABLE INDICATED AIR SPEED BE EXCEEDED.

ANGLES SHOWN ALLOW 10° FOR SAFETY. HOWEVER, UNDER PERFECTLY SMOOTH FLYING CONDITIONS IF IN THE AIRPLANE COMMANDER'S OPINION CONDITIONS WARRANT IT, THESE GIVEN ANGLES MAY BE EXCEEDED BY NOT MORE THAN 5°

THE GLIDE OR CLIMB ANGLE IS THE ANGLE INCLUDED BETWEEN THE EARTH'S SURFACE AND THE FUSELAGE CENTERLINE.



AN-MK1

1600 LB.

TOTAL LOAD - 12 BOMBS

FORWARD BOMB BAY — 6 BOMBS

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
6 a 7	1	46 °	43 ½°
6	2	26 ¼°	27 °
7	3	26 ¼°	27 °
6	4	17 ¼°	19 ½°
7	5	17 ¼°	19 ½°

REAR BOMB BAY — 6 BOMBS

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
6 a 7	1	47 °	47 ¾°
6	2	26 ¼°	29 °
7	3	26 ¼°	29 °
6	4	17 ¼°	20 ½°
7	5	17 ¼°	20 ½°

FIG. 39—BOMB FIXATION CHART—OVERLOAD

FIGS. 40 - 56, FLIGHT CURVES

(To be furnished when available)

SECTION IV

FLIGHT OPERATION DATA

Note: The following Flight Operation Data is temporary only, subject to change after first flight tests have been made. Additional flight information will be furnished when available.

WEIGHT & BALANCE CHART (PRELIM.)

AIRPLANE MODELS

XB-29

BALANCE (C.G.) LIMITS

CONDITION	PERCENT M.A.C.
TAKE-OFF	18.0 % TO 32.0 %
LANDING	18.0 % TO 32.0 %

BASIC LOAD ITEMS	POUNDS
WEIGHT EMPTY, (INCLUDING)	65880
FIXED GUN INSTALLATION (S): ( ) CAL. LB. ( ) CAL. LB. GUN SIGHT. LB. FIXED CANNON INSTALLATION (S): ( ) MM LB. ( ) MM LB.	
FLEXIBLE GUN INSTALLATION (S): (0) .50 CAL. 855 LB. ( ) CAL. LB. FLEXIBLE CANNON INSTALLATION (S): (1) 20 MM 173 LB. ( ) MM LB.	1028
EQUIPMENT:- NAVIGATION LB. PHOTOGRAPHIC LB. OXYGEN 99 LB. PYROTECNICS (FLARES ETC.) 34 LB.	133
CREW 6 (200 LB. EA. INCLUDING PARACHUTES) 1200 LB. OIL (322 U.S. GAL. 268 IMP. GALL.) 2412 LB.	3612
TACTICAL WEIGHT EMPTY (C.G. % M.A.C.)	70653

ALTERNATE ITEMS	ALTERNATE LOADING (POUNDS) MAXIMUM FUEL	NORMAL LOAD	MAXIMUM BOMBS	
FUEL (6 LB. PER U.S. GAL. - 7.2 LB. PER IMPERIAL GALL.) U.S. GAL. (IMP. GALL.)				
NORMAL LOAD - WING TANKS 5130 (4273)				
BOMB LOAD - WING TANKS 4532 (3775)		30780		
FUEL LOAD - WING TANKS 5188 (4322)			27194	
FUEL LOAD - BOMB BAY TANKS 2560 (2122)	31128			
	15360			
EXTRA TANK (S) INSTALLATION - BOMB BAY	1301			
EXTRA OIL (AS REQUIRED - MAXIMUM IS SHOWN) G. (G.)				
BOMB INSTALLATION (S): INTERNAL (4) 500 LB. ( ) EXTERNAL LB. OR (40) INTERNAL 500 LB. MAX.		2009	20595	
TORPEDO INSTALLATION				
AMMUNITION: 5000 RDS. .50 CAL. RDS. CAL. 60 RDS. 20 MM RDS. MM	1558	1558	1558	
PASSENGERS BAGGAGE (MAX.) LB.				
GROSS WEIGHT	120 000	105 000	120 000	
NOTE: 1% M.A.C. = 1.54 INCHES BALANCE (IN PERCENT M.A.C.)	22.8	24.0	23.0	

FIG. 57—WEIGHT AND BALANCE CHART

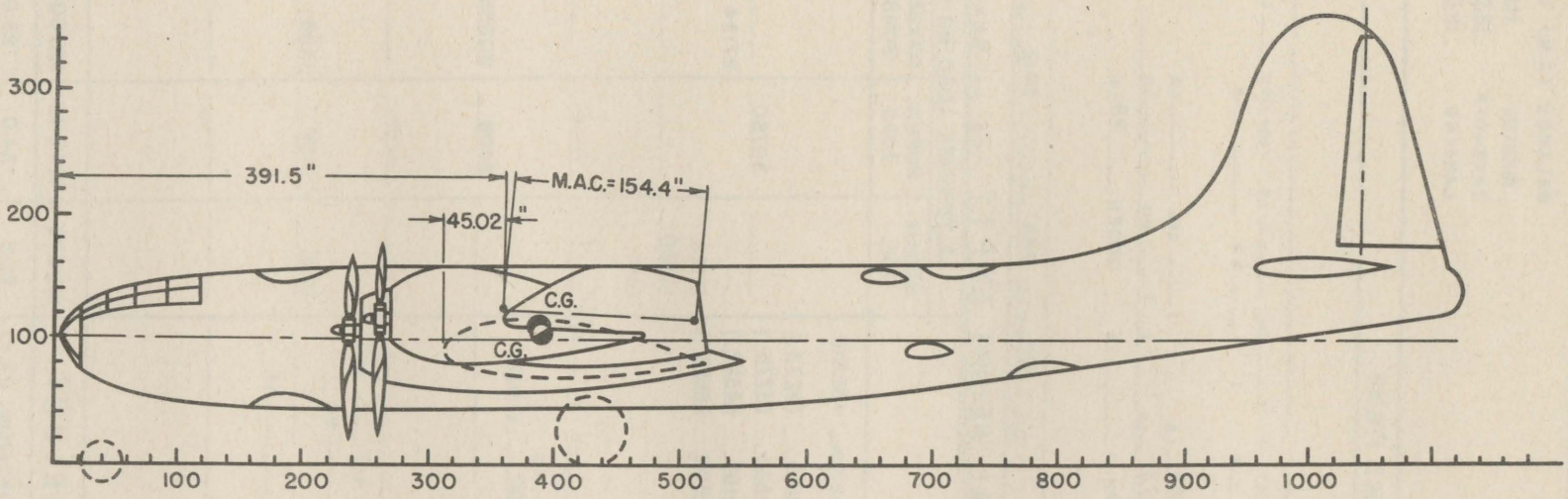


FIG. 58—BALANCE DIAGRAM

Horizontal C.G.	WHEELS UP	WHEELS DOWN
Back of ref. line	416.8	418.5
L.E.W. (root section) back of ref. line	346.48	346.48
L.E. MAC back of L.E.W. (root section)	45.02	45.02
C.G. back of L.E. MAC	25.3	27.0
Length of MAC	154.4	154.4
C.G. % MAC	16.4	17.5

Vertical C.G.	WHEELS UP	WHEELS DOWN
Above ref. line	107.5	102.3
L.E. MAC above ref. line	118.9	118.9
C.G. below MAC	11.4	16.6
Length of MAC .	154.4	154.4
C.G. % MAC	7.4	10.8

NO.	ITEM	WEIGHT	HORIZONTAL ARM	HORIZONTAL MOMENT	HORIZONTAL ARM	HORIZONTAL MOMENT
1.	Wing Group	14044	452.3	6352101	110.0	1544840
2.	Horizontal Tail Group	897	1064.1	954498	148.9	133563
3.	Vertical Tail Group	573	1057.0	605661	232.2	133051
4.	Fuselage	6921	468.7	3243873	101.8	704558
5.	Nacelles and Cowling	4348	349.4	1519191	105.3	457844
6.	Landing Gear	5994	427.1	2560037	86.8	520279
7.	Retracting Gear	515	400.6	206309	86.2	44393
8.	Nose Gear	793	108.3	85882	67.2	53290
9.	Nose Gear Retracting	110	128.6	14146	80.7	8877
10.	Tail Skid and Retracting Mechanism	146	1057.0	154322	111.0	16206
	Total Structure	34341		15696020		3616901
11.	Engines	10672	306.8	3274170	114.3	1219810
12.	Engine Accessories	3491	354.1	1236163	99.8	348402
13.	Engine Controls	291	333.5	97049	105.2	30613
14.	Propellers	2930	274.5	804285	114.0	334020
15.	Starting System	131	479.9	62867	105.4	13807
16.	Lubricating System	1255	388.7	487819	100.4	126002
17.	Fuel System	3205	438.6	1405713	111.4	357037
	Total Power Plant	21975		7368066		2429691
18.	Instruments	313	258.6	80942	109.6	34305
19.	Surface Controls	951	426.1	405221	107.6	102328
20.	Electrical	1379	471.9	650750	97.7	134728
21.	Radio	607	265.4	161098	109.8	66649
22.	Armament	3611	546.5	2028062	112.6	417859
23.	Furnishings	1369	340.6	466281	109.3	149632
24.	Cabin Supercharging and Heating	823	403.5	332081	102.7	84522
25.	Anti-Icing Equipment	249	488.1	121537	105.0	26145
26.	Auxiliary Power Plant	162	928.2	150368	130.0	21060
	Total Fixed Equipment	9564		4396340		1037228
27.	Weight Empty - Wheels Up	65880	416.8	27460426	107.5	7083820
	Lower Landing Gear			+ 110213		-346293
28.	Weight Empty - Wheels Down	65880	418.5	27570639	102.3	6737527

SPECIFIC ENGINE FLIGHT CHART

(To be furnished when available)

TAKEOFF, CLIMB AND LANDING CHART

(To be furnished when available)

FLIGHT OPERATION INSTRUCTION CHART

(To be furnished when available)

FIG. 62 - ENGINE FLIGHT CALIBRATION CURVES

(To be furnished when available)

PART TWO

FOREWARD

Part Two of this manual is devoted to Servicing Instructions and consists largely of illustrative diagrams and photographs. The information contained herein is based upon the first experimental airplane and is subject to change.

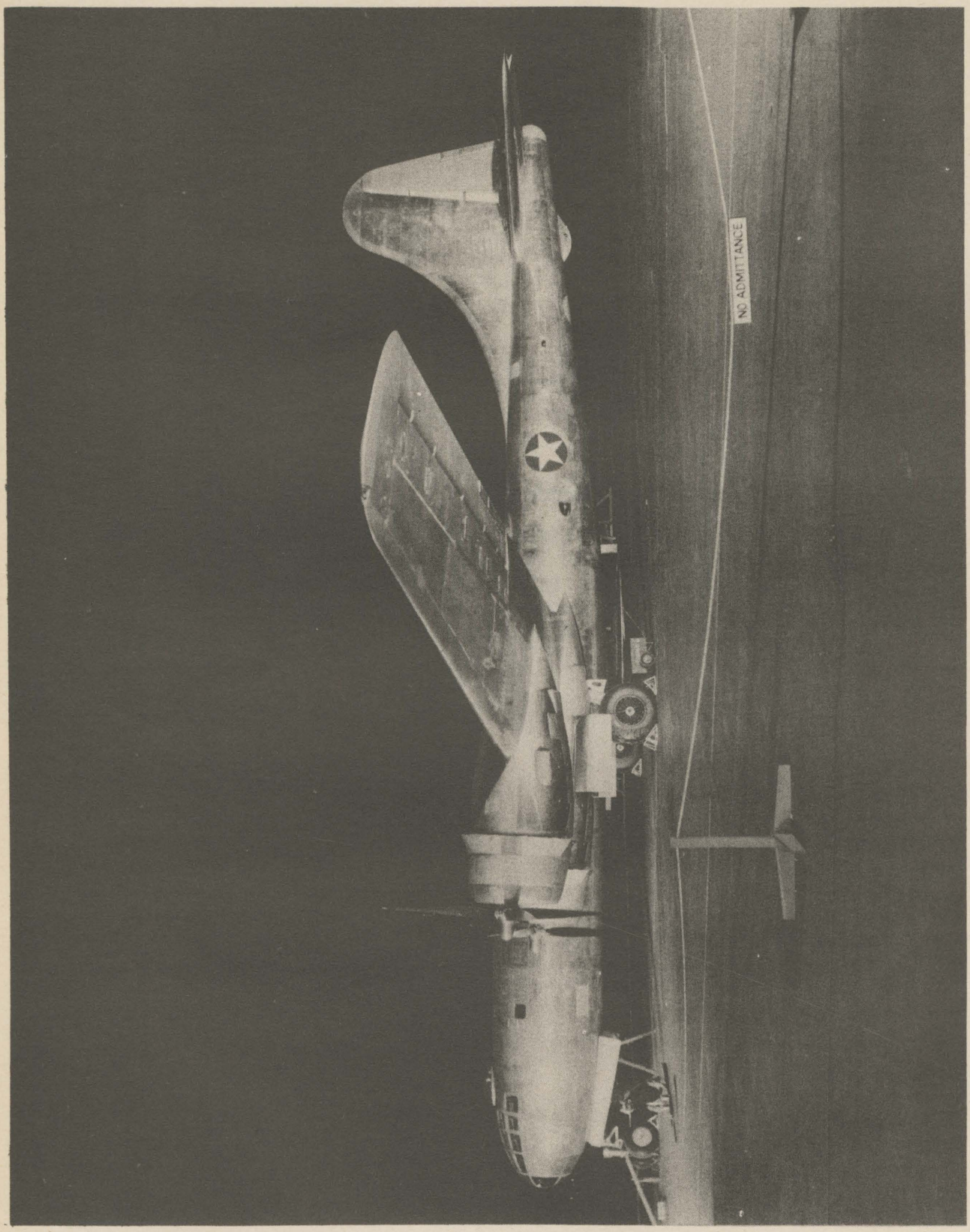


FIG. 63—COMPLETE AIRPLANE—LEFT SIDE VIEW

GENERAL

Figure No.	TITLE	Page
63	Complete Airplane - Left Side View	196
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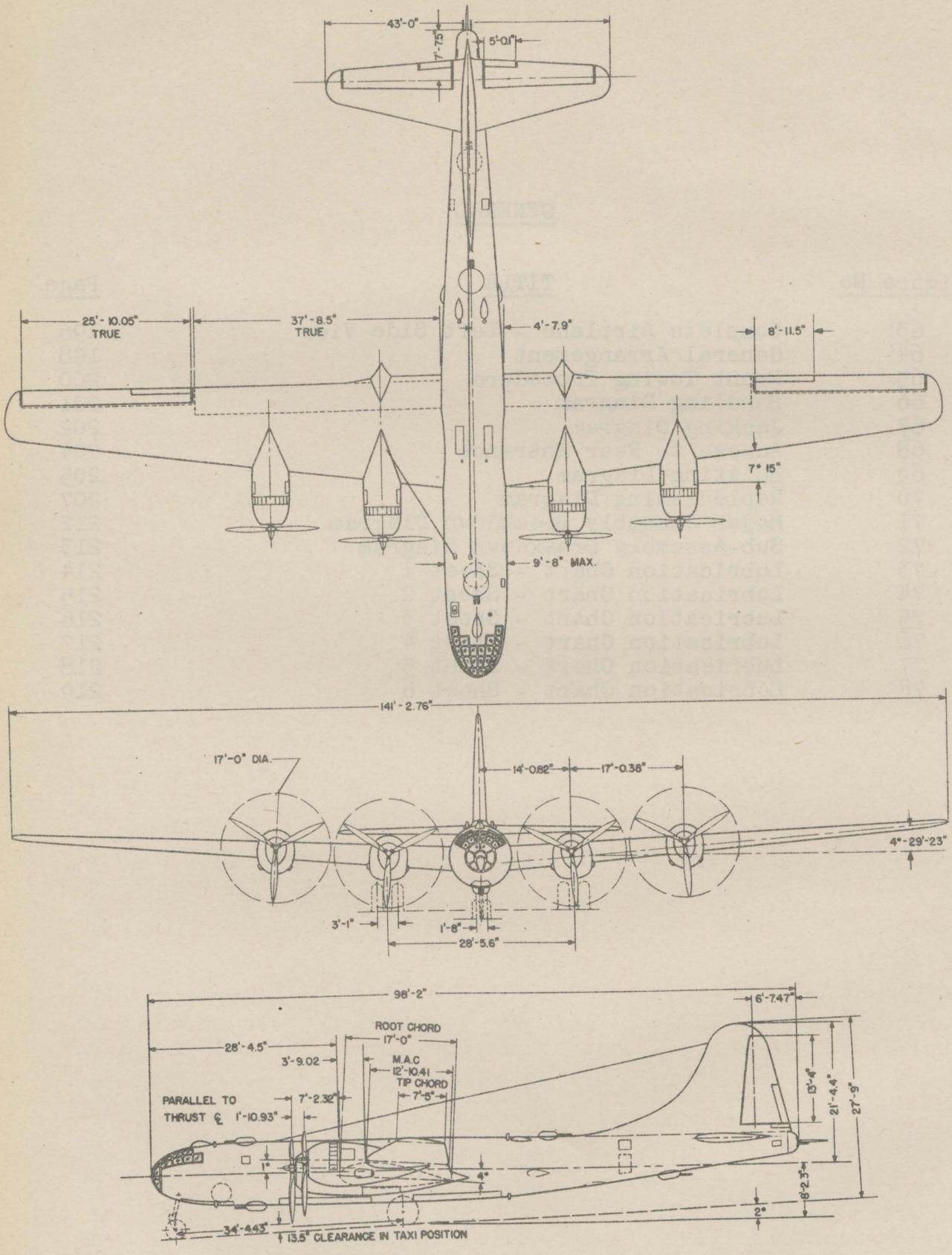


FIG. 64—GENERAL ARRANGEMENT

Handling

a. Towing

Towing lugs are located on the front side of the nose wheel gear for forward towing, and on the rear side of the main landing gear for rearward towing.

A towing bar (Boeing 15-9829) attaches to the nose wheel gear for forward towing.

b. Mooring

Lines may be attached at towing points and also at rope wells located at Wing Station 539.7 on the rear spar. In mooring the airplane set the parking brakes and lock the control surfaces.

c. Jacking

Jacking cones are provided in the following locations: body stations 153 and 1039, wing stations 97 and 247 and on the rear spar, and on the axle of each main landing gear.

The airplane as a whole may be jacked by using either wing stations 97 and body station 1039 or wing stations 247 and body station 153.

When changing tires or servicing the brakes it is recommended that jacks be placed under wing stations 97 and 247 on the same side of the fuselage as the tire to be changed. It is possible, but not recommended, to use only one jack under the wing.

It is necessary to relieve torsional stresses in the wing while removing or replacing access doors, therefore it is important that the wing be supported while the doors are being removed. It is recommended that the jacks be left in place while the panels are off. However, if it is necessary to move the airplane with the panels removed, no damage will result if it is towed slowly on a smooth surface.

When lifting at a single point, the path of that point is an arc and obviously the cone will not remain centered above the jack. This displacement will tend to cause failure of the jack or shifting of the airplane or both. Therefore, jacking of the airplane at one point only must be held to a minimum.

Consult the Jacking Diagram for jacking loads.

d. Leveling

Leveling brackets are provided in the forward bomb bay. Fore and aft leveling brackets are attached to the left catwalk. For lateral leveling, a bracket mounted on the right catwalk is used in

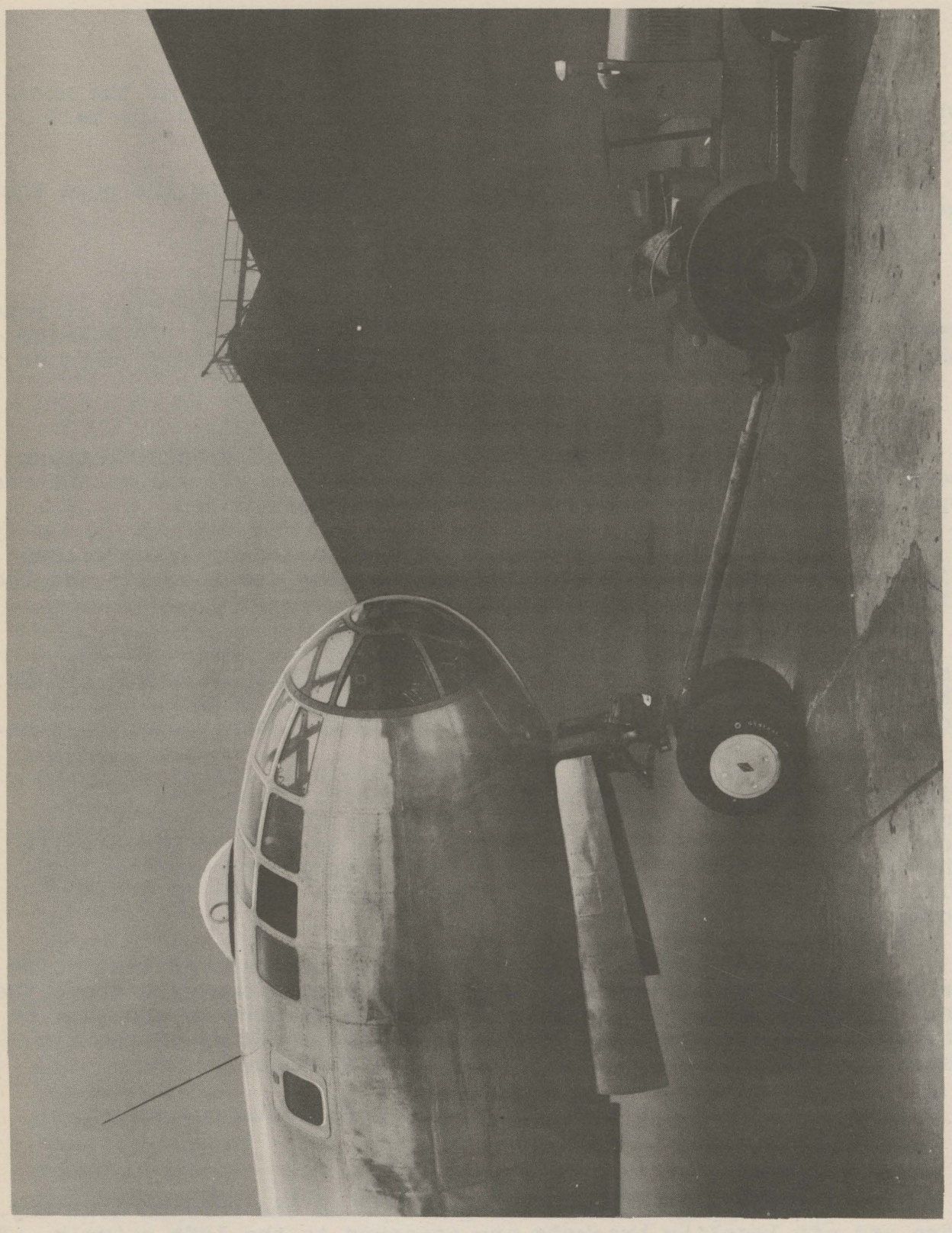


FIG. 65—FRONT TOWING PROCEDURE

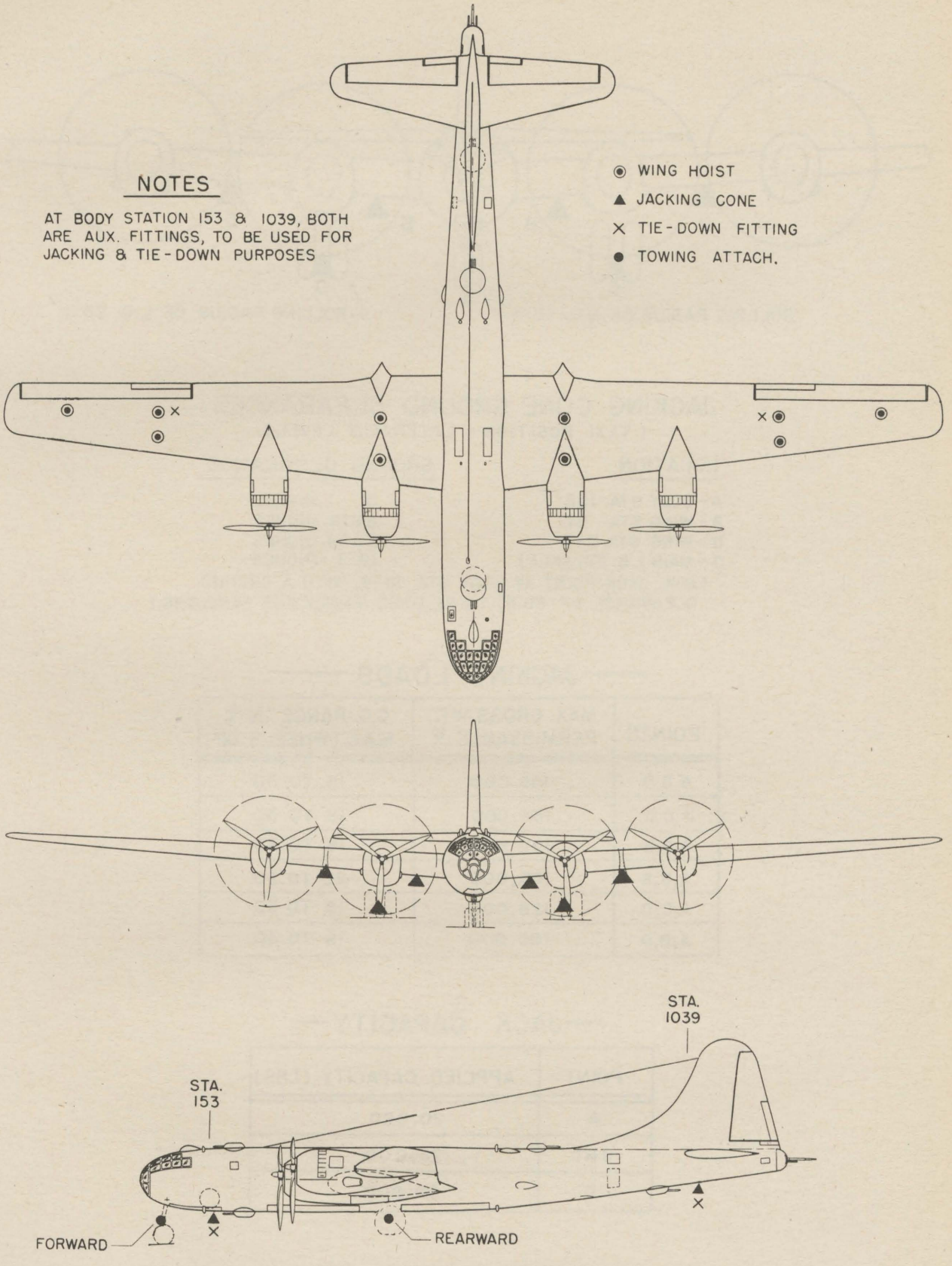
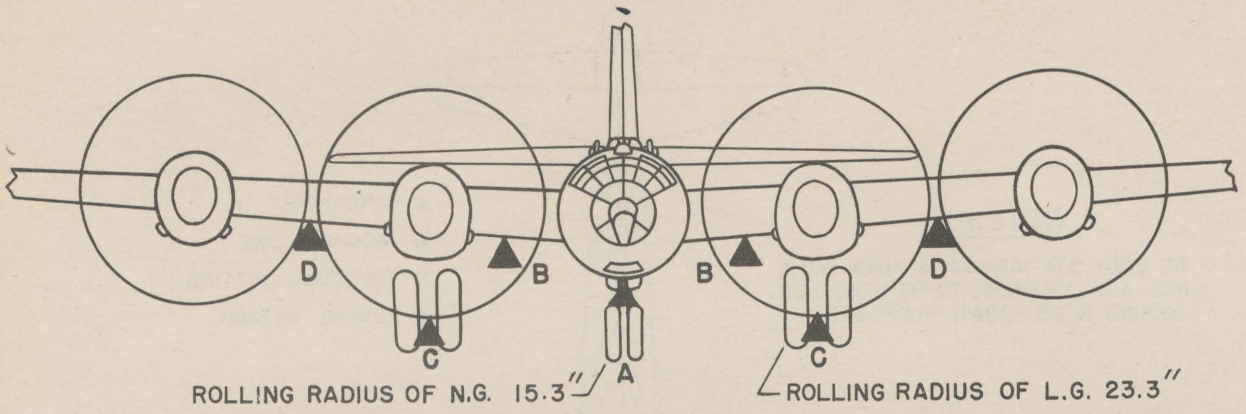


FIG. 66—HANDLING DIAGRAM



JACKING CONE GROUND CLEARANCES

(TAXI POSITION - LATERALLY LEVEL)

LOCATION	GROUND CLEARANCE
A - BODY STA. 153	51 INCHES
B - WING STA. 97	85.79 INCHES
D - WING STA. 247	71.84 INCHES
C - MAIN L.G. (ON AXLE)	19.5 INCHES

(AUX. JACK POINT AT BODY STA. 1039, WITH A GROUND CLEARANCE OF 69.8", TO BE USED MAINLY FOR SERVICING.)

JACKING LOADS

POINTS	MAX. GROSS WT. PERMISSABLE #	C.G. RANGE IN % M.A.C. (WHEELS UP)
A,D,D	105,000	18 TO 30
A,C,C	154,000	18 TO 30
A,B,B	120,000	18 TO 30
A,B,B	105,000	22 TO 30
A,C,D	128,000	18 TO 30
A,B,D	105,000	18 TO 30

JACK CAPACITY

POINT	APPLIED CAPACITY (LBS.)
A	20,000
B&C	75,000
D	50,000

FIG. 67—JACKING DIAGRAM

conjunction with the front leveling bracket on the left catwalk.

e. Hoisting

No provisions are made for hoisting the complete airplane. However, major assemblies of the ship may be hoisted separately. The outboard wing panel may be hoisted by using the lugs provided at Wing Stations 579 and 747 on the rear spar, and 579 on the front spar.

The inner wing may be handled as a unit by using four hoisting lugs, two on each side of the ship, and located at Station 164.7 on the front and rear spars.

The four fuselage sections may be hoisted separately by using the bolt holes that are provided for fastening the sections together.

Consult the Hoisting Diagram for hoisting loads.

f. Walkways, Ladders and Protective Covering

(1) Walkways

Within the airplane, all ribs, brackets, cross members, etc. not usable as steps are plainly labeled NO STEP. Special care should be taken to avoid any weight on the bomb door ribs.

It is permissible to walk on the wing surface in the area bounded by the fuselage, the rear spar and the Wing Station 819.

CAUTION: DO NOT STEP ON AREAS OTHER THAN THOSE DESIGNATED. SHOULD ACCESS TO THESE PORTIONS OF STRUCTURE BE NECESSARY, SUITABLE PLATFORMS OR SCAFFOLDING MUST BE USED.

(2) Ladders

A ladder is supplied to facilitate ingress and egress at the rear door of the airplane and is stowed aft of the rear pressurized compartment on the left sidewall.

Two small ladders are located at either end of the communication tunnel to assist in entering or leaving the tunnel.

(3) Protective Covering

Four canvas engine protective covers are supplied with each airplane to provide protection for the engines from dust and weather. These covers are stowed under the bunks in the rear pressurized compartment when not in use.

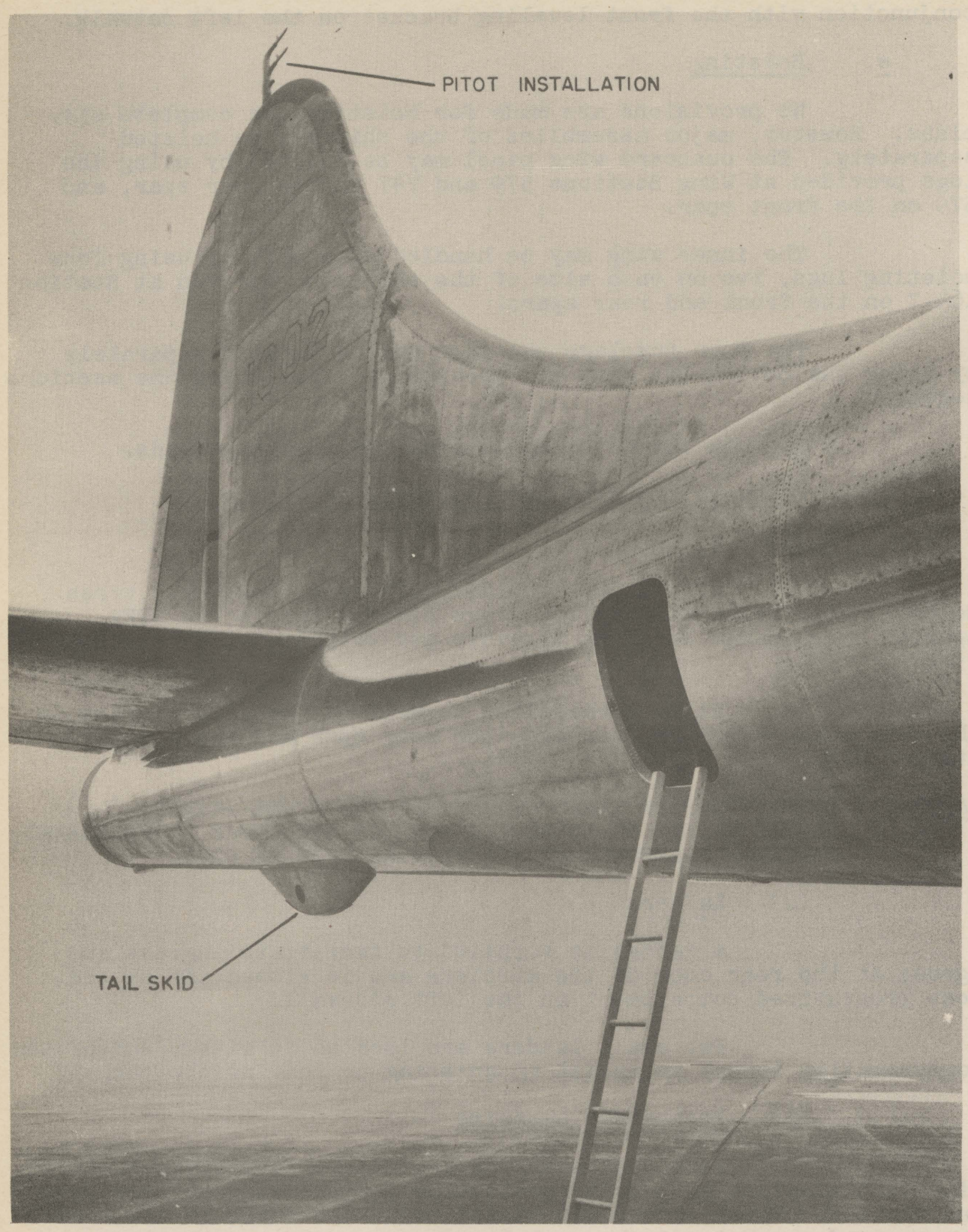
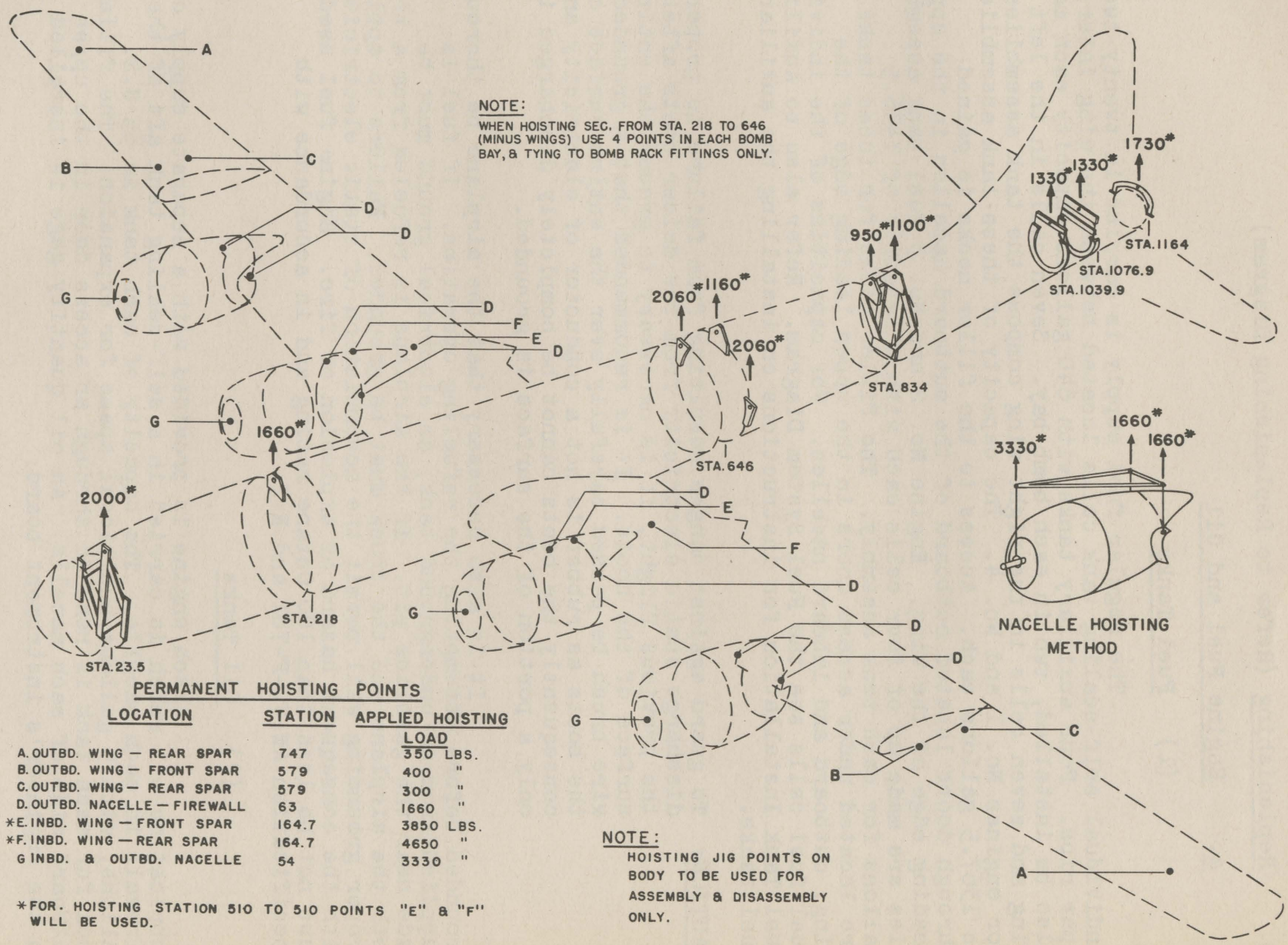


FIG. 68—ACCESS TO REAR ENTRANCE



NOTE:
WHEN HOISTING SEC. FROM STA. 218 TO 646 (MINUS WINGS) USE 4 POINTS IN EACH BOMB BAY, & TYING TO BOMB RACK FITTINGS ONLY.

FIG. 69—HOISTING DIAGRAM

PERMANENT HOISTING POINTS

LOCATION	STATION	APPLIED HOISTING LOAD
A. OUTBD. WING — REAR SPAR	747	350 LBS.
B. OUTBD. WING — FRONT SPAR	579	400 "
C. OUTBD. WING — REAR SPAR	579	300 "
D. OUTBD. NACELLE — FIREWALL	63	1660 "
*E. INBD. WING — FRONT SPAR	164.7	3850 LBS.
*F. INBD. WING — REAR SPAR	164.7	4650 "
G INBD. & OUTBD. NACELLE	54	3330 "

*FOR. HOISTING STATION 510 TO 510 POINTS "E" & "F" WILL BE USED.

NOTE:
HOISTING JIG POINTS ON BODY TO BE USED FOR ASSEMBLY & DISASSEMBLY ONLY.

2. Replenishing (Refer to Replenishing Diagram)

a. Engine Fuel and Oil

(1) Fuel Tanks

The regular fuel supply is carried in twenty-two individual self-sealing tank cells located between the wing inter-spar ribs. Four auxiliary tanks with 640 gallons capacity each may also be installed, two in each bomb bay. Seven cells in the left wing and seven cells in the right wing compose the tank assemblies for engines No. 1 and No. 4. The capacity of these tank assemblies is 1367.5 gallons each. Access to the filler necks is gained through doors located outboard of the outboard nacelles in the upper leading edge of the wing. Engine No. 2 and No. 3 fuel tank assemblies are made up of four cells each with a capacity of 1436.5 gallons for each tank assembly. The filler necks for these tanks are located under access doors in the upper leading edge of the wing, outboard and inboard nacelles. For capacities of the individual fuel cells see the Fuel System Diagram. Refer also to Auxiliary Fuel Tank Installation for instructions on installing the auxiliary fuel tanks.

CAUTION: To guard against danger resulting from failure to properly discharge static electricity from the deicer boots after the previous flight, it is necessary to ground the entire surface of the boots. It is recommended that a grounded wire brush be passed carefully over the entire surface of the boots as rubber is not a conductor of electricity and consequently the boots cannot be completely discharged if only a portion of the surface is grounded.

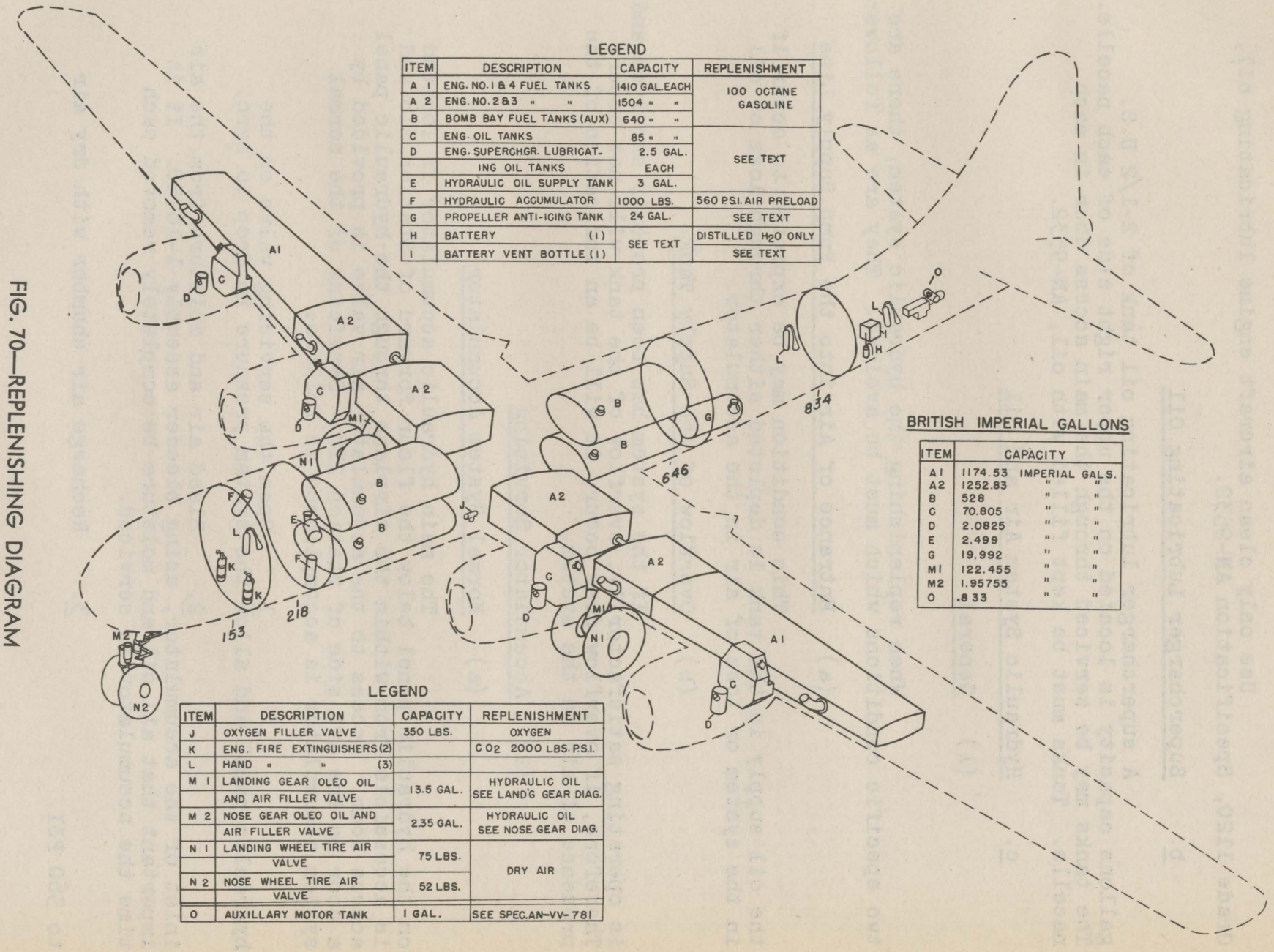
It is also necessary that the airplane be thoroughly grounded before attempting the refueling operation. If fuel is supplied from an underground tank, an electrical ground must be made near the gasoline pit. If the airplane is refueled from a truck, both the airplane and the truck must be grounded. Failure to apply proper grounding will permit the accumulation of static electricity, with the consequent hazard of explosion or fire. Engine fuel used must not be less than 100 Octane rating and in accordance with Specification AN-VV-F-781 and N-2.

(2) Oil Tanks

Each engine is provided with a separate supply of lubricating oil which is carried in a self-sealing tank aft of the firewall in each nacelle. The capacity of each tank is 85 U.S. gallons, with 5 gallons additional space for expansion. The filler neck for each tank is reached through an access door in the upper outboard side of each nacelle. An oil quantity gage is installed on the engineer's instrument board.

LEGEND

ITEM	DESCRIPTION	CAPACITY	REPLENISHMENT
A 1	ENG. NO. 1 & 4 FUEL TANKS	1410 GAL. EACH	100 OCTANE GASOLINE
A 2	ENG. NO. 2 & 3 " "	1504 " "	
B	BOMB BAY FUEL TANKS (AUX)	640 " "	
C	ENG. OIL TANKS	85 " "	SEE TEXT
D	ENG. SUPERCHGR. LUBRICAT- ING OIL TANKS	2.5 GAL. EACH	
E	HYDRAULIC OIL SUPPLY TANK	3 GAL.	
F	HYDRAULIC ACCUMULATOR	1000 LBS.	560 P.S.I. AIR PRELOAD
G	PROPELLER ANTI-ICING TANK	24 GAL.	SEE TEXT
H	BATTERY (1)	SEE TEXT	DISTILLED H_2O ONLY
I	BATTERY VENT BOTTLE (1)		SEE TEXT



BRITISH IMPERIAL GALLONS

ITEM	CAPACITY
A1	1174.53 IMPERIAL GALS.
A2	1252.83 " "
B	528 " "
C	70.805 " "
D	2.0825 " "
E	2.499 " "
G	19.992 " "
M1	122.455 " "
M2	1.95755 " "
O	.833 "

LEGEND

ITEM	DESCRIPTION	CAPACITY	REPLENISHMENT
J	OXYGEN FILLER VALVE	350 LBS.	OXYGEN
K	ENG. FIRE EXTINGUISHERS (2)		C O2 2000 LBS. P.S.I.
L	HAND " " (3)		
M 1	LANDING GEAR OLEO OIL AND AIR FILLER VALVE	13.5 GAL.	HYDRAULIC OIL SEE LAND'G GEAR DIAG.
M 2	NOSE GEAR OLEO OIL AND AIR FILLER VALVE	2.35 GAL.	HYDRAULIC OIL SEE NOSE GEAR DIAG.
N 1	LANDING WHEEL TIRE AIR VALVE	75 LBS.	DRY AIR
N 2	NOSE WHEEL TIRE AIR VALVE	52 LBS.	
O	AUXILLARY MOTOR TANK	1 GAL.	SEE SPEC. AN-VV-781

FIG. 70—REPLENISHING DIAGRAM

Use only clean aircraft engine lubricating oil, Grade 1120, Specification AN-9532.

b. Supercharger Lubricating Oil

A supercharger lubricating oil tank of 2-1/2 U.S. gallons capacity is located on the upper right side of each nacelle. The tanks may be serviced through the main access door in each nacelle. Tanks must be kept filled with oil, AN-9532.

c. Hydraulic System Air and Oil

(1) General

When replenishing the hydraulic system, there are two specific conditions which must be avoided. They are as follows:

(a) Entrance of Air into the Pump Supply Line

This condition may be expected to occur if the oil supply in the tank is depleted either through loss of oil in the system or loss of air in the accumulator.

(b) Overflow of the Supply Tank

If the system has been properly serviced and is operating satisfactorily, overflow of the tank will not occur. Therefore, if overflow does occur, it will be an indication of the presence of air in the system.

(2) Accumulator Servicing

(a) Normal System Accumulator

The main hydraulic accumulator is located on the hydraulic panel below the floor forward of Station 218 and is accessible from within the airplane through the hydraulic panel access door. Access to the accumulator air valve is provided by a door on the aft side of Station 218. Servicing of the normal system accumulator is accomplished as follows:

1. Open the servicing valve on the hydraulic panel and allow the system pressure to drop to zero.

2. Bleed air and moisture from the air inlet of the accumulator, using bleeder assembly 1-16750. It is important that all oil and moisture be completely removed each time the accumulator is serviced.

3. Recharge air chamber with dry air to 560 PSI.

4. Close the servicing valve on the hydraulic panel.

5. Pump the normal system pressure to 1000 PSI.

(b) Emergency System Accumulator

The emergency system accumulator is located on the right side of the pilot's compartment aft of the engineer's panel. Servicing is as follows:

1. Operate emergency brake valve (handle at pilot's aisle stand) until the emergency system pressure is reduced to zero.

2. Bleed air to remove any oil and water from the air chamber, using bleeder assembly 1-16750.

3. Recharge air chamber with dry air to 560 PSI.

4. Open filler valve on engineer's panel to recharge the emergency system.

5. Close filler valve when pressure reaches 1000 PSI.

(3) Hydraulic Oil Supply Tank

The hydraulic oil tank is located on the left side of the forward pressurized compartment near Bulkhead 218 on top of the navigator's cabinet. The tank has a capacity of 3 gallons.

To fill the system, pump the normal and emergency system pressures up to 1000 PSI, and fill to the indicated level with hydraulic fluid as follows: for average ground temperatures above -20°F use Specification 3580-C medium grade hydraulic fluid; for temperatures below 0°F use Specification 3580-C light grade fluid.

To bleed the air from the brake lines, the lines must be opened at the brakes and the brakes applied several times until all air is removed. To bleed the rudder boost lines, the lines must be opened at the rudder boost cylinder and the rudder operated several times until the lines are free of air.

d. Propeller Anti-Icer Fluid

A supply tank of 24 U.S. gallons fluid capacity is located below the floor in the rear pressurized compartment immediately aft of Bulkhead 646. Replenishing is accomplished through an access door in the floor. A capacity gage is located directly above the filler neck. The anti-icer fluid is a solution of 15% glycerine, 4% methyl (wood) alcohol and 81% ethyl (grain) alcohol, in accordance with A.C. Specification 3585-A.

e. Batteries

One 24 volt battery, Type G-1, is located on the left-hand side of the airplane just aft of the rear pressure bulkhead at Station 834.

Do not add electrolyte to batteries. If necessary, add distilled water at weekly intervals to the required level.

In case electrolyte is spilled on aluminum alloy parts, wash off immediately with ammonia and flood with water. Do not use soda of any kind.

Keep the battery vent sump (Pint mason jar) filled to the top of the felt discs with a saturated solution of barium hydroxide.

f. Oxygen System

The filler and relief valves for the oxygen system are located under an access door on the lower left-hand side of the body under the leading edge of the wing. Fill to 350 pounds pressure.

g. Fire Extinguishers

(1) Remotely Controlled - for engines

The engine fire extinguisher system employs two CO_2 bottles that are accessible inside the nose wheel well. The bottles may be removed for replacement by disconnecting the control cables and the tubing and removing the straps holding the bottles. The CO_2 bottles are replenished to 2000 PSI.

(2) Hand Operated

Two Type A-17 fire extinguishers are installed in the airplane, one in each pressurized cabin. In the forward cabin the extinguisher is located near the navigator's table, and in the aft compartment on pressure bulkhead 834. Three Type A-2 fire extinguishers are installed, one in each wheel well, accessible only from the ground, and one in the rear compartment, aft of the rear entrance door.

h. Landing Gear and Nose Gear

(1) Oleo Air and Oil

(a) Landing Gear Oleo to Air Valve

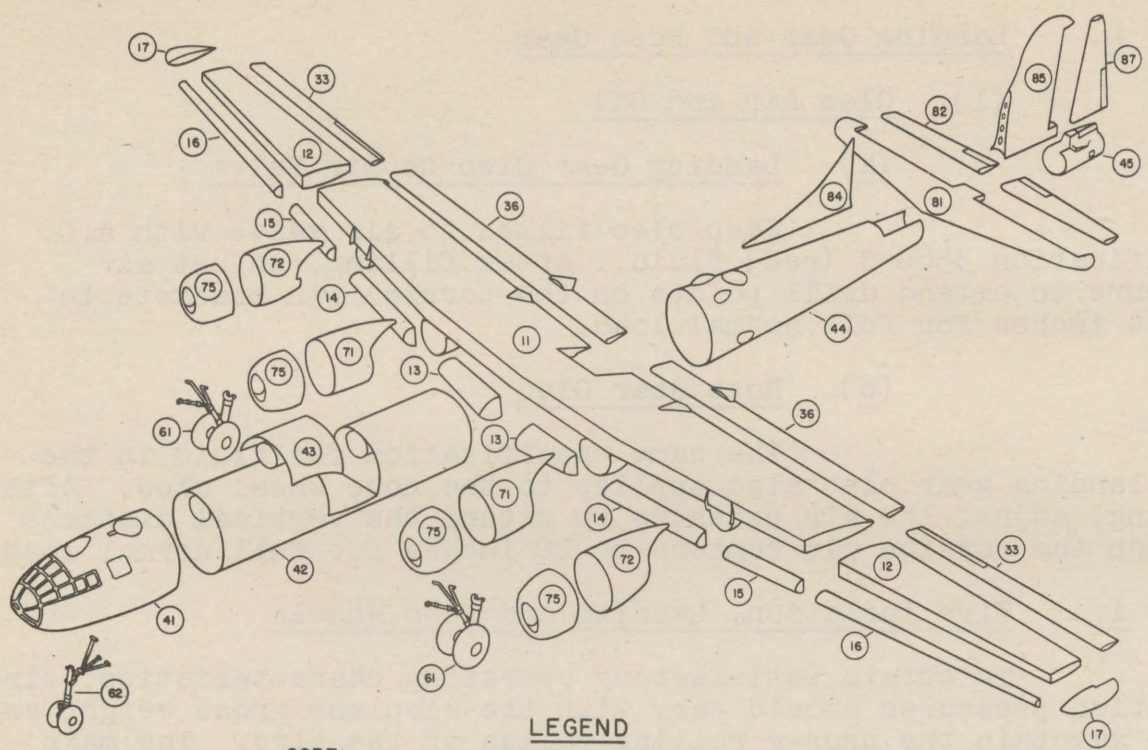
Keep oleo filled to air valve with A.C. Specification 3580-C (red) fluid. After filling, adjust air pressure to extend drill points on the torsion pin brackets to 13-3/4 inches for full normal load.

(b) Nose Gear Oleo

The same specification for fluid in the main landing gear oleo also applies to the nose wheel oleo. After filling, adjust the air pressure to extend the vertical distance between the torsion pin centers to 10 inches for full normal load.

i. Tire Inflation, Landing and Nose Wheels

To obtain satisfactory operating characteristics, tire inflation pressures should vary with the airplane gross weight so as to maintain the proper rolling radius of the tire. The main landing gear tires are designed to operate with a rolling radius of 23.3 inches, which will require inflation pressures from 75 to 85 PSI. The nose wheel tires are designed to operate with a rolling radius of 15.3 inches, which will require inflation pressures of 50 to 57 PSI.

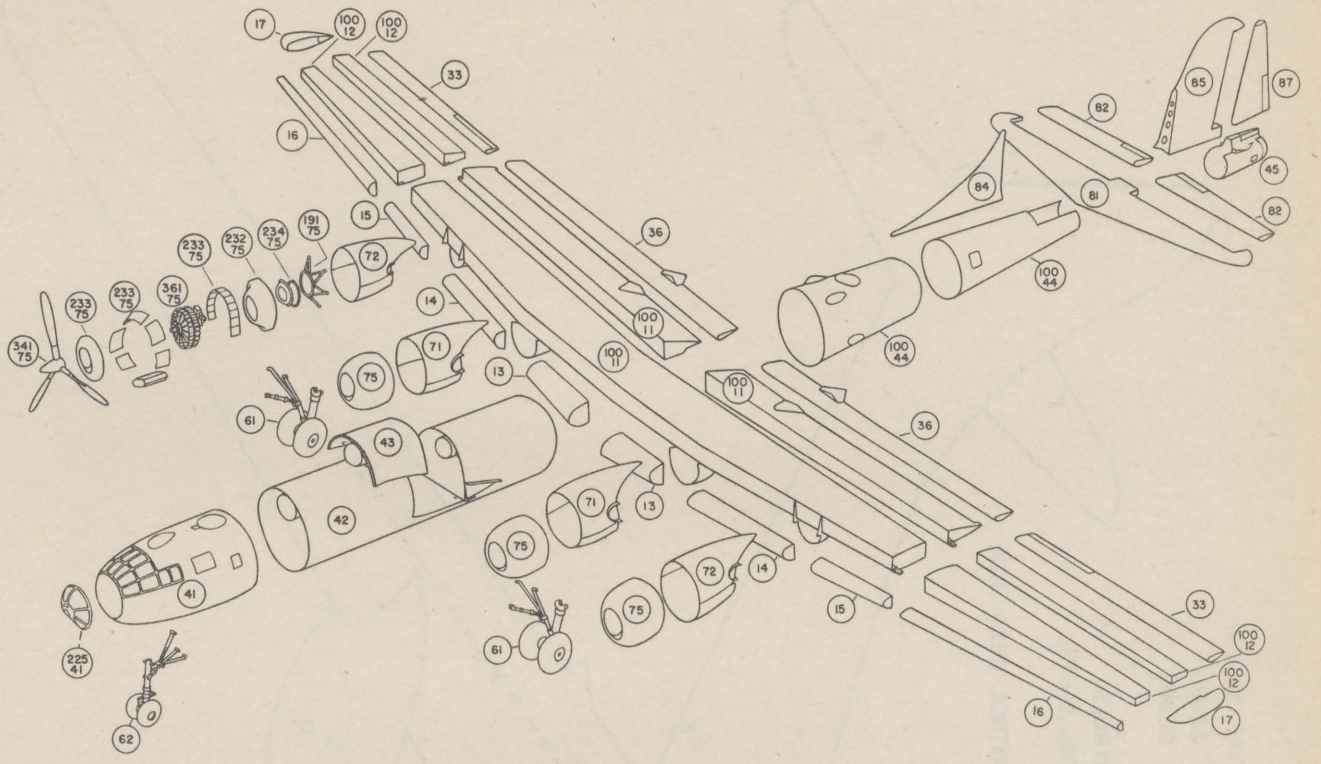


LEGEND

CODE	PART NAME	DWG. NO.
75	ENGINE INST. R. H. OUTBOARD	3-14374
75	ENGINE INST. L. H. OUTBOARD	3-14371
75	ENGINE INST. R.H. INBOARD	3-14373
75	ENGINE INST. L.H. INBOARD	3-14372
72	NACELLE INST. R.H. OUTBOARD	3-14344
72	NACELLE INST. L.H. OUTBOARD	3-14341
71	NACELLE INST. R.H. INBOARD	3-14343
71	NACELLE INST. L.H. INBOARD	3-14343
62	NOSE GEAR INST.	1-24050
61	LANDING GEAR INST. R.H.	1-23285
61	LANDING GEAR INST. L.H.	1-23285
41	BODY INST. (FWD. PRESSURIZED COMPT.)	3-14331
42	BODY INST. CENTER	3-14332
43	BODY INST. WING GAP	3-14333
44	BODY INST. (REAR PRESSURIZED COMPT.)	3-14334
45	BODY INST. TAIL	3-14335
16	WING LEADING EDGE INST. R.H. OUTBOARD	15-7249-3
16	WING LEADING EDGE INST. L.H. OUTBOARD	15-7249-2
15	WING LEADING EDGE INST. R.H. INBOARD	15-7246-3
15	WING LEADING EDGE INST. L.H. INBOARD	15-7246-2
14	WING LEADING EDGE INST. R.H. INBOARD	15-7247
14	WING LEADING EDGE INST. L.H. INBOARD	15-7247
13	WING LEADING EDGE INST. R.H. INBOARD	15-7246
13	WING LEADING EDGE INST. L.H. INBOARD	15-7246
12	WING INST. R.H. OUTBOARD	15-7147
12	WING INST. L.H. OUTBOARD	15-7148
11	WING INST. INBOARD	15-7150
33	AILERON INST. R.H.	15-7301-1
33	AILERON INST. L.H.	15-7301
36	FLAP INST. R.H.	15-8489-1
36	FLAP INST. L.H.	15-8489
17	WING TIP INST. R.H.	15-7304-3
17	WING TIP INST. L.H.	15-7304-2
81	STABILIZER INST. R.H.	15-7200
82	ELEVATOR INST. R.H.	15-7202-1
82	ELEVATOR INST. L.H.	15-7202
84	DORSAL FIN INST.	15-7205
85	FIN INST.	15-8032
87	RUDDER INST.	15-8030

NOTE:
CODE NUMBERS DO NOT INDICATE ORDER OF INST.

FIG. 71—MAJOR ASSEMBLY BREAKDOWN DIAGRAM



LEGEND

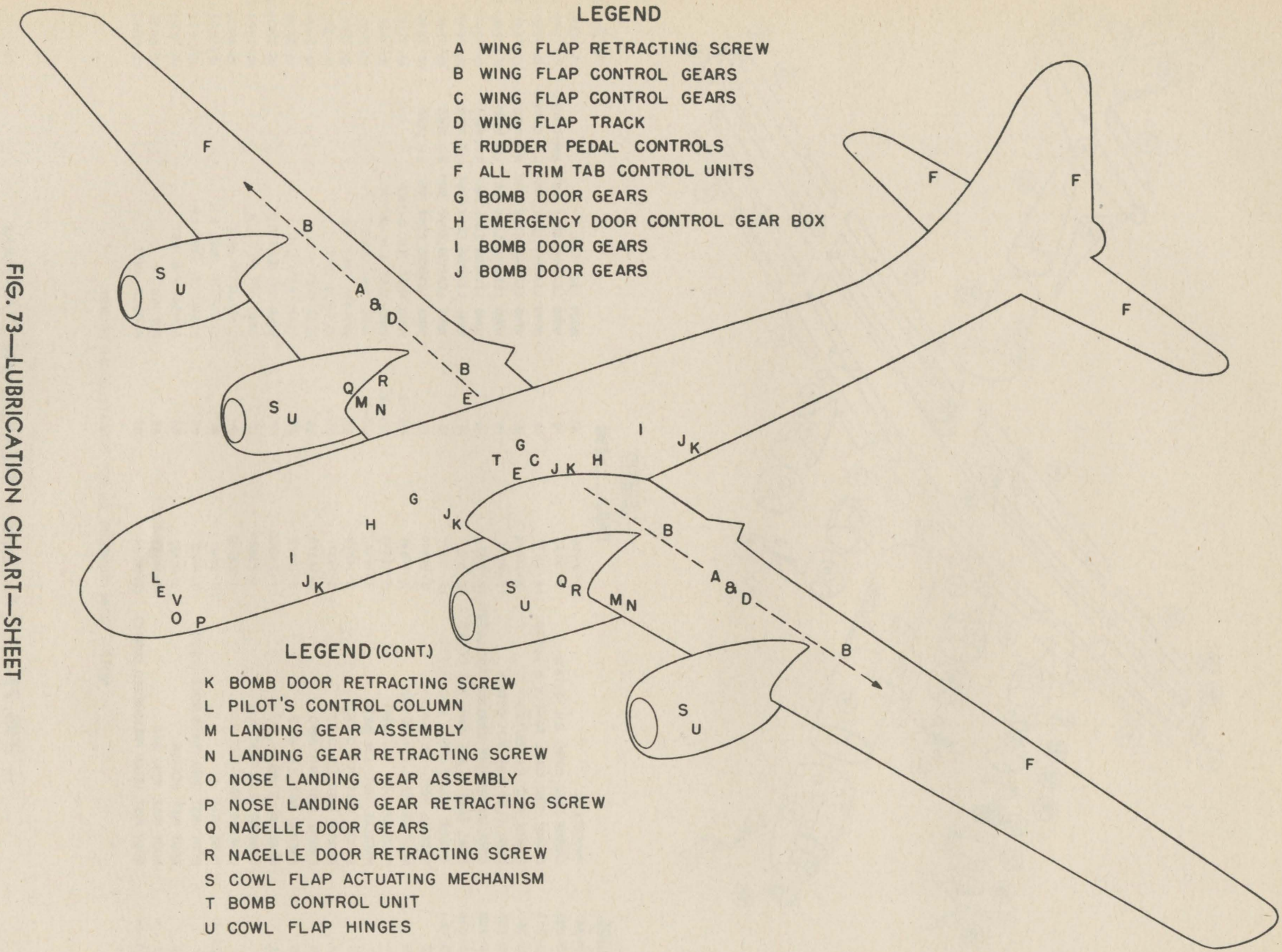
CODE		PART	NAME			DWG. NO.
75-341	PROPELLER	15-8474	45	BODY INST. TAIL		3-14335
75-233	ENGINE RING COWL R.H. OUTB'D	9-4243	16	WING LEADING EDGE INST. R.H. OUTB'D		15-7249-3
75-233	ENGINE RING COWL PANELS & DUCTS	14-2837	16	WING LEADING EDGE INST. L.H. OUTB'D		15-7249-2
75-361	ENGINE INST. R.H. OUTB'D	3-14374	15	WING LEADING EDGE INST. R.H. INB'D		15-7246-3
75-233	COWL FLAP INST. R.H. OUTB'D	15-8071	15	WING LEADING EDGE INST. L.H. INB'D		15-7246-2
75-232	COWL ACCESSORY COWLING R.H. OUTB'D	12-503	14	WING LEADING EDGE INST. R.H. INB D		15-7247
75-234	COWL SEAL PLATE INST. R.H. OUTB'D	12-512	14	WING LEADING EDGE INST. L.H. INB D		15-7247
75-191	ENGINE MOUNT ASSY. R.H. OUTB'D	15-7157	13	WING LEADING EDGE INST. R.H. INB'D		15-7246
72	NACELLE INST. R.H. OUTB'D	3-14344	13	WING LEADING EDGE INST. L.H. INB'D		15-7246
72	NACELLE INST. L.H. OUTB'D	3-14341	100-12	WING INST. R.H. OUTB'D		15-7147
71	NACELLE INST. R.H. INB'D	3-14343	100-12	WING INST. L.H. OUTB'D		15-7148
71	NACELLE INST. L.H. INB'D	3-14342	100-11	WING INST. INB'D		15-7150
75	ENGINE INST. R.H. OUTB'D	3-14374	33	AILERON INST. R.H.		15-7301-1
75	ENGINE INST. L.H. OUTB'D	3-14371	33	AILERON INST. L.H.		15-7301
75	ENGINE INST. R.H. INB'D	3-14373	36	FLAP INST. R.H.		15-8489-1
75	ENGINE INST. L.H. INB'D	3-14372	36	FLAP INST. L.H.		15-8489
62	NOSE GEAR INST.	1-24050	17	WING TIP INST. R.H.		15-7304-3
61	LANDING GEAR INST. R.H.	1-23285	17	WING TIP INST. L.H.		15-7304-2
61	LANDING GEAR INST. L.H.	1-23285	81	STABILIZER INST.		15-7200
225-41	NOSE INST.	15-8497	82	ELEVATOR INST. R.H.		15-7202-1
41	BODY INST. (FWD. PRESSURIZED COMPT.)	3-14331	82	ELEVATOR INST. L.H.		15-7202
42	BODY INST. CENTER	3-14332	84	DORSAL FIN INST.		15-7205
43	BODY INST. WING GAP	3-14333	85	FIN INST.		15-8032
100-44	BODY INST. (REAR PRESSURIZED COMPT.)	3-14334	87	RUDDER INST.		15-8030

NOTE:- CODE NUMBERS DO NOT INDICATE ORDER OF INST.

FIG. 72—SUB-ASSEMBLY BREAKDOWN DIAGRAM

LEGEND

A WING FLAP RETRACTING SCREW
B WING FLAP CONTROL GEARS
C WING FLAP CONTROL GEARS
D WING FLAP TRACK
E RUDDER PEDAL CONTROLS
F ALL TRIM TAB CONTROL UNITS
G BOMB DOOR GEARS
H EMERGENCY DOOR CONTROL GEAR BOX
I BOMB DOOR GEARS
J BOMB DOOR GEARS



LEGEND (CONT.)

K BOMB DOOR RETRACTING SCREW
L PILOT'S CONTROL COLUMN
M LANDING GEAR ASSEMBLY
N LANDING GEAR RETRACTING SCREW
O NOSE LANDING GEAR ASSEMBLY
P NOSE LANDING GEAR RETRACTING SCREW
Q NACELLE DOOR GEARS
R NACELLE DOOR RETRACTING SCREW
S COWL FLAP ACTUATING MECHANISM
T BOMB CONTROL UNIT
U COWL FLAP HINGES

FIG. 73—LUBRICATION CHART—SHEET

LUBRICATION PERIODS

25 HOURS

UNITS INDICATED ON CHART I		LUBRICATION INSTRUCTION
I	UNIT-A,N,P, RETRACTING SCREWS	3
II	UNIT-D,J,Q EXPOSED SURFACES	7
III	UNIT-A,D,E,M,N,O,P,U ZERK FITTINGS	2
OTHER ITEMS		
	DOOR HINGES & LOCKS	1
	EXPOSED UNIVERSAL JOINTS	1
	PILOT'S AND COPILOT'S WINDOWS	1
	ALL OTHER PINNED JOINTS	1
	LATCHES, SPLINES AND SLIDES	1
	RUDDER, ELEVATOR LOCK PINS	1
	WARNING—DO NOT LUBRICATE ENGAGING AREA OF PINS	

200 HOURS

IV	UNIT-K,R,S,	RETRACTING SCREWS	3
V	UNIT-Q	GEAR BOXES	4

500 HOURS

VI	UNIT-F	RETRACTING SCREWS	3
VII	UNIT-B,C,F,G,H,I,J,N,P,S,T,	GEAR BOXES ENCLOSED UNIVERSALS	4
VIII	UNIT-F,	ZERK FITTINGS	2
IX	UNIT-M,O	WHEEL BEARINGS	5
X	UNIT-S	FLEXIBLE SHAFTING	6
XI	UNIT-L	UNSHIELDED ANTI-FRICTION BEARINGS	5

LUBRICANT SYMBOLS

○ LOW TEMPERATURE GREASE - ARMY-NAVY SPEC. 3G (STANDARD OIL OF NEW JERSEY OR PENOLA INC. BEACON LUBRICANT M-285)

● HIGH MELTING POINT GREASE, MEDIUM - U.S. AIR CORPS SPEC. 3560E - (GENERAL PETROLEUM PD433-P - STANDARD OIL OF NEW JERSEY OR PENOLA INC. ANDOK LUBRICANT B.

□ AIRCRAFT INSTRUMENT AND MACHINE GUN OIL U.S. ARMY SPEC. 2-27E (STANDARD OIL OF CALIFORNIA AIRCRAFT INSTRUMENT OIL OR SHELL AIRCRAFT INSTRUMENT OIL)

LUBRICATION INSTRUCTIONS

GENERAL INSTRUCTIONS

ITEMS SUCH AS RETRACTING SCREW MECHANISMS, GEAR BOXES, ENCLOSED UNIVERSALS, FLEXIBLE SHAFTING AND UNSHIELDED ANTI-FRICTION BEARINGS SHOULD BE INSPECTED EACH LUBRICATION PERIOD FOR THE PRESENCE OF MOISTURE, LOSS, AND GENERAL DETERIORATION OF LUBRICANT. WHERE NECESSARY, CLEAN THOROUGHLY AND APPLY THE PROPER LUBRICANT AS SPECIFIED FOR THE PARTICULAR UNIT:

CAUTION AVOID INDISCRIMINATE GREASING. ZERKS ARE PROVIDED ONLY FOR CONVENIENCE WHEN SPECIFIED PROCEDURE INDICATES RELUBRICATION.

1 PINNED JOINTS, EXPOSED UNIVERSALS, DOOR HINGES AND LATCHES, SPLINES ETC. - LUBRICATE WITH □

2 ALL ZERK FITTINGS, LUBRICATE WITH ○

3 RETRACTING SCREWS, CLEAN THOROUGHLY AND APPLY A LIGHT COAT OF ○

4 GEAR BOXES AND ENCLOSED UNIVERSALS, WHERE NECESSARY, CLEAN THOROUGHLY AND RELUBRICATE TO 1/3 CAPACITY WITH ○

5 UNSHIELDED ANTI-FRICTION BEARINGS, CLEAN THOROUGHLY AND PACK TO 1/3 CAPACITY AS FOLLOWS, FOR WHEEL BEARINGS IN MAIN AND NOSE LANDING GEAR ASSEMBLIES USE ● LUBRICATE ALL OTHER BALL AND ROLLER BEARINGS WITH ○

6 FLEXIBLE SHAFTING, CLEAN THOROUGHLY AND APPLY A LIGHT COAT OF ○

7 CLEAN THOROUGHLY AND APPLY A LIGHT COAT OF ○

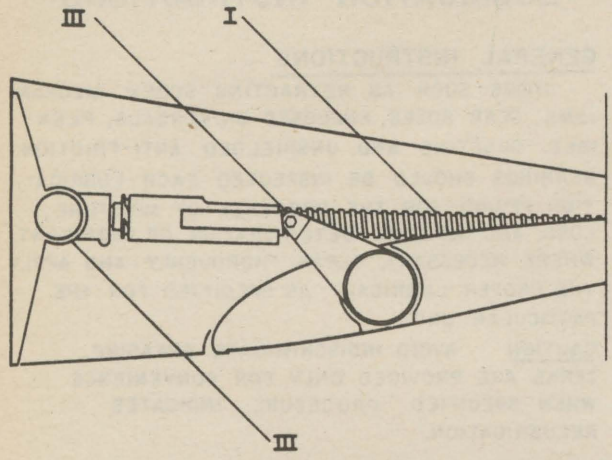
OTHER MANUFACTURERS' PARTS

REFER TO RESPECTIVE MANUFACTURERS' LUBRICATION INSTRUCTIONS:

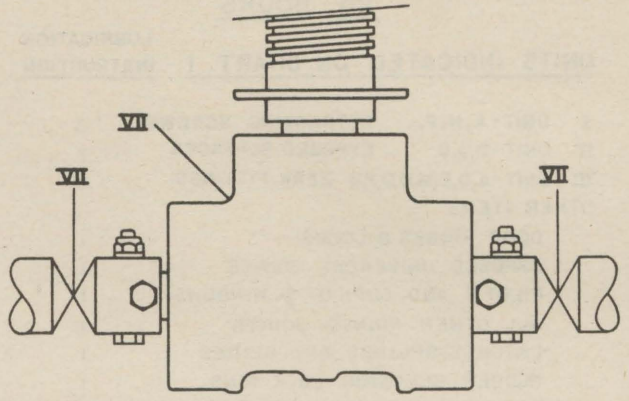
ENGINES	WRIGHT AERO. CORP.
PROPELLER AND HUB	HAMILTON STANDARD
PROP. DE-ICER MOTORS	ECLIPSE AVIATION
WING FLAP MOTORS	ECLIPSE AVIATION
BOMB DOOR MOTORS	ECLIPSE AVIATION
WHEEL DOOR MOTORS	ECLIPSE AVIATION
AUXILIARY POWER PLANT	RUCKSTELL BURKHARDT
COWL FLAP MOTORS	AIR ASSOCIATES
FUEL TRANSFER MOTORS	ROMEC PUMP CO.

FIG. 74—LUBRICATION CHART—SHEET 2

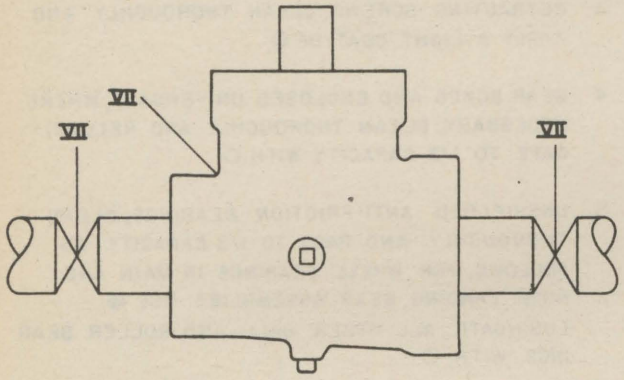
WING FLAP RETRACTING SCREW A



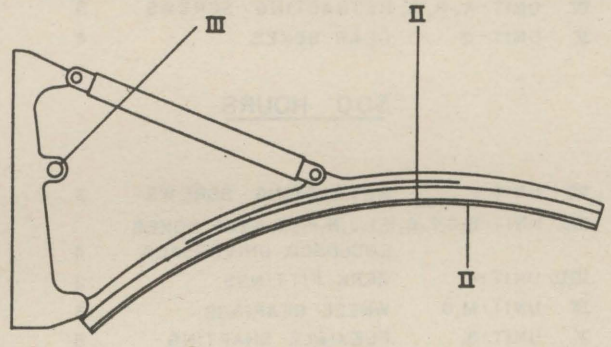
WING FLAP CONTROL GEARS B



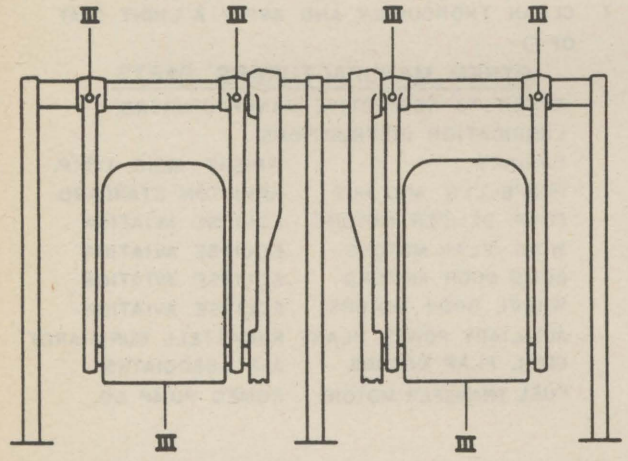
WING FLAP CONTROL GEARS C



WING FLAP TRACK D



RUDDER PEDAL CONTROLS E



ALL TRIM TAB CONTROL UNITS F

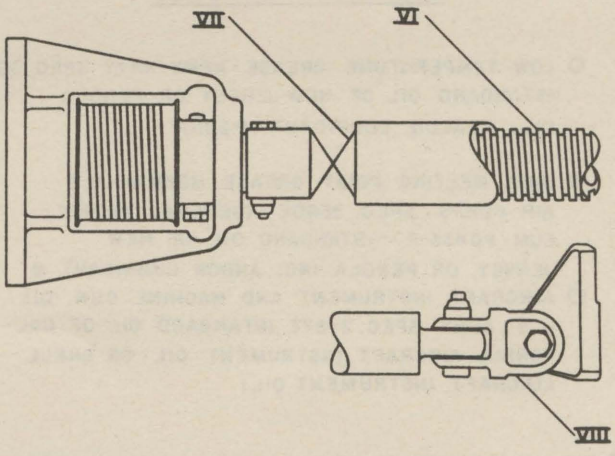
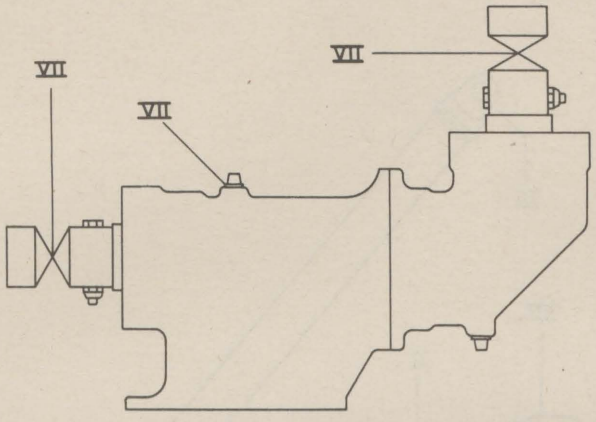
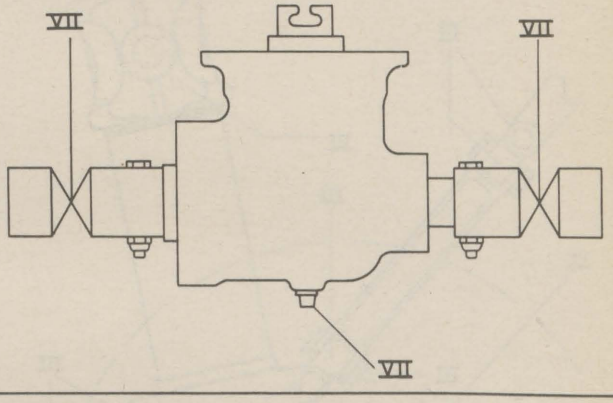


FIG. 75—LUBRICATION CHART—SHEET 3

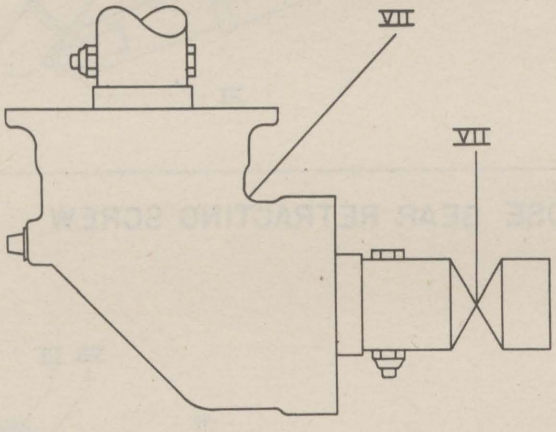
BOMB DOOR GEARS G



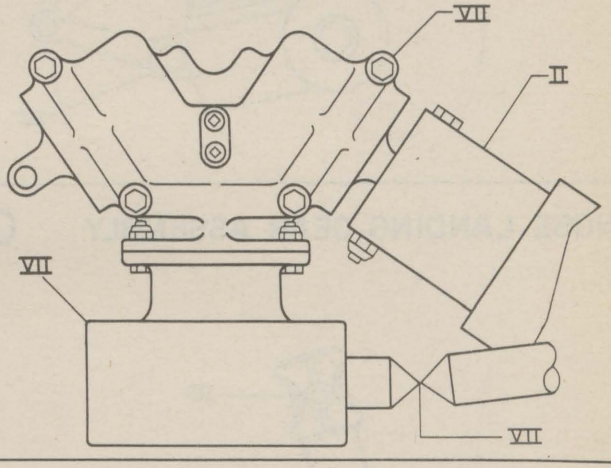
BOMB DOOR GEARS
EMERGENCY CONTROL H



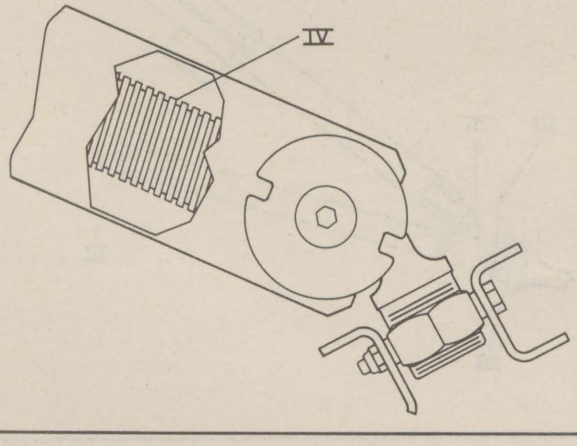
BOMB DOOR GEARS I



BOMB DOOR GEARS J



BOMB DOOR RETRACTING SCREW K



PILOT'S CONTROL COLUMN L

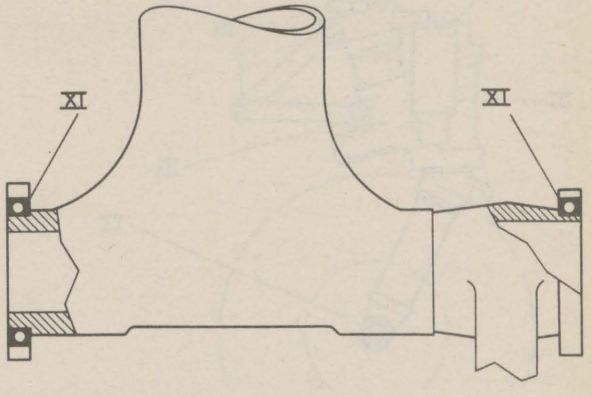
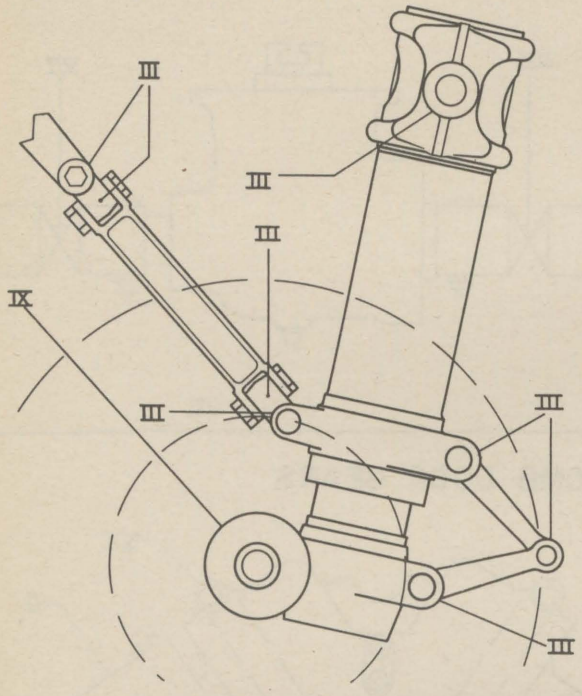
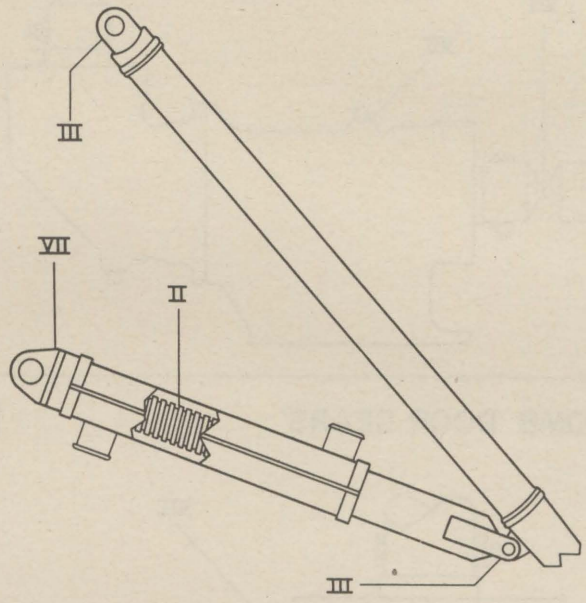


FIG. 76—LUBRICATION CHART—SHEET 4

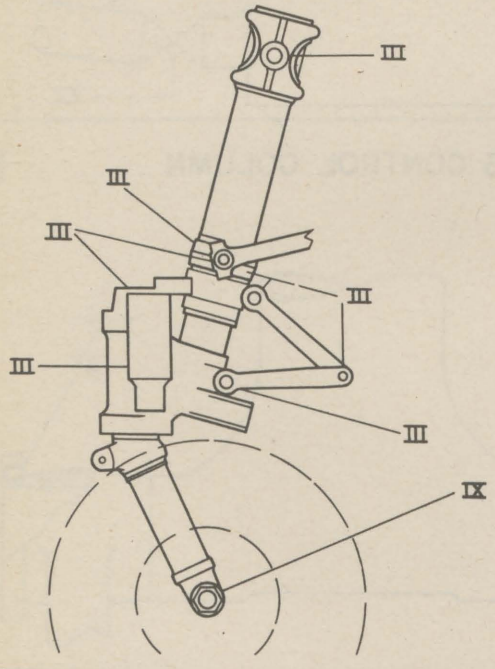
LANDING GEAR ASSEMBLY M



LANDING GEAR RETRACT. SCREW N



NOSE LANDING GEAR ASSEMBLY O



NOSE GEAR RETRACTING SCREW P

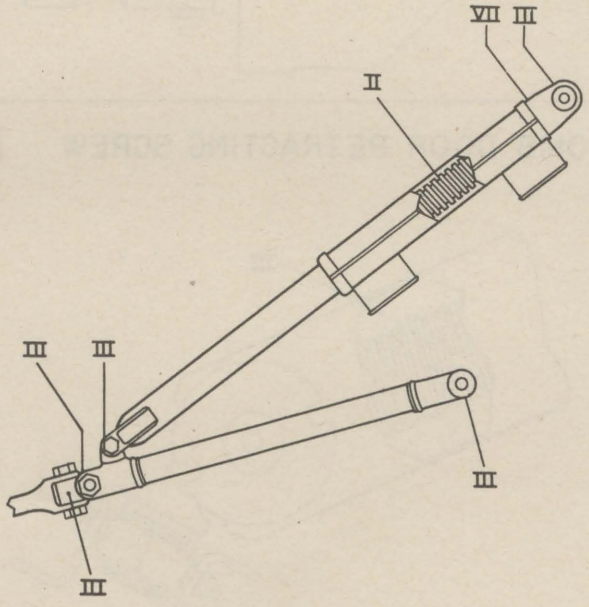
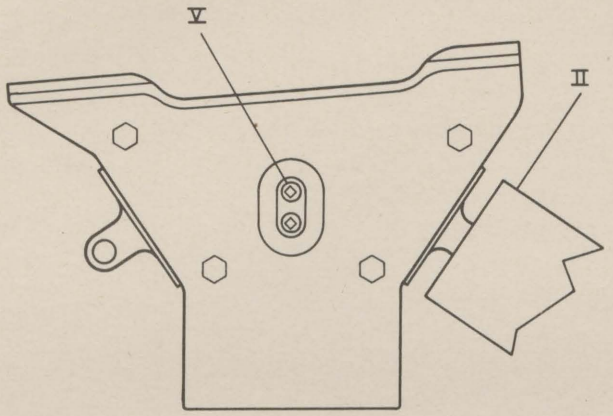
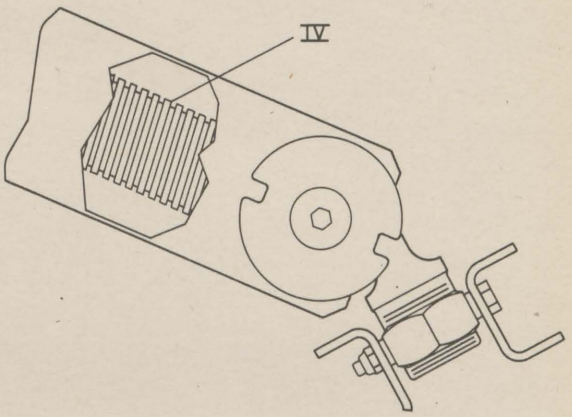


FIG. 77—LUBRICATION CHART—SHEET 5

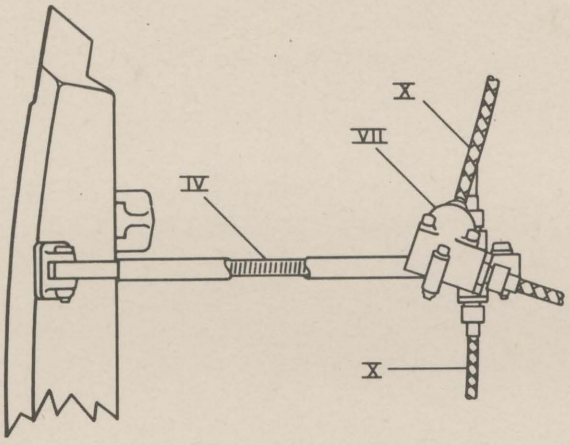
NACELLE DOOR GEARS Q



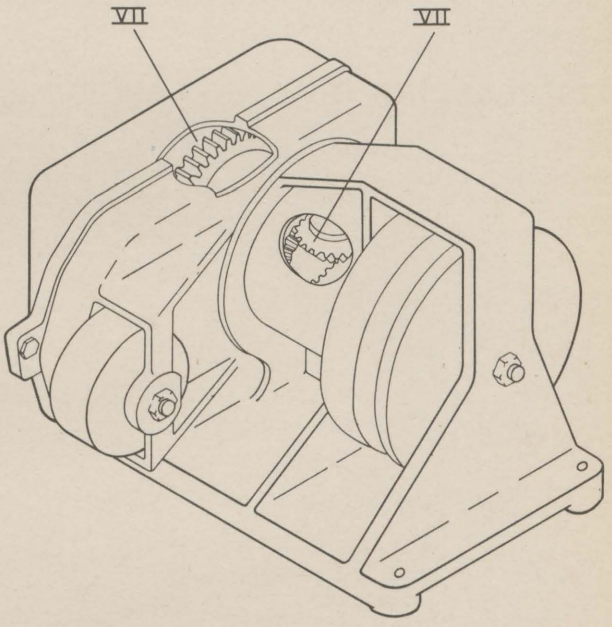
NACELLE DOOR RETRACT. SCREW R



COWL FLAP ACTUATING MECH. S



BOMB CONTROL UNIT T



CONTROL FLAP HINGES U

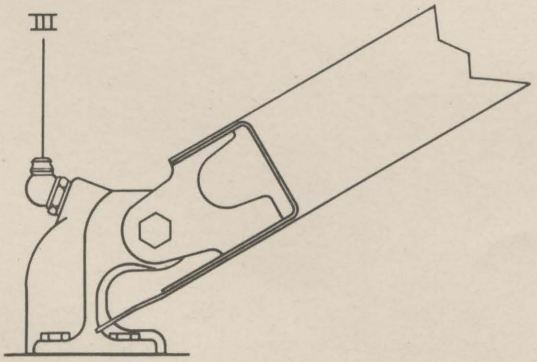
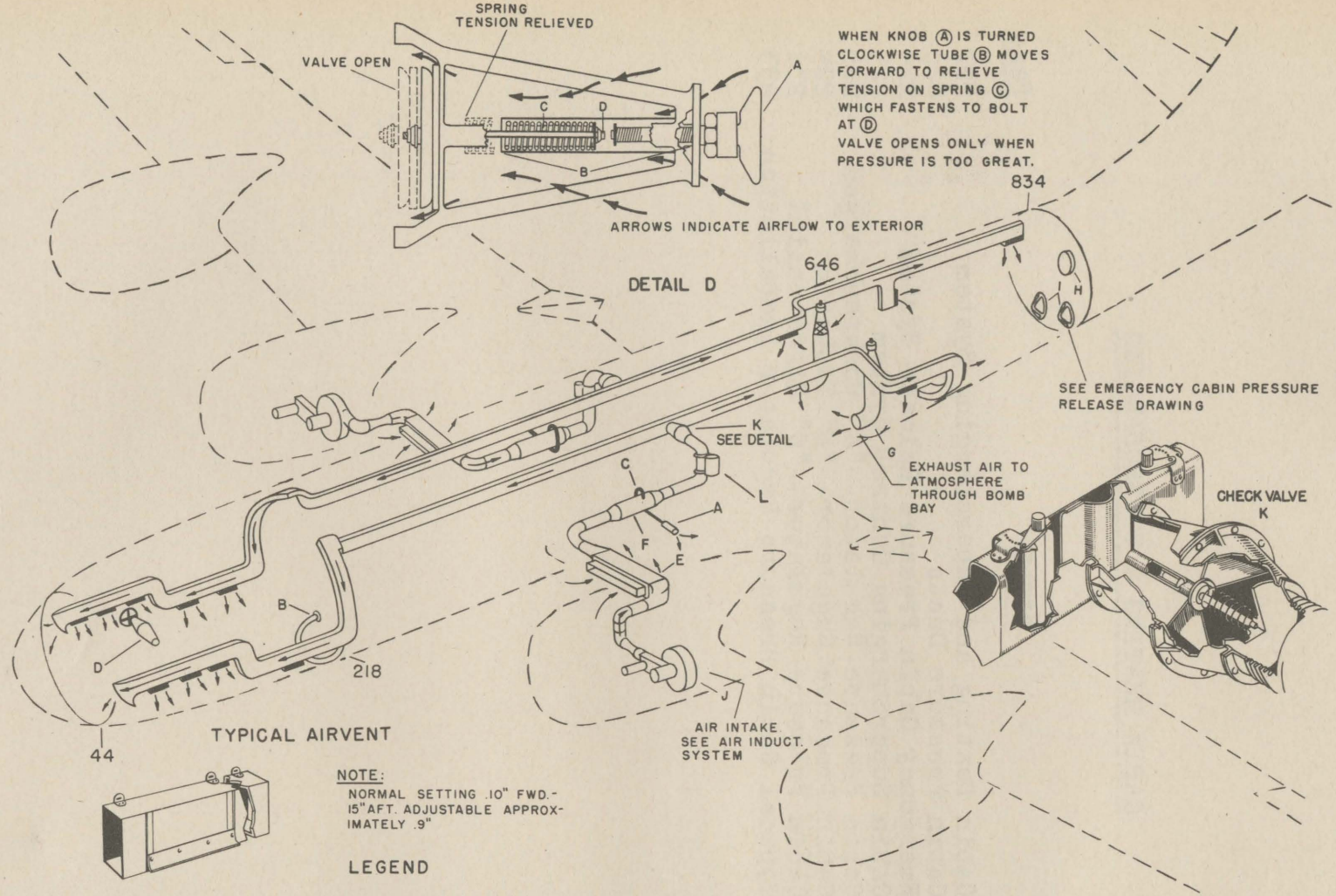


FIG. 78—LUBRICATION CHART—SHEET 6

CABIN HEATING & SUPERCHARGING

Figure No.	TITLE	Page
79	Cabin Heating and Supercharging System	222
80	Cabin Pressure Ducts	223
81	Emergency Cabin Pressure Release System	224
82	Cabin Supercharging Control System	225
83	Cabin Pressure Regulator--"A" Unsupercharged	226
84	Cabin Pressure Regulator--"B" Isobaric	229
85	Cabin Pressure Regulator--"C" Differential	231
86	Typical Cabin Pressure Regulator Installation	233

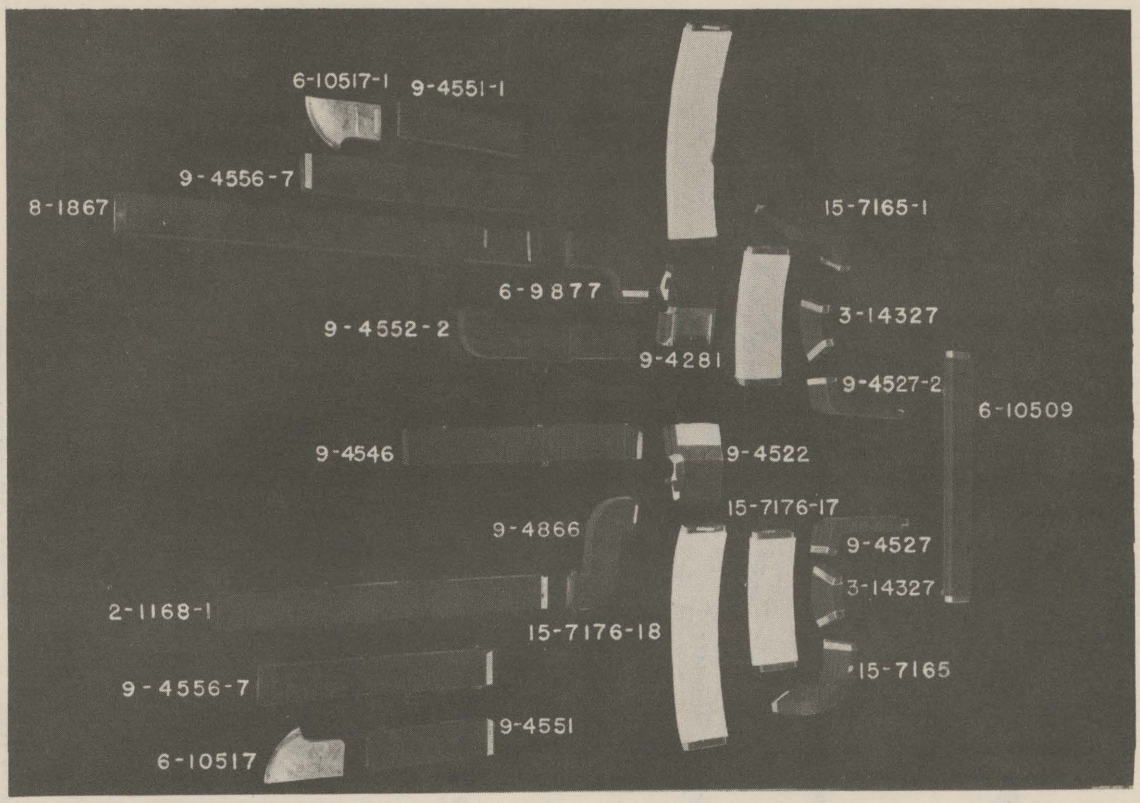


LEGEND

PART	MFGR.	MFGR'S NO.	BAC. INST. NO.
A. EXHAUST-CABIN HEATER OUTLET	BOEING	6-12191	6-12190
B. DUCT-HYDRAULIC PANEL COMP'T	BOEING	1-22035	8-2007
C. EXHAUST-CABIN HEATER	BOEING	3-17034	9-5165
D. VALVE-PRESSURE RELIEF	BOEING	14-2273	15-7184
E. AFTERCOOLER-CABIN SUPERCHARGER	BOEING	15-7182	15-7182 SH.2
F. HEATER	STEWART-WARNER	793 A	15-7171
G. REGULATOR-CABIN PRESSURE	AIRESEARCH MFG. CO.	IE 663	15-7142
H. VALVE-CABIN VAC. RELIEF	BOEING	14-2219	14-2219
I. VALVE-PRESSURE RELEASE	BOEING	14-2256	15-8040
J. SUPERCHARGER	PIONEER INST. CO.	898 X(III)	15-7174
K. CHECK VALVE	BOEING	8-2066	15-7185
L. DUCT PRESSURE CONTROL	STEWART-WARNER	471992	15-7185

AIRVENT OUTLET. DIRECTION OF AIRFLOW.

FIG. 79—CABIN HEATING AND SUPERCHARGING SYSTEM



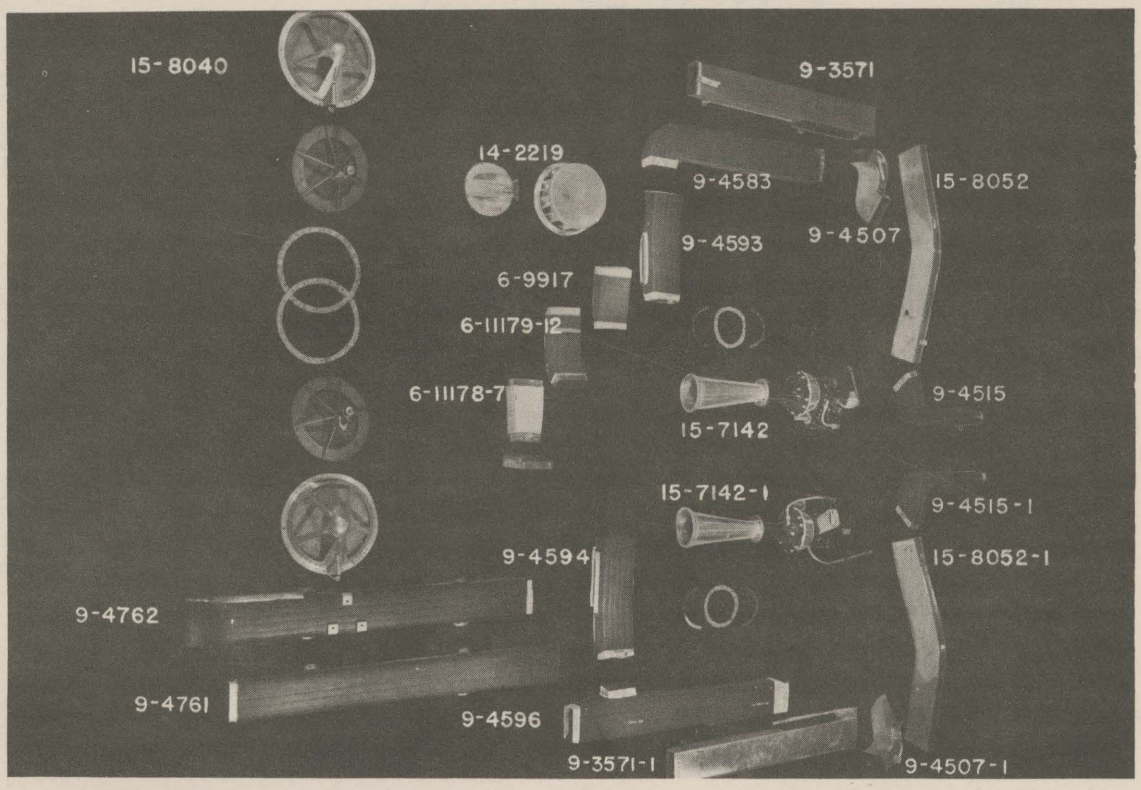


FIG. 80—CABIN PRESSURE DUCTS

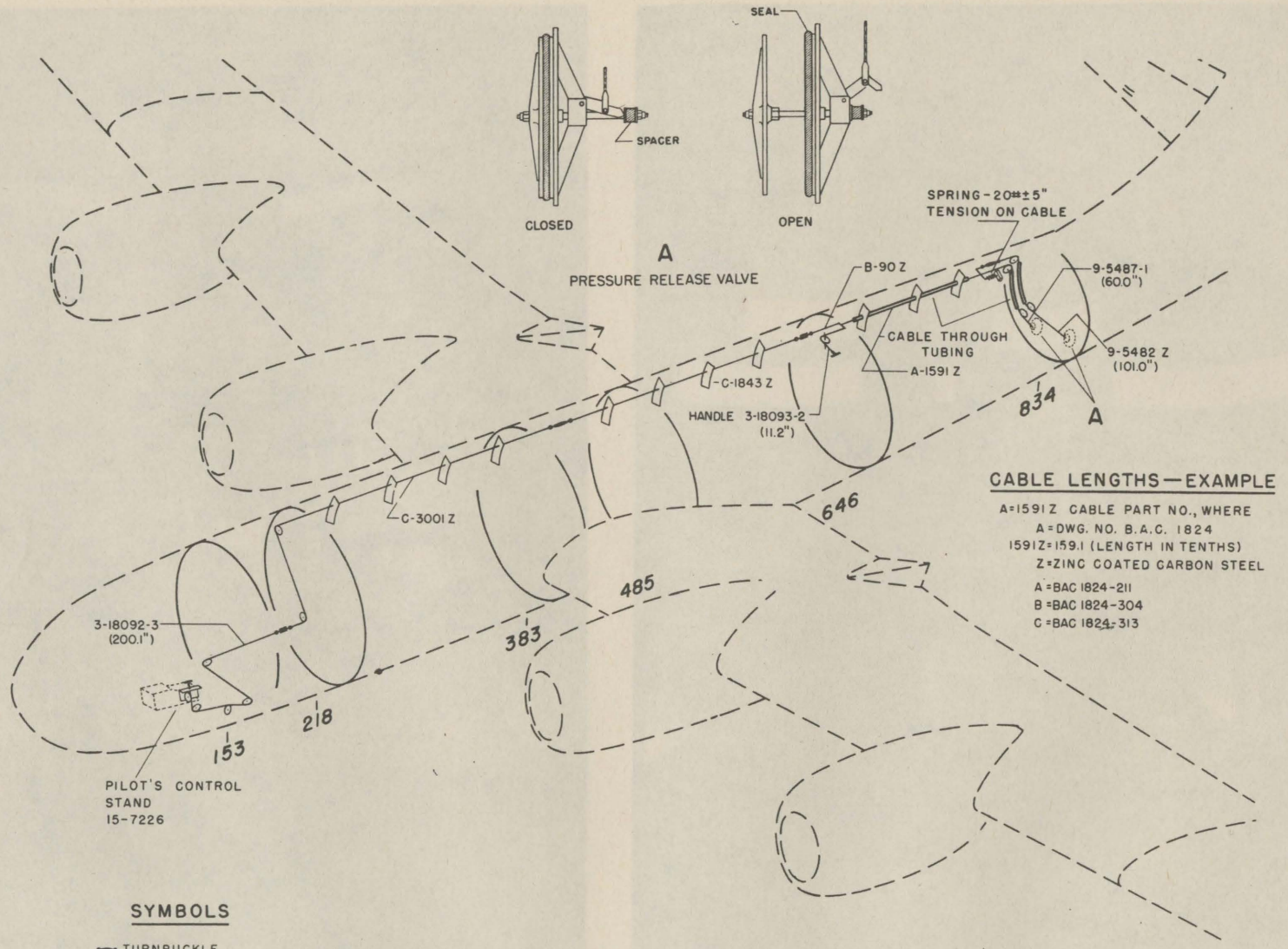
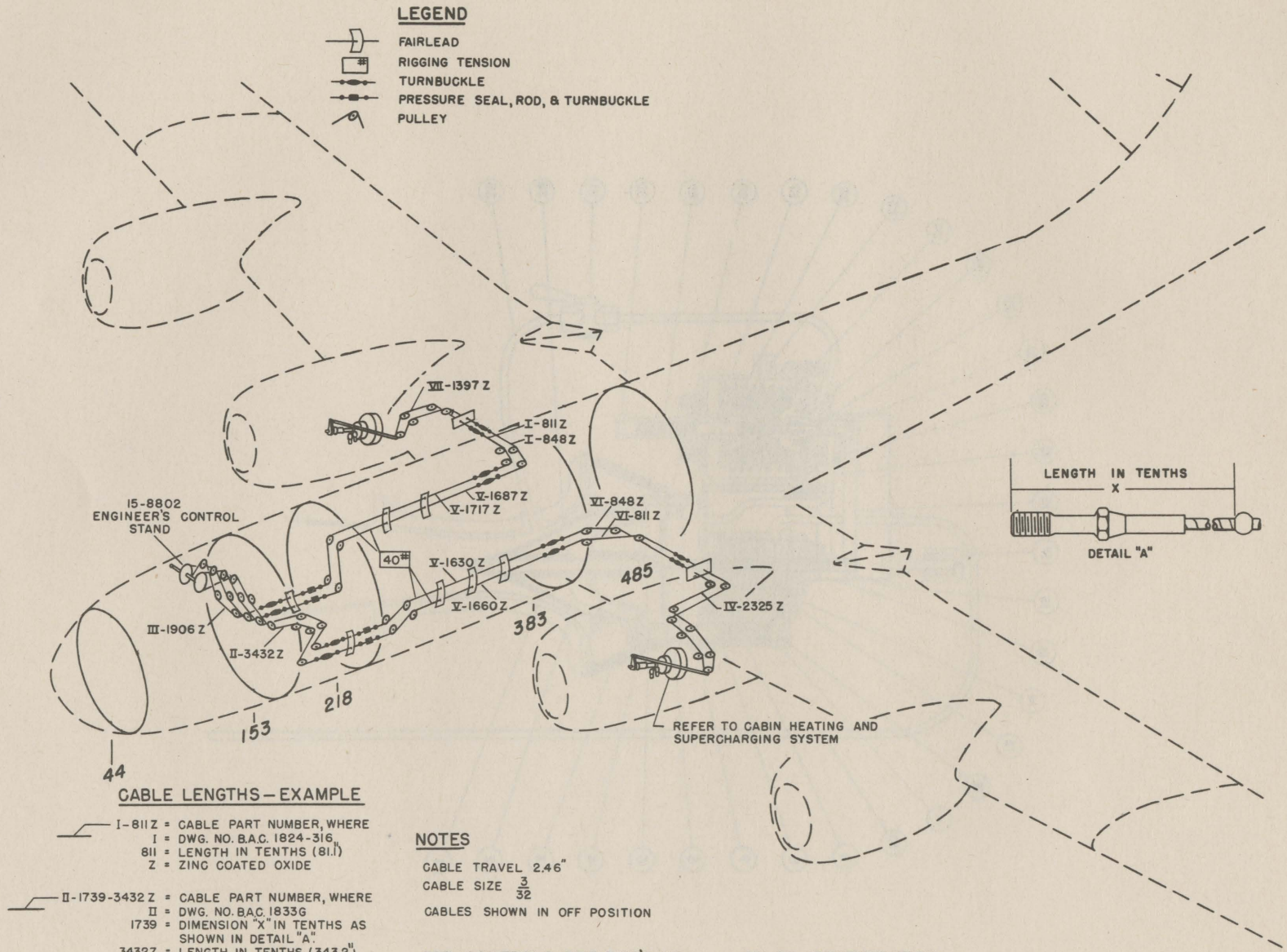


FIG. 81—EMERGENCY CABIN PRESSURE RELEASE SYSTEM



CABLE LENGTHS—EXAMPLE

I-811Z = CABLE PART NUMBER, WHERE
I = DWG. NO. B.A.C. 1824-316
811 = LENGTH IN TENTHS (81.1")
Z = ZINC COATED OXIDE

II-1739-3432Z = CABLE PART NUMBER, WHERE
II = DWG. NO. B.A.C. 1833G
1739 = DIMENSION "X" IN TENTHS AS SHOWN IN DETAIL "A".
3432Z = LENGTH IN TENTHS (343.2")

I = BAC 1824-316
II = BAC 1833G-1739
III = BAC 1833G-954
IV = BAC 1833H-1187
V = BAC 1824-315
VI = BAC 1824-323
VII = BAC 1833K-712

NOTES

CABLE TRAVEL 2.46"
CABLE SIZE $\frac{3}{32}$
CABLES SHOWN IN OFF POSITION

FOR CONTROLS SEE DWG'S NO.

15-8500-SEC. 41
15-8501-SEC. 42
15-8506-SEC. 71
15-8507-SEC. 71
15-8509-SEC 11

COLOR IDENTIFICATION

HIGH-LIGHT GREEN
LOW-BROWN

FIG. 82—CABIN SUPERCHARGING CONTROL SYSTEM

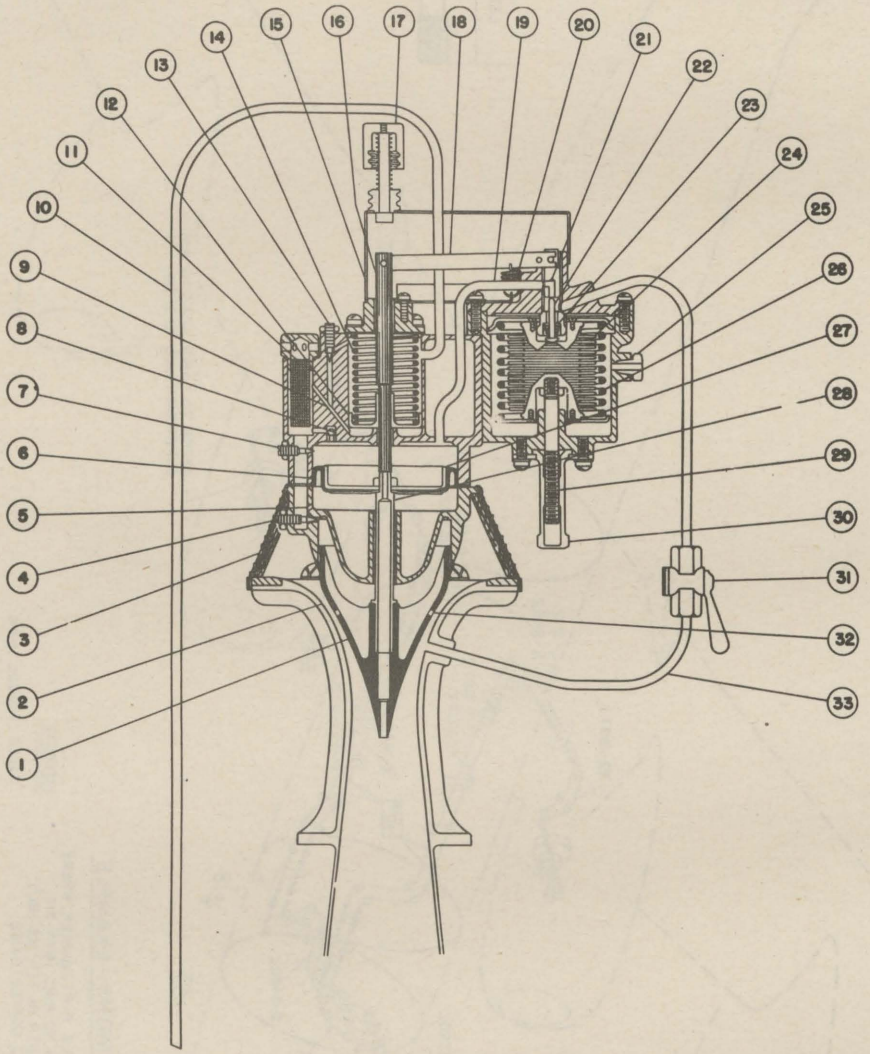


FIG. 83—CABIN PRESSURE REGULATOR—"A"

LEGEND

1. OUTLET VALVE
2. DIFFUSER - SEAT
3. OUTLET SCREEN
4. NEEDLE VALVE
5. VENT TO CABIN
6. DIAPHRAGM
7. NEEDLE VALVE
8. BALL CHECK
9. VENT TO CABIN
10. TUBE TO ATMOSPHERE
11. CABIN VENT FILLER SCREEN
12. DIFFERENTIAL PRESSURE CONTROL PISTON
13. NEEDLE VALVE
14. DIFFERENTIAL PRESSURE CONTROL SPRING
15. DUST SHIELD
16. OUTLET VALVE PLUNGER
17. LOCKING DEVICE
18. ROCKER ARM
19. TUBE
20. ROCKER ARM SPRING
21. RECIPROCATING ORIFICE
22. METERING PIN
23. METERING PIN REPELLING SPRING
24. EVACUATING BELLOWS
25. BELLOWS CHAMBER VENT TO CABIN
26. BELLOWS SPRINGS
27. DIAPHRAGM STIFFENER PLATE
28. VALVE STEM
29. ABSOLUTE PRESSURE ADJUSTING SCREW
30. ABSOLUTE PRESSURE ADJUSTMENT CAP
31. SHUTOFF VALVE
32. RELIEF VENT
33. TUBE

NOTES

CONDITION - A	0 TO 8000 FEET
CONDITION - B	8000 TO 30000 FEET
CONDITION - C	30000 AND ABOVE

Operation of Cabin Pressure Regulator (Refer to Diagrams)

a. Condition A - Unsupercharged Operation at Low Altitudes

This condition of operation is applicable to the low range of altitudes wherein cabin pressure in excess of atmospheric pressure is not required, although a small differential will usually exist because of the restricted escape of the normal quantity of ventilating air which enters the sealed cabin through the compressor.

Valve 1, which is mounted on a common shaft (28) with diaphragm (6) will tend to rest on diffuser seat (2) due to gravity. A supercharged condition in the cabin will cause air to attempt to escape through valve (1). This will cause a venturi action between valve (1) and diffuser seat (2) drawing air from the top of the diaphragm (6) by way of tube (19), orifice (21) and tube (33). Cabin pressure air entering through screen (11) to the bottom of diaphragm due to the decreased pressure on the top, causing diaphragm (6) to lift valve (1) and allow air to escape. Needle valve (7) should be adjusted to allow a slight amount of air to escape over the top of the diaphragm. It can thus be seen that under such circumstances the presence of a slight cabin differential pressure will cause the valve to open and thereby prevent any increase in cabin pressure.

b. Condition B - Isobaric Regulation

The termination of Condition A and the beginning of supercharged operation occurs around 8000 feet or 22.22" Hg. At this altitude the lowered cabin pressure allows the evacuated bellows (24) to expand upward and cause metering pin (22) to restrict the flow of air from the upper side of diaphragm (6) through orifice (21). This tends to equalize the pressure across the diaphragm, causing the valve to move toward its seat, as explained in Condition A. The increased cabin pressure due to the closing of the valve causes recompression of bellows (24) and reopening of orifice (21) to the passage of air from the upper side of diaphragm (6), which results in reopening of the valve and a consequent reduction of cabin pressure.

It is evident that the foregoing action would result in a cycle of instability wherein the valve would "hunt". This undesirable effect is overcome by the linkage of valve (1) to orifice (21) through plunger (16) and rocker arm (18). As the valve closes in response to expansion of the bellows, orifice (21) is withdrawn slightly from metering pin (22) and to check the downward travel of the valve. Conversely, as the valve opens to relieve superfluous air from the cabin, orifice (21) descends on metering pin (22) and thereby restricts the flow of air from the upper side of diaphragm (6) and checks the upward travel of the valve. It can be thus seen that as the valve begins to move in either direction in response to a change in cabin pressure, there is an immediate counter effect which opposes such motion and prevents over travel of the valve. The result is that the flow of air from the upper side of diaphragm (6)

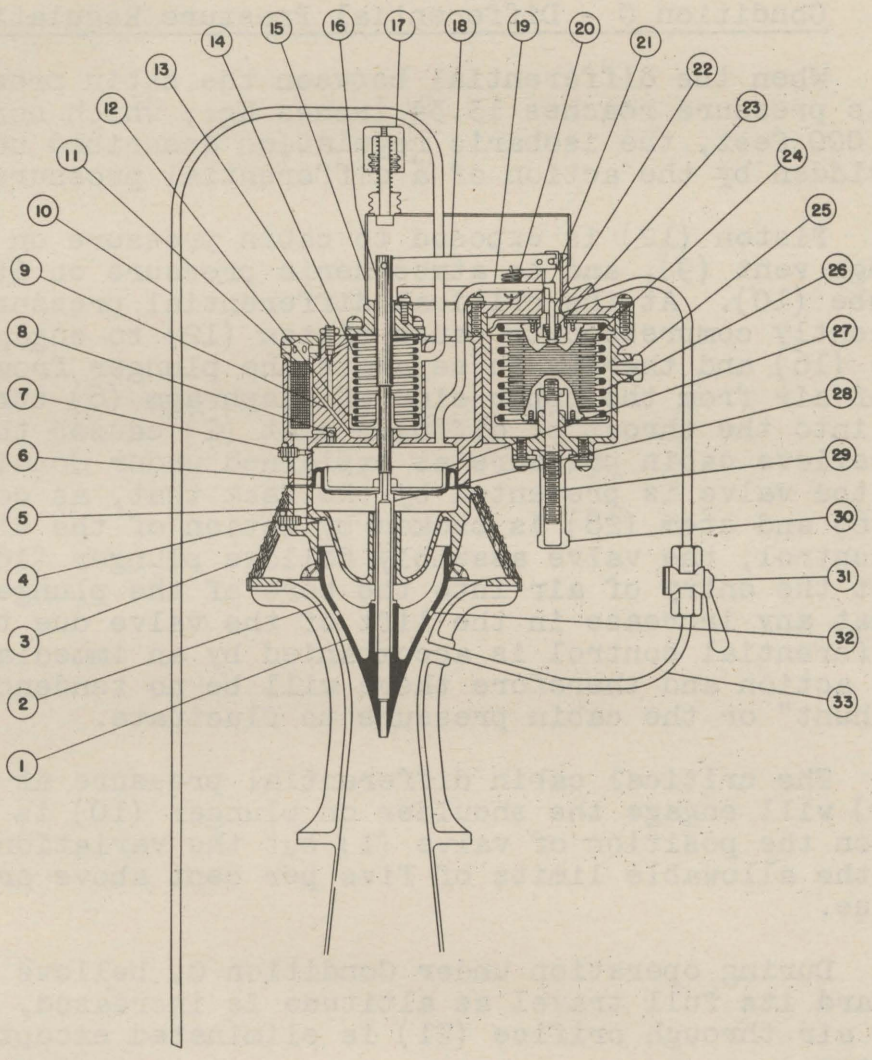


FIG. 84—CABIN PRESSURE REGULATOR—"B"

is metered and thereby causes valve (1) to seek a stable position. Since this stable position may tend to vary considerably with changes in ventilating rate, differential pressure or cabin leakage conditions, the linkage between valve (1) and orifice (21) is so arranged that the travel of the valve is approximately thirteen times that of the orifice. In this way the position of orifice (21) and the critical cabin pressure which the unit tends to maintain are not appreciably altered by any responsive movement of the valve.

c. Condition C - Differential Pressure Regulation

When the differential between the cabin pressure and the atmospheric pressure reaches 13.34 inches Hg., which normally occurs around 30,000 feet, the isobaric regulation described under Condition B is overridden by the action of a differential pressure control.

Piston (12) is exposed to cabin pressure on its lower side through vent (9), and to atmospheric pressure on its upper side through tube (10). At the critical differential pressure, spring (14) is sufficiently compressed to cause piston (12) to engage the shoulder on plunger (16) and thereby to separate the plunger from stem (28). The flow of air from the upper side of diaphragm (6) through valve stem (28) into the throat of diffuser seat (2) causes the valve to open and relieve cabin pressure as explained under Condition A. Over-travel of the valve is prevented by the fact that, as contact between plunger (16) and stem (28) is broken by action of the differential pressure control, the valve assembly follows plunger (16) and tends to restrict the entry of air into the bore of the plunger. It is thus evident that any increase in the lift of the valve due to response of the differential control is accompanied by an immediate resistance to further action and therefore there will be no tendency for the valve to "hunt" or the cabin pressure to fluctuate.

The critical cabin differential pressure at which piston (12) will engage the shoulder on plunger (10) is somewhat dependent on the position of valve (1) but the variation will not transcend the allowable limits of five per cent above or below the chosen value.

During operation under Condition C, bellows (24) will extend toward its full travel as altitude is increased, so that the passage of air through orifice (21) is eliminated except for negligible leakage.

d. Auxiliary Valves and Adjustments

(1) Shut-Off Valve

The function of shut-off valve (31) is to close the vent from the absolute pressure control to diffuser seat (2), thereby preventing unsupercharged cabin ventilation and isobaric

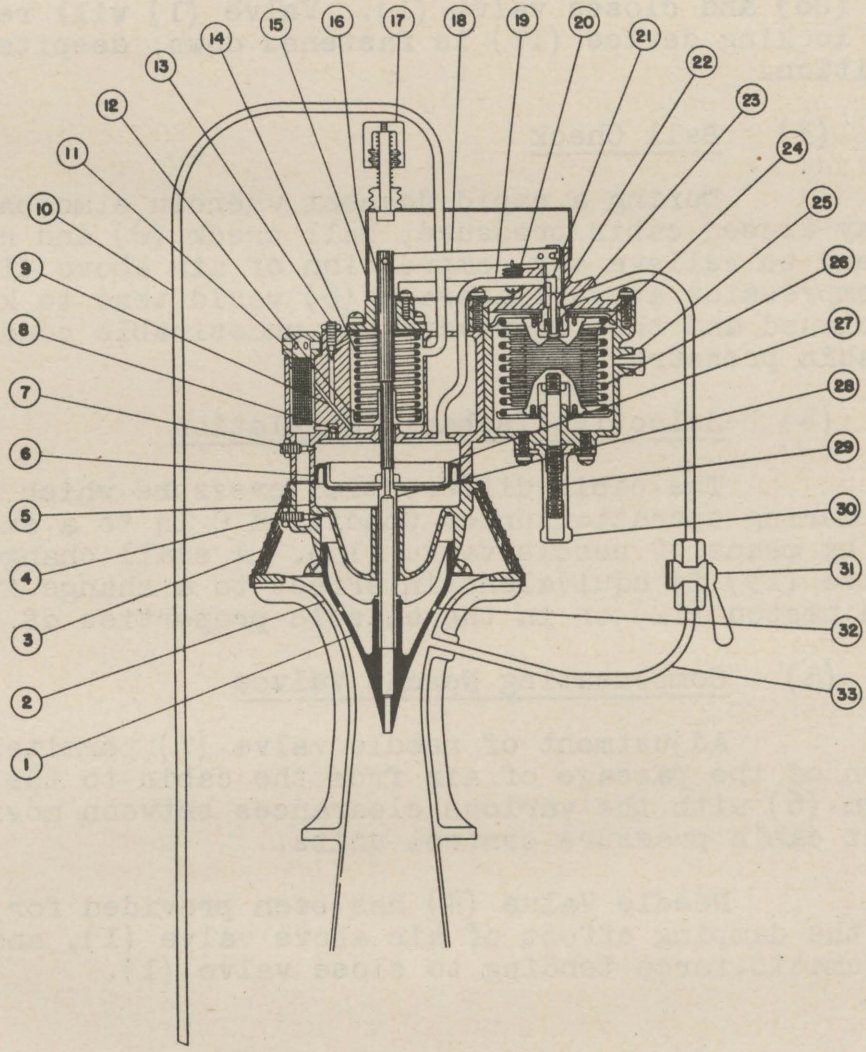


FIG. 84—CABIN PRESSURE REGULATOR—"C"

regulation as described in Condition B. Valve (1) will remain in the closed position until Condition C is reached if shut-off valve (31) is closed.

(2) Locking Device

The operation of the cabin pressure regulator is prevented by locking device (17), which, when screwed down in the closed position, forces outlet valve plunger (16) down against valve stem (28) and closes valve (1). Valve (1) will remain closed as long as locking device (17) is fastened down, despite any operating condition.

(3) Ball Check

During a rapid descent wherein atmospheric pressure may exceed cabin pressure, ball check (8) and needle valve (7) will tend to relieve any compression of air above diaphragm (6). Any such compression above diaphragm (6) would tend to keep the valve (1) closed and thus aggravate the undesirable condition of negative cabin pressure.

(4) Selective Isobaric Regulation

The cabin differential pressure which will be maintained during operation under Condition C is to a small extent adjustable by means of needle valve (13). A small change in leakage through valve (13) is equivalent in effect to a change in the clearance around piston (12) or in the elastic properties of spring (14).

(5) Compensating Needle Valves

Adjustment of needle valve (7) permits the proper coordination of the passage of air from the cabin to the upper side of diaphragm (6) with the various clearances between moving parts of different cabin pressure control units.

Needle Valve (4) has been provided for the purpose of varying the damping effect of air above valve (1), and for varying the pneumatic force tending to close valve (1).

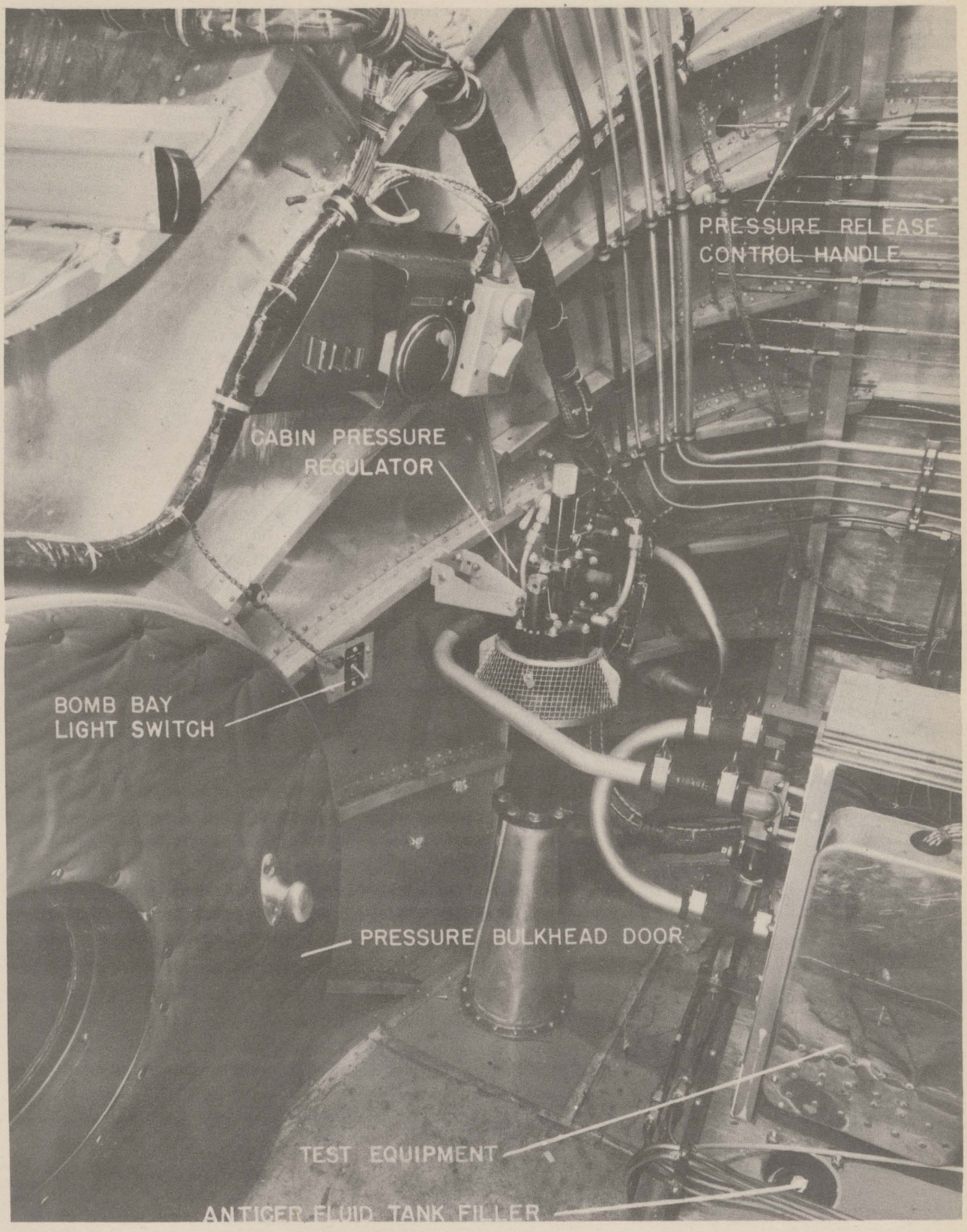


FIG. 86—TYPICAL CABIN PRESSURE REGULATOR INSTALLATION

ELECTRICAL SYSTEM

Figure No.	TITLE	Page
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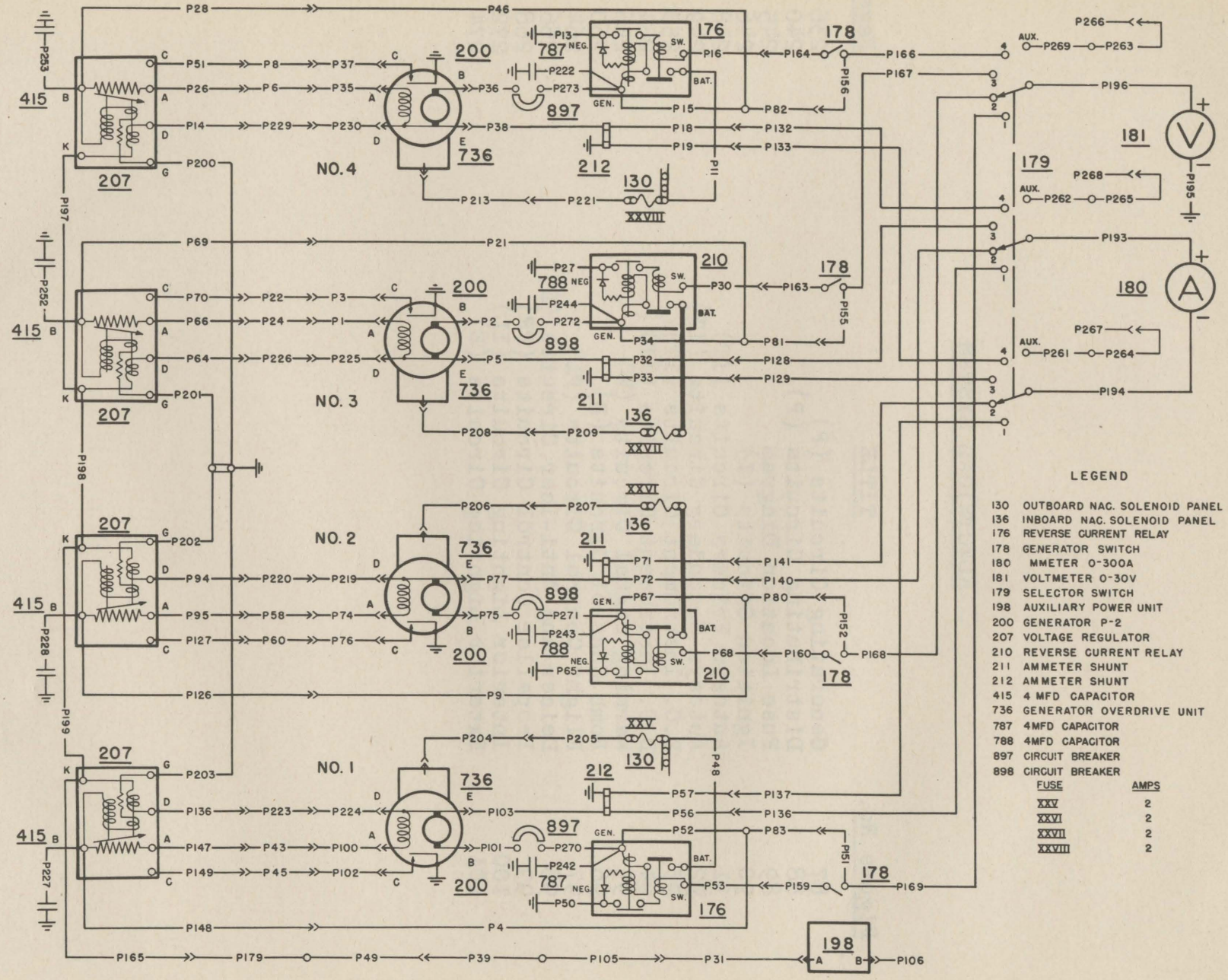


FIG. 87—GENERATING CIRCUITS (P)

Generator Circuits

a. Generators

The main power supply for this airplane consists of four Type P-2 generators driven from the generator accessory pads on each engine and air cooled by tubes connected to the inter-cooler inlet ducts. The generators are of the shunt field type and contain an overload (thermostat) contactor. The overload feature is not utilized in this installation.

An overdrive unit has been incorporated into the generator drive, permitting the generators to develop full voltage when the engines are operating at reduced RPM. Each overdrive receives power from the bus and through a two ampere fuse in the nacelle solenoid panel accessible through a hatch in the top of each nacelle.

b. Regulators

Four voltage regulators (Specification 32276) are installed in a ventilated shield mounted on the center wing section between the bomb bays. Ventilating air is obtained from the right-hand cabin supercharger aftercooler inlet.

The regulator consists essentially of a variable field resistance, the value of which is controlled by potential and equalizer coils. The potential coil is connected to the generator output, while the equalizer coil is connected to a common "equalizer lead" and to the generator negative lead. Resistances of the generator negative leads, including ammeter shunts, are identical for each installation. Since the voltage drop across each generator negative lead will be proportional to the generator load and since the equalizer lead will assume the average value of voltage drop, the equalizer coils, actuated by voltage differences due to unequal generator loading, will trend toward uniform load distribution.

c. Reverse Current Relays

The output of each generator is fed through a reverse current relay (Specification 94-32278) mounted in the nacelle solenoid panel. The reverse current relay consists primarily of two normally open relays, the main contactor relay and the pilot relay. The main contactor coil is energized from the generator output through the associated generator switch (engineer's switch panel) and pilot relay contacts. The pilot relay has two coils, one of many turns of fine wire (potential coil) and the other of a single turn of heavy wire (current coil).

Operating sequence of the relays is as follows: when the generator voltage has built up to approximately 26.5 volts,

the potential coil closes the pilot relay contacts energizing the main contactor coil, providing the generator switch is closed. The main contacts then close, coupling the load circuit to the generator through the current coil. A rectifier in the potential coil circuit prevents the pilot relay from closing in event the generator builds up with reverse polarity. If at any time the generator voltage drops below the line voltage, causing reverse current to flow, the current coil will then buck the potential coil, allowing the pilot relay to open, breaking the main contactor coil circuit and thereby opening the generator load circuit.

d. Voltmeter and Ammeter

A 0-30 volt voltmeter and 0-300 ampere external shunt ammeter, together with a three pole, five position selector switch, are installed in the engineer's instrument panel. The selector switch may be set to connect the output and shunt of any of the four generators or the auxiliary power unit to the voltmeter and ammeter respectively.

Distributing Circuits

a. Fuse Panels

Power from the generator reverse current relays is distributed among the various circuits through seventeen fuse panels located in the airplane as shown in Figure 89. Of these panels: the nacelle solenoid panels (4) are inaccessible in flight; the nose gear solenoid shield, inverter relay shield, forward bomb bay door solenoid shield, aft bomb bay door solenoid shield and battery solenoid shield are accessible in unsupercharged flight only; and since all other fuse panels are located in the pressurized cabins they are readily accessible during flight.

Spare fuses for each fuse position are carried in the shield covers of the respective panels. (Spare fuses for the nacelle solenoid panels are mounted on the panels themselves.)

The disposition of the various panels is as follows:

(1) Bombardier's Fuse Panel

The bombardier's fuse panel is mounted on top of the bombardier's instrument board.

(2) Aisle Stand Fuse Panel

The aisle stand fuse panel is located in the right-hand side of the aisle stand.

(3) Nose Gear Solenoid Shield

The nose gear solenoid shield is located on the right-hand wall of the nose gear wheel well.

(4) Engineer's Forward Fuse Panel

The engineer's forward fuse panel is located in the inboard side of his control stand.

(5) Engineer's Fuse Panel

The engineer's fuse panel is located in the rear of his control stand.

(6) Radio Compass Relay Shield

The radio compass relay shield is mounted below the liaison radio transmitter.

(7) Forward Fire Control Junction Shield

The forward fire control junction shield is

(To be furnished when available)

FIG. 88—DISTRIBUTING CIRCUITS (P)

LEGEND

11	RADIO COMPASS RELAY SHIELD
93	BOMBER'S CONTROL PANEL
96	PILOT'S AISLE CONTROL STAND
119	PILOT'S EMERG. IGNITION SWITCH
120	IGNITION SWITCH
130	OUTBD NACELLE SOLENOID PANEL
136	INBOARD NACELLE SOLENOID PANEL
154	INVERTER RELAY SWITCH
156	BATTERY RELAY SWITCH
170	NOSE WHEEL MOTOR SOLENOID
176	REVERSE CURRENT RELAY
182	BOMB HOIST RECEPTACLE
183	FWD BOMB DOOR MOTOR SOLENOID SHIELD
184	INVERTER
188	AFT BOMB DOOR MOTOR SOLENOID SHIELD
189	FLAP MOTOR SOLENOID SHIELD
195	BATTERY SOLENOID SHIELD
196	BATTERY SOLENOID
197	BATTERY
198	AUXILIARY POWER PLANT
201	TURRET JUNCTION SHIELD
208	STARTER PLUG SHIELD
210	REVERSE CURRENT RELAY
213	INVERTER RELAY
220	WING FLAP EMERG. MOTOR RECEPTACLE
240	ENGINEER'S FUSE PANEL
307	EMERG. LANDING GEAR SOLENOID
314	POWER TRANSFER SOLENOID
317	POWER CONTRACTOR RELAYS
347	STARTER PLUG
363	AFT BOMB DOOR EMERG. MOTOR RECEPTACLE
364	FORWARD BOMB DOOR EMERG. MOTOR RECEPTACLE
380	EXTERNAL POWER RECEPTACLE
387	SIGNAL LIGHT RECEPTACLE
393	EXTERNAL POWER SOLENOID
399	EMGERGENCY CIRCUIT SWITCH
522	ENGINEER'S FWD. FUSE PANEL
586	FORWARD FIRE CONTROL JUNCTION SHIELD
587	AFT FIRE CONTROL JUNCTION SHIELD
748	EMERG. LANDING GEAR SWITCH
756	EMERG. NOSE WHEEL MOTOR SOLENOID
782	CAPACITOR - 4 MFD
783	CAPACITOR - 4 MFD
784	CAPACITOR - 4 MFD
817	BOMB DOOR MOTOR SOLENOID
818	BOMB DOOR MOTOR SOLENOID
821	HYD. PUMP MOTOR SOLENOID

FUSE	AMPS	FUSE	AMPS	FUSE	AMPS	FUSE	AMPS	FUSE	AMPS
I	3	XXVII	2	XLIX	15	LXVII	150	XCI	15
II	5	XXVIII	2	L	15	LXIX	15	XCII	2
III	15	XXIX	2	LI	50	LXX	15	XCIII	5
VI	5	XXX	2	LII	30	LXXI	100	XCIV	10
VII	2	XXXI	2	LIII	20	LXXII	50	XCV	15
X	15	XXXII	2	LIV	20	LXXIV	30	CV	150
XI	2	XXXIII	5	LV	20	LXXV	50	CVI	10
XII	15	XXXIV	10	LVI	20	LXXVI	15	CVII	15
XIII	50	XXXV	2	LVII	2	LXXVII	100	CVIII	10
XIV	5	XXXVIII	100	LVIII	10	LXXIX	50	CIX	10
XV	2	XXXIX	5	LIX	10	LXXXI	30	CX	15
XVI	2	XL	2	LX	3	LXXXII	50	CXI	10
XIX	10	XLI	5	LXI	10	LXXXIII	15	CXXVII	150
XX	10	XLII	5	LXII	2	LXXXIV	15	CXXVIII	1
XXI	5	XLIII	2	LXIII	2	LXXXV	5	CXXIX	2
XXII	20	XLIV	15	LXIV	35	LXXXVII	150	CXXX	30
XXIV	5	XLV	15	LXV	3	LXXXVIII	10	CXXXI	15
XXV	2	XLVI	15	LXVI	150	LXXXIX	5		
XXVI	2	XLVII	15	LXVII	150	LC	15		

mounted on the forward cabin floor at the forward gunner's station.

(8) Inverter Relay Shield

The inverter relay shield is located between the bomb bays on the right-hand side of the communication tunnel.

(9) Forward Bomb Bay Door Motor Solenoid Shield

The forward bomb bay door motor solenoid shield is mounted on the fuselage below the front spar of the center wing section.

(10) Aft Bomb Bay Door Motor Solenoid Shield

The aft bomb bay door motor solenoid shield is located on the fuselage right-hand sidewall near the rear spar of the center wing section.

(11) Nacelle Solenoid Panels

The nacelle solenoid panels are mounted in the upper rear portion of the nacelles and are accessible through hatches in nacelle top fairings.

(12) Aft Fire Control Junction Shield

The aft fire control junction shield is mounted in fuselage centerline aft of the rear gunner's stations.

(13) Turret Junction Shield

The turret junction shield is mounted on the rear pressurized cabin left sidewall near the cabin aft bulkhead.

(14) Battery Solenoid Shield

The battery solenoid shield is located aft of the pressure bulkhead on the fuselage tail section left sidewall.

b. Inverters

Either of two 1 k.v.a. inverters may be employed to furnish 400 cycle, alternating current. These inverters supply both 26 volt single phase, and 115 volt three phase current; however, of the 115 volt output, only one phase is utilized. The inverters, together with the inverter relay, are mounted on the tunnel right sidewall between the bomb bays.

The three pole, three position inverter relay, Square D Company Type 975, connects an inverter in circuit when either of its coils is energized. Also, by means of normally closed auxiliary contacts the switching operation introduces a resistor into the coil circuit, thereby reducing the coil current to a (holding)

minimum. Either relay coil may be energized by means of a Type B-9A switch installed in the engineer's switch panel. Power is supplied this circuit through a two ampere fuse in the engineer's forward fuse panel.

The inverters are supplied current from the forward bomb bay door motor solenoid shield power bus through their respective 50 ampere fuses in the inverter relay shield.

c. Battery

A Type G1, 34 ampere hour, 24 volt battery is installed on the fuselage tail section left sidewall aft of the pressure bulkhead. The battery is vented by air led from the horizontal stabilizer leading edge to the battery and thence to the atmosphere through the vent jar, installed below the battery.

The battery solenoid switch, when open, isolates the battery and is controlled by a Type B-5A switch in the engineer's switch panel. Wired in series with the switch in the coil circuit are both the pilot's and engineer's emergency ignition switches. All three of these switches must be "on" before the battery solenoid switch will close. Current is supplied the coil circuit from the battery through a two ampere fuse located in the battery solenoid shield.

d. Auxiliary Power Unit

A 200 ampere, gasoline engine-driven auxiliary power unit (Specification 32165A) is mounted aft of the battery installation. This unit is ordinarily used to supply power during starting, takeoff and landing.

The engine must be warmed up before connecting the generator to the load and for this purpose a switch is provided on the unit allowing choice of START, WARM-UP, or ON operation.

e. Emergency Circuit

A separate power bus system is provided for emergency operation of the landing gear and (by means of a portable motor) the wing flaps and bomb doors.

To energize this circuit the battery and auxiliary power unit may be isolated and transferred to this circuit by means of the emergency circuit switch installed in the forward face of the battery solenoid shield. Or the pilot, at his option, may operate the power transfer switch in his control stand (see Retracting Motor Circuits) to energize the emergency circuit from the regular power system by means of the power transfer solenoid switch installed in the aft bomb bay door motor solenoid shield.

Power receptacles for emergency operation of the wing flaps, forward bomb bay doors, and aft bomb bay doors are located, respectively, on the top of the wing center section near the fuselage centerline, and near the right-hand bomb bay catwalks near Stations 337 and 544.

f. External Power Receptacle

The external power receptacle is located in the left-hand nacelle wheel well and is connected to the nacelle solenoid panel power bus through a solenoid switch. The receptacle comprises three connectors of which one, shorter than the other (power) connectors, is connected to the solenoid coil circuit. On plugging in the power source, the first action engages the main contactors. Subsequent action engages the short connector, energizing the solenoid to close the circuit, thereby preventing destructive arcing at the power receptacle on breaking and making the power connection.

g. Starter Receptacles

Starter receptacles, similar to the external power receptacle but employing only the two large connectors, are located in the rear wall of both nacelle wheel wells. Power is supplied them from their respective nacelle solenoid panels.

h. Bomb Hoist Receptacles

The power receptacles for operation of the bomb hoist motors are installed under the aft bomb bay door motor solenoid shield.

i. Signal Lamp Receptacle

A power receptacle for the Type C-3A signal lamp is installed in the rear of the aisle stand.

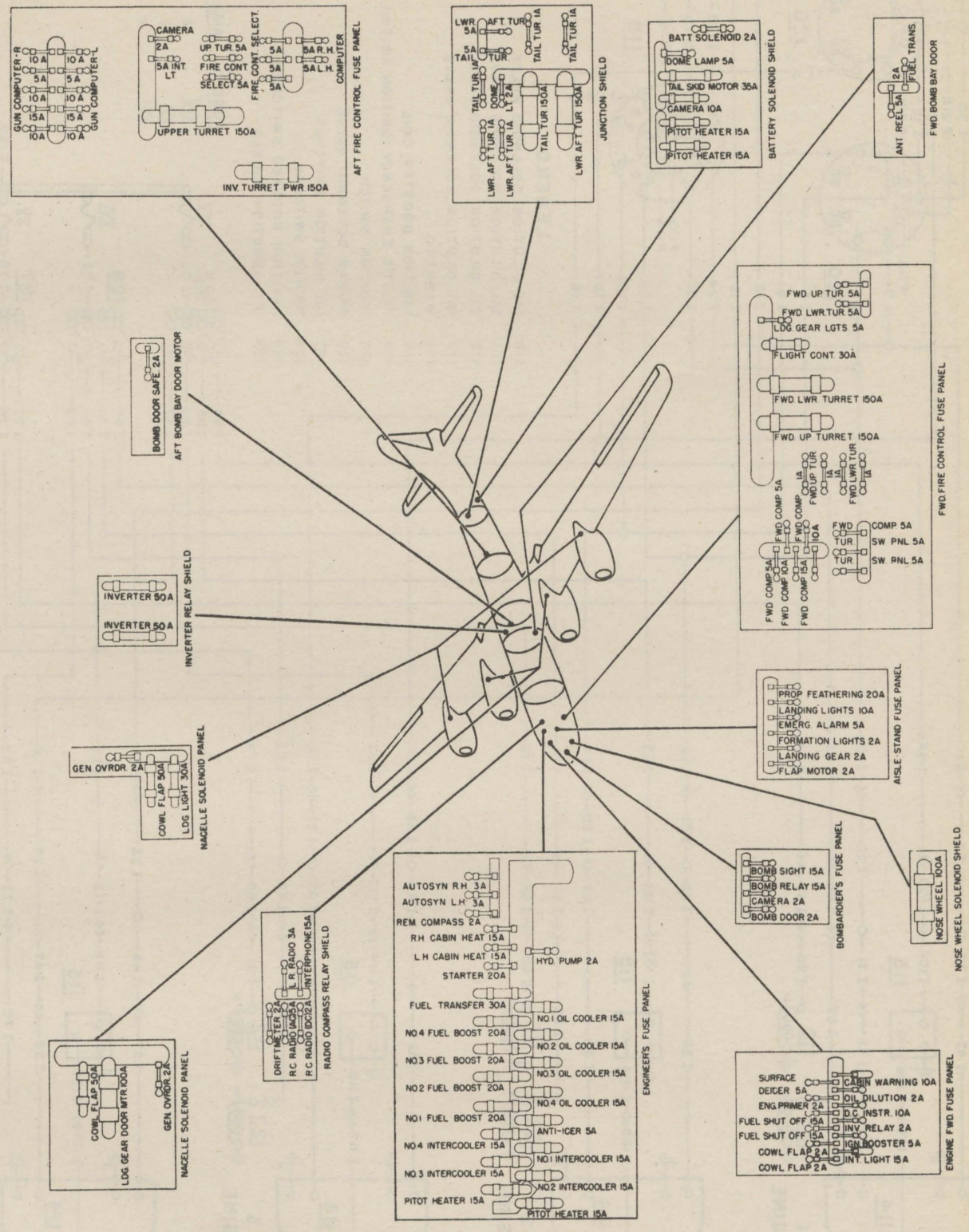


FIG. 89—FUSE LOCATION DIAGRAM

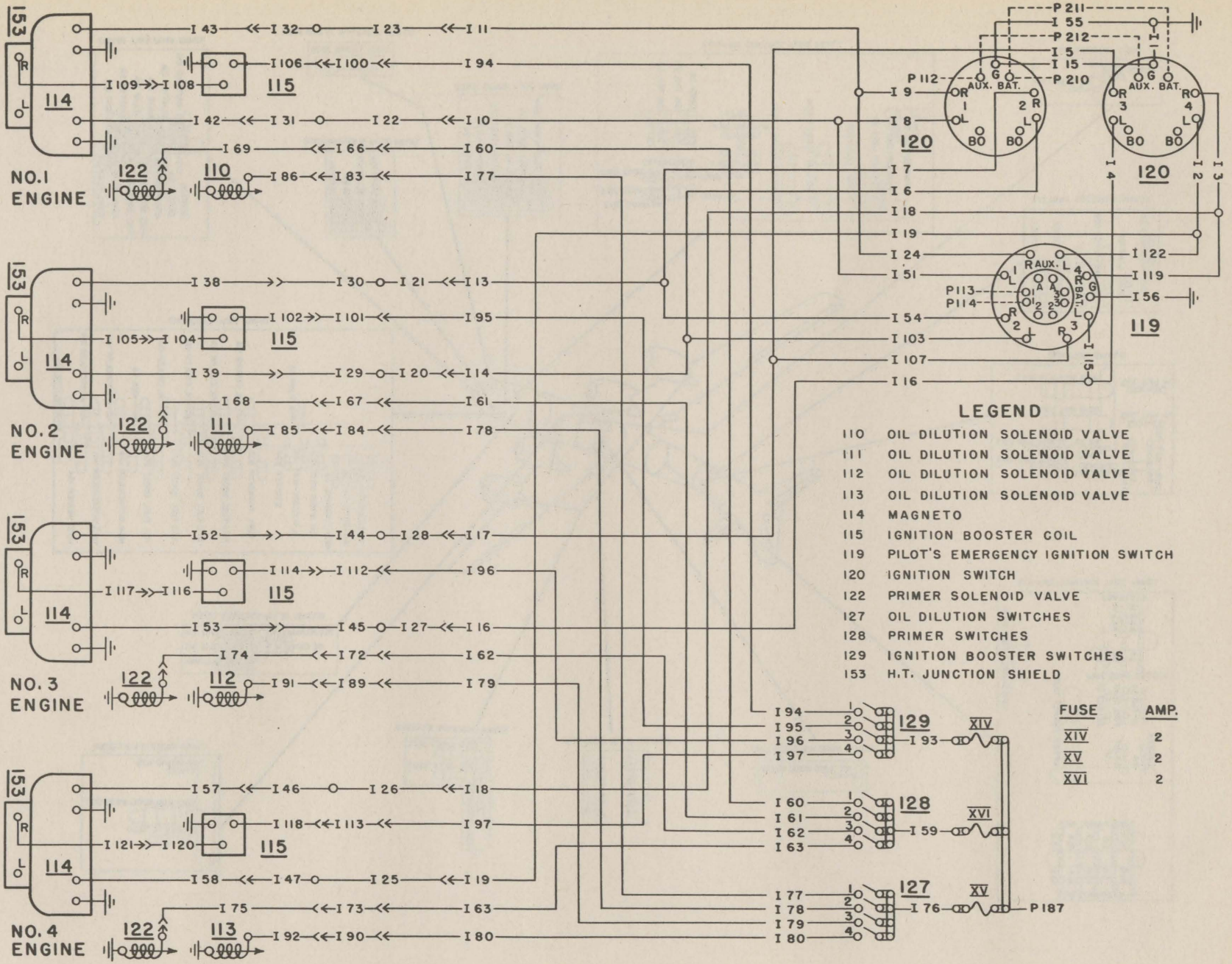


FIG. 90—IGNITION CIRCUITS (1)

LEGEND

110	OIL DILUTION SOLENOID VALVE
111	OIL DILUTION SOLENOID VALVE
112	OIL DILUTION SOLENOID VALVE
113	OIL DILUTION SOLENOID VALVE
114	MAGNETO
115	IGNITION BOOSTER COIL
119	PILOT'S EMERGENCY IGNITION SWITCH
120	IGNITION SWITCH
122	PRIMER SOLENOID VALVE
127	OIL DILUTION SWITCHES
128	PRIMER SWITCHES
129	IGNITION BOOSTER SWITCHES
153	H.T. JUNCTION SHIELD

FUSE	AMP.
XIV	2
XV	2
XVI	2

Ignition Circuits

a. Magnetos

Four air-cooled Scintilla DF-18LN-1 dual magnetos are employed in the ignition system. Magneto cooling air is obtained through a tube connected to the intercooler inlet. The magneto primary grounding leads are connected to the ignition switches and are fed through the nacelle sidewall by a plug and receptacle. Magnetos are controlled normally by two Type B-5 ignition switches mounted on the engineer's instrument panel. Emergency control is provided by means of the toggles on the engineer's switches and a Type C-7 ignition switch mounted in the pilot's auxiliary control panel.

WARNING: Removal of the above-mentioned connector plug from its receptacle isolates the magneto in an operable condition independent of control by the ignition switches.

b. Ignition Booster Coils

Type C-1 booster coils are employed to augment the engine's regular ignition system during the starting operation. The coils are mounted in a shield on the nacelle right-hand sidewalls. The coil primary leads are connected to switches in the engineer's switch panel and are supplied current from the power bus and through a two ampere fuse in the engineer's forward fuse panel. The coil high tension leads are connected to the "R" terminal of the high tension junction shield, mounted on the engine.

c. Primer Valves

The priming valves, integral with the carburetor and supplying fuel directly to the engine blower case, are designed for electrical operation. This is attained by means of solenoids energized by switches located in the engineer's switch panel. Operating current for the solenoid is fed from the power bus and through a two ampere fuse in the engineer's forward fuse panel.

d. Oil Dilution Valves

Solenoid-operated oil dilution valves allow fuel to flow into the crank case, diluting the oil to permit easier starting. The valves are located on the nacelle left-hand sidewalls at Station 15, and are controlled by switches mounted in the engineer's switch panel. Current is supplied these circuits from the power bus and through a two ampere fuse in the engineer's forward fuse panel.

WARNING: Do not dilute the oil for more than four minutes.

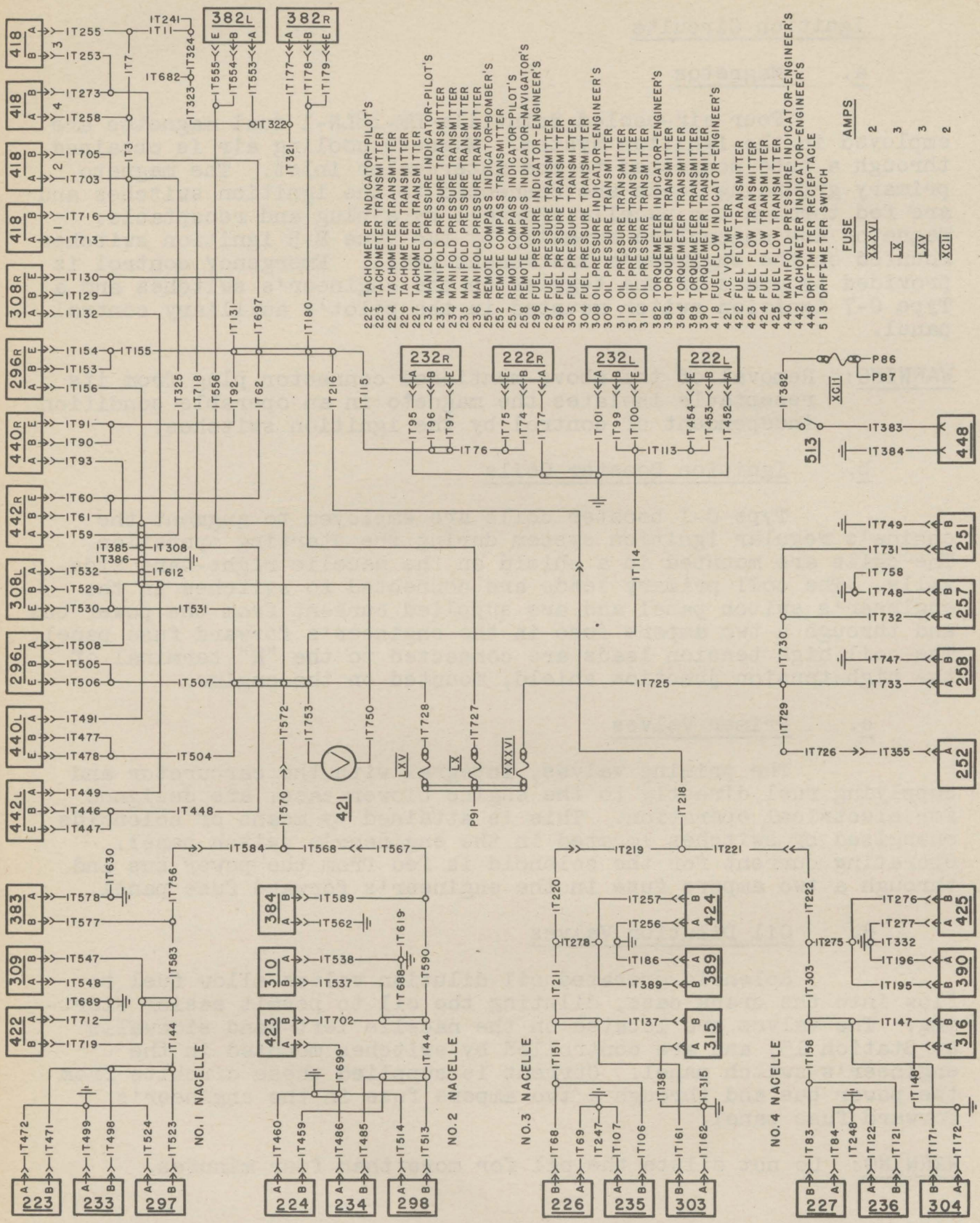


FIG. 91—AUTOSYN PRIMARY CIRCUITS (IT)

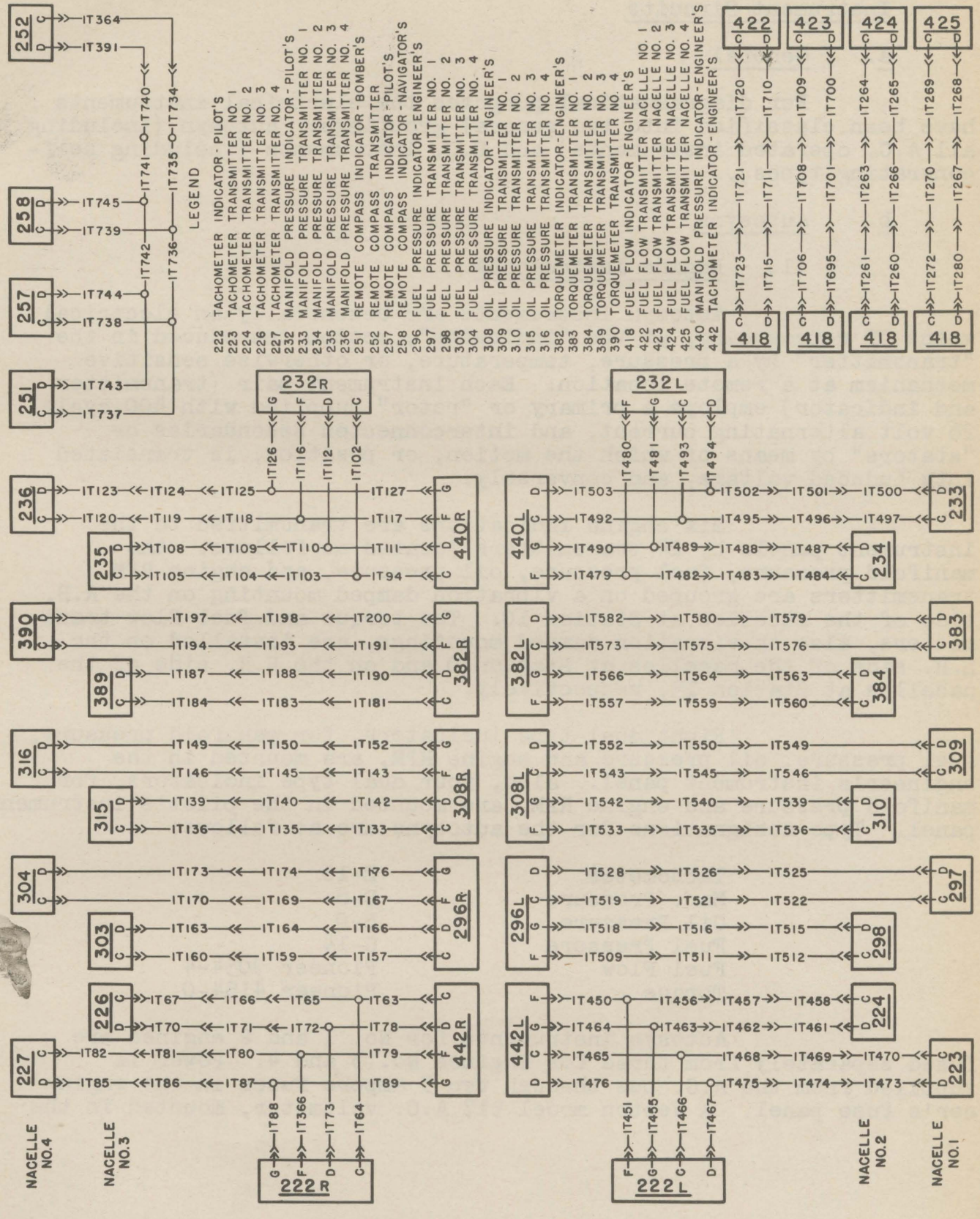


FIG. 92—AUTOSYN SECONDARY CIRCUITS (IT)

Instrument Circuits

a. General

For diagrammatical purposes the electrical instruments have been classified into two general groupings: autosyn (including all A.C. operated instruments) and D.C. instruments (including self-generating types).

b. Autosyns

(1) Engine Instruments

Autosyn instruments are essentially an electrical means of reproducing, at the "indicator", motion introduced in the "transmitter" by a pressure, temperature, or otherwise sensitive mechanism at a remote location. Each instrument pair (transmitter and indicator) employs a primary or "rotor" supplied with 400 cycle 26 volt alternating current, and interconnected secondaries or "stators" by means of which the motion, or position, is translated into induced voltage, and conversely.

Six engine indications are transmitted to the instrument panels by 24 transmitters located as follows: the manifold pressure, fuel pressure, oil pressure, and engine RPM transmitters are grouped on a vibration damped mounting on the R.H. side of the nacelles at Station 10. The torque and fuel flow transmitters, also on vibration damped mountings, are installed on the L.H. side of the nacelles at Station 0 and on the R.H. side of the nacelles at Station 15, respectively.

Eight dual type indicators, for manifold pressure, fuel pressure, oil pressure and engine RPM, are mounted in the engineer's instrument panel. Also, four dual type indicators, for manifold pressure and engine RPM, are mounted in the pilot's instrument panel. Type designations for the autosyns are as follows:

Tachometer	E-10
Man. Pressure	D-8
Oil Pressure	B-9
Fuel Pressure	C-14
Fuel Flow	Pioneer 9054-4
Torque	Pioneer 4154-0

Autosyn instruments for No. 1 and 2 engines are fused separately from those for Engines No. 3 and 4. Power is supplied from the A.C. bus through two 3 ampere fuses in the engineer's fuse panel. A Weston model 517 A.C. voltmeter, mounted in the

engineer's instrument panel, indicates autosyn primary voltage.

NOTE: Since the voltmeter is connected to the circuit of the No. 1 and No. 2 engine instruments only, a full voltage indication cannot be assumed to indicate a fuse continuity in the No. 3 and No. 4 engine instrument circuits.

(2) Remote Compass

A Type AN 5730 remote indicating magnetic compass system is employed in this airplane to provide a directive system as free as possible from the influence of armor plate, motors, and other distorting factors of the earth's magnetic field. The direction sensitive element and transmitter are located near the top of the fuselage at Station 992. Indicators are installed in the bomber's, pilot's, and navigator's instrument panels. 26 volt alternating current is supplied through a two ampere fuse in the engineer's fuse panel.

(3) Driftmeter

The Type B-3 driftmeter is electrically operated and derives power from the 115 volt A.C. bus and through a two ampere fuse in the radio compass relay junction shield. The driftmeter switch and receptacle are mounted on the inboard leg of the navigator's table.

c. D.C. Instruments

(1) Position Indicators

The remote indicating D.C. instruments employ a bridge circuit, wherein a potentiometer (transmitter) forms two variable circuit arms and a ratiometer (indicator) completes the circuit. By indicating the degree of circuit unbalance, the ratiometer indicates the transmitter position.

Two liquidometer Type EA-48-AW indicator units are mounted in the engineer's instrument panel and are employed for remote indication of the liquid quantity in the fuel and oil tanks. Each unit is equipped with a four-position selector switch which allows a reading to be made of any of four tanks. Movement of the selector switch changes the dial face to correspond with the tank being read and also switches the associated warning light circuit. When the switch is positioned to read a tank in which the level is low, the warning light will operate. This light may be tested by depressing the adjacent test button. The current supply (3 volts) for the illuminator and warning lamps is obtained through a resistor. (Refer to the interior lighting circuits.) A spare 3 volt lamp is located in the panel below the instruments.

Two float-operated transmitting units are mounted one at each end of each engine fuel tank. Operation of the units is devised so the motion of one float complements the other, providing full even operation through a range which, due to the wing dihedral angle, is necessarily greater than the capability of a single unit. There is no provision for the remote indication of bomb bay fuel tanks.

The oil tanks being of simpler construction, indication is accomplished with one transmitter to each tank.

The landing gear and wing flap position indicator Type AN-5780, is mounted in the copilot's instrument panel. The indicator incorporates four ratiometer movements, each governed by a Type AN-5785 transmitter. Transmitters are attached to the respective wing flap and landing gear mechanisms.

Two indicators, similarly incorporating four ratiometer movements, are mounted in the engineer's instrument panel and indicate intercooler and cowl flap positions. Transmitters are attached to the respective flap mechanisms in each nacelle.

Electrically-driven Type C-1 turn and bank indicators are installed in the pilot's and copilot's panels.

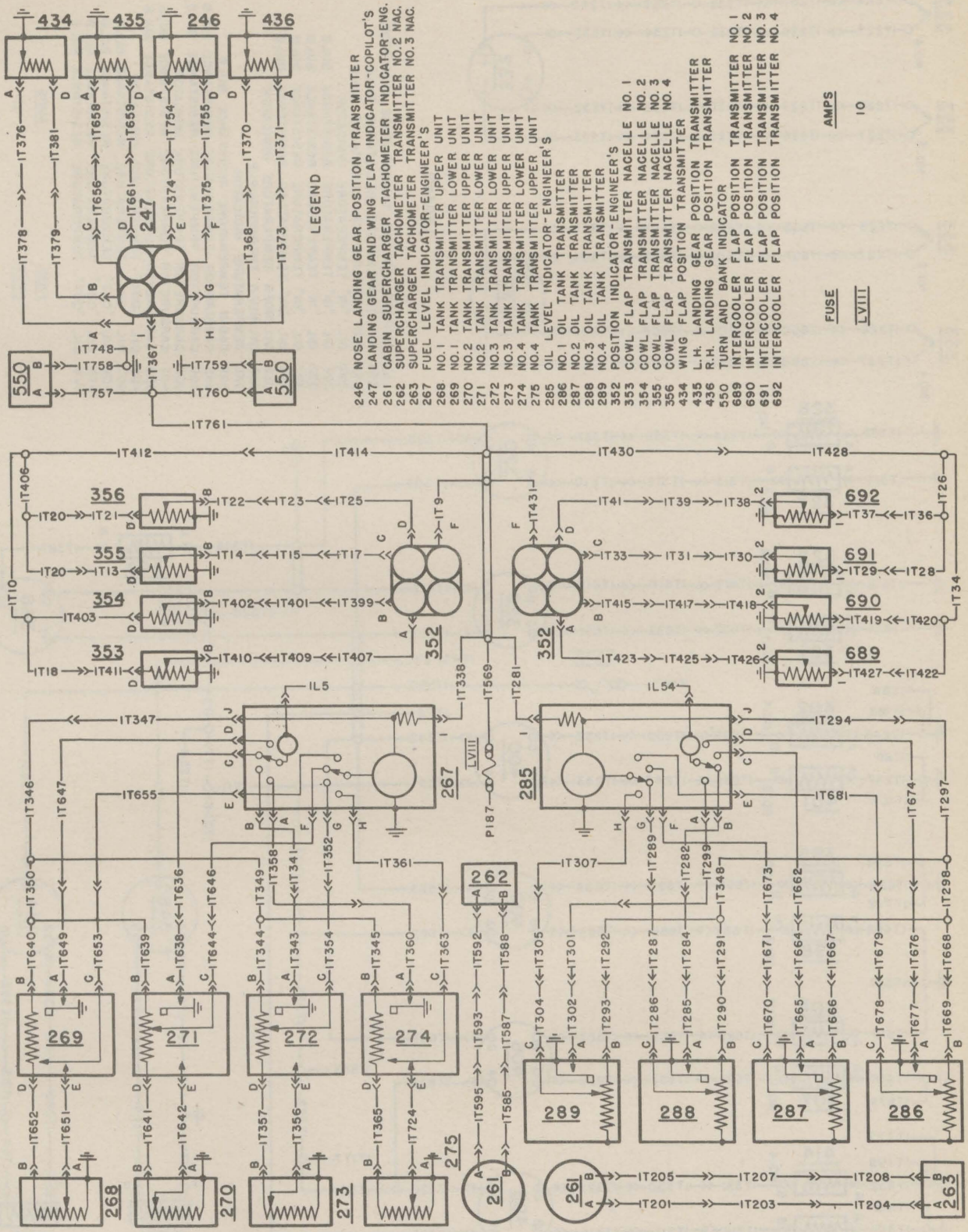


FIG. 93—D.C. INSTRUMENT CIRCUITS (IT)

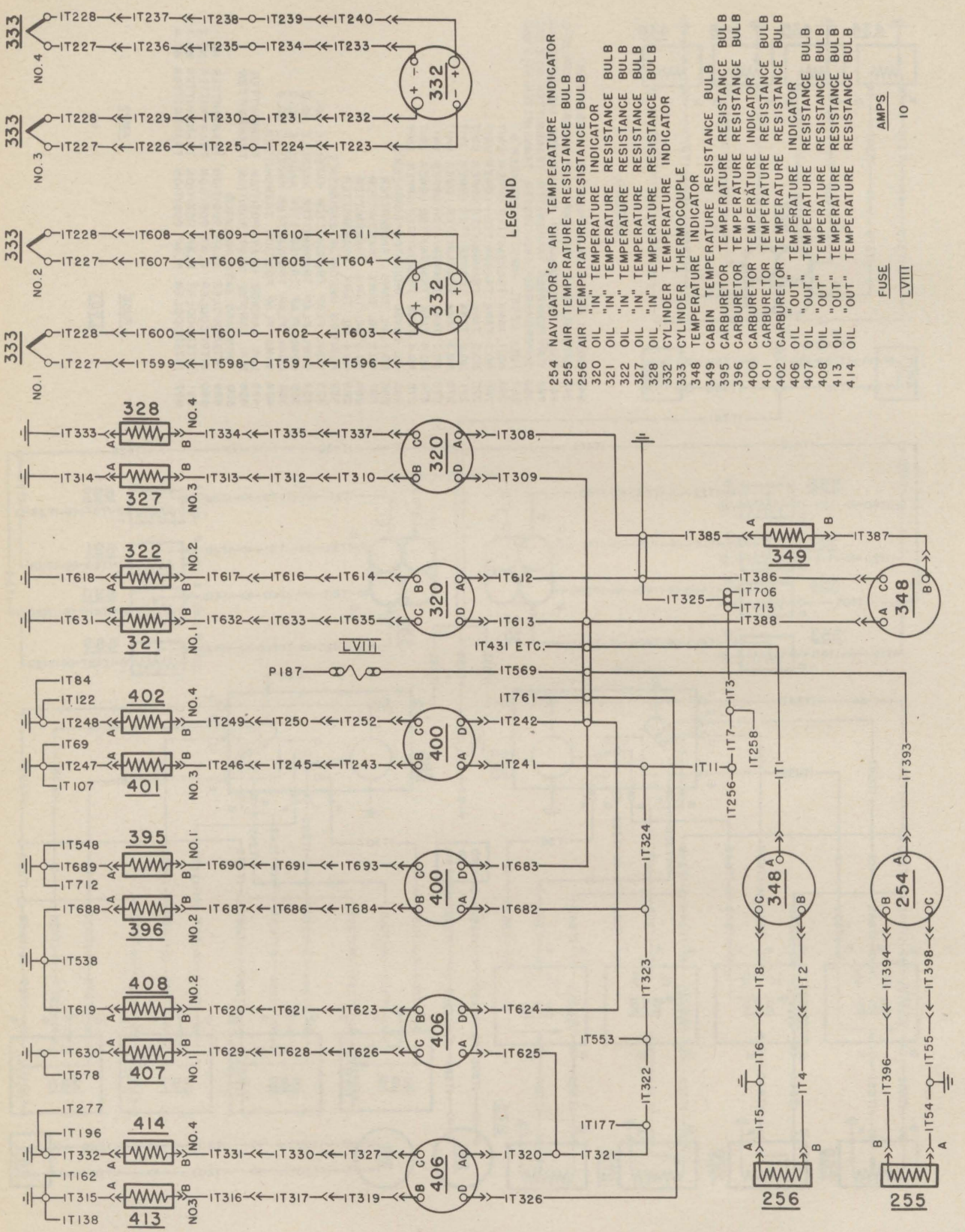


FIG. 94—D.C. INSTRUMENT CIRCUITS (IT)

(2) Temperature Instruments

Six dual indicators, mounted at the engineer's station, indicate engine temperatures. Two Type A-24, dual indicators (oil in) are mounted in the engineer's instrument panel and are connected to the resistance bulbs mounted in the oil tank sumps. Two Type F-10 dual indicators, mounted in the engineer's auxiliary instrument panel, are connected with resistance bulbs mounted in the carburetor throat. Two Type A-24 dual indicators (oil out) are mounted also in the engineer's auxiliary instrument panel and are connected with resistance bulbs mounted in the engine oil return lines. Oil out temperature indication is provided in only airplane serial number AC-41-2.

Two free air indications are provided. A resistance bulb is installed below the leading edge of each wing at the junction with the fuselage. The left-hand bulb is connected to a Type C-10 indicator mounted in the navigator's instrument panel. A Type C-11 indicator connects with the right-hand bulb and is mounted in the engineer's instrument panel. Cabin air temperature is indicated by a Type C-11 indicator, mounted in the engineer's instrument panel and connected with a resistance bulb installed aft of the engineer's auxiliary instrument panel.

All D.C. instruments are fused through a 10 ampere fuse in the engineer's forward fuse panel.

(3) Self-Generating Instruments

An AND10200 thermocouple (cylinder temperature) is mounted under the rear spark plug of the No. 1 cylinder in the rear bank of each engine. Two Type B-11 dual cylinder temperature indicators are mounted on the engineer's instrument panel. All wiring in the thermocouple circuits is of either iron or constantan wire.

Cabin supercharger tachometer transmitters, Pioneer Type 2270, are mounted, one each, on the outboard sides of nacelles 2 and 3 at Station 10. Transmitters are driven at one third of the supercharger oil pump RPM and generate three phase alternating current of a frequency proportional to the driving RPM. Each transmitter is connected to a Pioneer Type 2216 indicator mounted in the engineer's panel. A maximum oil pump speed of 6000 RPM is indicated when the transmitter is driven at 2000 RPM.

Due to the supercharger design, employing differential gearing, impeller RPM varies inversely with the oil pump RPM, and directly with the engine RPM, and can be read by entering the impeller RPM chart with the indicated oil pump and engine RPM.

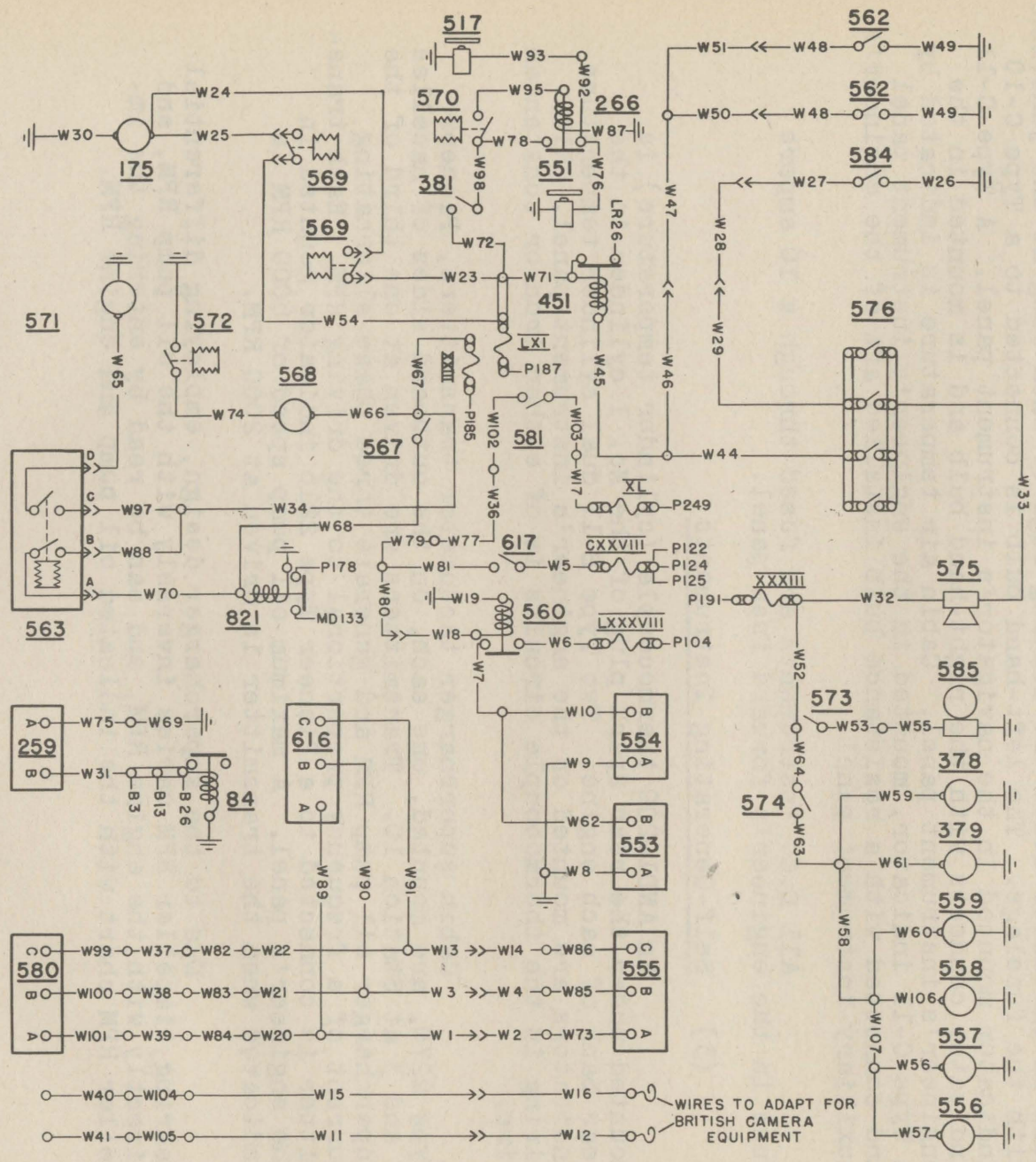


FIG. 95—WARNING SIGNAL CIRCUITS (W)

LEGEND

84	AGASTAT SLOW RELEASE RELAY
175	OXYGEN PRESSURE WARNING LIGHT
259	BOMBER'S ORIENTATION RECEPTACLE
266	CABIN PRESSURE WARNING RELAY
378	L.H. GUNNER'S PHONE CALL LIGHT
379	R.H. GUNNER'S PHONE CALL LIGHT
381	CABIN PRESSURE WARNING CUT-OFF
451	ANTENNA WARNING RELAY
517	CHIME (AFT CABIN)
551	CHIME (FORWARD CABIN)
553	CAMERA HEATER RECEPTACLE
554	CAMERA RECEPTACLE
555	INTERVALOMETER RECEPTACLE (CAMERA)
556	CAMERA OPERATOR'S PHONE CALL LIGHT
557	CREW'S PHONE CALL LIGHT
558	L.H. OBSERVER'S PHONE CALL LIGHT
559	R.H. OBSERVER'S PHONE CALL LIGHT
560	CAMERA RELAY
562	LANDING GEAR WARNING SWITCH
563	HYDRAULIC SYSTEM PRESSURE REGULATOR
567	HYDRAULIC PUMP MOTOR SWITCH
568	HYDRAULIC PRESSURE WARNING LIGHT
569	OXYGEN PRESSURE WARNING SWITCH
570	CABIN PRESSURE SWITCH
571	EMERGENCY HYDRAULIC SYSTEM PRESSURE WARNING LIGHT
572	EMERGENCY HYDRAULIC PRESSURE SWITCH
573	PILOT'S ALARM SWITCH
574	PHONE CALL SWITCH
575	LANDING GEAR WARNING HORN
576	THROTTLE WARNING SWITCHES
580	BOMBER'S INTERVALOMETER RECEPTACLE
581	BOMBER'S CAMERA SWITCH
584	NOSE LANDING GEAR WARNING SWITCH
585	ALARM BELL
616	CAMERA OPERATOR'S INTERVALOMETER RECEPTACLE
617	CAMERA OPERATOR'S CAMERA SWITCH
821	HYDRAULIC PUMP MOTOR SOLENOID SWITCH

FUSE	AMPS
XXIII	2
XXXIII	5
XL	2
LXI	10
LXXXVIII	10
CXXVIII	2

Warning Signal Circuits

a. Cabin Pressure Warning

Two cabin pressure warning chimes are installed in the top of the fuselage, one in the forward cabin at Station 153 and the other in the aft cabin at Station 706. These chimes have repeating action and are controlled by a relay, which is in turn controlled by a pressure-operated switch. This switch is mounted in the engineer's instrument panel and is designed to close the relay circuit when the cabin pressure falls below 19.03 inches of mercury, corresponding to a pressure altitude of 12,000 feet. Operating current is supplied from a ten ampere fuse in the engineer's forward fuse panel. When desired, the power may be removed, thereby rendering the system inoperative, by means of a Type B-5A switch mounted in the engineer's switch panel.

b. Landing Gear Warning

A Type E-2 warning horn is installed above the pilot on the cabin left-hand sidewall, to provide an audible warning in event an engine throttle is closed while the landing gear is not fully extended. Type A-2 warning switches are located in the landing gear lower limit switch shields. These switches are normally closed and open simultaneously with the limit switches when the landing gear is completely extended. Wired in series parallel with the landing gear switches is a throttle warning switch assembly, consisting of four micro switches connected in parallel and operated by the copilot's throttle levers. Four reset buttons are built into the switch assembly to allow the warning to be cut off; however, the action is such that subsequent closing of another throttle will again operate the warning horn. Current is supplied the horn circuits from the power bus and through a five ampere fuse located in the pilot's aisle stand.

c. Antenna Warning

Wired also in series parallel with the landing gear switches, but fed from the cabin pressure warning fuse in the engineer's forward fuse panel is the antenna warning relay. This relay is of the normally closed type and is energized while the landing gear is retracted. In the de-energized position the relay contacts apply current to the radio operator's antenna reel control box warning light. Since this light circuit is completed through the reel limit switch, the operator will be warned of the approaching landing if the liaison antenna is not reeled in. Further information may be obtained by reference to the liaison radio diagram.

d. Hydraulic Pressure Warning

The hydraulic system pressure regulator switch is mounted in the hydraulic panel below the navigator's floor at

Station 218. This regulator maintains the system within a pressure range of 800 to 1000 PSI, by controlling the pump motor through a relay also mounted on the hydraulic panel. An additional set of contacts operates an amber signal light in the copilot's auxiliary panel if the pressure falls below 600 PSI. The regulator circuits are supplied with current through a 2 ampere fuse in the engineer's forward fuse panel. An override switch is provided, in the engineer's switch panel, whereby the hydraulic pump may be operated independent of the regulator.

e. Hydraulic Emergency Pressure Warning

An amber warning light, mounted in the engineer's instrument panel, indicates low pressure in the emergency hydraulic system. This light is controlled by a Bendix pressure switch located on the cabin sidewall above the hydraulic accumulator at Station 169. The switch is designed to operate the light when the pressure falls below approximately 900 PSI. Operating power is supplied from the input terminal of the hydraulic pump motor switch.

f. Oxygen Pressure Warning

Low oxygen system pressure is indicated by an amber warning light in the engineer's instrument panel. Also mounted in this panel are two Type C-1 oxygen pressure switches, connected to the forward and aft cabin oxygen systems respectively. These switches operate a warning light when the oxygen pressure falls below 100 pounds. The switches are wired in parallel and are supplied current tapped from the cabin pressure warning fuse.

g. Alarm Bell

A Type B-5A switch in the pilot's aisle stand controls an alarm bell mounted near the top of the aft cabin at Station 706. Operating current is obtained from the landing gear warning horn fuse.

h. Phone Call

A Type B-5A switch in the pilot's aisle stand controls amber phone call lights located in the camera operator's panel and in the interphone jack boxes at the observer, gunner and crew stations in the aft cabin. Operating current is supplied from the landing gear warning horn fuse.

i. Camera Circuits

The camera circuits are included in the warning circuit diagram. Three interconnected intervalometer receptacles are provided, one each on the bomber's panel, camera operator's panel (Sta. 720) and camera panel (Sta. 878). In addition, the camera panel contains power receptacles for the camera and camera

heater. These two receptacles are powered through the camera relay and a ten ampere fuse, both located in the battery solenoid junction shield. The relay may be controlled either by current supplied through a B-5A switch or two ampere fuse in the bomber's panel or a corresponding installation in the camera operator's panel, fused in the aft fire control junction shield.

The bomber's station is also provided with an orientation receptacle connected to the bomb interval release output. (Refer to the bomb control circuits).

A pair of wires is provided from the bomber's panel to the camera panel. These wires are not connected in circuit and are used only when the airplane is operated with British camera equipment.

(To be furnished when available)

FIG. 96—BOMB CONTROL CIRCUITS (B)

Bomb Control Circuits

a. General

The electrical bomb control system incorporates an arrangement whereby bombs may be released singly, or in train, either automatically by the bombsight or manually by a switch accessible to the bomber. An independent mechanical system is provided to jettison the bomb bay fuel tanks and for emergency bomb release, in salvo and unarmed. Bombs are released in the armed condition by the electrical system only.

b. Bombsight

The bomb control system employs a Type M-7 bombsight. Power is supplied it from the bus and through a 15 ampere fuse in the bomber's panel.

c. Bomb Release Switch

A Type B-11 bomb release switch is mounted on the pilot's floor left of the bombardier's seat. This switch is of the momentary contact type and is operable in either direction. A hinged guard prevents inadvertant operation. The switch is wired in parallel with the bombsight apparatus and when ON energizes the bomb interval release control circuit through the bomb door safety relay contacts.

d. Bomb Door Safety Switches

Type A-1 switches are wired in series and attached to the forward bomb door in such a manner that the safety relay is energized only when the bomb doors are fully open. When energized, the relay completes the circuit to the bomb release switch allowing the bomb interval circuit to operate, subject to control by this switch. The relay coil circuit is supplied from the power bus and through a two ampere fuse in the aft bomb bay door motor shield.

e. Bomb Interval Release

Train release of bombs is accomplished through the medium of a Type B-3 interval release. This instrument is mounted in the bombardier's panel. Controls are provided to vary the interval and number of bombs in a train. A switch allows choice of operation in the SELECTIVE, or TRAIN positions. The instrument contains a pilot jewel which is illumined when the device is operable, i.e.: in the SELECTIVE position, or in the TRAIN position when the counter dial is displaced from zero. The interval release is powered from the supply bus and through a 15 ampere fuse in the bomber's panel. Current for the control circuit is tapped from this fuse and fed through the bomb door safety relay contacts and the bomb release switch. The bomb releasing pulses are transmitted to two cascaded rack selector relays and thence to the bomb racks.

f. Bomb Selector Relays

The Type RS-2 rack selector relays are utilized to permit "layer" sequence release of four bomb groups with a minimum amount of wiring and to prevent spaces or dead pulses in the bomb train resulting from release failure or enemy action. Operation of the relays is automatic in transferring the release pulse in sequence to the next bomb release which has a circuit completed to ground. One or more bomb groups may be omitted from a release train by opening its circuit by means of the corresponding bomb group selector switch in the bomber's panel. When bomb bay fuel tanks are installed, safety switches mounted on the communicating tunnel wall in each bay are opened thereby isolating the electrical release circuits in their respective bays.

Power to operate the rack selector relays is tapped from the bomb door relay circuit in series with the door safety switches.

g. Signal Lights

A red bomb door signal light is mounted on the bomber's panel and wired from the door safety relay contacts to indicate when the bomb doors are fully open. The amber pilot's bomb release indicator light is mounted in the pilot's instrument panel and is connected to the bomb interval release output to flash with each release pulse.

A Type E-1 bomb release formation light is mounted below the rudder and to the rear of the vertical stabilizer and connected in parallel with the bomber's door signal light, thereby indicating to the rear when the doors are open. Intensity of illumination may be varied by a resistor and an OFF, BRIGHT, DIM switch on the bomber's panel. This formation light contains a solenoid, which, when actuated, thrusts a red transparent filter over the white lamp. This solenoid is connected in parallel with the lamp circuit through the contacts of an agastat type of fast-closing, delay-opening relay. The agastat is actuated by the bomb release pulses, and thereby causes the white formation signal to flash red with each pulse.

h. Bomb Racks

Four alternative bomb rack arrangements for carrying 100 and 300; 500; 1000; 1600, 2000 and 4000 lb. bombs, respectively, are provided for each bomb bay. Type AX-5 bomb release receptacles are mounted in the racks at each bomb station. Bomb rack and bomb release receptacles are of the closed circuit type containing a shorting switch, which when the plug is not inserted, by-passes the release pulse to the next receptacle in the series.

With all group selector switches closed, releasing sequence is from forward to aft bomb bay and alternate sides of each bay resulting in least disturbance of the airplane's center of gravity.

i. Bomb Release Units

Bomb release is accomplished in conjunction with the bomb shackle by Type A-2 bomb release units which are plugged into the racks at each active bomb station. The release may be tripped electrically or mechanically. When tripped electrically both releasing and arming levers on the bomb shackle are actuated. Simultaneously, this action operates a switch which disconnects the tripping solenoid and transfers the pulse circuit to the input connection of the succeeding release unit. Release units are wired to release on successive pulses from the bottom to the top of the racks and in event of release failure no transfer is made, thereby preventing release of bombs from above onto the jammed bomb.

The mechanical provision operates only the release lever of the bombshackle or can be positioned to lock all release units in the cocked position. Means for testing the release action by a screwdriver is also provided.

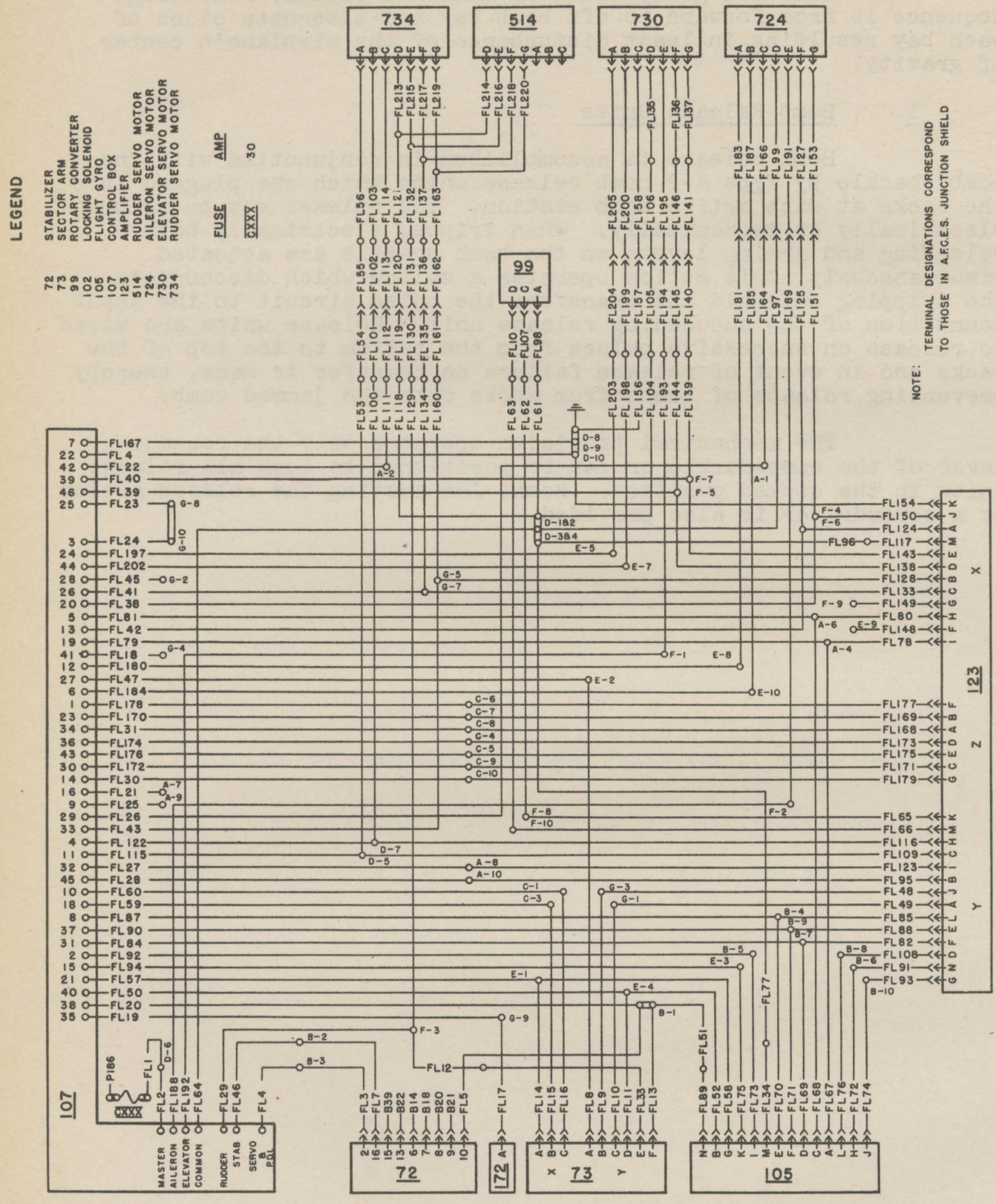
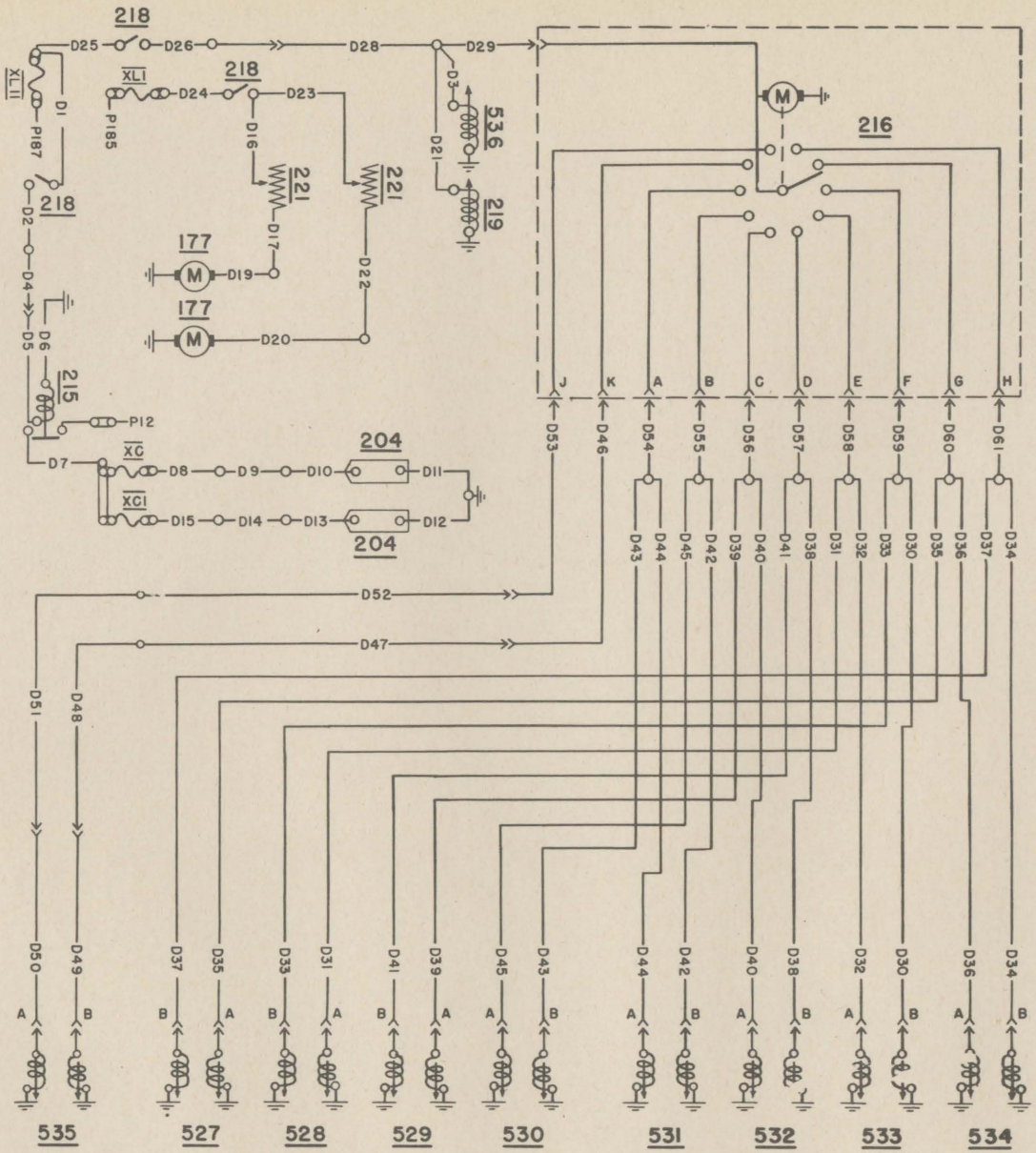


FIG. 97—FLIGHT CONTROL CIRCUITS (FL)

Flight Control Circuits

Interconnecting wiring among the various units comprising the automatic flight control electronic system is shown in the accompanying diagram. Full information on the service and maintenance of this equipment may be obtained by reference to the appropriate ordinance instructions.

WARNING: In event a unit becomes damaged, jamming of the associated control may ensue, necessitating severance of the A.F.C.E. servo cables in order to restore manual operation.



LEGEND

177 PROPELLER ANTI-ICER PUMP MOTOR
204 PITOT TUBE HEATER
215 PITOT TUBE HEATER RELAY
216 SURFACE DEICER DISTRIBUTOR SWITCH
218 SURFACE DEICER CONTROL SWITCH
218 PITOT TUBE HEATER SWITCH
218 PROPELLER ANTI-ICER SWITCH
219 SURFACE DEICER UNLOADING SOLENOID VALVE
221 PROPELLER ANTI-ICER RHEOSTATS
527 SURFACE DEICER SOLENOID VALVES-R.H.-WING
528 SURFACE DEICER SOLENOID VALVES-R.H.-WING
529 SURFACE DEICER SOLENOID VALVES-R.H.-WING
530 SURFACE DEICER SOLENOID VALVES-R.H.-WING
531 SURFACE DEICER SOLENOID VALVES-L.H.-WING
532 SURFACE DEICER SOLENOID VALVES-L.H.-WING.
533 SURFACE DEICER SOLENOID VALVES-L.H.-WING
534 SURFACE DEICER SOLENOID VALVES-L.H.-WING
535 SURFACE DEICER SOLENOID VALVES-EMPENNAGE
536 SURFACE DEICER UNLOADING SOLENOID VALVE

FUSE	AMPS.
XL1	5
XL11	5
XC	15
XC1	15

FIG. 98—DEICER AND ANTI-ICER CIRCUITS (D)

Deicing and Anti-Icing Circuits

a. Propeller Anti-Icer

Propeller icing is prevented by an ice-retardant solution pumped to the propeller spinners by two electrically-driven pumps located below the aft pressurized cabin floor at Station 675. Fluid is metered to the inboard propellers by one pump and to the outboard propellers by the other. The rate of flow for each pump may be varied by means of two rheostats mounted in the lower portion of the engineer's control stand. A Type B-5A toggle switch in the engineer's switch panel controls both pump motor circuits. Power is supplied these circuits from the power bus and through a five ampere fuse in the engineer's fuse panel.

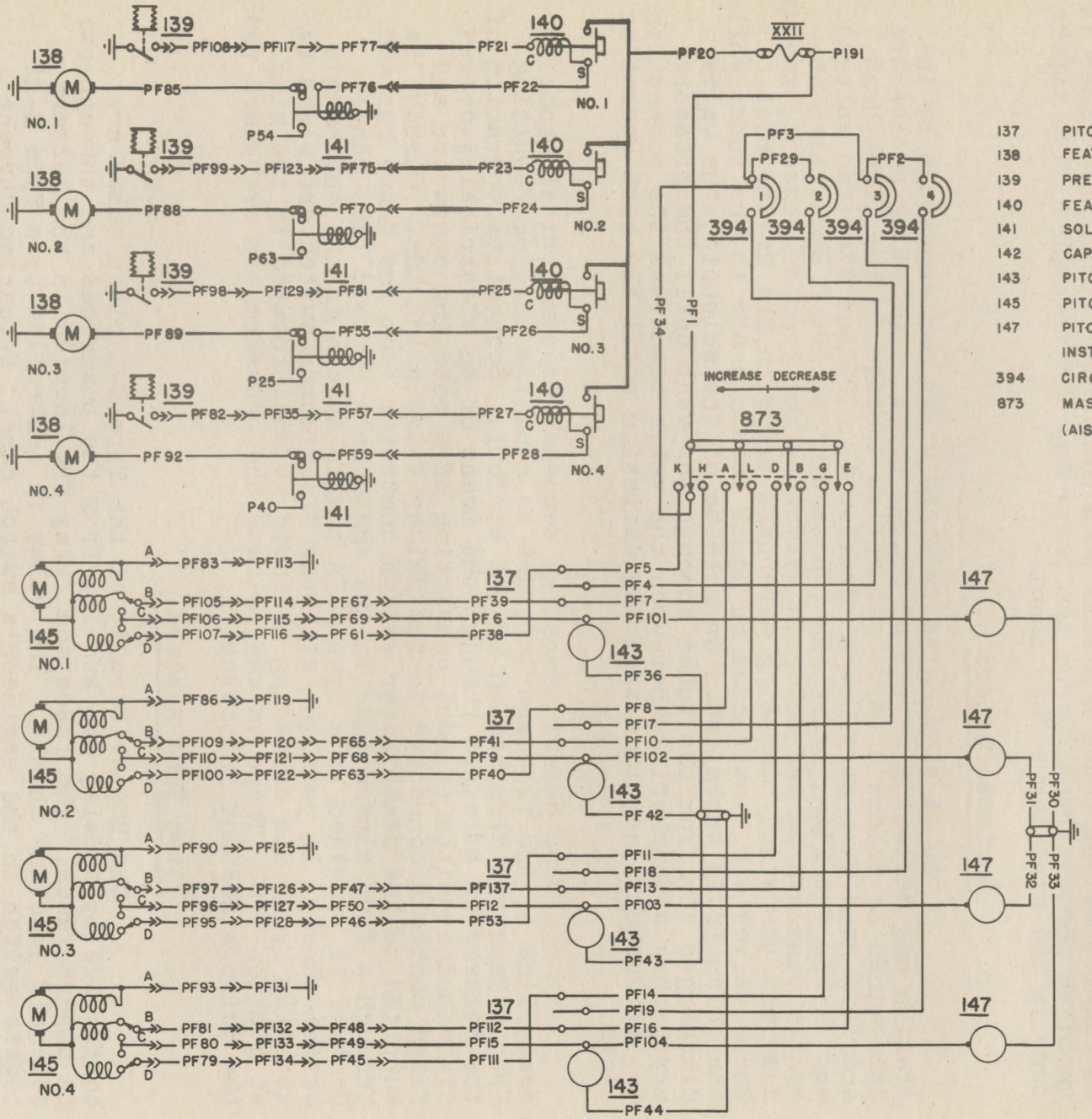
b. Surface Deicers

Ice is eliminated from the wings and empennage by inflation and deflation of rubber deicer boots. Operating cycles are determined by solenoid valve assemblies located in the right-hand and left-hand wing portions at Station 62, 202 and 476 (two valves) and in the fuselage, below the fin at Station 900. Each valve assembly consists of two solenoid valves having common pressure, vacuum and vent ports and operating alternate tubes in the deicer boot. These valves are constructed to admit pressure air to the tubes while the solenoid is energized. On release of the solenoid, the valve discharges air from the tubes through the vent until the pressure approaches atmospheric, whereupon the valve transfers the connection to the vacuum line, thus assuring deflation until the next operating cycle.

Wing deicer operating sequence is symmetrical about the centerline of the fuselage in order to minimize rolling resulting from asymmetric deformation of the airfoil. Sequential operation of the deicers is attained through the means of an electrically-driven distributor switch (timer) consisting of a rotating contactor and fixed contacts connected to the deicer valve solenoids. Current is supplied to the distributor switch contactor from the power bus and through a five ampere fuse in the engineer's forward fuse panel. Control is provided by a Type B-5A toggle switch in the engineer's switch panel. In parallel with the distributor switch are wired two normally open, air unloading solenoid valves, located in the wing at Station 476. These valves relieve the pressure air overboard when the deicers are not in operation.

c. Pitot Tube Heaters

The heater circuit of the Type D-1 pitot tubes are controlled by a relay and are fed from the power bus and through two 15 ampere fuses. The fuses and relay are located in the battery solenoid junction shield. The relay is controlled by a Type B-5A toggle switch in the engineer's switch panel, actuating current being tapped from the surface deicer circuit fuse.



LEGEND

137	PITCH CONTROL SWITCH (ENGINEER).
138	FEATHERING PUMP MOTOR
139	PRESSURE CUT-OUT SWITCH.
140	FEATHERING CONTROL SWITCH.
141	SOLENOID SWITCH.
142	CAPACITOR .5 MFD 200 V.
143	PITCH LIMIT SIGNAL LIGHT (ENGINEER)
145	PITCH GOVERNOR CONTROL MOTOR.
147	PITCH LIMIT SIGNAL LIGHT (COPILOT'S INSTRUMENT BOARD)
394	CIRCUIT BREAKER - 15 AMP.
873	MASTER PITCH CONTROL SWITCH (AISLE STAND).

FUSE	AMP
XXII	20

FIG. 99—PROPELLER CONTROL CIRCUITS (PF)

Propeller Control Circuits

a. Pitch Control

Adjustment of the hydraulic propeller governor controls is provided by reversible electric motors. Power is fed each motor circuit from the power bus and through 15 ampere circuit breakers located in the pilot's aisle stand. Each motor circuit is individually controlled by a Type B-11 switch located in the engineer's control stand, and master controlled on the aisle stand panel by a three position gang switch. Movement of this switch from the center (normal) position activates the motors together in the indicated direction and simultaneously breaks the power supply circuit to the engineer's switches, providing overriding control thereby. Limit switches, incorporated into the motor assembly, limit governor travel and also control amber signal lamps in the engineer's and copilot's instrument board. These signal lamps indicate the end of governor travel in either direction.

b. Feathering Control

Full feathering and unfeathering for each propeller is accomplished hydraulically, employing engine oil through the means of an electrically-driven pump mounted near the left side of each nacelle near Station 0. The pump motor circuits are fed directly from the generator relay terminals without fusing and are controlled by Eclipse Type 518-2-A solenoid switches located in the nacelles. Power to activate the solenoids is fed from the power bus through a 20 ampere fuse located in the pilot's aisle stand, and is controlled by a push button switch located in the pilot's aisle stand for each motor circuit. Wired in parallel with the solenoid is a holding coil built integrally with the push button switch and connected in series with a pressure cutout switch designed to break circuit when subjected to hydraulic pressures in excess of 400 PSI.

To feather a propeller the corresponding push button is engaged. It is held in contact by its holding coil until feathering is completed, at which point the pressure rapidly increases through 400 PSI. This pressure actuates the pressure cutout switch, releasing the push button switch, thereby de-energizing the solenoid switch and opening the pump motor circuit. Should it be necessary to stop the feathering operation prior to completion, the push button may be manually pulled out.

Unfeathering requires a pressure in excess of 600 PSI. This operation requires that the push button be held engaged manually, since, with this pressure, the cutout switch disallows employment of the magnetic holding feature. The push button switch is held closed until the governor has attained sufficient RPM to resume automatic operation.

CAUTION: Due to the excessive current resulting, do not attempt feathering or unfeathering of more than one propeller at a time except in an emergency.

Interior Lighting Circuits

a. Instrument Lighting

The method of instrument lighting in this airplane is especially adapted for night flying by the use of self-luminous fluorescent instrument scales and indices. The markings, ordinarily visible in the dark, are excited to greater luminescence when bathed with ultra-violet light projected from the Type C-5, 28 volt direct current, fluorescent lamps with which this airplane is equipped. The lamps are provided with a sector shutter type light filter whereby the visible light radiated may be varied or eliminated if desired.

The bomber's instruments are illuminated by a lamp mounted under the pilot's instrument panel. The control for this lamp is on the bomber's instrument panel. Both pilots' instrument boards are illuminated by two lamps mounted on each control column with the controls in the respective pilots' auxiliary panels. The engineer's instrument panel is provided with three lamps, two mounted on the cabin sidewall and one mounted on the engineer's switch panel. Lamp controls are mounted adjacent to the lamps.

The driftmeter, copilot's compass and engineer's fuel and oil quantity gages are provided with self-contained lamps for direct illumination of their scales. The copilot's compass circuit also contains a rheostat, mounted in the copilot's auxiliary panel, with which the compass illumination intensity may be varied.

A Type A-7 table lamp, a gooseneck lamp and a Type A-9 dome lamp are provided for the bomber's, navigator's and radio operator's work tables, respectively.

Type C-4 adjustable spotlights, with self-contained switch and rheostat, located at the navigator's, pilot's and gunners' stations provide optional illumination of their instruments.

Type B-7 extension lamps for miscellaneous instrument illumination are provided at all stations in the forward cabin and in the aft cabin and tail section at Stations 1115, 900, 742 and 680, the last listed location being accessible to either aft gunner.

b. Dome Lights

General interior illumination is provided by dome lights, Type A-9 lights being in general use except in the bomb bays wherein the provisional use of fuel tanks requires installation of the vaporproof Type A-7 light.

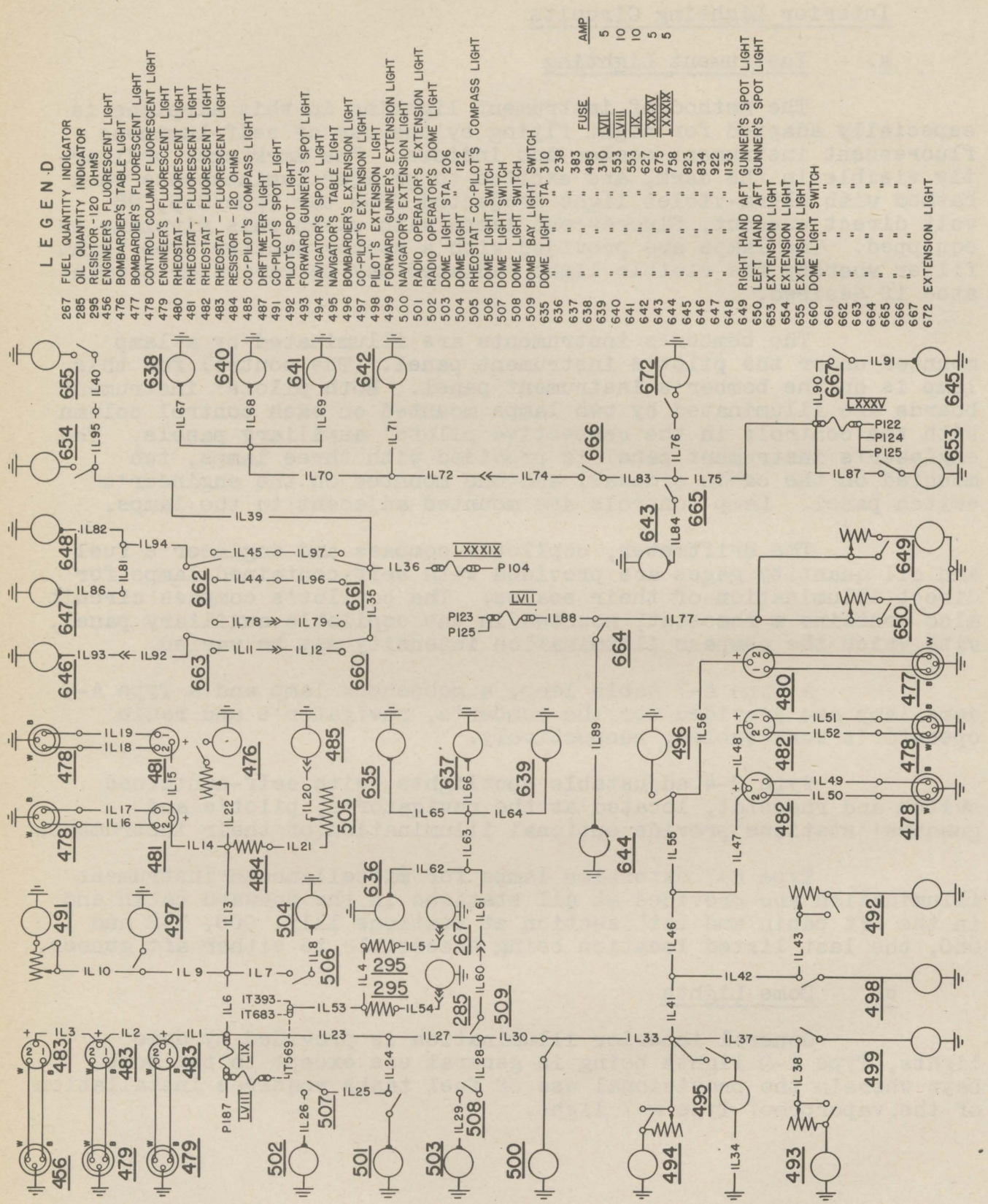


FIG. 100—INTERIOR LIGHTING CIRCUITS (IL)

In the pressurized cabins, dome lights are mounted near the top of the fuselage at Stations 122, 206, 218, 675, 758 and 823. Switches are mounted adjacent to the lights.

Each bomb bay contains four dome lamps, two mounted in the sidewalls near the middle of the bay and one at each end of the bay, under the communicating tunnel. Lights in each bay are controlled by a switch mounted near the bulkhead door in the adjacent cabin.

The tail section contains three dome lamps. One lamp at Station 834 is controlled by either of two Type B-1B switches wired to allow control from either inside the aft pressurized cabin or from the tail section side of the bulkhead. In like manner lights at Stations 922 and 1133 are controlled as a unit from either of two Type B-1B switches located at Stations 900 and 1133 respectively.

c. Power Supply

All lights in the forward bomb bay and cabin are supplied power through a ten ampere fuse in the engineer's forward fuse panel, except the fuel and oil level lights which are connected through the ten ampere D.C. instrument fuse also in the engineer's forward fuse panel.

Current for operating the Station 758 dome light and the gunner's spot lamp is obtained through a five ampere fuse in the Station 834 turret junction shield. All other lights in the aft bomb bay and cabin are fused through a five ampere fuse in the aft fire control junction shield.

All lights in the tail section are fused through a five ampere fuse in the battery solenoid junction shield.

(To be furnished when available)

FIG. 101—EXTERIOR LIGHTING CIRCUITS (E)

Exterior Lighting Circuits

a. Position Lights

Four position lights are installed, one Type A-9 wing light at each wing tip, and one Type D-1 tail light at each tip of the horizontal stabilizer. The lamps are fed from the power bus and through a ten ampere fuse located in the pilot's aisle stand. Also in this aisle stand are two resistors and a Type C-2, two pole, three position switch, wired to allow choice of OFF, BRIGHT and DIM positions.

b. Landing Lights

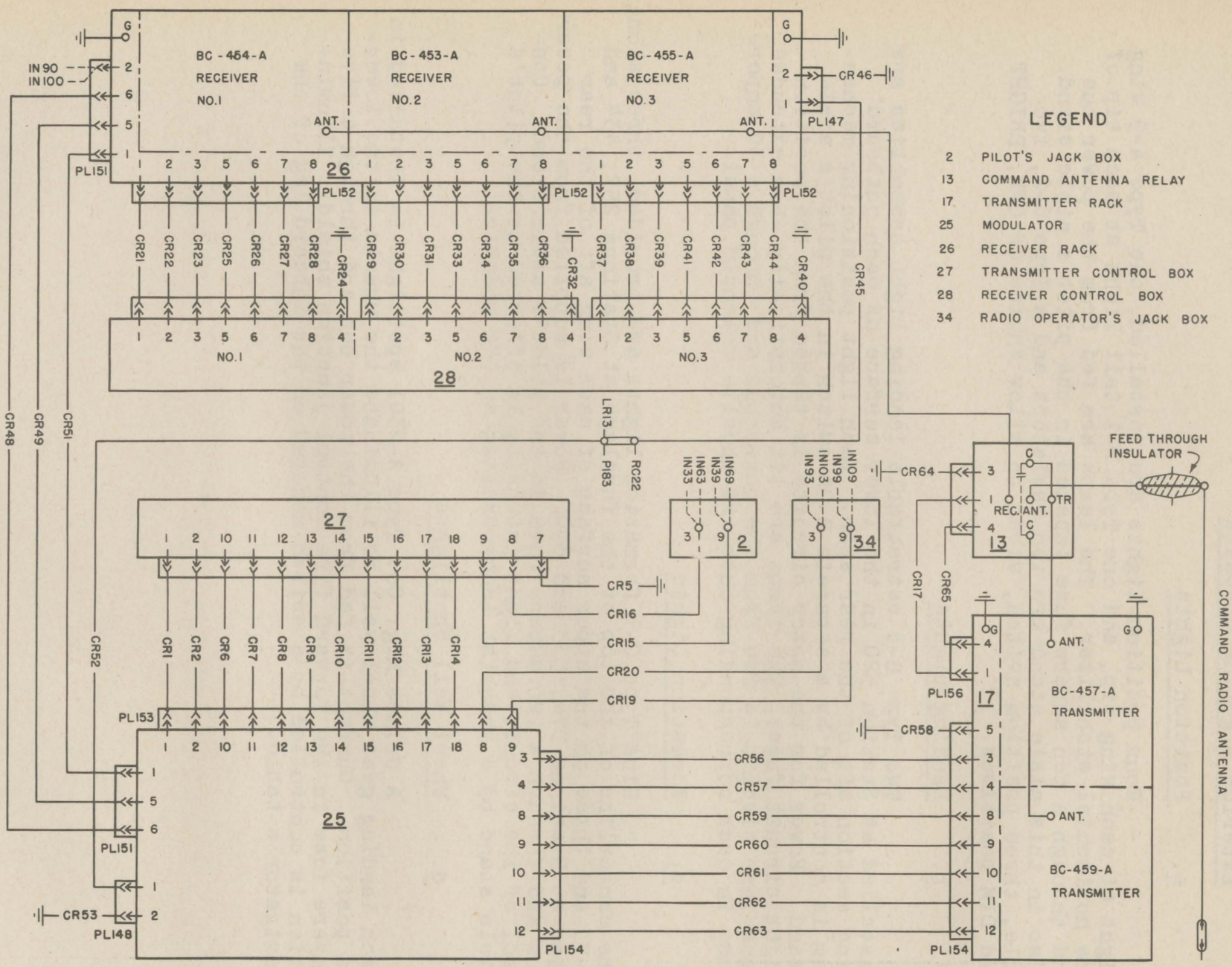
Two Type B-3 retractable landing light assemblies are installed at Station 520 in the lower surface of each outboard wing section aft of the rear spar. Each light positioning mechanism is controlled by a separate B-9A switch in the pilot's aisle stand. Power for the motor circuits is tapped from the position light circuit fuse. The lamps are lit automatically when extended. Each lamp circuit is fed from the power bus and through a 30 ampere fuse in each corresponding outboard nacelle solenoid panel.

c. Formation Lights

Nine Type C-1 formation lights are provided, three along the centerline of the top of the fuselage at Stations 257, 434 and 6-7, and three on the upper surface of each wing aft of the rear spar at Stations 374, 533 and 699. Power is supplied from the power bus and through a two ampere fuse in the pilot's aisle stand. Control of the circuit and light intensity is effected at the pilot's aisle stand by a rheostat incorporating an OFF position.

d. Wheel Well Spotlights

A Grimes Mfg. Co. Type A-2301 spotlight is installed in each landing gear wheel well to illuminate the wheels in the lowered position. Current is fed from the power bus and through a five ampere fuse in the forward fire control junction shield. Illumination is controlled by a switch mounted on the inboard leg of the navigator's table.



LEGEND

2	PILOT'S JACK BOX
13	COMMAND ANTENNA RELAY
17	TRANSMITTER RACK
25	MODULATOR
26	RECEIVER RACK
27	TRANSMITTER CONTROL BOX
28	RECEIVER CONTROL BOX
34	RADIO OPERATOR'S JACK BOX

FIG. 107—COMMAND RADIO CIRCUITS (CR)

ADDITIONAL ELECTRICAL DIAGRAMS TO BE

FURNISHED WHEN AVAILABLE

COMMUNICATION SYSTEM

Figure No.	TITLE	Page
105	Communication Equipment Diagram	287
106	Liaison Radio Circuits (LR)	290
107	Command Radio Circuits (CR)	292
108	Radio Compass and Marker Beacon Circuits (CR)	294
109	Interphone Circuits (IN)	296

(To be furnished when available)

FIG. 105—COMMUNICATION EQUIPMENT DIAGRAM

Communications

a. General

The communication system on the XB-29 airplane comprises radio and interphone equipment arranged to provide communication with ground stations or with airplanes; intraplane communication among the crew members; automatic direction finding; and reception of weather, range and marker beacon signals.

The system consists of four sets of circuits diagramed in this section and identified by the following code:

Liaison Radio	LR
Command Radi	CR
Radio Compass and Marker Beacon	RC
Interphone	IN

Only wiring installed by the manufacturer is identified by code numbers. Code numbers are attached at both ends of each wire.

b. Liaison Radio Set (Type SCR-287-A)

(1) Transmitter

A Type BC-375-C transmitter is mounted on the right-hand sidewall of the forward pressurized cabin adjacent to the radio operator's table. Six transmitting frequency ranges are provided by use of six plug-in tuning units. Units not in use are stowed in cases located as follows: two under the radio operator's table and four in the rear pressurized cabin aft of the computers' armor plate.

CAUTION: Operation of transmitter at cabin pressure altitudes above 15,000 feet is subject to flash-over with some tuning units. Refer to transmitter instruction book.

1000 volt direct current is supplied the transmitter by a Type PE-73-B dynamotor mounted below the transmitter and aft of the engineer's control stand. Dynamotor and low voltage transmitter supply is fed from the power bus in the radio compass relay shield. Fuses for transmitter high voltage, transmitter low voltage and dynamotor circuits are located in the relay box on the top of the dynamotor unit.

DANGER: High voltages are employed in the operation of this equipment. For safe procedure refer to instruction book.

(To be furnished when available)

FIG. 106—LIAISON RADIO CIRCUITS (LR)

(2) Receiver

A Type BC-348-B receiver is located on the radio operator's table. Receiver plate voltage is supplied by a self-contained dynamotor. Power for the dynamotor and other receiver circuits is fed from the power bus and through a three ampere fuse in the radio compass relay shield, thence through a five ampere fuse in the receiver.

(3) Controls

Off-on switches are incorporated in the transmitter and receiver panels. A double pole, double throw, monitor test switch is located in the radio compass relay shield. This switch is so wired to permit, in the MONITOR position, receiver operation for test purposes independent of the transmitter send-receive relay.

Transmitter keying is accomplished through the means of a Type J-37 key on the radio operator's table. An antenna tuning unit, Type BC-306-A, is mounted on the sidewall above the transmitter. A Type BC-211-A portable frequency meter is furnished as a component of the liaison radio equipment. A holder for stowing this instrument is provided on the rear of the engineer's control stand.

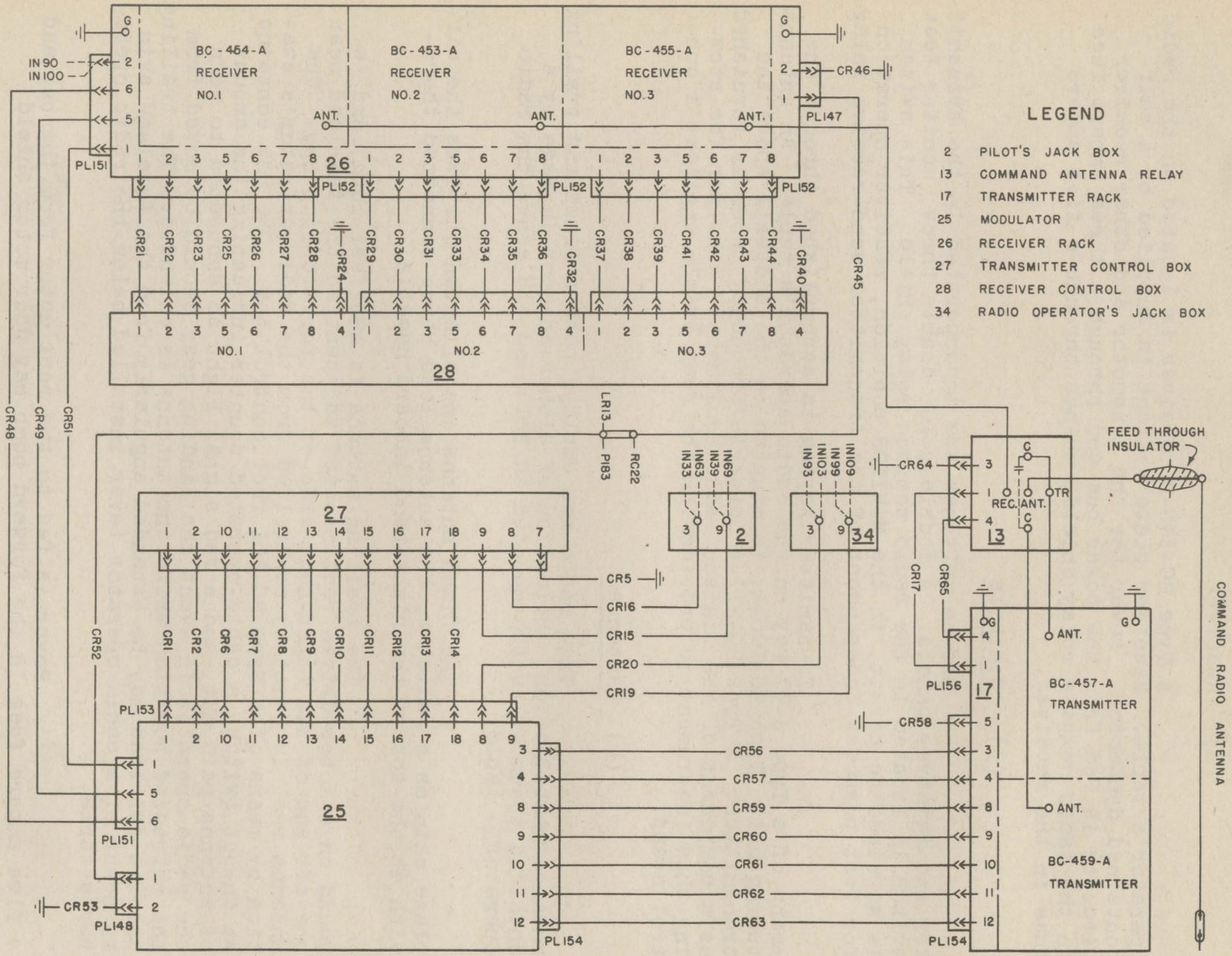
(4) Antennae

This radio set employs both a fixed and trailing antenna installation. Selection of either antenna is made by a shielded transfer switch mounted on Bulkhead 218 above the radio operator's table.

The fixed antenna installation utilizes the airplane skin as a radiator, the antenna lead being connected therewith at the top of the right-hand inboard nacelle.

The trailing antenna is 150 feet long, and is wound on a motor-driven reel mounted adjacent to the fairlead near the aft end of the right-hand side of the forward bomb bay. The antenna reel is remotely controlled from the radio operator's station by means of a Type BC-461 reel control box. The box contains an in-out switch, a cable-operated counter indicating the amount of antenna paid out, and a red signal light so connected to warn the radio operator in event the landing gear should be moved from the retracted position while the antenna is extended. The trailing antenna fairlead may be extended angularly from the fuselage skin by means of a cable operator lever installed below the radio operator's table.

Power is fed to the reel motor from the bus and a five ampere fuse in the forward bomb bay door motor shield.



LEGEND

2	PILOT'S JACK BOX
13	COMMAND ANTENNA RELAY
17	TRANSMITTER RACK
25	MODULATOR
26	RECEIVER RACK
27	TRANSMITTER CONTROL BOX
28	RECEIVER CONTROL BOX
34	RADIO OPERATOR'S JACK BOX

FIG. 107—COMMAND RADIO CIRCUITS (CR)

Current is supplied to the warning light through a relay in the radio compass relay junction box, and through its associated five ampere (cabin warning) fuse in the engineer's forward fuse panel.

c. Command Radio Set (SCR-287-N)

The command radio complement consists of a set of three receivers and a set of two transmitters, each set mounted in a special connector rack on the forward cabin sidewall above the radio operator's table. Separate remote control boxes for the transmitter and receiver sets are mounted on the cabin left-hand sidewall immediately below the windows at the pilot's station.

(1) Transmitters

The transmitting set comprises Type BC-457-A and Type BC-459-A transmitters. 600 volt direct current is supplied to the transmitters by the Type DM-33-A dynamotor within the Type BC-456-A modulator unit mounted on the cabin sidewall above the command receivers. Current is fed this unit from the radio compass relay shield power bus through fuses contained in the modulator unit.

Transmitter control is effected at the pilot's station by a Type BC-451-A transmitter control box. This box is provided with an "on-off", a "transmitter selector" and an "emission type selector" switch. Inasmuch as the dynamotor operates continuously while the emission selector is in the TONE or CW position, this switch should be left in the VOICE position to reduce battery drain and promote dynamotor life unless continuous tone or CW transmission is anticipated.

(2) Receivers

Type BC-453-A, BC-454-A and B-455-A receivers are used in this set. Three Type DM-32-A dynamotors located in the receiver rack unit furnish high voltage to the receivers. The receivers and dynamotors are fed from the radio compass relay junction shield power bus through three five ampere fuses in the receiver rack unit. Remote operation of each receiver is accomplished at the pilot's station with a Type BC-450-A receiver control box mounted on the sidewall adjacent to the transmitter control box.

(3) Antenna

The command radio antenna extends from the pitot tube mast at the top of the vertical fin to a lead-in insulator near Bulkhead 218. The antenna is coupled to the receivers and transmitters by an antenna transfer relay located on the cabin sidewall above the command transmitters.

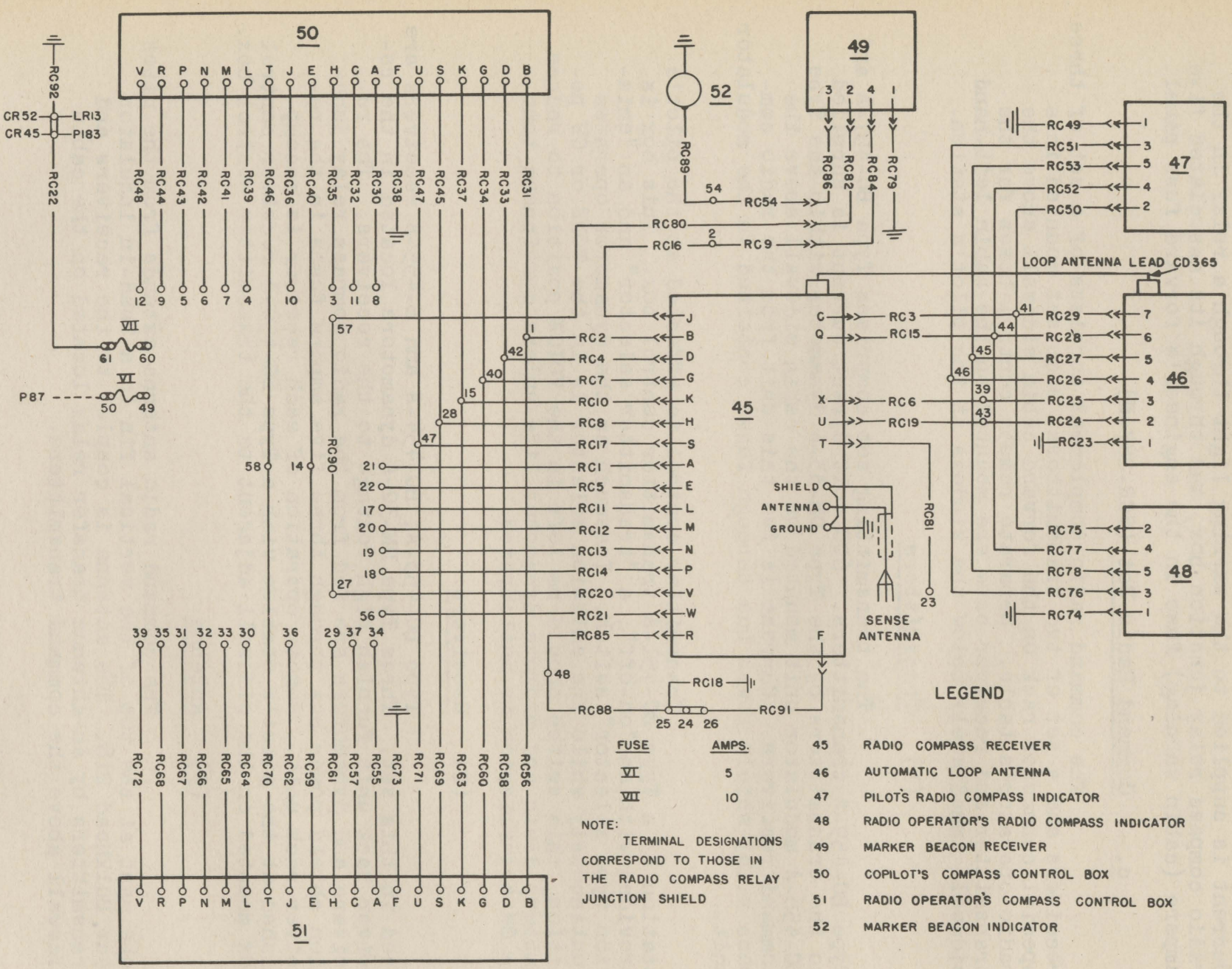


FIG. 108—RADIO COMPASS AND MARKER BEACON CIRCUITS (RC)

FUSE	AMPS.
VI	5
VII	10

NOTE:
TERMINAL DESIGNATIONS CORRESPOND TO THOSE IN THE RADIO COMPASS RELAY JUNCTION SHIELD

LEGEND

45	RADIO COMPASS RECEIVER
46	AUTOMATIC LOOP ANTENNA
47	PILOT'S RADIO COMPASS INDICATOR
48	RADIO OPERATOR'S RADIO COMPASS INDICATOR
49	MARKER BEACON RECEIVER
50	COPILOT'S COMPASS CONTROL BOX
51	RADIO OPERATOR'S COMPASS CONTROL BOX
52	MARKER BEACON INDICATOR

d. Radio Compass (SCR-269-A)

(1) Receiver

The radio compass receiver, Type BC-433-A, is mounted near the top of the forward cabin right-hand sidewall, aft of the engineer's instrument panel. Remote control of this receiver is accomplished by control boxes at the copilot's and radio operator's stations. Two Type BC-434-A control boxes are installed, one on the cabin sidewall above the copilot's control stand and one on Bulkhead 218 above the radio operator's table.

(2) Indicators

Two autosyn bearing indicators are employed in this set. A Type I-81-A and I-82-A indicator is mounted in the pilot's instrument board and in the aft portion of the radio operator's table respectively. The radio operator's indicator is protected by a cover hinged over the indicator well.

Both alternating and direct current is fed the equipment from power busses and through fuses located in the radio compass relay junction shield mounted below the liaison transmitter. The A.C. and D.C. fuses are of five ampere and two ampere capacities respectively. The Type BK-22-A relay is mounted on the rear side of the junction shield panel.

(3) Antenna

The loop unit, Type LP-21-A, with housing removed, is located in the after portion of the commander's observation dome. The retractable "whip", sense antenna is 52 inches in length and projects through the upper part of the fuselage above the engineer's window.

(4) Marker Beacon Set (RC-43-A)

The marker beacon receiver, Type BC-357-A, is a part of this equipment. The receiver is located in the fuselage under the center wing section and controls an indicator lamp in the pilot's instrument panel by means of a relay. This relay is sufficiently fast acting to follow transmitter keying (fan-type and C.A.A. instrument landing markers).

The receiver is powered through the radio compass supply and is in operation concurrently with the radio compass receiver.

The antenna for this receiver consists of 75.5 inches of wire mounted parallel to and 6 inches below the fuselage between bomb bay doors. The receiver is coupled to the antenna by a co-axial transmission line.

(To be furnished when available)

FIG. 109—INTERPHONE CIRCUITS (IN)

e. Interphone

(1) General

The interphone system provides intraplane communication between the several interphone stations. In addition it allows these stations limited use of the plane's radio facilities. The twelve interphone stations are located for the following personnel: bomber, pilot, copilot, forward gunner, engineer, navigator, radio operator, right-hand gunner, left-hand gunner, right-hand observer, left-hand observer and "crew" (near cameraman's pit). Each station is equipped with a Type BC-366 jack box, allowing a choice of the radio compass, command radio, liaison radio or interphone channel. Modulation of the command radio transmitter may be accomplished at all stations; however, modulation of the liaison radio transmitter is possible only at the pilot's, copilot's and radio operator's stations. Each jack box contains microphone and headset jacks, headset volume control and a channel selector switch. In the CALL position this switch will connect the station to all other stations without regard to their respective selector switch positions. A spring is provided to return the selector to the INTER position to prevent the selector from being left inadvertently in the CALL position.

(2) Amplifier

The interphone amplifier, Type BC-347, is located at the radio operator's station aft of and adjacent to the command radio modulator.

(3) Dynamotor

Amplifier plate voltage is supplied by a Type PE-86 dynamotor mounted below the amplifier and adjacent to the command radio receiver rack. Power is obtained from the power bus and through the five ampere fuse located in the radio compass relay shield. Inasmuch as there is no switch in this circuit, the amplifier and dynamotor will operate whenever the battery or generator circuits are on.

(4) Microphones

Type T-30 throat microphones are furnished all stations. Microphone "push-to-talk" switches are located on the aileron control wheels for each pilot and in the cabin floor (foot switch) for each gunner. All other stations are provided with standard cord switches.

(5) Filters (RC-32)

A Type FL-5B filter and associated control box, Type BC-345, is provided for each pilot to permit selective reception of either voice or range signals when both are being received simultaneously.