Classification Cancelled
Auth: CG. AMC
Date: 13 Nov. 1947
By P.K. Thompson
Capt USAF

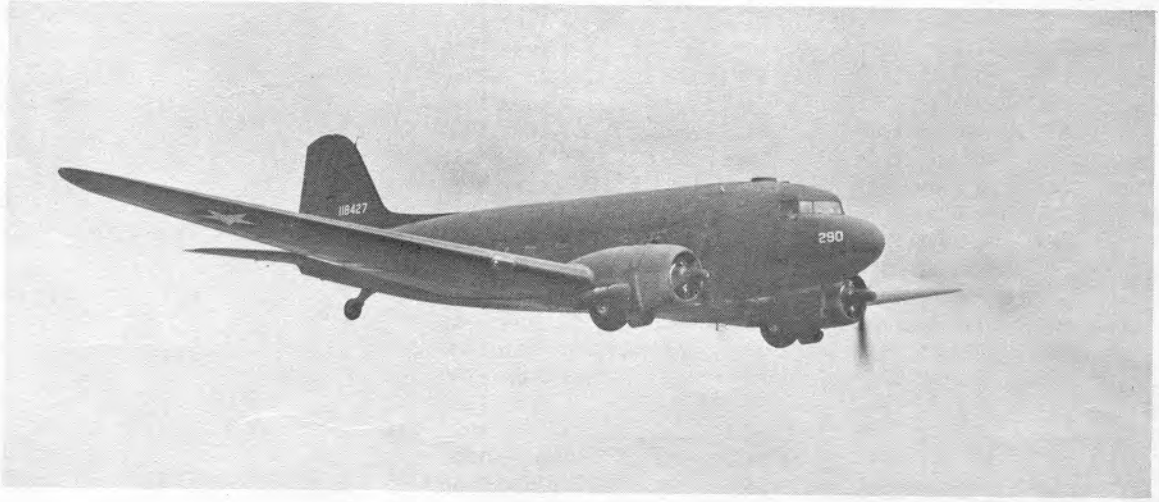
AN 01-40NC-1

HANDBOOK
FLIGHT OPERATING INSTRUCTIONS

USAF SERIES — NAVY MODELS

C-47, C-47A — R4D-1, R4D-5

AIRCRAFT



REVISION NOTICE

LATEST REVISED PAGES SUPERSEDE THE SAME PAGES OF PREVIOUS DATE

Insert revised pages into basic publication. Destroy superseded pages.

Appendix I of this publication shall not be carried in aircraft on missions where there is a reasonable chance of its falling into the hands of an unfriendly nation.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE AND THE CHIEF OF THE BUREAU OF AERONAUTICS

Ross-Gould Co., St. Louis, Mo.-Reprint-4000-1/28/52

20 NOVEMBER 1944
REVISED 2 NOVEMBER 1951

Reproduction for non-military use of the information or illustrations contained in this publication is not permitted without specific approval of the issuing service (BuAer or AMC). The policy for use of Classified Publications is established for the Air Force in AFR 205-1 and for the Navy in Navy Regulations, Article 1509.

LIST OF REVISED PAGES ISSUED

INSERT LATEST REVISED PAGES. DESTROY SUPERSEDED PAGES.

NOTE: The portion of the text affected by the current revision is indicated by a vertical line in the outer margins of the page.

Page No.	*Date of Latest Revision*
* i	2 November 1951
* ii	2 November 1951
* iii	2 November 1951
* iv	2 November 1951
1	9 June 1950
* 2	2 November 1951
* 4	2 November 1951
5	27 January 1948
6	16 July 1947
7	Deleted 16 July 1947
8	Deleted 16 July 1947
9	Deleted 16 July 1947
10	Deleted 16 July 1947
11	Deleted 16 July 1947
12	Deleted 16 July 1947
* 15	2 November 1951
* 16	2 November 1951
17	16 July 1947
19	16 July 1947
* 20	2 November 1951
23	18 November 1947
* 25	2 November 1951
* 27	2 November 1951
* 29	2 November 1951
30	16 July 1947
31	16 July 1947
33	9 June 1950
34	9 June 1950
36	16 July 1947
* 37	2 November 1951
* 38	2 November 1951
* 38A	2 November 1951
* 39	2 November 1951
* 40	2 November 1951
* 41	2 November 1951
* 42	2 November 1951
* 43	2 November 1951
* 44	2 November 1951
* 44A	Deleted 2 November 1951
* 45	2 November 1951
* 46	2 November 1951
47	9 June 1950
48	9 June 1950
* 50	2 November 1951
* 50A	2 November 1951
* 51	2 November 1951
* 52	2 November 1951
* 52A	2 November 1951
* 52B	2 November 1951
* 53	2 November 1951
* 54	2 November 1951
* 55	2 November 1951
56	1 February 1946
* 57	2 November 1951
* 58	2 November 1951
61	16 July 1947
63	16 July 1947
64	9 June 1950
65	9 June 1950
66	9 June 1950
67	9 June 1950
68	13 June 1949
69	9 June 1950
71	16 July 1947
74	5 February 1945
82	16 July 1947
84	13 June 1949
86	16 July 1947
91	Deleted 16 July 1947
92	Deleted 16 July 1947
93	9 June 1950
94	9 June 1950
94A	9 June 1950
94B	9 June 1950
* 94C	2 November 1951
95	9 June 1950
* 96	2 November 1951
* 97	2 November 1951
* 98	2 November 1951
* 99	2 November 1951
*100	2 November 1951
*101	2 November 1951
*102	2 November 1951
103	9 June 1950
104	16 July 1947
105	Deleted 16 July 1947
106	Deleted 16 July 1947
107	Deleted 16 July 1947
108	Deleted 16 July 1947
109	Deleted 16 July 1947
110	Deleted 16 July 1947
111	Deleted 16 July 1947
112	Deleted 16 July 1947

* The asterisk indicates pages revised, added or deleted by the current revision.

ADDITIONAL COPIES OF THIS PUBLICATION MAY BE OBTAINED AS FOLLOWS:

USAF ACTIVITIES.—In accordance with Technical Order No. 00-5-2. USAF

NAVY ACTIVITIES.—Submit request to nearest supply point listed below, using form NavAer-140: NAS, Alameda, Calif.; ASD, Orote, Guam; NAS, Jacksonville, Fla.; NAS, Norfolk, Va.; NASD, Oahu; NASD, Philadelphia, Pa.; NAS, San Diego, Calif.; NAS, Seattle, Wash.

For listing of available material and details of distribution see Naval Aeronautics Publications Index NavAer 00-500.

TABLE OF CONTENTS

FOREWORD iii

SECTION I ***Description***

1. Airplane 1
   - *a.* General 1
   - *b.* Flight Controls 1
   - *c.* Landing Gear 1
   - *d.* Hydraulic System 4
   - *e.* Electrical System 4
2. Power Plant 15
   - *a.* Engines 15
   - *b.* Fuel and Oil Specification 15
   - *c.* Fuel System 16
   - *d.* Induction System 20
   - *e.* Oil System 20
   - *f.* Engine Controls 20
   - *g.* Carburetor Air Temperature and Air Filter Control 20
   - *h.* Superchargers 20
   - *i.* Cowl Flap Controls 20
   - *j.* Ignition Switches 20

SECTION II ***Pilot Operating Instructions***

1. Flight Restrictions 25
1A. Minimum Crew Requirements 25
2. Before Entering Pilot's Compartment 25
3. On Entering Pilot's Compartment 27
4. Fuel System Management 28
4A. Alternate Fuel Grade Operating Limits (91/98) 29
5. Starting Engines 29
6. Engine Warm-up and Accessory Check 37
7. "Scramble" Take-Off 38
8. Engine and Accessory Operation Ground Test 38
9. Taxiing 39
10. Take-Off 40
11. Deleted 41
12. Climb 41
13. General Flying Characteristics 41
14. Stalls 43
14A. Turbulent Air and Thunderstorm Flying 43
15. Spins 43
16. Acrobatics 44
17. Diving 44
18. Night Flying 44
19. Approach and Landing 44
19A. Post-Flight Check 47
20. Stopping Engines 47
21. Before Leaving Pilot's Compartment 47

SECTION III ***Flight Operation Data***

1. Operational Weight Limitations 50

SECTION IV ***Emergency Operating Instructions***

1. Engine Failure During Take-Off 52A
1A. Engine Failure During Flight 53
2. Fire 54
3. Alarm Bell 55
4. Emergency Exits 55
5. Emergency Wing Flap Operation 56
6. Emergency Landing Gear Operation 56
7. Emergency Brake Operation 56
8. Emergency Landing with Gear Retracted 56
9. Emergency Landing in Water (Ditching) 57
10. Miscellaneous Emergency Equipment 57

SECTION V ***Operational Equipment***

1. Heating and Ventilating 61
2. Fixed Oxygen System 63
3. Walk-about Oxygen Equipment 66
4. Communications Equipment General 66
5. Ice Eliminating Equipment 71
6. Armament 74
7. Fuselage Equipment 74
8. Pilot's Compartment 77
9. Radio Operator's Compartment 86
10. Navigator's Compartment 87
11. Troop Carrying (Main Cargo) Compartment 88

Appendix I 93

This page intentionally left blank

IMPORTANT

If you are to gain the maximum benefits from this handbook, it is imperative that you read this page carefully.

FOREWORD

This official publication has been prepared by the contractor for use by flight crews. Read the entire handbook for a complete familiarization of the aircraft models covered and use it as a reference manual to answer specific questions. The handbook is kept current by frequent revisions. However, since the incorporation of revision data takes time, it is imperative that the flight crews stay abreast of the short technical orders of the AN 01-40NC series which frequently cover critical flight restrictions or new operating techniques which have not as yet been incorporated in the handbook.

The handbook is divided into five sections and an appendix as follows:

SECTION I, DESCRIPTION

The function of this section is to describe the airplane, its equipment, systems, and controls which are essential to flight and which will be needed for one complete non-combat mission in good weather at medium altitude. All emergency equipment which is not part of the auxiliary equipment and all miscellaneous equipment is also covered in this section.

SECTION II, PILOTS' OPERATING INSTRUCTIONS

This section contains the steps of procedure to be accomplished from the time the airplane is approached by the flight crew until it is left parked on the ramp after accomplishing one complete non-combat mission in good weather at medium altitude.

SECTION III, FLIGHT OPERATION DATA

This section includes an air-speed indicator correction chart, a discussion on operational weight limitations and the instrument range markings for the airplane.

SECTION IV, EMERGENCY OPERATING INSTRUCTIONS

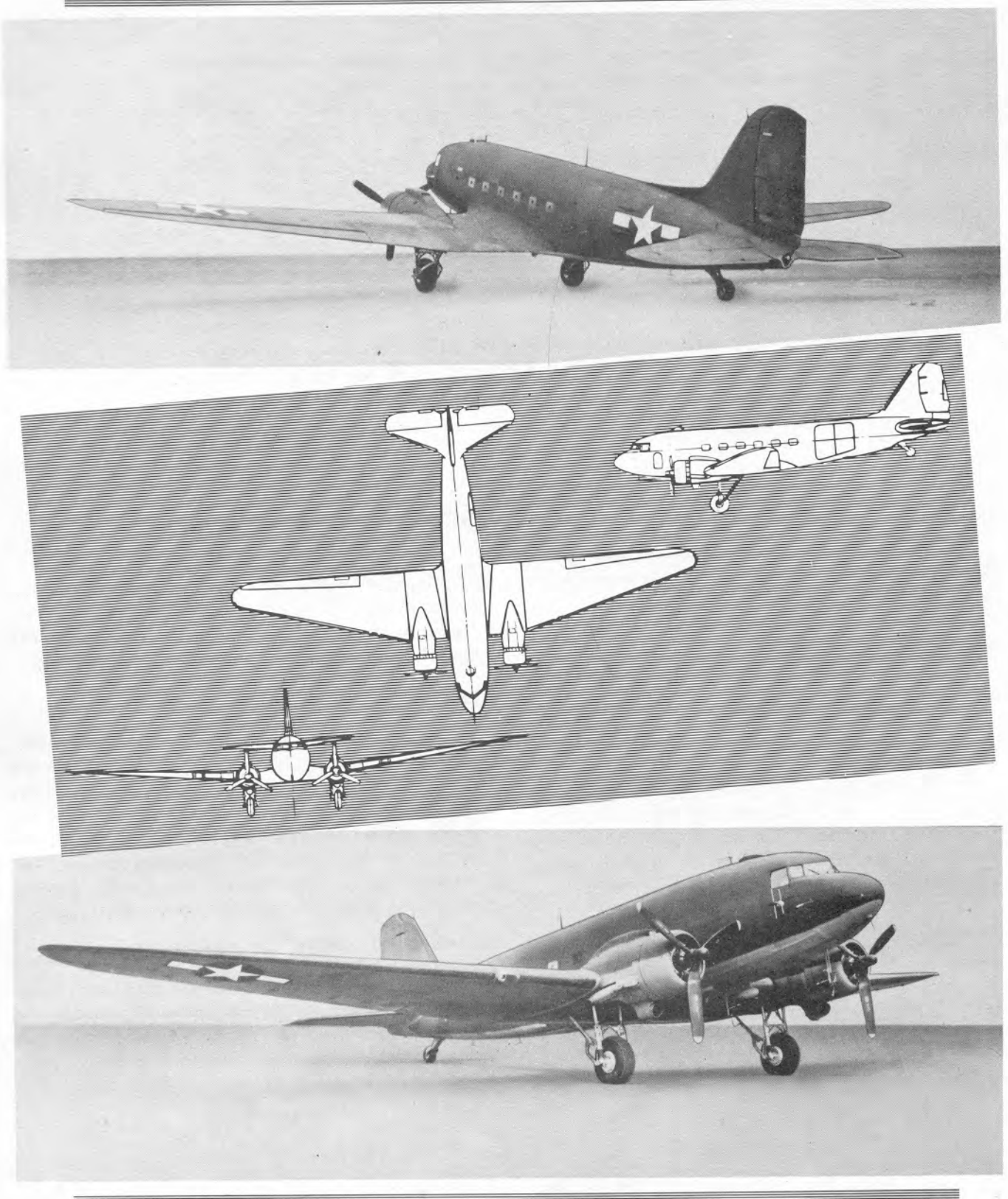
This section clearly and concisely describes the procedure to be followed in meeting any emergency (except those in connection with the auxiliary equipment) that could reasonably be expected to be encountered.

SECTION V, OPERATIONAL EQUIPMENT

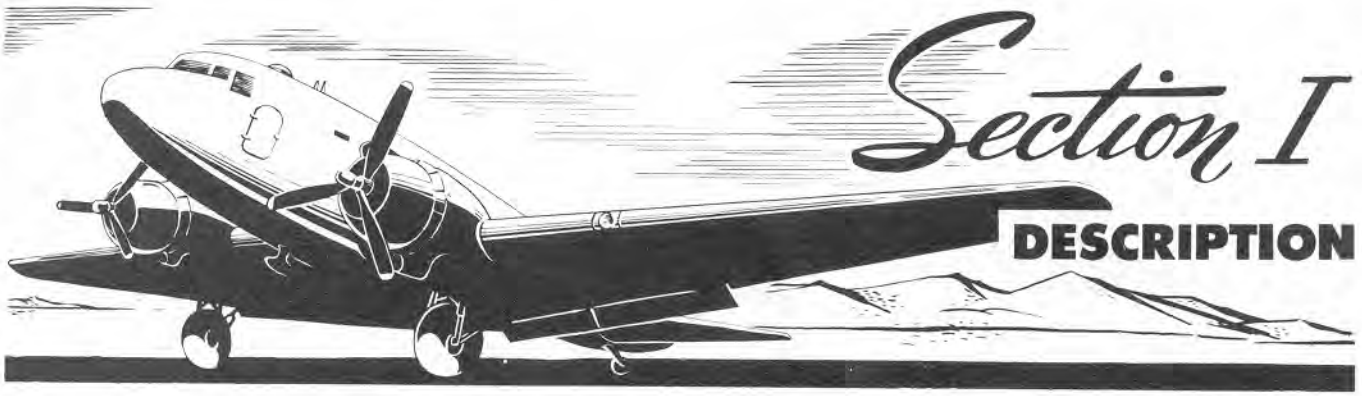
This section includes the description, normal operation and emergency operation of all equipment not directly contributing to flight but which enables the airplane to perform certain specialized functions. Included in this category are such items of equipment as: heating and ventilating system, oxygen system, communications, ice eliminating equipment, fuselage equipment, navigation and troop-cargo equipment.

APPENDIX I, OPERATING CHARTS AND TABLES

This section contains all operating data charts necessary for pre-flight and in-flight mission planning and includes explanatory text on the use of the data presented.



C-47 Series Cargo Transport Airplane



Section I
DESCRIPTION

1. AIRPLANE.

a. GENERAL.

(1) IDENTIFICATION AND OVERALL DIMENSIONS.—The C-47 and C-47A, cargo transport airplanes are twin-engine, low-wing land monoplanes. A glider tow arrangement is provided on some airplanes which makes it possible to pull one or more gliders, depending on their size and loads. Propellers and releasable parachute packs may be carried underneath the fuselage. Overall dimensions are as follows:

Span.....95 ft.
Length.....64 ft. 5½ in.
Height (at rest).....17 ft.

(2) COMPARTMENTS AND NUMBER, POSITION AND MOVEMENT OF CREW MEMBERS.

(a) GENERAL.—These airplanes accommodate a flight crew of two to five men. The pilot and co-pilot are stationed in a front or pilot's compartment. A radio operator is located in a compartment aft of the co-pilot. On some airplanes a navigator is stationed in a compartment aft of the pilot, and a flight engineer is stationed in the main cargo compartment. Folding benches for passengers are installed along both sides of the main cargo compartment. Litters can be installed in the main cargo compartment to transport wounded personnel. A lavatory compartment is located in the aft of the airplane. Movement of crew members from one station to another is readily accomplished.

(b) CAPACITY.—As a cargo transport—
Crew 2-5
Cargo .....Depends on fuel load
As a passenger transport—
Crew 2-5
Passengers 27
As an ambulance transport—
Crew 2-5
Passengers .....18 to 24
(depending on litter arrangement)

b. FLIGHT CONTROLS.

(1) TRIM TABS.—Basic flight controls are conventional. The rudder trim tab *(figure 25-8)*, elevator trim tabs *(figure 25-3)*, and right-hand aileron trim tab *(figure 25-12)* controls are located on the control pedestal.

(2) WING FLAPS.—The wing flaps are hydraulically controlled by a three-position flap control located on the hydraulic control panel. A wing flap position indicator is located in front of the pilot below the instrument panel.

(3) AUTOMATIC PILOT.—The speed controls for the automatic pilot are located on the instrument panel. A shut-off valve is located on the control pedestal.

(4) SURFACE CONTROL LOCKS.—Five surface control locks, one for each aileron, one for each elevator, and one for the rudder are provided. When not in use the locks are stowed in the lavatory compartment.

c. LANDING GEAR.

(1) GENERAL.—The landing gear control handle is located on the hydraulic control panel. A safety latch mechanism control prevents inadvertent raising of the landing gear.

(2) TAIL LANDING GEAR.—The tail landing gear is non-retractable. The tail wheel, when unlocked, is free to swivel 360 degrees. For take-offs and landings, the tail wheel must be locked in the trailing position by the operation of the tailwheel centering lock control *(figure 25-11)* located on the control pedestal.

(3) BRAKES.—The hydraulically operated brakes are controlled by toe pressure on the rudder pedals. Full braking action is possible when the landing gear is retracted. The brakes may be locked "ON" for parking, by applying toe pressure on the pilot's rudder pedals and pulling the parking brake lock *(figure 25-9)*, located on the forward side of the control pedestal.

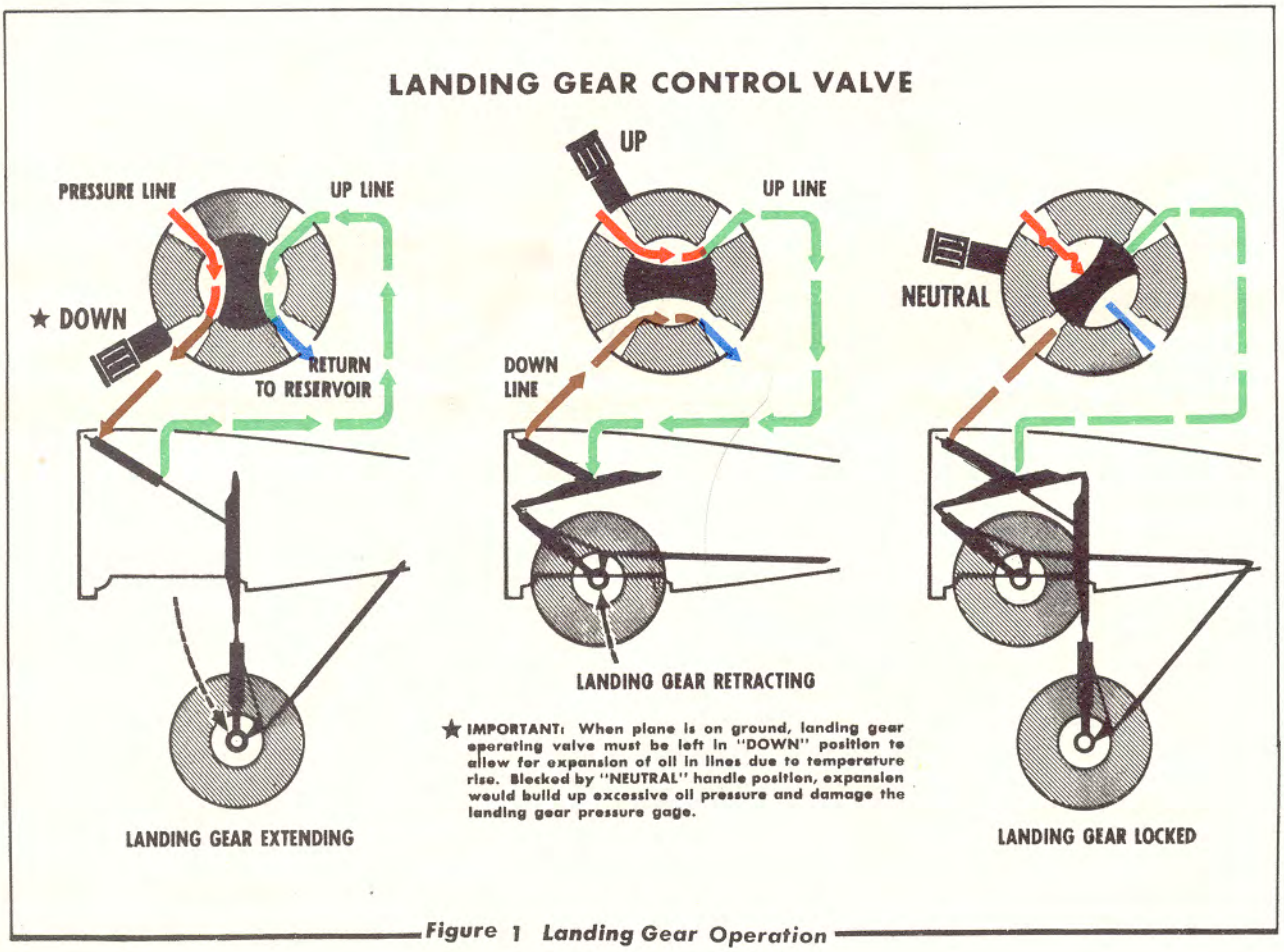


Figure 1 Landing Gear Operation

(4) LANDING GEAR SAFETY DEVICES.

(*a*) SAFETY PINS.—Safety pins are provided to be installed in the landing gear linkage when the airplane is on the ground. When not installed, the pins are stowed in the canvas pocket on the aft bulkhead of the main cargo compartment.

(*b*) LANDING GEAR SAFETY LATCH.—The landing gear safety latch is controlled by a lever which is mounted on the floor to the right of the pilot's seat. The landing gear can not be raised with the latch lever in the forward position as the landing gear control handle is locked by means of a mechanism interconnecting the safety latch and the landing gear control.

(5) LANDING GEAR WARNING SYSTEM.—The landing gear warning system consists of a warning horn and a red and green indicator light located on the right side of the instrument panel.

(*a*) The warning horn will sound whenever one or both throttles are closed, and either the landing gear is not down and locked, or the gear is down and locked but the landing gear control is not in the neutral position.

(*b*) The green light will be illuminated whenever the gear is down and locked and the landing gear control is in neutral.

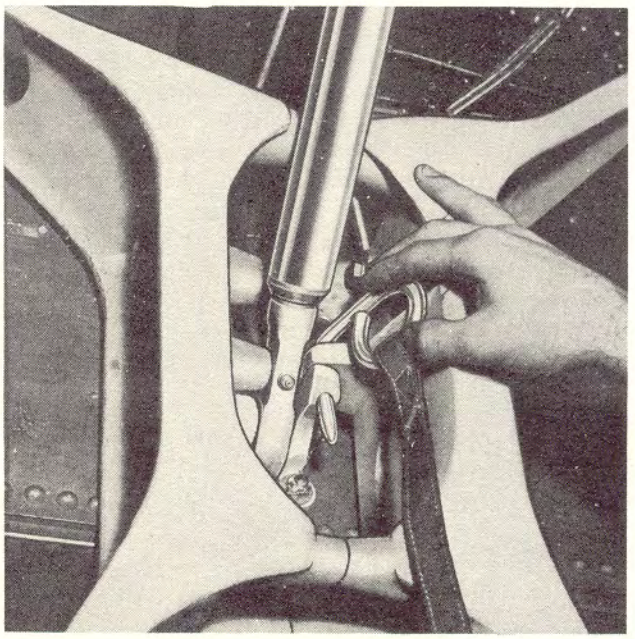


Figure 2 — Installing Landing Gear Safety Pin

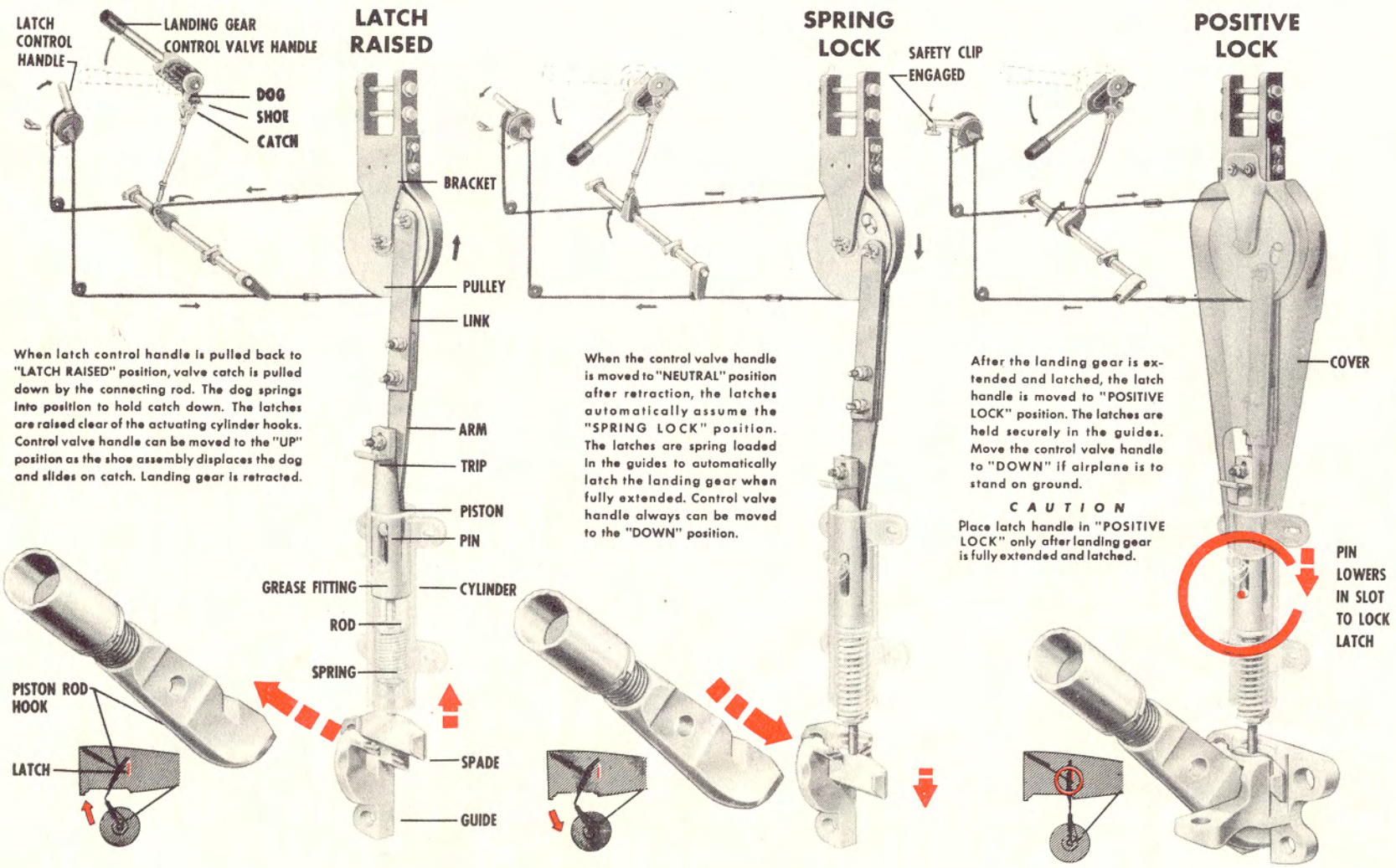


Figure 3 — Landing Gear Mechanical Safety Latch Operation

"Beardsley, please remember an airplane is like a baby. Install the safety pins or the gear will drop!"

(*c*) On some airplanes the red warning light will be illuminated whenever the gear is not down and locked or the gear is down and locked but the control is not in neutral. On other airplanes the red warning light will be illuminated whenever the gear is fully retracted or in any other position other than down and locked or when the gear is down and locked but the control is not in neutral.

d. HYDRAULIC SYSTEM.

(1) GENERAL.—A pressure accumulator type hydraulic system operates the landing gear, brakes, cowl flaps, wing flaps, non-ram carburetor air filter mechanism (if installed), and windshield wipers. The system operates in a pressure range of 600 to 900 P.S.I.

CAUTION

The landing gear and wing flap controls are normally returned to the NEUTRAL position after operation of the unit. To prevent rupture of the lines due to thermal expansion when the airplane is parked, these controls should be moved to the pressure side of the hydraulic system (incorporates a pressure relief valve).

(2) ENGINE-DRIVEN HYDRAULIC PUMPS.—An engine-driven hydraulic pump, located on each engine, provides the operating pressure for the system. During normal operation, one engine-driven hydraulic pump supplies pressure for the hydraulic system, the other supplies pressure for the automatic pilot. Selection of the hydraulic pump is governed by the position of the hydraulic pump selector control. For normal operation the control handle is in the aft position, so that the hydraulic pump mounted on the left engine supplies pressure for the hydraulic system and the pump mounted on the right engine supplies the pressure for the automatic pilot system. When the control handle is in the forward position, the systems for which the pumps supply pressure are reversed.

(3) HYDRAULIC HAND PUMP.—A hydraulic hand pump located on the bottom of the hydraulic control panel has a handle which extends between the seats in the pilot's compartment. This hydraulic hand pump is incorporated into the hydraulic system for use when the engine-driven hydraulic pumps fail to supply sufficient pressure, or when the hydraulic fluid (except the hydraulic hand pump reserve quantity) has been lost. The hand pump may be used to supply pressure to any unit operated by the main hydraulic system.

(4) HYDRAULIC SYSTEM GAGES.—A hydraulic fluid quantity sight gage is located on the top of the hydraulic control panel. Adjacent to this gage will be found instructions for maintaining the proper system fluid level. A hydraulic system pressure gage and a landing gear hydraulic pressure gage are located on the right-hand side of the pilots' compartment adjacent to the co-pilot's control column wheel. The landing gear hydraulic pressure gage indication should not be less than the normal limits before the mechanical latch is placed in the positive lock position, on attempting to land the airplane.

e. ELECTRICAL SYSTEM.

(1) GENERAL.—On C-47 airplanes a 12 volt electrical system with ground return is used. On C-47A airplanes a 24 volt system with ground return is used. The capacity of each of the two generators is above that required for normal flying and the airplane's electrical system will operate on one generator only. The batteries are adequate to keep the electrical system functioning for a short time if all load not essential to flight is turned off and if the batteries are fully charged.

(2) LOCATION OF MAIN SWITCHES.

(*a*) MAIN LINE SWITCHES.—Two electrical switches are incorporated into the main line circuit to enable the pilot to select either or both of the generators to supply current to the electrical system. These switches are located in the main electrical junction box on the aft wall of the forward cargo loading door companionway.

(*b*) BATTERY MASTER SWITCHES.—On C-47 airplanes, two battery master switches are located on the pilot's left-hand electrical control panel. On C-47A airplanes, one battery master switch is located on the pilot's left-hand electrical control panel. By the operation of these switches the pilot can open or close the battery circuit, thus connecting or disconnecting the batteries from the electrical system.

(3) LOCATION OF MAIN FUSES.—Fuses are located in the main electrical junction box on the aft wall of the forward cargo loading door companionway, in the two junction boxes located in the radio operator's compartment, and in the nacelle firewall junction boxes.

(4) LOCATION OF MAIN SPARE LAMPS AND FUSES.—Spare lamps for replacement use during flight are carried in a box located above the co-pilot's seat in the pilot's compartment. Spare fuses for all active

Figure 4 deleted.

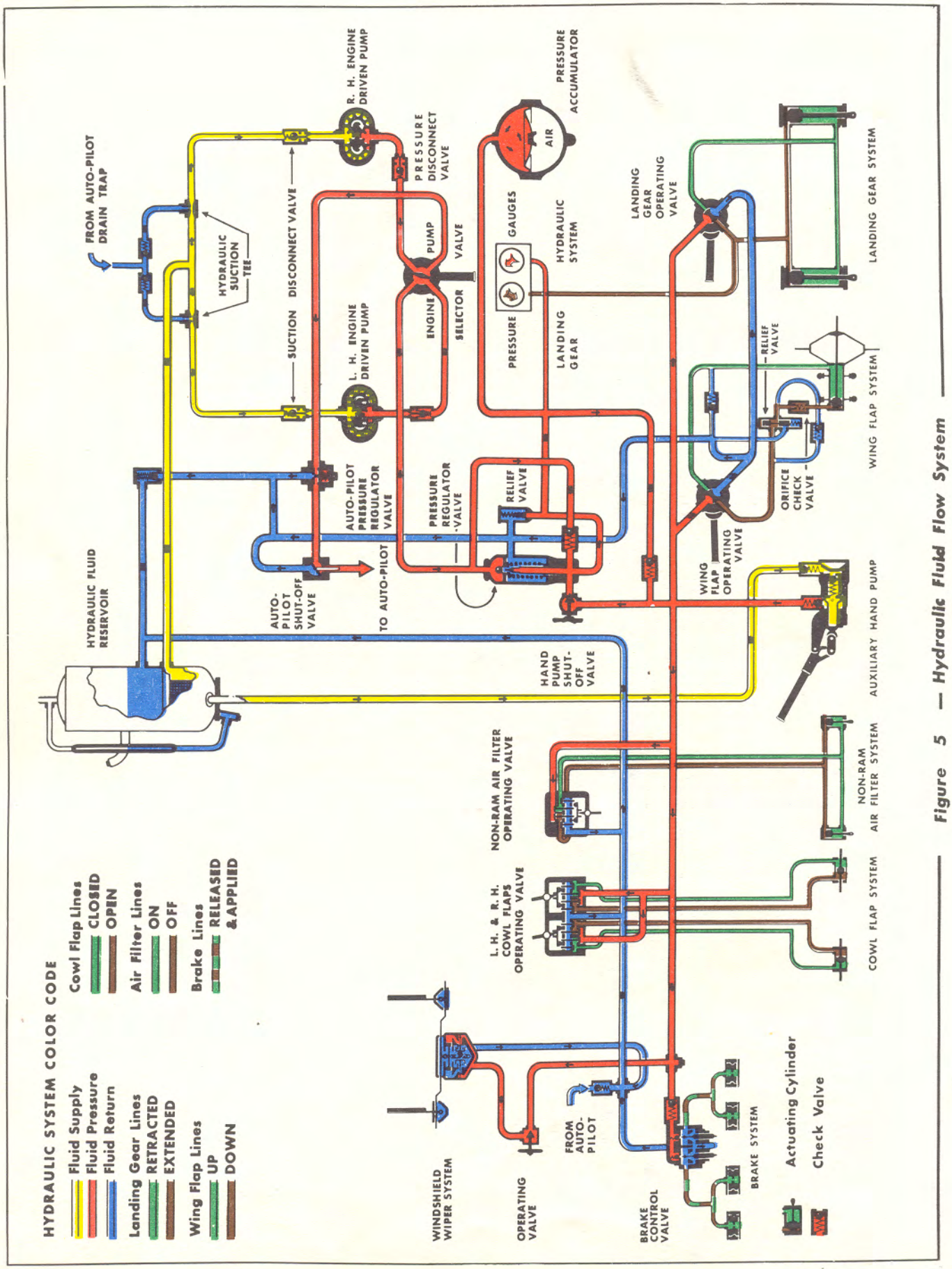


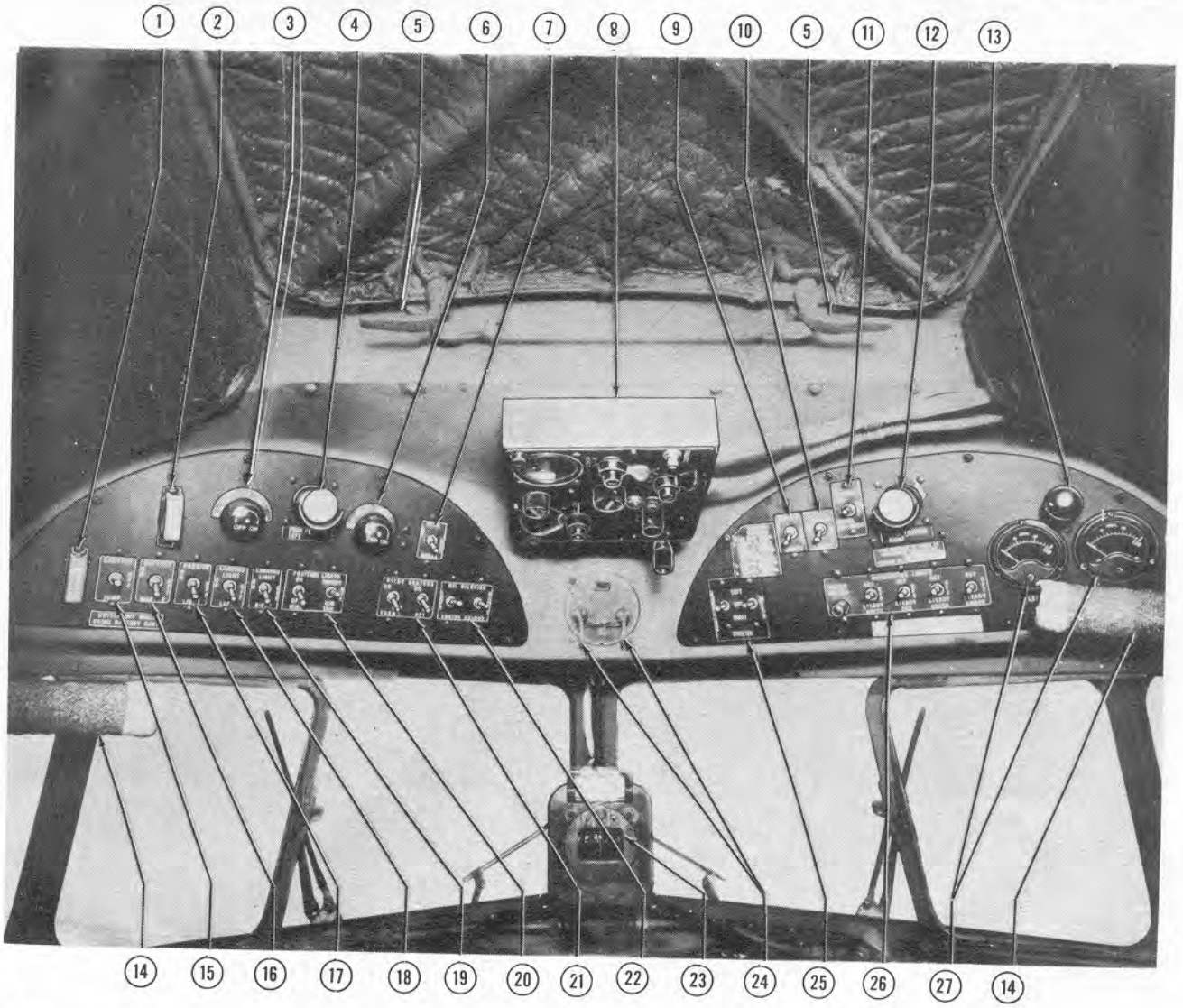
Figure 5 — Hydraulic Fluid Flow System

fuses are carried on the electrical fuse panel located in the main electrical junction box.

(5) BATTERY CART RECEPTACLE.—The battery cart receptacle is located on the bottom of the fuselage in line with the landing gear wheels.

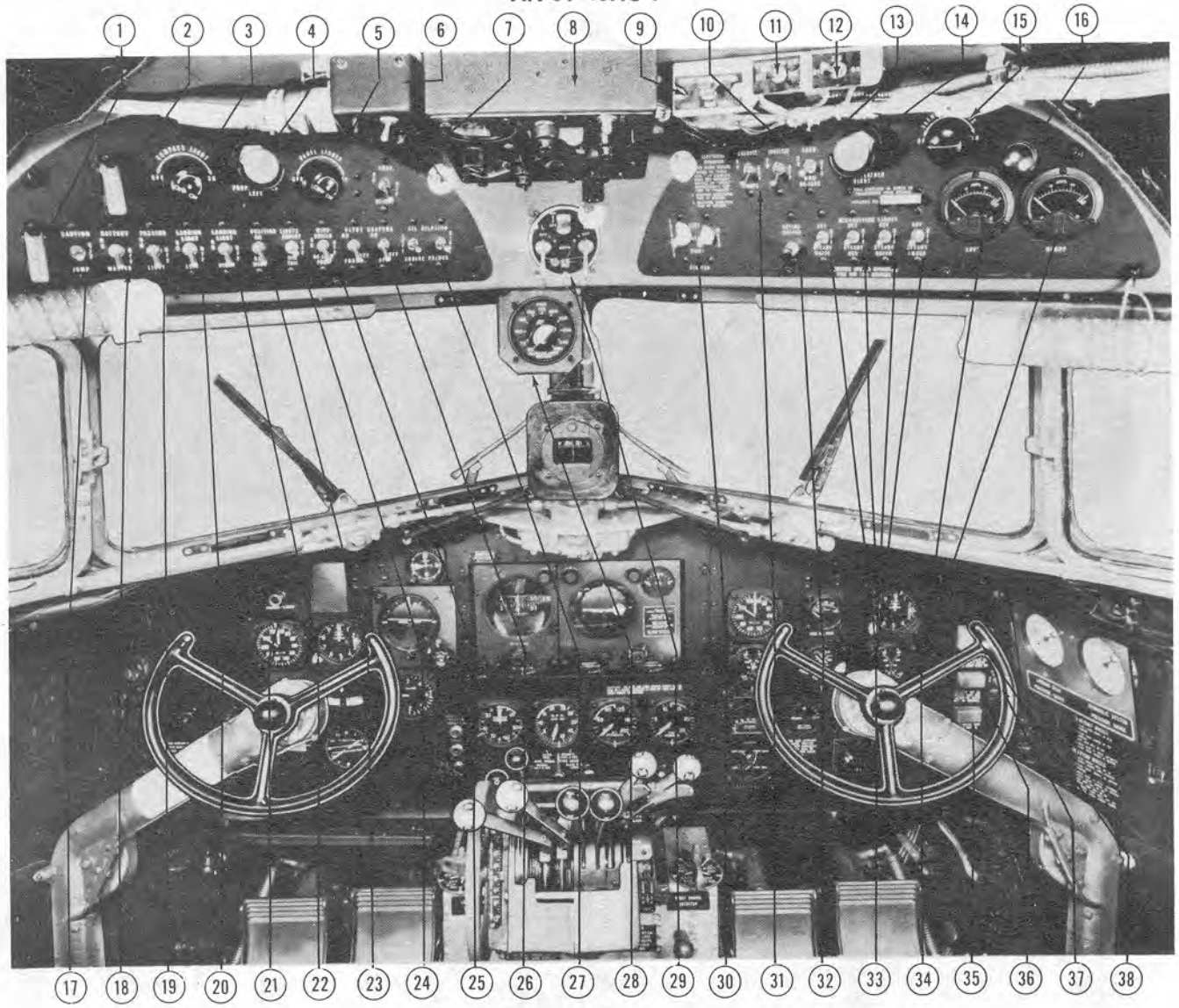
(6) ALARM BELL.—The alarm bell "BAIL OUT" switch, located on the L.H. electrical panel, may also be used for prearranged signals between crew members.

(7) RECEPTACLES FOR ELECTRICALLY-HEATED SUITS.—On some airplanes, five suit heat



1. Para-Pack Salvo Switch
2. Bail Out Switch
3. Compass Light Rheostat
4. Left Hand Propeller Feathering Switch
5. Escape Hatch Handles - (2)
6. Instrument Panel Lights Rheostat
7. Propeller De-Icer Switch
8. Radio Compass Remote Control Unit
9. Cockpit Lights Switch
10. Fluorescent Lights Switch
11. Carburetor De-Icer Switch
12. R. H. Propeller Feathering Switch
13. Lamp
14. Windshield Defrosters - (2)
15. Parachutists' Jump Switch
16. Master Battery Switch
17. Passing Light Switch
18. L. H. Landing Light Switch
19. R. H. Landing Light Switch
20. Position Light Switches
21. Pitot Heater Switch
22. Oil Dilution Switches
23. Magnetic Compass
24. Ignition Switches
25. Starter Energize and Mesh Switches
26. Recognition Lights Switch
27. Ammeters

Figure 12 — C-47 Pilots' Electrical Panel (Early Airplanes)



1. Para-Pack Salvo Switch
2. Bail Out Switch
3. Compass Light
4. L. H. Propeller Feathering Button
5. Panel Lights Control
6. Localizer, PL-P256
7. Propeller De-Icer Switch
8. Radio Compass Remote Control Unit
9. Command Transmitter Control Switch
10. Inverter Switch
11. Compass CW Switch
12. ZB "ON" - "OFF" Switch
13. Carburetor De-Icer Switch
14. R. H. Propeller Feathering Button
15. Formation Lights
16. Panel Lamp
17. Parachute Troops Jump Switch
18. Battery Master Switch
19. Passing Light Switch
20. L. H. Landing Light Switch
21. Marker Beacon Light
22. R. H. Landing Light Switch
23. Position Lights Switch (Wing)
24. Position Lights Switch (Tail)
25. Windshield De-Icer Pump Switch
26. Pitot Heaters Switch
27. Oil Dilution and Engine Primers Switch
28. Altitude Limit Switch
29. Ignition Switches
30. Starter Switches
31. Cockpit Lights
32. Keying Switch
33. Recognition Switches
34. Ammeters
35. Landing Gear "SAFE" Light
36. Landing Gear "UNSAFE" Light
37. Instrument Panel Fluorescent Light Switch
38. Heating and Ventilating Critical Temperature Warning Lights

Figure 13 — C-47A Pilots' Electrical Panel

rheostats are installed, one beside each crew member's seat and one in the forward passageway for the flight engineer.

2. POWER PLANT.

a. ENGINES.—The C-47 and C-47A airplanes are powered with two Pratt & Whitney R-1830-92, 14-cylinder, Twin Wasp engines with single-speed blowers. The engines are equipped with a combination electric inertia direct cranking starter. The starter hand crank for all airplanes is stowed on the main cargo compartment aft bulkhead.

Note

Green index numbers on diagrams and photographs throughout this Handbook indicate power plant and fuel system controls and instruments.

b. FUEL AND OIL SPECIFICATIONS.

(1) FUEL: Specification MIL-F-5572

(a) Recommended Grade: 100/130

(b) Alternate Grade: 91/98

Note

For operating limits with alternate grade fuel see paragraph 4A, Section II.

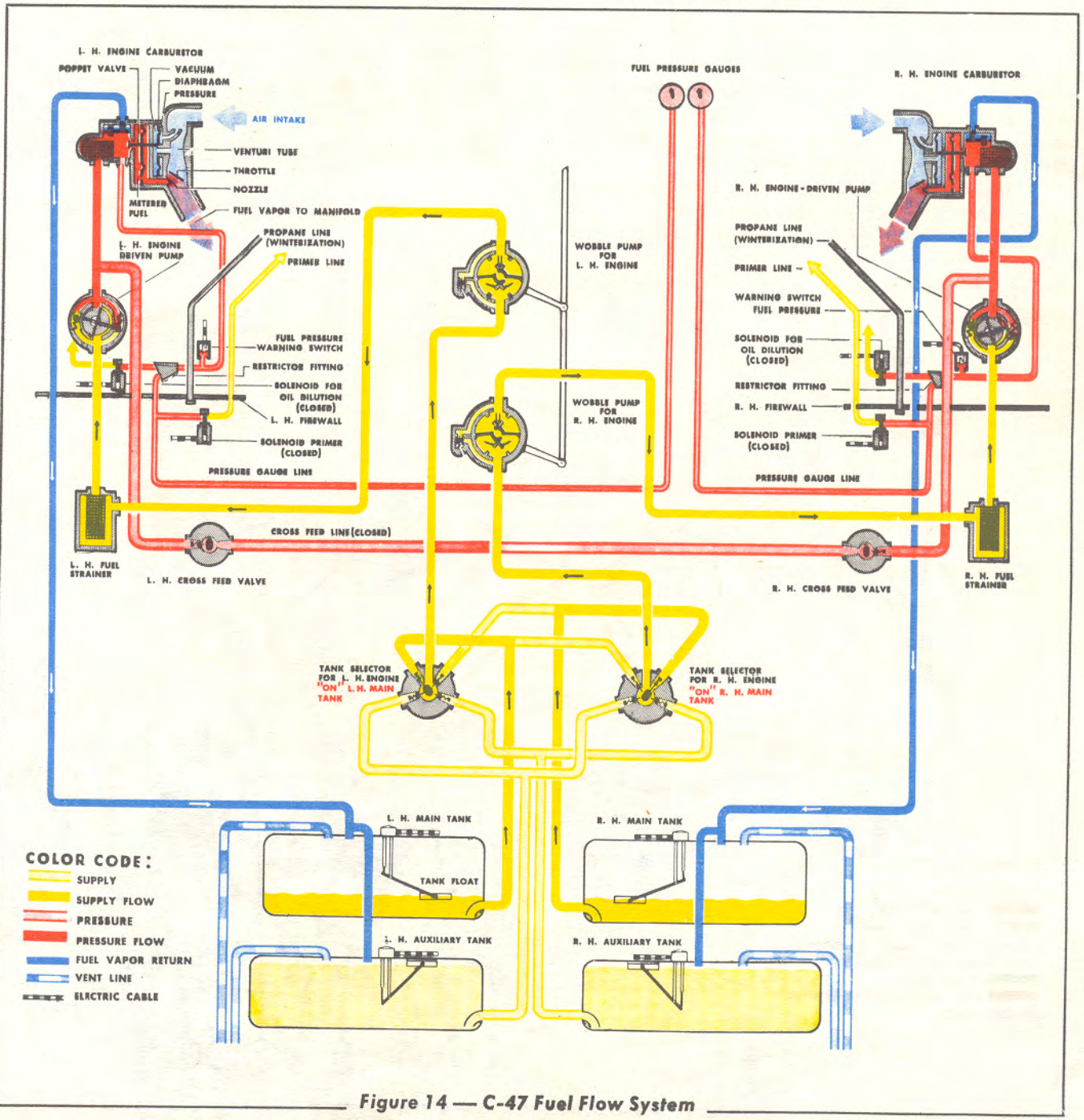


Figure 14 — C-47 Fuel Flow System

(2) OIL: Specification No. MIL-0-6082
Normal Operation
Grade: 1100
Cold Weather Operation
Grade: 1100A

c. FUEL SYSTEM.

(1) FUEL TANKS.—Four fuel tanks are located within the center wing. The total usable fuel is 802 gallons.

FUEL QUANTITY DATA (GAL)

Tanks	*No.*	*Usable Fuel (each)*	*Unusable Fuel Level Flight (each)*	*Expansion Space (each)*	*Total Volume (each)*
Main	2	202.0	2.0	1.25	205.25
Auxiliary	2	199.0	1.0	2.0	202.0

(2) LONG RANGE FUEL TANKS.—Varying amounts of extra fuel tanks can be installed in the main cargo compartment to increase fuel capacity for long range flights. The long range tanks increase the total fuel capacity 100 U. S. gals. per tank.

(3) SELECTOR VALVES.—The fuel system is so arranged that, through the operation of the fuel tank selector valve controls *(figure 25-6 & -14)*, the fuel may be supplied to either or both engines from any one of the wing tanks.

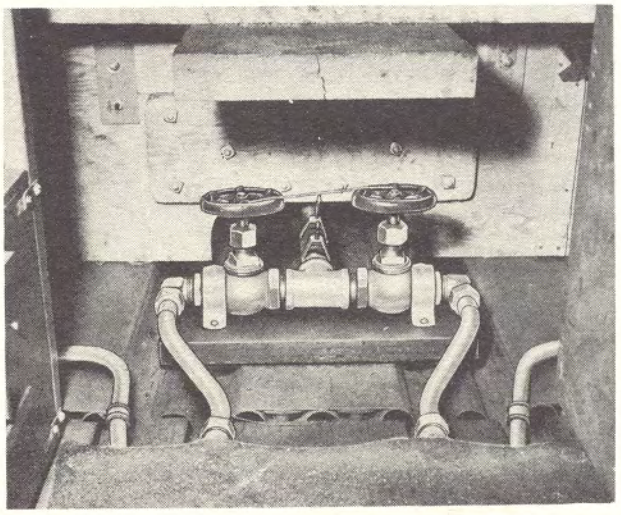


Figure 15 — Long Range Fuel Shut Off Valves

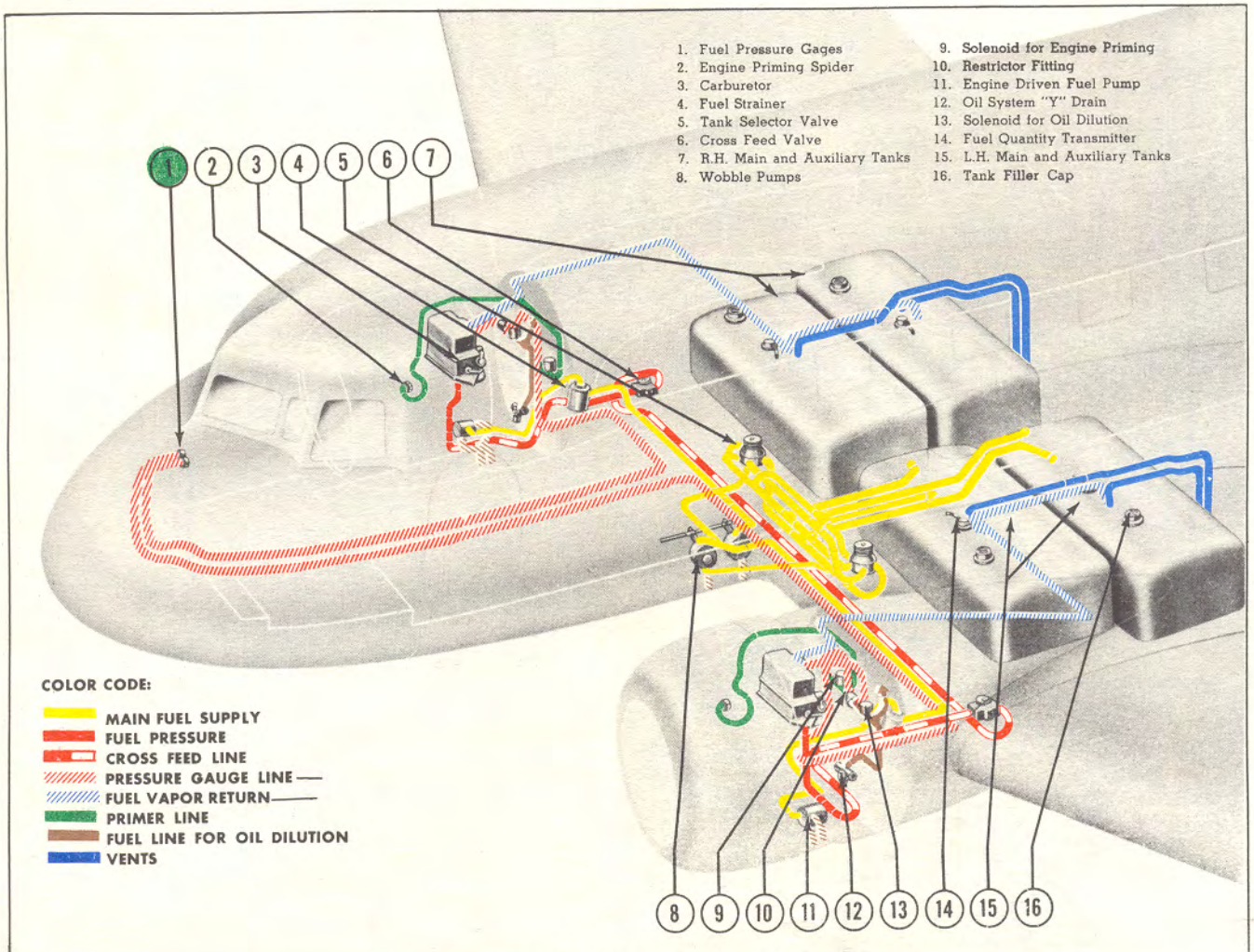


Figure 16 — Fuel System (On Some C-47A Airplanes)

(4) CROSS-FEED FUEL SYSTEM.—On all C-47 airplanes and some C-47A airplanes a cross-feed system is incorporated into the main fuel system to enable the pilot, by operating the cross-feed fuel system control on the control pedestal, to supply fuel to both engines by means of either engine-driven fuel pump should one or the other fail.

(5) FUEL WOBBLE PUMPS.—On all C-47 airplanes and on some C-47A airplanes two hand type wobble pumps are incorporated into the fuel system for supplying pressure before starting the engines; or if the fuel pressure fails during flight. Both pumps are operated simultaneously by the wobble pump handle located adjacent to the pilots' compartment door frame.

(6) FUEL BOOSTER PUMPS.—On some C-47A airplanes two electrically driven auxiliary booster pumps are provided, in addition to the engine-driven fuel pumps, to supply fuel to both engines. Switches for controlling the booster pumps are located on the pilot's right-hand electrical panel. This system provides fuel to either engine from any one of the wing fuel tanks.

(7) PRIMER.—On some airplanes the engine primers are operated by toggle type switches mounted on the pilots' electrical panel. On other airplanes, a hand primer, located in each nacelle, is used in place of the primer solenoid valve.

(8) FUEL PRESSURE GAGES AND WARNING LIGHTS.—Fuel pressure gages, and on some airplanes, red warning lights, are located on the upper right side of the instrument panel.

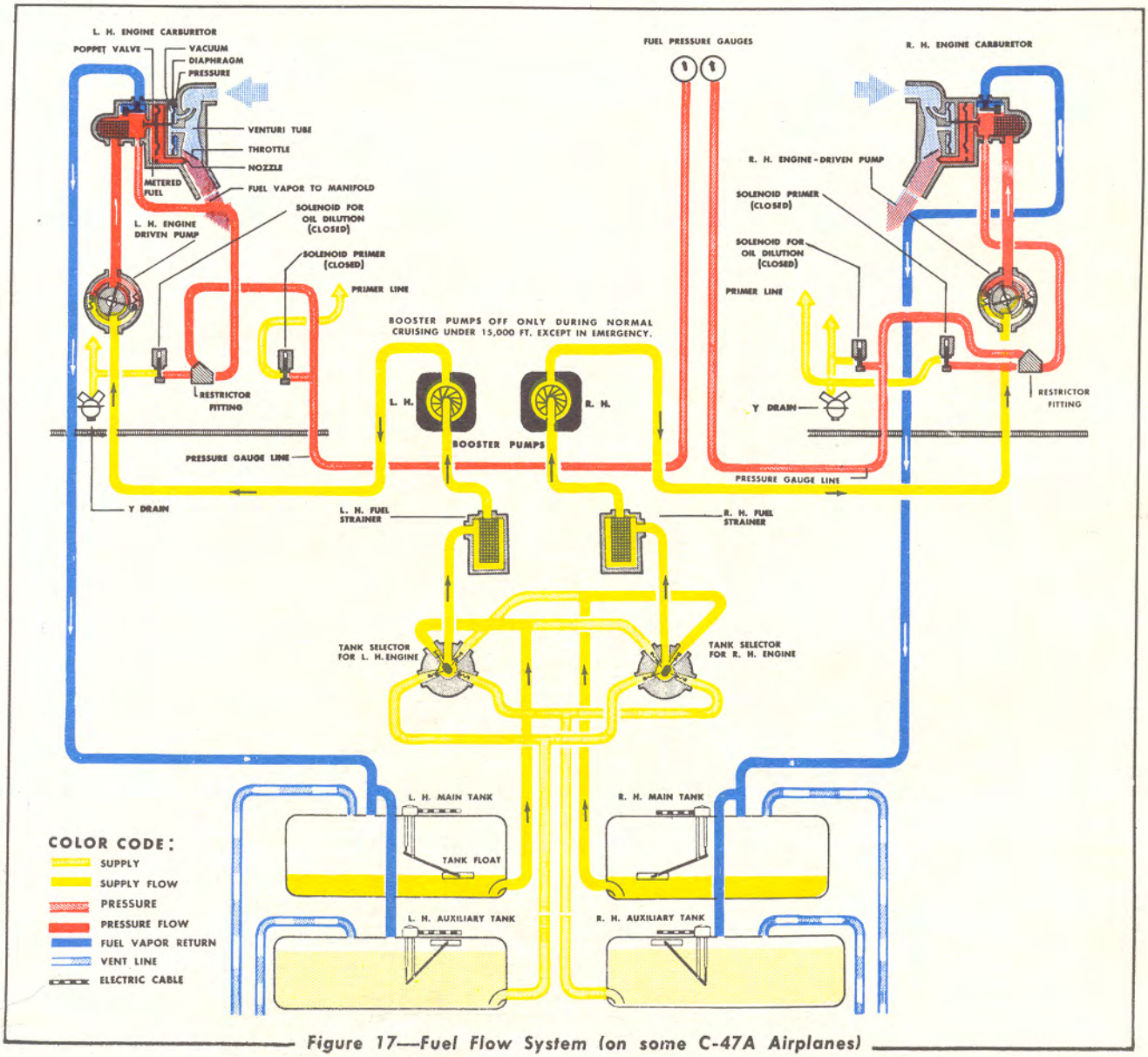


Figure 17—Fuel Flow System (on some C-47A Airplanes)

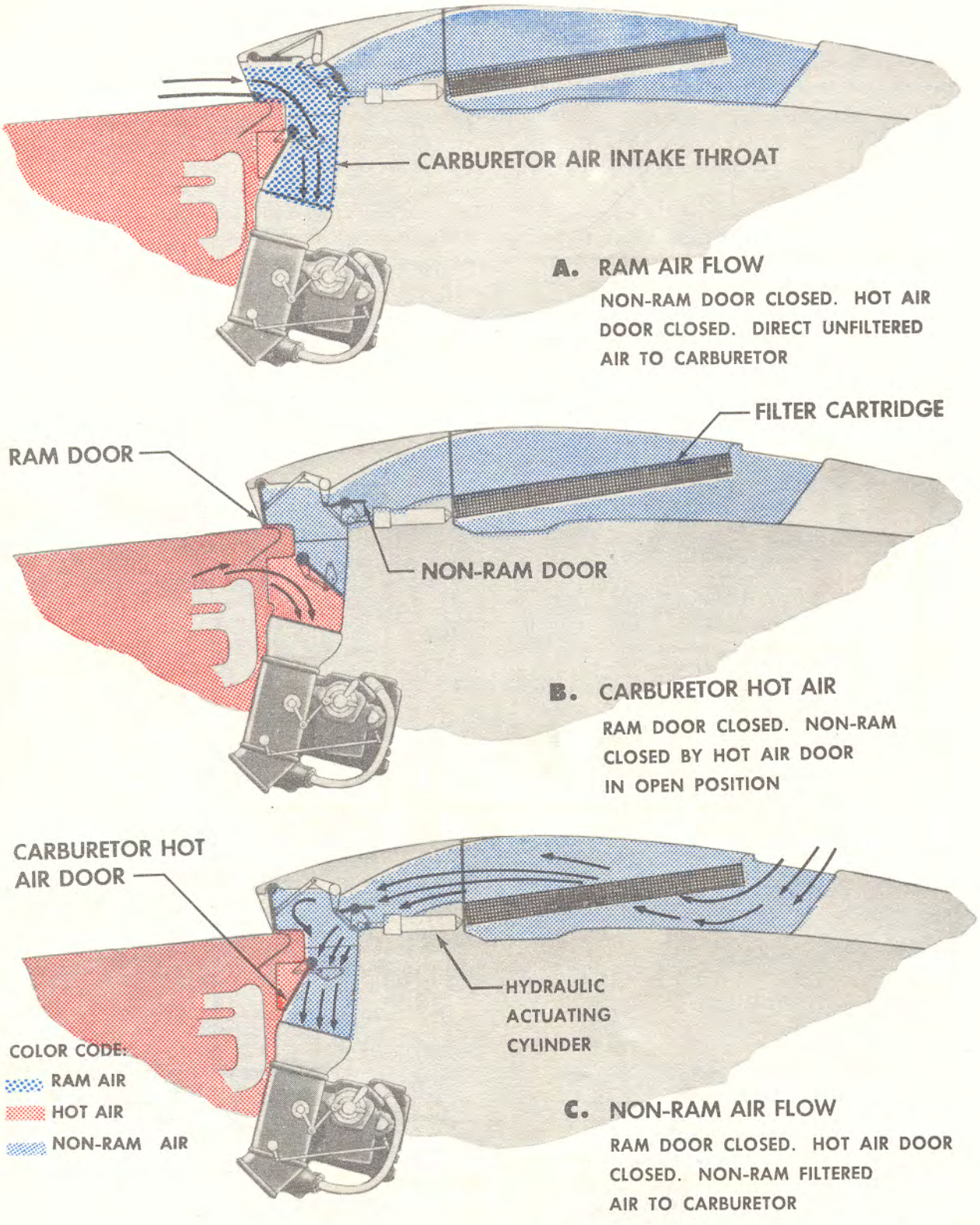


Figure 18 — C-47A Carburetor Air Induction Systems (Hydraulic and Manually Operated)

Figure 19 deleted.

d. INDUCTION SYSTEM.

(1) FUEL INDUCTION.

(*a*) C-47 and C-47A AIRPLANES.—The fuel induction system consists of an injection type carburetor supplying fuel to a single speed integral supercharger.

(2) AIR INDUCTION.

(*a*) RAM TYPE.—On early C-47 series airplanes the carburetor air induction system consists of a simple ram type system which routes air directly into the carburetor.

(*b*) RAM TYPE WITH AIR FILTER. — On some airplanes the ram type air induction system is fitted with a fixed air filter in the forward part of the air scoop to provide filtered air.

(*c*) RAM-NON RAM TYPE.—On later airplanes a ram-non ram type air induction system (*figure 18*) is provided. An opening at the front of the air scoop allows direct ram air induction. An opening on top and near the aft end of the scoop allows filtered air to be supplied to the carburetor.

e. OIL SYSTEM.

(1) OIL TANKS.—Each engine oil system incorporates an oil tank having a capacity of 29 U. S. gals. To allow for expansion, only 25 U. S. gallons of oil should be put into each tank.

(2) OIL DILUTION.—Electrical switches for operating the engine oil dilution equipment for cold weather starting are located on pliot's left-hand electrical control panel (*figure 12-22*).

(3) WARNING LIGHTS.—A red warning light, located adjacent to each oil pressure gage on the instrument panel, comes on when the oil pressure falls below 50 psi.

(4) TEMPERATURE AND PRESSURE GAGES. —Engine oil pressure and oil temperature gages are located on the right-side of the instrument panel.

(5) ENGINE OIL-COOLER SHUTTERS. — Engine oil-cooler shutter controls are located on the control pedestal. For permissible oil temperatures, see the Specific Engine Flight Chart (*figures 30 & 31*).

f. ENGINE CONTROLS.—The engine controls are mounted on the control pedestal and are conventional in operation. The mixture controls have four positions: "IDLE CUT-OFF," "AUTO-LEAN," "AUTO-RICH," and "EMERGENCY RICH."

Note

Emergency Rich position is normally wired off with lock wire so as to be inoperative. Emergency Rich may be obtained, if necessary, by breaking the lock wire by a full movement of mixture control lever.

g. CARBURETOR AIR TEMPERATURE AND AIR FILTER CONTROLS (*figures 23-28*).

(1) RAM TYPE.—A door in the air intake throat directly above the carburetor is controlled by the carburetor hot air control levers on the engine control pedestal. When the hot air door is open, the ram air door is closed. The amount of carburetor heat is indicated by the carburetor air temperature indicator located on the right-hand instrument panel in the pilots' compartment.

(2) RAM TYPE WITH AIR FILTER.—On those airplanes with fixed air filters the carburetor hot air control door is actuated by levers on the engine control pedestal as in the preceding paragraph.

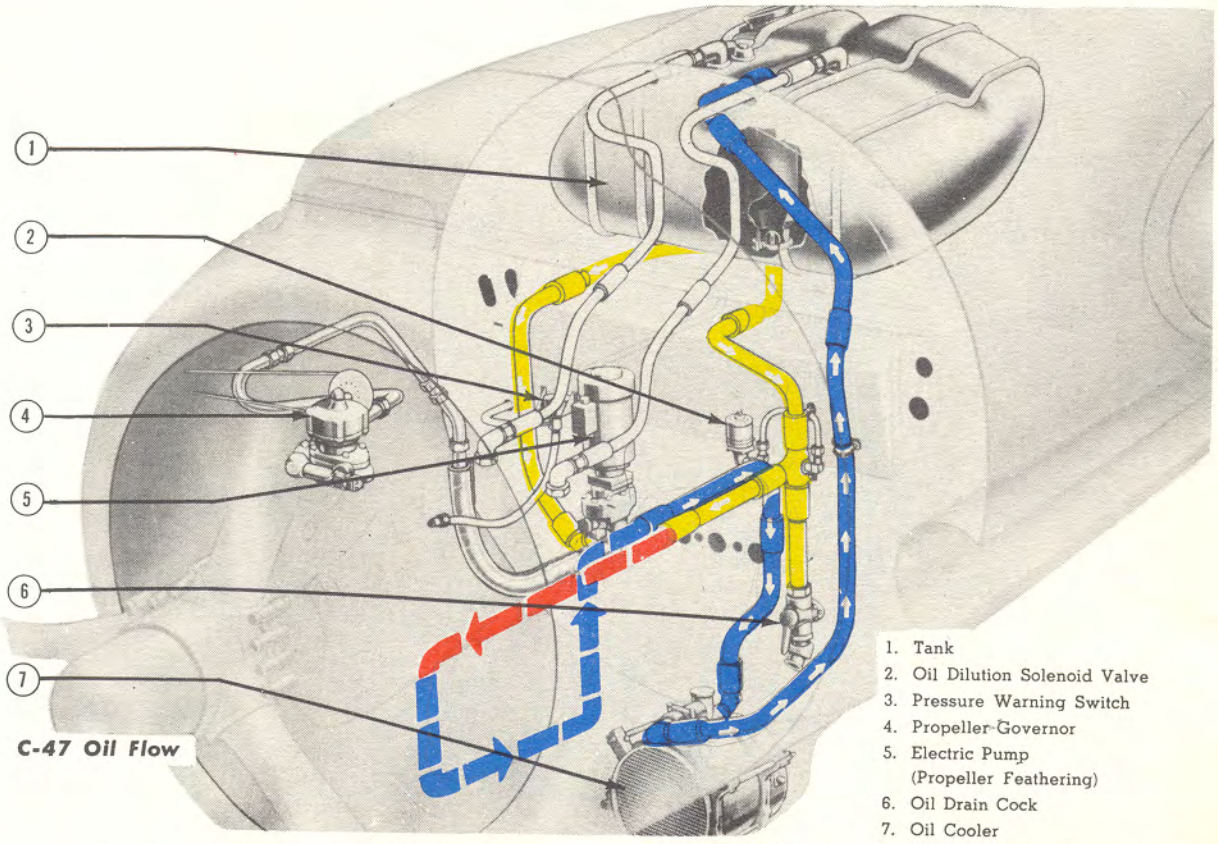
(3) RAM-NON RAM TYPE. — On some airplanes using the "RAM-NON RAM TYPE INDUCTION SYSTEM" the control doors are hydraulically operated by a valve control located on the bulkhead behind the pilot's seat. This valve is marked on early installations "NON-RAM AIR FILTER" and has three positions: "OPEN," "OFF," and "CLOSED." On late airplanes these positions are "FILTERED," "UNFILTERED" and "LOCKED."

h. SUPERCHARGERS.

(1) TYPE.—C-47 and C-47A airplanes have an integral single speed blower with an impeller gear ratio of 7.15 to 1.

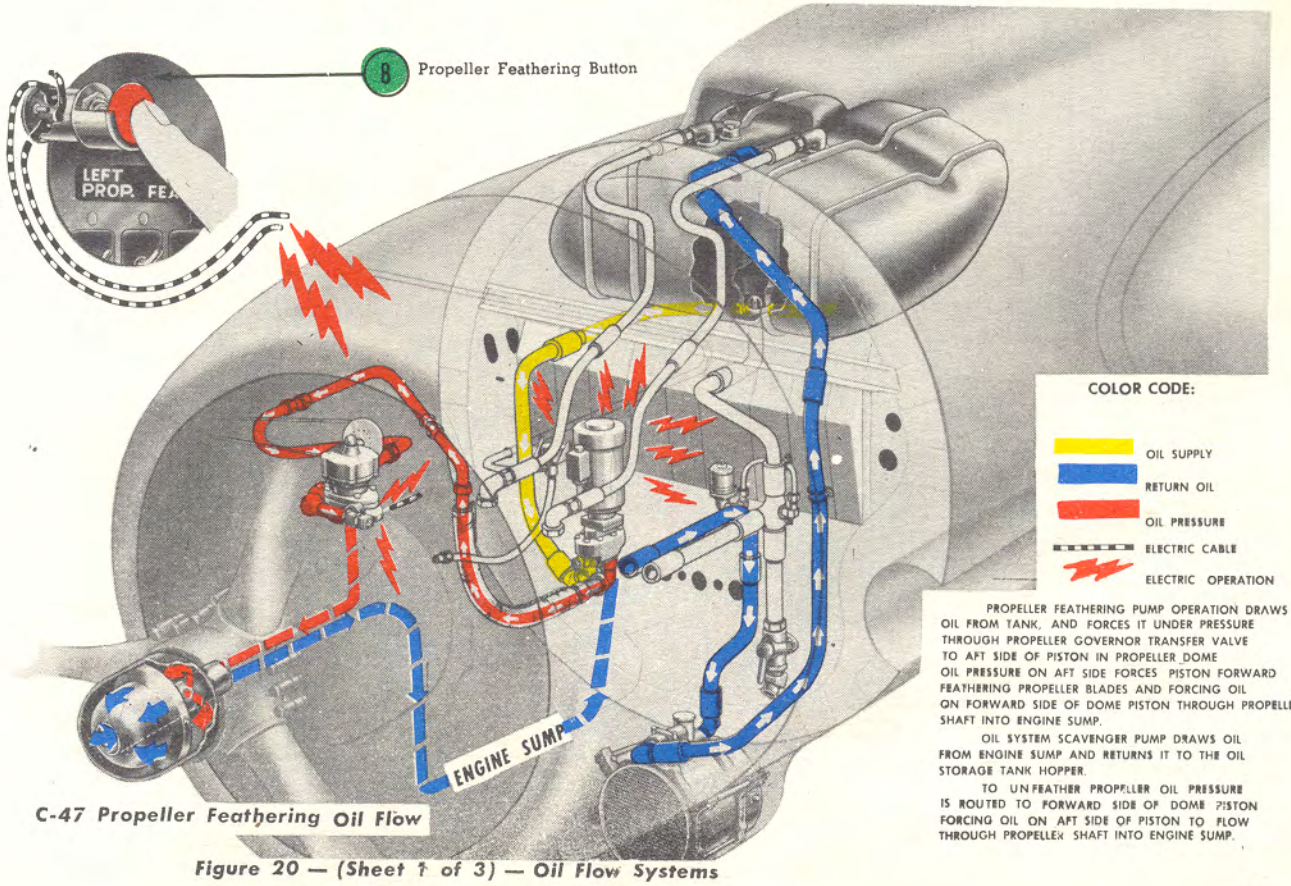
i. COWL FLAP CONTROLS.—The cowl flap controls are located on the side of the fuselage adjacent to the co-pilot's seat. The cowl flaps are hydraulically controlled, and the control valve has five positions: "CLOSE," "OFF," "TRAIL," "OFF," and "OPEN."

j. IGNITION SWITCHES.—The ignition switch unit is located above the windshields between the pilot's left and right electrical control panels and incorporates a master switch and individual ignition switches.



C-47 Oil Flow

1. Tank
2. Oil Dilution Solenoid Valve
3. Pressure Warning Switch
4. Propeller Governor
5. Electric Pump (Propeller Feathering)
6. Oil Drain Cock
7. Oil Cooler



C-47 Propeller Feathering Oil Flow

COLOR CODE:

- OIL SUPPLY
- RETURN OIL
- OIL PRESSURE
- ELECTRIC CABLE
- ELECTRIC OPERATION

PROPELLER FEATHERING PUMP OPERATION DRAWS OIL FROM TANK, AND FORCES IT UNDER PRESSURE THROUGH PROPELLER GOVERNOR TRANSFER VALVE TO AFT SIDE OF PISTON IN PROPELLER DOME. OIL PRESSURE ON AFT SIDE FORCES PISTON FORWARD FEATHERING PROPELLER BLADES AND FORCING OIL ON FORWARD SIDE OF DOME PISTON THROUGH PROPELLER SHAFT INTO ENGINE SUMP.

OIL SYSTEM SCAVENGER PUMP DRAWS OIL FROM ENGINE SUMP AND RETURNS IT TO THE OIL STORAGE TANK HOPPER.

TO UNFEATHER PROPELLER OIL PRESSURE IS ROUTED TO FORWARD SIDE OF DOME PISTON FORCING OIL ON AFT SIDE OF PISTON TO FLOW THROUGH PROPELLER SHAFT INTO ENGINE SUMP.

Figure 20 — (Sheet 1 of 3) — Oil Flow Systems

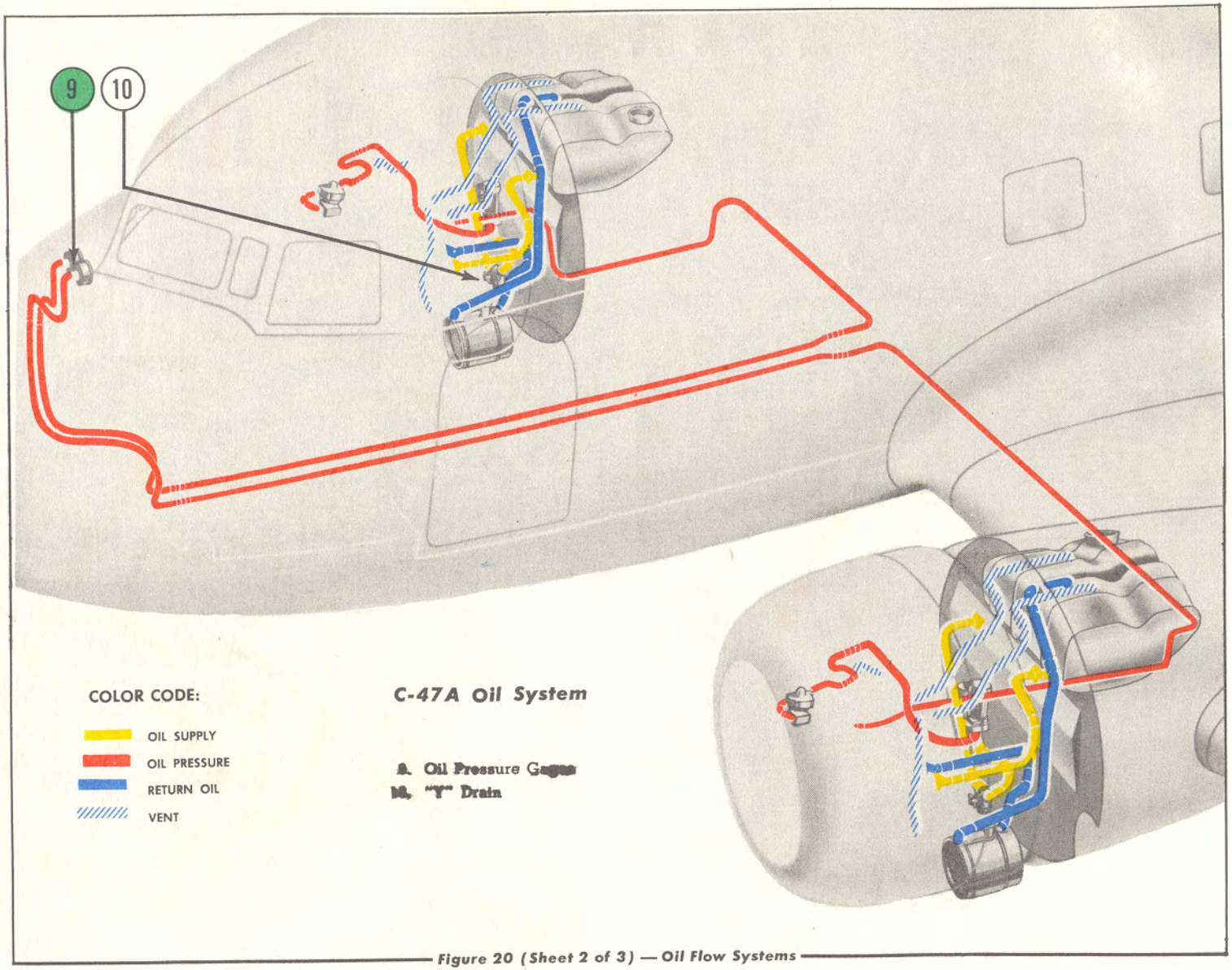
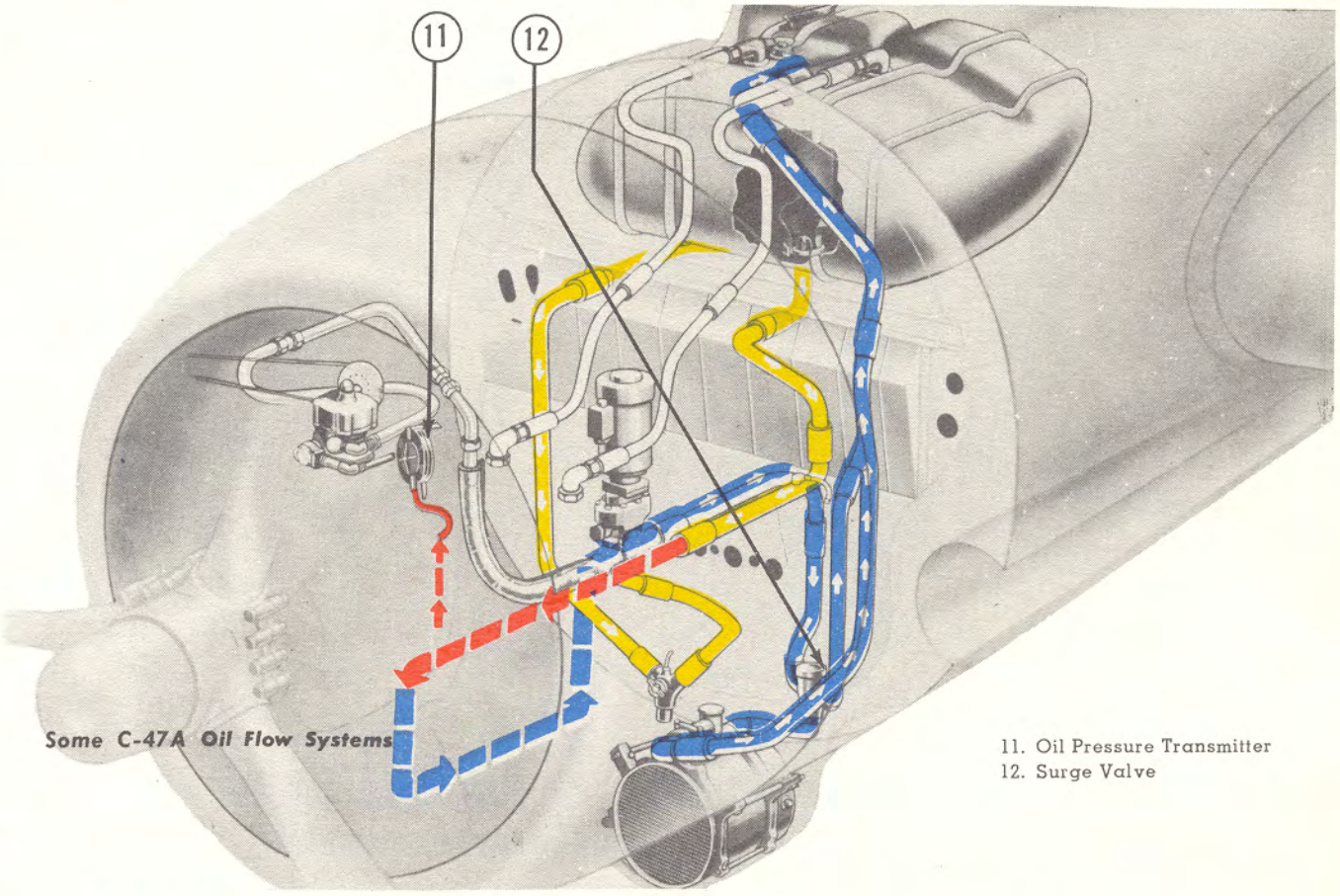


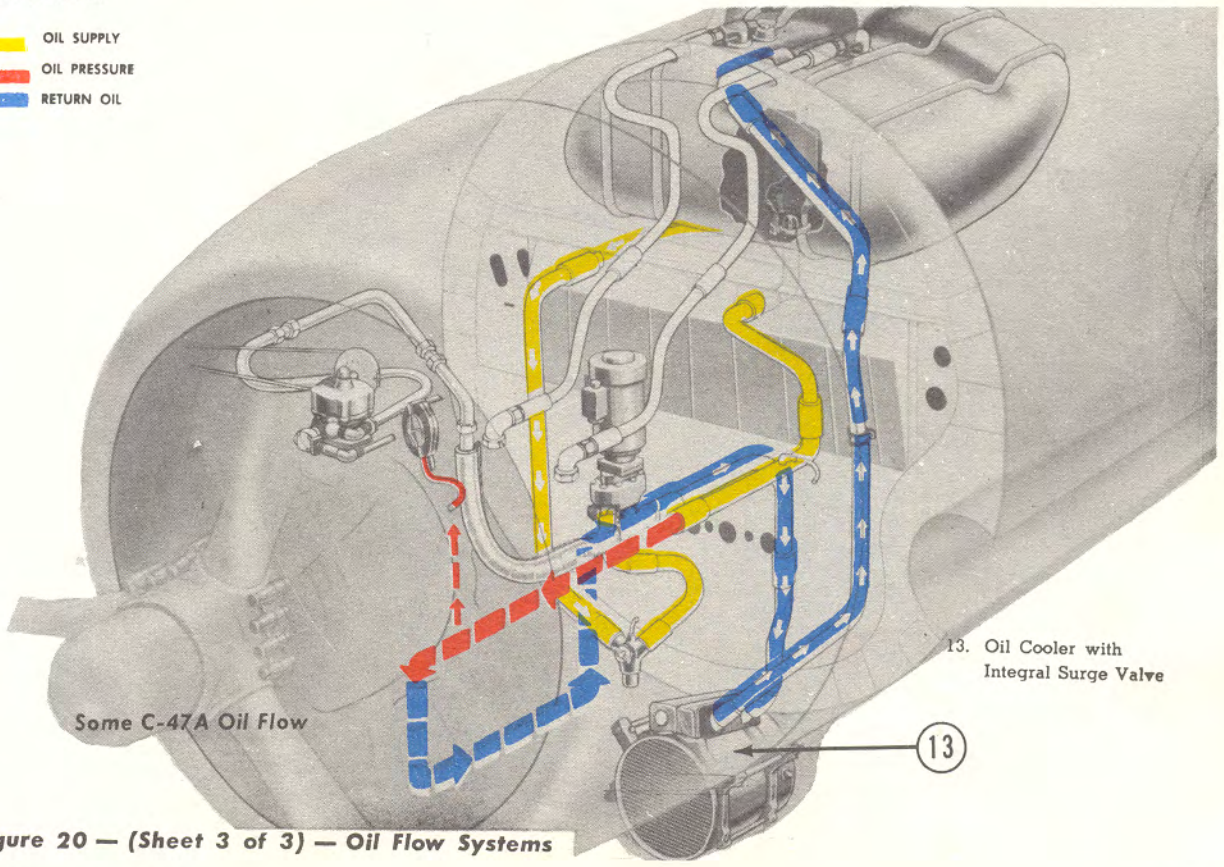
Figure 20 (Sheet 2 of 3) — Oil Flow Systems



11. Oil Pressure Transmitter
12. Surge Valve

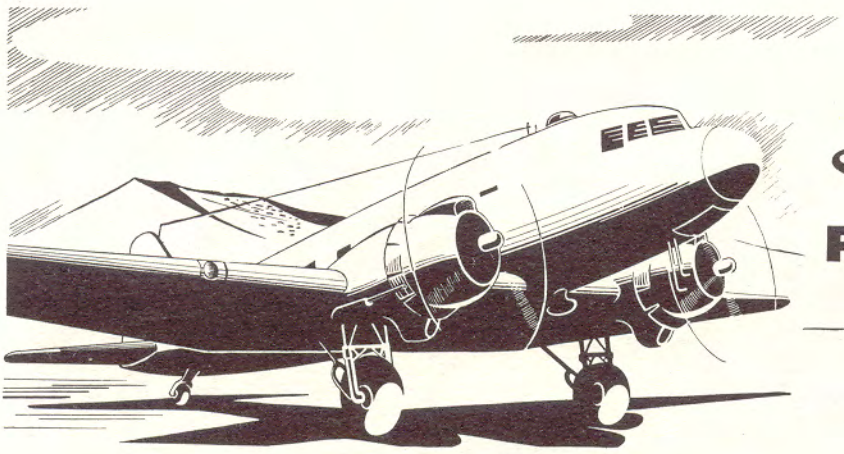
COLOR CODE:

OIL SUPPLY
OIL PRESSURE
RETURN OIL



13. Oil Cooler with Integral Surge Valve

Figure 20 — (Sheet 3 of 3) — Oil Flow Systems



Section II

PILOTS' OPERATING INSTRUCTIONS

1. FLIGHT RESTRICTIONS.

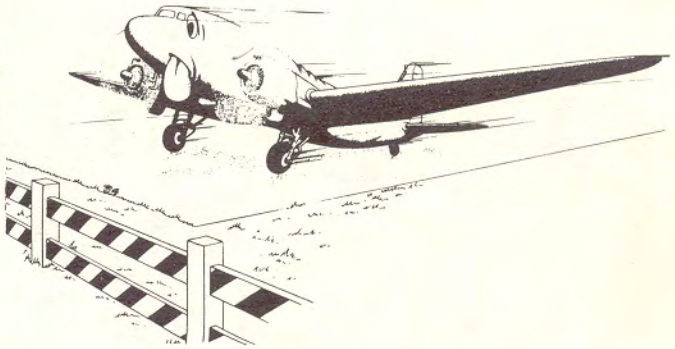
a. MANEUVERS PROHIBITED.

(1) Loops
(2) Immelmans
(3) Spins
(4) Dives
(5) Rolls
(6) Vertical Banks
(7) Stalls
(8) Inverted Flight

b. MAX GROSS WEIGHT FOR TAKE-OFF AND LANDING—33,000 pounds.

c. AIR SPEED LIMITATIONS.

Item	*26,000 lbs. gross wt.*	*29,000 lbs. gross wt.*	*31,000 lbs. gross wt.*	*33,000 lbs. gross wt.*
Max. level flight (indicated)	204 mph	187 mph	170 mph	163 mph
Max. glide (indicated)	255 mph	207 mph	191 mph	185 mph
Max. for extending landing gear (indicated)	160 mph	160 mph	160 mph	160 mph
Max. for extending wing flaps (indicated)	112 mph	112 mph	112 mph	112 mph



"With this load, I should have been born a Heliocopter."

1A. MINIMUM CREW REQUIREMENTS.

The minimum crew requirements for this airplane are pilot and copilot. Additional crew members as required will be added at the discretion of the Commanding Officer.

2. BEFORE ENTERING PILOTS' COMPARTMENT.

a. Gross weight and loading—Check load, balance and security.

b. Wheels—chocked and landing gear pins installed.

c. Ground battery cart, if available; plug into battery receptacle.

Note

Be certain the airplane battery master switches are "OFF" before the battery cart is plugged into the receptacle provided.

d. Remove pitot head cover.

e. Make certain that all surface control locks are removed and stowed.

f. Visually check contents of fuel and oil tank.

g. Check Forms I and F.

h. Enter the airplane through the main cargo loading door located on the left-hand side of the airplane forward of the horizontal stabilizer, or through the forward cargo loading door located forward of the wing on the left side of the fuselage. A step ladder, which clips to holes in the main cargo door sill to provide entrance, is carried aft of the door on the main cargo compartment bulkhead. An extension ladder is provided for entrance through the forward cargo load-

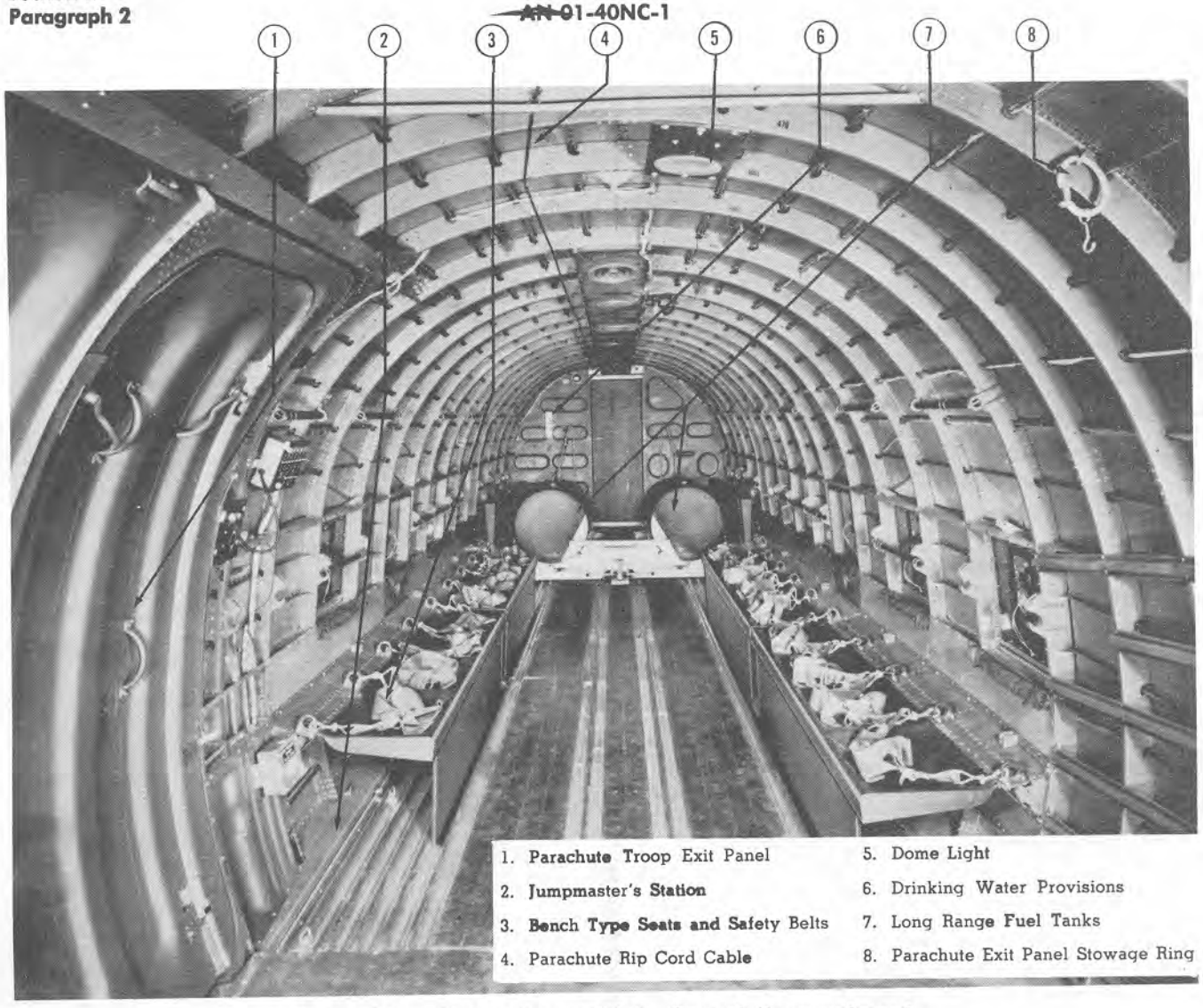


Figure 21 — Troop Cargo (Main Cargo) Compartment

ing door. This ladder is stowed in the left-hand forward baggage compartment. On airplanes on which this baggage compartment is converted into the navigator's compartment, this ladder is stowed on the aft side of the pilots' compartment aft bulkhead.

i. Make a general inspection of the main cargo compartment as follows:

(1) Long range tank shut-off valves—"OFF."

(2) Ascertain that all tools and other items not belonging in the compartment have been removed.

(3) Make certain that all cargo is secured at its given station.

Note

This will prevent damage to the airplane resulting from load shifting due to airplane maneuvers or flying in rough air.

(4) Before leaving the main cargo compartment, on airplanes equipped with steam type heating system, adjust the main cargo compartment air duct control *(figure 35)* as follows:

(a) Turn the control to the "OFF" position provided that no passenger load or cargo that requires heat is carried.

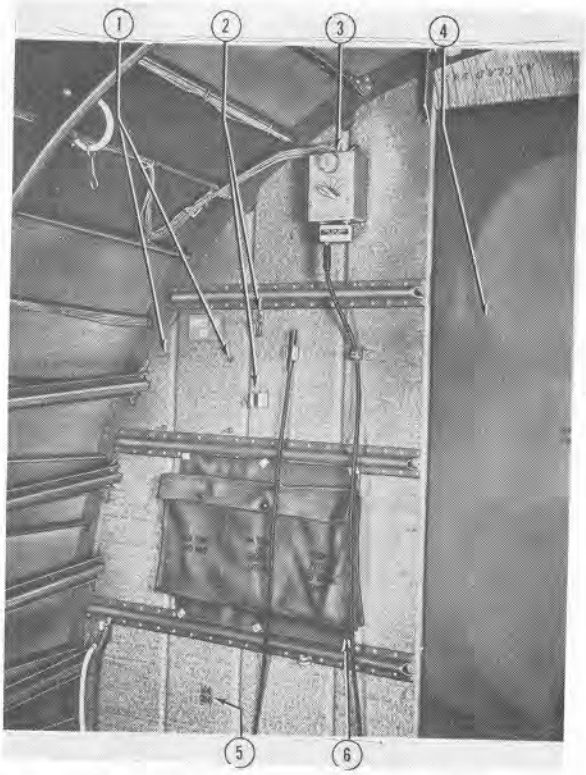
(b) If a passenger load or cargo that requires heat is carried, adjust the control as necessary.

j. Adjust the heating and ventilating controls in the radio compartment as follows:

(1) *Airplanes Equipped with Steam Type Heating System.*

(a) Make certain the steam supply shut-off valve control is in the "OFF" position *(figure 35-7).*

(b) Adjust the radio operator's and pilots' compartment air supply valve control as necessary.



1. First Aid Kit Provisions
2. Microphone Hook and Holder
3. Interphone Jack Box and Equipment
4. Lavatory Door
5. Engine Cover Stowage Provisions
6. Miscellaneous Stowage Bag

Figure 22—Main Cargo Compartment Aft Bulkhead

(*c*) Adjust the cold air intake valve control as weather conditions require.

(*d*) Adjust the air mixture control as necessary.

(2) *Airplanes Equipped with the Hot Air Type Heating System.*—Air mixing valve controls in "SPILL" position.

3. ON ENTERING PILOT'S COMPARTMENT.

Note

A pilot's check list is provided in the pilots' compartment for quick check of operating instructions.

a. STANDARD CHECK FOR ALL FLIGHTS.

(1) Hydraulic fluid supply—"NORMAL LEVEL" on gage.

(2) Determine whether carburetor air filters are installed.

(3) Seat and rudder pedals—Adjust as necessary.

(4) Safety belts—Fastened.

(5) Check flight controls for freedom of movement and slack. Set trim tabs at zero.

(6) Landing gear hydraulic pressure — within limits. If pressure is low, pump it up during the hydraulic hand pump check.

(7) Landing gear safety latch control — "POSITIVE LOCK."

(8) Landing gear control—"DOWN."

(9) Hydraulic hand pump check.

(*a*) Deleted.

CAUTION

The hydraulic hand pump emergency shut-off valve must be closed and safetied in order that hand pump pressure will be immediately available to the components of the hydraulic system during an emergency.

(*b*) To check operation of the hydraulic hand pump check the landing gear control in the "DOWN" position. Actuating the hand pump should increase pressure on the *landing gear pressure gage;* do not exceed the limits. Return landing gear control to neutral.

Note

It should be noted that the increase in pressure will be indicated on the landing gear hydraulic pressure gage. At no time during the hand pump check should the pressure indicated on the gage be allowed to exceed the hydraulic pressure limits.

(10) Parking brake set. If hydraulic system pressure is low, use the hand pump to build up hydraulic pressure to set the brakes.

(11) Battery switches—"OFF" ("ON" if external power is not used—this will be considered an emergency procedure).

(12) External power—Connected.

(13) Landing gear safety pins—Have pulled and stowed.

(14) Generator switches check "ON."

(15) Fuel quantity gages—Check for adequate supply.

(16) Compass and electrical instruments — Check for proper settings and indications.

(17) Communication equipment—Check operation.

(18) Oxygen equipment—Check operation.

(19) Fire detector system—Check circuit.

(20) Flashlight—Check.

b. SPECIAL CHECK FOR NIGHT FLIGHTS.—Test the following lights, if installed:

Location of Light	*Location of Switch*
Pilots' compt. lights (3) (*figures 23, 24 & 25*), and one on the forward side of control pedestal)	(*figures 12 & 13*)
Pilots' compt. fluorescent light (3) (*figure 23, 24 & 27*)	(*figures 12 & 13*)
Automatic pilot, compass, and command receiver remote tuning unit lights	(*figures 12 & 13*)
Pilots' compt. spot light (back and above the co-pilot)	Adjacent to light
Landing lights (2) (leading edge of each outer wing)	(*figures 12 & 13*)

CAUTION

Use landing lights only as necessary to conserve bulb life and to avoid current load on the batteries when the engines are not running.

Running lights (3) (on each wing tip and the tail cone)	
Recognition lights (4) (one on top of the fuselage, three underneath the fuselage aft of the main cargo door)	(*figures 12 & 13*)

CAUTION

Do not allow the recognition lights to remain "ON" longer than necessary (10 seconds maximum) when the airplane is on the ground because prolonged use will cause the lenses to melt.

Passing lights (within the left wing landing light reflector)	(*figures 12 & 13*)
Main elect. junction box light (within the main electrical junction box)	Lights as door is opened.
Forward passageway dome light (ceiling of companionway adjacent to radio operator's compartment)	Adjacent to light.
Radio compartment dome light (ceiling of compartment)	Adjacent to light.

4. FUEL SYSTEM MANAGEMENT.

a. FUEL TANK SELECTION.—When the engines are operated, the main fuel tanks or the auxiliary fuel tanks can be selected to supply fuel to a single engine (left or right-hand engine) or to both engines. The long range fuel tanks (if installed) can be selected, through a valve at the front tanks, to supply fuel to either or both engines. On those airplanes having the installation, a cross-feed and wobble pump system facilitate fuel supply in accordance with fuel tank selection. On other airplanes, fuel tank selector valves, used with fuel booster pumps, make selection from all tanks possible.

b. NORMAL FUEL TANK PROCEDURE.—When running fuel tanks empty in flight, keep a close check on the fuel pressure gage. It is advisable to switch to another tank as soon as the fuel pressure begins to drop. If a tank is allowed to run dry to the extent that the engine slows down, the throttle should be moved toward the "CLOSE" position before the tank selector valve is moved, in order to prevent the engine from over-speeding. All take-offs and landings should be made with fuel selector set to tanks containing the greatest quantity of fuel.

Note

It is very important upon reaching a cruising altitude that fuel be consumed from main tanks first and auxiliary tanks last. This procedure will permit using a minimum amount of elevator tab to trim the airplane.

c. LONG RANGE FUEL TANK PROCEDURE (if installed).

(1) When cruising altitude has been reached, turn the fuselage tank shut-off valve "ON."

(2) Turn the fuselage tank cross-feed valve (if installed) "OFF."

(3) Turn the right and left engine fuel tank selector valves "OFF."

(4) When the fuel supply in the long range fuel tanks becomes low, turn the left and right fuel tank selector valves to the "LEFT MAIN" and the "RIGHT MAIN" positions, respectively.

CAUTION

Long range fuel system shut-off values must be turned off when operating on main or auxiliary tanks to prevent airlocks.

Note

If the long range fuel tanks run dry and the engines are allowed to slow down, move the throttles toward the "CLOSE" position before moving the right and the left fuel tank selector valve controls from the "OFF" positions. This will prevent the engines from overspeeding. Operate the fuel pressure wobble pump (if installed), or turn "ON" the booster pumps (if installed), until the engine runs smoothly.

(5) Do not operate with both normal and long range fuel systems on at the same time; do not climb

at a steep angle when operating on the long range fuel system and the fuel level is low in the tanks.

d. CROSS FEED.—On all C-47 airplanes and some C-47A airplanes a cross feed system enables both engines to receive fuel through one engine-driven pump in case either pump fails. In normal operation the cross-feed valves are in the "OFF" position, but in case of failure of one of the engine-driven pumps the cross-feed valves may be turned "ON" and pressure from the operating engine-driven pump will pass through the cross-feed system to supply the other engine. The cross-feed control valve handle is located in the lower right corner of the control pedestal.

e. WOBBLE PUMPS. — On airplanes having a wobble pump control installed, operate these pumps to raise the fuel pressure when starting the engine or in case of engine-driven pump failure.

f. BOOSTER PUMPS.

(1) On airplanes having fuel booster pumps installed, operate the fuel system, using the booster pumps if necessary to obtain a desired fuel pressure of 17 psi. The minimum allowable fuel pressure is 16 psi with a maximum pressure of 18 psi.

(*a*) Turn the booster pump switch "ON" for desired engine.

(*b*) Turn fuel selector valve for the desired engine to the applicable positions: "RIGHT MAIN," "RIGHT AUX.," "LEFT MAIN," "LEFT AUX.," or "OFF."

(2) During climbs and flight, use the booster pumps whenever the engine-driven pumps alone do not supply adequate fuel pressure.

(3) When desired altitude has been reached, wait three or four minutes before turning the booster pumps "OFF" in order to allow the fuel tank internal pressure to become equalized with atmospheric pressures. The booster pumps should be turned "OFF" one at a time, and then only if the engine-driven pumps maintain sufficient pressure.

(4) In switching from one tank to another, use the booster pumps to help displace any air that may have entered the system, and to assure sufficient fuel pressure.

4A. ALTERNATE FUEL GRADE OPERATING LIMITS (91/98).

a. Take-off:	2700 rpm 46 in. Hg at S.L. A. R. Mixture
b. Max Continuous	2550 rpm 41 in. Hg at S.L. A. R. Mixture
c. Max Auto-Lean	2250 rpm 34 in. Hg at S.L.

5. STARTING ENGINES.

a. INSTRUCTIONS IN CASE OF FIRE.—Be sure adequate fire fighting equipment is near the engine being started. Open the engine fire extinguisher control access door (*figure 33*) and turn the selector valve control to position for engine being started.

CAUTION

If a fire occurs while starting an engine, move the mixture control to "IDLE CUT-OFF," move the throttle to "OPEN," and keep the engine turning over with the starter to draw fire from the induction system through the engine. If this procedure does not extinguish the fire, pull the fluid emergency shut-off valve control (if installed) out. If fire persists pull engine fire extinguisher pull handle.

b. PRELIMINARY PROCEDURE.—If the engines have been idle for more than 30 minutes or if excessive priming has been used during starting attempts, make certain the ignition switch is off and rotate the propeller two complete revolutions in the direction of normal engine rotation to determine that all combustion chambers are clear of hydraulic locks. The propellers may be pulled through by meshing the starter and then *intermittently* energizing, watch for a tendency of the engine rotation to stall. If fuel or oil is present in the combustion chambers, as indicated by abnormal resistance to propeller rotation, remove the spark plugs from the lower cylinders and allow the fuel and oil to drain. After the fuel and oil have drained, reinstall the spark plugs.

c. CHECK THE FOLLOWING CONTROLS FOR BOTH ENGINES.

(1) Engine ignition switches (*figures 12 & 13*)—"OFF."

(2) Airplane battery master switches (*figures 12 & 13*)—"OFF."

(3) Fuel cross-feed valve control (if installed)—"OFF."

Note

This will prevent the left engine from being flooded while the right engine is being started.

(4) Fuel booster pumps (if installed)—"OFF."

(5) Cowl flaps open; controls (*figure 24-19*)—"OFF."

(6) Propeller controls (*figure 25-2*) —"INCREASE RPM."

(7) Carburetor Air Temperature Controls—"FULL COLD" or "RAM."

(8) Carburetor anti-icer (if installed on electrical panel)—"OFF."

(9) Propeller anti-icer switch and rheostat—"OFF."

(10) Forward windshield anti-icer shut-off (*figure 27-22*)—"OFF."

(11) Left and right side windshield anti-icers (*figures 23 & 24*)—"OFF."

(12) Wing and empennage de-icer (*figure 24-30*) —"OFF."

(13) Deleted.

(14) Carburetor mixture controls (*figure 25-5*)—"IDLE CUT-OFF."

(15) Long range fuselage fuel tank valves (if installed)—"OFF."

d. START THE RIGHT ENGINE.

(1) Oil cooler controls—"OPEN."

Figure 23 — Pilot's Compartment

KEY TO FIGURE 23

L.H. SIDE OF PILOT'S COMPARTMENT

1. Oxygen Regulator to Mask Hose
2. Hand Fire Extinguisher
3. Command Radio Transmitter Control Box
4. Oxygen Regulator Valve
5. Windshield Defroster and Hand-warmer Butterfly Valves
6. Flexible Handwarmer and Spot Defroster
7. Carburetor Air Induction System Controls
8. Command Radio Receiver Control Box
9. Shielded Lamp
10. Windshield Friction Lock Knob
11. L.H. Electrical Control Panel
12. Windshield Defroster Hose
13. Fluorescent Lamp
14. Windshield Wiper Operating Mechanism
15. Fuel System Flow Diagram
16. Propeller Anti-Icer Control Rheostat
17. Propeller De-Icer Fluid Supply Tank
18. Suit-Heat Rheostat
19. Radio Filter Box
20. Interphone Junction Box
21. Seat and Safety Belt
22. Seat Adjusting Cord
23. Windshield Anti-Icing Shut-Off Valve
24. Microphone Hook and Holder
25. Pilot's Check List

27. Control Wheel

KEY TO FIGURE 24

R.H. SIDE OF PILOT'S COMPARTMENT

1. Control Wheel
2. Shielded Lamp
3. Windshield De-Icer Pump Handle
4. R.H. Electrical Control Panel
5. Windshield Friction Lock Knob
6. Compass Radio Switch
7. Radio Compass Remote Control Unit
8. Azimuth Control
9. Window Panel Slide Handle
10. Oxygen Supply Warning Box
11. Windshield Defroster Hose
12. Windshield Defroster and Hand Warmer Butterfly Valve
13. SCR-522 Radio Control Box
14. Liaison Radio Power Switch
15. Co-Pilots' Junction Box
16. Oxygen Regulator Valve
17. Oxygen Regulator to Mask Hose
18. Fluorescent Lamp
19. Cowl Flap Controls
20. Shielded Lamp
21. Microphone Hook and Holder
22. Windshield Anti-Icing Shut Off Valve
23. Seat and Safety Belt
24. Seat Adjusting Cord
25. Interphone Junction Box
26. Radio Filter Box
27. Suit-Heat Rheostat
28. CO_2 Fire Extinguisher Supply Bottle
29. Cockpit Heat Control
30. De-Icer Control Valve
31. Flexible Hand Warmer and Spot Defroster
32. Hydraulic Control Panel

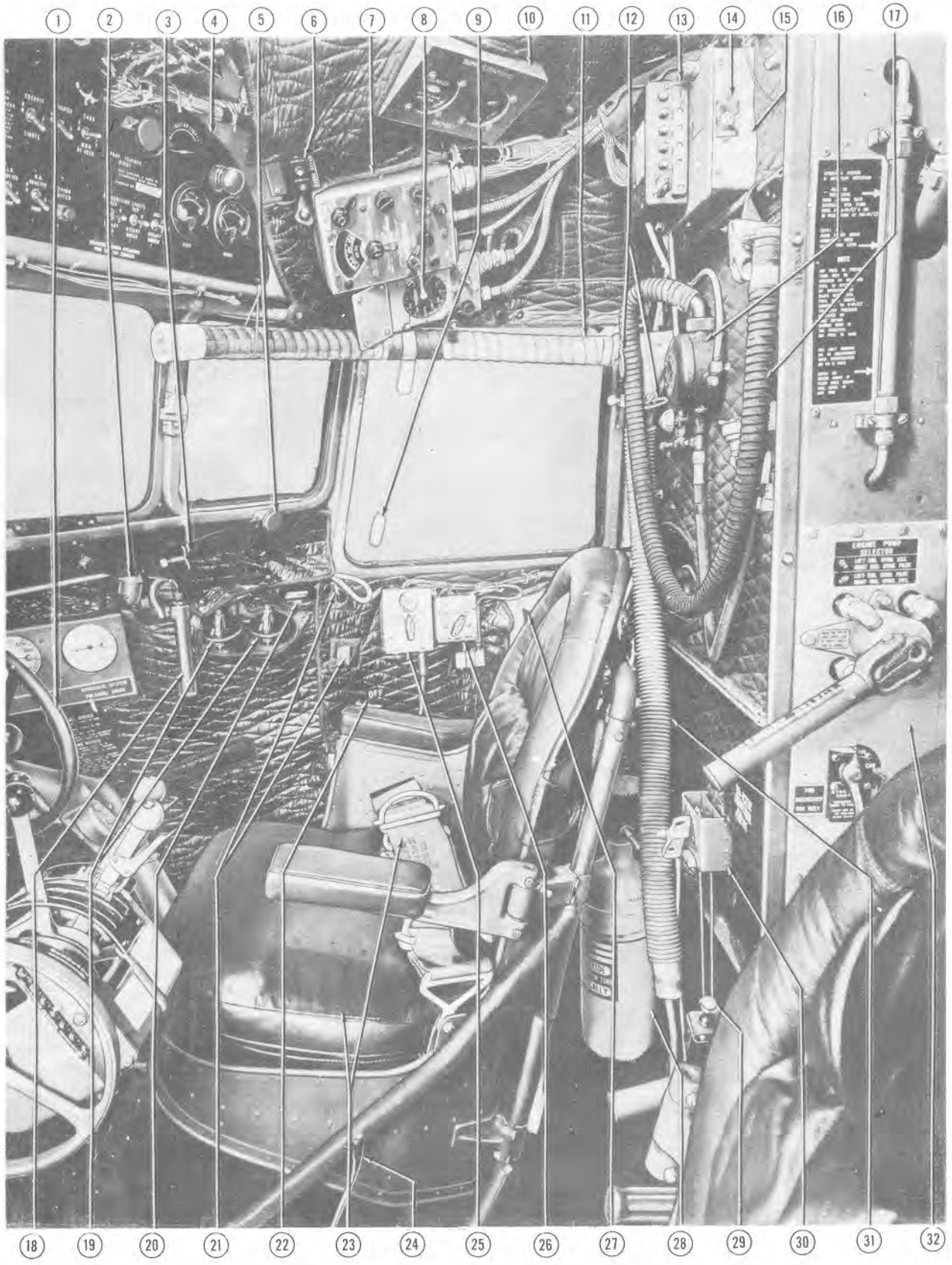
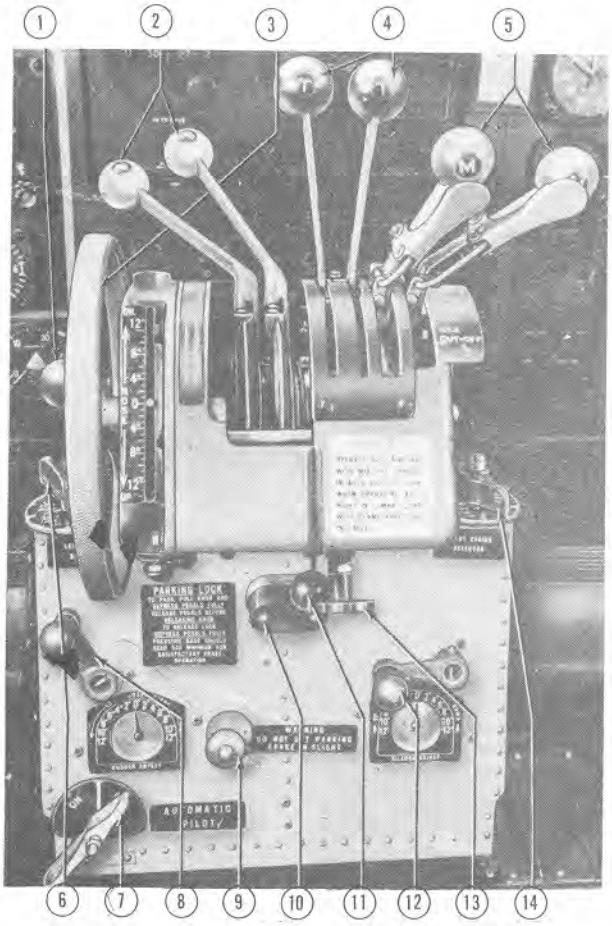


Figure 24 — Co Pilot's Compartment



1. Oil Cooler Control Levers
2. Propeller Controls
3. Elevator Trim Tab Control
4. Throttle Controls
5. Mixture Levers
6. Left Engine Fuel Selector Valve
7. Automatic Pilot Control Valve
8. Rudder Trim Tab Control
9. Parking Brake Control Knob
10. Shielded Lamp
11. Tail-Wheel Lock Lever
12. Aileron Trim Tab Control
13. Throttle Controls Friction Lock
14. Right Engine Fuel Selector Valve

Figure 25 — Control Pedestal

(2) Turn the right engine fuel tank selector valve control *(figure 25-14)* to the fullest right-hand tank.

(3) Battery switch — "OFF" ("ON" if external power is not used—this will be considered an emergency operation).

Note

External power should not be disconnected until after engine warm-up and all tests are completed.

(4) Deleted.

(5) Adjust the engine throttle to approximately the one quarter open position *(figure 25-4)*.

(6) Operate the fuel pressure wobble pump (if installed) until the right fuel pressure gage *(figures 26 & 27)* indicates 3 psi.

(7) Turn master ignition switch on.

(8) Engine starter safety switch (some airplanes) to the "ON" position and momentarily mesh the right engine starter.

Note

This procedure is necessary only on airplanes equipped with Jack & Heintz starters. If the starter hand crank has been previously used this will automatically seat the brushes. On other types of starters it is necessary to seat the brushes manually.

(9) Simultaneously move the engine starter safety switch to the "ON" position and the engine starter switch to the energizing position for the right engine.

Note

Both switches are spring loaded; therefore, they must be held in place.

(10) When the engine starter has reached full speed, hold the engine starter safety switch in the "ON" position and move the engine starter switch to the mesh position for the right engine. After one complete revolution of the propeller, turn the right engine ignition switch to the "BOTH" position.

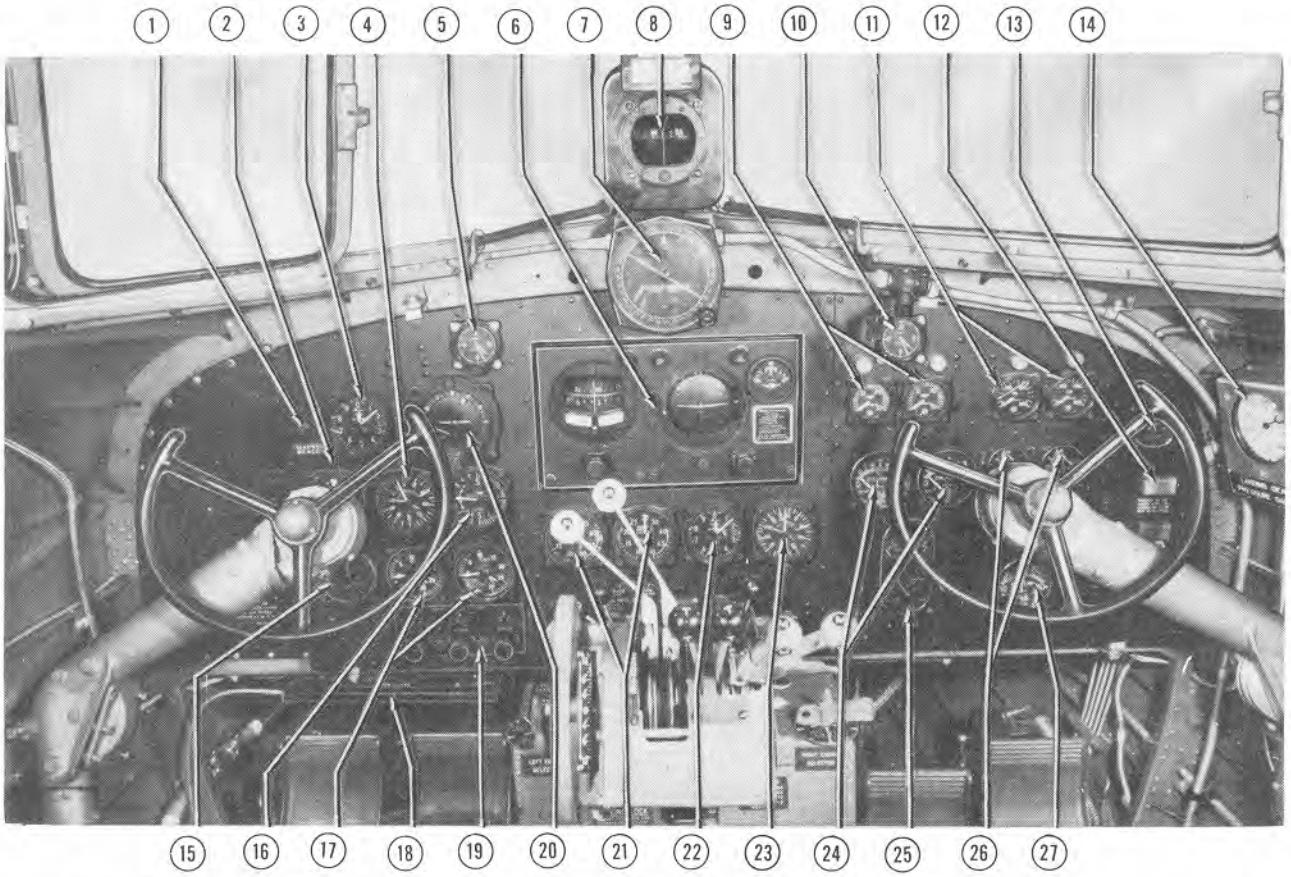
(11) Booster pumps switches (if installed)—"ON."

(12) For airplanes equipped with an electric primer, hold the engine prime switch in the "ON" position until after the engine has started and the engine speed stabilizes. For airplanes equipped with a hand pump engine primer use even strokes in lieu of electric primer.

(13) Make transition from primer operation to carburetor operation by moving the carburetor mixture control from "IDLE CUT-OFF" to "AUTO RICH" and then stop priming. To prevent backfiring, movement of the mixture control from "IDLE CUT-OFF" to "AUTO RICH" should occur slightly before ceasing to prime in order to allow the carburetor to come up to operating pressures and start functioning in a normal manner.

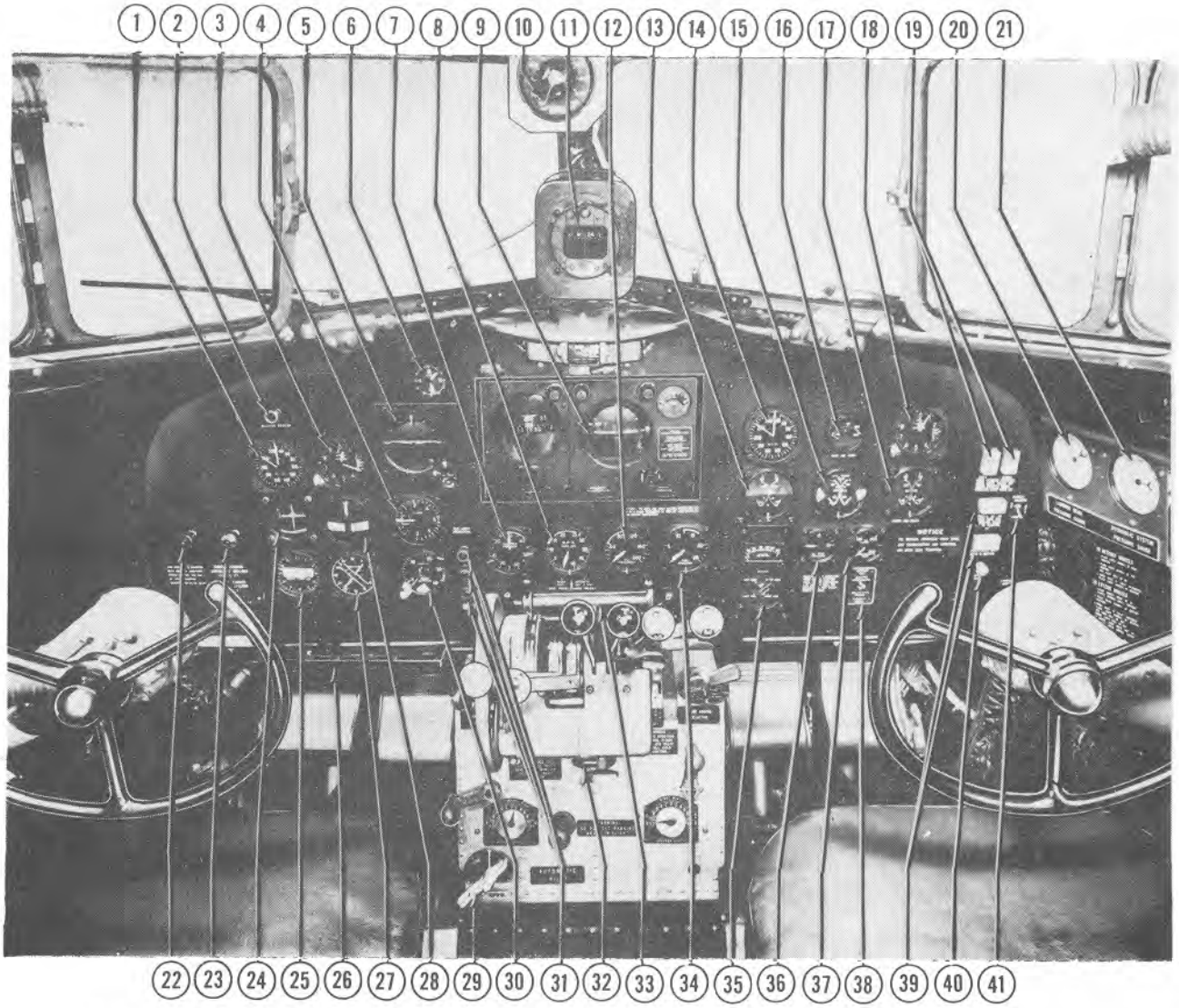
(14) (Deleted)

(15) Turn the fuel booster pump (if installed) "OFF" after engine is running smoothly.



1. Marker Beacon Indicator
2. Bank and Turn Indicator
3. Altimeter
4. Airspeed Indicator (Pilot's)
5. Clock
6. Automatic Pilot
7. Azimuth Indicator
8. Magnetic Compass
9. Engine Fuel Pressure Gages
10. Clock
11. Engine Oil Pressure Gages
12. Landing Gear Warning Light
13. De-Icer Pressure Gage
14. Landing Gear Pressure Gage
15. Remote Compass
16. Rate of Climb Indicator
17. Engine Tachometers
18. Wing Flap Indicator
19. Automatic Pilot Speed Controls
20. Artificial Horizon
21. Manifold Pressure Gages (L.H. and R.H.)
22. Altimeter
23. Airspeed Indicator Co-Pilot's
24. Cylinder Head Temperature Indicators
25. Gasoline Gage (All Tanks)
26. Oil Temperature Gages
27. Outside Air Temperature Gages

Figure 26 — Instruments (Early Airplanes)



1. Airspeed Indicator
2. Marker Beacon Indicator
3. Altimeter
4. Rate of Climb Indicator
5. Artificial Horizon
6. Clock
7. Manifold Pressure Gage (Dual)
8. Tachometer (Dual)
9. Automatic Pilot
10. Altitude Limit Indicator
11. Magnetic Compass
12. Oil Pressure Indicator (Dual)
13. Oil Temperature Indicator (Dual)
14. Airspeed Indicator
15. Cylinder Head Temperature Indicator
16. Free Air Temperature Indicator
17. Carburetor Air Temperature Indicator
18. Altimeter
19. Heating and Ventilating System Warning Lights
20. Landing Gear Pressure Gage
21. Hydraulic System Pressure Gage
22. Windshield Anti-Icer Valve
23. Windshield Wiper Valve
24. Remote Magnetic Compass Indicator
25. Radio Compass
26. Wing Flap Position Indicator
27. Localizer Receiver Indicator
28. Turn and Bank Indicator
29. Automatic Pilot Control Valve.
30. Radio Altitude Indicator
31. Altitude Limit Indicator Lights
32. Control Pedestal Lamp
33. Instrument Panel Fluorescent Lamp
34. Fuel Pressure Indicator (Dual)
35. Gasoline Gauge (4 Wing Tanks)
36. De-Icing Pressure Gage
37. Automatic Pilot Pressure Gage
38. Static Pressure Selector Valve
39. Landing Gear Warning Lights
40. Cargo Door Open Lamp
41. Fluorescent Lights Warning Switch

Figure 27 — Instruments (Later Airplanes)

Figure 28 Deleted.

(16) Adjust the throttle so that the right tachometer *(figures 26 & 27)* indicates between 1000 and 1200 rpm.

CAUTION

Continued idling below 800 rpm may damage the spark plug elbow insulation because the cylinder head temperature will quickly rise and may exceed the critical temperature limits.

(17) Allow the engine to operate between 1000 and 1200 rpm until the right engine oil pressure gage *(figures 26 & 27)* indicates at least 14 psi.

CAUTION

If oil pressure is not indicated within 30 seconds, stop the engine and determine the reason for the malfunction.

e. START THE LEFT ENGINE.

(1) Turn the left engine fuel tank selector valve control *(figure 25-6)* to the fullest left-hand tank.

(2) Continue the starting procedure in a similar manner to that for starting the right engine.

6. ENGINE WARM-UP AND ACCESSORY CHECK.

a. SEQUENCE OF WARM-UP OPERATIONS.

(1) Operate the engine at 1000 to 1200 rpm, until the following conditions are attained:

(a) Engine oil temperature within limits.

(b) Engine cylinder head temperatures within limits.

CAUTION

Do not close engine cowl flaps.

(c) Engine oil pressure within limits.

CAUTION

Avoid prolonged engine warm-up. Do not allow the engine cylinder head temperature to exceed 232°C (450°F).

(2) Increase the engine speed to 1500 rpm.

(3) Move the propeller controls *(figure 25-2)* from "INCREASE RPM" to "DECREASE RPM" and back three to four times to force warm oil into the propeller dome.

CAUTION

Do not operate engines continuously between 1300 and 1700 rpm as undue vibration occurs. The normal operating range is 1700 to 2550 rpm. Maximum operation is 2700 rpm.

(4) Increase the engine speed to 2350 rpm and the manifold pressure to 30 in. hg. at sea level and check the following.

(a) Engine oil pressure within limits.

(b) Fuel pressure within limits.

(c) Oil temperature within limits.

(5) Deleted.

(6) *Generators.*

(a) Check generator operation.

1. Move the right engine generator main line switch to the "OFF" position (within main electrical junction box).

Note

If both engine generators are functioning properly, the right ammeter *(figures 12 & 13)* indication will decrease. If it does not decrease, inspect the generator unit for evidence of malfunction.

2. Return the right engine generator main line electric switch to the "ON" position.

3. Repeat the check for the left generator.

(8) *Hydraulic System Pressures.*

(a) Check hydraulic system pressures.

Note

Move hydraulic controls rapidly to minimize interflow.

1. Move the wing flaps from the up position to the down position and then back to the up position to eliminate air that may have accumulated within the hydraulic system.

2. Check the hydraulic pressure system gage within limits.

Note

When the airplane has been inoperative for several hours, there is a possibility that all pressure within the hydraulic system and within the hydraulic system landing gear "down" line has been dissipated.

3. Check the pressure indication of the hydraulic landing gear (down-line) pressure gage *(figures 26 & 27)*. If the hydraulic pressure indication is below the normal limits, move the hydraulic landing gear valve control to the "DOWN" position until the

hydraulic landing gear (down-line) pressure gage indicates that pressure is within limits.

4. Return the landing gear control handle to the NEUTRAL position.

5. Test the hydraulic engine driven pumps (landing gear control handle in NEUTRAL).

a. Lower the wing flaps.

Note

As the wing flaps are lowered, the hydraulic system pressure gage indication should decrease (*figure 27*).

b. When the wing flaps have reached the full down position, the hydraulic system pressure gage indication should immediately increase to 850-900 psi.

c. Move the hydraulic selector valve control to the position for the alternate engine pump, move the flap control to the up position and follow the test procedure outlined in paragraph b., watching the pressure gage for indication as the flaps reach the up position.

6. If 850-900 psi. cannot be maintained with the wing flaps, landing gear, and engine cowl flap controls in the "NEUTRAL" positions; the main wheel brakes, windshield wiper, hydraulic carburetor air induction system and the automatic pilot controls in the "OFF" position; the hydraulic system is not functioning properly.

(9) *Wing and Empennage De-icer System.*

(*a*) Check de-icer operation.

1. Turn the wing and empennage de-icer valve control to the "ON" position (*figure 24-30*).

2. Make certain the wing and empennage de-icer boots function properly by observing the pulsation of the de-icer boots.

3. Check the wing and empennage de-icer pressure gage for 7.5 to 8.5 psi indication (*figures 26 & 27*).

4. Turn the wing and empennage de-icer control "OFF."

(10) *Automatic Pilot.*

(*a*) Check operation of the automatic pilot.

1. Check the automatic pilot oil pressure gage for an indication of 105-125 psi (*figure 27*).

2. Cage and immediately uncage the bank and climb gyro if necessary.

3. Set the rudder follow-up card and the directional gyro card on "0."

4. Turn the automatic pilot servo units "ON-OFF" valve control on the pedestal to the "ON" position (*figures 26 & 27*).

Note

The automatic pilot emergency shut-off valve control on the hydraulic control panel (*figure 4*) should always be in the "ON" position.

6. Check the operation of the automatic pilot by turning each control knob on the gyro units.

7. Actuate all the flight controls to their respective "full throw" positions to eliminate air that may have accumulated within the automatic pilot hydraulic system.

8. Turn the automatic pilot servo unit "ON-OFF" control on the pedestal to the "OFF' position.

(11) Check vacuum system suction pressure within limits.

(12) Disconnect external power.

(13) Turn the airplane battery master switch "ON" (engines operating at 1000 to 1200 rpm).

(14) Fire detector system—Check circuit.

7. SCRAMBLE TAKEOFF.

If the engine oil was properly diluted when the engines were previously stopped, the oil pressure should quickly steady itself within the limits set forth on the Specific Engine Flight Chart (Power Plant Chart), Section III. If the oil pressure is too high, fluctuates, or falls back when the engine rpm is increased, the oil dilution system should be operated to correct this condition; however, the oil pressure gage should be watched carefully as over dilution, and a low oil pressure, is likely to result under these conditions. The airpane may be flown, with fuel booster pumps (if installed) in the "ON" position as soon as there has been a definite rise (10°C or 18°F) in the oil temperatures, the oil pressures are steady, and the engines are running smoothly.

8. ENGINE AND ACCESSORY OPERATION GROUND TEST.

a. POWER CHECK.

(1) This check should be performed on one engine at a time to prevent nose-up and "brake-slipping" accidents. Retard one throttle to idle.

(2) Open the other throttle until the engine speed is: 2450 rpm (airplanes with paddle-bladed propellers); 2350 rpm (airplanes with narrow-bladed propellers.

(3) The manifold pressure gage should read field elevation pressure as was indicated by that gage prior to starting the engine. A variation of ± 1 inch Hg. is satisfactory. If the manifold pressure reading falls outside these limits, the power is not operating properly.

(4) Instrument readings—Check within operating range.

b. IGNITION SYSTEM. — For efficient operation this check should be combined with the power check to avoid unnecessary throttle juggling. Perform the check on one engine at a time.

(1) Engine speed—Same as power check.

(2) Left engine ignition switch — Move from "BOTH" to "LEFT" and observe "drop off"—65 rpm maximum (25 rpm normal).

(3) Return the left ignition switch to "BOTH". Leave the switch in the "BOTH" position until the engine has "picked-up" the lost rpm.

(4) Left ignition switch—Move from "BOTH" to "RIGHT" and observe "drop-off"—rpm maximum (25 rpm normal).

(5) Move the left ignition switch from "RIGHT" to "BOTH".

(6) Decrease left engine speed to 1000 to 1200 rpm and then repeat magneto check for right engine.

(7) If, during test, the "drop-off" exceeds 65 rpm on either "LEFT" or "RIGHT" magneto, the difference between the "drop-off" exceeds 40 rpm with the switches in either the "LEFT" or "RIGHT" position, or the engine vibrates excessively, stop the engines and inspect for malfunctions.

CAUTION

Make this ignition system check in as short a time as practicable (30 seconds maximum). Cooling of the cylinder heads, barrels, and ignition harness is insufficient when the engines are operated for prolonged periods above 1400 rpm. Do not allow the cylinder head temperatures to exceed 232°C (450°F).

c. PROPELLER GOVERNORS.—With the engines operating at 1500 rpm, move the propeller controls toward "DECREASE RPM" position until a drop in engine rpm is evidenced; then return the control to "FULL INCREASE RPM" position. Repeat this procedure three or four times during cold weather. Minimum governing speed is 1200 rpm.

d. Accomplish the following checks:

(1) Propeller feathering—Check at 1500 rpm.

(2) Cruising fuel air mixture check.

(*a*) Throttle at 1700 rpm.

(*b*) Mixture control—"AUTO RICH."

(*c*) After engine speed and instruments have been stabilized, move mixture control to "AUTO LEAN."

(*d*) Observe the engine rpm change. A change of over 25 rpm increase or 75 rpm decrease as a result of the mixture change indicates an excessively rich or lean carburetor.

(3) Acceleration and deceleration check.

(*a*) Mixture control—"AUTO RICH."

(*b*) Check acceleration and deceleration of engine. The engine should accelerate rapidly and smoothly with no tendency to backfire.

(*c*) Repeat the check with mixture control in "AUTO LEAN."

(*d*) Do not exceed 2350 rpm.

(4) Check the idle speed for 450 rpm.

(5) Ignition switch check.

(*a*) Both throttles—700 rpm.

(*b*) Pull master ignition switch "OFF' momentarily. Observe that the engines completely cease firing. Perform this check as rapidly as possible in order to prevent severe backfire when the switch is pushed on again.

(*c*) If either or both engines do not cease firing, shut down the engines and be sure personnel keep clear of the affected propeller until the difficulty has been remedied. The switch may be defective or a magneto ground lead may be open.

CAUTION

The usual system check before take-off will be unreliable when magneto ground lead trouble exists.

e. FUEL TANK SELECTION TEST.—Operate the engines, using fuel from each tank for a period of three minutes to make certain the selector valves operate properly. Operate the engines for three minutes with the cross-feed valve control (if installed) set in the "ON" position with either the right or left fuel selector valve "OFF" and the other selector valve set to an opposite tank. After the test has been completed, return both selector valves to fullest tanks and the cross-feed valve control to "OFF."

f. ADDITIONAL CHECKS.

(1) Battery switches—"ON."

(2) External power—Disconnected.

(3) Exits, and doors—Closed and secured.

(4) Surface control locks—Removed and stowed.

(5) Check the landing gear hydraulc pressure gage for a minimum indication of 500 psi (hydraulic landing gear control in NEUTRAL).

(6) Landing gear safety latch control—POSITIVE LOCKED.

(7) Deleted.

(8) All obstructions clear of the airplane.

(9) Wheel chocks—Removed.

9. TAXIING.

a. Depress the pilot's rudder pedals. This will release the parking brake control.

b. Unlock the tail wheel centering lock (*figure 25-11*).

Note

Before unlocking the tail wheel centering lock, the airplane should be rolled forward. This will relieve the locking pin from possibe side load.

Note

If the parking brake control spring breaks, depress the rudder pedals, and then push the control in.

c. Maneuver the airplane by the use of differential engine power first, the brakes second, and the rudder last.

d. Open and close the throttles gradually. Excessive engine acceleration may cause engine detonation.

CAUTION

Do not turn the airplane with the brakes fully applied to one wheel because this may damage the tire.

e. When a position opposite the end of the runway has been reached, apply the brakes evenly and as the airplane approaches a stop, reduce the braking gradually to minimize pitching.

10. TAKE-OFF.

a. SAFETY CHECK BEFORE TAKE-OFF.

(1) Carburetor mixture control—"AUTO RICH."

(2) Propeller controls—"INCREASE RPM."

(3) Fuel quantity gage (*figures 26 & 27*)—Adequate supply.

(4) Fuel tank selector controls—fullest right and left tanks.

(5) Fuel cross-feed control (if installed)—"ON."

(6) Fuel booster pumps (if installed)—"ON."

(7) Deleted.

(8) Landing gear control (*figure 4*) — "NEUTRAL."

(9) Wing flap control (*figure 4*) with wing flaps in up position—"NEUTRAL."

Note

If it is necessary to take-off in the shortest possible distance, the wing flaps may be set at a maximum of ¼ down position.

(10) Carburetor air temperature controls—"FULL COLD." If icing conditions exist—"HOT AIR." If dust conditions exist—"FILTER," if installed.

(11) Deleted.

(12) Automatic pilot servo units "ON-OFF" valve control—"OFF."

(13) All trim tab controls (*figure 25*) — "0" degrees.

(14) Engine cowl flap control (*figure 24-19*)—"TRAIL."

(15) Tail wheel centering lock control — Lock position.

(16) Adjust the throttles for 30 in. Hg. manifold pressure at sea level and check for the following conditions:

(*a*) Engine oil pressure within limits.

(*b*) Engine oil temperature within limits.

(*c*) Fuel pressure within limits.

b. TAKE-OFF.

(1) Taxi the airplane to take-off position and stop. Allow the airplane to roll forward a few feet in the direction of the take-off to insure that the airplane is aligned with the runway.

(2) With brakes applied, adjust both throttles for maximum take-off power.

Note

A minimum of 80 psi oil pressure is desired for 2700 rpm.

(3) Adjust the throttle friction lever to prevent throttle creeping during take-off.

(4) Release the brakes. As the brakes are released, there may be a slight change in heading. This can be corrected by use of differential engine power and/or by application of the rudder.

(5) After releasing the brakes, allow the airplane to accelerate without operating the elevator controls.

(6) During take-off, the co-pilot should have his left hand on the fuel pressure wobble pump handle (if installed) to maintain fuel pressure, in case of an engine fuel pump failure.

(7) When the airplane is clear of the ground, retract the landing gear in the following manner.

(*a*) Pull the landing gear safety latch control handle to the "LATCH RAISED" position (*figure 3*).

(*b*) Move the landing gear control handle to the "UP" position.

Note

The landing gear green warning light will go off, and the landing gear red warning light will come on (*figures 26 & 27*).

(*c*) When the landing gear is fully retracted, return the hydraulic landing gear control handle to the "NEUTRAL" position.

Note

The landing gear safety latch control will automatically be turned to the "SPRING LOCKED" position.

(8) Maintain maximum engine power until the air speed indicator indicates 120 mph (*figures 26 & 27*).

(9) For additional information pertinent to take-offs see the Take-off, Climb and Landing Chart Appendix I.

11. Deleted

12. CLIMB.

a. When an indicated airspeed of 120 mph has been attained, adjust the throttles as necessary to obtain the power plant settings recommended in the Take-Off, Climb, and Landing Charts, Appendix I for 435 inches Hg. (manifold pressure at sea level).

b. Refer to the Take-Off, Climb, and Landing Chart, Appendix I, for the best climbing airspeeds, time limitations on engine power, and supercharger blower control settings (if installed).

c. Use "AUTO RICH" mixture for all climbs, regardless of power conditions.

d. Deleted.

e. Adjust the engine cowl-flaps controls to maintain engine cylinder head temperatures less than 260°C (500°F).

f. Move the carburetor air controls to the "FULL COLD" position when an altitude has been attained where the air is free from excessive dust. "HOT AIR" if icing conditions are present, "FILTER" (if installed) if dust conditions are present.

Note

If icing conditions do exist, adjust the carburetor air controls to maintain 15-38°C carburetor air temperature after power is reduced.

g. As the altitude is increased, adjust the engine power controls for normal climb conditions.

Note

If necessary, the engine cylinder head temperatures and the engine oil temperatures can be reduced by climbing at indicated air speeds 10 to 20 mph higher than those specified in the Take-off, Climb and Landing Chart Appendix I.

13. GENERAL FLYING CHARACTERISTICS.

a. GENERAL.

(1) Stability:

(*a*) With normal and full military loads, the airplane is stable.

(*b*) Under normal loading conditions, a tendency toward nose heaviness is anticipated. This gives rise to the restriction calling for use of fuel from front (MAIN) tanks first after cruising altitude has been reached. In certain limited instances when cargo cannot be carried well forward and there is a definite trend toward tail heaviness, it is permissible to reverse the usual procedure and consume fuel from the rear (AUX.) tanks first. This will alleviate the tail heavy

condition which would be accentuated if fuel were used from the front tanks first. However, it is more desirable that the cargo be so located that the normal fuel consumption procedure can be followed.

(*c*) Do not subject the airplane to high acceleration loading during steep turns.

(2) Trim:

(*a*) Elevator trim tabs: The elevator trim tabs are sensitive and must be used with care.

(*b*) Flaps down: Airplane has a tendency to be nose heavy.

(*c*) Landing gear down: Slightly nose heavy.

(*d*) Cowl flaps open: Slightly nose heavy.

(*e*) One engine failure: Nose heavy and requires a 3° rudder tab trim setting.

b. CHANGING POWER CONDITIONS DURING FLIGHT.

(1) Refer to the Flight Operation Instruction Charts, Appendix I, for the desirable settings of the propeller control when the flying distance is predetermined, and for all the alternate cruising conditions.

(2) For minimum fuel consumption under cruising conditions, operate at reduced engine power. Reduce the engine power by means of lower engine speed rather than by reduced manifold pressures at high engine speed.

(3) To prevent excessive cylinder pressures when changing power conditions, use the following procedure:

(*a*) INCREASING POWER.

1. Mixture control lever—At the proper setting for the desired power condition.

2. Propeller controls—Adjust to obtain the desired engine rpm.

3. Throttle controls—Adjust to obtain the desired manifold pressure.

(*b*) REDUCING POWER.

1. Throttle controls—Adjust to obtain the desired manifold pressure.

2. Propeller controls—Adjust to obtain the desired engine rpm.

3. Throttle controls—Readjust as necessary.

4. Mixture controls—Adjust to the proper setting for the desired cruising condition.

(4) If reference is not made to the Flight Operation Instruction Chart, when changing engine power, use the following method: Below full throttle altitude, in order to maintain constant power at a constant engine rpm, gradually increase the manifold pressure approximately ¼ inch Hg. per 1000 feet increase in altitude. Above full throttle altitude, approximate constant power can be maintained by increasing the engine speed 50 rpm to offset each inch Hg. loss of manifold pressure until a maximum allowable cruising rpm is reached.

(5) Apply carburetor heat for 1 to 2 minutes every ½ hour during flight to preclude the possibility of carburetor icing.

c. Deleted.

d. RESTRICTED USE OF AUTOMATIC PILOT.

(1) Do not operate airplane by automatic pilot in extremely turbulent air, or when one engine is not delivering normal power output.

(2) Do not place airplane under control of the automatic pilot at any speed or altitude until the pilot has determined by manual operation that the existing flight conditions permit safe control by the automatic pilot, and in no case will automatic pilots be used when the airplane is flying at less than an indicated airspeed of 40 mph above the stalling speed.

(3) Do not use automatic pilot unless one rated pilot remains "on watch" and maintains a close check of the airplane and instruments.

(4) Do not engage automatic pilot when follow-up indexes are not lined up.

(5) Do not make course and altitude changes by rapid knob movements. Turn slowly and smoothly.

(6) Do not allow airplane to get too far out of trim.

(7) Do not turn any of the three speed controls to "OFF" or lowest speed when automatic pilot is engaged, as this would lock the corresponding surface controls in whatever position they happen to be.

14. STALLS.

a. STALLING SPEEDS. — The power-off stalling speeds of the airplane (Airspeed Indicator Readings) are as follows:

GROSS WEIGHT (LBS.) / FLAP SETTING	21,000	26,000	31,000	33,000
	INDICATED AIRSPEED (MPH)			
Retracted	69	77	84	87
¼ Down	66	73	80	83
½ Down	63	70	76	79
Full Down	60	67	73	75

b. CHARACTERISTICS.

(1) Gentle buffeting warns of an impending stall.

(2) When stalled, the airplane has a tendency to roll.

(3) Maintaining the airplane at a stall results in severe tail buffeting.

c. RECOVERY.—If altitude permits, accomplish the recovery gently, but firmly. Normal procedure is used for corrective measures.

14A. TURBULENT AIR AND THUNDERSTORM FLYING.

Note

Flight through a thunderstorm should be avoided if it is at all possible. However, since circumstances may force you at some time to enter a zone of severe turbulence, you should be familiar with the techniques recommended for flying the airplane under such conditions. Do not operate the airplane at gross weights above 26,000 pounds if flight through a thunderstorm is contemplated. At these higher weights it is unsafe to penetrate a thunderstorm where 43 fps gusts will be encountered. When gusts are 30 fps or less, the best penetration speeds are 142 mph IAS to 179 mph IAS.

a. GENERAL.—Power setting and pitch attitude are the keys to proper flight technique in turbulent air. The power setting and pitch attitude required for the desired penetration airspeed (*figure 28A*) and established before entering the storm must—if maintained throughout the storm—result in a constant airspeed, regardless of any false readings of the airspeed indicator. Specific instructions for preparing to enter a storm and flying in it are given in the following paragraphs.

b. APPROACHING THE STORM.—It is imperative that you prepare the airplane prior to entering a zone of turbulent air. If the storm cannot be seen, its proximity can be detected by radio crash static. Prepare the airplane as follows:

(1) Disengage auto-pilot.

(2) Propeller controls 2350 rpm for gyroscopic stability.

(3) Mixture controls—"RICH."

(4) Pitot tube heater switch—"ON."

(5) Carburetor heat—As required.

(6) Throttles adjusted as necessary to obtain penetration speed. (*See figure 28A*).

(7) Check suction gage for desired reading and gyro instruments for proper settings.

(8) Safety belt tightened. (Check with crew members.)

(9) Turn off any radio equipment rendered useless by static.

(10) Make sure trailing antenna is not extended.

(11) At night, turn cockpit lights full bright or use dark glasses to minimize blinding effect of lighting.

CAUTION

Do not lower gear and flaps as they merely decrease the aerodynamic efficiency of the airplane.

c. IN THE STORM.

(1) Maintain power setting and pitch attitude (established before entering the storm) throughout the storm. Hold these constant and your airspeed will be constant—regardless of the airspeed indicator.

(2) Devote all attention to flying the airplane.

(3) Expect turbulence, precipitation, and lightning, and don't allow them to cause undue concern.

(4) Maintain attitude. Concentrate principally on holding a level attitude by reference to the artificial horizon.

(5) Don't chase the airspeed indicator, since doing so will result in extreme airplane attitudes. If a sudden gust should be encountered while airplane is in a nose high attitude, a stall might easily result. A heavy rain, by partial blocking of the pitot tube pressure head, may decrease the indicated airspeed reading by as much as 70 mph.

(6) Use as little elevator control as possible to maintain your attitude in order to minimize the stresses imposed on the airplane.

(7) The altimeter is unreliable in thunderstorm flying because of differential barometric pressures within the turbulent area. A gain or loss of several thousand feet may be expected. Make allowance for this error in determining minimum safe altitude.

Note

Normally, the least turbulent area in a thunderstorm will be below an altitude of 6000 feet above the terrain. Altitudes between 10,000 feet and 20,000 feet are usually the most turbulent.

15. SPINS.

If an inadvertent spin occurs, recovery is normal, attention should be given to the wing loading during the "Pull-out."

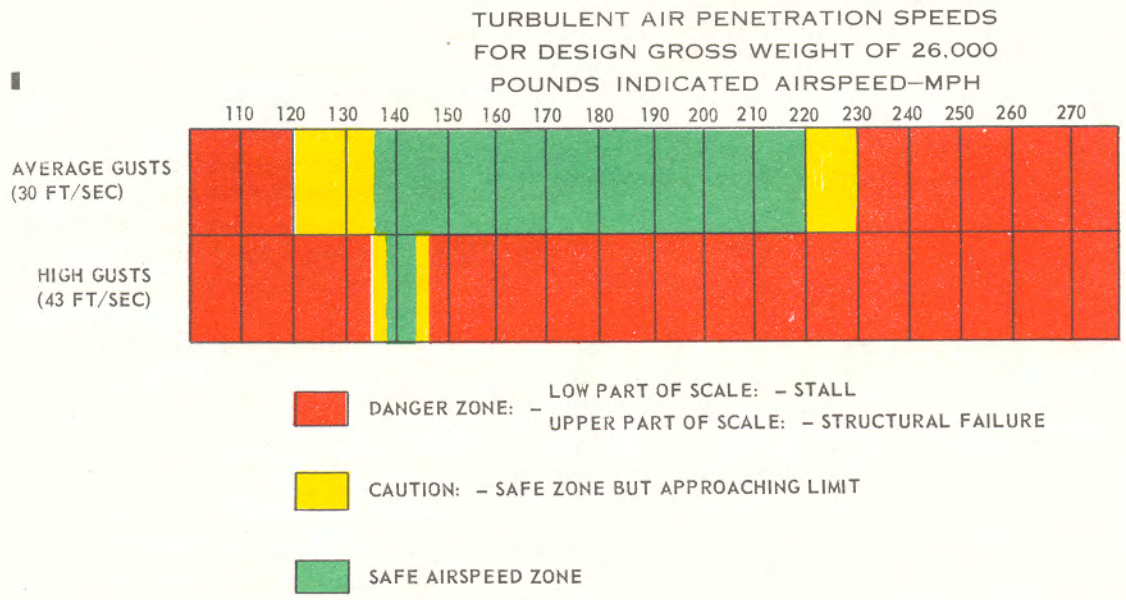


Figure 28A—Turbulent Air Penetration Speeds

WARNING

If an uncontrollable spin is allowed to develop below 5,000 feet, abandon the airplane.

16. ACROBATICS.

Acrobatics are strictly prohibited.

17. DIVING.

Diving is strictly prohibited.

18. NIGHT FLYING.

a. EXTERNAL LAMPS.—Turn on the landing lights, passing light, recognition lights, and running lights.

b. NIGHT LANDING. — Landings at night are made in the normal manner.

19. APPROACH AND LANDING.

a. PRELIMINARY APPROACH.—Make the preliminary approach for landing at 1000 feet altitude at an indicated airspeed of 110 mph.

(1) Turn the fuel tank selector controls to the tanks containing the largest quantity of gasoline. (Right and left tanks respectively.)

(2) Cross-feed control (if installed)—"ON."

(3) Booster pumps (if installed)—"ON."

(4) Trailing wire antenna—Retracted.

(5) Carburetor mixture control—"AUTO-RICH."

(6) Automatic pilot engaging control (*figure 25-7*) "OFF."

(7) Engine cowl flaps—"CLOSED."

(8) Adjust propeller controls to obtain approximately 2550 rpm.

CAUTION

When the airplane is in a glide, move the throttles to 1/3-1/2 open position at intervals of not more than 20 seconds. This will prevent the engine from stalling due to the fouling of the spark plugs or because of low cylinder head temperatures.

(9) Carburetor air control — "FULL COLD." If icing conditions exist, "HOT AIR." If dust conditions exist, "FILTER."

(10) Test the operation of the landing gear warning horn by closing one throttle. The warning horn should sound when the landing gear is not down and locked.

(11) Check landing gear safety latch control — "SPRING LOCK."

Note

If the safety latch control is inadvertently moved to "LATCH RAISED", this sequency error can be corrected by pulling the dog (*figure 3*) forward to allow the catch to spring into place. The latch control will then return to "SPRING LOCK."

(12) Landing gear control—"DOWN."

CAUTION

Do not extend the landing gear in excess of 160 mph IAS.

(13) When the landing gear has reached the extended position and the landing gear hydraulic pressure has built up to 850 psi, move the landing gear control handle rapidly to "NEUTRAL."

(14) Landing gear safety latch control—"POSITIVE LOCK."

(15) Deleted.

(16) Check the landing gear warning lights:

(*a*) Green warning light "ON" (*figures 26 & 27*).

(*b*) Red warning light "OFF."

(17) Landing gear warning horn — "SILENT," with throttles closed.

Note

The landing gear warning horn will sound provided one or both throttles are closed or if any one of the following conditions exist:

(*a*) One or both landing gears are retracted.

(*b*) One or both landing gears are unlatched.

(*c*) The landing gear control is not in the "NEUTRAL" position.

(18) Visually check each landing gear for full extended position.

Note

If sufficient hydraulic pressure to extend the landing gear, 500 psi, is not maintained by the engine-driven hydraulic pumps, actuate the hydraulic hand pump handle (*figure 4*) to raise the hydraulic pressure.

(19) Extend the wing flaps as necessary. Return the wing flap control handle (*figure 4*) to the "NEUTRAL" position.

(20) Test the brake (toe pressure to pedals) for normal brake pressure.

(21) Check the tail wheel centering lock control in "LOCK" position.

b. FINAL APPROACH AND LANDING.

(1) Refer to the Take-off, Climb, and Landing Chart, Appendix II, for the necessary landing run.

(2) Make the final approach for landing at an altitude sufficient to clear any obstructions at the end of the runway at an indicated airspeed of 100 mph.

(3) Extend the wing flaps as necessary.

CAUTION

Do not extend the wing flaps at an airspeed in excess of the airspeed allowable for lowering the flaps. The allowable airspeed for extending the flaps is marked on the airspeed indicator.

(4) Retract the wing flaps as soon as possible after landing.

(5) Apply the wheel brakes as necessary.

Note

If necessary, the wheel brakes can be fully applied (even though the airplane is in the tail high attitude), provided the airspeed is above 40 mph and the control column is held all the way back.

(6) Before taxiing "unlock" the tail wheel centering lock.

c. Deleted.

d. CROSS-WIND LANDING.

CAUTION

In cross-winds higher than 20 mph do not attempt to land at more than 10 degrees out of the wind.

(1) Keep the nose of the airplane lower than usual during final approach.

(2) Lower the windward wing. Head the airplane toward the wind sufficiently to maintain a course parallel to the runway.

(3) When the airplane is within a few feet of the ground, level the wings and turn the airplane parallel to the runway.

(4) Make a definite two wheel landing (tail wheel up).

(5) When the wheels contact the ground, slightly lower the airplane nose, idle the downwind engine, and retract the wing flaps.

Note

The airplane is much less affected by horizontal wind gusts when the wing flaps are retracted.

(6) Adjust the power of the upwind engine as necessary in order to maintain the directional course of the airplane.

e. EMERGENCY TAKE-OFF IF LANDING IS NOT COMPLETED.

(1) Move the throttles gradually toward "OPEN."

(2) Move the propeller controls to "INCREASE RPM" position.

(3) When the airplane is clear of the ground and all obstructions, retract the landing gear.

(4) "Milk" the wing flaps up.

CAUTION

Do not leave the wing flaps extended more than 12 degrees.

(5) As the wing flaps are retracted, trim the airplane for climb.

(6) Move the engine cowl flap control to the "TRAIL" position.

(7) Maintain maximum engine power until an indicated air speed of 120 mph has been attained.

(8) Adjust the throttles as necessary. Adjust the propeller controls for 2550 rpm.

(9) Proceed with normal climb.

19A. POST-FLIGHT CHECK.

After the last flight of the day accomplish the following post-flight checks:

a. Ignition switch check.

b. Idle speed and mixture check.

(1) Check the idle speed for 450 rpm.

(2) When the engine speed is stabilized, move the mixture control slowly and with a smooth movement toward "IDLE CUT-OFF" and carefully observe the manifold pressure gage for any change in manifold pressure during this leaning procedure. When the engine speed has dropped to 300 rpm during the leaning procedure, return the mixture control to "AUTO-RICH." While leaning out the mixture with the mixture control, a decrease of more than 1/4-inch manifold pressure during the leaning out indicates an excessively rich idle mixture. An immediate increase in manifold pressure not preceded by a momentary decrease indicates that the idle mixture is too lean.

c. Engine power check.

d. Ignition system check.

e. Cruising fuel air mixture check.

20. STOPPING ENGINES.

a. STOPPING ENGINES DURING WARM WEATHER.

(1) COWL FLAPS—"OPEN."

Note

Residual heat above 120°C (248°F) within the engine section may damage the spark plug elbow electrical-insulation.

(2) If the engine cylinder temperature is above 205°C (400°F) idle the engine at 1000 rpm until the temperature is below this figure.

(3) Move the propeller controls to "INCREASE RPM."

(4) Turn the booster pump switches (if installed) —"OFF."

(5) Move the carburetor mixture control—"IDLE CUT-OFF."

Note

The carburetor mixture controls should be in the "IDLE-CUT-OFF" position at all times when the engines are inoperative.

(6) After the engine has stopped, turn the engine ignition switch "OFF" *(figures 12 & 13)*.

(7) Make certain all radio equipment switches are "OFF."

(8) Deleted 10 March 1948.

(9) Turn the airplane battery switches *(figures 12 & 13)* "OFF."

b. STOPPING ENGINES DURING COLD WEATHER.

(1) If a temperature below 4°C (40°F) is anticipated before the engines are to be started, dilute the oil as follows:

(a) Idle the engines (or allow the engines to remain inoperative) until the cylinder head temperatures are below 148°C (234°F) and until the engine oil temperatures are below 50°C (120°F).

(b) With the engines idling at 800-900 rpm, hold the oil dilution switches *(figures 12 & 13)* in the "DILUTE" position from 1 to 7 minutes depending on the expected temperature and the grade and amount of oil in the system. A drop in oil pressure indicates that the oil dilution system is functioning.

1. For temperatures from 4°C to minus 12°C (40°F to 10°F) "DILUTE" for approximately 2 minutes.

2. For temperatures from minus 12°C to minus 29°C (10°F to minus 20°F)—"DILUTE" for approximately 4 minutes.

3. For temperatures from minus 29°C to minus 46°C (minus 20°F to minus 50°F)—"DILUTE" for approximately 7 minutes.

(c) At the end of the oil dilution period increase the engine speed to 1200 rpm. Move the propeller controls slowly from "INCREASE RPM" to "DECREASE RPM" in order to allow diluted oil to enter the propeller domes. Return the controls to "INCREASE RPM." Repeat this procedure three times.

(d) After the oil is diluted as much as desired, turn the carburetor mixture controls to "IDLE CUT-OFF." Continue the oil dilution until the engine stops.

(e) Turn the ignition switches—"OFF."

(f) Move the engine cowl flaps control—"OPEN."

21. BEFORE LEAVING PILOT'S COMPARTMENT.

a. Fuel tank selector controls—"OFF."

b. Mixture controls—"IDLE CUT-OFF."

c. Cross-feed control (if installed)—"OFF."

d. Booster pumps (if installed) "OFF."

e. Deleted.

f. Throttle friction lock control—"LOCKED" position.

g. Adjust the following hydraulic controls to the position that will allow unequal pressure (due to thermal expansion) to equalize throughout the hydraulic system:

(1) Wing flap control—"UP" position.

(2) After engine has cooled, cowl flap valve control "CLOSED" position.

(3) Landing gear control—"DOWN" position.

h. All electrical switches except generator switches —"OFF."

i. Radio equipment switches—"OFF."

j. Aileron, elevator and rudder trim tab controls—Set at "0" degrees.

k. Apply the tail wheel centering lock.

Note

Move the airplane forward to relieve the tail wheel locking pin from possible side load.

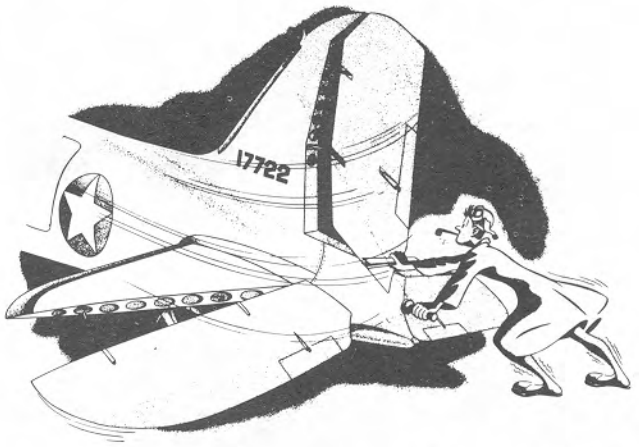
l. Release parking brakes after wheel chocks are in place.

m. Before leaving the airplane, make the following checks:

(1) Main cargo door securely closed.

(2) Landing gear safety pins installed.

(3) Wing and empennage surface control locks installed.



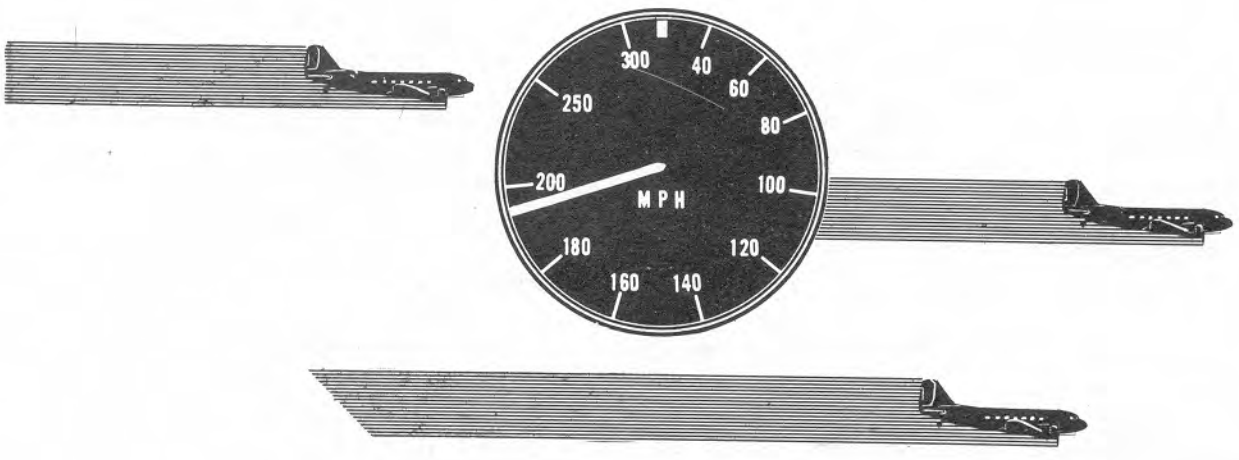
"March winds and April showers blow your surfaces and disturb your hours."

Section III

FLIGHT OPERATION DATA

MPH. INDICATED AIRSPEED	MPH. CORRECTION
80	+6
100	+6
120	+6
140	+6
160	+5
180	+5
200	+4

Figure 29 — Air Speed Indicator Correction Chart.



(Figure 30 deleted)

1. OPERATIONAL WEIGHT LIMITATIONS

a. GENERAL.—"What is the maximum weight at which this airplane can be operated?" is one of the questions which frequently arise as a natural adjunct of flight planning. Unfortunately, there is no single answer to this question since the "maximum" permissible weight of an airplane can vary within broad limits, depending on certain weight controlling criteria. And since these criteria can be set at various optimums to accommodate varying conditions, it becomes apparent that the maximum weight of an airplane can be a rather elusive quantity. Following are some of the controlling criteria with illustrations of how they can vary:

(1) SPACE CAPACITY.—The maximum load that can be carried in a given aircraft will be limited by the space available in which to carry additional load. Space limitations do not normally apply to cargo aircraft.

(2) MARGIN OF SAFETY AND LOAD FACTORS.—It is readily understandable that as a structure is loaded to higher weights, its ability to withstand shocks or additional loads resulting from maneuvers becomes increasingly less. The amount of shock or additional load that the structure will sustain before failure occurs is the margin of safety. In planning any airplane mission, cognizance must be taken of the fact that the "maximum" permissible weight may depend on the margin of safety desired for the various supporting structures (wings, landing gear, bomb shackles, etc.) Should the mission require excessive maneuvering or flight through turbulent air, it would be advisable to maintain a larger margin of safety for the wing structure than if smooth, level flight were contemplated. And as pointed out, the larger the margin of safety, the lower the "maximum" permissible weight. It will be noted that as regards aircraft, load factors are used as an indication of the margin of safety that is available. At any particular moment of operation, the structural margin of safety of the wing, for example, will be equal to the difference between the load factor the wing is capable of making good, and the load factor the wing is sustaining at that moment. For example, should the airplane be loaded so that the wing is capable of making good a load factor of 2.6, and during various phases of the flight, load factors of 2.0, 2.3, and 1.5 are imposed on the wing, the margins of safety during these phases will be 0.6, 0.3, and 1.1 load factors, respectively. It is therefore of prime importance to anticipate the maximum load factors that will be encountered during a mission, in order that the airplane will be loaded in such fashion that the load factors it can make good will never be exceeded during any part of the flight. Experience has shown that an airplane should never be overloaded to the point where it cannot make good a load factor of 2.0, inasmuch as it is extremely difficult to accomplish a mission, even under ideal conditions, during which the aircraft will not be subjected to load factors of at least 2.0.

(3) DISTRIBUTION OF LOAD. — The maximum load that the airplane can carry is dependent on the way that load is distributed throughout the airplane. The weight of an airplane in flight is supported by the wings, and therefore the more load that is carried in the fuselage, the greater will be the bending moment on the wings. This means that an airplane might safely carry 20,000 pounds if 12,000 pounds were carried in the fuselage and 8000 pounds were in the wings. But the same 20,000 pounds might become an unsafe load if the weight distribution were 16,000 pounds in the fuselage and 4000 pounds in the wings—the unsafe condition resulting from the excessive bending moment imposed on the wings by the 16,000 pounds in the fuselage.

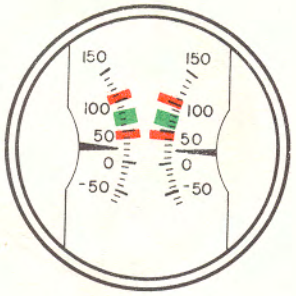
(4) PERFORMANCE LIMITATIONS.—In some instances, it will be found necessary to limit the maximum permissible weight of the airplane, not because of structural considerations, but because of unsatisfactory performance at the higher weights. Maximum take-off weight must necessarily be limited by the ability of the aircraft to take-off within the available runway length, its ability to clear any obstacles, and its ability to fly with partial power failure.

b. OPERATING WEIGHT.—Thus we may see that the old question of maximum gross weight for operation is a two-fold consideration: strength of the structure, and performance of the airplane. The design gross weight of the C-47 is 26,000 pounds. This weight should not be construed to be the maximum at which the airplane may be flown; it is merely a weight chosen as a basis for design. At this weight the C-47 has a positive limit load factor of 3.00, meaning simply that the structure can stand a positive acceleration of 3 G's (2 G's in addition to the 1 G enforced on the structure by straight and level flight in smooth air). At 33,000 pounds this limit load factor reduces to 2.33; and while the airplane will stand moderately rough air, it should not be flown in turbulence such as might be encountered in a thunderstorm. Performance wise the airplane is limited to 33,000 pounds since at this weight single engine operation becomes the limiting factor. On a standard day (NACA) the single engine service ceiling of a 33,000 pound C-47 is sea level; that is, sea level is the highest altitude at which a rate of climb of 100 feet per minute can be maintained on one engine operating at full military

power (1200 BHP). A weight which might be chosen for normal operation could be 29,000 pounds. At this weight the single engine service ceiling with military power is 6500 feet; with normal rated power, 5800 feet.

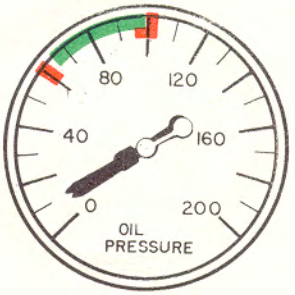
c. LANDING GEAR LOAD FACTOR. — Under landing conditions the loads applied to an aircraft structure are quite different from flight conditions. At 33,000 pounds the limit load factor of a C-47 during landing is 2.95 and is safe for any reasonable landing. The brakes have the capacity to stop the airplane when they are used in accordance with the proper procedures.

d. CONCLUSIONS.—That the fixing of a number and designating it as the maximum allowable gross weight of an airplane is controversial must be apparent An airplane is a dynamic thing— a complex series of compromises. In gaining heavy loading, safety factors must be sacrificed. To recommend a maximum gross weight of any airplane would be forcing a dynamic machine into a set of fixed conditions, whereas these conditions really vary from day to day and hour to hour. The temperature, the barometer, and the wind existing at the particular time must be considered. Reference to the Appendix I data of this Flight Handbook is recommended. This data is conservative and based on a standard atmosphere. Correction factors are given where applicable.



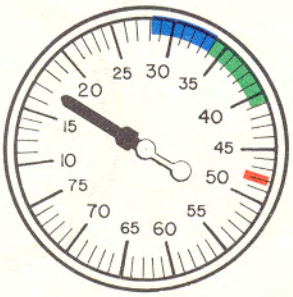
OIL TEMPERATURE

- 40°C MIN FOR FLIGHT
- 60°C TO 80°C NORMAL
- 100°C MAXIMUM



OIL PRESSURE

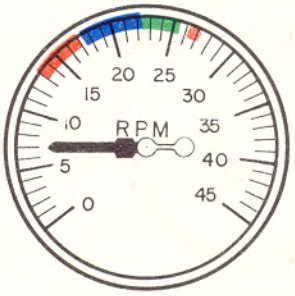
- 60 PSI MIN FOR FLIGHT
- 65 TO 100 PSI NORMAL
- 100 PSI MAXIMUM



MANIFOLD PRESSURE

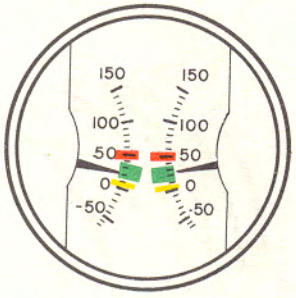
- BLUE ARC 28-34 IN. HG.
- GREEN ARC 34-41 IN. HG.
- ABOVE 41 IN. HG. 5 MIN. LIMIT A.R. REQ.
- 48 IN. HG. TAKE OFF POWER

FUEL GRADE 100/130



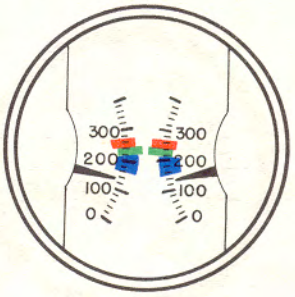
TACHOMETER

- 1300 TO 1700 RPM DANGEROUS EMPENNAGE VIBRATION
- 1700 TO 2250 RPM–A.L. PERMITTED
- 2250 TO 2550 RPM–A.R. REQ. ABOVE 2550 RPM 5 MIN LIMIT A.R. REQ.
- 2700 RPM MAXIMUM



CARB. AIR TEMPERATURE

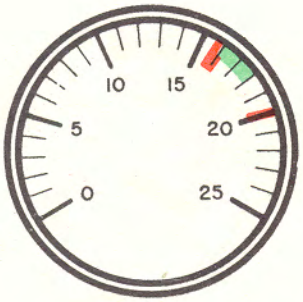
- -10°C TO 15°C – POSSIBLE ICING
- 15°C TO 38°C – NORMAL
- 50°C — DETONATION



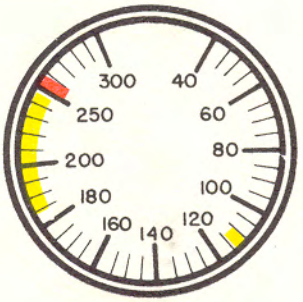
CYL. HEAD TEMPERATURE

- 150°C–232°C–A.L. PERMITTED
- 232°C TO 260°C – A.R. REQ
- 260°C – MAX.

Figure 31—Instrument Range Markings
(Sheet 1 of 2)



FUEL GRADE 100/130

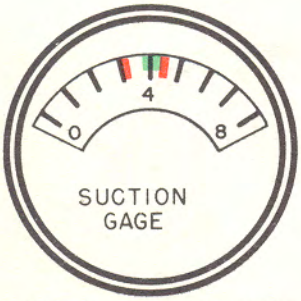


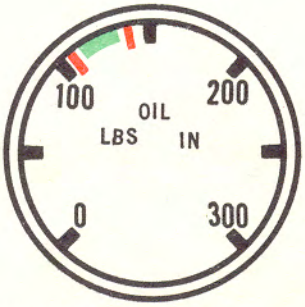
FUEL PRESSURE

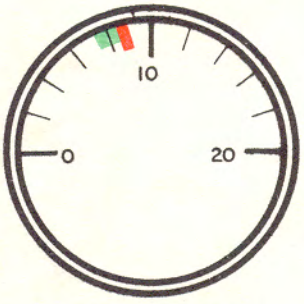
- 16 PSI—MIN. FOR FLIGHT
- 16 TO 18 PSI—NORMAL
- 20 PSI — MAX.

AIRSPEED

- 112 MPH—MAX. FLAPS
- 185-255 MPH MAX DIVING (33,000-26,000 LB)
- 255 MPH—MAX. DIVING







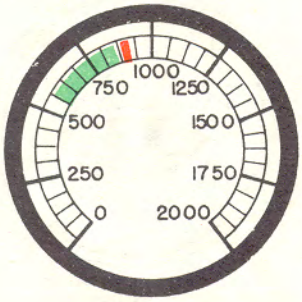
- 3.5" IN. HG — MINIMUM
- 3.75" TO 4.25" IN. HG — NORMAL
- 4.5" IN. HG — MAX

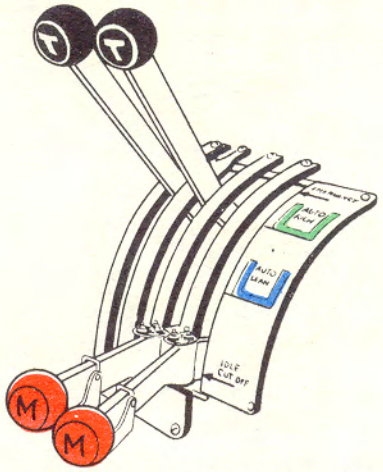
AUTO PILOT OIL PRESSURE

- 105 PSI – MINIMUM
- 110 – 130 PSI – NORMAL
- 140 PSI – MAX.

DEICING PRESSURE

- 7.5 TO 8.5 PSI—NORMAL
- 9 PSI — MAX.





HYDRAULIC PRESSURE

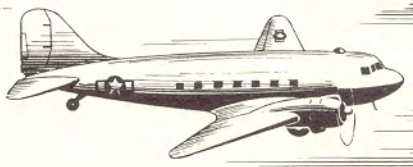
- 600 TO 875 PSI—NORMAL
- 900 PSI——MAX.

MIXTURE CONTROL QUADRANT

- AUTO — LEAN
- AUTO — RICH

Figure 31—Instrument Range Markings (Sheet 2 of 2)

Section IV



EMERGENCY OPERATING INSTRUCTIONS

1. ENGINE FAILURE DURING TAKE-OFF.

a. FAILURE ON THE GROUND.

(1) Do not attempt to take-off.

(2) Close the throttles and apply the brakes.

(3) Mixture control—"IDLE CUT OFF."

(4) Ignition, generator, and the battery switches —"OFF."

(5) Fuel booster pump switches (if installed)—"OFF."

(6) Fuel tank selector controls and cross-feed control (if installed)—"OFF."

Note

If it is impossible to stop on the runway, it may be desirable to retract the landing gear to obtain a more sudden stop in order to avoid running into obstacles.

b. ONE ENGINE FAILURE IN THE AIR PRIOR TO REACHING SINGLE ENGINE AIR SPEED. (Minimum of 110 mph for take-off.)

(1) Close the throttles, lower the wing flaps, and maintain "straight ahead" directional control in preparation to land.

(2) If there are obstacles or rough terrain ahead, retract the landing gear.

(3) Mixture control—"IDLE CUT OFF."

(4) Ignition, generator and battery switches—"OFF."

(5) Booster pump switches (if installed)—"OFF."

(6) Fuel tank selector controls and cross-feed controls (if installed)—"OFF."

(7) Land straight ahead.

c. ONE ENGINE FAILURE IN THE AIR AFTER REACHING SINGLE ENGINE AIR SPEED.

(1) Lower the nose of the airplane sufficiently to attain 110 mph before starting climb.

(2) Adjust the operative engine controls to insure safe single engine performance.

(*a*) Adjust the rudder trim tab control for directional control (*figure 25-8*).

CAUTION

Reduce the engine power if *full* rudder trim tab position will not maintain directional control.

(*b*) Adjust the engine cowl flaps as necessary to prevent the engine cylinder head temperature from exceeding 260°C (500°F).

Note

In case of emergency, move the carburetor mixture control to the "EMERGENCY" position by pushing the control forward and breaking the safety lock wire.

(3) Turn the engine hydraulic pump selector control to the operative engine pump.

(4) Retract the landing gear if not already in the retracted position.

(5) Operate the fuel pressure wobble pump (if installed). Booster pump (if installed)—"ON."

(*a*) If the failing engine responds, continue the operation of the wobble pump, and then attempt to attain maximum engine power.

(6) If the failing engine does not respond, feather the propeller in accordance with following paragraph 1A*a*. (8).

(7) In an attempt to re-start the inoperative engine is made, proceed in accordance with following paragraph 1A*b*.

(8) If prolonged single engine flight is necessary, after an altitude of 500 feet has been attained, turn the aileron trim tab control as necessary *toward* the operative engine.

(9) If prolonged single engine flight is not necessary, prepare to land.

CAUTION

Turns into a dead engine may be made safely if airplane is trimmed and safe airspeed is obtained before starting a turn. Never increase power on operative engine suddenly during a turn as this may cause loss of control. However, whenever possible, turns should be made toward the operative engine.

(*a*) Deleted.

(*b*) Deleted.

(*c*) Deleted.

WARNING

Deleted

(*d*) Deleted.

(*e*) Deleted.

1A. ENGINE FAILURE DURING FLIGHT.

a. FAILURE OF ONE ENGINE.—It is very important in most cases of engine failure to get the operating engine properly adjusted first so as to continue safe single engine flight. The controls for the operating engine should be set as follows:

(1) Mixture control "AUTO RICH."

(2) Adjust controls of the operative engine to insure safe single-engine performance.

(3) Deleted.

(4) Open cowl flaps as necessary to keep cylinder temperatures below 260°C (500°F).

Note

In case of emergency, move the carburetor mixture control to the "EMERGENCY" position by pushing the control all the way forward (this will break the safety lockwire).

(5) Turn the engine hydraulic pump selector control for the main hydraulic system to the operative engine (*figure 4*).

(6) Adjust the rudder trim tab control for directional control (*figure 25-8*).

CAUTION

Reduce the engine power if *full* rudder trim tab position will not maintain directional control.

(7) Set the aileron trim tab control at a 3° bank *toward* the operative engine.

(8) Feather the propeller of the inoperative engine as follows:

(*a*) Throttle control—Closed.

(*b*) Depress the propeller feathering button (*figures 12 and 13*).

Note

If the feathering action does not occur within 90 seconds, pull the feathering button out.

(*c*) Mixture control—"IDLE CUT-OFF."

(*d*) Fuel tank selector control—"OFF."

(*e*) Cross feed valve (*if installed*)—"OFF."

(*f*) Fire extinguisher selector control—Set to *inoperative engine.*

(*g*) Cowl flap control—"TRAIL."

(*h*) Ignition switch (*after propeller has stopped turning*)—"OFF."

(*i*) Generator main line switch (*within the main electrical junction box*)—"OFF."

(*j*) Shut down engine completely.

(9) If prolonged single engine flight is necessary, refer to the Flight Operation Instruction Charts, Appendix I, for single engine cruising data.

b. RESTARTING AN ENGINE DURING FLIGHT.

(1) Propeller control—Full "DECREASE RPM."

(2) Throttle control—¼ open.

(3) Depress feathering button and hold in place until engine speed is approximately 1000 rpm.

(4) Ignition switch—"BOTH," after propeller has turned at least three revolutions.

(5) Fuel tank selector control—On desired tank.

(6) Fuel booster pump switch (*if installed*)—"ON."

(7) Mixture control—"AUTO RICH" after fuel pressure is attained.

(8) Generator switch—"ON" at 1000 rpm (*release feathering button*).

(9) Cowl flap control—As required.

(10) Allow engine to warm up at low rpm.

c. LANDING WITH ONE ENGINE INOPERATIVE.—If possible, a normal traffic pattern and approach should be flown. Under certain conditions such as maximum gross weight, it may be desirable to make the downwind and base leg of the pattern at slightly higher altitude, but after the landing gear has been extended, the final approach should be as close to normal as conditions permit. Extend the landing gear and wing flaps only when it is assured the airplanes will get into the field without power. Normally, the landing gear should be extended after turning on the final approach. The pilot should have the co-pilot or other crew member stand by to operate the hydraulic handpump should the engine driven pump fail. Approach at 110 mph IAS (minimum of 100 IAS) with good engine operating at a low manifold pressure. Keep the throttle open sufficiently to maintain the desired 110 IAS until it is certain that the added drag will not cause undershooting. Reduce power and straighten the rudder tab as the landing gear is being extended. When the landing gear is fully down and locked, lower the wing flaps as needed. Land the airplane in the normal manner.

Note

During single-engine landings it is recommended that the propeller of the failing engine be feathered only if the engine is entirely inoperative. If the engine can be operated at reduced power, (even though a drop in oil pressure or engine roughness is present) operate during landing.

2. FIRE.

a. GENERAL.

(1) When a fire is discovered, all members of the crew and personnel aboard should attach parachutes in readiness for emergency use.

(2) If flying at a low altitude, and conditions permit, gain as much altitude as possible.

(3) If attempts to extinguish the fire fail and favorable conditions exist, attempt a landing.

(4) If necessary, abandon the airplane over an uninhabited area where it will cause the least damage to property as a result of crashing.

(5) Remove the bail-out warning bell switch cover and move the switch (*figures 12 & 13*) to the "ON" position to signal all aboard to abandon the airplane.

b. ENGINE FIRE.—Proceed as follows for the engine on fire:

(1) Feathering button—Depress.

(2) Mixture control—"IDLE CUT-OFF."

(3) Fuel tank selector control—"OFF."

(4) Cross feed valve—"OFF' (if installed).

(5) Fire extinguisher selector control—Set to engine on fire.

(6) Fire extinguisher release handle—Pull up as soon as engine stops.

(7) Cowl flap control—"TRAIL."

(8) Ignition switch—"OFF."

(9) Shut down engine completely.

(10) Do not attempt to restart engine.

(11) Open all emergency exits (*figure 32*) in case it becomes necessary to abandon airplanes while in flight.

(12) Land as soon as possible, determine the cause of the fire, and correct the condition before starting the engine.

Note

After the fire has been extinguished and the engine has cooled sufficiently, close the cowl flaps to obtain minimum drag.

c. WING FIRE.

(1) If a wing fire occurs during night flight operation, turn the switches which control all the lights within the wing to the "OFF" position.

(2) Open the airplane emergency exits.

(3) Attempt to extinguish the fire by side-slipping the airplane away from the wing afire.

d. CABIN FIRE.

(1) Close all hatches, doors, and ventilating ducts. On airplanes equipped with the steam type heating system, turn the cold air intake conrtol (*figure 35*) to the "OFF' position. On airplanes equipped with the direct exhaust type heating system, adjust the mixing valve controls to the full "HOT" positions. Turn both emergency spill valve controls to the "SPILL" position.

(2) Use the hand fire extinguisher (behind and above the pilot's seat) on the fire.

(3) Attack fire immediately with all available fire extinguishers. Crew members not actively engaged in fighting the fire will use 100% oxygen supply and will aid those engaged in fighting the fire if they are in distress.

WARNING

The products of decomposition of carbon tetrachloride and the products of combustion of various combustible materials are toxic. Prolonged exposure to these fumes is undesirable. Carbon dioxide in concentrations available in hand extinguishers in this aircraft are non-toxic.

(4) After the fire is extinguished, to dissipate smoke and fumes from cabin, open only companionway door, open pilot's and co-pilot's clear vision panels, and remove rear parachute troop exit panel on the main cargo door.

3. ALARM BELL.

a. GENERAL.—An emergency warning bell is mounted on the left-hand side of the main cargo compartment forward bulkhead. This bell is operated by a guarded electric switch marked "BAIL OUT" mounted on the pilots' left-hand electric panel.

b. EMERGENCY ALARM BELL PROCEDURES.

(1) TO ABANDON AIRCRAFT.

(a) Warning—spoken warning on the interphone.

(b) Warning—three short rings on the alarm bell.

(c) Bail out—bail out order on the interphone.

(d) Bail out—one long ring on the alarm bell.

(2) DITCHING OR FORCED LANDING.

(a) Warning—spoken warning on the interphone.

(b) Warning—six short rings.

(c) Prepare for ditching or forced landing—brace—one long sustained ring on the alarm bell.

4. EMERGENCY EXITS.

a. GENERAL.—All escape handles and hatches in the airplane are plainly stenciled. *Figure 32* graphically illustrates emergency exits.

b. EMERGENCY EXIT OPERATION.

(1) MAIN CARGO DOOR EXIT.—Kick down on the painted release latch located at the main cargo door forward end and push the door from the airplane.

(2) MAIN CABIN AUXILIARY WINDOW EXITS.—Turn the handle on the window in the direction indicated by the arrows on the handle and push the window out.

(3) PILOTS' EMERGENCY EXIT.—Turn both handles aft, and push from the airplane.

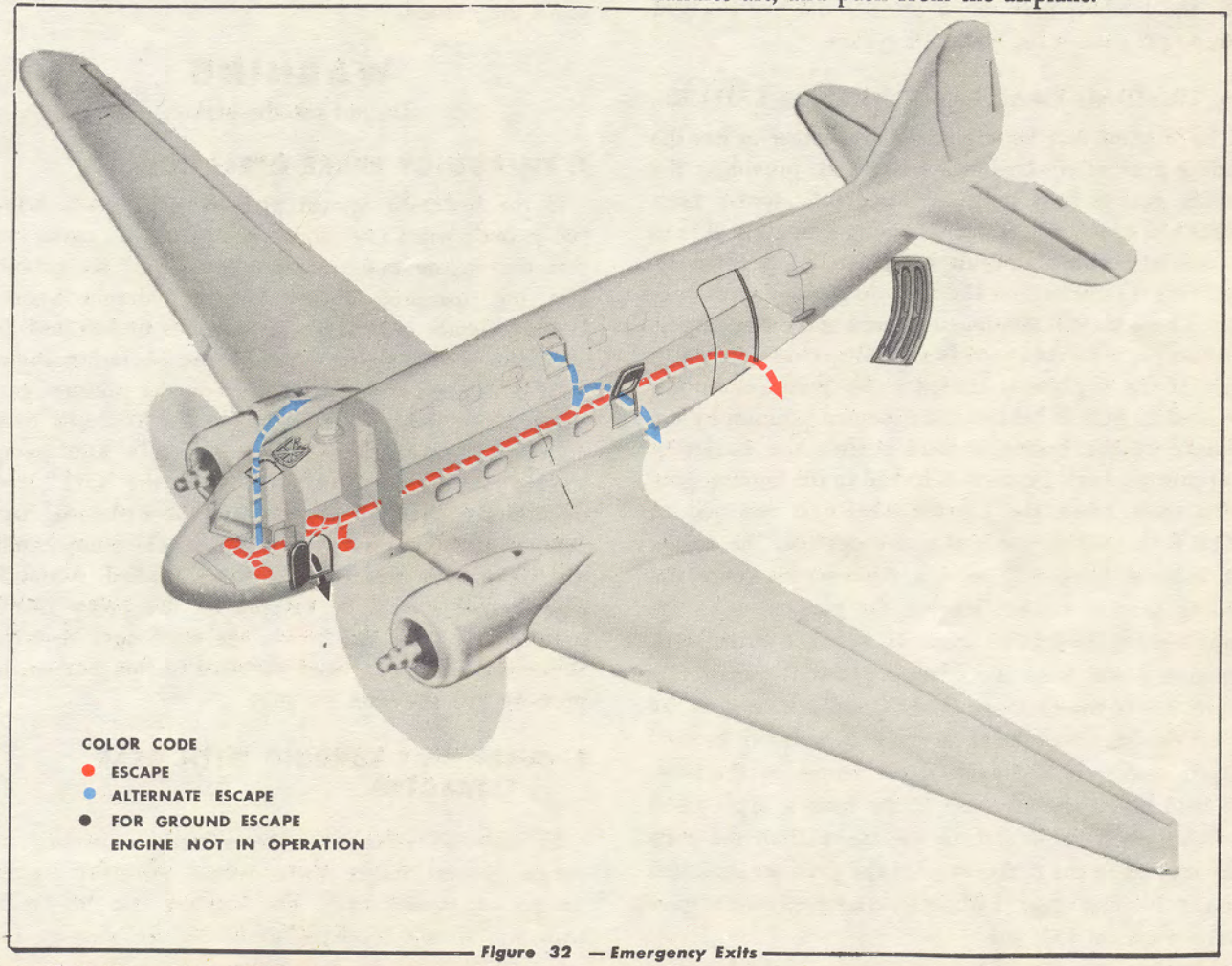


Figure 32 — Emergency Exits

5. EMERGENCY WING FLAP OPERATION.

If a loss of hydraulic pressure occurs and it is desired to operate the wing flaps, move the wing flap control handle to the applicable "UP" or "DOWN" position and actuate the hydraulic hand pump control lever.

6. EMERGENCY LANDING GEAR OPERATION.

a. HYDRAULIC LINE OR PRESSURE ACCUMULATOR FAILURE.—In the event of a complete line failure beyond the landing gear selector valve, the landing gear can be snapped down so that the latches will engage. A failure in these lines will seldom be more than a small leak so that the oil capacity in the pressure accumulator will hold out long enough to lower the landing gear completely. Return the landing gear selector control to NEUTRAL as soon as it is certain that the safety latches have engaged so as to conserve all the fluid and pressure possible for wing flap and brake operation. If the above condition exists, the green landing gear warning light will go on when the control handle is returned to NEUTRAL, but the pressure shown on the landing gear system pressure gage will fall rapidly to zero. The airplane may be safely landed with the landing gear down position latches engaged with no pressure in the hydraulic system.

b. LANDING GEAR SAFETY LATCH FAILURE.—The airplane may be safely landed whether or not the landing gear safety latches are engaged, providing the landing gear is fully down, the hydraulic system pressure is 850 to 900 psi, and the landing gear control is in the neutral position. Pressure in the landing gear actuating struts is indicated on the forward hydraulic pressure gage. The horn will continue to sound and the red lights will stay on, since the switches are connected to the safety latch. If the airplane is landed under these conditions, the landing gear is held in the extended position by the pressure of the hydraulic fluid against the retracting strut pistons. Fluid pressure is locked in the landing gear down lines when the control handle is returned to NEUTRAL. When the brakes are applied, the resulting rotative force will have a tendency to cause the landing gear to retract, moving the pistons up in the struts and resulting in an increased pressure in the landing gear down lines. To prevent possibility of a line failure due to the excessive rise in pressure caused by the piston moving up in the strut, the brakes should be used only if absolutely necessary. If the length of the landing field necessitates the use of the brakes, apply them as lightly as possible and, in any event, limit the pressure applied to the brakes so that the pressure indicated on the landing gear hydraulic system pressure gage *does not exceed 1500 psi.*

CAUTION

Place latch handle in "POSITIVE LOCK" position only after landing gear is fully extended and latched.

c. LANDING WITHOUT HYDRAULIC SYSTEM PRESSURE.—The only occasion necessitating a landing without fluid pressure would be in case of failure in the lines from the hand pump to the retracting struts. In this case, the landing gear down position latches will hold the gear in place, and a safe landing can be made. Move the landing gear control handle to the "DOWN" position to allow all fluid possible to get into the actuating strut and then zoom the airplane two or three times to snap down and engage the latches. Return the control handle to NEUTRAL. If the warning light is green, it indicates that the latches have engaged and a normal landing can be made.

d. LANDING WITHOUT HYDRAULIC SYSTEM PRESSURE OR SAFETY LATCHES.—If the latches cannot be engaged as described in the preceding paragraph, move the landing gear control handle to the "DOWN" position and operate the hydraulic hand pump hard for several minutes immediately before the wheels touch the ground.

WARNING

Do not use the brakes.

7. EMERGENCY BRAKE OPERATION.

If the hydraulic system pressure gage reads below 500 pounds when one engine is inoperative, make sure that the engine pump selector control is set to connect the operating engine to the hydraulic system. If the pressure gage reads 500 pounds or less and the hydraulic system is connected to the operating engine or if both engines are operating and the pressure gage reads below 500 pounds, carry out the hydraulic braking operation with the aid of the hydraulic hand pump, leaving the shut-off valve lockwired in the "OFF" position. The co-pilot should operate the hydraulic hand pump to supply pressure to the brakes. The pump handle will move each time the brakes are applied. About 50 pounds pull should be exerted on the pump handle continuously until the brakes are no longer required. When the brakes are hand operated in this manner, no pressure will show on the gage.

8. EMERGENCY LANDING WITH GEAR RETRACTED.

In case an emergency necessitates a landing on rough ground where there would normally be the danger of nosing over, the airplane can be landed with the wheels retracted to lessen the danger. Full

control of the brakes is possible when the landing gear is in the retracted position. A forced landing with the landing gear retracted should be made with the flaps extended at least half-way to make the landing as slow as possible. The angle that the fuselage makes with the horizontal on a landing with the flaps down is less than without flaps, and the speed of the landing as the wheels touch the ground will be considerably less. The flaps will probably be damaged but will have served their purpose. The airplane will probably be damaged less than without the use of flaps.

9. EMERGENCY LANDING IN WATER (DITCHING).

Note

Three Type A-3 life rafts are carried on the right-hand side of the cargo compartment.

a. PREPARATION FOR DITCHING.

(1) If possible, use up most of the fuel supply. This lightens the airplane and reduces stalling speed. Make sure, however, that some fuel is available, as power is of great importance to control of the airplane during approach.

(2) Remove the pilot's emergency exit and the main cargo door exit. If possible, the main cargo exit should be used for escape by all personnel stationed in the cargo compartment.

(3) Jettison all loose equipment and as much cargo as possible through the main cargo door exit.

(4) Make certain the landing gear is retracted.

(5) If it is dark, switch on the landing lights and upper recognition light (provided the reflection does not impair vision). Turn off all lights within the airplane to accustom the eyes to the darkness. Partially inflate the life jacket with one or two breaths.

(6) If ditching with passengers in the cargo compartment is unavoidable, the passengers should assist in jettisoning all loose equipment not required in the ditching operation and then assume positions in the troop seats. The forward troop seats should be used as available in accordance with the number of passengers. Lap belts should be fastened and drawn snug. Personnel should lean toward the nose of the airplane as far as possible. On the signal from the pilot, brace for the impact.

b. DITCHING THE AIRPLANE.

(1) APPROACH.—Lower the wing flaps to a half-down position, to reduce contacting speed. Use the normal approach, but if symmetrical power is not available, use a normal glide approach. This will insure control and permit some margin of speed after leveling off, so that the best point for ditching on a swell may be chosen. If only left or right power is available, a little power may be used to flatten approach, but a margin of rudder control must remain available. Do not, on any account, apply power at final stage of ditching. Immediately before contact, each crew member, other than the pilot, shall assume his ditching position. This position should be prone, if possible, with the feet against a compartment bulkhead.

(2) MAKING CONTACT.—Hold off power until all excess speed above stalling speed is lost, and then strike the sea in a three-point attitude. There will be a slight impact as the tail section strikes the water. This will be followed by a severe impact with extreme deceleration in most cases. If the alighting has been made too fast, a bounce will occur. As the airplane comes to rest, the airplane nose will submerge; but if the alighting has been accomplished correctly, the effect of submerging of the nose will be minimized. The airplane can be expected to float for a minimum period of one minute.

c. IMMEDIATELY AFTER DITCHING.

(1) Crew members detailed to ditching positions in the cargo compartment shall remove the life rafts through the main cargo door exit. If possible, all crew members should exit through this door.

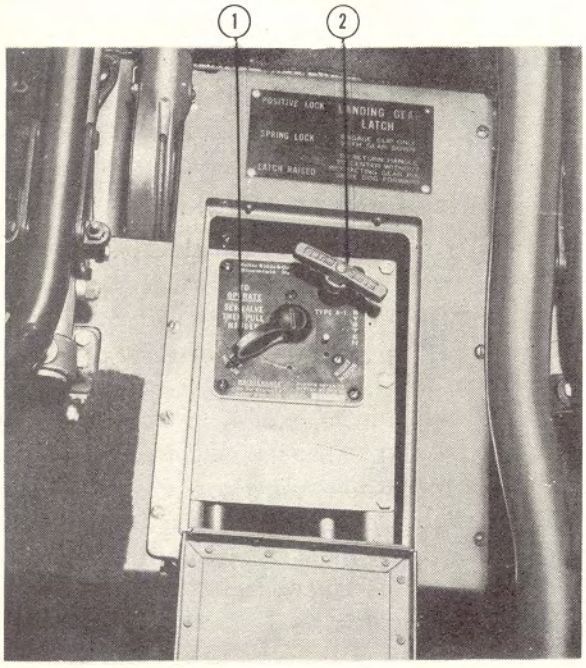
(2) Immediately after passing through the exit doors, each crew member shall fully inflate his life jacket.

10. MISCELLANEOUS EMERGENCY EQUIPMENT.

a. HAND FIRE EXTINGUISHERS.—Two (pyrene) carbon-tetrachloride fire extinguishers are installed, one above and back of the pilot's head and one on the inside face of the main cargo door aft section.

b. ENGINE FIRE EXTINGUISHER SYSTEM.—A "Lux" CO_2 pressure fire extinguisher system is installed in the airplane with outlets at the engines. The CO_2 bottle (7¼ pound size) is located behind the co-pilot's seat. The control handle and a right-hand, left-hand selector valve are located under a hinged door in the pilot's compartment floor between the pilot and co-pilot seats.

c. ENGINE FIRE DETECTION WARNING SYSTEM.—Two fire detection warning lights, one for each nacelle, are located on the instrument panel just above the autopilot control box. A fire detection circuit test switch (button type) is located adjacent to the warning lights. This provides a method of checking that the fire warn- circuit will function.



1. Engine Selector
2. Release Control Handle

Figure 33—Engine Fire Extinguisher Controls

d. FIRST-AID KITS.—Thirteen first aid kits are carried in the following positions: On both sides of the bukhead behind the pilot; aft of the bulkhead behind the navigator; at the right and forward side of the bulkhead in front of the lavatory; five along the right side of the cabin above the seats; and four along the left side above the seats.

CAUTION

Seals on the first aid kits must not be broken until use of the kits is necessary.

e. BLACKOUT CURTAINS. — On some airplanes blackout curtains are installed on the windows in the main cargo compartment, the pilots' compartment, the navigator and radio operator's windows, and the astro-dome.

f. EMERGENCY RATIONS, FIRE-AXE, AND FLASHLIGHT.—On some airplanes, a box of emergency rations, a fire-axe, and a flashlight are provided. This equipment is stowed loose and crew members should locate the stowage points before flight.

g. EXHAUST FLAME DAMPENERS. — On some airplanes two metal, exhaust flame dampeners, are stowed on the right, bottomside of the bulkhead in front of the lavatory compartment. They are attached to the ends of the exhaust stacks whenever it is desirable to obliterate flames coming from the exhaust stacks.

CAUTION

Low engine RPM must be used when flame dampeners are installed as damage may be caused by engine overheating.

h. DROP MESSAGE BAG.—A white weighted bag attached to a long, yellow streamer may be used by crew members for dropping messages. This bag is stowed as loose equipment on some airplanes.

i. PYROTECHNICS EQUIPMENT. — A pyrotechnic pistol and pistol holder is located on top of the compass receiver box aft end and inboard of the navigator's seat. A pyrotechnic pistol mount is installed in the fuselage on the upper left side of the baggage compartment. A signal flare ("ammunition") container, and ammunition is located on top of the compass receiver box with the pyrotechnic pistol. On some airplanes the pyrotechnic pistol is stowed on the aft wall of the forward cargo loading door companionway above the radio tuning unit.

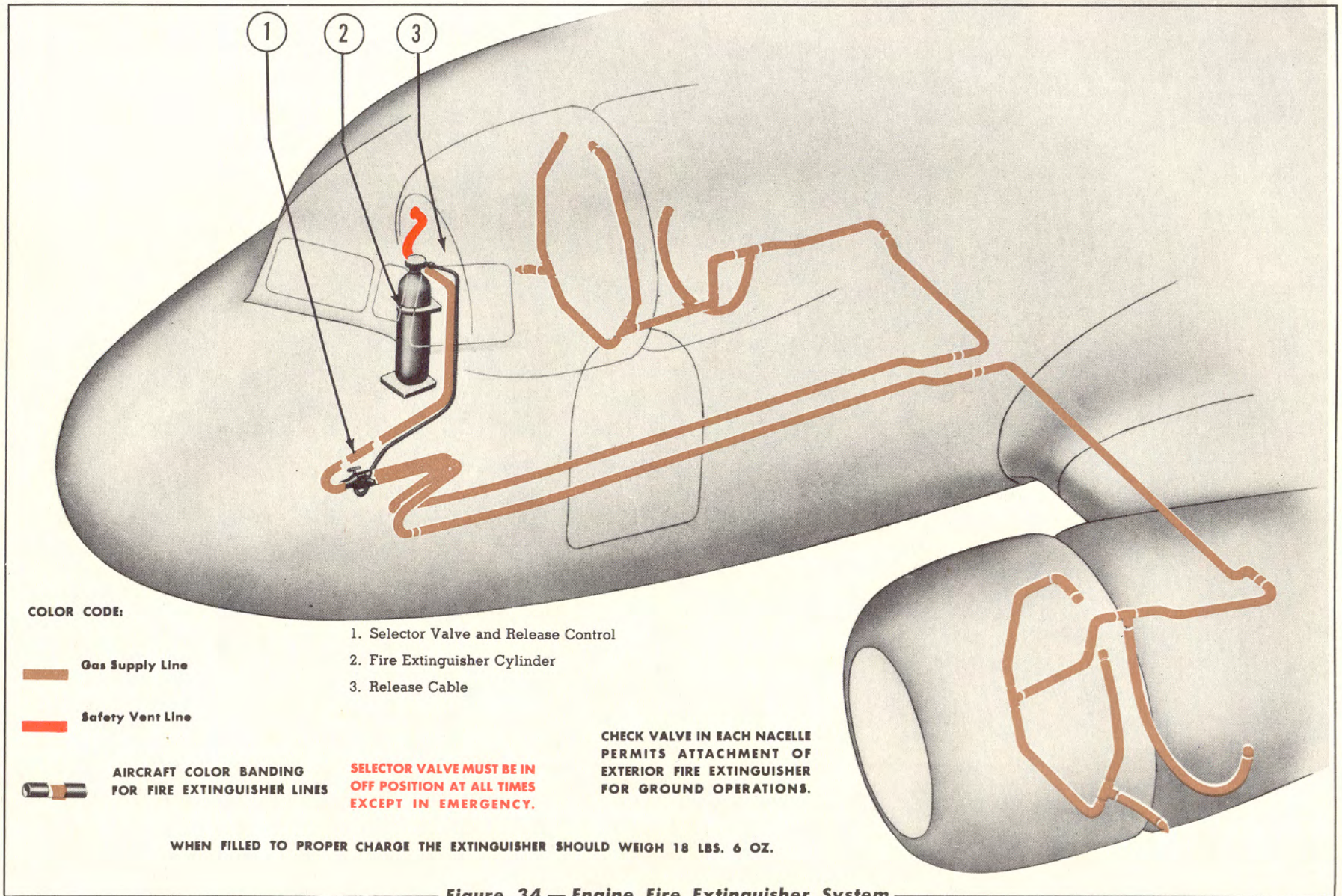
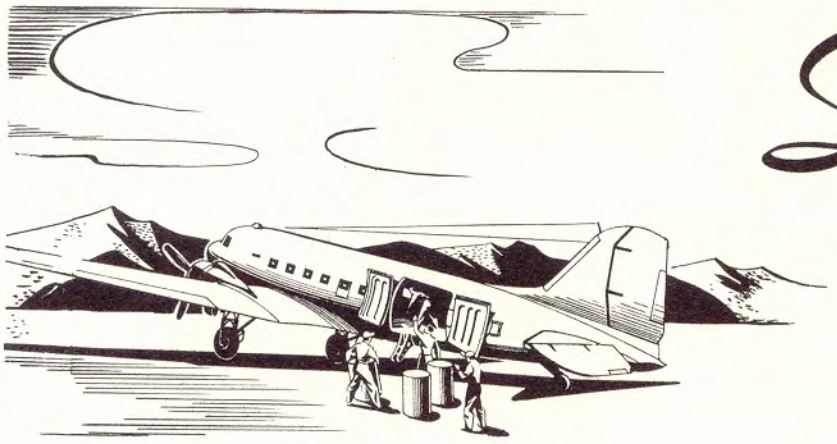


Figure 34 — Engine Fire Extinguisher System



Section V

OPERATIONAL EQUIPMENT

1. HEATING AND VENTILATING.

a. GENERAL.—A steam type heating and ventilating system is installed in all C-47 airplanes and in early C-47A airplanes. A hot air type system is installed in all other C-47A airplanes.

b. STEAM TYPE SYSTEM.—This heating and ventilating system is a steam boiler and radiator type system. The boiler *(figure 35-15)*, located on the right-hand exhaust collector tail pipe, supplies steam to the radiator *(figure 35-2)*, located in the top of the left-hand baggage compartment. The steam line shut-off valve is controlled from the radio operator's compartment by pulling or pushing the control handle *(figure 35-7)*. Outside air is introduced into the system through

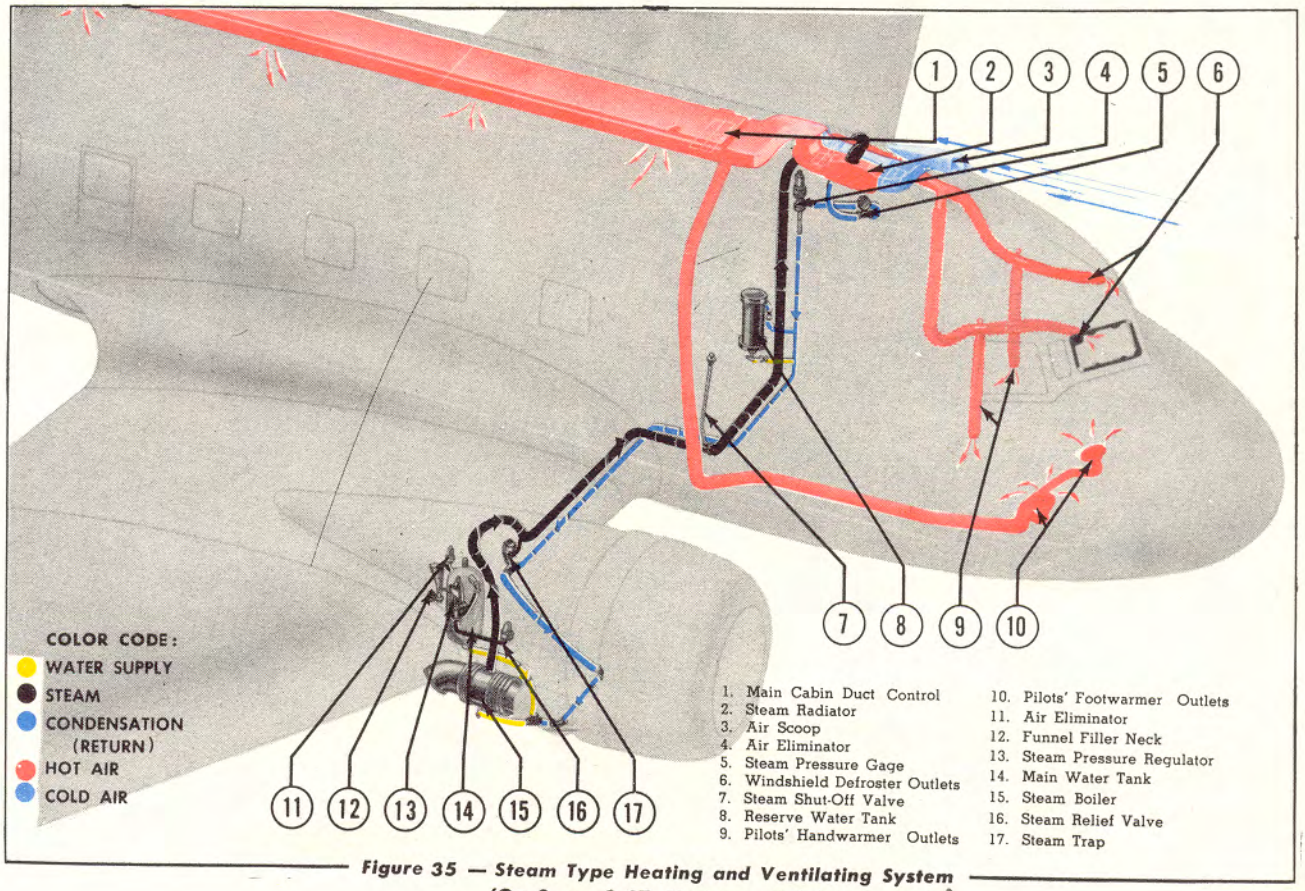
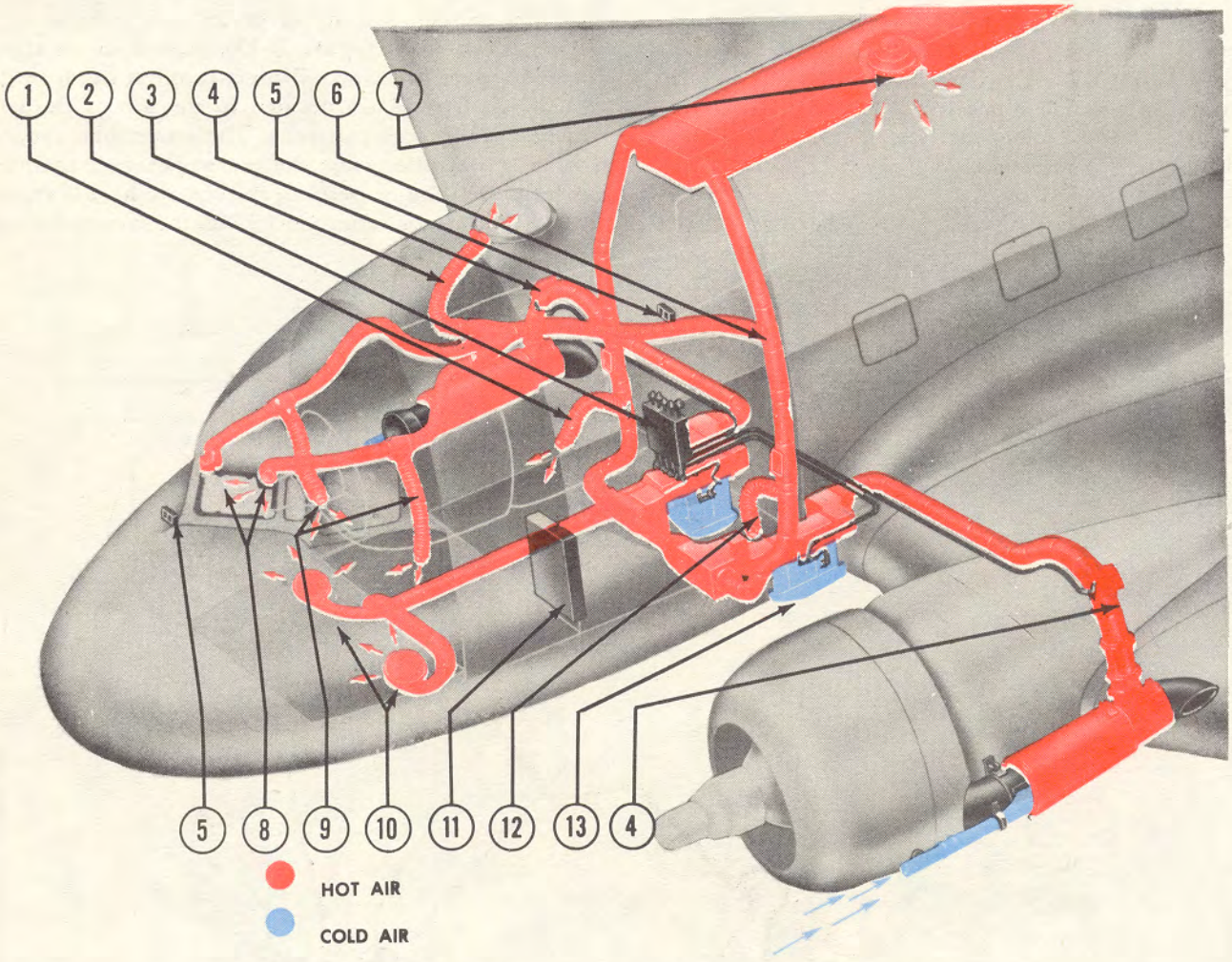


Figure 35 — Steam Type Heating and Ventilating System (On Some C-47 Airplanes Only)

a scoop and is routed through a radiator, a cold air duct or bath, depending upon air temperature desired. Selection of hot or cold air is made with the air mixture control handle on the side of the radiator. A valve at the front of the main cabin duct regulates the quantity of air for that compartment. A slide type valve regulates the air in the radio operator's compartment.

c. HOT AIR TYPE SYSTEM. – This heating and ventilating system is an exhaust-heated air system. Each engine exhaust heat exchanger supplies separate systems, the right-hand engine supplying the pilot's compartment, and the left-hand engine supplying the forward baggage compartment, the radio operator's compartment, the main cargo compartment, and the defrosting systems. Outside air is introduced into the system through scoops located on the outboard sides of the nacelles, forward of the engine cowl flaps. The air is heated while passing through heat exchangers attached to the engine exhaust tail pipes. The air is then conducted to the fuselage through insulated ducts in the nacelles and the center wing. Passing through mixing valves, the heated air is mixed with cold air, obtained through scoops on the bottom of the airplane, and maintained at any desired temperature by means of the manually-operated control in the radio operator's compartment. A by-pass valve control, permitting single engine operation (on airplanes equipped



1. Radio Compartment Flexible Hose
2. Control Box
3. Astro-Dome Flexible Hose and Valve Control
4. Emergency Spill Valves and Outlets
5. Critical Temperature Warning Lights
6. Defroster System Heat Supply Valve Control
7. Main Cargo Compartment Duct Grill (4 Places)
8. Windshield Defroster and Valve Controls
9. Pilots' Flexible Hose and Valve Controls
10. Pilot's Heat Outlets
11. Double Windshield Stowage Box
12. Navigator's Compartment Flexible Hose
13. Mixing Chamber (Cold Air Scoop, Hot Air Outlet)

Figure 36 — Hot Air Type Heating and Ventilating System (On Early C-47A Airplanes)

with the hot air type system as shown in *figure 36),* is located in the radio operator's compartment. Emergency spill valves, located on the top of each nacelle, permit hot air to be ducted overboard in case of excessive temperatures or hot weather operation. The controls for these spill valves are located in the radio operator's compartment. Red warning lights, located on the pilots' instrument panel and in the radio operator's compartment, give indication of excessive temperatures in the heating and ventilating systems.

2. FIXED OXYGEN SYSTEM.

a. GENERAL.—A high pressure oxygen system operating at a working pressure of 1800 psi is installed on all C-47 airplanes and on early C-47A airplanes. Late C-47A airplanes use a low pressure demand oxygen system operating at a working pressure of 400 psi.

b. OPERATION OF THE HIGH PRESSURE SYSTEM.—Outlets are provided for each crew member. The oxygen outlets *(figure 38)* for the pilot and co-pilot are located outboard of their respective seats. The radio operator's oxygen outlet protrudes from the underside of the forward radio shelf. On airplanes which are provided with a nagivator's compartment, left of the companionway, an oxygen outlet is installed on the outboard side of the compartment above the navigator's table. In addition to the outlets the oxygen equipment consists of an oxygen cylinder on which is installed a high pressure oxygen gage, an oxygen regulator, and a shut-off valve. An oxygen pressure gage is located on the instrument panel. Oxygen is released into the system by opening the shut-off valve and is regulated by the oxygen regulator. The oxygen pressure necessary for the crew members is determined by the altitude of the airplane. To adjust the oxygen output correctly turn the oxygen regulator control until the oxygen pressure gage indicates the same altitude as the altimeter.

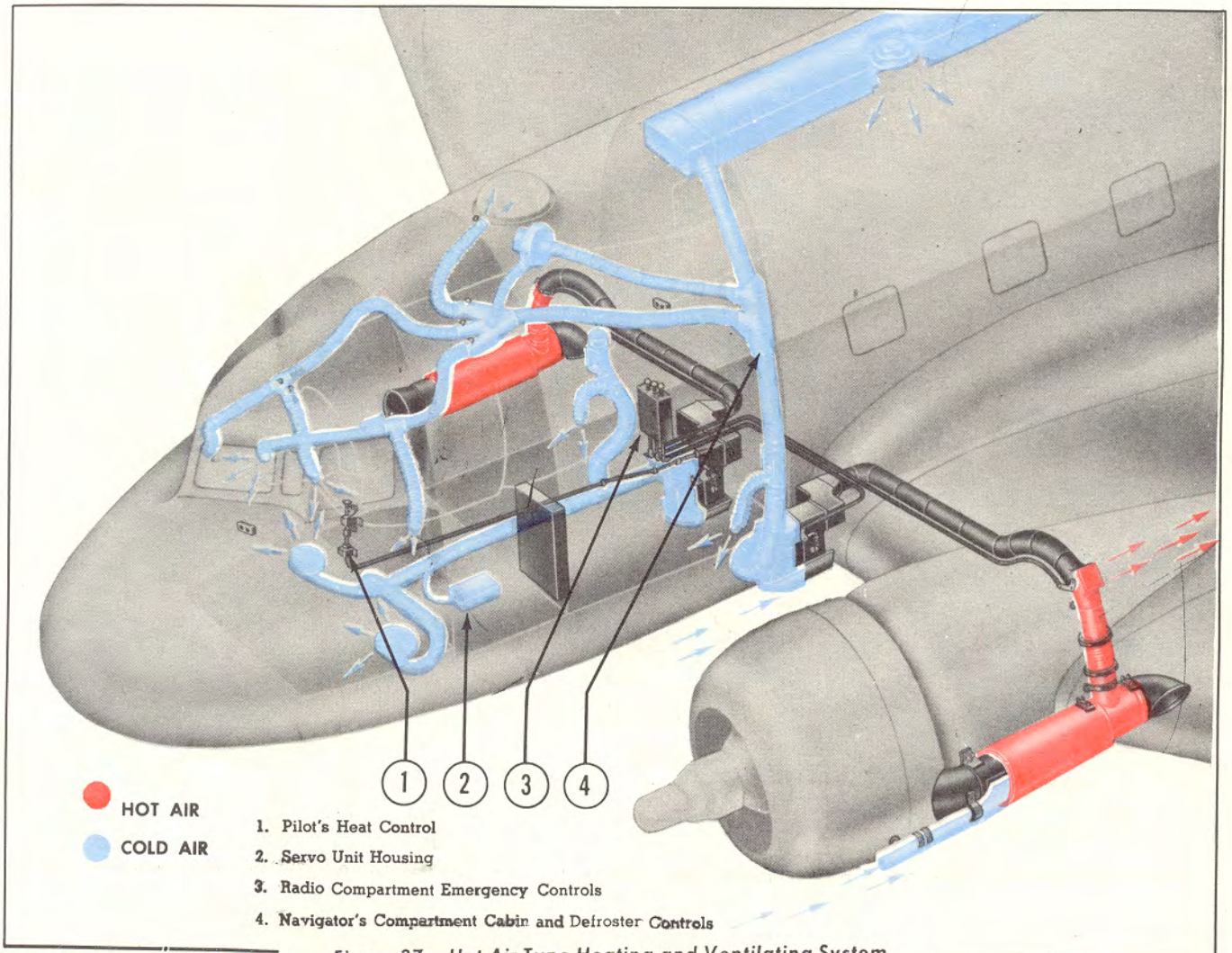


Figure 37—Hot Air Type Heating and Ventilating System (On Late C-47A Airplanes)

Note

Airplanes equipped with the high pressure system have no provisions for additional oxygen equipment. The oxygen consumption for the high pressure system at a normal operating pressure of 1800 psi is as follows:

10.5 Man Hours at 10,000 ft.
6.2 Man Hours at 15,000 ft.
4.8 Man Hours at 20,000 ft.
4.0 Man Hours at 25,000 ft.

c. LOW PRESSURE OXYGEN SYSTEM.

(1) GENERAL.—A low pressure oxygen system supplied by ten Type F-2 oxygen cylinders is installed in the airplane. On some airplanes two cylinders supply oxygen to a separate pilot's system and the remaining eight cylinders supply oxygen to a system for the other crew members. On other airplanes the ten cylinders supply all crew members. The oxygen system is provided with check valves as a combat safety precaution in the event of a rupture in the system. A single filler valve, located on the left side of the cargo compartment just forward of the main cargo door, is provided for filling all the cylinders.

(2) CONTROLS.—A diluter demand oxygen regulator is installed at each station. This regulator incorporates a diluter lever with two positions, "NORMAL OXYGEN" and "100% OXYGEN." A red emergency knob is provided which may be used in the event the demand oxygen regulator becomes inoperative. This emergency knob is always safety-wired closed and should be opened only in an emergency.

(3) INDICATORS.—A pressure gage and a flow indicator are installed at each station.

(4) DURATION CHART.—The approximate oxygen duration of the crew oxygen system is given in figure 39A.

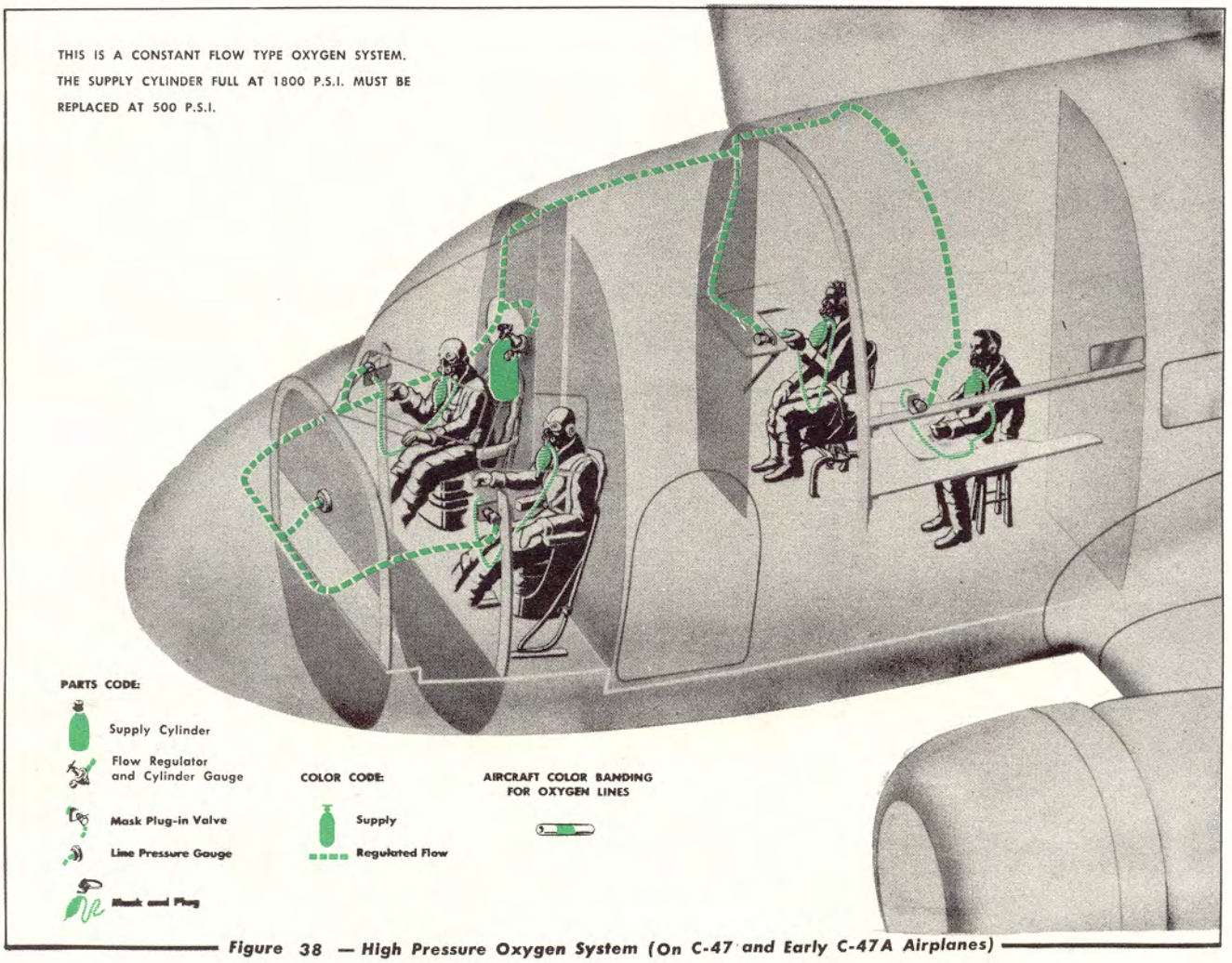


Figure 38 — High Pressure Oxygen System (On C-47 and Early C-47A Airplanes)

Note

Only a demand oxygen mask should be used.

(5) NORMAL OPERATION.—The diluter lever on the diluter demand regulator should always be set at the "NORMAL OXYGEN" position except under emergency conditions.

(6) EMERGENCY OPERATION.—With symptoms of the onset of anoxia or if smoke or fuel fumes should enter the cabin, set the diluter lever of the regulator to "100% OXYGEN." If the demand regulator is inoperative, open the emergency valve by turning the red emergency knob counterclockwise.

CAUTION

When use of "100% OXYGEN" of the emergency valve becomes necessary, the airplane commander will be informed of this action. Use of "100% OXYGEN" or opening of the emergency valve will reduce the oxygen duration for the crew. After emergency is over set diluter lever to "NORMAL OXYGEN" and close emergency valve.

C-47 & C-47' CREW MEMBER OXYGEN DURATION – HOURS
(DILUTER DEMAND OXYGEN SYSTEM)

CABIN ALTITUDE – FEET	GAGE PRESSURE – P.S.I. 400	350	300	250	200	150	100	BELOW 100
40,000								EMERGENCY – DESCEND TO ALTITUDE NOT REQUIRING OXYGEN
35,000								
30,000	4.1 4.2	3.5 3.6	2.9 3.0	2.3 2.4	1.8 1.8	1.2 1.2	0.6 0.6	
25,000	3.2 4.0	2.7 3.4	2.3 2.8	1.8 2.3	1.4 1.7	0.9 1.1	0.5 0.6	
20,000	2.4 4.5	2.0 3.9	1.7 3.2	1.4 2.6	1.0 1.9	0.7 1.3	0.3 0.6	
15,000	1.9 5.4	1.6 4.6	1.4 3.9	1.1 3.1	0.8 2.3	0.5 1.5	0.3 0.8	
10,000	1.5 7.2	1.3 6.2	1.1 5.2	0.9 4.1	0.7 3.1	0.4 2.1	0.2 1.0	

BLACK FIGURES INDICATE DILUTER LEVER "NORMAL"
RED FIGURES INDICATE DILUTER LEVER "100%"
CYLINDERS: 10 TYPE F-2
CREW: 5

Figure 38A — Oxygen Duration Chart

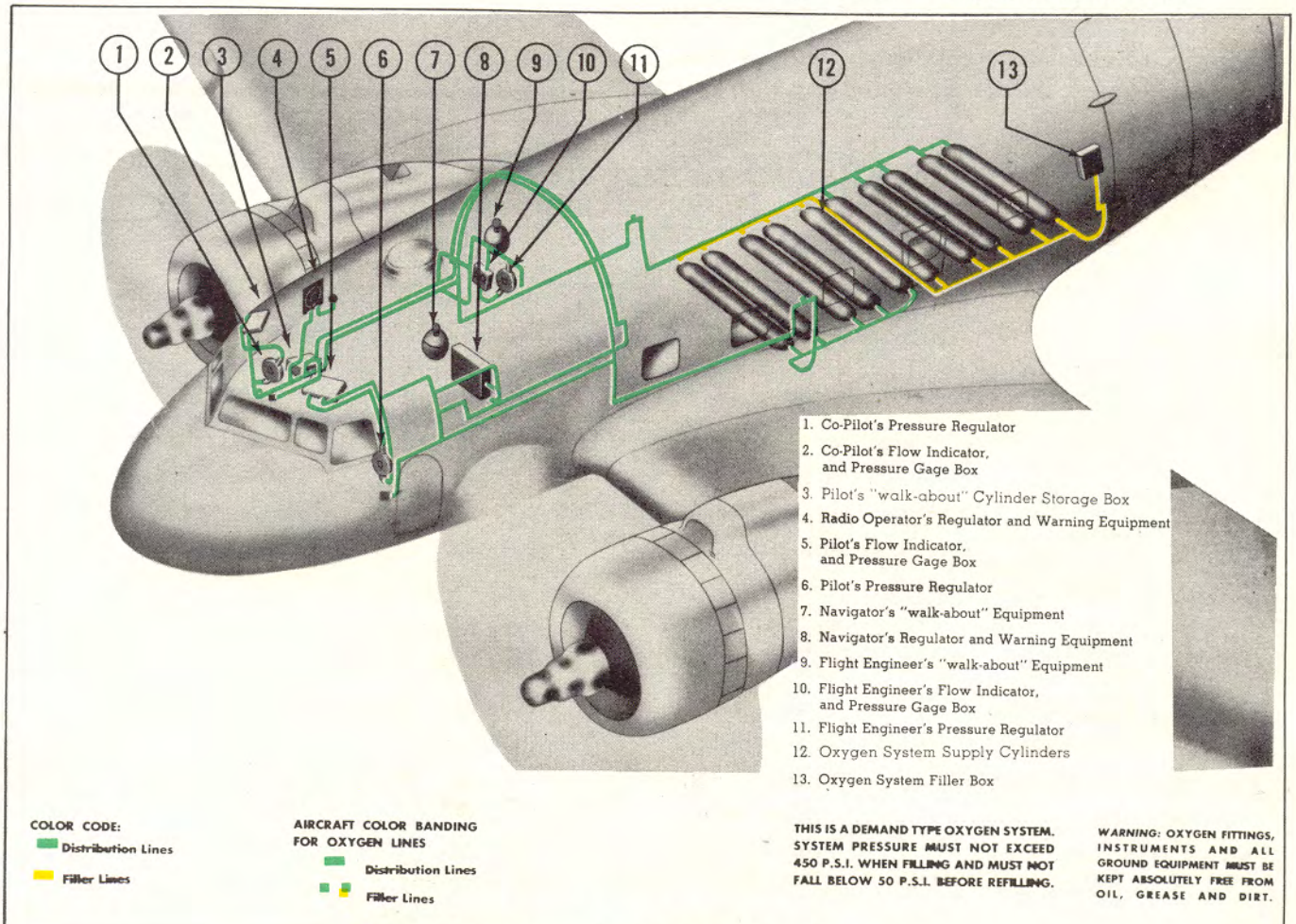


Figure 39—Low Pressure Oxygen System (On Late C-47A Airplanes)

3. WALK-ABOUT OXYGEN EQUIPMENT.

a. GENERAL.—On some airplanes three demand-type portable units and three recharger assemblies are provided in the crew compartment. Each cylinder is equipped with a pressure regulator which incorporates a pressure gage and a filler valve.

b. OPERATION.

(1) To refill the bottle, insert the connection on the hose leading from the recharger assembly, into the filler valve on the pressure regulator.

Note

The pressure shown on the gage of the portable cylinder will be equal to the system pressure.

(2) Plug the hose leading from the oxygen mask into the outlet on top of the portable unit and breathe oxygen as desired.

4. COMMUNICATIONS EQUIPMENT GENERAL. —

The communications equipment installed in the airplane consists of the following:

a. INTERPHONE EQUIPMENT (RC-36 or RC-45).

(1) GENERAL.—For crew member to crew member communication and for crew member participation in radio operations, an interphone jack box is installed at each crew member's station and a jack box is also installed at the rear of the cargo compartment. The interphone system functions as follows when the jack box selector switch is placed as given below:

(a) On "COMP" supplies audio output of radio compass receiver.

(b) On "LIAISON" supplies audio output of radio receiver (liaison) and liaison transmitter sidetone, and when operating adjustments are completed at radio operator's position, permits pilot, co-pilot, or radio operator to modulate liaison transmitter when microphone "push-to talk" switch is pressed.

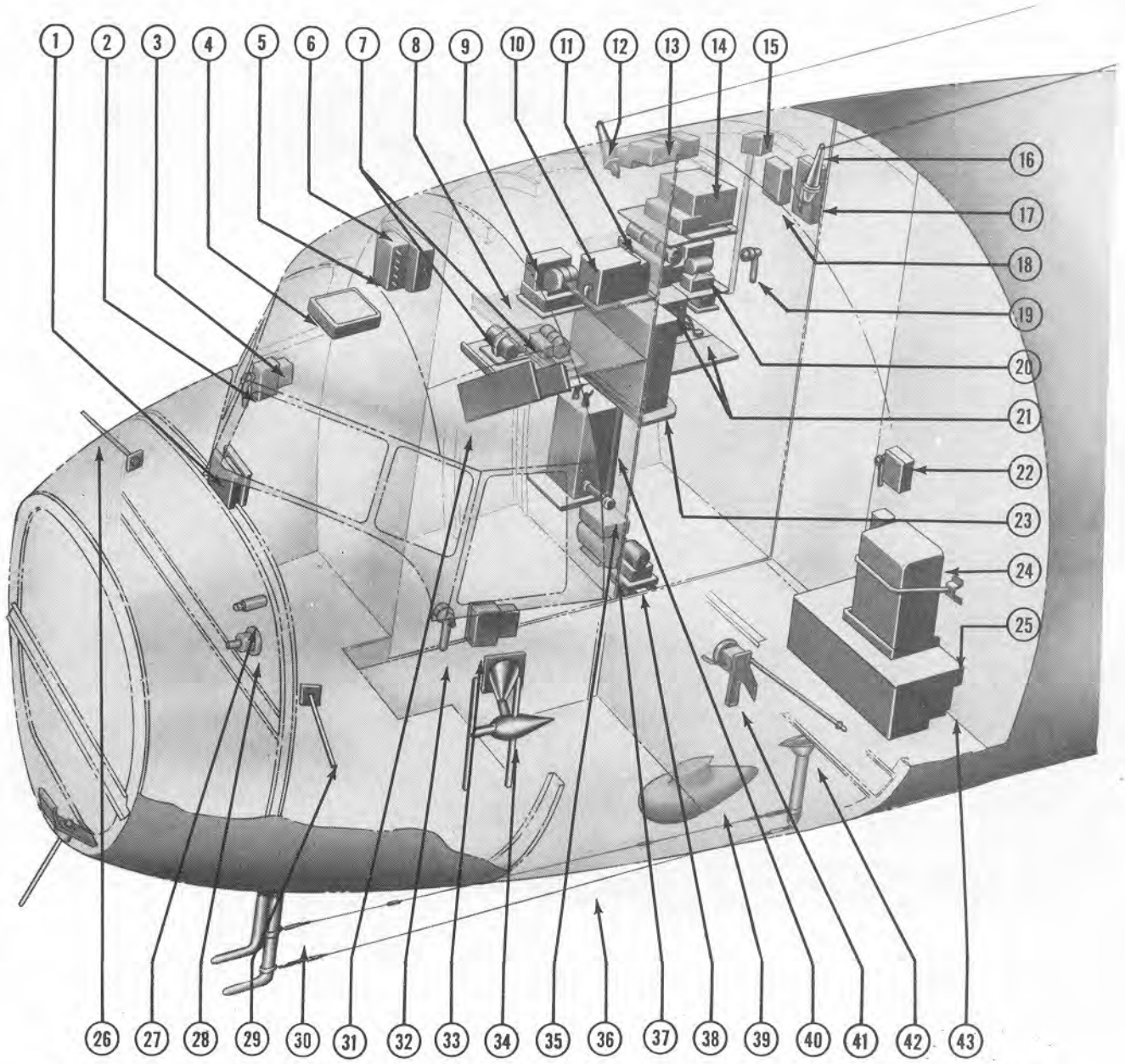
(c) On "COMMAND" supplies the audio output of command receivers of radio set SCR-( )-183, SCR-274-N, or SCR-522A (if installed), and permits pilot, co-pilot, or radio operator to modulate command set transmitter when microphone "push-to talk" switch is pressed.

(d) On "INTER" permits communication with any other crew member whose jack box selector switch is on "INTER."

(e) On "CALL" permits any member of the crew to call any other crew member regardless of setting of his selector switch.

NOTE: RADIO SETS SCR-274 AND SCR-522 HAVE BEEN REPLACED BY RADIO SET AN/ARC-3 (SOME AIRPLANES).

	C-47	C-47A
Command Set	Type SCR-( )-183 Type SCR-522 ( ) (if installed)	Type SCR-274 Type SCR-522 ( ) (if installed)
Liaison Set	Type SCR-187	Type SCR-187
Identification Set	Type SCR-535 (if installed)	Type SCR-595-A
Radio Compass	Type SCR-280 or SCR-269	Type SCR-269
Marker Beacon Receptor	Type RC-39	Type RC-43
Interphone	Type RC-45	Type RC-36
Frequency Meter	Type SCR-211	Type SCR-211
Emergency Radio Set	Type SCR-578 ( ) (if installed)	Type SCR-578 ( ) (if installed)
Radio Receiving Equipment	Type AN/ARR-1 (if installed)	Type AN/ARR-1 (if installed)
Beacon Transmitter Receiver	Type AN/APN-2 (if installed)	Type AN/APN-2 (if installed)
Radio Altimeter	Type AN/APN-1 (if installed)	Type AN/APN-1 (if installed)

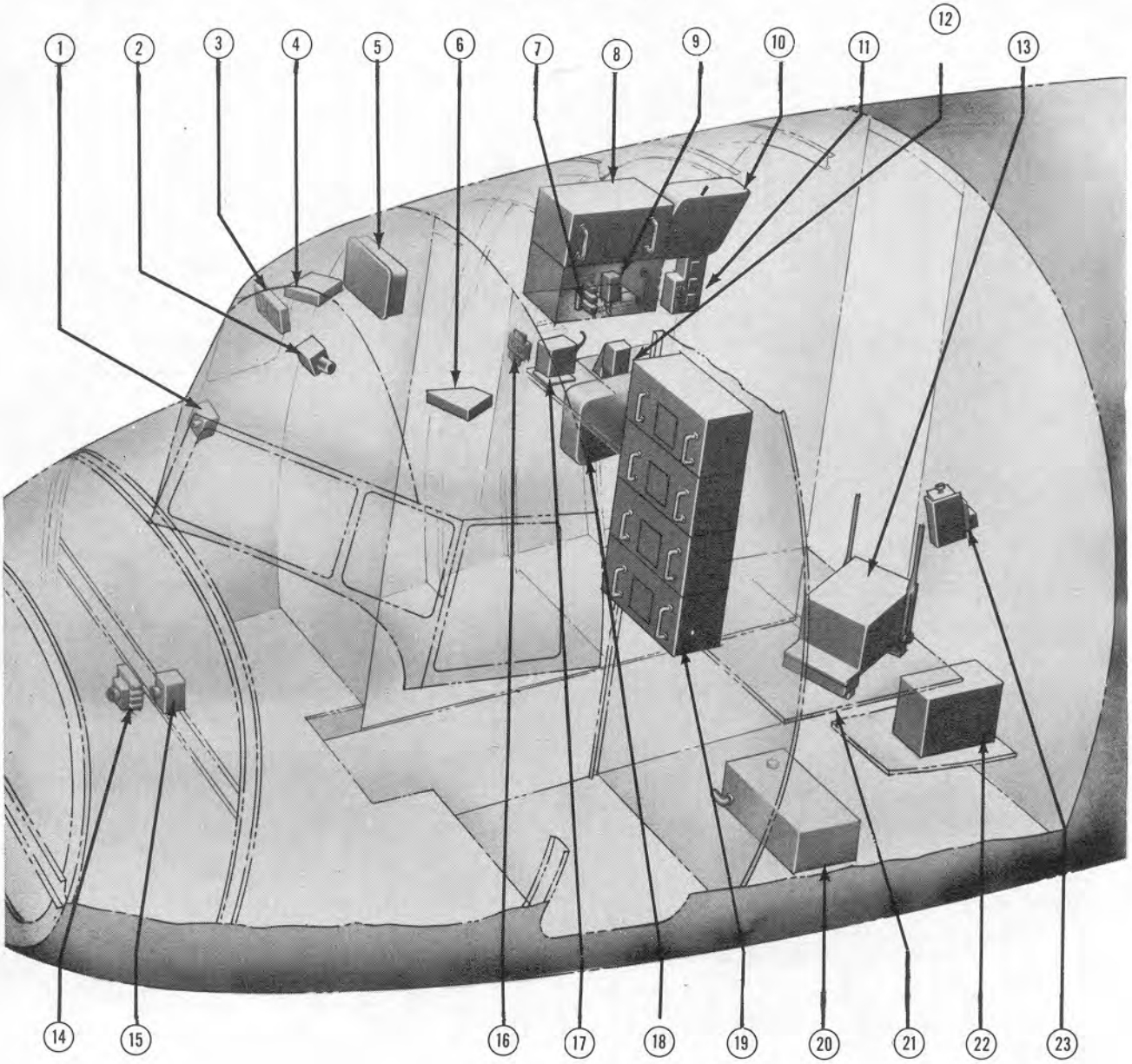


1. SCR-280 Radio Compass Bearing Indicator
2. Radio Microphone R. H. Side
3. Cockpit Interphone Equipment R. H. Side
4. 24 Volt SCR-269-G Radio Compass Remote Control Box
5. Co-Pilot's "J" Box & Detonator
6. BC-602-( ) Control Box
7. Radio Compass Inverters & Switch
8. Upper Forward Radio Shelf
9. Modulator & Indicator
10. BC-733-( ) Receiver
11. Command Set Receivers
12. Command Antenna, Liaison Antenna & Rear Mast
13. SCR-183 Transmitter Plug & Coil
14. Command Set Transmitters
15. SCR-183 Antenna Switching Relay
16. Antenna Selector Switch & Upper Masts
17. SCR-183 Receiver Plug & Coil
18. Interphone Amplifier
19. Microphone
20. Dynamotors
21. Liaison Receiver & Key
22. Navigator's Interphone Equipment
23. Liaison Transmitter & Mount
24. Frequency Meter
25. Compass Receiver Guard & Fairlead
26. (AT-1/APN-2) Transmitting Antenna R. H. Side
27. Marker Beacon & Bearing Indicators
28. Marker Beacon & Bearing Indicators
29. (AT-/APN-2) Transmitting Antenna L. H. Side
30. Belly Antenna-Marker Beacon
31. Command Set Remote Control
32. Radio Microphone L. H. Side
33. Cockpit Interphone Equipment—L. H. Side
34. (AT-2/APN-2) Antenna L. H. & R. H. Side
35. Loop Dehydrator
36. Belly Antenna Compass
37. 24 Volt Liaison Dynamotor
38. SCR-183 Dynamotor
39. Loop Antenna
40. Tuning Unit & Support
41. Trailing Antenna Reel
42. Forward Belly Mast
43. Compass Receiver

NOTE: RADIO SETS SCR-274 and SCR-522 HAVE BEEN REPLACED BY RADIO SET AN ARC-3 (SOME AIRPLANES).

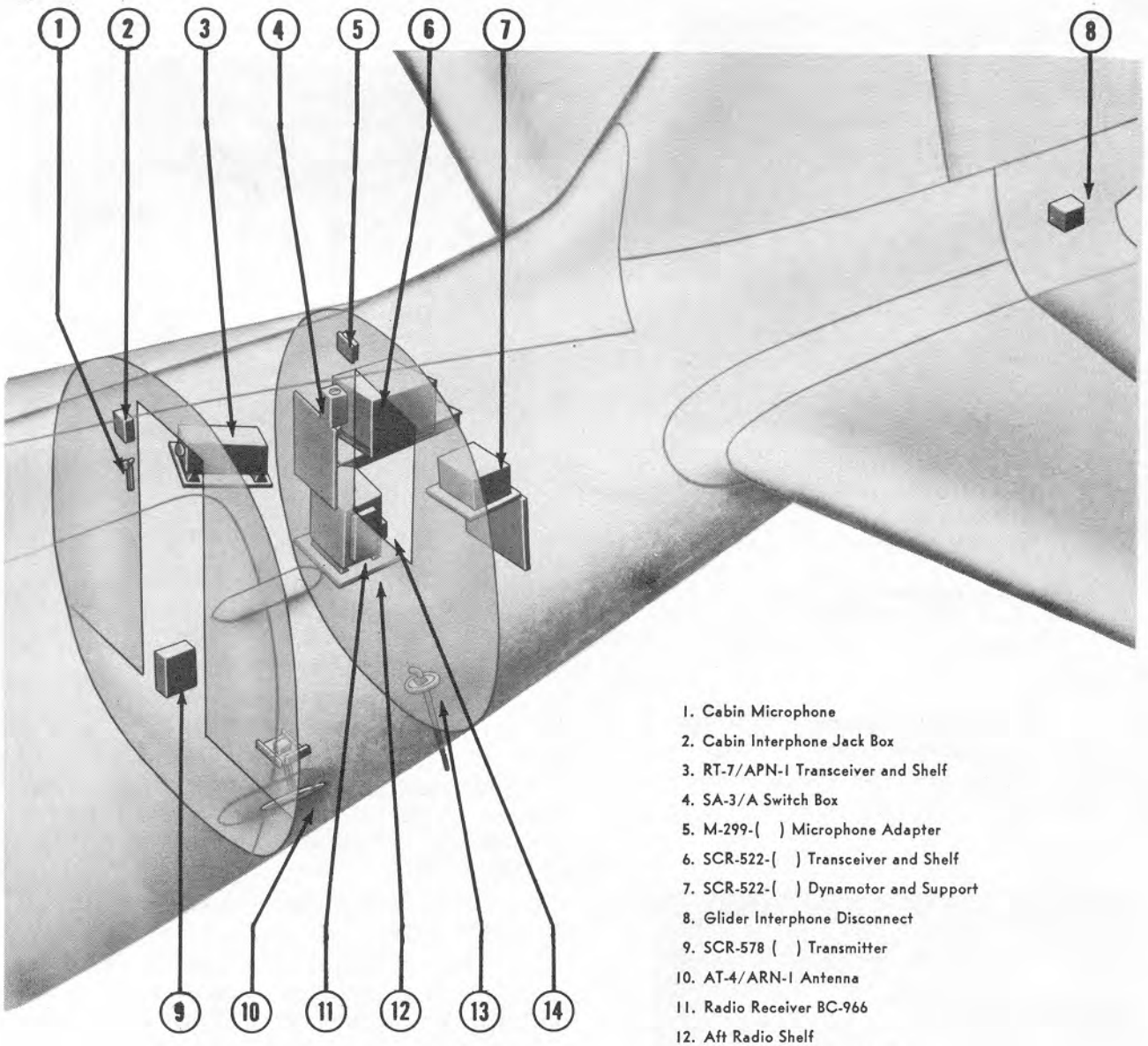
NOTE: RADIO TRANSMITTER BC-375 ( ) HAS BEEN REPLACED BY RADIO TRANSMITTING SET AN/ART-13A.

Figure 40 (Sheet 1 of 3) — C-47 Communications



1. SA-1 (APN-1 Alt. Lim. S. W.)
2. (BC-732) Control Box
3. Special Radio Switches
4. SCR 183 Receiver Control Box
5. Co-Pilot's "J" Box & Detonator
6. SCR-183 Transmitter Control Box
7. Liaison Ant. Selector Switch
8. Liaison Transmitter Spare Coils
9. Antenna Reel Control Box
10. Command & Liaison Radio Junction Box
11. SCR-595 Control Box
12. Jack Box & Antenna Reel Control Box
13. (AN/APN-2) Indicator
14. ID-14/APN-1 Indicator
15. Indicator I-101-( )
16. Co-Pilots's Junction Box & Detonator
17. Marker Beacon Receiver
18. Radio Compass Junction Box
19. Liaison Transmitter Spare Coils
20. Radio Compass Receiver
21. Navigator's Table
22. RT-1/APN-2 Transceiver &
23. C-3/APN-2 Control Box

Figure 40 (Sheet 2 of 3) — C-47 Communications



1. Cabin Microphone
2. Cabin Interphone Jack Box
3. RT-7/APN-1 Transceiver and Shelf
4. SA-3/A Switch Box
5. M-299-( ) Microphone Adapter
6. SCR-522-( ) Transceiver and Shelf
7. SCR-522-( ) Dynamotor and Support
8. Glider Interphone Disconnect
9. SCR-578 ( ) Transmitter
10. AT-4/ARN-1 Antenna
11. Radio Receiver BC-966
12. Aft Radio Shelf
13. AN-95-( ) Antenna Mast
14. Indicator

NOTE: Radio sets SCR-274 and SCR-522 have been replaced by radio set AN/ARC-3 (SOME AIRPLANES).

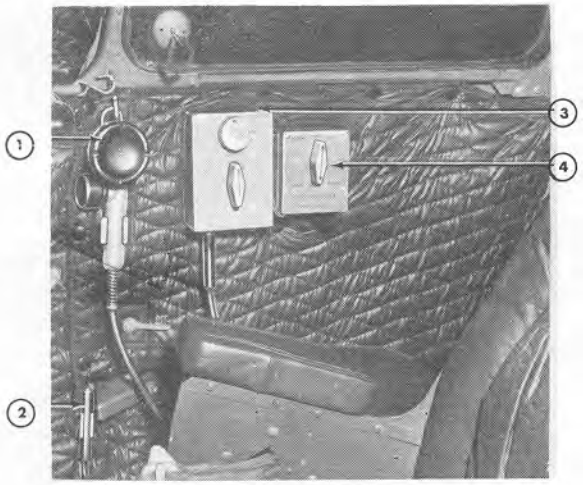
Figure 40 (Sheet 3 of 3)—C-47 Communications

(2) TO OPERATE.

(a) Plug microphone into "MIC" jack of jack box *(figure 41-3)*.

(b) Plug headset disconnector cord into "PHONES" jack of switchbox BC-345 *(figure 42-1)*, when installed, if headset HS-23 is to be used. This procedure is not necessary when FL-8A *(figure 41-4)* is used in place of BC-345. If headset HS-33 or HS-38 is to be used, plug headset disconnector cord into adapter MC-385-( ) and connect patch cord between adapter and "PHONES" jack of switchbox BC-345.

(c) Plug headset into headset disconnector jack *(figure 41-2)*.

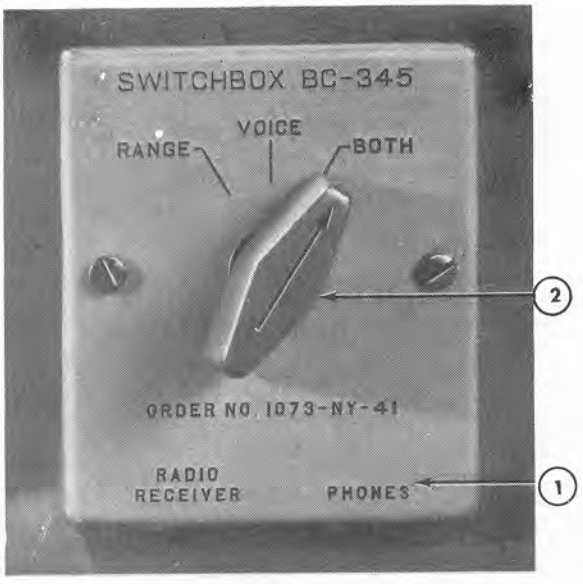


1. Microphone T-17
2. Disconnector Cord for Headset
3. Interphone Jackbox
4. Radio Filter FL-8-A

Figure 41 — Copilot's Station in C-47A (Interphone Equipment)

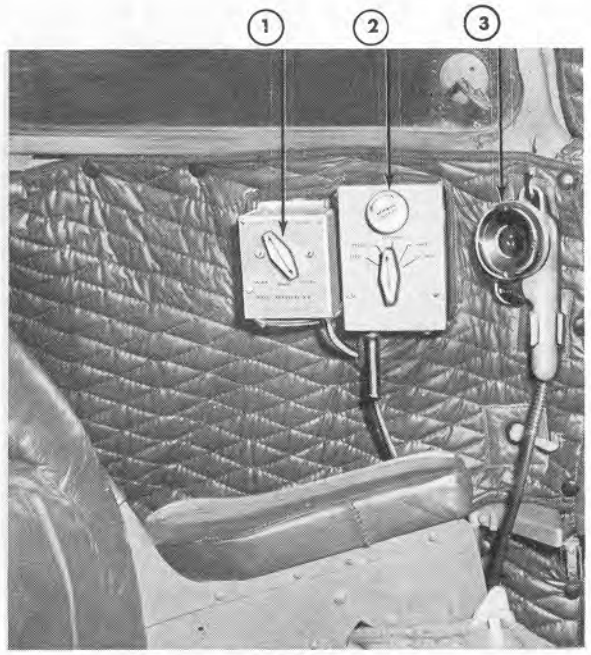
Note

If communications equipment is to be operated without airplane engines running, the use of a battery-cart or portable generator is highly desirable.



1. Headset "Phones" Jack
2. Selector Switch

Figure 42 — Filter Switch Box in C-47



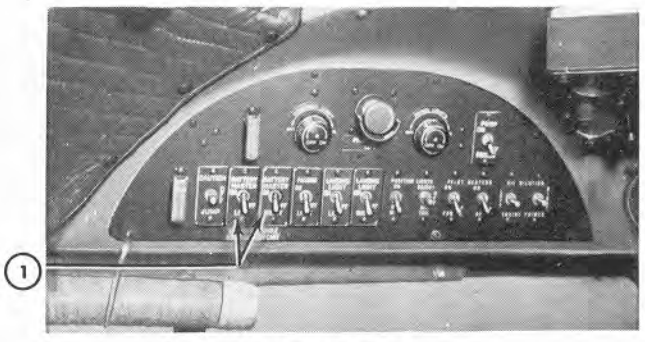
1. Radio Filter FL-8-A
2. Interphone Jackbox BC-366
3. Hand Microphone T-17

Figure 43 — Pilot's Station in C-47A (Interphone Equipment)

(d) Place "MASTER BATTERY" switches *(figure 44-1)* in "ON" position. If a battery-cart or portable generator is used, leave "MASTER BATTERY" switches "OFF."

(e) TO ENERGIZE INTERPHONE AMPLIFIER.

1. C-47 airplanes: Energize interphone amplifier *(figure 45)*, which is mounted on forward side of bulkhead aft of radio operator's station, by turning



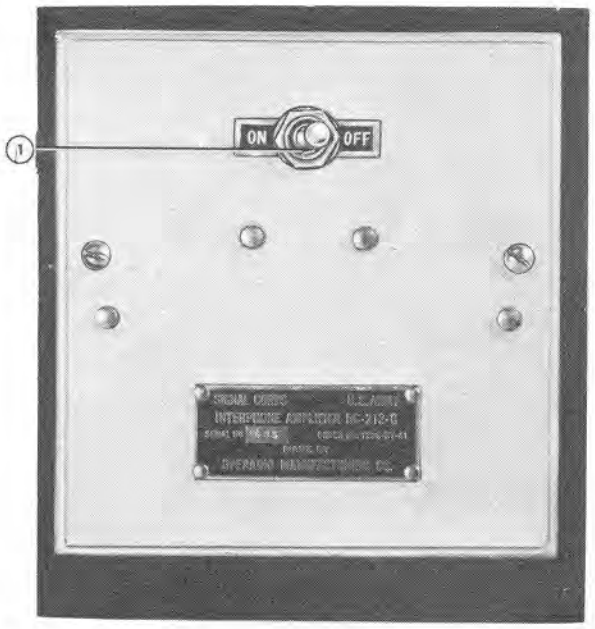
1. Battery Switches

Figure 44 — Port Side Above Pilot's Head in C-47

receiver switch *(figure 46-1)* to "AUTO" or "MANUAL" or by placing interphone amplifier switch *(figure 45-1)* "ON." Normally the amplifier switch is left in "OFF" position unless it is desirable to use the interphone without turning on the command set. Both these switches must be in "OFF" position to turn amplifier off.

2. C-47A airplanes: Interphone amplifier is energized at all times the "MASTER BATTERY" switches are "ON" or when an external power source is being used.

(f) To call any of crew, hold selector switch on "CALL," press microphone switch and speak into microphone in a normal tone. Release selector switch, which will be spring-returned to "INTER."



1. Power Switch

Figure 45 — Interphone Amplifier BC-212-( ) Installed in C-47

(g) When crew member answers, communicate by pressing microphone switch to transmit and releasing pressure to listen.

(h) To operate radio compass, command set, liaison set, or to receive audio output of marker beacon, place interphone selector switch on appropriate position and proceed as directed under the operating instructions following for each set.

Note

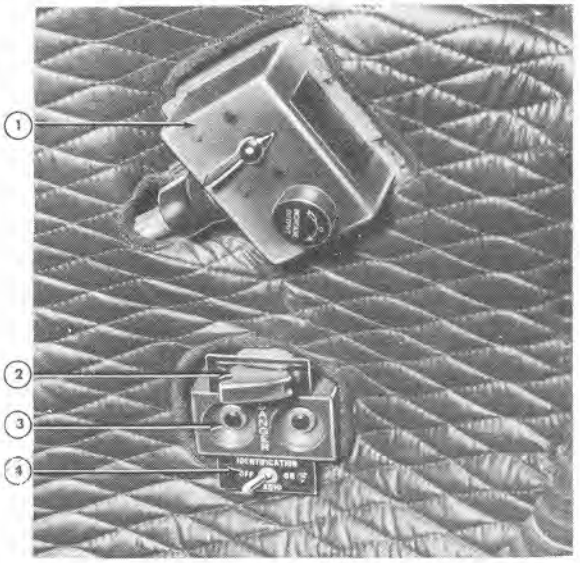
In the event of interphone amplifier failure in C-47A airplanes, the audio output of the various receivers is still available with selector switch on the appropriate position, but communication with crew will not be possible with any selector switch position without the transmission being broadcast. In such cases:

1. Place the radio set SCR-274-N "TRANSMITTER SELECTION" switch *(figures 58-5 & 60-4)* on position "3" or "4."

2. Place "TRANS POWER" switch *(figures 58-5 & 60-5)* in "ON" position.

3. With all interphone selector switches on "COMMAND" position, communication can be effected between crew members.

4. To return to normal command set operation, place "TRANSMITTER SELECTION" *(figure 60-4)* switch on "1" or "2."



1. Command Receiver Control Box BC-( )-231
2. IFF "Emergency" Switch
3. Detonator Switchbox
4. Remote IFF Power Switch

Figure 46 — Port Side Above Pilot's Head in C-47

5. ICE ELIMINATING EQUIPMENT.

a. PROPELLER ANTI-ICER SYSTEM.—A propeller anti-icing fluid tank holding 4 U. S. gallons (3.3 Imperial gallons) is located behind the pilot's seat and supplies isopropyl alcohol to the slinger rings located aft of the hub on each propeller. A rheostat *(figure 23-16)* located inboard of the tank, controls the speed of the anti-icing fluid pump and thus the rate of the fluid flow.

b. CARBURETOR ANTI-ICER SYSTEM. — The carburetor anti-icer system (if installed) consists of a 10 U. S. gallon (8 Imperial gallon) tank and an electric pump in the right-hand baggage compartment a double throw switch on the pilots' right-hand electrical panel, and outlets on each carburetor air inlet adapter. The double-throw control switch has an "ON" position for continuous operation, a "MOM" psition for momentary operation, and an "OFF" position.

c. WINDSHIELD ANTI-ICER SYSTEM. — The windshield anti-icer system is actually two independent systems with the same source of alcohol supply, a 6 U. S. gallon (4.9 Imperial gallon) tank located in the right-hand baggage compartment. One system supplies alcohol to the sliding panels located on each side of the fixed portion of the windshield. This system is intended primarily to remove ice from the edges of these sliding panels to permit their being opened or closed during icing conditions. The system should only be operated as necessary to free the panels. Operating a hand pump *(figure 24-3)* located below the lower right-hand corner of the instrument panel forces

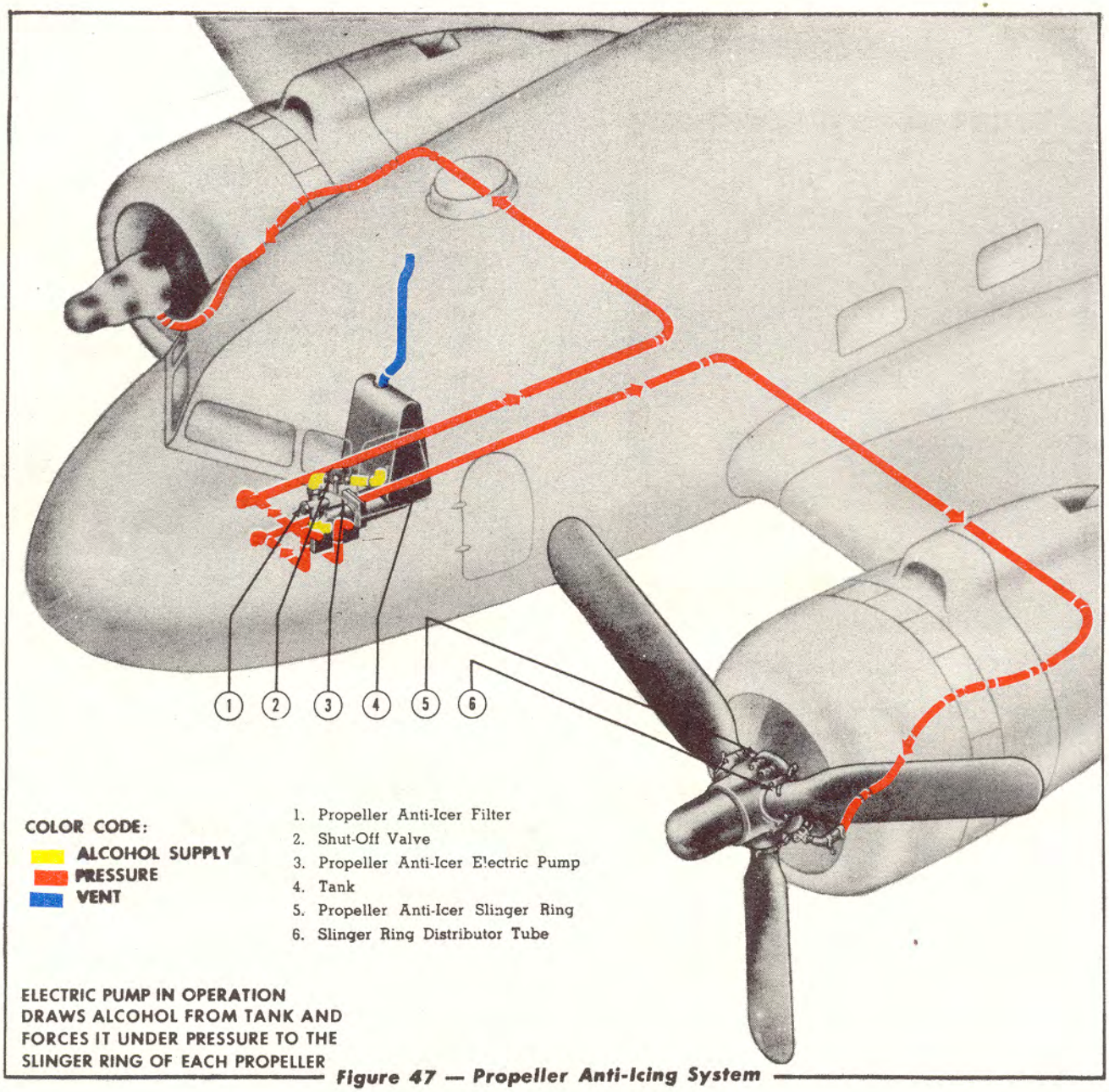


Figure 47 — Propeller Anti-Icing System

alcohol through perforated tubing which outlines the frames of the panels. Two "ON-OFF" control valves *(figures 23 & 24)* permit either set of panels to be freed of ice independently of the other set. The other system supplies alcohol to the two forward windshields and, in heavy rain or ice, works in conjunction with windshield wipers. Operation is controlled by a valve *(figure 27-22)* and an electric pump switch *(figure 13)* located on the left electrical panel. The switch will not start the pump unless the alcohol line valve is open. The windshield wiper control is on this same panel, located adjacent to the valve.

d. WINDSHIELD DEFROSTER SYSTEM. – Three windshield defrosters are provided. One each for the pilot's and co-pilot's windshields and one to defrost the astro-dome in the navigator's compartment. When the heating and ventilating system is in operation the defrosters may be turned on by opening the butterfly valves at the ends of the flexible tubes.

e. WINDSHIELD WIPERS. – A windshield wiper system is provided for the two forward windshields. These Acrotorque windshield wipers are hydraulically operated and are controlled by a valve *(figure 27-23)* located on a panel left of the instrument panel. During heavy rain, or if ice forms on the windshield, the anti-icer alcohol valve and electric switch, located on the same panel, may be turned on to aid in cleaning the windshields. Do not operate the windshield wipers on dry windshields.

f. PITOT HEATERS. – The pitot static tubes are equipped with integral heaters which prevent ice from forming on the tubes. The pitot heaters are controlled by one electric switch *(figure 13-26)* located on the pilot's left-hand electrical panel. Two electric switches are installed for the operation of these pitot static tube heaters on winterized airplanes.

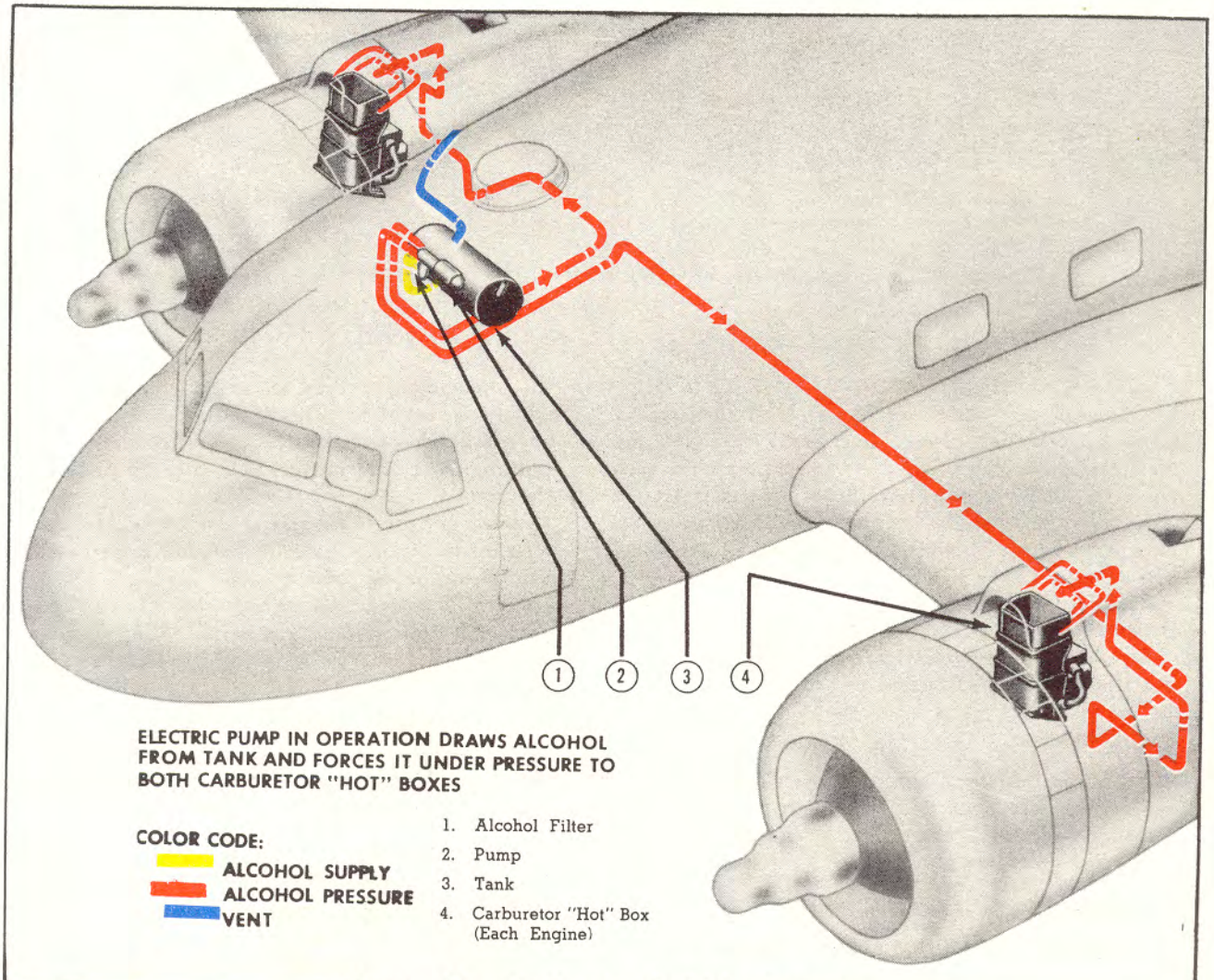


Figure 48 — Carburetor Anti-Icing System

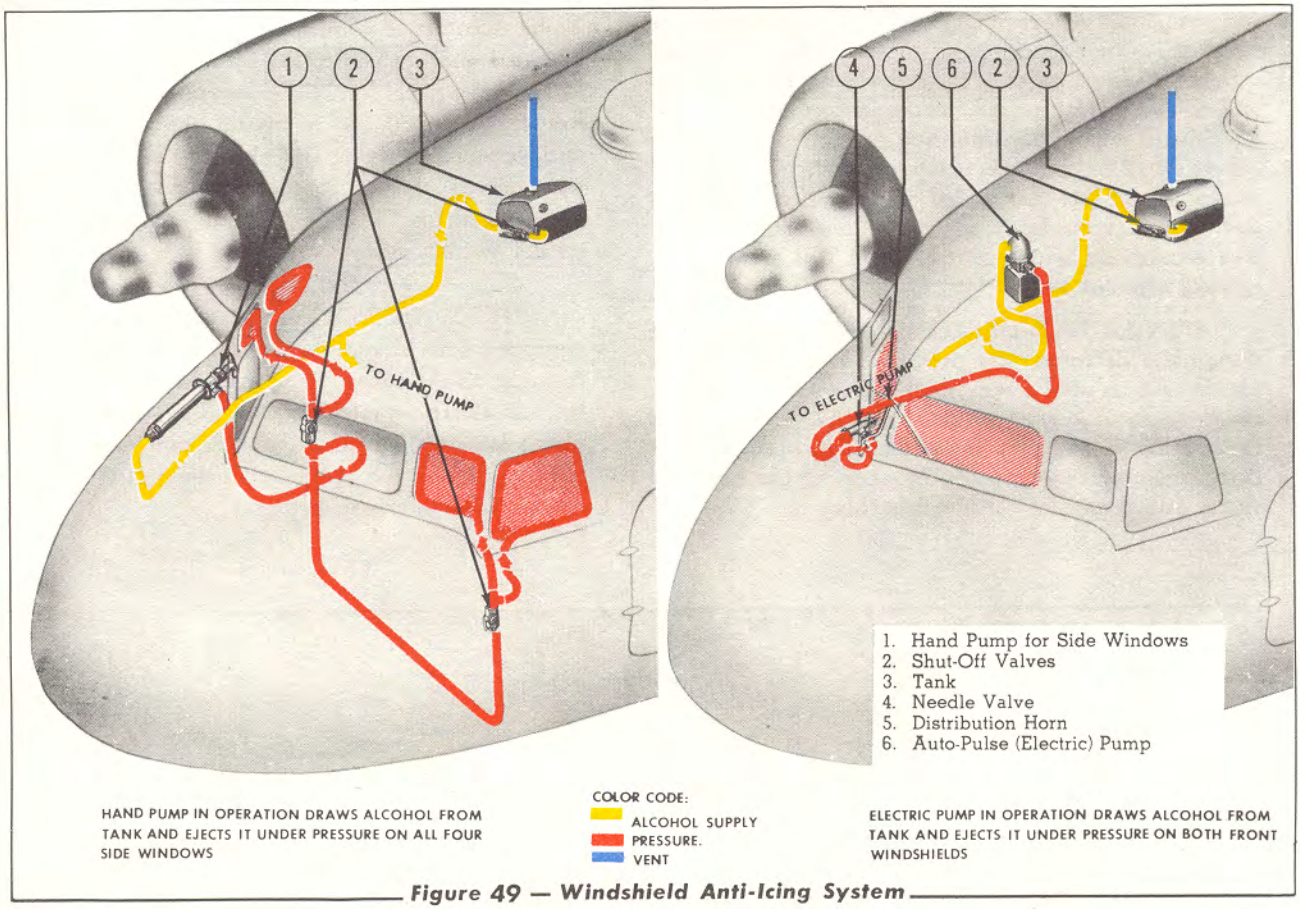


Figure 49 — Windshield Anti-Icing System

g. DE-ICER SYSTEM (WING AND TAIL SURFACES).—De-icer shoes are installed on the leading edge of each wing, of each horizontal stabilizer, and of the vertical stabilizer. A vacuum pump on each engine supplies air to the bladders of the shoes through a de-icer rotary air distributing valve. This valve rotates, causing an inflation and deflation of the bladders in a pulsating action. When the de-icer system is inoperative, the air from the de-icer vacuum pumps is exhausted into the atmosphere through the forward center section. The control *(figure 24-30)* for the de-icer system is located behind the co-pilot's seat.

6. ARMAMENT.

There are no provisions for armament on this airplane; however, each of the main cargo compartment windows has a removable transparent plug which will allow defensive gun fire.

7. FUSELAGE EQUIPMENT.

a. MISCELLANEOUS EQUIPMENT.

(1) SEATS.—Position adjustments of the seats in the pilots' compartment are made as follows: up and down movement by lifting the adjusting lever on the outboard side of the seat, fore and aft movement by pulling the cloth-covered cable *(figures 23 & 24)* on the inboard side of the seat. The radio operator's seat is a swivel type chair and is not adjustable but will lock in the straight forward position for take-off and landings. During take-off and landings, the radio operator should sit facing forward. The navigator is provided with a stool. A row of folding, bench type seats is located on each side of the main cargo compartment.

(2) RELIEF TUBES.—Three relief tubes are installed in the airplane: one beneath the pilot's seat, one beneath the co-pilot's seat, and one on the aft bulkhead of the lavatory compartment.

(3) LAVATORY.—The lavatory compartment is located aft of the main cargo compartment and includes a chemical disposal type toilet, a relief tube, and a wash basin. Water for the wash basin is carried in a tank on the aft wall of the compartment. Water for the basin is drawn from the tank by pushing the

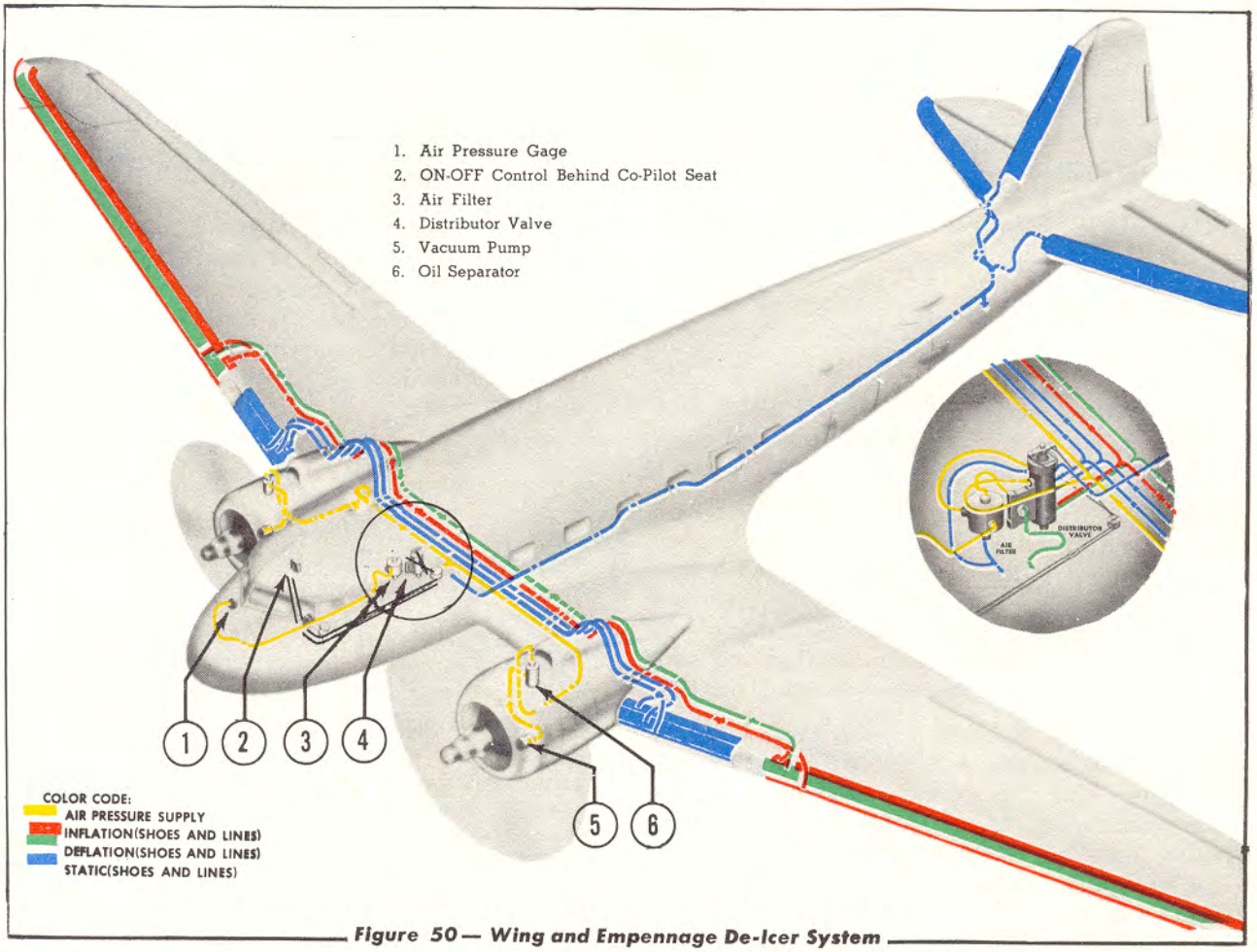


Figure 50 — Wing and Empennage De-Icer System

button on top of the faucet. Chemicals for the toilet are carried beneath the wash basin. A holder for carrying a first-aid kit is installed on the aft bulkhead of the lavatory.

(4) DRINKING WATER PROVISIONS. — On some airplanes a drinking water tank is located above the navigator's head. The water tap and a drinking cup holder are located on the forward bulkhead of the main cargo compartment.

(5) CABIN ENTRANCE STEP. — A cabin entrance step is stowed on the left side of the bulkhead in front of the lavatory.

(6) STARTER HAND CRANK AND GEAR BOX.—The starter hand crank and gear box (an integral unit) is stowed on the left-hand side of the main cargo compartment aft bulkhead.

(7) CARGO DOOR HANDLE GUARD. — This guard eliminates the possibility of the para-troopers' equipment becoming fouled on the door handles when leaving the airplane. The guard is stowed by means of straps on the inside of the cargo door aft section.

(8) ENGINE COVERS.—Two engine covers are stowed on the aft bulkhead of the main cargo compartment.

(9) CANVAS CONTAINER. — This canvas bag contains the landing gear safety pins, the cargo tie down fittings, the tail mooring anchor plate, the floor plug buttons, and the jack points and bolts when these are not in use. This container is stowed on the bulkhead in front of the lavatory compartment.

(10) MAP CASE AND DATA HOLDERS.—The pilot and the co-pilot are each provided with a map case and data holder installed outboard from their seats.

(11) INFORMATION CHARTS.—A fuel system chart is installed on the left face of the left wall of the baggage compartment. A smaller fuel system chart is directly behind the pilot below the fire extinguisher. Oxygen and heating system charts are installed on the front of the door separating the cabin and radio compartments. Wiring charts are on the main junction box aft of the small cargo door and on those in the front of the nacelles.

(12) TOOL KITS.—The engine, propeller, emergency repair kit, radio repair kit, crew chief emergency kit, hydraulic and de-icer patching kits, are carried in the small compartment forward of the radio operator.

b. CARGO AND TROOP CARRYING EQUIPMENT.

(1) TROOP EQUIPMENT (WITHIN AIRPLANE).

(a) SEATS.—Folding, bench type seats are provided in the main cargo compartment for the seating of 27 passengers.

(b) PARACHUTE RIP CORD CABLE. — A parachute rip cord anchorage cable is installed along the top of the fuselage.

(c) PARACHUTE TROOP EXIT PANEL.—On some airplanes the inside panel of the forward half on the main cargo door is removable inward and is used as the exit for parachute troops. Four hooks and bungee rings installed on the right-hand side of the fuselage, opposite the main cargo loading door, are provided for stowing the panel while using the exit.

(d) LITTER SUPPORTS.—On some airplanes eighteen sets of metal supports are carried and are used to set up the litter accommodations. The supports are stowed beneath the aft end of the main cargo compartment floor and, in use, attach to built-in fittings in the main cargo compartment floor. On other airplanes leather type strap supports are provided making possible the installation of 24 litters. Canvas bags, marked "LITTER STRAP STOWAGE," are snapped to the longerons in the main cargo compartment.

(2) CARGO EQUIPMENT (WITHIN AIRPLANE).

(a) SNATCH BLOCK AND IDLER PULLEY.—To facilitate the loading of heavy cargo a snatch block, an idler pulley, and a ring for securing an additional snatch block are provided. The snatch block is located opposite the main cargo loading door on the side of the fuselage near the floor. The idler pulley in use is attached to the cargo door sill. When not in use the idler pulley is stowed on the main cargo compartment aft bulkhead. The ring for an additional snatch block is stowed near the floor on the left-hand side of the forward bulkhead.

(b) TIE-DOWN FITTINGS AND RINGS.—Tie-down rings, installed along the sides of the main cargo compartment, and male tie-down fittings, are used for securing cargo. These fittings are stowed in a canvas pocket on the main cargo compartment aft bulkhead.

(c) ENGINE TRANSPORTATION.—The main cargo compartment is large enough to carry engines of several types and sizes. The following is a list of proven load combinations including cradles:

4 R-1830 Pratt & Whitney Engines

4 V-1570 Curtiss Engines

3 V-1710 Allison Engines

2 GR-3350 Wright Engines

(d) LOADING RAMPS. — Loading ramps are provided for the loading of heavy equipment. Holes for the attachment of the ramps are provided in the main cargo loading door sill; directions for the attachment of the ramps are contained on the sides of the ramps and on the door sill adjacent to the attaching holes.

(3) CARGO AND TROOP EQUIPMENT (EXTERIOR OF AIRPLANE).

(a) PROPELLER CARRYING PROVISIONS.—Fittings are installed in the bottom of the fuselage for carrying two propellers.

(b) PARACHUTE PACK PROVISIONS. — There are provisions for carrying six parachute pack racks beneath the belly of the fuselage. These racks are attached to the airplane at fittings installed flush with the fuselage belly skin. Standard bomb shackles in the parachute pack racks provide the carrying and releasing mechanism for the parachute packs. A parachute troop jumpmaster, located in the main cargo compartment at the jumpmaster's station, operates the controls which release the parachute packs. A salvo control for emergency release is located in the pilot's compartment.

(c) GLIDER TOW PROVISIONS. — A glider tow release unit is installed on the aft end of the fuselage. This unit incorporates a release mechanism which is operated by pulling a handle located on the pilots' compartment aft bulkhead above the co-pilot's seat.

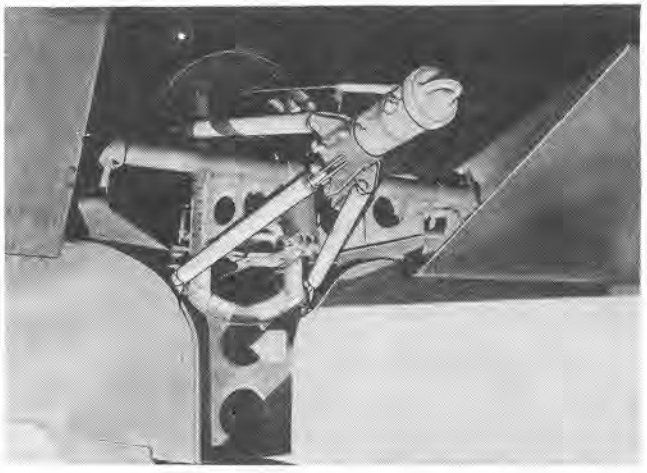
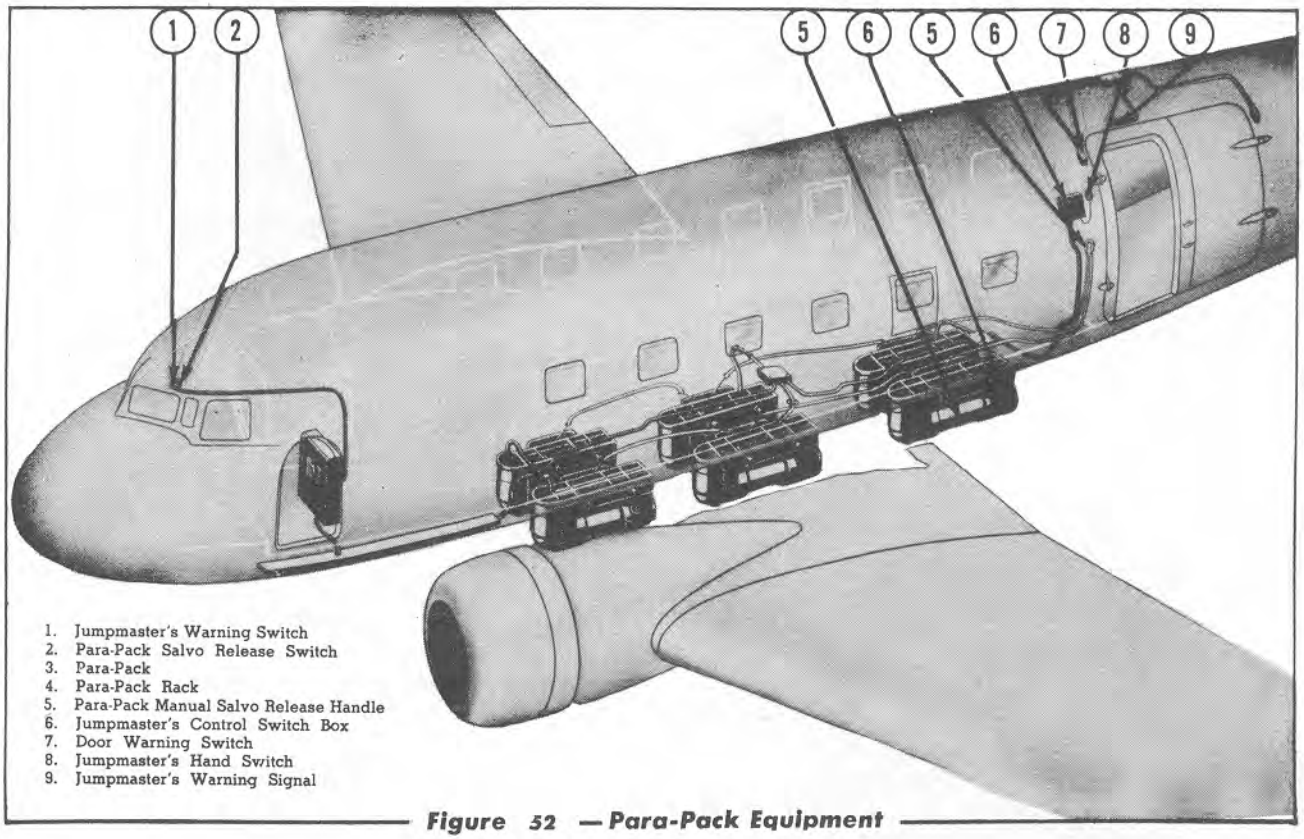


Figure 51— Glider Tow



1. Jumpmaster's Warning Switch
2. Para-Pack Salvo Release Switch
3. Para-Pack
4. Para-Pack Rack
5. Para-Pack Manual Salvo Release Handle
6. Jumpmaster's Control Switch Box
7. Door Warning Switch
8. Jumpmaster's Hand Switch
9. Jumpmaster's Warning Signal

Figure 52 — Para-Pack Equipment

8. PILOT'S COMPARTMENT.

a. GENERAL.—Controls for the release of parachute packs, glider tow release and certain communication equipment is located in the pilots' compartment and is operated as follows:

b. PARACHUTE PACK SALVO SWITCH. – A guarded electrical salvo switch *(figures 12 & 13)*, located on the pilot's left-hand electrical panel, when tripped, will release all six parachute packs simultaneously.

c. GLIDER TOW RELEASE.

(1) OPERATION.

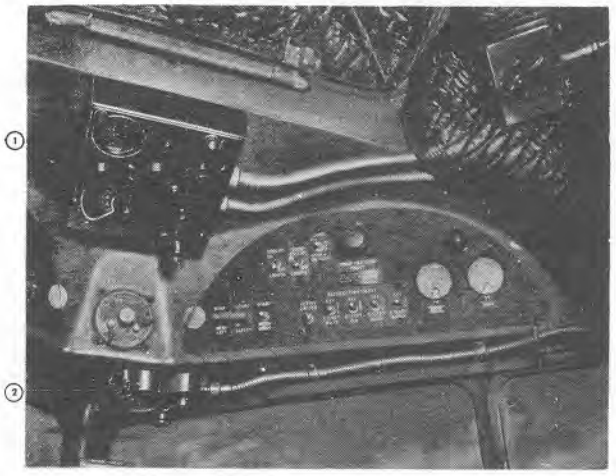
(a) Signal for glider release.

(b) Pull the handle located on the pilots' compartment aft bulkhead above the co-pilot.

(c) Verify that glider has been released.

CAUTION

The glider tow cable should not be released, except in case of emergency, until all gliders being towed have released themselves from their tow cable.



1. Compass Control Box
2. Remote Tuning Unit MC-125-( ) for Command Receiver
3. Command Transmitter Radio Control Box BC-( )-132

Figure 53 — Starboard Side Above Copilot's Head In C-47

d. COMMUNICATIONS EQUIPMENT.

(1) OPERATION OF SCR-( )-183 COMMAND RADIO SET (C-47 AIRPLANES).

(a) The command set provides for comparatively short range transmission of CW or MCW signals on a pre-set frequency and for reception of MCW signals in the 201-398 kc and 2500-7700 kc bands. A dual receiving coil unit, covering 201-398 kc and 2500-4700 kc, is switched from the "low" to the "high" band by means of the "HI-LO" switch *(figure 54)* mounted aft of co-pilot.

Figure 54 — Hi-Lo Selector Switch

(b) To Operate Receiver.

1. Plug into interphone set.

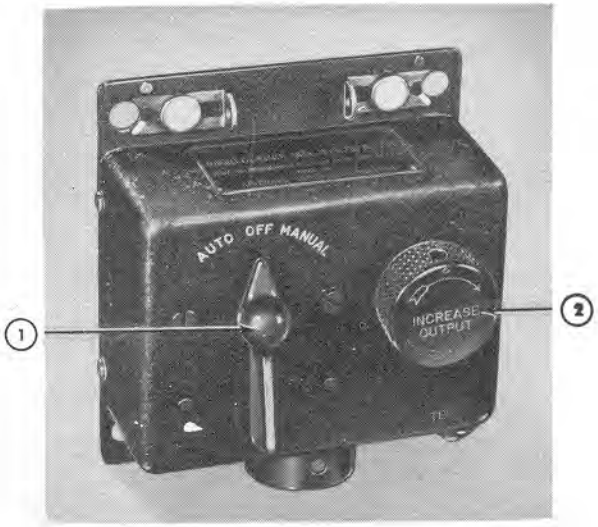
2. Place the "VHG-MED FREQ" switch (located to right of compass control box, if installed) in "MED FREQ" position. This switch permits operation of SCR-522A (if installed) or SCR-( )-183 through "COMMAND" position of interphone jack box.

3. Turn the selector switch *(figures 53-3 & 55-1)* to "MANUAL."

4. If dual coil unit is installed, place "HI-LO" switch in appropriate position.

5. Adjust headset volume with "INCREASE OUTPUT" knob *(figure 55-2).*

6. Tune to desired station frequency, by means of tuning crank *(figure 56-5)* located at vee of windshield indicated on the frequency dial *(figures 56-2, 56-3, or 56-4).*



1. Selector Switch
2. Increase OUTPUT, Volume Control

Figure 55 — Command Receiver Control Box BC-( )-231

7. After station is tuned in, turn selector switch to "AUTO" unless receiving radio range signals. AVC tends to broaden the frequency band, making it difficult to distinguish between "A" and "N" radio range quadrant signals.

(c) TO OPERATE TRANSMITTER.

1. Plug into interphone set.

2. Place "VHG-MED FREQ" switch, if installed, in "MED FREQ" position and tune in receiver.

3. Monitor frequency of station to be contacted.

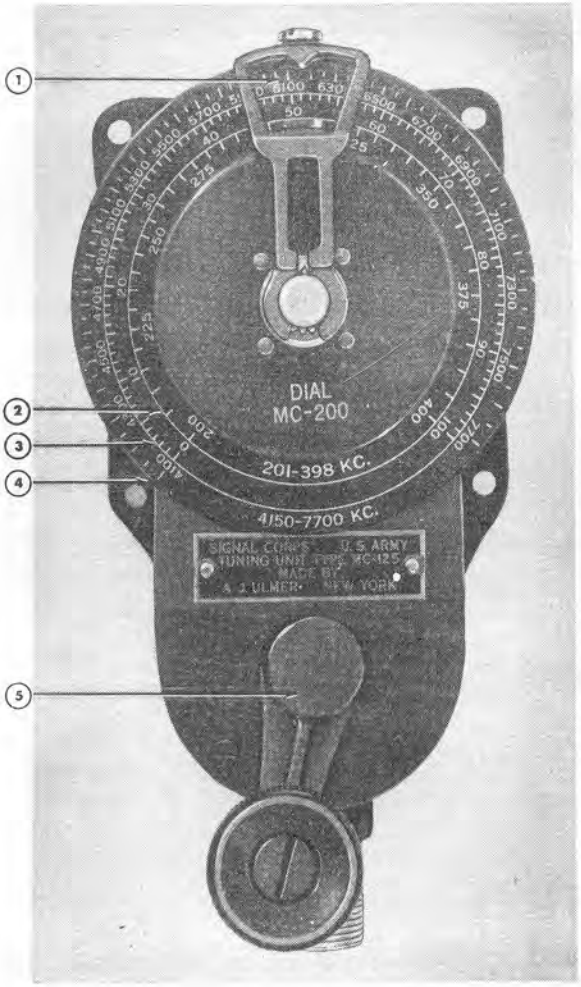
4. Set emission selector switch *(figure 57-3)* to type emission desired.

5. For "TONE" or "CW" transmit by pressing microphone switch or the key *(figure 57-4)* on the control box. For "VOICE" press microphone switch and speak into microphone in a normal tone. Release pressure on microphone switch to receive.

6. Both the receiver and transmitter are turned off by the "ON-OFF" switch *(figure 55-1).*

(2) OPERATION OF SCR-274-N COMMAND SET.

(a) The command set provides for comparatively short range transmission of CW or MCW signals on either of two pre-set frequencies, and for the reception of CW or MCW signals in the 190-550 kc, 3-6 mc, and 6-9.1 mc bands. Simultaneous reception on more than one band is possible.



1. Frequency Pointer
2. 201-398 Kilocycle Calibration Scale
3. 0-100 Frequency Calibration Scale
4. 4150-770 Kilocycle Calibration Scale
5. Tuning Crank

Figure 56 — Remote Tuning Control for Command Receiver (SCR-( )-183 Set)

(b) To Operate Receiving Components.

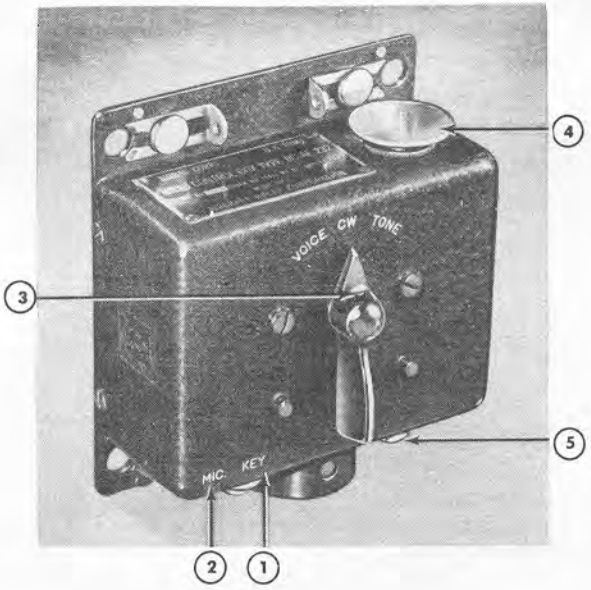
1. Plug into interphone set.

2. Place the "VHF-MED FREQ" switch, if installed, in "MED FREQ" position.

Note

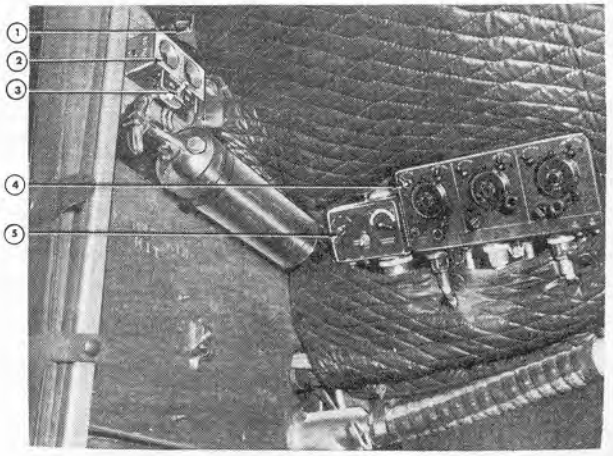
This switch permits operation of SCR-522-A (if installed) or SCR-274-N through "COMMAND" position of interphone jackbox.

3. Place the three "A-B" switches *(figure 59-3)* on "A."



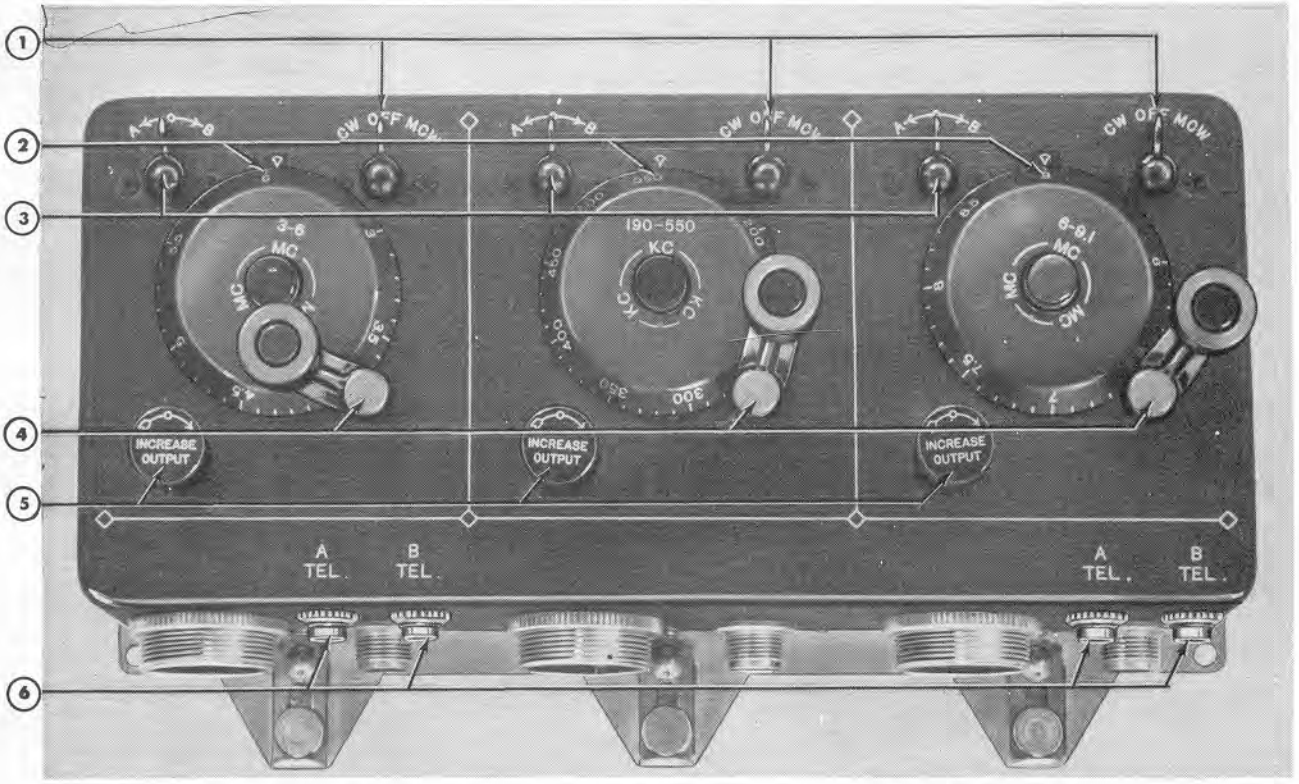
1. CW Key Jack
2. Microphone Jack
3. Emission Selector Switch
4. Built-in CW Key
5. Key Adjustment Screw

Figure 57 — Command Transmitter Control Box BC-( )-232



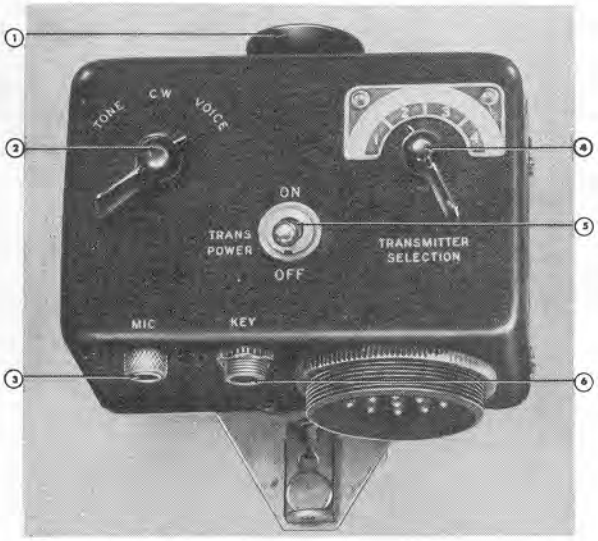
1. Remote Emergency Switch
2. Destructor Switchbox
3. Remote IFF Power Switch
4. Control Box BC-450-A for Command Receivers
5. Control Box BC-451-A for Command Transmitters

Figure 58 — Control Boxes for IFF and Command Radio Sets in C-47A



1. "CW-OFF-MCW" Switches
2. Frequency Band Tuning Dials
3. "A-B" Telephone Switches
4. Tuning Cranks
5. Volume Control Knobs
6. "A-B TEL" Phone Jacks

Figure 59 — Command Receiver Control Box BC-450-A in C-47A



1. "CW" Key
2. Emission Selector Switch
3. Microphone Jack with Adjustable Knurled Nut
4. Transmitter Selector Switch
5. Transmitter Power Switch
6. KEY Jack

Figure 60 — Command Transmitter Control Box BC-451 in C-47A

4. On control box section (covering the desired frequency) place "CW-OFF-MCW" switch *(figure 59-1)* on type of reception desired.

5. Adjust to desired station frequency with the tuning crank *(figure 59-4),* rocking across frequency marking to locate strongest signal.

6. Adjust headset volume with "INCREASE OUTPUT" knob *(figure 59-5).*

7. To receive in more than one frequency band, place the "A-B" switch of the tuned-in receiver on "B" (or turn its "INCREASE OUTPUT" knob fully counterclockwise until reception is desired).

8. Complete the steps directed in *4. 5. and 6.,* above for the second receiver.

9. Return "A-B" switch of first receiver to "A" (or turn its "INCREASE OUTPUT" knob to position for proper volume).

(c) To Operate Transmitting Components.

1. Plug into interphone set.

2. Place "VHF-MED FREQ" switch mounted to the right of the radio compass control box (if installed), in "MED FREQ" position and tune in applicable receiver.

1. Inverter Switch
2. Control Box BC-602-A for SCR-522-A
3. Remote Liaison Transmitter Power Switch
4. Compass Operation Chart

Figure 61 — Bulkhead Aft of Copilot in C-47A

3. Monitor frequency of station to be contacted.

4. Place "TRANS POWER" switch *(figure 60-5)* in "ON" position.

5. Set "TRANSMITTER SELECTION" switch *(figure 60-4)* on position "1" or "2" as shown on placard above switch for frequency to be used.

6. Set "TONE-CW-VOICE" switch *(figure 60-2)* on desired type of emission.

7. See that knurled nut *(figure 60-3)* is in full counterclockwise position.

8. For "TONE" or "CW" transmit by pressing microphone switch or the key on control box *(figure 60-1)*. For "VOICE" press microphone switch and speak into microphone in a normal tone. Release pressure on microphone switch to receive.

9. If transmitter is to be turned off on completion of transmission, place "TRANS-POWER" switch on "OFF." Ordinarily during flight the "TRANS-POWER" switch is kept "ON" and the "TONE-CW-VOICE" switch on "VOICE" even while not transmitting. This is done to keep the tube filaments ready for instant use and to prevent command set dynamotor from running continuously as it does when switch is on "TONE" or "CW."

(3) OPERATION OF SCR-522-A RADIO SET (if installed).

(a) Plug into interphone set.

(b) Place "VHF-MED FREQUENCY" switch on "VHF."

(c) Place "T-R-REM" switch *(figure 61-2)* on "REM."

(d) To receive on channel A, B, C, or D, press corresponding button on control box. Tubes will require approximately 30 seconds to warm up.

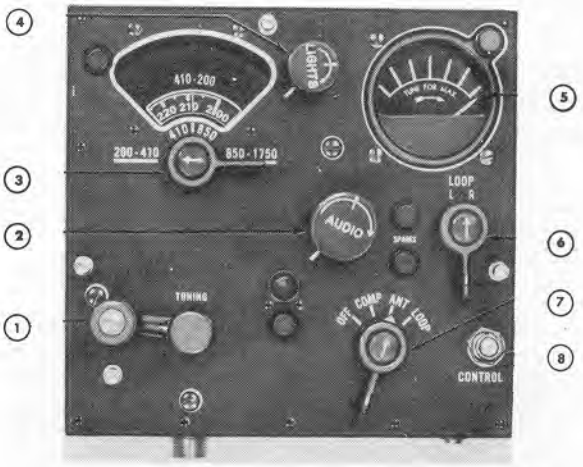
(e) Adjust headset volume with "INCREASE OUTPUT" knob on interphone jack box.

(f) To transmit, press button for channel selected and monitor the station to be contacted.

(g) Press microphone "press-to-talk" switch and speak into microphone in a normal tone.

(h) To receive, release pressure on microphone switch.

(i) To turn set off, press "OFF" button on control box.



1. Tuning Crank
2. Audio Output Control
3. Frequency Band Selector Switch
4. Dial Lights Control
5. Tuning Meter
6. Loop-drive Control
7. Selector Switch
8. Control Push Switch (not used)

Figure 62 — Radio Compass Control Box BC-434-A (For SCR-269G Radio Compass)

Note

With switch in either "T" or "REM" position and A, B, C, or D button depressed, any intracommunication will be broadcast. To avoid this keep toggle switch on "R" when intracommunication is being effected.

(4) OPERATION OF SCR-269-G RADIO COMPASS.

Note

If radio compass SCR-280-A is installed, see paragraph (5) following.

(a) Radio compass SCR-269-G provides for the reception of "CW" and "MCW" signals in the 200-1750 kc band, with or without indications of the direction from which the signals are arriving. For aural identification of "CW" signals, the remote "CW-VOICE" switch mounted by the control box in some installations, and on the compass unit in others, must be in "CW" position, although the compass and homing features of the set will function properly on "CW" signals with this switch on "VOICE."

1. For best reception during periods of rain-snow static, operate on "LOOP" rotating loop to obtain strongest signal.

2. For aural reception of "A-N" signals, operate on "ANT" or "LOOP" since the automatic volume control on "COMP" position results in very broad course indications.

3. For best definition of "A-N" signals to keep interphone jack box "INCREASE OUTPUT" knob in full clockwise position, and adjust headset volume to minimum usable level with the "AUDIO" knob of compass control box.

(b) To Operate.

1. Plug into interphone set.

2. Place selector switch *(figures 53-1 & 62-7)* on "COMP," "ANT," or "LOOP," as required.

3. An A. C. inverter power unit will be heard when the compass set is turned on. In case of failure of A. C. inverter power unit in the earlier C-47A airplanes, place "INVERTER NO. 1, NO. 2 INVERTER" switch *(figure 61-1)* on opposite position. Later C-47A airplanes have only one inverter.

4. Adjust dial lamps with "LIGHTS" control *(figure 62-4).*

5. Adjust receiver to frequency of desired station with band selector switch and tuning crank. Rock back and forth across frequency markings to find point of maximum indication on tuning meter *(figure 62-5).* The tuning meter is not to be considered as a distance indicator.

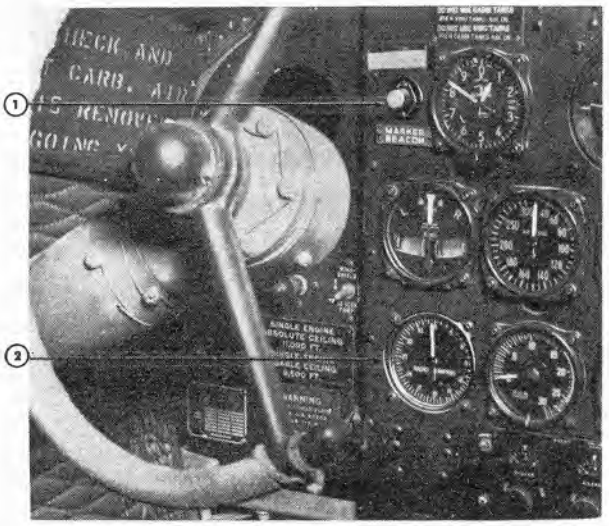
6. Adjust headset volume with "AUDIO" knob *(figure 62-2).*

7. To turn radio compass off, turn selector switch to "OFF."

(5) OPERATION OF SCR-280-A RADIO COMPASS.

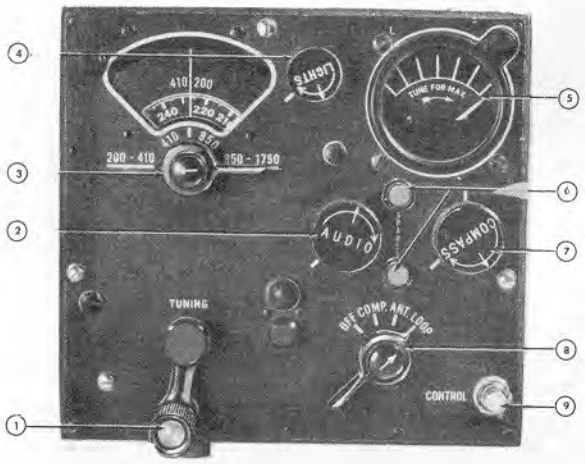
1. "CW-VOICE" Switch

Figure 63 — Radio Compass Unit BC-433-G (Part of SCR-269-G)



1. Marker Beacon Indicator
2. Radio Compass Indicator (for SCR-269-G)

Figure 64 — Instrument Panel on Pilot's Side



1. Tuning Crank
2. Audio Output Control
3. Frequency Band Selector Switch
4. Dial Lights Control
5. Tuning Meter
6. Spare Lamps
7. Compass Sensitivity Control
8. Selector Switch
9. Control Push Switch (not used)

Figure 65 — Radio Compass Control Box BC-432 (For SCR-280-A)

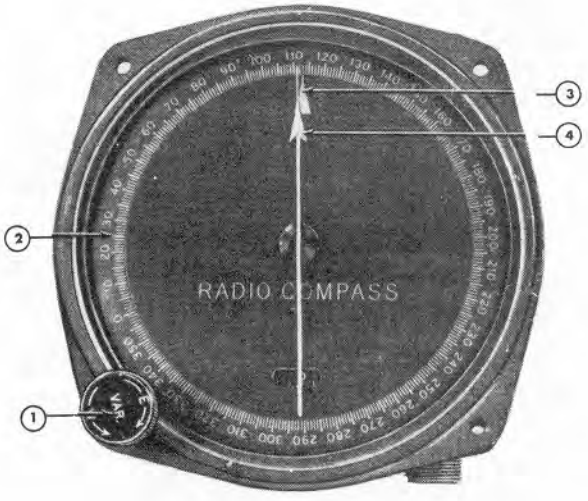
(a) Radio compass SCR-280-A performs the same functions as Radio Compass SCR-269-G with the exception that "CW" signals cannot be received.

(b) The control box *(figure 65)* is similar to the control box for Radio Compass SCR-269-G except that Radio Compass SCR-280-A control box has no "LOOP L-R" switch. Radio Compass SCR-280-A has a left-right compass indicator *(figure 67)* mounted on the pilot's instrument panel. This indicator may be used in conjunction with the azimuth bearing indicator *(figure 66)*. The azimuth bearing indicator is controlled by an adjacent tuning crank when operating on "LOOP" or "COMP" positions.

(6) OPERATION OF RC-39 OR RC-43 MARKER BEACON RECEIVING EQUIPMENT.

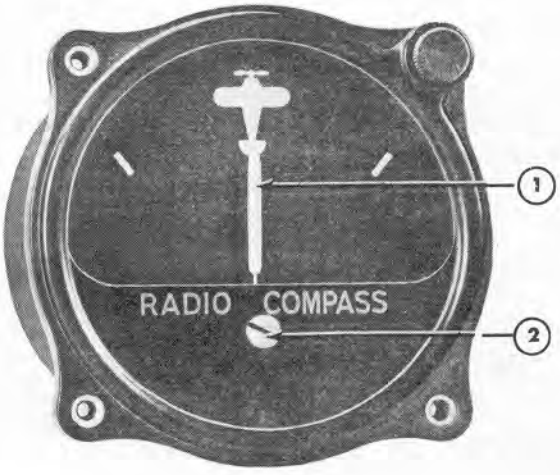
(a) Marker Beacon Radio Receiver BC-341-( ) or BC-357-( ) provides visual indication of passage of the airplane over or in close proximity to a marker beacon transmitter. The receiver is pre-tuned and requires no operational adjustment.

(b) To Operate, turn on radio compass, which furnishes the power for marker beacon receiver. Indicator lamp *(figure 64-1)* will light when airplane is passing over or near to marker beacon transmitters. Length of the lighted period is dependent on the altitude and speed of the airplane and the type of marker, varying from a few seconds to several minutes.



1. Variation Control
2. Azimuth Scale (rotatable)
3. Index Marker (fixed)
4. Bearing Indicator Pointer

Figure 66 — Bearing Indicator 1-75-A



1. Compass Indicator Pointer
2. Zero Adjusting Screw

Figure 67 — Compass Indicator 1-65-D Mounted on Instrument Panel

1. Liaison Antenna Switch
2. Reel Control Box
3. Transmitter BC-375( )
4. Interphone Jackbox
5. Monitor Switch
6. Control Box for SCR-595-A
7. Radio Receiver BG-348-H

Note: Radio Transmitter BC-375-( ) has been replaced by Radio Transmitting Set AN/ART-13A.

Figure 68 (Sheet 1 of 3)—Radio Operator's Station in C-47A

(c) To turn off the marker beacon receiver, turn radio compass "OFF."

(7) OPERATION OF SCR-187-A OR SCR-287-A LIAISON RADIO SET.

(a) Radio Set SCR-187-A or SCR-287-A is a long range set providing for the transmission of CW or MCW signals in the 200-500 kc bands, and for reception of CW or MCW signals in the 200-500 kc and 1,500-18,000 kc bands. For operation by pilot or co-pilot, the radio operator must first make the necessary operating adjustments.

(b) To operate, instruct radio operator to make the necessary adjustments of receiver and transmitter.

1. Place interphone selector switch on "LIAISON."

2. Receive and transmit by conventional use of headset, interphone "INCREASE OUTPUT" control, and microphone.

3. If headset volume is too low with interphone "INCREASE OUTPUT" control full-on, instruct radio operator to increase volume at the set.

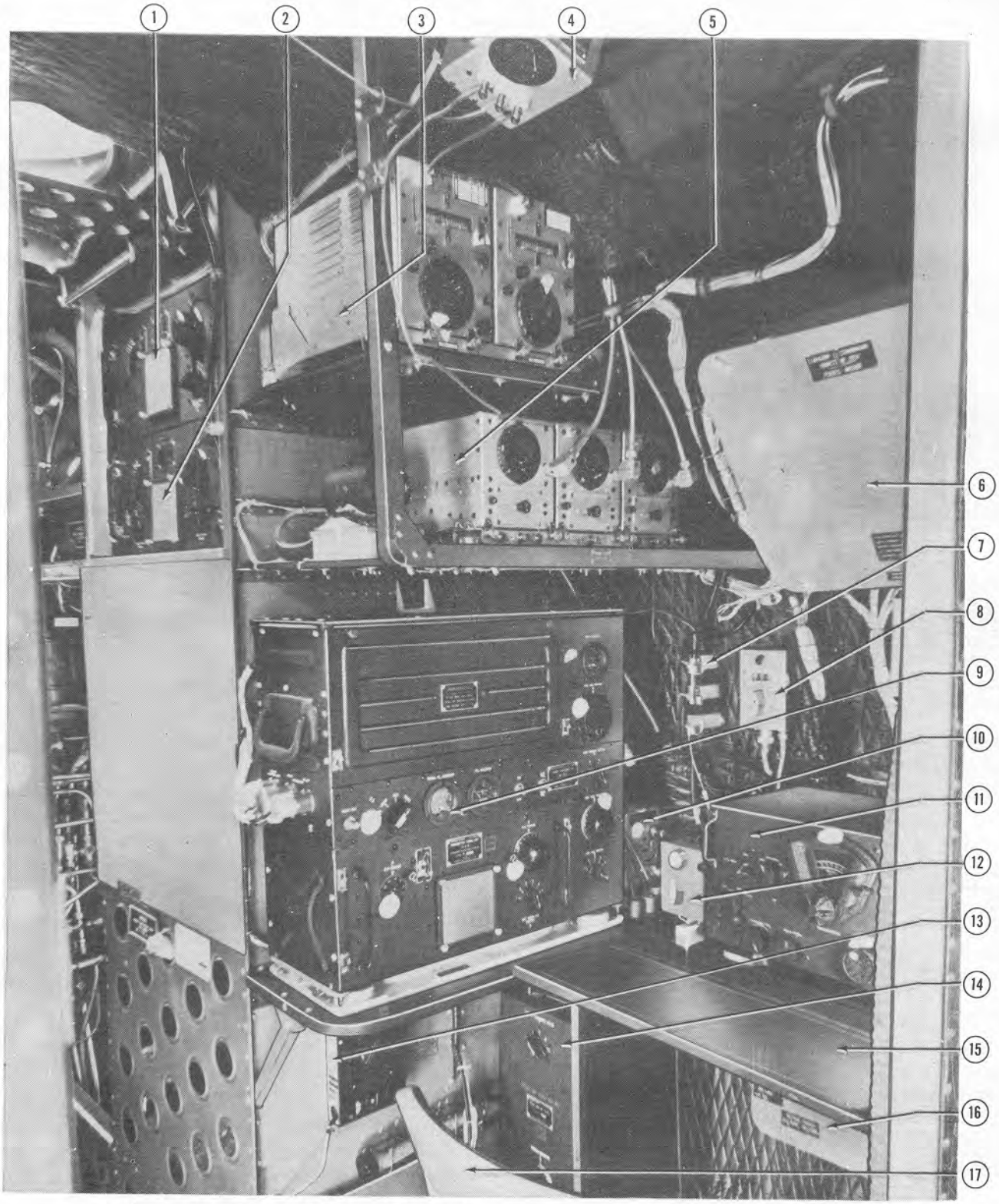
4. On completion of communication, instruct radio operator to turn off equipment and if necessary, to reel in trailing antenna.

(8) OPERATION OF SCR-595-A RADIO SET OR SCR-695-A RADIO SET

(a) Radio Set SCR-595-A or SCR-695-A provides automatic identification signals and transmits emergency signals where required.

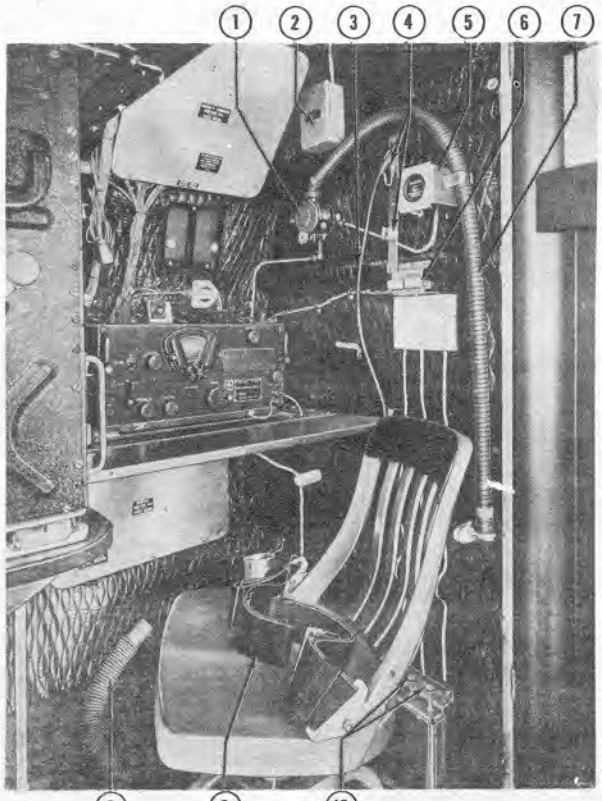
(b) To operate place power "ON-OFF" switch *(figure 46-4 or 58-3)* located at pilot's position in "ON" position, or the "ON-OFF" switch *(figure 68-6)* at radio operator's station in "ON."

1. Turn selector switch on control unit *(figure 68-6)* to the numbered position designated in tactical orders.



1. Transmitter Tuning Unit TU-8-B
2. Transmitter Tuning Unit TU-10-B
3. Command Set Transmitters
4. Antenna Relay Unit BC-442-A
5. Command Set Receivers
6. Liaison and Command Junction Box
7. Liaison Antenna Switch
8. Reel Control Box
9. Transmitter Tuning Unit TU-8-B
10. Radio Receiver BC-357-P
11. Liaison Receiver, BC-224-( ) or BC-348-( )
12. Interphone Jack Box
13. Suit Heat Rheostat
14. Antenna Tuning Unit BC-306-A
15. Table
16. Compass Junction Box
17. Chair

Figure 68 (Sheet 2 of 3)— Radio Operator's Compartment



1. Oxygen Pressure Regulator
2. Interphone Amplifier
3. Interphone Headset Cord
4. Microphone Hook and Holder
5. Oxygen Flow Indicator
6. Heating and Ventilating System Warning Lights
7. Oxygen Regulator to Mask Tubing
8. Radio Operator's Hand Warmer
9. Radio Operator's Seat and Safety Belt
10. Heating and Ventilating System Controls

Figure 68 (Sheet 3 of 3) — Radio Compartment (Aft View)

2. When emergency operation as designated in tactical orders is necessary, place "EMERGENCY" switch *(figure 46-2, 58-1, or 68-6 Sheet 1)* in "ON" position. Either of the "EMERGENCY" switches will perform the "EMERGENCY" function when "ON."

3. To turn off radio set, place "ON-OFF" switch in "OFF" position. (Both power switches must be "OFF."

Note

On C-47 Airplanes the emergency detonation switch for the Identification Radio Set is located on the ceiling above the pilot's seat. On C-47A airplanes the switch is located on the aft bulkhead of the pilot's compartment behind and above the pilots' seat. The switch is marked "DANGER." In the event of a crash, destruction of the set is automatically accomplished by the operation of an inertia type switch.

(9) OPERATION OF AN/ARR-1 RADIO RECEIVING EQUIPMENT.—For operation of this equipment (if installed) refer to the instruction book stowed in the data holders located outboard of each pilot.

(10) OPERATION OF AN/APN-1 RADIO ALTIMETER.—For operation of this equipment (if installed) refer to the instruction book stowed in the data holders located outboard of each pilot.

9. RADIO OPERATOR'S COMPARTMENT.

a. GENERAL.—The radio operator's compartment is located on the right side of the companionway. It is provided with a swivel chair, table and overhead window. The chair is not adjustable, but may be locked in the forward position. A dome lamp provided with a switch is within easy reach of the radio operator.

WARNING

The radio operator's chair must be locked in the straight forward position for all take-offs and landings.

b. OPERATION OF RADIO EQUIPMENT.—The radio equipment located in the radio operator's compartment is as follows:

(1) SCR-( ) 183 COMMAND RADIO SET (C-47 AIRPLANES).

(a) A transmitter, receiver, dynamotor, coil units, coil sets, and an antenna relay are located at the radio operator's position.

(b) All operating adjustments are made at the pilot's position.

(c) Transmitter frequency range, 2500-7700 kc, is covered by five removable coil sets.

(2) SCR-274-N COMMAND RADIO SET (C-47A AIRPLANES).

(a) Two transmitters, each with a pre-set frequency, three receivers, a modulator and dynamotor unit, and an antenna relay unit for switching antenna between transmitters and receivers are located on racks at the radio operator's position.

(b) All operating adjustments are made at pilot's position.

(3) SCR-522-A COMMAND RADIO SET (if installed).

(a) Receiver-transmitter unit and dynamotor are located forward of the radio operator's position.

(b) All operating adjustments are made at pilot's position.

(4) SCR-269-G RADIO COMPASS (if installed). —The SCR-269-G radio compass consists of the following: A control box *(figures 53-1 & 62)*, a radio compass indicator *(figure 64-2)*, a radio compass loop installed on the underside of the fuselage, a loop dehydrator mounted beneath the liaison transmitter, a receiver mounted on floor across the aisle from radio operator's compartment. This set is operated by the pilot.

(5) SCR-280-A RADIO COMPASS (if installed). —Radio compass SCR-280-A consists of a control box *(figure 65)* located overhead in pilot's compartment, a compass indicator *(figure 67)* mounted on pilot's instrument panel, a bearing indicator mounted below the windshield in front of co-pilot, a receiver unit mounted on or under the floor aft of pilot's position and a loop antenna installed on the underside of the fuselage. The loop is controlled by a hand crank adjacent to the bearing indicator. The frequency range (200-1750 kc) is covered by three bands, each band being marked on the control box. This set is operated by the pilot.

(6) SCR-187-A OR SCR-287-A LIAISON RADIO SET.

(a) The liaison receiver, transmitter, antenna loading unit, and transmitting key are all mounted in the radio operator's compartment *(figure 68 Sheet 1)*. The liaison transmitter has a frequency range of 200-500 kilocycles and 1500-12,500 kilocycles which is covered by seven removable tuning units. The liaison receiver frequency range is from 200-500 kilocycles and 1500-18,0000 kilocycles.

(b) Two antennas are available for use. One is a fixed and the other a trailing wire antenna, both being attached to a change over switch *(figure 68-1 Sheet 1 of 3)*. The trailing antenna is electrically operated from a control box *(figure 68-2)*.

(7) OPERATION OF SCR-211 FREQUENCY METER SET.

(a) GENERAL.—Each time the frequency is changed the liaison transmitter must be tuned. The frequency should be checked with a frequency meter to insure on-frequency operation. The frequency meter is located across the aisle from the radio operator's compartment *(figure 69-3)*.

(8) LIAISON MONITOR SWITCH.

(a) The liaison monitor switch is mounted at the radio operator's station *(figure 68-5)*, and is used to tune the transmitter quickly to the frequency of any selected answering station.

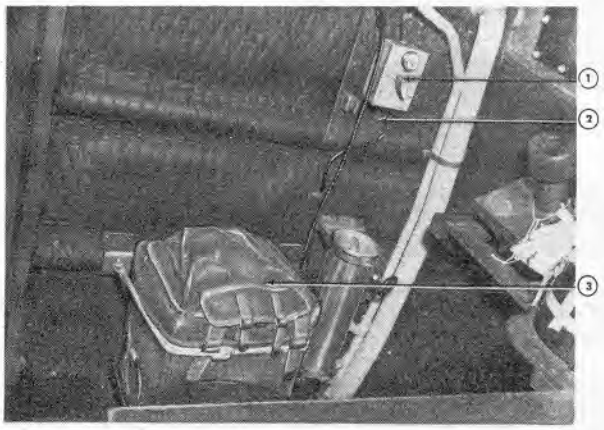
(b) Tune transmitter approximately to the desired frequency.

(c) Place monitor switch in the "MONITOR" position.

(d) Listen to a signal of the selected frequency, using liaison receiver, and adjust transmitter "MO TUNING" control "B" *(figure 70-5)* until transmitter sidetone beats against the desired signal.

(e) Place monitor switch in "NORMAL" position and tune the transmitter.

(9) OPERATION OF PORTABLE EMERGENCY RADIO TRANSMITTER SCR-578).—A complete self-contained portable emergency transmitter *(figure 71 or 72)* is provided for operation anywhere away from the airplane. It is stowed in the baggage compartment aft of pilot's compartment.



1. Interphone Jackbox
2. Headset Disconnector Cord
3. Frequency Meter Set SCR-211-( )

Figure 69 — Port Side Aft of Navigator Seat in C-47A

10. NAVIGATOR'S COMPARTMENT (If installed).

a. GENERAL. – On some airplanes a navigator's compartment is installed on the left side of the companionway. The compartment is equipped with a navigator's table and stool. A work lamp is mounted on the forward outboard edge of the table and is controlled by a switch marked "WORK LIGHT" located directly over the table. A dome light and switch are located adjacent to the work light switch. A small window is provided for observation.

1. Filament Voltage Meter
2. Total Plate Current Meter
3. Emission Selector Switch
4. Test Key
5. "MO" Tuning Control (B)
6. Calibration Chart
7. Antenna Current Meter
8. Variable Antenna Inductance Tuning Control (M)
9. Antenna Circuit Switch (N)
10. "CW Filament—MOD. Filament" Switch
11. Transmitter Power Switch
12. Variable Antenna Capacitance Tuning Control (O)
13. Power Amplifier Tuning Control (C)
14. Antenna Inductance Switch (P)
15. Antenna Coupling Switch (D)

Figure 70 — Liaison Transmitter BC-191-( ) or BC-375-( )

b. NAVIGATING EQUIPMENT.—A compass is located to the left of the navigator's stool. A driftmeter is installed adjacent to the compass. On some airplanes a remote indicating compass is installed in place of the conventional type compass. A screw top tube is located under the navigator's table for use as a navigating chart case. An astro-dome is located at the top of the fuselage on the centerline of the airplane just forward of the navigator's compartment. A support for mounting an astro compass is located directly under the astro dome. A supply of drift signals is provided.

c. NAVIGATOR'S RADIO EQUIPMENT.—An interphone jack box is located on the aft bulkhead of the compartment. On some airplanes an AN/APN-2 Beacon transmitter receiver is installed. For operation of this radio set refer to the instruction book stowed in the data holders located in the pilot's compartment.

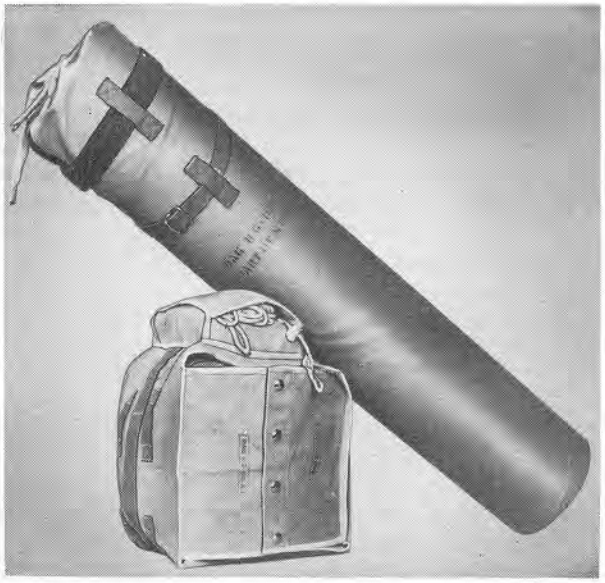
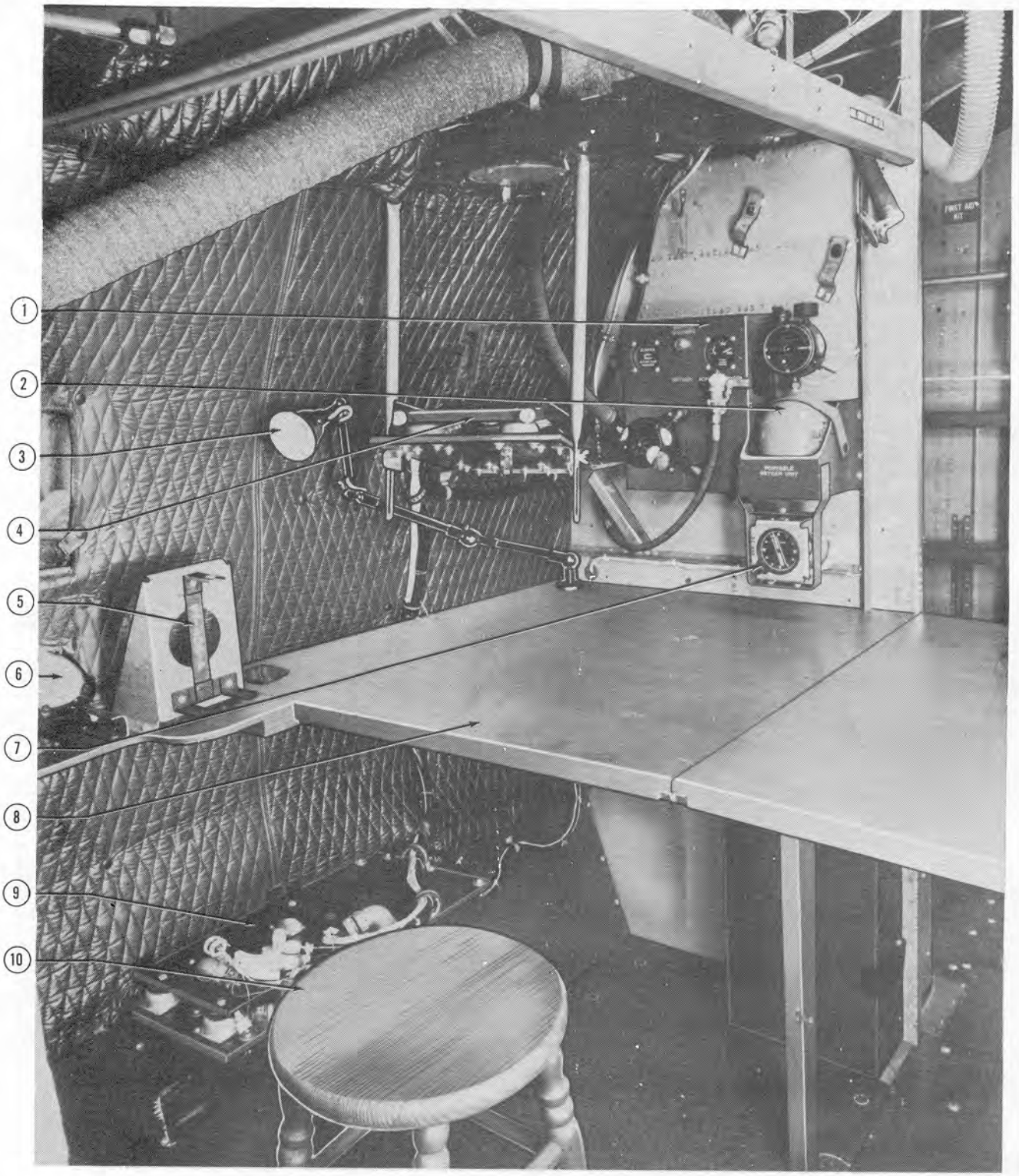


Figure 71 — Emergency Radio Set SCR-578-A

Figure 72 — Emergency Radio Set SCR-578-B

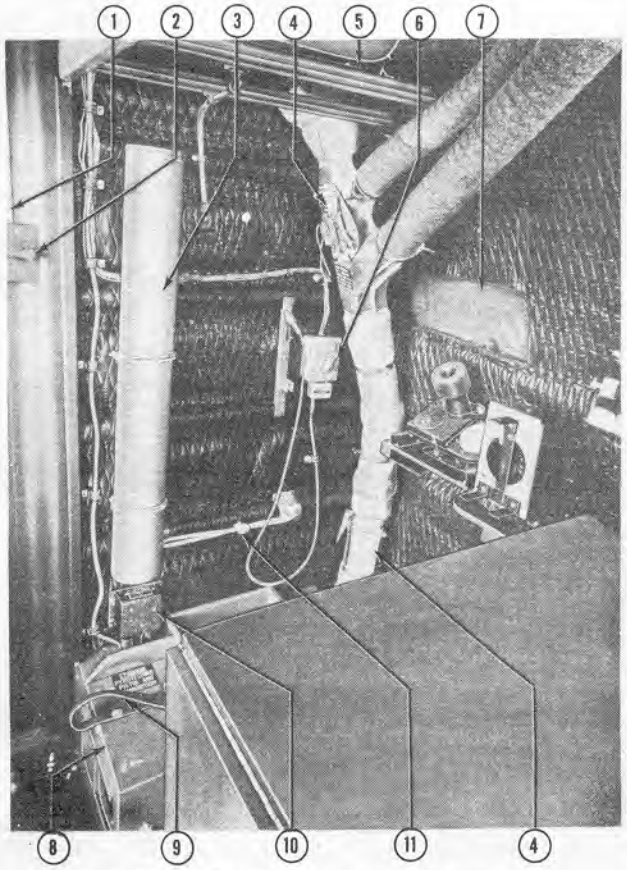
11. TROOP CARRYING (MAIN CARGO) COMPARTMENT.

a. GENERAL.—The main cargo compartment in this airplane is equipped to carry passengers, cargo, or a combination of both. An interphone jack box and microphone are installed on the aft bulkhead of the main cargo compartment. Four dome lights are in-



1. Low Pressure Demand Oxygen System
2. Portable Oxygen Equipment
3. Work Lamp
4. Support for AN/APN-2 Indicator (if Installed)
5. Support for AN/APN-2 Control Box (if Installed)
6. Drift Meter
7. Navigator's Remote Indicating Compass
8. Table
9. Support for AN/APN-2 Receiver (if Installed)
10. Stool

Figure 73 — Navigator's Compartment (If Installed)

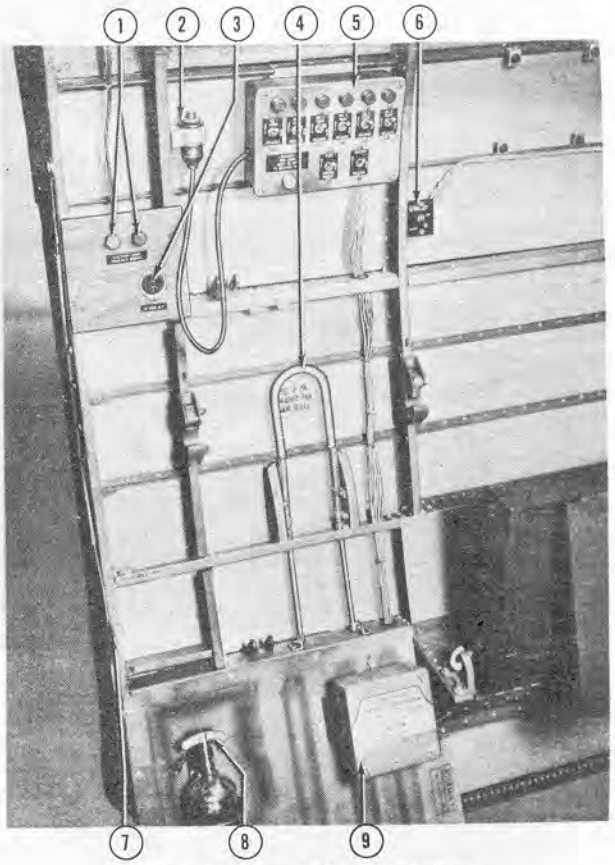


1. Oxygen System Diagram
2. Companionway Door
3. Map Case Holder
4. Heating and Ventilating Controls
5. Drinking Water Tank
6. Interphone Equipment
7. Window
8. Radio Beacon Transmitter Receiver
9. Pyrotechnic Pistol and Ammunition Stowage
10. Radio Beacon Transmitter — Receiver Switching Relay
11. Frequency Meter Bungee Cord

Figure 74 — Aft View of Navigator's Compartment

stalled in the ceiling. These lights are controlled by two electric switches, one near the main cargo compartment forward door on the side of the air duct. On some airplanes a jumpmaster's station is located next to the cargo door. The jumpmaster releases the parachute packs and directs the exiting of the parachute troops as they leave the airplane.

b. JUMPMASTER'S STATION.—An electric control panel *(figure 75-5)* is located forward of the main cargo loading door. On the face of this control box is a master switch and a red light, which goes on when the master switch is in the "OFF" position. If parachute packs are installed, the six green lights at the top of the control box will go on when the master switch is in the "ON" position and will go off, one by one, as the packs are released. Below these green lights is a row of six selector switches, the operation of which enables the jumpmaster to release the parachute packs in any desired order. An electrical release button switch *(figure 75-2)* is connected to the box by an insulated wire. The operation of this switch releases the parachute packs one at a time in numerical sequence. If an overload occurs in the control circuit, when attempting to release a pack electrically, the circuit breaker will automatically switch to the "OFF" position. Before attempting to release another pack, move the circuit-breaker lever back to the "ON" position. Located below the electric control box is a manual salvo control handle *(figure 75-4)* by which all the parachute packs can be released simultaneously should the electrical release fail to operate. A red and green light, located near the door, is operated by an electrical switch located on the pilot's left-hand electrical panel as a signal for jumping.



1. Parachute Troop's Warning Lamps
2. Parachute Pack Release Button
3. 24-Volt Direct Current Outlet Plug
4. Parachute Pack Salvo Release Cord
5. Parachute Pack Control Panel
6. Glider Tow Detonator
7. Cargo Door Emergency Release Lever
8. Hand Type Fire Extinguisher
9. Low Pressure Oxygen Filler Valve

Figure 75 — Jumpmaster's Station

APPENDIX I

FLIGHT OPERATING CHARTS

"Look before you hop!"

A-1. FLIGHT PLANNING.

A-2. GENERAL.

A-3. A series of charts are provided on the following pages to aid in selecting the speeds and powers required for obtaining various ranges. These charts are divided into three sets: (1) Take-off, Climb and Landing Chart, (2) cruising charts for single-engine operation, and (3) cruising charts for two-engine operation.

A-4. These charts are provided to give the pilot sufficient data to make a safe and efficient cruising flight plan. Inasmuch as the number of variables involved make very accurate range predictions impossible, the ranges and fuel flows quoted are conservative. For example, data based on flight test are 5% conservative on range and fuel flow values. This policy has been followed to allow for variations in airplane speeds, fuel flows, pilot technique, and other variables not considered in the preparation of the charts. No allowances have been made for wind, navigational error, combat or formation flight, or other contingencies. Appropriate allowances for these items should be dictated by local policy.

A-5. These charts are arranged to give maximum utility for pre-flight and in-flight range planning. The following will be noted on inspection:

a. The climb chart gives fuel requirements for warm-up, take-off, and climb to any altitude for three typical weights. The fuel tabulated in the column labeled "at sea level" shows the allowance for warm-up, taxi, and take-off. Fuel requirements listed at other altitudes include this allowance plus the fuel required to climb from sea level.

b. The Flight Operation Instruction Charts vary in 2,000 or 3,000 pound increments from maximum gross weight to minimum possible flying weight with standard configuration.

c. Maximum to minimum practical fuel loadings are entered on each chart under the fuel column.

d. Data listed under Column I is for emergency high speed cruising only. Columns II, III, IV, and V give increases in range with a sacrifice in speed.

e. Ranges shown on a given chart are based on fuel flows obtained by re-setting power as gross weight changes to a lower weight bracket shown on succeeding charts. It is essential, therefore, that this practice be adhered to in flight.

A-6. USE OF CHARTS.

A-7. The following sample problem based on a typical C-47A mission and employing actual chart values demonstrates how the charts should be used.

A-8. It is required that 5,000 pounds of equipment be dropped to troops located 700 miles from the airfield. Flight must be accomplished at a minimum altitude of 5,000 feet to clear terrain. Elevation at drop point is 2,500 feet.

A-9. Write down the conditions of the problem and the questions to be answered.

Take-off gross weight	31,000 pounds
Required range	1,400 miles
Weather	CAVU
Winds (outbound)	15 mi/hr effective tailwind at 5,000 ft
	30 mi/hr effective tailwind at 10,000 ft
Cargo weight	5,000 lb
Aircraft basic weight	17,920 lb
Crew weight (5 men)	1,000 lb
Oil weight (58 gal at 7.5 lb/gal	435 lb
Total weight (less fuel)	24,355 lb

Take-off gross weight is 31,000 pounds, therefore, 31,000 — 24,355 = 6,645 lb (permissible fuel weight). Fuel load at 6 pounds per gallon = 1,107 gallons.

A-10. Determine the actual flight plan. Now that the conditions relative to the flight have been determined, it is necessary to establish a flight plan as follows:

a. The flight out will be accomplished at 10,000 feet to take advantage of favorable tailwinds at that altitude. At the drop point it will be necessary to descend to 2,500 feet. Return flight will be made at 5,000 feet.

b. Determine the fuel available for flight planning by deducting the necessary fuel allowances and reserves from the actual fuel aboard as follows:

Warm-up, take-off, and climb to 10,000 feet	105 gal
Climb from drop point to 5,000 feet	20 gal
Total allowance for warm-up, take-off and climb	125 gal

The above allowances are taken from the climb chart. It will be noted that the fuel quoted at 10,000 feet altitude includes fuel used for warm-up and take-off.

The allowance for climb from drop point to 5,000 feet is calculated by subtracting the fuel quoted at sea level from the fuel quoted at 5,000 feet for a gross weight of 26,000 pounds. This value will be in excess of actual requirements. The distances covered in climb are neglected.

Wind reserve (outgoing)—0

Normally, tailwinds are treated as no-wind condition for range planning.

Wind reserve (return)—35 gallons

The required wind reserve may be based on good judgment or approximated as follows:

Assuming the return flight will be made at an approximate true airspeed of 180 miles per hour, the ground speed will be 180 — 15 =165 miles per hour and the time required for the return flight will be 700 ÷ 165 = 4¼ hours. The wind will increase the air miles to be flown by 15 x 4¼ = 64 miles. Assuming approximately 1.8 miles per gallon (see Column IV of the 23,000 to 19,000 Flight Operation Instruction Chart) the required wind reserve is 64 ÷ 1.8 = 35 gallons.

Two hour endurance reserve — 150 gallon

The above figure is calculated by multiplying the fuel flow under Column V, 5,000 foot altitude, 23,000 to 19,000 pound chart, by the number of hours reserve desired or 75 x 2 = 150 gallons.

Collecting all the required fuel allowances:

Warm-up, take-off, and climbs	125 gal
Wind	35 gal
Endurance	150 gal
Total allowance	310 gal

Therefore, the actual fuel available for cruising is 1,107 — 310 = 797 gallons. Reference to the 31,000 pound chart shows that the required flight of 1,400 miles can be flown with 797 gallons of fuel if the flight is accomplished in Column IV or V. This completes the solution of the range problem.

c. Since the weight change during the flight will span several charts, it is necessary to divide the balance of the problem into several parts. A tabulation of the data will assist in the calculation and provide a useful reference in flight.

Leg	*Fig*	*Initial Wt*	*Fuel Gal*	*Condition*	*Altitude*	*Power Settings*	*Fuel Used Gal*
1	76	31,000	1107	Climb	S.L. to 10,000	2550 rpm 41″ Hg A.R.	105

Note: The fuel used includes 45 gallons allowance for warm-up and take-off.

Entries whose derivation may not be clear are explained as follows (refer to the Climb Data Chart for 31,000 pounds):

FUEL — Because a take-off gross weight of 31,000 pounds was chosen, the fuel load was determined to be 1,107 gallons (see paragraph A-9).

RPM, MP MIXTURE, AND FUEL USED: — These items are read directly from the chart.

Note: The time and distance covered in climbing is considered negligible in this instance; however, these items should be considered in extremely long climbs.

The outgoing flight will be accomplished under Column IV at 10,000 feet altitude:

Leg	*Fig*	*Plane Wt*	*Fuel Gal*	*Power Settings*	*Gal Hr*	*TAS*	*Hours*	*Dist*	*Fuel Used Gal*
2	77 2 of 9	30,370	1002	2200 rpm 30.0″ Hg A.L.	110	188	2.1	395	228

Note: The length of leg 2 is determined by the required time for the gross weight to become 29,000 pounds (the low limit of the first chart).

WEIGHT: In using 105 gallons of fuel for warm-up, take-off, and climb, weight becomes 31,000 — 630 = 30,370 pounds. (Use fuel weight as 6 pounds per gallon.)

FUEL: Initial fuel load of 1,107 gallons was reduced 105 gallons in leg 1.

RPM, MP, MIXTURE, TAS, & GAL/HR: These items were read directly opposite 10,000 feet in Column IV of the 31,000 to 29,000 pound Flight Operation Instruction Chart.

FUEL: The fuel was calculated by dividing the gross weight change by 6 pounds per gallon, i.e., (30,370 — 29,000) ÷ 6 = 228 gallons.

HOURS: The time was calculated by dividing the fuel used by the fuel flow, i.e., 228 ÷ 110 = 2.1 hours.

DISTANCE: The air miles covered are calculated by multiplying the true airspeed by the time, i.e., 188 x 2.1 = 395 miles.

Leg	*Fig*	*Plane Wt*	*Fuel Gal*	*Power Settings*	*Gal Hr*	*TAS*	*Hours*	*Dist*	*Fuel Used Gal*
3	77 3 of 9	29,000	774	2200 rpm 30.0" Hg A.L.	110	192	1.6	305	176

Note: It may be noted that the power setting has not changed in this instance but this is usually not the case. The increased airspeed at the same fuel flow indicates an increased miles per gallon.

WEIGHT: The plane weight was established by calculating leg 2.

DISTANCE: The miles remaining to the drop point, i.e., 700 — 395 = 305 miles.

HOURS: The distance covered by true airspeed, i.e., 305 ÷ 192 = 1.6 hours.

FUEL USED: The fuel flow multiplied by the time, i.e., 110 x 1.6 = 176 gallons.

Gross weight at end of leg 3	27,944 pounds
Cargo drop	5,000 pounds
Gross weight at beginning of return flight	22,944 pounds

Leg	*Fig*	*Plane Wt*	*Fuel Gal*	*Condition*	*Altitude*	*Power Settings*	*Fuel Used Gal*
4	76	22,944	598	Climb	Sea Level to 5,000 ft	2550 rpm 41" Hg A.R.	20

Note: The fuel used in climb is based on a climb from sea level to 5,000 feet at 26,000 pounds gross weight. The distance covered is neglected. These approximations facilitate rapid calculation and are conservative.

Leg	*Fig*	*Plane Wt*	*Fuel Gal*	*Power Settings*	*Gal Hr*	*TAS*	*Hours*	*Dist*	*Fuel Used Gal*
5	77 5 of 9	22,824	578	2100 rpm 31.0" Hg A.L.	100	185	3.8	700	380

Note: The calculated fuel remaining at the end of the flight is 578 — 380 = 198 gallons. The original allowance for wind and endurance was 185 gallons which gives a close check on the calculations.

A-11. Once the cruising plan is satisfactorily computed, it should be assembled on a master chart to facilitate use of the data in flight.

A-12. Upon completion of the flight, a comparison may be made between the actual and computed data. This will give the pilot a better idea of the margin of safety afforded by the charts and enable more accurate planning on future missions.

A-13. The sample problem just completed shows how the charts may be used for preflight planning, in-flight operation, and post-flight analysis. Should an engine fail while in flight, the remainder of the flight would have to be planned while in the air. The following variation of the first problem will demonstrate a recommended procedure.

a. Assume an engine is lost after the climb to 5,000 feet following the cargo drop. The plane weight as shown in leg 5 would be 22,824 pounds with 578 gallons of fuel and 700 miles remaining. Allowing 50 gallons for wind allowance and 100 gallons for endurance reserve leave 428 gallons for cruise.

b. Under the above conditions, Column V should be selected for the balance of the flight.

Leg	*Fig*	*Plane Wt*	*Fuel Gal*	*Power Settings*	*Gal Hr*	*TAS*	*Hours*	*Dist*	*Fuel Used Gal*
5A	77 9 of 9	22,824	578	2050 rpm 32.0″ Hg A.L.	50	110	6.4	700	320

Note: The calculated fuel remaining at the end of the flight is 578 — 320 = 258 gallons, enough to cover the desired wind and endurance reserve.

AAFMC-527
3-1-44

AIRCRAFT MODEL(S)
C-47 & C-47A

TAKE-OFF, CLIMB & LANDING CHART

ENGINE MODEL(S)
R-1830-92

TAKE-OFF DISTANCE FEET

GROSS WEIGHT LB.	HEAD WIND		HARD SURFACE RUNWAY						SOD-TURF RUNWAY						SOFT SURFACE RUNWAY					
			AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET	
	M.P.H.	KTS.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.	GROUND RUN	TO CLEAR 50' OBJ.
33000	0	0	2900	5100	3250	5800	4100	7300												
	20	17	1900	3700	2100	4200	2700	5400												
	40	35	1050	2400	1200	2800	1650	3700												
31000	0	0	2450	4300	2750	4800	3450	6200	2800	4650	3150	5250	4100	6800	4400	6300	5150	7200	7500	10200
	20	17	1550	3000	1750	3450	2300	4500	1750	3250	2050	3700	2700	4950	2800	4250	3300	5000	4950	7750
	40	35	850	1950	1000	2250	1350	3050	950	2050	1150	2400	1600	3300	1500	2650	1850	3150	2900	4600
26000	0	0	1550	2750	1800	3050	2250	3850	1750	2900	2000	3300	2500	4150	2400	3550	2800	4100	3800	5450
	20	17	950	1900	1100	2100	1400	2700	1050	2000	1200	2250	1600	2900	1450	2400	1700	2750	2400	3700
	40	35	450	1100	550	1300	750	1750	500	1150	650	1400	850	1850	700	1350	900	1650	1300	2250

NOTE: INCREASE CHART DISTANCES AS FOLLOWS: 75°F + 10%; 100°F + 20%; 125°F + 30%; 150°F + 40%
OPTIMUM TAKE-OFF WITH 2700 RPM, 48 IN.HG. & 0 DEG. FLAP IS 80% OF CHART VALUES
DATA AS OF 1 DEC 1949 BASED ON: FLIGHT TEST
FUEL GRADE 100/130

CLIMB DATA

GROSS WEIGHT LB.	AT SEA LEVEL				AT 5000 FEET					AT 10,000 FEET					AT 15,000 FEET					AT FEET					AT FEET				
	BEST I.A.S.		RATE OF CLIMB F.P.M.	GAL. OF FUEL USED	BEST I.A.S.		RATE OF CLIMB F.P.M.	FROM SEA LEVEL		BEST I.A.S.		RATE OF CLIMB F.P.M.	FROM SEA LEVEL		BEST I.A.S.		RATE OF CLIMB F.P.M.	FROM SEA LEVEL		BEST I.A.S.		RATE OF CLIMB F.P.M.	FROM SEA LEVEL		BEST I.A.S.		RATE OF CLIMB F.P.M.	FROM SEA LEVEL	
	MPH	KTS			MPH	KTS		TIME MIN.	FUEL USED	MPH	KTS		TIME MIN.	FUEL USED	MPH	KTS		TIME MIN.	FUEL USED	MPH	KTS		TIME MIN.	FUEL USED	MPH	KTS		TIME MIN.	FUEL USED
33000	110	95	715	45	110	95	655	7.5	75	105	90	410	16.5	115	100	85	200	33.5	170										
31000	110	95	810	45	110	95	755	6.5	70	105	90	510	15.0	105	100	85	285	26.5	150										
26000	110	95	1115	45	110	95	1070	4.5	65	105	90	775	10.0	90	100	85	520	18.0	115										

POWER PLANT SETTINGS: 2550 RPM, 41" HG, A.R.
DATA AS OF 1 DEC 1949 BASED ON: FLIGHT TEST
FUEL GRADE 100/130
FUEL USED (U.S. GAL.) INCLUDES WARM-UP & TAKE-OFF ALLOWANCE

LANDING DISTANCE FEET

GROSS WEIGHT LB.	BEST IAS APPROACH				HARD DRY SURFACE						FIRM DRY SOD						WET OR SLIPPERY					
	POWER OFF		POWER ON		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET		AT SEA LEVEL		AT 3000 FEET		AT 6000 FEET	
	MPH	KTS	MPH	KTS	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.	GROUND ROLL	TO CLEAR 50' OBJ.
33,000	90	78	90	78	2400	3700	2600	3950	2800	4250	2550	3950	2900	4200	3100	4600	5550	7000	6150	7500	6650	8100
26,000	81	71	81	71	1550	2600	1700	2800	1850	3050	1700	2800	1900	3000	2050	3250	4000	5100	4400	5500	4800	6000
21,000	72	63	72	63	1250	2200	1350	2350	1450	2550	1400	2350	1500	2550	1650	2700	3250	4200	3550	4550	3900	4950

DATA AS OF 1 DEC 1949 BASED ON:
OPTIMUM LANDING IS 80% OF CHART VALUES

REMARKS: BEST IAS APPROACH IS 120% OF POWER OFF STALL SPEED, WING FLAPS DOWN.

FUEL GRADE 100/130

LEGEND
I.A.S. : INDICATED AIRSPEED
M.P.H. : MILES PER HOUR
KTS. : KNOTS
F.P.M. : FEET PER MINUTE

Figure 76—Take Off, Climb and Landing Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL(S)
C-47 & C-47A

ENGINE(S): R-1830-92

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 33,000 TO 31,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING: TWO

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.							
MILITARY POWER	2700	48.0		A. R.	5 MIN	260°C	300

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND)[1]. TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I						FUEL	COLUMN II						COLUMN III						COLUMN IV						FUEL	COLUMN V					
RANGE IN AIRMILES						U.S.	RANGE IN AIRMILES						RANGE IN AIRMILES						RANGE IN AIRMILES						U.S.	RANGE IN AIRMILES					
STATUTE			NAUTICAL			GAL.	STATUTE			NAUTICAL			STATUTE			NAUTICAL			STATUTE			NAUTICAL			GAL.	STATUTE			NAUTICAL		
							SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]																							
						(2) 1704																			(2) 1704						
1375			1195			1600	1795			1560			2270			1970			2775			2410			1600	3195			2775		
1295			1125			1500	1680			1460			2120			1840			2590			2250			1500	2975			2585		
1215			1055			1400	1565			1360			1970			1710			2405			2090			1400	2755			2395		
1135			985			1300	1450			1260			1825			1585			2225			1930			1300	2540			2205		
1055			915			1200	1335			1155			1680			1460			2040			1770			1200	2330			2025		
975			845			1100	1225			1065			1535			1335			1860			1615			1100	2120			1840		
895			775			1000	1110			965			1390			1205			1680			1460			1000	1910			1660		
815			710			900	1000			850			1245			1085			1505			1305			900	1715			1490		
735			670			800	890			775			1100			955			1335			1155			800	1520			1320		
655			565			700	785			680			960			835			1165			1015			700	1325			1155		
565			490			600	675			586			820			710			995			865			600	1130			980		
MAXIMUM CONTINUOUS						PRESS	(1.16 STAT. (1.01 NAUT.) MI./GAL.)						(1.34 STAT. (1.16 NAUT.) MI./GAL.)						(1.62 STAT. (1.41 NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000 35000 30000	SET COWL FLAPS FOR LIMITING CYLINDER TEMPERATURE																		40000 35000 30000						
						25000 20000 15000	2550	FT	AR	180	210	182	2400	FT	AR	145	198	172	2250	FT	AR	110	185	161	25000 20000 15000	2250	FT	AL	100	185	161
2550	FT (SEE NOTE 3)	AR	230	217	188	10000 5000 S. L.	2300 2100 2100	33.0 FT 37.5	AR AR AR	170 170 155	203 198 186	176 172 161	2200 2100 2100	32.0 34.5 34.5	AR AR AR	140 140 125	195 188 175	169 163 152	2250 2100 2000	30.5 31.5 34.0	AL AL AL	115 105 100	187 176 168	162 153 146	10000 5000 S. L.	1900 1800 1700	FT 30.5 32.5	AL AL AL	90 85 80	170 157 148	148 136 129

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB, PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
(2) 1704 U.S. GALLONS IS TOTAL FUEL CAPACITY WITH NINE FUSELAGE TANKS INSTALLED.
(3) DO NOT EXCEED 185 MPH IAS AT 33000 LBS. GROSS WEIGHT

EXAMPLE

AT 33000 LB. GROSS WEIGHT WITH 1500 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 175 GAL.) TO FLY 1680 STAT. AIRMILES AT 10000 FT. ALTITUDE MAINTAIN 2300 RPM AND 33.0 IN. MANIFOLD PRESSURE WITH MIXTURE SET: AUTO RICH. REFER TO COLUMN II OF NEXT CHART WHEN GROSS WEIGHT IS 31000 LBS.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 1 DEC 49 BASED ON: FLIGHT TEST FUEL GRADE 100/130

Figure 77 — (Sheet 1 of 9) Flight Operation Instruction Chart

AAFMC-528 4-1-44

AIRCRAFT MODEL(S)
C-47 & C-47A

ENGINE(S): R-1830-92

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 31,000 TO 29,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING. TWO

LIMITS	RPM	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.							
MILITARY POWER	2700	48.0		A.R.	5 min	260°C	300

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).[1] TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I			FUEL	COLUMN II			COLUMN III			COLUMN IV			FUEL	COLUMN V		
RANGE IN AIRMILES			U.S.	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			U.S.	RANGE IN AIRMILES		
STATUTE		NAUTICAL	GAL.	STATUTE		NAUTICAL	STATUTE		NAUTICAL	STATUTE		NAUTICAL	GAL.	STATUTE		NAUTICAL
				SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]												
			(2)										(2)			
			1704										1704			
1325		1150	1600	1795		1560	2325		2020	2850		2475	1600	3310		2875
1245		1080	1500	1680		1460	2175		1890	2665		2315	1500	3095		2690
1165		1010	1400	1565		1360	2025		1760	2480		2155	1400	2875		2500
1085		940	1300	1450		1260	1875		1630	2295		1995	1300	2655		2305
1005		870	1200	1330		1155	1725		1500	2110		1835	1200	2435		2115
925		805	1100	1215		1055	1575		1370	1930		1675	1100	2215		1925
845		745	1000	1100		955	1425		1240	1745		1515	1000	1995		1735
765		665	900	1000		870	1280		1110	1560		1355	900	1785		1550
685		595	800	875		760	1135		985	1380		1200	800	1575		1370
605		225	700	765		665	990		860	1195		1040	700	1365		1185
525		455	600	655		570	850		740	1025		890	600	1165		1010

MAXIMUM CONTINUOUS						PRESS	(1.08 STAT. (.94 NAUT.) MI./GAL.)						(1.40 STAT. (1.22 NAUT.) MI./GAL.)						(1.70 STAT. (1.49 NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000																			40000						
						35000																			35000						
						30000	SET COWL FLAPS FOR LIMITING CYLINDER TEMPERATURE																		30000						
						25000																			25000						
						20000																			20000						
						15000	2550	F.T.	A.R.	180	213	185	2400	F.T.	A.R.	145	203	176	2250	F.T.	A.R.	110	191	166	15000	2150	F.T.	A.L.	95	185	161
2550	F.T.	A.R. (SEE NOTE 3)	230	219	190	10000	2400	F.T.	A.R.	195	210	182	2150	F.T.	A.R.	135	195	169	2200	30.0	A.L.	110	188	163	10000	1900	F.T.	A.L.	90	175	152
						5000	2150	F.T.	A.R.	185	203	176	2100	33.5	A.R.	130	187	162	2100	31.5	A.L.	105	179	155	5000	1700	31.5	A.L.	80	160	139
						S.L.	2100	39.0	A.R.	170	191	166	2100	34.5	A.R.	125	177	154	2000	34.0	A.L.	100	171	148	S.L.	1700	31.5	A.L.	75	148	129

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 76) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
(2) 1704 U.S. GAL. IS TOTAL FUEL CAPACITY WITH NINE FUSELAGE TANKS INSTALLED.
(3) DO NOT EXCEED 191 T.A.S. AT 31000# GROSS WEIGHT.

EXAMPLE

AT 31000 LB. GROSS WEIGHT WITH 900 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 175 GAL.) TO FLY 1560 STAT. AIRMILES AT 10000 FT. ALTITUDE MAINTAIN 2200 RPM AND 30.0 IN. MANIFOLD PRESSURE WITH MIXTURE SET: AUTO-LEAN. REFER TO COLUMN IV OF NEXT CHART WHEN GROSS WEIGHT IS 29000 LBS.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 9-9-44
REVISED 9-6-46

BASED ON: FLIGHT TESTS

FUEL GRADE 100/130

Figure 77—(Sheet 2 of 9) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL(S)
C-47 & C-47A

ENGINE(S): R-1830-92

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 29,000 TO 26,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING: TWO

LIMITS	RPM.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.							
MILITARY POWER	2700	48.0	-	A.R.	5 min	260°C	300

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).[1] TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I						FUEL	COLUMN II						COLUMN III						COLUMN IV						FUEL	COLUMN V					
RANGE IN AIRMILES						U.S.	RANGE IN AIRMILES						RANGE IN AIRMILES						RANGE IN AIRMILES						U.S.	RANGE IN AIRMILES					
STATUTE		NAUTICAL				GAL.	STATUTE		NAUTICAL				STATUTE		NAUTICAL				STATUTE		NAUTICAL				GAL.	STATUTE		NAUTICAL			
						1604[2]							SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]												1604[2]						
1200		1040				1500	1705		1480				2210		1920				2715		2360				1500	3190		2770			
1120		975				1400	1590		1380				2060		1790				2530		2200				1400	2970		2580			
1040		905				1300	1475		1280				1910		1660				2350		2040				1300	2750		2390			
960		835				1200	1360		1180				1760		1530				2165		1880				1200	2530		2195			
880		765				1100	1240		1075				1610		1400				1980		1720				1100	2310		2010			
800		695				1000	1125		980				1460		1270				1795		1560				1000	2090		1815			
720		625				900	1010		880				1310		1140				1610		1400				900	1870		1625			
640		555				800	895		775				1160		1010				1430		1240				800	1650		1430			
560		485				700	780		680				1010		880				1245		1080				700	1430		1240			
480		415				600	665		575				865		750				1060		920				600	1220		1060			
400		345				500	555		480				720		625				880		765				500	1010		880			
320		280				400	440		380				575		500				700		610				400	800		695			
240		210				300	330		285				430		375				515		445				300	590		515			
160		140				200	220		190				285		250				345		300				200	390		340			
80		70				100	110		95				145		125				170		150				100	195		170			
MAXIMUM CONTINUOUS						PRESS	(STAT. (NAUT.) MI./GAL.)						(STAT. (NAUT.) MI./GAL.)						(STAT. (NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000																			40000						
						35000																			35000						
						30000																			30000						
						25000																			25000						
						20000																			20000						
						15000	2550	F.T.	A.R.	180	215	187	2400	F.T.	A.R.	145	207	180	2250	F.T.	A.R.	110	194	168	15000	2150	F.T.	A.L.	95	189	164
2550	F.T.	A.R.	230	220	191	10000	2400	F.T.	A.R.	195	212	184	2150	F.T.	A.R.	135	198	172	2200	30.0	A.L.	110	192	167	10000	1900	F.T.	A.L.	90	179	155
2550	41.0	A.R.	260	219	190	5000	2150	F.T.	A.R.	185	205	177	2100	33.5	A.R.	130	189	164	2100	31.5	A.L.	105	181	157	5000	1700	31.5	A.L.	80	164	142
(SEE NOTE 3)						S.L.	2100	39.5	A.R.	175	194	168	2100	34.5	A.R.	125	179	155	2000	34.0	A.L.	100	173	150	S.L.	1700	30.0	A.L.	75	147	128

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 76) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
(2) 1604 U.S. GAL. IS TOTAL FUEL CAPACITY WITH EIGHT FUSELAGE TANKS.
(3) DO NOT EXCEED 207 IAS AT 29000# GROSS WEIGHT.

DATA AS OF 9-9-44
REVISED 9-6-46

BASED ON: FLIGHT TESTS

EXAMPLE

AT 29000 LB. GROSS WEIGHT WITH 800 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 175 GAL.) TO FLY 1160 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 2100 RPM AND 33.5 IN. MANIFOLD PRESSURE WITH MIXTURE SET: AUTO-RICH. REFER TO COL. III OF NEXT CHART WHEN GROSS WEIGHT IS 26000 LBS.

FUEL GRADE 100/130

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

Figure 77—(Sheet 3 of 9) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL(S)
C-47 & C-47A

ENGINE(S): R-1830-92

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 26,000 TO 23,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING: 2

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.							
MILITARY POWER	2700	48.0	-	A.R.	5 min	260°C	300

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND)[1]. TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S.GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I			FUEL	COLUMN II			COLUMN III			COLUMN IV			FUEL	COLUMN V		
RANGE IN AIRMILES			U.S.	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			U.S.	RANGE IN AIRMILES		
STATUTE		NAUTICAL	GAL.	STATUTE		NAUTICAL	STATUTE		NAUTICAL	STATUTE		NAUTICAL	GAL.	STATUTE		NAUTICAL
				SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]												
800		690	1000[2]	1150		985	1485		1275	1835		1575	1000[2]	2170		1865
720		620	900	1030		880	1335		1150	1650		1415	900	1950		1675
640		550	800	915		785	1185		1020	1465		1260	800	1730		1485
560		480	700	800		685	1035		890	1280		1100	700	1510		1295
480		410	600	685		590	885		760	1100		940	600	1290		1110
400		345	500	570		490	735		630	915		785	500	1070		920
320		275	400	450		385	585		505	730		625	400	850		730
240		205	300	335		290	435		375	545		465	300	630		540
160		135	200	225		195	290		250	365		315	200	420		360
80		70	100	110		95	145		125	180		155	100	210		180
MAXIMUM CONTINUOUS				(1.12 STAT. (.97 NAUT.) MI./GAL.)			(1.45 STAT. (1.25 NAUT.) MI./GAL.)			(1.82 STAT. (1.58 NAUT.) MI./GAL.)				MAXIMUM AIR RANGE		

R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	PRESS ALT. FEET	R.P.M.	M.P. INCHES	MIXTURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000																			40000						
						35000																			35000						
						30000																			30000						
						25000	SET COWL FLAPS FOR LIMITING CYLINDER TEMPERATURE																		25000						
						20000																			20000						
						15000	2550	F.T.	A.R.	180	219	190	2400	F.T.	A.R.	145	211	183	2250	F.T.	A.R.	110	200	174	15000	2100	F.T.	A.L.	90	193	168
2550	F.T.	A.R.	230	222	193	10000	2350	F.T.	A.R.	185	213	185	2150	F.T.	A.R.	135	203	176	2100	30.5	A.L.	105	195	169	10000	1900	29.0	A.L.	85	180	156
2550	41.0	A.R.	260	220	192	5000	2150	38.0	A.R.	180	205	178	2100	33.5	A.R.	130	191	166	2100	31.0	A.L.	100	184	160	5000	1700	30.0	A.L.	75	165	143
2550	41.0	A.R.	255	209	181	S.L.	2100	39.5	A.R.	175	195	168	2100	34.0	A.R.	120	180	155	2000	33.5	A.L.	95	174	151	S.L.	1700	28.5	A.L.	70	146	127

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 76) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

(2) 1004 U.S. GAL. IS TOTAL CAPACITY WITH TWO FUSELAGE TANKS.

EXAMPLE

AT 26,000 LB. GROSS WEIGHT WITH 600 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 150 GAL.) TO FLY 1100 STAT. AIRMILES AT 10,000 FT. ALTITUDE MAINTAIN 2100 RPM AND 30.5 IN. MANIFOLD PRESSURE WITH MIXTURE SET: AUTO LEAN. REFER TO COL. IV OF NEXT CHART WHEN GROSS WEIGHT IS 23000 LBS.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S.GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 9-9-44
REVISED 9-6-46

BASED ON: FLIGHT TESTS

FUEL GRADE 100 130

Figure 77—(Sheet 4 of 9) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL(S)
C-47 & C-47A

ENGINE(S): R-1830-92

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 23,000 TO 19,000 POUNDS

EXTERNAL LOAD ITEMS
NONE

NUMBER OF ENGINES OPERATING: 2

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.							
MILITARY POWER	2700	48.0	-	A.R.	5 min	260°C	300

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).[1] TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I						FUEL	COLUMN II						COLUMN III						COLUMN IV						FUEL	COLUMN V					
RANGE IN AIRMILES						U.S.	RANGE IN AIRMILES						RANGE IN AIRMILES						RANGE IN AIRMILES						U.S.	RANGE IN AIRMILES					
STATUTE			NAUTICAL			GAL.	STATUTE			NAUTICAL			STATUTE			NAUTICAL			STATUTE			NAUTICAL			GAL.	STATUTE			NAUTICAL		
													SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]																		
490			425			600	695			520			900			780			1105			960			600	1320			1145		
410			355			500	580			505			750			650			920			800			500	1100			955		
330			285			400	465			405			600			520			735			640			400	880			765		
245			215			300	350			305			450			390			550			480			300	660			575		
165			145			200	230			200			300			260			370			320			200	440			380		
80			70			100	115			100			150			130			185			160			100	220			190		
MAXIMUM CONTINUOUS						PRESS	(1.16 STAT. (1.01 NAUT.) MI./GAL.)						(1.50 STAT. (1.30 NAUT.) MI./GAL.)						(1.84 STAT. (1.60 NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000 35000 30000																			40000 35000 30000						
													SET COWL FLAPS FOR LIMITING CYLINDER TEMPERATURE																		
						25000 20000 15000	2550	F.T.	A.R.	180	221	192	2400	F.T.	A.R.	145	213	185	2250	F.T.	A.R.	110	203	176	25000 20000 15000	2100	F.T.	A.L.	90	197	171
2550	F.T.	A.R.	230	223	194	10000	2350	F.T.	A.R.	185	215	187	2150	F.T.	A.R.	135	205	178	2100	30.5	A.L.	105	197	171	10000	1800	29.0	A.L.	80	180	156
2550	41.0	A.R.	260	221	192	5000	2100	F.T.	A.R.	170	204	177	2100	33.5	A.R.	130	193	168	2100	31.0	A.L.	100	185	161	5000	1700	29.5	A.L.	75	165	143
2550	41.0	A.R.	255	210	182	S.L.	2100	38.5	A.R.	165	194	168	2100	34.0	A.R.	120	182	158	2000	33.5	A.L.	95	175	152	S.L.	1700	26.5	A.L.	65	143	124

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 76) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

EXAMPLE

AT 23,000 LB. GROSS WEIGHT WITH 400 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES OF 150 GAL.) TO FLY 735 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 2100 RPM AND 31.0 IN. MANIFOLD PRESSURE WITH MIXTURE SET: AUTO LEAN.

LEGEND

ALT. : PRESSURE ALTITUDE	F.R. : FULL RICH
M.P. : MANIFOLD PRESSURE	A.R. : AUTO-RICH
GPH : U.S. GAL. PER HOUR	A.L. : AUTO-LEAN
TAS : TRUE AIRSPEED	C.L. : CRUISING LEAN
KTS. : KNOTS	M.L. : MANUAL LEAN
S.L. : SEA LEVEL	F.T. : FULL THROTTLE

DATA AS OF 9-9-44
REVISED 9-6-46

BASED ON: FLIGHT TEST

FUEL GRADE 100 130

Figure 77—(Sheet 5 of 9) Flight Operation Instruction Chart

AAFMC-528 4-1-44

AIRCRAFT MODEL(S)
C-47 & C-47A

ENGINE(S): R-1830-92

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 31,000 TO 29,000 POUNDS

EXTERNAL LOAD ITEMS
ONE FEATHERED PROP.

NUMBER OF ENGINES OPERATING: ONE

LIMITS	RPM.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.							
MILITARY POWER	2700	48.0	-	A.R.	5 min.	260°C	130

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).[1] TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES.		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
				SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]							
		1704[2]							1704[2]		
1725	1500	1650							1650	2490	2160
1560	1355	1500		SET COWL FLAPS FOR LIMITING CYLINDER HEAD TEMPERATURES					1500	2170	1880
1395	1210	1350							1350	1840	1600
1235	1075	1200							1200	1590	1380
1075	935	1050							1050	1350	1170
915	795	900							900	1110	960
755	655	750							750	900	780
605	525	600							600	710	620

MAXIMUM CONTINUOUS						PRESS	(STAT. (NAUT.) MI./GAL.)						(STAT. (NAUT.) MI./GAL.)						(STAT. (NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. GPH.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000																			40000						
						35000																			35000						
						30000																			30000						
						25000																			25000						
						20000																			20000						
						15000																			15000						
						10000																			10000						
2550	41.0	A.R.	130	127	110	5000 S.L.																			5000 S.L.	2200	42.0	A.R.	105	117	102

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 76) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

(2) 1200 U.S. GAL. IS TOTAL FUEL CAPACITY WITH NINE FUSELAGE FUEL TANKS INSTALLED.

EXAMPLE

AT 30,000 LB. GROSS WEIGHT WITH 1050 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES) TO FLY 1350 STAT. AIRMILES AT S.L. FT. ALTITUDE MAINTAIN 2200 RPM AND 42.0 IN. MANIFOLD PRESSURE WITH MIXTURE SET: AUTO-RICH. WHEN GROSS WEIGHT DECREASES TO 29000# REFER TO COLUMN IV OF NEXT CHART.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S.GAL.PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 9-9-44
REVISED 9-6-46

BASED ON: FLIGHT TESTS

FUEL GRADE 100/130

Figure 77—(Sheet 6 of 9) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL(S)
C-47 & C-47A

ENGINE(S): R-1830-92

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 29,000 TO 26,000 POUNDS

EXTERNAL LOAD ITEMS
ONE FEATHERED PROP.

NUMBER OF ENGINES OPERATING: ONE

LIMITS	RPM.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.							
MILITARY POWER	2700	48.0	-	A.R.	5 min	260°C	150

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING(1) MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND)(1). TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
		1604(2)	SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING(1)						1604(2)		
1650	1430	1550					2370	2060	1550	2620	2280
1595	1385	1500					2270	1970	1500	2520	2190
1430	1240	1350					1090	1730	1350	2190	1900
1265	1100	1200					1710	1480	1200	1870	1620
1100	955	1050					1430	1240	1050	1550	1350
935	810	900					1190	1030	900	1280	1110
775	675	750					970	840	750	1040	900
615	535	500					750	650	600	800	690
460	400	450					540	470	450	580	500
305	265	300					360	310	300	380	330
155	135	150					180	160	150	190	160

MAXIMUM CONTINUOUS						PRESS	(STAT. (NAUT.) MI./GAL.)						(STAT. (NAUT.) MI./GAL.)						(1.21 STAT. (1.05 NAUT.) MI./GAL.)						PRESS	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	ALT. FEET	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000																			40000						
						35000																			35000						
						30000	SET COWL FLAPS FOR LIMITING CYLINDER HEAD TEMPERATURES.																		30000						
						25000																			25000						
						20000																			20000						
						15000																			15000						
2550	41.0	A.R.	130	141	122	10000													2300	38.0	A.R.	100	117	102	10000						
2550	41.0	A.R.	130	133	115	5000													2200	41.5	A.R.	105	124	108	5000						
						S.L.																			S.L.	2100	40.0	A.R.	90	115	100

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 76) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

(2) 1604 U.S. GAL. TOTAL FUEL CAPACITY WITH EIGHT FUSELAGE FUEL TANKS INSTALLED

EXAMPLE

AT 27,000 LB. GROSS WEIGHT WITH 900 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES) TO FLY 1190 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 2300 RPM AND 38.0 IN. MANIFOLD PRESSURE WITH MIXTURE SET: AUTO-RICH. WHEN GROSS WEIGHT DECREASES TO 26,000#, REFER TO COLUMN IV OF NEXT CHART.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 9-9-44
REVISED 9-6-46

BASED ON: Flight Tests

FUEL GRADE 100/130

Figure 77—(Sheet 7 of 9) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL(S)
C-47 & C-47A

ENGINE(S): R-1830-92

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 26,000 TO 23,000 POUNDS

EXTERNAL LOAD ITEMS
ONE FEATHERED PROP.

NUMBER OF ENGINES OPERATING: ONE

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.							
MILITARY POWER	2700	48.0	-	A.R.	5 min	260°C	150

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN **FUEL** COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT **RANGE** VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND **MIXTURE** SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).[1] TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S.GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I		FUEL	COLUMN II		COLUMN III		COLUMN IV		FUEL	COLUMN V	
RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES		RANGE IN AIRMILES		RANGE IN AIRMILES		U.S.	RANGE IN AIRMILES	
STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL	STATUTE	NAUTICAL	STATUTE	NAUTICAL	GAL.	STATUTE	NAUTICAL
					SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]						
1140	990	1000[2]			1465	1270	1670	1450	1000[2]	1880	1630
975	850	900			1300	1130	1480	1290	900	1660	1440
810	705	750			1060	920	1200	1040	750	1340	1160
645	560	600			820	710	920	800	600	1020	890
480	415	450			590	510	660	570	450	720	630
320	280	300			400	350	440	380	300	480	420
160	140	150			200	170	220	190	150	240	210

MAXIMUM CONTINUOUS						PRESS ALT. FEET	(STAT. (NAUT.) MI./GAL.)						(1.32 STAT. (1.15 NAUT.) MI./GAL.)						(1.45 STAT. (1.27 NAUT.) MI./GAL.)						PRESS ALT. FEET	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.		R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.		R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000 35000 30000							SET COWL FLAPS WIDE OPEN IN OPERATING ENGINE													40000 35000 30000						
						25000 20000 15000																				25000 20000 15000						
2550	F.T.	A.R.	115	139	121	10000							2450	33.0	A.R.	90	115	100							10000						
2550	41.0	A.R.	130	147	128	5000							2350	38.0	A.R.	100	134	116	2200	36.5	A.R.	86	124	108	5000						
2550	41.0	A.R.	130	139	121	S.L.							2150	41.5	A.R.	100	131	114	2100	39.0	A.R.	85	123	107	S.L.	2100	36.0	A.R.	70	111	96

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 76) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.
(2) 1004 U.S. GAL. IS TOTAL FUEL CAPACITY WITH TWO FUSELAGE TANKS.

DATA AS OF 9-9-44
REVISED 9-6-46

BASED ON: FLIGHT TESTS

EXAMPLE

AT 26,000 LB. GROSS WEIGHT WITH 900 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES) TO FLY 1480 STAT. AIRMILES AT 5000 FT. ALTITUDE MAINTAIN 2200 RPM AND 36.5 IN. MANIFOLD PRESSURE WITH MIXTURE SET: AUTO-RICH. WHEN GROSS WEIGHT DECREASES TO 23000#, REFER TO COLUMN IV ON NEXT CHART.

FUEL GRADE 100/130

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S.GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

Figure 77—(Sheet 8 of 9) Flight Operation Instruction Chart

AAFMC-528
4-1-44

AIRCRAFT MODEL(S)
C-47 & C-47A

ENGINE(S): R-1830-92

FLIGHT OPERATION INSTRUCTION CHART

CHART WEIGHT LIMITS: 23,000 TO 19,000 POUNDS

EXTERNAL LOAD ITEMS
ONE FEATHERED PROP.

NUMBER OF ENGINES OPERATING: ONE

LIMITS	R.P.M.	M.P. IN.HG.	BLOWER POSITION	MIXTURE POSITION	TIME LIMIT	CYL. TEMP.	TOTAL G.P.H.
WAR EMERG.							
MILITARY POWER	2700	48.0	-	A.R.	5 min	260°C	150

INSTRUCTIONS FOR USING CHART: SELECT FIGURE IN FUEL COLUMN EQUAL TO OR LESS THAN AMOUNT OF FUEL TO BE USED FOR CRUISING[1] MOVE HORIZONTALLY TO RIGHT OR LEFT AND SELECT RANGE VALUE EQUAL TO OR GREATER THAN THE STATUTE OR NAUTICAL AIR MILES TO BE FLOWN. VERTICALLY BELOW AND OPPOSITE VALUE NEAREST DESIRED CRUISING ALTITUDE (ALT.) READ RPM, MANIFOLD PRESSURE (M.P.) AND MIXTURE SETTING REQUIRED.

NOTES: COLUMN I IS FOR EMERGENCY HIGH SPEED CRUISING ONLY. COLUMNS II, III, IV AND V GIVE PROGRESSIVE INCREASE IN RANGE AT A SACRIFICE IN SPEED. AIR MILES PER GALLON (MI./GAL.) (NO WIND), GALLONS PER HR. (G.P.H.) AND TRUE AIRSPEED (T.A.S.) ARE APPROXIMATE VALUES FOR REFERENCE. RANGE VALUES ARE FOR AN AVERAGE AIRPLANE FLYING ALONE (NO WIND).[1] TO OBTAIN BRITISH IMPERIAL GAL. (OR G.P.H.): MULTIPLY U.S. GAL. (OR G.P.H.) BY 10 THEN DIVIDE BY 12.

COLUMN I			FUEL	COLUMN II			COLUMN III			COLUMN IV			FUEL	COLUMN V		
RANGE IN AIRMILES			U.S.	RANGE IN AIRMILES			RANGE IN AIRMILES			RANGE IN AIRMILES			U.S.	RANGE IN AIRMILES		
STAUTE		NAUTICAL	GAL.	STATUTE		NAUTICAL	STATUTE		NAUTICAL	STATUTE		NAUTICAL	GAL.	STATUTE		NAUTICAL
				SUBTRACT FUEL ALLOWANCES NOT AVAILABLE FOR CRUISING[1]												
660		570	600	800		690	970		840	1130		980	600	1290		1120
495		430	450	600		520	730		630	850		740	450	970		840
330		285	300	400		350	480		420	560		490	300	650		560
165		145	150	200		170	240		210	280		240	150	320		280

MAXIMUM CONTINUOUS						PRESS ALT. FEET	(1.34 STAT. (1.16 NAUT.) MI./GAL.)						(1.61 STAT. (1.40 NAUT.) MI./GAL.)						(1.88 STAT. (1.63 NAUT.) MI./GAL.)						PRESS ALT. FEET	MAXIMUM AIR RANGE					
R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.		R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.	R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.		R.P.M.	M.P. INCHES	MIX-TURE	APPROX. TOT. G.P.H.	APPROX. T.A.S. MPH.	APPROX. T.A.S. KTS.
						40000 35000 30000	SET COWL FLAPS WIDE OPEN ON OPERATING ENGINE																		40000 35000 30000						
						25000 20000 15000																			25000 20000 15000						
2550	F.T.	A.R.	115	142	123	10000	2400	F.T.	A.R.	100	137	119	2400	32.5	A.R.	85	133	115							10000						
2550	41.0	A.R.	130	153	133	5000	2400	38.5	A.R.	105	143	124	2200	36.5	A.R.	85	133	115	2100	33.0	A.R.	65	119	103	5000	2050	32.0	A.L.	50	110	96
2550	41.0	A.R.	130	144	125	S.L.	2200	41.5	A.R.	105	139	121	2100	38.0	A.R.	80	128	111	2100	34.0	A.R.	60	117	102	S.L.	2100	34.0	A.L.	55	113	98

SPECIAL NOTES

(1) MAKE ALLOWANCE FOR WARM-UP, TAKE-OFF & CLIMB (SEE FIG. 76) PLUS ALLOWANCE FOR WIND, RESERVE AND COMBAT AS REQUIRED.

EXAMPLE

AT 22000 LB. GROSS WEIGHT WITH 300 GAL. OF FUEL (AFTER DEDUCTING TOTAL ALLOWANCES) OF GAL.) TO FLY 480 STAT. AIRMILES AT S.L. FT. ALTITUDE MAINTAIN 2100 RPM AND 38.0 IN. MANIFOLD PRESSURE WITH MIXTURE SET: AUTO-RICH.

LEGEND

ALT. : PRESSURE ALTITUDE
M.P. : MANIFOLD PRESSURE
GPH : U.S. GAL. PER HOUR
TAS : TRUE AIRSPEED
KTS. : KNOTS
S.L. : SEA LEVEL
F.R. : FULL RICH
A.R. : AUTO-RICH
A.L. : AUTO-LEAN
C.L. : CRUISING LEAN
M.L. : MANUAL LEAN
F.T. : FULL THROTTLE

DATA AS OF 9-9-44
REVISED 9-6-46

BASED ON: FLIGHT TESTS

FUEL GRADE 100/130

Figure 77—(Sheet 9 of 9) Flight Operation Instruction Chart

Pages 105 through 112 deleted
by revision dated 16 July 1947.