# PILOT'S MANUAL For

# **BOEING B-17** FLYING FORTRESS



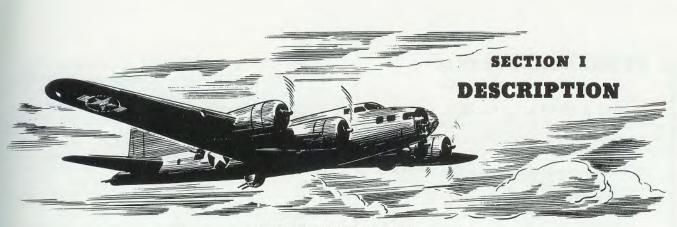


Figure 1 - B-17F in Flight

## 1. AIRPLANE.

a. Model B-17F and G bombardmentairplanes are four-engine-midwing monoplanes. The approximate over-all dimensions are: length, 74 feet 9 inches; height, taxying position, 19 feet 1 inch; span, 103 feet 9 inches.

<u>b</u>. Electrically operated landing gear, tail gear, wing flaps, bomb bay doors, and hydraulically operated brakes and cowl flaps are provided.

c. The crew includes pilot, copilot, navigator, bombardier, upper turret gunner, lower turret gunner, radio operator, side gunner(s), and tail gunner. The airplane can be entered either through the main entrance door on the right side of the airplane just forward of the horizontal stabilizer, or through the front hatch in the bottom of the fuselage below the pilot's compartment.

d. Defensive armament of the B-17F consists of three turrets, each mounting two .50 calibre machine guns, and five single flexibly mounted .50 mounted .50 calibre machine guns. The B-17G has an additional power turret just below the nose of the airplane and controlled from the bombardier's compartment.

e. Provisions are made for loading 2000-pound or smaller bombs on racks within the bomb bay, and one bomb, up to 4000 pounds may be carried under each wing.

f. Automatic flight control equipment is provided.

### 2. POWER PLANT.

<u>a</u>. ENGINES. - The Wright model R-1820-97 engines are air-cooled, nine-cylinder radial aircraft engines, equipped with integral reduction gears through which the propellers are driven.

<u>b</u>. TURBOSUPERCHARGERS. - A type B-2 General Electric turbosupercharger is provided for each engine to boost manifold pressure for take-off and highaltitude flight. Superchargers are controlled by automatic hydraulic regulators adjusted from the pilot's control pedestal.



Figure 3 - Power Plant

<u>c</u>. PROPELLERS. - The Hamilton standard threeblade propellers are hydromatically controlled with constant-speed and full feathering provisions.

<u>d</u>. AUTOMATIC ENGINE CONTROL. - Should engine control cables be shot away, four of the controls will automatically assume predetermined positions: throttles, wide open; superchargers, 65 percent power; intercoolers, cold; and propellers, 1850 rpm. Functioning of the automatic control at one unit will not affect placement of controls at other units, or of similar controls on other engines.

> Figure 2 Three-quarter Rear View



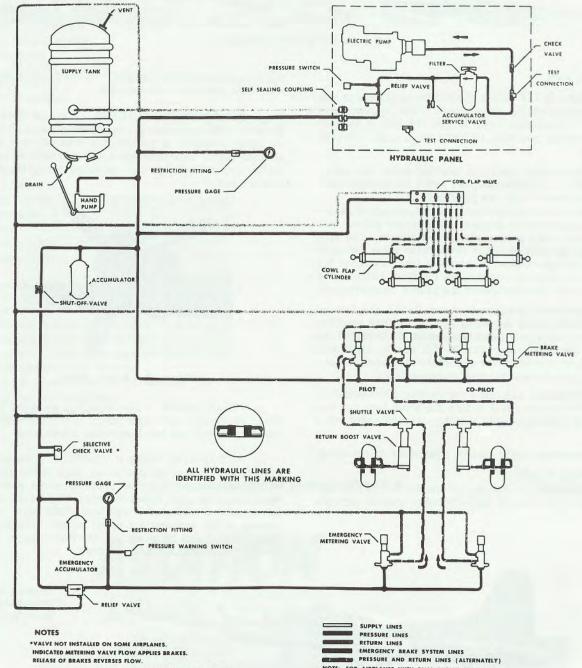
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# **3. HYDRAULIC SYSTEM**

a. SERVICE SYSTEM. - Hydraulic pressure for operating brakes and cowl flaps is supplied by an electric motor-driven pump, or by an accumulator while the pump is not operating.

(1) When the hydraulic pump switch on the pilot's

control panel is in the "AUTO" position, pressure is automatically regulated by a pressure cut-out switch, starting the pump when pressure drops to 600 pounds and stopping the pump when the pressure builds up to 800 pounds. In case the automatic pressure switch fails, pressure may be maintained by holding the hy-draulic pump switch in the "MANUAL" position. A relief valve opens if pressure in the system reaches 900 pounds.



PARKING BRAKES OPERATED FROM CO-PILOT'S METERING VALVES.

Figure 4 - Hydraulic Flow Diagram

NOTE: FOR AIRPLANES WITH DUAL DUPLEX BRAKES.

### WARNING

Should leakage occur in the hydraulic system, the pump must be stopped to prevent loss of fluid. Remove the hydraulic pump switch fuse in the station 4 fuse panel, or disconnect the electrical receptacle at the pressure switch.

(2) In some airplanes the hydraulic pump is controlled by an "ON-OFF" switch on the pilot's control panel. This switch must be "ON" to maintain pressure automatically.

b. EMERGENCY BRAKE SYSTEM. - A spare accumulator and auxiliary metering valves provide emergency brake operation. A red warning lamp on the pilot's instrument panel lights when pressure in the emergency system falls to approximately 700 pounds per square inch. To charge the emergency accumulator, open the manual shut-off valve. If a selective check valve is installed, place it in "SERVICING" position, unless it is lockwired in "NORMAL" position. (These units are located on the right side wall at the rear of the control cabin. See figure 5.) Build up 800 pounds pressure in the system, then return the selective check valve to "NORMAL" position and close the manual shut-off valve.

### NOTE

The emergency brake system has been eliminated from the later model airplanes.

c. PRESSURE GAGES. - Pressure in the service and emergency brake systems is indicated by two gages on the pilot's instrument panel.

d. HAND PUMP. - A hand pump on the side wall at the right of the copilot is used to supply pressure for ground service operations, and to recharge the accumulators if the electric pump fails.

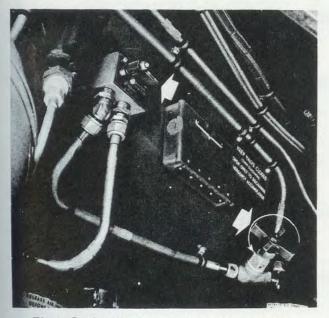


Figure 5 - Servicing Emergency Accumulator

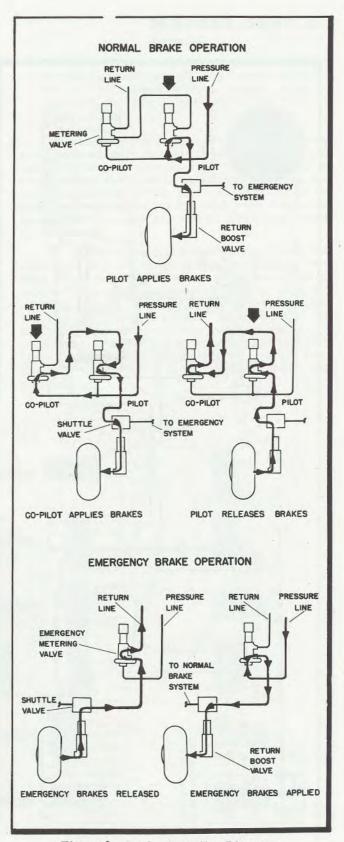
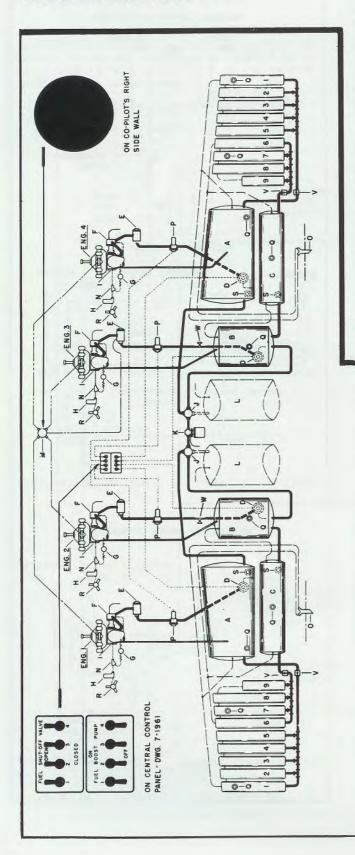


Figure 6 - Brake Operation Diagram

# 4. FUEL SYSTEM



The fuel system consists of four independent singleengine systems as shown in figure 7. The fuel supply for one engine can be used for another engine only by transferring fuel from one engine tank to another through the fuel transfer system. All fuel tanks are the celf-sealing type.

<u>a</u>. FUEL BOOST PUMPS. - Electrically driven fuel boost pumps, controlled by toggle switches on the central control panel, supply pressure required for engine starting, and supplement the engine-driven fuel pumps for take-off and for high-altitude flight. The boost pumps are normally turned off after the climb from take-off is well under way and started again at 15,000 to 18,000 feet to prevent vaporization in the fuel lines to the engine-driven pumps. Booster pump pressure at engine No. 3 fuel strainer is used to supply the cylinder head primer.

<u>b.</u> FUEL SHUT-OFF VALVES. - Fuel shut-off valves, controlled by switches on the central control panel, are installed in the fuel lines between each booster pump and fuel strainer, providing immediate stoppage of flow to an engine in case a line is severed.

Figure 7 - Fuel Flow Diagram



<u>c</u>. PRIMER. - The cylinder head primer has positions corresponding to each of the four engines, and an "OFF" position in which the primer handle is locked. To operate, push the handle down, turn the valve to the engine position required, and then withdraw the handle and pump the charge to the engine.

### IMPORTANT

Pressure from No. 3 fuel booster pump is on the suction side of the primer and overpriming will result, if the handle is left in the withdrawn position. Therefore, each priming operation <u>must</u> terminate with the handle returned to the locked position.

### d. FUEL TRANSFER SYSTEM.

(1) Fuel is transferred by means of an electric motor-driven pump and two selector valves. The motor switch and selector valve handles are in the rear of the control cabin below the door leading to the bomb bay. Direct transfer can only be made across the center line of the airplane. (See figure 8 for fuel transfer procedure.)

### WARNING

Do not use bomb bay valve position when bomb bay tanks are not installed. It is recommended that a 6-inch length of hose, plugged at the outer end, be attached to the bomb bay valve ports.

(2) An emergency hand-operated fuel pump, mounted on the rear bulkhead of the bomb bay, can be substituted for the electric-driven transfer pump by disconnecting the electric pump lines from the fuel transfer selector valves at the forward end of the bomb bay and connecting the hand pump lines. The hand pump can also be used as a refueling pump. (See figure 60.)

(3) Airplanes equipped with auxiliary wing fuel cells have shut-off valves in the lines leading from each group of cells. These valves are controlled by handles in the radio compartment or in the bomb bay near bulkhead No. 5. (See figure 59.) Keep auxiliary cell shut-off valves "CLOSED" (handles out) at all times except when transferring fuel from auxiliary to main tanks. <u>Transfer fuel only when fuel level of main</u> <u>tanks has dropped to 100 gallons per engine</u>. After transfer, return valve to "CLOSED" (handle out) position.

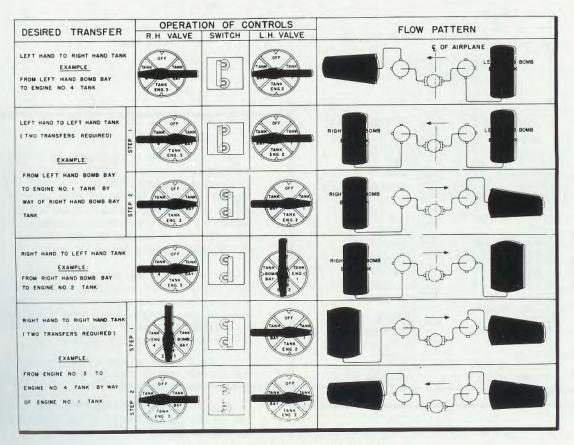


Figure 8 - Fuel Transfer Diagram

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# 5. OIL SYSTEM

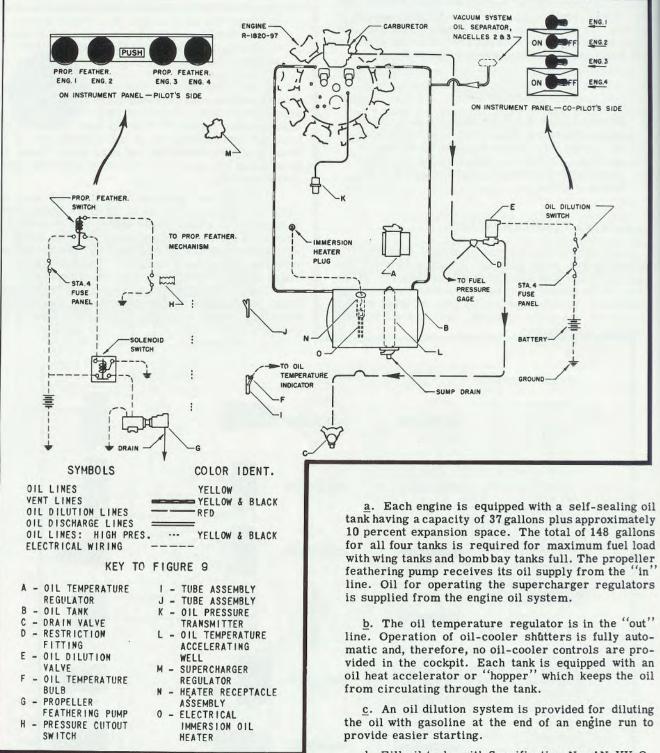


Figure 9 - Oil Flow Diagram

<u>d</u>. Fill oil tanks with Specification No. AN-VV-O-446, grade 1120 for normal operations, grade 1100A for cold weather.

# 6. ELECTRICAL SYSTEM

a. A 24-volt d-c system distributes power from four engine-driven generators and from three storage batteries in the leading edges of the wing, just outboard of the fuselage. Three solenoid-operated battery switches are controlled by toggle switches on the pilot's control panel.

b. A gasoline engine-driven generator unit stowed in the rear fuselage compartment may be operated on the ground to provide auxiliary electric power for recharging batteries and for limited radio operation.

c. Alternating current for the Autosyn instruments, drift meter, radio compass, and warning signals transformer is furnished by two inverters under the pilot's and copilot's seats. A double-throw switch on the pilot's control panel selects the inverter to be used: in "NORMAL" position the left inverter is on; in "ALTERNATE" position the right inverter is on. Both inverters are off when the switch is centered.

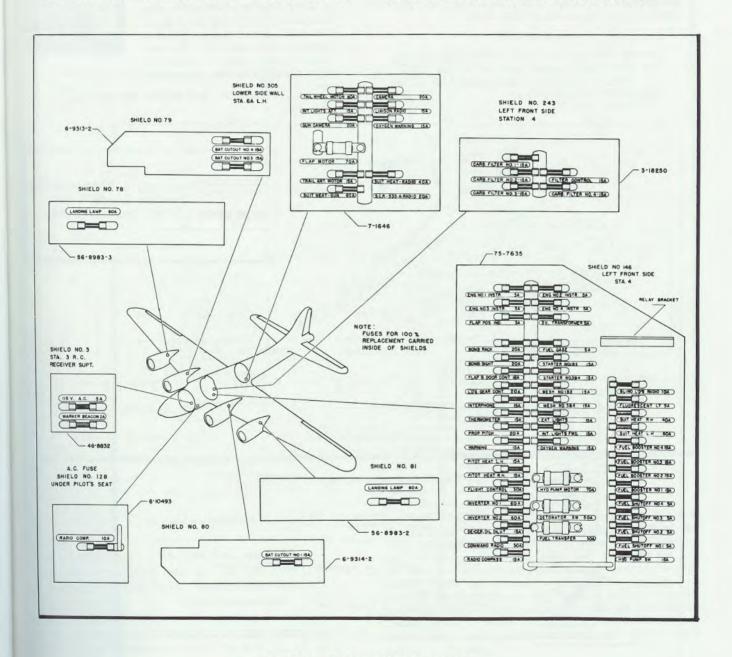


Figure 10 - Fuse Location Diagram

# 7. HEATING

<u>a</u>. GLYCOL HEATING SYSTEM. - Cabin heat is supplied by a hot air system in which heat is transferred to the ventilating air from a glycol system in the No. 2 nacelle. Flow of heated air to the cabin is controlled by a damper at the pilot's left. Defroster air is controlled by a red knob in the "v" of the pilot's windshield and by a control near the outlet in the bombardier's air duct. Fill glycol tank with approved mixture only; do not dilute with water.

### CAUTION

During starting and ground operation of engines, the cabin heat control must be in the "OFF" or "COLD" position to prevent glycol in the system from boiling away. b. AUXILIARY HEATING SYS-TEM. - A similar glycol system, installed in the No. 3 nacelle of some airplanes, supplies eight radiator-fan heating and defrosting units in various locations in the airplane. Fan motors are thermostatically controlled and the flow of heating air is regulated by a damper at each unit.

c. SUIT HEATER OUTLET. - Ten receptacles for plugging in electric suit heaters are provided at various crew stations. The heat output of each suit is controlled by a rheostat on the receptacle box.



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Figure 12 - Suit Heater Receptacle

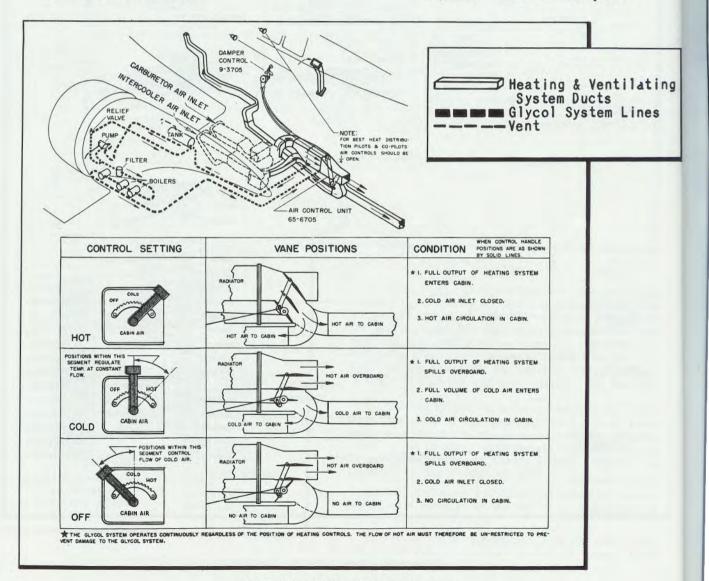


Figure 11 - Heating System Diagram

# 8. VACUUM AND DE-ICING SYSTEM

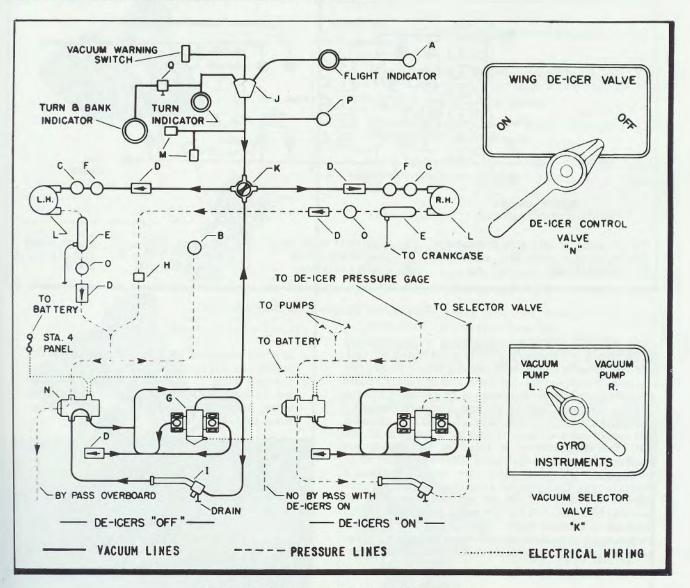


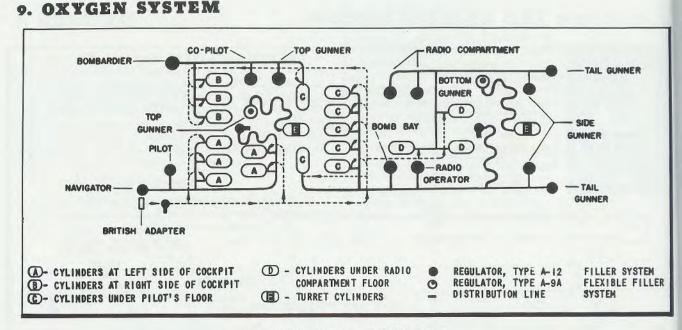
Figure 13 - Vacuum and De-icer Flow Diagram

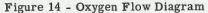
# KEY TO FIGURE 13

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A	-	SUCTION GAGE	1	-	OIL SEPARATOR
B	-	DE-ICER PRESSURE GAGE	J	-	MANIFOLD (INSTR. TUBING)
C	-	SUCTION RELIEF VALVE	K	-	SELECTOR VALVE
D		CHECK VALVE	L	-	VACUUM PUMP
Ε	-	OIL SEPARATOR	M	-	SHUT-OFF VALVE
F	-	PRESSURE RELIEF VALVE	N	-	DE-ICER CONTROL VALVE
G	-	ROTARY DISTRIBUTING	0	-	PRESSURE RELIEF VALVE
		VALVE	P	-	SHUT-OFF VALVE
H	-	TEST CONNECTION	Q	-	VALVE

Vacuum pumps are driven by engines Nos. 2 and 3. The selector valve on the side wall at the left of the pilot permits selection of either pump for deflation of de-icer shoes and at the same time provides the use of the other pump for all other vacuum-operated equipment. When the de-icer control valve is "ON," it directs the discharge of both vacuum pumps to the deicer distributor valve and also starts the distributor valve motors. When it is "OFF" the exhaust from both pumps is bypassed overboard, and the distributor motor is stopped.





a. SUPPLY SYSTEM. - Breathing oxygen is stored in T8 type G-1 cylinders and is distributed by four self-contained systems, each serving two or more crew stations, which prevent complete loss of supply should a distribution line be severed. A check valve at each cylinder prevents loss of system pressure through a punctured cylinder. Each fully charged G-1 cylinder will supply one man with oxygen for 5 hours at 30,000 feet. The main system is filled to 400 pounds per square inch pressure through a filler valve just aft of the forward entrance hatch. On some airplanes a separate type F-1 cylinder at each power turret provides 2-1/2 hours of oxygen for one man at 30,000 feet and is refilled from the main system through a valve on a flexible hose. (See figure 15) Portable oxygen units provided for each crew member may be filled at the recharging valve at any demand regulator.

<u>b.</u> REGULATORS. - A type A-12 demand regulator and an indicator panel are located at each crew station. (See figure 16 for operation.) Power turrets are equipped with A-9A constant-flow regulators in airplanes having separate turret cylinders.

c. INDICATOR PANELS. - When oxygen flows from the regulator, the ball in the indicator bounces up in the glass tube; when flow stops, the ball falls. Do not be surprised if the indicator shows no oxygen flowing when the airplane is on the ground and the auto-mix is "ON," as the regulator is not necessarily supposed to add oxygen at ground level. The gage shows the pressure in the supply cylinders for that station. The warning signal lights when that pressure falls below 100 pounds per square inch.

### NOTE

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In some airplanes 15 constant-flow type A-9A regulators are provided. This installation has a relief valve in the filler system, and does not have the indicator panels or the portable units, but is essentially the same as the demand system.

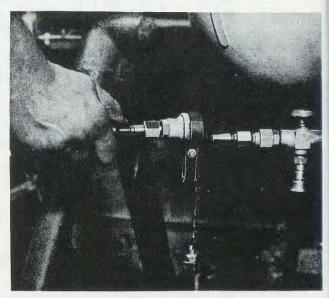


Figure 15 - Refilling Turret Oxygen Cylinder



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2. Carry your bail-out cylinder charged to 1800 pounds.

3. Check to see that there is a portable "walk-around" unit at each station, filled to 400 pounds, and in working order.

4. Check system pressure before flight; it should be 400 pounds.

5. Check function of demand regulator in both "ON" and "OFF" positions. Flow gage should function when auto-mix is "OFF."

6. Check knurled collar on elbow connecting mask hose to regulator for tightness.

7. Open emergency valve to check flow; then close. This valve should not be open except in case of emergency.

- 8. Turn regulator to auto-mix "ON" position.
- 9. Use auto-mix "OFF" only -When oxygen officer advises the use of pure oxygen before take-off, in which case, use it all the way up as protection against "bends.

When treating men for shock, loss of blood, or as protection against poisonous gas.

10. Start using oxygen at 10,000 feet. At night use oxygen from ground up, with auto-mix in "ON" position.

11. In flight above 10,000 feet, always use "walkaround" unit when moving from one station to another.



To use portable unit; first: Check pressure gage of portable unit; 2nd: Inhale deeply, then disconnect mask from regular hose and quickly open spring cover of regulator connection and snap in male fitting on end of mask hose. Clamp portable unit to clothing.

DON'T DELAY-When pointer on pressure gage reaches red area refill cylinder.

Figure 17 - Portable Oxygen Unit in Use

# MAN HOURS OF AVAILABLE OXYGEN

# 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!

# AIRCO REGULATORS TYPE A-12

# PIONEER REGULATORS TYPE A-12

_		_		~	-	_		-	_	_		_	~		_		-
Gage Pres. Alt. Ft.	400	350	300	250	200	150	100	50	Gage Pres. Alt. Ft.	400	350	300	250	200	150	100	5
40,000	41.5 41.5	35.6 35.6	29.4 29.4	23.6 23.6	17.8 17.8	12.0 12.0	5.8 5.8	E	40,000	41.5 41.5	35.6 35.6	29.4 29.4	23.6 23.6	17.8 17.8	12.0 12.0	5.8 5.8	]
35,000	29.5 29.5	25.3 25.3	20.9 20.9	16.8 16.8	12.6 12.6	8.5 8.5	4.0 4.0	M	35,000	29.5 30.0	25.3 25.8	20.9 21.3	16.8 17.1	12.6 12.9	8.5 8.7	4.0 4.2	N
30,000	21.5 22.0	18.5 18.9	15.2 15.6	12.2 12.5	9.2 10.4	6.0 6.2	3.0 3.0	E	30,000	21.5 22.5	18.5 19.3	15.2 15.9	12.2 12.8	9.2 9.6	6.0 6.5	3.0 3.1	]
25,000		14.1 18.0	11.5 14.9	9.0 11.9	7.0 9.0	4.7 6.0	2.0 2.9	R	25,000	16.5 22.0	14.1 18.4	11.5 15.6	9.0 12.5	7.0 9.4	4.7 6.3	2.0 3.0	ł
20,000	13.0 23.5	11.1 20.2	9.2 16.6	7.4 13.3	5.5 10.1	3.7 6.8	1.5 3.2	G	20,000	13.0 39.0	11.1 33.5	9.2 26.6	7.4 22.2	5.5 16.7	3.7 11.3	1.5 5.4	(
15,000	10.0 28.5	8.6 24.5	7.0 •20.2	5.7 16.2	4.0 12.2	3.9 8.2	1.4 3.9	E	15,000	10.0 38.0	8.6 32.6	7.0 26.9	5.7 21.6	4.0 16.3	3.9 11.0	1.4 5.3	]
10,000	8.0 48.5	6.8 41.7	5.6 34.4	4.5 27.6	3.4 20.8	2.3 14.0	1.1 6.7	N	10,000	8.0 37.5	6.8 32.2	5.6 26.6	4.5 21.3	3.4 16.1	2.3 10.8	1.1 5.2	I
5,000	6.5	5.5	4.6	3.7	2.8	1.8	1.0	С	5,000	6.5 28.5	5.5 24.5	4.6 20.2	3.7 16.1	2.8 12.2	1.8 8.2	1.0 3.9	(
S. L.	5.5	4.7	3.9	3.1	2.3	1.5	0.7	Y	S. L.	5.5 30.0	4.7 25.8	3.9 21.3	2.3 17.1	2.3 12.9	1.5 8.7	0.7 4.2	
Gage Pres. Alt. Ft.	400	350	300	250	200	150	100	50	Gage Pres. Alt. Ft.	400	350	300	250	200	150	100	5
40,000	33.2 33.2	28.6 28.5	23.6 23.6	19.0 18.9	14.2 14.2	9.6 9.6	4.6 4.6	E	40,000	33.2 33.2	28.6 28.5	23.6 23.6	19.0 18.9	14.2 14.2	9.6 9.6	4.6 4.6	
35,000	23.6 23.6	20.2 20.3	16.8 16.7	13.4 13.4	10.2 10.1	6.8 6.8	3.4 3.3	M	35,000	23.6 24.0	20.2 20.6	16.8 19.0	13.4 13.7	10.2 10.3	6.8 6.9	3.4 3.3	1
	17.2 17.6	14.8 15.1	12.2 12.5	9.8 10.0	7.4 7.6	5.0 5.0	2.4 2.4	E	30,000	17.2 18.0	14.8 15.5	12.2 12.8	9.8 10.2	7.4 7.7	5.0 5.2	2.4 2.5	
30,000		11.2	9.2	7.4	5.6 7.2	3.8 4.8	1.8 3.3	R	25,000	13.2 17.6	11.2 14.7	9.2 12.5	7.4 10.0	5.6 7.6	3.8 7.1	1.8 2.4	1
30,000	13.2 16.8	14.4	11.9	9.6						/	9.0	7.4	6.0	4.4	3.0	1.4	1
			11.9 7.4 13.3	9.6 6.0 10.7	4.4 8.1	3.0 5.4	1.4 2.6	G	20,000	10.4 31.2	26.8	22.1	17.8	13.4	9.0	4.3	
25,000	16.8 10.4 18.8 8.0	14.4 9.0 16.2 6.8	7.4 13.3 5.6	6.0				G E	20,000	31.2 8.0	26.8 6.8			13.4 3.4 13.0	9.0 2.4 8.8	4.3 1.2 4.2	
25,000 20,000	16.8 10.4 18.8 8.0 22.8 6.4	14.4 9.0 16.2 6.8 19.6 5.4	7.4 13.3 5.6 16.2 4.6	6.0 10.7 4.6 13.0 3.6	8.1 3.4 9.9 2.8	5.4 2.4 6.6 1.8	2.6 1.2			31.2 8.0 30.4 6.4	26.8 6.8 26.1 5.4	22.1 5.6 21.6 4.6	17.8 4.6 17.3 3.6	3.4 13.0 2.8	2.4	1.2 4.2 0.8	1
25,000 20,000 15,000	16.8 10.4 18.8 8.0 22.8 6.4	14.4 9.0 16.2 6.8 19.6 5.4	7.4 13.3 5.6 16.2 4.6	6.0 10.7 4.6 13.0 3.6	8.1 3.4 9.9 2.8	5.4 2.4 6.6 1.8 11.2	2.6 1.2 3.2 0.8	E	15,000	31.2 8.0 30.4 6.4 30.0 5.2	26.8 6.8 26.1 5.4 25.9 4.4	22.1 5.6 21.6 4.6 21.3 3.6	17.8 4.6 17.3 3.6 17.1 3.0	3.4 13.0 2.8	2.4 8.8 1.8	1.2 4.2 0.8 4.2 0.8	-

# MAN HOURS OF AVAILABLE OXYGEN

# BLACK FIGURES INDICATE AUTO-MIX "ON"

RED FIGURES INDICATE AUTO-MIX "OFF"

NOTE: Each turret cylinder, Type F-1, will supply one man for approximately 2 hours at 30,000 feet, 2<sup>1</sup>/<sub>2</sub> hours at 25,000 feet, 3 hours at 20,000 feet.

# AIRCO REGULATORS

TYPE A-12

# PIONEER REGULATORS TYPE A-12

Gage Pres.								
Alt Ft.	400	350	300	250	200	150	100	50
	49.8	42.8	35.4	28.4	21.4	14.4	7.0	E
40,000	49.8	42.8	35.4	28.4	21.2	14.4	6.9	E
	35.4	30.4	25.0	20.2	15.2	10.2	5.0	M
35,000	35.4	30.4	25.0	20.1	15.1	10.2	4.9	IVI
	25.8	22.2	18.2	15.6	11.0	7.4	2.8	E
30,000	26.4	22.6	18.7	15.0	11.3	7.5	3.6	E
	19.8	16.8	13.8	11.2	8.4	5.6	2.8	D
25,000	25.2	21.6	17.8	14.3	10.8	7.2	3.4	R
	15.6	13.6	11.0	8.8	6.6	4.4	2.2	G
20,000	28.2	24.2	19.9	16.0	12.1	8.1	3.9	G
	12.0	10.4	8.6	6.8	5.2	3.4	1.6	E
15,000	34.2	29.4	24.2	19.4	14.7	9.9	4.7	E
	9.6	8.2	6.8	5.4	4.2	2.8	1.4	N
10,000	58.2	50.0	41.2	33.1	25.0	16.8	8.1	IN
	7.8	6.6	5.6	4.2	3.4	2.2	1.2	С
5,000	-	-	-	-	-	-	-	C
	6.6	5.6	4.6	3.8	2.8	1.8	0.8	Y
S. L.	-	-	-	-	-	-	-	I

Gage Pres.								
Alt. Ft.	400	350	300	250	200	150	100	50
	49.8	42.8	35.4	28.4	21.4	14.4	7.0	E
40,000	49.8	42.8	35.4	28.4	21.3	14.4	6.9	E
	35.4	30.4	25.0	20.2	15.2	10.2	5.0	M
35,000	36.0	30.9	25.5	20.5	15.4	10.4	5.0	M
	25.8	22.2	18.2	15.6	11.0	7.4	2.8	E
30,000	27.0	23.2	19.1	15.3	11.5	7.8	3.7	E
	19.8	16.8	13.8	11.2	8.4	5.6	2.8	n
25,000	26.4	22.0	18.7	15.0	11.3	7.6	3.8	R
	15.6	13.6	11.0	8.8	6.6	4.4	2.2	0
20,000	46.8	40.2	33.1	26.6	20.1	13.5	6.5	G
	12.0	10.4	8.6	6.8	5.2	3.4	1.6	E
15,000	45.6	39.1	31.7	25.9	19.5	13.2	6.3	E
	9.6	8.2	6.8	5.4	4.2	2.8	1.4	NT
10,000	45.0	38.7	31.9	25.6	19.3	13.0	6.3	N
	7.8	6.6	5.6	4.2	3.4	2.2	1.2	C
5,000	32.2	29.4	24.2	19.4	14.7	9.9	4.5	С
	6.6	5.6	4.6	3.8	2.8	1.8	0.8	v
S. L.	36.0	31.9	25.5	20.5	15.4	10.4	5.0	Y

Gage Pres. Alt. Ft.	400	350	300	250	200	150	100	50
	24.9	21.4	17.7	14.2	10.7	7.2	3.5	F
40,000	24.9	21.4	17.7	14.2	10.7	7.2	3.5	E
	17.7	15.2	12.5	10.1	7.6	5.1	2.5	3.6
35,000	17.7	15.2	12.5	10.1	7.6	5.1	2.5	M
	12.9	11.1	9.1	7.3	5.5	3.7	1.4	F
30,000	13.2	11.3	9.4	7.5	5.7	3.8	1.8	E
	9.9	8.4	6.9	5.6	4.2	2.8	1.4	D
25,000	12.6	10.8	8.9	7.2	5.4	3.6	1.7	R
	7.8	6.8	5.5	4.4	3.3	2.2	1.1	C
20,000	14.1	12.1	10.0	8.0	6.1	4.1	1.9	G
	6.0	5.2	4.3	3.4	2.6	1.7	0.8	E
15,000	17.1	14.7	12.1	9.7	7.3	4.9	2.4	E
	4.8	4.1	3.4	2.7	2.1	1.4	0.7	N
10,000	29.1	25.0	20.5	16.6	12.3	8.4	4.0	IN
	3.9	3.3	2.8	2.1	1.7	1.1	0.6	C
5,000	-	-	-	-	-	-	-	С
	3.3	2.8	2.3	1.9	1.4	0.9	0.4	Y
S. L.	-	-	-	-	-	-	-	r

Gage Pres.	400	350	300	250	200	150	100	50
Alt. Ft.	400	550	500	290	200	150	100	50
	24.9	21.4	17.7	14.2	10.7	7.2	3.5	Г
40,000	24.9	21.4	17.7	14.2	10.7	7.2	3.5	E
	17.7	15.2	12.5	10.1	7.6	5.1	2.5	3.4
35,000	18.0	15.5	12.8	10.3	7.7	5.2	2.5	M
	12.9	11.1	9.1	7.3	5.5	3.7	1.8	E
30,000	13.5	11.6	9.6	7.7	5.8	3.9	1.9	E
	9.9	8.4	6.9	5.6	4.2	2.8	1.4	R
25,000	13.2	11.0	9.4	7.5	5.7	3.8	1.8	A
	7.8	6.8	5.4	4.4	3.3	2.2	1.1	C
20,000	23.4	20.1	16.6	13.3	10.0	6.8	3.3	G
	6.0	5.2	4.3	3.4	2.6	1.7	0.8	E
15,000	22.8	19.6	16.2	13.0	9.8	6.6	3.2	Е
	4.8	4.1	3.4	2.7	2.1	1.4	0.7	N
10,000	22.5	19.3	16.0	12.8	9.7	6.5	3.1	TA
	3.9	3.3	2.8	2.1	1.7	1.1	0.6	С
5,000	16.1	14.7	12.1	9.7	7.3	4.9	2.3	C
	3.3	2.8	2.3	1.9	1.4	0.9	0.4	Y
S. L.	18.0	15.5	12.8	10.3	7.7	5.2	2.5	I

GROUP III (6 G-1 Cylinders) Bomb Bay, Radio Operator, Side Gunner, Tail Gunner, and Ball Turret Filler

GROUP IV (3 G-1 Cylinders) Radio Compartment (2 Outlets), Side Gunner and Tail Gunner

# **10. COMMUNICATIONS EQUIPMENT**

<u>a</u>. GENERAL. - A radio and interphone system provides for communications between crew members within the airplane; between the airplane and ground stations or other airplanes; reception of weather, range, and marker beacon signals; and ground and interphone identification.

<u>b.</u> INTERPHONE SYSTEM. - Interphone jack boxes are installed at 11 locations in the airplane. With <u>any</u> selector switch in "CALL" position, that station may be heard at all other stations regardless of the position of their selector switches. With all switches adjusted to "INTER," any station may be heard at all other stations. Any station may listen to the liaison, command, or radio compass receiver by adjusting the selector switch to those positions. Any station can modulate the command radio transmitter; however, modulation of the liaison transmitter is provided for pilot, copilot, navigator, and radio operator. All stations are provided with throat microphones, which, with the exception of those for the pilot and copilot, are controlled by "PUSH-TO-TALK" switches on the cords. They are connected to the jack boxes by extension cords.

<u>c</u>. OTHER COMMU-NICATIONS EQUIPMENT. Instruction for operating other communication equipment will be found in the section covering the compartment in which the equipment is located.

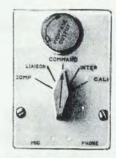


Figure 18 Interphone Jack Box

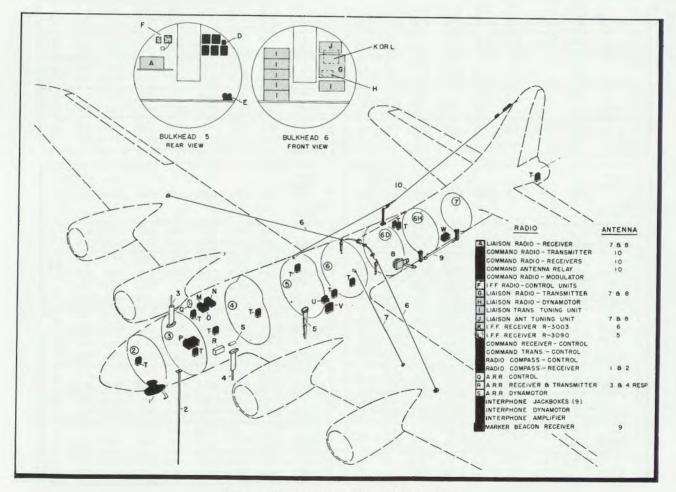
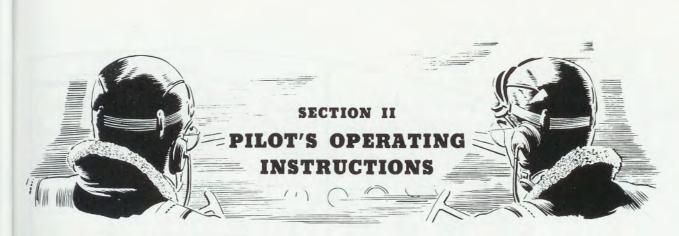
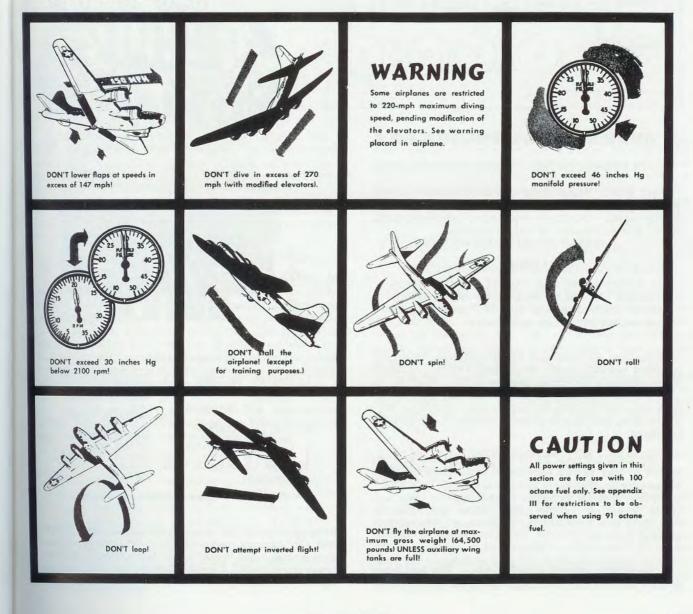


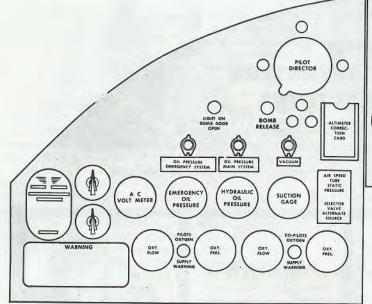
Figure 19 - Communications Equipment



# **1. RESTRICTIONS**



RESTRICTED



# 2. OPERATIONAL EQUIPMENT

a. CENTRAL CONTROL PANEL AND PEDESTAL.

(1) WING FLAP AND LANDING GEAR CON-TROLS. - The wing flap motor is controlled by a toggle switch. The time required to lower the flaps at 147 mph is between 15 and 30 seconds.

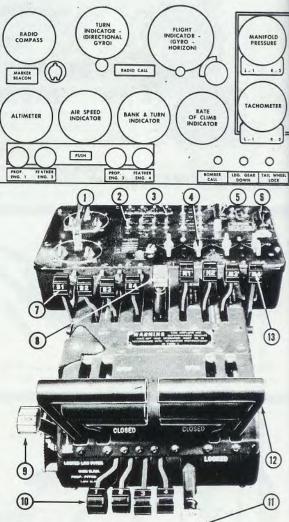
### WARNING

In returning the flap control switches from "DOWN" to "OFF," be sure the toggle switch is not allowed to snap to "UP," resulting in immediate retraction of the flaps.

(2) The main landing wheels and tail wheel are operated simultaneously by a toggle switch. A hinged guard prevents accidental moving of the switch to the "UP" position. Warning that the landing gear is not fully extended is given by a green indicator lamp failing to light, and by a horn which sounds if any throttle is closed.

(3) COWL FLAP VALVES. - Cowl flaps are operated by four valves, each valve controlling the flaps on one nacelle. The valve must be turned to "LOCKED" when the desired position of the flaps is reached. Slight "cracking" of the control valve will result in relatively slow travel of the flaps when close adjustment is desired.

(4) FUEL BOOST CONTROLS. - The fuel boost pumps, operated by four toggle switches, provide fuel

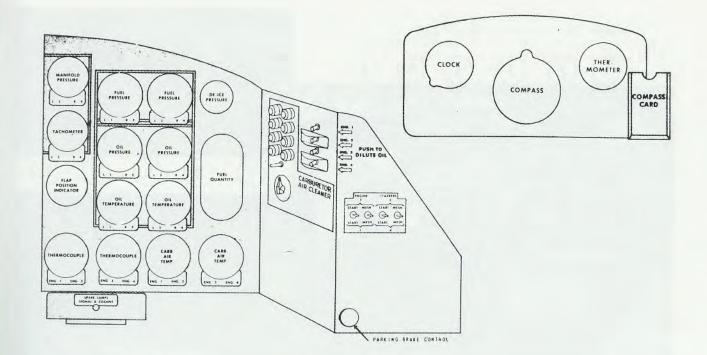


**KEY TO FIGURE 21** 

1.	IGNITION SWITCHES	8.	TURBO AND MIXTURE
	FUEL BOOST PUMP		CONTROL LOCK
	SWITCHES	9.	THROTTLE CONTROL
3.	FUEL SHUT-OFF VALVE		LOCK
	SWITCHES	10.	PROPELLER PITCH
4.	COWL FLAP CONTROL		CONTROLS
	VALVES	11.	PROPELLER PITCH
5.	LANDING GEAR SWITCH		CONTROL LOCK
6.	WING FLAP SWITCH		THROTTLE CONTROLS
7.	TURBO SUPERCHARGER	13.	MIXTURE
	CONTROLS		CONTROLS

Figure 21 - Control Panel and Pedestal

pressure for starting engines and for maximum power, and also prevent vaporization in the lines to enginedriven pumps due to hot fuel or high altitudes. Booster pressure at the No. 3 nacelle fuel strainer also supplies fuel to the priming system.



(5) FUEL SHUT-OFF VALVE SWITCHES. - Solenoid valves, operated by four toggle switches permit immediate shut-off of the fuel at the tank when necessary. Failure of electrical power causes the valves to "OPEN" allowing fuel to flow.

(6) IDENTIFICATION LIGHTS. - Two switches and a keying button permit signalling with any combination of the four lights.

### (7) PROPELLER FEATHERING SWITCHES.

(a) Each propeller is feathered individually by one of the four red push button switches above the central control panel on the instrument panel. Pushing the switch in starts an electric pump in the nacelle which supplies hydraulic power for the feathering operation. When the propeller is fully feathered the push button automatically releases, stopping the pump. To stop the operation before feathering is complete, pull out the switch button by hand.

(b) To unfeather a propeller, the push-button switch must be manually held in the closed position until unfeathering has been accomplished.

### NOTE

When unfeathering a propeller on a cold engine, do not allow the engine speed to exceed minimum governing speed until oil pressure and oil temperature appear satisfactory. Turn off the ignition after feathering any propeller if the engine is to remain inoperative for any length of time. Do not operate more than one propeller feathering switch at a time, except in emergencies. (8) TURBOSUPERCHARGER CONTROLS. - The supercharger regulators are operated by engine oil pressure. With warm oil in the engine the minimum time for operating the regulator control from the low boost to the high boost position should be 5 seconds. If the oil is somewhat cooler than normal engine temperatures, this should be extended to 15 seconds.

### b. COPILOT'S AUXILIARY PANEL.

## (1) CARBURETOR AIR FILTER CONTROLS.

(a) Carburetor air filter valve motors are controlled by one double-throw toggle switch located on the side of the auxiliary panel, forward of the copilot. When all the valves are "ON" permitting only <u>filtered</u> air to enter the supercharger intakes, four <u>amber</u> lamps are lighted. Four <u>green</u> lamps light when the control valves are "OFF," admitting only <u>unfiltered</u> air to the supercharger intakes. Any lamp failing to light indicates that the corresponding valve has not completed its travel to the full open or full closed position.

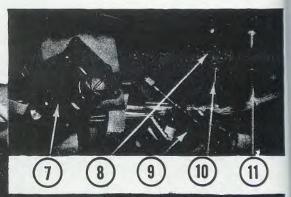
(b) Air filters should be "ON" for <u>all</u> ground operations and for dust conditions up to 8000 feet.

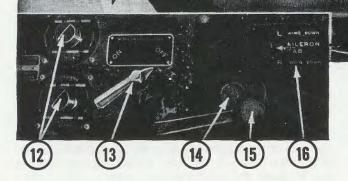
(c) Use of the filters above 8000 feet should be avoided, since operation above that altitude is accompanied by a rise in carburetor air inlet temperature, increasing the possibility of detonation. (This condition is aggravated by abnormally high outside air temperatures.) The turbo also has a tendency to overspeed. IN <u>ALL</u> CASES, THE FILTERS MUST BE CLOSED ABOVE 15,000 FEET! Failure to obFigure 22 - Controls at Pilot's Left

3

5

4





### KEY TO FIGURE 22

	DANCE LIGHT
1	PANEL LIGHT
2.	PANEL LIGHT SWITCH
3.	PILOT'S SEAT
4.	FILTER SELECTOR
	SWITCH
5.	PROPELLER ANTI-ICER
	SWITCH
6.	INTERPHONE JACKBOX
7.	OXYGEN REGULATOR
8.	WINDSHIELD WIPER

- 9.
- 10.
- WINDSHIELD WIPER CONTROLS PORTABLE OXYGEN UNIT RECHARGER WINDSHIELD ANTI-ICER SWITCH WINDSHIELD ANTI-ICER FLOW CONTROL 11.

12.	PROPELLER ANTI-ICER
	RHEOSTATS
13.	SURFACE DE-ICER
	CONTROL
14.	AILERON TRIM TAB

- 15.
- AILERON IRIM IAB CONTROL PILOT'S SEAT ADJUST-MENT LEVER AILERON TRIM TAB INDICATOR CABIN AIR CONTROL SUIT HEATER OUTLET
- 16.
- 17.
- 18.
- VACUUM SELECTOR 19.
- VALVE EMERGENCY BOMB
- 20. RELEASE

serve this precaution may cause detonation and eventual engine failure or sufficient overspeeding of the turbo wheel to cause serious damage.

19

18

20

(d) Filters must be "ON" before landing, since the supercharger control levers were adjusted for a maximum manifold pressure at take-off with the filters "ON." If emergency power is attempted with the filters "OFF," manifold pressures above the rec-ommended maximum of 46 inches will be obtained.

## (2) OIL DILUTION SWITCHES.

ALLEI

Ŕ

(a) Four momentary contact toggle switches on the side of the copilot's auxiliary panel operate solenoid valves in the corresponding nacelle, admitting fuel to the engine oil in line. This operation is performed AFTER an engine run, immediately prior to shutting it off.

(b) Do not dilute oil over 4 minutes. The supercharger controls should be operated continuously during this period to cause diluted oil to flow to the regulators. The propeller control should be moved from extreme increase to extreme decrease rpm slowly several times to fill the propeller dome with diluted oil and prevent sluggish response of the propeller when starting the engine.

(3) STARTER SWITCHES. - Two START and two MESH switches control the engine starters. The START switch energizes the starter motor, rotating the inertia flywheel. The MESH switch engages the starter and engine jaws while the START switch is held on.

### NOTE

Some airplanes have a "START-OFF-MESH" switch for each engine starter.

(4) PARKING BRAKE. - The pull handle at the bottom of the instrument panel sets the copilot's brake metering valves when the foot pedals are depressed. This utilizes the regular braking system; therefore, hydraulic system pressure must be available when the parking brake is required for any length of time. When necessary, set the parking brake handle and pump the system pressure to at least 400 pounds per square inch (minimum pressure for full braking control).

### WARNING

Do not set parking brake while brake drums are hot.

(5) FUEL INDICATOR. - A liquidometer indicator, on the extreme right side of the instrument panel, shows the available fuel supply in any one of the six main fuel tanks. A six-position switch directly below the indicating dial, selects the tank to be checked.

### (6) INSTRUMENT LIGHTING.

(a) Three spot lamps light the instrument panel and a fourth on the ceiling lights the compass panel. Two types of light are available: for flood lighting with visible fluorescent light, rotate the shutter to the left; for ultra-violet activation of the luminous paint on the instrument dials, rotate the shutter in the opposite direction approximately one-quarter turn.

(b) The spot lights are controlled by switches, two on the pilot's instrument panel, and one on the copilot's auxiliary panel. To operate, hold the switch in the "START" position for approximately 2 seconds; then, release the switch allowing it to spring back to the "ON" position.

### c. CONTROLS AT PILOT'S LEFT.

(1) CABIN AIR CONTROL. - Heat and ventilation are controlled by a lever on the side wall. (See figure 11 for operation.)

### CAUTION

Be sure the heater control is "OFF" or "COLD" for all starting and ground operations.

(2) VACUUM PUMP CONTROL. - The "GYRO INSTRUMENTS" selector valve on the side wall permits use of either vacuum pump for the gyro instruments, suction from the other pump being connected to the surface de-icer system. (See figure 13.)

(3) DE-ICER CONTROL. - The de-icer valve on the floor panel controls the operation of the surface de-icer shoes. In the "ON" position it starts the deicer distributor and connects the exhaust pressure from both vacuum pumps, and the suction from one vacuum pump to the distributor valve. In the "OFF" position the distributor motor is turned off and the pressure from the vacuum pumps is bypassed overboard. Suction remains connected to the distributor valve in order to keep the de-icer shoes deflated.

(4) PROPELLER ANTI-ICER CONTROL. - A toggle switch on the side wall controls the two propeller anti-icer pumps. Two rheostats on the floor panel control the speed of the pump motors and may be used to turn the motors off if desired. Normally the rheostats should be left adjusted to a predetermined rate of flow and the pump motors turned on or off by means of the toggle switch.

(5) WINDSHIELD WIPER AND ANTI-ICER. -Windshield wiper and anti-icer controls are on a panel at the pilot's left.

(a) A toggle switch controls the operation of the wiper motor, "OFF," "SLOW," or "FAST," and a circuit breaker is provided to protect motor in case of an overload.

(b) An "ON-OFF" switch controls the alcohol pump, and flow is regulated by a needle valve.

### CAUTION

### Do not operate wipers on dry glass!

(6) EMERGENCY BOMB RELEASE. - An emergency bomb release handle is at the pilot's left. Pulling the handle immediately releases bomb door latches, and continued pulling will release all bombs SALVO the instant the doors are fully open. Bomb bay fuel tanks may be dropped by the release handle.

### d. PILOT'S CONTROL PANEL.

(1) ALARM BELL CONTROL. - A toggle switch operates three alarm bells: one under the navigator's table, one above the radio operator's table, and one in the tail wheel compartment inside the dorsal fin.

(2) PHONE CALL. - Another toggle switch operates four amber phone call signal lamps: three ad-

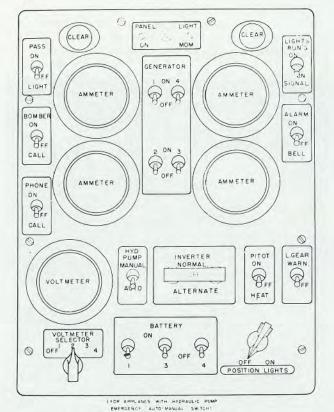


Figure 23' - Pilot's Control Panel

jacent to the alarm bells, and the fourth at the tail gunner's right.

(3) BOMBARDIER CALL. - A toggle switch on the pilot's control panel operates an amber call lamp on the bombardier's control panel; and a toggle switch on the bombardier's panel operates an amber call lamp on the pilot's instrument panel.

(4) LANDING GEAR WARNING HORN RESET. -A switch on the control panel permits the silencing of the landing gear warning horn when it is desired to continue flight with one or more throttles closed. Operation of this switch does not prevent repetition of the warning for subsequent closing of any throttle while the landing gear is up. The switch is reset when the throttles are opened.

(5) INVERTER SWITCH. - A double-throw switch selects which of two inverters is to be used: in "NORMAL" position the left inverter is on; in "AL-TERNATE" position the right inverter is on.

(6) HYDRAULIC PUMP SWITCH. - With this switch in the "AUTO" position, pressure is automatically regulated between 600 and 800 pounds. In case of failure of the automatic pressure, cut-out pressure may be maintained by holding the switch in the "MANUAL" position.

### WARNING

In case of leakage stop the pump to prevent loss of fluid. Remove switch fuse at station 4 fuse panel or disconnect receptable at switch. In some airplanes the hydraulic pump is controlled by an "ON-OFF" switch.

### (7) CARBURETOR ANTI-ICER.

(a) Carburetor icing may occur in outside air temperatures up to  $50^{\circ}$ F ( $10^{\circ}$ C), with humidity greater than 50 percent. Ice formation in the carburetor adaptor or at the fuel nozzle, indicated by engine roughness and a drop in manifold pressure, may be eliminated by moving the intercooler shutters to "HOT," or by setting the turbos "FULL ON" and adjusting power with the throttles. Apply full power and climb above icing condition if possible. Below 15,000 feet the air filters may be opened to provide a further increase of carburetor air temperature.

### WARNING

### DO NOT EXCEED ALLOWABLE LIMITS FOR MANIFOLD PRESSURE, ENGINE RPM, AND CYLINDER HEAD TEMPERATURE.

(b) Some airplanes are equipped with carburetor anti-icers consisting of pumps controlled by toggle switches on the pilot's control panel. One supplies inboard engines; the other, outboard engines. Approximately 4 gallons of isopropyl alcohol per hour are sprayed into the pressure duct of each carburetor, the entire system sustaining a total of 2 hours operation. This equipment should be used as follows:

1. To start an engine after severe carburetor icing or engine stoppage.

2. To determine cause of power loss or engine roughness; if adjustment of engine controls and use of

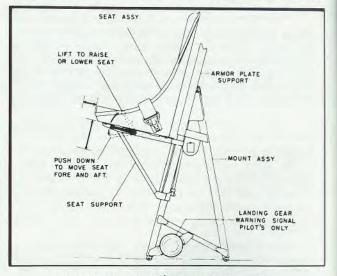


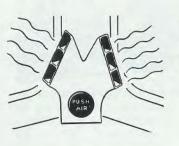
Figure 24 - Pilot's Seat Adjustment

alcohol system does not relieve condition, it can be assumed the trouble is not caused by icing.

3. To clear out engines quickly after a glide at low power through icing conditions.

4. To obtain full power under icing conditions.

5. As an alternate method of ice elimination if use of fuel turbo or carburetor air filter is prohibited.



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igine se of e. DEFROSTER CONTROL. - Hot air for defrosting the pilot's and copilot's windshields is controlled by a red button in the vee of the windshield.

### f. TRIM TAB CONTROLS.

(1) Complete aileron tab travel requires about 3-3/4 turns of the knob located on the pilot's floor panel.

(2) Complete rudder tab travel requires about seven turns of the wheel located on the floor in front of the control pedestal.

(3) The elevator trim tab wheel on the left side of the control pedestal requires about six turns for complete travel. It has a friction brake to prevent creeping.

### g. LOCKS.

(1) AILERON LOCK. - The aileron is locked in neutral position by a pin which is manually inserted in a hole in the left control column, holding the center spoke of that wheel in a padded slot. The pin is clipped to the pilot's control column when not in use.

(2) RUDDER AND ELEVATOR LOCK. - The rudder and elevator locking lever operates by cable control to place a pin in a socket on a segment at each of the control quadrants. The locking lever, which is recessed into the floor aft of the engine control pedestal, is locked in either the "UP" or "DOWN" position. The lever may be moved to the "UP" or "LOCKED" position, regardless of the attitude of the control surfaces. Under this condition, the control surfaces will automatically lock when the rudder is in the "NEUTRAL" position and the elevator is in the "DOWN" position.

(3) TAIL WHEEL LOCK. - The tail wheel locking lever operates a single cable to retrace a springloaded locking pin from a socket in the treadle. The locking lever which is recessed into the floor aft of the control pedestal, latches in the "UP" position only and may be moved into the "DOWN" position regardless of the attitude of the tail wheel, which will lock when centered. To release the locking handle, press the knob on the end of it. A red signal light on the pilot's instrument panel is "OFF" when the tail wheel is locked.

h. AUTOMATIC FLIGHT CONTROL EQUIPMENT. The automatic flight control panel is located on the front of the control pedestal. To engage A.F.C.E.:

(1) Throw "ON" master and stabilizer switches.

(2) CAREFULLY TRIM AIRPLANE FOR STRAIGHT AND LEVEL FLIGHT.

(3) Turn "ON" tell-tale lights.

(4) After master and stabilizer switches have been "ON" for 10 minutes, throw "ON" PDI and servo switches.

(5) Center PDI by turning plane and resuming straight and level flight.

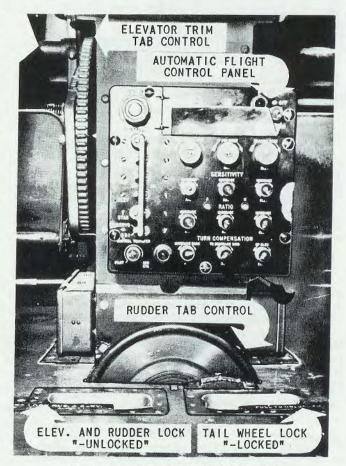


Figure 25 - Lower Control Pedestal

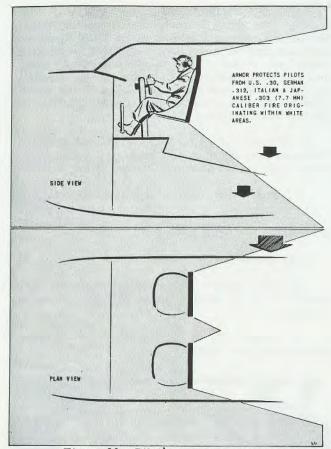


Figure 26 - Pilot's Armor Protection

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

(7) With wings level, adjust aileron centering knob until both aileron tell-tale lights go "OUT." Immediately throw aileron switch "ON."

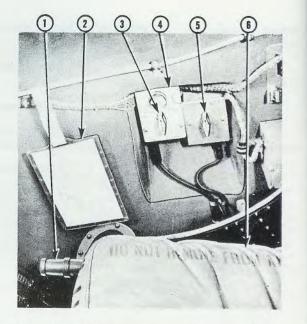
(8) With airplane flying level, adjust elevator centering knob until both elevator tell-tale lights go "OUT." Immediately throw elevator switch "ON."

(9) Observe PDI, artificial horizon, and rate-ofclimb or altimeter instruments. Then carefully retrim all centering knobs, until ship is flying as straight and level as possible, with PDI on "CENTER."

(10) With autopilot engaged, all course corrections must be made with turn control ONLY. Always turn knob with a slow steady movement.

### WARNING

Do not engage A.F.C.E. motors until all "tell-tale" lights are off.



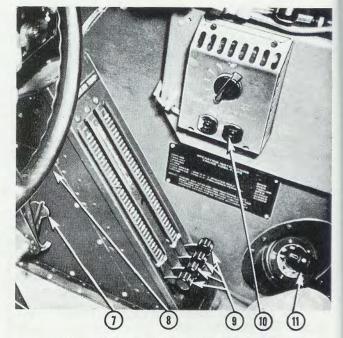


Figure 27 - Controls at Copilot's Right

## KEY TO FIGURE 27

	HYDRAULIC HAND PUMP	6. COPILOT'S SEAT 7. RUDDER PEDAL ADJUSTME	NT
2.	CHECK LIST	7. RUDDER FEDAL AUJUSTAL	
3.	INTERPHONE SELECTOR	8. COPILOT'S CONTROL	
	SWITCH	WHEEL	
4.	INTERPHONE JACKBOX	9. INTERCOOLER CONTROLS	
5.	FILTER SELECTOR	10. SUIT HEATER OUTLET	
	SWITCH	11. ENGINE PRIMER	

# i. CONTROLS AT COPILOT'S RIGHT.

(1) PRIMER. - The cylinder head primer has four positions corresponding to the four engines, and an "OFF" position. The primer handle is locked only in the "OFF" position. To operate, push the handle down, turn the valve to the engine position required, and then withdraw the handle and pump the charge to the cylinder.

### IMPORTANT

Overpriming will result if the handle is left in the withdrawn position. Therefore, each priming operation must terminate with the handle returned to the locked position.

(2) CARBURETOR TEMPERATURE CONTROLS. The intercooler shutters are controlled from a stand in front of the copilot. Each cable is operated by a slide latching in any desired position. To release the latch, pull handle out.

(3) HYDRAULIC HAND PUMP. - The hydraulic hand pump is manually operated to furnish pressure in case of failure of the electric pump.

(4) KEY CASE. - A key case on the side wall contains two keys which fit all door locks in the airplane.

<u>j.</u> RUDDER PEDAL ADJUSTMENT. - Rudder pedal tilt may be varied to any of five positions by a locking pin and sector at the outside corner of each pedal.

### k. PILOT'S COMMUNICATIONS CONTROLS.

### (1) GENERAL.

(a) All communications equipment may be operated to some extent from the pilot's compartment. Receiver and transmitter frequency selection may be controlled with the exception of the liaison equipment which must have both its transmitter and receiver frequencies set by the radio operator.

### CAUTION

For normal operation of all communications equipment, the filter selector switch should be set at "BOTH." To receive the radio range without possibility of voice interference, set the selector switch to "RANGE." To receive voice without range interference, set selector switch to "VOICE."

### NOTE

The head set extension cord should be plugged into the filter selector control box as shown in figure 28 and not into the interphone jackbox or the receiver control box.

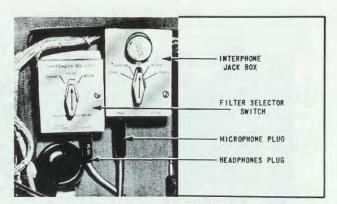


Figure 28 - Microphone and Headset Plugs

### IMPORTANT

When the throat microphone is being used for either interphone or • radio communication, it must be adjusted so that its two circular elements are held snugly against each side of the throat just above the "Adam's apple." SPEAK SLOWLY, DISTINCTLY, AND IN A NORMAL TONE OF VOICE. Shouting will seriously distort the voice signal.

(b) A possible means of limiting noise level in all radio equipment, caused by adverse conditions such as rain, snow, ice, or sand, is to direct the radio operator to proceed as follows:

1. Place the antenna change-over switch to the fixed antenna position.

 $\underline{2}$ . Release approximately 50 feet of the trailing wire antenna.

 $\underline{3}$ . Ground the trailing wire antenna post directly to the airplane structure (for instance, the metal support for the transmitter tuning units).

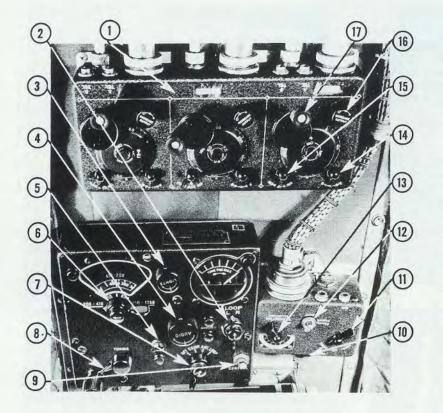
### CAUTION

Do not extend retractable rod antenna at speeds greater than 240 mph.

(2) INTERPHONE EQUIPMENT RC-36. - An interphone jack box is provided for both pilot and copilot. Refer to section I, paragraph 10.

(3) COMMAND SET SCR-274-N. - The command set is designed for short-range operation and is used for communicating with nearby aircraft for tactical purposes and with ground stations for navigational and traffic control purposes.

(a) RECEIVING. - The interphone jack box (figure 22) switch must first be placed in the "COMMAND" position. The receiver control box (figure 29) is divided into three sections, each controlling the par-



ticular receiver to which it is connected. Reception of a signal of a specific frequency as indicated on the dial is accomplished by the use of the section of the receiver control box which controls the particular receiver involved. The desired receiver is turned on and off by a switch in the left forward corner of the control box section used. This switch, in addition to having an "OFF" position, has two selective posi-tions marked "CW" and "MCW," which indicate the type of signal which is to be received. The "A-B" switch should be left in the "A" position at all times and need not be turned off when the receivers are turned off.

### NOTE

When tuning receiver for a definite frequency, always turn diala little to each side of the frequency calibration mark to find the point where the signal is the strongest.

### (b) TRANSMITTING.

1. Before transmitting, adjust radio receiver to the same frequency as the station with which you desire to talk, and listen in to be sure that the operator is not talking to someone else. If the station is transmitting, take advantage of the opportunity to more accurately set the airplane receiver on the assigned frequency, and when the other operator is finished, proceed with your transmission.

### KEY TO FIGURE 29

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- COMMAND RECEIVER 1.
- CONTROL UNIT 2.
- LOOP CONTROL SWITCH LIGHT CONTROL SWITCH 3.
- 4. VOLUME CONTROL
- 5. CONTROL INDICATOR
- LAMP
- 6. BAND SELECTOR KNOB
- 7. POWER SWITCH
- 8. TUNING CRANK
- 9. CONTROL PUSH BUTTON.
- TRANSMITTING KEY 10.
- TRANSMISSION SELECTOR 11. SWITCH (TONE-CW-VOICE)
- 12. TRANSMITTER POWER SWITCH
- 13. CHANNEL SELECTOR SWITCH
- A-B CHANNEL SWITCH 14.
- 15. SIGNAL SELECTOR SWITCH
- 16. **VOLUME CONTROL**
- 17. TUNING CRANK

Figure 29 - Radio Controls, Pilot's Compartment Ceiling

2. Throw the "OFF-ON" switch (figure 29) on the transmitter control box to the "ON" position. Select type of transmission desired with switch marked "TONE -CW -VOICE." With the switch in the "VOICE" position, the microphone from any interphone jack box switched to "COMMAND" position will be operative and voice will be transmitted when the push-to-talk button on the control wheel is pressed. With the switch turned to the "CW" position, a continuous wave, or unmodulated signal, will be transmitted and with the switch in the "TONE" position, a modulated tone signal is transmitted. Greatest effective range can be obtained on "CW." Range is most limited when operating on "VOICE."

3. On both the "CW" and "TONE" positions, the microphones are inoperative, and signalling by code is accomplished by a key which is located on the forward end of the transmitter control box.

### NOTE

To reduce battery drain and to increase dyna-motor life, the "TONE-CW-VOICE" switch should be left on "VOICE" unless continued use on "CW" or "TONE" is expected.

### (4) RADIO COMPASS SCR-269.

(a) Set the interphone jack box switch (figure 22) e "COMP" position, if aural reception of the to the

radio compass receiver is desired. If only visual indication is desired, the switch does not have to be set in the ''COMP'' position.

(b) The radio compass equipment is designed to perform the following functions:

<u>1</u>. Aural reception from the fixed antenna or from the rotatable loop. For signal reception during interference caused by precipitation static or proximative of signals, the loop will prove superior.

 $\underline{2}$ . Aural-null directional indication of an incoming signal with the loop only in use.

<u>3</u>. Visual unidirectional indication of an incoming signal.

(c) The receiving unit is turned on or off by a switch on the face of the remote control box, which, in addition to having an "OFF" position, has three other positions: "COMP," "ANT," and "LOOP."

<u>1</u>. With the switch in the "COMP" position, both the rotatable loop and the fixed antenna are in use.

2. In the position marked "ANT" only the fixed antenna is in use.

3. With the switch turned to the "LOOP" position, only the rotatable loop is in use.

(d) If the green indicator on the face of the control box does not light, depress button marked "CON-TROL' to establish control of the set at this unit. Select frequency band desired as indicated in kilocycles on the face of control box and tune by use of the crank to the desired frequency. The loop may be rotated to any position as indicated on the radio compass azimuth indicator by use of switch marked "LOOP L-R." (See figure 29.) This particular operation is possible only when operating on "LOOP" position of the selector switch. During periods of severe precip-itation static, operate on "LOOP." For best aural reception rotate the loop by means of the "LOOP L-R" switch until a maximum signal is obtained. Proper volume may be obtained by use of knob marked "AUDIO."

(5) MARKER BEACON EQUIPMENT RC-43. -Since the operation of the marker beacon equipment is fully automatic, no manual operation is necessary. As the ship passes over a fixed point from which a marker beacon signal is being transmitted, the signal is picked up by the receiver, causing the indicator to flash on, showing the pilot that he has passed over a marked beacon. The marker beacon equipment is simultaneously turned on when the radio compass is put into operation. The position of the interphone jack box switch does not affect the operation of the marker beacon equipment.

### (6) LIAISON SET SCR-287.

(a) The liaison equipment is to be used for longrange communication. Limited control is available to the pilot. The type of reception and transmission desired must be forwarded to the radio operator, who will in turn put the radio equipment in operating condition.

(b) Set the interphone jack box switch in "LIAI-SON" position to receive or transmit with the liaison equipment.

(c) It is possible for all crew members to receive on this equipment, but only the pilot, copilot, and radio operator may transmit.

(7) RADIO SET SCR-535 (IFF). - The remote "OFF-ON" switch for this equipment is located on the top of the instrument panel hood. The two destroyer push-button switches are located to the left of the "OFF-ON" switch. The destroyer switches should be used only when it is contemplated abandoning the airplane over enemy territory. When both destroyer push buttons are pressed simultaneously, a detonator is set off in the receiver which is located in the radio compartment. The explosion of the detonator will destroy the receiver internally. No damage should be done to either the airplane or personnel at the time of destruction of the set, but bodily contact with the receiver at the time of detonation should be avoided.

### NOTE

Regeneration adjustment of the IFF set must be made on the ground prior to flight in order to insure correct operation of the equipment.



- 3. FLIGHT INSTRUCTIONS.
  - a. BEFORE ENTERING PILOTS' COMPARTMENT.
    - (1) Check weight and balance data, form F, AN 01-1-40.
    - (2) Check forms 1 and 1A and sign exceptional release if necessary.
    - (3) Check flight engineer's report of preflight inspection.
  - b. ON ENTERING PILOTS' COMPARTMENT. Check for all flights:

### PILOT

### COPILOT

- (1) Emergency ignition switch "ON."
- (2) Check each battery switch separately with either inverter on.
- (3) Master battery switches "ON."
- (4) Turn hydraulic pump switch "ON." If it is momentary "AUTO-MANUAL" type, it should remain in "AUTO" unless the pump fails to operate.
- (5) Landing gear control switch in neutral.
- (6) Flap control switch in neutral.
- (7) Have copilot set parking brake.
- (8) Ascertain free movement of flight control column, wheel and rudder pedals to the extremities of their operating range.
- (7) Set parking brake at command of pilot.

# c. SPECIAL CHECK FOR NIGHT FLIGHTS.

- (1) Master battery switches "ON."
- (2) Turn control panel lights "ON."
- (3) Turn side control panel lights "ON."
- (4) Test operate the instrument panel lights.
- (5) Test operate the landing lights.

### WARNING

Do not permit lights to burn more than 5 seconds during test.

- (6) Test operate the identification lights.
- (7) Test operate the passing lights.
- (8) Test operate the position lights.



### d. STARTING ENGINES.

### PILOT

 If the engines have stood for over 2 hours, have the propellers turned over three complete revolutions by hand. Be sure ignition switches are "OFF."

- (4) Cabin heat control in "OFF" or "COLD" position.
- (5) Move turbo controls to "OFF."
- (6) Post fire guard.
- (7) Open all fuel shut-off valves.
- (8) Crack throttles (approximately 1000 rpm).
- (9) Direct copilot to open carburetor air filters.
- (10) Set propeller controls for high rpm.
- (11) Turn magneto switch for engine affected to "BOTH."
- (13) Direct copilot to start engines. Recommended starting order is 1-2-3-4.

### COPILOT

- (2) Order flight engineer to open manual shutoff valve and set selective check valve to "SERVICING" position.
- (3) Check hydraulic pressure, both gages (600 to 800 pounds per square inch). Order flight engineer to close manual shut-off valve. Set selective check valve to "NORMAL" position.
- (4) Open cowl flaps and return valves to "LOCKED" position.
- (5) Fuel transfer valves and pump switch should be "OFF." Have flight engineer check them.
- (6) Set fire extinguisher selector valve (if installed) to engine being started.
- (7) Move intercooler controls to "COLD."
- (8) Turn carburetor air filters "ON" when directed by pilot.
- (9) Move mixture controls to "ENGINE OFF."
- (10) Set primer to "OFF" position.
- (11) Start No. 3 fuel booster pump for primer pressure. It should be 6 to 8 pounds per square inch.
- (12) Start fuel booster pump for engine affected.
- (13) Start engines when directed by pilot.
  - (a) OLD-TYPE STARTER.
  - 1. Move starter switch of engine affected to "START" position and hold for approximately 30 seconds.
  - 2. While starter switch is in "START" position, unlock primer, set to engine affected, and expel air from line by pumping until a solid charge of fuel is obtained.
  - 3. When directed by pilot, move starter switch to "MESH" position.
- (b) NEW-TYPE STARTER.
- 1. Throw "START" switch to engine affected and energize for 12 seconds.

### PILOT

(14) When the engine fires, move the mixture control to "AUTOMATIC RICH."

### CAUTION

Do not advance the throttles as lean mixture and backfire hazard will result.

### COPILOT

- 2. Throw "MESH" switch while "START" switch is held on.
- (14) When the starter is meshed, prime with quick strokes (to atomize the primer charge) until the engine fires.
- (15) If necessary to prevent engine from quitting due to lack of fuel, pump primer with several slow strokes.

### CAUTION

Return primer to "OFF" position.

- (16) Shut off booster pump if fuel pressure from engine pump remains steady.
- (17) If engine stops, return mixture control to "ENGINE OFF" immediately, cut ignition switch and repeat the starting procedure.
- (18) After engine starts, check for indication of oil pressure. If no pressure is indicated within 1/2 minute, notify pilot; move mixture control to "ENGINE OFF" when directed by pilot.
- (19) When directed by pilot, stop engine by moving mixture control to "ENGINE OFF."
- (20) Close cowl flaps if the fire is in nacelle 3 or 4.
- (21) Pull fire extinguisher charges (if available) at command from pilot.

### NOTE

If engine accessory cowling is not installed, it is unlikely that the fire can be extinguished by the CO<sub>2</sub> system. External fire extinguishers must, therefore, be used.

- (18) If no oil pressure is indicated within 1/2minute after starting, direct copilot to stop engine with mixture control. Cut ignition and investigate.
- (19) In case of fire in the exhaust system, run up the engine in an attempt to blow out the fire. If this fails, direct copilot to stop the engine.
- (20) Close cowl flaps if the fire is in nacelle 1 or 2.
- (21) If fire is not smothered by closing the cowl flaps, close fuel shut-off valve, stop booster pump, and direct copilot to pull fire extinguisher, both charges if necessary.
- (22) Before resuming operations after fire, be sure that CO<sub>2</sub> cylinders are replaced.

### e. ENGINE WARM-UP.

### PILOT

- When oil temperature begins to rise and oil pressure is 50 pounds per square inch, open throttles 1000 to 1250 rpm.
- (2) When engines are thoroughly warmed, the rpm may be increased for instrument check.

### CAUTION

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

6 lb/sq in.
0 lb/ sq in.
$8^{\circ}C$ (190.4°F)
05°C (401°F)

### f. EMERGENCY TAKE-OFF.

(1) If the airplane has been on the "alert," the engines will have been started, and will be warm and ready for take-off by the time the flight crew gets within the airplane. The pilot will proceed with a routine take-off, being careful not to exceed 46 inches Hg manifold pressure.

(2) If an emergency take-off is necessary with cold engines, due to the lack of a ground crew, the following procedure should be followed:

(a) Start engines, using oil dilution as soon as engines fire in order to get minimum oil pressure of 70 pounds per square inch.

(b) Fuel pressure should be at least 12 pounds per square inch.

(c) Set wing flaps for take-off, leave cowl flaps less than 1/3 open to expedite warm-up. Proceed with take-off. Do not exceed 46 inches Hg manifold pressure.

### g. ENGINE AND ACCESSORIES GROUND TEST.

### PILOT

- (1) Direct gunner to secure lower turret with guns pointing rearward.
- (2) Set altimeter.
- (3) A.F.C.E. switches "OFF," all knobs on control panel, "POINTERS-UP," turn control, "CENTERED."

### COPILOT

- (1) See that all doors and hatches are closed.
- (2) Hydraulic pressure should be 600 to 800 pounds per square inch on each gage.
- (3) With ignition and battery switches "ON," hydraulic switch in "AUTO," warning and indicator lights should be:

Tail wheel unlocked - On (red) Landing gear - On (green) Hydraulic pressure: Service - Off. Emergency - Off. Vacuum - Off.

(4) Set propeller controls for high rpm and lock.

(4) Check all fuel quantities.

COPILOT

- Notify pilot when oil temperature begins to rise and oil pressure is 50 pounds per square inch.
- (2) Notify pilot when maximum temperature and pressure values are reached.

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### PILOT

(5) Turn command radio on.

- (6) Flight controls unlocked. Move them to the limits of their ranges to insure free operation.
- (9) Contact control tower for clearance.
- (10) Signal ground crew to remove wheel chocks.
- (11) With mixture controls in the "AUTOMATIC RICH," check ignition at 1900 to 2000 rpm.

### NOTE

The rpm drop should not exceed 100 when switching from two magnetos to one.

- (12) Check propeller governor at 1500 rpm by moving control to low rpm. When rpm decreases to approximately 1100, return control to high rpm position and lock.
- (13) Run up each engine individually and adjust supercharger regulator control stops for 46 inches Hg manifold pressure at full throttle and 2500 rpm.

### IMPORTANT

This adjustment must be made as quickly as possible and must not exceed 1/2 minute for each engine.

- (14) Set trim tabs in neutral.
- (15) Check flight controls.

### WARNING

Operate to full extent of their ranges to insure free and proper movement.

(16) Close window.

### COPILOT

- (5) Set intercooler controls to "COLD" unless icing conditions exist.
- (6) Cowl flaps should be open. Check visually.
- (7) Wing flaps up. Switch in neutral.
- (8) Tail wheel unlocked. Locking handle should be in up position.
- (11) Check the following during ignition check:

<u>Fuel Pressure</u>: Desired - 12 to 16 lb/sq in. Maximum - 16 lb/sq in. Minimum - 12 lb/sq in.

<u>Oil Pressure</u>: Desired - 75 lb/sq in. 80 lb/sq in. 70 lb/sq in.

- <u>Oil Temperature</u>: Desired 70<sup>o</sup>C (158<sup>o</sup>F) Maximum - 88<sup>o</sup>C (190<sup>o</sup>F) Minimum - 60<sup>o</sup>C (140<sup>o</sup>F)
- Cylinder Temperature: 205°C (401°F) Maximum
- (13) Notify pilot if any temperature or pressure reading is not satisfactory.

(15) Turn all fuel boost pumps "ON."

### (16) Close window.

h. TAXYING.

### PILOT

(1) Inboard throttles may be locked for taxying with outboard engines.

### COPILOT

(1) Notify pilot if:

Cylinder temperature exceeds 205°C (401°F). Oil pressure exceeds 75 pounds per square inch or is less than 15 pounds per square inch for idling engines.

<u>Oil inlet temperature</u> exceeds 70°C (158°F). <u>Fuel pressure</u> is over 16 pounds per square inch or under 12 pounds per square inch.

(2) Lock tail wheel (warning lamps off) after airplane has taxied to take-off position.

i, TAKE-OFF.

### PILOT

- (1) Refer to the Take-Off Chart, Appendix II.
- (2) Turn generator switches "ON."
- (3) Open throttles slowly to FULL THROTTLE
   (3 to 5 seconds). Hold three-point position until airplane leaves ground.
- (4) With a runaway turbo or propeller, follow the following instructions:
- (a) THROTTLE BACK FIRST.
- (b) Move turbo control to "OFF."
- (c) If necessary, set propeller controls (figure 40-3) in "LOW RPM." There is small likelihood of a runaway turbo, but the danger is great if it occurs during a take-off. The pilot MUST be alert during the take-off to note immediately and correct any excessive manifold pressure.
- (5) When airplane is clear of the ground, direct copilot to retract the landing gear.
- (6) Accelerate to speed for cruising climb.

COPILOT

- (5) Retract landing gear at command from pilot.
- (6) Cylinder head temperatures must not exceed  $260^{\circ}C$  ( $500^{\circ}F$ ) (5 minutes maximum).
  - Oil pressure desired 80 lb/sq in. Oil Temp desired  $70^{0}C~(158^{0}F)$  Fuel Pressure 12 to 16 lb/sq in.
- (7) Adjust intercooler control to "COLD" unless icing conditions prevail.

## j. ENGINE FAILURE DURING TAKE-OFF.

# PILOT

- (1) Failure of an engine during take-off may not be noticeable immediately except for a resultant swing. If, therefore, a swing develops, and there is room to close the throttles and pull up, this should be done.
- (2) If it is necessary to continue with the take-off, eventhough one engine has failed, hold the airplane straight by immediate application of rudder. Gain speed as rapidly as possible. See that the landing gear is up, or coming up, and feather the propeller of the dead engine. Retrim as necessary.
- k. CLIMB. (Refer to climb chart, Appendix II.)

# PILOT

- (1) Reduce manifold pressure with supercharger controls.
- (2) Reduce rpm as required for climb.
- (3) Make a visual check of engines 1 and 2.
- (4) Adjust trim tabs as required.
- (5) Order copilot to set carburetor air filter switch to "FILTER OFF" at 8000 feet unless dust conditions are found above that altitude.

### WARNING

Switch must never be left in the "FILTER ON" position above 15,000 feet.

### 1. LEVEL FLIGHT.

# PILOT

- (1) Refer to Cruising Control Charts, Appendix II.
- (2) Use full throttle and set power with turbo regulators at all altitudes.

- COPILOT
- (1) Press proper propeller feathering switch when ordered by pilot.

### COPILOT

- (2) Adjust cowl flaps as required to maintain proper cylinder head temperature.
- (3) Make a visual check of engines 3 and 4.
- (5) When ordered by pilot, move switch to "FIL-TER OFF.

### COPILOT

(2) Set mixture controls to "AUTOMATIC LEAN," below 2100 rpm, 30 inches Hg manifold pressure.

### CAUTION

Do not exceed 30 inches Hg manifold pressure below 2100 rpm.

### CAUTION

Instantaneous load factors above the allowable can be reached very easily with rough elevator control movements. In turbulent air or in combat maneuvering, corrections should be made very smoothly,

## PILOT

### m. PROPELLER FEATHERING.

### PILOT

- (1) TO FEATHER A PROPELLER.
- (a) Notify copilot to stop engine affected.
- (b) Turn automatic flight control equipment switches "OFF."
- (c) Notify copilot to press proper feathering switch.
- (d) When propeller stops, turn proper ignition switch to "ENGINE OFF."
- (e) Close throttle.
- (f) Adjust trim tabs as required.
- (g) Turn automatic flight control equipment switches "ON."
- (<u>h</u>) If the engine is not to be restarted, order engine fuel transferred to other tanks as required.
- (i) When No. 2 engine is affected:
- 1. The glycol pump is inoperative. If cold air is not desired in the cabins, shut off heating and ventilating system by moving control handle fully aft.
- When one vacuum pump is inoperative, (engine No. 2 or 3): Set vacuum pump selector ("GYRO INSTR.") valve to the <u>other</u> vacuum pump. (De-icer pressure will thus be reduced and de-icer vacuum will not be available. De-icer system will, therefore, operate inefficiently.)
- (2) TO UNFEATHER A PROPELLER.

### PILOT

- (a) Notify copilot which engine is to be restarted.
- (b) Turn automatic flight control equipment switches "OFF."

### COPILOT

- (3) Adjust cowl flaps as required to maintain proper cylinder head temperatures.
- (4) Stop booster pumps until needed (which will be above 15,000 feet).
- (5) Beginflight performance log and made entries in Form I as required.

### COPILOT

- (a) Move mixture control of affected engine to "ENGINE OFF."
- (b) Stop the booster pump if running.
- (c) Press proper feathering switch.
- (d) Close cowl flaps of engine affected.

(h) Assist aerial engineer to transfer fuel from the dead engine tank.

### COPILOT

- (a) Set propeller control to "LOW" rpm.
- (b) Set intercooler control to "HOT" position.

### PILOT

- (d) Crack proper throttle to 1000 rpm approximately.
- (e) Turn ignition switch to "BOTH."
- (f) Press proper feathering switch and hold it closed until engine speed reaches 1000 rpm.
- (g) Open throttle slowly to 1200 rpm.
- (h) Adjust trim tabs as desired.
- (i) Maintain 1200 rpm until notified by copilot that oil temperature is  $70^{\circ}C$  (158°F).
- (k) Synchronize manifold pressure and rpm with other engines.

### CAUTION

Above 15,000 feet, power must be adjusted with turbo control - full throttles.

- (1) Adjust trim tabs as required.
- (m) Turn automatic flight control equipment switches "ON."

### NOTE

When No. 2 propeller is unfeathered, the pilot may turn on the heating and ventilating system by moving the control to any position between one-half and fully forward.

### n. GENERAL FLYING CHARACTERISTICS.

### (1) GENERAL STABILITY.

(a) Increasing the power on the inboard engines causes the airplane to become slightly tail heavy, while a change of power on the outboard engines has no appreciable effect upon the trim.

(b) Closing the cowl flaps on the inboard engines causes a similar tail heaviness, but cowl flaps on the outboard engines have a negligible effect upon the trim.

(c) With the airplane properly trimmed for a landing with power off and flaps down, the pilot may apply power, throw the flap switch into the up position and go around with no change in trim tab setting

### COPILOT

- (c) Close cowl flaps.
- (d) Start proper booster pump (if above 15,000 feet).
- (e) Check fuel quantity in proper tank.
- (f) When engine speed reaches 1000 rpm, move mixture control from "ENGINE OFF" to "AUTOMATIC RICH."
- (i) Notify pilot when oil temperature reaches  $70^{\circ}C$  (158°F).
- When cylinder head temperature reaches 205<sup>o</sup>C (401<sup>o</sup>F), open cowl flaps as required for continuous operation.
- (k) Adjust intercooler control as required.

if a second approach is necessary. The flaps retract at a satisfactorily slow rate.

(2) TAKE-OFF. - During the take-off run, directional control should be maintained with rudder movement and throttles, differential throttling being done with the outboard engines as much as possible.

(3) CLIMB. - The airplane will require very little elevator trim and the elevator control pressure will build up rapidly as the climbing speed is reduced below normal.

(4) LEVEL FLIGHT. - In normal flight, turns can be made very smoothly with aileron control only. In instrument flight, the pilot should pay special attention

to holding the wing level, because the directional stability produces a noticeable turning tendency with one wing down.

### WARNING

Care should be taken to avoid excessive use of the ailerons.

### (5) ROUGH AIR OPERATION.

(a) The ailerons and rudder can be used without concern regarding excessive loads. It is almost impossible to damage the system without a deliberate attempt to do so. The forces required are small enough and the resultant responses large enough to maintain ample control of the airplane.

(b) In the case of the elevators, however, care must be exercised to assure smooth operation. In thunderstorms, squalls, and in or near extremely turbulent cumulous clouds, it is possible to develop excessive load factors with the elevators unless proper care is exercised.

(c) Operation in rough air should be made on the basis of holding constant the air speed with the elevator. Corrections for changes in altitude must be done with power, and for very rapidly rising air currents, it may be necessary to lower the landing gear.

(d) The airplane should not be dived through a cloud layer or through rough air at the maximum diving speed, nor should high-speed flight be attempted in rough air.

# (6) OBTAINING MAXIMUM PERFORMANCE.

(a) The ceiling and climb at 35,000 feet are as great or greater than that of many fighter airplanes,

but the high speed is not as great as most fighters at normal altitudes; therefore, in order to outperform any enemy at 35,000 feet it will be necessary to outclimb him rather than to outdistance him.

(b) The increase of speed obtained by nosing the airplane down below the horizontal at rated power and at any high power condition is smaller than that obtained by fighters.

(c) In order to obtain maximum climb, the following technique should be used:

<u>1</u>. Maintain the proper climbing air speed (135 mph indicated).

2. In any emergency whatever, such as being pursued by the enemy, engine speed should be increased to 2500 rpm. The increase in rpm has a very appreciable effect on increasing propeller efficiency and rate of climb under conditions of climbing speed and high altitude, and, in addition, is not detrimental to the engine. The pilot should avoid the use of less than 2500 rpm when primarily interested in a high rate of climb at high altitudes.

3. 21,300 rpm has been determined to be the maximum operating turbo speed with a 5 percent overspeed allowance in emergencies. This would provide an emergency rating of 22,400 rpm. At any altitude greater than 30,000 feet and at any power obtained in automatic rich (with 2300 rpm or 2500 rpm, full throttle and turbos set for manifold pressures indicated in the following table), the exhaust gas temperatures are dropping rapidly and it is very unlikely that critical temperatures will be approached. The following tentatively determined manifold pressures will permit safe operation of the turbo under the given conditions:

Altitude	Manifold Pressures giving rated power at 2300 engine rpm and 21,300 turbo rpm			Manifold Pressures giving military power at 2500 engine rpm and 21,300 turbo rpm				
S.L.		39.0	-	tt Q	47 in.	-		
10,000	Ver	38.0	allow	Militar Power 28,000	46 in.	allow		
20,000	l Power	37.5	not	Por Por 28,	45 in.	not		
30,000	Rated	37.0	pressures 2300 rpm		41.5 in.	pressures 2500 rpm		
31,000	H	37.0	press 2300		40.0 in.	2500		
32,000	50	36.5	-		38.5 in.			
33,000	Decreasing Power	35.0	manifold ble below		37.0 in.	manifold ble below		
34,000	Do	33.5	These mai able		35.0 in.			
35,000	Ц	32.0	The		33.0 in.	These		

#### NOTE

This table is based on the best present available information for maximum performance at 55,000-pound gross weight with carburetor air filters closed. All four turbo installations are not identical and hence, operation according to the above table will not result in identical turbo rpm for all engines.

4. The outboard engines have higher critical altitudes than the inboards by approximately 2000 to 3000 feet, and the inboard engine without boilers in the stack has a 1500-foot higher critical altitude than the engine with the boilers in the stack. The critical altitude of the outboard engines as far as limiting turbo rpm is concerned is 31,000 feet.

5. The above table actually applies only to the outboard engines. However, the differences between the inboard and outboard engines are covered by the margin of safety incorporated in the design of the turbo itself. Even though 22,400 rpm are allowable for military power operation, the right-hand column of the above table, is made for only 21,300 rpm.

(7) LANDING. - During the approach for landing very little change in elevator trim will be required. As the flaps are lowered the airplane becomes slightly tail heavy, but if it is trimmed slightly nose heavy at 147 mph with flaps up, it will be properly trimmed at 120 mph with flaps down. This is a satisfactory approach speed for gross weights below 50,000 pounds.

o. STALLS.

(1) Stalling characteristics are very satisfactory. Under no condition is there any sharp tendency to roll. Yawing is sufficiently suppressed to make any rolling at the stall of a very mild nature. Under all conditions a stall warning of several miles per hour is indicated by buffeting of the elevators.

(2) A pitching motion started by the elevators should be damped slowly. It will easily reduce the air speed well below the stall unless it is deliberately stopped.

(3) Full flap reduces the stalling speed about 15 mph for gross weights between 40,000 and 45,000 pounds, but full military power for the same loading conditions may reduce the stalling speed another 15 mph. Accidental or deliberate yawing will increase the stalling speed and increase any tendency to roll at the stall.

(4) The ailerons have a tendency to overbalance and reverse effectiveness at the stall. For example, if the left wing tends to drop at the stall and right aileron control is applied in an attempt to raise the left wing, the aileron operating forces will tend to decrease and cause full aileron deflection, but the response will be an increase in the roll to the left. THE PROCEDURE IN RECOVERING FROM A STALL IS TO HOLD THE AILERONS NEUTRAL AND RE-FRAIN ENTIRELY FROM THEIR USE.

(5) Procedure for recovering from a stall is normal. The air speed for normal flight must first be regained by <u>smooth</u> operation of the elevators. This may put the airplane into a dive of 30 degrees or less. During the process of regaining air speed the rudder may be used to maintain laterally level flight for lateral control, but <u>not until the air speed is regained</u>. RECOVERY FROM THE DIVE MUST BE DONE IN A SMOOTH MANNER. Failure to make a smooth recovery may be a restalling of the airplane or a structural failure, both due to excessive load factors.

(6) Air-speed increase necessary to regain normal flight need not generally be more than 20 mph, and possibly, after practice, even less.

<u>p.</u> SPINS. - Inadvertent spinning is very unlikely, as stability and damping are very high. The airplane is not designed for spinning, and this maneuver should never be attempted.

<u>q.</u> DIVES. - Airplanes having modified elevators are limited to a maximum diving speed of 270 mph. Those airplanes whose elevators have not been modified are restricted to 220 mph maximum diving speed. <u>See Warning Placard!</u>

When diving, it is essential that the sensitivity of the elevator trim tab be kept constantly in mind. In making dives the elevator trim tabs must be set during the dive to maintain zero elevator force and must be used with great care during recovery.

r. PRECAUTIONS.

(1) MAXIMUM LOAD.

(a) B-17F airplanes, with modified landing gear and added chord-wise wing tip tanks, can be flown up to and including a gross weight of 64,500 pounds, with the following restrictions:

(b) At 64,500 pounds, the extra wing tip tanks must be full to obtain the effect of a relieving load on the wings in flight. Care must be exercised in taxying avoiding rough ground. Take-offs, above a gross weight of 56,000 pounds may be made only on smooth fields or prepared runways. All pivot turns on one wheel, while taxying, will be avoided.

(c) All B-17 type airplanes, equipped with extra wing tip chord-wise tanks, must be operated in accordance with (b) preceding, whenever the wing tip tanks are more than half full. Maximum permissible indicated air speed of B-17F airplanes, with extra wing tip tanks full, must be limited to 230 mph, when loaded to 64,500 pounds. Maximum maneuver permissible at 64,500 pounds; positive, 2.056; negative, 1.22; landing gear, 2.1. (2) 1600-POUND BOMBS. - Some B-17F airplanes do not have a complete set of B-10 bomb shackles. 1600-pound bombs may be carried on the B-7 bomb shackle with these restrictions: If an airplane returns to base with 1600-pound bombs remaining on the racks,

## S. APPROACH AND LANDING.

#### PILOT

- (1) Check center of gravity location for landing by means of the load adjuster.
- (2) Set altimeter to airport pressure altitude.
- (3) Notify radio operator to retract trailing antenna.
- (4) Turn automatic flight control equipment switches "OFF."
- (5) Direct copilot to adjust carburetor air to "FILTERS ON."
- (6) Move supercharger controls to full "ON," and propeller controls to "MAX. CRUISE." (2100 rpm).
- (7) Shut off de-icer system, if operating.
- (8) Order copilot to extend landing gear.
- (9) Check position of ball turret. Guns should be horizontal and pointing rearward.
- (10) Check hydraulic pressure; it should be 600 to 800 pounds per square inch on both gages.
- (11) Operate brakes. Hydraulic pressure should remain above 600 pounds per square inch. If main brakes are inoperative, prepare for emergency landing.
- (13) After speed has dropped <u>below 147</u> mph, order copilot to lower wing flaps.
- (14) Adjust trim tabs as required.
- (15) Order copilot to call off air speed as required.
- t. EMERGENCY TAKE-OFF IF LANDING IS NOT COMPLETED.
- (1) Open throttle wide.

#### CAUTION

Do not exceed 46 inches Hg manifold pressure.

they shall be released, in the safe condition, over water or the safest available area. The maximum permissible gross weight of the airplane will not be exceeded when carrying 1600-pound bombs. The pilot will guard against any severe maneuvering of airplane.

#### COPILOT

- (1) SELECTIVE CHECK VALVE MUST BE IN "NORMAL" position.
- (2) Set mixture controls in "AUTOMATIC RICH."
- (3) Set intercooler controls in "COLD," unless icing conditions exist.
- (4) Radio control tower or landing clearance.
- (5) When directed by pilot, throw carburetor air filter switch to "FILTER ON."
- (7) Check instruments.
- (8) Extend landing gear when directed by pilot (green signal light on).
- (9) Tail wheel should be locked (warning light off), locking lever flush with floor.
- (12) Check cowl flap valves. They must be in "LOCKED" position to guard against loss of oil supply through leaks in cowl flap actuating mechanisms.
- (13) Lower wing flaps when directed by pilot.
- (15) Call off air speeds when directed by pilot.

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#### PILOT

- (2) Increase propeller speed to 2500 rpm.
- (3) Order copilot to raise landing gear and proceed with a normal take-off.
- (4) Order copilot to raise wingflaps after 500 feet altitude has been reached.
- u. AFTER LANDING.
  - (1) Move supercharger controls to "OFF" position.
  - (2) Generator switches "OFF."
  - (3) Order tail wheel unlocked after taxi speed has dropped below 30 mph.
- y. STOPPING OF ENGINES.
  - If parking brakes are set, do not permit them to remain so for very long if the brake drums are hot.
  - (2) Idle engines at approximately 800 rpm until cylinder temperature gages show temperatures are 170°C (338°F).
  - (3) If the airplane is to remain outside overnight, or if an engine start is anticipated in temperatures below 0° C (32°F), order copilot to dilute oil for 4 minutes maximum: During oil dilution period, operate supercharger controls continuously full open to fully closed in cycles of approximately 10 seconds, to dilute oil in supercharger regulator system.
  - (4) Set propeller controls in "HIGH RPM."
  - (5) Before stopping engines, run at 1200 rpm for 30 seconds. Direct copilot to stop engines with mixture control.
- W. BEFORE LEAVING THE PILOT'S COMPARTMENT.

Cut off all radio, de-icer, compartment, central control panel, and pilot's side control panel switches.

## COPILOT

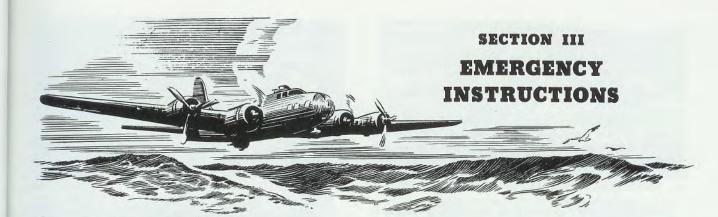
- (3) Raise landing gear when directed by pilot.
- (4) Raise wing flaps when directed by pilot.
- (1) Raise wing flaps.
- (2) Check cowl flaps "OPEN."
- (3) Unlock tail wheel when directed by pilot (lever as nearly vertical as possible).

(3) Close oil dilution switches when ordered by pilot.

(5) When directed by pilot, stop engines by moving mixture controls to "ENGINE OFF."

## Complete Form 1.

Moor the airplane with the nose into the wind, set the parking brakes and lock the rudder and elevators. When attaching the mooring lines at the rope wells in the wings, allow approximately 16 inches slack in the line. This will prevent damage to the structure or loss of mooring control in case a tire goes flat with result and elevation of the opposite wing. Rudder and elevator locks will withstand gust loads from any direction up to 60 mph velocity.



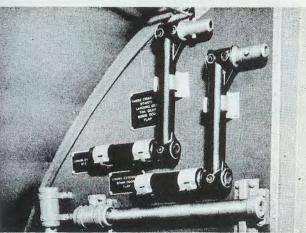


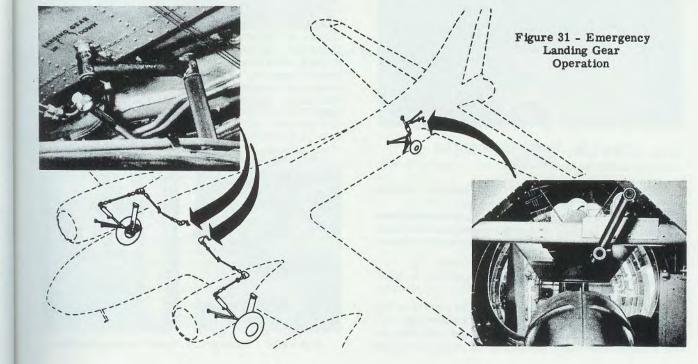
Figure 30 - Hand Cranks Stowed

## 1. HAND CRANKS.

Cranks for manual operation of landing gear, wing flaps, and bomb bay doors, and for hand starting of engines, are stowed on the aft bulkhead of the radio compartment. Crank extensions for use when operating engine starters, bomb doors, and wing flaps are stowed adjacent to the cranks.

## 2. EMERGENCY OPERATION OF LANDING GEAR.

Each main landing gear may be operated separately by means of a hand crank connection in the bomb bay, one to the left of the door in the forward bulkhead, and one to the right. To raise one of the landing wheels, insert the crank into the connection and rotate clockwise. Turn the crank counterclockwise to lower the wheel.



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#### DANGER

Be sure the landing gear electric switch is "OFF" before you attempt hand cranking.

## 3. EMERGENCY OPERATION OF THE TAIL WHEEL.

The crank used for manual operation of the landing wheels is also used for manual operation of the tail wheel. Insert the crank into the connection in the tail wheel compartment and rotate as desired.

#### 4. EMERGENCY OPERATION OF WING FLAPS.

Lift the camera pit door in the floor of the radio compartment and insert the hand crank into the torque connection at the forward end of the pit. Rotate the crank clockwise to lower the flaps and counterclockwise to raise them.

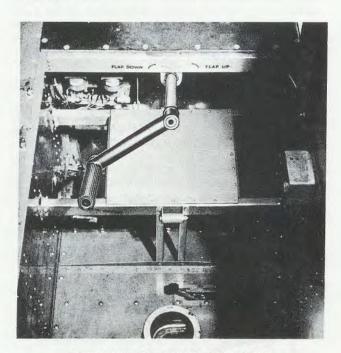


Figure 32 - Emergency Wing Flap Operation

## 5. EMERGENCY OPERATION OF BOMB BAY DOORS.

Insert the hand crank into the torque connection in the step at the forward end of the catwalk in the bomb bay and rotate clockwise to close the doors and counterclockwise to open them.

## 6. EMERGENCY BOMB RELEASE.

<u>a</u>. An emergency release handle is located at the pilot's left and another at the forward end of the catwalk in the bomb bay. Pull either handle through its full travel. The first portion of the stroke releases

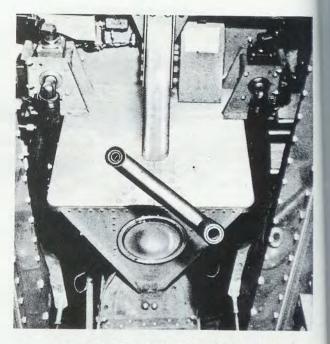


Figure 33 - Emergency Bomb Bay Door Operation

the bomb door latches, permitting the doors to open independently of the retracting screw, as shown in figure A. The latter portion of the stroke releases all external and internal bombs salvo and unarmed.

b. DOOR RETRACTION AFTER EMERGENCY RELEASE. - If the spring in the emergency release mechanism under the hinged door beneath the pilot's compartment floor has not entirely retrieved the linkage as shown in B, reset by pushing at the hinge of the link as shown in C. Operate the retracting screws electrically (or manually) to the fully extended position. This will engage the latches between the screws and door fittings as shown in D. The doors may now be retracted in the normal manner.

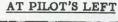






Figure 34 - Emergency Bomb Release Handles

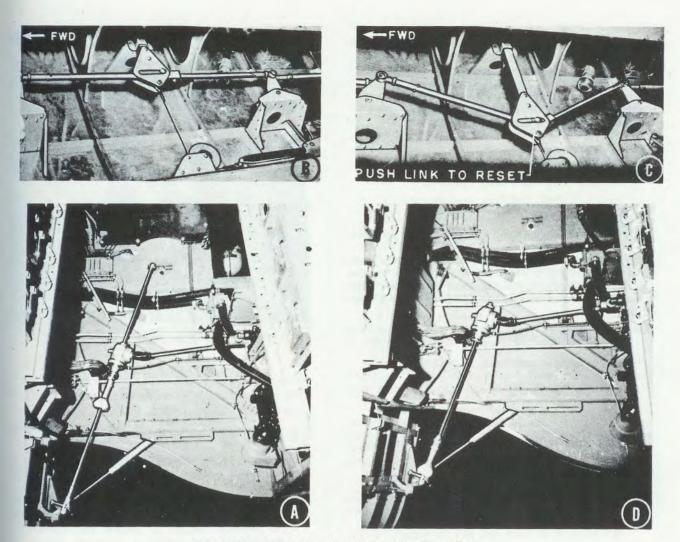


Figure 35 - Emergency Bomb Release Procedure

## 7. FIRE IN FLIGHT.

In case of engine or wing fires, open the emergency exits; signal stand by to abandon: one long ring (approximately 6 seconds). In case of a cabin fire, exits should NOT be open; signal stand by to abandon, exits closed: one long ring (approximately 6 seconds), and one short ring (approximately 2 seconds).

#### a. FUSELAGE FIRES.

(1) <u>Three carbon dioxide fire extinguishers</u> are located, one on the aft bulkhead of the navigator's compartment, one on the right rear bulkhead of the pilots' compartment, and one on the forward face of bulkhead of the radio compartment.

(a) To use; stand close to fire, raise horn, and direct gas to base of fire, holding on to rubber-in-sulated tubing.

#### WARNING

Do not grasp metal horn on top of cylinder. White discharge is "dry ice"; avoid frost bite.

(b) To shut off flow of gas, return horn to clip on side of cylinder. Extinguisher must be recharged after each use.

(2) Two <u>carbon tetrachloride fire extinguishers</u> are located one at the copilot's left, and one aft of th<sup>r</sup> main entrance door.

(a) Stand as far as possible from the fire when using a carbon tetrachloride extinguisher; effective range is 20 to 30 feet.

(b) To operate, turn handle and pump plunger. Keep stream full and steady. To shut off, push handle in and turn until sealing plunger is depressed.

#### WARNING

When sprayed on a fire, carbon tetrachloride produces phosgene, an extremely poisonous gas, which can be harmful even in small amounts; and if inhaled in excessive quantities may prove fatal. Do not use in a confined area and do not stand near fire. OPEN WINDOWS AND VENTILATORS immediately after fire is extinguished.

#### b. ENGINE FIRES DURING FLIGHT.

- (1) If caused by fuel or oil leakage:
  - (a) Close fuel shut-off valve of engine affected.

(b) Feather propeller immediately. This stops the pumping of oil to the flames, and should be done before so much oil is lost that the propeller cannot be feathered and additional damage is caused by windmilling.

- (c) Slow the air speed as much as possible.
- (d) Close the cowl flaps.
- (e) Pull CO<sub>2</sub> charge (if available).

#### CAUTION

Leave propeller feathered. Do not attempt to restart engine while hot.

- (2) Fire in exhaust due to overrich mixture:
- (a) Move mixture control to lean.
- (b) Attempt to blow out fire by engine run-up.
- (c) Close cowl flaps.
- (d) Close fuel shut-off valve to engine affected.
- (e) Pull CO<sub>2</sub> charge (if available).

## 8. EMERGENCY BRAKE OPERATION.

The emergency system operates the brake only. Pressure is applied through two hand-operated metering valves on the pilots' compartment ceiling; the left lever controls the left wheel, and the right lever controls the right wheel. If it is impossible to rebuild the pressure in the service system, use of the following procedure is recommended:

a. Manual shut-off valve "CLOSED."

b. Selective check valve "NORMAL."

c. Check pressure in emergency accumulator: 650 to 800 pounds.

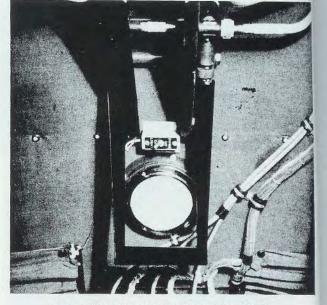


Figure 36 - Emergency Brake Handles

## CAUTION

Do not attempt to raise the accumulator pressure with the hand pump.

- d. Pilot: Operate throttle and rudder.
- e. Copilot: Operate emergency brake control.

#### WARNING

DO NOT "PUMP" EMERGENCY BRAKES. The pressure supply is limited and repeated applications may result in complete loss of emergency braking control.



9. WARNING SIGNALS.

The pilot can communicate with the crew by means of the interphone system, phone call lamps, and the alarm bell system. For emergency purposes, the alarm bell should be used according to prearranged signals which are thoroughly understood by the crew. A toggle switch on the pilot's electrical control panel operates three bells located, one under the navigator's table, one on the wall above the radio operator's table, and one in the tail compartment above the tail wheel boot. F

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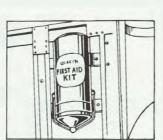
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## 10. FIRST-AID KITS.

First-aid kits are located on the bomb-sight storage box in the navigator's compartment, on the wiring diagram box on the back of the copilot's seat, and on the bulkhead forward of the lower turret.



## 11. ABANDONING AIRPLANE IN FLIGHT.

a. ESCAPE DOORS AND HATCHES. - All doors and hatches are quickly releasable. The side gunner's windows slide forward to open. Bomb doors may be opened by either of two emergency release handles, one at the left of the pilot and the other at the forward end of the catwalk in the bomb bay.

#### b. SIGNAL.

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(1) Stand by to abandon: one long ring (approximately 6 seconds).

(2) Abandon airplane: three short rings (approximately 2 seconds each).

c. SWITCHES. - The situation will determine whether fuel and electrical systems should be turned off prior to abandoning the airplane. Under normal conditions outside of combat zones, the master ignition switch battery switches and fuel shut-off valve switches should be turned off.

#### 12. CRASH LANDING.

## a. SIGNAL.

(1) Stand by for crash landing; by interphone.

(2) Abandon: four short rings (approximately 1/2 second each).

- (3) Pilot should:
- (a) Cut engines.
- (b) Turn master switch "OFF."
- (c) Turn battery switches "OFF."
- (d) Turn fuel shut-off valve switches "OFF."
- b. EGRESS.

(1) All crew members will take proper stations, remove parachutes, and fasten safety belts upon receiving interphone warning.

(2) At the signal to abandon, all crew members will leave the plane through the most practicable exit. (See figure 37.)

(3) In addition to the seven standard exits, the two side windows in the pilot's compartment are possible exits.

(4) In case some of the exits are blocked by fire, damage, or congestion, it may be best to make exit through a rupture in the fuselage, if any have occurred. Caution is required in this process to avoid fatal cuts from metal or broken glass.

(5) If there is imminent danger of fire, all personnel should disperse at least 50 feet from the airplane.

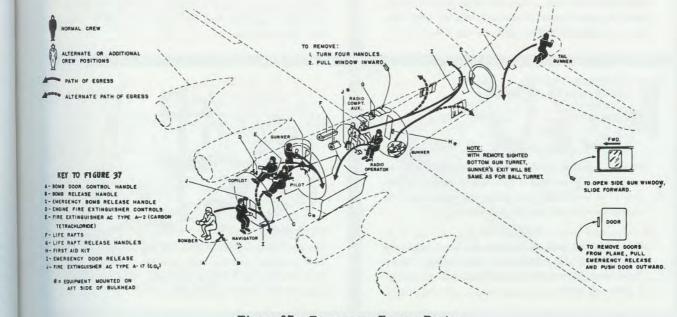
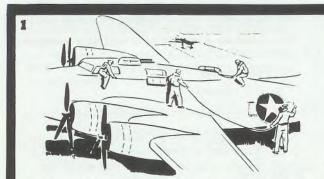


Figure 37 - Emergency Escape Routes

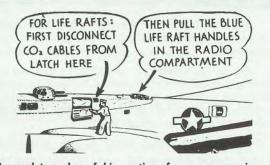
# **13. FORCED DESCENT AT SEA**



As complete evacuation of the airplane should not take over 30 seconds, preflight practice drills should be participated in by all crews who are to make a flight over water, or whose operations are generally over water.



Each crew member will acknowledge the command over the interphone.



A complete and careful inspection of emergency equipment should be made before each long over water flight. Check life rafts, emergency kit bags (provisions), and emergency radio equipment. The kit bags and radio are stored aft of the radio compartment.



The bombardier after acknowledging the command, will jettison bombs, or bomb bay tanks if more than half full, and close the bomb bay doors. If there is not sufficient time to release the bombs and close the bomb bay doors, ascertain that the bombs are "SAFE" and leave the doors closed.



When it becomes evident that the airplane is to be forced down at sea due to lack of fuel, or that an altitude of at least 1,000 feet cannot be maintained, the pilot gives warning over the interphone.

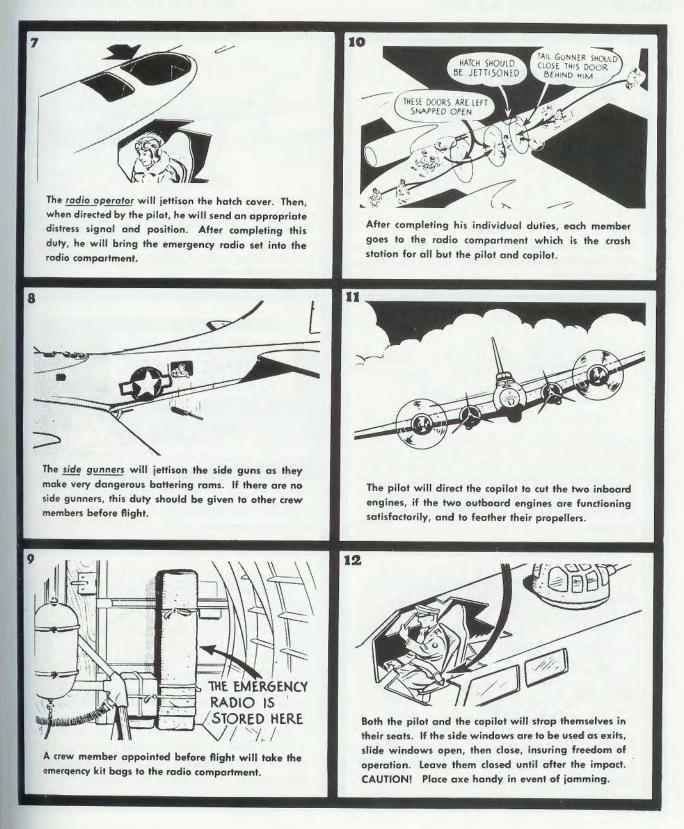
## WARNING!

This command must, if possible, be given while the fuel supply is still sufficient for 15 minutes of flight. The chances for a successful landing are much greater, if power is used.

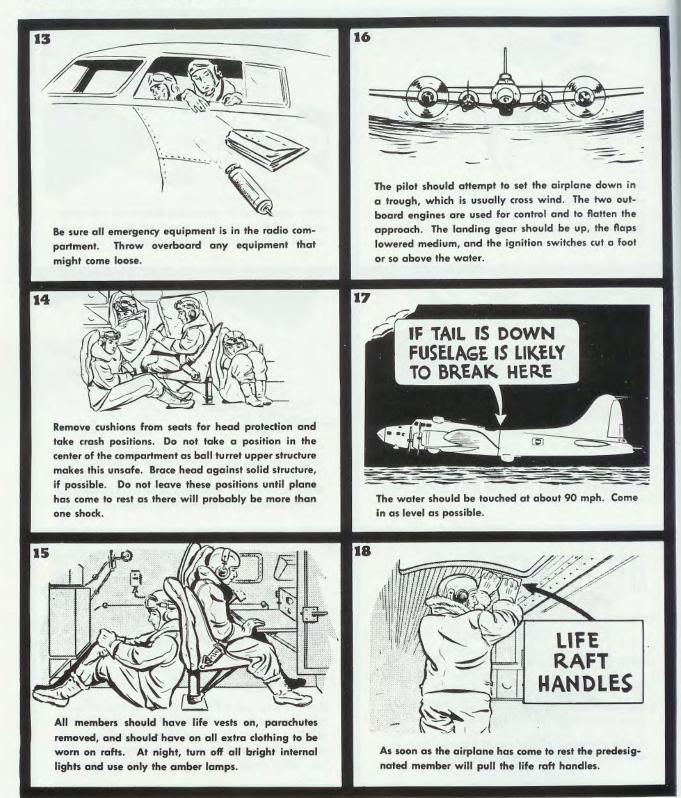


The navigator will determine the position and inform both the pilot and the radio operator. He will take with him the instruments necessary to make simple computation while on life rafts.

# FORCED DESCENT AT SEA



# FORCED DESCENT AT SEA



## 14. EMERGENCY OPERATION OF RADIO EQUIPMENT.

#### a. PORTABLE EMERGENCY RADIO TRANSMITTER (Type SCR-578-A).

(1) GENERAL.

(a) A complete self-contained portable emergency transmitter is stowed on the right rear side of bulkhead 6, and is provided for operation anywhere away from the airplane. It is primarily designed for use in a small boat or life raft, but it may be placed in operation anywhere a kite can be flown or where water may be found.

(b) When operated, the transmitter emits an MCW signal and is pretuned to the international distress frequency of 500 kilocycles. Automatic transmission of a predetermined signal is provided. Any searching party can "home" on the signal with the aid of a radio compass.

(c) No receiver is provided.

## (2) REMOVAL FROM AIRPLANE.

(a) If the airplane has made an emergency landing on water, the emergency set should be removed at the same time that the life raft is removed. The set is waterproof and will float, and it is not necessary to take any precautions in keeping the equipment out of the water; however, be sure that it does not float out of reach.

(b) The emergency set may be dropped from the airplane by use of the parachute attached. The altitude of the airplane when dropping the equipment should be between 300 and 500 feet. To drop the equipment, the following steps should be observed:

1. Tie the loose end of the parachute static line to any solid metal structure of the airplane.

#### CAUTION

Be sure that the static line is in the clear and will not foul.

2. Throw the emergency set out through a convenient opening in the airplane. Parachute will be opened by the static line.

#### CAUTION

Do not attach static line to any part of one's clothing or body when throwing the equipment through the opening.

(3) OPERATION. - Complete operating instructions are contained in one of the bags which contain the equipment. Complete instructions for the use of the transmitter are also located on the transmitter itself. b. INTERPHONE EQUIPMENT FAILURE. - In the event of interphone equipment failure, the audio frequency section of the command transmitter may be substituted for the regular interphone amplifier. To make this connection, the pilot should place his command transmitter control box channel selector switch in either channel No. 3 or 4 position. Set the interphone jack-box selector switch on the "COMMAND" to place the interphone equipment in operation.

#### NOTE

When the command transmitter control box channel selector switch is set in either the No. 3 or 4 position for emergency operation of the interphone equipment, it is not possible to establish communication with any station or any other airplane. It is possible at all times to resume normal command set operation by placing the channel selector switch of the command transmitter control box in either the No. 1 or 2 position.

c. SUBSTITUTION OF RADIO COMPASS RECEIV-ER FOR LOW FREQUENCY COMMAND SET RE-CEIVER. - If the low frequency receiver of the command set fails, the radio compass receiver may be substituted, with the pilot having <u>direct control</u> over the compass receiver. To complete this emergency hook-up, the pilot must set his interphone jack-box selector switch in the "COMP" position and then place the radio compass selector switch in the "ANT" position. The radio compass can then be tuned as desired.

d. SUBSTITUTION OF LIAISON RECEIVER FOR LOW, MEDIUM, AND/OR HIGH FREQUENCY COM-MAND RECEIVER. - In case of the failure of the low, medium, and/or high frequency receiver of the command radio equipment, the liaison receiver may be substituted, but the pilot will have only limited control over it. The pilot should first call the radio operator on the interphone system and tell him what frequency he desires to receive, that he is switching the interphone selector switch to the "LIAISON" position, and for him (the radio operator) to tune in this frequency and maintain the setting until further advised.

<u>e</u>. COMMAND SET TRANSMITTER FAILURE. - In case of failure of the command set transmitter, the liaison transmitter may be substituted. The pilot should first call the radio operator on the interphone and have him adjust the liaison transmitter to the frequency he desires to use. He should then set his interphone selector switch to the "LIAISON" position and operate his microphone button in the same manner that he did when the command set was in operation. When he is through using the liaison transmitter, the pilot should place the interphone selector switch in the "INTER" position and tell the radio operator to cut the liaison transmitter off, so as to reduce the load on the electrical system.

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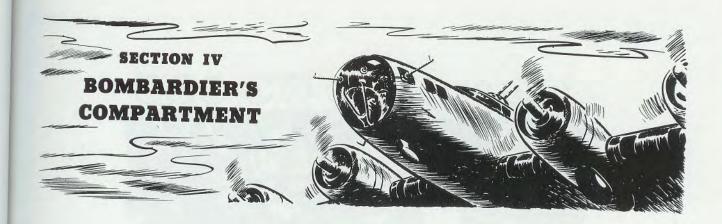
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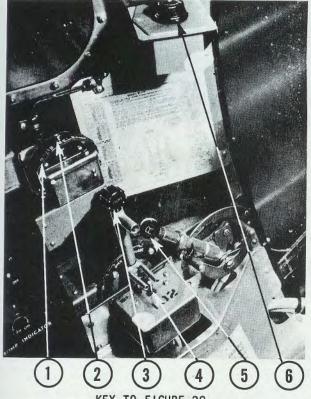
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. - In , the pilot hone fret his osiame us in ansctor opreWhen substituting one receiver for another, such as the compass receiver for the command receiver, the pilot must move his interphone selector switch to the "COMMAND" or "LIAI-SON" position, as the case may be, in order to transmit. At the end of the transmission, he must switch back to the position of the receiver being used. This will have to be done every time that the pilot desires to hold a twoway conversation.







KEY TO FIGURE 38

- I. BOMB RELEASE SWITCH GUARD
- 2. BOMB RELEASE SWITCH
- 3. BOMB DOOR CONTROL HANDLE
- 4. BOMB DOOR SWITCH
- 5. BOMB RELEASE HANDLE
- 6. BOMBARDIER'S LIGHT SWITCH

## Figure 38 - Bomb Controls

## 1. BOMB CONTROLS.

<u>a</u>. Bombs are normally released electrically, but can be released mechanically in an emergency. Electrical control provides for individual release of bombs either singly (selective) or continuously at predetermined intervals (train). Mechanical control is always in "SALVO," by operation of the bombardier's release handle or by operation of the emergency release handles. The bomb release handle has three positions.

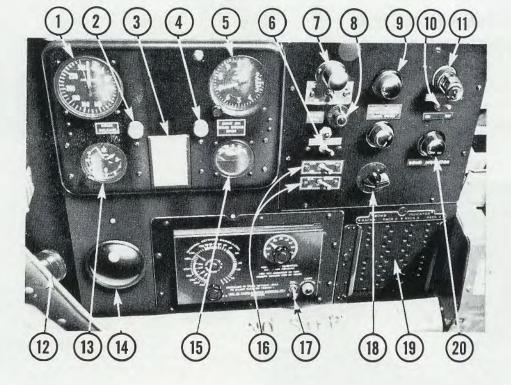
(1) In the "LOCK" position the bomb racks are locked against any release of bombs except by means of the emergency release handles.

(2) In the "SELECTIVE" position the bomb racks are prepared for electrical release by manual operation of the release switch, or by automatic operation through the bomb sight.

(3) The "SALVO" position, when the bomb doors are open, mechanically releases all bombs simultaneously and unarmed.

<u>b</u>. The bombardier's release switch, mounted on the forward end of the control panel, operates in either direction to energize the release unit solenoids through the interval release control mechanism. A hinged guard prevents accidental operation of this switch.

<u>c</u>. The interval release control unit is mounted at the bottom of the bombardier's control panel and may be set to provide either "SELECT" or "TRAIN" release. On airplanes serial Nos. 42-5050 and on, four switches on the bombardier's control panel permit selection of any external or internal rack for electrical release. Two indicator lamps beside the rack selector switches correspond to the external racks. Two additional rack selector switches in the bomb bay permit elemination of either right or left bomb bay from the release circuit if bomb bay fuel tanks are carried. Bomb release sequence is given in figure 40. Any rack or combination of racks may be eliminated from the release sequence by turning off



# KEY TO FIGURE 39

1.	AIR SPEED INDICATOR	6.	PIL
2.	BOMB RELEASE WARNING LAMP	7.	PAN
3.	ALTIMETER SCALE ERROR	8.	PHO
	CARD	9.	WAR
4.	BOMB DOOR WARNING LAMP	10.	EXT

5. ALTIMETER

6. PILOT CALL SWITCH 7. PANEL LIGHT 8. PHONE CALL LAMP 9. WARNING LAMP RHEOSTAT 10. EXTENSION LIGHT SWITCH 11. EXTENSION LIGHT

12. ULTRA-VIOLET SPOT LIGHT 13. CLOCK 14. ASH RECEIVER

15. FREE AIR THERMOMETER 16. BOMB RACK SELECTOR

- SWITCHES
- BOMB INTERVAL SWITCH
   ULTRA-VIOLET SPOTLIGHT CONTROL SWITCH
   BOMB INDICATOR

- 20. BOMB INDICATOR CONTROL
- KNOB

Figure 39 - Bombardier's Control Panel

the respective selector switch on the bombardier's control panel.

d. A bomb arming solenoid in each external rack is controlled by a switch on the bombardier's panel. A red indicator lamp beside the switch is on when the bombs are armed.

## NOTE

Some B-17F airplanes not equipped for external racks have only two rack selector switches and no bomb arming switch on the bombardier's panel. A few airplanes have no rack selector switches on the bombardier's panel but have a three-position switch in the bomb bay to turn off either internal rack.

e. The bomb door control handle is at the left of the bombardier, forward of the control panel, and operates a double-throw toggle switch controlling the solenoid switches for the bomb door retracting motor, A lug on the side of the handle is located so that when the door handle is in the "CLOSED" position, the bomb release lever cannot be moved out of the "LOCK" position.

## CAUTION

If bombs are carried above the 2000-pound bomb, they MUST NOT be released until the D-6 shackle and adapter have been removed. This definitely requires "SELECTIVE" release control for the 2000-pound bomb.

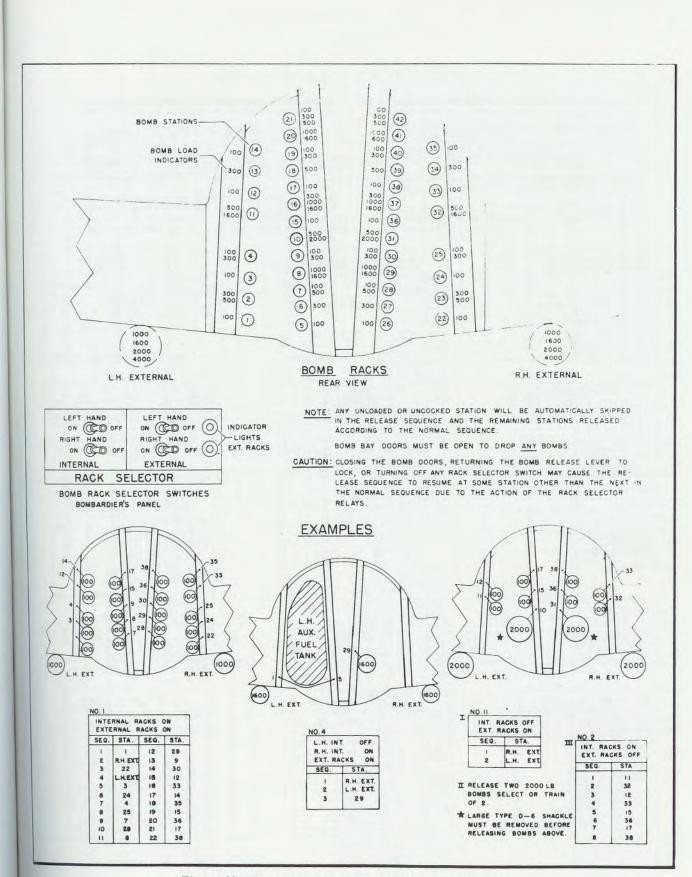


Figure 40 - Bomb Release Sequence Diagram (Sheet 1)

NO.I			AD ARE POSS	NO.2				NO.3		NO.4	
	INTERNAL	RACKS ON RACKS ON			INTERNAL EXTERNAL	RACKS ON RACKS OFF		R.H.	INT. ON INT. OFF RACKS ON	R.H.	INT. OFF INT. ON RACKS ON
Sequence	Bomb Sta.	Sequence	Bomb Sta.	Sequence	Bomb Sta.	Sequence	Bomb Sta.	Sequence	Bomb Sta.	Sequence	Bomb Sta
1 2 3 4 5 6 7 8 9 10 112 145 16 17 18 19 20 21 22	1 R.H. Ext. 22 L.H. Ext. 23 3 24 4 25 5 26 6 27 7 28 8 29 9 30 10 31	23456789012345678901234 44444444444444444444444444444444444	11 32 33 13 34 35 36 16 37 36 16 37 38 18 39 19 20 20 20 21 42	1 2 3 4 5 6 7 8 9 10 11 12 14 5 16 17 8 9 20 21	1 22 23 24 4 25 26 27 28 29 30 10 21 11	22 24 25 29 29 29 29 29 29 29 29 29 29 29 29 29	32 12 33 14 14 15 15 16 16 37 17 38 18 319 40 41 21 242	1 2 3 4 5 5 6 7 8 9 10 11 12 14 15 6 7 8 9 10 11 12 14 15 6 7 8 9 20 21 2 23	1 R.H. Ext. 2 4 5 6 7 8 9 10 11 12 14 15 15 16 17 18 19 20 21	1 3 5 6 7 8 9 10 12 14 15 16 17 18 19 21 22 23	R.H. Ext 22 L.H. Ext 24 25 25 26 27 28 29 30 31 32 33 35 36 37 35 36 37 37 35 36 37 40 41 42
NO.5				NO.6				NO.7	-	NO.8	
I	OTH INTERNA EXTERNA EXTERNA	L RACK OF	P		BOTH INTER L.H. EXTER R.H. EXTER	NAL RACK OF		R.H.	INT. ON INT. OFF RACKS OFF	R.H.	INT. OFF INT. ON RACKS OFF
Sequence	Bomb Sta.	Sequence	Bomb Sta.	Sequence	Bomb Sta.	Sequence	Bomb Sta.	Sequence	e Bomb Sta.	Sequence	Bomb Sta
1 2 3 4 5 6 7 8 9 10 11 12 14 15 16 18 19 20 22	R.H. Ext. 22 23 24 4 25 55 26 6 27 7 28 8 29 9 300 10 31 11	2345678901254567890123 335555678901223	32 33 33 34 35 136 137 138 3190 201 21 242	1 2 3 4 56 7 8 90 11 12 14 5 16 18 90 21 22	1 22 L.H. Ext. 23 24 25 26 27 7 28 29 9 30 10 31 11	234 256 278 29 312 334 56 78 99 312 334 56 78 99 442 3 3401 423	32 33 34 15 15 16 37 17 18 18 19 40 20 42 42	1 34 56 7 8 90 10 12 14 14 16 16 18 120 20	1 3 4 56 7 8 9 10 11 12 14 14 16 16 16 18 120 21	1 2 3 4 5 6 7 8 9 11 12 12 14 16 16 16 16 19 20 21	223 224 2267 228 2301 332 335 335 335 335 335 335 337 412 42
NO.9		N	0.10		NO.11		_	NO.14		NO.15	_
L.H. 1	INT. ON EXT. ON RS OFF		R.H. INT. C R.H. EXT. C OTHERS OFF	N	INT. EXT.	RACKS OFF RACKS ON		L.H. INT. R.H. EXT. OTHERS O	ON ON FF	R.H. L.H. OTHE	INT. ON EXT. ON RS OFF
Bequence	Bomb Sta.	Seq		Sta.	Sequence	Bomb S	_		omb Sta.	Sequence	Bomb Sta
1 2 3 4 5 6 7 8 9 0 11 15 16 7 18 10 11 15 16 7 18 20 21 22	1 L.H. Ext. 3 4 5 6 7 8 9 10 11 12 13 14 15 15 15 15 17 18 19 20 21		2 34 56	Ext. 23 24 25 26 26 26 27 28 29 20 20 20 20 20 20 20 20 20 20 20 20 20	L.H. R.H. Sequence 1 NO.13	L.H. E RACKS OFF EXT. ON EXT. OFF B Bomb S L.H. E RACKS OFF EXT. OPF EXT. ON	ita. ixt.	1 2 3 4 5 6 7 8 9 10 11 12 14 15 16 7 18 9 20 21 22	1 .H. Ext. 5 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	1 2 3 4 5 6 7 8 9 10 11 12 14 14 14 16 16 17 18 20 20 21 22	22 L.H.Ext 23 24 25 26 26 29 30 31 32 35 35 35 35 35 36 37 38 39 40 41 42

ANY BOMB LOAD WILL BE RELEASED ACCORDING TO ONE OF THESE SEQUENCES. COMBINATIONS OF RELEASE SEQUENCES FOR A PARTICULAR BOMB LOAD ARE POSSIBLE BY OPERATION OF

# THE RACK SELECTOR SWITCHES BETWEEN "STICKS." (SEE CAUTION ON SHEET NO.1)

Figure 40 - Bomb Release Sequence Diagram (Sheet 2)

2000LB. M-34

WITH WHEELS AND FLAPS UP: MAXIMUM ALLOWABLE INDICATED AIR SPEED 1° 270 MPH SAFE GLIDE ANGLE IS 15-1/4°.

WITH WHEELS AND FLAPS DOWN: MAXIMUM ALLOWABLE INDICA-TED AIR SPEED IS 147 MPH SAFE GLIDE ANGLE IS 13-1/2°.

NOTE: THE SAFE GLIDE ANGLES ARE BASED ON AN AIRPLANE GROSS WEIGHT OF 40,000 LBS WITH POWER OFF AND WIND-MILLING PROPELLERS.

WHILE THE MAJORITY OF BOMB STATIONS WILL PERMIT RE-LEASE OF BOMBS AT AN ANGLE WHICH WILL PRODUCE AN IN-DICATED AIR SPEED GREATER THAN THAT DESIGNATED FOR THE SAFE GLIDE ANGLE OF THE AIRPLANE, UNDER NO CONDITIONS SHALL THE MAXIMUM ALLOWABLE INDICATED AIR SPEED BE EXCEEDED.

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

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

THE ANGLES LISTED IN THE TABULATION ARE THE MAXIMUM AT WHICH BOMBS MAY BE RELEASED WITH A  $10^{\circ}$  clearance angle maintained in the bomb bay,

RACK NO.

110	OLB.	M-3	
RACK NO.	STA.	GLIDE	CLIME
HACK NO.		ANGLE	ANGL
	29 8 8	26	15
283	37816	11	64
	41820	5	2
300LB.	MK.I-	MK.I	MI
RACK NO.	STA.	GLIDE	CLIMB
	2823		33 3/4
184	4825	23 3/4	22
	13834	14 %	15
	278 6	44 1/2	40
	3089	27	25
283	3 78 16	17 1/4	16 1/4
	40819	111/2	
	4282	8	8
RACK NO.	LB. N	GLIDE	CLIMB
HAVA NU.	the set of the set	ANGLE	ANGLE
	1822	49 3/4	44 1/2
	3824	40	32
184	4825	29 1/2	26 %
	12833	23	20%
	14835	20	15
	2685	57 1/2	52
	2887	44 1/4	39 %
	3089	33	29 1/2
283	36815	25	22 1/2
	38817	19 %	18
	40819	15 1/2	14 /4
	42821	11 1/2	10%
100	10.1		-
100	LB. N	1-30	
RACK NO.	STA.	GLIDE	CLIMB
		ANGLE	ANGLE
	1822	47%	51
	3824	36 1/2	41
184	4825	28 14	33 12
	12 833	22	27 1/2
	14835	17 1/2	223/4
	2685	56	57 1/2
	2887	42 1/2	46 1/2
	3089	31 1/2	. 36 Vg
283	36815	23 %	29%
	38817	19	24
	40819	15	20-

a.,

2000		101 3	
RACK NO.	STA.	GLIDE	the second second second
283	31810	ANGLE	ANGLE
603	131010	0	0
600	DLB.	M-3	2
RACK NO.	STA.	GLIDE	
		ANGLE	
184	2823	32 1/2	
	2887	34 1/2	29 1/2
283	31810	18	10
	42821	5 1/2	6
		3 18	0
600LB.	MK.IM		
RACK NO.	STA.	GLIDE	GLIMB
	0007	ANGLE	
	2887	33	23
283	31810	9%	6 V
	42821	5	2 1/2
	TEGET	-	
		_	
300	DLB.	M- 3	
		GLIDE	CLIMB
300 RACK NO.	STA.	GLIDE	CLIMB
RACK NO.	STA. 2823	GLIDE ANGLE 38	CLIMB ANGLE 38 1/2
	STA. 2823 4825	GLIDE ANGLE 38 24	CLIMB ANGLE 38 1/2 26 1/2
RACK NO.	STA. 2823 4825 13834	GLIDE ANGLE 38 24 16	CLIMB ANGLE 38 1/2 26 1/2 18 3/6
RACK NO.	STA. 2823 4825 13834 2786	GLIDE ANGLE 38 24 16 45	CLIMB ANGLE 38 1/2 26 1/2 18 3/4 44 3/4
RACK NO.	STA. 2823 4825 13834 2786 3089	GLIDE ANGLE 38 24 16 45 27 1/4	CLIMB ANGLE 38 1/2 26 1/2 18 3/4 44 3/4 29 1/2
RACK NO.	STA. 2823 4825 13834 2786 3089 37816	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/2	CLIMB ANGLE 38 1/2 26 1/2 18 3/4 44 3/4 29 1/2 20
RACK NO.	STA. 2823 4825 13834 278.6 3089 37816 40819	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/2 1 1 3/4	CLIMB ANGLE 38 1/2 26 1/2 18 3/6 44 3/4 29 1/2 20 1 4 1/2
RACK NO.	STA. 2823 4825 13834 2786 3089 37816	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/2	CLIMB ANGLE 38 1/2 26 1/2 18 3/6 44 3/4 29 1/2 20 1 4 1/2
RACK NO. 1 8 4 2 8 3	STA. 2823 4825 13834 2786 3089 37816 40819 42821	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/2 11 3/4 8 1/4	CLIMB ANGLE 38 ½ 26 ½ 18 ¾ 44 ¾ 29 ½ 20 14 ½ 10 ½
RACK NO.	STA. 2823 4825 13834 2786 3089 37816 40819 42821	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/2 11 1/4 8 1/4 8 1/4	CLIMB ANGLE 38 1/2 26 1/2 18 3/4 44 3/4 29 1/2 20 14 1/2 10 1/2 10 1/2
RACK NO. 1 8 4 2 8 3	STA. 2823 4825 13834 2786 3089 37816 40819 42821	GLIDE ANGLE 38 24 16 45 27 ¼ 17 ½ 11 ¾ 8 ¼ 8 ¼	CLIMB ANGLE 38 Vg 26 Vg 18 % 44 % 44 % 29 Vg 20 14 Vg 10 Vg 10 Vg CIMB
RACK NO. 1 8 4 2 8 3 100	STA. 2823 4825 13834 2786 3089 37816 40819 42821 LB. STA.	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/2 1 1 3/4 8 1/4 GLIDE ANGLE	CLIMB ANGLE 38 ½ 26 ½ 18 ¾ 44 ¾ 29 ½ 20 14 ½ 10 ½ CLIMB ANGLE
RACK NO. 1 8 4 2 8 3 100	STA. 2823 4825 13834 2786 3089 37816 40819 42821 LB. MI STA. 1822	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/2 11 3/4 8 1/4 8 1/4 GLIDE GLIDE 46 1/4	CLIMB ANGLE 38 1/2 26 1/2 18 3/6 44 3/4 2 9 1/2 20 14 1/2 10 1/2 CLIMB ANGLE 45
RACK NO. 1 8 4 2 8 3 100 RACK NO.	STA. 2823 4825 13834 2786 3089 37816 40819 42821 <b>LB.</b> <b>MI</b> <b>STA.</b> <b>1822</b> 3824	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/4 8 1/4 8 1/4 8 1/4 MK.II GLIDE ANGLE 46 1/4 3 4 1/2	CLIMB ANGLE 38 1/2 26 1/2 18 3/4 44 3/4 29 1/2 20 14 1/2 20 14 1/2 10 1/2 CLIMB ANGLE 45 34 3/4
RACK NO. 1 8 4 2 8 3 100	STA. 2823 4825 13834 2786 3089 37816 40819 42821 <b>LB.</b> <b>MI</b> <b>STA.</b> 1822 3824 4825	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/2 1 1 3/4 8 1/4 8 1/4 GLIDE ANGLE 46 1/4 3 4 1/2 26 1/4	CLIMB ANGLE 38 1/2 26 1/2 18 3/4 44 3/4 29 1/2 20 14 1/2 20 14 1/2 10 1/2 CLIMB ANGLE 45 34 3/4 27
RACK NO. 1 8 4 2 8 3 100 RACK NO.	STA. 2823 4825 13834 2786 3089 37816 40819 42821 <b>LB.</b> <b>MI</b> <b>STA.</b> <b>1822</b> 3824 4825 12833	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/2 11 3/4 8 1/4 8 1/4 GLIDE ANGLE 46 1/4 34 1/2 26 1/4 20 1/2	CLIMB ANGLE 38 1/2 2 6 1/2 1 8 3/4 4 4 3/4 2 9 1/2 20 1 4 1/2 1 0 1/2 20 1 4 1/2 1 0 1/2 CLIMB ANGLE 45 3 4 3/4 2 7 2 1 1/2
RACK NO. 1 8 4 2 8 3 100 RACK NO.	STA. 2823 4825 13834 2786 3089 37816 40819 42821 STA. 1822 3824 4825 12833 14835	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/2 11 1/4 8 1/4 6 1/4 GLIDE ANGLE 46 1/4 34 1/2 26 1/4 20 1/2 16	CLIMB ANGLE 38 1/2 2 6 1/2 2 6 1/2 4 4 3/4 2 9 1/2 2 0 1 4 1/2 1 0 1/2 CLIMB ANGLE 45 3 4 3/4 2 7 2 1 1/2 1 6 3/4
RACK NO. 1 8 4 2 8 3 100 RACK NO.	STA. 2823 4825 13834 2786 3089 37816 40819 42821 <b>LB.</b> <b>MI</b> <b>STA.</b> 1822 3824 4825 12835 14835 14835 2685	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/2 11 3/4 8 1/4 8 1/4 1 1/4 1 1/4 1 1/4 1 1/4 1 1	CLIMB ANGLE 38 1/2 26 1/2 18 3/4 44 3/4 29 1/2 20 14 1/2 10 1/2 10 1/2 CLIMB ANGLE 45 34 3/4 27 21 1/2 16 3/4 52 1/2
RACK NO. 1 8 4 2 8 3 100 RACK NO.	STA. 2823 4825 13834 2786 3089 37816 40819 42821 <b>LB.</b> <b>MI</b> <b>STA.</b> 1822 3824 4825 12833 14835 2685 2887	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/2 11 3/4 8 1/4 8 1/4 6LIDE 46 1/4 34 1/2 26 1/4 20 1/2 16 54 1/2 40 3/4	CLIMB ANGLE 38 1/2 26 1/2 18 3/4 44 3/4 29 1/2 20 14 1/2 10 1/2 10 1/2 10 1/2 10 1/2 CLIMB ANGLE 45 34 3/4 27 21 1/2 27 21 1/2 40 1/4
RACK NO. 1 8 4 2 8 3 100 RACK NO.	STA. 2823 4825 13834 2786 3089 37816 40819 42821 <b>LB.</b> <b>MI</b> <b>STA.</b> 1822 3824 4825 12835 14835 14835 2685	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/2 1 1 3/4 8 1/4 8 1/4 6 1/4 6 1/4 6 1/4 20 1/2 26 1/4 20 1/2 26 1/4 20 1/2 26 1/4 20 1/2 26 1/4 20 1/2 20 1/2 26 1/4 20 1/2 20	CLIMB ANGLE 38 1/2 26 1/2 20 18 3/4 44 3/4 29 1/2 20 14 1/2 20 14 14 1/2 20 14 14 1/2 20 14 14 1/2 20 14 14 14 14 14 14 14 14 14 14 14 14 14
RACK NO. 1 8 4 2 8 3 100 RACK NO. 1 8 4	STA. 2823 4825 13834 2786 3089 37816 40819 42821 <b>LB.</b> <b>MI</b> <b>STA.</b> <b>1822</b> 3824 4825 12833 14835 2685 2685 2685	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/2 11 3/4 8 1/4 8 1/4 6 1/4 6 1/4 6 1/4 20 1/2 26 1/4 20 1/2 20 1	CLIMB ANGLE 38 1/2 26 1/2 26 1/2 20 14 1/2 20 20 20 21 14 1/2 20 20 21 14 1/2 20 21 1/2 20 21 1/2 20 21 1/2 20 21 1/2 20 21 1/2 20 21 1/2 20 21 1/2 20 20 21 1/2 20 20 20 20 20 20 20 20 20 20 20 20 20
RACK NO. 1 8 4 2 8 3 100 RACK NO. 1 8 4	STA. 2823 4825 13834 2786 3089 37816 40819 42821 STA. 1822 3824 4825 12833 14835 2685 2887 3089 36815	GLIDE ANGLE 38 24 16 45 27 1/4 17 1/2 1 1 3/4 8 1/4 8 1/4 6 1/4 6 1/4 6 1/4 20 1/2 26 1/4 20 1/2 26 1/4 20 1/2 26 1/4 20 1/2 26 1/4 20 1/2 20 1/2 26 1/4 20 1/2 20	CLIMB ANGLE 38 1/2 26 1/2 20 18 3/4 44 3/4 29 1/2 20 14 1/2 20 14 14 1/2 20 14 14 1/2 20 14 14 1/2 20 14 14 14 14 14 14 14 14 14 14 14 14 14

Figure 41 - Bomb Release Angles Chart

	288.7	341/4	
28	3181	18 %	21
201	39818	10	12 4
	4282	5 1/2	. 8
110	OLB.	MK. 11	1
RACK N	O. STA.	GLIDE	CLIME
	00.00	23 1/2	9
	2988	1 20 12	
283			1 1/2
283		10	1 1/2
	37816	10	0
160	0 LB.	10	0
	0 LB.	10 4 AN-N	
160	0 LB.	AN-N GLIDE ANGLE	
160 RACK P	OLB. 0 LB. 0 LB. 0 STA. 0 STA.	AN-A GLIDE ANGLE 7 16 be	
IGO RACK N	OLB. 0 LB. 0 LB. 0 STA. 0 STA.	AN-A GLIDE ANGLE 7 16 b2	O AKI CLIMB ANGLE

500LB. M-43

STA. GLIDE CLIMB ANGLE ANGLE 2023 33 33 14

11 832 17 19 1/4

RACK NO.	STA.	GLIDE	ANGLE	
HAOK NO.	SIA.	ANGLE		
10000	2988	25	17	
283	37816	11	8	
	41820	5	3	

	1	00	LB. I	W-3	9
RA	СК	NO.	STA.	GLIDE	CLIMB
			1822	46 V4	45
			3824	34 1/2	3434
1	8	4	4825	26 1/4	27
			12833	20 1/2	211/2
			14835	16	16%
	-		2685	54 V2	52 1/2
			2887	40%	40 %
			3089	29 4	30
2	8	3	368.15	22	23
			38617	17 1/4	1914
			40819	13 1/2	14 1/2
			42821	10	10%

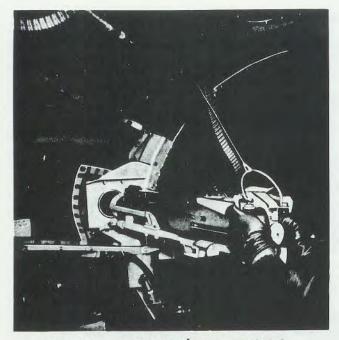


Figure 42 - Bombardier's Gun - Left Side

#### 2. BOMBARDIER'S GUNS.

a. Most airplanes have two .50-caliber machine gun installations, one mounted through a window on either side of the bombardier's compartment. A .50-caliber gun is also mounted in the center Plexiglas nose of some airplanes. In some airplanes ball and socket mounts are incorporated in the nose, side, and top windows for insertion of a .30-caliber machine gun.

b. On B-17G airplanes a type A-16 chin turret with two .50 calibre machine guns is mounted below, and is remotely controlled from, the bombardier's compartment.

#### 3. INTERPHONE.

Two interphone jack boxes are on the right side of the compartment. Operating instructions are given in section I, paragraph 10.

## 4. OXYGEN.

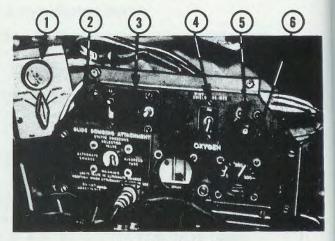
The oxygen regulator and indicator panel are on the right wall of the compartment. Operating instructions are given in section I, paragraph 9.

## 5. BOMB-SIGHT WINDOW

DEFROSTER.

A control knob in the floor in front of the bombardier's seat controls the flow of air to the bomb-sight window. Push forward to shut off the flow of air; pull aft to allow air to reach the bomb-sight window. Selection of hot and cold air is made by the pilot.





**KEY TO FIGURE 43** 

1.	INTERPHONE JACKBOX	4.	WINDSHIELD ANTI-ICER
	GLIDE BOMBING ATTACH-		PUMP SWITCH
-	MENT STATIC PRESSURE	5.	ANTI-ICER ALCOHOL
	SELECTOR SWITCH		FLOW VALVE
3.	WINDSHIELD WIPER CONTROLS	6.	OXYGEN INDICATORS

Figure 43 - Bombardier's Compartment - Right Side

## 6. WINDSHIELD WIPER AND ANTI-ICER.

Anti-icer and wiper controls for the bomb-sight window are on a panel at the bombardier's right.

a. A toggle switch regulates the wiper motor "OFF," "SLOW," or "FAST." A circuit breaker protects the circuit in case of an overload.

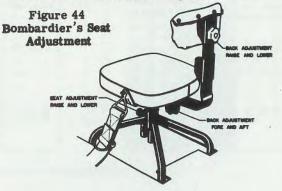
<u>b</u>. An "ON-OFF" switch controls the alcohol and flow is regulated by a needle valve.

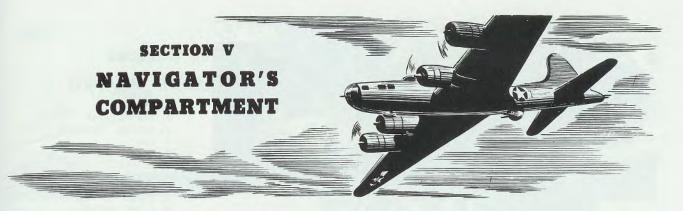
#### CAUTION

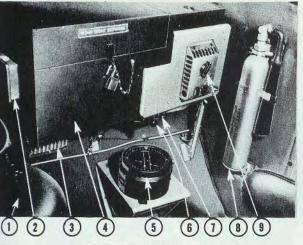
Do not operate the wiper on dry glass.

7. BOMB-SIGHT HEATING PAD.

Most airplanes are equipped with an electrical bomb-sight heating pad which may be plugged into the bombardier's suit heater receptacle.







**KEY TO FIGURE 45** 

1.	DRIFT METER	5.	APERIODIC COMPASS
2.	FUSE BOX	6.	PANEL LIGHT
3.	HEATING AND VENTILATING	7.	PANEL LIGHT SWITCH
	OUTLET	8.	FIRE EXTINGUISHER
4.	BOMB SIGHT STOWAGE BOX	9.	SUIT HEATER OUTLET

#### Figure 45 - Navigator's Compartment Right Rear Corner

#### 1. LIGHTING.

ICER

Side

ight

otor

aker

and

ical the

> A dome light and switch are in the ceiling of the compartment. A panel light and switch are above the navigator's table on the aft wall. The navigator's light is on the wall directly over his table; the switch is on the base of the lamp.

## 2. FIRE EXTINGUISHER.

A hand  $CO_2$  fire extinguisher is clipped to the aft wall of the compartment to the right of the door.

#### 3. INTERPHONE.

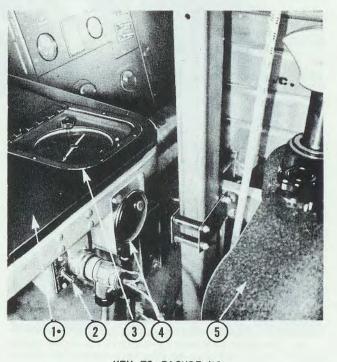
The interphone jack box is between the radio compass control box and the map case. Operating instructions are given in section I, paragraph 10.

## 4. OXYGEN.

The oxygen regulator is on the wall above the navigator's table. Refer to section I, paragraph 9.

#### 5. HEATING AND VENTILATING INLET.

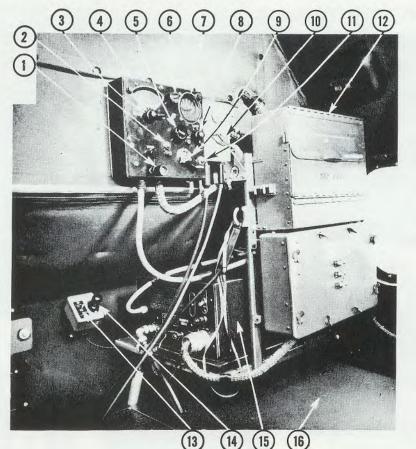
The inlet beneath the bomb-sight storage box is equipped with a push-pull knob for regulating the flow



## KEY TO FIGURE 46

- I. NAVIGATOR'S TABLE
- 2. DRIFT METER MASTER SWITCH
- 3. RADIO COMPASS INDICATOR
- 4. ASH RECEIVER 5. DRIFT METER
- and the second se

Figure 46 - Navigator's Equipment



#### KEY TO FIGURE 47

- I. TUNING CRANK
- CONTROL INDICATOR 2. LAMP
- 3. BAND SELECTOR SWITCH
- 4. RADIO COMPASS
- CONTROL UNIT
- 5. VOLUME CONTROL LIGHT CONTROL 6.
- SWITCH
- TUNING METER 7. LOOP CONTROL 8.
- SWITCH 9.
- RADIO COMPASS POWER SWITCH INTERPHONE 10.
- JACKBOX
- CONTROL PUSH 11. BUTTON
- 12. MAP CASE 13. PANEL LIGHT
- SWITCH
- 14. PANEL LIGHT
- RADIO COMPASS 15. RECEIVER
- 16. NAVIGATOR'S
- TABLE

Figure 47 - Navigator's Communications Controls

of air. Push to open and pull to close. The selection of hot or cold air is made by the pilot.

## 6. DRIFT METER MASTER SWITCH.

A master switch for the drift meter is below the edge of the navigator's table near the ash receiver on the front forward corner.

## 7. RADIO COMPASS RECEIVER.

a. The radio compass receiver is above the navi-gator's table and may be remotely controlled either from the pilot's compartment ceiling or from the control unit on the navigator's table. Operation of the radio compass receiver is the same for the navigator as for the pilot. Refer to section II, paragraph 2.

b. The bearing indicator is mounted beneath the forward inboard corner of the navigator's table and its dial may be seen by lifting the cover on the table. The loop antenna is remotely controlled from the radio compass receiver.

8. APERIODIC COMPASS.

The navigation compass is on the right side of the compartment, below the bomb-sight storage box.

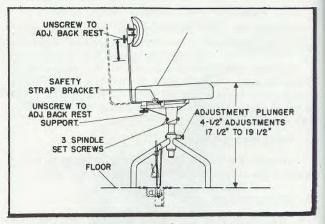
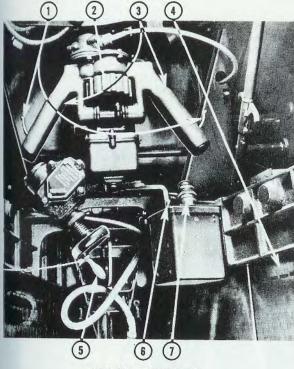


Figure 48 - Navigator's Seat Adjustment



## 1. GENERAL.

a. Elevation of the guns is controlled by lifting or depressing the hand control grips, the direction corresponding to the direction of the handgrip motion about the horizontal axis,



**KEY TO FIGURE 49** 

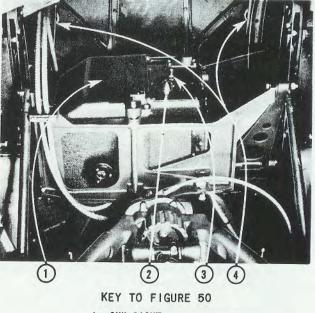
- I. DEADMAN SWITCH 5. AZIMUTH HANDCRANK 2. RANGE KNOB 6. TROUBLE LIGHT 3. HAND GRIP
- SWITCH 4. AMMUNITION BOX 7. TROUBLE LIGHT

Figure 49 - Upper Turret Controls

b. Rotation of the turret is obtained by turning the handgrips about the vertical axis. The range knob is mounted between the grips, so that the gunner rests both thumbs on this knob while holding the grips in the palms of his hands. This knob sets the range in the computing sight.

c. The hydraulic power unit furnishes the mechanical power for rotating the turret and elevating the guns.

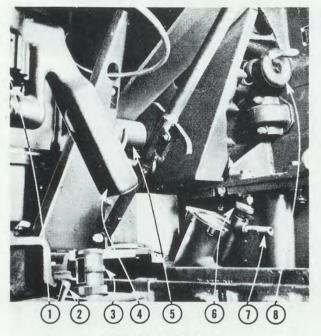
d. A gun firing switch is mounted to the rear and at the upper end of each handgrip. The two firing



- I. GUN SIGHT 2. SIGHT LIGHT RHEOSTAT CONTROL 3. SIGHT SWITCH
- 4. GUN CHARGING HANDLES

Figure 50 - Inside Upper Turret

switches are connected in parallel so that either switch can be used to fire the guns. Deadman switches, one on each grip, are connected in parallel so that the gunner can operate the turret when either hand rests on a grip. The deadman switch is provided so that the power circuits of the turret will be opened and all turret motion and firing of guns will be stopped when the gunner's hands are removed from the grips.



#### KEY TO FIGURE 51

1.	RANGE KNOB	5.	DEADMAN SWITCH
2.	TROUBLE LIGHT SWITCH	6.	OXYGEN FLOW CONTROL
3.	TROUBLE LIGHT	7.	OXYGEN MASK FITTING
4.	HAND GRIP	8.	ELEVATION HANDCRANK

## Figure 51 - Upper Turret Interior

## 2. PREFLIGHT CHECK.

<u>a</u>. Allow hydraulic units and sight to warm up at least 5 minutes before take-off.

b. Engage power clutches.

<u>c</u>. See that hand cranks are disengaged. (Do <u>not</u> disengage until after power clutches have been engaged.)

- d. Feed ammunition just up to the guns.
- e. Move main gun switch to "ON" position.

- f. Place sight switch in "ON" position.
- g. Close deadman switches on handgrips.

<u>h</u>. Check response of azimuth and elevation mechanisms by manipulating the handgrips.

i. Turn range knob and observe that reticles move in response.

j. Adjust reticle light to approximately the desired brilliance.

## 3. TURRET OPERATION.

a. Charge guns by pulling each handle twice.

b. Turn on gun selector switches.

 $\underline{c}.$  When target is sighted, set in target dimension on sight.

 $\underline{d}$ . Turn hand controls so that reticles frame the target.

e. Adjust range knob until reticles frame the target.

f. Press either firing switch.

g. After ammunition has been used, charge guns at least twice to clear out live shells.

<u>h</u>. When the turret is not being used, turn it so that the guns point aft and are parallel to the center line of the airplane.

<u>i.</u> In event of power failure, the turret may be controlled by the azimuth and elevation hand cranks. It is not possible to track a target with the hand cranks, but they may be used for approximate positioning of the turret and guns.

j. To use the hand cranks:

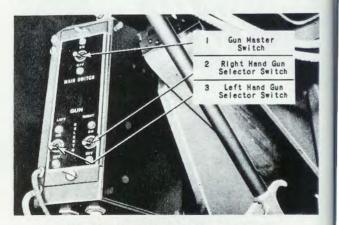


Figure 52 - Upper Turret Switches

- (1) Engage azimuth and elevation hand cranks.
- (2) Disengage power clutches.
- (3) Move turret and guns into desired position.
- (4) When finished, reengage power clutches.

(5) Be sure to disengage hand cranks before operating power motor again.

## 4. ADJACENT EQUIPMENT.

<u>a</u>. LIGHTING. - A panel light and switch are on the wall of the compartment to the left of the turret. A trouble light and switch are inside of the turret; on the right side looking aft.

<u>b.</u> INTERPHONE. - An interphone jack box is on the wall of the compartment to the left of the turret. Operating instructions are given in section I, paragraph 10.

# c. OXYGEN.

(1) An A-12 demand oxygen regulator on the right wall of the compartment is part of the main oxygen system and is operated as instructed in section I, paragraph 9. A continuous flow regulator, type A-9 is inside the turret, on the right side looking aft, and is connected to a separate supply cylinder attached to the turret.

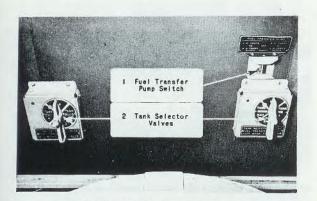


Figure 53 - Fuel Transfer Controls

(2) To use A-9A regulator, attach mask hose to regulator and open the manually operated valve until indicator points to altitude at which airplane is flying. If valve vibrates off setting, tighten packing nut.

(3) The turret supply cylinder can be refilled from the main supply system.

d. FUEL TRANSFER CONTROLS. - Two fuel transfer valves and the transfer pump switch are below the door leading to the bomb bay. Refer to section I, paragraph 4., for operating instructions. <u>e</u>. HYDRAULIC EQUIPMENT. - The hydraulic pump panel, accumulators, fluid tank, and servicing valves are at the right side of the compartment. Refer to section I, paragraph 3.

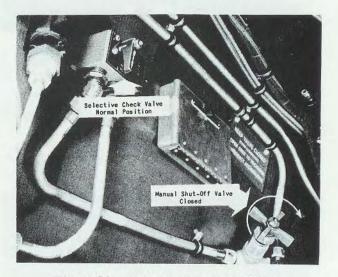


Figure 54 - Hydraulic Servicing Valves

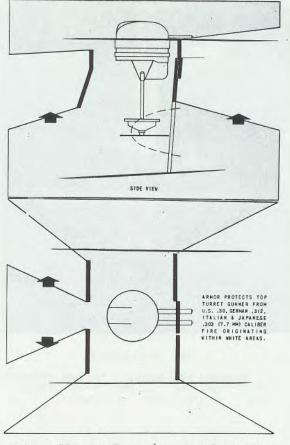
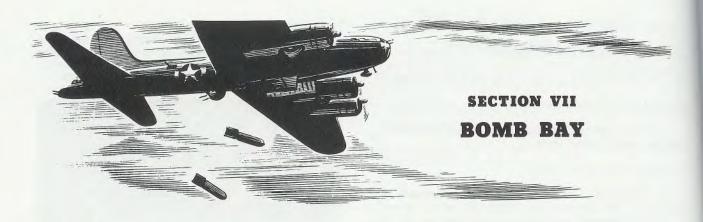


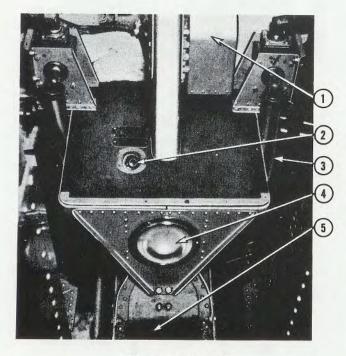
Figure 55 - Top Gunner's Armor Protection



#### 1. LIGHTING.

<u>a</u>. The step light at the forward end of the catwalk is operated by a switch on the forward wall of the radio compartment, to the right of the door.

b. Two dome lights, one on either side of aft end of the bay, are operated by switches on the aft bulkhead to the right of the door.



## **KEY TO FIGURE 56**

I. EMERGENCY BOMB RELEASE 2. BOMB DOOR HAND CRANK CONNECTION 3. HOSE TO FUEL TRANSFER PUMP 4. STEP LIGHT 5. CATWALK

Figure 56 - Forward End of Catwalk - Bomb Bay

## 2. OXYGEN.

The oxygen regulator is on the aft wall of the bomb bay to the left of the door.

#### 3. EMERGENCY EQUIPMENT.

<u>a</u>. A hand crank connection for manual operation of each main landing wheel is on the forward wall of the bomb bay.

<u>b</u>. A hand crank connection for manual operation of the bomb bay doors is on the step at the forward end of the catwalk.

c. An emergency bomb release handle is also on the step at the forward end of the catwalk and is protected by a hinged guard.

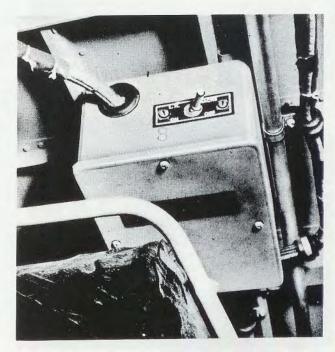


Figure 57 - Bomb Rack Selector Switch - Left Side

d. For use of emergency equipment, refer to section III.

## 4. BOMB RACK SELECTOR SWITCHES.

Two switches, one on each side of the bomb bay, are used in conjunction with the rack selector switches on the bombardier's control panel. When either switch is "OFF," electrical release of bombs or fuel tanks from that rack is impossible.

## 5. HAND TRANSFER OR REFUELING PUMP.

A hand pump mounted on the aft bulkhead of the bomb bay may be used to transfer fuel in case of electrical power failure or may be attached to a main landing gear shock strut and used as a refueling pump. (See figure 60.)

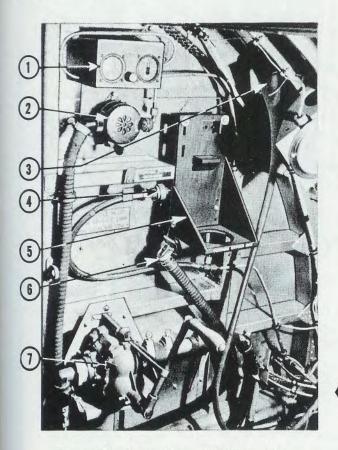


Figure 58 - Bomb Bay - Left Side, Aft

## 6. AUXILIARY WING FUEL CELL SHUT-OFF VALVES.

Remote control handles, operating shut-off valves in the lines from each group of outer wing fuel cells, are mounted below the door at the aft end of the bomb bay. Refer to section I, paragraph 4., for operating instructions.

## NOTE

In some installations these valve controls are in the radio compartment.

#### 7. RELIEF TUBE.

A relief tube is located behind the dome light in the left bomb bay.

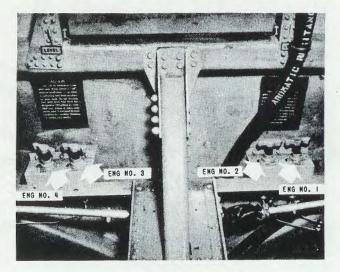


Figure 59 - Auxiliary Fuel Tank Shut-Off Valves

## **KEY TO FIGURE 58**

OXYGEN INDICATOR	5.	PORTABLE OXYGEN
		BRACKET
	6.	OXYGEN MASK
PORTABLE OXYGEN		CONNECTION
UNIT RECHARGER	7.	HAND FUEL PUMP
	PANEL OXYGEN REGULATOR RELIEF TUBE PORTABLE OXYGEN	PANEL OXYGEN REGULATOR RELIEF TUBE 6. PORTABLE OXYGEN

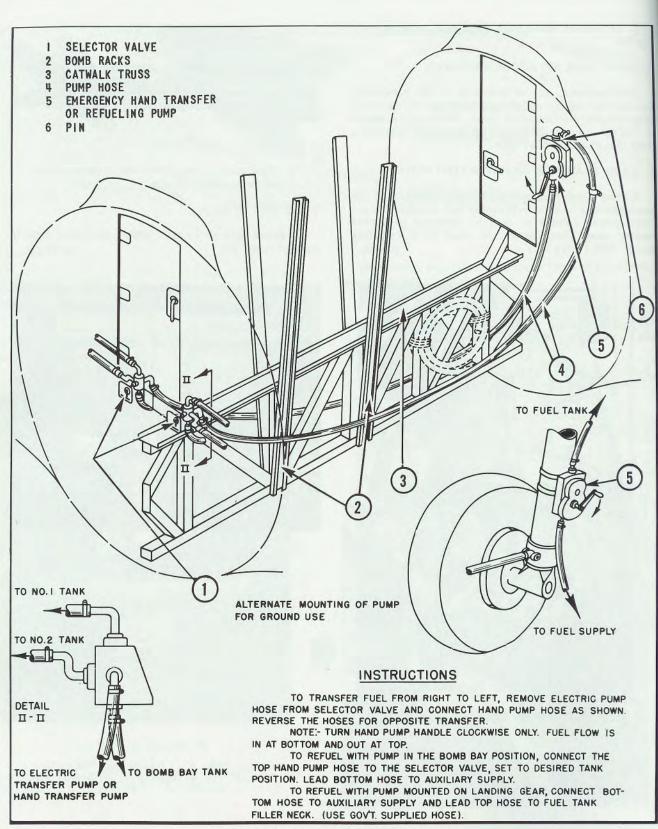
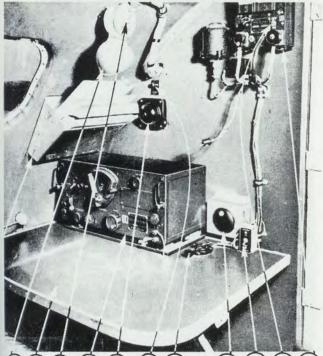


Figure 60 - Hand Fuel Pump Operation





#### 

## KEY TO FIGURE 61

I. RADIO OPERATOR'S LIGHT	8. ASH RECEIVER
2. RADIO OPERATOR'S TABLE	9. LIAISON TRANSMIT-
3. LIGHT SWITCH	TER MASTER SWITCH
4. LIAISON SET RECEIVER	10. LOCAL "OFF-ON"
5. ALARM BELL	SWITCH SCR-535
6. PHONE CALL LAMP	11. RADIO SET SCR-535
7. TRANSMITTING KEY	CONTROL BOX

Figure 61 - Radio Operator's Table and Controls

## 1. LIGHTING.

A lamp above the radio operator's table is operated by an adjacent switch. A similar lamp and switch are in the aft end of the compartment above the liaison transmitter. Another lamp and switch are on the side wall to the left of the radio operator's seat.

## 2. EMERGENCY EQUIPMENT.

 $\underline{a}$ . A fire extinguisher is on the forward wall of the compartment to the right of the door.

<u>b</u>. Two life raft release handles are on the ceiling of the compartment, just aft of the top hatch on the right side.

<u>c</u>. Four red emergency release handles are located along the edge of the top hatch.

<u>d</u>. An alarm bell is on the forward wall of the compartment above the radio operator's table.

e. Two hand cranks and two crank extensions for manual operation of the wing flaps, bomb bay doors, landing gear, tail gear, and engine starters are clipped to the aft wall of the compartment, above the transmitter tuning units. For use of hand cranks refer to section III.

## 3. OXYGEN CONTROLS.

Oxygen outlets are provided for the radio operator and for each of the two auxiliary crew members. Refer to section I, paragraph 9., for instructions.

## 4. HEATING AND VENTILATING INLET.

The inlet is on the floor of the compartment, to the left and aft of the radio operator's seat. Push the knob to close; pull, to open. Selection of hot or cold air is controlled by the pilot.

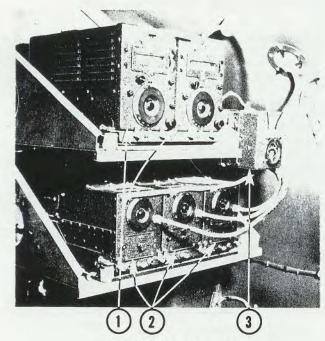
## 5. INTERPHONE CONTROLS.

The radio operator's interphone jack box is on the left side wall. Two additional jack boxes are provided in the compartment for other crew members. Refer to section I, paragraph 10., for instructions.

## 6. COMMUNICATIONS EQUIPMENT.

<u>a</u>. The communications equipment consists of the following:

Command set	SCR-274-N
Liaison set	SCR-287-A
Radio compass set	SCR-269-G
Interphone equipment	RC-36
Marker beacon equipment	RC-43
Radio altimeter	SCR-518-A
IFF radio set	SCR-535-A



KEY TO FIGURE 62

- I. COMMAND TRANSMITTERS
- 2. COMMAND RECEIVERS
- 3. ANTENNA RELAY CONTROL BOX

Figure 62 - Command Radio Installation

<u>b.</u> COMMAND RADIO. - Two command radio transmitters and three receivers are mounted on the right side of the compartment on the forward bulkhead. They are controlled by remote control units on the ceiling of the pilot's compartment. The transmitters' dynamotor and modulator are on the floor in the forward right corner of the compartment. The receiver's dynamotors are mounted on supports behind the receivers.

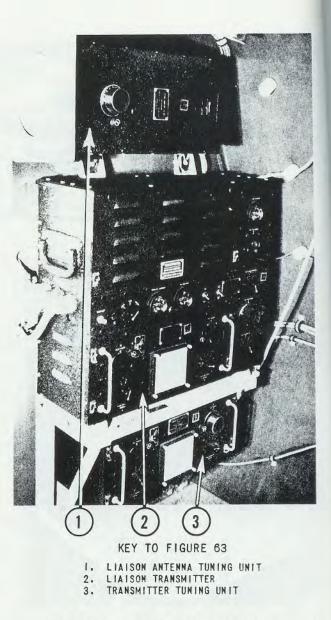


Figure 63 - Liaison Radio Installation

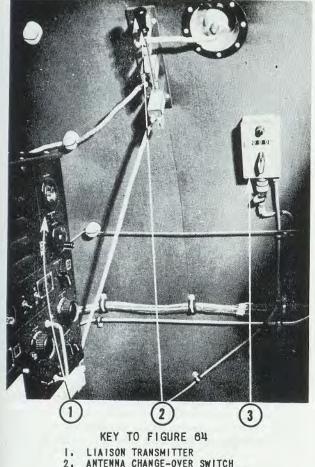
<u>c</u>. LIAISON RADIO. - The liason transmitter is installed on the left side of the aft bulkhead. The receiver is on the radio operator's table. The dynamotor is on the left rear side of the aft bulkhead, in the ball turret compartment. Two antennas are available for use with the liaison set. One employs the skin of the airplane, with the lead-in attached to the change-over switch on the left side wall. The other is the trailing antenna which is also attached to the change-over switch. The trailing antenna reel is operated electrically from a control box to the right of the change-over switch.

d. RADIO SET, SCR-518-A (HIGH-ALTITUDE ALTIMETER). - Radio set SCR-518-A consists of a

complete set of apparatus for determining the height of the airplane above the ground. It is operative over an altitude range of 0 to 20,000 feet, and it will work satisfactorily up to 30,000 feet, before the indications become erroneous. Operation of the set does not depend upon barometric pressure. It indicates altitude of the aircraft above the terrain below the airplane, and has no reference to sea level. If the aircraft is flying over broken country, more than one peak will appear on the indicator, the highest one representing the object closest to the airplane.

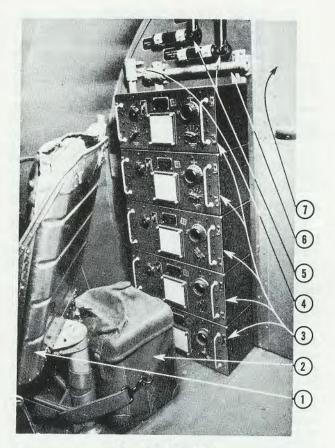
(1) Place the power switch in the "ON" position. This energizes all parts of the set except the automatic volume control which is controlled by a separate switch. A pilot lamp at the lower center of the control panel should light, indicating that the power is on.

(2) As the tubes reach their operating conditions, the circle traces, and indicating lobes appear on the screen of the indicator. During the first few minutes of operations the indications will be unsteady.



- 2. TRAILING ANTENNA REEL CONTROL 3.

Figure 64 - Radio Compartment - Left Side



KEY TO FIGURE 65

2.3.	SEAT FOR AUXILIARY CREW FREQUENCY METER TRANSMITTER TUNING UNITS	6.	HAND CRANKS CRANK EXTENSION FOR BOMB DOORS AND FLAPS DOOR TO BALL TURRET
4.	STARTER CRANK EXTENSION		COMPARTMENT

Figure 65 - Transmitter Tuning Units

(3) Turn the "CIRCLE SIZE" control knob until the two circle traces on the indicator screen are adjusted to the required diameter for readings. The proper size occurs when each circle is just visible as a luminous green ring on the gray background, just beyond the outer circumference of its dark calibrated scale ring.

(4) Turn the "RECEIVER GAIN" control to adjust the lobe readings for clearest legibility on the indicator screen. Maximum receiver sensitivity may be used at the higher altitudes and less than maximum sensitivity may be required at the lower altitudes. The receiver gain control must be adjusted in conjunction with the automatic volume control switch for maximum lobe legibility on the altimeter scale in accordance with the following paragraphs.

## (5) USE OF AUTOMATIC VOLUME CONTROL AT LOWER ALTITUDES.

(a) The automatic volume control improves the performance of the radio set at altitudes below 2000 feet and should only be used for reading up to 2000 feet. With the AVC switch on, receiver sensitivity is reduced but is automatically increased with altitude up to about 2000 feet. Overloading of the receiver is thus prevented at the lower altitudes.

(b) For operation when descending below 2000 feet:

 $\underline{1}$ . At any altitude above 1000 feet, throw AVC switch on.

<u>2.</u> Adjust "RECEIVER GAIN" control until the initial lobe appearing at zero on the 2000-foot scale is the proper height.

<u>3</u>. The reception lobe giving the altitude reading on the 2000-foot scale should now remain approximately constant in size as the ground is approached.

(6) USE OF AVC AT HIGHER ALTITUDES. - The AVC switch must be turned off, when the equipment is operating at altitudes above 2000 feet, as the AVC would otherwise impair the receiver sensitivity in certain sections of the higher-altitude ranges.

(7) Starting from zero and reading in a clockwise direction, read the <u>counterclockwise</u> edge of each lobe on each circle trace. (If the lobe is on the top of the dial, read to the left edge, and if it is at the bottom of the dial, read the right edge.) The first lobe (or index lobe) appears at the zero calibration on each scale. The second lobe (reflection lobe) indicates the altitude above terrain.

(a) On each scale (inner and outer), the index lobe will appear at the zero calibration. The second (reflection lobe) on each scale indicates the absolute altitude of the aircraft.

(b) The inner circle is merely a vernier on the outer circle. On the outer circle, it is possible to read to within 250 feet. If greater accuracy is required, the inner scale reading must be taken into consideration, as follows: Read the outer scale to the next lower even thousand (4000, for instance). Read the inner scale. If the reading of the inner scale should be 750 feet, the actual altitude of the aircraft is then obtained by adding the readings of the two scales: 4750 feet. The inner scale can, with practice, be read to within 25 feet.

(c) If the zero lobes have shifted away from zero, correct readings may be obtained by adding the amount of zero shift, if the shift is to the left of zero, and by subtracting the amount of zero shift, if the shift is to the right, from the reading of altitude which was obtained by following the procedure outlined in the preceding paragraph.

#### 7. FREQUENCY METER.

A portable frequency meter for use with any radio is carried in each airplane. No provision is made for stowage, so the unit is usually strapped to the support of the rear auxiliary seat in the radio compartment.

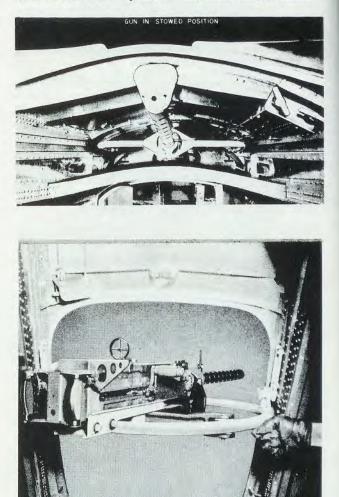


Figure 66 - Radio Compartment Gun

COLUMN STREET

#### 8. RADIO COMPARTMENT GUN.

Talana an

In some airplanes a single .50-caliber flexible machine gun is mounted on a yoke in top of the radio compartment to fire through the top hatch opening. The yoke slides on rails from stowed to firing position.

#### 9. CAMERA PIT.

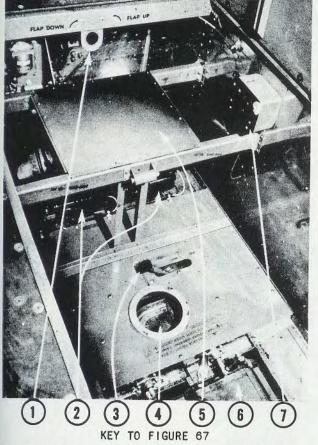
a. Camera equipment is installed in the pit under the floor of the radio compartment accessible door. Provision is made for three alternate installations as follows:

Type T-3A Installation:

Camera	Type T-3A
Camera mount	A-5A
View finder	A-2
Filter	A-3
Shutter induction coil	

Type K-3B Installation:

Camera	Type K-3B
Camera mount	A-8
View finder	A-2
Intervalometer	
Magazine	A-1A
Filter	A-2A



1.	WING FLAP HAND CRANK	4
	CONNECTION	5
2.	PROPELLER ANTI-ICER	6
	PUMPS	7
0	ALUFOA DOOD CONTOOL HAN	

3. CAMERA DOOR CONTROL HANDLE

4. VIEWFINDER APERTURE 5. CAMERA OPERATOR'S SEAT 6. CAMERA DOOR 7. INTERVALLMETER POWER E. RECEPTACLE

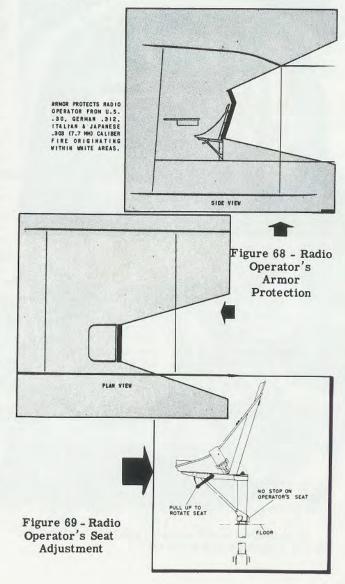
Figure 67 - Camera Pit

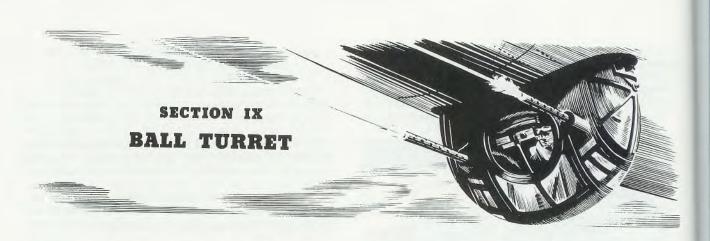
Type K-7C Installation:

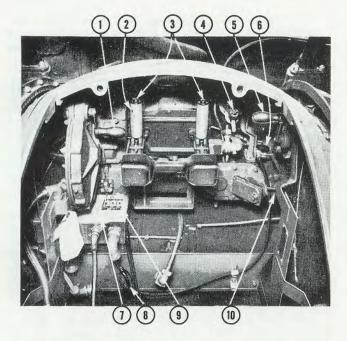
Camera	Type K-7C
Camera mount	A-8
View finder	A-2
Filter	A-4

<u>b</u>. The type A-2 view finder may be installed forward of the camera. The bracket assembly used to support the intervalometer is stowed on the right side of the camera pit. The intervalometer is stowed on the right side. A direct current power receptacle for the intervalometer is installed on the right side of the pit and a connection to the vacuum system is provided on the left side.

<u>c</u>. The double camera doors (figure 67) and the view finder door are hinged in the bottom of the fuse-lage and are operated by a lever located on the floor at the operator's seat.







#### **KEY TO FIGURE 70**

1.	ELEVATION HANDCRANK	6.	SPOT LIGHT
2.	HAND CONTROL GRIP	7.	ELECTRICAL SWITCH BOX
3.	FIRING SWITCHES	8.	SPOT LIGHT CONTROL SWITCH
4.	OXYGEN REGULATOR	9.	GUN SELECTOR SWITCHES
5.	AZIMUTH HANDCRANK	10.	ELEVATION POWER CLUTCH

Figure 70 - Interior of Ball Turret

## 1. GENERAL.

a. A Sperry ball-type power turret, equipped with twin .50-caliber machine guns, is installed in the bottom of the fuselage aft of the radio compartment.

b. A hydraulic unit provides power for driving the turret in azimuth and elevation.

c. The hand control and limit unit controls the outputs of the azimuth and elevation hydraulic systems. A pair of handgrips controls the motion of the turret in azimuth and elevation. Each handgrip has a firing switch on the top end.

<u>d</u>. The switch box controls distribution of the electric power to the various units in the turret. The terminal block in the top left end of the box has convenient posts for connecting the leads of the gunner's head set and microphone.

## 2. ENTERING THE TURRET.

## CAUTION

Do not attempt to rotate the turret in elevation while the airplane is on the ground. No crew member shall be in the turret during landing or take-off and the guns of the turret shall be in the horizontal position pointing aft.

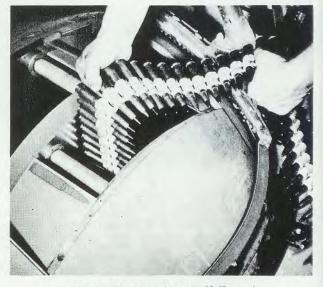
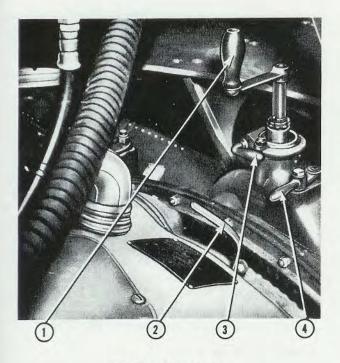


Figure 71 - Loading Ball Turret Ammunition Boxes



 KEY TO FIGURE 72

 I - ELEVATION HANDCRANK

 2 - LUG WRENCH

 4 - ELEVATION HANDCLUTCH

Figure 72 - External Manual Controls

<u>a</u>. Remove ammunition box cover and load. Push ammunition down to the guns.

<u>b</u>. Remove elevation hand crank from its clip and attach it to shaft. Be sure that the hand brake (figure 72) is locked.

<u>c</u>. Move elevation hand clutch to "IN" position. It may be necessary to loosen hand brake and rock hand crank back and forth before hand clutch can be moved to "IN" position.

<u>d</u>. Move elevation power clutch to "OUT" position using clutch handle; then, replace handle in its clip.

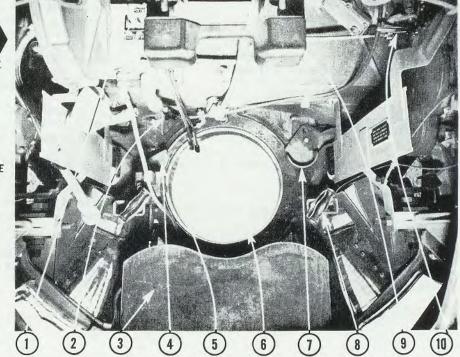
<u>e</u>. Loosen elevation brake slowly while holding elevation hand crank firmly.

<u>f.</u> Turn elevation hand crank in down direction until turret revolves to low limit of elevation (-90 degrees).

g. While holding elevation hand crank, open turret door, reach inside, and move elevation power clutch to "IN" position.

<u>h</u>. Move elevation hand clutch to "OUT" position, remove hand crank, and replace it in its clip.

 $\underline{i}$ . Enter turret. Close door securely. Be sure door handles are pushed all the way up and that the



KEY TO FIGURE 73

- I. ELECTRICAL SWITCH BOX
- 2. SPOT LIGHT SWITCH
- 3. GUNNER'S SEAT
- 4. RANGE FOOT PEDAL
- 5. HEADSET AND MICROPHONE LEADS
- 6. TURRET FRONT WINDOW
- 7. FOOT REST
- 8. CHARGING HANDLE
- 9. TURRET HAND CONTROL AND LIMIT UNIT
- 10. ELEVATOR POWER CLUTCH

Figure 73 Ball Turret, Top View



Figure 74 - Inside Ball Turret

turret door is locked before turning main power and sight switches "ON."

## 3. PREFLIGHT CHECK.

- a. Turn power switch "ON."
- b. Turn sight switch "ON."

c. Check response of azimuth and elevation mechanisms by manipulating the hand controls.

#### WARNING

Be sure that the guns are not driven down into the ground.

<u>d</u>. Adjust reticle light on sight to desired brilliance (approximately).

e. Work range foot pedal and observe if reticles move in response.

<u>f.</u> Lift each gun cover plate and pull ammunition down, feeding first shell by hand into magazine of gun; then, close gun cover plates.

#### 4. OPERATION.

<u>a</u>. Load ammunition boxes. (See figure 71.) Enter turret.

- b. Turn on power switch.
- c. Turn on sight switch.
- d. Charge guns by pulling charging handles twice.
- e. Turn on fire selector switches.
- f. By means of hand controls track the target.

g. Operate range foot pedal until reticles frame the target.

h. Close either firing key.

<u>i.</u> When ammunition is used up, charge guns at least twice to be sure that no live shells are left in the guns.

## 5. INTERPHONE.

A press-to-talk switch for inter-communication is located just in front of the gunner's right footrest.

#### 6. SUIT HEATER.

A rheostat control is provided for use with the gunner's heated suit. It is located on the underneath side of the seat and is adjusted to obtain the desired temperature in the suit.

#### 7. OXYGEN.

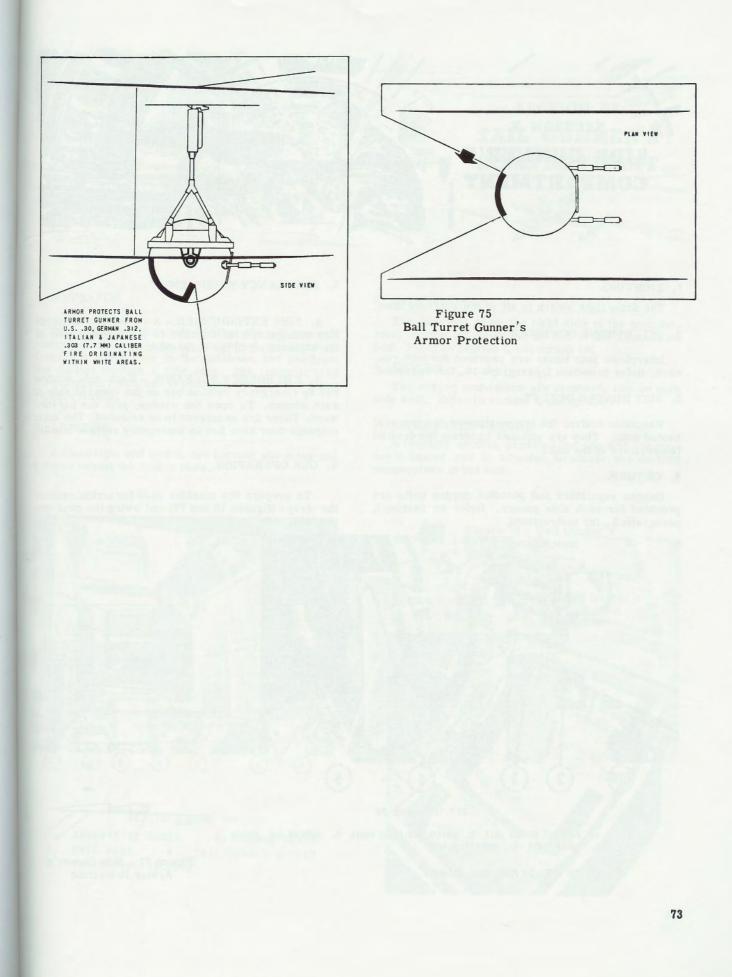
An oxygen regulator is provided on the inside of the ball turret on the right side. Refer to section VI, paragraph 4.c., for operation. Oxygen is supplied from the auxiliary cylinder above the turret. When the supply of this auxiliary cylinder is exhausted, it can be renewed from the airplane's main supply system.

#### 8. ADJACENT EQUIPMENT.

<u>a</u>. LIGHTING. - A dome light in the ceiling just aft of the turret support is operated by a switch to the right of the door to the radio compartment.

<u>b.</u> EMERGENCY RADIO - SCR 578. - Some airplanes are provided with a completely independent emergency radio which is carried on the right rear side of bulkhead 6 beside the ball turret. Refer to section III, paragraph 14., for further instructions.

c. FIRST-AID KIT. - A first-aid kit is clipped to the aft side of the bulkhead between the ball turret compartment and the radio compartment to the left of the door.





# 1. LIGHTING.

The dome light switch is aft of the entrance door.

# 2. INTERPHONE CONTROLS.

Interphone jack boxes are provided for both gunners. Refer to section I, paragraph 10., for operation.

#### 3. SUIT HEATER OUTLET.

Rheostats control the temperature of the gunners' heated suits. They are adjusted to obtain the desired temperature in the suits.

#### 4. OXYGEN.

Oxygen regulators and portable oxygen units are provided for each side gunner. Refer to section I, paragraph 9., for instructions.

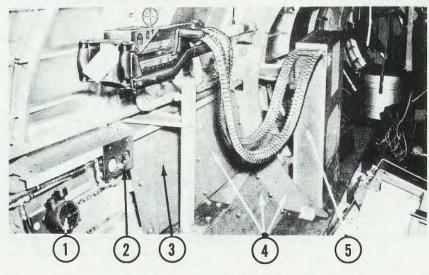
#### 5. EMERGENCY EQUIPMENT.

<u>a</u>. FIRE EXTINGUISHER. - A carbon tetrachloride fire extinguisher is attached to the forward side of the bulkhead aft of the main entrance.

<u>b.</u> EMERGENCY RELEASES. - Each side window has an emergency release bar on the forward side of each window. To open the window, jerk the barforward. There are no catches to be released. The main entrance door also has an emergency release handle.

#### 6. GUN OPERATION.

To prepare the machine guns for action, remove the straps (figures 76 and 77) and swing the guns into position.



KEY TO FIGURE 76

1. PORTABLE OXYGEN UNIT 2. OXYGEN INDICATOR PANEL 3. MACHINE GUN, STOWED 4. ARMOR PLATE 5. AMMUNITION BOX

Figure 76 - Right Side Gun Stowed

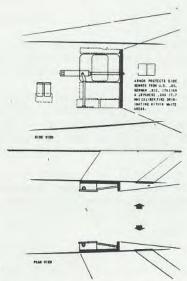
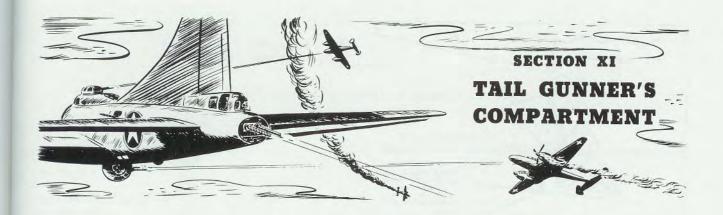


Figure 77 - Side Gunner's Armor Protection



# 1. ENTRANCE.

There are two ways of entering the tail gunner's compartment: one from the tail wheel compartment through a small door in the bulkhead, and one from the outside through a side door. The latter is used for emergency exit, and is equipped with an emergency release handle.

### 2. LIGHTING.

A dome light and switch are located above the gun handles behind the armor plate.

#### 3. INTERPHONE.

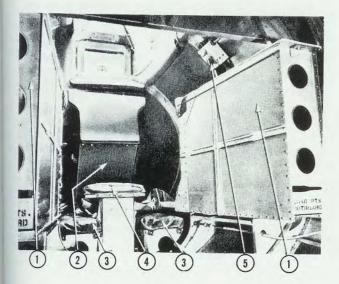
The jack box is on the right side of the compartment looking aft above the aft end of the ammunition box. Refer to section I, paragraph 10.

# 4. OXYGEN.

Two oxygen regulators are provided, one on each side wall. Refer to section I, paragraph 9.

### 5. SUIT HEATER OUTLET.

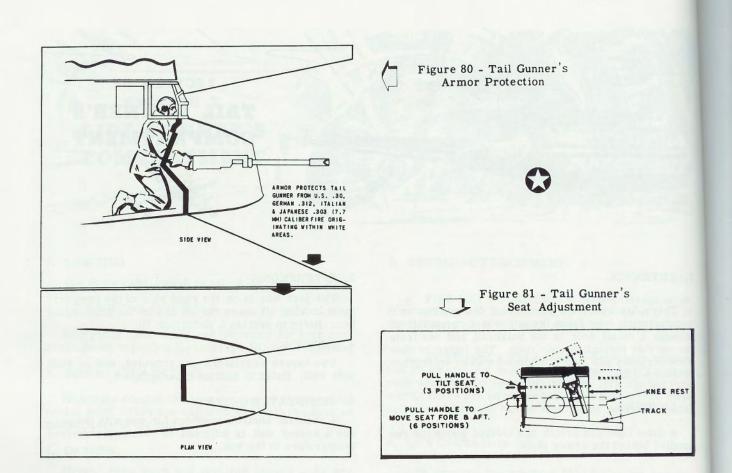
A rheostat control, provided for use with the gunner's heated suit is adjusted to obtain the desired temperature in the suit.



# KEY TO FIGURE 78

- I. AMMUNITION BOXES 2. ARMOR PLATE
- 3. KNEE PADS 4. TAIL GUNNER'S SEAT
- 5. INTERPHONE JACKBOX





# FORCED DESCENT AT SEA



During preflight drill, men should be assigned to evacuation duties. Each man should be familiar with these so that in case of accident alternate men can carry on. Each man should know his order.



Pilot and copilot will exit through their side windows or through the radio compartment hatch. Decide which before flight.

### CAUTION!

No crew member should inflate his life vest until he has emerged from the airplane.



If the life raft is inflated upside down, one man should jump into the water and right it. If there are handling patches on bottom of raft, grasp them with both hands, and with knees on bouyancy chamber, lean back and prepare to be submerged for a moment. Even the largest raft will turn over.



WARNING! Do not jump on an inverted raft, as this will expel the air trapped under it and righting becomes more difficult.



The rafts should be fastened together so they will not drift apart. Once aboard the rafts a check should be made to locate leaks. Repair them with the kit provided in the raft. Keep away from the airplane, if it floats but stay in the vicinity if possible. Do not remove wet clothing. Do not talk more than necessary; it dries the mouth. Do not move more than necessary; it takes energy.

24 A signal, kit containing a pistol and flares is in a

A signal, kit containing a pistol and tiares is in a waterproof sealed pocket of the life raft. It may be advisable to leave the kit sealed in the pocket until a ship or a plane is sighted so as to have dry signal equipment.

# APPENDIX I

# U. S. A. - BRITISH GLOSSARY OF NOMENCLATURE

U. :	ά.	Δ.
U. 1	D	м.

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# BRITISH

man and the second

Accumulator (hydraulic)	•		•	•	•	•	•	÷	•	Should not be confused with electrical accumulator or battery
Airfield			•			•			•	Aerodrome
Battery (electrical) .										Electrical accumulator
Bombardier			1.	1.2			644		1.1	Bomb aimer
Ceiling							1.1		1.1	Cloud height
Check valve (hydraulic)			124					1.1	100	Non-return valve
Copilot							• 7	1		Second pilot
Cylinder (hydraulic) .							1.11			Jack
Dump valve										Jettison valve
Empennage						1.		1.17	1	Tail Unit
Flight indicator				1	1		1.	120	20	
- 0							1.1		100	Artificial horizon
Gasoline (gas)							1.1	115	C * 1	Petrol
Glass, bulletproof					1			1	1.	Armour glass
Gross weight						1.	10		12	All-up weight
Ground (electrical) .							1.			Earth
Gyro horizon				1.	199	1.1	1.0		1.	Artificial horizon
Gyro pilot				14.1	1.	14.1	1.11			Automatic pilot
(to) Land				1.0	14	1		1.1	121	(to) Alight
Lean			1.	1.			12.0	1.		Weak
Left					14.2	1.1		2.0	245	Port
(to) Level off		1.1		.50		-	199	192		(to) Flatten out
Line, mooring								1.17	2.	Mooring guy.
Manifold pressure .								1.1	194	Boost
Mast, radio						5.23				Rod aerial
Overload					1				1.1	Non-standard load
Panel, outboard					120			1.1		Outer plane
Reticle (gun sight).					10		1.			Graticule
Screen										Filter
Set, command					2.9			1	1.0	Pilot controller set
							1.1	1.		
Set, liaison							1	1.		General purpose set
Airplane	. *		1	•			1.			Aircraft
Speed, indicated air (IAS							1.41	10	1.1	Air-speed-indicator reading
Stabilizer, horizontal .							. •		. •	Tail plane
Stabilizer, vertical .			1					14		Fin
Stack			. • 1		24.					Manifold (inlet or exhaust)
Tachometer					1.	14		4		Engine speed indicator
Tube (radio)							1.	1.		Valve
Turn indicator								150		Direction indicator
Valve (fuel or oil)						1.1		1.1	12	Cock
Weight empty						1.		1.1		Tare
Windshield		1.1.1	12	1.1	14.1	1.0	100	1.1	19	Windscreen
Wing		1	1.1.5	1						Main plane
		1	1.000	0	19	Selle.	121	13 14	the second	



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#### RESTRICTED AN 01-20EF-1

### APPENDIX II

# FLIGHT OPERATION DATA

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Page

9

0

Specific Engine Flight Chart 79
Take-Off, Climb and Landing Chart    80
Flight Operation Chart (no external load) 7 Sheets 81
Flight Operation Chart (external load - two 2000 - pound bombs)         3 Sheets
Flight Operation Chart (external load - two 4000 - pound bombs)         2 Sheets       91
Flight Operation Chart (one propeller feathered) 4 Sheets
Engine Flight Calibration Curve
Loading Chart
Take-Off Control Chart    99
Climb Control Chart 100
Composite Cruising Control Chart 101
Tactical Range Charts
Ferry Range Charts 104
Long Range Cruise Control Charts 105
Fuel Temperature Correction Curve
Fuel Consumption Curve

# CAUTION

POWER SETTINGS GIVEN IN THESE CHARTS ARE APPLICABLE ONLY WHEN USING 100 OCTANE FUEL. REFER TO APPENDIX III FOR RESTRIC-TIONS WITH USE OF 91 OCTANE FUEL.

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	1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	1			1	1		1	1	10120		Land Mar	1	1	1		
v			ALLOWABLE OIL CONSUMPTION		.8.0. U.S.QT/HR 13 IMP.PT/HR			OCTANE	MAXIMUM	(MINUTES)	Q		Q				00 FEET 0R 1000 FEET
ENGINE MODELS		2760	OIL CONS	<b>IR</b> 2	<b>IR</b> 15	<b>IR</b>	M 11		MUM TEMP.		500		500	450 CLIMB	HOI	101	OVE 15,0
SINE A	R-1820-97	PM:	LOWABLE	J.S.QT/F	J.S.QT/H	J.S.QT/H	S		MAXIMUM CYL. TEMP.	°.	260		260	232 CLIMB	205	205	USED AB
ENG	ц Ч	DIVING R	AU	14.5.1				100	FUEL ROW GAL/HR/ENG.)	IMP.	127		127	88	52	43 34 34 38 34 38 34 80 34 80 34 80 34 80 34 80 34 80 34 80 34 80 34 80 34 80 80 80 80 80 80 80 80 80 80 80 80 80	PRESSURES
		ISSIBLE D	N		UISE .		(S)	RADE:	FUEL (GAL/H	U.S.	152		152	103	62.5	52 444 415.5 37.8 37.8 31.2	THROTTLE
		MAX. PERMISSIBLE DIVING RPM 2760.	CONDITION	NORMAL RATED	MAX. CRUISE	MIN. SPECIFIC	OIL GRADE: (S) 1120	FUEL GRADE:	MIXTURE	POSITION	A.R.		A.R.	A.R.	A.L.	A.L.	SULT. FULL
SPECIFIC ENGINE	CHART								USE LOW BLOWER	BELOW:							BE OFF ABOVE 8000 FEET OR DANGEROUS TURBO OVERSPEEDING WILL RESULT. FULL THROTTLE MUST BE USED ABOVE 15,000 FEET OR Result. Dn not manually lean. Auto lean gives maximum range. *Decrease manifold pressures i-1/2 inch per 1000 Feet
FIC	÷								MEB	810	1		1	1.4			I GIVES
SPECI	FLIGHT	ANT	d.						CRITICAL ALTITUDE	NO RAM							ANGEROUS TURB
		COOLANT TEMP.	2.						ITICAL /	WITH RAM	000		000	000	000	SEE EN- GINE CAL- IBRATION CURVE	T 08 0/
	: :	OIL EMP.	d.	158	190				ő	WITH	27,000		27,000	30,000	35,000	SEE EN- GINE CAL- IBRATION CURVE	OOD FEE
S		OIL TEMP.	0	70	88				HORSE-	POWER	1200		1200	0001	750	670 650 650 450	ABOVE 8
AIRPLANE MODELS	B-17 F	OIL	(LB/SQ. IN.)	75	80	70	15	TURBO	MANIFOLD	(BOOST)	<b>д6</b>		#8 <b>*</b>	41.5*	35.2*	34,7 35,0 35,0 32,5 32,5 32,5 32,5 32,5 32,5 32,5 32,5	WILL WUST
AIRPLAN	B	FUEL	(LB/\$Q, INJ)	12-16	16	12		1.66.2	RPM		2500		2500	2300	2000	2000 1940 1780 1700 1400	NTAKE FILTER WERSPEEDING TITUDE,
		CONDITION		DESIRED	MAXIMUM	WINIMUM	IDLING	SUPERCHARGER TYPE.	OPERATING	NOILIGNOS	TAKE-OFF	WAR EMERGENCY	MILITARY	NORMAL RATED (MAX. CONT.)	MAXIMUM CRUISE	MINIMUM SPECIFIC CONSUMPTION	REMARKS: AIR INTAKE FILTER MUST DAMGEROUS TURBO OVERSPEEDING WILL ABOVE CRITICAL ALTITUDE.
1135	PORM MSON	199		1953	13.1	126	111	17.10	Mar Star	282			1244	1.		8	R DA

Specific Engine Flight Chart

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79

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ENGINE MODELS R-1820-97		SOFT SURFACE RUNWAY	FT. AT SEA LEVEL AT 3,000 FT. AT 6,000 FT.	TO CLEAR GROUND TO CLEAR GROUND TO CLEAR GROUND TO CLEAR 30' OBJ, BUN 50' OBJ, BUN 50' OBJ, BUN -50' OBJ,	6800 8950 10,000 5000 7100 8000 3600 5350 6000	µµ00         µ350         5000         5500         6200         7000         7800           3200         3100         3000         µ000         4600         5150         5800           2100         2100         2000         2750         3700         3700         1420	3000         2650         3200         3200         3850         4300           2100         1800         2250         2250         2700         3600         3100           1400         1100         1450         1450         1600         2000         3100	ENGINE LIMITS FOR TAKE-OFF 2500 RPM & 46 IN. HG	00		25,000 Frait. 30,000 Frait. 30,000 Frait. Mowing the second st. Brown Region St. Brown Region St. Brown Region St. Brown Region St. CHANGE	85 450 375 PRE-	39 270 225 135 117 170 55 380 317 <sup>1-1/2*</sup>	28 195 162 135 117 380 38 260 217 <sup>380,000</sup>	FUEL INCLUDES WARM-UP AND TAKE-OFF ALLOWANCE		WET OR SLIPPERY	AT SEA LEVEL AT 3,000 FT. AT 6,00	GROUND TO CLEAR GROUND TO CLEAR GROUND TO CLEAR GROUNT ROLL 30' ORL. FOLL 30' ORL ROLL 30' ORL ROLL	50 5450 3900 5900 4300 6450 4700	1.4.3.1 Indicated Air Sevel 1.4.3.1 Indicated Air Sevel 5.1.5.5.1 Level 0.15.1.1.5.5.0.1 Level 1.4.1.1.1.5.5.0.1 Level 1.4.1.1.1.2.5.0.1 Level 1.4.1.1.1.2.1.1.1.1.1.1.1.1.1.1.1.1.1.1.
NG CHART	( IN FEET )	R U N WAY	0 FT. AT 6,000 FT.	TO CLEAR CROUND 1 50' ORJ. RUN	5600 5600 14100 3950 2600 2600	3800 3600 2700 2550 1800 1600	2700 2350 1900 1600 1250 1000	ENGIN			BEST LALS. FT/MIN MPH KNOTS FT/MIN	135 117 140	135 117 360	135 117 600	No. on when	(IN FEET)	5 O D	T. AT 6,000 FT.	TO CLEAR 50' CBJ.	50 4900 3150	
B & LANDING	DISTANCE	SOD-TURF	A LEVEL AT 3,000 FT.	TO CLEAR GROUND 1 50' OBJ, BUN	5000 4500 5 3600 3150 2 2500 2150 2	3300 3100 3 2300 2100 2 1500 1350 1	2400 2100 2 1700 1450 1	32"FI	M D A T A		FL/MIN FROM S.L. U.S. IMP.	400 29 200 167	660 20 140 117	890 15 105 87		DISTANCE	FIRM DRY SOD	EVEL AT 3,000 FT.	GEOUND TO CLEAR GEOUND ROLL 50' OBJ. ROLL	2600 4500 2850	
DFF, CLIMB	KE-OFF		0 FT. AT SEA	TO CLEAR GROUND 50° CBJ, RUN	5800 3950 4300 25500 3050 1850	3900 2650 2800 1800 1800	2750 1850 1900 1250 1250 750	FOR EACH 20"F ABOVE 32"FI			REST LA.S. MPH KNOTS	135 117	135 117	135 117		NDING		T. AT SEA LEVEL	TO CLEAR \$0' OBJ.	2350 4150 2	
TAKE-OFF,	ΤA	RUNWAY	FT. AT 6,000 FT.	TO CLEAR GROUND T	5100 4600 3700 3250 2500 2250	3400 3100 2400 2150 1550 1350	2500 2100 1750 1400 1150 850	* 01			N FEDM FUEL FROM S.L. S.L. U.S. IMP.	18 125 104	13 90 75	9 60 50		ΓĄ	FACE	AT 6,000 FT.	TO CLEAR G 50° COL	001#	
LS		HARD SURFACE	AT 3,000	GROUND	4000 2750 1750	2700 1800 1100	1900 1300 800	FOR EACH 10°C ABOVE 0°C (	00	38 IN.1	MET LA.S. 17/MUN TOME MIN KONOTS TT/MUN TROM	135 117 500	35 117 750	135 117 990			HARD DRY SURFA	AT 3,000 FT.	TO CLEAN GROUND 50° OSJ. ROLL	3800 2150	
AIRPLANE MODELS B-17 F			AT SEA LEVEL	GROUND TO CLEAR RUN 50' OBJ.	3350 4400 2300 3200 1400 2050	2350 3400 1600 2100 1000 1400	1700 2250 1150 1600 850 1000	10 %		2300 RPM &	FI/MIN ROM	575	830	1060			НA	AT SEA LEVEL	TO CLEAR GROUND 50' OhJ: ROLL	3500 1950	
AIRPLA		annin a tan	HEAD WIND	STONN HIM	0 0 0 4	a 27 8 a 6 a 7 a 7 a 7 a 7 a 7 a 7 a 7 a 7 a 7 a 7	0 11 8 9 0 8 7 8	NOTE: INCREASE DISTANCE		COMBAT MISSIONS USE	CLIMB APPE SET 1A.5. CLIMB APP KNOTS	COMBAT 135 117	COMBAT 135 117	COMBAT 135 117			BEST 1. A. S.		MPH KNOTS 30	110 96 3	
915-950 181 1843 181 1843	1 34g		WEIGHT	(IN LBS.)	65,000	57, 000	50, 000	NOTE: INC	I A PRIMA	COMBAT M	GROSS T WEIGHT IN LBS. C	65,000	57,000	50,000			-	WEIGHT	1	50,000	REMARKS

# Take-Off, Climb and Landing Chart

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Appendix II

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								N 01										Aj
ITEMS	and the right pro- ) Manifold Pressure assimum values for over data are listed	(MAX. RANGE)	RANGE IN AIR MILES	NAUTICAL	2660 2500	2350	2180 2040	1880	1720	1410	1250	OPERATING DATA	MIX- M.P. U.S. IMP. TURE IN. HS P. R. H.	BELON 20.000 FT. SET RPM TO MAIN- TAIN 150 IAS WITH 29 MCHES MG- ABOVE 20.000 FT. USE IND MPM IAS	HG. IF SPEED CAM- IP TO 2000 RPM AND	28 INCH NG, USE HIGHER RPM AND RECONNENDED MAM. PRESSURES. USE AUTO-LEAM MIXTURE WHEN AT OR BELOW	LY UP TO 10,000	
EXTERNAL LOAD ITEMS	eccept in emergency. (B) Columns [N, III, IV & Y) toward the right pro- gestively give increase in range at sacrifice in speed. (C) Manifold Pressue [M.P.], Gallons Per Hour (G.P.H.), are opproximate maximum values for reference. (D) For quick reference, tals-off and military power date are listed in the upper left corner of chart. A S INO RESERVE FUEL ALLOWANCEI	V (MAX	RANGE IN	STATUTE	3070 2890	2700	2520 2350	2160	0181	1620	0htt I	OPERATI	R.P.M. I.A.S. MD M.P.M. TUI	BELOW 20.000 FT. TAIN 150 1AS NITI ABOVE 20.000 FT.	AND 29 ± 1 INCH 7 NOT BE DBTAINED 1	29 INCH HG, USE R RECOMMENDED MAM. AUTO-LEAN MIXTURE	2100 KPM. ABOYE SAMGES APPLY UP TO FT. ONLY.	1.4.5.: Indicated Att Speed M.P.: Manifeld Presser [18, H9] U.S.G.P.M. U.S.Gallers For How
TERN	Columns range at (G.P.H.) (G.P.H.) (G.P.H.) (G.P.H.) (G.P.H.)	FUEL	U.S.	GALS.	3612 3400 3200	3000	2600	21100	2000	1800	1600	0	ALT.	30000 25000	20000	12000	6000 3000 S. L.	cated Air S old Pressor U. S. Galle
	except in emergency. (B) Colum generatively give increase in croge (M.P.), Gollons Per Hour (G.P.) reference.(D) For quick references in the upper left corner of chort A.S. (NO RESI		R MILLES	NAUTICAL	2390 2250	2110	1970 -	1680	1540 1,410	1270	1130	DATA	M.P. U.S. M.P.			30 210 30 212 30 212	30 28.5 28	LALS: India M.P.: Manif U.S.G.P.M.
A CHART		AI	RANGE IN AIR MILES	STATUTE	2750 2590	2430	2270	01081	1/80	1460	1300	OPERATING DATA	I.A.S. NIX- W.P.H. TURE			50 149 A.L. 50 157 A.L. 50 164 A.L.	170 A.L. 175 A.L. 179 A.L.	
CTION SHETT	el column e contally to t ha air mile oltitude re cruising in C			-									R.P.M.			2050 2050 2050	2050 2050 2050	Ante-Rich to-Lean OR: Use Nigh
INSTRUCTION	ect figure in fue me. More horizo greater than th exited cruting old continuous c		IR MILES	NAUTICAL	FLIGHT 2150 2020	0061	0591 0441	1520	1390	1140	1010	G DATA	M.P. M.P. M. H.S.			. 31 253 31 252 31 250	10	BOLD NUMBERS: Use Auto-Rich UGHT NUMBERS: Use Auto-Lean WITH TWO SPEED BLOWER: Use high
NO	INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to or less than total amount of fuel in airplane. More horizontally to the right or left and select a figure equal to an greater than the oir miller to be flawn. Vertically below and apposite desired cruiting affinde read ap- timum arruiting conditions. NOTES: (A) Avoid continuous areaining in Column 1 LTERNATE CRUISING CONDITIO	I	RANGE IN AIR MILES	STATUTE	N	2190	2040 1900	1750	1460	1310	0/11	OPERATING DATA	LA.S. MIX- W.P.H. TURE			160 A.L. 167 A.L.	178	BOLD >
OPERATION SHEET J	s FOR USIN tal amount of figure lact a figure by below a conditions.	-		21 21	VAI						-		R.P.M.			2100 2100 2100	21002100	
<b>IGHT</b>	INSTRUCTION: or less than tot or left and sa flown. Vertical timum cruiting		IN AIR MILES	NAUTICAL	S. GALLONS NOT 1940 1830	1720	1480	1370	1260	1030	910 ON SHEFT		M.P. U.S. IN H9 C.		31.5	. 32 296 . 32 290 . 31.5280	A.L. 31.5273 A.L. 31.5269 A.L. 31 262	
<b>FL</b>	1981 1971 - 1	=	RANGE IN A	STATUTE	212 U.S. 6 2240 2110	1980	01/21	1580	1320	0611	CONTINUED	ATIN	R.P.M. I.A.S. NIX- M.P.M. M.P.M.		151	0 158 A.R. 0 172 A.R. 0 175 A.R.	179 183 187	EE AIR TEMPERATURE IMP. GAIS. FOR WARM UP AUTITUDE
	ынаттон u.s Б 608 5 808	13	U. S.						88					8 8		12000 2150 12000 2150 9000 2150	0.0	FREE AIR T IMP. GA
L (S)	A. R. A. R. A. R.	NT.) FUEL	-	eAts.	1		70 2800 70 2600	1	0 2200 0 2000		0 1600	0	NASHT NASHT	30000 25000				ECTED FOR
MODEL (S) B-I7F	им но номте милите милите ин но розпом облион ЧБ – А. R. А. R. ЦВ – А. R. А. R. В. С. С. В. С. В. В. С.	MAX. COI	MILES	NAUTICAL	11. AT25200 1860 1560	1470	1270	1170	980	880	780	DATA	M.P. C.S. N.N. P. C.S.	38 413 38 413		38 413 38 413 38 413	38 413 38 413 38 413	TUDE CORR U. S. GA
Z	2500 46 2500 46 8-1820-97	NORMAL RATED (MAX. CONT.)	RANGE IN AIR MILES		A135,000 A1 51. 1910 1800	690	1460	1350	0011	0101	006	OPERATING DATA	MIX- TURE	A.R. A.R.	A.R.	A.R. A.R.	A.R. A.R.	() INDICATED ALTITUDE CORRECTED FOR FREE ANY TEMPERATURE ALLOW 212 U.S. GAIS IMP. GAIS FOR W. ALLOW 212 U.S. GAIS IMP. GAIS FOR W.
	CONDITION R. TAKE OFF 27 MILTARY 27 POWNE 22 ENDINE CS	NORMA	RANG	STATUTE	AY S.L. A127 19 18	16	<u> </u>	<u> </u>	<u>N</u> =	01	0	OPE	R.P.M. LA.S. M.P.H.	2300 156 2300 172		2300 197 2300 197 2300 202	2300 207 2300 210 2300 214	O IND

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RANGES SHOWN ARE 90% OF FLIGHT TEST VALUES.

Appendix II

100 March 100 Ma

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Section 19											AN 01-2	OEF-1						
D ITEMS	rd the right pro- Manifold Pressure timum volues for rer data are listed	9	RANGE)	VIR MILES	NAUTICAL	1260	0011	950	780	630			G DATA	M.P. U.S. IMP. N.M.P. 00.	ET RPM TO MAIN- 29±1HQ. ABOVE 1AS WITH 29±11M. T BE OSFAIMED UP	IN. HG USE OMERDED MANIFOLD O-LEAN MIXTURE IDO RPM	BP To 10,000	
EXTERNAL LOAD ITEMS	ercept in emergency. (B) Column (III, IV & Y) toward the right pre- gressively give increase in range at socrifice in speed. (C) Marifold Presure (M.P.), Collons Per Hour (G.P.H.), are approximate maximum volues for reference. (D) For quick reference, take-off and military power data are listed in the upper left corner of chart.	(NO RESERVE FUEL ALLOWANCE)	V (MAX. RANGE)	RANGE IN AIR MILES	STATUTE	1450	1270	0801	006	720			OPERATING DATA	R.P.M. LA.S. MIX- M.P.N. TURE	BELON 20,000 FT. SET RPM TO MAIN- TAIN 150 IAS WITH 2941HG, ABOVE 20,000 FT.USE 140 IAS WITH 2941 HM. HG. IF SPEED CANNOT BE OBFAINED UP	TO 2000 RPM AND 23 N. HG USE HIGHER RPM AND RECOMMENCED MANIFOL PRESSURES. USE AUTO-LEAN HIXTURE HHEN AT OR BELOW 2100 RPM	ABOVE RANGES APPLY UP TO 10,000 FT. ONLY.	LAG: Indicated AV: Speed M.A. Macifold Pressure (In. Mp) M.A. Macifold Pressure (In. Mp) M.D. M. Impecial Galoos Per Hour LT. Full Thrette K.C. Son Level
TERN	Columns range at s (G.P.H.), ference, tal	RESERVI	FUEL	IMP.	CALS.	008	11000	1200	1000	800			Θ	ALT.	30000 25000 20000	15000 12000 9000	6000 3000 S. L	(1.4.5. Indicated Als Speed M.P. Martlold Presume (n. Mp) M.P. Martlold Presume (n. Mp) 1.26.0-K.U. Inspecial Salion Per Pro- MP.C.M. Viz. Inspecial Salion Per P. K.C. Sta Lewi
	except in emergancy. (B) Colum grassively give increase in range (M.N.), Collons Per Hour (C.P.) reference. (D) For quick reference in the upper left corner of chart.	UND .		VIR MILES	NAUTICAL	1130	066	850	200	560			G DATA	M.P. U.S. 100.		. 30 210 . 30 212 . 30 212	A.L. 30 211 A.L. 29.5 208 A.L. 29.5 203	1.4.5.1 Indicated J M.D., Maralfold Pro U.S.C.P.N. Inspire MPLOJ No. Inspire F.C. Sta Land S.C. Sta Land
ON CHART	13.02.91.066.111	DITIONS	N	RANGE IN AIR MILES	STATUTE	1300	0111	970	810	650			OPERATING DATA	R.P.M. I.A.S. MIX-		2050 149 A.L. 2050 157 A.L. 2050 164 A.L.	2050 170 A.L. 2050 175 A.L. 2050 179 A.L.	da kuph VALUES,
INSTRUCTION of 7 sheets 60,000	INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to or less than total amount of fuel in airplane. More harizontally to the right or left and select a figure equal to or greater than the air miles to be flown. Vertically below and apposite desired criving altitude read ap- timum crising conditions. NOTES: [A] Aveid cominnous cristing in Columa I	ING CON		LIR MILES	NAUTICAL	1020	890	760	630	510			G DATA	M.P. U.S. IM.		31 253 31 252 31 250	31 245 31 240 30.5 235	BOLD NUMBERS Use Arthorited Under Numbers: Use Arthorited With Two SPEID Allowers: Use Math bloww aboos hand lise and bloww aboos hand lise and blow ARE 90% OF FLIGHT TEST VALUES
2 LON	R USING CHART: Se mouth of fuel in airplu a figure equal to or elow and opposite d itioms. NOTES: [A] AV	TE CRUISING	H	RANGE IN AIR MILES	STATUTE	SHEET 1 1170	1020	870	730	580			OPERATING DATA	R.P.M. I.A.S. NIX- N.P.M. TURE		2100 160 A.L. 2100 167 A.L. 2100 173 A.L.	2100 178 A.L. 2090 182 A.L. 2090 185 A.L.	BOLD UNDER LIDER
FLIGHT OPERA	INSTRUCTIONS FO or less than total at or left and select Rown. Vertically b Himum cruising cond	ALTERNAT		RANGE IN AIR MILES	NAUTICAL	CONTINUED FROM	800	690	576	460			NG DATA	M.P. U.S. MP. IN. Ng P. P.	1. 31,5 284	32 298 32 290 315 290	315 273 315 269 . 31 262	
1 5	том и х. миг. 608		H	RANGE IN	STATUTE	1050 CO	920	790	660	530			OPERATING DATA	R.P.M. I.A.S. NIX- M.P.M. TURE	2150 151 A.R.	2150 168 A.R. 2150 172 A.R. 2150 175 A.R.	2100 179 A.L. 2100 183 A.L. 2100 187 A.L	DICATED ALTITUDE CORRECTED FOR FREE AIR TEMPERATURE. LOW - U. S. GALS IMP. GALS. FOR WARM UP. LOW - U. S. GALS FEET ALTITUDE LEOFF AND CLUAR TO - FEET ALTITUDE URN FUEL FOLOWS TO TANK URN FUEL FOLOWS TO TANK URN FUEL FOLOWS TO TANK FUEL FOLOWS TO TANK R PAGE ADDITIONAL ENGINE AUGMET CONTRACTOR R PAGE ADDITIONAL ENGINE AUGMET CONTRACTOR R ANG C.
S)	R. 5 R. 5 R. 5		FUEL	U. S.	CALS.	1800	1400	1200	0001	800			Θ	and the second se	30000 25000 20000	15000 12000 9000	6000 3000 S.L.	FOR FREE AIR TE - IMP. GA FEET ALTITUDE DLLOWING ORDEI C CAART" FOR ADDRI
MODEL (S) B-I7F	им. ис. исочте мотгок 116 - А.R. 126 - А.R. 120-97	INN WIND	(MAX. CONT.)	R MILES	NAUTICAL	AT S.L. AT 25,000 780	690	590	490	390			DATA	M.P. U.S. IMP. IN. Hg. P. P.	38 413 38 413 38 413	38 413 38 413 38 413	38 413 38 413 38 413	(i) INDICATED ALTITUDE CORRECTED FOR FREE AIR TEMPERATURE ALLOW - U. S. OALS IMP. GALS, FOR W. TAKEOFF AND CLIMB TO FEET ALTITUDE RETURE FOR FOUNS TO TANK. USE FUEL FROMS TO TANK. USE FUEL FROM TANKS IN THE FOLLOWING ORDER. USE FUEL FROM TANKS IN THE FOLLOWING ORDER. USE FUEL FOR TANKS IN THE FOLLOWING ORDER. USE FUEL FORM TANKS IN THE FOLLOWING ORDER. USE FUEL FORM TANKS IN THE FOLLOWING ORDER. USE FUEL FORM TANKS IN THE FOLLOWING ORDER. USE FOLL FORM TANKS IN THE FOLLOWING ORDER.
2	2500 2500		NORMAL RATED (MAX. CONT.)	RANGE IN AIR MILES	STATUTE	AT 25,000 9,00	790	680	560	1150			OPERATING DATA	M, LA.S. MIX- M.P.H. TURE	2300 156 A.R. 2300 172 A.R. 2300 183 A.R.	2300 192 A.R. 2300 197 A.R. 2300 202 A.R.	2300 207 A.R. 2300 210 A.R. 2300 214 A.R.	Comparison of the second
PORM ASCIENT	CONDITIO TAKE-OFF MILITARY POWER		-			AT 51.		in.					1	R.P.M.	2300 2300 2300	23(23)	2300 2300 2300	

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Appendix II

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	pro- tier fee				1												30.4	-W1 W	TAIN ISO NPH IAS WITH 29 INCHES + I INCH M.P. ABOVE 20,000 FT. USE	=	2000 RPM AND 29", USE HIGHER RPM"S	1			_	
S	d Pre- volue		1	LES	NAUTICAL		2150	1810	1850	1490	1320	1160	086	830	3	TA	Sor.z	2	OD FI	K.P.	GHER	BELOW	1	UP 10		
EXTERNAL LOAD ITEMS	eccept in emergency. (B) Columns (II, III, IV & Y) toward the right pro- greatively give increase in range of secrifice in speed. (C) Monifold Pressure (M.P.), Colons Per Hour (G.P.H.), are apprainted maximum values for reference. (D) For quick reference, toke off and military power data are listed in the upper left corner of short.		V (MAX. RANGE)	RANGE IN AIR MILES	NA		C1 1	1	-	1.	T	1.				OPERATING DATA	M.P.	BELON 20,000 FT. SET RPM TO MAIN-	20,00	140 MPN IAS AND 28" + 1" M.P. IF	HI 3			RANGES SHOWN ABOVE APPLY 15,000 FT. ONLY.		
E	C) M C) M manir	100	X. R.	AII			<u> </u>	14	100	1 V 1			10 g	1	30	ING	MIX- TURE	SET	S WIT	29"	50	N N		J.		
9	y) to eed. (	IM AL	MA	1 10												RAT		0 17.	P. AS	24	0 29	E MH	1.43	W AB(		
Ôш	IV & in sp proxin od mill	ALL	>	RAN.	STATUTE		2470 2280	2090	1900	1710	1520	1330	0111	DOAL	2	OPE	I.A.S. M.F.H.	0,00	N N N	I AS	M AN	XIUR	ł	SHOW	1	į
SL	III, rifice • opp	Isila			STU		~ ~	0		-	1	-	-				R.P.M.	LOW 2	I ING	CEN 0	00 85	AN HI	2100 RPM	RANGES SHOWN ABO 15.000 FT. ONLY.		Hg) r Hour
¥z	ns (1), at soc to be	37		100	1.0	1	1	14			18	11.11						-	-	-						Speed In Un
ER	Colum mge o G.P.H.	NO DESERVE FILEL ALLOWANCE	1101	S.	GALS.	2770	2600	2200	2000	1800	1600	0011	002	000		Θ	ALT.	30000	25000	20000	15000	9000	6000	3000	S.L.	LAS.: Indicated Air Speed M.P.: Menifold Pressure (In: Hg) U.S.G.P.M.: U.S. Gollon: Per Hour IMP.O.P.M.: Impurial Gollon: Per Hour ET. Edit Transle.
X	(B) (B) (C) (B) (C) (C) (C) (C) (C) (C) (C) (C) (C) (C	Q			-			-	-	-		_	-	_		-		~	2	N			-		-	Mir U.
	ency. create er H quict	1			AL	15											NONX	-		0	0 1	CV.	00	01 1	-	A.5.1
	merg ve in ons P ons P			115	NAUTICAL		1980	1880	1520	1370	1220	1070	910	100		TA	Sout	1		218	209	202	5 19		181	28925
	in e ely gi Gall Call			R M	NA					-	I	I	810			DA	M.P.			30	30 209	29.5 202	29.5 198	28	RZ	
CHART POUNDS	eccept in umergency. (B) Colum greatively give increase in conge. (M.P.). Collons Per Hour (C.P.) reference. (D) For quick references in the upper feft corner of chart.	VN	2	RANGE IN AIR MILES	-	-	34	1		1						OPERATING DATA	MIX- TURE			A. L.	A.L.	A.L.	A.L.	A.L.	A.L.	
MA	1.4	15	5	9.6	-	2.4										ERAI	Si X	-		A D				**	A	
	to by the	L		RAN	STATUTE	1	2280	930	750	580	100	230	000	100		OP	LA.S. M.P.H.			100	158	168	17	12	111	
<b>OPERATION INSTRUCTION</b> SHEET 3 OF 7 SHEETS 60,000 TO 55,000	MSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to or less than total omovart of fuel in airplans. Mare herizonthy to the right or left and salact a figure equal to ar greater than the air miles to be form. Verifically below and opposite desired cruising althrude read ap- timum cruising conditions. NOTES: (A) Aved continuous cruising in Colomn 1.	CONDITIO		1	LS.	1	~ ~	-	-	-	-						R.P.M.			2050	2050	2050	2050 172	2000	2000	. 1
IGHT OPERATION INSTRUCTIO SHEET <sup>3</sup> OF 7 SHEETS Wr 60,000 10 55,000	colu mally main air diring	NO		1	1			T								+	No L'H						en l	~ ~	N	BOLD NUMBERS: Use Auto-Rich UGHT NUMBERS: Use Auto-Rich WITH TWO SPEED SLOWES: Use high blever above harry live only
0.0	in fuel	U			T	1								1					QU I	0	ळ <del>त</del>	8	N	~	-	IOLD NUMBERS: Use Auto- John NUMBERS: Use Auto-La- Mithe TWO SPEED BLOWER: U Mithe TWO SPEED BLOWER: U
2-5	ove hor the cruis			LES .	NAUTICAL	-	1820	1540	1400	1260	11:20	980	840	580		TA	Sor's		242	240	5 23	30.5 228	30 222	217	Kol I	10 151 U.s.
NS	ne. M M. ne. M Breat	Z		N N	Z	FLIGHT				F	-					0	M.P.			ñ	30.	30.1			20	UMBE No. SPI
0	: Sele lirple	CRUISING	≡	RANGE IN AIR MILES					-		-					OPERATING DATA	MIX- TURE	1	A.L.	A.L.	A. L. 30.5 238 A. L. 30.5 234	A.L.	A.L.	A.L.	4.L.	LD N HI HI HI
No	HART HART Hain a val te pposi	17		101	2	IN										ERA		121	N OI	< /	0 0					O S M M
L . O	of fue of fue nd o	U		EA.	STATUTE	BLE	2090	770	610	450	1290	1130	DIA	840		0	LA.S. M.P.H.	1.10	143	101	165	173	177	181	101	
PERATION INST SHEET 3 OF 7 0,000 TO 5	USIN count figur ov a tions.	-			S	AILABLE IN	~ ~										R.P.M.		2100	0012	2100	2100	2100	2050	non	
SHEEL SHEEL	FOR ol om oct a y bel conditi	ALTERNATE	-			×			1.1			<u></u>			-	-			0 0			N	Q	01 0	2	
0 0	IONS d sol rical ing	Z			M	GALLONS NOT	0 0	0		0	0				FT M		A COLORINA		00 :	+ 1	0 0	オ	N	00	D	
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FLIGHT or. wi	INST or le flowi	1		-	N	110									ON SHEFT	0 2	M.P.		A.R.31.5278			.m	31	31	A. L. 30.0	
S.			=	N N	1.11	100.0				11		-					NIX- TURE		8.0	¥.	A.R.	A.L.	A.L.	A.L.	-	D W2
1.1	CATH.			RANGE IN AIR MILES	11	U.S.	0.0	0				~			CONTINUED	PERATING DATA	wi zi		4 8th	RO	57 A 73	78 A	82 A	86 4	× D	EE AIR TEMPERATURE
	из. 6.08 6.08			EA.	STATUTE	170 U	1760	181	1470	1320	1170	1030	790	590	ONT	0	LA.S. A.F.R.		-			-	1.0		-	S. FO
	and the second se				s	11									0		R.P.M.		2150	0012	2150	2100	2100	2100	3	R TEA
	N M M				3	0	0 0	0	0	0	0	0 0	5 0	00				0	the last sectors	-				0	-	LINE ALT
<u> </u>	W S SK		FUEL	U. S.	CALS.	2770	2600	2200	2000	1800	1600	00111	0001	800		Θ	ALT.	30000	25000	00007	12000	9000	6000	3000	1	- LEE
L	A.R. A.R.	ONI	17			00	00	0	-	0	0	0.0		. 0			No. X		100				1.1			NOO X
山下	NOL 1	IONIM ONI	CON	1	F	AT 30,000	1330	1130	1030	920	820	710	610	410		1	No.z	113	113	0 0		413	413	113	2	GAL
MODEL (>) B-17 F	UISON LISON	B	AX.	ULLES	NAUTICAL				1		100	235 24. 70		1	11.5	ATA	and the second second					1.2.0	1			U. S. MB T
ž	M.P.         RLOWTE         MICTURE         DUBATION           III.         POSITION         POSITION         PULATION           III.         -         A.R.         6           III.         -         A.R.         6           III.         -         A.R.         5	020	b (M	LIR P	N	AT 5.L.		13								G D	M.P.	. 38	38		38			. 38	0	ZO P CU
1.1		1-1-920	RATE	IN		-	0.0	0	0	0	0	0.0				VIIN	MIX- TURE	A.R.	A.R.		A.R.	A.R.	A.R	A.R.	V-V	FF AN
	5 0 C		NORMAL RATED (MAX. CONT.)	RANGE IN AIR MILES	E	AT 30,000	1410	1300	1180	1060	0116	820	500	470		OPERATING DATA	LA.S. M.F.K.	164	175	8 3	1999	203		513	-	INDICATED ALTITUDE CONNECTED POR FREE AIR TEMPERATURE     ALLOW 170 u.s. ONLS - IMP. ONLS POR WA     ALTOW FUEL ROWS TO TANK     RETURN FUEL ROWS TO TANK
	A REAL PROPERTY AND A REAL PROPERTY.		NORA	RA			2 3. 	199			102	12.0				ō			1.200	-				2300 2	4	00
the second se		6 1	1 .	1.12		AT S.L.		20.5		1. T. T. T.			1. 1.			1	R.P.M.	2300	2300	512	2300	2300	X	2 2		CORT PROV

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Flight Operation Chart (no external load) 7 Sheets

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83

WP-1-1-48-53

RANGES SHOWN ARE 90% OF FLIGHT TEST VALUES.

Appendix II

										AN 01-20	)EF-1						
D ITEMS	rd the right pro- Manifold Pressure admum values for wer data are listed		RANGED	AIR MILES	NAUTICAL	660	500	330	041			IG DATA	M.P. U.S. IMP.	SELON 20,000 FT. SET RPM TO MAIN- TAIN 140 MPH IAS WHICH 29 INCHES ± 1 INCH MP ABOVE 20,000 FT. 45E IVO MPH IAS AKD 29 INCHES ± 1 INCH	01 BE OBTAINED D 29 INCHES, USE RECOMMENDED NP*S. TURE WHEN AT OR	E APPLY UP TO	
EXTERNAL LOAD ITEMS	eccept in unargency. (B) Column (N, III, IV & Y) toward the right pro- gressively give increase in range at sacrifice in speed. (C) Manifold Pressue (M.P.), Gallons Per Haw (G.P.H.), are oppositionts maximum values for infrance. (D) For quick reference, take-off and military power data are listed in the upper left corner of chart.	(NO RESERVE FUEL ALLOWANCE)	V (MAX, RANGE)	RANGE IN AIR MILES	STATUTE	780	570	380	061			OPERATING DATA	R.P.M. LA.S. HIX- M.F.H. TURE	BELOW 20,000 FT. SET RPH TO MAIN- TAIN 140 MPH IAS WHICH 29 INCHES ± 1 INCH MP ABOVE 20,000 FT. 45E 140 MPH IAS AND 29 INCHES ± 1 INCI	HP. IF SPEED CANNOT BE OBJAINED UP TO 2000 RPM AND 29 INCHES, USE HIGHER RRMP'S AND RECOMMENDED MP'S. SURVE-LEAM MIXTUPE MHEM AT 08 OCTOMUNICODED	RANGES SHOWN ABOVE NPPLY UP	LA.S. Infected Air Speed Area. Manifed Preaser (a. Pig) U.S.O.F.M. S. Gallon, Per Hore ORI.C.N.S. Impaid Gallon, Per Hore Art. See Level S.L. See Level
TERN	Columns range at (G.P.H.), ference, to f chart.	O RESERV	FUEL	U.S.	GALS.	800	600	100	200			Θ	ALT.	30000 25000 20000	15000 12000 9000	6000 3000 S. L.	(A.S. Indicabed Air Sewed (A.S. Indicabed Air Sewed U.S.O.P.H. U. S. Gallen Per Hou- U.S.O.P.H. U. S. Gallen Per Hou- tor. Fall Theotia S.L. Sen Lavel S.L. Sen Lavel
	eccept in amargency. (8) Colum gressively give increase in range (M.P.), Gallens Per Hour (G.P.)- reference. (0) For quick reference, in the upper laft corner of chart.	ONO		R MILES	NAUTICAL	610	460	300	160			5 DATA	M.P. U.S. IMP. IN. He P. P.	30 216	A.L. 30 209 A.L.29.5 207 A.L.29.5 202	A.L.29.5 198 A.L. 29 192 A.L. 29 187	LALS: Indiceded March Manifield Pro- US, OFM: J. March MP, G.P. March R.L. San Lavel
N CHART	Contraction of the second	TIONS	N	RANGE IN AIR MILES	STATUTE	700	630	350	180			OPERATING DATA	I.A.S. MIX- M.P.N. TURE	0 150 A.L.	158 164 168	172 174 177	
	fuel column eq rizontally to the the air miles g altitude rea s cruising in Col	CONDITIO											. 1849. 8. P.M.	2 2050	8 2050 4 2050 8 2050	2 2050 7 2000	e Auto-Rich Auto-Loon DWER Use high ine only con only con VALING C
HION INSTRUCTIO	belect figure in plane, Move ho or greater than desired continuou		HI	RANGE IN AIR MILES	NAUTICAL	560	420	280	071			OPERATING DATA	MIX- M.P. U.S. TURE IN Hy P.	A.L. 31 245 A.L. 31 245	165 A. L. 30.5 238 169 A. L. 30.5 234 173 A. L. 30.5 228	A.L. 30 222 A.L. 30 217 A.L. 30 201	BOLD NUMBERS: Use Auto-Rich NUMP NUMBERS: Use Auto-Lean WITH THO SPEED BLOWRE, Use Nigh Slower close lawary fine only Slower close lawary fine only
РЕКАТІОN INSTRUCTIC внег <sup>4</sup> ог. 7 меття 0,000 го. 55,000	SING CHART: Sind CHART: Sur of fuel in oir gure equal to and apposite and apposite and apposite and apposite and apposite and apposite app	CRUISING		RANGEIN	STATUTE	640	08tt	320	180			OPERAT	R.P.M. LA.S. WI	2100 143 A.L. 2100 157 A.L.	2100 165 A. 2100 169 A. 2100 173 A.	2100 177 A.L. 2050 181 A.L. 2050 184 A.L.	BOLD NUMERS: Use Auto-Rich UGHT NUMERS: Use Auto-Lean write Two Press Book Use high blower blowe blowe blow has only blower blowe blower blow has only blower blower blowe
	INSTRUCTIONS FOR USING CHART. Select figure in feel column equal to or lass than total amount of fuel in airplane. More horizontally to the right or left and select a figure equal to or greater than the air miles to be flown. Vertically balow and opposite desired cruising altitude read op- timum cruising conditions. NOTES: (Å) Avoid continuous cruising in Column I	ALTERNATE		dites	NAUTICAL	I SHEET 3	380	250	130			DATA	M.P. U.S. IMP. IN. Ho O. O. R.P.	278 274	265 262 254		ON DATA.
FLIGHT GL. WL	AND. C. M. H.	AL	=	RANGE IN AIR MILES		CONTINUED FROM SHEET	0	0	0			DPERATING DATA	LA.S. NIX- M M.P.H. TURE IN	148 A.R.315	167 A.R. 3 173 A.R. 3 176 A.L. 3	182 A.L. 31 252 186 A.L. 31 246 189 A.L.30.5 238	DICATED ALTITUDE CORRECTED FOR FREE AIR TEMPERATURE. LOW 170 U S. GALS. — IMP. GALS. FOR WARM UP. GE-OFF AND CLIMB TO 5000 FREE ALTITUDE URB FUEL FROM STARKS IN THE FOLLOWING ORDER. REFUEL FROM TANKS IN THE FOLLOWING ORDER. REFUEL FROM TANKS IN THE FOLLOWING ORDER.
	IN MIN. 0.2.4. 5 9.08 5 9.08		1		15								R.P.M.	2150	2150 2150 2150	2100 2100 2100	(1) INDICATED ALTITUDE CORRECTED FOR FREE AIR TEMPERATURE. ALLOW 170 U S. GALS I.M. GALS. FOR WA TAKE OFF AND CLIME TO 5000 FEET ALTITUDE BITUEN FUEL FORD TANKS IN THE FOLLOWING ORDER BITUEN FUEL FROM TANKS IN THE FOLLOWING ORDER BEREE TO "SPECIFIC BROME RUGHT CHART" FOR ADDITIONAL BROME BEREE TO "SPECIFIC BROME RUGHT CHART" FOR ADDITIONAL BROME
(S)	A.R. A.R.	10)	THE C	U. S.	GALS.		-	100	200			Θ	MAP. DENSITY	30000 25000 20000	15000 12000 9000	6000 3000 S.L.	TED FOR
MODEL (S)	NOWER POSITION	IQNIM OND	MAX, CONT.	MILES	NAUTICAL	A. AT 30,000 4 1 0	300	210	100			DATA	M.P. U.S.	38 413 38 413 38 413 38 413	38 413 38 413 38 413	38 413 38 413 38 413 38 413	TUDE CORREC U S. GAIS CUMB TO 51 OWS TO TAN TANKS IN TH TINKS IN TH
N N N	8.8.44 (10, 10, 10, 10, 10, 10, 10, 10, 10, 10,	N-1000	NORMAL RATED (MAX, CONT.)	RANGE IN AIR MILES	14	AT 20,000 AT SA. 1270	350	240	120			OPERATING DATA	I.A.S. MIX- A	164 A.R. 175 A.R. 186 A.R.		the second second	
E SER VICES	COMPIFICION TAXE-OFF MILITARY FOWER		1 NORN	2.A	STATUTE	AT S.L. A						0	R.P.M.	2300 1 2300 1 2300 1	and the second second second second	2300 2 2300 2 2300 2	

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rems	rd the right pro- Manifold Pressure simum values for	rer data are listed		(MAX. RANGE)	IR MILES	NAUTICAL		1870 1800	1620	1440	1260	1080	300	220	540	370	180	M.P. U.S. UMP.	ET RPM TO MAIN- ITH 28±1 INGM E 140 MPH 1AS	P TO 2DOU RPM AND 29 IGRER RPM'S AND REC- USE AUTO-LEAM MIX- OR BELDW 2100 RPM,	APPLY UP TO	
EXTERNAL LOAD ITEMS	except in emergency. (B) Columns (II, III, IV & Y) toward the right pro- gressively give increase in range at sacrifice in speed. (C) Manifold Pressure (M.P.), Gallow Per Hour (G.P.H.), are opproximate maximem values for	reference. (D) for quick reference, take off and military power data are listed in the upper left corner of chart.	INO RESERVE FUEL ALLOWANCE	V (MAX.	RANGE IN AIR MILES	STATUTE		2270 2070	1860	1650	1450	1240	1030	830	620	420	210	CPERATING DATA R.P.M. 1.4.5. HIX- M.P. <sup>1</sup>	BELOW 20,000 FT. SET RPW TO MAIN- TAIN 150 MPH IAS NITH 29±1 INCH MP.ABOVE 20,0DO USE 140 MPH 1AS AND 29±1 INCH MP. IF SFEED COMMON	BE OSTAINED UP TO 2000 RPM AND 29 INCHES, USE RIGHER RPM'S AND REC- OMMENDED MP'S, USE AUTO-LEAN MIX- TURE WHEN AT OR BELOW 2100 RPM,	RANGES SHOWN ABOVE APPLY UP 15,000 FT. ONLY.	A.A.A. Indicated A.S. Steed M.P.: Macrided Pressure (n. Hg) M.P.: Macrided Pressure (n. Hg) M.P.C.2.M.: Impedial Gallous Per Hour M.P.C.2.M.: Impedial Gallous Per Hour F.E.: Fell TheoHa
TERN	Columns range af (G.P.H.)	ference, to f chart.	D RESERV	FUEL	U.S.	GALS.	2360	2200	1800	1600	1400	1200	1000	800	600	1000	200	ALT.	30000 25000 20000	15000 12000 9000	6000 3000 S.L.	1.A.S., Indicated Aci Speed M.P.: Macridol Pressure (In: Ho) M.P.: Macridol Pressure (In: Ho) M.P.C.P.N., Impecial Gallons Per H F.T. (Ed. Threthia
	4 in emergency. (B) vely give increase in , Gallons Per Hour	reference. (D) For quick reference in the upper left corner of chart.	NI IN		IR MILES	NAUTICAL		1620	1460	1300 .	0711	970	820	650	490	330	165	M.P. U.S. MP. IN. No. C. C.	30 216 30 212	30 265 29.5 200 29 193	29 186 29 180 29 173	LALS. Indicated M.P.: Marfield P. U.S.G.P.H., U.S. MIR.C.P.M. Impe
N CHART	1.000		ONDITIONS	M	RANGE IN AIR MILES	STATUTE		2050	1680	1500	1310	1120	040	750	560	380	DRI	R.P.M. LA.S. MIX- M.P. 4	2050 147 A.L. 2050 157 A.L.	2050 164 A.L. 2050 168 A.L. 2000 171 A.L.	2000 174 A.L. 2000 175 A.L. 2000 175 A.L.	
INSTRUCTION 50,000	INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to or less than total amount of fuel in airplane. Move horizontally to the right or left and select a figure equal to or greater than the cir miles to be	flown. Vertically below and opposite desired cruising altitude read op- timum aviiting conditions. NOTES: (A) Avoid continuous creating in Column !	NGC		IR MILES	NAUTICAL		1600	1310	1160	1020	880	730	580	440	300	007	NOAN SOAN	31 251 31 252 31 247	30.5 236 30.5 231 30 226	30 219 30 211 30 204	BOLD NUMBERS: Use Ante-ReA UNH NUMBERS: Use Ante-Rea WITH TWO SPEED BLOWER: Use Agh Mores above heary line only
TION O	R USING CHART: Sel nount of fuel in airpla a figure equal to or	How and opposite de Hiom. NOTES: (A) Ave	E CRUISI	H	RANGE IN AIR MILES	STATUTE	LAB	1840	1510	1340	0/11	1010	0168	670	500	340	Dire and	R.P.M. I.A.S. MIX- M.P. V	2100 141 A.L. 2100 154 A.L. 2100 164 A.L.	2100 171 A.L. 2100 175 A.L. 2050 178 A.L.	2050 181 A.L. 2050 183 A.L. 2050 185 A.L.	NOLD N LIGHT NU WITH TV Blower o
IGHT W	INSTRUCTIONS FOI or less than total ar or left and select	flown. Vertically be Himum arviting cond	ALTERNAT		AIR MILES	NAUTICAL	GALLONS NOT AVA	1440 1310	1180	1050	920	290	660	530	400	260	ATIME BATA	Nord Nord	32 292 32 290 31.5 277	31 265 31 260 31 255	31 247 31 240 30.5 233	
C. E	Ma ark ark	1 808		H	RANGE IN A	STATUTE	160 U.S. GAL	1510	1360	1210	1060	910	760	610	1160	300			2150 147 A.R. 2150 159 A.R. 2150 166 A.R.	2100 173 A.L. 2100 177 A.L. 2100 182 A.L.	2100 185 A.L. 2100 189 A.L. 2100 191 A.L.	LIMP. GAIR TEMPERATURE IMP. GAIS. FOR WARM UP ALTITUDE NG ORDER
(	2 x	2		FUEL	U. S.	GALS.	2360	2000	1800	1600	00tt1	1200	0000	800	600	000		ELC 6	30000 2 25000 2 20000 2	15000 2 12000 2 9000 2	6000 2 3000 2 S.L. 2	C FREE AL
MOUTEL (>) B-I7F	POSITION 1	6 - A.R. 0-97	(DNIM ON)	NORMAL RATED (MAX. CONT.)		NAUTICAL	1.1	10801	1.00	1.1	760	1.1.1	1.12	420	320	220		No ch	38 413 38 413 38 413	38 413 38 413 38 413	38 413 38 413 38 413	INDIRCATED ALTITUDE CORRECTED FOR FREE ALR TEMPERATURE     ALLOW 160 U. S. GALS - IMP. GALS FOR WA TAXELOFE AND CLIMB TO 5000 - FRET ALTITUDE     RETURE FUEL FLOWS TO TANK     USE FUEL FLOWS TO TANKS.
<	2500	* 2500 46		ORMAL RATED	RANGE IN AIR MILES	STATUTE	AT \$1. AT 30,000 AT	1240	1110	088	870	740	020	nRt	370	092	OPERATING DATA	LA.S. MIX- M.P.H. TURE	171 A.R. 181 A.R. 191 A.R.	200 A.R. 203 A.R. 208 A.R.	211 A.R. 215 A.R. 221 A.R.	TAKE OFF AND TAKE OFF AND RETURN FUEL F
FORM ASC-811	CONDITION TAKE-OFF MILITARY	FOWER ISI		N F		5	AT \$1.											R.P.M.	2300 2300 2300	2300 2300 2300	2300 2300 2300	

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# Appendix II

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RANGES SHOWN ARE 90% OF FLIGHT TEST VALUES.

										1	AN	01	-2	0EF-1											
MS	the right pro- uitold Pressure um values for data are listed		NGE)	AIR MILES	NAUTICAL		1540 1340	1150	960	770	270	380	190		DATA	M.P. U.S. IMP. IN Ng P. P. P.	RPM TO MAIN-	USE 140 MPH	MED UP TO	MPTS. USE	W VI OK DELOW	PLY UP TO			
EXTERNAL LOAD ITEMS	escept in emergency. (B) Columns (II, III, IV & Y) toward the right pro- gressively give increase in range at societics in speed. (C) Manifold Pressue (M.P.). Golifour Per Houe (G.P.H.), are approximate maximum volues for reference. (D) for quick reference, tale-off and military power date are linted in the upper left corner of chart.	INO RESERVE FUEL ALLOWANCE	V (MAX. RANGE)	RANGE IN AIR	STATUTE		1550	1330	0111	.890	660	0111	220		OPERATING DATA	R.P.M. I.A.S. HIX- N M.Y.M. TURE IN	BELOW 20,000 FT. SET RPM TO MAIN- TAIN 140 MPM 15 WITH 20-1 1844	MP. ABOVE 20, DOO FT. USE 140 MPH.	SPEED CANNOT BE OBTAINED UP TO	RPM'S AND RECOMMENDED MP18.	AUIU-LLAN MIAIUKE MALM AI UK BELOW 2100 RPM.	RANGES SHOWN ABOVE APPLY UP TO	25,000 FT. ONLY.	d - Hgl er Hour at Pre Haur	
TERNA	Columns (I) range at soc (G.P.H.), at ference, take f chart.	D RESERVE	FUEL	U.S.	GALS.	1732	1400	1200	1000	800	600	001	200		Θ	ALT. R.	-	25000	15000		-	6000 3000 RI	-	LAG. Indicated Als Speed M.P.: Marticle Pressue (In. Hg) 0.550-54. U.S. Gallent Per Hou- D.D.C.P.A.: Importal Gallent Per Hou- P.L. Full Thoufal 51. San Level	
EXTERN	eccept in emergency. (B) Colum greesively give increase in range (M.P.). Gallons Per Hour (G.P.) reference. (D) For quick reference in the upper left corner of chart.	INC	25. 200	MILES	NAUTICAL		1220	1040	870	700	520	340	170		DATA	M.P. U.S. IMP. IN. Hg. P. P. P.		30 214 30 204	29 195	1.1.1		29 176 29 168	1.1.1	LALS, Indicated M.P., Montfold P. 0.3.6.P.R. U. S. U.S. 6.P.R. Import F.L. Fol Thereite S.L. Soa Land	
CHART POUNDS		IONS	Al Street	RANGE IN AIR MILES			1100	200	1000	800	600	100	200		OPERATING DATA	LA.S. NIX- N M.F.H. TURE IN	A.L.	162 A.L.	168 A.L.	A.L.	A. L.	176 A.L.	A.L.		ES.
Z	I column equa ntally to the ri e air miles to thitude read	ONDITIO	1 1-3 Carl	A. N. A.	STATUTE			120	10	8	9	=	CV .		0	Mr. R.P.M. I.	1.	2050	1	-		0061	1850	ute-Rich e Lean F: Use Nigh only	NOW DATA. Ramges shown are 90% of flight test values
or 7, sherrs or 7, sherrs 0, 45,000	ct figure. In fue le. Move horizo preater than th tired cruising o id continuous or	U	State of the second	R MILES	NAUTICAL	FLIGHT	1230 1080	026 -	270	610	460	310	1.60		G DATA	M.P. U.S.	ē	30.5 239	30 229	30		30 206 29.5 199	29 193	BOLD NUMBERS: Use Auto-Nich LIGHT NUMBERS: Use Auto-Lean with two streep atomys. Use high blower above keery for only	FLIGHT T
NO	INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to ar less than total amount of fuel in airplane. More horizontally to the right or left and select of figure equal to or greater than the air miles to be flown. Vertically below and opposite desired cruising attrude read op- timum availed conditions. MOTES: [A] Avaid continuous cruiting in Column 1	CRUISING	HI STRAT	RANGE IN AIR MILES	STATUTE		1250	020	690	012	530	360	180		OPERATING DATA	I.A.S. MIX-	151	0 170 A.L.	0 176 A.L.	179	18	0 183 A.L.	188	C G108	RF 90% 0F
<b>OPERATION</b> SHEET 9.50,000	NS FOR USIN otal amount of telect a figur cally below a g conditions.	NATE		12.22		AVAILA										R.P.M.	2100		2050	The state		2050	2 X		NMUHS
FLIGHT (	INSTRUCTIO or left and flown. Verfit	ALTERI	100 Con	AIR MILES	NAUTICAL	GALLONS NOT	950	810	049	550	007	270	130		OPERATING DATA	K- M.P. U.S.	12 Kick	R. 32 290 R. 31.5 277	L. 31 264	8	-	L. 30.5 236		ï	OFFRATION DATA.
8	из. IMF. селя. олян. 608 - 808 -		H	RANGE IN AIR MILES	STATUTE		1250	0#0	780	630	470	310	150		OPERATI	M. LA.S. HIX- M.P.H. TURE	1.1	166	00 179 A.L.	184		00 190 A.L.	195	EMPERATURE. ALS FOR WARM UP. XE ER	SITIONAL ENGINE
(	NURATION IN MIK		FUEL	u. s.		100	1400	1200	1000	800	600	1000	200		Θ	ALT. R.P.M.		25000 2150 20000 2150	15000 2100			5000 2100 3000 2100	-	FOR FREE AIR TE - IMP. GAI - FEET ALTITUDE	CHART" FOR ADI
MODEL (S) B-17F	stowes mixtures rosition costition - A.R. - A.R.	IDNIM ONI	LX. CONT.)		NAUTICAL	0	950 880 770	670	550	440	330	220	110		Support of	20 6 X	113 113	413 413	413	¥13	38 413	38 413 38 413		DE CORRECTED U. S. GALS IMB TO	BARE TO "SPECIFIC ENGINE FUGHT CHART" FOR ADDITIONAL ENGINE OFFICIAL RATIO
MOM	2500 46	8-0701-1	NORMAL RATED (MAX. CONT.)	RANGE IN AIR MILES	5	AT 30,000 AT 5.L.	050	770	640	610	380	260	130		OPERATING DATA	S. MIX- M.P. A. TURE IN Hg	A.R.	192 A.R. 38	203 A.R. 38	A.R.	211 A.R. 3		226 A.R. 3	INDICATED ALITITUDE CORRECTID FOR FARE AIR TEMPE ALLOW 132 U. S. GAUS - INF. GAUS I TAKLOFF AND CLUM TO 5000 FEET ALITIUDE RETURN FUEL FLOWS TO TANK USE FUEL FROM TANKS IN THE FOLLOWING ORDER.	
EORM ASC-SILE	CONDITION R TAKE-OFF 2 MILITARY 2 POWRE	1	1 NORMA	RAN	STATUTE	AT S.L. AT :										R.P.M. LAS.	2300	2300	2300		2300 2	2300 2			and the second se

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Appendix II

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ITEMS	ward the right pro 3) Manifold Pressure azimum valves for over data are lister	CB	(MAX. RANGE)	RANGE IN AIR MILES	NAUTICAL	1010	810	620	200			OPERATING DATA	M. M	PT. SET RPM TO MAIN- IAS MITH 2941 INCH DOO USE 140 NPH 1AS MP. IF SPEED CANNOT	0 2000 RPM AND 0HER RPM S AND USE AUTO-LEAM	E APPLY UP TO	
EXTERNAL LOAD ITEMS	escept in emergency. (B) Columns [11, 11, 1V & Y) toward the right pro- greatively give increacy in concer to scriftce in speed. (C) Manifold Pressure (M.P.), Collocar Per Hour (0.2.H.), are approximate maximum values for reference. (D) for quite reference, tabe off and military power date are listed in the upper left corner of cherch.	INO RESERVE FUEL ALLOWANCE	V (MA3	RANGE IN	STATUTE	1160	930	710	230			OPERATI	R.P.M. LALS, MIX- M.H. TURE	BELON 20,000 FT. SET RPM TO MAIN. TAIN 150 MPH 1AS MITH 29+1 NGCH MP. ABOVE 20,000 USE 140 MPH (AG AND 29+1 NGCH MPL , E SPEFA CAMMON	BE DEFAIRED UP TO 2000 REM AND 29 INCHES, USE MIGHER RPWIS AND RECOMMENDED MPTS. USE AUTO-LEAM MIXTURE MMEM AT OR SELOW 2100 RPM.	RANGES SHOWN ABOVE APPLY 30,000 FT. DNLY.	1.A.S. Indicated An Speed M.F. Manfold Penanes (n. Hg) U.S.O.F.N.: U. S. Gallon Per Har M. O.F.N.: Inserial Gallon Per Have
TERN	) Columns is range at (G.P.H.), ference, to	O RESERV	FUEL	U.S.	GALS.	00	800	600 1400	200			0	ALT.	30000 25000 20000	15000 12000 9000	6000 3000 S.L.	LAS.: Indicated Air Speed M.P.: Manifeld Penares (In. U.S.G.P.H.: U.S. Gallers Pe D.P.O.P.H.: Impedial Gallers
ă	escept in emergency. (B) Colum greatery give increase in conge (M.P.). Colloon: Per Hour (O.P.) (M.P.). Colloon: Per Hour (O.P.) in the upper felt conner of chord:	8	1	<b>r</b> s	NAUTICAL	920	240	049 070	180			×	Norr Norr	215 206 196	185 178 171	165 158 151	LAS, Indicated M.P. Manifold P. U.S.C.P.H. U.S. U.S.C.P.H. Impe
5	apt is em ssively giv P.J. Gallos erence. (D) the upper J		N	AIR MIL	NAU	0	4	60	1			NG DAT	E IN No.	L 30 L 29	L. 29 L. 29 L. 29	L 29 L 29	
CHART Pounds	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	14	12	RANGE IN AIR MILES	STATUTE	1080	850	650 420	210			OPERATING DATA	I.A.S. NIX- M.P.H. TURE	150 A.L. 158 A.L.	168 A.L. 170 A.L. 172 A.L.	173 A.L. 173 A.L. 173 A.L.	
	ohumn equo lity to the r vir miles to vide read	NDITIO	-		STA'	°	8	07	2				R.P.M.	2050 2050 2000	2000 1950 1900	1900	tich • Ngh
INSTRUCTION or 7 SHEETS 40,000	INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to ar less than total amount of fuel in airplane. More horizortally to the right or left and select a figure equal to ar greater than the air miles to be flown. Verifically below and opposite deviced couling otherde read op- timum cruising conditions. NOTES: (A) Avaid confineous cruising in Column 1.	000	1.1	LES	NAUTICAL	840	670	500 330	041			TA	NOSH NOSH	245 235 224	214 207 199	193 186 179	BOLD NUMBERS: Use Asto-Rich UGNT NUMBERS: Use Asto-Leon WITH TWO SPEED REQWER: Use Nigh blower obere heavy line only
	Select fig plane. Mc or greate desired Avoid con	UISING	III	ALR MI	- NA							NG DN	MLX- M.P. TURE N. No	A.L. 31 A.L. 30.5 A.L. 30	L. 30 L. 29 L. 29	L. 29 L. 29 L. 29	NUMBER NUMBERS
7 or	CHART: fuel in air equal to opposite OTES: (A).	CRUI		RANGE IN AIR MILES	STATUTE	960	770	580 380	190			OPERATING DATA	ILA.S. HI M.P.H. TU	155 A.L. 163 A.L. 170 A.L.	176 A.L. 178 A.L. 180 A.L.	182 A.L. 184 A.L. 186 A.L.	POLE WITH Slow
OPERATION INST SHEEL 7 OF 45,000 TO	DR USING amount of a figure below and difficm. M	TE			STA	0	7	0 0					R.P.M.	2100 2100 2050	2050 2050 2000	2000 2000 1950	
45	CTIONS Fi than total a and select Vertically I vising con	RNAT		5	MAUTICAL	0	0	00	0				H. P.O.	281 267 256	245 239 231	223 216 209	
FLIGHT GR. WT	INSTRU or last flown.	ALTE		TH AJR MILES	NAU	750	590	800	150			IG DAT	M.P. IN. H2	31 32	30.5	30 30	é
<b>B</b> 5	ave, a.e.uk,		II	RANGE IN	E		0		0			OPERATING DATA	I.A.S. MIX- M.P.H. TURE	159 A.L. 165 A.L. 173 A.L.	180 A.L. 183 A.L. 186 A.L.	189 A.L. 191 A.L. 193 A.L.	NURE.
	10N U.S. AIN. C.P.N. 608 608	1911		E.A.	STATUTE	860	680	340	170			ō	R.P.M.	2150 1 2100 1 2100 1	2100 11 2100 11 2100 11	2050 11 2050 11 2050 11	EE AIR TEMPERATURE. 
2)	VUEL DURATION TON IN MIN. R. 5		FUEL	U. S.	OSE OSE	1000	800	1000	200			Θ	and the second second	30000 25000 20000	15000	6000 3000 S. L.	OR FREE AIR TE
MODEL (S) B-17F	A.R. A.R.	INIM ON	CONT.)	5	ICAL	AT 30,000 570	450	300 230	011				N. O. C. H.	413 113	413 413 413	413 413 413	MINICATED ALTITUDE CORRECTED FOR FREE AIR TEMPREATURE     ALLOWU \$ GAIS,IMP, GAIS, FOR WA     TAKEOFF AND CLIMB TOFRET ALTITUDE     RETURN FULL FLOWS TO TANK
MO B B	00 146	UR-DOO	D (MAX.	AIR MILE	글는	AT 51. A						G DATA	M.P.	38 38 38 38	38 38 38 38	38 38 38	D CLIMB T
	2500	-u	NORMAL RATED (MAX, CONT.)	RANGE IN AIR MILES		650	520	280	130			OPERATING DATA	LS. MIX-	179 A.R. 188 A.R. 198 A.R.	205 A.R. 209 A.R. 214 A.R.	217 A.R. 221 A.R. 226 A.R.	INDICATED ALTITUDE CORRECT ALLOW - U. S. GALS. TAKE-OFF AND CLIMB TO RETURN FULL FLOWS TO TANK
	CONDITION TAKE-ON MUTATY FOWER		1 NORM	RA.	S 1-	AT S.L. AT						0	R.P.M. I.A.S.	2300 17 2300 16 2300 16	2300 20 2300 20 2300 21	2300 217 2300 221 2300 226	00

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87

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RANGES SHOWN ARE 90% OF FLIGHT TEST VALUES.

# Appendix II

										A	N 01-20	)EF-1						
EMS	the right new.	anifold Pressure	r data are listed			RANGE)	AIR MILES	NAUTICAL	1490 1420	1280 1140 1000	850 710 570	420 290 140	DATA	M.P. U.S. 186- 10. Hg P. Q. G. H. H	T RPM TO MAIN- TH 20 INCHES ± 000 FT, USE 135 UNCH MO IF	INED UP TO IES, USE M GHER ED NP1 S, USE IEN AT OR BELOW	DT 40 YIGA	
EXTERNAL LOAD ITEMS (2) 2000 LB. BOMBS	assapt in umergency. [8] Columns [11, 11]. [V & V] toward the right root	gressively gire increase in range at socrifice in speed. (C) Manifold Pressure M P1 Colline B- U. CO BUI	reference. [0] For quick reference, false off and military power data are lished		FUEL ALLOWANCE	V (MAX. R	RANGE IN AI	STATUTE	1720	1470 1310 1150	980 820 660	490 330	OPERATING	R.P.M. ILALS, HIX- M.F.H. TURE	BELOW 20,000 FT. SET RPM T0 MAIN- TAIN 145 NPM IAS WITH 20 INCHES ± 1 180K MP-ABOVE 20,000 FT. USE 135 HPM AS AND 30 + 1 180CM MD 125	SPEED CANNOT BE OBTAINED UP TO 2000 RPM AND 29 INCHES, USE M GAREA RAW'S AND RECOMMENDED NP15, USE AUTO-LEAN MISTURE MED AT OR BELOW	2100 MPH. RANGES SHONN NBOVE. 6000 FT. ONLY.	d c. Holl ter Hour an Per Hour
TERNA 2) 200	Columns (	range at so	ference, take	f chart.	O RESERVE	FUEL	U.S.	GALS.	2282 2100 2000	0001 1000	800 1000 1000	600 200	Θ	ALT. R	30000 B 25000 T 20000 L	15000 5 12000 8 9000 8	6000 2 3000 R S. L. 6	LAGA: Indicated All Spand LAGA: Indicated All Spand U.G.O.P.H., U.S. Andreat Fer M.P.G.P.H., Ingenia M.P.G.P.H., Ingenia M.P.G.P.H., Ingenia Stat. Soa Level
9 <u>8</u>	in «mergency. [8]	ly give increase in	ce. (D) For quick re	in the upper left corner of chart.	ONI		AIR MILES	NAUTICAL	1360 1300	1160 1040 800	780 650 520	390 260 130	DATA	M.P. U.K. M.P. U.K. M. O.Y.K.		30 216 30 216 30 217	30 216 30 218 30 208	1.4.5.4 Indicated M.P.: Manifald P. W.S.O.P.H.: U. S. UKS.O.P.H.: Image P.L.: Fall Throthe S.G. See Level
CHART POUNDS					TIONS	M	RANGE IN AIR	STATUTE	570 1490	1340 1190 1040	900 750 600	150	OPERATING	LA.S. HIX- M.P.N. TURE		142 A.L. 147 A.L. 154 A.L.	160 A.L. 164 A.L. 168 A.L.	
RUCTION SHETTS 60,000	vel column equ	contally to the	altitude rea	cruiting in Col	DIDNO			2LI	112	013	010	± ∞-		0. R.P.M.		2050 2050 2050	2050 2050 2050	Auto-Rich Vo-Lees VIII: Use high • only
INSTRUCTION 60,000	act figure in fu	me, Move hori	exited cruising	aid continuous	ING C		IR MILES	NAUTICAL	FLIGHT 1220 1160	1050 940 820	700 580 470	360 240 110	G DATA	M.P. U.S. IN. Ng V.S.		31 255 31 255 31 255	31 250 31 245 30.5239	BOLD HUNKERS: Use Awfo-Elch WITH THUNKERS: Use Awfo-Less WITH THO SPEED RECHAR. Use Aig Slover above besty fee only
TION 10	INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to	or less than total amount of fuel in airplane. More horizontally to the right or left and select a finure entrol to be prevent than the size when to be	flown. Vertically below and opposite desired avising altitude read op-	himum cruising conditions. NOTES: (A) Avaid continuous cruising in Column I	CRUISI	HI .	RANGE IN AI	STATUTE	11486 11 1410 1340	1210 1080 940	810 670 540	130 130	OPERATING	LA.S. MIX- M.P.N. TURE		150 A.L. 156 A.L. 162 A.L.	166 A.L. 170 A.L. 174 A.L.	BOLD N LIGHT N WITH T
OPERATION SHEET 65,000	NS FOR USIN	otal amount	ally below a	g conditions.	NATE				NOT AVA					R.P.M.		2100	2100 2100	
IGHT	INSTRUCTIO	or less than t or laft and	Rown, Vertic	timum cruisin	ALTERI		AIR MILES	NAUTICAL	GALLONS 1080 1040	940 840 730	630 520 420	310 210 100	4G DATA	M.P. U.S.	.32.5310	.32.5 307 .32 .32 301 .32 299	R. 32 290 R. 31.5 281 R. 31.5 281	UP.
	U.S. IMP. G.P.H. G.P.H.	- 808	- 809			H	RANGE IN	STATUTE	182 U.S. 1280 1200	1080 960 840	720 600 4180	360 240 120	OPERATIN	LA.S. MIX-	0 148 A.R.	0 159 A.R. 0 164 A.R. 168 A.R.	172 A. 175 A. 179 A.	DICATED ALTITUDE CORRECTED FOR FREE AIR TEMPERATURE. COW 182 U. S. GALS IMP. GALS FOR WARM UP. GEOFF AND CLUMR TO 5000 JEET ALTITUDI. GEOFF AND CLUMR TO 5000 JEET ALTITUDI. GEOFF AND CLUMR TO 70 TANK. FUEL FROM TARKS IN THE FOLLOWING ORDER. RERE TO "PFECHE ENGINE FUELT FOR ADDITIONAL BRGINE DFFAATDEN DATA.
	DURATION IN MIN.	2	9			FUEL	U. S.	10	2282 2100 2000	800 800 400	8000 8000	800 200	0	ALT. R.P.M.	25000 25000 20000 2200	15000 2200 12000 2150 9000 2150	6000 2150 3000 2150 S.L. 2150	INDICATED ALTITUDE CORRECTED FOR FREE AIR TEMPERATURE ALLOW 182 U. S. GALS - IMP. GALS FOR WA TAKEOF AND CLIMB TO 5000 FEET ALTITUDI TAKEOF AND CLIMB TO TAKK UST FUEL FROM TAKES IN THE FOLLOWING ORDER UST FUEL FROM TAKES IN THE FOLLOWING ORDER
PF(S)	NOTITIZEN N	A.R.	A.R.	17	IONIM ONI	CONT.)			870 21 970 21 910 20	630 16 730 16 640 11	550 12 450 10 370 8	280 180 90 2		N S S S S				ALS ALS 5000 ANK THE FOLLC NUK
MODEL (S) B-17F	NOILISON ( D)	1		R-1820-9	OND	(MAX.	AIR MILES	NAU	13				DATA	M.P. G. IN.Hg P.	38 413 38 413 38 413 38 413	38 1413 38 1413 38 1413 38 1413	38 413 38 413 38 413	INDICATED ALTITUDE CORRECTED ALLOW 182 U. S. GARS TAKE OF AND CLAMB TO 50000 TAKE OF AND CLAMB TO 50000 USE FUEL FROM TANKE IN THE FO USE FUEL FROM TANKE IN THE FO
<	R.F.M. (IN. HG.)	2500 46	2500 46	R		AL RATED	RANGE IN AN		1110 1050	950 840 740	630 630 1420	320 210	PERATING	Mi K 1985	A.R. A.R.	A.R. A.R.	A.R. A.R.	LOW IS ALLOW IS ALLOW IS ALLOW IS ALLOW IS ALLOW IS ALLOW TURK FUEL FROM
YIIS-DEN MEDI	CONDITION	TAKE-OFF 2	MHITARY 2	ENGUNE (5)		I NORMAL	RAN	STA	AT S.L. AT				0110	R.P.M. LA.S. M.P.K.	2300 2300 158 2300 172	2300 179 2300 183 2300 188	2300 192 2300 199 2300 203	

RANGES SHOWN ARE 90% OF FLIGHT TEST VALUES.

Flight Operation Chart (external load - two 2000- pound bombs) 3 Sheets RESTRICTED

88

RESTRICTED AN 01-20EF-1

8

EXTERNAL LOAD ITEMS (2) 2000 LB. BOMBS	escept in margancy. [8] Columes (11, 111, 17 & Y) toward the right pro- gressively give increase in range at socifice in typed. (C) Manifold Pressure (M.F.), Callons Per Hour (G.P.H.), are approximate maximum values for reference. (D) For quick reference, take-off and military power data are listed in the upper left comer of chart.	OWANCE	V (MAX. RANGE)	RANGE IN AIR MILES	TE NAUTICAL	1110		620	310	OPERATING DATA	I.A.S. MIX- M.P. U.S. IMP. M.M. TURE IN H9 P. P. N.	BELON 20,000 FT, SET RPM TD NAIN- TAIN 195 NPH LAS MITH 29 INCHES ± 1 INCH MP. ABOVE 20,000 FT, USE 1 SK AMP AS AND 20 INCHES ± 1 INCH	MP. IF SPEED CANNOT BE OBTAINED UP TO 2000 RPM AND 29 INCHES, USE MICHER RPM'S AND RECOMMENDED NP'S.	BELOW 2100 RPM. BELOW 2100 RPM. RANGES SHOWN ABOVE APPLY UP TQ	00k/
RNAL LO	lumas (II, III, IV & ge at socrifice in sp P.H.J, are approxi- see, tale-off and mi ert.	INO RESERVE FUEL ALLOWANCE	FUEL Y		GALS. STATUTE	1600 1450 1280 1280		600 530	400 360	4.15	R.P.M.		-	0.0	Air Sp enum Gallon tul Ga
EXTE (2) 2	eccept in margancy. (8) Colum gratively give increase in range (M.P.), Gallant Per Hour (0,P.) reference. (0) For quick reference in the upper left corner of chart.	INO RE	P1		NAUTICAL GA	1010 1010 830		580 B	280 4	DATA O	M.P. U.S. MP. MART.	30000 A. L. 29.5 203 2000	213 212 212		
N CHART	Not design and the	CONDITIONS	N	RANGE IN AIR MILES	STATUTE	090 960	800	1480	320	OPERATING DATA	R.P.M. I.A.S. MIX- N M.P.N. TURE IN	2050 133 A.L. 2	2050 149 A.L. 30 2050 154 A.L. 30 2050 154 A.L. 30	163	1900 171 A.L. 29
<b>OPERATION INSTRUCTION</b> SHEFT 2 OF 3 SHEFT 50,000 TO 55,000	INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to an less than total amount of fuel in airplane. More horizontally to the right or left and select a figure squal to or greater than the oir miles to be flown. Verifically below and opposite desired cruising altitude read op- timum avising conditions. MOTES: (A) Aveid continuous avising in Column I	1.0		IR MILES	NAUTICAL	FLIGHT 900 750	630	370	250	S DATA	M.P. U.S. IMP. IN.No. P. P. P. N. H.	31 255	31 253 31 248 31 248	31 240 30.5233	A. L.13U. 5[229] [190 BOLD NUMBERS: Use Auto-Rich Mark TWO SEED ALONGY Use May WITH TWO SEED ALONGY Use May Numer above heavy line only
PERATION INST	R USING CHART: Sel mount of fuel in airpla a figure equal to ar slow and opposite di thom, NOTES: (A) Ave	E CRUISING	R	RANGE IN AIR MILES	STATUTE		720	064	280	OPERATING DATA	R.P.M. I.A.S. MIX- M.P.N. TURE	2100 146 A.L.	2100 157 A.L. 2100 162 A.L. 2100 167 A.L	A COLORING	ALL ALL ALL BOLD N BOLD N WITH TV Norme o
IGHT WI	INSTRUCTIONS FO or less than total or or lest ond select flown. Vertically b fimum cruising cond	ALTERNATE		AIR MILES	NAUTICAL	GALLONS NOT AVAILABLE IN 800 1040 660 880	550	330	220	NG DATA	M.P. U.S. MP. IN. Hg P.	33 314 33 312	A.R. 32 298 A.R. 32 292 A.R.31.5284	12.12	XT I
<b>d</b> 5	ATTON U.S. IMP. MIN. G.F.H. 5 603 - 5 803 -			RANGE IN AIR MILES	STATUTE	150 US. 6 920 760	640 610	380	250	OPERATING DATA	R.P.M. I.A.S. NIX- M.P.N. TURE	2200 146 A.R. 2200 157 A.R.	2150 163 A.1 2150 168 A.1 2150 171 A.1		O PARANE SO PERSON A SEL 2100 100 A. LAT 20 INCATED ALITUDE CORRECTED FOR FREE AIR TEMPERATURE INCATED ALITUDE CORRECTED FOR FREE AIR TEMPERATURE INCATED AUTO TO FANK TURN FUEL FLOWS TO TANK E FUEL SROW TANKS IN THE FOLLOWING ORDER
F <sup>(S)</sup>	MIXTURE DURATION POSITION IN MIN. A.R. 5 A.R. 5	ion	TJ) FUEL	U. S.	GAIS.	00 1800 1450	000		ficon	OBNICTY	and in case of the local division of the loc	30000 25000 20000	15000 12000 9000	0009	TEO FOR FREE
MODEL (S) B-I7F	м.э. вцомта 146 -	(INO WIND)	NORMAL RATED (MAX, CONT.)	AIR MILES	NAUTICAL	000,001 12 12 14 0007 57.0	480	290	190	NG DATA	M.P. O.S. IN. Ng P.	8, 38 413 8, 38 413 8, 38 413 8, 38 413	2. 38 413 2. 38 413 2. 38 413	1. 38 413	COUNTER ALTITUDE CORRECTED FOR FREE AIR TEMPERATURE     (1) INDICATED ALTITUDE CORRECTED FOR FREE AIR TEMPERATURE     (2) ALLOW LED U. S. GAUS     (2) ALLOW LED     (2) ALLOW     (2) A
	constrion a.F.m. a TAXE-off 2500 POWRE 2500 RHUTAAY 2500		IORMAL RAT	E IN	STATUTE	AT 5.1 AT 30,000	550 MMO	330	520	OPERATING DATA	R.P.M. LA.S. NIX-	2300 152 A.R. 2300 166 A.R. 2300 174 A.R.	2300 183 A.R. 2300 188 A.R. 2300 193 A.R.	2300 198 A.R. 2300 201 A.R.	

Flight Operation Chart (external load - two 2000- pound bombs) 3 Sheets

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89

# RESTRICTED AN 01-20EF-1

Appendix II

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											AN 01-2	0EF-1							
TEMS	rd the right pro- Manifold Pressure	ximum values for ver data are listed			RANGE)	VIR MILES	NAUTICAL	510	330	170			IG DATA	M.P. U.S. M.F. IN.H. P. G. G. N. H. H. H.	5ET RPM T0 18.5 WITN 29 P. ABOVE 20,000 Ab NA PO 100000	PEED CASHOT BE 00 RPM AND 25 R RPM'S AND	WSE AUTO-LEAN	H H	
EXTERNAL LOAD ITEMS (2) 2000 LB. BOMBS	eccept in emergency. (B) Columns (I), III, IV & Y) toward the right pro- greatively give increase in range at sacrifice in speed. (C) Manifold Pressure	[M.P.J. Collons Fer Mour (G.P.F.J.) are approximate maximum values for reference. (D) For quick reference, take-off and military power date are littled		RESERVE FUEL ALLOWANCE!	Y (MAX. RANGE)	RANGE IN AIR MILES	STATUTE	590	380	061			OPERATING DATA	R.P.M. I.A.S. MIX- M.P.H. TURE	BELOW 20,000 FT., SET RPM T0 MAINTAIN 145 MPH 185 MITE 28 MAINTAIN 145 MPH 185 MITE 28 MOULES ±1 1800 MPT 20,000 TF 1460 155 MPU A& MA 50 VO100	1 INCH MP. IF SPEED CASNOT BE COTAINED UP TO 2000 PPW AND 29 INCHES, USE WIGHER SPW'S AND	RECOMMENDED NP'S. USE AUTO-LEAN MIXTURE WHEN AT OR BELOW 2100 R	RANGES SHOWN ABOVE APPLY UP 15,000 FT. ONLY.	eerl (In. He.) 5 Per Maar Ilans Per Maar
TERN.	Columns range at	ference, to	f chart.	O RESERV	FUEL	U.S.	CALS.	620	00h	200			0	ALT.	30000 25000 20000	15000	0005	6000 3000 S. L	A.A.S.: Indicated A.S. Speed M.P.: Maxifold Pressee (In. Hq.) M.P.: Maxifold Pressee (In. Hq.) M.P.G.M.I. Theorid Solora Per Pleas M.P.G.M. Theorid Solora Per Pleas S.G. See Level
	ept in emergency. (B sively give increase in	<ol> <li>Galions Per Hour rence. (D) For quick re</li> </ol>	in the upper left corner of chart.	ONI		AIR MILES	NAUTICAL	460	300	150			NG DATA	M.P. U.S. IMC.	L. 30 220 L. 30 219	L. 30 215 L. 30 208	10	A.L.29 199 A.L.29 192 A.L.29 192	1.4.5. i heliseted M.P. Mandold IV. M.P. G. S.H. Theore M.P. Schl Theorie K.L. See Lovel K.L. See Lovel
ION CHART	1. 1. 1. 1.			NDITIONS	VI	RANGE IN AIR MILES	STATUTE	530	Ofte	021			OPERATING DATA	R.P.M. I.A.S. MIX- M.P.H. TURE	2050 137 A.L. 2050 147 A.L.	157	163	2000 166 A.L.29 2000 169 A.L.29 2000 172 A.L.29	lien - High V + 11E S
INSTRUCTION	INSTRUCTIONS FOR USING CHART: Select Figure in fuel column equal to or less than total amount of fuel in airplane. Move horizontally to the right	or tert and select a tigure equal to a greater than the air miles to be flown. Vertically below and opposite desired cruising altitude read op-	himum cruising conditions. NOTES: (A) Avoid continuous cruising in Column I	6 CO		AIR MILES	NAUTICAL	410	260	130			G DATA	M.P. U.S. IMP. IN. Ny P. P. P.	. 31 260 . 31 256	31 246 31 241	169 A.L.30.5236	1/3 A.L.30.5231 176 A.L.30.5226 180 A.L.30 219	BOLD NUMBERS: Ura Auto-Elen With Provasts. Ura Auto-Elen With Provastes. Ura Auto-Elen Borar obow herry [iss any borar obow herry [iss any
<b>OPERATION INSTI</b> setter 3 of 3 55,000 ro	R USING CHART: Se nount of fuel in airpl	a trgure equal to or slow and opposite o	itions. NOTES: (A) An	E CRUISIN	H	RANGE IN AIR MILES	STATUTE	024	300	150			OPERATING DATA	R.P.M. I.A.S. MIX- M.P.M. TURE	2100 144 A.L. 2100 153 A.L.	1. 1. 1. 1. 1.		2050 176 A.1 2050 176 A.1 2050 180 A.1	M GOD M MOLT NAME AND A MARKEN
FLIGHT OP	INSTRUCTIONS FO or less than total ar	or left and select flawn. Vertically bu	timum cruising cond	ALTERNAT		IN AIR MILES	NAUTICAL	360	230	011			OPERATING DATA	E M.P. C. M.P. C.	R. 33 316 R. 33 316 R. 32 306	A.R. 32 291 A.R.31.5283	-	A.L.31 269 A.L.31 262 A.L.31 256	
	ы ил име. И с.е.и. с.е.и. 608 -	608 -			=	RANGE IN	STATUTE	01h	270	081			OPERATI	R.P.M. LA.S. NIX- M.P.M. TURE	2200 141 A.R. 2200 154 A.R. 2200 181 A.R.	166	173	2100 176 A.L.31 2100 180 A.L.31 2100 184 A.L.31	INDICATED ALTITUDE CORRECTIO FOR TARE AIR FEAVERATURE     ALLOW U. S. GAIS INP. GAIS. FOR WARM UP.     ALLOW U. S. GAIS INP. GAIS. FOR WARM UP.     ALCOME TO AND TO TAKE.     ARTER TO "SPECIAL SIGNE TO TAKE" FOR ADDITIONAL INGUME OPERATION DATA     BERR TO "SPECIAL SHORE FUGHT CHART" FOR ADDITIONAL INGUME OPERATION DATA
(S)	DON IN MIN.				FUEL	U. S.	GALS.	620	00ħ	200			Θ		30000 25000 20000	Contraction of	in the second	6000 3000 S. L.	FOR FREE A
MODEL (S)	POSITION POSITION - A.R.	- A.R	R-1820-97	(DNIM ON)	NX. CONT.)	LES	NAUTICAL	AT 30,000 320	200	100			and state	No ex	8 1413 8 1413 8 1413 8 1413		8 413	38 413 38 413 38 413	INDICATED ALTITUDE CORRECTIO FOR FARE AIR TEN ALLOW <u>- U. 5 GAIS</u> - IMP, GAI TAKE OFF AND CLIMB TO - <u>- FET ALTITUDE</u> RETURN FUEL ROWS TO TANK USE FUEL REAM TANKS IN THE FOLLOWING ORDER BERRE TO "SPECING BIORNE FUGHT CLART FOR ADDIT
X	N.P. IIN. HG I	Sec. 1	R-18		RATED (MJ	RANGE IN AIR MILES		00 AT 5.L.	-				OPERATING DATA	NIX- M.P. TURE N. Hg	A.R. 38 A.R. 38 A.R. 38	TYPE AND		A.R. 38 A.R. 38 A.R. 38	INDICATED ALTITUDE COR ALLOWU. 5 C TXKE OFF AND CLIMB TO RETURN FUEL FLOW TO USE SULL FROM TANKS IN BREW TO "SPECIFIC BROW
	CONDITION R.P.M. TAKE-OFF 2500	MILITARY 2500	PNORME (S)		NORMAL RATED (MAX. CONT.)	RANGE	STATUTE	360 360	230	120			OPERA	I.A.S. M.P.H.	158 170 180	188	2300 195	2300 208 2300 208 2300 210	
FORM ASC-STLA	COME	MIL	BNG		-			AT 5.L						R.P.M.	2300 2300 2300	2300	53	23(23)	JEGEZO

Flight Operation Chart (external load - two 2000- pound bombs) 3 Sheets

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RESTRICTED AN 01-20EF-1

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										AI	N 0	1-20	EF-1			<u></u>		1		
MBS	d the right pro- Manifold Pressure cimum values for er data are fisted	8	RANGE)	UR MILES	NAUTICAL		1020	800	044	640	510	380 260		IG DATA	M.P. U.S. M.P. D. M.P. M.P. M.P. M.P. M.P. M.P.	TT. SET RPM TO MAIN- IAS WITH 2041 INCH DOO FT. USE 135 NPH DHES ± 1 INCH HP. IF	SE OBTAINED UP TO 28 INCHES, USE HIGHER DAMENDED MP15, USE TURE MHEN AT OR		É APPLY UP TO	
EXTERNAL LOAD ITEMS (2) 4000 LB. BOMBS	escept in emergency. (B) Columns (II, III, IV & Y) toward the right pro- gestively give increase in range at sacrifice in speed. (C) Manifold Pressure (M.P.), Gallous Pee Hour (G.P.H.), are approximate maximum values for reference. (D) For quick reference, take-off and military power data are litted in the upper left corner of chart.	INO RESERVE FUEL ALLOWANCE	Y (MAX. RANGE)	RANGE IN AIR MILES	STATUTE		1170	1030	880	730	590	300 300		OPERATING DATA	R.P.M. I.A.S. NIX- M.P.H. TURE	BELOW 20.000 FT. SET RPM TO MAIN- TAIN 145 MPH JAS MITH 2011 ING MP. ABOVE 20,000 FT. USE 35 MPH IAS AND 29 INCHES ± 1 INCH MP. IF	SPEED GENNOT BE OBTAINED UP TO 2000 RPM AND 20 INCHES, USE HI RPM'S AND RECOMMENDED MP'S. US AUTO-LEAM MIXTUBE WHEN AT DR	SELOW 2100 RPM.	RANGES SHOKK ABOVE APPLY UP TO 6,000 FT. OMLY.	LA.S. Indicated Alt Speed Alt - Marild Pressee (In Play) U.S.O.R.L. U.S. Galland Par Hour MM.C.Z.M., Imprid Gallan Pr. Hour L.J Edl Threith
TERN, 400	Columns range at s (G.P.H.), ference, tal	O RESERV	FUEL	U.S.	CALS.	>	1732	0011	1200	1000	800	600 1400		Θ		30000 25000 20000	15000	2004	3000 S.L.	L.A.S.: Indicated Al: Speed ALP: Manifold Pressors [In. Mg] U.S.G.P.M.: U. S. Gallons Per Hun- MMCDPML: Impurial Gallons Per H. P.L. Full Theolite
	ecopt in emergency. (B) Colum greatively give increase in cange. (M.P.), Callons Per Houre (Q.P.) relevance. (D) For quick references. In the upper left corner of chart.	0N		AIR MILES	NAUTICAL									NG DATA	E IN NP. 0.5 IMP					LAIS: Indicated MUL: Mariled P. MUS: OR AN: U.S. MUS: CAM, U.S. P.L. Stat Invelte S.L. Stat Javel
ON CHART		DITIONS	VI	CANGE IN AIR MILES	STATUTE									OPERATING DATA	R.P.M. LA.S. MIX- M.P.M. TURE					ch Nigh
OPERATION INSTRUCTION SHEFT OF 2 SHEFTS 55,000 ro 60,000	INSTRUCTIONS FOR USING CHART: Select figure in feel column equal to or less than total amount of feel in girplane. More herizontally to the right or left and select a figure equal to or greater than the air miles to be Bave. Vortically below and opposite derived cruising altitude read op- timum eviling conditions. NOTES: [A] Avaid continuous cruiting in Column 1	G CON		I MILES	NAUTICAL	HT	008	064	680	570	450	340 230		DATA	NOCH NOCH			31 241	A. L. 31 239 A. L. 30.5 236 A. L. 30.5 234	ADD NUMBERS: Use Avte-Rich UNIT NUMBERS: Use Auto-Lean WHIT TWO SPEED BLOWER: Use Nigh blower obore hedry files only
OPERATION INS SHEET 00F	ING CHART: Select of fuel in pitplane ura equal to or gr and opporite desi . NOTES: [A] Avaie	CRUISIN	III	RANGE IN AIR MILES	STATUTE	3LE IN FLIGHT		010	780	650	520	390 260		OPERATING DATA			145	1	2100 156 A.L.	BOLD NI INGHT NU WITH TW blever o
L.	RUCTIONS FOR US as than total amount off and select a fig a. Vartically below m cruising condition	LTERNATE		ILES	NAUTICAL	GALLONS NOT AVAILABLE IN	290	700	000	500	400	300 200		ATA	He U.S. INF. R.P.M.					
FLIGHT or. wi.	IMP. I. I. I.	ALI	H	RANGE IN AIR MILES	STATUTE N.	1000		000	000	570 570	80	350 230		OPERATING DATA	I.A.S. NIX- M.P. M.P.S. TURE N. Hy		149 A.R. 32 299 154 A.R. 32 295	157 A.R. 31, 5 290	160 A.R. 31.5283 164 A.R. 31 275 168 A.R. 31 275	FOR WARM UP.
	риталтом U.S. IN MIN. С.Р.Н. 5 608				51	-	978 SAU				800				T. R.P.M.	888		_	6000 2150 3000 2150 S.L. 2150	FREE AIR TEMP IMP. GALS EET ALTITUDE
(S)	A.R. A.R.	0	I SIIS	-	GALS.		1732	00101		0001	00	0.7		e	0 7 -	30000 25000 20000	15000	6	Son of	TED FOR
MODEL (S)	1 1 I	(ONIM ON)	NORMAL RATED (MAX. CONT.)	IR MILES	NAUTICAL	AT 5.L. AT 25,000	690	600	000	430	350	260		G DATA	M. N. 10	38 M13 38 M13 38 M13	38	38	. 38 413 . 38 413 . 38 413	CLIMING CLIMING
	2500 2500 8-1		ORMAL RATEC	RANGE IN AIR MILES	STATUTE	AT 25,000	790	000		080	100	300		OPERATING DATA		2300 150 A.R. 2300 162 A.R.	171	2300 179 A.R.	2300 183 A.R. 2300 189 A.R. 2300 194 A.R.	INDICATED     INDICATED     INDICATED     INTOW     INTEGEF     AN     RETURN FULL
VIIS-DSV MBOH	CONDITION TAKE-OFF MALITARY POWER		N I	1.1	1	AT \$L.									R.P.M.	230	2300 2300	230	2300 2300	

Flight Operation Chart (external load - two 4000- pound bombs) 2 Sneets

RESTRICTED

91

# RESTRICTED AN 01-20EF-1

Appendix II

4

							1	AN 01-2	:0EF-1						
TEMS	and the right pro- Manifold Pressure aximum volves for wer data are listed	9	(MAX. RANGE)	AIR MILES	NAUTICAL	560	430 280	140		NG DATA	с М.Р. U.S. Мин. М.Р. U.S. Мин. М. Ну 7. 7. 7.	SELOW 20,000 FT. SET RPM TO MAIN- TAIN 145 NPM 1A5 WITH 29 INCHES ± 1 INCH MP. ABOVE 20,000 FT. USE 135 NPM 1AS AND 29 INCHES ± 1 INCH	01 BE 08TAIMED UP 9 INCHES, USE RECOMMENDED MPTS. TURE MHEN AT OR	E APPLY UP TO	
EXTERNAL LOAD ITEMS (2) 4000 LB. BOMBS	except in emergency. (B) Columns (II, III, IV & Y) toward the right pro- gressively give increase in range at sacrifice in speed. (C) Manifold Pressure (M.P.). Gallons Per How (G.P.H.), are approximate maximum volues for information.(D) For quick reference, tale-off and military power data are listed in the upper left corner of chart.	INO RESERVE FUEL ALLOWANCE	V (MAX.	RANGE IN AIR MILES	STATUTE	650	190 320	160		OPERATING DATA	R.P.M. I.A.S. NIX- N.F.K. TURE	BELOW 20,000 FT, SET RPM T0 MAIN- TAIN 445 MPM IAS WITH 29 IMCHES ± 1 IMCH MP, ABOVE 20,000 FT, USE 135 MPM IAS AND 29 IMCHES ± 1 IMC	MP. IF SPEED CANNOT BE OFAINED UP TO 2000 RPM AND 29 INCHES, USE HIGHER RPM'S AND RECOMMENDED MP'S. USE AUTO-LEAN HIXTURE NHEN AT OR	ELEN 2100 KIN. RANGES SHOWN ABOVE APPLY UP TO 6000 FT. ONLY.	1.1.1. Indented Ari Speed M.P. Munded Perane (h. Hg) M.P. Munded Perane (h. Hg) M.P. Thu Ingenia Gallan Per Hou M.D.T. Fall Therefie E.J. Fal Therefie E.J. See Level
TERN 40	Columns range at (G.P.H.) ference, h	D RESERV	FUEL	U.S.	GALS.	800	600 400	200		Θ	ALT.	30000 25000 20000	15000 12000 9000	6000 3000 S. L.	1.1.1. Indicated Air Speed M.P. Municid Preaser (n. Hg) M.P. Municid Preaser (n. Hg) M.P. Arth. Impedia Gallon Pro P.J. Fall Treefie S.L. Sea Level
	except in emergency. (B) Colum greasively give increase in range (M.P.), Gellens Per Haar (G.P.) infrence. (D) For quick reference in the upper left corner of chart.	INC		EANGE IN AIR MILES	NAUTICAL	510	380 260	130		OPERATING DATA	M.P. U.S. IMP. IN. Ng P. G. G. H. H.		A.L.30.5224 A.L. 30 220 A.L. 30 218	. 30 213 30 210 30 208	LULED Indicated M.P.J. Manfeld P. M.P.G. M.M. IULE INDICATION INCOME F.J.L. Full Threefe S.J.L. Sea Genel
CHART POUNDS	10. 346 BALL	SNO	N	A HI 30						RATIN	MIX-			A.L.	
Charles and the second	INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to or less than total amount of fuel in airplane. More horizontally to the right or left and select a figure equal to or greater than the oir miles to be flown. Vertically below and opporting desired cruting altitude read op- timum cruting conditions. NOTES: (A) Avoid continuous cruting in Column 1	DITIO		RANG	STATUTE	590	000£	150		OPE	M. LA.S. M.P.H.		2050 144 2050 148 2050 152	2050 156 2050 160 2050 164	LUES.
TIO	l column malty to e oir mil utitude vising in	QNO			-			1997 (See		-	R.P.M.		2050 2050 2050	2050 2050 2050	do-Beh Leon the kip
<b>OPERATION INSTRUCTION</b> SHEET 2 OF 2 SHEETS 50,000 TO 55,000	re in fue ve horizo than th cruising inuous cr	U		ES	NAUTICAL	460	350 230	110		LA			259 256 251	248 242 237	ROLD NUMBERS: Use Auto-Back UGHT. NUMBERS: Use Auto-Back With Prov. SPLO. BLOWNER, Use Migh More there haven fine only More there have fine only SHOWN ARE SOS OF FLIGHT TEST VALUES
ISN	elect figurane. Mo ane. Mo graater desired roid cont	ING		ALR MI	NAI					NG DA	- M.P.	121		888	NUMBER NUMBERS TIPO SPEE
Z or INST	ART: Se Ant airpl al to or sparite S: (A) Av	RUISIN	HI	RANGE IN AIR MILES						OPERATING DATA	S. MIX-		8 A.L. 8 A.L.	2 A.L. 6 A.L. 0 A.L.	BOLD WITH Mover
DO 2	sing change of the second of t	v		RAN	STATUTE	530	1400	130		0	R.P.M. LA.S.		2100 148 2100 153 2100 158	2100 162 2100 166 2100 170	ARE
OPERAT SHEET 60,000	S FOR U tal amou lact a fi liy balav conditio	ATE	-								R.P.		10 10	512	SHOWN
-	UCTION than to t and se Vertica	ALTERN		113	NAUTICAL	410	300	100		TA	Sort	320 316	306 300 293	285 277 270	and the second second second
FLIGHT GR. WI	INSTR or left or left flown.	ALT	=	RANGE IN AIR MILES	NA					OPERATING DATA	M.P.	R. 33 R. 33	156 A.R. 32.5 306 160 A.R. 32 300 163 A.R. 32 293	166 A.R.31.5285 169 A.L.31.5277 172 A.L.31 270	UP, MERATION R.A.
1498年1月1日日日日日	INF. I I		-	NI 301	TE					ERATI	I.A.S. MIX- M.P.N. TURE	140 A.R. 33 148 A.R. 33	156 A.R. 32.1 160 A.R. 32 163 A.R. 32	166 A.R.31.6 169 A.L.31.6 172 A.L.31	POR WARM UP
	608 608			2.41	STATUTE	470	350 240	120		90	R.P.M. I.A	2200 II	the stranger	San Street	TEMPERA GALS FO JDE DER BDITIONAL
	DURATION IN MIN. 5		11	~	3		00	0			and the local distance of the		15000 2150 12000 2150 9000 2150	6000 2150 3000 2100 S.L. 2100	R FREE AIR TE JMP. GA SEET ALTITUDE SWING ORDEI (ART' FOR ABDI
(S)	A.R. A.R.	ION	-	U. S.	CALS.		600 1400	200		0	ALT.	30000 25000 20000	150	6000 3000 5. L.	TED FOR
MODEL (S)	ITION	INN WIND	NORMAL RATED (MAX. CONT.)	22	NAUTICAL	at 5.L. at 25,000 360	270 180	90		TA	30er	413 113	8 8 8 1 1 1 1		Indicated Altitude Corrected For Free Alt Temperature:     ALLOWU 5 OAL5INF, GAL5 FOR WARM UF, TAKE OFF AND CLIMB TOFEFT ALTITUDE     TAKE OF TO TAKE IN THE FOLLOWING ORDER     TAKE OF TAKE IN THE FOLLOWING ORDER     TAKE OF TAKET IN THE FOLLOWING ORDER     TAKE TO "SECHIC ENGINE RUGHE CHART" FOR ADDITIONAL ENGINE OFFEATION DATA     REVEL TO "SECHIC ENGINE RUGHE CHART" FOR ADDITIONAL ENGINE OFFEATION DATA     REVEL TO "SECHIC ENGINE RUGHE CHART" FOR ADDITIONAL ENGINE OFFEATION DATA
N N N	R 1820-97	10.00	D (MA)	ATR MIL	NAN	AT 5.L.				IG DA	M.P.	. 38	. 38	38 8	ALTITUDE ND CLIM ROM TAN
	2500 10 2500 2500 2500 2500 2500 2500 25	in the	AL RATE	RANGE IN AIR MILES	-	41 25,000	310	001	1.48	OPERATING DATA	S. MIX- M. TURE	6 A.R. 6 A.R.	6 A.R. 9 A.R. 4 A.R.	7 A.R. 2 A.R. 6 A.R.	
::.	CONDITION 2 TAKE-OFF 2 MALITARY 2 POWER 2	No.	NORM	A RAW	STATUTE		n N	-	1.546725	OP	R.P.M. IA.S.	2300 156 2300 156	2300 176 2300 179 2300 184	2300 187 A.R. 2300 192 A.R. 2300 195 A.R.	
FORM ASC-SILA	TAK NOC		-			AT			1223		a.	23	888	23 23	

Flight Operation Chart (external load - two 4000- pound bombs) 2 Sheets

# RESTRICTED

Appendix II

92

RESTRICTED AN 01-20EF-1

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ELLER	d the right pr Aonifold Pressu imum values f	er data are list		第二日には	LANGE)	IR MILES	NAUTICAL	1650	1520	1390	11.01	1020	770	640 510	S DATA	M.P. US.	T RPM TO MAI TH 29±1 1MCH USE 135 MP	UP TO 2000 R HIGHER RPM'S S. USE AUTO- T OK BELOW	APLY UP TO	
EXTERNAL LOAD ITEMS	escept in mmergency. (B) Columns (II, III, IV & V) toward the right pro- gressively give increase in range at sacrifice in speed, (C) Manifold Pressure (M.P.). Gallons Per Hour (G.P.H.), are approximate maximum values for	reference. (D) For quick reference, take-off and military power data are listed in the upper left corner of chart.		(NO RESERVE FUEL ALLOWANCE)	Y (MAX. RANGE)	RANGE IN AIR MILES	STATUTE	1900	1760	1600	ont i	1170	880	730 590	OPERATING DATA	R.P.M. LA.S. MIX- M.P.M. TURE	BELON 20,000 FT. SET RPM TO MAIN- TAIN 145 MPH IAS NITH 29+ INCH MP. ABOVE 20,000 FT, USE 35 MPH 115 AND 29+1 HKM MP. F SPEED	CARKOT BE OBTAINED UP TO 2000 RFM AND 29 INCNES, USE HIGHER RFM'S AND RECOMMENDED MP'S. USE AUTO- LEAM MIXTURE MNES AT DR BELOW	2100 RPN. RAMGES SHOMM ABOVE APPLY UP TO 6000 FT. ONLY.	ad In. HqJ Fer Hear on Per Hour
ATHER	Columns   columns   columns   columns	rference, tak		O RESERVE	FUEL	U.S.	GALS.	2770 2600	2400	2200	1000	1800	1200	1000	Θ	ELLE	30000 B 25000 1 20000 H	15000 A 12000 A	00	A. A. Indicated Air Speed (A. Indicated Air Speed M.P. Marifold Pressure (In, Hg) U.S.G.P.H., U.S. Gallon Per Hour M.P.J. H. Thoulet
	ot in emergency. (B wely give increase in ), Gallons Per Hou	reference. (D) For quick reference in the upper left corner of chart.		N		IR MILES	NAUTICAL		101	P NASA CARAGONIA CARAGONIA	A and				G DATA	M.P. U.S. IMP. N.H.9 0.5 IMP.				A Holizahad A Holizahad A Mascallah A Mascallah A Mascallah A Mascallah
ON CHART	168 C. C.			CONDITIONS	AI DAY	RANGE IN AIR MILES	STATUTE			4	Contra Co	a the second	a start		OPERATING DATA	R.P.M. I.A.S. NIX-				
or <sup>11</sup> SHETS 55,000	INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to or less than total amount of fuel in airplane. Move horizontally to the right or left and select a figure equal to or greater than the air miles to be	flown. Vertically below and opposite desired artisting altitude read ap- timum artisting conditions. NOTES: (A) Avoid continuous artisting in Column 1				RANGE IN AIR MILES	NAUTICAL	FLIGHT.						and a state of the	NG DATA	Norx Norx	2			IOLD NUMBERS: Use AveRich WITT NUMBERS: Use AveRich WITT TWO SPEED BLOWER Use Nigh blower above heary live only
OPERATION INST SHEET 1 OF 1 60,000 TO TO	t USING CHART: S neunt of fuel in airp i figure equal to a	low and opposite tions. NOTES: (A) A		TE CRUISING	H	RANGE IN	STATUTE	AVAILABLE IN F							OPERATING DATA	R.P.M. I.A.S. NIX- MORE MORE	Weiker Stand	Ø		Riowa
FLIGHT OPE SHE	INSTRUCTIONS FOIl or less than total an or left and select o	Rown. Vertically be Himum cruiting condi		ALTERNAT		IN AIR MILES		GALLONS NOT AV	1380.	1270	1010	920. 810	700.	570 460	TING DATA	M.P. U.S. MP. IN.No. P. P.			A.R. 32.5 230 A.R. 32 227	112 C10-11
	t us. Int. are crec	456 -		4	-	-		170 U.S. GA	1590	1460	1100	0900	800	660 530	OPERATIN	R.P.M. LA.S. MIX-			2150 152 A.R. 2150 157 A.R.	1 DC A
s) RATIOI	NE EVITATION ON IN MIN	3. 5			FUEL		10	2770 2600	2400	2200	1 800	1400	1200	800	Θ	ALT. R.P	30000 25000 20000	15000 12000 9000	-	OR FREE AIR
DEL (S	M.P. alower mixture duration in Met Position Position IN MIN. UG A.R. 5	- A.R.		INN MIND	X. CONT.)			AT \$1. AT 15,000 1350	1240.	1140	1	Series.	630	520 350		U.S. IM.		310 310 310	310	CORRECTED F CORRECTED F 5. GALS TO 5000
MODEL (S) B-I7F 3 ENGINE OPERATION		00 48	R-1820-97		NORMAL RATED (MAX. CONT.)	RANGE IN AIR MILES		A 1. 19 19 19	0	0 0	0	00	00	480	OPERATING DATA	MIX- M.P. TURE IN H2		A.R. 38 A.R. 38 A.R. 38	38 38	NDICATED ALTITUDE CONNECTED FOR FREE AIR TEN INDICATED ALTITUDE CONNECTED FOR FREE AIR TEN ALLOW 170 U S GAIS IMP GAI TAKEOFF AND CLIMB TO 5000 FRET ALTITUDE RETURN FUEL FLOWS TO TANK
3.6	and the second s	58	ENGINE (S) R		NORMAL	RANGE	31	AT 51. AT 15,000 1550	1430	1310	1070	840	720	600 480	OPERA	R.P.M. I.A.S.		2300 159 2300 165 2300 171	176	C INDICA

Flight Operation Chart (one propeller feathered) 4 Sheets

RESTRICTED

93

WALLPLAN.

RANGES SHOWN ARE 90% OF FLIGHT TEST VALUES.

Appendix II

12/14/2013								I	N C	01-20	EF-	1						
PELLER	ard the right pro- Manifold Pressure animum volves for wer data are listed		(MAX. RANGE)	AIR MILES	NAUTICAL	1650	1500	1360 1200	1050	300 800	450	300	1007 PATA	M.P. U.A. W.A. M. P. C. M. P.	SET RPM TO MAIN- WITH 29 + 1 INCH FT. USE 35 MPH + 1 INCK MP. IF	BTAINED OF TO NCRES, USE NIGHER NOED MP'S. USE NIEM AT OR BELOW	E APPLY UP TO	
EXTERNAL LOAD ITEMS	except in emergency. (B) Columns (II, III, IV & Y) toward the right pro- gravitely give increase in range at starrifice in speed. (C) Manifold Pressure (M.P.), Colleen Per Hour (G.P.H.), are approximate maximum values for reference. (D) For quick reference, take-off and military power data are listed in the upper left corner of chest.	LE FUEL ALLOWANCE	Y (MAX.	RANGE IN AIR MILES	STATUTE	1900	1730	1560	0121	870	520	350	OBEDATING DATA	R.P.M. 1.A.S. HIX- M.P.	SELOW 20,000 FT. SET RPM TO MAIN- TAIN 145 MPH AS WITH 29 + 1 10CH MP. ABOVE 20,000 FT, USE 35 MPH 1A3 AND 29 10CHES + 1 10CM MP. 1F	SPEED CANNOT \$E OBTAINED OF TO 2000 RPM AND 29 INCHES, USE HIGHER RPM"S AND RECOMMENDED NP"S, USE AUTO-LEAN WIXTURE WHEN AT 08 BELOW	2100 KPM. RANGES SHOWN ABOVE APPLY 6000 FT. ONLY.	1.4.5. Indicated Air Speed M.F. Martfold Preaver (Is, Hg) M.F. Martfold Preaver (Is, Hg) U.R.G.M.F. Impedial Gallen Per Huur F.L. Full Thombs S.L. Sas Level
TERN	Columns range at (G.P.H.), ference, té fechert.	INO RESERVE	FUEL	U.S.	CALS.	2360	2000	1600	0041	1000 800	600	001	30	ALT.	30000 25000 20000	15000 12000 9000	6000 3000 S. L.	A. S. Indicated A. Speed M. S. Indicated Answer (Iv. Hg) U.S.S. M. U. S. Galant R. Ho U.S.S. M. Ingebial Gallen Pe- R. A. H. Thoute S.L. Sa Level
	accept in emergency. (B) Colum grassively give increase in range (M.P.), Gollever Per Hour (G.P.F reference. (D) For quick reference in the upper left corner of shart.	DND		R MILES	NAUTICAL									M.P. U.S. W.				A.S.: Indicated M.S.: Manifold P. U.S.G.P.M.: U.S. U.M.C.R.M.: Impe- K.L.: Sea Level S.L.: Sea Level
		SNC	N	RANGE IN AIR MILES	E								CDED ATING DATA	S. MIX-				
ON CI	imn equal to to the right miles to be de read op g in Column I	DITIO		RAN	STATUTE									R.P.M. LAS.				ich Nigh
<b>OPERATION INSTRUCTION</b> SHEET 2 OF <sup>4</sup> SHEETS 55,000 TO 50,000	INSTRUCTIONS FOR USING CHART: Select figure in fuel column equal to ar less than total amount of fuel in airplane. More horizonfally to the right or left and select a figure equal to or greater than the air miles to be flown. Vertically below and apporte desired cruiting altitude read ap- timum cruiting conditions. MOTSS: (A) Avoid continuous cruiting in Columa I	G CON		1185	NAUTICAL	1500	1370	1240 1100	900	690 550	410	280	DATA NATA	Hora Jora		191	192   189   185	BOLD NUMBERS, Ure Aufo-Rich Lider Numbers, Ure Aufo-Jeen With tho stell BLOWER Ure Nigh blowe shore heary fee anty
2 OF	: Select Fig airplane. M o or great te desired I) Avoid co	UISIN	Ħ	RANGE IN AIR MILES	N	FLIGH		Walk and	0							A.L. 31	A.L. 31 A.L. 31 A.L. 31	DLD NUMBI GAT NUMBI VITN TWO SP Iswar above
ATION	NG CHART t of fuel in c ure equal 1 and opposit	CRU		RANGE	STATUTE	AVAILABLE IN 1730	1520	1420	0.60	790 630	0 <i>L</i> ħ	320	ONITA STOR			₫	150	. 31.2
OPERA SHEET	5 FOR US hal amount lect a fig by below conditions	ATE					11 10			Contractor Contractor		2		uur. R.P.M.		2100	2100 2100 2100	
1	INSTRUCTION or less than to or left and se flown. Vertical timum cruising	LTERN		R MILES	NAUTICAL	GALLONS NOT	1240	0111	0/8	620	370	250	4	N. S.		146 A.R. 33 239 152 A.R. 33 236 157 A.R.32.5 232	32 227 32 221 31 213	r, Extron data.
	INP.	•	=	RANGE IN ALL MILES	JTE	1.2.032403	1420	1140	RED .	710	130	290	ABCBATING	LA.S. HIT-		146 A.R. 33 152 A.R. 33 157 A.R. 32.5	160 A.R. 163 A.R. 164 A.R.	K AIR TEMPERATURE. IAN CALS FOR WARM UP ALTITUDE G ORDER OR ADDITIONAL INGUE OFFE
LION	AURTORE DURATION US. POSTITON IN MIN. 0.P.H. A.R. 5 1155 A.R. 5 1156			13	STATUTE	160 U.S. 1560	141	<u>8</u> = 9	5 0	ár-io	IT	ξi =		R.P.M.		2200 2200 2150	2150 2150 2150	K AIR TEMPE IMP, GALS J LTITUDE G ORDER
S) ERAT	R. BURA	-	FUEL	U. S.	GALS.	2360	2000	1800	0021	0001	600	001	80	ALT.	30000 25000 20000	15000 12000 9000	6000 3000 S. L.	POLLOWING
MODEL (S) B-17F 3 ENGINE OPERATION	1	GNIM ONI	NORMAL RATED (MAX. CONT.)	MILES	NAUTICAL	L A120,000 1220	1100	980 980	180	560	330	230		M.P. US WE	38 310 38 310 38 310	38 310 38 310 38 310	38 310 38 310 38 310	INDECATED ALTITUDE CORRECTED FOR FREE AIR TEMPERATURE.     ALLOW 160 U. 5. GAUS
M S ENGI	25500 146 146 146 146 146 146 146 146 146 146		AL RATED (A	RANGE IN AIR MILES		AT 20,000 AT 51.	1270	1020	760	640	380	260	AND DATE OF	S. MIX- M	A.R. A.R. A.R.	A.R. A.R. A.R.	A.R. A.R.	INDECATED ALTITUDE CORRECT ALLOW 160 U. S. GALS, TAKE-OFF AND CLIMB TO 50 RETURN FUEL FLOWS TO TANK USE FUEL FROM TANKS IN THE REFER TO "PRECHE ENGINE FLE
113-DSA MR01	ECONDITION 1 TAKE-OFF 2 MULITARY 2 POWER 151		I NORM	RAN	STATUTE	AT 5.L. AT	-							R.P.M. LAS.	2300 - 2300 139 2300 156	2300 166 2300 171 2300 178	2300 182 2300 186 2300 190	

RANGES SHOWN ARE 90% OF FLIGHT TEST VALUES.

Flight Operation Chart (one propeller feathered) 4 Sheets

RESTRICTED

Appendix II

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		-	-	-	-	_			T	N 01	-101		-	-				-
r	pro- sure sted				1								10	10 × 2	BELOW 20,000 FT. SET RPM TO MAIN- TAIN 145 MH21 AS WITH 29 ±1 HACH MP. ADVE 20,000 F1, USE 135 MPE	10%	2	-
Ē	I President		-	1	NAUTICAL	1430		00			1.		4	3044		UP UP		
LX	the r nifold um v data		V (MAX. RANGE)	RANGE IN AIR MILES	NAL	1 4		1250					OPERATING DATA	M. N.	RPH R 29 U SI	E WH	PPLY	L. Arth
正正	Marin Marin	8	RA.	ALE									0 N		SET SET	08TA CONM	VE M	12.00
00	d, fo	NAN	MAX	N I		No. CO.							ATI	NIX- TURE	FT.	N MI	PM.	13808
Ad	A solution	ILO	Ľ	ANG	STATUTE	9	2	9	T.				PER	LA.S. M.F.H.	,000 HPH	WINDT WINDT	BHOWS	12
D <sup>L</sup>	II. IV fice it appr appr	EL J	15	-	STAT	1840	2	ohtu					0		AB01	SPEED CANNOT BE OSTAINED UP TO 2,000 RPM AND RECONMENDED AP <sup>1</sup> 5 USE AUTO-LEAM MIXTURE MHEN AT	BELOW 2100 RPW. RANGES SHOWN ABOVE APPLY UP 6000 FT. ONLY.	Hear Hear
	(II, ) socrit are alte-of	E FL	10											R.P.M.	BEU TAII MP.	3PE 2,0	RAM	(in. For a fee
影뀌	P.H.	SERV	ISUS	1 05	CALS.	732		888	800	600 400	200		Θ	ALT.	30000 25000 20000	15000	9000 6000 3000	Air Sp Air Sp Gallar Gallar
E E	a ron ron efere efere	INO RESERVE FUEL ALLOWANCE	E	9	3)	1732	2	1200	8	64	N		Ľ	AN	30 25 20	120	900 100 500	icoted fata P U. S. U
EXTERNAL LOAD ITEMS	except in emergency. (B) Columns (N, III, IV & Y) toward the right programmery preventient provide increase in cargo at practifics in speed. (C) Manifold Pressure (M. F). Gallons Per Hour (G. P.H), are approximate maximum values for reference, (D) For quict reference, take off and military power data are listed in the upper left corner of chart.	E									150			-			6623	(A.S., Indicated Air Speed (A.S., Indicated Air Speed (A.S., Indicated Present (A. Hq) (V.S.O.H., U. S. Gallant Fer Hear (M.S.O.H., Import Gallant Fer Hear (M.S.O.H., Import Gallant Fer Hear)
	For gen			SI	NAUTICAL	1300		1150 980 820	650	500	170		A			168	168 166 163	A. A. C. M.
	n em y giv Gallor e. (D)			MIL	NAU	10.07		8	0	0 00	1		DAT	M.P.		30	30 30	10000
RT NDS	P.), O		N	ALE		Server.		Aler alert					UN	and the second s	1000		Contraction of the	L (March)
CHART POUNDS	Conception 2008	NS		E IN				V E	2				RATI	MIX-	CHE CARL	A.L.	149 A.L 155 A.L 158 A.L	
Ĵ	INSTRUCTIONS FOR USING CHART. Select figure in fuel column equal to cer less than total amount of fuel in airplane. More horizontally to the right or left and select or figure equal to on greater than the air miles to be flown. Vertically below and apposite desired cruiting attitude read op- timem cruiting coeditions. MOTES: (A) Avoid continuous cruiting in Column 1	DITION		RANGE IN AIR MILES	STATUTE	1500		11320	750	570	190		OPERATING DATA	LA.S. M.P.H.		E.	155	
z	a the files the Color	1-1		1	STA									R.P.M.	1000	2050	2050	
INSTRUCTION or 4 SHEETS 45,000	ally to ally to air m itude itude	OND		-		AND AND AND				N. AV	12			a. 8		50	50 50 50 50 50 50 50 50 50 50 50 50 50 5	DECK MURRERS: Use Auto-Bick BOLD MURRERS: Use Auto-Bick USAT MURRERS: Use Auto-Lise WITH TWO STRID BLOWER: Use Ait
	fuel c fixent the fixent officer	00								10	ſ	R		NOAX				BOLD NUMBERS: Use Auto-Eles BOLD NUMBERS: Use Auto-Eles WINT TWO STORD BLOWER: Use Al
<b>ນ</b> ທີ່	e in e hoe than ruitin			:	NAUTICAL	1 GHT.		1040 890 740	590	440	150	and	×	See.		193	185 185 185	Ute A
LS N	Mov Mov eater eat c	UZ		MIL	NAU	FLIGHT.		8 2	5	4 0	1	aller.	DAT	M.P.	100-200	31		SPRID SPRID
	Select plane or gri desir Avoid	SI	Ξ	AIR		N N						and a	UN		1.5	COLD STOCKED		NUN NUM
<b>ION IN</b> 3. of 10	in air to to (A)	CRUISING		RANGE IN AIR MILES									OPERATING DATA	TURF	12332	A.L.	100 A.L. 160 A.L. 164 A.L.	BOLD UGAT WITH
2.0	fuel equo offes	84		ANG	STATUTE	11LAB1 1360		1020	680	340	170		DPEI	LA.S. M.P.H.		141	1091 091	
	SING art of gure m. M			13	STA	AVAILABLE 1360		ΞΞŰ	ľ				Ĩ		200	2100	2100	
OPERATION SWEET 3 50,000	OR L amou below below	TE	-				-	e d'		1000				R.P.M.	Part of the	200	10 10 10	1923.64
OPERATION INSTRUCTIO SHEET 3 OF 4 SHEETS 50,000 10 45,000	INSTRUCTIONS FOR USING CHART. Select figure in fuel colume aqual to or less than total amount of fuel in airplane. More horizonfally to the right or left and alact o figure aqual to or greater than the air miles to be flown. Vertically below and apposite desired cruising attrude read ap- timem cruiting coeditions. MOTES: (A) Avoid continuous cruiting in Column 1	NA			1	NOT								NO N		No. 1		1993.34
	JCTIO Ihan and Varti cruiti	84		1	NAUTICAL	GALLONS 1060		930 800 660	530	400	130		×		100	230	216	
FLIGHT	45TRU 1 Ions 1 Ions	LTER		RANGE IN AIR MILES	NAU	ALL		000	10	4 04	7		OPERATING DATA	M.P.	1633			105.90.003
FLIG	₩ 0 0 ¢ ¥	V	=	AIR						<u> 1997</u>			BN	MIX- TURE	10100	R. 3	101 A.R. 32 183 A.R. 32 187 A.R. 31.	5
	1 1 1 E			NI BI		U.S.							RAT	Contraction of the local division of the loc	16.352		101 A.R. 183 A.R. 187 A.R. 171 A.L.	RE
	(U) (U)			LANG	STATUTE	132	1	920 760	810	300	150		OPE	LA.S. M.P.M.		151	161 183 187 187 187	FOR WA
z	456 456				STA	- <del>-</del> -	1						18	R.P.M.		2150	2150 2150 2150 2150	H AIR TEMPERATURE
0	D 5 MIN					405 M	1			544(3)				R. P	and the second		the second se	L AIR
A1			FUEL	U. S.	GAIS.	732	000	1200	800	100	200		Θ	ALT.	30000 25000 20000	15000	6000 3000 S. L.	E FRE
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QTW.		ONI	xo	Les	NAUTICAL	10 10	1	0 1 0	4	30	1		TA	Sour	310	310	310	INDICATED ALTITUDE CORRECT ALLOW 132 U. S. CALS. TAKE OFF AND CLIME TO 24.
YmZ	· · · · · · · · · · · · · · · · · · ·	1	(MA	R MI	NA	AT S.L.	1						DA	M.P.	38 38	38 38	38 38 38 38	CLIM
V NG	м. м. м. м. м. 00 Цб 8-1820-97		VTED	RANGE IN AIR MILES		And Street Street		1222	12	100			OPERATING DATA	MIX- TURE	A.R. A.R.	A.R. A.R.	A.R. A.R.	D AU 132
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:0:			NORMAL RATED (MAX. CONT.)	EAN	STATUTE	11	0			ar (u			OPE	I.A.S.	151	171	2300 187 2300 192 2300 192 2300 198	Implication attitude connected for rest and reare Autow 132 u s cars Implications Autow 132 u s cars. Autow 132 u s cars.     Autow 132 u s cars.
182903873297	CONDITION TAKE-OFF MILITARY POWER FNGINE 151				ST.	AT SL		1223				87		R.P.M.	2300 2300	2300	2300 2300 2300	00
FORM ASCIENT	8 - x M	1	-			2		1. 1. 1.	333	See.		12.1		e.	23	80.60	23 23	~~~

Flight Operation Chart (one propeller feathered) 4 Sheets

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95

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Appendix II

RANGES SHOWN ARE 90% OF FLIGHT TEST VALUES.

									AN 01	-20EF-1						
ITEMS DFELLER , Manifold Pressures rotinum values for over data are for	10	V (MAX. RANGE)	RANGE IN ALE MILES	NAUTICAL	000	064	600	390	nuz .		OPERATING DATA	X- M.P. U.S. M.P. R.	BELDW 20,000 FT. SET RPW TO MAIN- TAIN 145 MPH 1AS WITH 294 I NCH MP. ABOVE 20,000 USE 135 MPH 1AS AND 29 ± I INCH MP- I F SPEED 4AN-	UP TO 2000 RPM E MIGHER RPM'S MP'S. USE AUTO- M AT OR BELOW	VE APPLY UP TO	•
ART EXTERNAL LOAD ITEMS I FEATHERED PROPELLER uscopt in unregarer, (8) Column [11, 11, 14 M) toward the right pro- greatively give increase in range of sacrifica in speed. (C) Manifold Preuses (M.P.), Galloss Per Hour (G.P.H.), are approximate maximum values for informed. (D) For quick reference, take off and military power data are listed	NO BESERVE FILEI ALLOWANCE	V (MAX	FANGE IN	STATUTE	04(11	016	690	450	201		OPERATI	R.P.M. I.A.S. NIX- M.P. M.F.K. TURE IN Hy	BELOW 20,000 FT. TAIN 145 MPH 1AS HP. ABOVE 20,000 AND 29 ± 1 1MCH	NOT BE OBTAINED UP TO 2000 RPM AND 29 INCHES USE MIGHER RPM'S AND RECOMMENDED MP'S, USE AUTO LEAM MIXTURE WHEN AT OR BELOW	2100 MPR. RMNGES SHOWN ABOVE APPLY 10,000 FT. OKLY.	Ludd - Indianad Ali Spaad M.P. Mendod Praver (In Ha) M.P. Mendod Praver (In Ha) M.C. Alu Impedia Galen Par Hoer LU, Sei Leeli SL, Sei Leeli
ATHI ATHI	o becen.	- HEI	100	GALS.		800	600	004	3		Θ	ALT.	30000 25000 20000	15000 12000 9000	6000 3000 S. L.	Lud.: Indicated Ahr Speed M.P.: Menifold Protect In: Hig M.P.: Menifold Protect In: Hig M.C. And Impairid Guiden Par LUT. Full Thrette S.L. Sex Level
EX EX I FE Callors Per Hou Callors Per Hou			MILES.	NAUTICAL	0.00	230	560	370 180	194		DATA	M.P. U.S. IMP. N.H.V. P. O. M.P.		A.L. 30 160 A.L. 30 157 A.L. 29.5155	A.L. 29.5150 A.L. 29 146 A.L. 29 142	LAL Indianud M.N.: Munitida P. U.S.D.A.: U. S. U.S.D.A.: Inpu M.D. S.U. Sectored S.L. Sectored
		1	PANGE IN AIR MILES	STATUTE	LORO	840	040	420	012		OPERATING DATA	LA.S. MIX- M.P.H. TURE		144 148	155 158 161	E S
RUCTION H. SHEFTS 40,000 40,000 than the cirmilar than the cirmilar that the cirmilar							Eller Eller					MP. B.P.M.		0 2050 8 2050 5 2050	1 2000 6 2000 1 2000	Multific, Ure Anto-Rich Mattis, Ure Anto-Rich Mattis, Ure Anto-Lion or houry line only bore houry line only 51   GHT FFST VALUES
or 40,000 a greater than the air miles or greater than the air miles or greater than the air miles or greater than the air miles			PANGE IN AIR MILES	NAUTICAL	0 O	670	610	300	200		OPERATING DATA	MIX- M.P. 0.5. TURE IN Hy P.		A.L. 31 180 A.L. 31 178 A.L. 31 175	A.L. 30.5 171 A.L. 30 166 A.L. 30 161	BOLD NUMBERS: Ure Arrive Relation WITH Prov Steps Blockers, Ure Arrive Steps block above havey fire enty
OPERATION INSTRUCTIC SHEFT <sup>H</sup> OF <sup>H</sup> SHEFTS SHEFT <sup>H</sup> OF <sup>H</sup> SHEFTS 45,000 TO 40,000 ONS FOR USING CHARTI Select figure in fuel colum ONS FOR USING CHARTI Select figure in fuel colum total amount of faul in cipican, Move horizonfally t total amount of faul in cipican, Move horizonfally t total paloe and opposite derived cruiting offitude			PANGE I	STATUTE	vao	044	590	340			OPERAT	R.P.M. LA.S. H		2100 148 A. 2100 154 A. 2100 159 A.	2050 162 A. 2050 165 A. 2050 168 A.	N DOLD AND AND AND AND AND AND AND AND AND AN
FLIGHT OPERATION INSTRUCTION CP SHEF. <sup>4</sup> or <sup>4</sup> SHEFS SHEF. <sup>4</sup> or <sup>4</sup> SHEFS MATHON TO TO 40,000 R. WT 45,000 TO 70 40,0000 INSTRUCTIONS FOR USING CHART Salect figure in fuel column equal to ar less than total amount of fuel in alriplane, More herizontally to he right or left and select a figure equal to or greater than the air miles to be flown. Vertically below and opposite derived cruiting altitude read ap-		(	ID MILES	NAUTICAL	i i	610	470	300	100		G DATA	MCP. U.S. IMP. IN. No P. P. P.		31 199 31 196 31 194	31 191 31 186 31 182	
ил. (ме. 156 - 156 - 156		-	PANGE IN ALD MILES	STATUTE	000	200	540	350			OPERATING DATA	M. LA.S. NIX-		0 149 A.L.	0 165 A.L. 0 169 A.L.	DICATED ALTITUDE CORRECTED FOR RALE AIR TEMPERATURE. COM - U.S. CARS IMP. GAIS. FOR WARM UP. COFF AND CLIMB TO - FEET ALTITUDE. USA PEL R.COMS TO TANK - FEET ALTITUDE. USA PEL R.COMS TO TANK - FEET ALTITUDE. USA PEL R.COMS TO TANK - FEET ALTITUDE. TO TANK IN THE POLLOWING ORDIA. INGINE OFFICIATION DATA. BETTER TO "SPECIFIC EMBINE RIGHT CAMET" FOR ADDITIONAL INGINE OFFICIATION DATA.
TION.		-		GALS.	5 8	800	600	100	3		Θ	ALT. R.P.M.	30000 25000 20000	15000 2100 12000 2100 9000 2100	6000 2100 3000 2100 S.L. 2100	DE FREE AIR TE - IMP. GA FEET ALITUDE FEET ALITUDE OWING ORDER
MODEL (S) B-17F B-17F BINE OPERA MAR MERCAN MAR MERCAN MAR MERCAN MAR MERCAN MAR MAR MERCAN MAR	ALC MININ	-		AL	000	490			120		1200	2011 2011	310 30 310 25 310 25 310 20	310 15 310 12 310 12		CORRECTED FO
	R-1620-97	TED (MAY	A NUMBER OF A DATE OF A DA	NAUTICAL	AT S.L.						OPERATING DATA	MIX- M.P. TURE IN He	A.R. 38 3 A.R. 38 3 A.R. 38 3	38 38 38	38 38 38	INDICATED ALTITUDE CORRECTED FOR FREE AIR TEMPE ALTOW - U.S. GAIS, - INF GAIS, TAKEOFF AND CLIME TO - FEET ALTITUDE RETURN FUEL ROWS TO TANK. USE FUEL FROM TANKS IN THE POLLOWING ORDIRA BERE TO "SPECING ENGINE RUGHT CAART" FOR ADDITION
3 ENG TAKE OFF 2500 MULTER 2500		MORMAL BATED (MAY CONT)		STATUTE	4	560	430	280	2		OPERAT	LA.S. M.P.H.	144 159 169	178 183 186		
MILLI COND FORM ASCALLA	BHON	-	C 12		AT S.L.		1			12 mar	122	R.P.M.	2300 2300 2300	2300 2300	2300 2300 2300	

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Flight Operation Chart (one propeller feathered) 4 Sheets

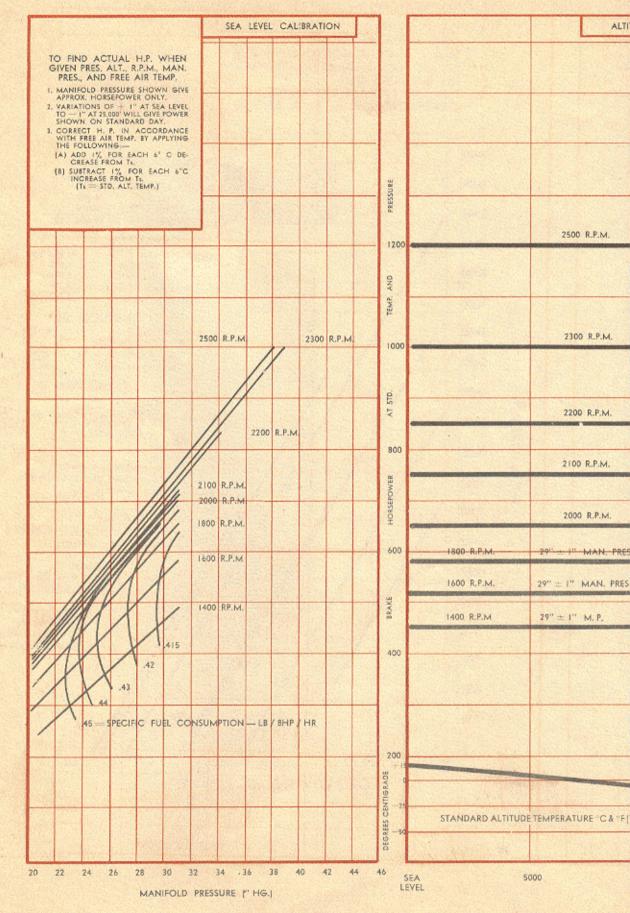
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96

Appendix II

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Engine Flight Calibration Curve

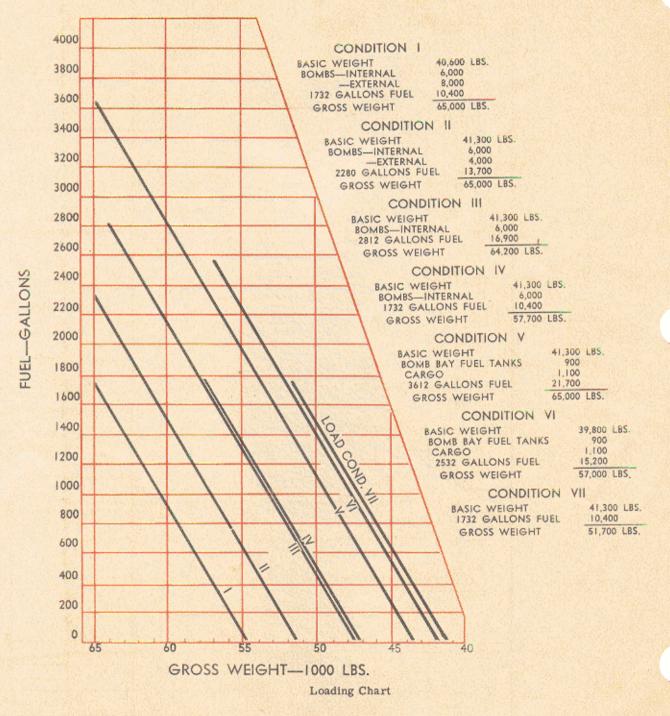
n.

	ALTITU	E CALIBRATION	(here and						
						CALIE AIRPLANI B - 17 E B - 17 I	R		
						COMPRES SUPERCH BLOWER CARBURE	MITS DN GEAP RATIO SSION RATIO & T ARGER TYPE G- GEAR RATIO 7.4 TION-STROMBER AN-VV-F-781	O 1 E TYPE B-2 IO: I	
							OCTANE		
	2500 R.P.M.	46" ± 1" MAN				1000' INGREA	NOTE NIFOLD PRESS, I SE IN ALTITUDE M. IS CONSTANT.	S" PER WHERE	
						Þ		1	
	2300 R.P.M.	38" ± 1" MAN	IFOLD PRESSURE			11. 100 TURBILLE & P.M.		T	
						11.300 11140146		AUTO-RICH	
	2200 R.P.M.	34" ± 1" MAN	NFOLD PRESSURE						
	2100 R.P.M.	31" ± 1" MAN	IFOLD PRESSURE	and the second	Sec.			+	
	2000 R.P.M.	29" ± 1" MAN	2 NIFOLD PRESSURE	1,300 TURBINE R.F	.м <del>.</del>				
800 R.P.M.	2?" I" MAN. PRESS.				66.5 <u>7</u>		Y	-LEAN	
600 R.P.M.	29" ± 1" MAN. PRESS.		E GATE CLOSED A	29" M. P.				AUTO	
1400 R.P.M	29" ± 1" M.P.		E GATE OF	PARENTER STOLENS	OSED POSITIO	N AT ALTITUD	Ę		
			GATE CLOSED LINI		Give K.F.M. Li				
									+30
TANDARD ALTITUD	DE TEMPERATURE °C & "F (T	.).							0 To 60
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	5000		5000 2 UDE (FT.)	0000	25000	30000 31	400	400	

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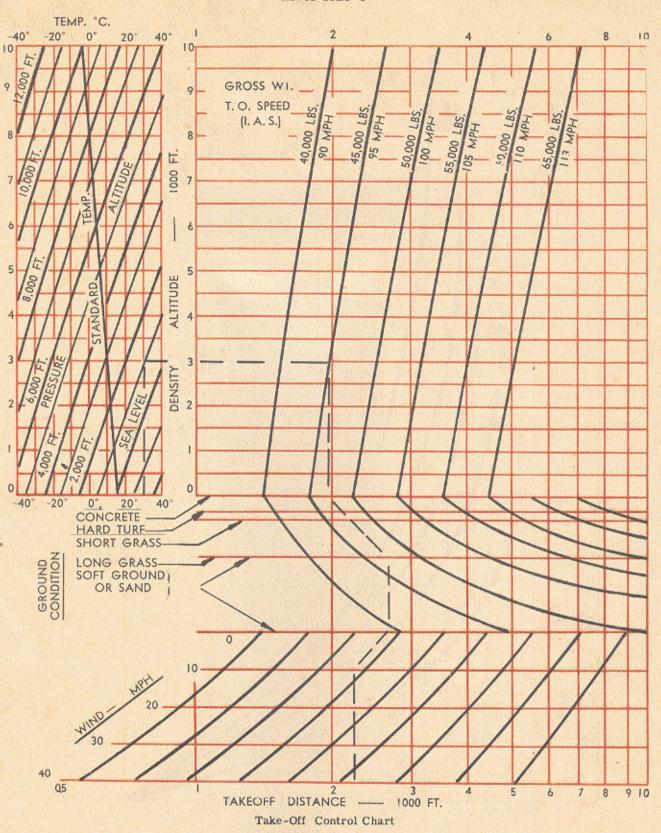
LOAD CONDITIONS INCLUDE IN BASIC WEIGHT:

CREW OF NINE NINE 50 CALIBER GUNS 3500 ROUNDS AMMUNITION EXCEPT I == 1170 ROUNDS 900 LBS. MISCELLANEOUS EQUIPMENT 144 GALLONS OIL 1500 LBS. EXTRA WING TANKS IN CONDITIONS I, II, III, IV, V, AND VII.



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99

Appendix II

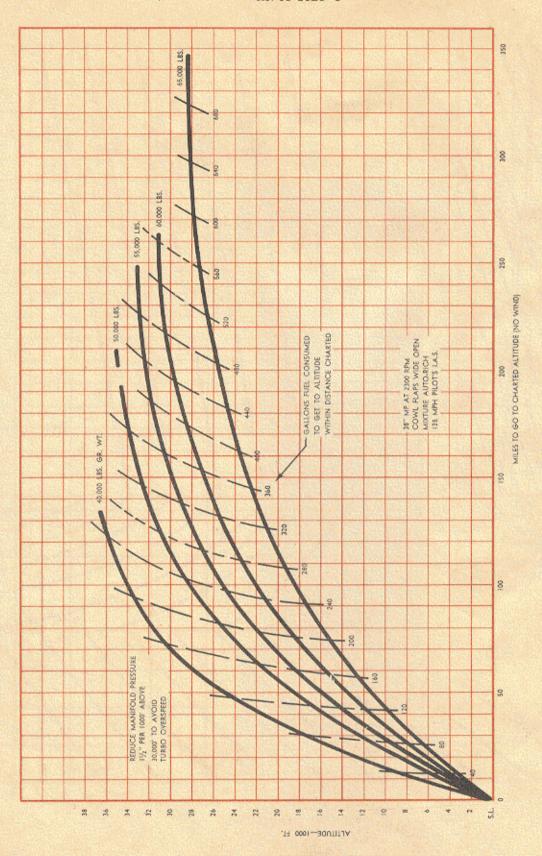
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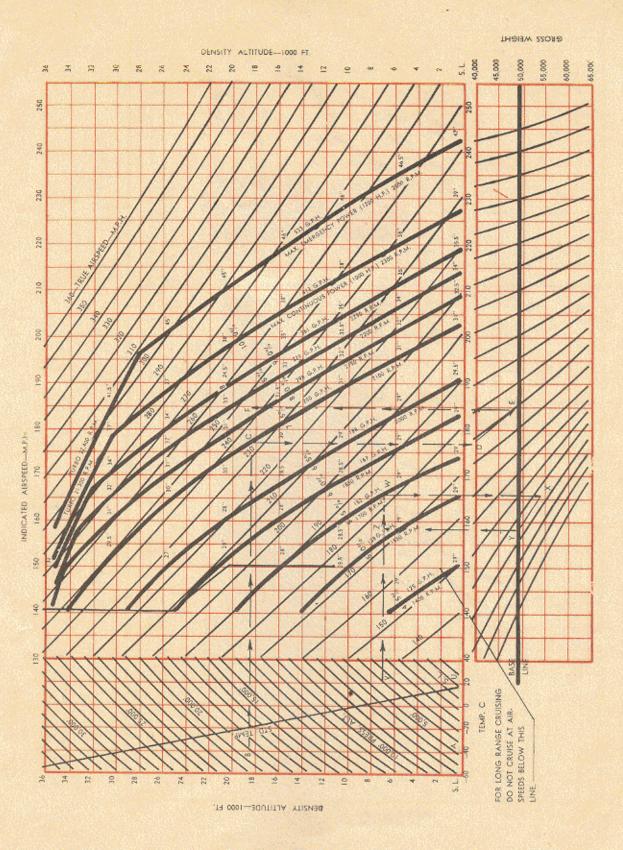
Climb Control Chart

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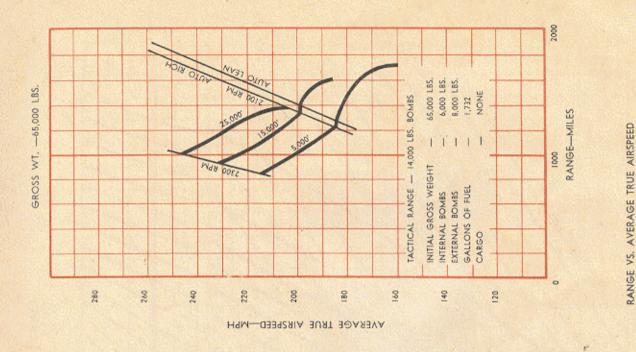
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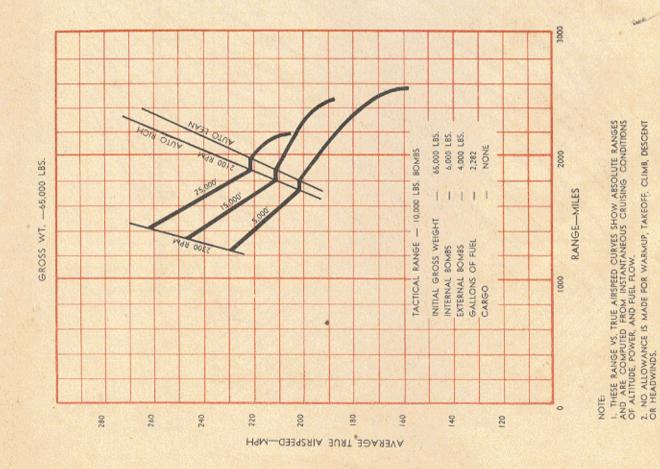
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Composite Cruising Control Chart

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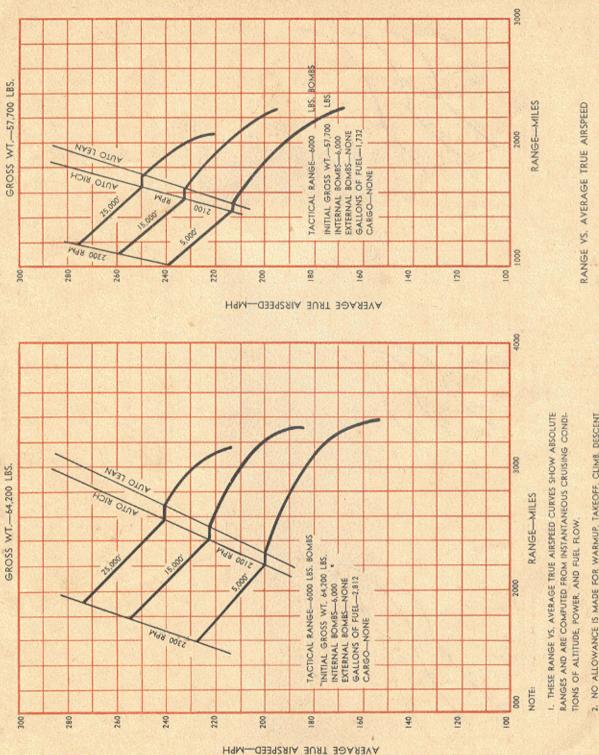
Tactical Range Charts

3. BOMES ARE CONSIDERED CARRIED HALF THE DISTANCE OF FLIGHT.

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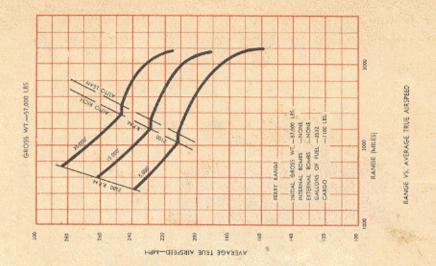
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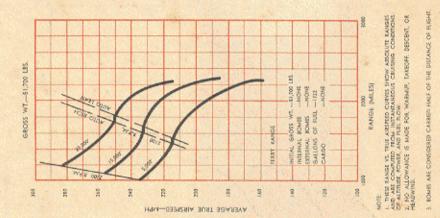
2. NO ALLOWANCE IS MADE FOR WARMUP, TAKEOFF, CLIMB, DESCENT OR HEADWINDS,

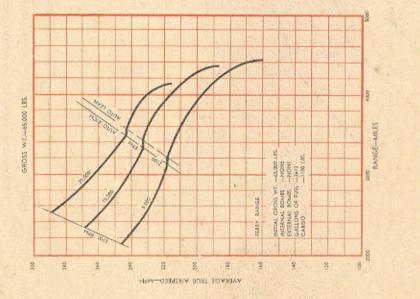
3. BOMBS ARE CONSIDERED CARRIED HALF THE DISTANCE OF FLIGHT.

Tactical Range Charts

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Ferry Range Charts

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