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PILOT'S FLIGHT OPERATING INSTRUCTIONS

FOR

AIRPLANES

ARMY MODELS

B-29 and B-29A

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Keller-Crescent Co., Evansville, Ind.—7-23-45—4,000

20 MAY 1945

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62	20 June 1945
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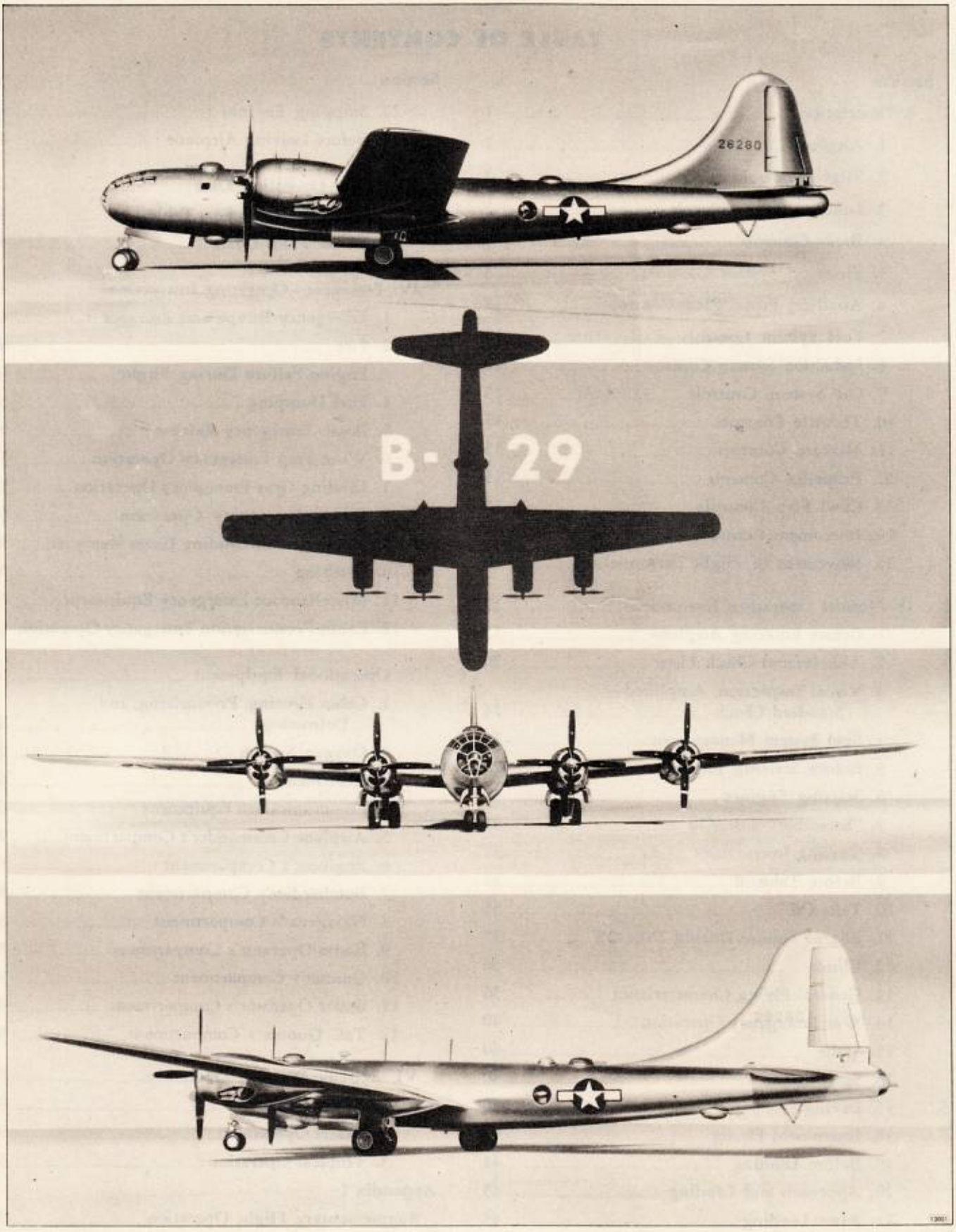


Figure 1—B-29 Bombardment Airplane

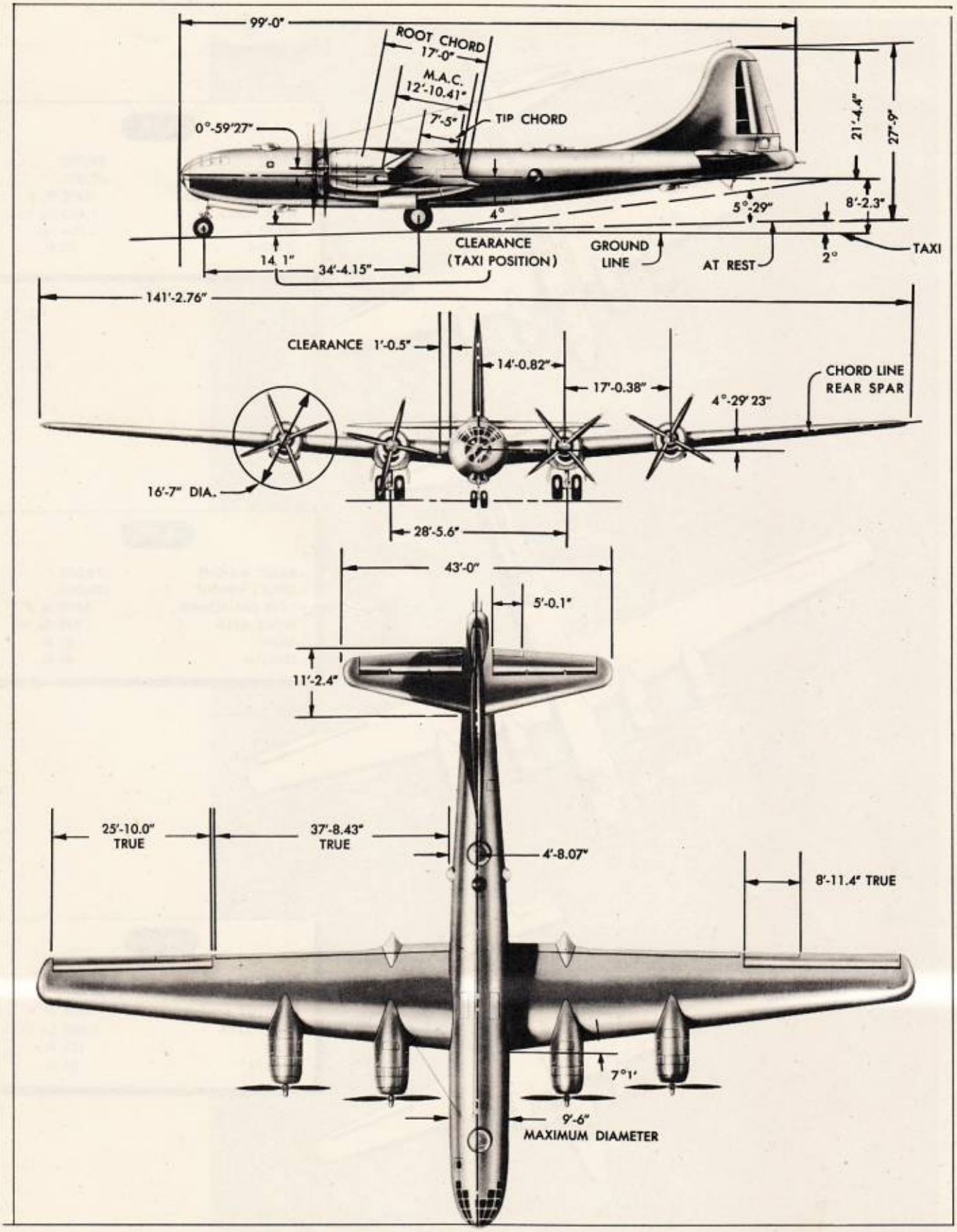
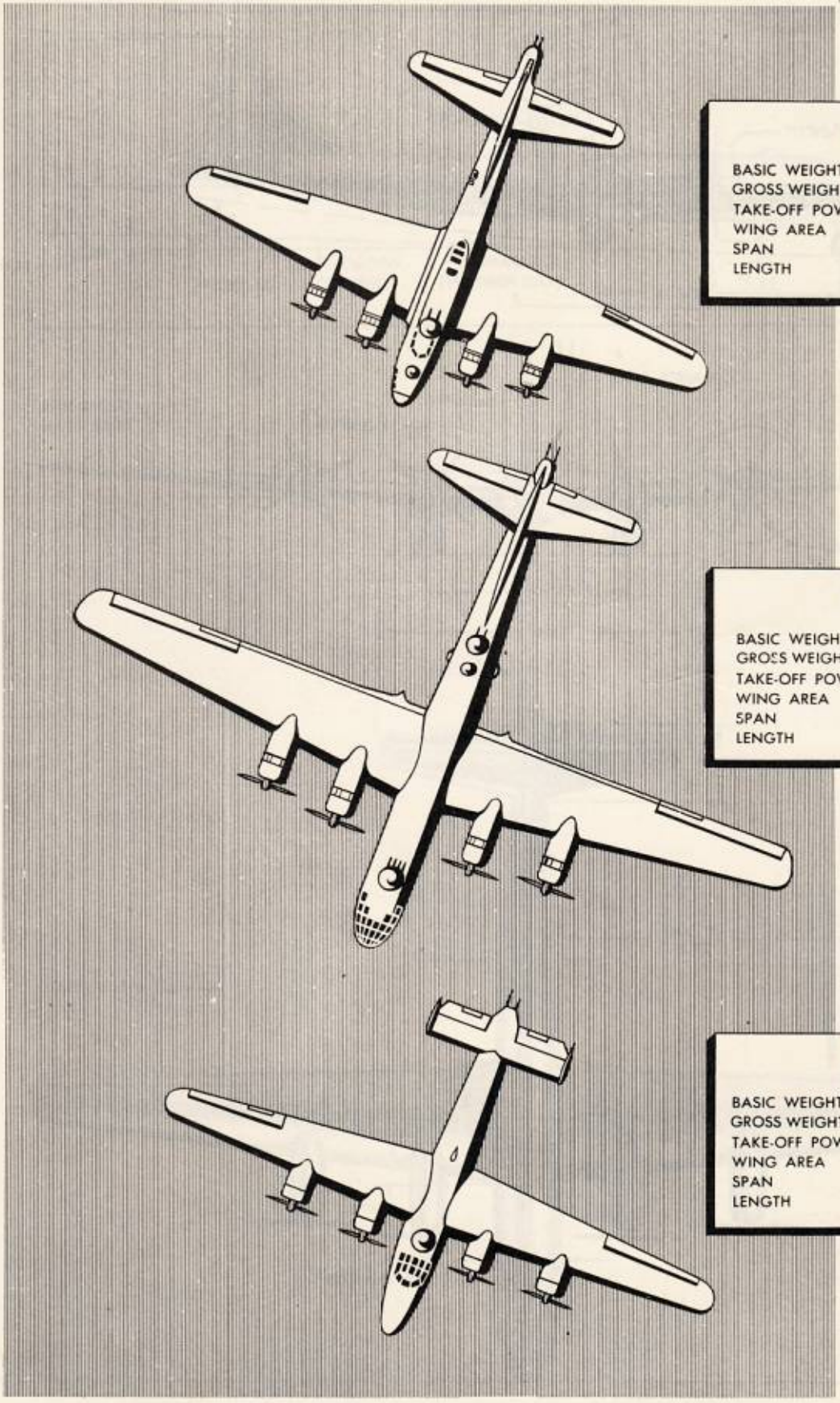


Figure 2—General Dimensions



B-17

BASIC WEIGHT	37,000
GROSS WEIGHT	60,000
TAKE-OFF POWER	4800 H. P.
WING AREA	1,420 Sq. Ft.
SPAN	104 Ft.
LENGTH	73 Ft.

B-29

BASIC WEIGHT	72,000
GROSS WEIGHT	120,000
TAKE-OFF POWER	8800 H. P.
WING AREA	1,738 Sq. Ft.
SPAN	141 Ft.
LENGTH	99 Ft.

B-24

BASIC WEIGHT	37,400
GROSS WEIGHT	60,000
TAKE-OFF POWER	4800 H. P.
WING AREA	1,050 Sq. Ft.
SPAN	110 Ft.
LENGTH	66 Ft.

Figure 3—Comparison B-17, B-29, and B-24

1. AIRPLANE.

a. GENERAL.—The B-29 very heavy bombardment airplane is designed for long range and high altitude operation. Auxiliary fuel tanks can be carried in both of the bomb bays. The tricycle landing gear and the tail skid are fully retractable, so that the aerodynamic cleanness of the airplane is not spoiled in flight. The wing spread is 141'3". In taxiing position the height of the tail is 29'6.7". The 99 foot long all metal fuselage is of semi-monocoque type, and is divided into compartments as shown in figure 4. Three of these compartments can be pressurized to afford comfort for the crew at extremely high altitudes. The forward pressurized compartment and the rear pressurized compartment are connected by a tunnel through which crew members may move to either compartment during flight. The tail gunner's pressurized enclosure is separate from the other compartments. The electrically operated wing flaps on the B-29 are exceptionally large; their function is conventional. Other conventional features of the airplane include trim tabs on ailerons, elevators, and rudder. Serial and model identification is stenciled on the nose (left side) of the airplane and is also on a metal plate fastened near the ceiling, on the upper forward turret structure in the forward pressurized compartment.

b. POWER PLANT.—There are four radial, 18 cylinder, R3350 engines, each with two exhaust-driven turbosuperchargers. The four bladed propellers can be fully feathered.

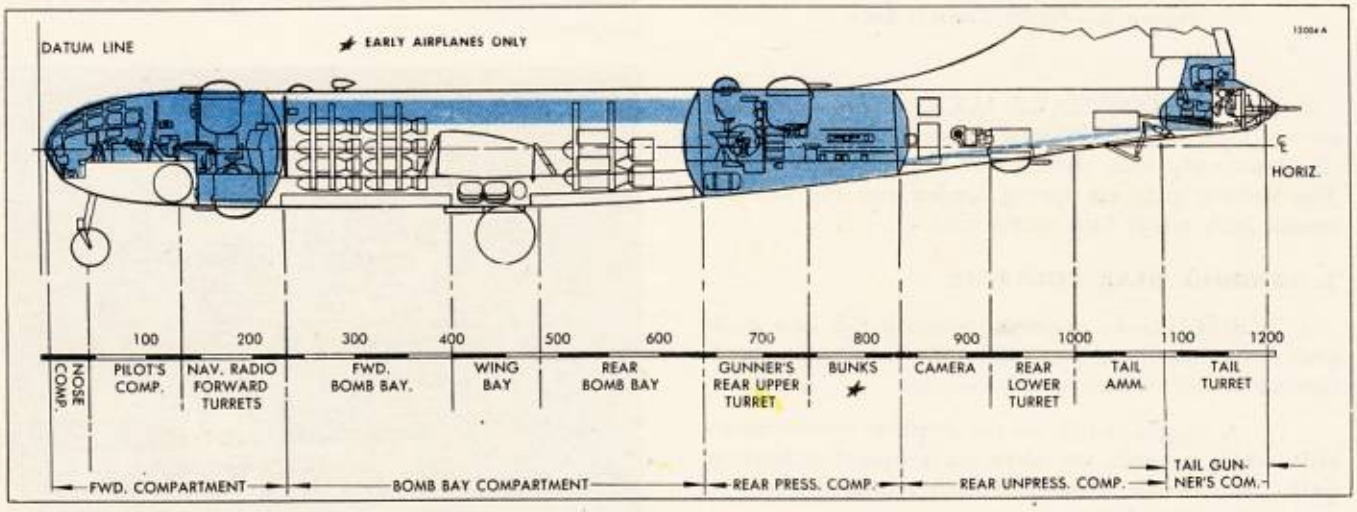


Figure 4—Pressurized Compartments Diagram

2. FLIGHT CONTROLS.

a. AUTOMATIC PILOT.—The main controls for the C-1 autopilot are on the aisle stand, as are the warning lights which indicate when servo motors are in operation.

b. WING FLAPS.—The wing flaps are actuated electrically, and controlled by a switch on the A-C aisle stand. A position indicator is on the copilot's instrument panel. If the flaps are not lowered between 20 and 30 degrees before take-off, the warning horn will blow when the throttles are opened 3/4 or more. In emergency the flaps can be operated by use of the portable electric motor which is normally stowed on top of the midwing section within the fuselage.

c. TRIM TABS.—The aileron trim tabs are geared to move when the ailerons move. The shape of the wing airfoil contour is such that the part covered by the ailerons is hollow on top and is full at the bottom. If the control cables get broken, the ailerons would ordinarily trim down because of this shape. To avoid this, the trim tabs are rigged down one inch at the trailing edge, which tends to trim the ailerons to more nearly neutral if the cables are shot.

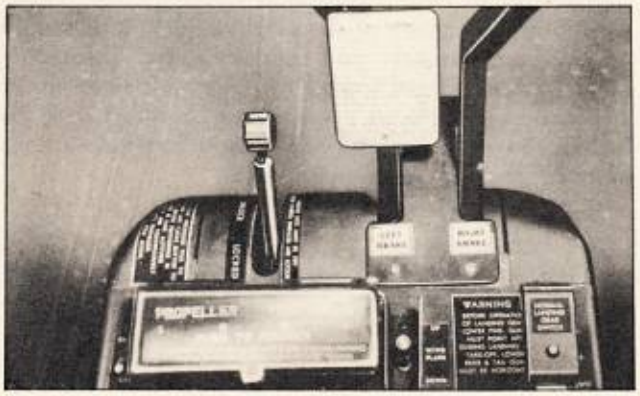


Figure 5—Flight Control Lock

d. FLIGHT CONTROLS LOCK.—The lock lever on the aisle stand will lock all control surfaces and simultaneously lock throttles in the closed position. The locking pins are spring loaded and the surfaces cannot lock when lock cables fail.

3. LANDING GEAR CONTROLS.

a. NORMAL.—In normal operation the two main gear units, nose gear unit, and tail skid retract simultaneously and extend simultaneously.

(1) A toggle switch on the airplane commander's aisle stand controls the electrically operated landing gear. The switch is shielded with a hinged guard to prevent accidental movement.

(2) Four warning lights for landing gear position are on the copilot's instrument panel.

b. EMERGENCY.

(1) EARLY AIRPLANES.—In emergency operation each main gear and the nose gear must be operated separately by an individual switch for each gear. There is no emergency means of extending or retracting the tail skid.

(a) POWER TRANSFER.—Power is directed for emergency landing gear use through the landing gear transfer switch (on the airplane commander's control stand), and the bus selector switch (battery solenoid shield). Both switches direct power to the emergency bus; the former from the engine driven generators, the latter from the put-put and battery.

(b) MAIN GEAR SWITCHES. — Emergency switches for the main landing gear units are on the forward wall of the forward bomb bay, near the pressure door. The switch on the right side is for the right main gear; the switch on the left is for the left main gear.

(c) NOSE GEAR SWITCH —The emergency nose gear switch is on the aft wall of the nose wheel well, just below floor level.

(d) LANDING GEAR DOOR RELEASE. -The emergency main gear door release is the TEE handle on the A.C. control stand.

(2) AIRPLANES WITH MANUAL EMERGENCY LANDING GEAR.

(a) EMERGENCY MAIN GEAR.—Each main gear can be operated manually with hand cranks or with the portable auxiliary wing flap motor. A gear box for operation of each main gear is on each side wall, above the catwalk just aft of the rear wing spar; a nacelle door and clutch pull-handle on the bulkhead at the forward end of the rear bomb bay serves to disconnect the normal electric motors, engages the manual system, and releases the nacelle doors. Handcranks are stowed near the gear boxes and pull handles.

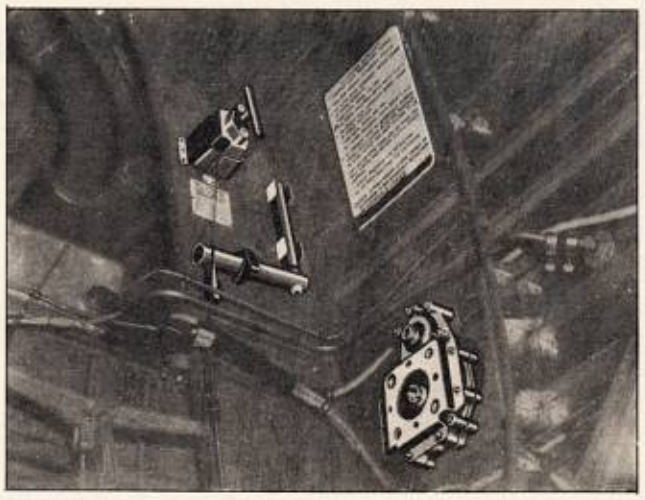


Figure 6—Manual Main Gear Controls

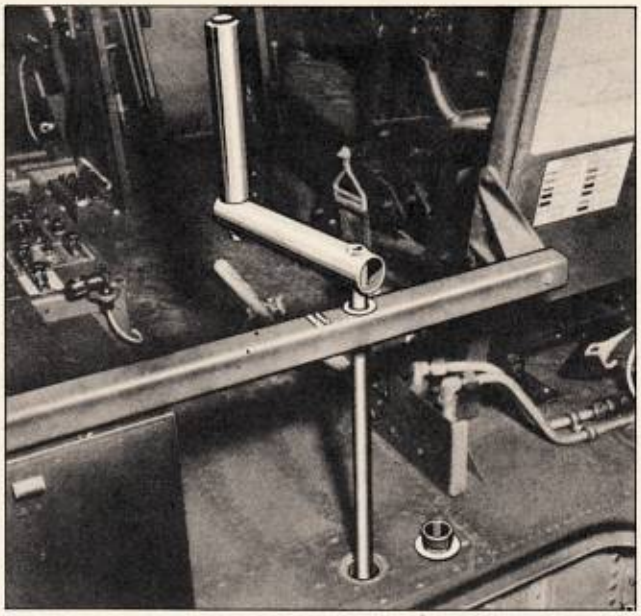


Figure 7—Nose Gear Crank in Place

(b) EMERGENCY NOSE GEAR. — The gear box socket is accessible through a hole in the floor aft of the aisle stand. The hole is normally closed with a plug. The crank is stowed beneath the entrance hatch. A bracing beam for the crank is clamped to the copilot's armor plate stanchion.

4. BRAKE CONTROLS.

a. GENERAL.—The B-29 has hydraulic brakes, and the hydraulic system is for the brakes only.

b. NORMAL AND PARKING BRAKES.—The normal brakes are controlled by toe pressure on the rudder pedals. The parking brake has a button type pull handle on the airplane commander's rudder pedal stand. After the brakes are set the knob should stay out. The parking brakes can be set only at the airplane commander's station.

c. EMERGENCY BRAKES.—For emergency use, there are two brake levers on the aisle stand.

d. ELECTRIC PUMP.—An electric pump keeps up pressure in the two hydraulic system accumulators. An automatic pressure switch starts the pump at 800 PSI and stops it at 1000 PSI. The pressure switch won't operate at system pressure below 200 PSI. A relief valve for the system is set at 1075 PSI.

e. PUMP SWITCH.—A momentary contact switch (engineer's switch panel) is used to start the hydraulic pump if the automatic pressure switch fails to do so at 800 PSI.

f. GAGES AND WARNING LIGHTS.—A normal system pressure gage and a warning light are on the copilot's control stand; the light flashes on at 625 PSI. A normal system pressure gage, an emergency system pressure gage, and an emergency warning light are on the engineer's instrument panel; the emergency system warning light flashes on at 900 PSI.

g. FILLER VALVE CONTROL.—A filler valve for the emergency accumulator is on the engineer's instrument panel. The valve handle pointer is normally at "CLOSED." To charge the emergency accumulator, the pointer of the valve handle is turned to "OPEN."

h. HAND PUMP. — The hydraulic system hand pump is on the floor at the copilot's left. It should be used well in advance of the time brakes are to be applied if hand pumping is needed to build up hydraulic system pressure.

5. ELECTRICAL SYSTEM CONTROLS.

a. GENERAL.—The B-29 uses a 28 volt, direct current, electrical system. Power is supplied by six engine driven generators; two on each outboard engine and one on each inboard engine. Switches for the generators are on the engineer's switch panel. An additional generator driven by the put-put supplies the necessary additional power required for starting, takeoff, or landing. A battery supplies supplemental power which can be directed to the power bus while on the ground or during flight. The battery also stabilizes power surges in the electrical system.

(1) An ammeter, a voltmeter, and a selector switch are on the engineer's instrument panel of all airplanes. Late airplanes have individual ammeters for each generator.

b. BUS SELECTOR SWITCH.—Early airplanes have a bus selector switch on the battery solenoid shield (near the put-put) which transfers power to the emergency bus for emergency landing gear motors and the portable electric motor.

c. EXTERNAL POWER. — The external power socket is on the wall of the nose wheel well.

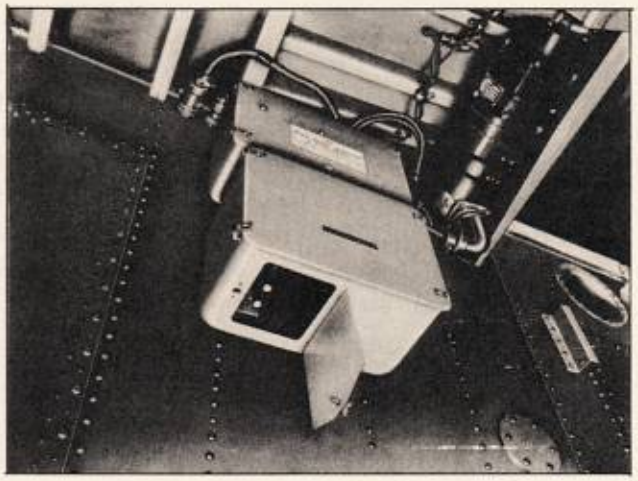


Figure 8—External Power Receptacle

Figure 9—Inverter Controls—Late Airplanes

d. INVERTERS.—There are two inverters; one main or normal, and one alternate which is used if the main inverter fails. These inverters change direct current power into alternating current.

(1) EARLY AIRPLANES. — On early airplanes the only inverter control is a toggle switch on the engineer's switch panel. When turned to "NORMAL" it operates the main inverter, and when turned to "ALTERNATE" it operates the alternate inverter.

(2) LATE AIRPLANES.—Late airplanes have an automatic changeover relay for the inverters which assures an uninterrupted alternating current supply. If the 115 volt line current drops to 70 volts or lower, or, upon starting engines if the current fails to build up within eight seconds, the alternate inverter will automatically cut in. A voltmeter for the inverter output circuit is on the engineer's instrument panel.

(a) INDICATOR LIGHTS.—There are two operation indicator lights on the engineer's switch panel and two identical lights are on the airplane commander's panel. With the normal inverter operating, both indicator lights will be off. Upon failure of the normal inverter, one light at each station comes on. Upon failure of both normal and alternate inverters both lights at both stations come on.

(b) CONTROLS. — Controls for the inverters are on the engineer's switch panel. A toggle switch labeled "NORMAL ON," "OFF," "ALTERNATE ON" is centrally located on the panel. A circuit breaker reset push button for the inverters, and one for the indicator lights, are near the inboard end of the panel.

ITEM	NORMAL LOAD (amperes)	PEAK BATTLE LOAD (amperes)
Upper forward turret	132.5	275.5
Upper aft turret	132.5	275.5
Lower forward turret	84.	84.
Lower aft turret	84.	84.
Tail turret	252.	420.
Tail ammunition booster motors (2)	40.	40.
Cameras (3)	6.	6.
Camera heaters (3)	2.	2.
Flight clothing (for 10)	75.	150.
C-1 Autopilot	6.	6.
Defroster blower motor (RH)	13.4	13.4
Defroster blower motor (LH)	25.	25.
Bomb doors forward	240.	240.
Bomb doors aft	240.	240.
Landing gear (2)	460.	
Nose gear	155.	
Wheel doors (2)	280.	
Propeller anti-icer pump (2)	4.2	
Wing flaps	200.	
Hydraulic pump	110.	110.
Landing lights	52.	
Liaison radio	38.	38.
Interphone	1.7	1.7
Radar	100.	100.
Radio compass and marker beacon	3.3	3.3
IFF radio	5.	5.
VHF command radio	11.5	11.5

Figure 10—Table of Amperage Loads

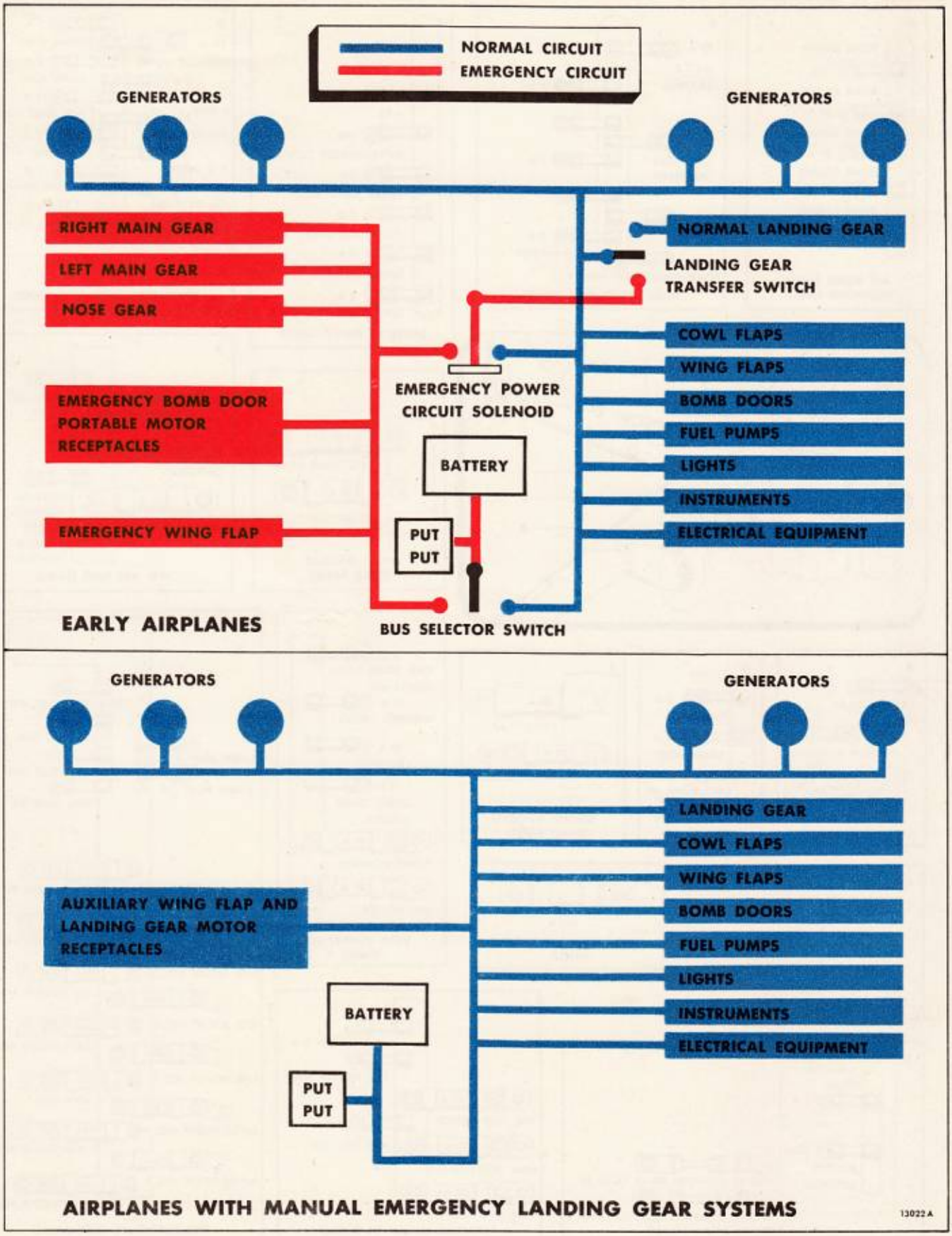


Figure 11—B-29 Power Distributing Systems (Simplified)

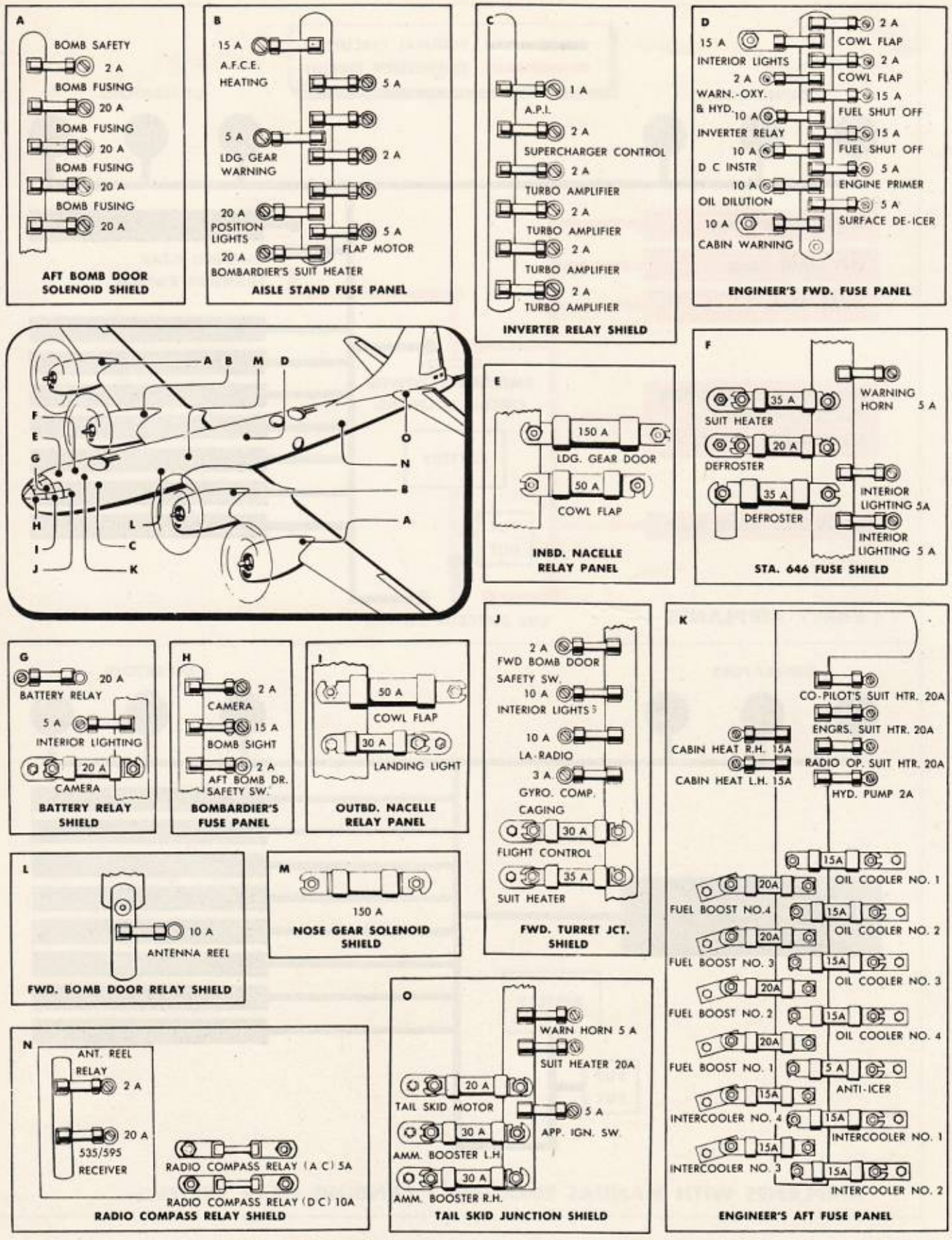


Figure 12—Typical Fuse Panels and Location Diagrams

e. FUSES.—There are 17 fuse panels in all airplanes, and an additional fuse panel in radar equipped airplanes. The radar and raven fuse panel is described in section V. There is a type and location list of fuses on the back of the copilot's armor plate and one on the back of the top gunner's seat. The bombardier's fuse panel, engineer's two fuse panels, aisle stand fuse shield, and turret junction shield are accessible at any time. The four nacelle solenoid panels are inaccessible in flight. The remaining six are inaccessible during pressurized flight: nose gear solenoid shield, forward and aft bomb door motor solenoid shields, inverter relay shield, battery solenoid shield, and the tail skid junction shield. A replacement for each active fuse is mounted either within or on the side of each fuse shield.

f. SPARE LAMPS.—Spare lamps for the A-6, A-7, A-9, B-7, C-4, and C-5 lights are stowed in a holder in the navigator's cabinet. A spare lamp panel in the top of the tail gun enclosure also holds two spare lamps for either the C-4 spotlight or the A-7 light. A spare lamp for the copilot's compass is on the copilot's instrument panel.

g. SUIT HEATER OUTLETS.—There is a 24 volt receptacle and rheostat for the suit heaters at each crew station.

h. INTERIOR LIGHTS.—There are dome lights for general lighting throughout the airplane. An extension light is by the auxiliary power plant.

(1) INSTRUMENT LIGHTING.—The copilot's compass is internally lighted and is controlled through a rheostat on the auxiliary panel (copilot's control stand). Fluorescent lights with shutters, on the airplane commander's and the copilot's instrument panels are controlled by rheostats on the respective auxiliary panels. The engineer's fluorescent lamps are controlled by rheostats on the auxiliary panel, (on the wall to the left).

(2) SPOTLIGHTS.—There is an adjustable spotlight with self-contained rheostat at each of the following stations: airplane commander, copilot, navigator, radio operator, top gunner, right gunner, and tail gunner.

(3) TABLE LIGHTS.—The engineer, navigator, radio operator, and bombardier are each provided with a table light.

i. EXTERIOR LIGHTS.

(1) RECOGNITION. — The conventional red, green, amber, and white recognition lights have toggle switches, and a keying push-button, on the aisle stand.

(2) POSITION.—The wing tip and tail position lights have switches on the aisle stand. Switch positions are "BRIGHT," "OFF," "DIM."

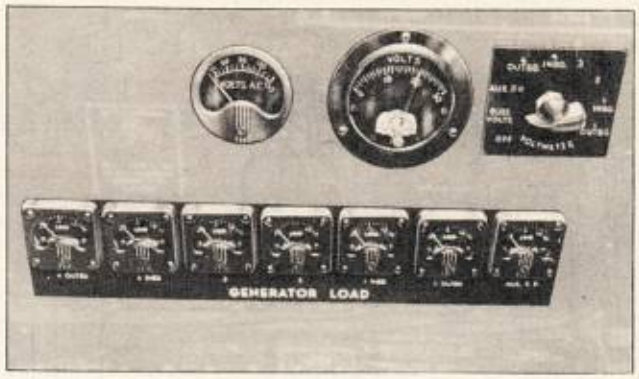


Figure 13—Ammeters and Voltmeters

(3) FORMATION. — There are three formation (blue) lights on the upper surface of the fuselage, and three on the upper surface of each wing, aft of the rear spar. The control rheostat is on the aisle stand.

(4) LANDING. — The landing lights turn on when they are extended (down) and turn off when retracted (up). A switch for each light is on the aisle stand. Wheel well spot lights for visual check at night have a switch on the engineer's panel.

j. INTER-AIRCRAFT SIGNAL LAMP.—The portable signal lamp has a trigger control on the handle. The cord may be plugged into any suit-heater receptacle. On early airplanes the lamp is stowed by the aisle stand. On late airplanes it is stowed in a bracket to the right of the engineer's instrument panel.

6. AUXILIARY POWER PLANT CONTROLS.

a. GENERAL.—The auxiliary power plant is in the rear unpressurized compartment. It drives a 200 ampere generator which supplies extra electrical power for the landing gear, starters, and other equipment. The unit has its own air cooling system, fuel and oil supply, and controls. It is not supercharged; above 10,000 feet its voltage output decreases as altitude increases.

(1) CONTROLS.—Controls on the unit consist of an ignition switch, a momentary energizing switch, start and run switch, fuel control lever, generator switch, and an equalizer switch, (to equalize voltage with that of the six engine-driven generators).

b. BUS SELECTOR SWITCH. — The bus selector switch (early airplanes) is used to direct A.P.P. output power to the emergency bus for emergency landing gear motors and the portable electric motor.

c. REMOTE CONTROLS.—Remote controls are on the engineer's instrument panel. The engineer's voltmeter will register A.P.P. voltage output when the voltmeter switch nearby is turned to "AUX PP." On late airplanes there is a switch at the left side of the engineer's panel which can turn the A.P.P. ignition "OFF." Above this switch is an indicator light which is labeled "A.P.P. IGN. ON WHEN LIT."

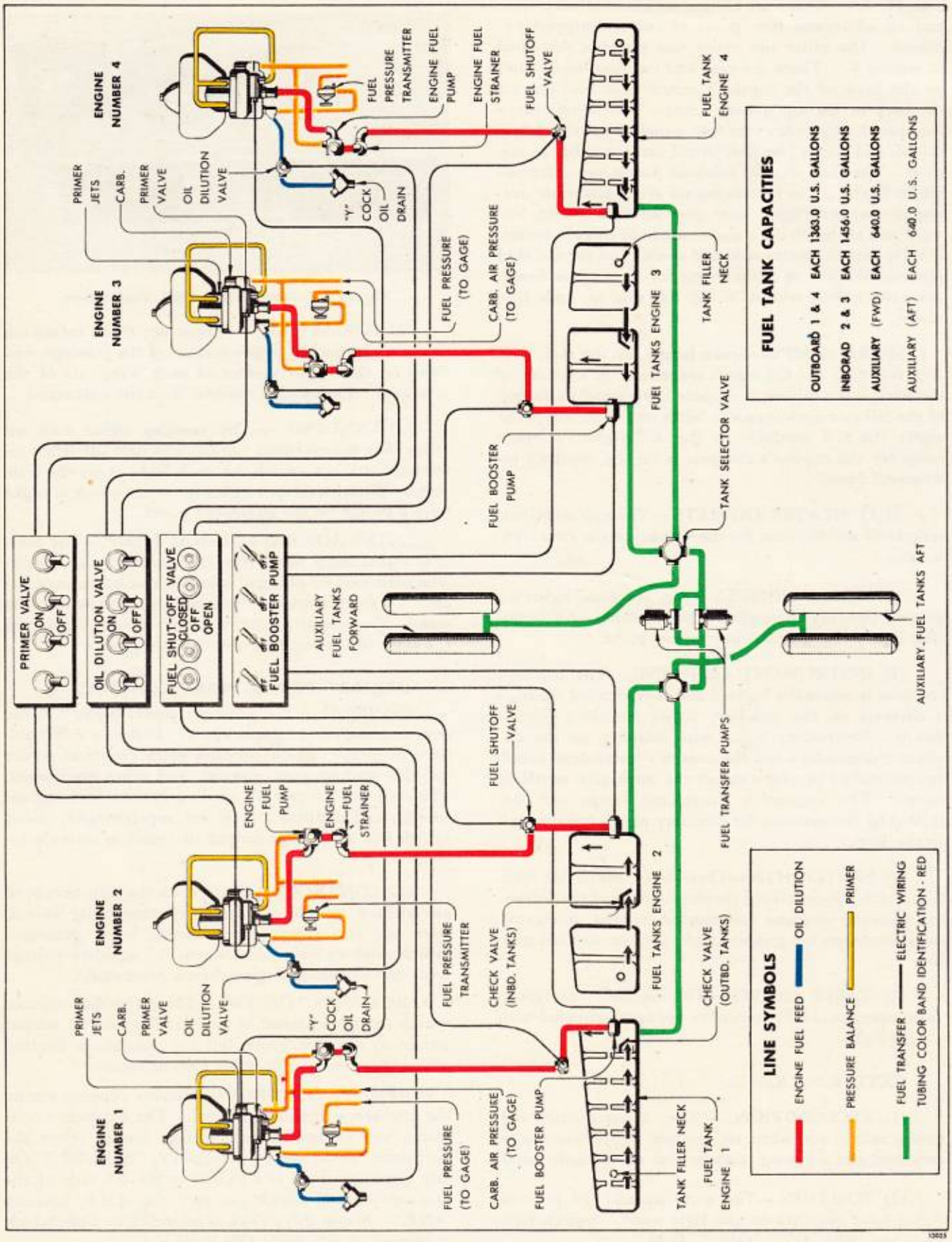


Figure 14—Fuel System Flow Diagram (Early Airplanes)

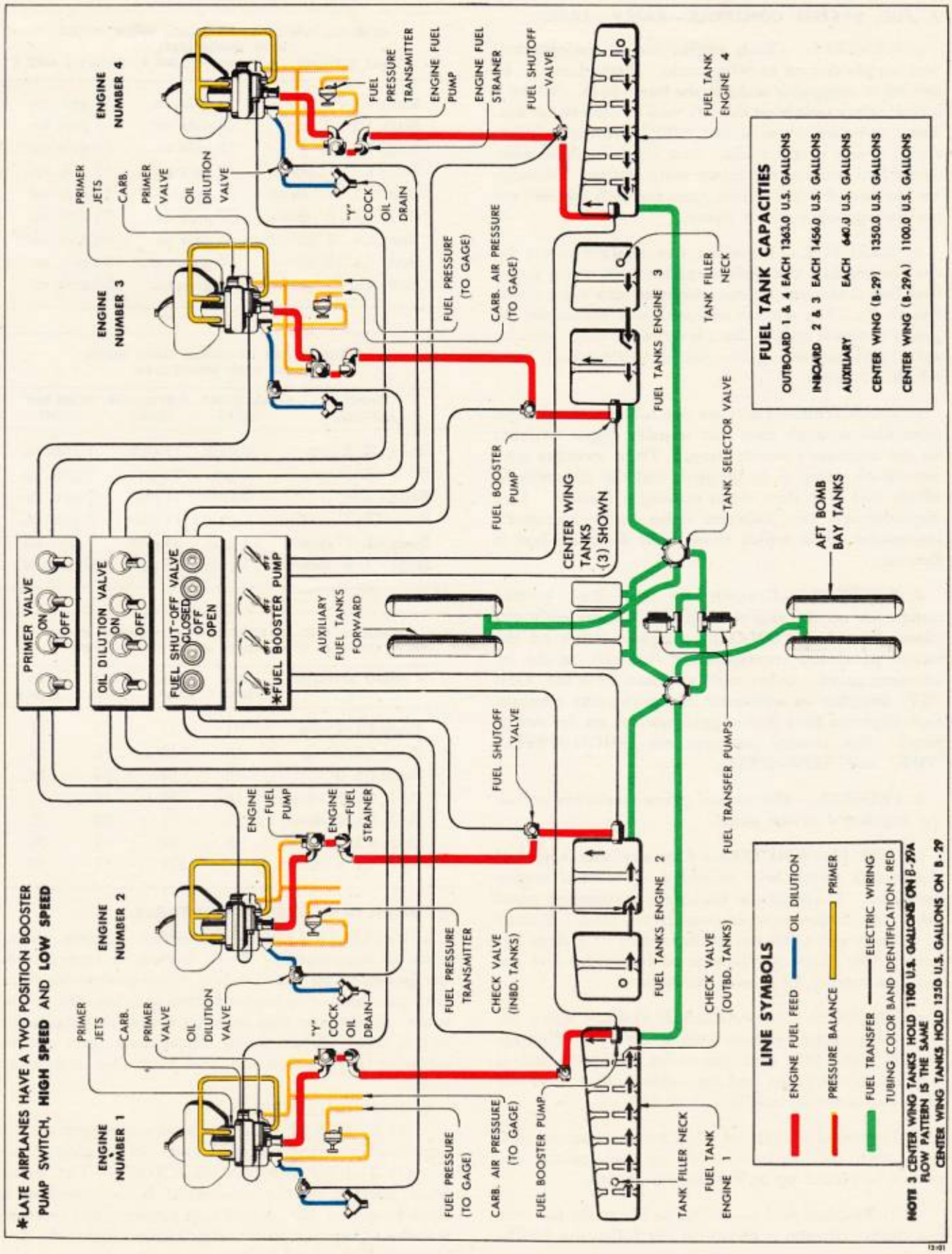


Figure 15—Fuel System Flow Diagram (Late Airplanes)

7. FUEL SYSTEM CONTROLS—EARLY—LATE.

a. GENERAL. — Each engine has an independent fuel supply carried in wing tanks. Extra fuel can be carried in droppable tanks in the bomb bays. There is a tank safety switch on the left wall of each bomb bay. These switches, when turned "OFF," prevent unintentional release of the tanks. Late airplanes have additional fuel tanks in the center wing section. Switches for the fuel shut-off valves, (one for each engine) are on the engineer's switch panel.

b. SELECTOR.—There are two selector valves for the fuel tanks. On early airplanes each valve serves four fuel tanks, and on late airplanes each valve serves five tanks. The selector control levers are on the engineer's control stand. Each lever controls one selector valve, and has settings for the individual fuel tanks which it serves.

c. TRANSFER.—There are two fuel transfer pumps, controlled through four fuel transfer toggle switches on the engineer's switch panel. These switches govern which pump is to be used, and the direction in which fuel is to flow when making a transfer. Late airplanes have two indicator lights on the engineer's instrument panel which show what direction fuel is flowing.

d. BOOSTER. — Controls for the fuel booster pumps are on the engineer's panels. Some early airplanes have four "ON-OFF" toggle switches on the switch panel and corresponding rheostats on the instrument panel. Other early airplanes have the "ON-OFF" switches incorporated in the rheostat controls. Late airplanes have four toggle switches on the switch panel. The control positions are "HIGH-SPEED," "OFF," and "LOW-SPEED."

e. PRIMERS.—The engine primer switches are on the engineer's switch panel.

f. FUEL FLOWMETERS.—Late airplanes have fuel flowmeters which help to assure economical engine operation. Dials on the engineer's instrument panel show fuel consumption in pounds per hour. A chart at the engineer's left shows conversion to gallons per hour. The accuracy tolerance is: flowmeter five per cent, transmitter 10 pounds per hour.

g. TRAPPED UNAVAILABLE FUEL.—When doing extreme maneuvers or making a steep landing approach with low fuel quantities, residual fuel is trapped in the tanks, and can cause one or more engines to cut out because of lack of fuel.

(1) Several gallons of fuel are trapped in each tank, with the airplane at rest on the ground, and cannot be picked up by the booster pumps.

(2) Residual fuel quantities in the tanks for various flight attitudes is shown in the following tabulations:

RESIDUAL FUEL IN WING TANKS WHEN FLYING WITH WINGS LEVEL

FLIGHT ATTITUDE	TANKS 1 AND 4	TANKS 2 AND 3
Body CL 4° up	21 gals. ea.	17 gals. ea.
Body CL 2° up	18 gals. ea.	17 gals. ea.
Body CL 0°	18 gals. ea.	23 gals. ea.
Body CL 2° down	18 gals. ea.	37 gals. ea.
Body CL 4° down	21 gals. ea.	55 gals. ea.
Body CL 6° down	27 gals. ea.	71 gals. ea.
Body CL 8° down	33 gals. ea.	86 gals. ea.
Body CL 15° down	70 gals. ea.	190 gals. ea.
Body CL 20° down	105 gals. ea.	268 gals. ea.

RESIDUAL FUEL IN CENTER TANKS WHEN FLYING WITH WINGS LEVEL

FLIGHT ATTITUDE	B–29A CENTER TANKS	B–29 CENTER TANKS	BOMB BAY TANKS
Body CL 2° up	0 gals.	17 gals.	3 gals. ea.
Body CL 4° up	1 gal.	24 gals.	9 gals. ea.
Body CL 0°	0 gals.	11 gals.	0 gals. ea.
Body CL 2° down	4 gals.	13 gals.	3 gals. ea.
Body CL 4° down	14 gals.	28 gals.	9 gals. ea.
Body CL 6° down	25 gals.	57 gals.	16 gals. ea.

RESIDUAL FUEL QUANTITIES FOR VARIOUS FLIGHT ATTITUDES WITH EITHER WING 2-1/2° DOWN

FLIGHT ATTITUDE	Gals. TANK 1	Gals. TANK 2	Gals. TANK 3	Gals. TANK 4
Body CL 4° up	21	17	17	21
Body CL 2° up	18	18	16	18
Body CL 0°	18	32	14	18
Body CL 2° down	18	50	24	18
Body CL 4° down	21	72	38	21
Body CL 6° down	28	99	43	26
Body CL 8° down	36	121	51	30

8. INDUCTION SYSTEM CONTROLS.

a. INTERCOOLERS.—Intercoolers regulate carburetor air temperature. With intercooler flaps closed, the incoming air remains hot; when intercooler flaps are open, the air is cooled before entering the carburetor. Intercooler flap switches are on the engineer's switch panel; carburetor air temperature gages and intercooler flap position indicators are on his instrument panel.

b. SUPERCHARGER.

(1) GENERAL.—The turbosuperchargers are all regulated by a single control knob on the aisle stand.

(2) TURBO BOOST SELECTOR. — The turbo boost selector on the aisle stand is calibrated with stops from 1 to 10. A dial stop prevents dial rotation into the emergency power range beyond eight; the dial stop can be released by pressure to the right.

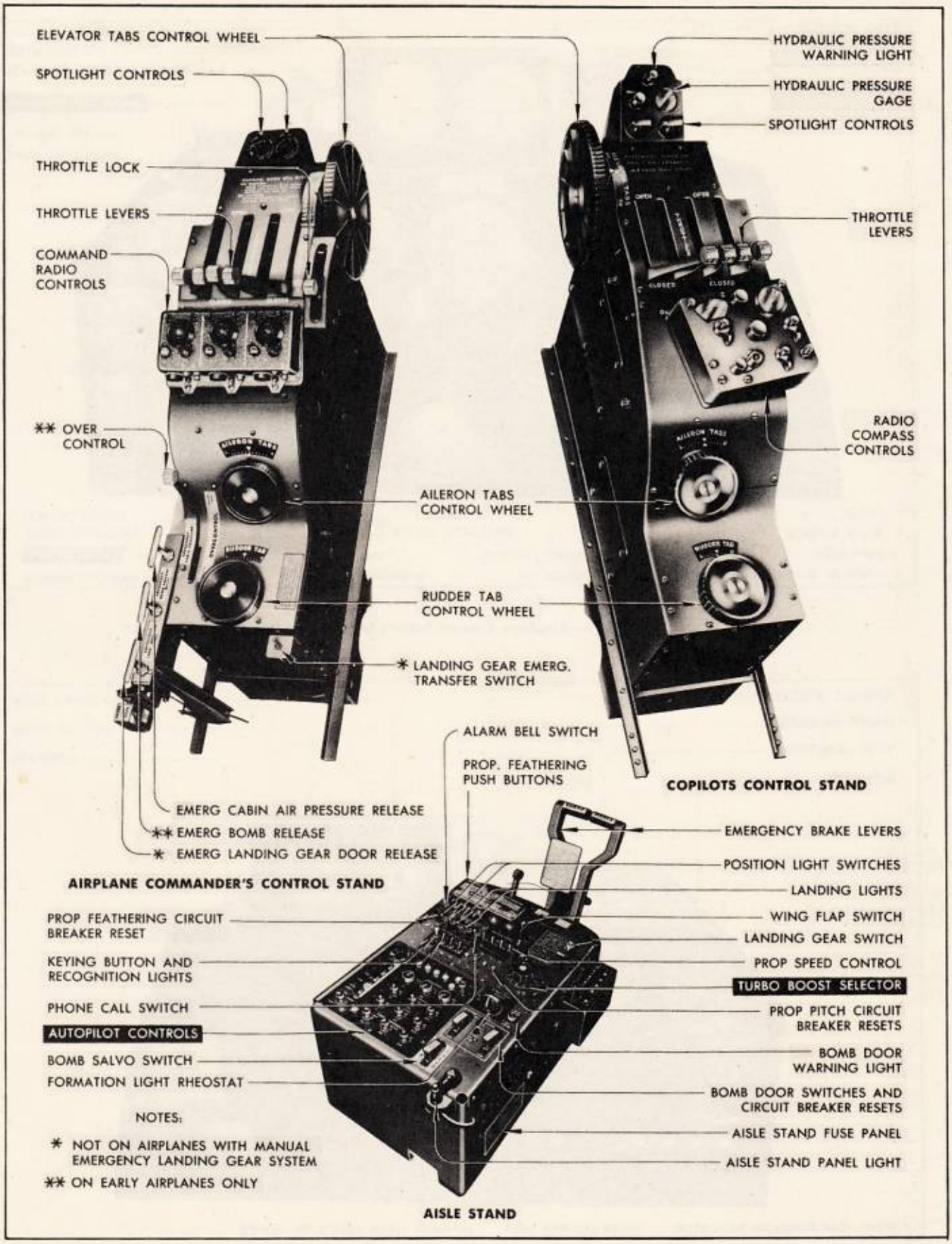


Figure 16—Control Stands

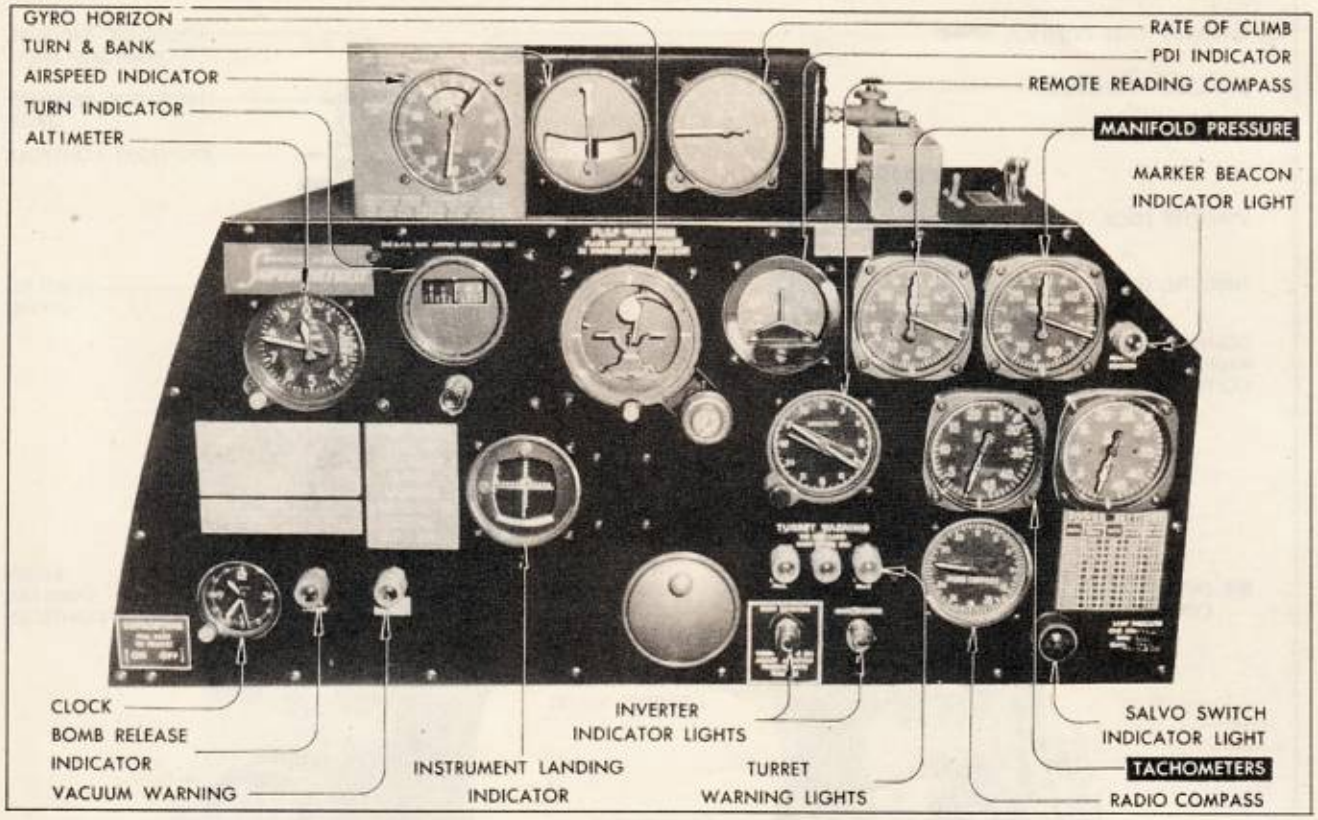


Figure 17—Airplane Commander's Instrument Panel

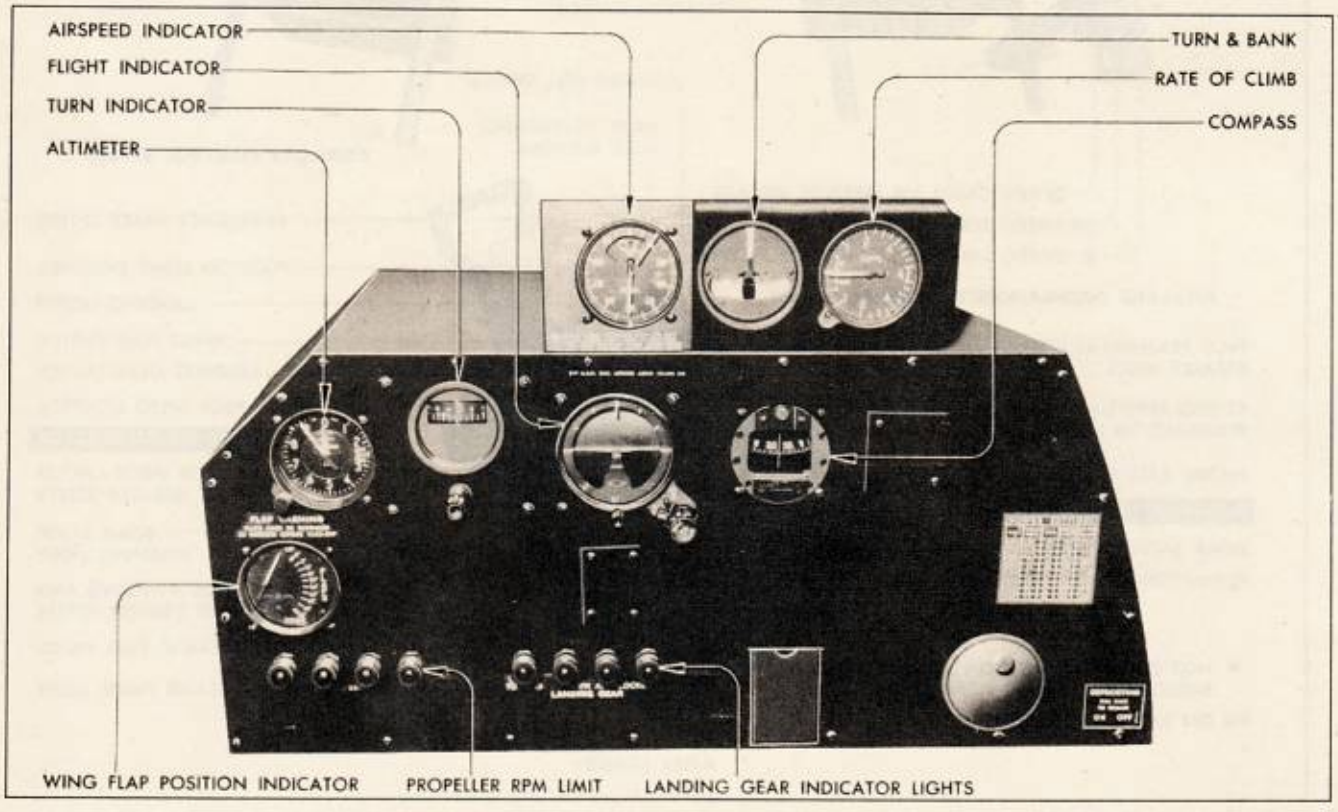


Figure 18—Copilot's Instrument Panel

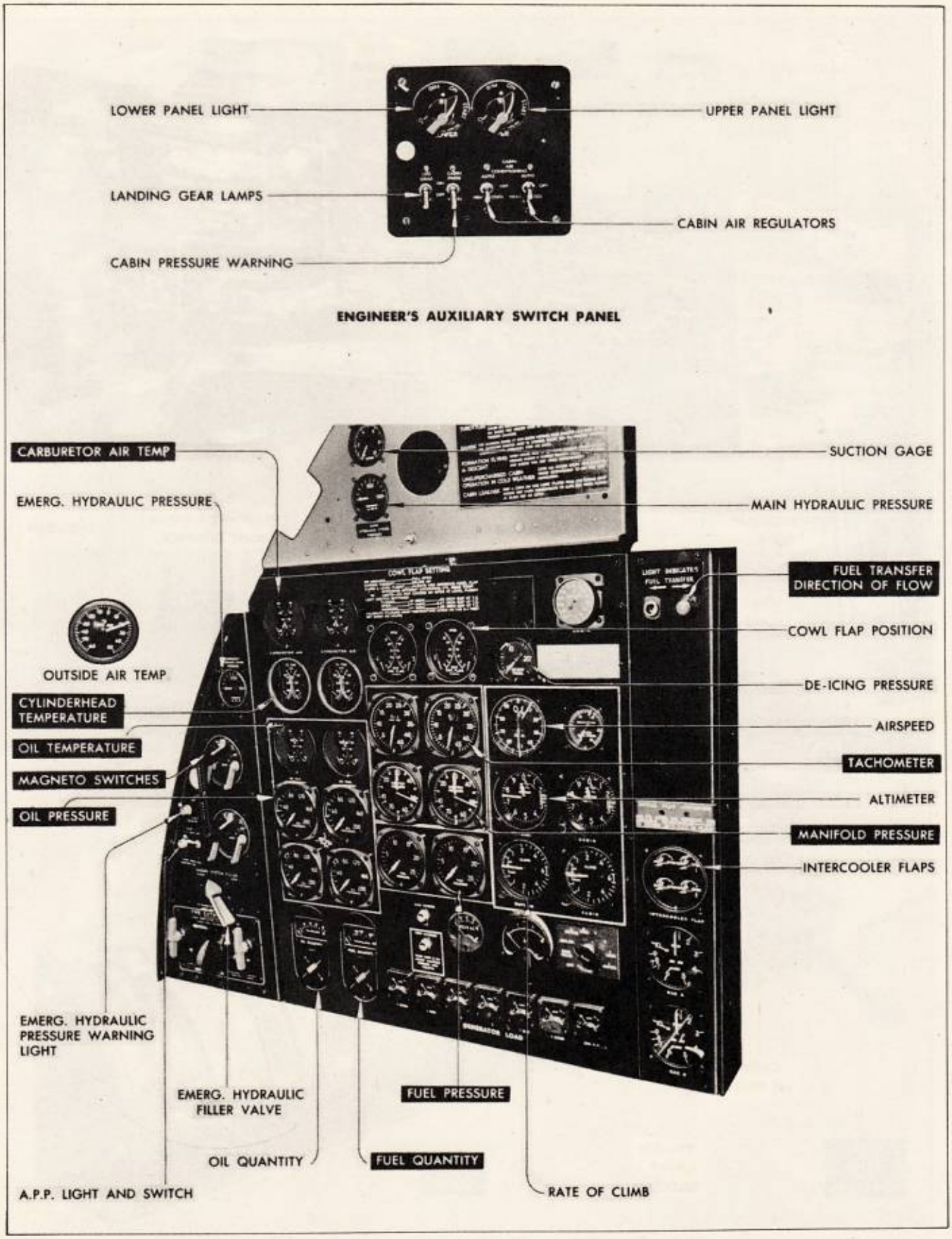


Figure 19—Engineer's Instrument Panel

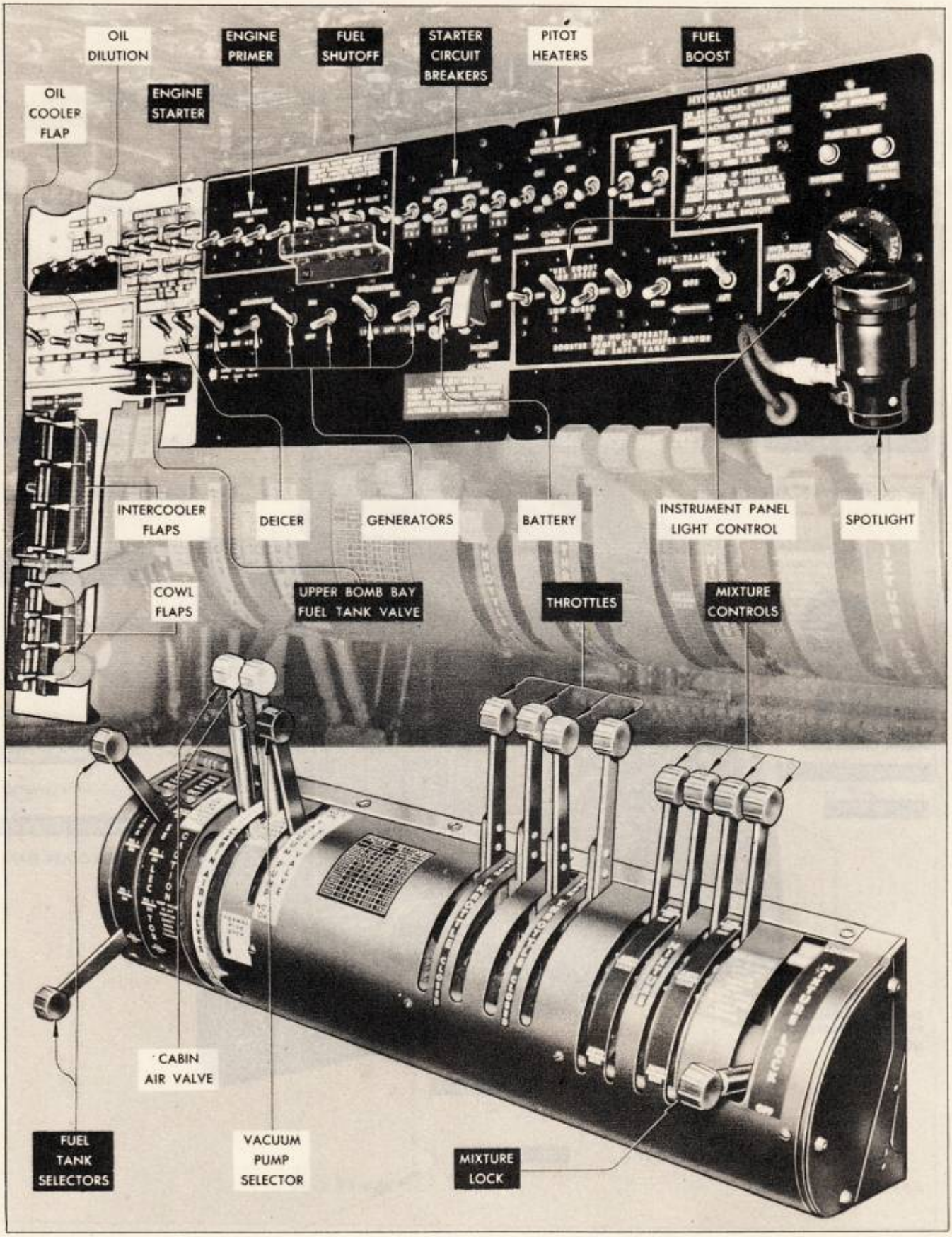


Figure 20—Engineer's Switch Panel and Control Stand

9. OIL SYSTEM CONTROLS.

a. GENERAL.—There is an independent oil supply system for each engine. The oil tank quantity gages, oil pressure gages, and oil temperature gages, are on the engineer's instrument panel.

b. DILUTION—The oil dilution switches (one for each engine) are on the engineer's switch panel.

c. COOLER SHUTTERS.—An oil cooler for each system is on the OUT line between the engine and the oil tank. The shutters are controlled through switches on the engineer's switch panel. The switches have four positions: "OPEN," "AUTOMATIC," "CLOSE," and "OFF."

10. THROTTLE CONTROLS.

a. GENERAL.—Throttle control levers are located on the airplane commander's, the copilot's, and the engineer's control stands.

b. OVERCONTROL.—Some early airplanes have an overcontrol lever on the airplane commander's control stand. This lever is used to disengage the engineer's throttles.

c. THROTTLE POSITIONS. — Throttle positions are conventional. The levers will stay as they are manually placed except that when an engine control cable is severed, the corresponding throttle will move to the full "OPEN" position.

d. THROTTLE FRICTION.—A throttle lock lever, to the right of the airplane commander's throttles, gives proper friction to the throttle levers.

11. MIXTURE CONTROLS.

a. GENERAL.—Carburetor mixture control levers are on the engineer's control stand.

b. MIXTURE POSITIONS.—Mixture control levers have three positions: "FUEL CUT-OFF," "AUTO LEAN," and "AUTO RICH."

12. PROPELLER CONTROLS.

a. GENERAL.—Oil pressure, controlled by governors, is used to regulate propeller R.P.M. The governors are controlled by electric motors which are actuated through switches on the aisle stand.

b. PROPELLER POSITION.—There are four propeller speed control switches on the aisle stand. "INCREASE" position gives high engine RPM and "DECREASE" gives low RPM. Signal lights on copilot's panel indicate limit of governor travel in either direction. There are four circuit breaker reset buttons (aisle stand) labeled "PROP PITCH," and "PUSH TO RESET."

c. PROPELLER FEATHERING.—Magnetic push-button switches for propeller feathering are on the aisle stand. A transparent hinged guard over the buttons prevents accidental feathering.

13. COWL FLAP CONTROLS.

a. GENERAL. — The cowl flaps are controlled through momentary contact switches on the engineer's switch panel. Cowl flap position indicators are on the engineer's instrument panel.

b. WARNING HORN.—The warning horn blows steadily if the cowl flaps are open more than 15 degrees when the throttles are more than 3/4 open.

14. INSTRUMENT CONTROLS.

a. GENERAL.—The flux gate compass, directional gyro, and flight indicator have caging knobs, and altimeters have conventional adjusting knobs. Pitot heater switch breakers are on the engineer's switch panel.

b. VACUUM SELECTOR.—The vacuum pump selector (engineer's control stand) can be set to use number 2 or number 3 engine vacuum pump, either of which will pull vacuum for directional gyros, flight indicators, deicer system, and cameras.

15. MOVEMENT OF FLIGHT PERSONNEL.

a. GENERAL.—The forward and the rear pressurized compartments afford ample room for crew members to move around as necessary, and the tunnel may be used whether or not the compartments are pressurized. When the airplane is not pressurized, crew members can also move throughout the rear unpressurized compartment and the bomb bays.

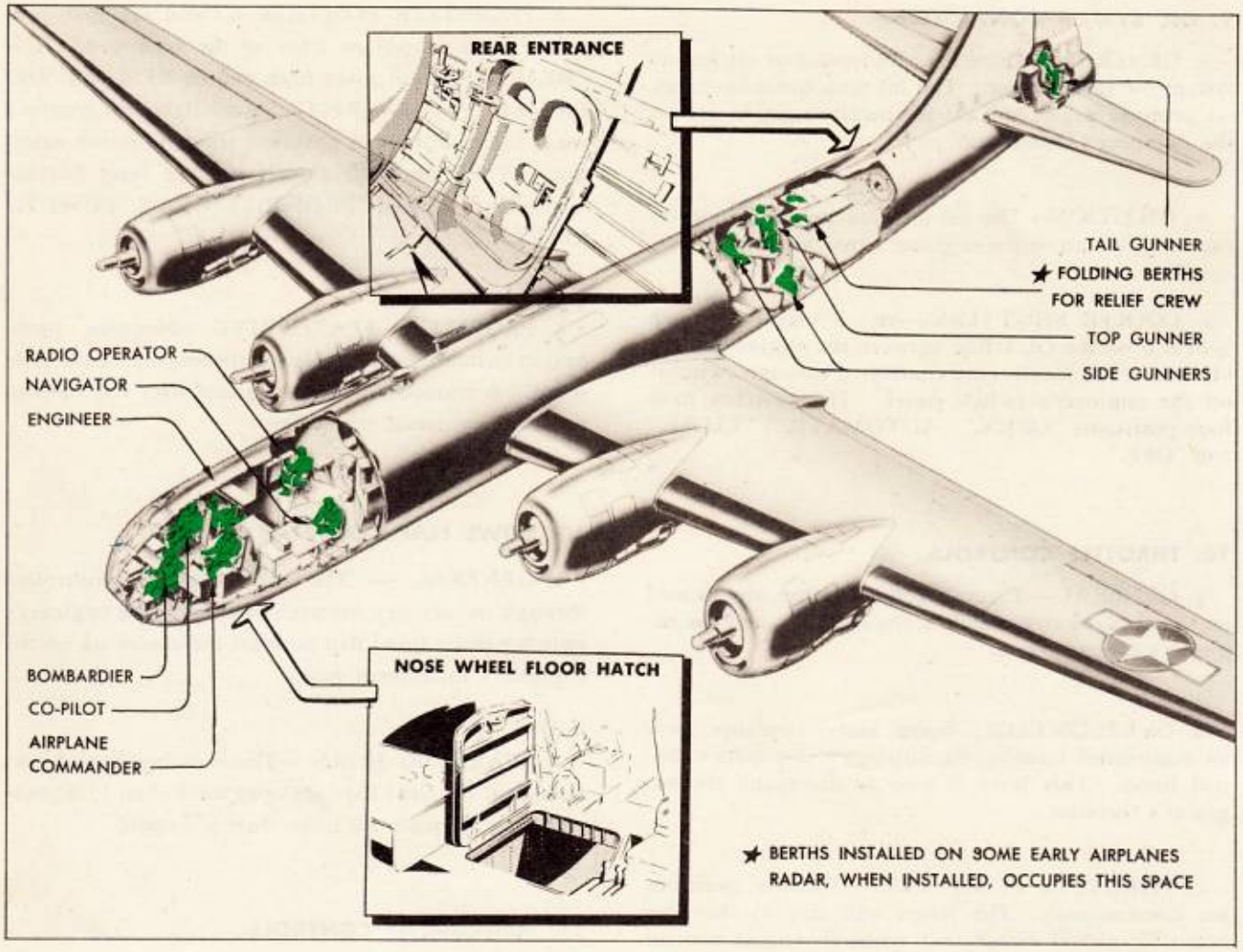


Figure 21—Crew Stations and Access to Airplane

1. BEFORE ENTERING AIRPLANE.

a. RESTRICTIONS.

(These limitations may be supplemented or superseded by instruction included in service publications.)

(1) FLIGHT RESTRICTIONS.—DIVES, LOOPS, SPINS, ROLLS, SLIPS, IMMELMAN TURNS, and INVERTED FLIGHT are prohibited maneuvers.

(2) AIRSPEED LIMITATIONS.

(a) MAXIMUM AIRSPEED.—Do not exceed 300 MPH (IAS) at any time (all altitudes).

(b) WING FLAPS.—Don't lower wing flaps completely above 180 MPH (IAS). The flaps may be lowered 25° at a maximum speed of 220 MPH (IAS).

(c) LANDING GEAR.—Don't lower landing gear at speeds in excess of 180 MPH (IAS).

(d) BOMB DOORS.—Don't open bomb doors at speeds in excess of 225 MPH (IAS).

(e) LANDING LIGHTS.—Don't extend landing lights at speeds in excess of 180 MPH (IAS).

(3) TAXIING INSTRUCTIONS.—The B-29 is a big airplane. Watch clearance at all points while taxiing. Don't ride your brakes. Don't pivot on one wheel.

(4) GROUND OPERATING RESTRICTIONS.—Run the engine at the lowest possible RPM for the shortest possible time. Begin taxiing as soon as all engines are running. Idle and taxi with all engines at 700 RPM.

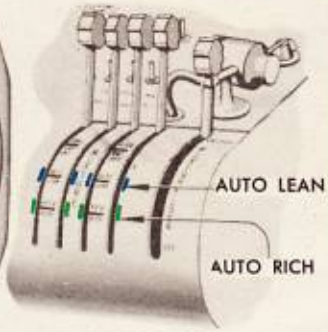
b. TAKE-OFF GROSS WEIGHT AND BALANCE.—Check Form F, and, if necessary, Form F-1, to see that weight and balance are satisfactory for take-off. The center of gravity must not be aft of 34 per cent M. A. C.

c. AIRPLANE COMMANDER'S AND ENGINEER'S CHECK.

(1) Condition of tires
(2) Chocks in place
(3) Oleo struts
(4) Hydraulic lines
(5) Shimmy damper
(6) Engine fire extinguishers
(7) Nacelle cannon plugs
(8) Wheel well door cables
(9) Pitot mast covers off
(10) Cowling and access door fasteners tight
(11) Engines and propellers
(12) Turbos, nacelles, and air scoops
(13) Control surfaces, flaps, and trim tabs
(14) Windows and sighting blisters
(15) All seams and connections for fluid leaks
(16) Form 1A, Loading List, Weight, and C.G.
(17) Crew inspection

d. HOW TO GAIN ENTRANCE.—Entrance to the airplane may be gained either through the nose wheel well floor hatch or the rear entrance door on the right aft side of the airplane.

POWER LIMITS ARE FOR GRADE 100/130 FUEL

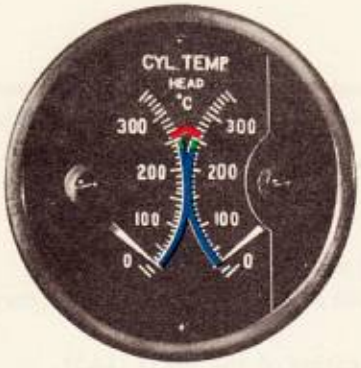


MIXTURE CONTROL

- *49 in.
- 50.5 in.
- 24 to 35 in.
- 35 to 43.5 in.

*UNLESS AFFECTED BY T.O. 01-20EJ-79

- *2800 rpm
- 1400 to 2200 rpm
- 2200 to 2400 rpm



- 260 C
- 25 C to 232 C
- 232 C to 248 C

CARBURETOR AIR TEMPERATURE

- 40 C
- -10 C 15 C
- 15 C to 40 C

OIL TEMPERATURE

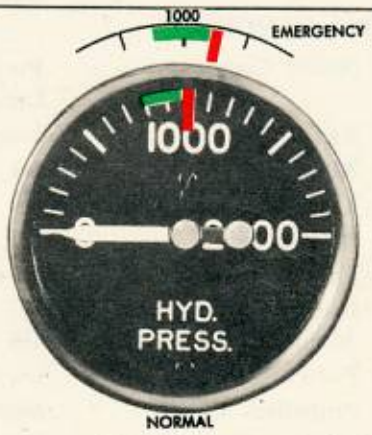
- 40 C
- 95 C
- 50 C to 85 C

	Rear	Front
	60 psi	20 psi
	80 psi	50 psi
	60 to 80 psi	30 to 50 psi

Figure 22—Instrument Limitations

300
180

15 psi
19 psi
16 to 18 psi



NORMAL	EMERGENCY
1000	1075
800 TO 1000	900 TO 1075

3.8
4.2
3.8 to 4.2

10
6 to 8.5

Figure 23—Instrument Limitations

2. ABBREVIATED CHECK LISTS.

a. AIRPLANE COMMANDER AND COPILOT.

—BEFORE STARTING ENGINES

	Airplane Comdr.	Copilot
(1) All Ignition Switches	Off	
(2) Propellers pulled through	OK	
(3) Parachute	OK	OK
(4) Clothing	OK	OK
(5) Life Preserver	OK	OK
(6) Parking Brakes and Chocks	SET	SET
*(7) Emergency Landing Gear Door Release	In Place	
*(8) Emergency Bomb Release	In Place	
(9) Emergency Cabin Pressure Release	In Place	
*(10) Landing Gear Transfer Switch	Normal	
*(11) Throttle Overcontrol	Engaged	
(12) Landing Gear Switch and Fuse	Down Fuse Checked	
(13) Battery Switch	On	
(14) Put-Put	Started	
(15) Hydraulic Pressure Main and Emergency	OK	OK
(16) Flight Controls	Checked	
(17) Radios	Checked	Checked
(18) Altimeters	SET	SET
(19) Turrets (lights out)	Stowed	
(20) Seats and Pedals	OK	OK
(21) Lights	Checked	Checked
(22) Oxygen	OK	OK
(23) Propellers	High RPM	
(24) Turbos	"0" Dial	
(25) Engineer's Report	Check list complete. Ready to start Engines.	
(26) Stand Clear—Fire Guard	Clear left Clear right	

—BEFORE TAXIING

(1) Vacuum	OK	
(2) Gyros	Uncaged	Uncaged
(3) Instruments	Checked	Checked
(4) Alarm Bell	OK	
(5) Phone Call Signal Light	OK	
(6) Combat Station Inspection	OK	
(7) Chocks	OUT left OUT right	
(8) Parking Brakes	Off, stand by to taxi	

*Early Airplanes Only

—BEFORE TAKE-OFF

(1) Bomb Doors	Closed	Closed
(2) Emergency Brakes	Checked	
(3) Airplane headed into wind		
(4) Nose Wheel	Straight	
(5) Engine Run-Up	Oil temp. 40° C Min. Stand by.	
(6) Wing Flaps	25 Degrees	
(7) Trim Tabs	Set	
(8) Auto Pilot	Off	
(9) Windows and Hatches	Closed	Closed
(10) Turbos	No. 8	
(11) Propellers	High RPM	
(12) Crew	Prepare for Take-Off	
(13) Radio Call	Completed	
(14) Throttle Brake	OK, Stand by for Take-Off	

—BEFORE LANDING

(1) Notify Crew	Prepare for Landing	
(2) Radio Call	Completed	
(3) Altimeters	Set	Set
(4) Trailing Antenna	In	
(5) Auto Pilot	Off	
(6) Turrets	Stowed	
(7) Hydraulic Pressure Main and Emergency	OK	OK
(8) Put-Put	On the line	
(9) Propellers	2400 RPM	
(10) Landing Gear	Down and Lights on	
(11) Engineer's Report	Check List Complete Weight ..... CG	
(12) Stall Speed	..... MPH	
(13) Wing Flaps	Standing By	
(14) Turbos	No. 8	

—AFTER LANDING

(1) Hydraulic Pressure	OK	
(2) Turbos	"0" Dial	
(3) Propellers	High RPM	
(4) Wing Flaps	Up	
(5) Parking Brakes	Set	
(6) Bomb Bay Doors	Open	
(7) Magnetos	Checked	
(8) Engines	Stopped	
(9) Radios	Off	
(10) Controls	Locked	
(11) Wheel Chocks (Left) (Right)	Chocks in Place Chocks in Place	
(12) Form 1 and 1A	Accomplished	
(13) Crew Inspection		

b. ENGINEER

—BEFORE STARTING ENGINES

(1) Flight Plan	Completed
(2) Engineer's Preflight	Completed
(3) Forms 1, 1A, and F	Completed
(4) Parachute	OK
(5) Clothing	OK
(6) Life Preserver	OK
(7) Battery Switch	ON
(8) Put-Put	Start
(9) Instruments	Check
(10) Emergency Hydraulic Pres.	OK
(11) Hydraulic Fluid	Proper Level
(12) Cabin Pressure Switch	On
(13) Fuel Boost Pumps	On
(14) Fuel Transfer Switches	Off
(15) Fuel Shut Off Valve	Off
(16) Inverter	On
(17) Mixture Controls	Fuel Cutoff
(18) Throttles	Set to Start
(19) Engineer's Cabin Air Valves and Relief Valve	Closed
(20) Cowl Flaps	Open
(21) Intercoolers	Open
(22) Oil Cooler Flaps	Automatic
(23) Pitot Heat	Off
(24) De-icers	Off
(25) Anti-icers	Off
(26) Generators	Off
(27) Fuel Quantity Gage	Check against dip stick
(28) Oil Quantity Gage	Proper Reading
(29) Emergency System Valve	Closed
(30) Oxygen	OK
(31) Lights	OK
(32) Put-Put	On Line
(33) Engineer's Report	Ready to Start Engine

—STARTING ENGINES

(1) Engine Fire Extinguisher	Set to Engine Being Started
(2) Master Ignition Switch	On
(3) Start Engines	1, 2, 3, 4.
(4) Engine Instrument Readings	Checked
(5) Vacuum	Checked

—BEFORE TAXIING

(1) Engineer's Report	OK

—BEFORE TAKE-OFF

(1) Bomb Bay Doors	Power to Close
(2) Generators	Checked
(3) Magnetos	Checked
(4) Mixture Controls	Auto-Rich
(5) Fuel Boost Pumps	On
(6) Report	Ready for Take-off
(7) Generators	On
(8) At start of take-off Roll, during Roll, and Take-Off	Pull Cowl Flaps from 15 deg. to 7½ deg. at time wheels leave ground.
(9) Intercoolers	1/2 Open

—AFTER TAKE-OFF

(1) When Gear Is Coming Up	Check Generators
(2) After Flaps and Gear Are Up	Stop Put-Put
(3) Cowl Flaps	Adjust as required
(4) Fuel Boost Pumps	Off

—CLIMB AND CRUISE

See Engineer's Amplified Check.

—BEFORE LANDING

(1) Weights and C.G.	Call in to Copilot
(2) Mixture Controls	Auto-Rich
(3) Put-Put	Start
(4) De-icers	Off
(5) Anti-icers	Off
(6) Fuel Boost Pumps	On
(7) Intercoolers	Open
(8) Cowl Flaps	Open to 7½ deg.
(9) Emergency Hydraulic Pres.	OK
(10) Report	Ready for Landing

—AFTER LANDING

(1) Cowl Flaps	Open
(2) Intercoolers	Open
(3) Generators	Off
(4) Boost Pumps	Off
(5) Bomb Bay Doors	Power to Open
(6) Magnetos	Checked
(7) Engines	Fuel Cut-Off
(8) All Switches	Off
(9) Wheel Chocks	In Place
(10) Brakes	Off
(11) Controls	Locked
(12) Flight Log	Complete
(13) Forms 1, 1A	Complete
(14) Give Crew Chief Report of Malfunctions	

c. BOMBARDIER

—BEFORE STARTING ENGINES

(1) Pneumatic Bomb Doors	
(a) Pressure 1200-1500 PSI.	
(b) Valve interconnect	Closed
(c) Compressor circuit breakers.	On.
(d) Bomb door air pressure light	Out
(e) Safety switch	On
(2) Bombsight	Pre-Flighted
(3) Autopilot	Pre-Flighted
(4) Racks	Pre-Flighted
(5) Bomb Bay Tanks Safety Switches	Checked
(6) Bombs	Inspected
(7) Pins	Pulled
(8) Oxygen & Mask	Checked
(9) Parachute	OK
(10) A B Computer and Scales	Checked
(11) Fuses and Spares	Checked
(12) Interphone	Checked
(13) Altimeter	Set
(14) Clock	Synchronized
(15) Intervalometer 0 Bombs and train	Checked
(16) Bomb Formation Lights	Checked
(17) Target Information	Checked
(18) Bombardier's Kit	Complete
(19) Nose Compartment	Clear
(20) Windows	Clean
(21) Nose Sighting Station	Pre-Flighted
(22) Camera Equipment	Checked
(23) Checked with Weather Office	OK
(24) Switches in Bombardier's Compartment	Off

—IMMEDIATELY BEFORE INITIAL POINT

(1) All Bombsight Switches	On
(2) Altitude Computations	Completed
(3) Disc Speed and Trail in Sight	OK
(4) Power Rack Selector Switches	On
(5) A B Computer Properly Set	Checked
(6) Bomb Bay Doors	Open
(7) Bombsight Stabilizer	Level
(8) Intervalometer 0 Bombs and train	Checked
(9) Autopilot Being Used	OK
(10) Camera Intervalometer	On
(11) Camera Doors	Open

—BEFORE LANDING

(1) Bombsight Switches	Off
(2) Bombardier's Panel Switches	Off
(3) Nose Sighting Station Switches	Off
(4) Sight	Covered
(5) Pneumatic Doors Air Compressor.	
(a) Safety switch	On
(b) Safety shut off valves	On
(c) Air compressor circuit breaker	On
Bombing Equipment Malfunction Report	Complete

d. NAVIGATOR

—PRE-FLIGHT

(1) Mission Data	OK
(2) Navigation Kit (Complete)	OK
(3) Maps and Charts	OK
(4) Weather	OK
(5) Flight Plan	Completed
(6) Clean B-3 Drift Meter Blister	

—BEFORE STARTING ENGINES

(1) Personal Effects (Clothing, Parachute, Oxygen Mask, Life Vest)	OK
(2) Headset and Microphone	OK
(3) Oxygen System	OK
(4) A.P.I. Checked for Coordinates of Departure and Proper Color for Latitude	OK
(5) Astro-Compass	OK
(6) Synchronization of all Time Pieces	Completed
(7) Check for Calibration Cards	OK

—WHILE TAXIING

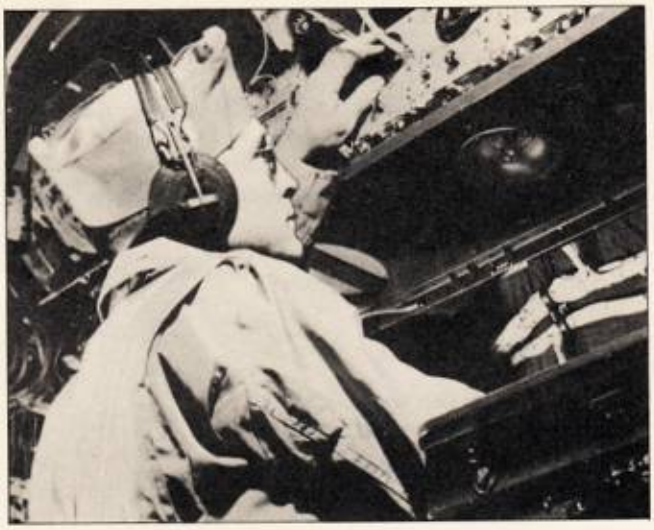
(1) Check Operation of Flux-Gate Compass	OK
(2) Turn on A.P.I. (Set variation on the A.P.I. Computer)	OK
Check B-3 Drift Meter	

—DURING FLIGHT

(1) Use all Methods of Navigation	Completed
(2) Altitude and Air-Speed	
(a) Set in the following: (Check every 10 min.)	
Temperature—(within 5 deg.)	
Altitude—(within 500 feet)	
Indicated Air Speed—(within 5 mph.)	Completed
(3) Navigator's Log	Completed

—AFTER LANDING

(1) Switches	Off
(2) Crew Inspection	



e. RADIO OPERATOR

—BEFORE STARTING ENGINES

(1) Antennas	Checked
(2) Form 1A	Checked
(3) "G" File	Checked
(4) Plugs-Tuning Cables-Connections	Checked
(5) Fuses-Spare Fuses-Circuit breakers	Checked
(6) VHF Command	Checked
(7) Blind Landing Equipment	Checked
(8) Liaison Equipment	Checked
(9) Radio Compass	Checked
(10) Aldis Lamp	Checked
(11) Interphone	Checked
(12) Radio Operator's Kit and SOI	Checked
(13) Very Pistol and Pyrotechnics	Checked
(14) Oxygen Pressure, 400 or above	Checked
(15) Parachute and Identification Tags	Checked
(16) Gibson Girl and Life Preserver	Checked
(17) Crew Inspection	

—BEFORE TAXIING

(1) Interphone	Stand-by
(2) Crew Report	OK

—AFTER TAXI STARTED

(1) Safety Valve	Open
(2) Bomb Bay Doors	Closed

—BEFORE LANDING

(1) Station	Closed
(2) Trailing Antenna	In
(3) Interphone	Stand-by

—AFTER LANDING

(1) Bomb Bay Doors	Open
(2) Safety Valve	Closed

—END OF TAXI

(1) All Radio Equipment	Off
(2) Form 1A	Completed
(3) Crew Inspection	

f. TOP GUNNER

—BEFORE STARTING ENGINES

(1) Pre-Flight Inspection of Sights, Turrets, Guns, Ammunition, Camera, etc.
(2) Crew Inspection
(3) Interphone Check
(4) Parachute and Oxygen
(5) Clothing

—BEFORE TAXIING

(1) Engine Alert
(2) Alarm Bell
(3) Phone Call Signal Light
(4) Combat Station Inspection

—BEFORE TAKE-OFF

(1) Taxi Alert
(2) Prepare for Take-Off

—AFTER TAKE-OFF

(1) When in the air: Check Operation of Sight, Turrets, and Guns.
(2) Enemy Aircraft Alert

—BEFORE LANDING

(1) Clear the Guns
(2) Stow equipment and turn switches off when copilot gives order, "Prepare for landing."

—AFTER LANDING

(1) Check to be sure guns are cleared
(2) Field Strip guns for cleaning
(3) Malfunction Report

g. LEFT AND RIGHT GUNNERS

—BEFORE STARTING ENGINES

(1) Pre-flight inspection: Sights, turrets, guns, ammunition, camera, etc.
(2) Crew inspection
(3) Interphone check
(4) Flight controls
(5) Parachute and oxygen
(6) Clothing

—BEFORE TAXIING

(1) Engine alert
(2) Bomb bay doors closed
(3) Phone call signal light
(4) Combat station inspection

—BEFORE TAKE-OFF

(1) Taxi alert
(2) Wing flap report (25 deg.)
(3) Prepare for take-off

—AFTER TAKE-OFF

(1) Landing gear and flaps (full up)
(2) In the air, operate sight and turrets, and test fire the guns
(3) Enemy aircraft alert

—BEFORE LANDING

(1) Equipment stowed and switches off, when co-pilot gives order, "Prepare for landing."
(2) Landing gear report (down and locked)
(3) Flap report

—AFTER LANDING

(1) Bomb bay doors open
(2) Guns cleared
(3) Field strip guns for cleaning
(4) Malfunction report

h. TAIL GUNNER

—BEFORE STARTING ENGINES

(1) Pre-flight inspection: Sight, turret, guns, ammunition, camera, etc.
(2) Crew inspection
(3) Start put-put (when battery switch is turned on)
(4) Interphone check
(5) Parachute and oxygen
(6) Clothing

—BEFORE TAXIING

(1) Phone call signal light
(2) Combat station inspection

—BEFORE TAKE-OFF

(1) Taxi alert
(2) Prepare for take-off

—AFTER TAKE-OFF

(1) Put-put off (after gear and flaps are up)
(2) In the air, operate sight and turrets, and test fire the guns
(3) Enemy aircraft alert
(4) Crew coordenation

—BEFORE LANDING

(1) Stow equipment and turn switches off, when co-pilot gives order, "Prepare for landing."
(2) Put-put started (as soon as above is accomplished)
(3) Notify copilot when put-put is on the line.

—AFTER LANDING—

(1) Put-put off at flight engineer's command
(2) Check to be sure guns are cleared
(3) Field strip guns for cleaning
(4) Malfunction reports

3. VISUAL INSPECTION, AMPLIFIED — STANDARD CHECK.

a. AIRPLANE COMMANDER.

(1) Condition of tires—examine carefully for cuts and slippage.

(2) Wheel chocks—2" in front of inboard tires and 2" behind outboard tires.

(3) Oleo struts—13 1/4" between pin centers on main gear, 10" on nose gear.

(4) Hydraulic lines—check for leaks.

(5) Shimmy damper—check oil level. Top of pin should be even with groove.

(6) Engine fire extinguishers—check red disk at end of line running down from each CO_2 bottle (nose wheel well). If bottle has been accidentally discharged, the red disk will be missing.

(7) Gear motor and door motor cannon plugs—check each plug for looseness. If the rotating collar is not screwed tight, engine vibration can shake loose the cannon plug connection.

(8) Cables on main wheel well doors — cables should be on pulleys and free of obstructions.

(9) Pitot tube covers off.

(10) All fastenings on inspection plates and engine cowling should be tight.

(11) See that engines and nacelles are free of oil and grease. Oil or grease is a fire hazard. Have it cleaned off before making the flight. Check turbosuperchargers. Inspect air scoops for obstructions.

(12) Inspect control surfaces and trim tabs for dents or damage.

(13) Inspect all windows and blisters for cracks and dirt.

(14) Check all seams and connections for fluid leaks.

(15) Form 1A, Loading List, and Form F checked. Engineer will hand Form 1A, Loading List and Form F to airplane commander for approval and signature. Airplane commander will sign Form 1A Exceptional Release, if necessary, and check the C. G. between 18 and 34%, depending on gross weight.

(16) Crew Inspection completed.

b. ENGINEER. — The Flight Engineer will figure progress curves for both 3 and 4 engine operation, and figure for an alternate airport, considering both distance and weather conditions.

(1) Fuel tanks for servicing and proper installation of tank caps.

(2) Oil tanks for servicing and proper installation of caps.

(3) Turbo oil supply.

(4) Cowling, condition and proper fastening.

(5) Cowl flaps for proper operation.

(6) General condition of skin and control surfaces.

(7) Condition of de-icer equipment (if applicable).

(8) Life raft doors for proper installation.

(9) All navigation or running lights.

(10) Remove air scoop seals and any obstructions.

(11) Engine nose sections (cracks, cylinders for condition of cooling fins and baffles, exhaust collector rings for burning).

(12) Remove pitot covers.

(13) Wheel locks removed (early airplanes only).

(14) Turbos, check for cracks, binding wheels or oil leaks (in excess).

(15) Under surfaces wings and fuselage.

(16) Bomb bay, bomb racks and cannon plugs.

(17) Propellers and governors for nicks and oil leaks.

(18) Auxiliary oil tank and motor and selector valves in off position.

(19) Fuel transfer system.

(20) Auxiliary power plant for servicing and condition. (Check condition of fuel tank cap).

(21) Bus selector switch for normal position.

(22) All articles are securely fastened.

(23) Emergency flap motor for proper installation.

(24) Bomb bay fuel tanks and selector valves.

(25) All visible cables for breaks and chafing.

(26) Axe, thermos jug, and fire extinguishers.

(27) First aid kits.

(28) Anti-icer tanks and fluid.

(29) Pressure doors closed and hinges for warping.

(30) Pressure regulator caps in up position.

(31) Tool kits installed.

(32) Oxygen equipment and pressure.

(33) Hydraulic tanks for servicing.

(34) Turbo amplifiers installed.

(35) Fuse panels for spare fuses.

(36) Check for the following forms:
(a) Form F
(b) Form 1 and 1A (for status of airplane)
(c) Load adjuster

(37) All personal equipment and Engineer's station.

c. SPECIAL CHECK FOR NIGHT FLIGHTS.

(1) Panel lights.

(2) Fluorescent lights.

(3) Landing and passing lights.

(4) Navigation, formation, and recognition lights.

(5) Spare lamps.

(6) Spare fuses.

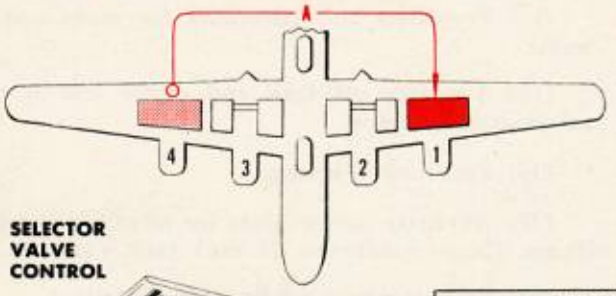
(7) Flares.

(8) Signal lamps.

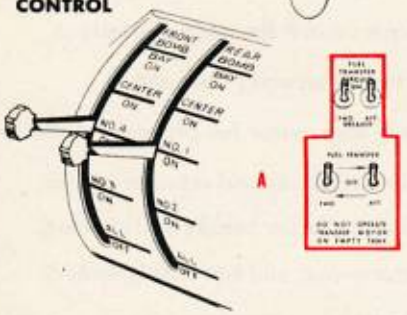
(9) Blackout curtains.

TYPICAL EXAMPLES OF FUEL TRANSFER COMBINATIONS IN EARLY AIRPLANES WHICH HAVE NO CENTER WING TANKS.
DIRECT TRANSFER CAN BE MADE ONLY BETWEEN TANKS DESIGNATED AT OPPOSITE LEVERS (EXAMPLES 1 & 2)
SHOULD A TRANSFER BE DESIRED BETWEEN TWO TANKS DESIGNATED AT ONE LEVER IT IS NECESSARY TO FIRST TRANSFER THE FUEL TO ONE OF THE TANKS DESIGNATED AT THE OPPOSITE LEVER, THEN BACK TO THE DESIRED TANK. (EXAMPLES 3 & 4)

A. FROM ENG. NO.4 TANK TO ENG. NO.1 TANK

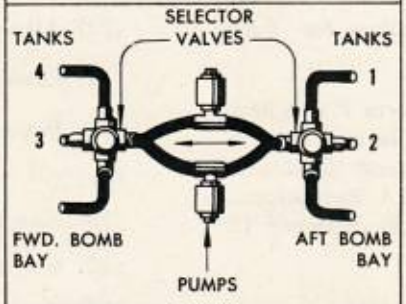


SELECTOR VALVE CONTROL

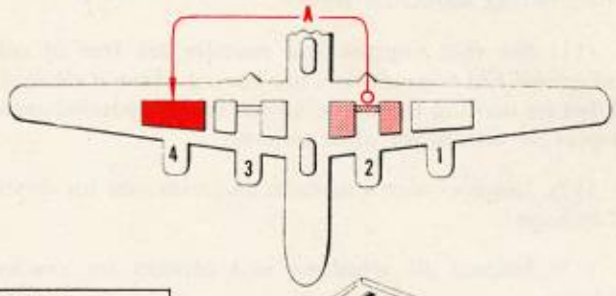


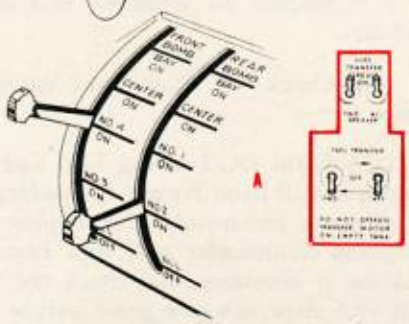
EXAMPLE NO.1

FLOW DIAGRAM



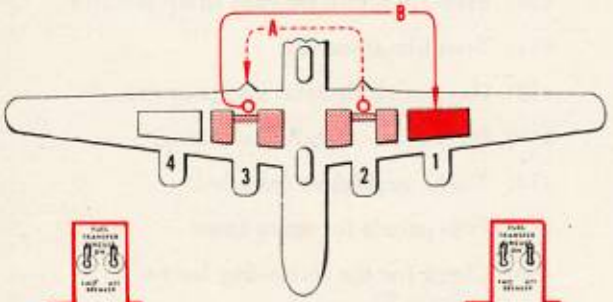
A. FROM ENG. NO.2 TANK TO ENG. NO.4 TANK

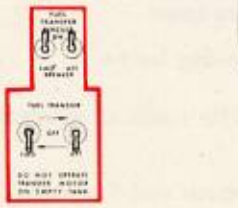


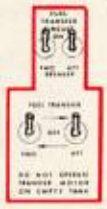


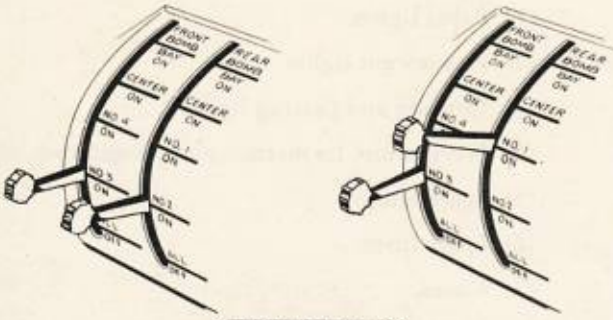
EXAMPLE NO.2

DESIRED TRANSFER - NO.2 TANK TO NO.1 TANK
A. FROM ENG. NO.2 TANK TO ENG. NO.3 TANK
B. FROM ENG. NO. 3 TANK TO ENG. NO.1 TANK



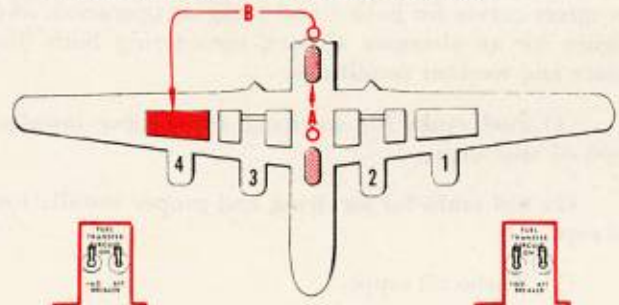


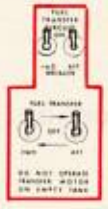


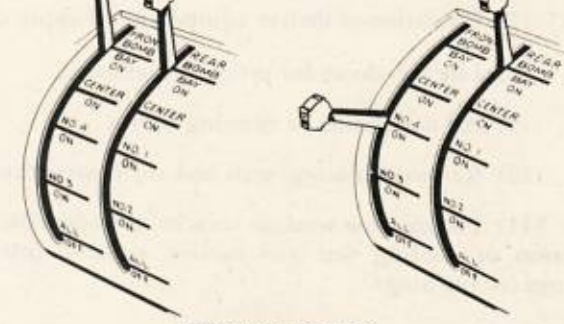


EXAMPLE NO. 3

DES. TRANSFER - FWD. BOMB BAY TO NO.4 TANK
A. FROM FMD. BOMB BAY TANKS TO AFT BOMB BAY
B. FROM AFT BOMB BAY TO ENG. NO.4 TANK





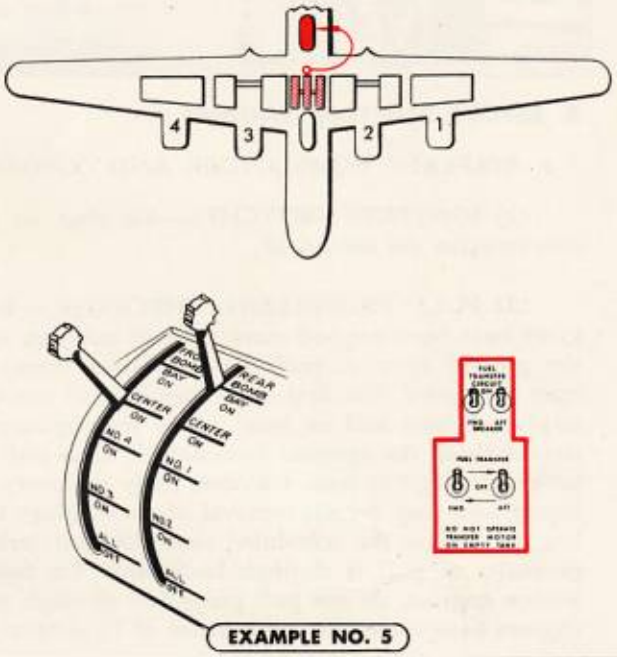


EXAMPLE NO. 4

Figure 24—Fuel Transfer Operation Diagram (Airplanes Without Center Tanks)

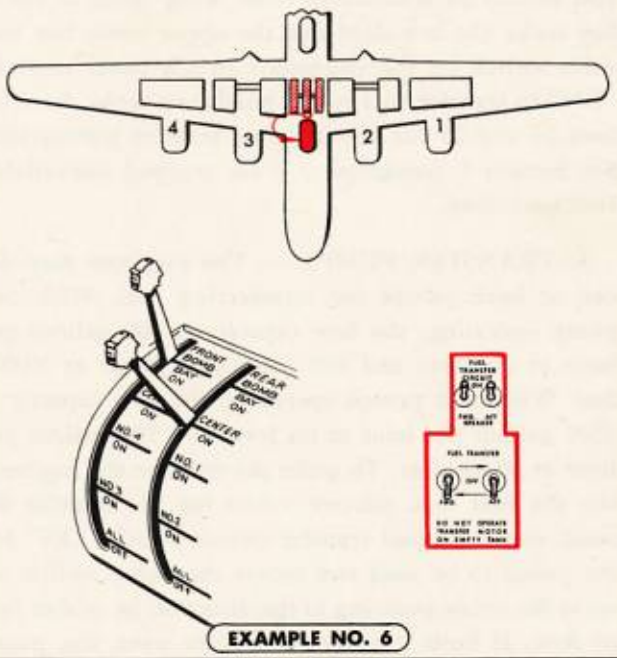
THIS DIAGRAM SHOWS TYPICAL EXAMPLES OF FUEL TRANSFER FROM CENTER TANK USING BOTH PUMPS. THE AFT BOMB BAY TANKS ARE CONNECTED TO THE LEFT SIDE SELECTOR VALVE, AND THE FORWARD BOMB BAY TANKS ARE CONNECTED TO THE RIGHT SIDE VALVE. (SEE EXAMPLES 5 AND 6).

FROM CENTER TANK TO REAR BOMB BAY
(ON CERTAIN LATE AIRPLANES)



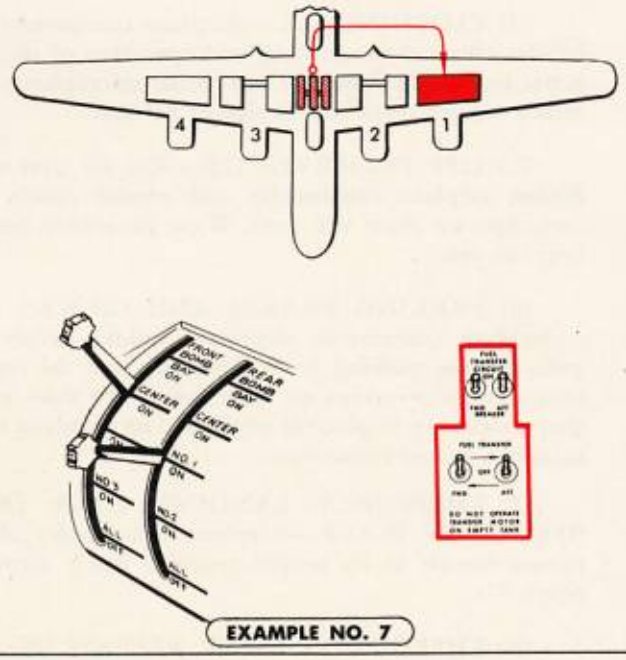
EXAMPLE NO. 5

FROM CENTER TANK TO FRONT BOMB BAY



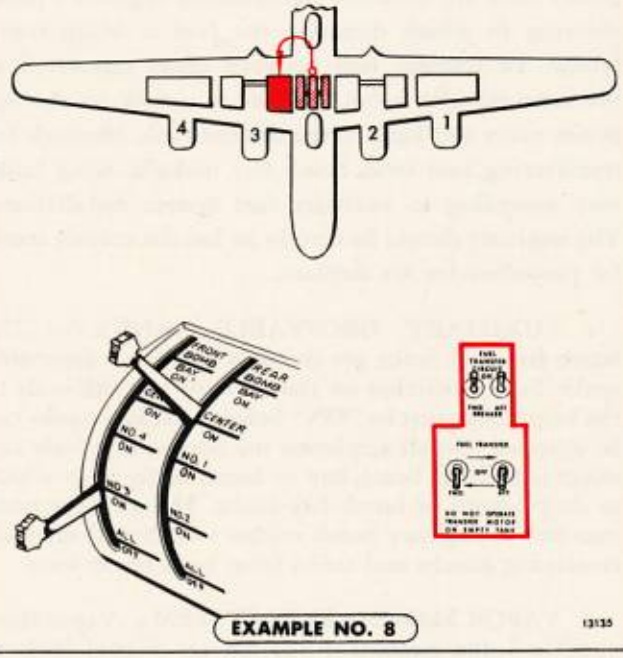
EXAMPLE NO. 6

FROM CENTER TANK TO NO. 1 TANK



EXAMPLE NO. 7

FROM CENTER TANK TO NO. 3 TANK



EXAMPLE NO. 8

13135

Figure 25—Fuel Transfer Operation Diagram (Airplanes with Center Tanks)

4. FUEL SYSTEM MANAGEMENT.

a. GENERAL. — Fuel can be transferred between rear and front bomb bay tanks, rear bomb bay tanks and tanks 3 or 4, front bomb bay tanks and tanks 1 or 2, and across the airplane centerline from tanks 1 or 2 to either 3 or 4. Fuel can be transferred from wing center section tanks to any wing tanks. On early airplanes, fuel cannot be transferred from wing tanks to bomb bay tanks. On late airplanes, the upper bomb bay fuel valve switch on the engineer's switch panel must be "ON" to transfer fuel to the bomb bay tanks. See Figures 24 and 25 for detailed fuel transfer instructions. See Section I, paragraph 7 *g* for trapped unavailable fuel quantities.

b. TRANSFER PUMPS. — The Engineer may use one or both pumps for transferring fuel. With one pump operating, the flow capacity is 900 gallons per hour at sea level and 300 gallons per hour at 30,000 feet. With both pumps operating, the flow capacity is 1500 gallons per hour at sea level and 500 gallons per hour at 30,000 feet. To make the transfer the engineer sets the fuel tank selector valves for the transfer desired, turns the fuel transfer circuit switch "ON" for the pump to be used and moves the pump switch toward the arrow pointing in the direction he wishes fuel to flow. If both transfer pumps are used, the pump switches MUST be deflected in the same direction. Otherwise, no fuel will be transferred, and there is a danger of burning out the pump motors. On late airplanes there are indicator lights on the engineer's panel showing in which direction the fuel is being transferred. To transfer fuel between tanks connected to the same transfer valve, transfer to a tank on the opposite valve and back to the desired tank. Methods for transferring fuel from bomb bay tanks to wing tanks vary according to auxiliary fuel system installations. The engineer should be certain he has the correct transfer procedure for his airplane.

c. AUXILIARY DROPPABLE TANKS. — The bomb bay fuel tanks are the only auxiliary droppable tanks. Safety switches on the forward left sidewalls of the bomb bay must be "ON" before auxiliary tanks can be dropped. On all airplanes, the bombardier only can select individual bomb bay or bomb racks from which to drop bombs or bomb bay tanks. The airplane commander's emergency bomb release switch will salvo all remaining bombs and tanks from both bomb bays.

d. VAPOR ELIMINATION SYSTEM.—Vapor from number 1 and number 2 engines are vented back to number 2 tank. Vapor from number 3 and number 4 engines are vented back to number 3 tank.

5. BEFORE STARTING ENGINES.

a. AIRPLANE COMMANDER AND COPILOT.

(1) IGNITION SWITCHES.—See that all ignition switches are turned off.

(2) PULL PROPELLERS THROUGH. — If engines have been stopped more than 30 minutes, signal the ground crew to pull the propellers through at least 12 blades. The first crew members to reach the airplane (about half an hour before starting engines) should check the ignition switches off, then pull propellers through at least 4 blades. Early discovery of a liquid lock may permit removal of spark plugs to allow take-off at the scheduled time. Do not jerk the propeller or pull it through backwards. On fuel injection engines, do not pull propellers through unless engines have cooled for a minimum of 15 minutes.

(3) PARACHUTE O.K. — Airplane commander and copilot put on parachutes. Check for location of seat-type dinghies if fitted in airplane.

(4) CLOTHING O.K.—Airplane commander and copilot check their clothing and operation of their electric suits. Adjust helmet and throat microphone, and attach oxygen mask to left side of helmet.

(5) LIFE PRESERVER O.K.—On all over-water flights, airplane commander and copilot check CO_2 cartridges on their life vests. Wear parachute harness over life vest.

(6) PARKING BRAKES AND CHOCKS SET. —Airplane commander depresses rudder pedals and pulls out the parking brake lever. He and the copilot look out the windows on their respective sides to see that chocks are in place as explained in Airplane Commander's Visual Inspection.

(7) EMERGENCY LANDING GEAR DOOR RELEASE IN PLACE.—Airplane commander checks release handle in its proper position (early airplanes only).

(8) EMERGENCY BOMB RELEASE IN PLACE.—T-Handle on airplane commander's control stand. (Early airplanes only).

(9) EMERGENCY CABIN PRESSURE RELEASE IN PLACE.—T-Handle on airplane commander's control stand.

(10) LANDING GEAR TRANSFER SWITCH "NORMAL."—On early airplanes, the airplane commander checks the landing gear transfer switch in "NORMAL" position. In this position the main landing gear and nose gear are operated by the landing gear switch. (Airplanes with the manual emergency landing gear system do not have a landing gear emergency transfer switch.)

(11) THROTTLE OVERCONTROL ENGAGED. —Airplane commander checks the throttle overcontrol lever, on the airplane commander's control stand. This engages the engineer's throttle. (Early airplanes only.)

(12) LANDING GEAR SWITCH NEUTRAL AND FUSE CHECKED.—Switch (airplane commander's aisle stand) should be neutral. Check to see that fuse in aisle stand is in place and not burned out.

(13) BATTERY SWITCH ON.—Flight engineer flips battery switch "ON" and notifies airplane commander. All electrical circuits can be energized either by the battery or the auxiliary power unit. Both are used for normal ground operation on loads up to 200 amperes. For additional power, use an external power source or the engine driven generators.

(14) PUT-PUT STARTED. — Copilot tells tail-gunner to start the put-put.

(15) HYDRAULIC PRESSURE O.K. — The copilot asks the flight engineer to check the emergency hydraulic pressure on engineer's panel (900-1075 PSI) and checks the pressure on his own instrument panel (800-1000 PSI). A fluctuating needle indicates a faulty pressure regulator.

(16) FLIGHT CONTROLS CHECKED. — Airplane commander pushes locking lever on forward end of airplane commander's aisle stand fully down. This unlocks both the flight controls and the throttles. The lock is designed so that a strong forward pressure on the throttles will force the flight control lock off and eliminate the possibility of taking off with the controls locked.

The control check is made by the copilot. "Copilot to gunners, stand by to check controls." He then pulls the control column back and says on interphone, "Check elevators." Left gunner answers, "Left elevator up, sir." Right gunner answers, "Right elevator up, sir." The copilot then pushes the column forward and completes his check on the elevators. Ailerons and rudder are checked in the same manner.

(17) RADIOS CHECKED. — While copilot is checking flight controls, airplane commander turns "ON" his command set and requests taxi information. Copilot, after checking controls, turns radio compass "ON," and checks for proper operation. He then turns radio compass "OFF" and stands by on interphone to be in constant contact with the crew.

(18) ALTIMETERS SET.—Airplane commander and copilot set their altimeters by the tower altimeter setting, and check the altitude reading against the known field elevation. If the tower setting differs from the known field elevation, check the setting again and note the difference in elevation to be used to correct the reading for landing.

(19) TURRETS STOWED.—Airplane commander checks the three turret warning lights "OFF" on his instrument panel.

(20) ADJUST SEAT AND PEDALS.

(21) LIGHTS CHECKED.—If any night operation is contemplated on the flight, all light switches on airplane commander's control stand must be checked —fluorescent lights, recognition lights, landing lights, and position lights. A ground crew member should be instructed to visually check the landing lights and position lights. At night, wing position lights can be inspected from inside the airplane by checking their reflection on the ground under the wing tips.

(22) OXYGEN O.K.—Airplane commander and copilot check their oxygen pressure gages and walk-around bottles at 400 to 425 PSI. Auto mix should be "ON," and the emergency valve "OFF."

(23) PROPELLERS HIGH RPM.—Copilot pushes the propeller switches (aisle stand) to "INCREASE RPM" and holds them until the propeller limit lights on his instrument panel flash on. The propeller will then be in high RPM.

(24) TURBOS OFF. — Airplane commander checks the turbo selector dial at "0" position.

(25) ENGINEER'S REPORT.—Check list complete, ready to start engines. If the engineer has not completed his check list, the airplane commander waits before giving the command to start engines.

(26) STAND CLEAR — FIRE GUARD. — Clear left, clear right. When ready to start the engines both the airplane commander and the copilot give the command "Stand Clear" to the ground crew (clear right, clear left). When the fire guard is ready, copilot says on interphone, "Stand by to start engines."

b. ENGINEER.

(1) PREFLIGHT CHECK.—Completed.

(2) FORMS 1, 1A, AND F.

(a) Check Form 1 and 1A and advise airplane commander of status of airplane. After entering the airplane, the flight engineer should go through the following check list very thoroughly.

(b) Fill out loading list and Form F. (Give to ground crew to turn in to Operations.)

(3) PARACHUTE.—Check for condition.

(4) CLOTHING.—Check for proper clothing for mission to be performed.

(5) LIFE PRESERVER.—For over-water mission, check CO_2 bottles for safety, and vests for condition.

(6) BATTERY SWITCH. — At copilot's command, turn switch "ON."

NOTE

Check normal inverter switch "OFF" before turning battery switch "ON".

(7) AUXILIARY POWER PLANT.—Check putput started, warmed up, and "on the line."

(8) EMERGENCY HYDRAULIC PRESSURE.—Check for 900-1075 PSI.

(9) HYDRAULIC FLUID.—With parking brakes set, and pressure at 1000 PSI, check for 2 gallon capacity.

(10) FUEL BOOST PUMPS.—On early airplanes, turn pump switches "ON;" turn rheostats to get 14-16 PSI with mixture control cracked; return mixture to fuel cut-off; turn pump switches "OFF." On some early airplanes the pump switch is incorporated in the rheostat control knob. Late airplanes have double-throw type pump switches. The switches should be on "LOW SPEED" during take-off and normal flight. With the engines stopped and the mixture control cracked, the fuel pressures should be 9 to 12 PSI on "LOW SPEED" and 21.5 to 29 PSI on "HIGH SPEED."

(11) FUEL TRANSFER SWITCHES.—Check for "OFF" position.

(12) INVERTERS. — On early airplanes, check normal and alternate inverters for 26—26 1/2 volts, leaving normal inverter "ON." On late airplanes, with the inverter automatic changeover relay, the "ALTERNATE" switch position MUST be checked first. Failure to do so may make the normal inverter inoperable. Then check the "NORMAL" position and leave the normal inverter on.

(13) MIXTURE CONTROLS.—"Fuel Cut-off."

(14) THROTTLES.—Open 1—1 1/2 inches, to obtain 900-1200 RPM for starting.

(15) ENGINEER'S CABIN AIR VALVES AND PRESSURE RELIEF VALVE. — Keep closed for all ground operations.

(16) COWL FLAPS.—Flaps will be full open for all ground operations.

(17) INTERCOOLERS. — Full open for ground operation.

(18) OIL COOLER FLAP.—Check operation by putting doors to full open position, obtain position report from gunners. Close and put in automatic.

(19) PITOT HEAT.—Leave in "OFF" position for ground operation.

(20) DEICERS.—Check for operation and leave in off position for take-off and landing.

(21) ANTI-ICERS.—Check for operation and return to off position.

(22) GENERATORS.—Switches "OFF."

(23) FUEL GAGES.—Record and check against dip stick.

(24) OIL GAGES.—Record and check against dip stick.

(25) HYDRAULIC SERVICING VALVE. — "CLOSED."

(26) OXYGEN.—Check for proper pressure and operation of A-12 regulator and blinker.

(27) LIGHTS. — Check for operation and spare bulbs.

(28) ENGINEER'S REPORT.—When check list is completed, inform airplane commander you are ready to start engines.

6. STARTING ENGINES.

a. STARTING PRECAUTIONS.

(1) Don't start the engines until the "Before Starting Check" has been covered item by item. (See Section II, Paragraph 5.)

(2) Don't start engines until a fire guard is posted.

(3) Don't jam throttles forward at any time.

b. CONTROL POSITIONS.

(1) TURBOSUPERCHARGERS.—"0" position.

(2) PROPELLERS.—Full increase RPM.

(3) MIXTURE.—"FUEL CUT-OFF."
For fuel injection engines—"AUTO-RICH."

(4) THROTTLES.—Open 1—1 1/2 inches to obtain 900—1200 RPM for starting.

c. DETAIL STARTING PROCEDURE. — ENGINEER.

(1) FIRE EXTINGUISHERS.—Set selector to engine being started.

(2) MASTER IGNITION SWITCH.—"ON."

(3) START ENGINES 1, 2, 3, 4.

(a) Turn fuel boost pump "LOW SPEED" (or 6—8 PSI).

(b) Energize starter 12 to 16 seconds.

(c) Engage starter.

(d) When propeller has turned one revolution, turn ignition switch "ON."

(e) Prime as needed to start, and smooth out engine at 800 to 1000 RPM. Do not prime fuel injection engines unless engines are extremely cold.

(f) Move mixture control to "AUTO RICH" and keep it in "AUTO RICH" for all ground running.

(4) ENGINE INSTRUMENTS.—Check oil pressure (nose and rear), manifold pressure, RPM, and oil temperature. Don't continue to run an engine unless nose and rear oil pressure build up to normal within 30 seconds after starting.

(5) VACUUM.—Check for 3.8"—4.2" Hg.

(6) AFTER STARTING. — When engine 1 is started and checked the flight engineer reports, "Engine operating normally. Ready to start number 2 engine." The procedure continues for engines number 3 and 4. The engineer handles throttles during the entire starting procedure, keeping 1000 to 1200 RPM for warm up. When engine is running properly set the throttles at 700 RPM (1000 RPM if oil temperature is below 40 C). Thereafter the airplane commander controls the throttles except when colling for engine driven generators, and during engine run-up. If copilot or engineer sees an engine loading up (black smoke or RPM drop) he will inform the airplane commander.

d. NACELLE OR ENGINE FIRE:—If the fire is known to be a torching turbo, put it out by increasing throttle setting momentarily. For other engine or nacelle fires, use the following steps:

(1) Any crew member spotting an engine fire immediately announces, "Fire in Number — engine," using "Call" position on radio jack box, and repeating engine location.

(2) *Airplane Commander* immediately closes throttle of engine on fire and simultaneously takes or directs the following action as required.

(3) *Engineer* moves mixture control to fuel cut-off, turns booster pump "OFF," turns fuel shut-off valve "OFF," and turns oil shut-off valves "OFF," simultaneously if airplane is so equipped.

(4) *Airplane Commander* feathers propeller on engine which is on fire.

(5) *Engineer* opens cowl flaps 10 degrees and at the same time turns selector knob to engine on fire and pulls handle of one (1) CO_2 bottle.

Note

The engine fire extinguisher is for fires in the accessory section and is not effective against fires in the engine itself.

7. "SCRAMBLE" TAKE-OFF.

Use oil dilution to obtain proper oil pressures at moderate power. As soon as the engines will take the throttles, taxi out and take off. Apply throttles slowly and steadily. Use oil dilution carefully, as overdilution can easily cause low oil pressures after the engines become warm.

8. TAXIING INSTRUCTIONS.

a. NORMAL INSTRUMENT READINGS:

Nose Oil Pressure	30-50 PSI
Rear Oil Pressure	60-80 PSI
Fuel Pressure	15-19 PSI
Oil Temperature	40-95° C.
De-icer Pressure	7-7.5 PSI
Vacuum Pressure	3.8"-4.2" Hg.
Hydraulic Pressure (Normal)	800-1,000 PSI
Hydraulic Pressure (Emergency)	900-1,075 PSI

b. BEFORE TAXIING.
—AIRPLANE COMMANDER'S CHECK.

(1) VACUUM O.K.—The copilot asks the flight engineer to check vacuum reading. The flight engineer, after checking the vacuum reading for both pumps (gage on engineer's panel should read 3.8" to 4.2" Hg.), reports this check to the copilot.

(2) GYROS UNCAGED.— Airplane commander and copilot check their gyro instruments to make sure that they are uncaged and set correctly.

(3) INSTRUMENTS CHECKED. — Airplane commander and copilot check their respective instrument panels for proper readings on all instruments.

(4) BOMB BAY DOORS CLOSED.—After the copilot has instructed the gunners and radio operator to check and see that all members of the ground crew are clear of the bomb bay doors, he says to the flight engineer, "Generators on coolest engine," and tells the bombardier to close the bomb bay doors. Flight engineer has meantime set throttle on coolest engine to 1400 RPM and turned generators on. The radio operator and one of the gunners check through the pressure doors and report to the copilot that the bomb bay doors are closed.

(5) (6) and (7) ALARM BELL, PHONE CALL SIGNAL, LIGHT, AND COMBAT STATION INSPECTION.—Airplane commander switches on alarm bell (aisle stand) and phone call signal light (aisle stand), then calls for combat station inspection. Copilot repeats this command on interphone and receives acknowledgment in the following manner: Bombardier, navigator, flight engineer, radio operator (in that order) acknowledge that they have completed a check of their stations by saying, for example, "Bombardier O K." Top gunner says, "Alarm bell O K, light O K, top gunner O K." Tail gunner says, "Light O K (radar compartment), tail gunner O K."

(8) CHOCKS OUT. — Airplane Commander and copilot check to see that chocks have been pulled.

(9) PARKING BRAKES OFF, STAND BY TO TAXI.—After releasing the parking brakes, the airplane commander gives the command to "Stand by to taxi." The copilot repeats the command over the telephone.

—ENGINEER'S AMPLIFIED CHECK LIST.

(1) POWER TO CLOSE BOMB BAY DOORS.—Flight engineer advances throttle on coolest engine to 1400 RPM and turns generators on. Turn generators off and retard throttle when doors are closed.

NOTE

Generators do not need to be on for pneumatic bomb doors.

(2) ENGINEER'S REPORT. — At copilot's request, during combat station inspection, say "Engineer O K."

c. TAXIING INSTRUCTIONS.

(1) GENERAL. — Like all tricycle-landing-gear airplanes, the B-29 taxis easily. Brakes are good—4 expander tubes per wheel. However, REMEMBER, it is a big, heavy airplane. It gains momentum rapidly, and, because of its size, you will have to depend on your side and top gunners to act as observers to warn you of obstacles.

(2) PRECAUTIONS.

(a) MIXTURE.—For all ground operations, set RPM at 700 (after oil temperatures reach 40°C), and mixture "AUTO RICH." Never use auto-lean for taxiing. If carburetors are set properly, engines will idle as low as 550 RPM without loading up.

(b) USE OF BRAKES. — Brakes alone should be used for control of speed and direction to prevent back-fires and to get maximum cooling. To enter a taxi turn with outside throttle doesn't save brakes because the extra power causes quick acceleration and requires braking to slow down. If you gain too much speed, bring the airplane almost to a stop, straight ahead, then stay off the brakes as long as possible to let them cool. Don't ride your brakes. Don't pivot on one wheel.

(c) TAXIING IN CROSSWIND. — Like most airplanes, the B-29 "weathervanes" into the wind. For this reason, when taxiing in a strong crosswind, set upwind, outboard throttle at more than 700 RPM to prevent excessive use of downwind brake.

9. BEFORE TAKE-OFF.

a. AIRPLANE COMMANDER'S CHECK.

(1) EMERGENCY BRAKES CHECKED. — After parking brakes are released, when starting to taxi copilot says, "Emergency Brakes." Airplane commander then pulls the emergency brakes hand metering levers (aisle stand) to see that emergency brakes are operating properly on both sides. Copilot then tells flight engineer to recharge emergency system. Normal brakes may be safely used while recharging the emergency system, since the electric hydraulic pump recharges both systems with the hydraulic servicing valve on emergency.

(2) Face airplane into wind during engine run-up for best cooling.

(3) NOSE WHEEL STRAIGHT.—Copilot checks through cockpit floor observation window to make sure the nose wheel is straight before engine run-up.

(4) ENGINE RUN-UP.—The airplane commander gives the command "Stand by for engine run-up," and the copilot repeats the command over the interphone. The engine run-up for first take-off should be accomplished in the following manner: (For subsequent take-offs, eliminate entire procedure, items *9a* through *f*.)

(a) Airplane commander increases all throttles to 1500 RPM and commands "Check generators." Copilot tells engineer to check generators and lowers wing flaps to full down position. When full flap travel is checked, copilot returns flaps to 25° take-off position. Gunners check the flaps and report "Left flap down 25°, sir," and "right flap down 25°, sir."

Note

Lowering wing flaps at this time not only provides a check of flap operation but puts a good load on the normal bus for the generator check.

(b) To test the propeller governors, the airplane commander moves all four propeller selector switches simultaneously by means of the hinged flaps to "FULL DECREASE" (limit light). Check tachometers for stable uniform reading of 1200-1300 RPM. Return to "FULL INCREASE" (limit light), where the tachometers should read 1500 RPM as before. Any propeller overshooting the original setting is not being governed properly, and should be corrected before take-off is attempted.

(c) When props and generators are checked, airplane commander pulls all throttles back to 700 RPM and tells flight engineer to "Check magnetos." Check generators in "OFF" position momentarily.

CAUTION

Do not check magnetos with turbos on. A backfire at this time (with turbos on) can damage turbo and waste gate assembly. Do not park airplane at 45 deg. to runway for engine runup. Head airplane directly into the wind for maximum cooling.

(d) Flight engineer advances No. 1 throttle to 2200 RPM, checks magnetos and calls out, "Right, Both, Left, Both." Flight engineer then returns throttle to 700 RPM. At this time, check each engine for manifold pressure necessary to get 2200 RPM. Excessive manifold pressure on one engine is an indication of a bad cylinder, a bad valve, or some other engine malfunction.

(e) Magneto check is made for each engine. Allowable drop at 2200 RPM is 100 RPM. If drop on any engine is more than 100 RPM, caused by fouled plugs, proceed with full power check for that engine. Then check magnetos (turbos off) on bad engine again. If RPM drop is still more than 100, return the airplane to the line.

CAUTION

Use of auto-lean to assist in burning off the fouled plug may cause damage to the engine.

(f) When magnetos are checked, airplane commander sets turbos on No. 8 and advances each throttle one at a time, full open, to check manifold pressure and RPM. For this ground check, tachometers should read between 2700 and 2800 RPM and manifold pressure should be between 48 and 49 inches Hg. After the check, pilot sets all throttles at 700 RPM, leaving turbo selector dial on "8."

(5) TRIM TABS SET.—The airplane commander checks all trim tab controls—rudder and ailerons neutral, elevator as needed according to the calculated position of the center of gravity.

(6) AUTO PILOT OFF. — The airplane commander makes sure all switches (aisle stand) are off, with turn control centered.

(7) WINDOWS AND HATCHES CLOSED.—As the airplane commander closes and secures his window, the copilot closes his, checks to see that the forward compartment entrance hatch is closed, and checks over the interphone with the tail gunner to make sure that the rear entrance door and rear escape hatch are closed.

(8) Turbos on No. 8.

(9) Propellers high RPM.

(10) CREW READY.—The copilot says on interphone, "Prepare for take-off."

(11) RADIO CALL COMPLETED. — Airplane commander calls tower and requests permission to take-off.

(12) THROTTLE BRAKE ON. — STAND BY FOR TAKE-OFF. — Airplane commander adjusts his throttle brake for desired friction to prevent slipping.

b. ENGINEER'S CHECK.

(1) GENERATORS.— As copilot lowers wing flaps, turn on each generator separately, checking for voltage and amperage output.

(2) MAGNETOS.—Advance each throttle to 2200 RPM, check magnetos for RPM drop. Call out to airplane commander (right, both, left, both). 100 RPM maximum drop. Watch for any engine roughness.

WARNING

Open throttles slowly to prevent fire and backfiring.

(3) MIXTURE CONTROLS.—"AUTO-RICH."

Note

Mixture controls will be in "AUTO-RICH" for ground operation, take-off, climb, landing, and cruise above 2200 RPM and 35 inches MP.

(4) FUEL BOOST PUMPS "ON."—Adjust to obtain 15-19 PSI at take-off. (Early airplanes).

(5) REPORT.—When ready to take-off, engineer will report to pilot, "Ready for take-off, standing by on generators and cowl flaps."

Note

If cylinder head temperature exceeds 220°C (428°F) before take-off, idle at 700 RPM to cool, with airplane headed into the wind.

(6) GENERATORS. — When throttles are advanced to 1200-1500 RPM, turn generators "ON."

(7) COWL FLAPS.—At start of take-off, set 15 degrees, then close cowl flaps to 7½°, or as needed not to exceed 260° cylinder head temperature at time wheels leave ground.

(8) INTERCOOLERS. — Set intercooler flaps at one-half "OPEN" for take-off and landing. With turbos off, intercooler flaps will be "CLOSED."

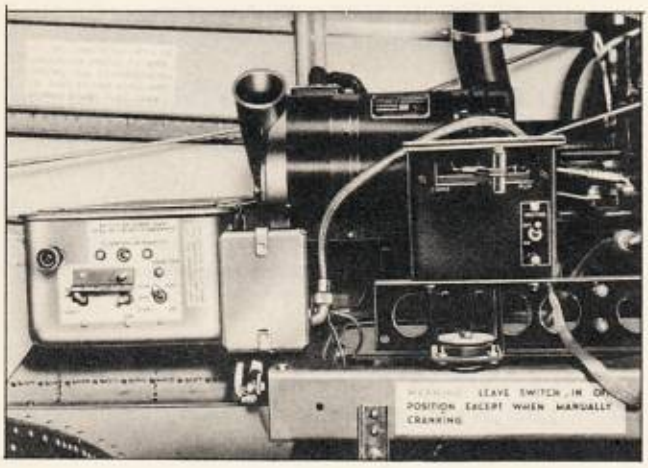


Figure 26—Auxiliary Power Plant Controls

c. AUXILIARY POWER PLANT.—CHECK LIST.

(1) PRE-STARTING CHECK.

(a) Examine the exterior of the unit for loose parts, oil leaks, fuel leaks, and loose electrical connections.

(b) Check the oil level with the bayonet gage under the oil filler caps. The oil level should be up to the "F" mark.

(c) Check the fuel tank for an adequate fuel supply, and cap for security.

(2) ELECTRICAL STARTING.

(a) Turn the battery switch on the engineer's panel to the "ON" position.

(b) On airplanes with remote control of the A. P. P. ignition, the equalizer switch is off when the ignition is off. On airplanes not equipped with remote ignition control, check that equalizer switch on the control box is "OFF."

(c) Turn the auxiliary power plant ignition switch on.

(d) Place the throttle control between the "IDLE" and "RUN" positions.

Note

No choking will be necessary at temperatures above 10°C (50°F). At lower temperatures, choking may be accomplished by moving the throttle control lever to the "CHOKE" position.

(e) Hold the starter switch at the "START" position, releasing it to the "OFF" position when the engine starts. On airplanes with two starting switches, hold both switches in the "START" position. When the engine starts one switch will return to the "RUN" position and the other to the "OFF" position.

Note

Do not place the throttle lever in the "RUN" position until the engine has warmed up.

(3) MANUAL STARTING.—The manual starting procedure is identical to that of the electrical starting except the starting cord is used instead of the generator-starter. The starting switch is left in the "OFF" position. Ignition and choke lever must be on.

Note

More choking will be necessary when starting the auxiliary power plant manually than when starting it electrically.

(4) ENGINE WARM-UP. — The engine should not be run at or near its rated speed until the oil temperature is at least 21°C (70°F).

(5) ENGINE OPERATION.

(a) After the engine is warmed up, the generator is put on the line by placing the starting switch in the "RUN" position. On airplanes having two starting switches, one switch is already in the "RUN" position; place the other switch in the "RUN" position.

(b) When the auxiliary power plant and engine generators are on the line the equalizer switch on the control box should be turned "ON." In some airplanes the equalizer switch is controlled by the ignition switch through the ignition relay.

(6) STOPPING THE ENGINE.

(a) Turn the starting switch to the "OFF" position.

(b) Turn the equalizer switch to the "OFF" position. On some airplanes the equalizer switch is turned off by the ignition switch.

(c) Move the throttle control to the "IDLE" position for five minutes.

(d) Turn the ignition switch off.

Note

Note remote ignition switch indicator light shows when the ignition is on. The engine may be stopped by turning off the ignition at the engineer's station.

10. TAKE-OFF.

a. NORMAL TAKE-OFF TECHNIQUE.

(1) Keep cylinder head temperatures at a minimum before take-off. Never start to take-off with any cylinder head temperature above 220°C. If cooling is satisfactory, check wing flaps 25 degrees down, and cowl flaps open 15 degrees (for both long and short chord cowl flaps).

(2) Roll on to the runway from the engine run-up point and line up without stopping. As much as 20 miles an hour initial speed can be gained this way. "Walk" throttles forward slowly until rudder control is gained at 60 and 65 MPH, IAS. Then move throttles steadily forward to full "OPEN" position. In this way directional control is maintained first with the throttles and then with the rudder. Do not use brakes to hold the airplane straight on the runway, except in emergencies, since this increases take-off distance and wears out the brakes. Never attempt to take-off with less than 47.5 inches Hg and 2600 RPM. The copilot should make a continuous power check as the throttles are advanced during the take-off run and after take-off, watching all instruments closely.

(3) At 90 MPH, IAS, relieve pressure on the nose wheel by easing the control column back. The speed at which the nose wheel is lifted off the ground is important, as some longitudinal instability is noticeable below 90 MPH, IAS before the elevators become completely effective. The airplane will then fly itself off the ground at 115 to 130 MPH, IAS depending on the gross weight. As soon as the airplane is safely off, the airplane commander brakes the wheels completely and calls for gears up. Starting to retract the gears before the wheels have completely stopped rotating may shear the bolt attaching the retracting screw to the drag strut.

(4) Cowl flaps, which are 15 degrees open at the start of the take-off run, should be closed to 7½° or as needed, to keep cylinder head temperatures below 260°C.

CONVERSION TABLE FOR COWL FLAP OPENINGS

SHORT CHORD		LONG CHORD
3¾ inches	15 degrees	4½ inches
3¼ inches	12½ degrees	3¾ inches
2¾ inches	10 degrees	3 inches
2 inches	7 degrees	2¼ inches
1½ inches	5 degrees	1½ inches
1 inch	2½ degrees	¾ inch
.62 inch	0 degree	0 inches

(5) At 140 MPH, airplane commander calls for 43½ inches Hg. at 2400 RPM. At high gross weights do not reduce power before the gears are retracted.

(6) At 150 MPH, and above 500 feet, airplane commander calls for flaps up. Gear and flaps may be raised together safely, provided four generators (put-put included) are operating, and provided switches are not tripped simultaneously. Engineer checks generator for amperage draw while gear and flaps are coming up.

(7) Cowl flaps should be 7½° or the smallest opening which will keep cylinder head temperatures below the required maximum (260°C for take-off, 248°C for continuous climb, and 232°C for continuous cruising).

b. MINIMUM RUN TAKE-OFF TECHNIQUE.—To take-off with the shortest possible ground run, hold the tail skid to the ground as take-off speed is reached. The tail skid is designed to be used during take-off, and helps to prevent taking off at too low an airspeed. The take-off is made just above the power-off stalling speed, and it is extremely important to keep the airspeed above take-off speed after the airplane leaves the ground.

11. ENGINE FAILURE DURING TAKE-OFF.

a. GENERAL.—Under no conditions should a take-off be started from a standstill with an engine inoperative or a propeller feathered. If an engine fails during the take-off run, don't leave the ground unless 135 MPH, IAS has been reached and unless all obstacles can be cleared. Retract the landing gear as quickly as possible. Feather the propeller as convenient. 135 MPH, IAS must be maintained to keep directional control, and at high gross weights, an additional margin is necessary to maintain level flight or to climb.

b. RUNAWAY PROPELLER.—If a runaway propeller occurs during take-off, throttle back the engine of the propeller affected to below 2800 RPM. This provides as much thrust as possible from the runaway propeller during take-off. The propeller will be dragging at 150 MPH, IAS. If the propeller is windmilling, keep down the RPM by intermittently pushing in and pulling out the feathering button. (The button has to be pulled out otherwise it will not pop out until the propeller is completely feathered.) Sometimes after the feathering button is used to keep down RPM, the governor will control the propeller, if the pilot is careful to avoid applying sudden power to the engine. In this case, do not feather the propeller. Handle the throttles carefully and land as soon as possible. Normal overspeeding of the propellers up to 3150 RPM, caused by power surge, should not be confused with a runaway propeller. An overspeeding propeller will normally be returned by the governor to the set speed within a few seconds.

c. RUNAWAY TURBO.—If a runaway turbo occurs during take-off, throttle back the affected engine to 40 inches Hg. Using the throttle to reduce mani-

fold pressure will prevent turbo overspeed by the runaway turbo and permit sufficient power for take-off. Reduction of manifold pressure by the turbo boost selector will reduce the power on all four engines, and must be avoided. Replace the turbo amplifier as soon as possible. The spare amplifiers are mounted forward of the navigator's table.

12. CLIMB.

a. POSITION OF COOLING FLAPS—ENGINEER.

(1) COWL FLAPS.—Adjust as required to maintain cylinder head temperatures under 248°C during the climb. On airplanes with either long or short chord cowl flaps the setting should be approximately 7 degrees open.

(2) INTERCOOLER FLAPS. — During take-off the intercooler flaps are one-half "OPEN." For climb and cruise use minimum flap openings, but do not exceed 38°C carburetor air temperature.

b. NORMAL CLIMB PROCEDURE. — Normal climbs are made 195 MPH, IAS at 43 1/2 inches Hg. and 2400 RPM. If a formation climb is being made, the lead plane will probably have to use slightly lower power settings. During sustained climbs, if all cylinder head temperatures are running high, hold climbing power setting and level off until cylinder head temperatures return to normal, then start climbing again. When power has been reduced and 1000 feet altitude obtained, engineer turns off fuel boost pumps and checks intercooler flap positions.

c. CLIMB PROCEDURE OVER OBSTACLES.—If it is necessary to clear obstacles on the climb-out after take-off, do not allow the speed to increase too much before starting to climb. No control difficulties will be encountered down to 10 MPH, IAS above the take-off speed, but the speed must never be allowed to drop below the take-off speed. Cylinder head temperatures must be checked constantly as engine cooling is considerably less at lower airspeeds. Raise the landing gears as soon as possible, and before the first power reduction. Retract flaps at 40 MPH, IAS above take-off speed.

13. GENERAL FLYING CHARACTERISTICS.

a. CONTROL RESPONSE. — Large airplanes are usually comparatively slow in responding to their controls, but in spite of its large size and heavy weight, the B-29 has about the same flying qualities as smaller multi-engined airplanes. Just after taking off, and also during the short interval of time while landing, the rudder and aileron control response is slow but very positive. However, there is little, if any, impression of sluggishness or lack of control.

(1) AILERON.—The effect of unequal amounts of fuel in the two wings is noticeable in aileron control in level flight, and can be corrected with the aileron trim tab. As speed decreases to near the stall, the amount of aileron needed to affect the unevenness will increase very rapidly. Don't attempt landing with this unevenness until the aileron control is checked in flight at landing speed. Because of the high mechanical advantage it is necessary to turn the control wheel through 180 degrees to get full aileron deflection.

(2) ELEVATORS.—The elevators are well balanced, and the lower leading edge of the tail airfoil surface is turned up to prevent the tail from stalling while making a power-on approach to landing with the flaps down. The elevator trim tab is very sensitive at high speeds.

(3) RUDDER.—Do not be misled by the very light forces on the rudder, since the forces alone don't indicate what the rudder is causing the airplane to do. During the landing approach, and under similar conditions, it is possible to get appreciable amounts of skid with very little effort. Remember that each maneuver in a large airplane takes a comparatively long amount of time to perform, and this also holds true for correcting and stopping a skid.

b. CRUISE.

(1) Refer to the chart if Figure *27*, page *38* that correct manifold pressure to RPM relationship is being used in cruise power setting. Too high manifold pressure settings lead to detonation. Too low manifold pressure settings waste fuel and decrease range.

(2) Before starting to cruise, climb above the desired altitude. Hold climbing power setting (43 1/2 inches Hg. and 2400 RPM) at zero rate of climb until 210 MPH, IAS is obtained. Set predetermined cruising power setting, open cowl flaps to 10 degrees, and descend to desired altitude at 210 MPH, IAS. Level off at desired altitude, close cowl flaps to predicted setting, and use elevators to hold desired cruising airspeed. Vary power settings slightly to maintain altitude. After desired airspeed is established, and cylinder head temperatures have stabilized, cowl flaps may be opened or closed individually to maintain proper cylinder head temperatures. Always reduce manifold pressure first, then RPM.

(3) For long range cruising, be sure to set up the proper cruising airspeed by varying power settings as necessary. Close intercooler flaps as far as possible, and not to exceed 38°C carburetor air temperature. Mixture controls should be "AUTO LEAN" for power settings below 35 inches Hg. and 2200 RPM, and "AUTO RICH" for power settings above 35 inches Hg. and 2200 RPM.

c. TURBOSUPERCHARGER. — USE AND LIMITATIONS.

(1) GENERAL.—A governor controlled by the turbo boost selector knob automatically limits the turbo speed to 26,400 RPM. There is no region of turbo overspeed for any altitude. The turbo continues to turn faster at higher altitudes at any given power, and at 33,000 feet the turbo speed at military power is 26,400 RPM. If altitude is increased above 33,000 feet the turbo boost control will prevent the turbo from turning any faster by automatically reducing manifold pressure approximately 1 1/2 inches per thousand feet.

(a) There is no need for the pilot to decrease manifold pressure at altitude to prevent turbo overspeed if the boost control is working properly. However, if military power manifold pressure (47.5 inches) is indicated above 33,000 feet or rated power (43.5 inches) above 35,000, the control is not functioning properly. Since the consequences of serious turbo overspeed might be explosion of the turbos, possibly damaging the front wing spar or puncturing a fuel tank, the crew should recognize faulty boost operations and correct it. Reduce manifold pressure with the throttles. Do not try to use the calibrating screw to reduce manifold pressure. Probably no malfunction would have occurred if the individual boost system had responded to the calibrating screw.

(b) Malfunction of any boost control will probably be noticed during the climb when that engine holds its manifold pressure as the others start dropping off at about 35,000 feet (rated power).

(2) TURBO SURGE.—Turbo surge is caused by the stalling or breakdown of airflow in the turbo compressor. It is usually encountered in the B-29 when operating at part throttle to get high pressure for cabin pressurizing, or when part-throttling during formation flying. When part-throttling is employed for cabin pressurizing, turbo surge will occur sooner on the outboard engines than on the inboard, since a greater quantity of air is passing through the inboard turbos. Surge is recognized by a fluctuation of from 10 to 15 inches Hg. manifold pressure for as much as 10 seconds. Surge also can be encountered during full throttle operation, and is more violent and also more difficult to correct. The proper procedures for moving out of the turbo surge range are given below.

(a) TURBO SURGE AT PART-THROTTLE.

1. Open throttle.
2. Decrease turbo boost.
3. Increase engine RPM if necessary.

(b) TURBO SURGE AT FULL THROTTLE.

1. Decrease turbo boost.
2. Increase engine RPM.

If above procedures are ineffective, altitude should be decreased.

d. ENGINE OPERATING LIMITS.—In the "Region of Excessive Fuel Consumption" chart, Figure 27 (region on left-hand side), the manifold pressure is too low for the given RPM. Power plant efficiency decreases in this region as it is operated farther away from the recommended settings. The lower the manifold pressure or the higher the RPM for a given power, the greater will be the quantity of fuel used to produce a given power. This region is not critical in that there is no danger of damaging the engine unless engine speeds in excess of the highest on the chart (2800 RPM) are used.

(1) In the region to the right of the "Desirable Region" described as the "Region of Excessive Engine Pressures," the manifold pressure is too high for a given RPM. Engine damage as well as severe loss of efficiency is the danger of this region, and detonation (possibly with pre-ignition) is usually the direct cause of this damage.

e. PROPELLER OPERATION.

(1) NORMAL OPERATION.—Check with chart, Figure 27, page 38 to see that correct propeller RPM to engine manifold pressure relationship is being used. The switches are "OFF" in the straight-up or neutral position. To increase propeller RPM, grasp the switches between the hinged flaps and move them forward toward "INCREASE." This method removes the possibility of one of the switches sticking in the actuating position and dangerously increasing the RPM of the propeller affected. When the desired RPM setting is reached, return the switches to neutral. To decrease propeller RPM, grasp the switches in the same manner and move them backwards to "DECREASE." Return the switches to neutral as soon as the desired reduction in RPM is made. Use the switches individually to increase or decrease RPM on any single propeller. If any of the propeller pitch circuit breaker buttons pop up due to a momentary peak load in the circuit, reset it by pushing the button in again.

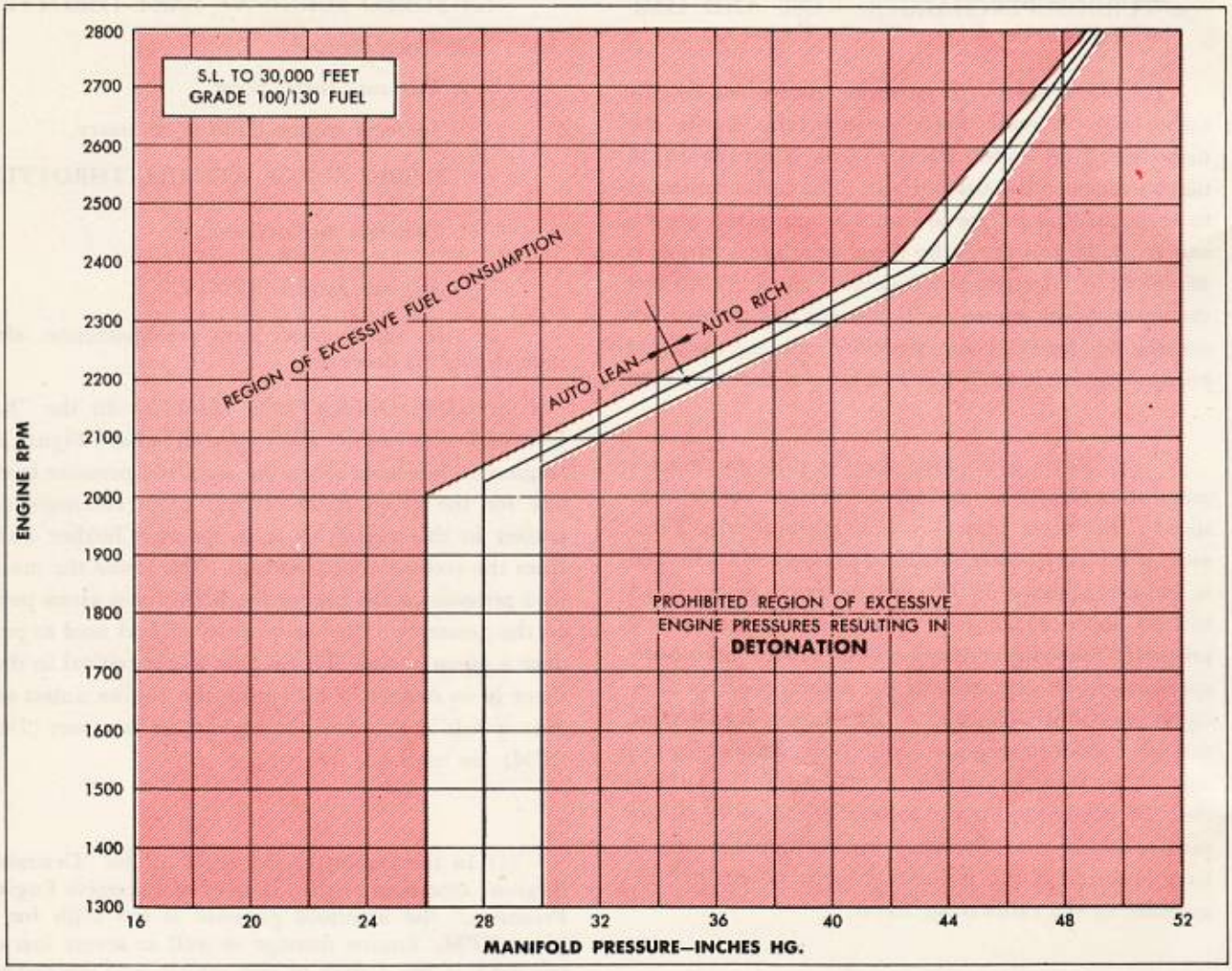


Figure 27—Engine Operating Limits

(2) PROPELLER FEATHERING.—To feather a propeller:

(a) Tell flight engineer, "Prepare to feather."

(b) Close throttle.

(c) Push feathering button. (Don't hold the button down. It will pop out when the propeller is fully feathered.)

(d) Mixture control on "FUEL CUT-OFF," fuel valve off, fuel shut-off switches "OFF," boost pump "OFF."

(e) Generators, cabin air valve, vacuum pump, and other auxiliary equipment off, or transferred to another engine.

(f) Cowl flaps and oil cooler shutters closed.

(g) Turn ignition off when propeller stops turning.

(h) Retrim airplane for balance and power.

(3) PROPELLER FEATHERING PRECAUTIONS.—Think twice before you feather a propeller under emergency conditions such as engine failure on take-off or landing. Feather a propeller only when you are sure that the engine is creating a drag. Even an idling engine delivers some thrust at relatively low speeds. On take-off it may be delivering just enough to mean the difference between crash landing and going around. Even if a crash landing is inevitable, do not feather propellers. Balance the power and land straight ahead. The B-29 propeller feathering system uses oil pumped by an electric motor into the propeller dome. If all oil in the main system is lost, a three-gallon oil reservoir holds enough oil for feathering, and unfeathering. (An airplane with this reservoir is easily identified. The feathering pump is located directly beneath the main oil tank.) If engine oil is lost, and the propeller cannot be feathered the greatest danger is from the windmilling propeller, its speed depending on your altitude and airspeed. As an example, if you are operating on three engines at 25,000 feet and 233 MPH, true airspeed, and the dead-engine propeller is windmilling in low pitch, RPM will be about 4000. Since high speeds can cause centrifugal

explosion of the propeller or destruction of the engine, reduce your power and lose airspeed, using flaps and gear if necessary. At lower altitudes and very low speeds, the windmilling propeller is not likely to exceed the normal RPM limits.

(4) PROPELLER UNFEATHERING. — To unfeather a propeller:

(a) Ignition "ON."

(b) Propeller switch to "DECREASE" RPM until limit lamp lights.

(c) Fuel valve on, fuel boost pump on "LOW," and mixture on "AUTO-RICH."

(d) Push feathering button and hold until propeller reaches 600 RPM, and not more than 1000 RPM.

(e) Warm oil to 40°C at 1200 RPM, then advance RPM and throttle.

f. AUTO PILOT OPERATING INSTRUCTIONS.

(1) BEFORE TAKE-OFF.

(a) Unless the knobs on the auto pilot control panel are known to need adjustment, they should be left alone.

(b) Center "TURN CONTROL," and make sure that control transfer knob is at "PILOT."

(c) Engage auto pilot clutch by turning knob clockwise.

(d) Disengage bombsight clutch by pulling clutch lever toward you

(2) AFTER TAKE-OFF.

(a) Turn "ON" master and stabilizer switches connected by bar.

(b) After five minutes, turn on PDI servo switch on the auto pilot control panel.

(c) Turn "ON" tell-tale lights or open shutter.

(d) After leveling off at cruising altitude, "get on the step" and trim airplane for straight and level flight.

(e) After master switch has been "ON" for ten minutes (to be sure gyros are erect) center PDI by either of the following methods:

Bombardier: Disengage auto pilot clutch and center PDI by moving auto pilot clutch arm to its center position. Then lock it in place by depressing the direction arm lock.

Alternate: Airplane commander center PDI by turning airplane in direction of PDI needle. Then, with PDI centered, resume straight-and-level flight.

(f) With wings level, adjust aileron centering knob until both aileron tell-tale lights go out. Immediately turn aileron switch "ON."

(g) With PDI on "ZERO," adjust rudder centering knob until both rudder tell-tale lights go out. Immediately throw rudder switch "ON."

(h) With airplane flying level, adjust elevator centering knob until both elevator tell-tale lights go out. Immediately throw elevator switch "ON."

(i) Observe PDI, artificial horizon and rate-of-climb or altimeter instruments, and then carefully retrim all centering knobs until airplane is flying as straight and level as possible, with PDI on center.

(3) FLIGHT ADJUSTMENTS.

(a) CENTERING.—The centering controls on the autopilot control panel are comparable to the trim tabs on the airplane.

CAUTION

Never operate trim tabs and autopilot simultaneously.

(b) SENSITIVITY. — The sensitivity knobs control the alertness of the autopilot, which is comparable to a human pilot's reaction time.

(4) TURN CONTROL OPERATION. — Whenever it is desired to turn the airplane to a new heading while flying on autopilot control, the airplane commander can execute the turn by an easy manipulation of the turn control.

(a) Rotate turn control slowly in the direction of turn desired. As the pointer passes the zero mark he will feel a "click" as the switch on the control closes, energizing the erecting cut out and directional arm lock.

(b) Stop rotation of knob when artifical horizon indicates airplane has reached desired degree of bank.

(c) A warning stop causes the knob to turn with increased difficulty after the signal for a 30-degree bank has been applied. This is to warn the airplane commander to "take it easy" as he is approaching the maximum degree of bank obtainable (40 degrees). A steeper bank may cause the vertical flight gyro roller spindle to strike against its stop on the gyro cover, resulting in precession.

(d) As the airplane approaches the desired new heading, slowly rotate control knob back to zero, timing this return so the pointers will reach zero when the desired heading is attained.

(e) Hold the pointer at zero until the airplane has leveled off on its new heading, then recenter the pointer to re-engage the erecting roller and release the directional arm lock. (No signal is applied by turn control when pointer is at either zero mark.)

(5) OPERATION OF THE CONTROL TRANSFER.—The control transfer is in the lower left-hand corner of the control panel. This control enables the airplane commander to transfer control of the airplane smoothly to the remote turn control which is operated in an identical manner by the bombardier

or radar operator. The airplane commander rotates the control transfer knob to its extreme clockwise position. This is done slowly to prevent the sudden introduction of a strong signal in case the remote turn control is not centered at the time of transfer. (Never leave transfer knob at an intermediate position.) An indicator light adjacent to the control transfer knob informs the airplane commander when the remote turn control is in control of the airplane.

(6) FLIGHT PRECAUTIONS.

(a) Before maneuvering always turn off the autopilot at least 10 minutes before attempting any extreme maneuvers, to allow time for gyros to slow down. If banks greater than 40 degrees are attempted with gyros running near rated speed, the gyros will be damaged by the violent precessing caused by striking their stops.

(b) CHECK DURING FLIGHT.—During a straight flight of several hours duration, it is advisable to check the airplane's course at regular intervals to determine whether precession of the directional stabilizer gyro has caused the airplane to deviate from its established heading. This precession is caused by the rotation of the earth and the curvature of its surface. When this phenomenon occurs, it is necessary to use the turn control to bring the airplane back to its proper heading.

(7) BOMBARDIER'S DUTIES—AUTOPILOT.

(a) Disengage the bombsight clutch and engage the autopilot clutch before take-off.

(b) Disengage autopilot clutch and hold PDI centered while the airplane commander is engaging the aileron and rudder servo units; then re-engage autopilot clutch when engaging of the units has been completed.

(c) Operate autopilot clutch arm to check adjustment of turn compensation.

(d) Make necessary dashpot adjustments during flight.

(e) Adjust stabilizer mount to keep directional stabilizer level when airplane is in straight and level flight.

(f) Open the ventilating cover on the top of the stabilizer housing as required to prevent overheating during flight.

14. WAR EMERGENCY OPERATION. *(only with 49 in. Hg. and 2800 RPM take-off).*

Under extreme combat conditions or during other critical operations, such as a short field take-off or go-round, war emergency power settings of 50.5 inches Hg. and 2800 RPM may be used. Push the lock on the turbo boost selector that normally limits the knob to turn to "8" and turn the selector knob to position "10." War emergency power settings must be used only when extreme emergency conditions are encountered.

15. STALLS.

a. STALLING SPEEDS.

POWER-OFF STALLING SPEEDS

Gross Weight	*Indicated Stalling Speeds Flaps Up*	*Flaps 25°*	*Flaps Full Down*
140,000	145	131	119
130,000	140	126	114
120,000	135	121	110
110,000	129	115	105
100,000	123	110	100
90,000	117	104	95
80,000	110	98	89
70,000	103	92	84

b. STALL WARNING.—Warning of the impending stall comes in the form of a comparatively mild buffeting of the horizontal stabilizer. With flaps up, the warning comes from 15 to 20 MPH, IAS above the stall speed. With partial flaps or full flaps down the warning comes approximately 10 MPH, IAS above the stalling speed. Both the buffeting and the stalls in the B-29 are relatively gentle, and present no problems to the average pilot. As the gross weight increases, the warning between the buffeting and stalling speeds decreases.

c. EFFECTIVENESS OF AILERONS.—The ailerons are fully effective right up to the stall. No violent rolling action either precedes or accompanies the power-off stall under any flap setting conditions. However, as in the case of all multi-engine airplanes, stalls encountered under asymmetrical power condition in the B-29 will probably cause violent rolling moments. The landing gear extended has no appreciable effects on the stalling characteristics.

d. RECOVERY FROM STALL.—When the airplane is stalled, recovery should always be made by nosing the airplane down. A reversal of elevator force takes place after the stall, but the force tending to keep the control column back is comparatively light. Apply power, but not before the nose has been dropped. Avoid abrupt use of the elevators or restalling the airplane during recovery from the stall.

16. SPINS.

Spins are one of the prohibited maneuvers in the B-29, and must never be done intentionally. However, in case a spin is entered accidentally, use normal recovery procedures to regain level flight.

17. DIVING.

Diving speeds must not exceed the maximum allowable airspeed of 300 MPH, IAS at any time. Avoid abrupt pull-outs at higher indicated air speeds.

18. INSTRUMENT FLYING.

a. TAKE-OFF.—It is important when making an instrument or night take-off, and immediately afterwards, to hold the airplane at the proper altitude and let the airspeed build up steadily. Take-off at 115 to 130 MPH, IAS and climb 500 feet at 160 MPH, IAS. Level off at 500 feet until climbing airspeed of 195 MPH, IAS is obtained. Then, continue climb at 195 MPH, IAS.

b. LANDING APPROACH.—When you are making an instrument approach and heading inbound toward the cone, set the flaps at 25 degrees, put the gear down, set the engine RPM at 2400, and put the turbo regulator dial on number 8. The airplane has less reserve performance with the flaps down; thus, it is recommended that flaps (25 degrees) be used when starting to let down toward the cone, before beam bracketing becomes difficult and before changes in altitude become critical. It is also recommended that full flaps be saved until after you have broken through and are lined up with the runway on final approach.

19. BEFORE LANDING.

a. AIRPLANE COMMANDER'S CHECK.

(1) NOTIFY CREW.—PREPARE FOR LANDING.—The before landing check begins about 10 minutes before landing. On transition missions, take-offs may be spaced as close as 10 minutes apart, provided that little or no braking has been used during the previous landing roll. If the brakes have been used excessively, allow up to 30 minutes for brake cooling. Copilot repeats the command, "Prepare for landing" over the interphone, at which time the tail gunner starts the put-put and informs the copilot. Crew members acknowledge in the following order: bombardier, navigator, flight engineer, radio operator, top gunner, left gunner, right gunner, radar operator, and tail gunner.

(2) RADIO CALL COMPLETED.—The airplane commander calls the tower for landing information.

(3) ALTIMETER SET. — Airplane commander and copilot set their altimeters to the altimeter setting given by the tower.

(4) TRAILING ANTENNA IN.

(5) AUTOPILOT OFF.

(6) TURRETS STOWED.

(7) HYDRAULIC PRESSURE OK.—The copilot meters the brake pedals till pressure falls below 800 PSI and checks to see that pressure is returned to 1000 lbs. per sq. in. Any difference in final pressure should be reported to the flight engineer, as copilot asks him to check emergency hydraulic pressure.

(8) PUT-PUT ON THE LINE. — The copilot checks with the tail gunner to make sure that the put-put is on the line, after the landing gear is down.

(9) PROPELLERS 2400 RPM.—The copilot adjusts propellers to 2400 RPM before airplane commander reduces power.

(10) LANDING GEAR DOWN AND LIGHTS ON.—The copilot, on command of the airplane commander, lowers the landing gear. Leave the landing gear switch in the "DOWN" position until the airplane is parked. The side gunners check the main gear and announce in order, "Left gear down and locked" and "Right gear down and locked." The copilot checks the nose wheel through the observation window in the floor of the cockpit and checks the landing gear warning lights on his instrument panel.

Note

The indicated air speed MUST BE LESS than 180 MPH, IAS before the gear is lowered.

The visual check by the gunners and copilot is most important. The red warning light and the green down and locked lights (and the landing gear warning horn, on early models) all operate from the gear motor limit switches. Remember this—the lights and the horn are *not* position indicators. They mean only that the limit switches have stopped the operation of the gear motors. If the switches open the circuit too soon, the gear will be only partly down and warning of this danger can come only from the visual check.

(11) ENGINEER'S REPORT.—The flight engineer gives the weight and C. G. figures to the copilot.

(12) STALL SPEED.—The copilot finds the stall speed based on gross weight and informs the airplane commander. Stalling speed charts are on the airplane commander's and copilot's control columns.

(13) WING FLAPS.—At the airplane commander's order the copilot extends the wing flap 25 degrees just before turning on base leg. Later, on the final approach and at the airplane commander's order, he extends full flaps at which point the airplane commander retrims the elevators. The side gunners check position of flaps and inform the copilot over the interphone.

(14) TURBOS ON NO. 8.—Airplane commander will call for turbos on base leg. Copilot will announce "TURBOS ON" to flight engineer and turn selector dial to "8."

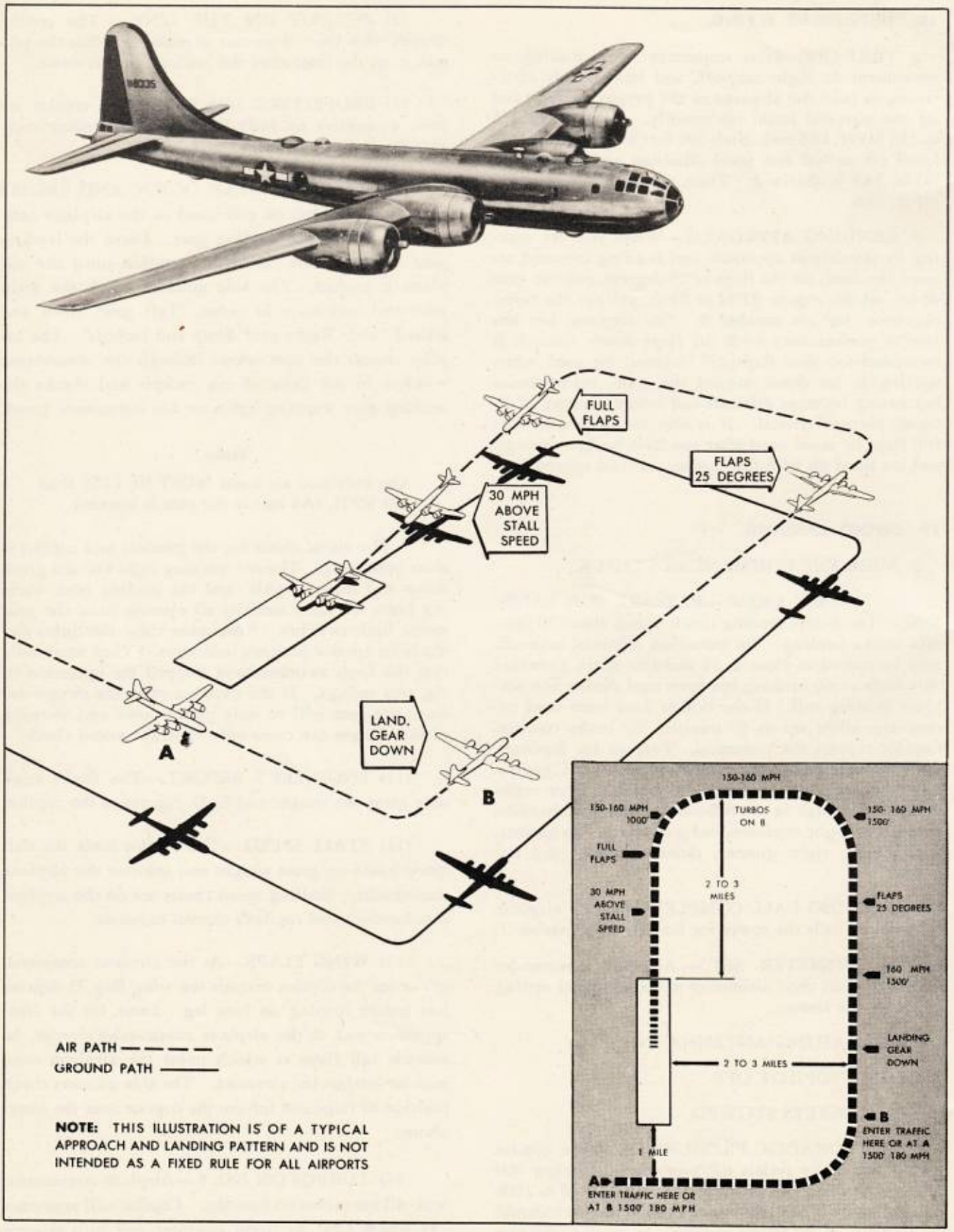


Figure 28—Traffic Pattern

b. ENGINEER'S CHECK.

(1) Weight and C. G. — Engineer will compute weight and C. G. (%MAC) and give to pilot.

(2) Mixture control—Put mixture in "AUTO RICH."

(3) Auxiliary power plant—Start and warm up, put generator to run position and equalizer on.

(4) De-icers "OFF."

(5) Anti-icers "OFF."

(6) Fuel boost pumps "ON."

(7) Intercoolers—One-half open, or as required.

(8) Cowl flaps—Closed.

(9) Hydraulic pressure — Inform copilot emergency pressure is 900—1075 PSI.

(10)—Report—Inform pilot, check list complete, ready for landing.

20. APPROACH AND LANDING.

a. GENERAL.

(1) Don't extend full flaps until you are lined up with runway and sure of making the field. Go-arounds are more difficult when flaps are full down. After extending full flaps, maintain indicated airspeed of 30 MPH, above the power-off stalling speed. Don't "chop" the power at any point on the approach. Long approaches are not necessary, even when landing on narrow runways (see traffic pattern), but the base leg will normally be placed farther out than for a B-17 or a B-24.

b. GO-AROUND. — The technique to be used for a refused landing is not complicated. Flaps should be raised from full-down position to 25 degrees as power is applied. Continue on the same approach angle until a safe flying speed is reached. Raise gear as soon as it becomes apparent that the runway will not be touched. Flaps and gears should be raised together if at least four generators are functioning. Raising the flaps immediately to 25 degrees is of paramount importance rather than waiting for a "safe airspeed." In case of an engine failure, a "safe airspeed" will never be reached as long as the flaps are down, due to the high flap drag and reduced acceleration.

c. CROSSWIND LANDINGS.—Although there is good aileron, rudder, and elevator control throughout the landing approach, remember that the B-29, because of its weight and size, is slow to respond to control movements. When making a crosswind landing, lower the wing on the upwind side and then raise it just before the wheels touch by applying a little throttle to the outboard engine on the low side. Make fairly long approaches on crosswind landings to give ample time to make drift corrections.

21. AFTER LANDING.

a. LANDING ROLL.—Don't use your brakes more than necessary after the wheels touch the ground. On a long runway, let the airplane roll until it loses speed. Lower the nose gently at 90 MPH, and when nearing end of runway, apply brakes evenly and smoothly. Toward the end of the landing roll, the co-pilot sets the turbo selector to "0," moves propeller control to "INCREASE" and throttles to 700 RPM for taxiing.

b. AIRPLANE COMMANDER'S CHECK.

(1) HYDRAULIC PRESSURE. — Copilot checks normal pressure gage for reading between 800 and 1000 PSI.

(2) TURBOS "OFF."

(3) PROPELLERS IN HIGH RPM.

(4) WING FLAPS UP.—Near the end of the landing roll, at the airplane commander's order, co-pilot raises flaps (all the way, if this is the last landing; to 25 degrees, if planning to make another take-off). Side gunners report on position of wing flaps.

(5) PARKING BRAKES SET

(6) BOMB BAY DOORS OPEN.—Airplane commander calls for bomb bay doors open.

(7) MAGNETOS CHECKED.—The flight engineer checks all magnetos at 2200 RPM.

(8) ENGINES STOPPED.—The pilot gives the order "Stop engines" to the flight engineer.

c. ENGINEER'S CHECK.

(1 & 2) COWL FLAPS AND INTERCOOLERS.—Upon landing, cowl flaps and intercoolers will be moved to full open position.

(3) GENERATORS.—Turn generators off.

(4) BOOST PUMPS.—Turn boost pumps off.

(5) BOMB BAY DOORS OPEN.—When copilot says, "Generators on coolest engine," flight engineer sets throttle at 1400 RPM and turns generator on. When doors are open and copilot says "Generators off," flight engineer turns off generators and retards throttle.

(6) MAGNETOS.—Set throttles to 2200 RPM one at a time and check magnetos.

(7) STOP ENGINES.—Stop all engines simultaneously, using the following procedure:

22. STOPPING ENGINES.

a. ENGINEER.

(1) Run engines at 700 RPM until cylinder head temperatures cool (190°C if possible). While engines are cooling at 700 RPM, flight engineer flips master ignition switch to the "OFF" position momentarily to see that all magnetos are grounded out.

(2) Increase throttle settings to 1200 RPM and run each engine for at least 30 seconds at this speed. Dilute oil at this time if necessary. See Section VI.

(3) Move the mixture control to fuel cut-off.

(4) Turn "OFF" ignition switches after propellers stop turning.

(5) On fuel injection engines—Place throttles in closed position after engines stop turning.

(6) Stop put-put.

(7) SWITCHES.—All switches "OFF."
(Lift guard and turn inverter switch off)

23. BEFORE LEAVING AIRPLANE.

a. AIRPLANE COMMANDER AND COPILOT.

(1) RADIOS OFF. — The airplane commander turns off the command set and copilot switches off the radio compass.

(2) CONTROLS LOCKED.

(3) WHEEL CHOCKS IN PLACE — BRAKES OFF.

(4) FORMS 1 AND 1A ACCOMPLISHED.—The flight engineer completes Forms 1 and 1A and presents them to the airplane commander for check.

b. ENGINEER.

(1) WHEEL CHOCKS IN PLACE.

(2) BRAKES OFF.

(3) CONTROLS LOCKED.

(4) FLIGHT LOG COMPLETE.

(5) FORMS 1 AND 1A.—Complete Forms 1 and 1A and give to airplane commander for approval.

(6) TROUBLE SHOOTING. — Report all malfunctions to crew chief and help him locate the trouble.

INSTRUMENT AIRSPEED	CORRECT I.A.S. (25000 FT.)	ALTIMETER ERROR	
		15000′	30000′
160	156	40	67
180	175	51	85
200	194	62	105
220	213	76	127
240	232	90	151
260	251	105	178
280	269	122	206

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THE CORRECTED AIRSPEED INCLUDES PITOT POSITION AND COMPRESSIBILITY ERRORS.
THE INSTRUMENT READS 1 1/2 PER CENT HIGH DUE TO PITOT POSITION ERROR.

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Figure 29—Airspeed Correction Table

POWER PLANT CHART

AIRCRAFT MODEL(S)
B-29
B-29A

PROPELLER(S)
Hamilton Standard Hydramatic

ENGINE MODEL(S)
R-3350-21, 23, 23A. 57, 59

GAUGE READING	FUEL PRESS.	REAR OIL PRESS.	NOSE OIL PRESS.	OIL TEMP.	CARB AIR
DESIRED MAXIMUM	15-18 19	60-80 80	30-50 50	50-85 95	15-40 40
MINIMUM IDLING	15 15	60 20	20	40	-10

MAXIMUM PERMISSABLE DIVING RPM: 3100
MINIMUM RECOMMENDED CRUISE RPM: 1400
MAXIMUM RECOMMENDED TURBO RPM: 26,400

OIL GRADE: (S) 1120 (W) 1120
FUEL GRADE: 100/130 Spec. AN-F-28

WAR EMERGENCY (COMBAT EMERGENCY)			MILITARY POWER (NON-COMBAT EMERGENCY)			OPERATING CONDITION			NORMAL RATED (MAXIMUM CONTINUOUS)			MAXIMUM CRUISE (NORMAL OPERATION)		
5 MINUTES			5 MINUTES			TIME LIMIT			UNLIMITED			UNLIMITED		
260° C			260° C			MAX. CYL. HD. TEMP.			248° C			232° C		
AUTO RICH 2800			AUTO RICH 2600			MIXTURE R. P. M.			AUTO RICH 2400			AUTO LEAN 2200		
MANIF. PRESS.	SUPER-CHARGER	FUEL (1) Gal/Min	MANIF. PRESS.	SUPER-CHARGER	FUEL (1) Gal/Min	STD. TEMP. °C	PRESSURE ALTITUDE	STD. TEMP. °F	MANIF. PRESS.	SUPER-CHARGER	FUEL GPH (2)	MANIF. PRESS.	SUPER-CHARGER	FUEL GPH (2)
						-55.0	40,000 FT.	-67.0						
						-55.0	38,000 FT.	-67.0						
						-55.0	36,000 FT.	-67.0						
			47.5		5	-52.4	34,000 FT.	-62.3	43.5		250	35		145
			"		5	-48.4	32,000 FT.	-55.1	"		250	"		145
50.5		5.5	"		5	-44.4	30,000 FT.	-48.0	"		250	"		145
"		5.5	"		5	-40.5	28,000 FT.	-40.9	"		250	"		145
"		5.5	"		5	-36.5	26,000 FT.	-33.7	"		255	"		150
"		5.5	"		5	-32.5	24,000 FT.	-26.5	"		255	"		150
"		5.5	"		5	-28.6	22,000 FT.	-19.4	"		255	"		150
"		5.5	"		5	-24.6	20,000 FT.	-12.3	"		255	"		150
"		5.5	"		5	-20.7	18,000 FT.	- 5.2	"		255	"		145
"		5.5	"		5	-16.7	16,000 FT.	2.0	"		255	"		145
"		5.5	"		5	-12.7	14,000 FT.	9.1	"		255	"		145
"		5.5	"		5	- 8.8	12,000 FT.	16.2	"		250	"		145
"		5.5	"		5	- 4.8	10,000 FT.	23.4	"		250	"		145
"		5.5	"		5	- 0.8	8,000 FT.	30.5	"		250	"		140
"		5.5	"		5	3.1	6,000 FT.	37.6	"		250	"		140
"		5.5	"		5	7.1	4,000 FT.	44.7	"		245	"		135
"		5.5	"		5	11.0	2,000 FT.	51.8	"		245	"		135
"		5.5	"		5	15.0	SEA LEVEL	59.0	"		240	"		130

GENERAL NOTES

(1) Gal/Min: APPROXIMATE U.S. GALLON PER MINUTE PER ENGINE (5% CONSERVATIVE)
(2) GPH: APPROXIMATE U.S. GALLON PER HOUR PER ENGINE. (5% CONSERVATIVE)
F.T.: MEANS FULL THROTTLE OPERATION.
VALUES ARE FOR LEVEL FLIGHT WITH RAM.

FOR COMPLETE CRUISING DATA SEE APPEND. X I
NOTE: TO DETERMINE CONSUMPTION IN BRITISH IMPERIAL UNITS, MULTIPLY BY 10 THEN DIVIDE BY 12.

TAKE-OFF CONDITIONS:

* 2800 RPM, 49" MP, AUTO-RICH, 260°C MAX.

CONDITIONS TO AVOID:

AVOID CRUISING BELOW 1400 RPM.

SPECIAL NOTES

ALL FIGURES ON THIS CHART SHALL BE CONSIDERED AS ESTIMATED DATA FOR FUEL INJECTION ENGINES.

* SAME AIRPLANES RESTRICTED TO 2600 RPM & 47.5" M.P. ON TAKE OFF - CHECK INSTRUMENT MARKINGS.

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DATA AS OF 2-20-45 BASED ON FLIGHT TESTS

WF-3-21-44-10M

Figure 30—Power Plant Chart

1. EMERGENCY ESCAPE AND ENTRANCE.

a. EMERGENCY EXITS.

(1) DURING FLIGHT.—Members in the forward compartment go through the hatch and the nose wheel well. The landing gear must be down to go through, however, an alternate path of exit is through the forward bomb bay.

Personnel in the rear pressurized compartment, abandon the airplane through the rear bomb bay and through the rear entrance door on the right side of the airplane.

The tail gunner should abandon through the escape window to the right of his position. If anything prevents this, come forward to abandon with the crew in the rear unpressurized compartment.

(2) ON GROUND.—Personnel in the forward compartment can leave through the escape windows at the airplane commander's, copilot's, and engineer's stations. The astrodome furnishes an excellent route.

Members in the rear pressurized compartment use the rear entrance after jettisoning the door in flight. The rear escape hatch on the left side of the fuselage is available and should be released before landing.

The tail gunner leaves through the escape window in his compartment. To avoid possible jamming, he should release the window before landing.

b. EMERGENCY ENTRANCE.—Normal entrance to the airplane can be considered as places of emergency entrance except when special conditions arise. Places of entrance by chopping through the body skin are marked with stencils on the airplane. The airplane commander's window, the flight engineer's window, sighting blisters, and the fuselage at the U. S. identifying insignia are some of the places marked for emergency entrance.

c. LOCATION OF PARACHUTES AND AXES.

(1) PARACHUTES. — All crew members have seats that will accomodate any type of parachute. The radio operator and navigator have seats that will serve detachable chutes more comfortably. If a detachable chute is used, have it nearby.

(2) AXES.—There is a hand axe near the fire extinguisher at the navigator's station and another one on the aft compartment auxiliary panel.

d. ALARM BELLS.

(1) EMERGENCY.—This system rings a bell in each compartment when the switch on the aisle stand is "ON."

(2) CABIN PRESSURE HORNS. — The cabin pressure horns will blow when the cabin pressure reaches the equivalent of 12,000 feet altitude (19.02 inches of mercury). There is a horn in each pressurized compartment.

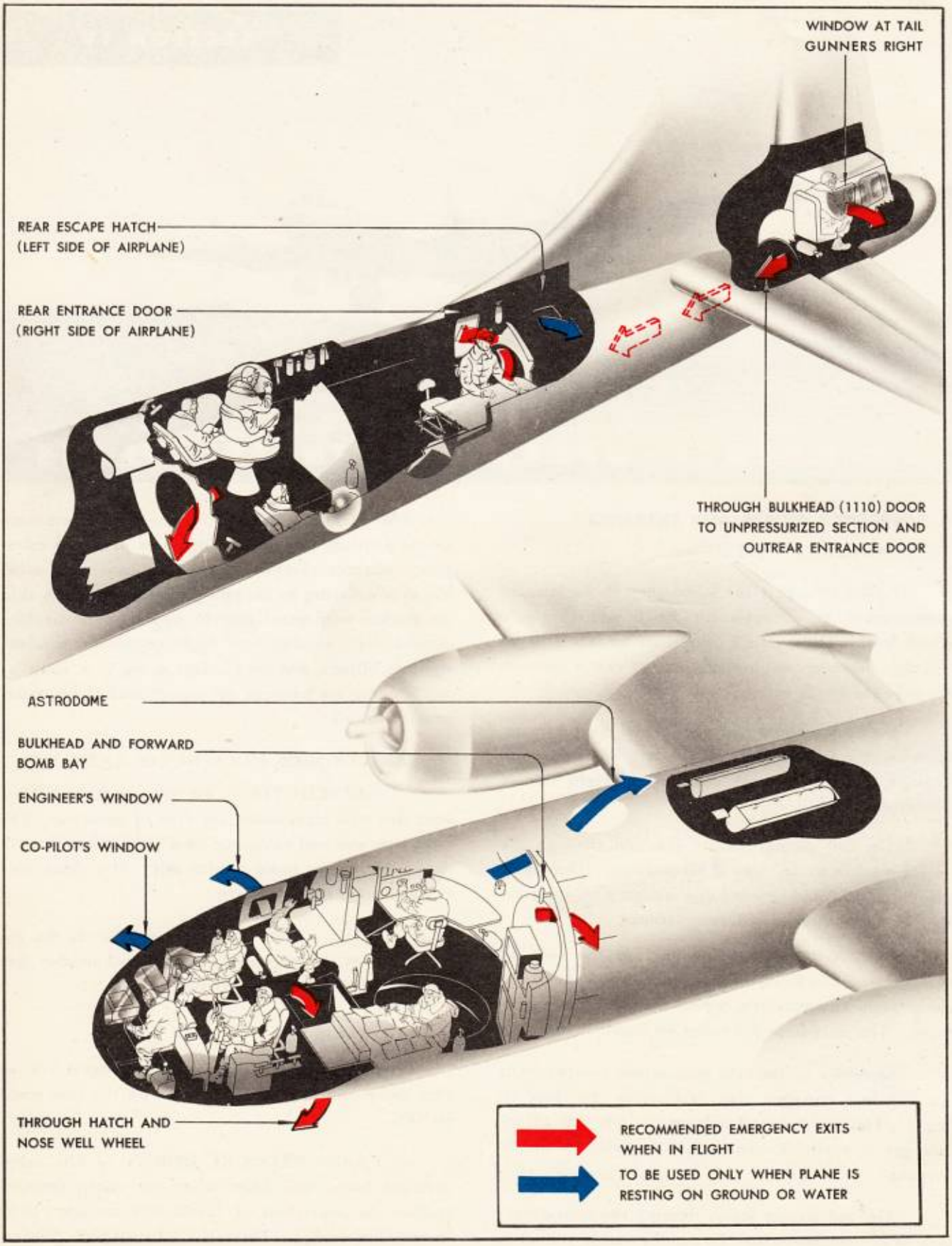


Figure 31—Emergency Exits

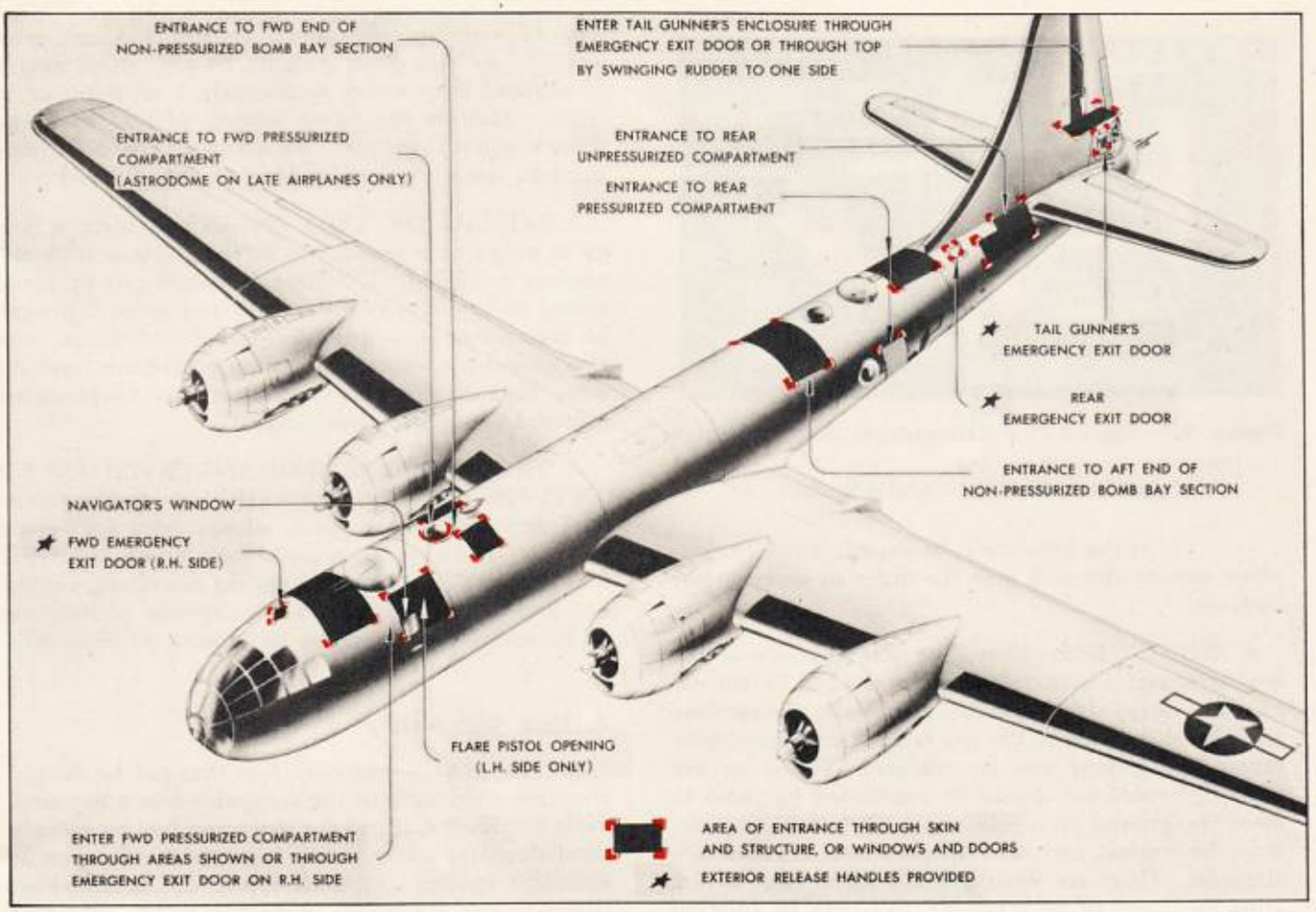


Figure 32—Emergency Entrance to Airplane

2. FIRE.

a. FIRE FIGHTING EQUIPMENT.

(1) ENGINE FIRE EXTINGUISHER.—The B-29 has a CO_2 system that furnishes CO_2 gas from two high pressure cylinders in the nose wheel well. Lines from each bottle run to all four engine nacelles. The flight engineer can direct the CO_2 charge to the desired engine by turning the selector knob on his instrument panel. Then pull the release handle (or both handles for two charges).

(2) HAND FIRE EXTINGUISHERS.—There are three hand fire extinguishers in the airplane. One is on the top forward turret by the engineer, another is on the left wall of the rear pressurized compartment, and the third is in the rear unpressurized compartment by the entrance door.

b. FIRE FIGHTING EQUIPMENT OPERATION.

(1) To use the CO_2 extinguisher, stand as close to the fire as practicable, raise the horn, and direct the gas to the base of the fire.

(2) To stop the flow of gas, replace the horn in the clip on the side of the cylinder.

(3) While using the extinguisher, hold to the rubber insulated tubing. During discharge of CO_2 gas the metal horn gives off "dry ice" and frost bite must be avoided by not holding the horn.

c. ENGINE FIRES.

(1) GENERAL.—Feathering a propeller and stopping the engine is the best way to put out a power plant fire. Members of the crew should maintain a regular check of the power plants and report anything unusual.

(2) NACELLE FIRES DURING FLIGHT.

(a) Any crew member who sees a fire will use the "CALL" position on the jack box to announce "FIRE ON ..... ENGINE."

(b) Airplane commander immediately closes throttle of engine on fire, takes and directs the following action.

(c) Engineer moves the mixture control to "FUEL CUT-OFF," turns the booster pump to "OFF," and turns the fuel shut-off valve switch "OFF." If the airplane has an oil shut-off valve, turn it off too.

(d) Airplane commander feathers correct propeller.

(e) Engineer opens cowl flaps to 10 degrees, turns fire extinguisher selector knob to engine afire, and pulls handle of one (1) CO_2 charge.

(f) If fire still exists, discharge second CO_2 bottle.

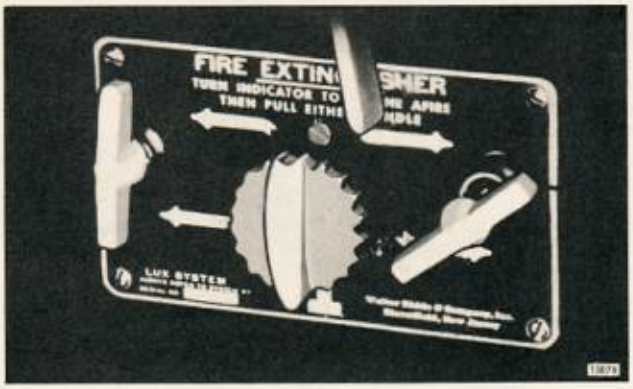


Figure 33—Engine Fire Extinguisher Selector Valve

(c) AIRPLANE COMMANDER.

1. If the fire cannot be extinguished, the airplane commander will give the order to abandon the airplane.

d. WING FIRES.—Fires that occur outside of the engine accessory section cannot be reached by the engine fire extinguisher system. In the air, the airplane must be abandoned if the fire reaches any proportion before the ground can be reached. When on the ground, outside aid should be summoned by radio to assist the ground crew who most likely will be near. Stop the engines and have all personnel abandon the airplane. There are vents in the leading edge of the wing outboard of each engine. CO_2 can be injected into these vents for combating a wing fire.

e. FUSELAGE FIRES.

(1) ON THE GROUND.—Report the fire to the airplane commander and get busy with a fire extinguisher. If the fire is from electrical wiring report its type and nature so that effective means can be applied in the quickest way.

(2) IN THE AIR.

(a) When flying at altitude, the airplane commander will order the crew to use oxygen and will pull the cabin air pressure release valve handle.

(b) If the fire appears to be of an electrical nature, turn off the generator switches and the battery switch.

(c) The airplane commander will give the bail-out signal, if necessary.

3. ENGINE FAILURE DURING FLIGHT.

a. ENGINE TROUBLESHOOTING.—See "Engine Troubleshooting Chart," figure 34.

b. FAILURE OF ONE ENGINE.—Failure of an outboard engine is more critical than the loss of an inboard engine because there is a tendency for the airplane to yaw and to roll. 135 MPH, IAS is necessary to maintain directional control for any gross weight. At high gross weights, an additional margin of airspeed is necessary to maintain level flight or to climb. Increase the power setting of the remaining three engines to increase the airspeed, and if altitude permits, lower the nose to increase the airspeed.

c. FAILURE OF TWO ENGINES.—With a low gross weight it is possible to fly the airplane with two engines feathered. Directional control can be maintained as low as 140 MPH, IAS and level flight can be maintained at a gross weight of 90,000 lbs. with two propellers feathered, landing gear down, and the wing flaps extended 25 degrees. Higher airspeeds are required for higher gross weights.

d. TRIMMING THE AIRPLANE (WITH ONE OR TWO ENGINES INOPERATIVE). — Apply rudder trim first and follow with aileron trim for lateral control. The airspeed must be kept above 140 MPH, IAS by using rated power from the remaining engines and by lowering the nose of the airplane. Altitude can be favorably exchanged for an increase in airspeed.

4. FUEL DUMPING.

a. GENERAL.—The only fuel that can be dumped from the airplane is in the droppable bomb bay tanks. Early airplanes dropped the tanks and fuel by a mechanical-electrical system, while late airplanes have an all-electrical system. In both types, the bomb release system is used for release of the fuel tanks. The tanks cannot be jettisoned while the fuel tank safety switches are "OFF."

b. FUEL TANK EMERGENCY RELEASE.

(1) MECHANICAL-ELECTRICAL SYSTEM.

(a) AIRPLANE COMMANDER.—Pull bomb emergency release handle.

(b) BOMBARDIER.—The bombardier from his station can release the tanks with his bomb emergency release and rewind wheel.

(c) LEFT SIDE GUNNER.—From his station, salvo of the tanks is possible by use of his bomb salvo handle.

(2) ALL-ELECTRICAL SYSTEM.

(a) AIRPLANE COMMANDER.—Move the BOMB SALVO switch to "ON."

(b) BOMBARDIER.—From the bombardier's station the tanks can be dropped by first turning the master switch "ON" and then moving the "BOMB SALVO" switch to "ON."

(c) RIGHT SIDE GUNNER.—The tanks can be jettisoned at the right side gunner's station by moving the "BOMB SALVO" switch to "ON."

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive head temperature	1. Exceeding limitations.	Adhere to limitations on power plant chart (figure 23). Keep cylinder head temperature below 220°C before actual start of take-off run.
	2. Mixture too lean	Check mixture control. Auto lean should not be used above 2200 RPM and 35 inches MP.
	3. Fuel pressure low.	Maintain fuel pressure between 15 and 19 PSI.
	4. Cowl flaps closed.	Maintain proper cowl flap openings. Never open cowl flaps more than 3½ inches (12°) in climb or 3 inches (10°) in level flight.
	5. Detonation.	Check propeller RPM; decrease manifold pressure, or use a rich mixture.
Incorrect manifold pressures	1. Turbo regulator.	Check manifold pressure selector control for proper operation, position, calibration.
High oil temperature	1. Faulty oil cooler operation.	Desirable oil temperatures should range between 50°C and 70°C, max. 95°C. Open oil cooler flaps manually. In extremely cold weather close oil cooler flaps to relieve congealed oil.
Low oil pressure	1. High oil temperature.	Proceed as in high oil temperature.
Low fuel pressure	1. Altitude.	Use booster pump. Maintain fuel pressure at 17±2 PSI.

Figure 34—Engine Troubleshooting Chart

5. BOMB EMERGENCY RELEASE.

a. GENERAL.—Early B-29 airplanes have a mechanical-electrical method of bomb release. Normal release is accomplished electrically. The emergency system, releases only by the mechanical means. Late airplanes have an all electric system of bomb release for both normal and emergency operation. The bombs can be dropped armed or safe.

b. MECHANICAL-ELECTRICAL SYSTEM.

(1) TO OPEN BOMB BAY DOORS AND RELEASE BOMBS.

(a) AIRPLANE COMMANDER. — Pull the emergency release handle on the control stand. The first part of the pull releases the bomb bay doors, the second part operates the bomb release lever.

(b) BOMBARDIER.—Rotate the bombardier's release-and-reset wheel 2-1/2 turns clockwise.

(c) LEFT SIDE GUNNER.—Pull the emergency release handle in the rear pressurized compartment by the forward pressure bulkhead.

(2) TO CLOSE THE BOMB BAY DOORS.

(a) BOMBARDIER.

1. Turn the bombardier's release-and-reset wheel 2-1/2 turns counter-clockwise.

2. Move bomb bay door switch to "OPEN."

3. Wait until the bomb door retraction screw engages the door mechanism, then move the bomb bay door switch to "CLOSE."

CAUTION

On airplanes equipped with the mechanical-electrical bomb release system, the bombardier's bomb door control handle and switch on the emergency bomb door motor must be in the same position (indicating either "OPEN" or "CLOSED") to prevent operation of the normal bomb bay door motors against the emergency bomb bay door motor. If the bombardier's handle is used, the emergency bomb door motor switch must be in the "OFF" position.

c. ALL ELECTRIC SYSTEM.

(1) The bombs can be salvoed from three positions in the airplane: closing any salvo switch will illuminate the salvo indicator lights. The bomb bay doors will open automatically.

(a) AIRPLANE COMMANDER.—Move the "BOMB SALVO" switch "ON."

(b) BOMBARDIER.

1. Turn the master switch "ON."

2. Move the "BOMB SALVO" switch "ON."

(c) RIGHT SIDE GUNNER. — Move the "BOMB SALVO" switch "ON."

(2) Some late B-29's have a pneumatic bomb door system. For emergency operation, there are two handles for opening the doors. One is at the airplane commander's station, the other is in the forward bomb bay. There are two pull handles for closing the bomb bay doors. The forward bomb bay, to the right of the emergency door release handle. The other handle, for the rear bomb bay doors, is along the right hand catwalk of the rear bomb bay. Without air pressure, the doors on either bomb bay cannot be closed. A standby air pressure accumulator makes an emergency supply of air available.

(a) TO CHARGE THE EMERGENCY RESERVOIR.

1. Close the actuating valve.

2. Open the charging valve.

3. When the compressor has completely charged the accumulator and the emergency reservoir, close the charging valve.

(b) EMERGENCY RETRACTION OF FRONT BOMB DOORS.

1. Open the forward door actuating valve.

2. Pull emergency retracting handle located on the cross walk. Hold until the doors are closed.

(c) EMERGENCY RETRACTION OF REAR BOMB DOORS.

1. The front doors must always be closed first.

2. Open the rear actuating valve.

3. Pull the emergency retracting handle located on the right catwalk. Hold until the doors are closed.

6. WING FLAP EMERGENCY OPERATION.

a. Check the airplane commander's power transfer switch and the bus selector switch in "NORMAL" position.

(1) After the landing gear is lowered, have a crew member insert the emergency wing flap motor, and plug the cord in the receptacle. Place the three-way switch in "FLAPS DOWN" position. The wing flaps will not lower, because the emergency system is not energized.

(2) The airplane commander can obtain wing flaps to any degree he desires through momentary use of his power transfer switch in the "EMERGENCY" position. DO NOT USE OVER 40 DEGREES OF WING FLAPS AS THERE ARE NO LIMIT SWITCHES.

(3) To raise the wing flaps, have a crew member put the switch in the "FLAPS UP" position, and use the "EMERGENCY" position of the power transfer switch. In case of a refused landing, the airplane commander can "work" the wing flaps up in this manner.

b. If the entire normal airplane power system is inoperative, leave the power transfer switch in "NORMAL." Start the auxiliary power plant, and install the auxiliary wing flap motor. The flaps can be controlled as desired by having a crew member momentarily move the bus selector switch from "NORMAL" to "EMERGENCY" upon instructions from the airplane commander over the interphone.

7. LANDING GEAR EMERGENCY OPERATION.

a. ELECTRICAL SYSTEM (EARLY AIRPLANES ONLY).

(1) Check the fuse. Replace if necessary.

(2) If the fuse is good, return the landing gear switch to "OFF." The landing gear transfer switch should be turned to "EMERGENCY." The auxiliary power plant should be placed in parallel with the normal system. However, if all engine generators are inoperative, move the bus selector switch to "EMERGENCY."

(3) To open the main gear doors, pull the nacelle door release handle out all the way and HOLD IT. Put landing gear switch in "UP POSITION" for approximately five seconds to prevent gear jamming the doors. Then place switch in "DOWN" position to lower the landing gear. Lower each main gear separately. While holding the nacelle door release handle all the way out, extend the gear with the main landing gear release switches located on the

forward wall of the forward bomb bay, until the wheels are visible below the nacelle doors. At this point, the position of the nacelle door release handle is unimportant. Complete the extension of the wheels.

(4) There are no limit switches in the emergency motor circuit. The switch should be held "down" for approximately ten seconds after all apparent movement of the wheels has stopped.

(5) Should difficulty be experienced in opening nacelle doors, proceed as follows:

(a) Pull nacelle door release handle out all the way and HOLD IT.

(b) If this has no effect, accelerate the speed of the airplane not to exceed 260 MPH, IAS in a shallow dive. The increased pressure differential should help to force the door open. Do not make sharp pull-outs to assist door opening or lowering wheels.

(c) Should the door still not open, maintain the increased airspeed, not to exceed 260 MPH, IAS. Hold the nacelle door release handle all the way, and bump the doors with the landing gear by alternately raising and lowering. If the door does not open after three or four cycles of "bumping," allow a time lapse of approximately five minutes for the motor to cool.

(d) Check with the flight engineer to insure that motors are operating by fluctuations in the current demands. If motor operation is not verified, return the landing gear transfer switch to "NORMAL." Place the bus selector switch on "EMERGENCY" and repeat the above procedure.

(6) The nose gear emergency switch is on the aft wall of the nose wheel well, just below the floor of the airplane commander's compartment.

(7) Emergency raising of gear is done in the same manner, but main gear doors cannot be closed. Emergency motors are actuated by three separate emergency landing gear switches. Do not raise the gear by use of the emergency system if conditions are otherwise normal. Land and find out what's wrong.

(8) Do not practice emergency landing gear operation during flight.

b. MANUAL EMERGENCY SYSTEM (LATE AIRPLANES).

(1) POWER OPERATION — EMERGENCY MAIN GEAR.

(a) Install the portable auxiliary flap motor at the lower position on the gear box. BE SURE THE NACELLE DOOR AND CLUTCH HANDLE IS OUT AND SECURED. The switch positions are noted on the motor handle.

(b) Run the motor until the stops engage. (A jar will occur and the motor clutch will start slipping.) One minute is required for retracting; 40 seconds for extending. ALWAYS RELEASE THE NACELLE DOOR AND CLUTCH HANDLE IMMEDIATELY AFTER MANUAL OPERATION IS COMPLETED.

(2) MANUAL OPERATION — EMERGENCY MAIN GEAR.

(a) Pull the nacelle door and clutch handle.

(b) Allow the swagged ball on the cable to drop behind the slot in the bracket.

(c) To raise the gear manually, insert the crank into the upper socket of the gear box. Turn clockwise until the stops engage.

(d) To lower the gear manually, insert the crank into the lower socket. Turn clockwise until the stops are engaged. 387 turns, taking about 12 minutes, are required.

(3) OPERATION—EMERGENCY NOSE GEAR.

(a) Open entrance hatch and disengage the clutch by moving clutch lever to the right (facing forward). The spring on the lever handle will attach to a clip to hold it in position. If the clutch is left engaged the motor will rotate while the landing gear is being lowered.

(b) Release upper end of support beam, swing down to horizontal position and secure to the pilot's armor plate stanchion.

(c) Insert shaft of crank through holes in beam, unscrew plug in the floor, using the hand crank as a wrench.

(d) After handcrank is engaged in the socket the nose gear can be raised or lowered with 257 turns of the crank. ALWAYS RETURN THE CLUTCH HANDLE TO THE ENGAGED POSITION AFTER HANDCRANKING. ALSO REMOVE THE CRANK AND STOW THE BEAM.

Note

In airplanes with a manual emergency landing gear system, the airplane commander's power transfer switch and the bus selector switch are removed. The auxiliary flap motor receptacle is connected directly to the normal bus. All operation is accomplished with the auxiliary flap motor switch upon instructions from the pilot over the interphone.

c. AIRPLANES WITH NON-STANDARD EMERGENCY RETRACTION SYSTEMS.—A small number of late airplanes have emergency operating systems which are non-standard.

(1) Emergency door release handles are located in forward part of rear bomb bay, one on each side.

(2) There is no bus selector switch on battery solenoid shield located near auxiliary power plant.

(3) Operation is the same for airplanes with electrical emergency systems (early airplanes), except that the nacelle doors must be released by the emergency handles in the rear bomb bay, and there is no emergency circuit in the electrical system. The battery and put-put are part of the normal system.

(4) Practice landing gear emergency operating procedures with airplane on jacks to insure a thorough knowledge of landing gear emergency operating procedure.

8. BRAKE-EMERGENCY OPERATION.

a. If the hydraulic pump fails in the air, and the rest of the brake system is functioning normally, one or both the normal and emergency accumulators will be completely charged. Three applications of the normal foot brakes or the emergency hand brakes will be available. Apply pressure steadily for reasonable time and refrain from pumping the brakes as the pressure in either accumulator decreases rapidly. Maximum use of the pressure available in the accumulators may be obtained by not releasing the brake pedals entirely, as complete release will then require again a maximum volume of fluid to fill the expander tube and a greater decrease in pressure.

b. If both accumulator pressures are down, and it is impossible to charge the emergency accumulator in the normal manner, then the hand pump may be used. It is necessary to fill the normal system accumulator before sufficient pressure will be available to operate brakes. This will require over 150 strokes of the hand pump. Check to determine, if possible, whether there are any broken lines, and if there is sufficient fluid in the tank, before attempting to charge the system with the hand pump.

c. If all efforts to charge the accumulators fail and hydraulic pressure is not available for the brakes for landing purposes, the following procedure is recommended:

(1) If a 7,000 to 10,000 foot runway is available, reduce the gross weight to 85,000—90,000 pounds, if possible, and proceed as follows:

(a) Station crew in the rear in same position as prescribed for crash landing.

(b) Upon contact with the ground, stop the two inboard engines.

(c) If the airplane can be slowed down to approximately 50 MPH, IAS a turn off the runway may be attempted to keep the airplane within the flying field.

9. LANDING WITH LANDING GEARS RETRACTED.

a. ALL GEARS RETRACTED. — When an approach is made for a landing with all wheels retracted, reduced drag will make overshooting much easier. Do not feather the propellers unless engine trouble requires feathering.

(1) If feasible, circle landing area until remaining fuel supply is 200 gallons for each engine.

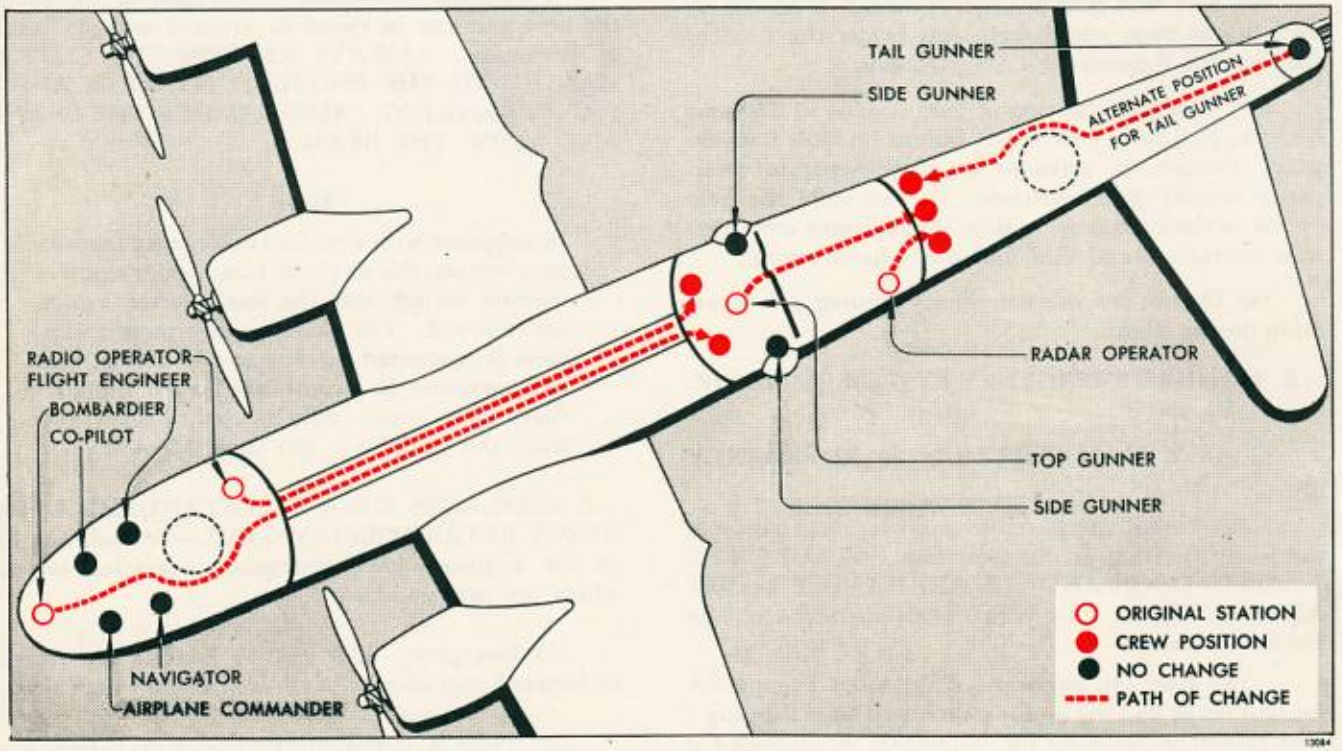


Figure 35—Crash Landing Positions

(2) Clear traffic; call for crash trucks.

(3) Give crew members not essential to crash landing permission to bail out if altitude is sufficient. Remaining crew will take crash landing positions.

(4) Clear lower turret areas for crash landing; turrets may tear loose and be forced up into the cabin.

(5) Drop all bombs, auxiliary bomb bay tanks, and flares.

(6) Open emergency escape hatches, except bomb bay doors.

(7) Close the nacelle doors if possible.

(8) Make normal approach sufficiently far back from the field, and high enough for the crew to perform the following last minute preparations at the airplane commander's command.

(9) Flight engineer ready to set engine nacelle fire extinguisher selector to any engine that might catch fire after landing.

(10) Lower full flaps for landing.

(11) Stop auxiliary power plant.

(12) Shut fuel boost pumps off.

(13) Have flight engineer close fuel shut-off valves on final approach when certain of making the field. Approximately 10 to 15 seconds of fuel, at lower power settings, remains in the lines after closing the fuel shut-off valves.

(14) Just prior to contact with the ground, throttle back and move the mixture controls to "FUEL CUT-OFF."

(15) Turn the master switch and battery switch "OFF."

(16) Warn crew members just prior to ground contact.

b. NOSE WHEEL IMPAIRED.—The recommended steps to follow in making an emergency landing when both main gears are down and the nose wheel is impaired:

(1) Hold the nose of the airplane in the air as long as possible with the elevators, and then lower it gently until it strikes the runway.

(2) After the nose of the airplane strikes the runway, apply brakes as necessary to stop the airplane.

c. ONE MAIN GEAR RETRACTED.—Following are the recommended steps for making an emergency landing when one main wheel is up and the nose wheel and the other main gear are down.

(1) Follows steps (1) through (16) under landing with all gears retracted, except leave the nacelle doors open.

(2) Make normal landing on the good wheel with the wing tip slightly low on the good wheel side.

(3) Hold the wing on the bad wheel side up as long as possible with ailerons.

(4) Be prepared for an extremely sharp ground loop in the direction of the crippled wheel, when the nacelle and wing tip dig into the runway. Use hard opposite brake to minimize ground loop.

d. NOSE GEAR AND ONE MAIN GEAR RETRACTED.—Following is the recommended procedure for making an emergency landing when one main gear is down, and the nose gear and the other main gear are retracted.

(1) Follow steps (1) through (16) under landing with all gears retracted, except leave the nacelle doors open.

(2) Make a one-wheel landing on the good wheel.

(3) Hold the nose up with elevators, and keep the wing tip on the bad wheel side up as long as possible.

e. BOTH MAIN GEARS IMPAIRED.—In case both main gears cannot be lowered all the way, definitely raise all wheels if possible, and make a belly landing.

f. LANDING ON SOFT RUNWAY.—If there is no hard surface to land on, raise all landing gears and make a belly landing.

10. DITCHING.

a. GENERAL.—Ditching calls for more co-ordinated effort on the part of the crew than does any other procedure. Every one who is associated with the mission of the crew must cooperate to see that the crew has everything available to cope with the situation. Inspection must be accomplished of every life raft, CO_2 cartridge, hand pump, flashlight, emergency ration, safety wiring, medical kit, and life jacket. Everything must be in readiness to enable the crew to evacuate the airplane and wait for rescue.

b. DITCHING DRILL.—Drill is the nearest approach to the reality of ditching itself. The crew must learn to move quickly and to make every movement count.

A well trained crew will understand the problems and know how to handle them when they occur. Talk ditching over with the rest of the crew and practice it again and again. Use the emergency equipment when practicing. The success of survival depends critically on the water supply, the signals, the medical equipment, and the food that accompanies the crew.

c. WIND DIRECTION.—Wind is one of the uncontrollable factors during ditching. Plans for ditching cannot be made without taking the wind into consideration. Waves move down-wind. Spray from wave crests too is blown down wind. Swells, however, do not always indicate wind direction and can, in fact,

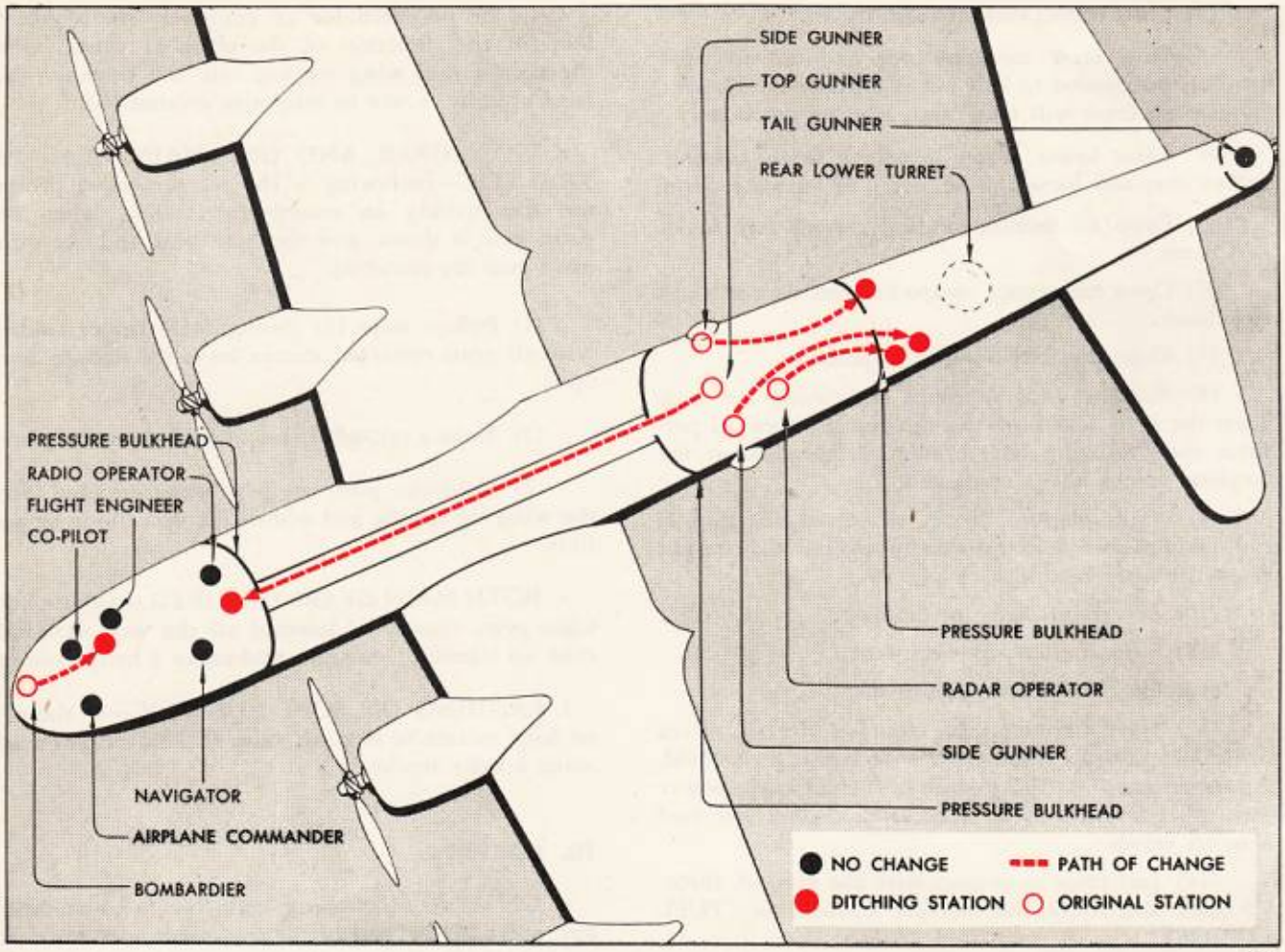


Figure 36—Stations for Ditching

be very large when the wind is calm. Swells are a result of past disturbance. Study the sea whenever possible and learn its characteristics.

d. WIND SPEED.—Surface winds are fairly predictable from the way they affect the water. Here are some aids that will help to estimate surface wind velocity.

(1) No white caps—0 to 10 MPH.

(2) A few white caps—10 to 20 MPH.

(3) Many white caps—30 to 40 MPH.

From low altitude, spray will be visible sometimes with many white caps and this indicates a very strong wind (40 to 50 MPH).

e. ALTITUDE.—Altitude can be judged without difficulty if there is wind. On a calm sea, the airplane commander must be more alert in his judgment of height. There are many advantages that accompany a forced landing on a calm sea. If power is available and the altitude is not needed to look for land or surface vessels, descend to a lower altitude and study surface conditions. At night the landing lights can be tried at various angles. They may be helpful.

f. HANDLING THE AIRPLANE.

1. Experience gained in ditching B-29 airplanes has shown that best results may be obtained by following the procedure listed below.

(a) Ditch while power is available. Power will allow the airplane commander to choose the spot for ditching to obtain best possible sea conditions and most favorable landing position and attitude.

(b) Ditch at lowest possible forward speed. At time of contact attempt to have the lowest possible forward speed consistant with safe control of the airplane, this will reduce the landing impact. Under no circumstances should the airplane be stalled in, as this will result in severe impact, and cause airplane to nose into the sea.

(c) Ditch at lowest possible rate of descent - 100 feet per minute is recommended.

(d) Ditch the airplane 5° nose high. This attitude gives best distribution of landing shock over the fuselage.

(e) Use flap setting of 25°. This flap setting should be used in most cases; however, with a very heavy airplane the stall speed will be very high, and full flap will be necessary.

(f) Avoid bouncing - Since bouncing is caused by too high a forward speed, and/or too flat a landing approach observance of items "a" thru "e" above should solve the bouncing problem.

(g) In daylight it is recommended that the airplane be ditched along the top of the swell, parallel to the rows of swells, if the wind does not exceed 40 mph. In high winds, it is recommended that ditching be conducted up-wind to take advantage of lowered forward speed. However, it must be remembered that the possibility of ramming nose-on into a wave is increased, as is the possibility of striking the tail on a wave crest and nosing in.

2. POWER-OFF AND DITCHING-In ditching with one or more engines inoperative the following should be borne in mind

(a) With two engines operative, on the same side of the airplane, use power on the inner engine only.

(b) If power is available from #2 and #4 engines considerable power may be used to control airplane.

(c) With symmetrical power conditions use power as required to give flattest approach, and lowest possible forward speed.

(d) On let down with any engine inoperative, it is advisable to hold speed 30 mph above stalling speed until flare out, at which time speed will be reduced to just above stalling and airplane set up for 5° nose high landing.

3. CROSSWIND DITCHING - The basic rules for ditching listed in paragraph #1 above will still apply in addition to those listed here.

(a) Crab the airplane to kill drift.

(b) Land on downwind side of the swell or wave.

4. UP-WIND DITCHING - The basic rules for ditching listed in paragraph f1 will still apply in addition to those listed below:

(a) Maintain nose up condition - avoid nose striking wave face.

(b) Touch down immediately before the crest of a rising wave.

(c) Hold nose up after first impact.

5. NIGHT DITCHING - Night ditchings shall be conducted with aid of instruments, to establish proper attitude of airplane.

(a) Hold wings level to avoid digging a wing tip into the sea and cart-wheeling the airplane.

(b) Maintain an up-wind heading; use will be made of the known prevailing winds, or a wind fix established by the navigator.

(c) Make an instrument let-down holding airspeed 30 mph above stalling speed, and at the lowest possible rate of descent. Landing attitude should be 5° nose high, with 25° flap (if no power, or unsymmetrical power is used no flaps will be employed).

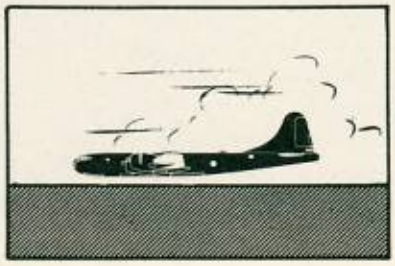
(d) Trailing antenna full out will aid in judging height, and if white caps are observed, the landing lights turned 45° down will aid in judging height while leveling off.

(c) If power is available, drop Mark V flares (15 to 18 minutes duration) in a string, then make procedure turn and land alongside lights. Under favorable conditions short duration Mark IV flares (3 to 3¼ minutes) can be used.

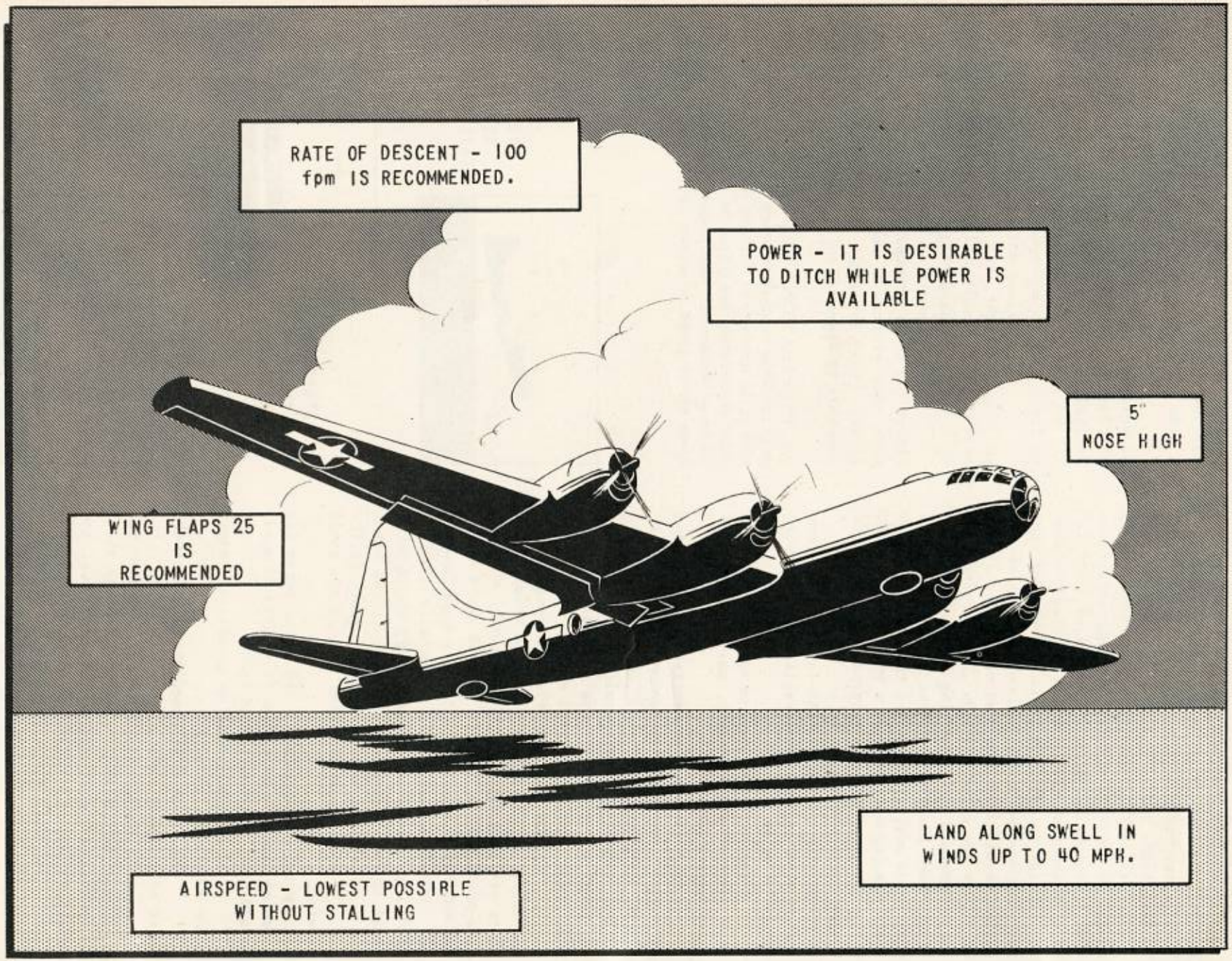
g. PREPARATION.—Ditching equipment should be in readiness at all times when flying over water. As soon as the necessity of ditching is evident and the airplane commander has given the order to prepare for ditching, jettison all equipment that is unessential. Some of the items to release include the bombsight,

TOO STEEP
SEVERE
TAIL SHOCK

5° DEGREE
ANGLE
IS IDEAL



TOO SHALLOW
CAUSES BOUNCING.
PLANE MAY
NOSE IN.



Airplane Ditching

the bombardier's gunsight, camera, and accessory power plant when not in use. Stay away from it, if jettisoning is not possible.

b. CREW PROCEDURE. - *4 GUN TURRET AIRPLANES.*

(1) GENERAL.—When no personnel injuries have been sustained in combat, each crew member will proceed with his individual responsibilities. If a crewman is injured, his responsibility will be accepted by the nearest of the crew. After the impact, look around for injured members, then get out to the leading edge of the wing. The first out will go for the raft if ejected, or to the life raft release handle if not ejected.

Crew preparation and procedure begins before the mission, and here are some general reminders:

(a) Before a mission, check the location of emergency equipment. IT HAS TO BE THERE.

(b) Each crew member will test inflate his life vest by mouth before a mission. If it won't work, get a new one. Also check to see that CO_2 cartridge is in place.

(c) Carry a flashlight.

(d) Release or break the astrodome. This opening is excellent for ditching.

(e) Use the life raft sea anchors in an effort to remain near the airplane. Rescue will be easier with the plane nearby.

(f) The radio operator must not forget to lock the transmitting key before he leaves his station for the landing.

(g) Use cushions and open parachute canopy for padding. Keep the lines folded in the pack.

(2) AIRPLANE COMMANDER.

(a) Remove parachute harness, flak suit, and helmet.

(b) Give copilot warning: "PREPARE FOR DITCHING IN ..... MINUTES." Give the standard ditching signal on the alarm bell, six short rings. Turn IFF emergency switch on. Fasten the safety belt and loosen shirt collar. Wear flying gloves.

(c) Advise any nearby aircraft of distress by radio, and then turn to interphone.

(d) Give copilot order: "OPEN EMERGENCY EXITS AND THROW OUT EQUIPMENT." If possible, give this order above 5,000 feet.

(e) Give Co-pilot order: "STATIONS FOR DITCHING, IMPACT IN SECONDS". If possible give this order above 2000 feet. Open windows, brace feet on rudder pedels and flex knees, about 5 seconds before impact give co-pilot order "BRACE FOR IMPACT".

(f) Exit through left window. Pull outside release if necessary. Get left life raft to front of left wing.

(3) COPILOT.

(a) Relay airplane commander's order over interphone: "PREPARE FOR DITCHING IN ..... MINUTES." Receive acknowledgments. Tell the airplane commander: "CREW NOTIFIED."

(b) Remove parachute harness, flak suit, and helmet and winter flying boots. Fasten safety belt and loosen shirt collar. Wear flying gloves.

(c) Stand by on interphone to relay airplane commander's orders.

(d) Relay order: "OPEN EMERGENCY EXITS AND THROW OUT EXCESS EQUIPMENT" and check on crew's progress.

(e) Relay order: "STATIONS FOR DITCHING. IMPACT IN ..... SECONDS." Open side window, brace feet on rudder bar with knees flexed. When airplane commander gives order: "BRACE FOR IMPACT," send one long ring on alarm bell.

(f) Exit through right window. Inflate life vest at window ledge. Climb atop cabin, then proceed to right wing. Secure right life raft and if necessary, pull outside raft release handle.

(4) BOMBARDIER.

(a) Acknowledge in turn: "BOMBARDIER DITCHING."

(b) Remove parachute harness, winter flying boots, and flak suit. Loosen shirt collar. Keep helmet on. Wear flying gloves.

(c) Destroy bombing data and remove bombsight. Pass bombsight back to rear of forward pressure compartment to be jettisoned out bomb bay doors.

(d) Open bomb bay doors and salvo bombs. If bomb bay tanks are empty, retain them for their flotation value and reinforcement they offer the bomb bay doors. When all loose equipment is jettisoned, close bomb bay doors.

(e) Take sitting position on floor with back against copilot's armor plate. Squeeze in with the flight engineer and brace right foot across the aisle. Protect head with arm or pillow.

(f) After airplane comes to rest, exit through right (engineer's) window, inflate life vest and proceed to right wing.

(5) FLIGHT ENGINEER.

(a) Acknowledge in turn: "FLIGHT ENGINEER DITCHING."

(b) Remove parachute harness, flak suit and winter flying boots. Keep flak helmet on and loosen shirt collar. Wear flying gloves.

(c) Open front emergency hatch and acknowledge to copilot: "FRONT HATCH OPEN." Pass it back together with any other loose equipment to jettison through front bomb bay.

(d) Get the emergency signal kit and tie its line to your arm.

(e) Take regular position facing aft, head and shoulders braced against copilot's armor plate, safety belt fastened, hands braced against control stand.

(f) Carrying signal kit, exit immediately through front emergency exit.

(g) Inflate life vest at window ledge. Climb atop cabin and proceed to right wing.

(h) Assist bombardier and copilot in securing life rafts.

(6) NAVIGATOR.

(a) Acknowledge in turn: "NAVIGATOR DITCHING."

(b) Remove parachute harness, winter flying boots, and flak suit. Keep flak helmet on and loosen shirt collar. Wear flying gloves.

(c) Calculate position, course, altitude, and ground speed for radio operator to transmit.

(d) Give pilot surface wind strength and direction. Destroy classified documents.

(e) Gather maps navigation equipment and smoke grenades into waterproof bag or tuck inside clothing.

(f) Jettison all drift signal flares through release tube.

(g) On late airplanes, grasp leather thong below astrodome and pull sealing strip away. If astrodome does not fall free, jerk sharply on center stud. A sharp jerk is better than a steady pull.

(h) Fold navigator's table upward and slide seat full rear. Sit on floor facing aft with parachute padded or cushioned back up against structure below navigator's table. Rest head against structure.

(i) When airplane comes to rest, pull life raft release handles, and exit through astrodome.

(j) Inflate life vest, and proceed to left wing with navigation equipment.

(7) RADIO OPERATOR.

(a) Acknowledge in turn: "RADIO OPERATOR DITCHING."

(b) Remove parachute harness, flak suit, and winter flying boots. Keep flak helmet on and loosen shirt collar. Wear flying gloves.

(c) Transmit position, course, altitude, and ground speed as received from navigator on DF. Relay fix or bearings obtained to navigator.

(d) Give DF contact all data without waiting too long to answer.

(e) Destroy classified material.

(f) Continue to send emergency signals. On command from copilot to take ditching position, screw down transmitter key.

(g) Remain at radio operator's seat with safety belt fastened, resting cushioned back and head against upper turret well.

(h) After airplane comes to rest, exit through astrodome opening.

(i) Inflate life vest and proceed to right wing.

(8) RIGHT GUNNER.

(a) Acknowledge in turn: "RIGHT GUNNER DITCHING."

(b) Remove parachute harness, flak suit, and winter flying boots. Keep flak helmet on and loosen shirt collar. Wear flying gloves.

(c) Proceed to rear unpressurized compartment and take position on right side of airplane with back against pressure bulkhead.

(d) Exit through rear entrance hatch.

(e) Inflate life vest and proceed to right wing.

(9 LEFT GUNNER.

(a) Acknowledge in turn: "LEFT GUNNER DITCHING."

(b) Remove parachute harness, flak suit, and winter flying boots. Keep flak helmet on and loosen shirt collar. Wear flying gloves.

(c) Shoot out all ammunition in lower rear turret.

(d) Proceed to rear unpressurized compartment and take position on left side of airplane just aft of the radar operator.

(e) Throw out extra emergency gear. Exit through rear escape hatch. Inflate life vest and proceed along fuselage to left wing.

(10) RADAR OPERATOR.

(a) Acknowledge in turn: "RADAR OPERATOR DITCHING."

(b) Remove parachute harness, flak suit, and winter flying boots. Keep flak helmet on and loosen shirt collar. Wear flying gloves.

(c) Destroy or jettison radar equipment if near enemy territory.

(d) Remain at position as long as pertinent information concerning altitude and other maters may be relayed to pilot.

(e) Just before taking ditching position, pull IFF detonator plug.

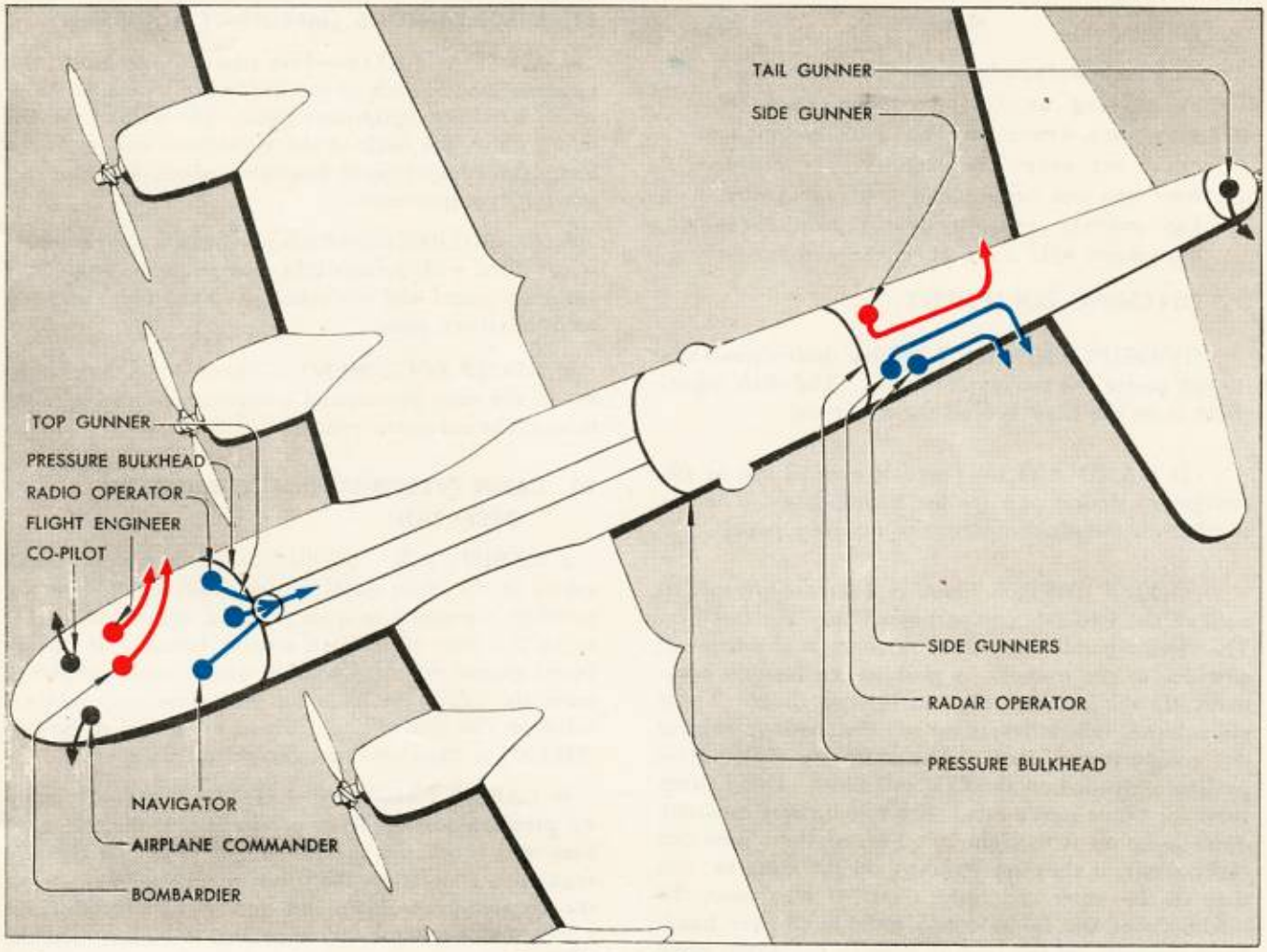


Figure 37—Ditching Exits

(f) Proceed to rear unpressurized compartment and close door carefully, being sure it is securely latched. Remain on interphone, if possible.

(g) Take position with back and head against bulkhead, cushioned with parachute, and with hands clasped behind head.

(h) When airplane comes to rest, exit through rear escape hatch. Inflate life vest and proceed atop fuselage to left wing.

(11) TOP GUNNER.

(a) Acknowledge in turn "TOP GUNNER DITCHING."

(b) Shoot out all ammunition from rear upper turret. Check gunners to see that lower rear and tail turret ammunition has been shot away.

(c) Remove parachute harness, flak suit, and winter flying boots. Keep flak helmet on and loosen shirt collar. Wear flying gloves.

(d) Be sure pressure door to bomb bay is closed and reinforced, if possible.

(e) Sit in forward pressurized compartment on lower forward turret with back placed against upper turret.

(f) After airplane comes to rest stand up and pull both life raft release handles at tunnel extrance-exit thru astrodome opening.

(12) TAIL GUNNER.

(a) Acknowledge in turn: "TAIL GUNNER DITCHING."

(b) Remove parachute harness, flak suit, and winter flying boots. Keep flak helmet on and loosen shirt collar.

(c) Shoot out ammunition in tail guns.

(d) Under most conditions, it is desirable to ditch in the tail gunner's compartment. Jettison escape hatch; remain in seat, safety belt fastened, back and head cushioned, knees flexed. When airplane comes to rest, tail may be low in water or under water. Dive out escape hatch and make way forward to left wing.

(13) ADDITIONAL CREW MEMBER.

(a) If crew includes an additional man (ROM observer or aerial observer) he will assume ditching position in forward end of tunnel-feet placed against upper turret, knees flexed, hands placed against tunnel walls. Exit thru astrodome.

Note

On most models, astrodome can be released by pulling on leather thong. On a few airplanes there may be time enough to break out astrodome with axe. If astrodome can not be removed, the navigator, top gunner, radio operator and extra passenger will exit thru forward hatch.

i. DITCHING EQUIPMENT.

(1) DRIFT SIGNALS.—Twelve drift signals are stowed under the navigator's table. The drift signal chute is on the floor behind the navigator.

(2) HAND AXES.—There is a hand axe at the navigator's station near the fire extinguisher. There is another on the aft compartment auxiliary panel.

(3) LIFE RAFTS.—There is a 6-man life raft in each of the two raft compartments atop the fuselage. The release handles for these rafts are at the forward entrance to the tunnel. A pull on the handles automatically releases the raft and inflates them. There are external release levers on top the fuselage next to the compartment doors. The rafts are inflated by pulling a ripcord on the CO_2 cylinders. Don't jump from the plane into a raft. If a raft inflates inverted, don't jump on it to right it. Two or three men can right a raft, if they are standing on the wing or, one man in the water can right a raft, if he throws the raftline over the far side and pulls hand over hand. Send the rafts off the leading edge of the wing; wing flaps are usually torn loose in ditching and offer jagged edges which can easily puncture a raft. When all the men are aboard, tie the rafts together.

(4) RAFT ACCESSORY KITS.—There is an accessory kit for each raft. Ordinarily the kit is stowed inside the raft, but sometimes stowage problems make it necessary to stow the kit separately. If the kits in your plane are not in the rafts, be sure to assign the kits to crew members. When you're adrift, keep the items of your kit inside the raft; tie the kit to the bottom of the raft. Keep signaling equipment near; when the time comes to use it, you'll want it in a hurry.

(5) EMERGENCY RADIO. — The emergency radio is in the right life raft compartment.

11. MISCELLANEOUS EMERGENCY EQUIPMENT.

a. FIRST-AID KITS.—Five first-aid kits are in the airplane, one of each at the following locations: engineer's auxiliary equipment panel, side wall of the enneer's stand, the back of the right-hand side gunner's seat, rear compartment auxiliary panel, and the tail gunner's compartment.

b. FLASHLIGHTS.—Each pressurized compartment is provided with a flashlight, one is on the engineer's auxiliary panel and the other is on the rear compartment auxiliary panel.

c. RELIEF EQUIPMENT.—There is a chemical toilet in the rear pressurized compartment and a relief tube at the navigator's station.

12. CABIN PRESSURIZATION EMERGENCY OPERATION.

a. CABIN AIR VALVES.—The cabin air check valves in the main ducts automatically close if intake pressure becomes less than pressure within the cabin, as in the case of inboard engine failure. If an inboard engine develops trouble which causes smoke to enter the cabin, the engineer will close the cabin air valve on the side affected. These valves are to be full "OPEN" at high altitudes except in emergency.

b. CABIN PRESSURE REGULATORS—If cabin air pressure deviates from proper limits, the side gunners will check the pressure regulators. To check a regulator: shut down the other regulator by screwing the knurled knob down and closing the shut-off cock. Check one regulator at a time and if faulty, turn the other regulator on and leave the faulty regulator off.

c. PRESSURE RELIEF VALVE.—If automatic regulators fail, engineer will regulate cabin pressure with the crank handle. This handle operates the cabin air pressure relief valve.

d. WARNING HORN.—The warning horn sounds when the cabin pressure exceeds 12,000 feet altitude (19.03 inches of mercury). The horn will also blow when the airplane is changing from an 8,000 feet equivalent to a differential pressure of 13.34 inches of mercury. This occurs above 30,000 feet and when it does, turn the warning horn "OFF."

e. EMERGENCY DEPRESSURIZATION.—If sudden depressurization is necessary, pull out either of the cabin pressure emergency release handles.

1. CABIN HEATING, PRESSURIZING, AND DEFROSTING.

a. GENERAL.—Air for cabin pressurizing, heating, and defrosting is supplied through the inboard turbosuperchargers of the inboard nacelles.

b. CABIN HEATING CONTROLS. — Cabin air is heated or cooled while passing through the aftercoolers, in relation to position of the dampers in those units. The dampers are controlled by switches on the engineer's auxiliary switch panel. The two switches (one for each aftercooler) each have "AUTO," "HEAT," "COOL," and "OFF" positions. On late airplanes "AUTO" position has been replaced by "RHEOSTAT" on the decal. There is a heat and ventilation outlet at each of the crew stations which can be opened or closed individually as desired.

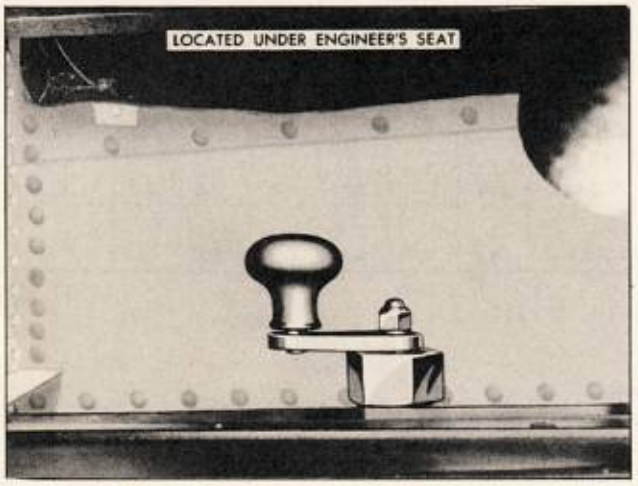


Figure 38—Air Relief Valve Crank

c. CABIN PRESSURE CONTROLS.—The two cabin air valve levers on the engineer's control stand operate check valves in the main inlet ducts. The levers allow high flow when at the "OPEN" position, can be set at intermediate points for lower flow, or can be "CLOSED." At high altitudes the LOW FLOW and "CLOSED" positions are for emergency use only. Two cabin pressure regulators, in the rear pressurized

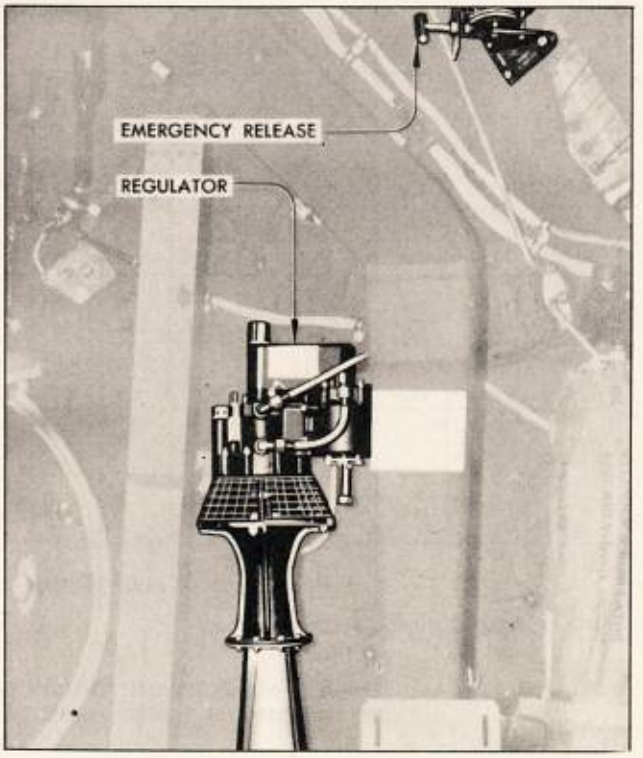


Figure 39—Cabin Pressure Regulator

compartment, automatically discharge air as necessary to maintain desired pressure within the compartments. A relief valve crank, under the engineer's seat, can be used for regulating pressure if the automatic regulators fail.

(1) EMERGENCY PRESSURE RELEASE. — There is an emergency release pull-handle on the airplane commander's control stand and one on the bulkhead forward of the right gunner's station. When either handle is pulled, the cabin pressure will be released immediately.

(2) TEMPERATURE AND PRESSURE GAGES. —A cabin air temperature gage, cabin air flow gages, cabin differential pressure gage, cabin pressure altimeter, and a cabin rate of climb gage are on the engineer's instrument panel. An outside air temperature gage is on the left sidewall, above the engineer's auxiliary switch panel.

d. DEFROSTING. — The forward cabin windows and the astrodome have defrosting ducts which continually blow air onto the panes. Late airplanes have electric fans (with integral switches) mounted in the forward compartment to supplement the defrosting vents by circulating more cabin air against the windows. The sighting blisters in the rear pressurized compartment each have a defrosting vent through which air is forced by blowers. The blowers are controlled through a switch on the station 646 fuse shield. The tail gunner's station has a flexible tube vent which can be positioned to direct the air blast as desired.

2. OXYGEN SYSTEM.

a. SUPPLY SYSTEM.—The demand oxygen system is supplied by 18, type G-1, low pressure, nonshatterable oxygen cylinders. The entire system is filled from one filler valve located outside of the fuselage on the left side forward of the wing. Each of the 13 oxygen stations is supplied from two distinct distribution lines. Loss of one line or its associated cylinders still leaves each station with an alternate source of oxygen. The entire system is equalized by the use of cross feeds controlled by automatic check valves. In the event

AIRCO REGULATORS TYPE A-12

ALT. FT.	GAGE PRESSURE 400	350	300	250	200	150	100	50	
40,000	11.3 11.3	10.7 10.7	8.8 8.8	7.1 7.1	5.3 5.3	3.6 3.6	1.7 1.7		E
35,000	8.8 8.8	7.5 7.6	6.3 6.3	5.0 5.0	3.8 3.7	2.5 2.5	1.2 1.2		M
30,000	6.4 6.4	5.5 5.6	4.5 4.7	3.6 3.7	2.7 2.8	1.8 1.8	.9 .9		E
25,000	4.9 6.3	4.1 5.4	3.4 4.4	2.7 3.6	2.1 2.7	1.2 1.8	.6 1.2		R
20,000	3.9 7.0	3.3 6.0	2.7 4.9	2.2 4.0	1.6 3.0	1.1 2.0	.5 .9		G
15,000	3.0 8.5	2.5 7.3	2.1 6.0	1.7 4.8	1.2 3.7	.9 2.4	.4 1.2		E
10,000	2.4 14.5	2.0 12.5	1.7 10.3	1.3 8.3	1.0 6.2	.6 4.1	.3 2.0		N
5,000	1.9	1.6	1.3	1.1	.8	.5	.3		C
S.L.	1.6	1.4	1.2	.9	.6	.4	.2		Y

PIONEER REGULATORS TYPE A-12

ALT. FT.	GAGE PRESSURE 400	350	300	250	200	150	100	50	
40,000	11.3 11.3	10.7 10.7	8.8 8.8	7.1 7.1	5.3 5.3	3.6 3.6	1.7 1.7		E
35,000	8.8 9.0	7.5 7.7	6.3 7.1	5.0 5.1	3.8 3.8	2.5 2.6	1.2 1.2		M
30,000	6.4 6.7	5.5 5.8	4.5 4.8	3.6 3.8	2.7 2.9	1.5 1.9	.9 .9		E
25,000	4.9 6.6	4.1 5.5	3.4 4.7	2.7 3.7	2.1 2.8	1.4 2.6	.6 .9		R
20,000	3.9 11.7	3.3 10.0	2.7 8.2	2.2 6.6	1.6 5.0	1.1 3.8	.5 1.8		G
15,000	3.0 11.4	2.5 9.7	2.1 8.1	1.7 6.5	1.2 4.8	.9 3.3	.4 1.5		E
10,000	2.4 11.6	2.0 9.7	1.7 8.0	1.3 6.4	1.0 4.8	.6 3.7	.3 1.5		N
5,000	1.9 8.5	1.6 7.3	1.3 6.0	1.1 4.8	.8 3.6	.5 3.2	.3 1.1		C
S.L.	1.6 9.0	1.4 7.7	1.2 6.3	.9 5.1	.6 3.8	.4 2.6	.2 1.2		Y

PROPORTION - 12 MEN; 18G-1 BOTTLES

BLACK FIGURES INDICATE AUTO MIX "ON"

RED FIGURES INDICATE AUTO-MIX "OFF"

CAUTION

THE AUTO-MIX IN THE "OFF" POSITION RAPIDLY DIMINISHES THE AVAILABLE OXYGEN SUPPLY. DO NOT USE THIS POSITION UNLESS IT IS NECESSARY TO GET PURE OXYGEN!

Figure 40—Hours of Available Oxygen

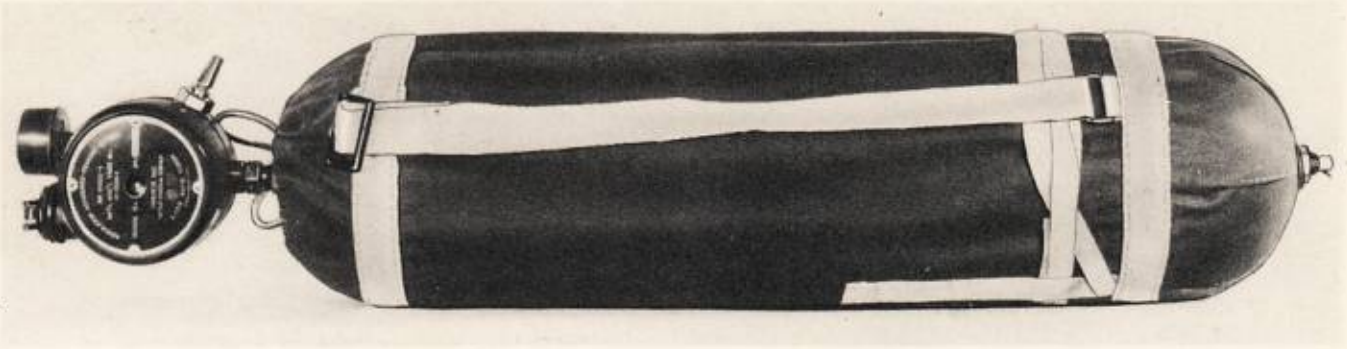


Figure 40A—D-2 Cylinder with an A-13 Regulator in Carrying Sling

of partial destruction of the system, all stations still functioning have equal access to the remaining oxygen supply.

b. REGULATOR PANELS.—Regulator panels are provided at the 12 crew stations throughout the airplane, and one additional panel is included for an extra relief crew member. The equipment mounted on each regulator panel consists of a type A-12, AN6004-1 or type A-14 oxygen regulator, a type K-1 or AN6021-1 oxygen pressure gage and a type A-3 or AN6029-1 flow indicator.

c. PORTABLE OXYGEN CYLINDERS. — Three types of demand type portable "walk-around" units may be found at convenient locations throughout the airplane.

(1) An A-4 cylinder with an A-13 regulator. The A-4 cylinder is painted green and has a maximum duration of 4 to 8 minutes depending on altitude.

(2) A D-2 cylinder with an A-13 regulator. (See figure 40A.) The D-2 cylinder is painted yellow and has a duration of approximately 40 minutes, depending on altitude.

(3) An A-6 cylinder with an A-15 regulator. (See figure 40B.) The A-6 cylinder is painted yellow and has a duration of approximately 40 minutes, depending on altitude. A sling is used to carry the last two assemblies and a clip is used to attach the A-4 unit to the clothing.

d. USE OF OXYGEN WITH UNPRESSURIZED CABIN.

(1) Have your oxygen mask which has been checked for fit by the Personal Equipment Officer with the type K-1 or K-2 test kit.

(2) On all flights above 30,000 feet, be sure to carry an H-2 "bail-out" cylinder assembly charged to at least 1800 psi.

(3) Check to see that all "walk-around" units are filled to 425 $\pm$ 25 psi and in working order.

(4) Check system pressure gages before flight at all stations. If not 425 $\pm$ 25 psi, refill system with AN-O-1b, grade A, aviator's breathing oxygen.

(5) Check function of demand regulator in both "ON" and "OFF" or "NORMAL" and "100% OXY-

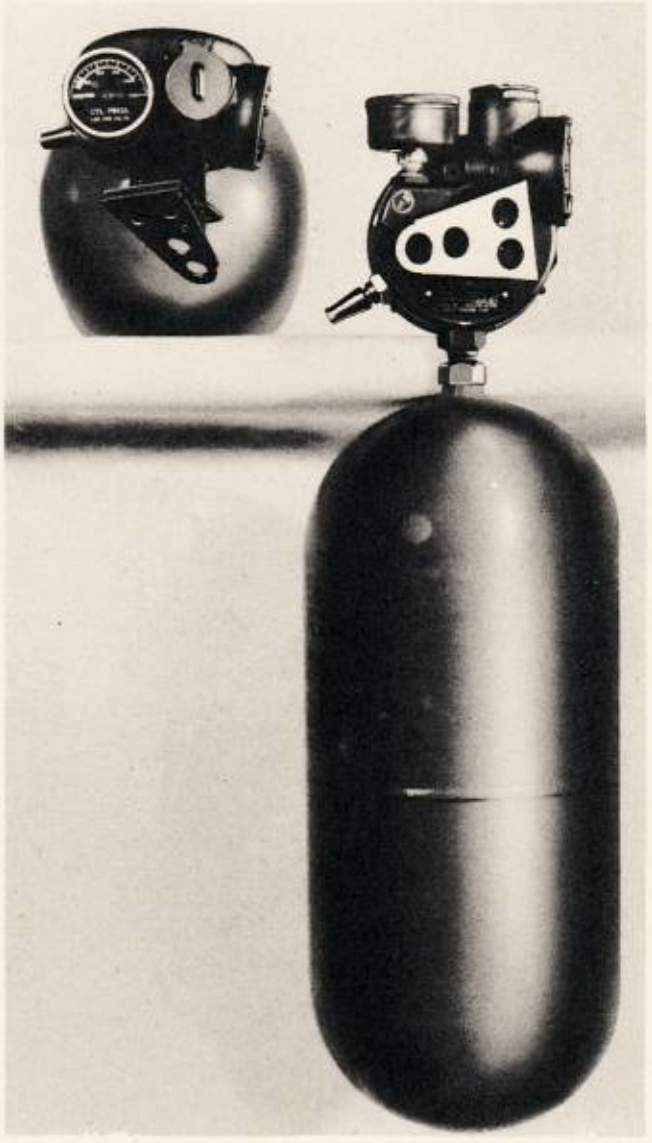


Figure 40B—Type A-6 Cylinder with A-15 Regulator

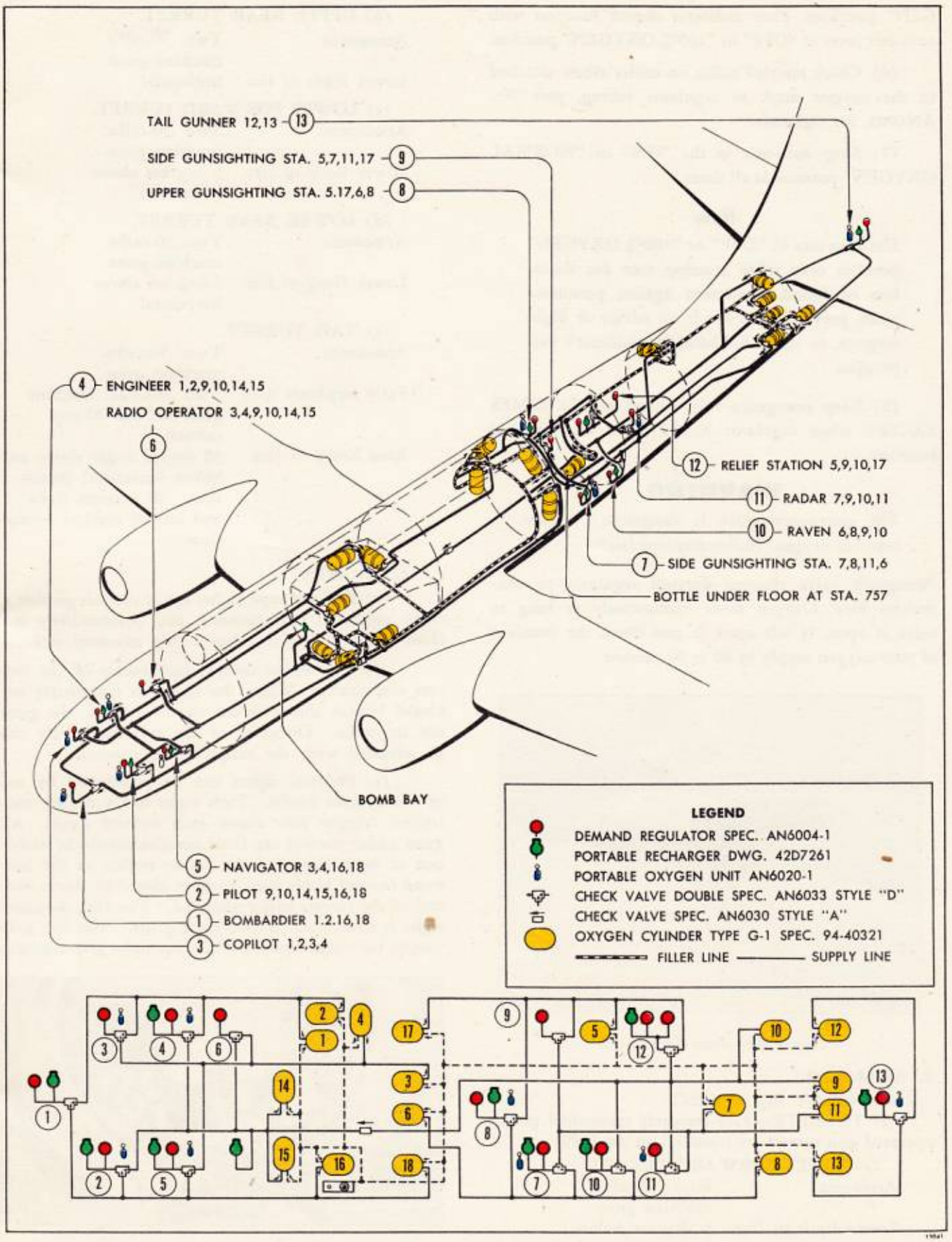


Figure 41—Oxygen Flow Diagram

GEN" positions. Flow indicator should function with auto-mix lever in "OFF" or "100% OXYGEN" position.

(6) Check knurled collar on outlet elbow attached to the oxygen mask to regulator tubing, part No. AN6003, for tightness.

(7) Keep auto-mix in the "ON" or "NORMAL OXYGEN" position at all times.

Note

Use auto-mix in "OFF" or "100% OXYGEN" position only when treating men for shock, loss of blood, protection against poisonous gases, prevention of bends on advice of flight surgeon, or check for holes in regulator's diaphragm.

(8) Keep emergency valve closed at ALL TIMES EXCEPT when regulator breaks down and fails to function.

WARNING

The emergency valve is dangerous! Causes waste of oxygen! Makes missions fail!

Emergency valve changes demand regulator to continuous flow. Oxygen flows continuously as long as valve is open. If left open, it cuts down the duration of your oxygen supply by 80 to 90 percent.

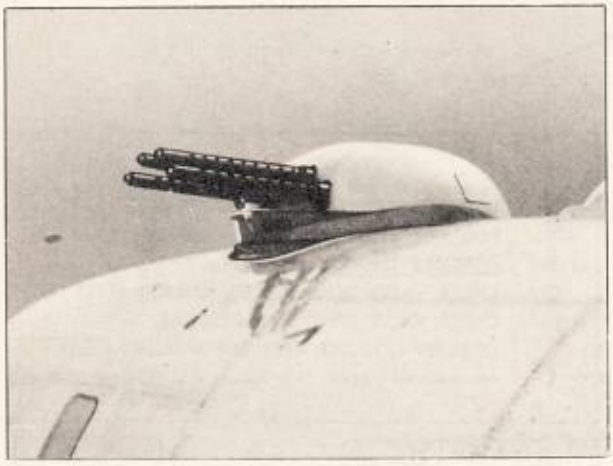


Figure 42—Four Gun Turret

3. ARMAMENT.

a. GUNNERY EQUIPMENT.

(1) TURRETS.—Five remotely controlled power operated gun turrets are installed on the B-29.

(a) UPPER FORWARD TURRET.

Armament	Four .50-calbr. machine guns
Lower limit of fire	5 degrees below horizontal

(b) UPPER REAR TURRET.

Armament	Two .50-calbr. machine guns
Lower limit of fire	horizontal

(c) LOWER FORWARD TURRET.

Armament	Two .50-calbr. machine guns
Lower limit of fire	5 degrees above horizontal

(d) LOWER REAR TURRET.

Armament	Two .50-calbr. machine guns
Lower limit of fire	5 degrees above horizontal

(e) TAIL TURRET.

Armament	Two .50-calbr. machine guns
Early airplanes have	Two .50-calbr. machine guns and one 20 mm cannon
Rear limits of fire	30 degree angle above and below horizontal centerline. 30 degrees right and left of vertical centerline.

(2) SIGHTS.

(a) Pedestal type sights are at the left gunner's, right gunner's, tail gunner's, and bombardier's stations. The top gunner has a ring mounted sight.

(b) The sights control movements of the turrets electrically. When the target is completely enclosed within the reflected circle of light, the guns are in range. Diameter of the reflected circle can be adjusted with the range finder control.

(c) Pedestal sights can be positioned by use of the control knobs. Each sight has a thumb controlled trigger just above each control knob. All guns under control are fired simultaneously by either one or both triggers. An action switch at the left-hand control knob must be kept closed to retain control of the turrets being operated. The ring mounted sight is controlled by two hand-grips. The left grip rotates for range control, while the right grip contains

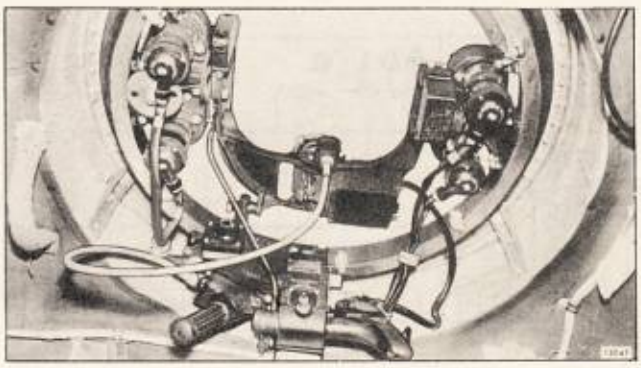


Figure 43—Top Gunner's Sight

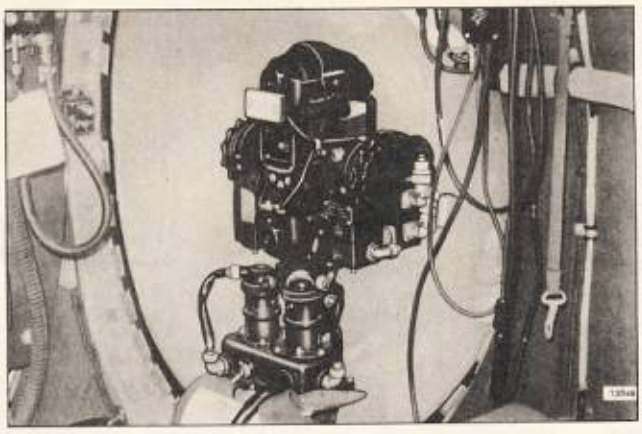


Figure 44—Side Gunner's Sight

the action switch and the trigger. The sight and seat have unlimited azimuth travel.

(d) All sights are stowed by means of the azimuth and elevation locks provided. Push in to lock, pull out to release.

(3) CONTROL AND SWITCH BOXES.

(a) BOMBARDIER.—Primary control of the two forward turrets is afforded the bombardier through the front sighting station. No secondary control of other turrets is possible for this station. When not in use the bombardier's gun sight may be swung to one side of its hinged bracket.

(b) TOP GUNNER.—Control over either or both of the upper turrets is provided for by a switch box located on the ceiling of the fuselage aft of the gun sight. Switches contained in this box turn on the power and operate the camera computer, and guns; however, primary control of the upper forward turret is by the bombardier's sight.

(c) SIDE GUNNERS.—Through switches the side gunners have primary control of the lower rear turret and secondary control of the lower front turret and tail turret. Only one sight can be in control of a given turret at any one time.

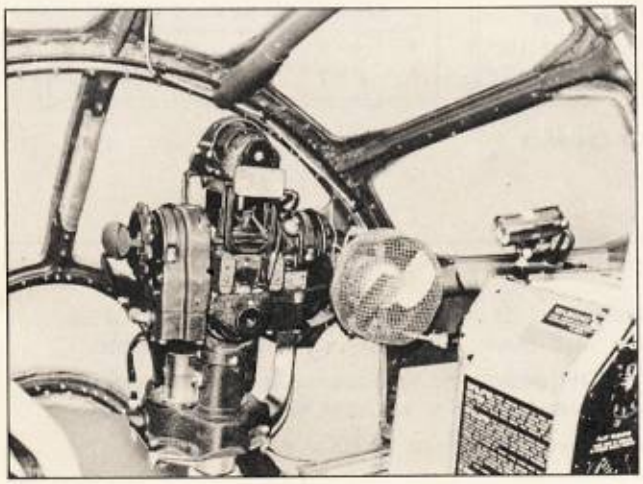


Figure 45—Bombardier's Gun Sight

(d) TAIL GUNNER.—Primary control of the tail turret is afforded at the tail gunner's sighting station but no secondary control of other turrets is possible from this station. Switches allow use of the guns and camera as desired.

(4) TURRET SAFETY SWITCHES. — Manual safety switches are mounted on or near all of the gun turrets, except the tail turret, and can easily be identified by their decals. The turrets will not operate unless the safety switches are in the "ON" position. The switches must be in the "OFF" position before working on the turret.

(5) TRAVERSE.—Both upper and lower turrets have a horizontal traverse of 360 degrees and may be elevated to 90 degrees from horizontal. These turrets are equipped with cam-controlled cut-off switches which protect the airplane from its own fire. The tail turret is equipped with cut-off switches and mechanical stops which limit its vertical and horizontal movement to 30 degrees each side of centered position.

(6) SEATING ARRANGEMENT.

(a) The bombardier is seated at his regular station.

(b) The tail gunner is seated just behind the armor plate aft pressure bulkhead door.

(c) The side gunners, one on the left and one on the right side of the airplane, sit facing aft, and have a 180 degrees horizontal traverse with a converging angle of vision behind the airplane.

(d) The top gunner sits on a swivel-type stool, the base of which contains slip rings to convey current from the power lines to the sight. The sight may be moved 60 degrees on the horizontal without swiveling the stool but further traverse of the sight without a corresponding rotation of the stool is prohibited by stops.

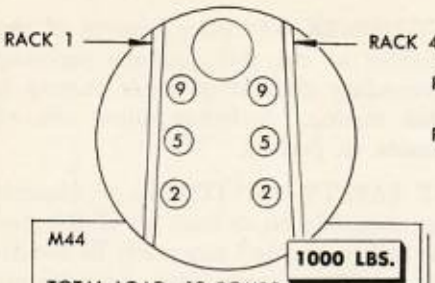
(7) REPLENISHING AMMUNITION.—The upper, lower, and tail turrets may be reloaded whenever the airplane is not pressurized. The 20-mm cannon installed on some early airplanes can only be serviced while on the ground.

b. BOMBING EQUIPMENT.

(1) GENERAL.

(a) The two bomb bays are located fore and aft of the wing center station and are separated from the forward and aft main pressurized areas. The bomb doors may be opened at any altitude without affecting the pressurized condition of the airplane; therefore, bombing from extreme altitudes is possible.

(b) Entrance to the bomb bays during flight is through the pressure bulkhead doors to the catwalks along both sides of each bay. Exit from the pressurized compartments during high altitude flights can be accomplished only after releasing cabin pressure.



M44 — **1000 LBS.**

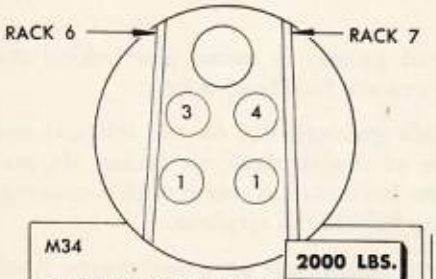
TOTAL LOAD=12 BOMBS

FORWARD BOMB BAY — 6 BOMBS

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 AND 4	2	59°	30 1/4°
1 AND 4	5	44°	15 3/4°
1 AND 4	9	33°	8 1/2°

REAR BOMB BAY — 6 BOMBS

1 AND 4	2	59 1/4°	33 1/4°
1 AND 4	5	44 1/4°	16 1/2°
1 AND 4	9	33 1/2°	8 1/2°



M34 — **2000 LBS.**

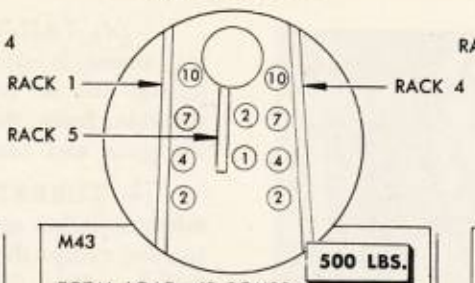
TOTAL LOAD=8 BOMBS

FORWARD BOMB BAY — 4 BOMBS

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
6 AND 7	1	42 1/4°	37°
6	3	20 1/2°	18 3/4°
7	4	20 1/2°	18 3/4°

REAR BOMB BAY — 4 BOMBS

6 AND 7	1	43°	40°
6	3	21°	19 1/2°
7	4	21°	19 1/2°



M43 — **500 LBS.**

TOTAL LOAD=40 BOMBS

FORWARD BOMB BAY — 20 BOMBS

FORWARD IN BAY

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
1 AND 4	2	24 1/2°	17 1/4°
1 AND 4	4	10 3/4°	1°
1 AND 4	7	4 1/2°	17 1/4°
1 AND 4	10	1°	0°
5	1	11°	47 1/2°
5	2	6°	40 1/2°

AFT IN BAY

1 AND 4	2	63 1/4°	19 3/4°
1 AND 4	4	53 1/2°	9 1/2°
1 AND 4	7	45°	4 3/4°
1 AND 4	10	37 1/2°	1/2°
5	1	17 1/4°	11 1/2°
5	2	1°	4°

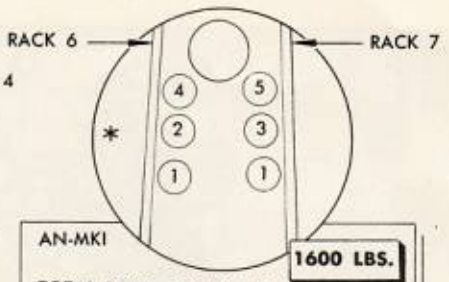
REAR BOMB BAY — 20 BOMBS

FORWARD IN BAY

1 AND 4	2	24 1/2°	63°
1 AND 4	4	11 1/4°	53 1/4°
1 AND 4	7	5 1/4°	44 3/4°
1 AND 4	10	0°	37°
5	1	12°	17°
5	2	3 1/4°	1/2°

AFT IN BAY

1 AND 4	2	17 1/4°	22 1/4°
1 AND 4	4	1°	9 3/4°
1 AND 4	7	17 1/4°	4°
1 AND 4	10	0°	1/2°
5	1	49°	11 1/4°
5	2	41 1/2°	5 1/4°



AN-MKI — **1600 LBS.**

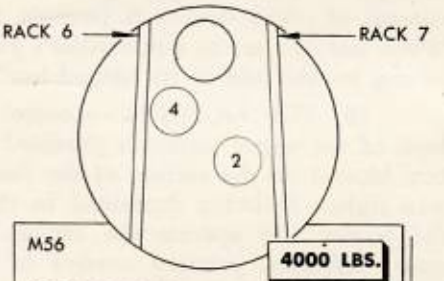
TOTAL LOAD=12 BOMBS

FORWARD BOMB BAY — 6 BOMBS

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

REAR BOMB BAY — 6 BOMBS

6 AND 7	1	47°	47 3/4°
6	2	26 1/4°	29°
7	3	26 1/4°	29°
6	4	17 1/4°	20 1/2°
7	5	17 1/4°	20 1/2°



M56 — **4000 LBS.**

TOTAL BOMB LOAD=4 BOMBS

FORWARD BOMB BAY — 2 BOMBS

RACK	STA.	GLIDE ANGLE	CLIMB ANGLE
6	4	4 3/4°	7 3/4°
7	2	21°	20 1/4°

REAR BOMB BAY — 2 BOMBS

6	4	2 1/2°	7 1/4°
7	2	22°	22 1/4°

*FOUR STATIONS ONLY ON RACK 6

NOTES

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 FUSELAGE CENTERLINE.

Figure 46—Bomb Fixation Chart (Overload)

(c) The bomb racks, equipped with B-7 and D-6 shackles, are five sizes for various bomb loading conditions. These racks are attached to the bomb rack supports and the catwalks by means of quick acting pins.

Figure 47—Bombardier's Control Panel (Early Airplanes)

(2) MECHANICAL-ELECTRICAL SYSTEM, EARLY AIRPLANES.

(a) GENERAL. — The bombardier's control panel is located on the left side of his compartment and is provided with controls, lights, and instruments as shown in figure 47. The bomb door control lever, the bomb release lever, and the emergency bomb release and rewind wheel are incorporated on a stand at the left of the bombardier's seat. The bomb door control lever controls the electric motors which actuate the doors. Refer to section 4, paragraph 5, for emergency bomb release controls.

(b) BOMB RELEASE LEVER.—In the "LOCK" position of the bomb release lever, the bombs cannot be released except by the emergency release and rewind wheel or either of the two emergency release handles. In the "SELECTIVE" position of the lever, the bomb racks are unlocked for electrical release of the bombs. The bomb release lever cannot be moved to the "SALVO" position.

(c) BOMB RELEASE SWITCH.—The bomb release switch to the left of the bombardier's seat initiates the electrical release of bombs. A hinged guard protects it against accidental release.

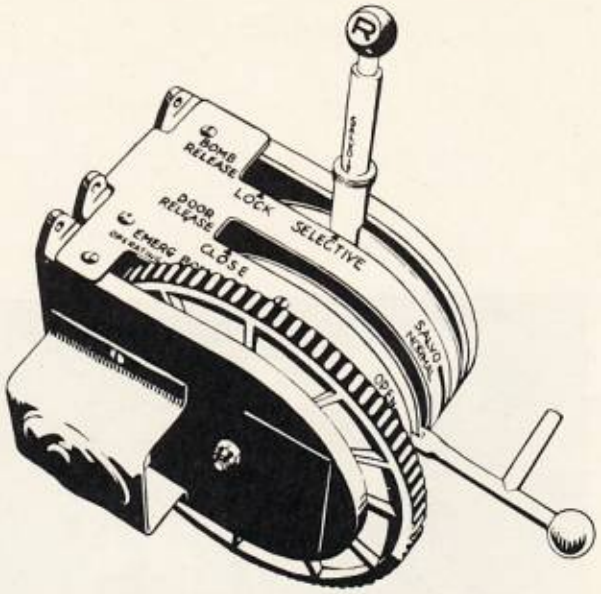


Figure 48—Bombardier's Control Stand (Early Airplanes)

(3) ALL-ELECTRIC BOMB CONTROL SYSTEM, LATE AIRPLANES.

(a) GENERAL.—The all-electric bomb control system does away with the mechanical system used on early airplanes.

1. The bombardier's control panel for the all-electric bomb system has instruments and controls as shown in figure 49. The bomb release switch, on a flexible cord, is stowed in a clip on the side of the control panel.

2. All combinations for dropping bombs can be pre-selected by the positioning of indicators and switches on the control panel.

Note

Do not operate indicator switch when dropping bombs in normal release. (Bombs will drop salvo and unarmed.)

3. Some late airplanes have pneumatic snap action bomb bay doors which are operated by moving the bomb door toggle switch to "OPEN" or "CLOSE" position as desired. The doors snap open immediately or snap closed immediately as the switch is operated.

WARNING

Never enter the bomb bay from outside the airplane without first checking that the bomb door safety switches are "OFF." The aft bomb door safety switch is mounted on the rear bulkhead beside the bomb bay light. The forward bomb door safety switch is mounted on the forward bulkhead beside the bomb bay light.

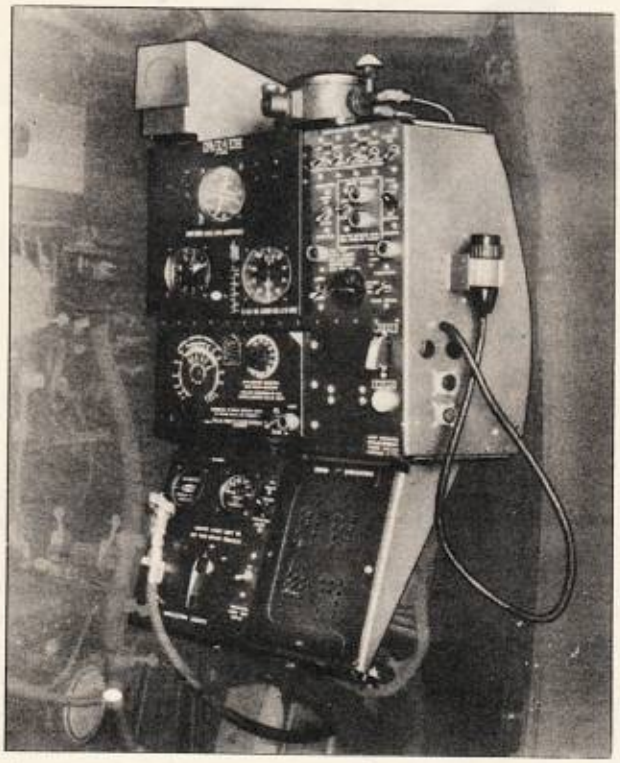


Figure 49—Bombardier's Control Panel (Late Airplanes)

WARNING

After each flight and after taxiing, when the bomb doors are opened, a designated crew member in the crew's compartment and in the nose compartment will turn the bomb door safety switches to "OFF" before any crew member exits through the bomb bay. These switches remain in the "OFF" position at all times while the airplane is on the ground except during bomb door tests.

(b) BOMB TIMER.—On late airplanes with the all-electric bomb control system an A-1 bomb timer is installed to permit automatic opening of the bomb doors, dropping of the bomb load, and closing of the doors. The doors may be opened by either the bomb release switch or the bomb sight itself.

4. COMMUNICATION EQUIPMENT.

a. GENERAL.

(1) The B-29 airplane has the radio sets shown in figure 51. In addition, some airplanes may have the radio altimeter (SCR-718A), Lorenze Blind Landing Equipment, Eagle Radar (AN/APQ-7), Aircraft Recognition Radio (SCR-515), a complete SCR-274N command radio which was later replaced by the SCR-522 very-high-frequency command set, and the SCR-287A liaison transmitter, tuning units, and frequency meter replaced later by the AN/ART-13 liaison transmitter.

(2) General operating instructions for the radio sets are included in paragraphs 5 through 12 of this section instructing each crew member. Detailed instructions for the specialized radios must be obtained from the applicable technical orders, which are carried in the navigator's cupboard and at the radar operator's station. The airplane's radio call numbers are on the airplane commander's and copilot's instrument panels, the rack over the radio operator's table, and on the nose and each side of the tail of the airplane.

b. SIGNAL LIGHT.—A portable signal light (spotlight) with a box of colored filters is stowed on the upper forward turret. The spotlight can be plugged into the 24 volt receptacle on any of the suit heater outlets, and can be keyed in code by a trigger on the handle.

c. PHONE CALL LIGHTS. — The airplane commander or copilot can attract the attention of the

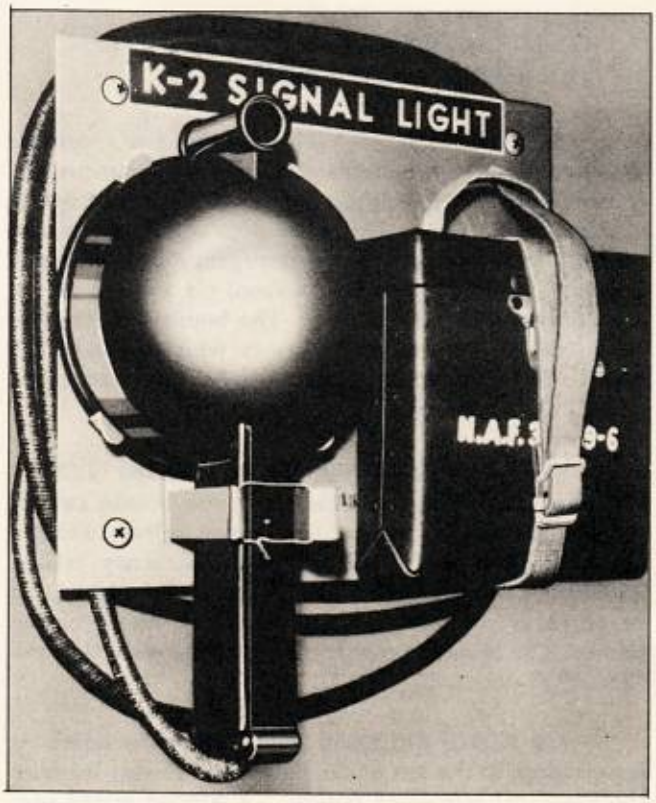


Figure 50—Signal Light

RADIO	TYPE	USE	PRIMARY CONTROL
Interphone	AN/AIC-2	Intercrew Communication; partial use with some radios	Radio Operator
VHF Command	SCR-522	Short range, two way voice communication	Airplane Commander and Copilot
Command Receiver	SCR-274N	Reception of tower messages in 19-550 kc band	Airplane Commander
Liaison Radio	AN/ARC-8	Long range, two way, code (and voice) communication	Radio Operator
Radio Compass	AN/ARN-7	Reception of voice and code signals; direction bearing, homing	Copilot and Navigator
Marker Beacon	RC-193	Location on navigation radio beam	Copilot and Navigator Light for Airplane Commander
Long Range Navigation	AN/APN-9	Mapping fixes for position and distance	Navigator
Blind Landing	SCR-570	Lateral and vertical glide path indicator	Airplane Commander
I.F.F.	SCR-695	Identification	Airplane Commander and Radar Operator
Radar	AN/APQ-13	Radio detecting and ranging	Radar Operator, Auxiliary Navigator, Navigator,
Raven	AN/APQ-2A AN/APT-1 AN/APT-2	Countermeasure. Jam enemy radar	Radar Operator
Dinghy Transmitter	SCR-578	Distress Signals when forced down	Any crew member

Figure 51—Table of Radio Sets in the B-29 (Late Airplanes)

crew in the rear compartments if their headsets are not plugged in or their jackbox switches are not on "INTER" by turning on the "PHONE CALL" switch on the aisle stand. This turns on amber lights at the top, both side, and tail gunners' stations, and the radar operator's station.

d. INTERPHONE AN/AIC-2.

(1) The interphone system permits conversation among the crew members, and allows them to listen to or talk over some of the radios as shown in figure 53, "Communication Equipment Utility Chart."

(2) Each crew station, except the bomb bay and the raven, has an interphone jackbox into which the microphone and headset extension cords are plugged. A switch on the jackbox permits selection of "COMP" (radio compass), "VHF" (very high frequency command radio) or "LIAISON" (radio operator only). "COMMAND" (190-550 kc receiver) "INTER" (interphone), or "CALL" (spring loaded position which enables any crew member to call another who does not have his switch on "INTER." With any station switch on "CALL" all radios and all interphone stations will be heard at all stations, but the strength of the individual units will depend upon the settings of their volume controls). A volume control knob on the jackbox allows the crew member to adjust the volume on any of the radio positions but not on "INTER" and "CALL."

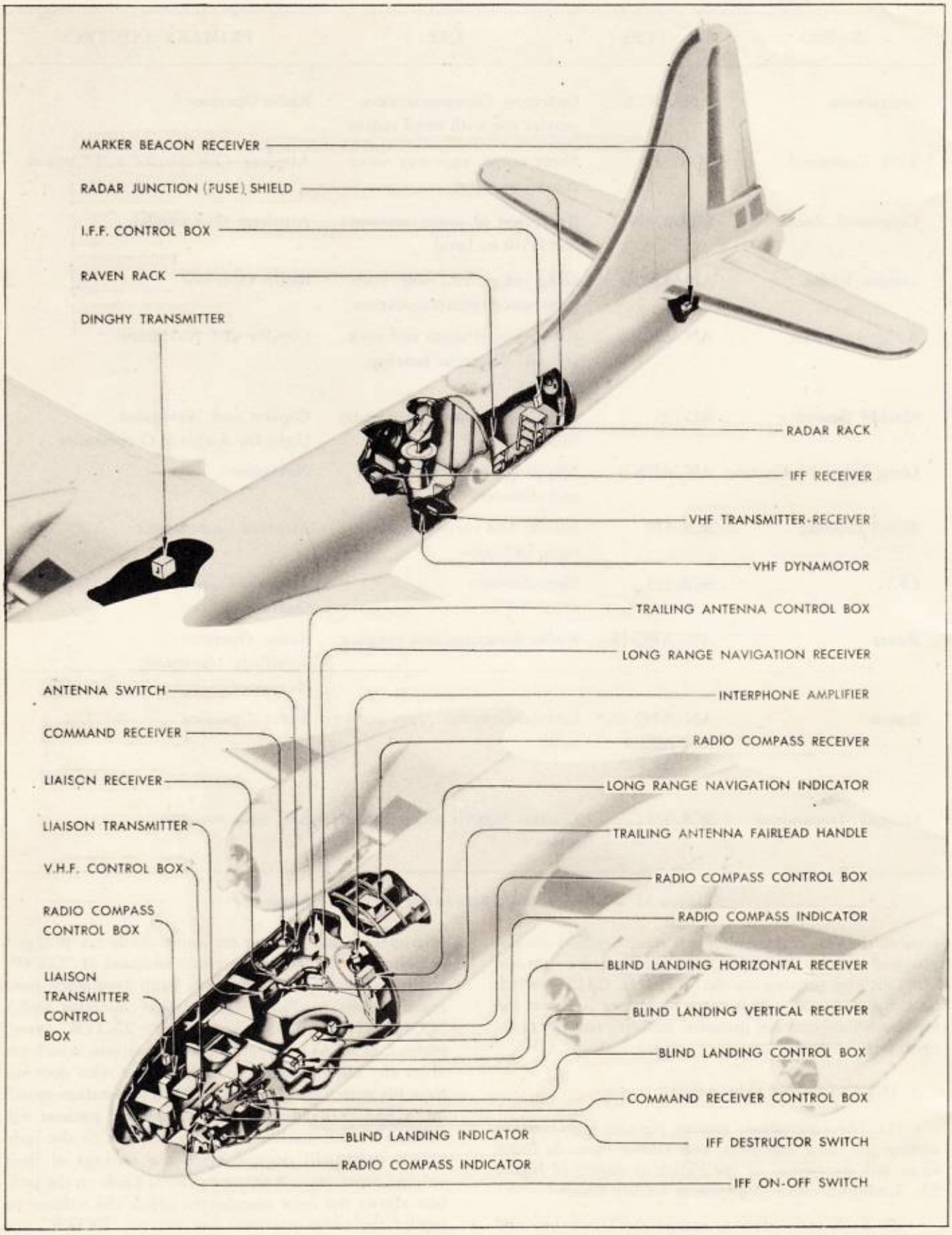


Figure 52—Communication Equipment Location Diagram

	INTERPHONE		INTERPHONE CALL		VHF COMMAND		LIAISON		COMMAND RECEIVER	RADIO COMPASS RECEIVER	BLIND LANDING RECEIVERS
	LISTEN	TALK	LISTEN	TALK	LISTEN	TALK	LISTEN	TALK	LISTEN	LISTEN	LISTEN***
AIRPLANE COMMANDER	✓	✓	✓	✓	✓	✓			✓	✓	✓
COPILOT	✓	✓	✓	✓	✓	✓		✓*	✓	✓	✓
BOMBARDIER	✓	✓	✓	✓	✓	✓			✓	✓	✓
ENGINEER	✓	✓	✓	✓	✓				✓	✓	✓
NAVIGATOR	✓	✓	✓	✓	✓				✓	✓	✓
RADIO OPERATOR	✓	✓	✓	✓			✓	✓*	✓	✓	✓
TOP GUNNER	✓	✓	✓	✓	✓	✓			✓	✓	✓
RIGHT GUNNER	✓	✓	✓	✓	✓				✓	✓	✓
LEFT GUNNER	✓	✓	✓	✓	✓				✓	✓	✓
TAIL GUNNER	✓	✓	✓	✓	✓				✓	✓	✓
RADAR OPERATOR	✓	✓	✓	✓	✓				✓	✓	✓
AUXILIARY NAVIGATOR	✓	✓	✓	✓	✓				✓	✓	✓
RAVEN OPERATOR	✓	✓									
BOMB BAY STATION	✓	✓									

* CAN ALSO TRANSMIT CODE BY KEY.
** BY PLUGGING MICROPHONE INTO TRANSMITTER CONTROL BOX.
***ON "COMMAND"

Figure 53—Communication Equipment Utility Chart

(3) Each crew member is provided with a headset and a T-30 throat microphone. The low impedance headset HS-33 (or HS-38, in a helmet) and its extension cord must be plugged into the headset adapter beside the jackbox. (If the crew member has the high impedance headset HS-23, he should plug it and its extension cord into the jackbox itself.) The microphone switches for the airplane commander and copilot are on their control wheels; for the bombardier, navigator, and engineer, on the floor at their stations; for the tail and side gunners, on the floor or on their sights; for the raven operator, on the transmitter rack; for the bomb bay station, on the forward light bracket in the rear bomb bay; and for the other crew members, on their microphone cords.

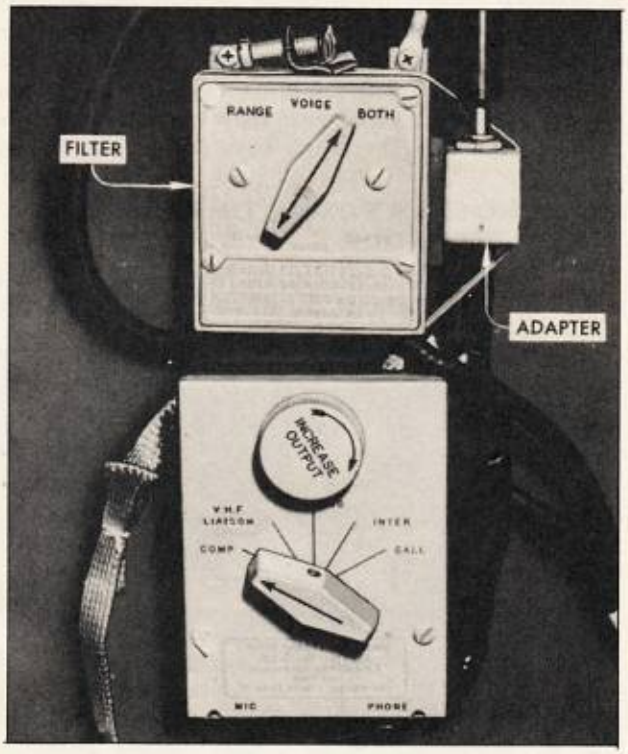


Figure 54—Interphone Jackbox, Filter and Headset Adapter

(4) The airplane commander and the copilot each have a filter switch box plugged into the headset circuit between the adapter and the jackbox. The "RANGE"—"VOICE"—"BOTH" switch permits exclusive reception of code signals, voice signals, or both.

(5) The interphone amplifier, which increases the strength of the signals in the interphone system, is on the navigator's cabinet within reach of both the navigator and the radio operator. A gain control on the amplifier can be set to obtain the best signal for the altitude at which the airplane is flying as follows:

ALTITUDE	GAIN CONTROL SETTING
Ground to 10,000 feet	1
10,000 to 20,000 feet	2
20,000 to 30,000 feet	3
Above 30,000 feet	4

Figure 55—Interphone Amplifier

e. RADIO SET SCR-522A (VHF COMMAND).

(1) The very-high-frequency command set provides two-way voice communication between airplanes or between the airplane and ground stations. The set works on any one of four pre-set channels in the 100 to 156 megacycle frequency band, and the channels are selected by a push-button control box on the airplane commander's aisle stand, after switching the interphone jackbox to "VHF."

(2) The set is turned on when any one of the four channel buttons ("A," "B," "C," or "D") is pushed, and a green light beside the button shows which channel is in use. A "T" (transmit)—"R" (receive—"REM" (remote control) switch on the box has a white light which is on when the switch is at "R," and a lever tab by the switch which when pulled toward the switch locks it out of the "REM" position and spring load the "T" position so the toggle returns to "R" when released. In this airplane the switch is usually safety wired to "REM" so the other crew members can select the VHF radio and talk over it by pressing their microphone switches. Another lever tab by the "OFF" button opens and closes a masking shutter to vary the indicator light intensity.

(3) Line-of-sight communication normally is necessary for satisfactory operation of very-high-frequency radios. Obstructing objects such as wings, propellers, and terrain may cause low signal strength or garbled reception. The following table lists the approximate range of communication between the airplane and a ground station over level country:

Figure 56—VHF Command Radio Control Box

ALTITUDE ABOVE TERRAIN (Feet)	APPROXIMATE RANGE (Miles)
1,000	30
3,000	70
5,000	80
10,000	120
15,000	150
20,000	180

(4) The transmitter-receiver, dynamotor, and high impedance carbon microphone adapter are mounted under the floor of the side gunner's compartment. A circuit breaker switch which should be left "ON" at all times is on a small shield on the floor in front of the right gunner. The rear mast of the radio compass antenna over the bomb bays is the SCR-522 antenna.

f. RADIO SET SCR-274N (COMMAND RECEIVER).

(1) When the very-high-frequency SCR-522A command radio replaced the transmitter and other re-

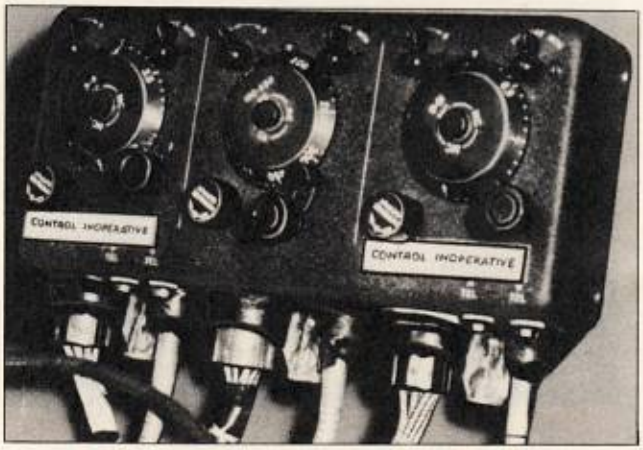


Figure 57—Command Receiver Control Box

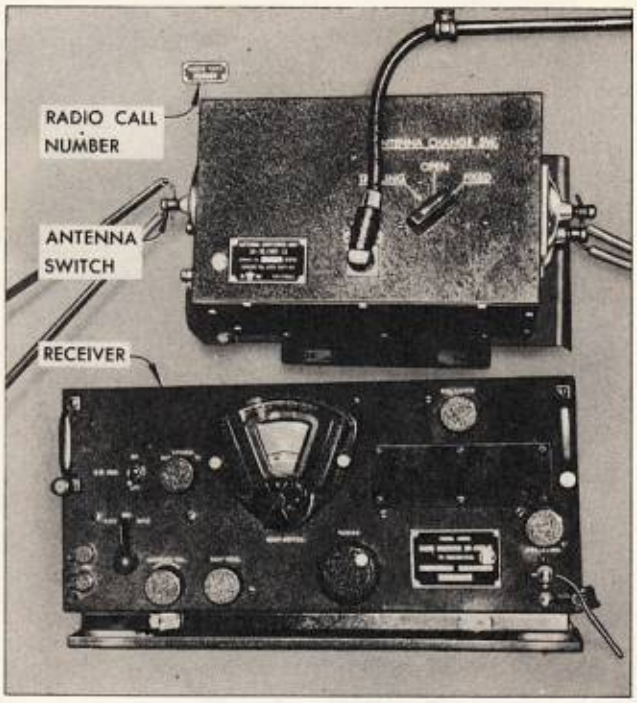


Figure 58—Liaison Receiver

ceivers of the SCR-274N command radio, the low frequency receiver was left in the airplane so the airplane commander and other crew members could listen to the radio range and tower stations in the 190 to 550 kilocycle band. The receiver is turned on and tuned by a single control box on the airplane commander's control stand.

(2) The receiver is installed on the shelf over the radio operator's table, and the command antenna is a wire from the right tip of the horizontal stabilizer to the fuselage by the navigator's plexiglas dome.

g. RADIO SET AN/ARC-8 (LIAISON).

(1) The liaison radio is a long range, two-way communication set consisting of a receiver, a transmitter, and controls for the fixed and trailing antennas

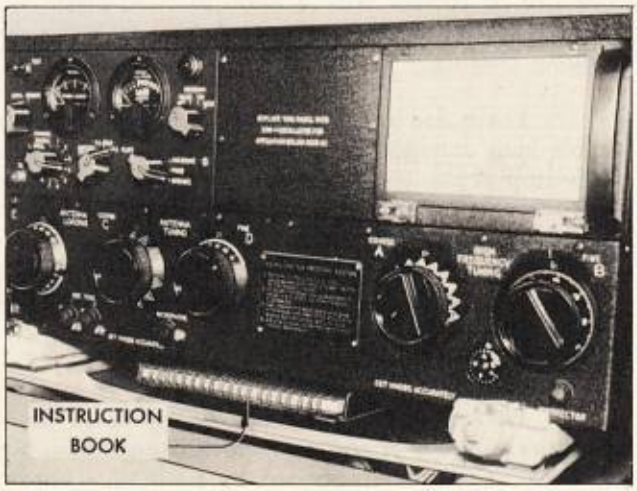


Figure 59—Liaison Transmitter

at the radio operator's station, and a transmitter remote control box at the copilot's station.

(2) The receiver can be tuned to any frequency in six bands as selected by the band switch.

BAND	FREQUENCY RANGE
1	200— 500 kc
2	1.5— 3.5 mc
3	3.5— 6.0 mc
4	6.0— 9.5 mc
5	9.5—13.5 mc
6	13.5—18.0 mc

The receiver can be set for voice, MCW (tone code) or CW (carrier wave code) reception with manual or automatic volume control.

(3) The transmitter is pre-tuned to eleven separate frequencies which may be selected by the "CHANNEL" selector switches on either the transmitter or the remote control box. A "REMOTE-LOCAL" switch on the transmitter must be set by the radio operator for either control. The transmitter is tuned on from either station by setting the "OFF-VOICE-CW-MCW" switch to "VOICE" until the set warms up and a red indicator light beside the switch comes on. The switch can then be set for the desired type of transmission. Ten of the frequencies are in the range from 2,000 kc to 18,100 kc and one, indicated "L.F.," is between 200 and 1,500 kc. The channels are normally pre-tuned on the ground but may be re-tuned by the radio operator in the air. The frequencies are marked on a card on the front of the transmitter. A monitor switch is on the junction box over the transmitter.

(4) The radio operator must set the interphone jackbox switch to "LIAISON" to transmit and receive, and then transmit code with the key on his table, and voice by pressing the switch on the microphone cord and speaking through the throat microphone. The copilot can transmit code with the key on the control box, but must plug his throat microphone into the control box and press the button on the control wheel to talk over the set. He normally receives over the command receiver or the VHF command set, but *can* hear the liaison receiver by switching to "CALL."

(5) The radio operator selects either the fixed or the trailing antenna with a switch above his table. The switch may be either on a large black box suspended under the shelf or on a smaller shield on the bulkhead at his right. The fixed antenna is a 72-foot wire from the top of the tail fin to the fuselage beside the navigator's plexiglas dome. The 250-foot wire trailing antenna is wound on a motor driven reel in the right-hand side of the forward bomb bay. The wire passes outside of the airplane through a retractable fairlead operated by a handle on the forward leg of the radio operator's table. The reel motor is con-

Figure 60—Liaison Transmitter Control Box

trolled by a switch on a box above the aft end of the table. A counter dial driven by a flexible shaft shows the number of turns of the reel the wire is out (one turn equals approximately one foot of wire), and the counter can be set to zero when the wire is reeled in by a knurled wheel beside the dial. An amber light on the box warns the radio operator if the landing gear is extended while the trailing antenna is reeled out.

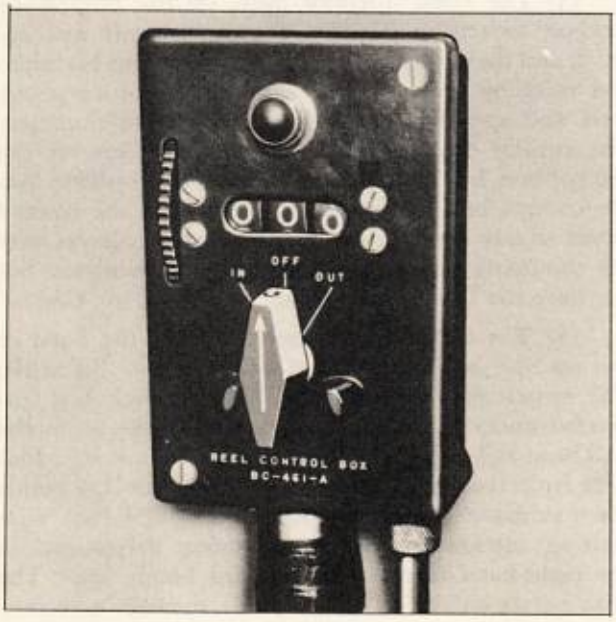


Figure 61—Trailing Antenna Control Box

Figure 62—Navigator's Radio Compass Indicator

b. RADIO COMPASS AN ARN-7.

(1) The radio compass is used in navigation to take bearings on two or more radio stations to establish a fix, to home on (fly directly toward) any radio station, or simply to listen to any station in the frequency range. The major components of the radio compass are the receiver in the forward bomb bay, a control box and an indicator at the navigator's station, a control box on the copilot's stand and an indicator on the airplane commander's panel (visible to the copilot). The outer dial of the navigator's indicator can be rotated with a knob to compensate for magnetic deviation and variation before taking a directional bearing.

(2) There are two antennas for the receiver: a rotable loop antenna enclosed in a streamlined housing on top of the nose section and a twenty-foot wire sense antenna on top of the bomb bays. The loop antenna is motor driven and picks up the maximum directional signals when edgewise to the transmitting station. The sense antenna is non-directional and combines signals with the loop antenna to prevent 180 degrees false directional indication.

(3) The radio compass can be operated from either the copilot's or the navigator's control box, but not both. Control is obtained by pushing a button on the control box. When control is established, a

Figure 63—Radio Compass Control Box

green light comes on. The receiver is tuned by a band switch, a tuning crank, and a "TUNE FOR MAX." gage on the control box. There is also an "AUDIO" volume control knob, a "LOOP-L-R" switch to rotate the loop antenna, a "CW-VOICE" switch to separate code and voice reception, a dial light rheostat switch, and two spare dial lights. The set is turned on and off, and the type of antenna reception selected by an "OFF-COMP.-ANT.-LOOP" switch.

Figure 64—Airplane Commander's Radio Compass Indicator

(4) The "ANT." position is used to listen to signals from the non-directional sense antenna, such as radio range or standard broadcast signals. For best reception of these signals set the interphone volume knob fully clockwise and adjust the volume with the "AUDIO" knob on the radio compass control box.

(5) The "LOOP" position may be used for better reception if there is too much precipitation static on "ANT." Turn the loop antenna with the "LOOP-L-R" knob for maximum signal in the headset or "TUNE FOR MAX." gage, and adjust the volume with the "AUDIO" knob.

(6) The "LOOP" position is used to obtain directional bearings on the indicator by turning the loop with the "LOOP-L-R" switch and listening for a minimum (aural null) signal or tuning the gage for a minimum (visual null). Turning up the volume with the "AUDIO" knob will decrease the width of the null and give a more accurate bearing. Setting the "CW-VOICE" switch to "CW" will also increase the accuracy of the bearing. When the "LOOP-L-R" switch is turned to "L" or "R" the loop rotates slowly. Pressing in on the switch rotates the loop fast. Bearings obtained by either the aural null or the visual null are subject to 180 degree ambiguity, i.e., may point away from the station instead of toward it.

(7) The "COMP." position is used for automatic direction finding. When the desired station is tuned in, the loop turns toward it automatically, the sense antenna prevents 180 degree ambiguity, and the indicator needle shows the direction of the station either for homing or for obtaining a bearing. The signal will also be heard in the headsets.

i. MARKER BEACON RECEIVER RC-193A.

(1) The marker beacon receiver is in the rear unpressurized compartment beside the tail gun left hand ammunition box. It receives ultra high frequency signals in the range of 62 to 80 megacycles, and responds to instrument landing markers, fan and cone of silence markers, and other facilities transmitting 75 mc horizontally polarized and modulated signals. As the airplane passes through the field of such a transmitter, the amber indicator lamp on the airplane commander's instrument panel will flash in sychronizm with the transmitter keying. The operation of this equipment is automatic, the only requirement being that the radio compass must be turned on to supply the power.

(2) The six-foot wire antenna is on the lower left side of the fuselage beside the tail skid, and is connected to the receiver by a coaxial transmission line.

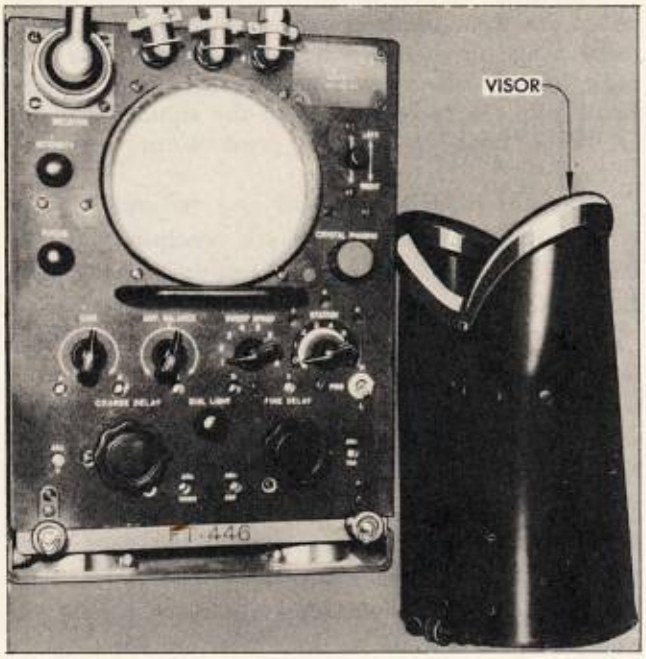


Figure 65—Long Range Navigation Indicator

j. RADIO SET AN/APN-9 (LONG RANGE NAVIGATION).

(1) The AN/APN-9 radio (also known as LORAN, from Long Range Navigation) is used to receive signals from ground stations which appear on an oscilloscope indicator and are read as distances. The intersection of arcs drawn on a map with the distances from two or more stations as radii will determine the position of the airplane, and a line drawn between this intersection and the intersection of later readings will show the course of the airplane. Readings can be taken as far as 700 miles from the station during the day and 1,200 miles at night.

(2) The radio consists of a receiver under the radio operator's table and an indicator on the cabinet behind the navigator. The set uses the liaison radio fixed and the trailing antennas, and the antenna switch over the radio operator's table is connected so when one radio is on the fixed antenna, the other is on the trailing antenna.

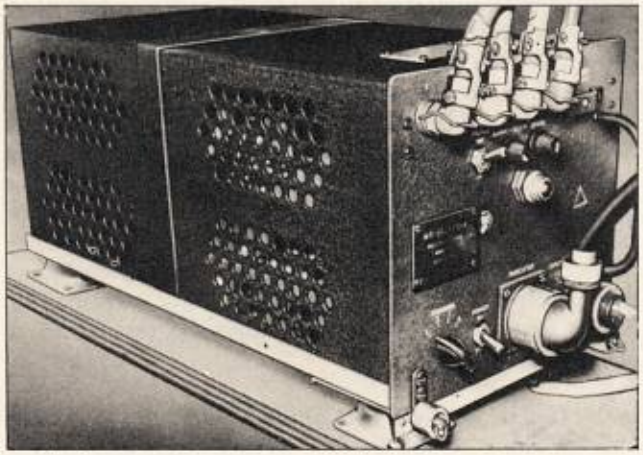


Figure 66—Long Range Navigation Receiver

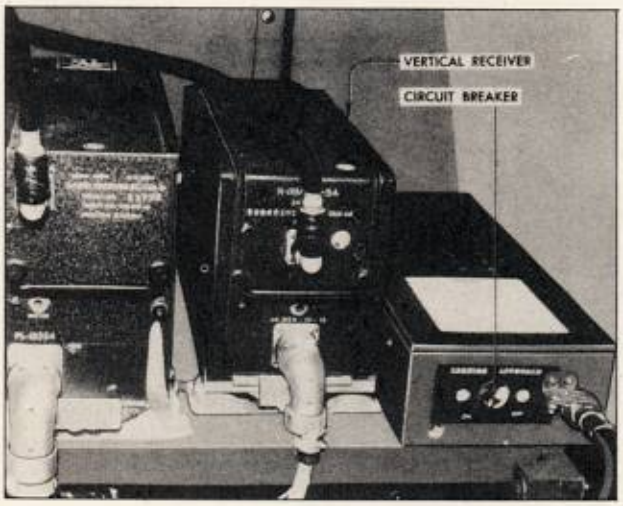


Figure 67—Blind Landing Receivers

k. AIRBORNE LANDING EQUIPMENT SCR-570 (BLIND LANDING).

(1) Radio equipment SCR-570 is composed of radio receiving equipment RC-103A and radio receiving equipment AN/ARN-5A, the former providing lateral guidance when making an instrument approach with visibility zero, and the latter providing vertical guidance. The radios receive signals from the landing field transmitted by the Army Air Force Instrument Approach System.

(2) The set consists of the two receivers in the rack behind the airplane commander, a control box on the airplane commander's sidewall, an indicator on his instrument panel, and a dual di-pole half wave

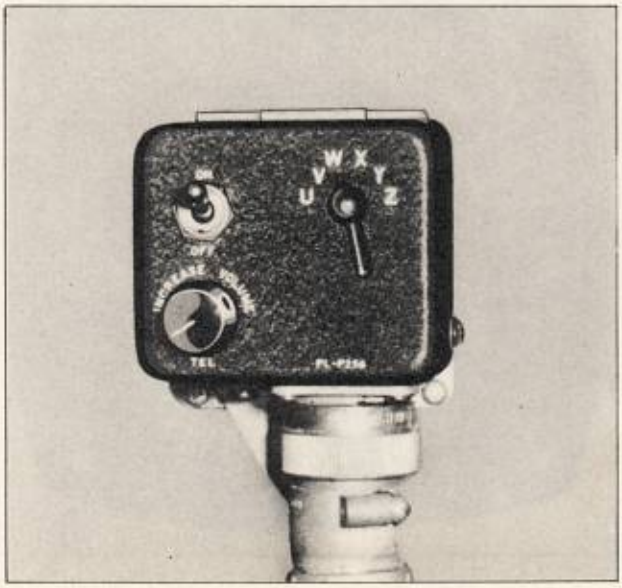


Figure 68—Blind Landing Control Box

antenna on the top of the fuselage by the navigator's plexiglas dome.

(3) The set is turned on and off by a switch on the control box, and a selector switch is turned to the letter which tunes in the frequencies of the field transmitters. An "AUDIO" knob on the control box varies the volume of the signals in the headsets when the interphone jack box switch is on "COMMAND." When the airplane is above or to the left of the glide path, a 90 cycle tone will be predominantly heard in the headsets; below or to the right will give predominantly a 150 cycle tone; on course will give equal tones; and either above and right or below and left will give both which may be equal, so that the only way to determine the position is to observe the indicator.

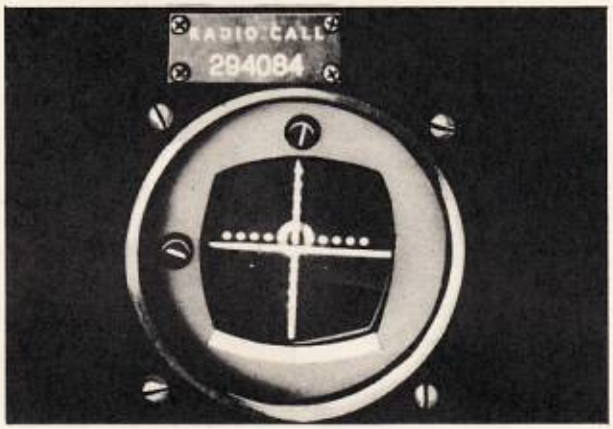


Figure 69—Blind Landing Indicator

(4) The indicator has a vertical pointer and a horizontal pointer. The airplane should be flown in the direction the pointers show to get on course.

(5) The vertical receiver has three interchangeable crystals which can be replaced in flight to tune in the proper frequency.

l. RADIO SET SCR-695A (I.F.F.).

(1) The identification-friend-or-foe radio identifies the airplane automatically when challenged by a ground station or another airplane. The receiver-transmitter is under the floor forward of the right gunner. It contains six explosive destructors to destroy it in case of a forced landing in enemy territory or a crash. The destructors are energized through a plug on the receiver which must be connected only when on a mission over enemy territory.

(2) A control box at the radar operator's station is used to select the proper code of the hour from the six possible codes. The set can be turned on and off, and the emergency band turned on from the box.

(3) Normally, however, the set is turned on and off by the airplane commander with a switch on top of his instrument panel. Another switch on top of the

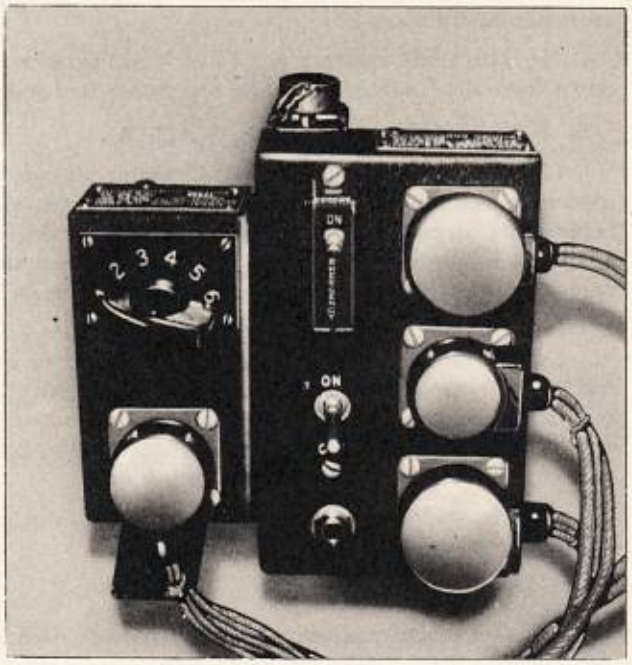


Figure 70—I.F.F. Control Box

panel enables him to turn on the G-band as instructed by the communications officer. In case the airplane is lost, in danger of being forced down, or needs assistance, the "EMERGENCY" switch under a green guard on top of the panel can be turned on to send out a distress signal on which ground stations can also obtain a location fix.

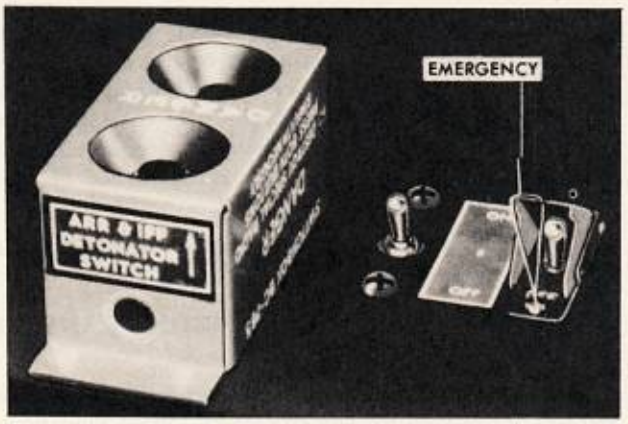


Figure 71—I.F.F. Control Switches

(4) If the airplane is going down in enemy territory, the airplane commander can destroy the receiver-transmitter by pushing the two buttons in the red "DESTRUCTOR" box on top of his instrument panel. (In some airplanes the destructor switches are on the bulkhead above the radio operator's table.) If the airplane crashes, an impact switch on the bulkhead above radio operator's table will automatically blow up the receiver-transmitter. Whenever the two red indicator lights beside the impact switch are lit, power

is on the destructor circuit and the destructor plug must not be connected.

(5) The I.F.F. antenna is a 14-inch rod projecting down from the fuselage aft of the rear bomb bay doors.

m. RADIO SET AN/APQ-13 (RADAR).

(1) The Radio Detecting and Ranging set can be used to search the entire area ahead, at both sides, and behind the airplane, to scan the forward 180 degree sector, or to concentrate on any one area. It can also determine the horizontal and vertical direction of a target and its distance from the airplane.

(2) All of the radar equipment is installed in the rear pressurized section except an auxiliary indicator at the navigator's station, some equipment between the bomb bays, and the antenna radome on the bottom of the fuselage between the bomb bays.

(3) The radar fuses are in a panel under the radar operator's table.

n. RAVEN EQUIPMENT.

(1) The raven countermeasure equipment used to jam enemy radar, consists of three transmitters which transmit radio "hash" over three different frequency bands. The transmitters are mounted in a rack just aft of the left side gunner's station, and are controlled by the radar operator or the auxiliary navigator. Some airplanes have separate oxygen, suit heat, and interphone outlets at the rack for a special raven operator. The rod antenna projects down below the fuselage just forward of the lower rear turret. Two spare antennas and a remote control box are furnished with the airplane for special theater installations.

(2) Each transmitter is pre-tuned on the ground to some frequency corresponding to the enemy radar. For example, one transmitter can be tuned anywhere between 480 and 700 megacycles. It then generates and transmits a hash over a band of frequencies two to three megacycles wide. Each set is turned on only as long as it is needed.

(3) The raven fuses are in a panel under the radar operator's table.

o. RADIO SET SCR-578A (DINGHY TRANSMITTER).

(1) A completely independent portable transmitter and accessories for use in case of forced landing on water or land is fastened by quick release strap in the right side life raft compartment. The equipment consists of the transmitter and accessories enclosed in bright yellow canvas bags strapped together and provided with a parachute. The kit is watertight and non-sinkable. When the airplane lands, a crew member can obtain the transmitter by pulling the release handle either at the forward end of the tunnel or outside at the front of the life raft compartment door and reaching down inside the life raft compartment. The transmitter is carried in straps under the hinged bottom.

(2) In use, the transmitter is strapped to the legs of the operator who turns the hand crank, adjusts the switches, sends up the antenna or holds the signal lamp, and operates the key. A cam arrangement will automatically send out in code on the international distress frequency of 500 kilocycles the signal ...---...-- (SOS DASH) or .-.-- (AA DASH), or the transmitter may be keyed to send out position, personnel, etc. No receiver is provided. The same signals or a steady light can be sent out with the signal lamp. A book of instructions is included with the transmitter.

(3) Sealed in a separate, watertight container are the following accessories: 1 box kite, 2 inflating tubes, 2 balloons, 2 hydrogen generators, 1 extra reel of wire, 1 signal light, and 1 spare signal light bulb.

(4) The antenna wire is wound on a reel in the transmitter and is carried aloft by the kite or a balloon. A grounding wire must be hung in the water, or if on land, be buried in wet earth. The balloon is inflated to a diameter of four feet by attaching the balloon and a hydrogen gas generator to an inflating tube, and holding the generator in the water. Rotate the hand crank in the transmitter a few times each month to keep the grease free. The parachute should be checked and repacked at least once every 60 days.

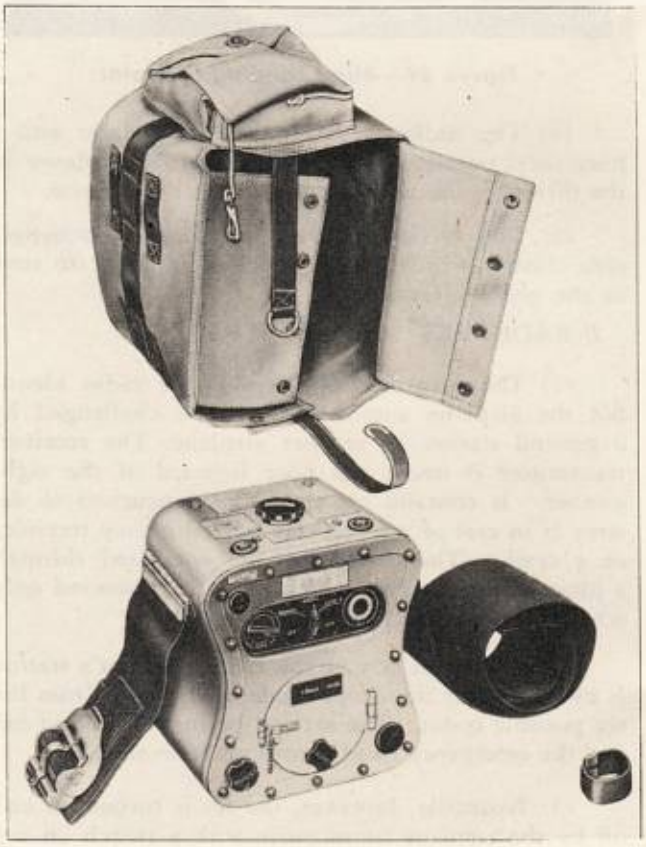


Figure 72—Dinghy Transmitter and Case

5. AIRPLANE COMMANDER'S COMPARTMENT.

a. SPECIFIC INSTRUCTIONS.

(1) SURFACE DE-ICING SYSTEM.—Some B-29 airplanes are equipped with conventional de-icer boots on the leading edges of the wings and the tail surfaces. The vacuum gage on the airplane commander's instrument panel should have a normal reading of 4 to 6 inches Hg.

(2) CABIN PRESSURIZING AND DEFROSTING CONTROL.

(a) PRESSURIZING.—When advised by the engineer that airplane is to be pressurized, set the turbo boost selector as required for cabin pressurizing under current cruising requirements.

(b) DEFROSTING.—The front windows should be adequately defrosted automatically during normal cabin air flow. On late airplanes equipped with electric fans, the fans may be turned on to get additional air circulation and at the same time supplement the defrosting duct system by blowing more air against the windows.

(3) RADIO SET SCR-522A (VHF COMMAND).

(a) Push button "A," "B," "C," or "D" on the control box on the aisle stand to turn on the set and to select the desired channel. If the indicator lights don't come on, have the right side gunner turn on the circuit breaker switch forward of his seat.

(b) While the set is warming up, check that the "T-R-REM" switch is set or lockwired at "REM," and adjust the indicator light brightness with the toggle opposite the "OFF" button.

(c) Set interphone jack box switch to "VHF." Adjust volume with "INCREASE OUTPUT" knob.

(d) Press the "MICROPHONE" button on the control wheel to talk over the set; release it to listen.

(e) To turn off the set, press the "OFF" button on the control box.

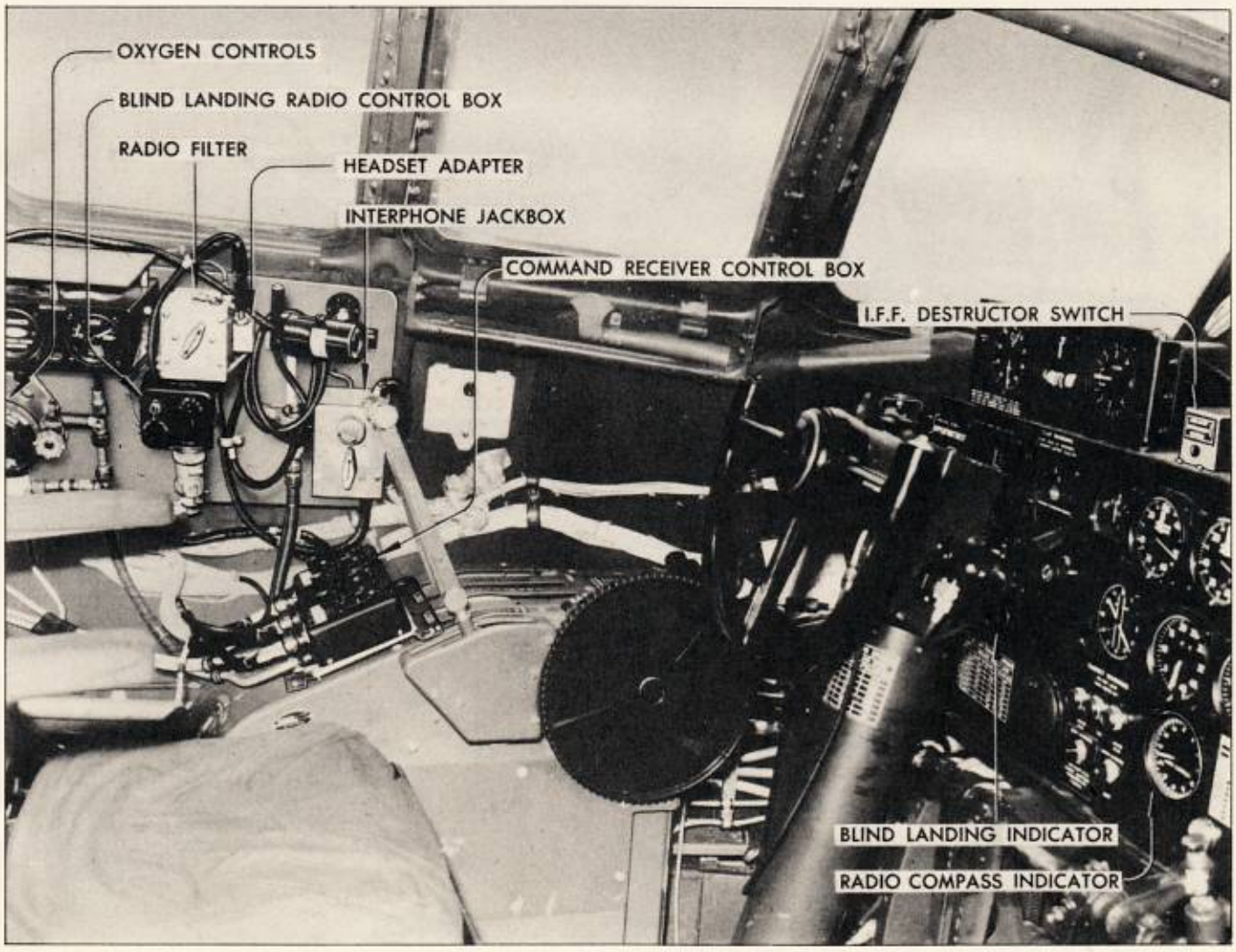


Figure 73—Airplane Commander's Station

(4) RADIO SET SCR-274N (COMMAND RECEIVER).

(a) Set the "OFF-CW-MCW" switch on the control box on the airplane commander's stand to either "CW" or "MCW" to turn the receiver on. "CW" is for listening to unmodulated code signals; "MCW" is for listening to voice or tone modulated reception.

(b) While the receiver warms up, check that the "A-B" switch is at "A." The centered and "B" positions are inoperative.

(c) Set the interphone jack box switch to "COMMAND."

(d) Tune the radio to any frequency between 190 and 550 kilocycles with the tuning crank and dial.

(e) It is best to leave the interphone jack box volume control knob at some intermediate position, and adjust the receiver volume with the knob on the receiver control box. However, if the signals are weak turn the jack box knob to full "INCREASE OUTPUT" before adjusting with the receiver control box knob.

(f) To turn the command receiver off, return the "OFF-CW-MCW" switch to "OFF."

(5) RADIO SET AN ARC-8 (LIAISON).

(a) To turn the liaison transmitter on, first call the radio operator on the interphone and have him switch the "LOCAL-REMOTE" switch on the transmitter to "REMOTE." If you don't know the proper "CHANNEL" switch position for the desired frequency, have him read it to you from the card on the front of the transmitter.

(b) Set the "CHANNEL" switch to the proper number.

(c) Turn the "OFF-VOICE-CW-MCW" switch to "VOICE," and when the red light comes on indicating that the transmitter is warmed up, switch to the desired type of transmission—voice, code, or modulated code.

(d) If "CW" or "MCW" is selected, transmit code with the key on the transmitter control box.

(e) If "VOICE" is selected, pull the microphone plug out of the jack box and plug it into the trans-

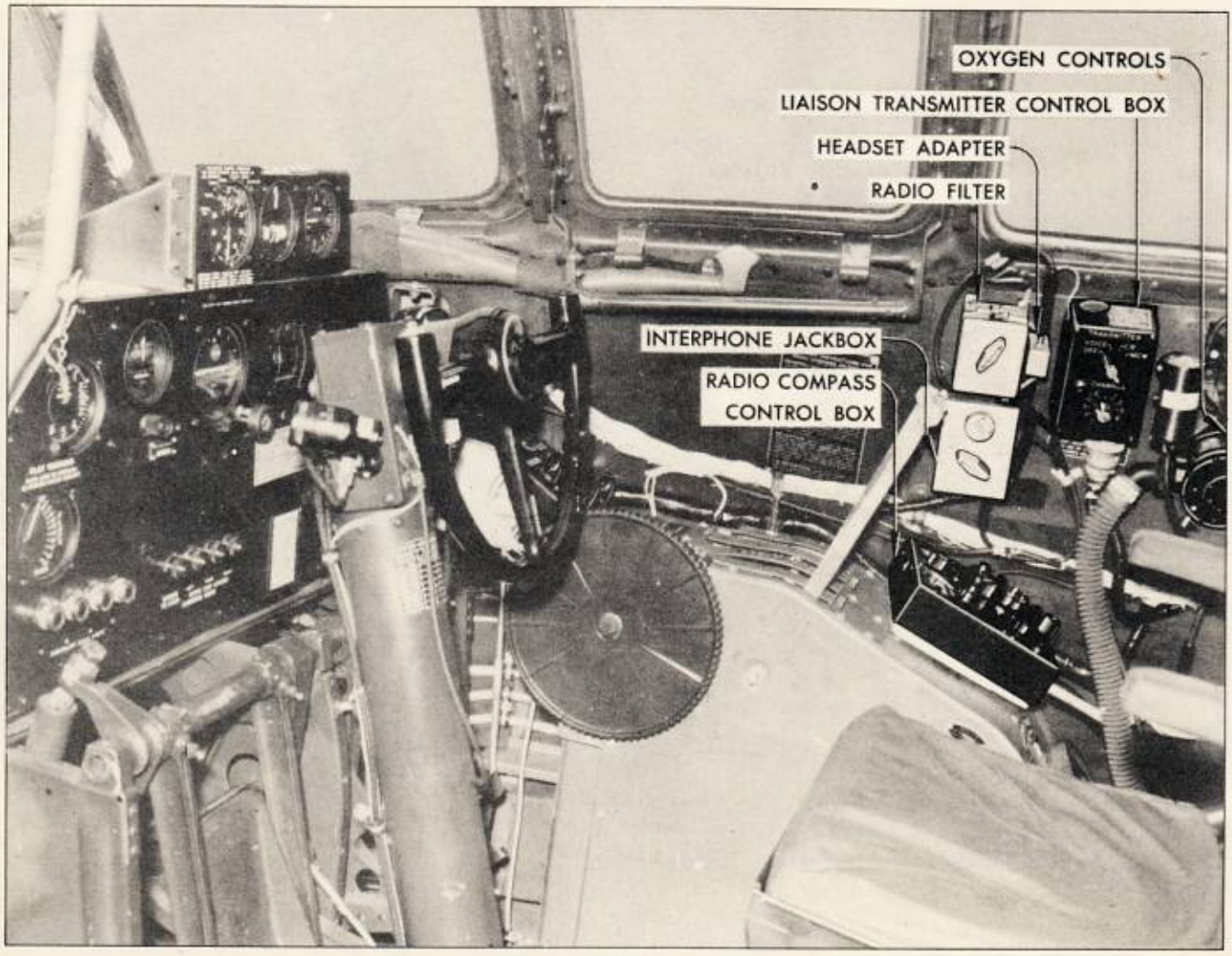


Figure 74—Copilot's Station

mitter control box jack. Press the "MICROPHONE" button on the copilot's control wheel to talk over the transmitter.

(f) Although only the radio operator can normally listen to the liaison receiver, any crew member can hear it by switching his interphone jack box to "CALL." However, this will interrupt the other crew members who are listening to the interphone or to other radios.

(g) Turn the transmitter off by returning the "OFF-VOICE-CW-MCW" switch to "OFF," and return the microphone plug to the jack box.

(6) RADIO COMPASS AN/ARN-7.

(a) Be sure the AC inverter is on. Turn the radio compass on by setting the "OFF-COMP.-ANT.-LOOP" switch on the control box on the copilot's stand to "COMP.," "ANT.," or "LOOP," depending on whether you want to have automatic direction finding, to listen to any station, or to take bearings or cut down precipitation static respectively.

(b) If the green light is not on, push the "CONTROL" button to switch the control to this box.

(c) Switch the interphone jack box to "COMP" to listen to the radio compass.

(d) Rotate the bandswitch to the desired frequency band.

(e) Turn the "TUNING" crank to the desired frequency in kilocycles as shown on the dial, and rotate it back and forth through resonance for maximum deflection of the "TUNE FOR MAX." gage.

(f) Set the "CW-VOICE" switch for the type of signal being received.

(g) Adjust the volume with the "AUDIO" knob, and the dial light brillance with the "LIGHTS" knob.

(h) To take bearing on any station or to cut down precipitation static by rotating the loop antenna, switch to "LOOP" and then switch the "LOOP-L-R" switch to "L" or "R" to turn the loop left or right. Press in on the switch to make the loop rotate faster. Observe the indicator on the airplane commander's instrument panel.

(i) Turn the radio compass off by returning the "OFF-COMP.-ANT.-LOOP" switch to "OFF."

(7) MARKER BEACON RECEIVER RC-193A.

(a) Turn the marker beacon receiver on or off, when requested by the airplane commander, with the "OFF-COMP.-ANT.-LOOP" switch on the radio compass control box after pushing the "CONTROL" button to turn on the green light. (Inverter must be on.)

(8) AIRBORNE LANDING EQUIPMENT SCR-570 (BLIND LANDING).

(a) Approximately 20 minutes before approaching the landing runway turn the "ON-OFF" switch on the "LOCALIZER" control box on the airplane commander's sidewall on "ON."

(b) Turn the frequency selector switch to the letter representing the desired frequency as determined from the radio facility charts or by communication with the ground.

SWITCH POSITION	FREQUENCY LAT. RECEIVER	FREQUENCY VERT. RECEIVER
1	108.3 mc	332.6 mc
2	108.7 mc	333.8 mc
3	109.1 mc	335.0 mc
4	109.5 mc	332.6 mc
5	109.9 mc	333.8 mc
6	110.3 mc	335.0 mc

If the crystal covering the desired frequency is not plugged into the vertical receiver, turn off the set, remove the side panel of the receiver in the rack behind the airplane commander, and replace the crystal with the correct one stowed in the receiver. Stow the other crystal, replace the cover, and turn on the set.

(c) Set the interphone jack box switch to "COMMAND" to hear the 90 and 150 cps course tones, and adjust the volume with the "AUDIO" knob on the "LOCALIZER" control box. This does not affect the operation of the indicator.

(d) Fly the airplane in the direction the indicator needles point to get on course. In other words, if the horizontal needle points up, go up; if the vertical needle points left, go left. A deviation of 1/4 scale deflection of the vertical needle left or right of center is not too great for a successful landing.

(e) If the horizontal needle deflects up and stays up, it means that ground vertical path transmitter has failed or the receiver has failed. If the needles do not move from center, it means that the receivers are not getting power.

(f) After landing, turn the "ON-OFF" switch to the "OFF" position.

(9) RADIO SET SCR-695A (I.F.F.).

(a) Turn the identification-friend-or-foe radio on and off with the toggle switch on top of the airplane commander's instrument panel. (Have the right side gunner check that the "SCR-695A" circuit breaker switch forward of his seat is "ON.")

(b) In case the airplane is lost, is in danger of being forced down, or needs assistance, break the thread, lift the guard, and turn on the "EMERGENCY" switch on top of the airplane commander's instrument panel.

(c) Use the G-band "ON-TIME" switch on top of the airplane commander's instrument panel only as specified by the communications officer.

(d) If the airplane is going to land in enemy territory, simultaneously push the two buttons in the red "DESTRUCTOR" box on top of the airplane commander's instrument panel.

(10) BOMB DOOR OPERATION.—On early airplanes the emergency bomb release T-handles will open bomb doors and salvo the bomb load. These handles on late airplanes will only open the doors. Late airplanes have BOMB DOOR switches on the aisle stand. To open doors, turn OPEN switch "ON." Turn to "OFF" after doors are fully open. To close doors, turn CLOSE switch "ON," and when doors are fully closed return switch to "OFF."

(11) EMERGENCY BOMB RELEASE.—To salvo all bombs and bomb bay fuel tanks during an emergency, lift the guard of the BOMB SALVO switch to "ON." When using the salvo switch, it is not necessary to use the bomb door switch to open the bomb doors.

b. LOCATION.

(1) OXYGEN CONTROLS.—The demand regulator, the oxygen flow indicator, and the oxygen pressure gage of the airplane commander are on the sidewall directly to his left. The copilot's oxygen controls are on the sidewall to his right.

(2) INTERPHONE CONTROLS.—The airplane commander's and copilot's interphone jack boxes, headset adapters, filter switch boxes, and extension cords are on the sidewall above their control stands. Microphone switches are on the control wheels.

6. ENGINEER'S COMPARTMENT.

a. SPECIFIC INSTRUCTIONS.

(1) CABIN HEATING AND DEFROSTING WITHOUT CABIN PRESSURE.

—STARTING, TAKE-OFF, AND DESCENT.

(a) Place cabin air valve levers in "CLOSED" position before starting engines.

(b) Move lever to "OPEN" after starting.

(c) See that at least one pressure door is open.

—FLYING IN HOT WEATHER.

(a) Place cabin air valve levers in "OPEN" position.

(b) See that all pressure doors are open.

—FLYING IN COLD WEATHER.

(a) Place cabin air valve levers in "OPEN" position.

(b) Have radar operator open entrance door in the rear compartment.

(c) See that all other doors are closed.

(2) CABIN PRESSURIZATION.

(a) Be sure air valve levers are "OPEN."

(b) Have side gunners check cabin pressure regulators.

(c) Set cabin pressure relief valve crank arm in full closed position.

(d) Instruct crew members to close all windows and doors.

(e) Have airplane commander set turbo boost selector for pressurized cabin operation.

WARNING

While the airplane is operating with cabin pressure, all crew members should keep their oxygen masks near at hand and should carry the portable "walk-around" units when moving from one station to another, for emergency use in case of sudden cabin depressurization.

(f) Adjust throttles to correct manifold pressure.

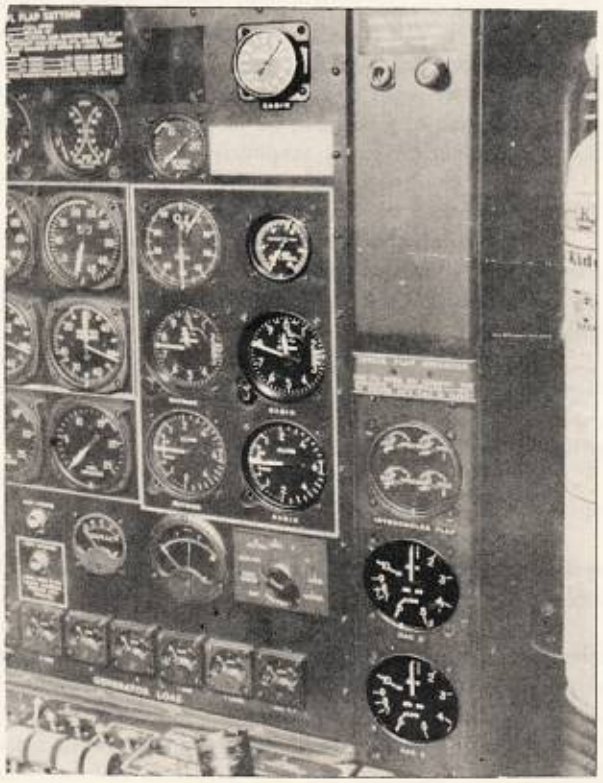


Figure 75—Cabin Air Gages

(g) Check the two cabin airflow gages. Cabin air flow should begin above 3,000 feet in level flight or above 4,500 feet during climb. The gages should indicate between "8" and "10" for adequate ventilation and defrosting, and if possible, airflow should be maintained to read "HI" on the gages. If airflow decreases to "LOW," advise airplane commander to increase manifold pressure setting. Engineer then decreases throttle setting until manifold pressure gage agrees with cruising chart.

(h) Check cabin pressure altimeter and cabin differential pressure gage when above 8,000 feet. Between 8,000 and 30,000 feet outside altitude, the cabin altimeter should indicate 8,000 feet, plus or minus 300 feet. Above 30,000 feet the differential pressure gage should indicate approximately 22,000 feet differential.

(i) If, when climbing above 33,000 feet, the airplane will satisfactorily climb and maintain altitude, the cabin air valve control levers should be kept in full "OPEN" position; otherwise move control levers to "LOW FLOW" to get better engine power. The "LOW FLOW" position involves the loss of some cabin air ventilation and heat, and causes insufficient defrosting heat. Therefore, it should be used only when necessary at high altitudes. The "LOW FLOW" position should not affect the cabin altimeter or differential pressure gage readings. If these instrument readings deviate from normal, refer to cabin air emergency operation.

(j) Instruct all crew members to use oxygen masks when cabin altimeter shows altitude of 10,000 feet or higher.

(k) Keep cabin pressure warning switch "ON" during normal cabin pressure operation. Warning horns will sound an intermittent signal when cabin pressure falls below 12,000 feet plus or minus 300 feet. To silence the horns turn warning switch "OFF." When cabin altitude returns to below 12,000 feet, return switch to "ON."

(l) Tell all crew members to start using oxygen when warning horn gives intermittent signal.

(m) Advise crew members to operate controls per emergency (section IV, paragraph 12) if warning horns sound below an outside altitude of 34,000 feet.

(3) TEMPERATURE CONTROL.

(a) Engineer will place cabin air conditioning switches at "AUTO" position. Under ordinary atmospheric conditions the cabin temperature should be 60°F to 70°F up to 30,000 feet altitude.

(b) If automatic temperature control fails, manually turn the switch to "HEAT" or "COLD" as needed.

(c) When full heating or full cooling is desired, the switches should be held in manual position for one minute and then placed in "OFF."

(d) If slight change in temperature is desired, hold switches in manual position for a 10 second interval and then turn to "OFF," as it will require about five minutes for the new setting to affect cabin temperature sufficiently for determination of the new temperature.

(e) Crew members position their individual outlets as desired.

(f) Side gunners check cabin pressure regulators to see that shut-off valve is open during normal operation of the heating system.

(g) During "LOW FLOW" of cabin pressure, or when one side is not supplying air, the cabin air temperature will be low. Air flow must be brought up to normal if temperature is to be raised.

(4) OPERATION OF THERMOSTAT SYSTEM. —On late airplanes with "THERMOSTAT" position instead of "AUTO" position on the cabin air conditioning switch, the function and operation of the switch position remains unchanged.

Figure 76—Engineer's Station

b. LOCATION.

(1) OXYGEN CONTROLS. — The oxygen controls, including a demand regulator, an oxygen flow indicator, and an oxygen pressure gage, are on the sidewall to the left of the flight engineer.

(2) INTERPHONE CONTROLS. — The engineer's interphone jack box, headset adapter, and extension cords are on the sidewall beside his seat. The microphone switch is on the floor.

(3) SURFACE DE-ICING SYSTEM.—A toggle switch on the engineer's switch panel provides control over the de-icing system. Either inboard engine vacuum pump may be selected to provide vacuum for the instruments and de-icer boots, by means of a lever on the engineer's control stand. The de-icing pressure gage on the engineer's instrument panel has a normal indication of from 6 to 8.5 pounds per square inch.

(4) PROPELLER ANTI-ICER SYSTEM. — An anti-icing fluid may be pumped to a slinger ring at each propeller from where it is directed to the propeller leading edges. A toggle switch on the engineer's switch panel energizes two electric pumps, which direct fluid to the slinger rings at the rate of two to five gallons per hour. The rate of flow may be controlled by two rheostats located on the lower right-hand side of the engineer's control stand.

(5) PITOT TUBE HEATERS.—The pitot tube heaters are located in the nose of the tube and are controlled by the switches on the engineer's switch panel.

7. BOMBARDIER'S COMPARTMENT.

a. SPECIFIC INSTRUCTIONS.

(1) A-1 BOMB TIMER.

(a) Set the switch to "AUTO-TIMER" and allow 10 minutes for the timer to warm up.

(b) If the bombsight release of bombs is to be used, allow two seconds for the doors to open until the first bomb release box functions.

(c) If the bomb release switch is used, the train selective switch may be set at either "TRAIN" or "SELECTIVE." In "SELECTIVE," the doors will open when the bomb release switch is placed in "ON." Two seconds later the bomb release box is actuated, and three seconds after that the doors will close. If more than one bomb is released by this method, the doors will remain open if the bombs are released within three seconds of each other.

(d) In "TRAIN," and the intervalometer adjusted as desired, the bomb release switch will open the doors when placed in "ON." Two seconds later the first bomb release box will be actuated, and the train carried through. The bomb doors will close three seconds after the last bomb release box has been actuated.

(2) GUN CONTROLS. — Control of a turret is accomplished by turning "ON" the turret power switches and depressing the action switch. The turret is then under the control of the operator and may be positioned as desired.

b. LOCATION.

(1) OXYGEN CONTROLS. — The bombardier's demand regulator, oxygen flow indicator, and oxygen pressure gage are located directly below the bomb controls to his left.

(2) HEAT, VENTILATION, AND DEFROSTING.—Flow of heated cabin air for the bombardier can be regulated by adjusting the valve in the cabin air duct at his station. The windows are automatically defrosted by the defrosting duct vents. On late airplanes the electric fan can be turned "ON" for additional defrosting and air circulation. The lower front window has an automatic dehydrator.

(3) INTERPHONE CONTROLS.—The bombardier's interphone jack box, headset adapter, and extension cords are on the forward side of the copilot's instrument panel. The microphone switch is on the floor.

8. NAVIGATOR'S COMPARTMENT.

a. SPECIFIC INSTRUCTIONS.

(1) RADIO COMPASS AN/A R N-7.

(a) Be sure the AC inverter is on. Turn the radio compass on by setting the "OFF—COMP.—ANT.—LOOP" switch on the control box over the navigator's table to "COMP.," "ANT.," or "LOOP," depending on whether you want to have automatic direction finding, to listen to any station, or to take bearings or cut down on precipitation static respectively.

(b) If the green light is not on, push the "CONTROL" button to switch the control to this box.

(c) Switch the interphone jack box to "COMP." to listen to the radio compass.

(d) Rotate the band switch to the desired frequency band.

(e) Turn the "TUNING" crank to the desired frequency in kilocycles as shown on the dial, and rotate it back and forth through resonance for maximum deflection of the "TUNE FOR MAX." gage.

(f) Set the "CW—VOICE" switch for the type of signal being received.

(g) Adjust the volume with the "AUDIO" knob, and the dial light brilliance with the "LIGHTS" knob.

(h) To take bearings on any station or to cut down precipitation static by rotating the loop antenna, switch to "LOOP" and then switch the "LOOP—L——R" switch to "L" or "R" to turn the loop left or right. Press in on the switch to make the loop rotate faster.

(i) When taking bearings from the indicator on the sidewall above the navigator's table, the magnetic deviation and variation can be set on the dial by rotating the knob on the indicator.

(j) Turn the radio compass off by returning the "OFF—COMP.—ANT.—LOOP" switch to "OFF."

(2) MARKER BEACON RECEIVER RC-193A.

(a) Turn the marker beacon receiver on or off, when requested by the airplane commander, with the "OFF—COMP.—ANT.—LOOP" switch on the radio compass control box after pushing the "CONTROL" button to turn on the green light. (Inverter must be on.)

(3) RADIO SET AN/APN-9 (LONG RANGE NAVIGATION).

(a) Operating instructions for the LORAN radio are in a Technical Order carried in the navigator's cabinet. Check the part numbers on the receiver under the radio operator's table and the indicator on the navigator's cabinet with the part numbers in the instruction book to be sure the correct instructions are being followed.

(b) After the airplane is in the air and the LORAN radio is warmed up, have the radio operator switch the trailing antenna to the LORAN set, and let out 60 to 70 turns of it. Observing the indicator, have him adjust the length to give a maximum signal amplitude.

(c) To turn the LORAN set off, flip the "PWR-ON-OFF" switch on the receiver to "OFF."

(4) RADIO SET AN/APQ-13 (RADAR).

(a) Operating instructions for the radar indicator over the navigator's table are in a Technical Or-

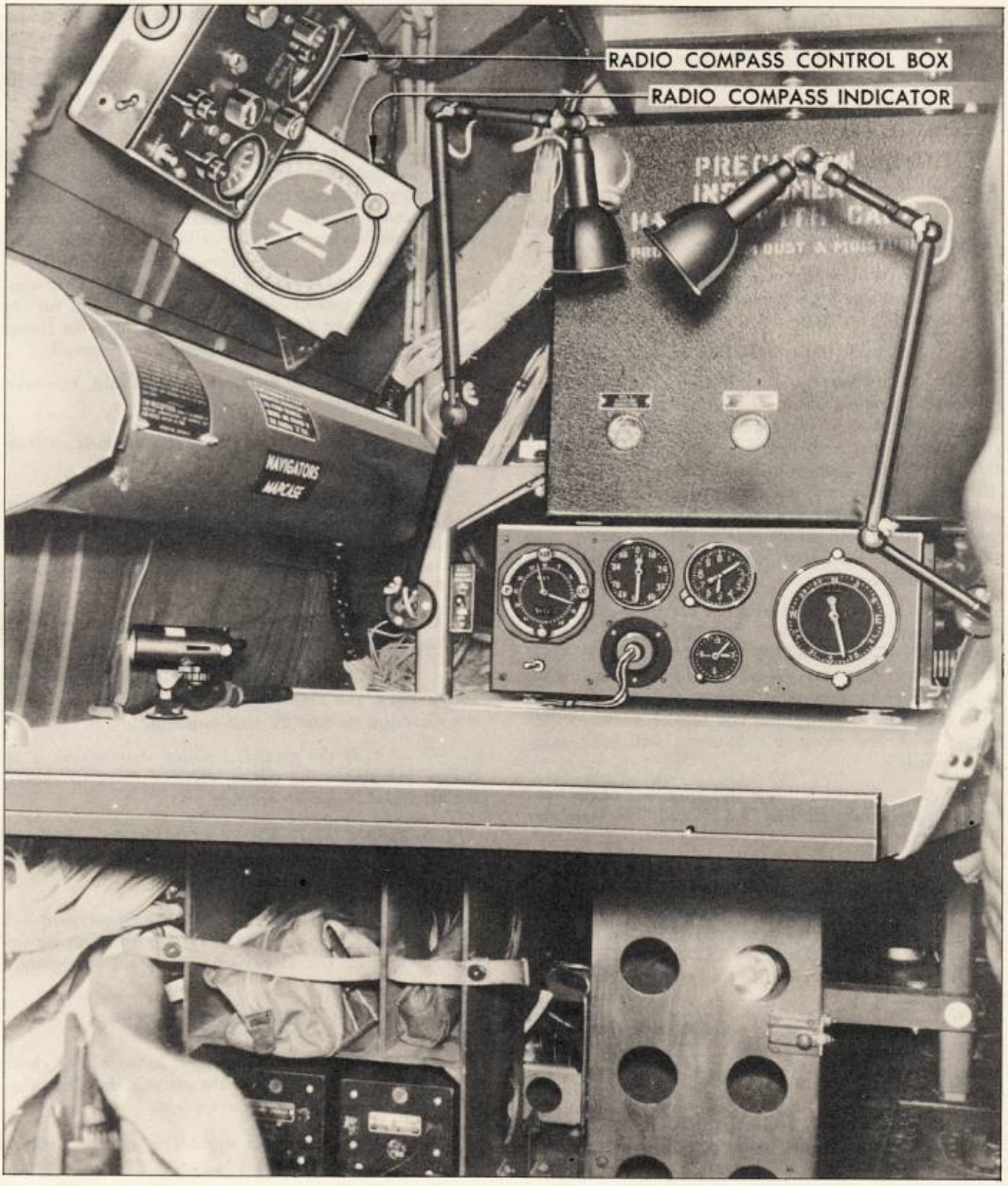


Figure 77—Navigator's Station

der at the radar operator's station. There may be a duplicate Technical Order in the navigator's cabinet.

(b) Do not turn this radio on until the engines (or the auxiliary power plant) are running and the generator switches are turned on. Check with the engineer.

(5) AIR POSITION INDICATOR.

(a) PREFLIGHT.

1. Have the gyro flux gate compass in normal operation.

2. Switch on the power, and see that the amplifier toggle switch is "ON."

3. Allow the gyro about five minutes to come up to speed.

4. Run through the cage-uncage cycle, having the transmitter gyro in the uncaged position.

5. Be sure that the gain control on the amplifier is set at the highest position which will not produce indicator oscillation.

6. Check the air position indicator system.

a. When the air position indicator is operated with the gyro flux gate compass system, compensations are made at the master indicator and on the computer so that both instruments synchronize. When the air position indicator is operating correctly, the direction pointer on the computer will continually oscillate 1 to 4 degrees, and it is necessary to use the mean reading about which this oscillation occurs. No difficulty will be found interpolating this value to within 1 degree.

b. Set variation on the computer, using the top knob marked "VAR." DO NOT SET VARIATION ON THE MASTER INDICATOR AT ANY TIME. Leave the variation on the master indicator set at ZERO. The direction pointer of the computer will then read true heading and the master indicator, together with the repeater indicators, will read magnetic heading.

c. Set the latitude and longitude of the field by using the knobs marked "LAT" and " " (lambda) respectively.

d. Check the flip levers on the bottom of the computer face for the proper latitude and longitude. Check the hemisphere tell-tale to the right of the latitude counter. This signal should appear WHITE for NORTH LATITUDES and RED for SOUTH LATITUDES. The identifying letters appear to the left of the counters.

e. Throw the air position indicator switch "ON" immediately before take-off. This switch is not a master switch and must be turned "OFF" at the completion of flight.

(b) IN FLIGHT.—After the plane has attained a speed of about 70 MPH, the direction pointer and counters should begin to function.

1. If the latitude and longitude were not set prior to take-off, fly over the field, or pick a point of departure, and set in the coordinates when flying over it.

2. It is also recommended that the correct variation be set 1 degree at a time during flight. If intermediate fixes are taken enroute to check the air position indicator or to obtain a wind by the air position indicator, it is not advisable to use average variation for the flight. Wind may be determined by double drift, using a drift sight, or by the air position indicator itself.

a. To determine wind by the air position indicator, note the vector difference between the indicated air position on the air position indicator and the true ground position, obtained by a suitable check point, after having flown for at least a half hour. The best available fix, either pilotage, celestial, radar, or radio can be used to obtain the wind vector. This wind vector can be considered as the average wind for the time and distance flown, and it may be used for future flying until a wind shift is suspected or observed.

b. Double drift readings should, however, be used as a check whenever possible.

3. Reset the counters of the air position indicator whenever necessary.

4. The maximum over-all error of the air position indicator is 5 per cent in the determination of ground position, after applying the wind vector. If this error should become in excess of 5 per cent, make the following checks:

a. Check the coordinate readings and wind determination.

b. If the air position indicator and the wind vector show the right distance, but off-course, check the direction pointer on that heading.

c. If the ground position determined is on course, but shows the wrong distance (over or short), the air speed input is probably off.

(6) HEAT AND VENT CONTROLS.—Flow of heated cabin air can be regulated by adjusting air duct outlet valve at the station.

(8) DRIFTMETER.—On late airplanes, the B-5 drift recorder is replaced by a Type B-3 driftmeter installed through the floor just aft of the navigator's chair.

(a) PREFLIGHT INSTRUCTIONS.

1. Before take-off, using a loose fold of cloth or a clean paint brush, clean the outside sighting window and the top lens of the eye piece.

2. The driftmeter should be in the "ZERO" position on the drift scale.

3. The gyro switch should be "OFF," and the gyro caged.

(b) IN FLIGHT INSTRUCTIONS.

1. Switch on the gyro, and allow it to run

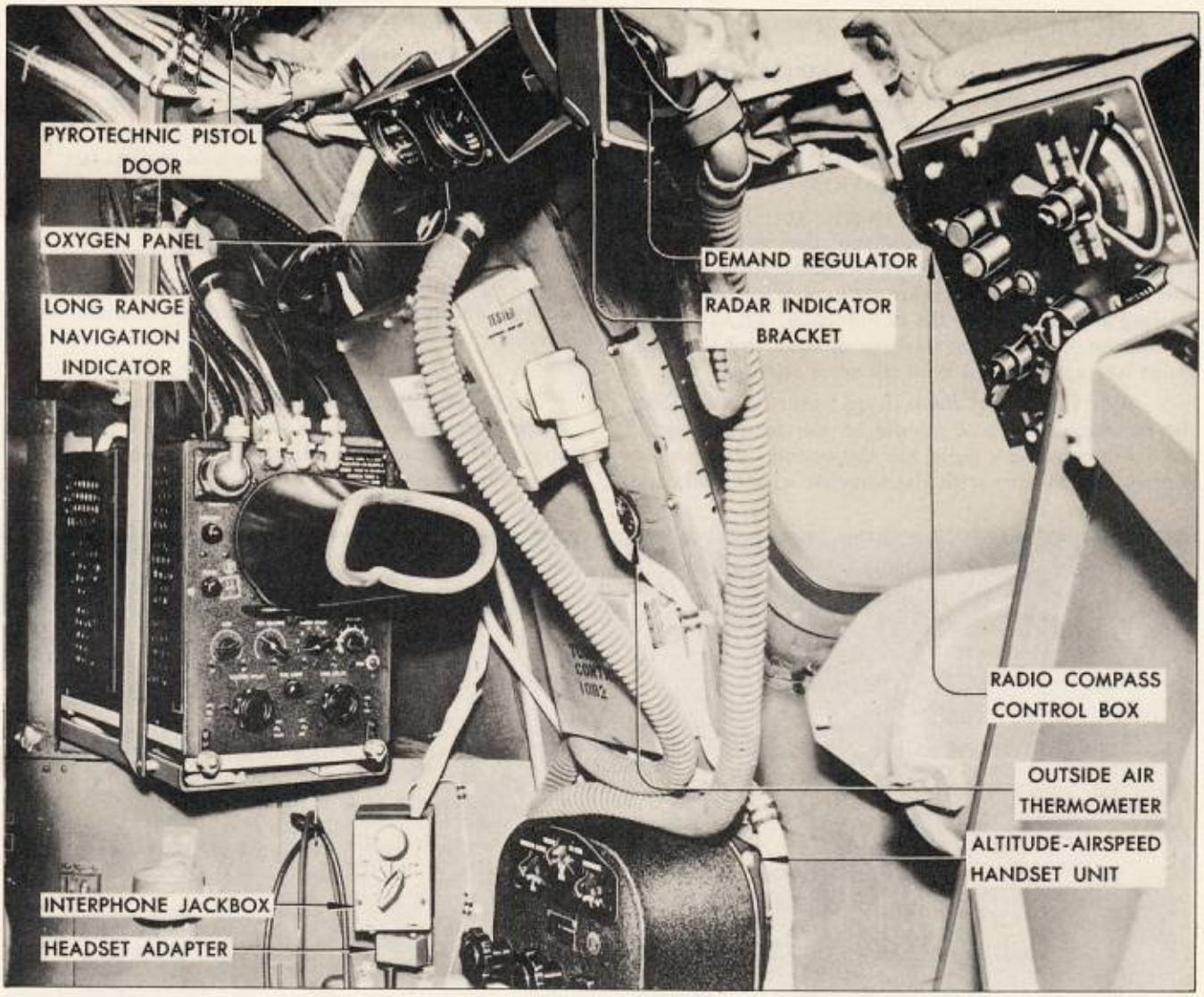


Figure 78—Navigator's Station (Looking Aft)

from three to five minutes before uncaging.

2. To uncage the gyro, pull the caging knob out and move it as far as it will go toward "UNCAGED." Do not uncage the gyro when the motor is stationary or running slowly. Do not attempt to cage the gyro during a turn.

3. Sight through the eyepiece and turn the rheostat knob for proper illumination of the reticle lines.

4. After the readings have been taken, cage the gyro by pulling out the knob and moving it as far as possible toward "CAGED." Then turn off the gyro switch.

(9) SURFACE DE-ICING SYSTEM.—In the event of a de-icer boot rupture, the entire de-icing system may be shut off by closing the emergency vacuum shut-off valve mounted on the navigator's filing cabinet. This does not affect proper functioning of the vacuum instruments.

b. LOCATION.

(1) OXYGEN CONTROLS.—The demand regulator, oxygen flow indicator, and oxygen pressure gage are on the sidewall to the navigator's left, just above the map case.

(2) MAP CASE.—The map case is located on the sidewall directly to the left of the navigator.

(3) INTERPHONE CONTROLS.—The navigator's interphone jack box, headset adapter, and extension cords are on the sidewall above his table. The microphone switch is on the floor.

(4) DRIFT SIGNALS.—Stowage for 20 drift signals is provided in a cabinet under the navigator's table. The drift signal chute is located in the floor behind the navigator's seat.

9. RADIO OPERATOR'S COMPARTMENT.

a. SPECIFIC INSTRUCTIONS.

(1) RADIO SET AN ARC-8 (LIAISON).

(a) Turn the liaison receiver on by setting the "AVC-OFF-MVC" switch to "MVC."

(b) While the receiver is warming up, switch the interphone jack box to "LIAISON."

(c) Set the antenna switch for "FIXED" or "TRAILING" as desired. When the switch is on "FIXED," the liaison radio is using the fixed antenna and the long range navigation radio is connected to the trailing antenna. When the switch is on "TRAILING," the liaison set is on the trailing antenna and the long range navigation radio is on the fixed antenna.

(d) To run out the trailing antenna, push down the retractable fairlead handle on the forward leg of the radio operator's table, set the counter dial on the control box to zero with the knurled wheel, and hold the switch to "OUT" until the counter shows the desired number of feet of wire are out.

(e) To receive voice or modulated code signals, have the "C.W. OSC." switch "OFF." To receive unmodulated code signals, turn the "C.W. OSC." switch "ON" and after tuning in the signal, adjust the "BEAT FREQ." knob for the desired pitch in the headset.

(f) Set the "BAND SWITCH" for the desired frequency band and tune in the correct frequency with the "TUNING" knob.

(g) Adjust the "INCREASE VOL." knob for the desired volume. If automatic volume control is desired, switch to "AVC" and readjust the volume control.

(h) When extreme selectivity is desired to minimize interference, switch the "CRYSTAL" band pass filter "IN." Readjust tuning, beat frequency, and volume as necessary.

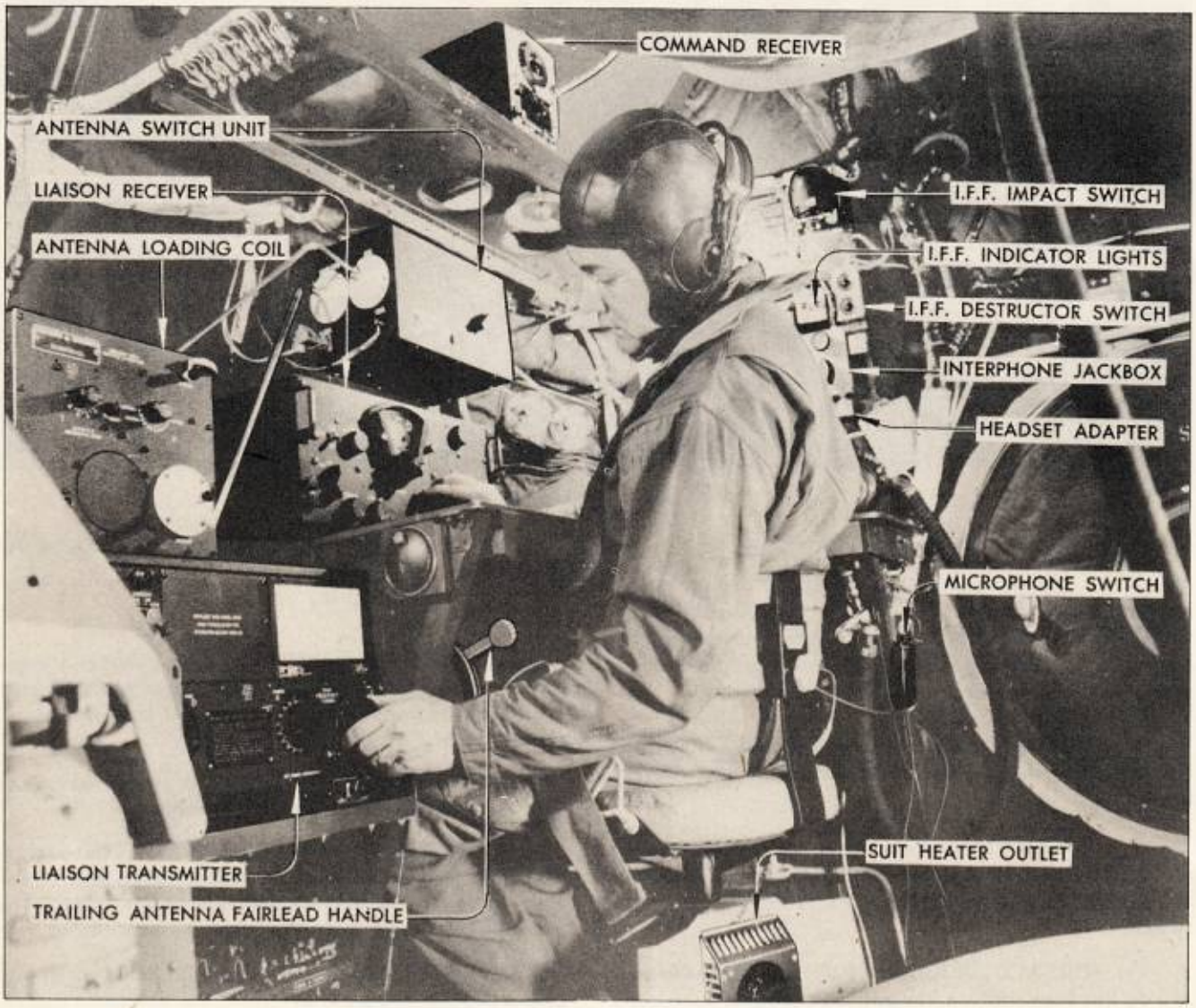


Figure 79—Radio Operator's Station

(i) To check the antenna alignment, tune in a signal at approximately 500 kilocycles on "MVC," and adjust the "ANTENNA ALIGN." knob for maximum output.

(j) Turn on the liaison transmitter by setting the "EMISSION" section switch to "VOICE."

(k) Set the "LOCAL-REMOTE" switch to "LOCAL." (Set to "REMOTE" for control by the co-pilot.)

(l) Set the "CHANNEL" switch to the desired frequency as shown by the card on the front of the transmitter.

(m) When the red light comes on, place the "EMISSION" switch on "VOICE," "CW," or "MCW" as desired.

(n) On "VOICE," talk over the set by pressing the microphone switch on the microphone cord. On "CW" or "MCW," send code with the key on the table. Do not transmit while changing the EMISSION switch.

(o) To change the frequency of any of the pre-tuned channels, follow the instructions in the small manual stowed under the transmitter or the Technical Order for the transmitter in the navigator's cabinet.

(p) Setting the monitor switch on the junction box over the transmitter to "MONITOR" makes it possible to tune the transmitter to the exact frequency as a signal being heard in the receiver by tuning to zero beat. Also in "MONITOR," other crew members can hear the liaison transmitter by switching their interphone jack boxes to "CALL." Usually the monitoring switch should be left at "NORMAL."

(q) Turn the transmitter off by setting the "EMISSION" switch to "OFF."

(r) Turn the receiver off by setting the "AVC-OFF-MVC" switch to "OFF."

(2) INTERPHONE AN AIC-2.

(a) Turn "ON" the interphone amplifier "ON-OFF" switch when entering the airplane (amplifier on navigator's cabinet).

(b) Set the gain control for the proper altitude when in flight as shown on the amplifier.

b. LOCATION.

(1) OXYGEN CONTROLS.—The radio operator's demand regulator, oxygen flow indicator, and oxygen pressure gage are on the rear pressurized bulkhead to his right.

(2) HEAT AND VENT CONTROLS.—The flow of heated air can be regulated by the cabin air duct valve at the radio operator's station.

(3) INTERPHONE CONTROLS. — The radio operator's interphone jack box, headset adapter, and extension cords are on the bulkhead above his table. The microphone switch is on the microphone extension cord.

10. GUNNER'S COMPARTMENT.

a. SPECIFIC INSTRUCTIONS.

(1) GUN CONTROLS.—Control of a turret is accomplished by turning "ON" the turret power switches and depressing the action switch. The turret is then under the control of the operator and may be positioned as desired.

(2) CABIN PRESSURIZING AND DEFROSTING CONTROLS.

(a) The side gunners will check the cabin pressure regulators when ordered by the engineer.

(b) Defroster blowers for the sighting blisters are operated by a switch on the station 646 fuse panel which is forward of the right gunners station. This switch is normally "OFF." Turn "ON" only when regular cabin air is insufficient for proper defrosting.

(3) HEAT AND VENTILATION CONTROLS.—Heated cabin air flow is regulated at each gunners station by adjusting the valve in the cabin air duct outlets as desired.

b. LOCATION.

(1) OXYGEN CONTROLS.—The left gunner's oxygen control panel is to his left just aft of the gun sight. The right gunner's oxygen panel is to his right, aft of the gun sight. The top gunner's oxygen panel is mounted on the back of his swivel seat. Each panel has a demand regulator, an oxygen flow indicator, and an oxygen pressure gage.

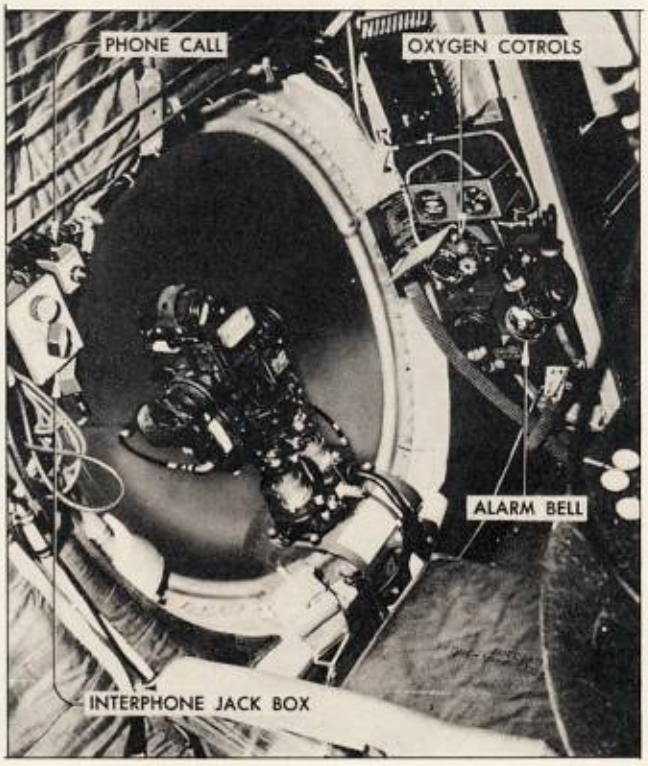


Figure 80—Right Side Gunner's Station

(2) INTERPHONE CONTROLS. — The interphone jack box, headset adapter, and extension cords for the top gunner and the two side gunners are beside their gun sights. The microphone switch is on the sight (in early airplanes it may be on the floor) and a phone call light turned on by the airplane commander or co-pilot is beside the jack box.

11. RADAR OPERATOR'S COMPARTMENT.

a. SPECIFIC INSTRUCTIONS.

(1) RADIO SET AN/APQ-13 (RADAR).

(a) Operating instructions for the radar set are carried at the radar operator's station.

(b) Do not turn the radar set on until the engines are running and the generator switches are turned on, or the auxiliary power plant is running and its generator switch is on. Check with the engineer.

(2) RAVEN EQUIPMENT.

(a) Turn the AN/APQ-2 transmitter on and off with its "ON-OFF" switch. The pilot light must be on and the fan motor running when the transmitter is operating.

(b) Turn the AN/APT-2 transmitter on and off with the "ON-OFF" switch near the bottom of the transmitter. Adjust the brilliance of the pilot light by turning the lamp jewel. To stop the transmitting without shutting off the set, flip the "MOD-ON-OFF" switch to "OFF."

(c) Turn the AN/APT-1 transmitter on by setting the "FIL-ON-OFF" switch to "ON," and after the set has warmed up *two minutes,* set the "PLATE-ON-OFF" switch to "ON." To stop transmitting without shutting off the set, turn the "PLATE" switch "OFF."

(d) Turn the AN/APT-1 transmitter off by first turning the "PLATE" switch "OFF" and then the "FIL." switch "OFF."

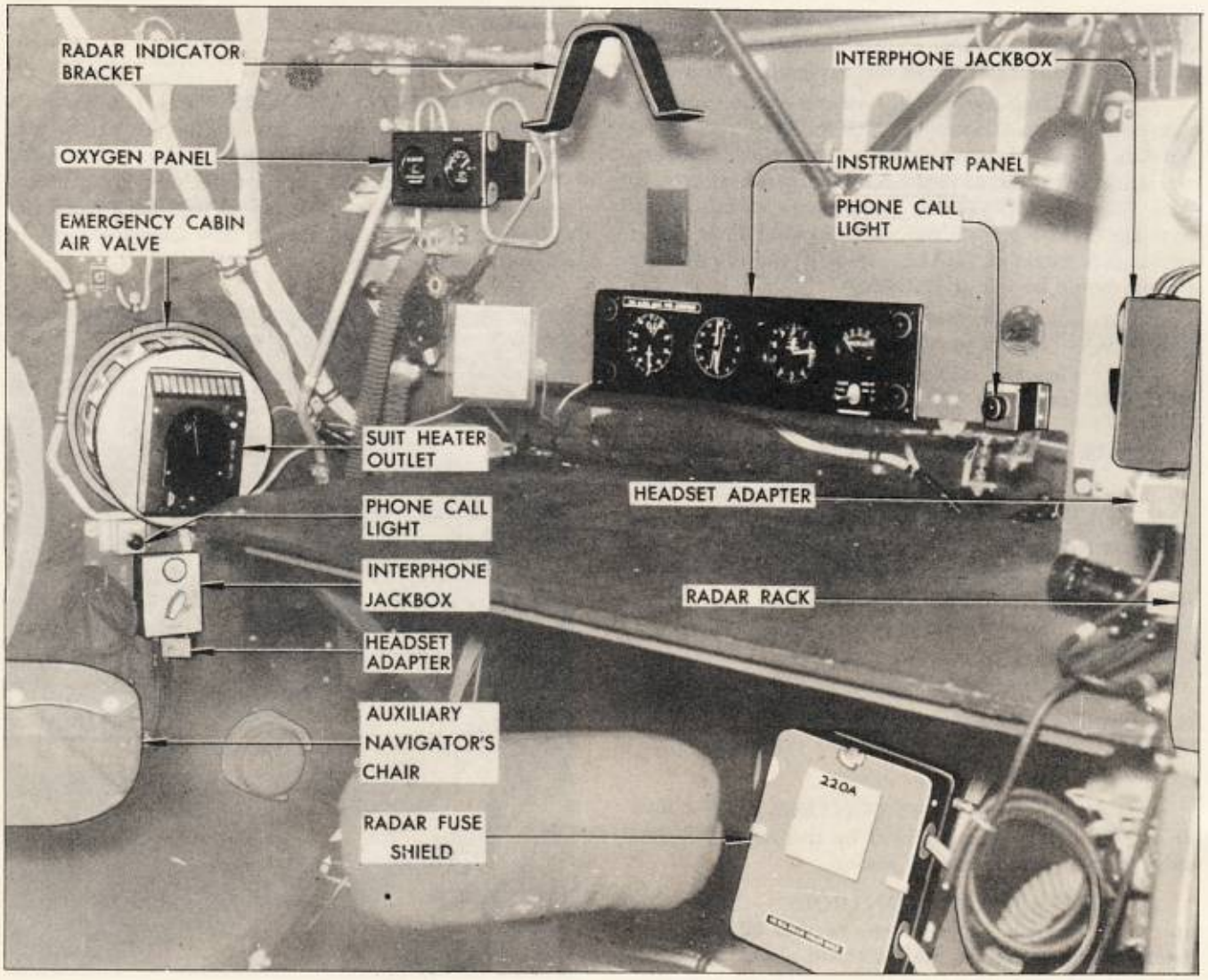


Figure 81—Radar Operator's Station

(3) RADIO SET SCR-695A (I.F.F.).

(a) The airplane commander normally controls the I.F.F. set with the switches on top of his instrument panel, but the radar operator must set the selector switch on the control box over his table to the correct position for the code of the hour as specified by the communication officer.

(b) In the absence of specific information, set the selector switch to position 1.

(c) The "ON-OFF" and the "EMERGENCY" switches must be "OFF" unless otherwise instructed by the airplane commander.

b. LOCATION.

(1) OXYGEN CONTROLS. — The radar operator's oxygen panel is on the airplane sidewall above and to the left of the table, and has a demand regulator, oxygen flow indicator, and oxygen pressure gage.

(2) HEAT AND VENT CONTROLS.—The flow of heated air can be regulated by the cabin air duct valve at the radar operator's station.

(3) INTERPHONE CONTROLS.—The radar operator and the auxiliary navigator each have an interphone jack box, a headset adapter, and extension cords beside their table, and a microphone switch on the floor under the table. The raven operator may have a jack box, adapter, and extension cords on the left sidewall by the raven transmitters, or may have just a microphone switch and extension cords on the transmitter rack. There is a phone call light over the table which is turned on by the airplane commander or the copilot.

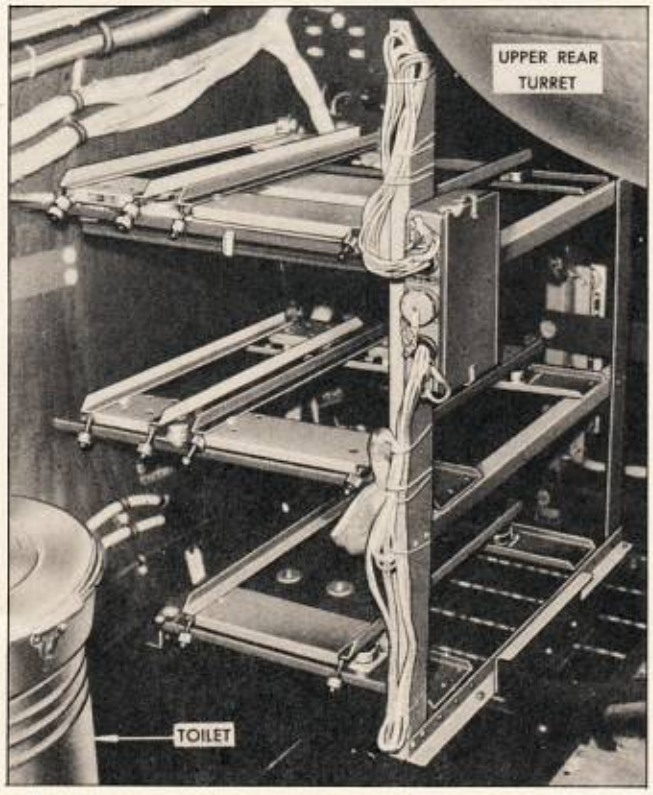


Figure 82—Raven Transmitter Racks

12. TAIL GUNNER'S COMPARTMENT.

a. SPECIFIC INSTRUCTIONS.

(1) GUN CONTROLS.—Control of a turret is accomplished by turning "ON" the turret power switches and depressing the action switch. The turret is then under the control of the operator and may be positioned as desired.

(2) HEAT, VENTILATION, AND DEFROSTING CONTROLS.—Heated cabin air supply is regulated by positioning the valve in the fixed cabin air duct outlet at the tail gunner's station. A flexible duct, extending along the wall to his left, has a nozzle on the end through which air is vented for defrosting the windows. The nozzle may be positioned to blow air in whichever direction the tail gunner desires.

b. LOCATION.

(1) OXYGEN CONTROLS.—The tail gunner's demand regulator, oxygen flow indicator, and oxygen pressure gage are on the sidewall to the left.

(2) INTERPHONE CONTROLS. — The interphone jack box, headset adapter, and extension cords at the tail gunner's station are on the right sidewall beside the sight. The microphone switch is on the sight (in early airplanes it may be on the floor). There is a phone call light by the jack box which is turned on by the airplane commander or the copilot.

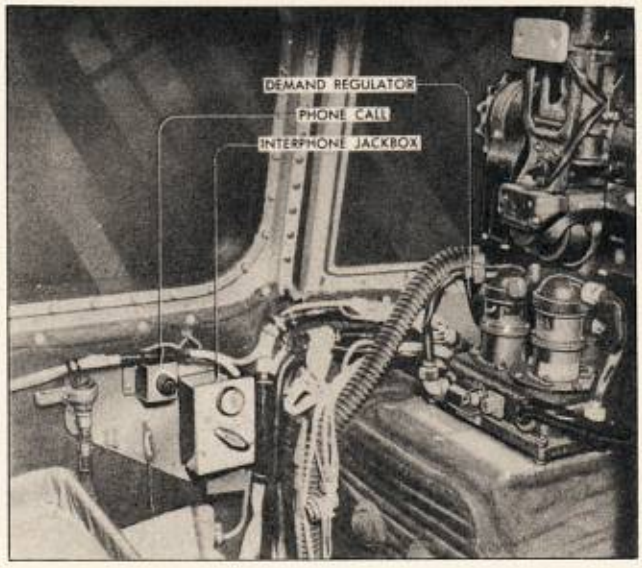
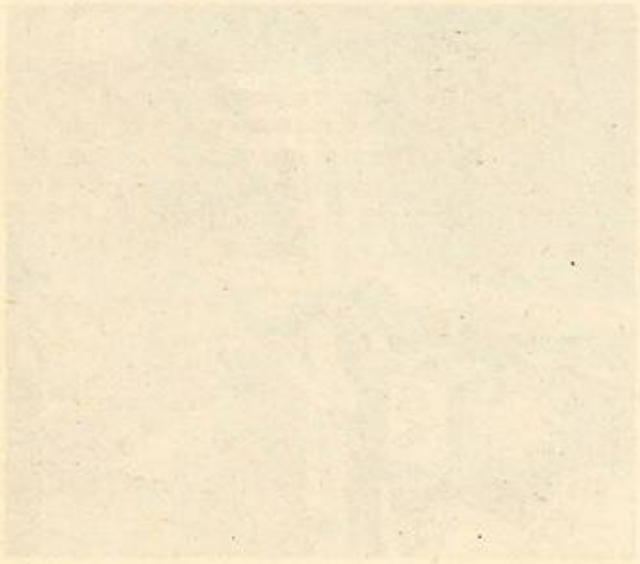


Figure 83—Tail Gunner's Station



1. ARCTIC OPERATION.

a. OIL DILUTION.

(1) GENERAL.—The most important single operation in cold weather is the proper dilution of the engine oil. Upon it rests the success of the next day's operation. These are the recommended oil dilution periods for the following outside air temperatures with grade 1100 or 1120 oil:

OUTSIDE AIR TEMPERATURE	DILUTION TIME
4°C to –12°C	4 minutes
–12°C to –29°C	7 minutes
–29°C and below	8 to 12 minutes (max.)

In extreme cases where experience indicates necessity for more than eight minutes dilution, the dilution period should be increased to the maximum of 12 minutes. In any case, the dilution period should be divided as required to prevent oil temperatures above 50°C. Thirty per cent dilution, which is the maximum for reasonable assurance against rapid loss of oil through the engine breather, will be reached at approximately 12 minutes (with a full hopper).

(2) OIL DILUTION BEFORE LEAVING THE AIRPLANE.—When a cold weather start is anticipated, proceed as follows:

(a) If engine oil temperatures are above 50°C, stop the engines and allow them to cool before diluting the oil. Allow the oil temperature to drop below 40°C before restarting. Fuel will evaporate upon entering the engine when the temperature of the oil is above 50°C.

(b) Idle engines between 1000 and 1200 RPM and move the propeller speed control through range of operation several times. Acceleration near the end of the dilution period will avoid spark plug fouling and will clear the oil sump.

(c) If the oil temperature rises above 50°C, while diluting, it will be necessary to divide the oil dilution into more than one period. Under all conditions, release the oil dilution switch only *after* placing mixture control in "FUEL CUT-OFF" and after the engine has stopped. Otherwise, undiluted oil will be pumped into the crank case, and the purpose of dilution is not achieved.

(d) Do not permit the engine oil pressure to fall below 15 PSI. If necessary, stop the engine and wait 15 minutes before continuing with the dilution. If the oil tanks require servicing, split the dilution period in half and stop the engines after the first half of the dilution. Service the tanks and then start the engines to accomplish remaining dilution. If it is possible to service the oil tanks before the engines have cooled the entire dilution may be accomplished immediately, instead of dividing the period after servicing.

(e) A drop in fuel pressure indicates proper functioning of the oil dilution system. If a fuel pressure drop is not obtained, investigate the possibility of a faulty dilution solenoid, a plugged line, a reversed restriction fitting, or an opening in the dilution circuit.

(f) After short ground runs, redilution is necessary. The amount of ground operation will determine the length of redilution.

(3) OIL DILUTION AT ENGINE START.—Start the engines in a normal manner. If the oil pressure is too high or fluctuates and falls when the RPM is increased, push the dilution control intermittently to decrease the viscosity of the oil, otherwise the engine may be supplied with raw fuel instead of oil.

This procedure must be used with *caution* and is recommended only when time and extreme temperature conditions do not permit engine warm-up in the normal procedure.

(4) NOTES ON OIL DILUTION.

(a) It is safe to make an immediate take-off after oil dilution, provided that there has been a rise in oil temperature, the oil pressure is steady, and the engine is running smoothly. Cold oil, properly diluted, has the same viscosity as hot, undiluted oil, and thereby can circulate to lubricate an airplane engine properly.

(b) When the oil dilution valve is used frequently, its operation should be checked every 25 hours. Remove the oil dilution line at the Y-oil drain fittings, adjust fuel boost pressure, and operate the dilution switch with full fuel pressure to make sure it properly opens and closes the valve.

(c) Engines that show a sudden loss of oil pressure or throw oil out of the breather case during flight should be checked to see that the oil dilution valve is closed and fully seated. Each time the valve is used it is very important to check, by watching for a fuel pressure drop, to see that the oil dilution valve does not stick open. Possible engine failure on the next flight can result from a stuck oil dilution solenoid. Normal operation can be expected after the fuel evaporates from the oil.

(d) During the last minute of dilution run propeller governors through one or two cycles of operation. When in full decrease position, exercise throttles slightly at 1200 RPM engine speed in order to induce diluted oil into the propeller dome.

(e) Run engines at 1200 RPM and reduce to 1000 RPM with the feathering button. Two cycles for each engine are normally sufficient. This will be the final operation before cutting the engines. Some airplanes are equipped with a hydraulic fluid feathering system and this paragraph does not apply to them.

(f) In freezing weather it is possible during oil dilution for oil in the tank surrounding the hopper not to be diluted, even though proper dilution has been given oil in the sump, hopper, lines, and in the engine. To fail to dilute any of the oil is dangerous. After the take-off when the diluted oil has been used, the congealed oil in the tank will not flow into the tank sump. Engine failure can result. Avoid any such possibilities by use of oil immersion heaters, oil tank and nacelle preheating, and by draining the entire oil supply before it congeals. Replenish the tank with warm oil before engine starting.

b. ENGINE STARTING.

(1) BEFORE STARTING PREPARATION.—If the prevailing outside temperature is below −18°C preheat the engine accessory compartment. Use the sleeve for the engine cover and the starter meshing handle access door for warm air inlets. It is desirable to reach a head temperature of 0°C before starting the engine. If the engine oil has been drained after the preceding flight, the oil should be heated to a temperature of 70°C before being returned to the system to prevent congealing in the cold lines. If the oil is heated outside, check the Y-oil drain after filling to see if the oil is fluid in the lines. If not, heat the lines too. Heating of the auxiliary power plant (put-put), the instrument panel, and autosyn transmitters (on early airplanes) is also necessary in very cold weather.

(2) STARTING.

(a) Remove the engine covers and follow the normal starting procedure. After one turn of the propeller, hold the primer on two to four seconds, then release it. If the engine begins to fire, prime intermittently at one second intervals until 800 RPM is obtained. Move the mixture control to "AUTO RICH," and continue to prime if necessary.

(b) If the engine fails to fire during the initial four seconds of steady priming do not continue attempting to start by direct cranking. Have the ground crew watch for fuel running out of the blower case drain. This should occur if the engine stops after the mixture control is moved to "AUTO RICH" or if the engine has been over-primed during the starting attempt. If fuel does not run out of the blower drain, shut off the ignition, open the throttle wide and have the engine pulled through by hand to remove excess fuel. Check the blower drain valve for freedom from restriction and then begin starting procedure again.

c. PRECAUTIONS BEFORE TAKE-OFF.

(1) Avoid overspeeding propellers at take-off by having warm oil in the propeller dome and throughout the system. Use the RPM control to get full change from high RPM to low RPM and back two or more times, as required to get normal response.

(2) All frost, snow, and ice must be removed from the airplane before the take-off. When frost is forming rapidly, keep the wing covers on while taxiing out to take-off position.

(3) Check all controls for freedom of movement. It is possible for ice or freezing rain to restrict movement of the controls.

(4) Before taxiing, apply brakes lightly several times to exercise the expander tubes in order to prevent rupture by sudden heavy brake application.

(5) Have all antennae clear of ice, frost, and snow.

d. FLIGHT INSTRUCTIONS AND PROCEDURES.

(1) Climb from the take-off with the cowl flaps closed, or as needed to keep cylinder head temperature below 248°C.

(2) Carburetor icing may occur with carburetor air temperature between −10°C and 15°C, and more easily around the higher temperature noted. Indications of carburetor icing are engine roughness and loss of power (without drop in MAP if turbo boost is on). Keep carburetor air between 20°C and 38°C if possible, or open intercooler to get −10°C. Performance is improved by operating near the maximum carburetor air temperature of 38°C since minimum intercooler exit opening will be required.

Depending on power settings involved, it usually is more desirable, to increase turbo boost and throttle back to maintain required MAP than to open intercooler for −10°C. This will increase carburetor heat and can provide protection at better economy than dropping carburetor air below the icing range. If icing is imminent at the time of approach for landing or during landing, close the intercooler flaps until on the ground. If the landing is not made, set intercooler flaps one-half open before "going around."

e. SPECIAL GROUND PROCEDURES.—There is a time when every air crew must care for its airplane on the ground to assure readiness for flight the next day. Special maintenance procedures exist in Arctic conditions and these are some that the air crew should be sure are done.

(1) Drain the fuel tank sumps, fuel strainers, and fuel transfer selector valves to prevent accumulated water from freezing.

(2) Be sure that fuel tank vent lines and oil tank to engine crankcase lines are clear.

(3) Drain the oil tank sump, oil cooler, and the oil Y-valve to remove water. Oil Y-drains and fuel cell drains must be opened and any accumulated water drained off after every flight. A preflight check should be made to see if water has frozen in the drains. If so, hot air must be applied and the water drained.

(4) Check for water at engine oil sump magnetic plug.

(5) Check engine oil outlet connections for tightness and possible slippage.

(6) Drain hydraulic system filter.

(7) Check air pressure and drain condensation from hydraulic accumulators.

(8) Change the turbo-lubricating oil from engine oil to hydraulic oil.

(9) Check the battery.

(10) Check the ice eliminating equipment.

(11) Check the AN installation servicing drains on manifold pressure lines in the forward bomb bay.

(12) Protect the tires from freezing to the runway and be sure they are not frozen before taxiing.

(13) Airplanes with synthetic rubber and nylon tires can develop a flat spot when parked in cold weather. Move the airplane once a day to prevent the condition from getting worse.

(14) Check the landing gear, struts, limit-switch boxes. In the past ice has formed on the micro switches from moisture in the boxes. This has prevented the gear from retracting. While attending the landing gear, be sure that the oleo pistons are free of all snow, ice, or dirt. Clean the exposed piston surface with a cloth soaked in hydraulic fluid. On airplanes with an oleo scraper ring, see that it is not clogged with ice and dirt. If grit or hard dirt is encountered, the use of kerosene will expedite its removal after which the piston should be lubricated with hydraulic fluid.

2. DESERT OPERATION.

a. GENERAL.—Wind-blown sand is the main enemy to operation in the desert. Many of the malfunctions that occur will be found to originate on the ground. In the air, avoid sand storms and rain storms.

b. GROUND OPERATION. — The airplane must be given special treatment all the time it is based in the desert, if successful operation is to be had. Below are listed some of the required special treatments that will pay big dividends:

(1) Keep all the filters INSTALLED and CLEAN.

(2) Hold ground operation of the airplane at a minimum.

(3) Cover all air intakes and ducts as soon as possible after landing to prevent the entrance of blowing sand.

(4) Keep all equipment free of sand, dirt, or moisture.

(5) Keep the airplanes dispersed as much as possible to protect one from the other. The engines of one airplane can add hours to the maintenance problems of others, when proper taxiing or ground running is not accomplished.

(6) Head airplanes into wind for ground running of engine.

3. TROPICAL OPERATION.

a. GENERAL.—Operation in the tropics has many disadvantages to share in common with conditions on the desert. All of the conditions will be extreme and demand ingenious solutions. In addition to periods when sand and dust are serious problems, heat, humidity, and rain will also be encountered in tropical areas.

(1) HEAT.—As on the desert, there will be occasions in the tropics when the temperature inside the airplane will be 140°F to 150°F. Partial relief can be obtained by keeping open the windows and doors (including bomb bays). Get the airplane into the air as soon as possible; it's comfortable for the crew and

good for the airplane. If ground operation of the engine is too long, the cylinder head temperatures will exceed 220°C, the maximum allowable for start of take-off run. A rise of 40°C in the cylinder head temperature is to be expected during the take-off. Have the temperature low enough to allow for this increase.

A take-off during hot periods of the day requires longer runs. Efficiency up to 10 per cent is lost to heat at this time. Air fields that are situated well above sea level will require longer take-off runs as a result of thinner air.

(2) HUMIDITY AND RAIN. — In locations where high humidity is encountered, idle airplanes and stored equipment will be subject to malfunctions caused by corrosion, fungus, and moisture absorption of non-metallic materials. Electrical equipment is particularly vulnerable to damage of this nature. When possible, all items of electrical equipment should be operated long enough for the internal heat, resulting from operation, to dry them out. Rain and the extreme humidity that accompanies tropical conditions create special problems:

(a) Check all equipment and wiring regularly for corrosion.

(b) Keep all vents and moisture drains open and dry.

(c) Keep the vacuum filter screen free of dust, corrosion, and mold.

(d) Check inflation of oleo struts and tires frequently. Changes in air pressure caused by wide changes in temperature result in improper inflation. Over-inflation is most often encountered.

(e) Use all covers available for equipment inside and outside of the airplane.

(f) Heat and moisture swell valves and packings and encourage leaks in the hydraulic system.

(g) The engine oil system collects carbon and sludge much faster in the tropics.

(3) FLIGHT RECOMMENDATIONS.

(a) Watch for wind gusts on the take-off.

(b) Retract flaps with caution.

(c) In emergency, prepare to jettison the load at take-off.

(d) Do not take-off into a squall.

(e) Avoid thunder heads.

(f) Realize that a longer run is necessary in a hot climate.

(g) Extreme weather operation calls for additional effort on the part of the air crew. The demands upon the airplane and the individuals who operate and maintain it are exaggerated by the conditions that prevail in extreme climates.

APPENDIX I

SUPPLEMENTARY FLIGHT OPERATION

AAFMC-527 4-1-44

AIRCRAFT MODEL(S) B-29, B-29A

TAKE-OFF, CLIMB & LANDING CHART

ENGINE MODEL(S) R-3350-13, 21, 23, 23A

TAKE-OFF DISTANCE FEET

GROSS WEIGHT LB.	HEAD WIND M.P.H.	HEAD WIND KTS.	HARD SURFACE RUNWAY AT SEA LEVEL GROUND RUN	HARD SURFACE RUNWAY AT SEA LEVEL TO CLEAR 50' OBJ.	HARD SURFACE RUNWAY AT 3000 FEET GROUND RUN	HARD SURFACE RUNWAY AT 3000 FEET TO CLEAR 50' OBJ.	HARD SURFACE RUNWAY AT 6000 FEET GROUND RUN	HARD SURFACE RUNWAY AT 6000 FEET TO CLEAR 50' OBJ.	SOD-TURF RUNWAY AT SEA LEVEL GROUND RUN	SOD-TURF RUNWAY AT SEA LEVEL TO CLEAR 50' OBJ.	SOD-TURF RUNWAY AT 3000 FEET GROUND RUN	SOD-TURF RUNWAY AT 3000 FEET TO CLEAR 50' OBJ.	SOD-TURF RUNWAY AT 6000 FEET GROUND RUN	SOD-TURF RUNWAY AT 6000 FEET TO CLEAR 50' OBJ.	SOFT SURFACE RUNWAY AT SEA LEVEL GROUND RUN	SOFT SURFACE RUNWAY AT SEA LEVEL TO CLEAR 50' OBJ.	SOFT SURFACE RUNWAY AT 3000 FEET GROUND RUN	SOFT SURFACE RUNWAY AT 3000 FEET TO CLEAR 50' OBJ.	SOFT SURFACE RUNWAY AT 6000 FEET GROUND RUN	SOFT SURFACE RUNWAY AT 6000 FEET TO CLEAR 50' OBJ.
HEAVY WEIGHT 130,000 LB.	0		4250	6250	4775	7100	5400	8000	5200	7200	5775	8100	6750	9350	7750	9750	9400	11000	11400*	14000
	20		3125	4925	3525	5600	4050	6250	3800	5600	4325	6400	5200	7400	5800	7600	6300	8500	9000	11200
	40		2275	3750	2575	4325	2900	4750	2825	4300	3050	4900	3850	5700	4275	5750	4550	6400	6750	9600
AVERAGE WEIGHT 110,000 LB.	0		2725	4000	3075	4525	3500	5100	3200	4475	3600	5050	4300	5900	4375	5650	4900	6500	5200	7800
	20		2100	3125	2350	3575	2750	4050	2475	3500	2775	4000	3300	4600	3400	4425	3750	5050	4850	6150
	40		1525	2350	1775	2750	1950	3000	1775	2600	2050	3000	2450	3500	2525	3350	2800	3850	3550	4600
LIGHT WEIGHT 90,000 LB.	0		1750	2575	1975	2900	2225	3300	1975	2900	2275	3200	2525	3600	2500	3325	2725	3800	3325	4400
	20		1400	2000	1550	2300	1675	2500	1560	2150	1700	2450	1975	2800	1950	2550	2125	2950	2575	3400
	40		1075	1550	1200	1750	1325	1950	1175	1650	1350	1900	1475	4100	1425	1900	1575	2200	1925	2550

NOTE: INCREASE CHART DISTANCES AS FOLLOWS: 75°F + 10%; 100°F + 20%; 125°F + 30%; 150°F+ 40%

OPTIMUM TAKE-OFF WITH 2600 RPM, 47.5 IN. HG. & 25 DEG. FLAP IS 80% OF CHART VALUES

DATA AS OF 2-20-45 BASED ON: ESTIMATES

CLIMB DATA

GROSS WEIGHT LB.	AT SEA LEVEL BEST I.A.S. MPH	AT SEA LEVEL BEST I.A.S. KTS	AT SEA LEVEL RATE OF CLIMB F.P.M.	AT SEA LEVEL GAL. OF FUEL USED	AT 5000 FEET BEST I.A.S. MPH	AT 5000 FEET BEST I.A.S. KTS	AT 5000 FEET RATE OF CLIMB F.P.M.	AT 5000 FEET FROM SEA LEVEL TIME MIN.	AT 5000 FEET FROM SEA LEVEL FUEL USED	AT 10,000 FEET BEST I.A.S. MPH	AT 10,000 FEET BEST I.A.S. KTS	AT 10,000 FEET RATE OF CLIMB F.P.M.	AT 10,000 FEET FROM SEA LEVEL TIME MIN.	AT 10,000 FEET FROM SEA LEVEL FUEL USED	AT 15,000 FEET BEST I.A.S. MPH	AT 15,000 FEET BEST I.A.S. KTS	AT 15,000 FEET RATE OF CLIMB F.P.M.	AT 15,000 FEET FROM SEA LEVEL TIME MIN.	AT 15,000 FEET FROM SEA LEVEL FUEL USED	AT 25,000 FEET BEST I.A.S. MPH	AT 25,000 FEET BEST I.A.S. KTS	AT 25,000 FEET RATE OF CLIMB F.P.M.	AT 25,000 FEET FROM SEA LEVEL TIME MIN.	AT 25,000 FEET FROM SEA LEVEL FUEL USED	AT 30,000 FEET BEST I.A.S. MPH	AT 30,000 FEET BEST I.A.S. KTS	AT 30,000 FEET RATE OF CLIMB F.P.M.	AT 30,000 FEET FROM SEA LEVEL TIME MIN.	AT 30,000 FEET FROM SEA LEVEL FUEL USED
HEAVY WEIGHT 130,000 LBS.	195		625	160	195		575	9	295	195		490	18	450	195		385	29	640	195		110	73	1385	--		--	--	--
AVERAGE WEIGHT 110,000 LBS.	195		940	160	195		895	6	250	195		825	11	350	195		730	18	455	195		460	34	735	195		255	49	975
LIGHT WEIGHT 90,000 LBS.	195		1330	160	195		1280	4	225	195		1200	8	290	195		1100	13	360	195		805	23	540	195		590	30	660

POWER PLANT SETTINGS: (DETAILS ON FIG. 49 SECTION III): 2400 RPM & 43.5 IN. HG. AUTO RICH

DATA AS OF 2-20-45 BASED ON: FLIGHT TESTS

* FUEL USED (U.S. GAL.) INCLUDES WARM-UP & TAKE-OFF ALLOWANCE

LANDING DISTANCE FEET

GROSS WEIGHT LB.	BEST IAS APPROACH POWER OFF MPH	POWER OFF KTS	POWER ON MPH	POWER ON KTS	HARD DRY SURFACE AT SEA LEVEL GROUND ROLL	HARD DRY SURFACE AT SEA LEVEL TO CLEAR 50' OBJ.	HARD DRY SURFACE AT 3000 FEET GROUND ROLL	HARD DRY SURFACE AT 3000 FEET TO CLEAR 50' OBJ.	HARD DRY SURFACE AT 6000 FEET GROUND ROLL	HARD DRY SURFACE AT 6000 FEET TO CLEAR 50' OBJ.	FIRM DRY SOD AT SEA LEVEL GROUND ROLL	FIRM DRY SOD AT SEA LEVEL TO CLEAR 50' OBJ.	FIRM DRY SOD AT 3000 FEET GROUND ROLL	FIRM DRY SOD AT 3000 FEET TO CLEAR 50' OBJ.	FIRM DRY SOD AT 6000 FEET GROUND ROLL	FIRM DRY SOD AT 6000 FEET TO CLEAR 50' OBJ.	WET OR SLIPPERY AT SEA LEVEL GROUND ROLL	WET OR SLIPPERY AT SEA LEVEL TO CLEAR 50' OBJ.	WET OR SLIPPERY AT 3000 FEET GROUND ROLL	WET OR SLIPPERY AT 3000 FEET TO CLEAR 50' OBJ.	WET OR SLIPPERY AT 6000 FEET GROUND ROLL	WET OR SLIPPERY AT 6000 FEET TO CLEAR 50' OBJ.
LIGHT WEIGHT 90,000 LB.	125		125		2370	3150	2590	3450	2820	3750	2640	3420	2880	3750	3150	4080	6120	6900	6690	7560	7320	8250

DATA AS OF 2-20-45 BASED ON: ESTIMATES

OPTIMUM LANDING IS 80% OF CHART VALUES

REMARKS:

NOTE: TO DETERMINE FUEL CONSUMPTION IN BRITISH IMPERIAL GALLONS, MULTIPLY BY 10, THEN DIVIDE BY 12

* FUEL USED FOR WARMUP AND TAKE-OFF BASED ON 10 MINUTES AT RATED POWER

LEGEND

I.A.S. : INDICATED AIRSPEED
M.P.H. : MILES PER HOUR
KTS. : KNOTS
F.P.M. : FEET PER MINUTE

Figure 84—Take-Off, Climb, and Landing Chart

AAFMC-528 4-1-44

AIRCRAFT MODEL(S)
B-29, B-29A
ENGINE(S): R-3350-21, 23, 23A, 57,[2] 59[2]

FLIGHT OPERATION INSTRUCTION CHART
COMBAT AIRPLANE
CHART WEIGHT LIMITS: 140,000 TO 130,000 POUNDS

EXTERNAL LOAD ITEMS
NONE
NUMBER OF ENGINES OPERATING: 4

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.	2900	50.5	--	AR	--	--	1330
MILITARY POWER	2600	47.5	--	A.R.	5	260°	1195

FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING.[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).[2] TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I RANGE IN AIRMILES (3) STATUTE	COLUMN I RANGE IN AIRMILES (3) NAUTICAL	FUEL U.S. GAL.	COLUMN II RANGE IN AIRMILES STATUTE	COLUMN II RANGE IN AIRMILES NAUTICAL	COLUMN III RANGE IN AIRMILES STATUTE	COLUMN III RANGE IN AIRMILES NAUTICAL	COLUMN IV RANGE IN AIRMILES STATUTE	COLUMN IV RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN V RANGE IN AIRMILES STATUTE	COLUMN V RANGE IN AIRMILES NAUTICAL
				SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]							
2820	2450	10000	3830	3330	4870	4230				REFER TO	
2680	2320	9500	3620	3150	4570	3970					
2530	2200	9000	3410	2960	4280	3710				LONG RANGE	
2390	2070	8500	3200	2780	3980	3460				CRUISING CHART	
2250	1950	8000	3000	2600	3700	3210					
2100	1830	7500	2790	2430	3430	2970					
1960	1700	7000	2590	2250	3150	2740					
1820	1590	6500	2390	2070	2880	2500					
1680	1460	6000	2190	1900	2630	2290					
1540	1330	5500	1990	1720	2380	2070					
1390	1210	5000	1780	1550	2130	1850					

MAXIMUM CONTINUOUS R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	PRESS ALT. FEET	(.33 STAT. (NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	(.36 STAT. (NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	(STAT. (NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	PRESS ALT. FEET	MAXIMUM AIR RANGE R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.
						40000																				40000						
						35000																				35000						
						30000																				30000			SEE NOTE			
--	--	--	--	--	--	25000	--	---	--	--	--	--														25000			ABOVE			
2400	43.5	A R	1020	317		20000	2350	41	A R	931	307															20000						
2400	43.5	A R	1020	306		15000	2350	39	A R	882	291		2250	37	AR	745	268									15000						
2400	43.5	A R	1000	293		10000	2200	39	A R	836	276		2250	36	A R	720	259									10000						
2400	43.5	A R	990	278		5000	2250	39	A R	783	258		2250	36	A R	687	247									5000						
2400	43.5	A R	960	266		S.L.	2250	39	A R	745	246		2250	35	A R	654	235									S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

(2) ALL FIGURES ON THIS CHART SHALL BE CONSIDERED AS ESTIMATED DATA FOR FUEL INJECTION ENGINES

EXAMPLE

AT LB. GROSS WEIGHT WITH GAL. OF FUEL
(AFTER DEDUCTING TOTAL ALLOWANCES OF GAL.)
TO FLY STAT. AIRMILES AT FT. ALTITUDE
MAINTAIN RPM AND IN. MANIFOLD PRESSURE
WITH MIXTURE SET:

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 2-20-45 BASED ON: FLIGHT TEST

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure 85—Flight Operation Instruction Chart (Sheet 1 of 6 Sheets)

AAFMC-528 4-1-44

AIRCRAFT MODEL(S)

B-29, B-29A

ENGINE(S): R-3350-21, 23, 23A, 57(2) 59(2)

FLIGHT OPERATION INSTRUCTION CHART

COMBAT AIRPLANE

CHART WEIGHT LIMITS: 130,000 TO 120,000 POUNDS

EXTERNAL LOAD ITEMS

NONE

NUMBER OF ENGINES OPERATING: 4

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.	2800	50.5		AR			1330
MILITARY POWER	2600	47.5		A R	5	260°	1195

FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).(1) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING(1)								
2260	1970	8000	3140	2730	4070	3540					
2120	1840	7500	2930	2550	3780	3280					
1980	1720	7000	2720	2370	3480	3020				REFER TO LONG RANGE CRUISING CHART	
1830	1590	6500	2520	2180	3190	2770					
1690	1470	6000	2310	2010	2920	2530					
1550	1340	5500	2110	1830	2640	2290					
1410	1220	5000	1900	1650	2370	2060					
1250	1100	4500	1700	1480	2120	1840					
1120	975	4000	1500	1300	1870	1620					
980	850	3500	1300	1130	1620	1400					
840	730	3000	1100	960	1380	1190					

MAXIMUM CONTINUOUS						PRESS	(.35 STAT. (NAUT.) MI./GAL.)						(.45 STAT. (NAUT.) MI./GAL.)						(STAT. (NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.
						40000																			40000						
						35000																			35000						
2400	43.5	A R	1000	340	--	30000																			30000		SEE NOTE ABOVE				
2400	43.5	A.R.	1020	336		25000	2400	41	AR	939	329	--													25000						
2400	43.5	A R	1020	325		20000	2350	39	A R.	890	312														20000						
2400	43.5	A.R	1020	312		15000	2300	39	A R	840	294		--	--	--	--	--	--							15000						
2400	43.5	A.R.	1000	298		10000	2250	38	A R.	786	275		2200	35	AL	599	269								10000						
2400	43.5	A.R.	990	283		5000	2250	38	A R.	744	260		2200	35	AL	577	260								5000						
2400	43.5	A R	960	269		S.L.	2250	37	A R	703	246		2200	35	AL	552	248								S.L.						
													2200	35	AL	524	236														

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

(2) ALL FIGURES ON THIS CHART SHALL BE CONSIDERED AS ESTIMATED DATA FOR FUEL INJECTION ENGINES

EXAMPLE

AT LB. GROSS WEIGHT WITH GAL. OF FUEL
(AFTER DEDUCTING TOTAL ALLOWANCES OF GAL.)
TO FLY STAT. AIRMILES AT FT. ALTITUDE
MAINTAIN RPM AND IN. MANIFOLD PRESSURE
WITH MIXTURE SET:

LEGEND

ALT. : PRESSURE ALTITUDE	F.R. : FULL RICH
M.P. : MANIFOLD PRESSURE	A.R. : AUTO-RICH
GPH : U.S. GAL. PER HOUR	A.L. : AUTO-LEAN
TAS : TRUE AIRSPEED	C.L. : CRUISING LEAN
KTS. : KNOTS	M.L. : MANUAL LEAN
S.L. : SEA LEVEL	F.T. : FULL THROTTLE

DATA AS OF 2-20-45 BASED ON: FLIGHT TEST

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure 85—Flight Operation Instruction Chart (Sheet 2 of 6 Sheets)

AAFMC-528 6-1-44

AIRCRAFT MODEL(S)
B-29, B-29A

ENGINE(S): R-3350-21, 23, 23A, -57(2), -59(2)

FLIGHT OPERATION INSTRUCTION CHART

COMBAT AIRPLANE

CHART WEIGHT LIMITS: 120,000 TO 110,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING: 4

LIMITS	RPM.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.	2900	50.5	--	AR	--	--	1330
MILITARY POWER	2600	47.5	--	AR	5	250°	1195

FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1). MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). (2) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I RANGE IN AIRMILES STATUTE	COLUMN I RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN II RANGE IN AIRMILES STATUTE	COLUMN II RANGE IN AIRMILES NAUTICAL	COLUMN III RANGE IN AIRMILES STATUTE	COLUMN III RANGE IN AIRMILES NAUTICAL	COLUMN IV RANGE IN AIRMILES STATUTE	COLUMN IV RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN V RANGE IN AIRMILES STATUTE	COLUMN V RANGE IN AIRMILES NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING(1)								
1600 1480	1350 1700	6500 6000	2630 2420	2280 2100	3420 3130	2970 2710	3850 3520	3350 3060	6500 6000	REFER TO	
1350 1230 1110	1560 1420 1270	5500 5000 4500	2210 2000 1800	1920 1740 1580	2830 2530 2260	2460 2200 1960	3190 2850 2540	2770 2470 2210	5500 5000 4500	LONG RANGE CRUISING CHARTS	
990 860 735	1130 990 945	4000 3500 3000	1590 1390 1190	1380 1200 1030	1980 1710 1450	1720 1480 1260	2230 1920 1630	1940 1670 1410	4000 3500 3000		
705 560 420	810 490 385	2500 2000 1500	995 795 585	855 530 510	1200 950 705	1040 825 610	1340 1060 780	1170 920 675	2500 2000 1500		

MAXIMUM CONTINUOUS R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	(.39 STAT. (NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	(.47 STAT. (NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	(.52 STAT. (NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	MAXIMUM AIR RANGE R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
2400	43.5	AR	990	359		40000	--	--	--	--	--															40000							
2400	43.5	AR	1000	353	--	35000																				35000							
						30000	2300	41	AR	869	339	--														30000	SEE NOTE ABOVE						
2400	43.5	A R	1020	345		25000	2300	39	AR	832	324		--	--	--	--	--		--	--	--	--	--		25000							
2400	43.5	A R	1020	330		20000	2250	37	AR	786	307		2200	35	AL	615	289	--	2200	33	AL	543	282		20000							
2400	43.5	A R	1020	316		15000	2250	37	AR	734	286		2200	35	AL	593	276		2150	33	AL	518	270		15000							
2400	43.5	A R	1000	302		10000	2200	35	AR	693	270		2200	35	AL	566	255		2150	33	AL	492	256		10000							
2400	43.5	A R	990	286		5000	2200	36	AR	652	254		2200	35	AL	539	253		2150	33	AL	462	240		5000							
2400	43.5	A R	960	271		S.L.	2200	35	AL	520	240		2200	35	AL	520	238		2150	33	AL	436	227		S.L.							

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

(2) ALL FIGURES ON THIS CHART SHALL BE CONSIDERED AS ESTIMATED DATA FOR FUEL INJECTION ENGINES

EXAMPLE

AT LB. GROSS WEIGHT WITH GAL. OF FUEL
(AFTER DEDUCTING TOTAL ALLOWANCES OF GAL.)
TO FLY STAT. AIRMILES AT FT. ALTITUDE
MAINTAIN RPM AND IN. MANIFOLD PRESSURE
WITH MIXTURE SET:

LEGEND

ALT. : PRESSURE ALTITUDE	F.R. : FULL RICH
M.P. : MANIFOLD PRESSURE	A.R. : AUTO-RICH
GPH : U.S. GAL. PER HOUR	A.L. : AUTO-LEAN
TAS : TRUE AIRSPEED	C.L. : CRUISING LEAN
KTS. : KNOTS	M.L. : MANUAL LEAN
S.L. : SEA LEVEL	F.T. : FULL THROTTLE

DATA AS OF 2-20-45 BASED ON: FLIGHT TEST

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure 85—Flight Operation Instruction Chart (Sheet 3 of 6 Sheets)

AAFMC-528 4-1-44

AIRCRAFT MODEL(S)
B-29 B-29A
ENGINE(S):-21, 23, 23A, -57(2) 59(2)

FLIGHT OPERATION INSTRUCTION CHART

COMBAT AIRPLANE

CHART WEIGHT LIMITS: 110,000 TO 100,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING: 4

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.	2800	50.5	--	AR	-	-	1330
MILITARY POWER	2600	47.5	--	AR	5	260°	1195

FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND)(1). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I RANGE IN AIRMILES (3) STATUTE	COLUMN I RANGE IN AIRMILES (3) NAUTICAL	FUEL U.S. GAL.	COLUMN II RANGE IN AIRMILES STATUTE	COLUMN II RANGE IN AIRMILES NAUTICAL	COLUMN III RANGE IN AIRMILES STATUTE	COLUMN III RANGE IN AIRMILES NAUTICAL	COLUMN IV RANGE IN AIRMILES STATUTE	COLUMN IV RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN V RANGE IN AIRMILES STATUTE	COLUMN V RANGE IN AIRMILES NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING(1)								
1430	1240	5000	2050	1780	2740	2380	3100	2690	5000		
1280	1110	4500	1840	1600	2440	2120	2780	2400	4500	REFER TO	
1140	990	4000	1630	1420	2150	1860	2430	2110	4000	LONG RANGE	
995	865	3500	1420	1230	1850	1610	2100	1820	3500	CRUISING CHARTS	
850	740	3000	1210	1050	1570	1360	1780	1540	3000		
710	615	2500	1010	875	1290	1120	1470	1280	2500		
565	495	2000	805	700	1020	885	1160	1010	2000		
425	370	1500	600	520	750	650	855	740	1500		
285	245	1000	400	345	500	435	570	495	1000		
140	125	500	200	175	250	215	285	245	500		

MAXIMUM CONTINUOUS R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	(.40 STAT. (NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	(.50 STAT. (NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	(.57 STAT. (NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	MAXIMUM AIR RANGE R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
2400	43.5	AR	990	373		40000																				40000						
2400	43.5	AR	1000	361		35000	2350	41	AR	907	363															35000						
						30000	2350	40	AR	872	349															30000						
2400	43.5	AR	1020	349		25000	2300	39	AR	829	331		2200	35	AL	600	311		--	--	--	--	--				25000						
2400	43.5	AR	1020	334		20000	2250	37	AR	777	311		2200	35	AL	600	298		2150	33	AL	501	285				20000	SEE NOTE ABOVE					
2400	43.5	AR	1020	319		15000	2250	36	AR	727	291		2200	35	AL	580	282		2100	33	AL	471	268				15000						
2400	43.5	AR	1000	303		10000							2200	35	AL	560	268		2100	32	AL	442	251				10000						
2400	43.5	AR	990	288		5000	SEE COL. III						2200	35	AL	540	253		2100	31	AL	408	232				5000						
2400	43.5	AR	960	273		S.L.							2200	35	AL	520	239		2050	31	AL	379	216				S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.)
PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

(2) ALL FIGURES ON THIS CHART SHALL BE CONSIDERED AS ESTIMATED DATA FOR FUEL INJECTION ENGINES

EXAMPLE

AT LB. GROSS WEIGHT WITH GAL. OF FUEL
(AFTER DEDUCTING TOTAL ALLOWANCES OF GAL.)
TO FLY STAT. AIRMILES AT FT. ALTITUDE
MAINTAIN RPM AND IN. MANIFOLD PRESSURE
WITH MIXTURE SET:

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 2-20-45 BASED ON: FLIGHT TEST

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure 85—Flight Operation Instruction Chart (Sheet 4 of 6 Sheets)

AAFMC-528 4-1-44

AIRCRAFT MODEL(S)
B - 2 9 B - 29A
ENGINE(S): R-3350-21, 23, 23A, -57 (2) 59 (2)

FLIGHT OPERATION INSTRUCTION CHART
COMBAT AIRPLANE
CHART WEIGHT LIMITS: 100,000 TO 90,000 POUNDS

EXTERNAL LOAD ITEMS
NONE
NUMBER OF ENGINES OPERATING: 4

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.	FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)
WAR EMERG.	2800	50.5		AR	--	--	1330	
MILITARY POWER	2600	47.5		AR	5	260°	1195	

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN (1) EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING. MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). (1) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I RANGE IN AIRMILES STATUTE	COLUMN I RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN II RANGE IN AIRMILES STATUTE	COLUMN II RANGE IN AIRMILES NAUTICAL	COLUMN III RANGE IN AIRMILES STATUTE	COLUMN III RANGE IN AIRMILES NAUTICAL	COLUMN IV RANGE IN AIRMILES STATUTE	COLUMN IV RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN V RANGE IN AIRMILES STATUTE	COLUMN V RANGE IN AIRMILES NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING (1)								
1000 855	870 745	3500 3000	1450 1240	1260 1080	2000 1700	1740 1480	2260 1930	1960 1670	3500 3000	REFER TO	
715 570 425	620 495 370	2500 2000 1500	1030 825 615	895 715 535	1410 1110 825	1220 965 715	1590 1260 930	1380 1090 810	2500 2000 1500	LONG RANGE CRUISING CHARTS	
285 145	250 125	1000 500	410 205	355 180	550 275	480 240	620 310	540 270	1000 500		

MAXIMUM CONTINUOUS R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	(.41 STAT. (NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	(.55 STAT. (NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	(.62 STAT. (NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	MAXIMUM AIR RANGE R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000																				40000							
2400	--	AR	990	382	--	35000	2350	41	AR	913	374	--														35000							
2400	43.5	A R	1000	369		30000	2300	41	A R	876	359		2200	35	AL	605	333		2150	33	AL	518	321		30000	SEE NOTE ABOVE						
2400	43.5	A R	1020	354		25000	2300	39	A R	824	338		2200	35	--	600	316	--	2100	33	AL	486	301		25000							
2400	43.5	A R	1020	339		20000	2250	37	A R	771	316		2200	35	A L	600	300		2100	32	AL	459	284		20000							
2400	43.5	A R	1020	322		15000	2200	37	A R	719	295		2150	33	A L	512	282		2100	31	AL	428	265	--	15000							
2400	43.5	A R	1000	306		10000	2200	36	A R	672	276		2150	33	A L	482	265		2050	30	A L	397	246		10000							
2400	43.5	A R	990	290		5000	2200	35	AL	540	262		2100	33	A L	448	246		2000	30	A L	359	222		5000							
2400	43.5	A R	960	275		S.L.	2200	35	AL	520	246		2100	33	A L	422	232		2000	30	A L	331	205		S.L.							

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.)
PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

(2) ALL FIGURES ON THIS CHART SHALL BE CONSIDERED AS ESTIMATED DATA FOR FUEL INJECTION ENGINES

EXAMPLE

AT LB. GROSS WEIGHT WITH GAL. OF FUEL
(AFTER DEDUCTING TOTAL ALLOWANCES OF GAL.)
TO FLY STAT. AIRMILES AT FT. ALTITUDE
MAINTAIN RPM AND IN. MANIFOLD PRESSURE
WITH MIXTURE SET:

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 2-20-45 BASED ON: FLIGHT TEST

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure 85—Flight Operation Instruction Chart (Sheet 5 of 6 Sheets)

AAFMC-520 4-1-44

AIRCRAFT MODEL(S)
B-29 B-29A

ENGINE(S): R3350-21, 23, 23A-57 (2) 59 (2)

FLIGHT OPERATION INSTRUCTION CHART

COMBAT AIRPLANE

CHART WEIGHT LIMITS: 90,000 TO 80,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING. 4

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.	2800	50.5		AR			1330
MILITARY POWER	2600	47.5		A.R.	5	260°	1195

FOR DETAILS SEE POWER PLANT CHART (FIG. SECT. III)

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING (1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND). (1) TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I RANGE IN AIRMILES STATUTE	COLUMN I RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN II RANGE IN AIRMILES STATUTE	COLUMN II RANGE IN AIRMILES NAUTICAL	COLUMN III RANGE IN AIRMILES STATUTE	COLUMN III RANGE IN AIRMILES NAUTICAL	COLUMN IV RANGE IN AIRMILES STATUTE	COLUMN IV RANGE IN AIRMILES NAUTICAL	FUEL U.S. GAL.	COLUMN V RANGE IN AIRMILES STATUTE	COLUMN V RANGE IN AIRMILES NAUTICAL
			SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING (1)								
575 515	500 450	2000 1800	840 755	730 655	1180 1060	1030 925	1340 1210	1160 1050	2000 1800		
480 400 345	400 350 300	1600 1400 1200	670 590 505	585 510 435	945 830 710	820 720 615	1070 940 805	930 815 700	1600 1400 1200	REFER TO LONG RANGE	
285 230 170	250 200 150	1000 800 600	420 335 250	365 290 220	590 470 355	510 410 305	670 535 400	580 465 350	1000 800 600	CRUISING CHART	
115 60	100 50	400 200	170 85	145 75	235 120	205 100	270 135	230 115	400 200		

MAXIMUM CONTINUOUS R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	PRESS ALT. FEET	(.42 STAT. (NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	(.50 STAT. (NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	(.67 STAT. (NAUT.) MI./GAL.) R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. (2) GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.	PRESS ALT. FEET	MAXIMUM AIR RANGE R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH	APPROX. T.A.S. MPH	APPROX. T.A.S. KTS.
						40000																				40000						
2400	43.5	AR	990	390	--	35000	2850	41	AR	910	382	--	2200	36	AL	588	352		2150	34	AL	517	346		35000						
2400	43.5	A R	1000	373		30000	2300	41	AR	862	362		2200	35	AL	576	340	--	2150	32	AL	481	322		30000	SEE NOTE ABOVE					
2400	43.5	A R	1020	358		25000	2300	39	A R	813	341		2150	34	A L	540	319		2100	31	AL	450	301		25000						
2400	43.5	A R	1020	342		20000	2250	37	A R	760	319		2150	34	A L	509	300		2050	30	A L	420	281		20000						
2400	43.5	A R	1020	326		15000	2200	37	A R	706	296		2100	33	A L	476	281		2050	29	A L	386	258		15000						
2400	43.5	A R	1000	308		10000	2290	35	AL	580	279		2100	32	A L	446	263		2000	28	A L	357	239		10000						
2400	43.5	A R	990	292		5000	2200	35	AL	560	264		2100	31	A L	411	242		1900	28	A L	328	218		5000						
2400	43.5	A R	960	277		S.L.	2200	35	AL	520	248		2100	31	A L	382	225		1900	28	A L	301	201		S.L.						

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG.) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

(2) ALL FIGURES ON THIS CHART SHALL BE CONSIDERED AS ESTIMATED DATA FOR FUEL INJECTION ENGINES

EXAMPLE

AT LB. GROSS WEIGHT WITH GAL. OF FUEL
(AFTER DEDUCTING TOTAL ALLOWANCES OF GAL.)
TO FLY STAT. AIRMILES AT FT. ALTITUDE
MAINTAIN RPM AND IN. MANIFOLD PRESSURE
WITH MIXTURE SET:

LEGEND

ALT. : PRESSURE ALTITUDE	F.R. : FULL RICH
M.P. : MANIFOLD PRESSURE	A.R. : AUTO-RICH
GPH : U.S. GAL. PER HOUR	A.L. : AUTO-LEAN
TAS : TRUE AIRSPEED	C.L. : CRUISING LEAN
KTS. : KNOTS	M.L. : MANUAL LEAN
S.L. : SEA LEVEL	F.T. : FULL THROTTLE

DATA AS OF 2-20-45 BASED ON: FLIGHT TEST

RED FIGURES ARE PRELIMINARY DATA, SUBJECT TO REVISION AFTER FLIGHT CHECK

Figure 85—Flight Operation Instruction Chart (Sheet 6 of 6 Sheets)

LONG RANGE CRUISING B-29

4 ENGINES COMBAT AIRPLANE

CONFIGURATION

ENGINES R-3350-23A
PROPELLERS HAMILTON STANDARD HYDROMATIC
CARBURETORS CHANDLER-EVANS TYPE 58-CPB

SHORT COWL FLAPS
TOP COWL FLAPS OPEN 2.5 INCHES
RADOME RETRACTED
INTERCOOLER FLAPS CLOSED
OIL COOLER FLAP ANGLE 8°

GROSS WT. 100,000-90,000 LB HOLD 190-185 IAS								PRESSURE ALTITUDE FEET	GROSS WT. 90,000-80,000 LB HOLD 185-180 IAS							
* O.A.T.	R.P.M.	MAN. PRESS	MIX.	G.P.H.	T.A.S.	TIME	AIR MILES		* O.A.T.	R.P.M.	MAN. PRESS	MIX.	G.P.H.	T.A.S.	TIME	AIR MILES
								40,000								
−45.7	2150	32	AL	488	320	3.4	1092	35,000	−46.1	2050	30	AL	412	310	4.0	1253
−37.2	2050	31	AL	434	292.5	3.8	1122	30,000	−37.5	2000	29	AL	377	284.5	4.4	1260
−28.3	2050	29	AL	394	270	4.2	1141	25,000	−28.6	1800	28	AL	343	262	4.9	1283
−19.4	1950	28	AL	358	247.5	4.6	1151	20,000	−19.6	1750	27	AL	312	242	5.3	1295
−10.3	1750	28	AL	327	229	5.1	1168	15,000	−10.5	1600	27	AL	285	222	5.8	1300
1.0	1700	28	AL	302	211.5	5.5	1170	10,000	1.2	1500	28	AL	262	205.5	6.3	1305
8.3	1700	28	AL	283	196	5.9	1155	5,000	8.2	1500	28	AL	247	191	6.7	1282
17.8	1750	28	AL	270	182.3	6.2	1128	S.L.	17.6	1550	28	AL	238	177.2	7.0	1240

NOTES:

HOLD PILOTS INDICATED AIRSPEED AS NOTED

VALUES BASED ON HEAVY WEIGHT IN EACH WEIGHT BAND FOR STANDARD DAY

TIME IN HOURS NECESSARY TO CONSUME 10,000 LB OF FUEL

*OBSERVED TEMPERATURE DEGREES C.

HIGH PERFORMANCE — NO ALLOWANCES INCLUDED

Figure 86—Long Range Cruising Chart (Sheet 1 of 3 Sheets)

LONG RANGE CRUISING B-29

4 ENGINES COMBAT AIRPLANE

CONFIGURATION

ENGINES R-3350-23A
PROPELLERS HAMILTON STANDARD HYDROMATIC
CARBURETORS CHANDLER-EVANS TYPE 58-CPB

SHORT COWL FLAPS
TOP COWL FLAPS OPEN 2.5 INCHES
RADOME RETRACTED
INTERCOOLER FLAPS CLOSED
OIL COOLER FLAP ANGLE 8°

GROSS WT. 120,000-110,000 LB HOLD 200-195 IAS								PRESSURE ALTITUDE FEET	GROSS WT. 110,000-100,000 LB HOLD 195-190 IAS							
* O.A.T.	R.P.M.	MAN. PRESS	MIX.	G.P.H.	T.A.S.	TIME	AIR MILES		* O.A.T.	R.P.M.	MAN. PRESS	MIX.	G.P.H.	T.A.S.	TIME	AIR MILES
								40,000								
−44.7	2300	41	AR	865	336	1.9	649	35,000	−45.1	2200	37	AR	705	328	2.4	776
−36.4	2250	36	AR	726	308	2.3	707	30,000	−36.7	2150	33	AL	510	301	3.3	985
−27.7	2150	35	AL	540	284	3.1	875	25,000	−28.0	2100	32	AL	454	276	3.7	1015
−18.8	2100	33	AL	470	260	3.5	924	20,000	−19.1	2050	30	AL	410	254	4.1	1040
−9.8	2050	31	AL	422	241	3.9	950	15,000	−10.0	2000	29	AL	377	235	4.4	1040
0.6	2050	30	AL	391	223	4.3	959	10,000	0.8	1950	28	AL	348	217.5	4.8	1042
8.7	2050	29	AL	364	206	4.6	944	5,000	8.5	1900	28	AL	326	201	5.1	1025
18.2	2050	29	AL	344	192	4.8	928	S.L.	18.0	1950	28	AL	308	187	5.4	1011

NOTES:

HOLD PILOTS INDICATED AIRSPEED AS NOTED

VALUES BASED ON HEAVY WEIGHT IN EACH WEIGHT BAND FOR STANDARD DAY

TIME IN HOURS NECESSARY TO CONSUME 10,000 LB OF FUEL

*OBSERVED TEMPERATURE DEGREES C.

HIGH PERFORMANCE — NO ALLOWANCES INCLUDED

Figure 86—Long Range Cruising Chart (Sheet 2 of 3 Sheets)

LONG RANGE CRUISING B-29

4 ENGINES COMBAT AIRPLANE

CONFIGURATION

ENGINES R-3350-23A
PROPELLERS HAMILTON STANDARD HYDROMATIC
CARBURETORS CHANDLER-EVANS TYPE 58-CPB

SHORT COWL FLAPS
TOP COWL FLAPS OPEN 2.5 INCHES
RADOME RETRACTED
INTERCOOLER FLAPS CLOSED
OIL COOLER FLAP ANGLE 8°

GROSS WT. 140,000-130,000 LB HOLD 210-205 IAS								PRESSURE ALTITUDE FEET	GROSS WT. 130,000-120,000 LB HOLD 205-200 IAS							
* O.A.T.	R.P.M.	MAN. PRESS	MIX.	G.P.H.	T.A.S.	TIME	AIR MILES		* O.A.T.	R.P.M.	MAN. PRESS	MIX.	G.P.H.	T.A.S.	TIME	AIR MILES
								40,000								
								35,000								
−35.6	2500	45	AR	1080	324	1.5	500	30,000	−35.9	2300	41	AR	872	316	1.9	604
−27.1	2350	41	AR	890	298	1.9	557	25,000	−27.4	2230	37	AR	755	291	2.2	641
−18.3	2250	38	AR	772	274	2.2	591	20,000	−18.5	2150	35	AL	562	267	2.9	791
−9.3	2200	35.5	AR	684	252	2.4	616	15,000	−9.5	2100	33	AL	484	246.5	3.4	850
−0.2	2150	34	AL	510	234	3.3	765	10,000	−0.4	2100	32	AL	440	228.5	3.8	866
9.1	2150	32	AL	456	216.5	3.7	790	5,000	8.9	2100	31	AL	406	211.2	4.1	866
18.5	2150	32	AL	421	202	3.9	800	S.L.	18.4	2100	31	AL	379	197	4.4	866

NOTES:

HOLD PILOTS INDICATED AIRSPEED AS NOTED

VALUES BASED ON HEAVY WEIGHT IN EACH WEIGHT BAND FOR STANDARD DAY
TIME IN HOURS NECESSARY TO CONSUME 10,000 LB OF FUEL

*OBSERVED TEMPERATURE DEGREES C.

HIGH PERFORMANCE — NO ALLOWANCES INCLUDED

Figure 86—Long Range Cruising Chart (Sheet 3 of 3 Sheets)

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