EO 05-45B-1

CANADIAN FORCES

AIRCRAFT OPERATING INSTRUCTIONS

EXPEDITOR

(This EO replaces EO 05-45B-1, dated 26 Sep 66, and all Revisions, including Interim Revisions, issued thereto.)

ISSUED ON AUTHORITY OF THE CHIEF OF THE DEFENCE STAFF

19 AUG 68

LIST OF REVISIONS

DATE	PAGE NO	DATE	PAGE NO

INTERIM REVISION 1-68
TO
AIRCRAFT OPERATING INSTRUCTIONS
EXPEDITOR
DATED 26 SEP 66

ISSUED ON THE AUTHORITY OF THE CHIEF OF THE DEFENCE STAFF

INTERIM REVISIONS (IRs) ARE TO BE RETAINED IN NUMERICAL SEQUENCE IN THE FRONT OF THE PERTINENT AOI. THE ANNUAL "REVISION NOTICE" WILL INCLUDE INSTRUCTIONS WITH RESPECT TO THE RETENTION OR REMOVAL OF PUBLISHED IRs.

LIST OF EFFECTIVE INTERIM REVISIONS: 2-67, 1-68

(A note should be placed in the margin of revised pages, directing attention to these revisions.)

The following revisions apply only to aircraft on which modification 05-45B-6A/248 has been incorporated. This modification is the installation of a guarded landing gear emergency override button which, when pressed, bypasses the landing gear safety circuit micro-switches, and allows the retraction of the landing gear while the aircraft is moving on the ground.

1. REVISION:

Part 1, page 1-25, para 66, line 7 — add after "latch":
"This safety feature may be de-activated by the landing gear emergency override installation, which bypasses the safety circuits."

2. REVISION:

Part 1, page 1-25, para 66, line 8 of NOTE after "position" — delete period, insert comma, and add:
"except when the landing gear emergency override feature is activated."

REVISION DATE: 24 JUL 68

cont'd overleaf

3. REVISION:

Part 1, page 1-25, after para 66, NOTE — insert new para 66A as follows:

"LANDING GEAR EMERGENCY OVERRIDE

66A A guarded push button, labelled L/G EMERG OVERRIDE, is located directly above the landing gear selector lever. When pressed, this button bypasses the safety circuits, and allows a retraction to be made while the weight of the aircraft is on the wheels. To raise the landing gear in an emergency, the button must be pressed and, simultaneously, the landing gear selector lever must be raised to the UP position. When the selector lever has commenced its upward travel, the button may be released, and the landing gear will retract when the lever reaches the UP position.

CAUTION

If the landing gear selector lever is raised by this method while the aircraft is motionless on the ground, the geometric locks will prevent the gear from retracting; however, damage will occur to the landing gear retracting mechanism. If the override is operated while the aircraft is in motion, the wheels will retract and the aircraft will settle on its belly."

4. REVISION:

Part 3, page 3-1, para 3 — subpara (c) to read:
"(c) Ignition switches - OFF."

5. REVISION:

Part 3, page 3-1, para 3 — subpara (e) to read:
"(e) If it is apparent that the aircraft will overshoot the landing area, prepare to ground loop or retract the landing gear, if necessary, to prevent collision with obstacles ahead. If the landing gear is to be raised, the battery switch must be ON to operate the landing gear emergency override system, and must be turned OFF after the gear has been retracted."

6. REVISION:

Part 3, page 3-1, para 3 — delete NOTE, insert WARNING as follows:

WARNING

"If, while moving at high speed, the aircraft enters deep snow or any soft or unprepared surface that causes excessive drag on the wheels, it is prone to overturn. If this occurs, considerable airframe damage will result, and the fire hazard is extreme. If it is apparent that the aircraft will enter or has entered such an area, the landing gear should be raised using the landing gear emergency override system. The aircraft will slide to a stop on its belly, resulting in minimum airframe damage and minimum danger to the crew. At 80 knots IAS the aircraft will normally be on its belly 250 feet after the selection has been made; at 60 knots IAS the distance will be 200 feet. The tail of the aircraft should be in the level flight attitude, if possible, when the emergency landing gear retraction is initiated."

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TELECOMMUNICATION AND NAVIGATION EQUIPMENT IN EXPEDITOR AIRCRAFT NOT EQUIPPED WITH TACAN

LIST OF ILLUSTRATIONS


3TM and 3NMT
The EXPEDITOR
3NM

PART 1

DESCRIPTION

INTRODUCTION

GENERAL

1 The Expeditor 3 is a twin-engine, low-wing, land monoplane of all-metal semi-monocoque design. Its empennage consists of one horizontal and two vertical stabilizers. The control surfaces are fabric-covered.

2 Three versions of the Expeditor 3 appear in this Engineering Order: 3NM, 3TM, and 3 NMT. The Expeditor 3NM is equipped with an astrodome and furnished with navigational equipment (see Figure 1-1). Additional floor fittings are provided in the Expeditor 3NM so that navigational furnishings may be replaced by transportation furnishings to convert it to the 3TM version. The 3NMT is basically a 3NM converted to a transport aircraft. Furnishings in the 3TM and 3NMT include seating for five personnel, three dome lights which provide cabin illumination, and in the 3TM, reading spot lights installed on the air ducts above each cabin seat (see Figure 1-2).

CREW

3 The minimum crew for the Expeditor is one pilot; however, a normal crew consists of a pilot and a co-pilot. The aircraft may easily be flown solo, although it is recommended that the right seat be occupied during flight.

ENGINES

4 Each power plant contains a Pratt and Whitney Wasp Junior, radial, air-cooled engine with nine cylinders in a single row. It has a maximum power rating at sea level of 450 hp at 2,300 rpm, with a manifold pressure of 36" Hg. The engine drives a two-bladed, fully-feathering, Hamilton Standard Hydromatic propeller through a direct shaft.

LEADING PARTICULARS

DIMENSIONS

5 Over-all dimensions of the aircraft are as follows:

(a) Length - 34 ft 2-3/4 in.

(b) Height - 9 ft 1/2 in.

(c) Height (tail wheel on ground, propeller blades vertical, main landing gear struts inflated to 2-1/2 in) - 10 ft 8-1/16 in.

(d) Wing Span - 47 ft 7 in.

WEIGHTS

6 Weights of the aircraft are as follows:

(a) Basic weight of aircraft (approx)	6,475 lbs.
(b) Maximum permissible take-off gross weight	9,300 lbs.
(c) Maximum permissible landing gross weight	9,000 lbs.

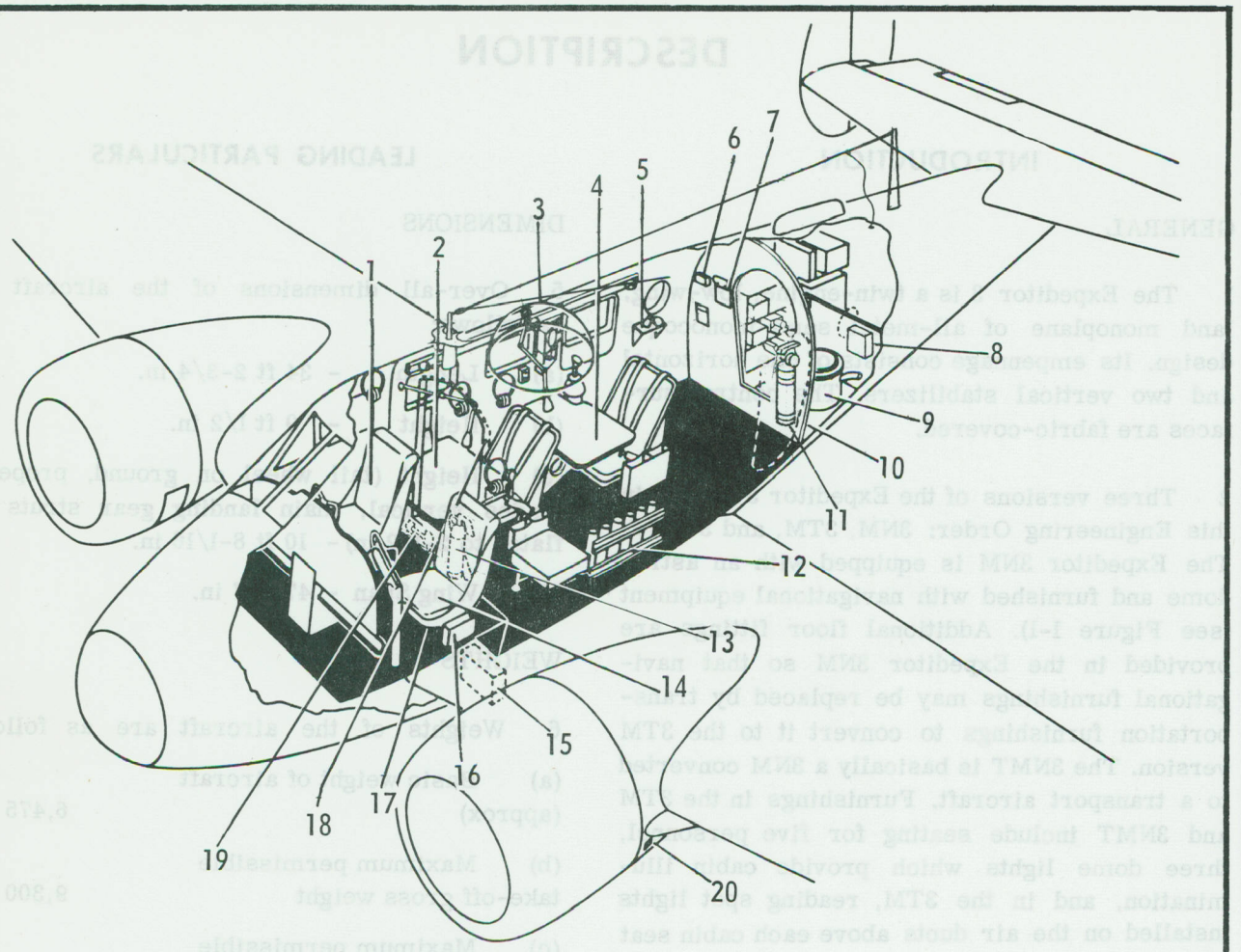
FUEL AND OIL TANK CAPACITIES

7 Fuel and oil tank capacities are shown in Figure 1-3.

FUEL SYSTEM

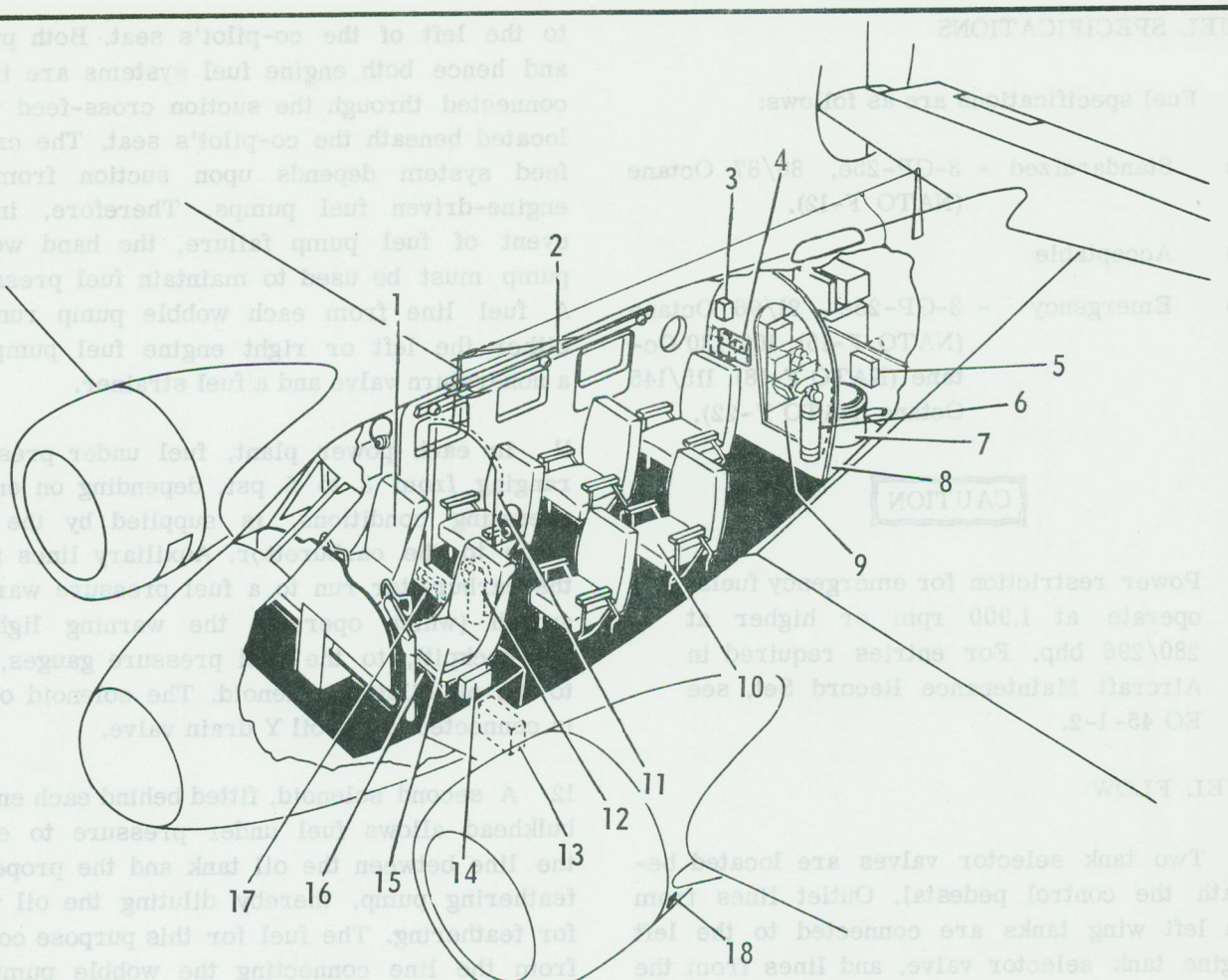
GENERAL

8 Fuel to the engines is stored in five tanks, two in each inner wing and one in the nose. The aluminum wing tanks consist of the forward main tank and the rear auxiliary tank. The nose tank, situated in the lower half of the nose baggage compartment, is of the bladder type which facilitates installation through the nose door. Wing tanks supply fuel only to the engine on the same side of the fuselage, unless CROSSFEED is selected. The nose tank supplies both engines without cross-feed selection.



1 CO-PILOT'S POSITION
2 FORWARD NAVIGATOR'S POSITION
3 ASTRODOME
4 REAR NAVIGATOR'S POSITION
5 B5 DRIFT RECORDER
6 SPARE BULB CONTAINER
7 FORCED LANDING INSTRUCTIONS BAG, WEIGHT & BALANCE DATA
8 DATA CASE (REAR BAGGAGE COMPARTMENT)
9 CHEMICAL TOILET
10 RELIEF TUBE
11 WATER-GLYCOL FIRE EXTINGUISHER
12 FLARE STOWAGE
13 CO_2 FIRE EXTINGUISHER
14 PILOT'S POSITION
15 INTERNAL BATTERY (BOTH LEADING EDGES)
16 MAP AND DATA CASE
17 PILOT'S RELIEF TUBE
18 COCKPIT-CABIN PARTITIONING CURTAIN
19 CRASH AXE
20 EXTERNAL POWER RECEPTACLE

Figure 1-1 General Arrangement, Expeditor 3NM



1 CO-PILOT'S POSITION
2 CABIN COLD AIR DUCT
3 SPARE BULB CONTAINER
4 FORCED LANDING INSTRUCTIONS BAG, WEIGHT & BALANCE DATA (ALTERNATIVE LOCATION ON REAR BAGGAGE COMPARTMENT DOOR)
5 DATA CASE (REAR BAGGAGE COMPARTMENT)
6 WATER-GLYCOL FIRE EXTINGUISHER
7 CHEMICAL TOILET
8 RELIEF TUBE
9 REAR BAGGAGE COMPARTMENT
10 RECLINING CABIN SEATS (5 PASSENGERS)
11 COCKPIT-CABIN PARTITIONING CURTAIN
12 CO_2 FIRE EXTINGUISHER
13 INTERNAL BATTERY (BOTH LEADING EDGES)
14 MAP AND DATA CASE
15 PILOT'S POSITION
16 PILOT'S RELIEF TUBE
17 CRASH AXE
18 EXTERNAL POWER RECEPTACLE

Figure 1-2 General Arrangement, Expeditor 3TM and 3NMT

FUEL SPECIFICATIONS

9 Fuel specifications are as follows:

(a) Standardized - 3-GP-25e, 80/87 Octane (NATO F-12).

(b) Acceptable

(c) Emergency - 3-GP-25e - 91/96 Octane (NATO F-15), 100/130 Octane (NATO F-18), 115/145 Octane (NATO F-22).

CAUTION

Power restriction for emergency fuels: operate at 1,900 rpm or higher at 280/296 bhp. For entries required in Aircraft Maintenance Record Set, see EO 45-1-2.

FUEL FLOW

10 Two tank selector valves are located beneath the control pedestal. Outlet lines from the left wing tanks are connected to the left engine tank selector valve, and lines from the right wing tanks connect to the right engine selector valve (see Figure 1-4). A line from the nose tank passes to each selector valve. Fuel then flows to two wobble pumps which are operated manually by a single handle, located to the left of the co-pilot's seat. Both pumps and hence both engine fuel systems are interconnected through the suction cross-feed valve located beneath the co-pilot's seat. The cross-feed system depends upon suction from the engine-driven fuel pumps. Therefore, in the event of fuel pump failure, the hand wobble pump must be used to maintain fuel pressure. A fuel line from each wobble pump runs to either the left or right engine fuel pump via a non-return valve and a fuel strainer.

FUEL TANKS	CAPACITY (Imp gals)
Front Main - Left	63
Front Main - Right	63
Rear Aux. - Left	21
Rear Aux. - Right	21
Nose Tank	67
OIL TANKS	
Left Nacelle	6.6
Right Nacelle	6.6

Figure 1-3 Fuel and Oil Tank Capacity Table

11 In each power plant, fuel under pressure ranging from 3 to 5 psi, depending on engine operating conditions, is supplied by the fuel pump to the carburettor. Auxiliary lines from the carburettor run to a fuel pressure warning switch (which operates the warning light in the cockpit), to the fuel pressure gauges, and to the oil dilution solenoid. The solenoid outlet is connected to the oil Y drain valve.

12 A second solenoid, fitted behind each engine bulkhead allows fuel under pressure to enter the line between the oil tank and the propeller feathering pump, thereby diluting the oil used for feathering. The fuel for this purpose comes from the line connecting the wobble pump to the right engine strainer, and goes to a Plessey pump located in the right wheel well. This single pump sends the fuel to both engine feathering line solenoids.

13 A third line from the left engine strainer is connected to a manual engine priming pump located on the pedestal. Two lines from the primer carry the fuel directly to the five uppermost cylinders of each engine.

FUEL QUANTITY GAUGE

14 The actual fuel content of each tank is indicated on a common electrically operated gauge, located to the extreme left of the main instrument panel (see Figure 1-10). The fuel-quantity-gauge selector switch has six positions, one position for each tank and an OFF position. When a tank is selected, the quantity of fuel remaining in that particular tank is indicated on the fuel quantity gauge in tenths.

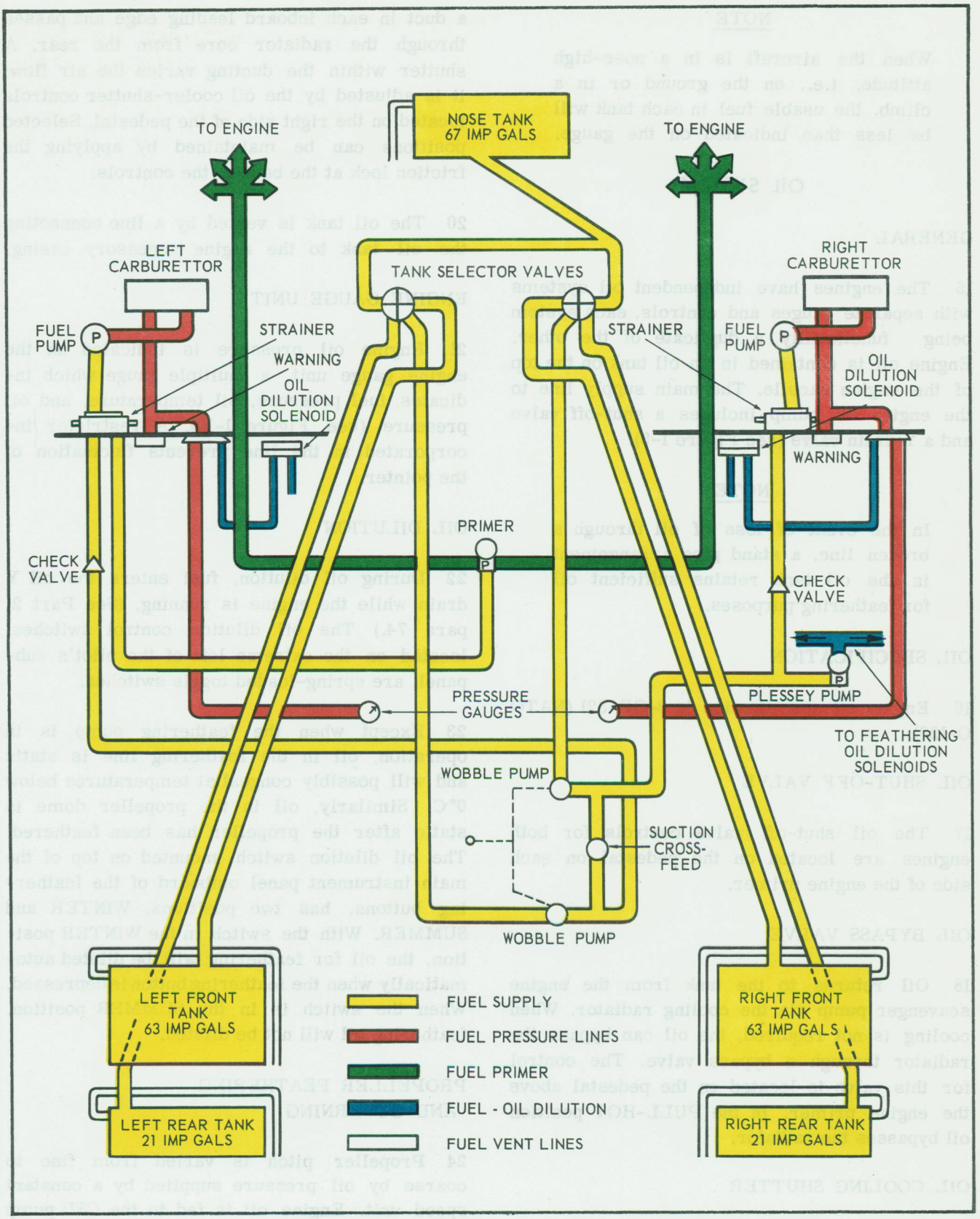


Figure 1-4 Fuel System

NOTE

When the aircraft is in a nose-high attitude, i.e., on the ground or in a climb, the usable fuel in each tank will be less than indicated on the gauge.

OIL SYSTEM

GENERAL

15 The engines have independent oil systems with separate gauges and controls, each system being functionally a duplicate of the other. Engine oil is contained in an oil tank on the top of the engine nacelle. The main supply line to the engine oil pump includes a shut-off valve and a Y drain valve (see Figure 1-5).

NOTE

In the event of loss of oil through a broken line, a stand pipe arrangement in the oil tank retains sufficient oil for feathering purposes.

OIL SPECIFICATION

16 Engine oil specification is 3-GP-321 (NATO O-128).

OIL SHUT-OFF VALVE

17 The oil shut-off valve controls for both engines are located on the pedestal on each side of the engine primer.

OIL BYPASS VALVE

18 Oil returns to the tank from the engine scavenger pump via the cooling radiator. When cooling is not required, the oil can bypass the radiator through a bypass valve. The control for this valve is located on the pedestal above the engine primer. In the PULL-HOT position oil bypasses the radiator.

OIL COOLING SHUTTER

19 The oil radiator is mounted on the forward face of the fire-wall. The cooling air enters a duct in each inboard leading edge and passes through the radiator core from the rear. A shutter within the ducting varies the air flow; it is adjusted by the oil cooler-shutter controls located on the right side of the pedestal. Selected positions can be maintained by applying the friction lock at the base of the controls.

20 The oil tank is vented by a line connecting the oil tank to the engine accessory casing.

ENGINE GAUGE UNIT

21 Engine oil pressure is indicated on the engine gauge unit, a multiple gauge which indicates fuel pressure, oil temperature, and oil pressure (see Figure 1-10). A restricter incorporated in the line prevents fluctuation of the pointer.

OIL DILUTION

22 During oil dilution, fuel enters the oil Y drain while the engine is running. (See Part 2, para 74.) The oil dilution control switches, located on the extreme left of the pilot's subpanel, are spring-loaded toggle switches.

23 Except when the feathering pump is in operation, oil in the feathering line is static and will possibly congeal at temperatures below 0°C. Similarly, oil in the propeller dome is static after the propeller has been feathered. The oil dilution switch, mounted on top of the main instrument panel outboard of the feathering buttons, has two positions, WINTER and SUMMER. With the switch in the WINTER position, the oil for feathering will be diluted automatically when the feathering button is depressed. When the switch is in the SUMMER position, feathering oil will not be diluted.

PROPELLER FEATHERING AND GOVERNING

24 Propeller pitch is varied from fine to coarse by oil pressure supplied by a constant speed unit. Engine oil is fed to the CSU pump which supplies oil to one side of the propeller pitch-varying piston via a distributing adapter

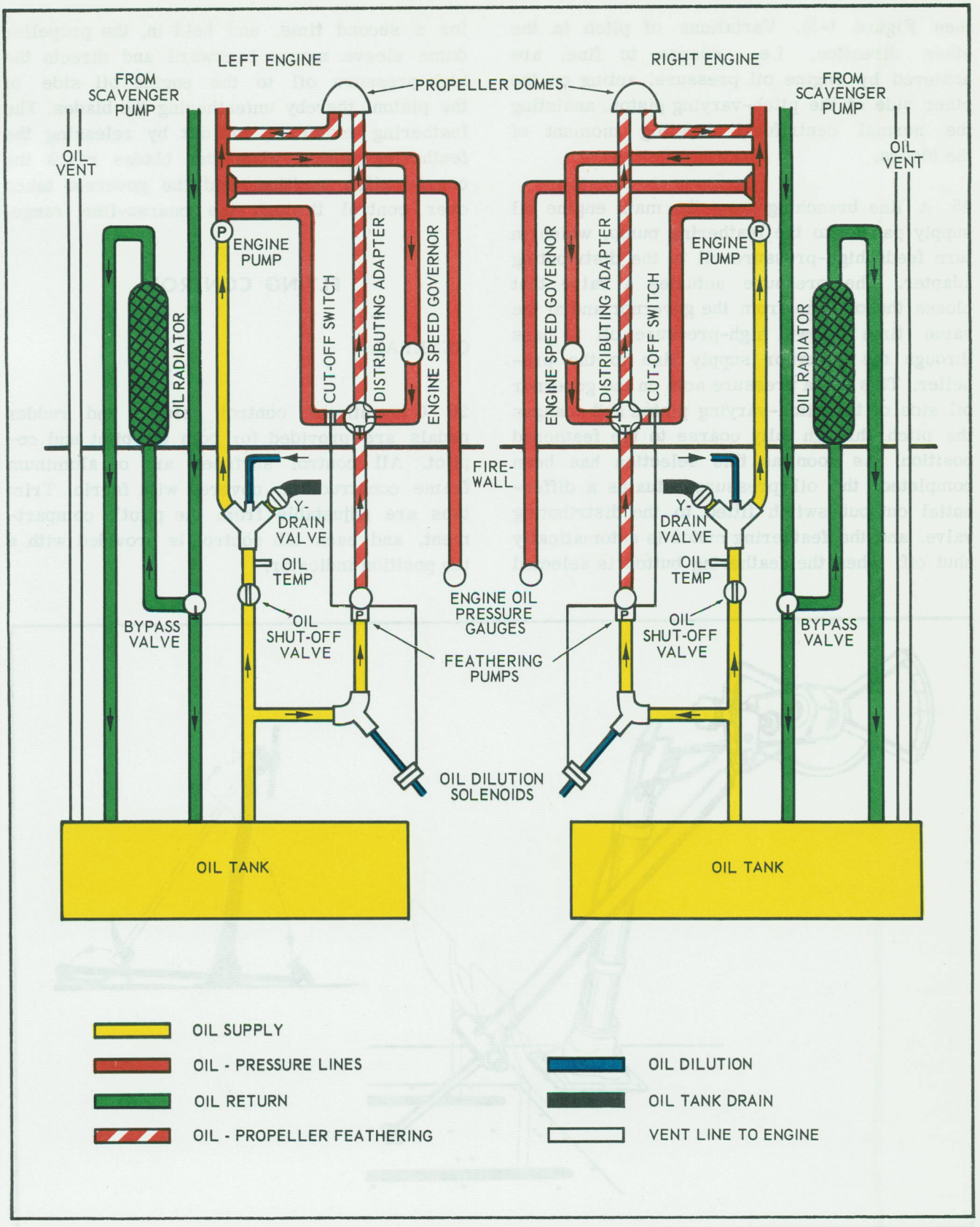


Figure 1-5 Oil System

(see Figure 1-5). Variations of pitch in the other direction, i.e., coarse to fine, are achieved by engine oil pressure, acting on the other side of the pitch-varying piston, assisting the normal centrifugal twisting moment of the blades.

25 A line branching from the main engine oil supply passes to the feathering pump, which in turn feeds high-pressure oil to the distributing adapter. The pressure actuates a valve that closes the oil line from the governor and at the same time allows high-pressure oil to pass through the governor supply line to the propeller. This extra pressure acts on the governor oil side of the pitch-varying piston and changes the pitch through fully coarse to the feathered position. As soon as this selection has been completed, the oil pressure actuates a differential cut-out switch fitted to the distributing valve, and the feathering motor is automatically shut off. When the feathering button is selected for a second time, and held in, the propeller dome sleeve moves backward and directs the high-pressure oil to the engine oil side of the piston, thereby unfeathering the blades. The feathering motor is cut out by releasing the feathering button when the blades reach the coarse pitch position, and the governor takes over control through the coarse-fine range.

FLYING CONTROLS

GENERAL

26 Conventional control column and rudder pedals are provided for both the pilot and co-pilot. All control surfaces are of aluminum frame construction, covered with fabric. Trim tabs are adjustable from the pilot's compartment, and each tab control is provided with a tab position indicator.

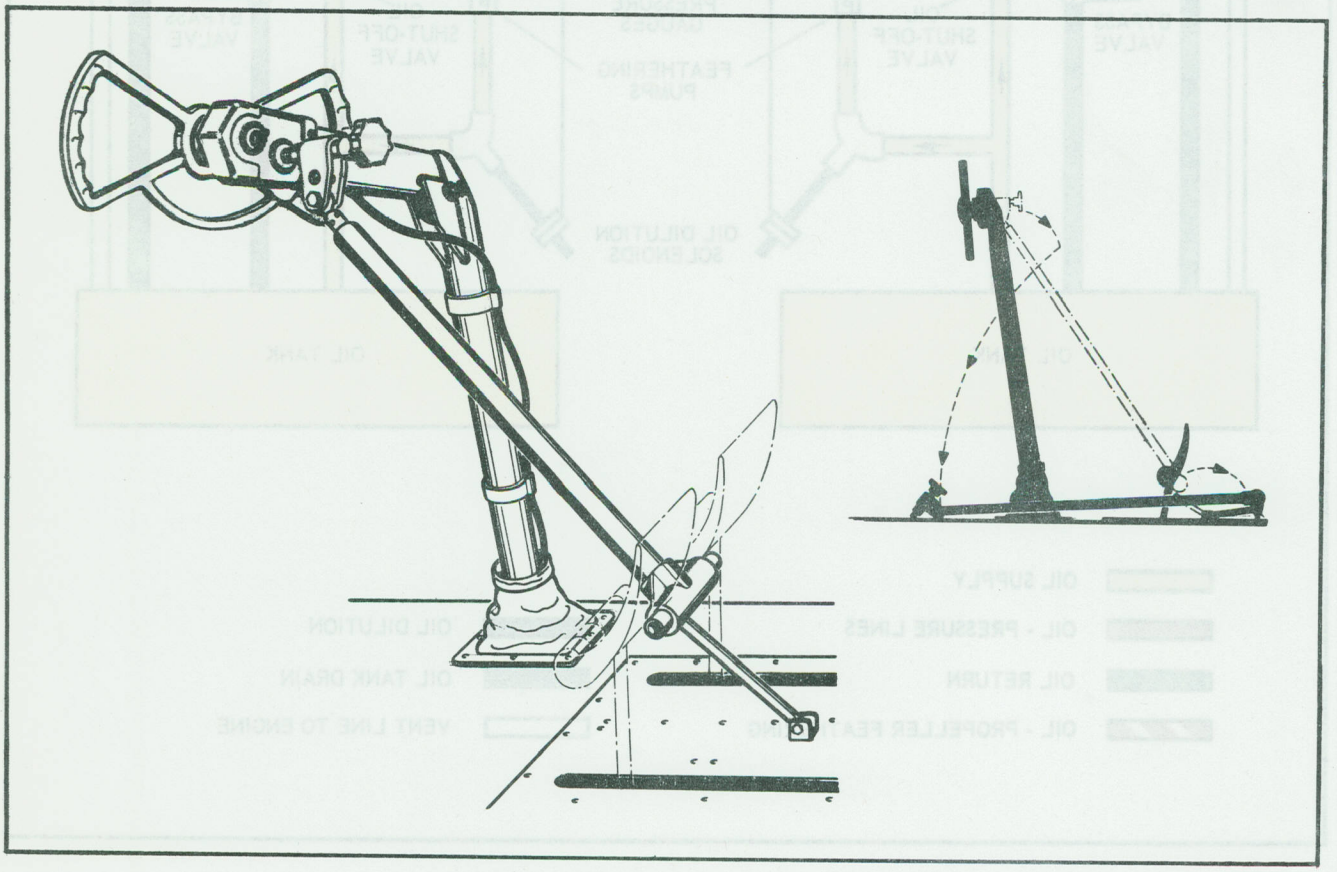


Figure 1-6 Flight Control Lock

This sheet to be inserted in EO facing page 1-9.

In aircraft in which modification 05-45B-6A/248 has been incorporated, the control pedestal is as shown below.

Figure 1-7A Control Pedestal

This sheet to be inserted in EO facing page 1-9.

In aircraft in which modification 05-45B-6A/248 has been incorporated, the control pedestal is as shown below.

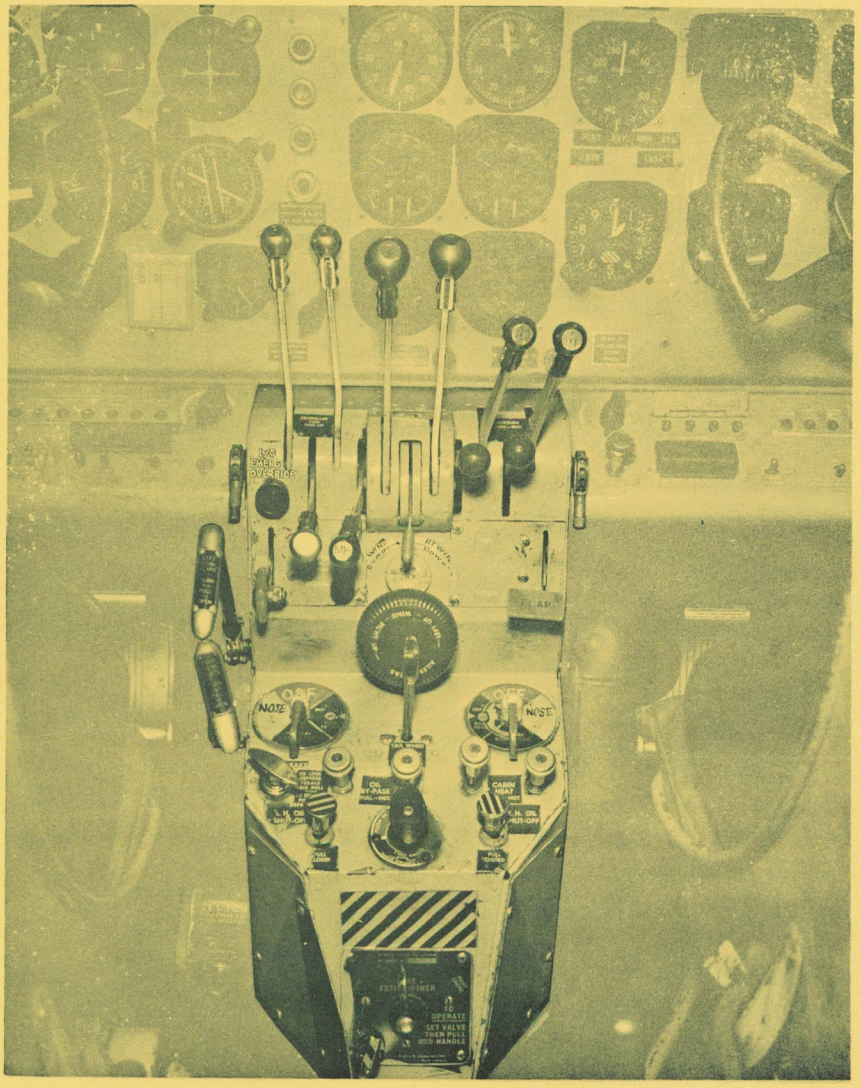


Figure 1-7A Control Pedestal

ELEVATOR TRIM TABS

27 Elevator trim tabs are adjusted by a wheel mounted on the bulkhead at the lower right side of the pilot's seat (see Figure 1-15). Roll the wheel forward for nose-down position, and backward for nose-up position. The elevator tab position indicator (electrically operated) is located on the main instrument panel (see Figure 1-10).

AILERON TRIM TAB

28 The aileron trim tab is adjusted by a wheel in the centre of the control pedestal (see Figure 1-7). When turned clockwise the right wing is lowered; when turned counter-clockwise the left wing is lowered. The single tab is located on the left aileron and is visible from the pilot's seat. An aileron tab position indicator (mechanically operated) is mounted immediately above the aileron trim tab control.

RUDDER TRIM TABS

29 A crank, located in the centre and to the rear of the overhead radio control panel in the cockpit, adjusts the rudder trim tabs. The direction of turn is indicated by arrows on the crank-supporting bracket. A mechanically operated tab position indicator is located adjacent to the rudder trim tab crank. The left rudder trim tab is visible from the pilot's seat.

FLIGHT CONTROL LOCK
(See Figure 1-6)

30 The flight control lock, made of steel tubing and painted red, secures the rudder pedals and control column in such a way that control surfaces are locked in a neutral position. The lock is used only when the aircraft is parked, to prevent damage to controls and adjacent equipment. When not in use the lock is stowed on the cockpit floor between the pilot's rudder pedals.

WING FLAPS

31 The wing flaps, located on the inboard trailing edge, are of aluminum construction.

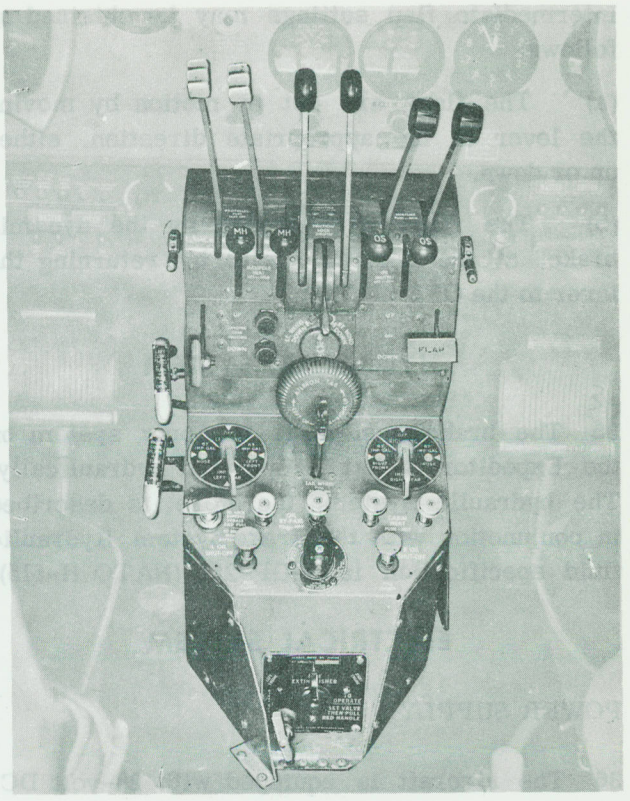


Figure 1-7 Control Pedestal

32 The flaps operate through an angle of 45 degrees, below the neutral (UP) position. Power for moving them is supplied to a torsion shaft by an electric motor. Varying flap positions are maintained using a dynamic brake.

33 The flap control lever, located on the vertical portion of the pedestal has three positions: UP, OFF, and DOWN (see Figure 1-7). For normal operation of the flaps the lever is moved to the DOWN position to lower them, and to the UP position to raise them. To move the lever from either the UP or the DOWN position, it must first be pulled out and then moved to the desired position. However, the lever can be moved from the OFF position by applying a direct up or down force. A small indentation in the guide gives the lever a positive OFF location.

34 As the flap moves through its range, its position is indicated on an electrical flap position indicator, located on the pilot's side of

the main instrument panel (see Figure 1-10). Intermediate flap settings may be obtained as follows:

(a) The flaps are set in motion by moving the lever in the appropriate direction, either up or down.

(b) The flaps are stopped by the dynamic brake, at the desired angle, by returning the lever to the OFF position.

HYDRAULIC SYSTEM

35 The brake system is the only system on the Expeditor 3 that is operated hydraulically. The hydraulic system, therefore, is described in conjunction with the Brake System. Hydraulic fluid specification is 3-GP-26b (NATO H-515).

ELECTRICAL SYSTEM

POWER SUPPLY

36 The aircraft is equipped with 28-volt DC, single-wire, ground return circuitry that carries energy for electrically powered systems and accessories (see Figure 1-8). The primary power source consists of two 100-ampere, engine-driven generators, one mounted on each power plant. The power supply is supplemented by two 12-volt batteries connected in series. With the engines running, the generators supply the necessary power to satisfy the system and to maintain battery charging.

37 Equipment throughout the aircraft is designed to operate on 22 to 29 volts. The majority of the instruments work with an optimum efficiency at 27.5 volts. Voltage regulators within the system maintain the supply at 28 volts so that each piece of equipment, considering line drop, is operated at 27.5 volts.

INVERTER

38 An inverter, incorporated in the circuitry, supplies alternating current to operate the C2 compass, Distance and Radio Magnetic Indicator (DRMI) and light, Track Indicator (except track bar in ILS mode), and the attitude indicator on the pilot's side of the main instrument panel. The UHF inverter may be used as an emergency instrument inverter to provide electrical power to the services described above when the main instrument inverter fails.

GENERATOR FAILURE

39 If one generator fails, the other generator has enough power to maintain the necessary supply for operating the system, with the exception of propeller unfeathering. For unfeathering an initial load of 200 amperes is placed on the circuit. The operating generator can supply 100 amperes, but for the short period of unfeathering the deficiency can be made up with battery power. Two generator failure warning lights, one for each generator, are located below the engine temperature gauges on the main instrument panel.

VOLTAGE REGULATORS

40 To provide a convenient means of adjusting the voltage for the electrical system from within the aircraft, two voltage regulator control rheostats are mounted within a box on the upper rear face of the main spar bulkhead. Initial adjustment of the voltage is carried out externally by ground personnel, and fine adjustment is accomplished in flight by adjusting the two slot-headed rheostat shafts in the regulator box.

EXTERNAL POWER FACILITIES

41 A receptacle, located on the outboard side of the left engine nacelle beneath a small hinged plate, marked EXTERNAL POWER 24 VOLTS, enables an external ground power source to be connected to the circuit for engine starting and to energize aircraft services.

CAUTION

The battery switch must be in the OFF position when external power is being used.

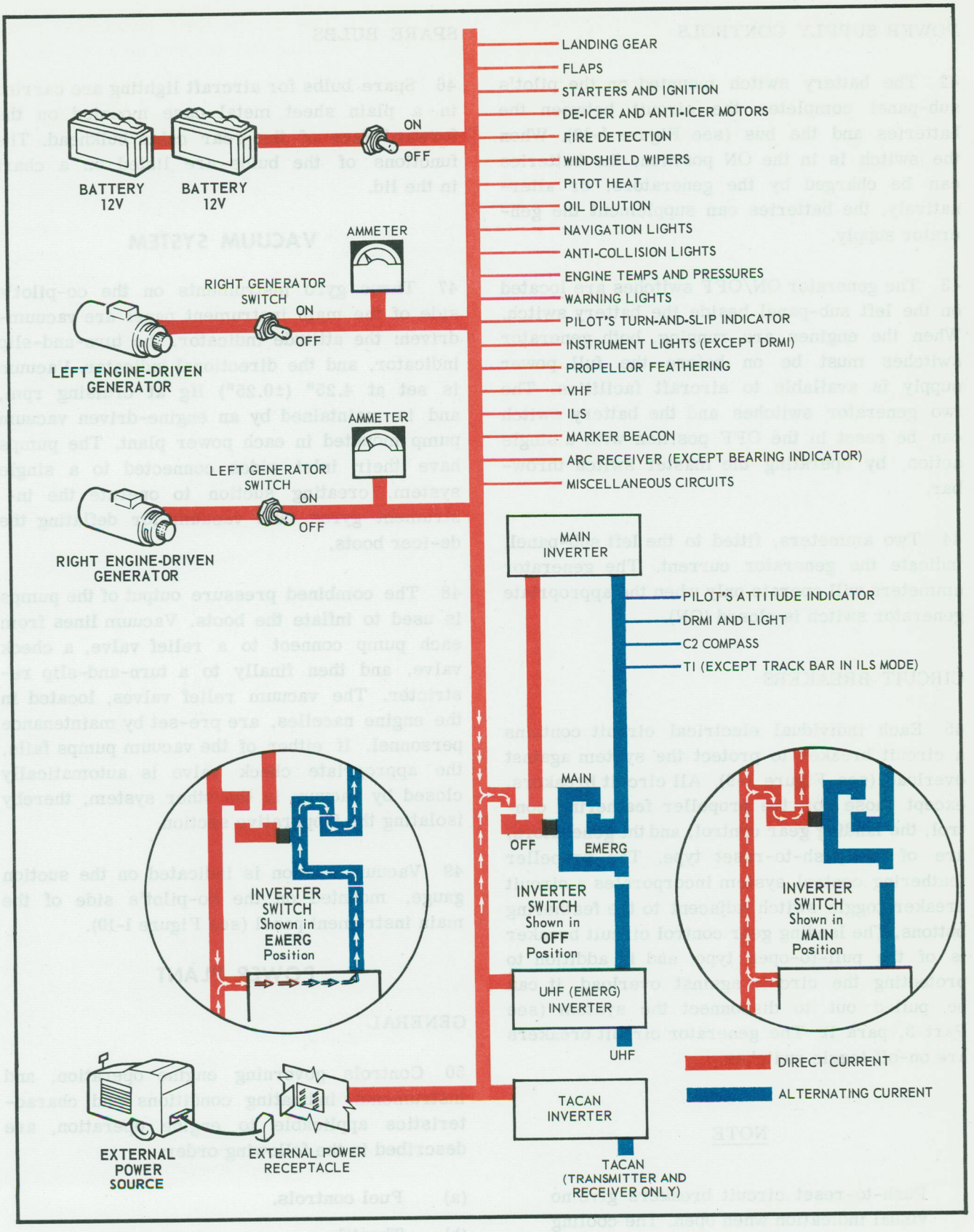


Figure 1-8 Electrical Power Supply

POWER SUPPLY CONTROLS

42 The battery switch mounted on the pilot's sub-panel completes the circuit between the batteries and the bus (see Figure 1-12). When the switch is in the ON position, the batteries can be charged by the generators, or alternatively, the batteries can supplement the generator supply.

43 The generator ON/OFF switches are located on the left sub-panel beside the battery switch. When the engines are running, both generator switches must be on before the full power supply is available to aircraft facilities. The two generator switches and the battery switch can be reset in the OFF position with a single action, by operating the master switch throwbar.

44 Two ammeters, fitted to the left sub-panel, indicate the generator current. The generator ammeters will operate only when the appropriate generator switch is closed (ON).

CIRCUIT BREAKERS

45 Each individual electrical circuit contains a circuit breaker to protect the system against overload (see Figure 1-9). All circuit breakers, except those for the propeller feathering control, the landing gear control, and the generators, are of the push-to-reset type. The propeller feathering control system incorporates a circuit breaker toggle switch adjacent to the feathering buttons. The landing gear control circuit breaker is of the pull-to-open type, and in addition to protecting the circuit against overload, it can be pulled out to disconnect the system (see Part 3, para 1). The generator circuit breakers are on-off toggle switches.

NOTE

Push-to-reset circuit breakers give no visual indication when open. The cooling period required is one minute before resetting this type of circuit breaker.

SPARE BULBS

46 Spare bulbs for aircraft lighting are carried in a plain sheet metal case mounted on the forward face of the rear cabin bulkhead. The functions of the bulbs are listed on a chart in the lid.

VACUUM SYSTEM

47 Three gyro instruments on the co-pilot's side of the main instrument panel are vacuum-driven: the attitude indicator, the turn-and-slip indicator, and the directional indicator. Vacuum is set at 4.25" (±0.25") Hg at cruising rpm, and is maintained by an engine-driven vacuum pump mounted in each power plant. The pumps have their inlet sides connected to a single system, creating suction to operate the instrument gyros, and vacuum for deflating the de-icer boots.

48 The combined pressure output of the pumps is used to inflate the boots. Vacuum lines from each pump connect to a relief valve, a check valve, and then finally to a turn-and-slip restricter. The vacuum relief valves, located in the engine nacelles, are pre-set by maintenance personnel. If either of the vacuum pumps fails, the appropriate check valve is automatically closed by vacuum in the other system, thereby isolating the inoperative section.

49 Vacuum suction is indicated on the suction gauge, mounted on the co-pilot's side of the main instrument panel (see Figure 1-10).

POWER PLANT

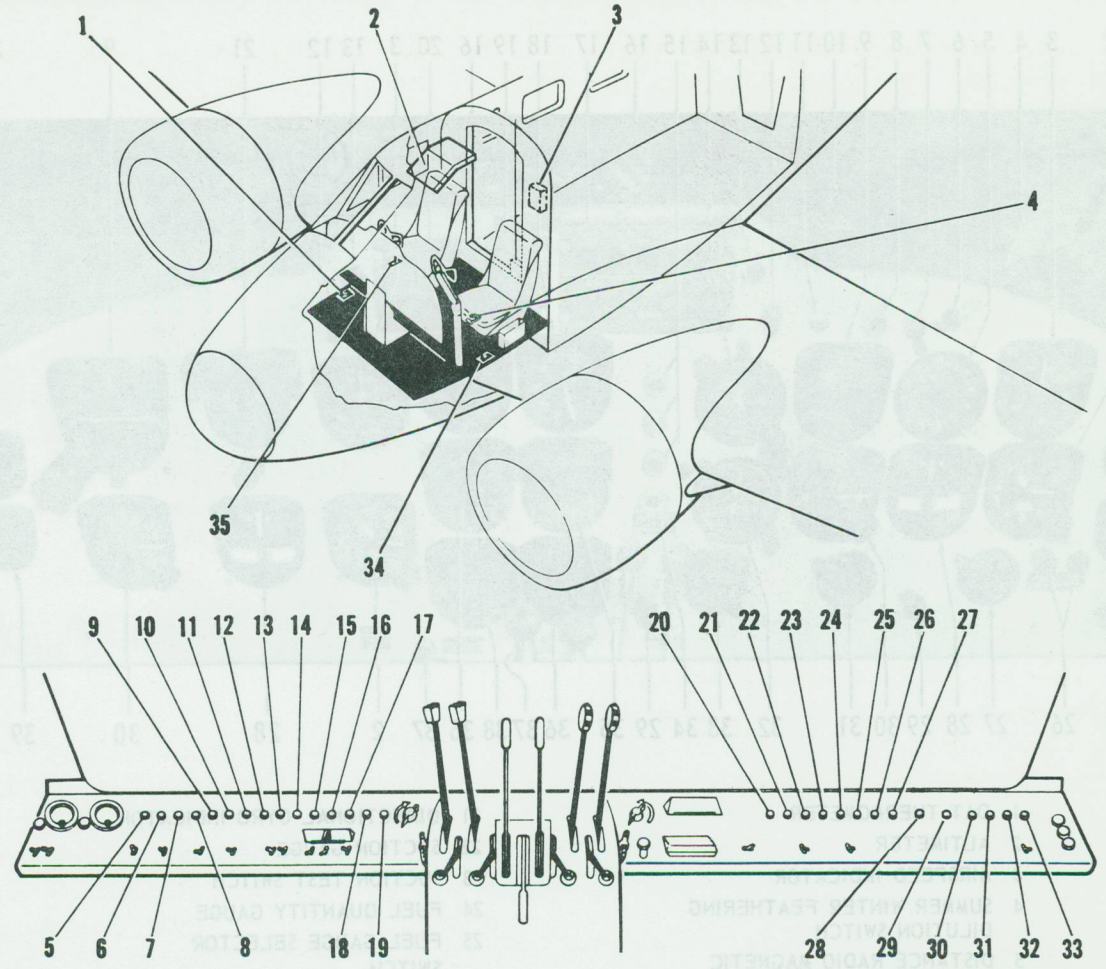
GENERAL

50 Controls governing engine operation, and instruments indicating conditions and characteristics applicable to engine operation, are described in the following order:

(a) Fuel controls.

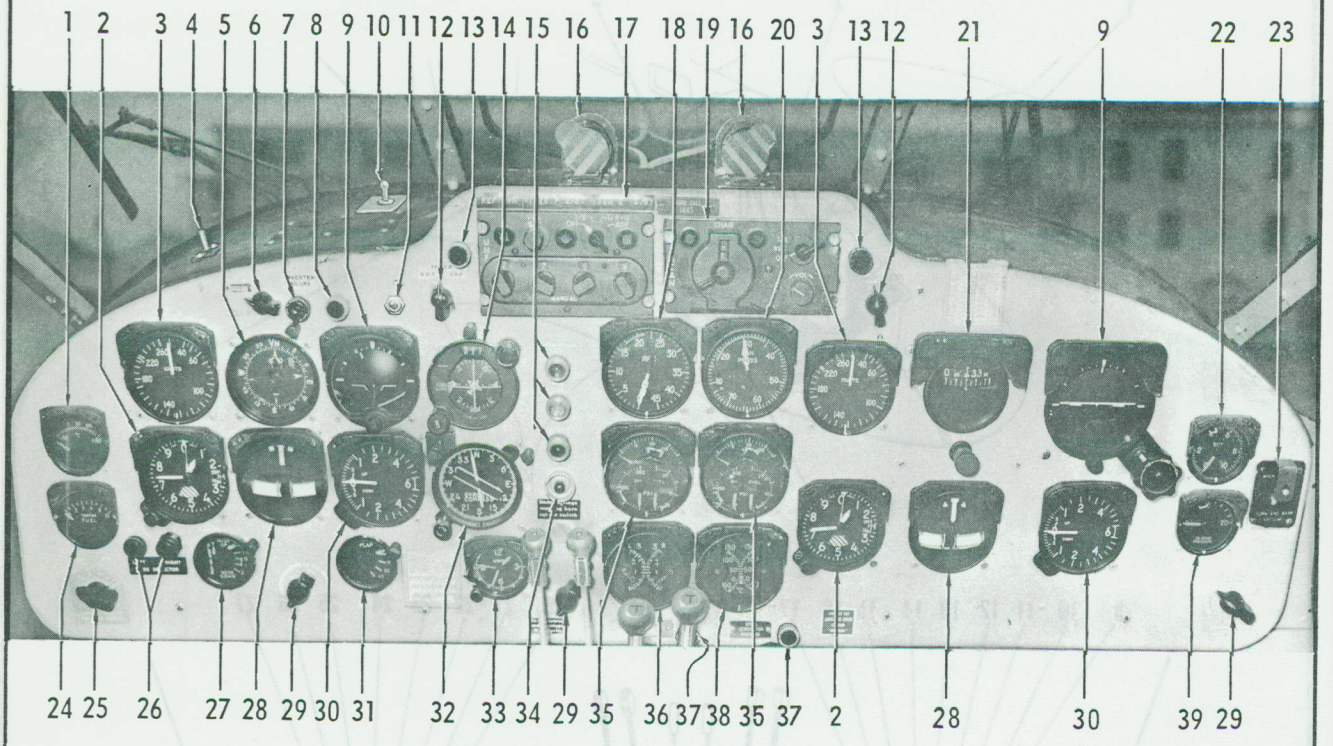
(b) Throttle.

(c) Carburettor.



1 GENERATOR, RIGHT ENGINE (105 AMP)
2 RADIO CONTROL PANEL
3 GENERATOR VOLTAGE CONTROL BOX
4 LANDING GEAR (50 AMP)
5 FIRE DETECTION (5 AMP)
6 LANDING GEAR CONTROL (10 AMP)
7 WINDSHIELD WIPER (15 AMP)
8 IGNITION BOOSTER (10 AMP)
9 PITOT HEAD (20 AMP)
10 OIL DILUTION (15 AMP)
11 NAVIGATION LIGHTS (10 AMP)
12 LANDING GEAR WARNING HORN (10 AMP)
13 LEFT LANDING LIGHT BULB (30 AMP)
14 RIGHT LANDING LIGHT BULB (30 AMP)
15 FUEL GAUGE AND WARNING LIGHTS (10 AMP)
16 LANDING GEAR POSITION AND GENERATOR WARNING LIGHTS (10 AMP)
17 CARBURETTOR MIXTURE TEMPERATURE (10 AMP)
18 LEFT LANDING LIGHT MOTOR (10 AMP)
19 RIGHT LANDING LIGHT MOTOR (10 AMP)
20 ANTI-COLLISION LIGHT (10 AMP)
21 ANTI-ICER MOTOR (10 AMP)
22 INSTRUMENT LIGHTING (10 AMP)
23 FLAP AND ELEVATOR TAB POSITION INDICATORS (10 AMP)
24 DE-ICER (10 AMP)
25 CABIN AND READING LIGHTS (10 AMP)
26 FLAP MOTOR (20 AMP)
27 LEFT OIL TEMPERATURE (10 AMP)
28 RIGHT OIL TEMPERATURE (10 AMP)
29 AIR MILEAGE UNIT (5 AMP)
30 GYROSYN COMPASS DC POWER (10 AMP)
31 TURN-AND-SLIP INDICATOR (5 AMP)
32 INVERTER (20 AMP)
33 INSTRUMENT LIGHTS (10 AMP)
34 GENERATOR, LEFT ENGINE (105 AMP)
35 PROPELLER FEATHERING (5 AMP)

Figure 1-9 Circuit Breakers and Junction Box



1 OAT THERMOMETER
2 ALTIMETER
3 AIRSPEED INDICATOR
4 SUMMER/WINTER FEATHERING DILUTION SWITCH
5 DISTANCE RADIO MAGNETIC INDICATOR
6 ILS/TACAN MODE SWITCH
7 INVERTER FAILURE WARNING LIGHT
8 ATTITUDE INDICATOR LIGHT
9 ATTITUDE INDICATOR
10 PROPELLER FEATHERING CIRCUIT BREAKER
11 ATTITUDE INDICATOR ERECTION SWITCH
12 MICROPHONE SELECTOR SWITCH
13 FUEL PRESSURE WARNING LIGHT
14 TRACK INDICATOR
15 MARKER BEACON LIGHTS
16 PROPELLER FEATHERING BUTTON
17 UHF REMOTE CONTROL SUB-PANEL
18 RPM INDICATORS (TACHOMETERS)
19 TACAN CONTROL SUB-PANEL
20 MANIFOLD PRESSURE GAUGE
21 DIRECTIONAL GYRO INDICATOR
22 SUCTION GAUGE
23 SUCTION TEST SWITCH
24 FUEL QUANTITY GAUGE
25 FUEL GAUGE SELECTOR SWITCH
26 FIRE WARNING LIGHTS
27 ELEVATOR TAB POSITION INDICATOR
28 TURN-AND-SLIP INDICATOR
29 INSTRUMENT LIGHT SWITCH
30 RATE-OF-CLIMB INDICATOR
31 FLAP POSITION INDICATOR
32 GYROSYN COMPASS
33 CLOCK
34 LANDING GEAR WARNING HORN CUT-OUT BUTTON
35 ENGINE GAUGE UNIT
36 CYLINDER HEAD TEMPERATURE GAUGE
37 GENERATOR FAILURE WARNING LIGHT
38 CARBURETTOR MIXTURE TEMPERATURE GAUGE
39 DE-ICING PRESSURE GAUGE

Figure 1-10 Main Instrument Panel

(d) Impeller.

(e) Engine cooling.

(f) Ignition.

(g) Engine primer.

(h) Starter.

(j) Propeller.

FUEL TANK SELECTORS

51 The left and right engine fuel tank selectors, located above the sloping face of the pedestal, have four positions each. When the upper vertical OFF position is selected, the fuel supply to that particular engine is shut off, provided the fuel SUCTION CROSSFEED selector is turned OFF (see para 10). The three remaining positions are for selection of the forward main tank, the rear auxiliary tank, and the nose tank (see Figure 1-7).

WOBBLE PUMP

52 The single red telescopic operating handle for the wobble pumps is located to the left of the co-pilot's seat (see Figure 1-16). The function of the pump is as follows:

(a) It builds up fuel pressure for engine starting.

(b) It maintains fuel pressure (if necessary) during a change-over period from one tank to another or from one side to another.

(c) It maintains fuel pressure in the event that either one or both fuel pumps fail to operate. During normal operation the engine fuel pumps draw the fuel through the stationary wobble pumps.

MIXTURE CONTROLS

53 Two mixture controls are located on top

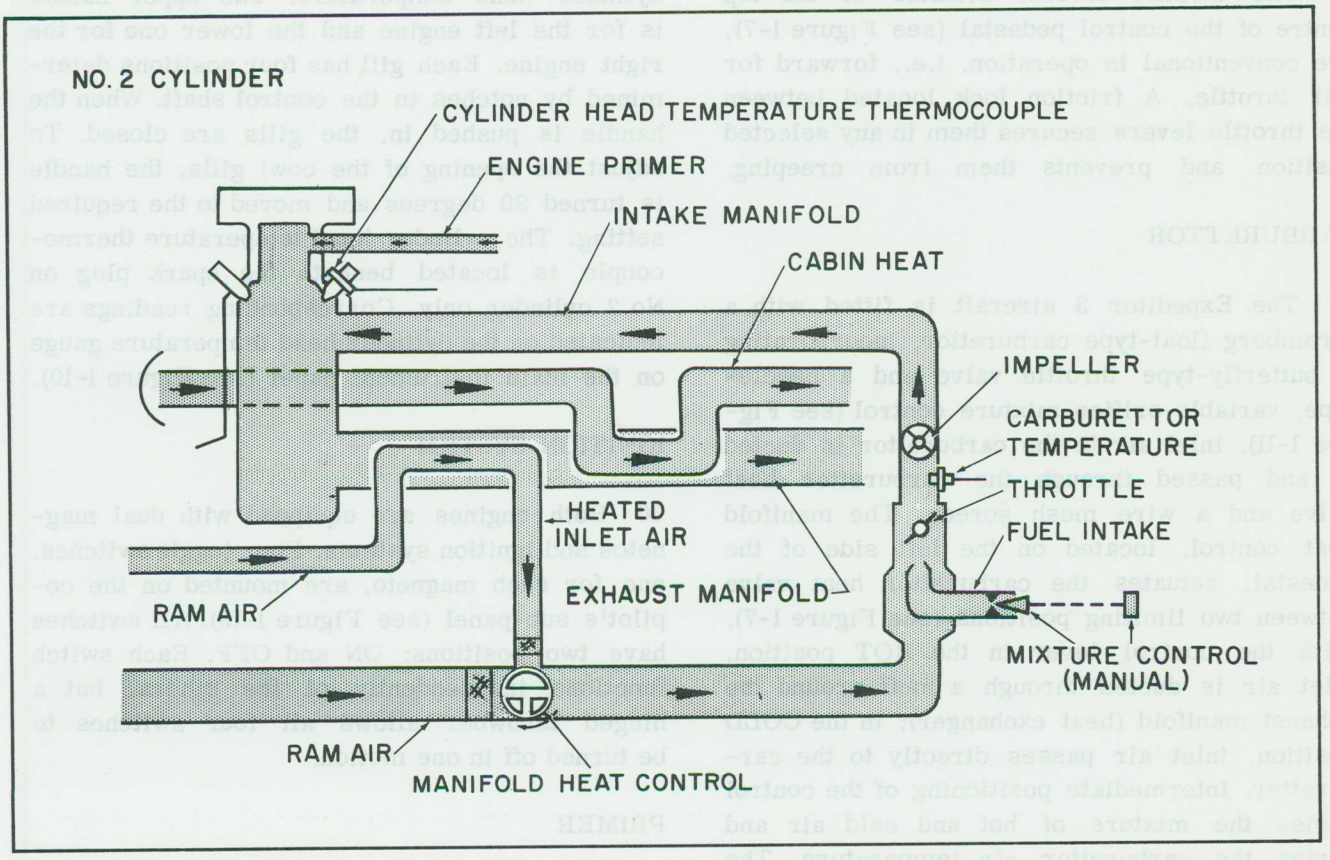


Figure 1-11 Air Induction System

of the pedestal to the right of the throttles. There are two positions: fully forward or full RICH and fully aft or idle cut-off (ICO). Progressive leaning can be accomplished by moving the levers from full RICH toward the idle cut-off position. A friction lock holds the lever in its selected position.

FUEL PRESSURE WARNING LIGHTS

54 The fuel pressure warning lights, located at the top of the main instrument panel, illuminate to indicate insufficient fuel pressure for engine operation, i.e., below 2.25 psi.

ENGINE GAUGE UNIT

55 The engine gauge unit is a multiple gauge indicating fuel pressure, oil temperature, and oil pressure.

THROTTLE

56 The throttle levers, situated at the top centre of the control pedestal (see Figure 1-7), are conventional in operation, i.e., forward for full throttle. A friction lock located between the throttle levers secures them in any selected position and prevents them from creeping.

CARBURETTOR

57 The Expeditor 3 aircraft is fitted with a Stromberg float-type carburettor, incorporating a butterfly-type throttle valve and a needle-type, variable-orifice mixture control (see Figure 1-11). Inlet air to the carburettor is ducted to and passed through the carburettor heat valve and a wire mesh screen. The manifold heat control, located on the left side of the pedestal, actuates the carburettor heat valve between two limiting positions (see Figure 1-7). With the control lever in the HOT position, inlet air is ducted through a muff around the exhaust manifold (heat exchanger); in the COLD position, inlet air passes directly to the carburettor. Intermediate positioning of the control varies the mixture of hot and cold air and varies the carburettor air temperature. The temperature of the mixture, indicated on the carburettor mixture temperature gauge on the main instrument panel (see Figure 1-10), is sensed by a temperature probe fitted in the carburettor between the throttle valve and the engine impeller (see Figure 1-11).

IMPELLER

58 The impeller, located within the engine impeller casing, is driven by the engine crankshaft through reduction gearing. There are no impeller controls: its speed is a function of the engine speed.

ENGINE COOLING

59 Engine cooling is accomplished by the adjustment of a set of cowl gills on the underside of each power plant. Ram air is guided and accelerated around each cylinder head by sheet metal baffles. Two cowl gill handles, located on the left side of the pedestal, control the escape of the ram air, and thereby adjust the cylinder head temperature. The upper handle is for the left engine and the lower one for the right engine. Each gill has four positions determined by notches in the control shaft. When the handle is pushed in, the gills are closed. To adjust the opening of the cowl gills, the handle is turned 90 degrees and moved to the required setting. The cylinder head temperature thermocouple is located beneath the spark plug on No.2 cylinder only. Corresponding readings are indicated on the cylinder head temperature gauge on the main instrument panel (see Figure 1-10).

IGNITION SYSTEM

60 Both engines are equipped with dual magnetos and ignition systems. Four toggle switches, one for each magneto, are mounted on the co-pilot's sub-panel (see Figure 1-13). All switches have two positions: ON and OFF. Each switch functions independently of the others, but a hinged throwbar allows all four switches to be turned off in one motion.

PRIMER

61 An engine priming pump, operated manually

by a handle on the pedestal (see Figure 1-7), pumps raw fuel into the five uppermost cylinders of the engine selected.

STARTER

62 The engines are equipped with direct-engaging electric starters incorporating a clutch device. A hot ignition spark for starting is provided by the ignition booster induction vibrator.

63 Controls for the starters and ignition booster are located on the right sub-panel. They consist of a starter selector switch, a starter button, and a booster button. The starter and booster buttons are both shielded by a single-hinged metal guard designed to prevent inadvertent operation. When starters are not in use, the selector switch should be in its central ("off") position. The controls have the following functions:

(a) The STARTER SELECTOR switch has three positions: LEFT, RIGHT, and a centre "off" position. This switch must be moved to either LEFT or RIGHT before the starter and booster for the corresponding engine will operate.

(b) The black IGNITION BOOSTER button is located to the left under the guard. When it is depressed, the booster augments the ignition system.

(c) The red STARTER button is located to the right under the guard. When it is depressed, the starter motor engages and cranks the engine.

PROPELLER

64 Each engine drives a two-bladed, Hamilton Standard hydromatic propeller, 99 inches in diameter. Engine speed is governed in the conventional manner, through variations of blade pitch. Engine oil pressure and the centrifugal twisting moment of the blades in one direction, and pressure created and controlled by an engine-driven governor in the other, varies the propeller pitch for constant speed conditions. The two propeller levers on the control pedestal are mechanically linked to the propeller governors; they are used to select the desired pitch and, hence, engine speed. The levers vary the pitch from fine (fully forward) to coarse (fully aft). Either propeller can be fully feathered, using oil pressure supplied by an electric pump operated by push-button controls mounted on top of the main instrument panel (see Figure 1-10).

65 Oil dilution necessary for feathering during periods of low temperature is available automatically, provided the oil dilution switch is in the WINTER position (see para 23).

LANDING GEAR SYSTEM

GENERAL

66 The landing gear on all Expeditor 3 aircraft consists of two retractable main wheels and a retractable tail wheel. When the tail wheel is unlocked, it is free to swivel 360 degrees. For take-offs and landings, the tail wheel is to be locked in the "trail" position by pushing down the lock control, located on the pedestal. The main wheels are supported by oleo legs incorporating air-oil shock absorption. Lowering and raising the landing gear is accomplished electrically. A motor transmits power through a clutch to a torsion-shaft. This, in turn, rotates a chain and slider mechanism which is connected to the landing gear leg. The geometric design of the landing gear is such that up and down locks are not required.

LANDING GEAR SELECTOR

67 The landing gear selector, identified by the miniature wheel forming its handle, has two positions: UP and DOWN, (see Figure 1-7). To lower or raise the landing gear, pull the landing gear lever outward and then move it to the desired position.

LANDING GEAR SAFETY FEATURES

68 A solenoid-operated switch latch in the control pedestal engages and locks the landing gear position selector in the DOWN position. As the right shock strut extends, it actuates a micro-switch which opens the circuit to the solenoid, releasing the switch latch allowing

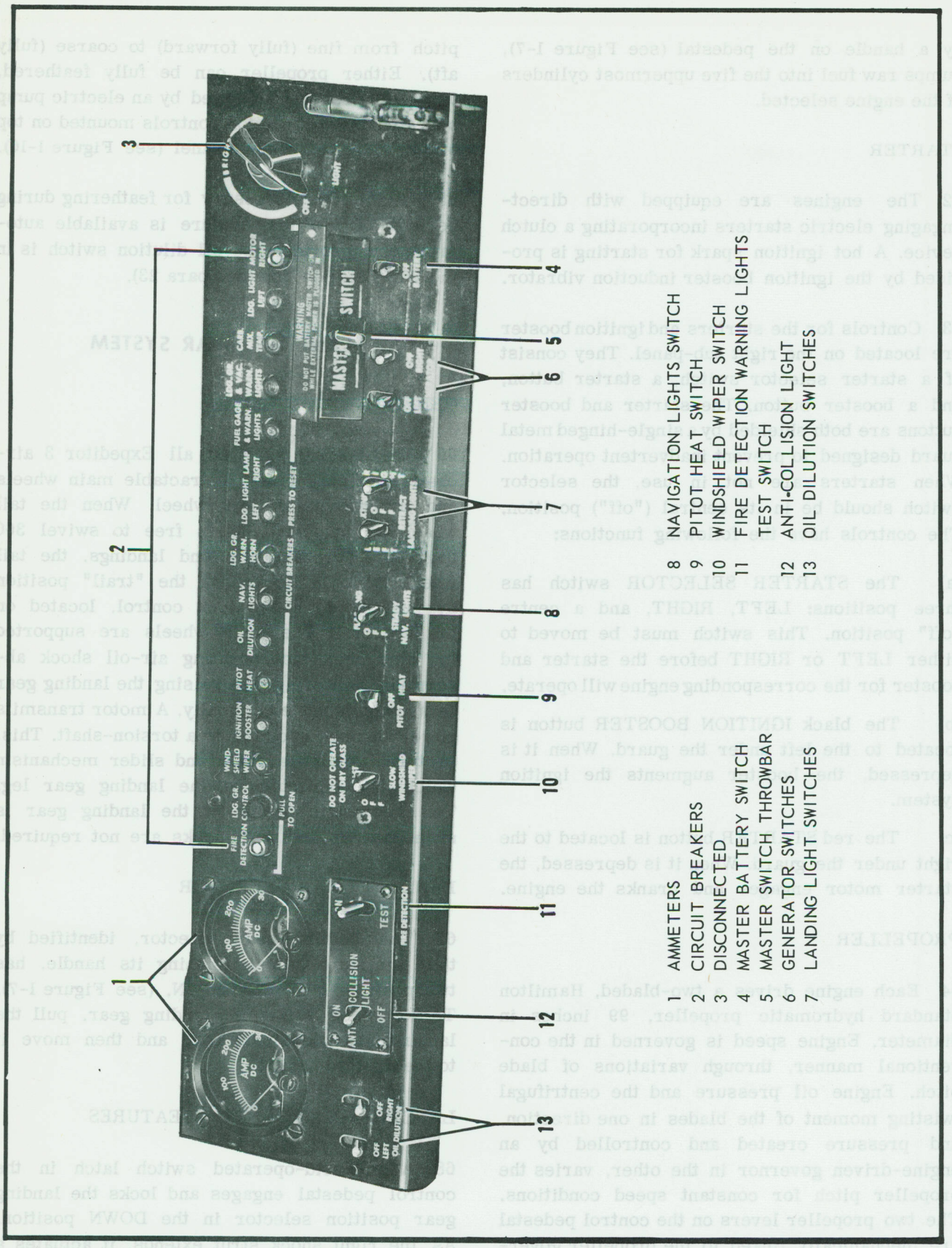


Figure 1-12 Pilot's Sub-Panel

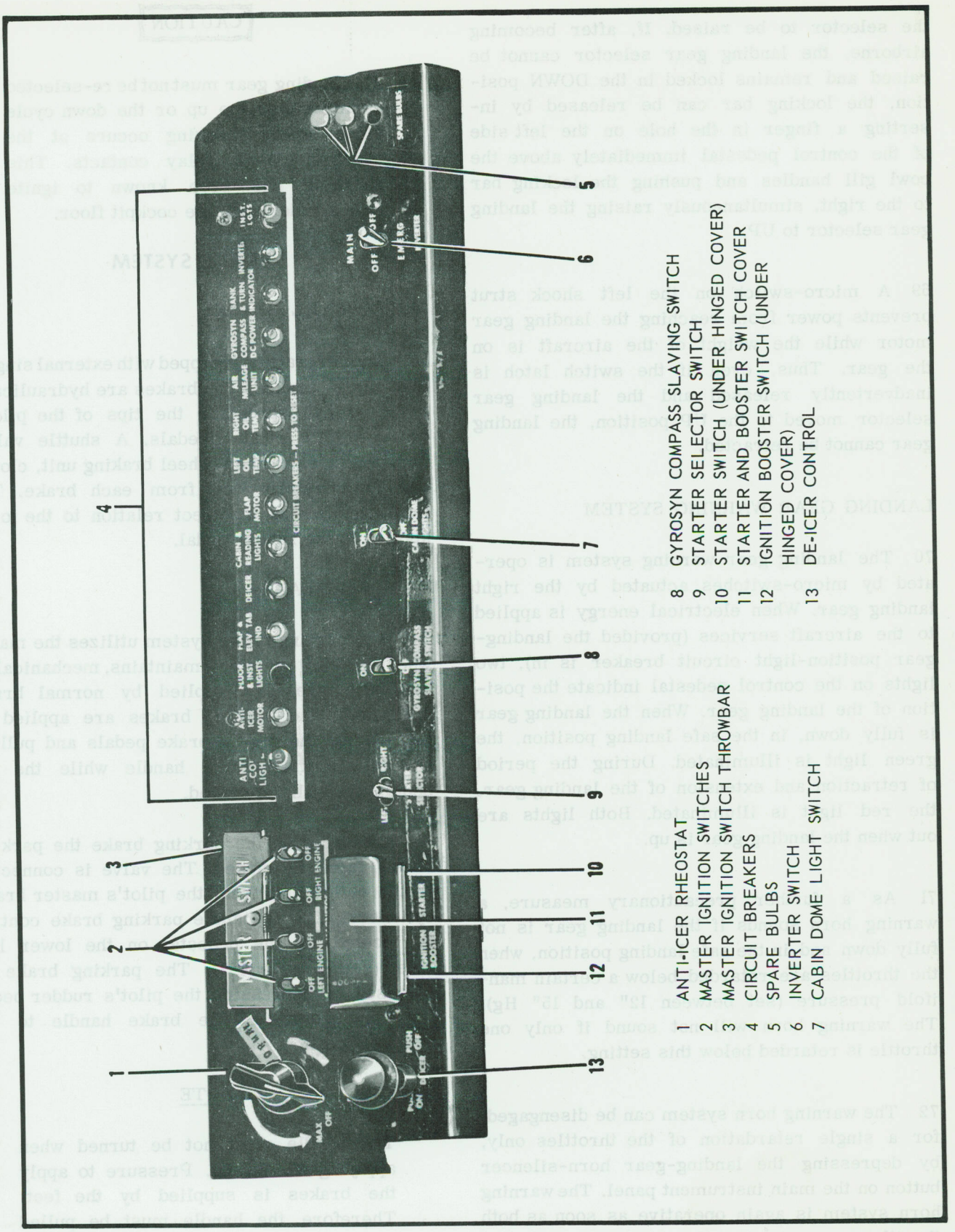


Figure 1-13 Co-Pilot's Sub-Panel

the selector to be raised. If, after becoming airborne, the landing gear selector cannot be raised and remains locked in the DOWN position, the locking bar can be released by inserting a finger in the hole on the left side of the control pedestal immediately above the cowl gill handles and pushing the locking bar to the right, simultaneously raising the landing gear selector to UP.

69 A micro-switch on the left shock strut prevents power from reaching the landing gear motor while the weight of the aircraft is on the gear. Thus, even if the switch latch is inadvertently released and the landing gear selector moved to the UP position, the landing gear cannot be retracted.

LANDING GEAR WARNING SYSTEM

70 The landing gear warning system is operated by micro-switches actuated by the right landing gear. When electrical energy is applied to the aircraft services (provided the landing-gear position-light circuit breaker is in), two lights on the control pedestal indicate the position of the landing gear. When the landing gear is fully down, in the safe landing position, the green light is illuminated. During the period of retraction and extension of the landing gear, the red light is illuminated. Both lights are out when the landing gear is up.

71 As a further precautionary measure, a warning horn sounds if the landing gear is not fully down and in the safe landing position, when the throttles are retarded below a certain manifold pressure (set between 12" and 15" Hg). The warning horn will not sound if only one throttle is retarded below this setting.

72 The warning horn system can be disengaged, for a single retardation of the throttles only, by depressing the landing-gear horn-silencer button on the main instrument panel. The warning horn system is again operative as soon as both throttles are advanced to a position above the limiting manifold pressure setting.

CAUTION

The landing gear must not be re-selected during either the up or the down cycle since heavy sparking occurs at the dynamic clutch relay contacts. This sparking has been known to ignite fumes underneath the cockpit floor.

BRAKE SYSTEM

MAIN WHEEL BRAKES

73 The aircraft is equipped with external single-disc wheel brakes. The brakes are hydraulically operated by depressing the tips of the pilot's or co-pilot's rudder pedals. A shuttle valve, mounted on each main-wheel braking unit, closes the fluid return line from each brake. The braking effect is in direct relation to the force applied to the rudder pedal.

PARKING BRAKES

74 The parking brake system utilizes the main-wheel braking system. It maintains, mechanically, hydraulic pressure applied by normal brake operation. The parking brakes are applied by depressing the pilot's brake pedals and pulling out the parking brake handle while the toe pedals are still depressed.

75 By applying the parking brake the parking brake valve is closed. The valve is connected to the outlet line from the pilot's master brake cylinders. The T-handle parking brake control is located on the pedestal on the lower left side (see Figure 1-7). The parking brake is released by depressing the pilot's rudder pedal tips and returning the brake handle to its original position.

NOTE

The handle must not be turned when applying the brake. Pressure to apply the brakes is supplied by the feet. Therefore the handle must be pulled gently to locate the valve and hence sustain brake pressure.

This sheet to be inserted in EO facing page 1-20.

For aircraft in which modification 05-45B-6A/248 has been incorporated, paras 68 (beginning on page 1-17) and 69 shall read as below. New para 69A shall be added after para 69.

LANDING GEAR SAFETY FEATURES

68 A solenoid-operated switch latch in the control pedestal engages and locks the landing gear position selector in the DOWN position. As the right shock strut extends, it actuates a micro-switch which opens the circuit to the solenoid, releasing the switch latch and allowing the selector to be raised. This safety feature may be de-activated by the landing gear emergency override installation which bypasses the safety circuits. If, after becoming airborne, the landing gear selector cannot be raised and remains locked in the DOWN position, the locking bar can be released by inserting a finger in the hole on the left side of the control pedestal immediately above the cowl gill handles and pushing the locking bar to the right, simultaneously raising the landing gear selector to UP.

69 A micro-switch on the left shock strut prevents power from reaching the landing gear motor while the weight of the aircraft is on the gear. Thus, even if the switch latch is inadvertently released and the landing gear selector moved to the UP position, the landing gear cannot be retracted, except when the landing gear emergency override feature is activated.

LANDING GEAR EMERGENCY OVERRIDE

69A A guarded push button, labelled L/G EMERG OVERRIDE, is located directly above the landing gear selector lever. When pressed, this button bypasses the safety circuits, and allows a retraction to be made while the aircraft is moving on the ground. To raise the landing gear in an emergency, the button must be pressed and, simultaneously, the landing gear selector lever must be raised to the UP position. When the selector lever has commenced its upward travel, the button may be released, and the landing gear will retract when the lever reaches the UP position.

CAUTION

If an attempt is made to raise the landing gear by this method while the aircraft is motionless on the ground, the geometric locks will prevent the gear from retracting; however, there will be damage to the landing gear retracting mechanism. If the override is operated while the aircraft is in motion, the wheels will retract and the aircraft will settle on its belly.

EO 05-45B-1

This sheet to be inserted in EO facing page I-20.

For aircraft in which modification 05-45B-6A/248 has been incorporated, paras 68 (beginning on page I-17) and 69 shall read as below. New para 69A shall be added after para 69.

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19 Aug 68

HEATING SYSTEM

GENERAL

76 The heating system for all three Expeditor 3 versions comprises two separate symmetrical systems originating at the power plants. Each engine heats the air for use of its own side of the fuselage only. Ram air enters a duct, situated outboard of the engine nacelle (see Figure 1-11). The air passes through a seamless, stainless-steel intensifier tube within the engine exhaust tailpipe to a control valve at the aft end of the intensifier tube. The ducting then divides: one duct goes to the floor of the cockpit and the other to outlets in the cabin.

HOT AIR CONTROL

77 Two push-pull controls marked PUSH-HOT, mounted on the lower pedestal (see Figure 1-7), in all three types of the aircraft, adjust the overflow valve in each nacelle, thus controlling the quantity of hot air flowing to the cockpit, cabin, and windshield, by a single action. In the "cold" position, hot air escapes to the atmosphere, and in the HOT position, hot air flows to the cockpit, the windshield, and the cabin. Intermediate positioning of the control varies the degree of heating. The control is operated by depressing the large button and sliding the plunger to the desired position.

COCKPIT HEATING

78 Heated air to the cockpit passes through a valve before entering the louver on the cockpit floor. This valve interconnects two systems: cockpit heating and cockpit ventilating. Both systems, therefore, utilize the same inlet louver. A push-pull control, located to the rear of the swivel-type inlet,changes the supply from heated air to cold air and has intermediate positions for mixing the air supply and hence for varying the inlet temperature (see Figure 1-14). When air is being supplied to the cockpit, a portion of that air will automatically flow over the windshield surface for defrosting purposes, regardless of the inlet air temperature.

CABIN HEATING (3NM)

79 Heated air enters the cabin through a non-adjustable air-scoop outlet near the floor, at a mid-cabin location. An auxiliary duct from the left side inlet channels hot air to the astrodome for defrosting purposes. An ON/OFF cock mounted on the cabin inlet duct controls and varies the air supply to the astrodome.

CABIN HEATING (3TM and 3NMT)

80 The heating system is similar to the 3NM. However, because there is no astrodome there is no defrosting duct. Running along each side of the cabin, level with the main hot air inlet, is a duct with three outlet louvers in it. The swivel-type louvers adjust the direction and quantity of the inlet air. Four controls, two on the pedestal and two on the cockpit floor, control the hot air supply by the same method as in aircraft type 3NM.

VENTILATING SYSTEM

GENERAL

81 Cold air is supplied to the fuselage through two separate symmetrical systems, one on the left side of the aircraft and one on the right.

CABIN SUPPLY

82 Fresh air enters a small duct through the inboard leading edge and passes through a valve in the cockpit on the outboard side of each seat. The total air supply from each system to the cabin is adjusted at the valve by a push-pull control (up - ON, down - OFF), mounted on the step portion of the main spar bulkhead (see Figure 1-15). After passing through ducting above the cabin windows, the air enters the cabin through three swivel-type louvers. The direction and quantity of inlet air for each passenger can be adjusted with the louvers.

COCKPIT SUPPLY

83 Air to the cockpit enters a duct on the side of the fuselage and is fed into the cockpit

through the valve which also regulates the heated air supply (see para 78).

EXHAUST

84 On all versions of the Expeditor 3, air within the fuselage is exhausted through vents in the roof. Two are located in the cockpit and two in the cabin. Rear-facing scoops on the outer skin tend to draw the air from the fuselage. Each vent can be adjusted by turning the swivel-type plate mounted over the outlet.

ANTI-ICING AND DE-ICING SYSTEMS

WING/STABILIZER DE-ICING

85 De-icing boots are fitted to the leading edges of the wings and horizontal stabilizer. The pressure side of the engine-driven vacuum pumps supplies air pressure to operate the system. A rotating, electrically driven distribution valve controls inflation and deflation of the boot sections. A line from the suction side of the vacuum system, connected to the distribution valve, holds the boot against the leading edge when the system is not in use, and helps to hasten deflation during that cycle of operation. The de-icing system is controlled by a two-position (fully out and fully in) push-pull control, located on the co-pilot's sub-panel (see Figure 1-13). A de-icing pressure gauge is located in the lower right corner of the main instrument panel (see Figure 1-10). The normal de-icer operating pressure is between 7 and 9 psi. Between complete cycles of operation, however, the pressure will drop to approximately 2 psi.

86 The lower portion of the vertical stabilizers are neoprene-covered and no de-icing liquid or mechanism is required for de-icing at this location.

PROPELLER ANTI-ICING

87 An anti-icer fluid tank is situated behind the pilot's seat. It has a capacity of 2.5 Imp gals (3 US) and is equipped with a quantity gauge mounted on top. Specification for anti-icing fluid (Isopropyl alcohol) is 3-GP-525b (NATO S-737). An anti-icing slinger ring is attached to each propeller hub. Anti-icing fluid is forced to the slinger rings from the tank behind the pilot's seat by an electrical pump located beneath the seat. The speed of this pump, and thus the rate of flow of anti-icing fluid, is controlled by a rheostat, located on the co-pilot's sub-panel (see Figure 1-13). The controlling rheostat operates in a clockwise direction. When it is moved from the OFF position, the control passes to the MAX position, at which point the pump is operating at its maximum rate. When it is turned further to the right, the rate of fluid supply to the propeller slinger ring is gradually reduced. When the pump is operating at maximum speed, the total output to the propellers is 9 or more Imp quarts per hour. This output may be as high as 20 Imp quarts per hour, giving a duration of 30 minutes. When the rheostat is set at NORMAL and the anti-icing system is adjusted correctly, the total output is 6 to 7.2 Imp quarts per hour, giving a duration of supply between 1 hour 23 minutes and 1 hour 40 minutes. To provide an additional supply of fluid, a 4-Imperial-gallon auxiliary anti-icer tank is located on the forward cabin bulkhead. The auxiliary anti-icer tank shut-off cock at the bottom of the tank is to be left in the OFF position, except when refilling the main anti-icer tank.

CAUTION

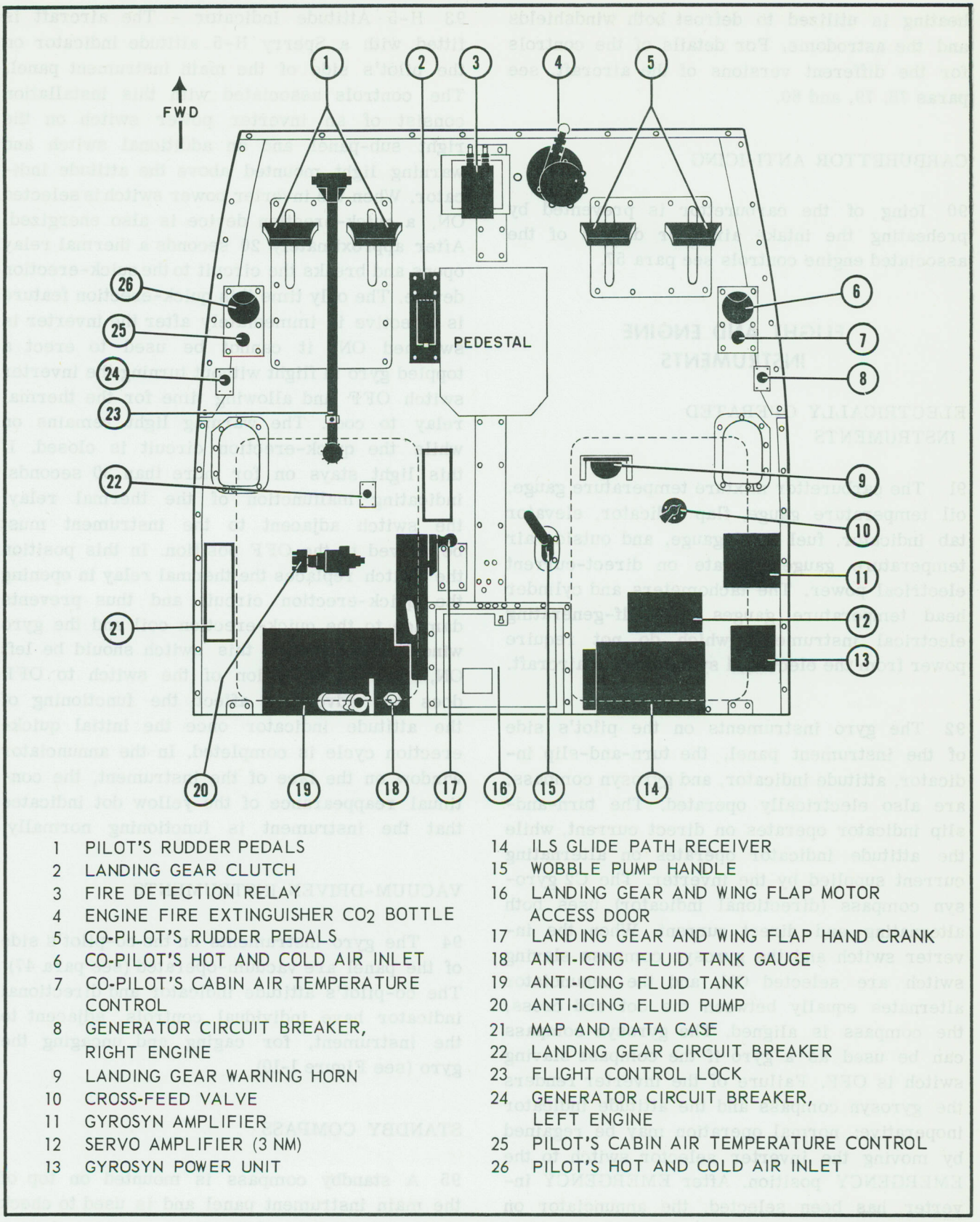
To protect the anti-icer pump from stalling, do not operate the controlling rheostat beyond the lower limit, indicated by the word NORMAL.

PITOT HEAT

88 Both right and left pitot tubes are equipped with electric pitot heaters. An ON/OFF switch for the heaters is located on the pilot's sub-panel (see Figure 1-12).

WINDSHIELD AND ASTRODOME DEFROSTERS

89 The heated air supply for cockpit and cabin



1 PILOT'S RUDDER PEDALS
2 LANDING GEAR CLUTCH
3 FIRE DETECTION RELAY
4 ENGINE FIRE EXTINGUISHER CO_2 BOTTLE
5 CO-PILOT'S RUDDER PEDALS
6 CO-PILOT'S HOT AND COLD AIR INLET
7 CO-PILOT'S CABIN AIR TEMPERATURE CONTROL
8 GENERATOR CIRCUIT BREAKER, RIGHT ENGINE
9 LANDING GEAR WARNING HORN
10 CROSS-FEED VALVE
11 GYROSYN AMPLIFIER
12 SERVO AMPLIFIER (3 NM)
13 GYROSYN POWER UNIT
14 ILS GLIDE PATH RECEIVER
15 WOBBLE PUMP HANDLE
16 LANDING GEAR AND WING FLAP MOTOR ACCESS DOOR
17 LANDING GEAR AND WING FLAP HAND CRANK
18 ANTI-ICING FLUID TANK GAUGE
19 ANTI-ICING FLUID TANK
20 ANTI-ICING FLUID PUMP
21 MAP AND DATA CASE
22 LANDING GEAR CIRCUIT BREAKER
23 FLIGHT CONTROL LOCK
24 GENERATOR CIRCUIT BREAKER, LEFT ENGINE
25 PILOT'S CABIN AIR TEMPERATURE CONTROL
26 PILOT'S HOT AND COLD AIR INLET

Figure 1-14 Cockpit Floor

heating is utilized to defrost both windshields and the astrodome. For details of the controls for the different versions of the aircraft, see paras 78, 79, and 80.

CARBURETTOR ANTI-ICING

90 Icing of the carburettor is prevented by preheating the intake air. For details of the associated engine controls see para 57.

FLIGHT AND ENGINE INSTRUMENTS

ELECTRICALLY OPERATED INSTRUMENTS

91 The carburettor mixture temperature gauge, oil temperature gauge, flap indicator, elevator tab indicator, fuel level gauge, and outside air temperature gauge operate on direct-current electrical power. The tachometers and cylinder head temperature gauges are self-generating electrical instruments which do not require power from the electrical system of the aircraft.

92 The gyro instruments on the pilot's side of the instrument panel, the turn-and-slip indicator, attitude indicator, and gyrosyn compass, are also electrically operated. The turn-and-slip indicator operates on direct current, while the attitude indicator operates on alternating current supplied by the inverter. The C2 gyrosyn compass (directional indicator) uses both alternating and direct current. When the inverter switch and the gyrosyn compass slaving switch are selected ON, and the annunciator alternates equally between the dot and cross, the compass is aligned. The gyrosyn compass can be used as a gyro if the compass slaving switch is OFF. Failure of the inverter renders the gyrosyn compass and the attitude indicator inoperative; normal operation may be regained by moving the inverter selector switch to the EMERGENCY position. After EMERGENCY inverter has been selected, the annunciator on the C2 gyrosyn compass should be checked and the repeater reset if necessary.

93 H-5 Attitude Indicator - The aircraft is fitted with a Sperry H-5 attitude indicator on the pilot's side of the main instrument panel. The controls associated with this installation consist of an inverter power switch on the right sub-panel and an additional switch and warning light mounted above the attitude indicator. When the inverter power switch is selected ON, a quick-erection device is also energized. After approximately 20 seconds a thermal relay opens and breaks the circuit to the quick-erection device. The only time this quick-erection feature is effective is immediately after the inverter is switched ON; it cannot be used to erect a toppled gyro in flight without turning the inverter switch OFF and allowing time for the thermal relay to cool. The warning light remains on while the quick-erection circuit is closed. If this light stays on for more than 30 seconds, indicating malfunction of the thermal relay, the switch adjacent to the instrument must be moved to the OFF position. In this position the switch replaces the thermal relay in opening the quick-erection circuit and thus prevents damage to the quick-erection coil and the gyro windings. Normally, this switch should be left ON, but the selection of the switch to OFF does not adversely affect the functioning of the attitude indicator once the initial quick-erection cycle is completed. In the annunciator window on the face of the instrument, the continual reappearance of the yellow dot indicates that the instrument is functioning normally.

VACUUM-DRIVEN INSTRUMENTS

94 The gyro instruments on the co-pilot's side of the panel are vacuum-operated (see para 47). The co-pilot's attitude indicator and directional indicator have individual controls, adjacent to the instrument, for caging and uncaging the gyro (see Figure 1-10).

STANDBY COMPASS

95 A standby compass is mounted on top of the main instrument panel and is used to check the serviceability of the C2 compass and as a standby in the event of failure of the C2 compass.

PRESSURE-OPERATED INSTRUMENTS

96 Instruments operated by static pressure include the altimeter, ASI, and rate-of-climb indicator for both pilot and co-pilot. Static pressure openings are located on either side of the fuselage about four feet forward of the horizontal stabilizer. Since the aircraft is equipped with twin sources of static pressure, an alternative source is unnecessary.

MANIFOLD PRESSURE GAUGE

97 The manifold pressure gauge, located on the main instrument panel, measures the fuel mixture pressure in the induction manifold. The gauge is operated by pressure supply lines from the engine, and has coaxial pointers marked L and R which indicate the pressure in inches of mercury ("Hg) within each engine.

FREE AIR TEMPERATURE GAUGE

98 A direct-sensing free air temperature gauge is fitted in the cockpit ceiling above the pilot. Because it indicates accurately the outside air temperature, it is used to detect temperature in the critical icing range.

INTERIOR LIGHTING EQUIPMENT

GENERAL

99 The master battery switch must be turned on before any lights can be operated by their individual switches, unless either external power is being used or the generators are operating.

INSTRUMENT PANEL LIGHTS

100 The instrument panel is illuminated by eyebrow lighting, consisting of individual light assemblies over each instrument, controlled by three rheostat switches — one in front of the pilot, one in front of the co-pilot, and one forward of the propeller levers. The B21 compass is individually lighted by a lamp in the case with the radio light control on the radio control panel. The radio controls may be illuminated by an amber spotlight recessed in the lower forward side of the main spar bulkhead. This light is controlled by a rheostat adjacent to its left, but operates only when the navigation lights are on.

MAP LIGHTS

101 Two red lights for night map reading are fitted one on either side above the side windows in the cockpit; a switch is mounted on the light base. A map-reading extension light is fitted to the top of the cockpit above the pilot's head with an alternative position above the entrance to the cabin.

CABIN LIGHTS

102 The cabin is illuminated by two dome lights controlled by the CABIN DOME LIGHT switch on the co-pilot's sub-panel.

103 Each navigation table (3NM) is equipped with an angle-poise lamp. The controlling rheostat of the forward lamp is mounted on the navigator's instrument panel, and the control for the rear lamp is mounted on the base.

104 3TM aircraft have fixed independent reading lamps fitted to the upper air duct above each of the five seats. ON/OFF switches for the reading lamps are fitted to each lamp mounting plate.

BAGGAGE COMPARTMENT LIGHTS

105 Both baggage compartments are adequately illuminated by individual lights. An ON/OFF switch is provided on each installation. The rear compartment light also illuminates the toilet and the radio equipment.

EXTERIOR LIGHTING EQUIPMENT

NAVIGATION LIGHTS

106 The aircraft is equipped with flashing navigation lights controlled by a switch on the pilot's sub-panel. The system consists of a red (left) and green (right) wing tip light, a red and white

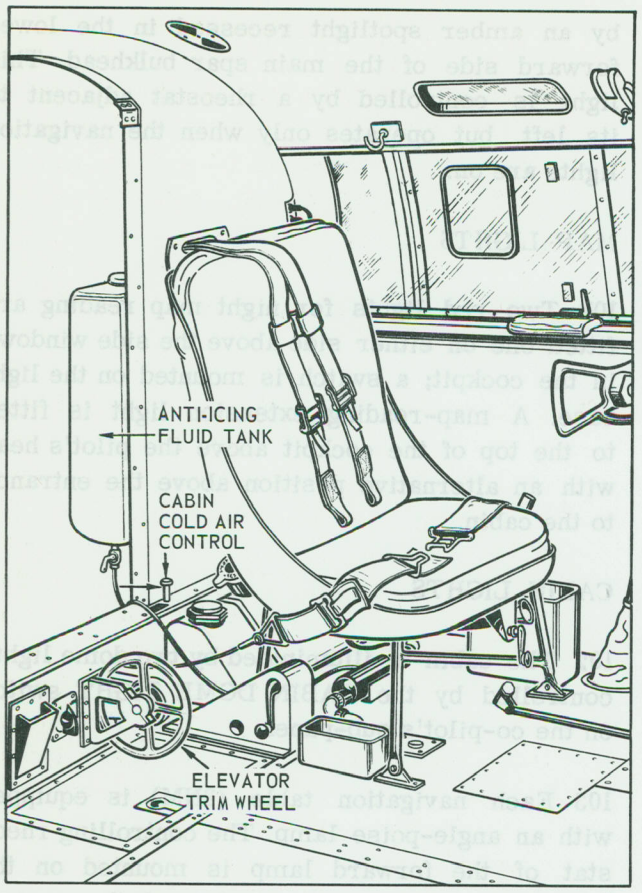


Figure 1-15 Pilot's Position

twin tail light installation, and an upper and lower white fuselage light. The wing tip lights have plexiglass reflectors attached to them which make them visible from the cockpit. The control has three positions: FLASHING (up), STEADY (down), and OFF (centre). When the switch is in the FLASHING position, the red and green wing tip lights and white tail light alternate with the red tail light and the upper and lower fuselage lights. When the switch is in the STEADY position, the red and green wing tip lights and the white lights burn continuously. If the flasher control unit fails, these three lights will remain on.

ANTI-COLLISION LIGHT

107 An anti-collision light is mounted on top of the fuselage. An ON/OFF switch is located on the pilot's sub-panel.

LANDING LIGHTS

108 Two switches mounted on the pilot's sub-panel control the landing lights. The switches have three positions: EXTEND, OFF, and RETRACT. The lights turn on automatically when they extend and OFF automatically when they retract. When the switch is positioned in OFF, energy to both the light and actuating motor is cut off. The switch should be placed in OFF whenever lights are not in use.

COCKPIT EQUIPMENT

PILOT'S AND CO-PILOT'S SEATS

109 Both seats are adjusted by turning a small crank located below the forward edge on each seat (see Figure 1-16). The seat moves forward and up, or aft and down, when the crank is turned. The seats are equipped with conventional

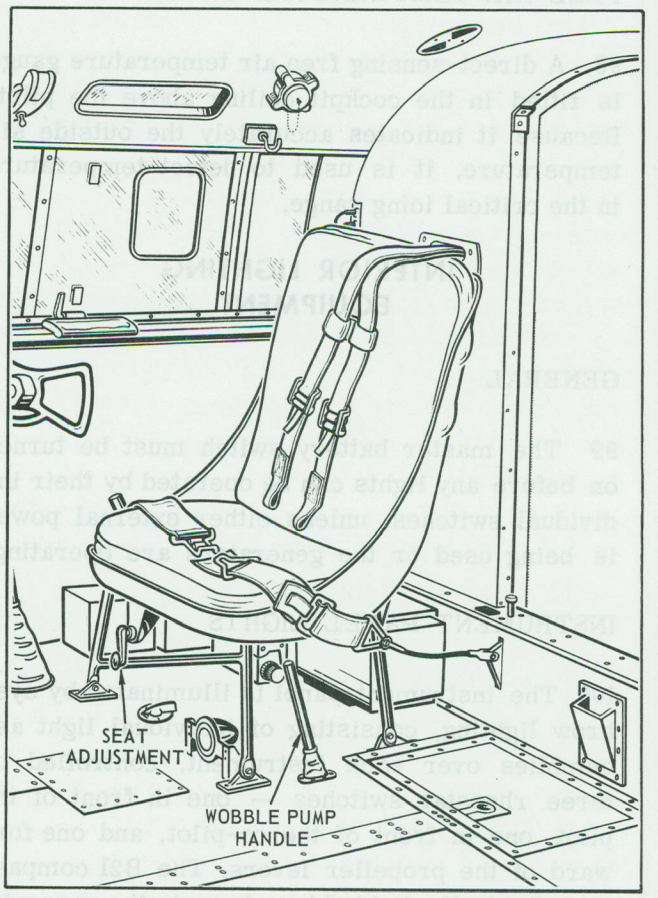


Figure 1-16 Co-Pilot's Position

waist and shoulder safety straps. When in use, the loops on the shoulder straps pass through the catch on the right waist strap. The shoulder straps are secured to the main spar bulkhead by means of an inertia reel. This reel keeps the straps taut, and at the same time does not restrict body movement, allowing both pilot and co-pilot to lean forward to operate controls, visually check wheels, etc., without unfastening their shoulder harnesses, unless the inertia reel locks are applied.

INERTIA REEL LOCKS

110 Inertia reel locks for locking the shoulder harness inertia reels are mounted on the outboard side of both pilot's and co-pilot's seats. They are locked by depressing the button on top of the lever, and then moving the lever forward.

WINDOWS

111 Windows on both sides of the cockpit can be opened on the ground or during flight for ventilation. The small clear-vision panel to the rear of the curved windshield on the pilot's side may also be opened if forward visibility is obstructed by ice on the windshield. The window is secured by two rotating latches in the closed position, and by a knurled nut and stud on the cockpit roof in the open position. Side windows are of the sliding type. They are secured at various positions by a latch at their base.

EMERGENCY EQUIPMENT

HAND FIRE EXTINGUISHERS

112 The aircraft is equipped with two hand fire extinguishers. A CO_2-type extinguisher is stowed on the rear face of the main spar bulkhead on the left side of the entrance to the cockpit. A water-glycol-charged extinguisher is mounted on the forward face of the rear cabin bulkhead.

NOTE

The water-glycol-charged extinguisher is for use on "A" class fires only, e.g., fires caused by burning paper, wood, cloth, cardboard, and similar material.

ENGINE FIRE EXTINGUISHER SYSTEM

113 The pressure-type, one-shot, carbon dioxide engine fire extinguisher system is operated by the two controls mounted near the deck on the control pedestal (see Figure 1-7). The selector valve has three positions: LEFT ENGINE, OFF, and RIGHT ENGINE. The other control is a discharge handle which is connected to the valve on the carbon dioxide bottle by a cable. The carbon dioxide bottle is located forward of the control pedestal. Pulling the discharge handle straight back allows carbon dioxide to flood the engine compartment to which the selector valve is set.

FIRE DETECTION LIGHTS

114 Two red fire detection lights, one for each engine, are mounted on the main instrument panel below the pilot's altimeter (see Figure 1-10). The lights are designed to illuminate whenever any one of the detector units, either on the fire-wall or in the nacelle, is subjected to an abnormally rapid increase in temperature. The warning light goes out when the fire is extinguished, but will relight in cases of re-ignition. No resetting is necessary. A switch for testing the continuity of the fire warning circuit is located on the pilot's sub-panel.

DISCHARGE INDICATOR

115 An engine fire extinguisher discharge indicator is fitted to the skin of the aircraft between the two pitot tubes. The red indicator disc is ejected when the pressure in the system is abnormally high (e.g., if extinguisher is activated with selector valve in OFF position). This red indicator disc is not displaced on normal discharge of the extinguisher.

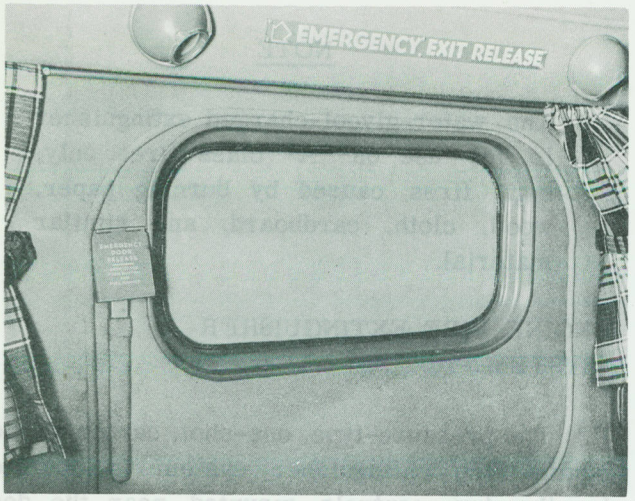


Figure 1-17 Emergency Exit Ejection Mechanism

CRASH AXE

116 A crash axe is mounted on the rear face of the main spar bulkhead in a leather holster.

EMERGENCY EXIT

117 In an emergency, escape can be made from aircraft by opening the emergency exit located on the right cabin wall. The exit is designed primarily for escape when the cabin door is blocked, and should not be opened except in emergency. Instructions for opening the hatch appear on each exit (see Figure 1-17).

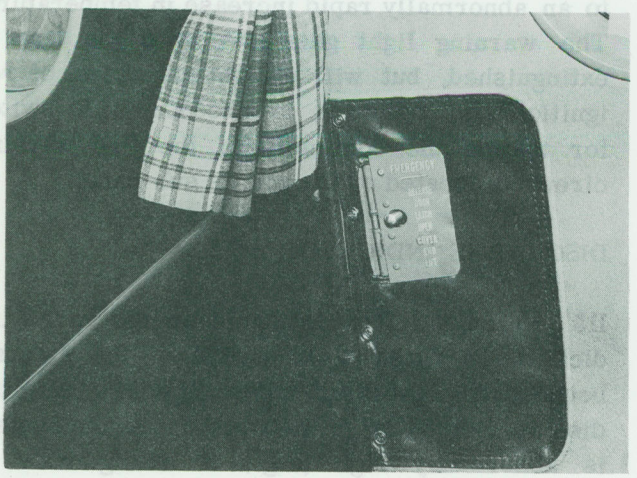


Figure 1-18 Cabin Door Hinge Emergency Release

MAIN DOOR HINGE EMERGENCY RELEASE

118 The cabin door is provided with a mechanism for releasing the hinge pins so that the door may be jettisoned in an emergency (see Figure 1-18). The release handle is at the forward edge of the door beneath a red metal flap on the cabin wall.

ASTRODOME EMERGENCY RELEASE

119 The astrodome on 3NM aircraft serves as an extra emergency exit and can be removed by pulling the T-shaped handle secured to its

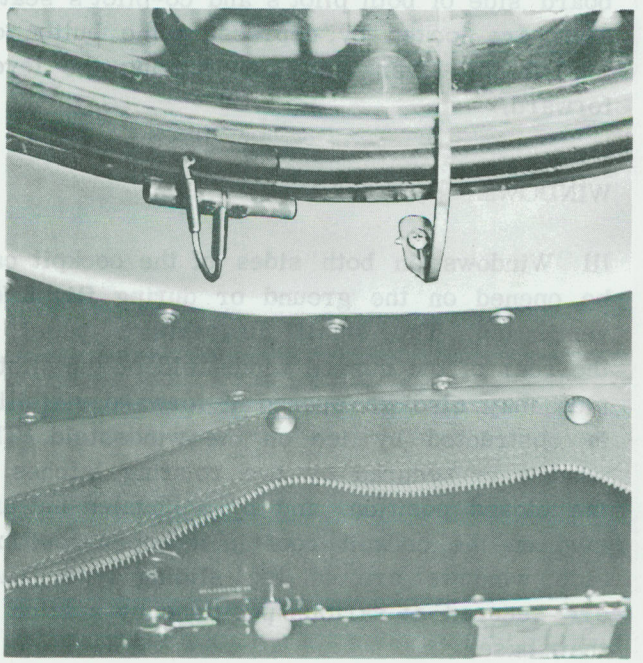


Figure 1-19 Astrodome Emergency Release Handle

forward edge (see Figure 1-19). Vigorous movement breaks the bonding strip and the dome can be pulled downward.

FIRST AID KIT

120 A sealed first aid kit is mounted on the rear of the lavatory compartment door in all aircraft.

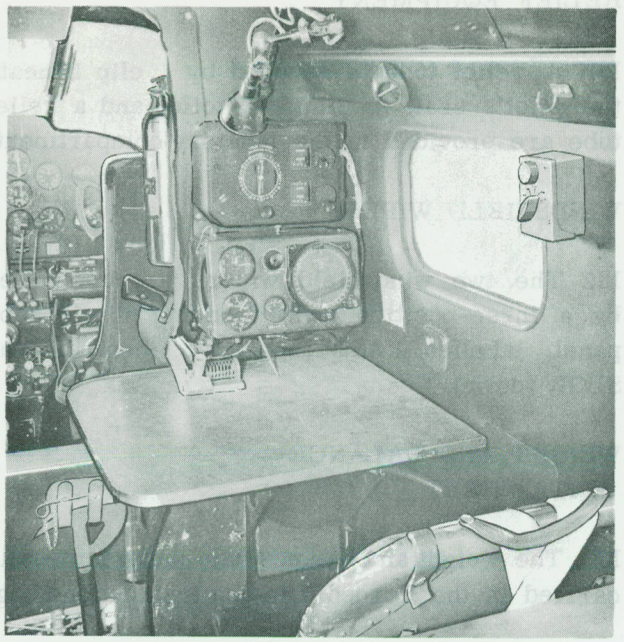


Figure 1-20 Forward Navigator Position

EMERGENCY MAPS AND FORCED LANDING (OR CRASH) INSTRUCTIONS

121 All aircraft are equipped with emergency maps and a set of forced landing instructions. These items are stowed in a canvas bag, mounted on the rear cabin bulkhead or on the rear baggage compartment door.

PARACHUTES

122 Normally there is provision for the stowage of three parachutes on Expeditors 3NM and 3NMT. Two may be stowed on the left side of the cabin and the third may be secured to the back of the rear seat. The stowage consists of a clamped bungee cord. No provision is made for the stowage of parachute packs on 3TM aircraft.

NAVIGATIONAL EQUIPMENT

INSTRUMENTS

123 There are two navigator positions in the Expeditor 3NM (see Figures 1-20 and 1-21). The forward navigator position has a free air temperature gauge, a Mark 1 airspeed indicator, C2 gyrosyn compass, altimeter, Mark 1 air position indicator, and a Mark 1 air mileage unit. The rear navigator position has an ARN7 radio compass, a 182A azimuth indicator, and a V3 gyrosyn repeater.

124 In addition to the cabin instruments, the rear navigator position is equipped with a B3 driftmeter, mounted directly to the right of the chair and a B5 drift recorder, mounted on the right sidewall behind the navigator's chair. A Mark 9A sextant and case, and an astrocompass may be stowed on the shelf supporting the B3 driftmeter adjacent to the rear navigator's chair.

SEATING

125 Both forward and rear navigator positions are provided with tables and seats. The non-adjustable seats are equipped with conventional safety belts. A folding seat on the left side of the cabin is provided; this position also includes a jack box and headphone set. Since no safety harness is fitted for this seat, it must not be occupied during take-off or landing.

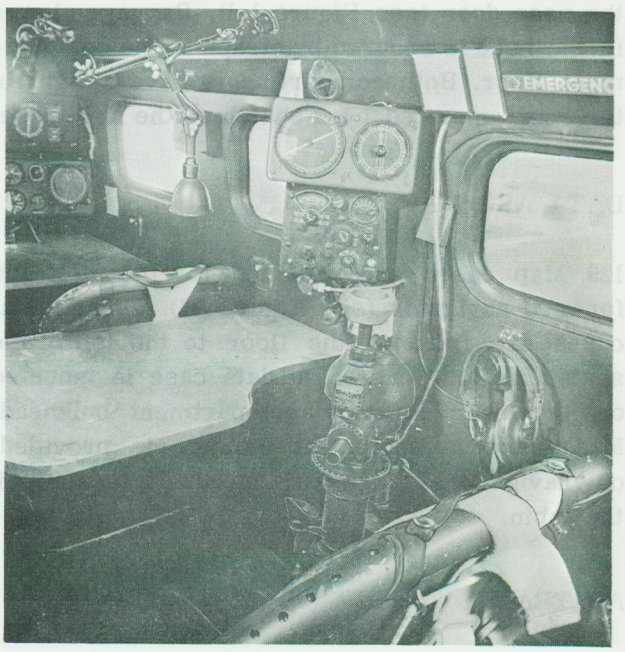


Figure 1-21 Rear Navigator Position

ASTRODOME

126 The 3NM incorporates a plastic astrodome in the forward cabin roof. A bracket, attached to the crown of the dome, contains a fitting that accommodates the astrocompass and the sextant when they are in use.

MISCELLANEOUS EQUIPMENT

SEATS
(See Figure 1-2)

127 Expeditors 3NMT and 3TM have facilities for carrying five passengers in forward-facing seats, two on the left and three on the right. 3NMT and 3TM seats are fully-reclining and are adjusted by means of a handle on the right side of each chair. All seats are equipped with regulation, quick-release, waist safety belts.

BAGGAGE COMPARTMENTS

128 Two baggage compartments are provided on all Expeditor aircraft. The rear compartment is accessible from within the cabin, through the lavatory compartment. The nose compartment may be reached only from outside, through the nose door (see Figure 1-1). Baggage stowed in the nose is secured by straps to the compartment floor. Both compartments have a light in the roof, operated by a switch on the light base.

DATA AND MAP CASES

129 Map cases are provided for the pilot and forward navigator (see Figure 1-1). These metal cases are fixed to the floor to the left of the seats, in both cases. A data case is mounted on the rear lavatory compartment bulkhead. Miscellaneous equipment stowage is provided, on navigational aircraft, on the left side of the cabin.

ASHTRAYS

130 All positions have individual ashtrays, mounted within the fuselage walls.

RELIEF EQUIPMENT

131 A relief tube is secured by a clip beneath the pilot's seat. A chemical toilet and a relief tube are provided in the lavatory compartment.

WINDSHIELD WIPERS

132 The two windshield wipers are controlled by a three-position switch on the pilot's subpanel, labelled FAST (up), OFF (centre), and SLOW (down).

WEIGHT AND BALANCE DATA SHEET

133 The weight and balance data sheet is usually carried in the Forced Landing Instructions bag.

CABIN-COCKPIT PARTITIONING CURTAIN

134 A curtain which partitions the cockpit from the cabin is fitted to the rear of the main spar bulkhead by press studs. It is opened and closed with a long zipper.

COMMUNICATION EQUIPMENT

GENERAL

NOTE

For aircraft not equipped with TACAN see Appendix "A".

135 TACAN/UHF-equipped Expeditor aircraft are fitted with TACAN (ARN501), radio compass (ARN6), ILS (ARN5), marker beacon receiver (MN53B), UHF 1,750-channel transceiver (ARC-552), VHF 10-channel transceiver (ICA67), an interphone system, and an isolation amplifier. Aural reception is obtained through headphones only. Controls and equipment are located as follows:

(a) Remote controls for the ARC, ILS, VHF, marker beacon, and interphone communication equipment are located on the overhead radio panel in the cockpit (see Figure 1-22).

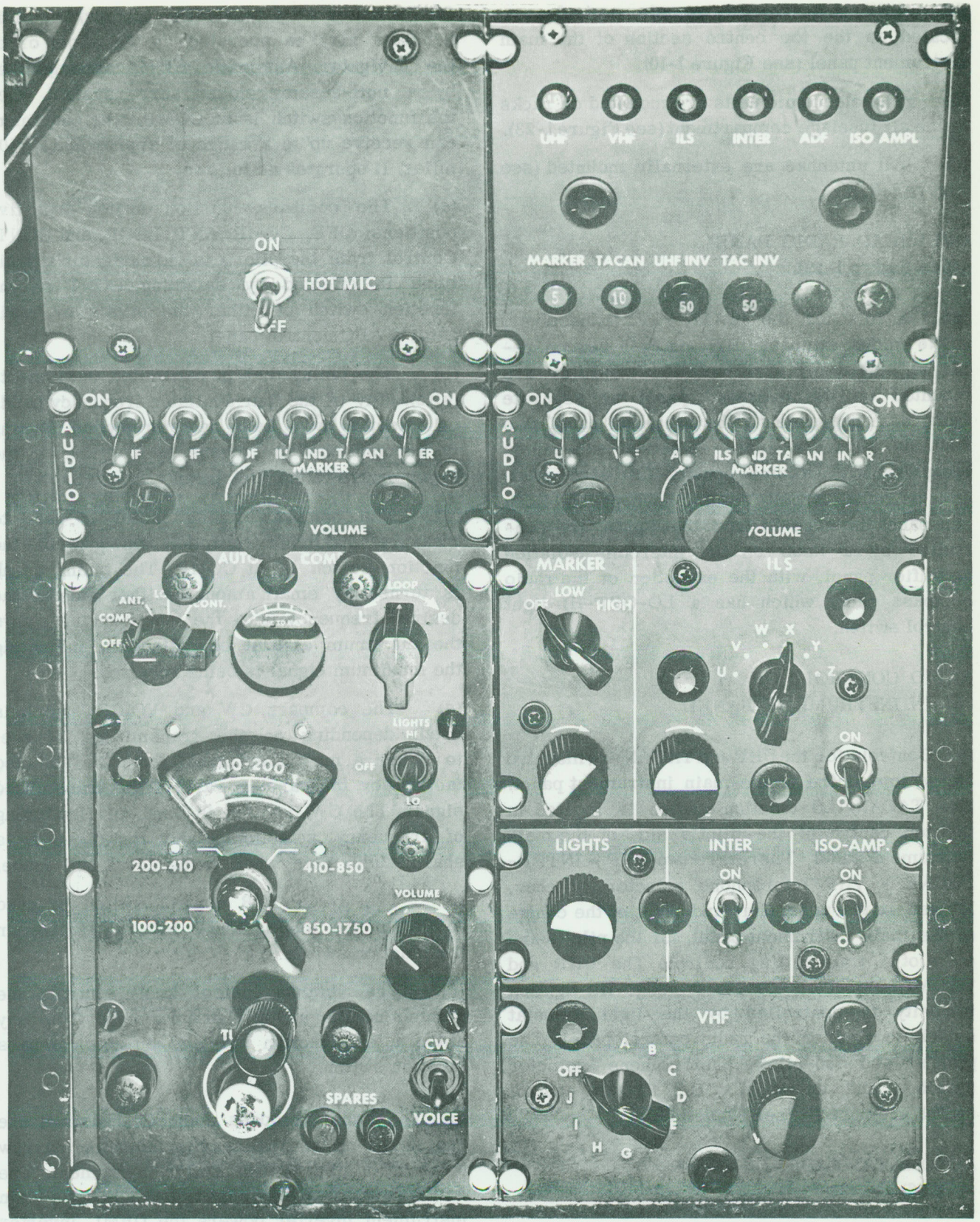


Figure 1-22 Overhead Radio Control Panel

(b) UHF and TACAN remote controls are located on the top centre section of the main instrument panel (see Figure 1-10).

(c) The electronic units are mounted on racks in the aft fuselage compartment (see Figure 1-23).

(d) All antennae are externally mounted (see Figure 1-23).

OVERHEAD RADIO PANEL
(See Figure 1-22)

136 Controls for the ICA67 VHF transceiver, ARN6 radio compass, ILS, marker beacon receiver, intercom, and isolation amplifier are mounted on the overhead panel as separate removable sub-panels. The overhead panel also contains separate audio selection sub-panels complete with volume control for each pilot, and a radio circuit breaker sub-panel. Each sub-panel is edge-lit and the lights are controlled by a knob on the intercom isolation amplifier panel, with the exception of the radio compass panel which has a LO-OFF-HI light control switch.

RADIO CONTROLS ON
MAIN INSTRUMENT PANEL

137 Controls for the UHF and TACAN are mounted at the top centre of the main instrument panel. The TACAN/ILS function switch is located in the top centre of the pilot's side of the main instrument panel. There are two UHF - INTERPHONE - VHF microphone selector switches, located at the upper left and right of the centre of the main instrument panel, for the pilot's and co-pilot's transmitting control. The UHF and TACAN control sub-panels are edge-lit; lighting intensity is controlled by the light rheostat switch located on the radio control panel. The pilot's and co-pilot's microphone selector switches and the pilot's ILS/TACAN control switch are post-lit (see Figure 1-10).

AUTOMATIC RADIO COMPASS
(ARN6)

138 The radio compass is used for manually controlled or automatic radio direction finding. On Expeditor 3NM (navigation trainer) the radio compass may be operated by the pilots or by the navigator. Automatic DF is accomplished by a null-seeking closed servo system when the function switch is at COMP. The equipment can receive up to a range of approximately 100 miles. It operates as follows:

(a) The compass function switch has five positions: OFF, COMP, ANT, LOOP, and CONT. Control from the pilot's to the navigator's positions is effected by selecting CONT on the function switch of either the pilot's or navigator's ARC control panel.

(b) The tuning dial is calibrated in kilohertz (kHz). Any of the four available frequency bands is selected by a band selector switch. Tuning is accomplished by means of a crank on the lower centre of the ARC panel.

(c) The compass tuning meter is used to measure maximum reception tuning when the function switch is at COMP. The tuning crank is turned by small amounts either side of the desired frequency until the tuning meter shows the maximum amount of deflection, indicating the maximum signal is being received.

(d) The compass CW and VOICE switch is used, depending on the transmitting source, to obtain a modulated signal from the selected facility or the carrier wave of the transmitted signal. The CW position is used for fine tuning of frequency selections, and for obtaining a sharp audio note when using aural null mode.

(e) The LOOP-L/R control switch is used to rotate the loop antenna left or right when the function switch is at LOOP.

(f) The volume control knob controls the volume of the audio signal received from any antenna or function selected on the compass function switch.

139 The radio compass magnetic bearings are registered on the ARC bearing indicator (narrow pointer) on the ID5040 DRMI instrument. The ARC operates on DC power, but since the main instrument inverter powers the DRMI, inverter power must be available to operate the ARC bearing indicator. When there is instrument

inverter power failure, the ARC still provides audio reception on DC power, but the ARC bearing indicator does not operate. If the DRMI fails completely, there are no ARC indications. If only the DRMI rotating compass card fails, ARC relative bearings are available, these bearings being relative to the nose of the aircraft. Normal ARC presentation and operation is available on emergency inverter power which, when selected, supplies power to the DRMI.

UHF TRANSCEIVER
(ARC552)

140 The UHF equipment is designed to provide 1,750-channel, two-way AM radio-telephone communication in the frequency range of 225.0 to 399.9 megahertz (MHz). The desired frequency is dialed on the remote control sub-panel which has the following features:

(a) There are four rotary frequency switches, one for hundreds, one for tens, one for digits, and one for tenths. The appropriate microphone selector switch must be selected to UHF for pilot transmissions.

(b) There is a UHF function switch which has four positions: OFF, T/R, T/R+G, and ADF. When T/R is selected, the UHF transceiver operates on whichever frequency the pilot selects. When T/R+G is selected, the guard receiver is also energized, so that the pilot also receives any transmissions on guard frequency (243.0 MHz).

(c) The ADF function of the UHF control is inoperative.

(d) UHF power is provided by a separate inverter which functions when the UHF is selected to either T/R or T/R+G. The UHF inverter is also used as an emergency instrument inverter when the normal main inverter fails and the pilot selects the emergency inverter ON.

VHF TRANSCEIVER
(ICA67)

141 The ICA67 VHF 10-channel transceiver is remotely controlled from the overhead VHF sub-panel and the pilot's and co-pilot's microphone selector switches on the main instrument panel. Channels are marked A to J and correspond to installed crystal frequencies which are recorded on a radio frequency card mounted at either side of the overhead radio panel. The ICA67 VHF operates on DC power and may be supplied by either battery or generator power in the event of electrical difficulties such as generator failure or battery failure.

TACAN SYSTEM
(ARN501)

142 The TACAN is operated by the control sub-panel, mounted on the main instrument panel, and displays TACAN information on the following instruments (see Figure 1-10 for control panel and instrumentation):

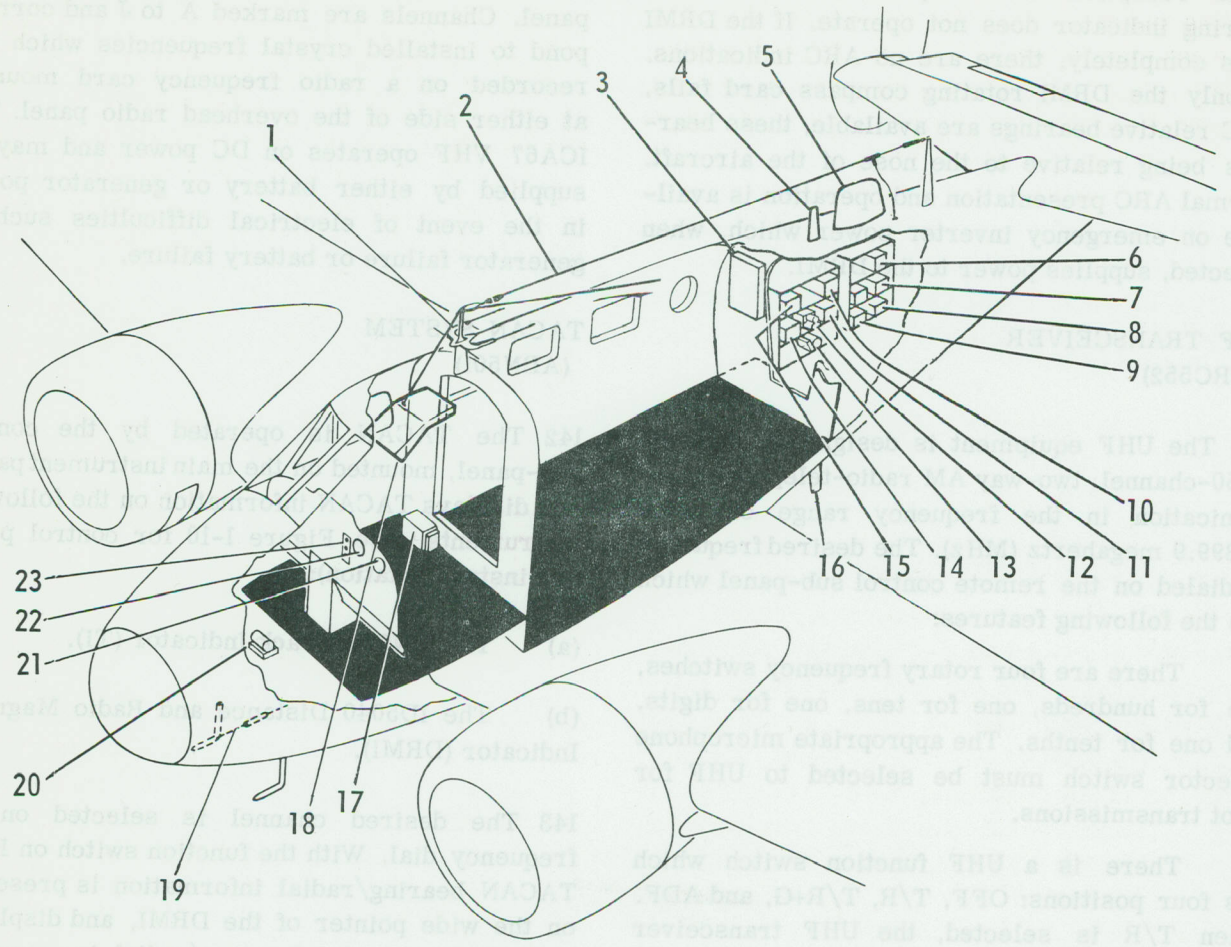
(a) The MN97H Track Indicator (TI).

(b) The ID5040 Distance and Radio Magnetic Indicator (DRMI).

143 The desired channel is selected on the frequency dial. With the function switch on REC, TACAN bearing/radial information is presented on the wide pointer of the DRMI, and displacement from selected bearing/radial is presented on the TI, provided that TACAN is selected on the ILS/TACAN mode switch. With the function switch on T/R, the same bearing outputs are available, and distance is displayed on counters on the DRMI. The DRMI and TI are powered by either the normal or the emergency instrument inverters. The relative heading indicator on the TI is fed from the C2 compass, which is powered by the normal or emergency instrument inverter.

ILS SYSTEM
(ARN5)

144 The ILS is operated by the control sub-panel mounted on the overhead radio panel and by the pilot's ILS/TACAN mode switch mounted on the upper left of the main instrument panel. The ILS channel selector switch has six positions, marked U, V, W, X, Y, and Z, which



1 LOCALIZER AND GLIDE PATH RECEIVERS DI-POLE ANTENNA
2 RADIO COMPASS SENSE ANTENNA
3 No. 10 BULKHEAD JUNCTION BOX
4 UHF ANTENNA
5 RADIO COMPASS LOOP ANTENNA
6 OA5002 ISOLATION AMPLIFIER
7 UHF 3-PHASE TRANSFORMER
8 M53B MARKER BEACON
9 ICA67 VHF TRANSCEIVER
10 ARN501 TACAN RECEIVER
11 ARC552 UHF TRANSCEIVER AND INVERTER
12 BC347 and PE86 INTERPHONE COMMUNICATION EQUIPMENT
13 TACAN INVERTER
14 BC733 ILS LOCALIZER RECEIVER
15 ARN6 RADIO COMPASS
16 TACAN ANTENNA
17 ARN5 GLIDE PATH RECEIVER
18 OVERHEAD RADIO CONTROL PANEL
19 MARKER AND RANGE ANTENNA
20 MAIN INVERTER
21 ID5040 DISTANCE AND RADIO MAGNETIC INDICATOR
22 MN97H TRACK INDICATOR
23 MARKER BEACON LIGHTS

Figure 1-23 Radio Equipment Location

correspond to ILS pre-set frequencies shown on the ILS channel crystallization cards mounted on either side of the overhead radio panel. The volume control knob is used to check the audio identity signal of the ILS station which is selected on the channel selector. When the pilot's ILS/TACAN mode switch is selected to the desired ILS station, the lateral deviation from the ILS localizer and the vertical deviation from the glide slope is displayed on the TI; the ILS localizer receiver and the glide path receiver are powered by direct current.

MARKER BEACON RECEIVER (MN53B)

145 The marker beacon receiver is pre-set to receive a 75-MHz modulated signal. Power to the receiver is controlled by a sensitivity selector switch, marked OFF, LOW, and HIGH, which is mounted on the sub-panel of the overhead panel. Selection of HIGH increases the area of reception of the beacon cone. Indicator lights, mounted vertically in the centre of the main instrument panel, illuminate upon reception of the appropriate beacon (blue — outer marker, white — airway Z marker, amber — middle marker). Audio level is controlled by the volume control on the marker control sub-panel and by the volume control on either pilot's audio panel. The MN53B marker beacon receiver requires only DC power to operate.

INTERPHONE SYSTEM

146 The interphone system is controlled by the intercom ON/OFF switch, which is located on the interphone control sub-panel portion of the overhead radio panel; separate microphone selector switches mounted on the main instrument panel provide communication between the pilot and co-pilot. Volume is controlled by the volume controls on the pilot's and co-pilot's audio sub-panels on the overhead radio panel. The interphone system requires only DC power to operate. A "hot mike" is included in the system, with an ON/OFF switch located on the radio control panel.

ISOLATION AMPLIFIER

147 The isolation amplifier ON/OFF switch is located on the interphone control panel. This switch activates the isolation amplifier which, in conjunction with the individual audio and microphone selection switches, permits the pilot and co-pilot to select separately any desired combination of receivers and transmitters. The ON/OFF switch should be selected ON whenever any of the radio equipment is to be used. The isolation amplifier requires only DC power to operate.

148 When there are audio malfunctions, the isolation amplifier may have to be turned OFF, so that radio equipment can be operated individually.

NOTE

When the isolation amplifier is switched OFF, or has failed, audio reception volume is reduced and it is not possible to transmit on either VHF or UHF.

TRACK INDICATOR (MN97H)

149 The Track Indicator has a track setting knob and a track selector window, a vertical track bar, a glide slope indicator, warning off flags, an ambiguity (TO/FROM) indicator, and a heading pointer. The indicator light is inoperative. The TI displays TACAN azimuth information when the TACAN is selected ON and the ILS/TACAN mode is selected to TACAN; the TI displays ILS information when the ILS is ON, the proper channel is selected and the ILS/TACAN mode switch is selected to ILS. The TI is powered by the ILS system when the ILS mode is selected. The ILS system operates on DC power and supplies signals to the TI when the ILS/TACAN mode switch is on ILS. Thus main instrument inverter power is not required for ILS operation of the TI. The heading pointer of the TI is powered by signals from the C2 compass.

DISTANCE RADIO MAGNETIC INDICATOR (ID5040)

150 The distance radio magnetic indicator (DRMI) contains a TACAN bearing indicator (wide pointer) and an ARC bearing indicator (narrow pointer) which indicate magnetic bearings against the rotating compass card ring of the instrument. The compass card is activated by the C2 gyrosyn compass, so that the aircraft's magnetic heading is always indicated at the top of the dial opposite the aircraft heading index. The compass card operates as a function of the C2 gyrosyn compass and therefore operates on main inverter power or emergency inverter power. If the C2 compass fails, or the DRMI compass card fails, magnetic bearing information is no longer available on the TACAN or ARC indicators. The ARC pointer continues to indicate bearings relative to the nose of the aircraft when the compass card becomes inoperative. If there is a general failure of the DRMI, no bearing information is provided.

151 The slant distance to the selected TACAN station is displayed in the DME window, which is positioned in the top centre of the DRMI instrument face. An off flag covers the last digit of the mileage indicator drums when the instrument is inoperative or when the distance from the station exceeds the range capabilities of the TACAN.

NOTE

The DRMI compass card is a repeater-type component which gives the same heading indications as the C2 compass. The C2 compass must be correctly set and the annunciator (dot, cross) operating so that both repeaters give accurate indications.

INVERTER FAILURE

152 Failure of the main instrument inverter causes failure of the DRMI (including its lighting), C2 magnetic compass, and the pilot's attitude indicator. An amber inverter failure warning light, located on the upper centre of the main instrument panel, illuminates when the main inverter fails or when the emergency inverter is in use. When the emergency inverter switch is selected ON, emergency power is provided to all instruments and lights. (Single-phase power for the emergency system is provided by the UHF inverter, which is activated by the selection of the emergency inverter switch, regardless of whether the UHF is ON or OFF.)

NOTE

After emergency inverter power has been selected, the annunciator on the C2 magnetic repeater should be checked, and the repeater should be reset if necessary.

PART 2
HANDLING

PRE-FLIGHT PROCEDURES

BEFORE ENTERING COCKPIT

1 Proceed as follows:

(a) Ensure that weight and balance are within the limits specified in EO 05-45B-8 for the complete flight. (See also Weight and Balance Data in Part 4 of this EO.)

NOTE

Refer to Figure 4-2 to ensure that the all-up weight is within limits to obtain a rate of climb of 100 feet per minute on single engine at full power.

(b) Determine length of runway required for take-off and landing (see Figure 4-5).

(c) Determine whether any limitations have been imposed on the aircraft, and ensure that aircraft has been properly serviced by checking the Aircraft Maintenance Record Set.

(d) Check general condition and position of the aircraft and ensure that the area is clear of obstructions.

PRE-EXTERNAL CHECK

2 Enter the cockpit and carry out the pre-external check as follows:

(a) Control locks - Removed and stowed.

(b) Landing gear selector - DOWN.

(c) External power or battery switch - ON.

(d) Landing gear light - On (green).

(e) Fuel - Check contents.

(f) Propeller anti-icers - Check operation and tank contents. Ensure tank covers are secure and auxiliary tank shut-off cock is OFF.

(g) Mixture - Ensure in "idle cut-off".

(h) Trim tabs - Check for travel and return to neutral.

(j) Flaps - Fully down and selector OFF.

(k) Magneto switches - OFF.

(m) Battery master and exterior lights - As required.

EXTERNAL CHECK

3 Carry out the external check as detailed in Figure 2-1.

INTERNAL CHECK

4 Enter the aircraft and carry out the following checks:

(a) Rear compartment —

(1) Radios - Securely mounted.

(2) Baggage - Properly stowed.

(3) First aid kit - In place on the rear of the lavatory door and seal unbroken; door closed.

(b) Main cabin compartment —

(1) SARAH - In place and properly stowed.

(2) Rear cabin fire extinguisher - Seal unbroken - pressure gauge reading approximately 150 psi.

(3) Main door - Secured.

(4) Spare bulbs - In place.

(5) Forced landing instructions and emergency maps - In place.

(6) Safety equipment - Carried and stowed in accordance with unit instructions.

(7) Emergency exit - Securely closed.

(8) Astrodome (if applicable) - Secure with release toggle in place.

(9) CO_2 extinguisher - Secure and seal unbroken.

PRE-START CHECK

5 Perform the following checks:

(a) Load, Aircraft Maintenance Record Set, Travelling Copy - Checked and carried.

(b) External/internal checks - Completed.

(c) Fuel contents, propeller anti-icer - Checked.

(d) External power - ON.

(e) Seat and safety harness - Adjusted.

(f) Cross-feed - OFF.

(g) Fire extinguisher - Selected to the right engine.

(h) Parking brakes - Reset.

(j) Oil shut-off valve - IN (open); safety wire unbroken.

(k) Oil bypass - PULL-HOT (bypass).

(m) Fuel selectors - Both on nose.

(n) Flaps - Raise flaps; check manual and electrical operation; return selector to OFF.

(p) Cowl gills - Check operation; set OPEN.

(q) Manifold heat - COLD, tension released.

(r) Pitch - Fully forward (fine pitch).

(s) Throttles - Cracked, i.e., about 1/8 open. (If throttles are opened too wide the tendency to backfire is increased.)

(t) Mixture - Fully forward (RICH).

(u) Oil shutters - Closed.

(v) Battery and generator switches - OFF (battery switch ON if starting on aircraft batteries).

(w) Circuit breakers - Push all circuit breakers to ensure they are set (see Part 1, para 45, NOTE).

(x) Anti-collision light - ON.

(y) Radios - All OFF.

(z) Chocks - In place.

(aa) Fire guard - Standing by.

NIGHT FLIGHT CHECKS

6 Make the following additional checks for night flights:

(a) Check operation of all exterior lights.

(b) Check magnetic compass light. Spare miniature bulbs are located on right sub-panel.

(c) Check instrument lighting.

(d) Check cockpit and cabin lighting, and reel-type extension light.

STARTING PROCEDURE

7 Carry out the following procedure. (Note field barometric pressure (FBP) indicated by the manifold pressure gauge.)

(a) Priming - Operate the wobble pump to build up fuel pressure to 3 or 4 psi. Prime right engine seven full strokes for cold engine (10 to 15 strokes if OAT is below -20° C) and three to four strokes for warm engine.

CAUTION

Do not overprime the engines. The raw gasoline will wash oil from the cylinder walls, creating excessive wear. Pumping the throttles does not prime the engine. It merely floods the carburettor and may create a fire hazard.

Use of manifold heat during starting may result in serious damage and fire if engine backfires. Manifold heat levers tend to move to HOT during backfiring. Return levers to COLD but do not hold or lock in position as damage to carb heat mechanism may result.

(b) Starter selector and fire extinguisher - Select RIGHT engine.

(c) Starter - Depress starter button. Allow engine to turn over eight blades. If there is evidence of a hydraulic lock, discontinue the starting procedure and make an entry in the Aircraft Maintenance Record Set.

(d) Switches - Ignition switches ON.

(e) Booster - Engage booster and hold until engine is running smoothly.

CAUTION

If starting difficulties are encountered, limit continuous operation of starter and booster to periods of less than 30 seconds duration. Allow equipment to cool for 2 or 3 minutes between attempts.

(f) Oil - Check pressure (if it does not build up to 20 psi within 30 seconds, shut off engine).

(g) Suction - Check operation of suction pump.

CAUTION

If engine backfires, close throttle immediately.

8 Start left engine as follows:

(a) Priming - Prime left engine as in para 7(a).

(b) Starter selector and fire extinguisher - Select LEFT engine.

(c) Start engine in accordance with procedure outlined in paras 7(b) to 7(f) inclusive.

(d) Battery - External power supply disconnected; aircraft battery switch ON; generator switches ON; check ammeters.

(e) Inverter switch - EMERGENCY.

(f) Compass switch - ON.

FAILURE-TO-START PROCEDURE

9 If an engine fails to start, proceed as follows:

(a) Release starter and booster buttons.

(b) When propeller stops rotating turn ignition switches OFF.

(c) Allow starter to cool (2-3 minutes).

NOTE

If the engine has been overprimed, turn off ignition switches, move mixture control to "idle cut-off". Open throttle slowly to fully open position and have the engine turned over two or three revolutions by hand in direction of rotation.

(d) Repeat starting procedure.

(e) If re-starting is impossible, carry out Shut-Down Procedure (see para 59).

WARM -UP PROCEDURE

10 To warm up the engines use the following procedure:

(a) During the first 30 seconds after starting allow the engines to run at low speed - approximately 700 rpm.

(b) Adjust throttles to approximately 1,000 rpm until oil temperatures reach 20° C. Advance rpm to 1,200 until temperatures reach 30° C and then complete warm-up at 1,500 rpm. Do not exceed 1,500 rpm until the oil temperatures reach 40° C.

(c) When the oil temperatures have reached 40° C, move the oil bypass valve to the COLD position (in). At this point an oil temperature drop will be observed if coring is not present.

TARMAC CHECK

11 Carry out a systematic check of the cockpit:

(a) Radio panel - Turn on all radio and navigation equipment.

(b) Floor —

(1) Adjust the cabin air push-pull controls on the main spar.

(2) Co-pilot's heat control - As required.

(3) Right generator circuit breaker - On.

(4) Fuel cross-feed valve - OFF.

(5) Radio panel light rheostat - OFF.

(6) Landing gear motor circuit breaker - In; left generator circuit breaker - On.

(7) Landing gear clutch pedal to the rear and cover fastened.

(8) Pilot's heat control - As required.

(c) Engine control pedestal, left and right sub-panels —

(1) Engine fire extinguisher selected neutral.

(2) Oil shut-off valves - In and lock-wired.

(3) Engine primer - OFF.

(4) Oil bypass and cabin heat valves - As required.

(5) Tail wheel - Unlocked.

(6) Fuel selectors - On NOSE.

(7) Landing gear selector - DOWN, lights checked.

(8) Flaps - Up, selector returned to neutral.

(9) Engine controls - Checked for freedom of movement, pitch fine, mixture RICH, manifold heat COLD, and oil shutters as required.

(10) Generators - Charging.

(11) Test engine fire detecting system.

(12) Turn pitot heat on and check for a slight rise in ammeter reading; return pitot heat to off position.

(13) Windshield wiper, navigation lights, and landing lights - As required.

(14) Battery and generator switches - ON.

(15) All left sub-panel circuit breakers - Checked.

(16) De-icer boots - Checked and OFF.

(17) Propeller anti-icer rheostat - OFF.

(18) Starter selector switch - OFF.

(19) Gyrosyn slaving switch - ON.

(20) Cabin lights - As required.

(21) Inverter switch - MAIN.

(22) All right sub-panel circuit breakers - Checked in.

(d) Instrument panel —

(1) Fuel.

(2) Pilot's lighting - As required.

(3) Altimeter - Set to field elevation.

(4) ILS/TACAN mode switch - As desired.

(5) C2 compass set - Annunciating and cross-checked with DRMI and B21.

(6) Attitude indicator - Annunciating, quick erection switch ON.

(7) UHF - ON, appropriate frequency selected.

(8) TACAN control panel - Set as desired.

(9) Press-to-test all lights.

(10) Clock - Set to GMT.

(11) Engine instruments - Checked; lighting - As required.

(12) Co-pilot's altimeter - Set to field elevation.

(13) Co-pilot's DI - Uncaged and set.

(14) Co-pilot's attitude indicator - Uncaged.

(15) Co-pilot's lighting - As required.

(e) Above main instrument panel —

(1) Propeller feathering circuit breaker - ON.

(2) SUMMER/WINTER switch - Selected according to OAT. (Below 0°C place in WINTER position.)

(f) Radio panel - All radios and navigation equipment - Checked and set to appropriate frequencies.

TAXIING

PRE-TAXI CHECK

12 Check the following:

(a) External power - Disconnected.

(b) Battery and generator switches - ON.

(c) Inverter and compass switches - MAIN.

(d) Starter selector switch - OFF.

(e) Gyros - Uncaged.

(f) Fuel - On rear tanks.

(g) Tail wheel - Unlocked.

(h) Chocks - Removed.

CAUTION

Before moving the aircraft ensure that all gyro instruments are uncaged to prevent damage during taxiing.

WHILE TAXIING

13 During taxiing ensure that gyro instruments operate correctly.

RUN-UP PROCEDURE

PRE-RUN-UP CHECK

14 Check the following:

(a) Parking brakes - ON.

(b) Magnetos - At minimum rpm switch off each magneto in turn; switch off both together momentarily to check grounding out.

(c) Idle - 1,000 rpm.

(d) Radios - Checked and set.

(e) Gyros and suction - Checked.

(f) Fuel - Front tanks selected.

(g) Temperatures and pressures - Within limits for run-up.

ENGINE AND ACCESSORY CHECK

15 Proceed as follows:

NOTE

The tail wheel must be unlocked for run-up.

(a) Power - Open both throttles to 1,500 rpm.

(b) Generators - Check ammeter indication; generator warning lights out to ensure that generators are charging.

(c) CSU - Move propeller control to coarse pitch (fully back) and check rpm drop (minimum 300 rpm); return to fine pitch.

(d) Feathering - Depress each feathering button in turn until a decrease in rpm occurs (200-300 rpm), then pull out the button. Check ammeters for equal loading during feathering.

(e) Manifold heat - Operate each manifold heat control to obtain a 10-degree rise in carburettor air temperature, then replace controls to COLD position.

(f) Mixture - Move mixture control slowly back until a slight drop in rpm is noted. Return to fully RICH position.

(g) Return throttles to 1,000 rpm.

POWER CHECK

16 Proceed as follows:

(a) Throttle - Calculate the referenced rpm corrected for outside air temperature and wind velocity as follows —

(1) Add or subtract 1 rpm to the referenced rpm for each degree the outside air temperature is above or below standard atmosphere (ICAO).

(2) As the aircraft should be facing into wind for run-up, add 2 rpm to the referenced rpm for each mph of wind.

(3) Applying (1) and (2) to the referenced rpm gives the corrected reference rpm. Advance right throttle until the manifold pressure reading is equal to the existing field barometric pressure. The engine speed obtained should be within 50 of the rpm placarded, corrected for outside air temperature and windspeed.

(b) Magnetos - With the throttle in the same position check the magnetos. Normal drop-off is 50-75 rpm. Maximum drop-off should not exceed 100 rpm and maximum drop-off between left and right magnetos should not exceed 40 rpm. When magnetos are checked at the recommended power, the drop-off on the right magneto

may be as high as 150 rpm. If this is the case, recheck the magnetos at 2,200 rpm. At this higher power, if the drop-off on the right magneto as well as on the left magneto is less than 100 rpm and the difference in drop between right and left is not more than 40 rpm, the check may be accepted as satisfactory.

(c) Temperatures and pressures - Check within limits.

(d) Idling - Throttle back slowly and check idling (500 to 600 rpm). Ensure generator cut-out warning lights on.

(e) Idle right engine at 1,000 rpm, and repeat procedure for left engine.

TAKE-OFF PROCEDURE

PRE-TAKE-OFF CHECK

17 Before positioning aircraft on the runway for take-off, perform the following checks:

(a) Seat belt and shoulder harness - Adjusted; check passengers and crew.

(b) Doors and windows - Closed.

(c) Trim - Rudder and aileron neutral, elevator approximately 1/2 unit nose down.

(d) Tension - Adjust the three friction locks tight enough to maintain selections.

(e) Temperatures and pressures - Ensure temperatures and pressures are within take-off limits.

(f) Mixture - RICH (fully forward).

(g) Carburettor heat - COLD (up), or as required.

(h) Pitch - FINE (fully forward).

(j) Fuel - FRONT tanks selected; check contents; cross-feed OFF, primer OFF.

(k) Flaps - As required.

(m) Cowl gills - In trail position.

(n) Oil shutters - As required.

(p) Oil bypass - Open (push in).

NOTE

Cylinder head temperature will increase 25° C to 30° C during take-off. Before commencing take-off run, temperatures must be sufficiently low to prevent this rise from exceeding the maximum allowable temperature of 260° C. This temperature is allowable for 5 minutes only.

(q) Gyros - Check; set and uncaged.

(r) Switches (nine) - ON (inverter, compass, four magnetos, battery, two generators).

(s) Pitot heat - ON.

(t) Anti-collision light - ON.

(u) Feathering circuit breaker - ON.

(v) De-icer boots - OFF.

(w) Controls - Check for freedom and proper movement.

(x) Tail wheel - Locked on runway.

(y) Take-off briefing - Ensure co-pilot understands procedures. The statement, "This will be a normal take-off", means —

(1) When the aircraft is lined up on the runway, the pilot calls "tail wheel locked", whereupon the co-pilot shall engage the tail-wheel lock and acknowledge. The pilot will check the positive engagement of the tail-wheel locking pin as per para 18 (a).

(2) The pilot shall open the throttles to 30" MP, at which point the co-pilot, who has been following through with his hand below and behind the pilot's hand, shall take control of the throttles and advance the throttles to the specified setting. Reduce the "full power" manifold pressure of 36" by 1" for each 10° C the OAT is below standard atmosphere (ICAO) temperature.

(3) After "full power" is set, the co-pilot shall monitor the manifold pressure, rpm, and engine instruments, and advise the pilot immediately of any irregularities.

(4) In the event of a malfunction, the pilot shall decide whether to abort or continue the take-off. If he decides to abort, he shall call

out "abort", take control of the throttles, and reduce the power as required. The co-pilot shall advise the controlling agency of the decision to abort the take-off.

(5) When the aircraft is safely airborne and has accelerated to 90 knots IAS (safety speed), the pilot shall raise the landing gear and signal for the first power reduction (a backward movement of the hand accompanied by the command "maximum continuous"). After the co-pilot has reduced the MP and the rpm to the maximum continuous power settings of 33-1/2" MP and 2,200 rpm (corrected for OAT) the pilot will call for the post-take-off check.

(6) At a pre-determined altitude, normally 500 feet AGL or highest circling minima, the pilot will signal for climbing power (28" MP, 2,000 rpm) by the same method as in (5) above, calling for "climbing power".

(7) For the remainder of the climb to altitude, the co-pilot shall maintain the manifold pressure at climbing power setting and make adjustments for temperatures and pressures as required.

WARNING

The lavatory compartment on all types, and the collapsible seat (jump seat) on the 3NM, must not be occupied during take-off.

TAKE-OFF

18 For normal take-off, proceed as follows:

(a) When lined up on the runway, allow the aircraft to roll straight for a few feet, and then lock the tail wheel. While aircraft is moving, ensure that the locking pin is positively engaged before starting take-off roll by gently applying rudder and brake.

(b) Advance both throttles smoothly to "full power".

(c) Aircraft should normally be flown off at 70 to 75 knots IAS. When safely airborne, allow the aircraft to accelerate as rapidly as possible to the safety speed of 90 knots IAS and raise the landing gear.

(d) During night take-offs, landing lights will normally be used.

MINIMUM-ROLL TAKE-OFF

19 To carry out a minimum-roll take-off, line the aircraft up on the runway in the normal manner, then proceed as follows:

(a) Flaps - Lower 10 degrees.

(b) Brakes - Applied.

(c) Control column - Fully back.

(d) Throttle - Open throttles smoothly to "full power", releasing the brakes as the manifold pressure goes through 30", and place the control column in the neutral position.

(e) Control - As the tail begins to rise at approximately 40 knots IAS, assist it into the flying position with a slight forward movement of the control column.

(f) Lift-off - When the aircraft reaches flying speed (65 to 70 knots IAS), pull aircraft off the ground firmly and decisively.

(g) Landing gear - When assured aircraft will remain airborne, raise the landing gear.

WARNING

Be sure that sufficient speed has been attained before raising landing gear. The retraction mechanism will probably be damaged if wheels are allowed to touch the ground after landing gear has started to retract.

(h) Flaps - Raise the flaps at 80 knots IAS.

CROSSWIND TAKE-OFF

20 In a crosswind take-off, initial directional control is maintained by differential throttle opening and brake. After rudder control is

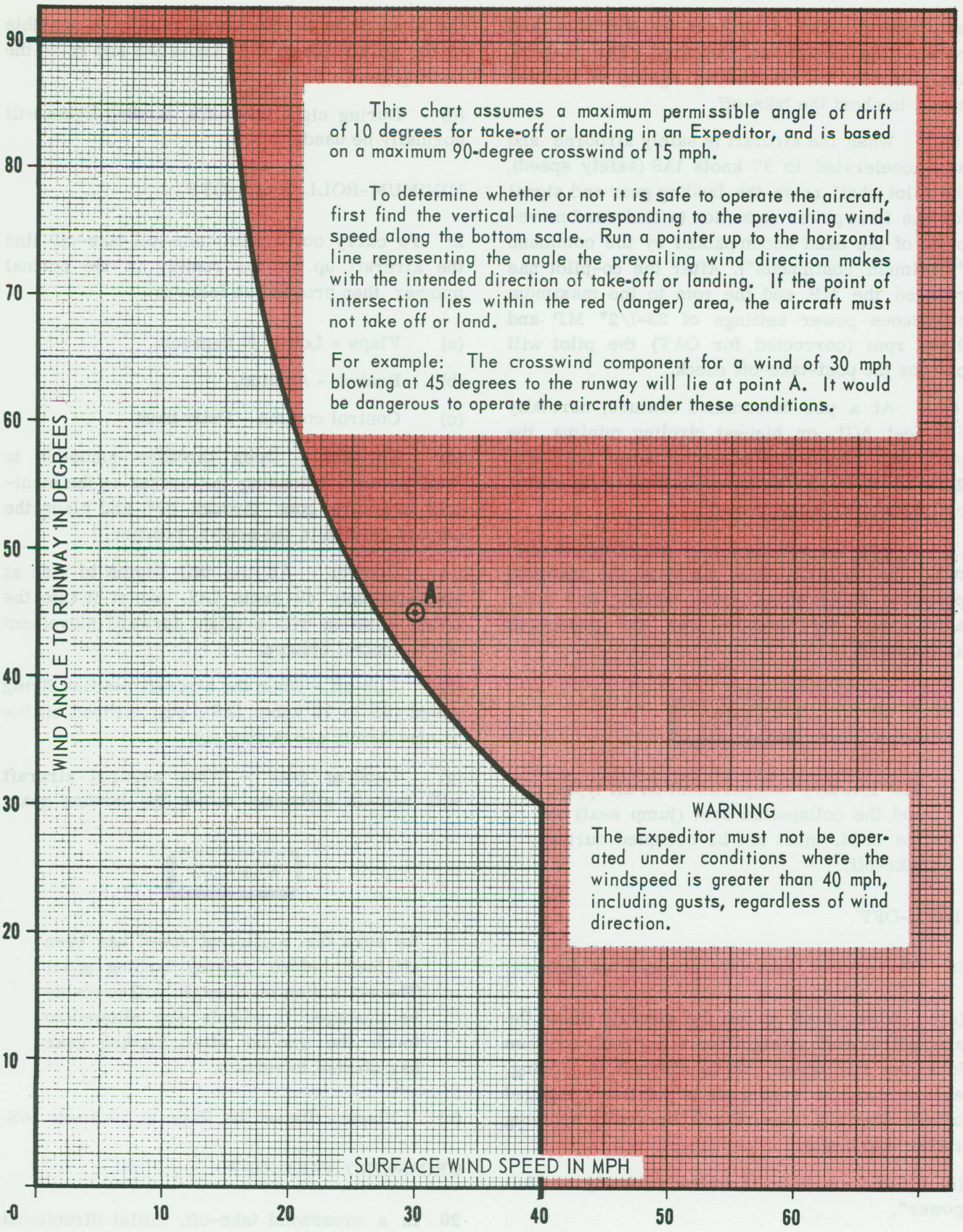


Figure 2-2 Crosswind Component Chart

attained, control is maintained by coarse use of rudder. The aircraft is held on ground until adequate (75 to 80 knots IAS) flying speed is attained, then lifted cleanly from the ground. On no account must the aircraft be allowed to touch the ground after crab is established. The application of into-wind aileron throughout the take-off run will aid in maintaining directional control and reduce the lifting tendency of the into-wind wing.

NOTE

Do not operate the aircraft when the surface windspeed exceeds 40 mph including gusts. Do not attempt cross-wind take-offs when the crosswind component exceeds 15 mph at 90 degrees (see Figure 2-2).

CLIMB

POST-TAKE-OFF

21 Proceed as follows:

(a) When the airspeed reaches 95 knots IAS, and the landing gear and flaps have been selected UP, reduce to maximum continuous power of 33-1/2" MP and 2,200 rpm. Attain the recommended climbing speed of 105 knots IAS and complete the Post-Take-Off Check as follows:

(1) Landing gear - UP; ensure red light out.

(2) Flaps - UP and OFF.

(3) Landing lights - UP and OFF.

(4) Temperatures and pressures - Check (carburettor mixture temperature set +5° to +10° C).

NOTE

If landing gear cannot be retracted, follow procedure as outlined in Part 1, para 68.

(b) On reaching 500 feet AGL or highest circling minima, reduce power setting to normal climbing power at 28" MP and 2,000 rpm.

NOTE

If carburettor heat is in COLD position during climb, decrease the recommended manifold pressure by 0.5" for each 10° C the carburettor mixture temperature is below standard OAT for the altitude.

CRUISING FLIGHT

NORMAL CRUISING PROCEDURE

22 When the desired cruising altitude and airspeed is reached, proceed as follows:

(a) Signal for a reduction to cruising power (a lateral motion of the hand over the control pedestal accompanied by the command "cruising power"). The co-pilot then adjusts both the rpm and MP slowly and smoothly to the settings as determined from Figure 2-3.

(b) Select fuel to the appropriate tanks.

(c) Adjust the carburettor heat and oil temperature controls if necessary.

(d) Carry out a drag check.

(e) Move the mixture controls individually to the proper lean setting (see para 23). If the cylinder head temperatures are high, the mixture controls should be left in the RICH setting until the temperatures return to the normal cruising range.

FUEL/AIR MIXTURE ADJUSTMENT

23 An improper mixture adjustment can make a great difference in the performance of the engines; if the mixture is too lean, it will be reflected by a poor airspeed even though the engines are not running roughly. It is preferable to have a slightly rich mixture rather than a slightly lean mixture. To obtain the proper fuel/air mixture proceed as follows:

(a) It is important that throttles, pitch controls, carburettor air temperature, and the altitude are set as they are to remain; any change in these items will affect the required fuel/air ratio.

ALTITUDE	STANDARD ATMOSPHERE (ICAO) OAT	RPM 1,700	1,800	1,900	2,000	
Sea Level	15° C	30.5	30.5	30.5	30.5	
2,000 feet	11° C	29.5	29.5	29.5	29.5	MP
4,000 feet	7° C	29.0	29.0	29.0	29.0	in
6,000 feet	3° C	28.0	28.0	28.0	28.0	"Hg
8,000 feet	-1° C	26.5	27.0	27.5	27.5	
10,000 feet	-5° C	24.8	25.5	25.5	26.5	
Limiting BHP		253	268	283	298	
Approximate Fuel Consumption (Imp Gals/hour)		33	35	37.5	40	

Figure 2-3 Power Setting Table

(b) With the engines synchronized, move the mixture control back in short, quick one-inch stages. When the engine goes out of synchronization, move the mixture control 1/2 inch forward: the engine will surge, and synchronization will probably be regained. Now move the mixture control forward 1/2 inch, and if the engine does not surge on this last 1/2 inch of travel, move the mixture control back 1/2 inch for the best fuel/air ratio. Correct leaning of the mixture will usually bring the cylinder head temperature up 20 to 30° C from the fully rich position. Repeat this procedure for the other engine.

(c) If the mixture control is moved slowly backward, it is not possible to tell when engine power is first lost, because the constant speed unit will tend to hold the engine at the set rpm. Any change in MP, rpm, or altitude will necessitate further adjustment to maintain the best fuel/air ratio.

POWER SETTINGS AT MAXIMUM BMEP

24 The combinations of manifold pressure and rpm in Figure 2-3 will produce the maximum allowable brake mean effective pressure (BMEP) for the mixture-lean condition. Do not exceed the manifold pressures for the corresponding rpm shown in Figure 2-3.

NOTE

Decrease manifold pressure by 0.5" for each 10° C that the carburettor mixture temperature is below the standard OAT.

FLYING THROUGH SEVERE TURBULENCE

25 Before entering an area of severe turbulence, perform the following checks:

(a) Secure all loose gear.

(b) No smoking. Seat belts fastened.

(c) Turn fuel tank selector valves to fullest tanks, preferably to the two front tanks.

(d) Set engine speed to 2,000 rpm, mixture fully RICH, and decrease airspeed to 130 knots.

(e) Check all instruments and align gyros.

(f) If icing is anticipated, turn on propeller anti-icers.

(g) If lightning is expected, turn all interior and instrument lights on full bright.

(h) Turn off all unnecessary radio equipment.

(j) If heavy precipitation is encountered, close cowl gills to prevent the engines from cooling off too rapidly.

(k) Keep aircraft within flight limitations. Once the aircraft has been trimmed properly, further use of the trim tabs to recover from climb or dives is not recommended.

FLYING FOR MAXIMUM RANGE

26 To achieve maximum range, under normal load conditions, adjust the engine speed to a low setting. Minimum in-flight rpm (i.e. 1,700 rpm) is recommended. Adjust the manifold pressure to obtain an airspeed of 125 knots IAS. Adjust mixture control to lean (see para 23).

FLYING FOR MAXIMUM ENDURANCE

27 To achieve maximum endurance, set the engine speed at 1,700 rpm and adjust the manifold pressure to give a recommended airspeed of 95 knots IAS at minimum safe altitude. Lean out the mixture as described in para 23.

FEATHERING

28 When it is desired to feather a propeller, carry out the following procedure:

(a) Ensure that the feathering oil dilution switch is in the WINTER position if the OAT is below 0° C.

(b) Ensure that both generators are charging.

(c) Throttle - Closed.

(d) Propeller - Fully coarse.

(e) Mixture control - Idle cut-off.

(f) Ignition switches - OFF.

(g) Feathering button - Depress.

(h) Fuel - Tank selector OFF, cross-feed OFF.

(j) Generator - Switch OFF.

NOTE

Expeditor propellers shall not be feathered for practice purposes. Single-engine practice shall be carried out by reducing rpm to minimum, retaining 1" MP for every 100 rpm indicated. To recover, increase pitch to desired setting and then advance throttle to desired MP. Below 1,000 feet the simulation of engine failure should be attained by the use of 12" MP and the pitch setting of the dead engine commensurate with that of the live engine. When practising single-engine approach and landing, the pitch settings should be adjusted during the pre-landing check.

UNFEATHERING

29 To unfeather the propeller proceed as follows:

(a) Feathering oil dilution switch - SUMMER position.

(b) Propeller - Fully coarse.

(c) Throttle - Closed.

(d) Mixture - Idle cut-off.

NOTE

If propeller has been feathered for more than 2 minutes, rotate the engine two revolutions with the starter before unfeathering.

(e) Ignition switches - ON.

(f) Generator - Charging on live engine.

(g) Fuel - Tank selector ON.

(h) Feathering button - Hold button in until 400 to 600 rpm is attained, then release.

(j) Mixture control - RICH.

(k) Generator switch - ON.

(m) Warm up engine at 15" MP and 1,500 rpm.

MANAGEMENT OF FUEL SYSTEM

FUEL TANK SELECTORS

30 Two fuel tank selectors — LEFT and RIGHT — control the fuel flow from the tanks to the engines:

(a) Left engine - The left fuel tank selector is marked LEFT FRONT, LEFT REAR, NOSE, and OFF. To supply fuel to the left engine only from either of the three tanks, move the selector switch to the appropriate designation. Each designation has a detent for positive selection.

(b) Right engine - The right fuel tank selector operates in the same manner as the left selector and supplies the right engine only.

FUEL TRANSFER

31 To cross-feed fuel from one mainplane to the engine on the opposite side, e.g., left mainplane to right engine, make the following selections:

(a) Suction cross-feed - ON.

(b) Right fuel tank selector - OFF.

(c) Wobble pump - Operate during transfer to maintain pressure above 3 psi.

WARNING

When the cross-feed cock is ON, fuel from whichever tank is selected is supplied to both engines. Therefore, if either engine is inoperative, cross-feed must not be used, as the inoperative engine could, under certain conditions, represent a fire hazard.

FUEL TANK LIMITATIONS

32 Avoid running the tanks dry for two reasons. First, there is a possibility of detonation and air lock with resultant engine failure or inability to regain fuel pressure. Second, damage to the liquidometer float and the fuel tank is caused by vibration during flight if the float is allowed to rest on the tank bottom.

33 Always take off and land on main tanks. When accelerating in a nose-high attitude, and the fuel level in the rear tanks is low, it is possible that the fuel will not feed to the engines. For this reason do not use rear tanks under such conditions. C of G limitation must be complied with for full-tank and empty-tank conditions. In order to preserve the balance of the aircraft, however, tank selections must vary according to configuration.

WARNING

Erroneous indications of fuel remaining in the nose tank, and cutting out of the engine may occur under conditions where the nose tank vent line becomes blocked by ice or any other foreign object. When icing conditions are anticipated, make careful note of the contents of the nose tank, and if a misreading is suspected, use the nose tank on a time basis only, based on fuel consumption figures for the aircraft, allowing a good time safety margin in fuel management. No attempt should be made to run the nose tank down to nearly empty under these conditions.

TANK SELECTION

34 Select the tanks as follows:

(a) When the aircraft is operated as a transport aircraft with all five cabin seats occupied, the fuel tanks must be selected in the following order —

(1) Rear wing tanks.

(2) Front wing tanks until 3/4 of supply is used.

(3) Nose tank.

(4) Front wing tanks.

NOTE

If it is necessary to reduce the quantity of fuel carried in order to stay within the maximum allowable gross weight of 9,300 lbs, such fuel should be left out of the rear wing tanks.

(b) When the aircraft is operated with only the pilot's and co-pilot's seats occupied, the fuel tanks should be selected in the following order —

(1) Nose tank.

(2) Rear wing tanks.

(3) Front wing tanks.

FLIGHT CHARACTERISTICS

GENERAL

35 The Expeditor has the normal characteristics of aircraft equipped with a tail wheel.

STALLING

36 Stall characteristics are good, with no tendency to spin. Ample stall warning is indicated by considerable buffeting of tail surfaces and sloppy controls. There is adequate rudder control throughout the stall, and the aircraft will mush considerably before the nose drops. To recover, drop the nose slightly and apply power. Approximate stalling speeds are as follows:

(a) Power ON - Flaps and landing gear UP - 75 knots IAS.

(b) Power ON - Flaps and landing gear DOWN - 70 knots IAS.

(c) Power OFF - Flaps and landing gear UP - 80 knots IAS.

(d) Power OFF - Flaps and landing gear DOWN - 75 knots IAS.

SPINNING

37 Intentional spins are prohibited. In the event of unintentional spinning, normal spin recovery shall be employed.

AEROBATICS

38 Aerobatic manoeuvres are prohibited.

DIVING

39 The aircraft becomes slightly tail-heavy as speed increases in a dive, but there is no tendency to yaw.

CAUTION

Do not exceed 220 knots IAS at any time. Do not exceed 175 knots in rough air. Maximum allowable rpm is 2,300. Cowl gills should be closed during the dive.

NOTE

Any engine speed in excess of 2,350 rpm must be reported in the Aircraft Maintenance Record Set as a major unserviceability.

HEATING AND VENTILATING

COCKPIT

40 To obtain maximum heat in the cockpit, proceed as follows:

(a) Close both controls (HOT position) on the pedestal.

(b) Close both controls (PULL-HOT) in the floor outboard of the rudder pedals.

(c) Turn both inlet louvers so that the inlets face forward for maximum volume (see Figure 2-4).

41 To obtain maximum cold air in the cockpit, proceed as follows:

(a) Open both pedestal controls (COLD position), allowing hot air to spill to atmosphere.

(b) Open both floor controls (PUSH-COLD).

(c) Turn both inlet louvers forward for maximum volume (see Figure 2-4).

42 Intermediate positioning of these controls varies the mixture of hot and cold air and varies the inlet temperature.

CABIN — EXPEDITORS 3NM and 3NMT

43 To obtain maximum heat in the cabin, proceed as follows:

(a) Close both controls (HOT position) on the pedestal.

(b) Turn inlet louvers on cockpit floor so that inlet faces aft (no flow).

(c) Turn the astrodome defrosting valve OFF (3NM only).

(d) Turn off cold air inlet valves.

NOTE

When the floor louvers in the cockpit are facing aft, no air can enter the cockpit. The build-up of air causes a greater volume to flow to the defroster and to the cabin, thereby increasing the cabin heat.

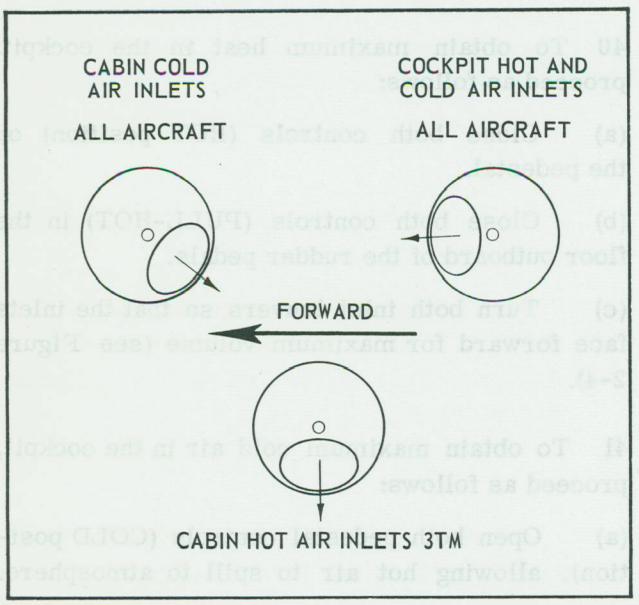


Figure 2-4 Maximum Flow Positions of Inlet Louvers

44 To obtain maximum cold air in cabin, proceed as follows:

(a) Open both pedestal controls (allowing hot air to spill to atmosphere).

(b) Open the cold air valves on the main spar bulkhead (PULL-COLD).

(c) Adjust the inlet louvers on the upper duct for maximum air (see Figure 2-4).

CABIN — EXPEDITOR 3TM

45 To obtain maximum heat in the cabin, adopt the procedure for 3NM and 3NMT aircraft. Then adjust the inlet hot air louver (near the floor) for maximum flow (see Figure 2-4).

46 The procedure to obtain maximum cold air is the same as that for 3NM and 3NMT aircraft.

47 Intermediate positioning of the hot and cold controls varies the mixture of hot and cold and hence varies the temperature.

LANDING PROCEDURES

BEFORE ENTERING TRAFFIC PATTERN

48 Before entering traffic pattern (see Figure 2-5), proceed as follows:

(a) Set manifold pressure at cruising rpm to give approximate airspeed of 105 knots IAS (approximately 20").

(b) Ensure that passengers' seat harnesses are fastened.

PRE-LANDING CHECK

49 Before arriving at "intitial", carry out the following checks:

(a) Harness - Crew and passengers securely strapped in.

(b) Fuel - Select FRONT tanks, check contents.

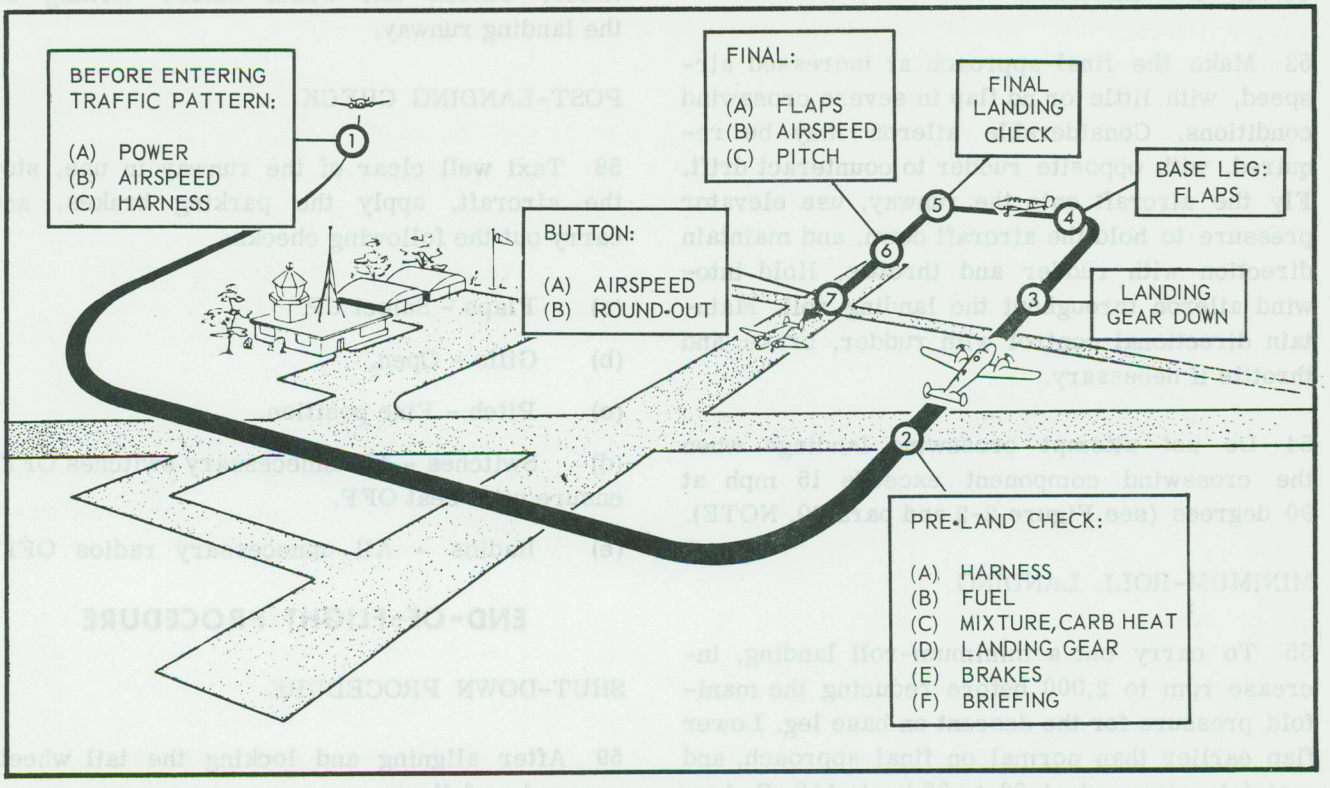


Figure 2-5 Landing Pattern

(c) Mixture - RICH (fully forward).

(d) Carburettor heat - Set.

(e) Landing gear - When required (normally lowered just before turning to base leg).

(f) Brakes - Check pressure after the landing gear is down.

(g) Landing briefing - Ensure co-pilot understands procedure.

BASE LEG

50 Turn onto base leg and lower flaps as required (not above 100 knots).

FINAL APPROACH

51 After completing the turn onto final approach, carry out the Final Landing Check:

(a) Landing gear - Landing gear selector lever DOWN; green light on.

(b) Select flap as required. Reduce speed to cross the button at 85 knots IAS. Move pitch to fully fine before touch-down. Carry out a tail-down wheel landing, and allow the tail to lower slowly during landing run. Gentle application of brake may be necessary to maintain directional control as rudder control is limited at low speeds.

NOTE

The lavatory compartment on all aircraft and the collapsible jump seat on type 3NM must not be occupied during landing.

52 Techniques for night landings are the same as for day, except that it is recommended that landing lights be used. If the pilot is of the opinion that the use of landing lights is a hindrance, rather than an aid to visibility, landing lights will be used at the pilot's discretion.

CROSSWIND LANDING

53 Make the final approach at increased airspeed, with little or no flap in severe crosswind conditions. Considerable aileron may be required, with opposite rudder to counteract drift. Fly the aircraft onto the runway, use elevator pressure to hold the aircraft down, and maintain direction with rudder and throttle. Hold into-wind aileron throughout the landing roll. Maintain directional control with rudder, brake, and throttle if necessary.

54 Do not attempt crosswind landings when the crosswind component exceeds 15 mph at 90 degrees (see Figure 2-2 and para 20, NOTE).

MINIMUM-ROLL LANDING

55 To carry out a minimum-roll landing, increase rpm to 2,000 before reducing the manifold pressure for the descent on base leg. Lower flap earlier than normal on final approach, and maintain airspeed at 80 to 85 knots IAS. Reduce the airspeed late in the approach to cross the button at 70 to 75 knots IAS, and close throttles over the button. Place pitch controls in the fully fine position. After landing maintain back pressure on the control column, raise the flaps, and apply as much brake pressure as practicable.

OVERSHOOT

56 In the event that an overshoot is necessary, carry out the following procedure:

(a) Apply power as required up to "full power".

(b) Raise the landing gear and attain climbing speed as soon as possible.

(c) Raise the flaps at a safe altitude and trim as necessary.

(d) Proceed with the Post-Take-Off Check.

(e) Continue normal climb procedures (see para 21).

AFTER LANDING

57 Avoid harsh application of brakes at all times. Unlock tail wheel before turning off the landing runway.

POST-LANDING CHECK

58 Taxi well clear of the runway in use, stop the aircraft, apply the parking brakes, and carry out the following checks:

(a) Flaps - Select UP.

(b) Gills - Open.

(c) Pitch - Fine position.

(d) Switches - All unnecessary switches OFF; ensure pitot heat OFF.

(e) Radios - All unnecessary radios OFF.

END-OF-FLIGHT PROCEDURE

SHUT-DOWN PROCEDURE

59 After aligning and locking the tail wheel, proceed as follows:

(a) Set parking brakes.

(b) Check magnetos ground out at idling rpm.

(c) Carry out oil dilution as required.

(d) Idle at 1,000 rpm.

(e) Select flaps DOWN.

(f) Move right mixture control to "idle cut-off" position and push the throttle forward slowly as the rpm decreases.

(g) Check suction and repeat for left engine.

POST-SHUT-DOWN CHECK

60 After the engines have stopped, carry out the following check:

(a) Radios - OFF.

(b) Gyros - Caged.

(c) All switches - OFF.

(d) Fuel - OFF.

(e) Controls - Locked.

61 After leaving the aircraft, proceed and check as follows:

(a) Cabin door - Closed.

(b) Pitot covers - On.

(c) Tail wheel - Straight; locking pin engaged.

(d) Chocks - In place.

PICKETING THE AIRCRAFT

62 Tie-down lugs are provided on the underside of each wing. For tail picketing, loop rope through tail-wheel strut. The towing lugs on the inboard side of the landing gear strut near the hub also can be used for picketing. If high winds are expected, the best additional picketing is to loop a rope over the propeller hub or engine shaft and secure the other end directly below and a little forward of the propeller. Always lock tail wheel and double-chock the tail wheel as well as the main wheels.

COLD WEATHER OPERATION

BEFORE ENTERING THE AIRCRAFT

63 Before entering the aircraft perform the external check (see Figure 2-1), and ensure that aircraft surfaces are free from ice and snow. In addition ensure that the following vents are free from ice:

(a) The engine breather (inboard of each power plant).

(b) De-icer oil separator (inboard side of nacelle).

(c) Wing fuel tank (beneath centre section of each wing).

(d) Nose fuel tank (beneath nose, rear of access door).

(e) Generator control box (on inboard side of nacelles).

(f) Tail cone drain (beneath tail cone).

NOTE

If the drain is stopped up, water may collect inside the cone. As the temperature drops, this water will freeze, restricting or even blocking elevator travel. Ensure that the strip between the movable and fixed parts of the tail cone has been moistened with low-temperature lubricating grease. When this felt strip gets wet and then freezes, it holds the elevator in one position. This situation is not dangerous, but the elevator will tend to stick in any position to which it is moved, and smoothness of control is lost.

64 Ensure that each propeller is pulled through five complete revolutions by hand.

AFTER ENTERING THE AIRCRAFT

65 Carry out the Pre-Start Check (see para 5), then push cockpit heating control on pedestal to HOT. Select floor controls in cockpit to HOT. Turn the cockpit louvers to face aft. This allows maximum flow of air to the windshields, cold at first, then becoming warm as the intensifiers warm up, after the engines start.

NOTE

When starting Expeditor aircraft during winter operations, when aircraft have been in hangar, place the oil bypass valve in the COLD position. This is to prevent coring and possible rupture of the oil cooler.

STARTING ENGINES

66 Proceed as follows:

(a) Start the engines as detailed in paras 7 and 8, utilizing the modified selections below.

(b) Prime the engine immediately before engaging the starter in accordance with para 7. While the engine is turning over by the starter actions, prime intermittently until the engine fires regularly.

NOTE

Moisture forms quickly on the spark plugs during cold starting, causing irregular firing. If the engine will not respond when the throttle is advanced, run the engine at 400 to 600 rpm for two or three minutes, using primed fuel only as required, to keep the engine running. With care, partial manifold heat may be used during this period.

(c) Maintain the cowl gills open during all ground operations, to prevent overheating of the engine accessories.

(d) Repeat (a) to (c) above for the other engine.

WARMING UP

67 To warm up the engines, proceed as follows:

(a) Adjust throttle to approximately 1,000 rpm until oil temperature reaches 20° C. Advance rpm to 1,200 until temperature reaches 30° C and then complete warm-up at 1,500 rpm. Do not exceed 1,500 rpm until the oil temperature reaches 40° C. When the oil temperature has reached 40° C, move the oil bypass valve slowly to the cold position. At this point an oil temperature drop should be observed if coring is not present. Oil pressure should remain within limits at all times. In extreme cold, the automatic bypass function of the valve may not operate properly, though normally when the oil reaches 20° C, the bypass valve will be warmed sufficiently to allow oil to bypass the radiator automatically if the radiator is blocked by congealed oil.

NOTE

When the OAT is low, maintain the oil temperature near the upper limit to prevent clogging of the radiator.

(b) Use manifold heat as required to improve vaporization and to prevent backfiring.

(c) When subjected to excessive drain, storage batteries deteriorate rapidly in cold weather; therefore, no electrical equipment should be used until generators are supplying current. When the generators are operating, the red failure warning lights go out.

ENGINE AND ACCESSORY CHECK

68 Carry out the normal engine accessory check. In addition, operate the propeller through at least three complete cycles of pitch range.

NOTE

After a hangar start a coring check can be made by opening the oil shutters for a short time. A slight drop in oil temperatures indicates that no coring is present.

TAKE-OFF

69 Proceed as follows:

(a) Carry out Pre-Take-Off Check.

(b) When ambient temperature is —

(1) Standard Atmosphere (ICAO) OAT to -20° C, reduce MP by one inch for each 10° C temperature is below that standard.

(2) Below -20° C, use carburettor heat to maintain +5° C to +10° C carburettor mixture temperature and use 36" MP during take-off. If carburettor mixture temperature is set at 0° C at 1,800 rpm on run-up, approximately +5° C to +10° C will be obtained on take-off.

AFTER TAKE-OFF, CLIMB, AND DURING FLIGHT

70 Set carburettor heat levers to maintain a carburettor mixture temperature between +5° C and +10° C at all times during flight. Carburettor heat is effective as an ice preventative, hence should be used continuously to prevent ice rather than to remove it periodically. In severe icing conditions move the throttle levers frequently so that they will not become frozen in any one position.

OIL DILUTION REQUIREMENTS		
Anticipated Temperature at Next Start	Dilution Period	Boil-Off Period
Above 0° C	No Dilution	Normally no boil-off period is required. If a full oil supply is required, boil off for 8 minutes for each minute of dilution prior to topping up the oil tanks. Oil temperature must be 40° C or above during boil-off.
0° C to -10° C	1 min	
-10° C to -20° C	2 min	
-20° C to -30° C	3 min	
-30° C to -40° C	4 min	
Add 1 minute dilution for each additional 5° C below -40° C		

Figure 2-6 Oil Dilution Table

71 About every half hour exercise propeller levers through cruising range to flush cold oil from propeller hubs. Maintain oil temperature near upper limits, if possible, to provide better governing.

DESCENT AND LANDING

72 When reducing rpm watch engine temperatures closely. Keep cylinder head temperatures above 120° C by maintaining sufficient power, adding carburettor heat, and closing cowl gills. This will assure good fuel vaporization, thus minimizing the danger of backfiring and cutting out. Oil temperature should be maintained above 40° C at all times during flight.

WARNING

Do not fail to use sufficient carburettor heat during approach and landing.

73 Maintain the carburettor heat control in HOT (down) position while taxiing.

OIL DILUTION AND SHUT-DOWN

74 Oil dilution must be carried out if the forecast temperature at the next start is 0° C or lower. The following procedure is to be used:

(a) Allow the engines to cool until the oil temperature falls below 40° C. If necessary, shut down the engines and re-start after the oil temperature drops.

(b) WINTER/SUMMER switch to WINTER.

(c) Run engines at 1,400 rpm.

NOTE

This rpm is necessary to ensure that the generators are charging during the feathering procedure, and that propeller operation is normal.

(d) Turn oil dilution switches ON, and hold for the period indicated in Figure 2-6 for the anticipated temperature.

(e) Actuate the pitch control full travel three times, noting a drop in rpm.

(f) Actuate the feathering button three times. Pull the feathering button out when the rpm drops by 400.

(g) Continue to hold the dilution switches ON while completing the shut-down procedure.

(h) Place the oil bypass in the PULL-HOT position.

NOTE

Extremely high pressure can be built up by congealed oil in the oil cooler, and the cooler can be ruptured if the bypass valve is closed. The valve should be left in the PULL-HOT position on the next start until the oil temperature reaches at least 40° C.

(j) Complete the shut-down procedures as described in paras 60 and 61.

PART 3

EMERGENCY HANDLING

SECTION 1

NON-CRITICAL EMERGENCIES

EMERGENCIES IN THIS SECTION ARE CONSIDERED TO BE OF A NON-CRITICAL NATURE. SUFFICIENT TIME IS AVAILABLE TO CONSULT THE CHECK LIST FOR REMEDIAL ACTION.

SYSTEMS FAILURE

EMERGENCY LOWERING OF LANDING GEAR

1 If landing gear cannot be lowered electrically, ensure airspeed is 110 knots IAS or less and proceed as follows:

(a) Reset the landing-gear motor circuit breaker, located under the pilot's seat (see Figure 3-1-1), and the landing-gear control circuit breaker, located on left sub-panel.

(b) Ensure generators are ON and operating.

(c) Try lowering landing gear again electrically.

(d) If gear does not go down, pull out landing-gear circuit breaker, located on left sub-panel, and place landing-gear selector lever DOWN.

(e) Raise landing gear clutch-pedal cover and depress clutch (see Figure 3-1-2). The gear will drop to a trailing position.

(f) Keep pedal depressed and engage landing-gear/wing-flap hand crank (see Figure 3-1-3) by pulling inboard (away from pilot). Lower gear by cranking so that crank moves forward at the top of the stroke.

NOTE

The same crank is used to lower wing flaps manually. The crank must be

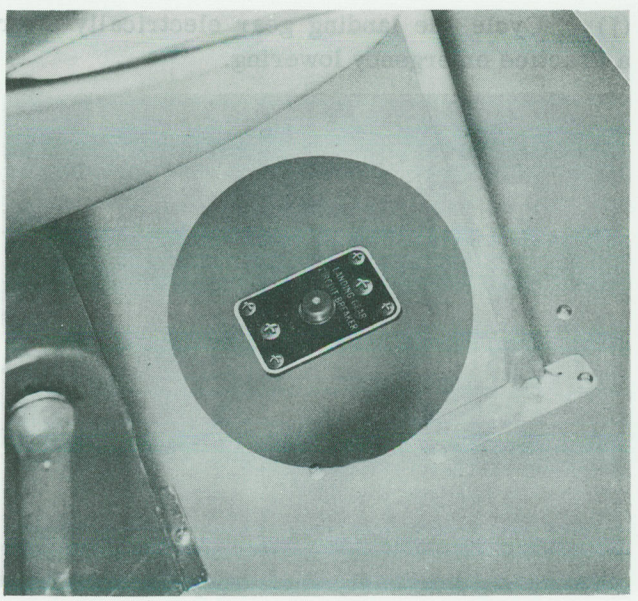


Figure 3-1-1 Landing-Gear Circuit Breaker

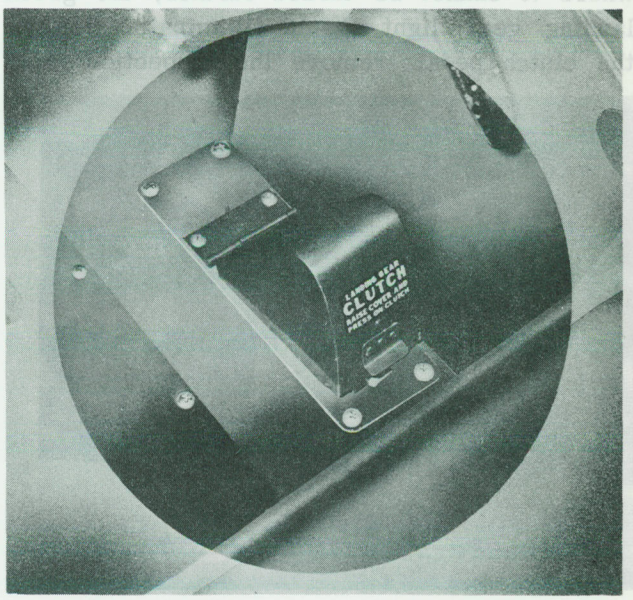


Figure 3-1-2 Landing-Gear Clutch Pedal

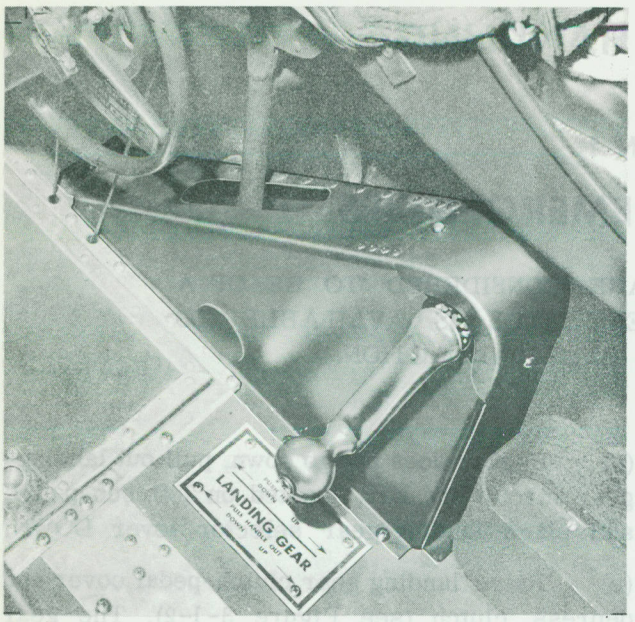


Figure 3-1-3 Landing-Gear/Wing-Flap Hand Crank

pulled inboard (away from pilot) in order to operate the landing gear. By releasing the clutch pedal, the gear may be held in any position during manual operation.

(g) As soon as the crank reaches the point where it cannot be turned further, the green landing gear light should illuminate. Release the clutch pedal, remove the inspection panel between the pilots' seats, and visually check to see if the clutch teeth on the cross shaft are fully engaged (see Figure 3-1-4). When the crank is turned as far as it will go, but the teeth are not engaged (see Figure 3-1-5), move the crank backward slightly so that the teeth engage at the next available position.

WARNING

To lower the gear manually, always depress the clutch and allow the wheels to drop free before attempting to engage the hand crank. If the hand crank is engaged before depressing the clutch, the entire weight of the gear must be supported by the hand crank after the clutch is depressed. It is extremely difficult to maintain control of the hand crank under these conditions: if the crank slips out of the operator's hand, the weight of the wheels will cause it to spin rapidly, resulting in probable injury to the operator.

(h) Replace clutch cover over clutch pedal.

(j) Cycle the landing gear electrically after a practice emergency lowering.

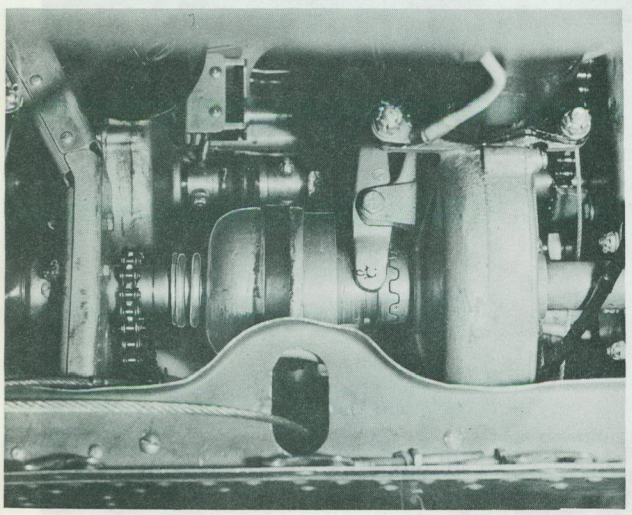


Figure 3-1-4 Landing-Gear Clutch, Teeth Engaged

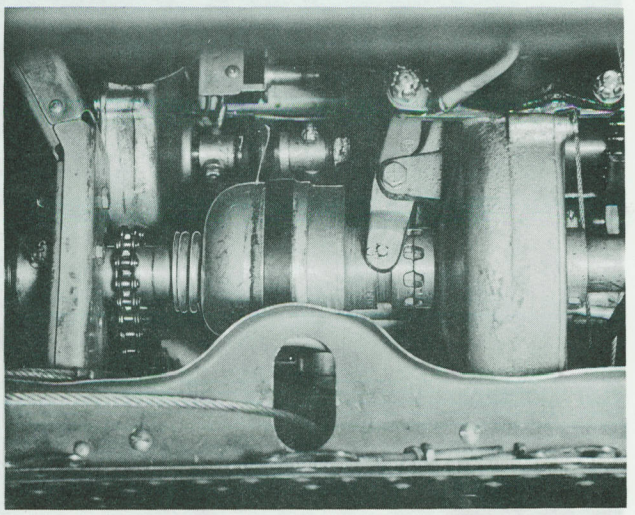


Figure 3-1-5 Landing-Gear Clutch, Teeth Disengaged

EMERGENCY OPERATION OF WING FLAPS

2 Wing flaps may be operated manually with the landing-gear/wing-flap hand crank, located at the right side of the pilot's seat (see Figure 3-1-3). If flaps will not operate electrically, proceed as follows:

(a) Place flap switch in OFF (centre) position.

(b) Push crank in (towards pilot).

(c) To lower wing flaps, turn crank so that crank handle moves forward at top of rotation. Turn crank in opposite direction to raise flaps. Approximately 30 turns are required for full deflection.

WARNING

Do not lower wing flaps when IAS exceeds 100 knots.

ELECTRICAL FAILURE

GENERAL

3 In the event of an electrical failure, check first to see if the generator switches are ON.

GENERATOR FAILURE

4 If one generator failure light comes on, proceed as follows:

(a) Select switch of failed generator to OFF.

(b) Reduce electrical load to less than 100 amps.

(c) Wait one minute.

(d) Reset circuit breaker of failed generator.

(e) Select switch of failed generator to ON.

(f) If generator fails to come on the line (failure light remains on), select failed generator switch OFF.

(g) If generator returns on the line (failure light goes out), return electrical load to normal.

5 If both generators fail, as indicated by both failure lights coming on, proceed as follows:

(a) Reduce electrical load as much as possible to conserve battery power.

(b) Select both generator switches OFF.

(c) Wait one minute.

(d) Reset generator circuit breakers.

(e) Select one generator switch ON. If failure light does not extinguish, select generator switch OFF. Repeat this operation for the other generator.

(f) If neither generator will return on the line, leave both switches in the OFF position and continue to conserve battery power by keeping the electrical load as low as possible.

ZERO AMMETER READING

6 If one ammeter reads zero, but the corresponding generator light is not on, proceed as follows:

(a) Reduce electrical load as much as possible.

(b) Select appropriate generator switch OFF.

(c) Wait one minute.

(d) Reset generator circuit breaker.

(e) Select generator switch ON.

(f) If ammeter gives proper indication, return electrical load to normal.

(g) If ammeter remains at zero, select generator switch OFF.

COMPLETE ELECTRICAL FAILURE

7 If there is a complete electrical failure (no power available at all), proceed as follows:

(a) Check battery and generator switches to ensure they are ON.

(b) Select battery and generator switches to OFF.

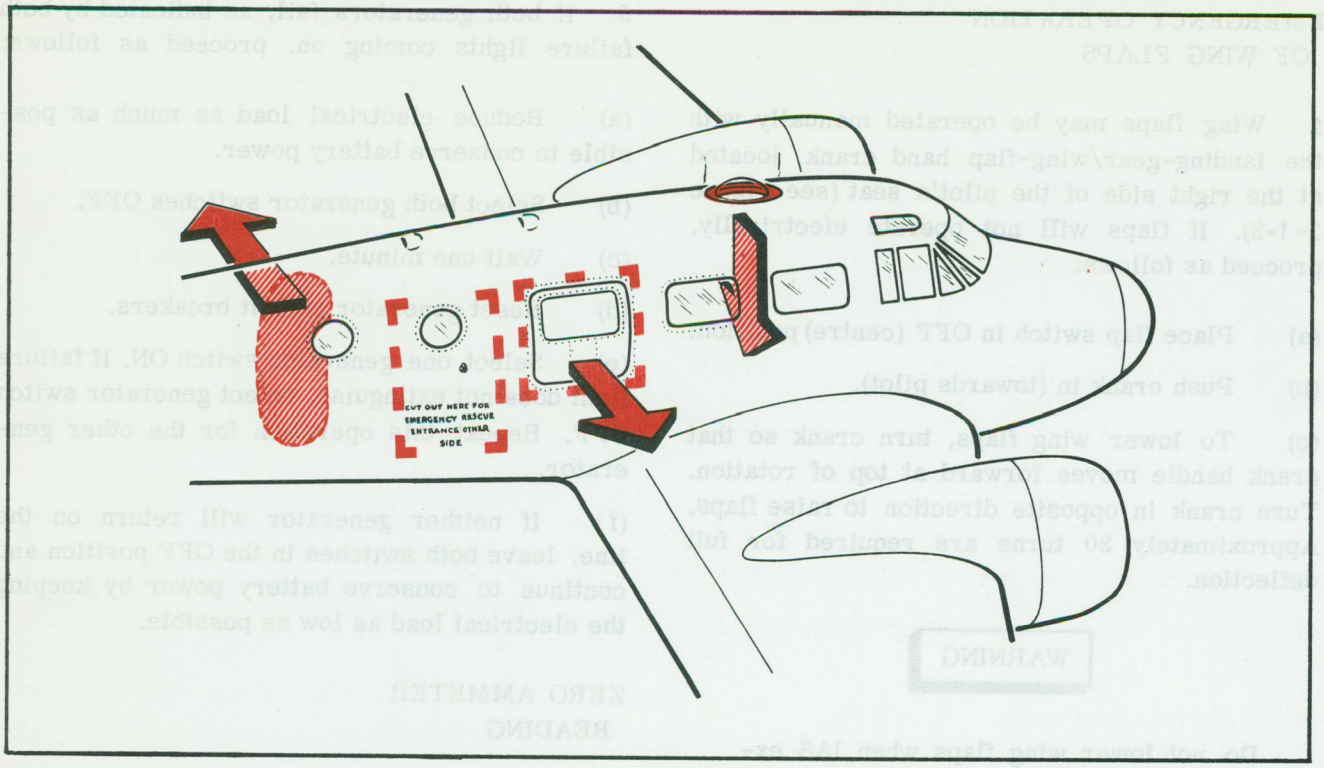


Figure 3-1-6 Emergency Exits and Entrance

(c) Wait one minute.

(d) Reset both generator circuit breakers.

(e) Select both generator switches to ON.

NOTE

Leave battery switch in OFF position.

EMERGENCY LANDING

8 Proceed as follows:

(a) Alert crew and passengers verbally.

(b) Carry out emergency radio procedures.

(c) Check baggage and safety equipment for security.

(d) Jettison unnecessary equipment.

(e) Approach speed - Normal.

(f) Landing gear - UP or DOWN at pilot's discretion.

NOTE

If in doubt, land with landing gear retracted.

(g) Fuel tank selectors - OFF.

(h) Master ignition switch throwbar - OFF.

(j) Wing flaps - DOWN.

(k) Battery and generator switches - OFF.

(m) Cabin door - unlatched.

CAUTION

Unless the aircraft is to be abandoned in flight, do not jettison cabin door as it will damage the empennage.

NOTE

If the landing must be made because of low fuel supply, it is advisable to land before the fuel is completely ex-

hausted so that power will be available. Escape can be made from the aircraft through the emergency escape hatch and, in the 3NM type, through the astrodome. See Part 1, paras 117, 118, and 119 for details of release of these exits.

DITCHING

9 If possible, use up most of the fuel supply to lighten the aircraft and reduce stalling speed. Then proceed as follows:

(a) Alert crew and passengers verbally.

(b) Have crew and passengers don Mae Wests.

(c) Carry out emergency radio procedures.

(d) Check baggage and safety equipment for security.

(e) Jettison unnecessary equipment.

(f) Approach speed - Normal.

(g) Landing gear - UP.

(h) Wing flaps - 1/2 down.

(j) Landing lights - As required.

(k) Touch-down - At as low an airspeed as possible in a nose-high attitude. Touch-down should be along the waves parallel to the swell.

(m) After ditching, pilot shall proceed to the rear and supervise disembarkment.

CAUTION

When a dinghy is carried, ensure the lanyard is connected to the aircraft before the dinghy is thrown into the water.

ABANDONING IN FLIGHT

10 Proceed as follows:

(a) Alert crew and passengers verbally.

(b) Turn aircraft away from built-up areas.

(c) Decrease IAS to 90 knots.

(d) Jettison the cabin door.

(e) Maintain level flight while occupants leave the aircraft.

(f) Trim aircraft slightly nose-down and proceed to the cabin door.

(g) Adjust parachute. Kneel on the cabin floor facing the doorway. Roll out head first, turning a summersault.

WARNING

Do not jump or you may not clear the tail surfaces. Do not bail out from either the emergency hatch or the astrodome as this could result in personal injury.

This sheet to be inserted in EO facing page 3-2-1.

For aircraft in which modification 05-45B-6A/248 has been incorporated, para 12 shall read as follows:

ENGINE FAILURE BEFORE AIRBORNE

12 If an engine fails before the aircraft leaves the ground, carry out the following procedure:

(a) Throttle back immediately and bring aircraft to a stop using brakes.

(b) Mixture - To "idle cut-off".

(c) Ignition switches - OFF.

(d) Fuel - Tank selectors to OFF.

(e) If it is apparent that the aircraft will overshoot the landing area, prepare to ground loop or retract the landing gear. if necessary, to prevent collision with obstacles ahead. If the landing gear is to be raised, the battery switch must be ON to operate the landing gear emergency override system, and must be turned OFF after the gear has been retracted.

WARNING

If, while moving at high speed, the aircraft enters deep snow or any soft or unprepared surface which causes excessive drag on the wheels, it is prone to overturn. If this occurs, considerable airframe damage will result, and the fire hazard is extreme. If it is apparent that the aircraft will enter or has entered such an area, the landing gear should be raised using the landing gear emergency override system. The aircraft will slide to a stop on its belly, resulting in minimum airframe damage and minimum danger to the crew. At 80 knots IAS the aircraft will normally be on its belly 250 feet after the selection has been made; at 60 knots IAS the distance will be 200 feet. The tail of the aircraft should be in the level flight attitude, if possible, when the emergency landing gear retraction is initiated.

SECTION 2

CRITICAL EMERGENCIES

EMERGENICES IN THIS SECTION ARE CONSIDERED TO BE OF A CRITICAL NATURE. THESE PROCEDURES SHOULD BE PERFORMED IMMEDIATELY AND INSTINCTIVELY, WITHOUT REFERENCE TO WRITTEN CHECK LISTS, AND SHOULD BE COMMITTED TO MEMORY.

ENGINE FAILURE

FLIGHT CHARACTERISTICS UNDER PARTIAL-POWER CONDITIONS

11 With one engine dead, the aircraft can be trimmed to fly hands- and feet-off, down to a minimum speed of 90 knots IAS. Under conditions of single-engine flight, the operating engine automatically maintains suction to operate instruments, and pressure to actuate de-icer boots.

ENGINE FAILURE BEFORE AIRBORNE

12 If an engine fails before the aircraft leaves the ground, carry out the following procedure:

(a) Throttle back immediately and bring aircraft to a stop using brakes.

(b) Mixture - To "idle cut-off".

(c) Switches - OFF.

(d) Fuel - Tank selectors to OFF.

(e) If it is apparent that the aircraft will overshoot the landing area, prepare to ground loop if necessary to prevent collision with obstacles ahead.

NOTE

The landing gear cannot be retracted while the weight of the aircraft is on the main landing gear.

ENGINE FAILURE DURING TAKE-OFF BELOW SAFETY SPEED

13 In the event of engine failure before safety speed has been reached, proceed as follows:

(a) If it is apparent that continuing the take-off is impossible, land straight ahead, with landing gear up or down, depending upon whether it is possible to complete a normal landing, or necessary to land wheels-up.

(b) Proceed as in 12 (b) to (e) above.

ENGINE FAILURE DURING TAKE-OFF ABOVE SAFETY SPEED

14 In the event of engine failure after safety speed has been reached, carry out the following procedure:

(a) Control - Maintain directional control, adjust attitude to achieve 95 knots IAS.

(b) Power - Apply "full power" to the live engine.

(c) Drag check - Ensure landing gear and flaps are UP. Close throttle of dead engine and feather. Ensure cowl gills of dead engine are closed and retrim aircraft.

(d) Maintain "full power" as long as necessary, but cylinder head temperature must not be allowed to exceed 260° C.

NOTE

Refer to chart, Figure 4-2, to ensure that the aircraft all-up weight is within limits to obtain 100 feet per minute rate of climb on single-engine at "full power".

(e) On reaching single-engine climb speed of 95 knots, reduce power to maximum continuous (33-1/2" MP and 2,200 rpm), if practicable.

(f) Shut down dead engine as follows:

(1) Mixture - "Idle cut-off".

(2) Fuel - OFF.

(3) Ignition switches - OFF.

(4) Generator switch - OFF.

ENGINE FAILURE DURING FLIGHT

15 In the event of engine failure during flight, carry out the following procedure:

(a) Control - Maintain directional control and adjust speed to maintain 110 knots IAS.

(b) Power - Apply "maximum continuous" to live engine (33-1/2" MP and 2,200 rpm).

(c) Drag check - Ensure landing gear and flaps UP. Close throttle of dead engine.

(d) Trim - Rough rudder trim only.

(e) Check cause of engine failure as follows:

F Fuel - Check pressure.

M Mixture - To RICH; carburettor heat - both HOT.

S Switches - Check.

WARNING

Apply carburettor heat slowly to prevent the live engine from cutting out.

(f) If the cause of failure is not found, or the situation cannot be rectified, feather the dead engine and proceed as follows:

(1) Feather - Depress feathering button.

(2) Mixture - "Idle cut-off".

(3) Fuel - OFF on dead engine side when propeller stops rotating.

(4) Ignition switches - OFF.

(5) Generator - OFF.

(6) Propeller anti-icer - OFF.

CAUTION

Anti-icing fluid in its liquid form represents a fire hazard. If an engine is inoperative, anti-icing fluid can flow to the collector ring and then overflow into the engine or down the lower blade of the propeller. If there is a possibility of an engine fire re-igniting, do not operate anti-icer under these conditions. If the engine is inoperative due to circumstances other than fire, anti-icing for the operating propeller may be used with caution.

(7) Retrim the aircraft, and adjust all controls for asymmetric flight. The recommended single-engine speed for maximum range is 110 knots IAS.

LANDING WITH ONE ENGINE INOPERATIVE

16 Carry out a normal approach and landing, but note the following:

(a) Do not lower the landing gear until it is evident that a normal approach and landing can be made, ensuring sufficient time to complete an emergency lowering of the landing gear in the event of failure of the electrical method.

(b) If flaps are used, do not select until it is certain the landing field will be reached.

(c) Carry out final approach at 95 knots IAS and aim to cross the button at 85 knots IAS (full flap) or 90 knots (flapless).

GO-AROUND WITH ONE ENGINE INOPERATIVE

17 If it is found necessary to go around, proceed as follows:

(a) Apply "full power" to the live engine.

(b) Check the descent and maintain 95 knots IAS.

(c) Raise the landing gear and the flaps.

(d) Initiate climb at 95 knots IAS.

(e) Reduce power for climb as soon as possible and check temperatures and pressures on live engine.

(f) Adjust cowl gills as necessary.

RUNAWAY PROPELLER

18 In the event of a runaway propeller in flight, carry out the following procedures:

(a) Control - Turn up and away from the affected propeller until the rpm is under control.

(b) Power - OFF (close throttle of affected engine).

(c) Drag - Feather propeller of affected engine.

(d) After the propeller has been feathered, shut down the dead engine.

(e) If the propeller will not feather, reduce airspeed and altitude as safety permits to keep the rpm below the maximum continuous allowable limits (2,200 rpm).

FIRES

ENGINE FIRE ON THE GROUND

19 To extinguish an engine fire on the ground, carry out the following procedures:

(a) Throttles - Closed.

(b) Mixtures - "Idle cut-off".

(c) Fuel - OFF.

(d) Switches - OFF.

(e) Fight fire with ground apparatus. If necessary use the engine fire extinguisher. Evacuate the aircraft.

ENGINE FIRE IN FLIGHT

20 To extinguish an engine fire in flight, carry out the following procedures:

(a) Throttle - Closed.

(b) Propeller - Feather.

(c) Mixture - "Idle cut-off".

(d) Fuel - OFF.

(e) Oil shut-off valve - Closed.

(f) Cowl gills - Closed.

(g) Propeller anti-icer - Off.

(h) Ignition switches - OFF.

(j) Fire extinguisher - Select, discharge when propeller stops rotating.

(k) Set aircraft up for asymmetric flight, ensuring generator switch of dead engine is OFF.

FUSELAGE FIRE
(OTHER THAN ELECTRICAL)

21 Use the water glycol fire extinguisher, located in the fuselage. Carry out the extinguisher operating instructions on the bottle (see Part 1, para 112, NOTE). For means of dissipating smoke and fumes, see para 23 in this section.

ELECTRICAL FIRES

22 Eliminate the cause of the fire by turning off the fire-causing service. Then extinguish the fire with the CO_2-type extinguisher. If the fire-causing service cannot immediately be located, carry out the following procedure:

(a) Battery master and generator switches - OFF.

(b) All electrical and radio equipment - OFF.

(c) Battery master and generator switches - ON.

(d) Re-select services one at a time until the fire-causing service is located.

(e) Select only those electrical services required for subsequent flight, leaving fire-causing services off.

(f) Use extinguisher as necessary.

(g) Land as soon as practicable.

SMOKE ELIMINATION

23 To eliminate smoke and toxic fumes after the fire is completely extinguished, open the side windows, cockpit and cabin cold air supplies, and the exhaust grills in roof.

PART 4

OPERATING DATA

INTRODUCTION

1 This part contains operating data for pre-flight planning. Limiting conditions are listed for both the power plants and the airframe. Instruments that indicate an operating range or limit are illustrated.

ENGINE RESTRICTIONS

MAXIMUM ALLOWABLE RPM

2 The maximum allowable rpm is 2,300. Cowl gills must be closed throughout diving manouevres. Maximum overspeed is 2,350 rpm (see Part 2, para 39, NOTE).

FULL POWER

3 Full power is limited to one minute duration for two-engine operation, but may be used as long as necessary in case of single-engine emergency. The following data apply for "full power":

(a) Engine speed - 2,300 rpm.

(b) Manifold pressure - 36" Hg.

(c) Cylinder head temperature - 260° C.

(d) Cylinder head temperature for extended emergency operation - 232° C.

(e) Mixture - Fully RICH.

MAXIMUM CONTINUOUS POWER

4 The following data apply for "maximum continuous power":

(a) Engine speed - 2,200 rpm.

(b) Manifold pressure - 33.5" Hg.

(c) Cylinder head temperature - 232° C.

(d) Mixture - Fully RICH.

THROTTLE AND PROPELLER CONTROLS

5 Avoid violent changes of the throttle and propeller controls to prevent overspeeding of the engines.

FUEL SPECIFICATIONS — POWER RESTRICTIONS

6 Fuel specifications are listed in Part 1, para 9. Power restrictions for emergency fuel are: operate at 1,900 rpm or higher at 280/296 bhp. For all restrictions on the use of emergency-rated fuels see EO 45-1-2.

FLIGHT RESTRICTIONS

AIRSPEED LIMITATIONS

7 Airspeed limitations are as follows:

(a) Maximum speed, smooth air - 220 knots IAS.

(b) Maximum speed, rough air - 175 knots IAS.

(c) Maximum speed for lowering flaps - 100 knots IAS.

(d) Maximum speed for lowering landing gear - 110 knots IAS.

(e) Maximum speed for lowering landing lights - 95 knots IAS.

(f) Maximum speed for landing lights extended - 105 knots IAS.

RECOMMENDED SPEEDS

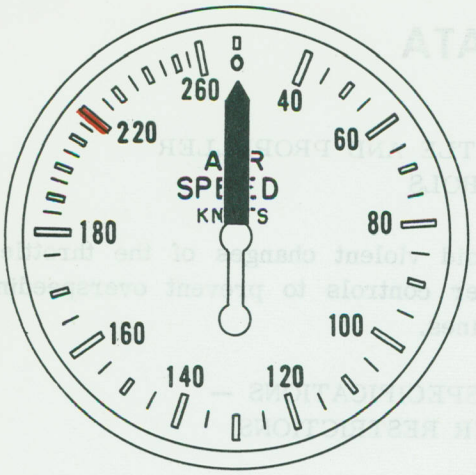
8 Recommended speeds are as follows:

(a) Normal climb - 105 knots IAS.

(b) Maximum glide - 95 knots IAS.

(c) Maximum range - 125 knots IAS.

(d) Maximum endurance - 95 knots IAS.

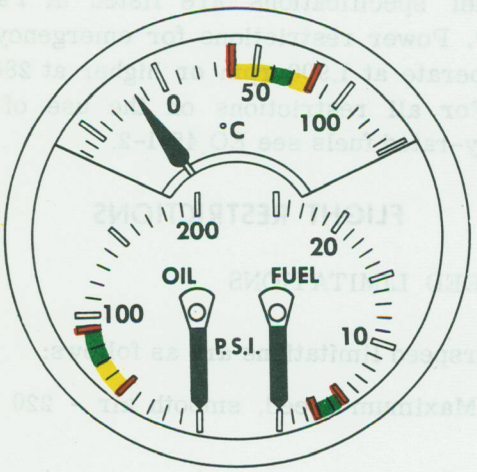


AIRSPEED

	220 Knots	Maximum Allowable (Smooth Air)

OIL TEMPERATURE

	40°C	Minimum In Flight
	40 – 60°C	Cautionary Range
	60 – 70°C	Normal
	70 – 85°C	Cautionary Range
	85°C	Maximum



OIL PRESSURE

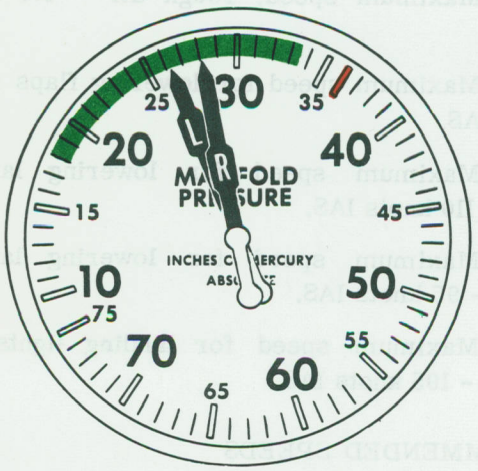
	50 psi	Minimum In Flight
	50 – 70 psi	Cautionary Range
	70 – 90 psi	Normal
	90 psi	Maximum

FUEL PRESSURE

	2.25 psi	Minimum
	3 – 5 psi	Normal
	5 psi	Maximum

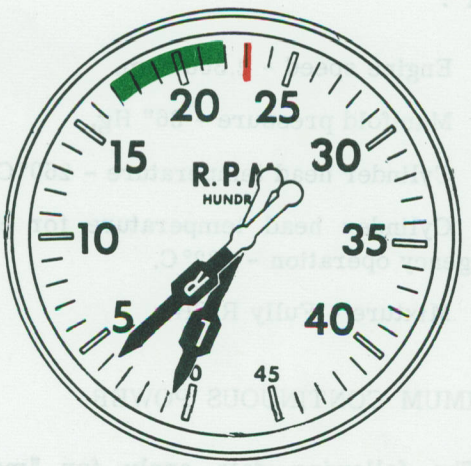
NOTE

Markings based upon 80/87 grade fuel.



MANIFOLD PRESSURE

	18 – 33.5" Hg	Cruising
	36" Hg	Maximum

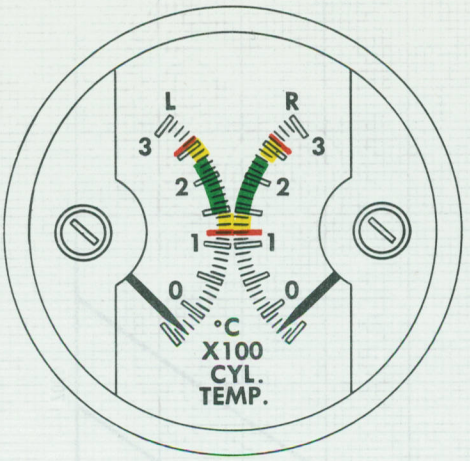


TACHOMETER

	1,700 – 2,200 rpm	Cruising
	2,300 rpm	Maximum Allowable

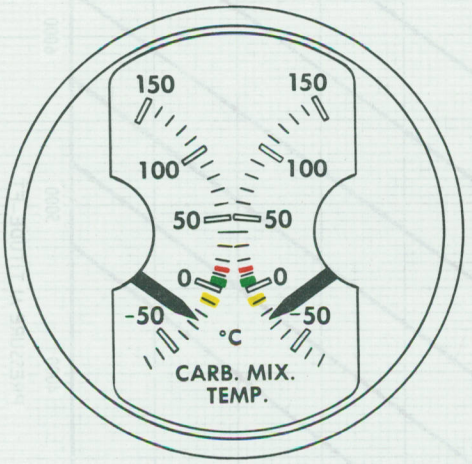
NOTE: 2,350 rpm – Maximum Overspeed

Figure 4-1 (Sheet 1 of 2) Instrument Range Markings



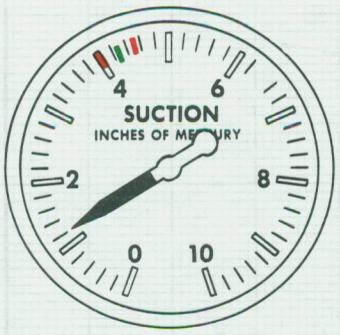
CYLINDER HEAD TEMPERATURE

120°C	Minimum
120 – 150°C	Cautionary Range
150 – 232°C	Normal
232 – 260°C	Cautionary Range
260°C	Maximum



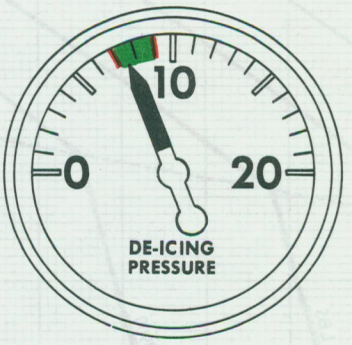
CARBURETTOR MIXTURE TEMPERATURE

15°C	Maximum
5 to 10°C	Normal
-3 to -10°C	Cautionary Range



SUCTION

4.00" Hg	Minimum	
4.25" Hg	Normal	
4.50" Hg	Maximum	



DE-ICING PRESSURE

7 psi	Minimum	
7 – 9 psi	Normal	
9 psi	Maximum	

Figure 4-1 (Sheet 2 of 2) Instrument Range Markings

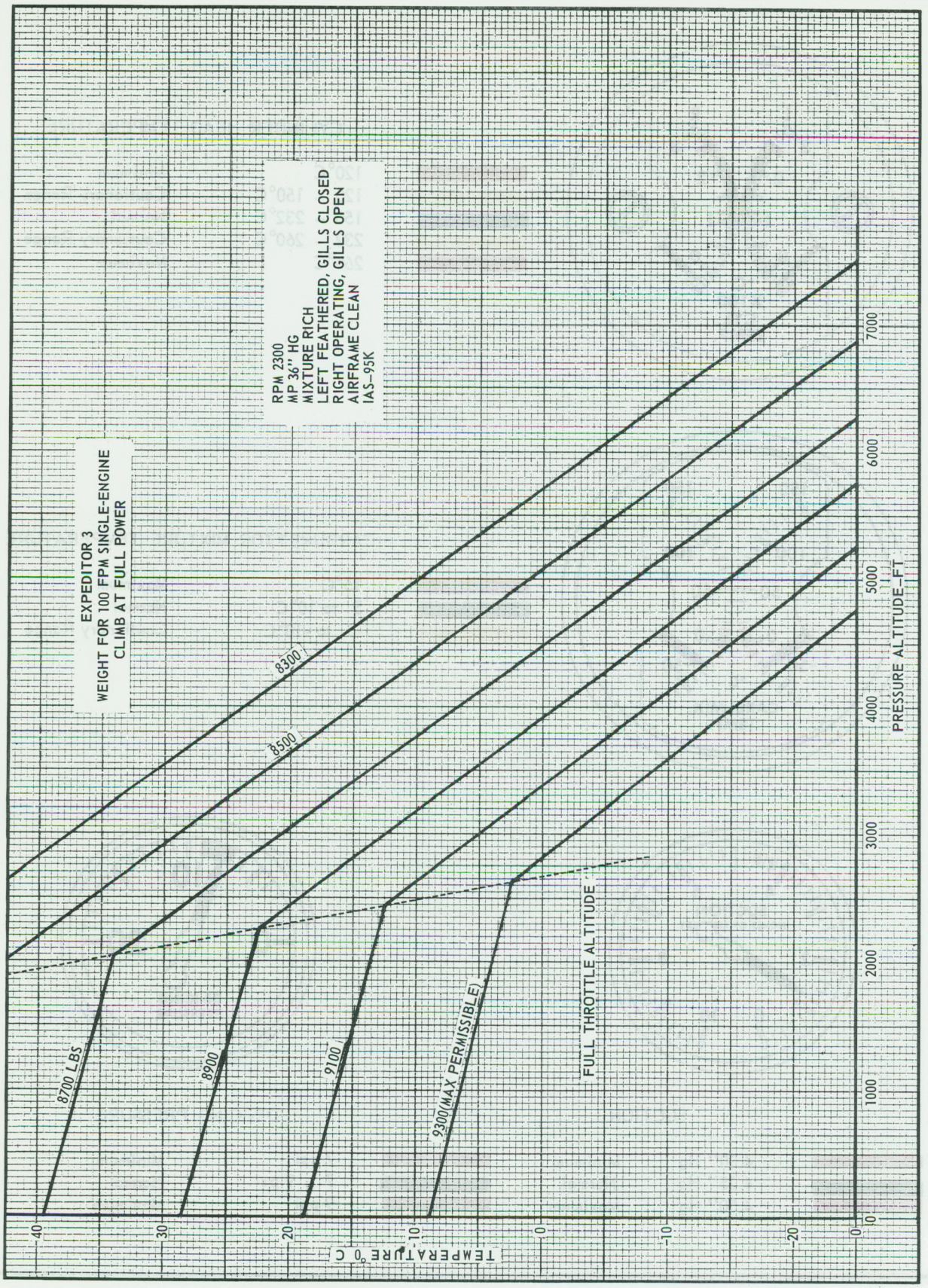


Figure 4-2 Weight for 100 FPM Single-Engine Climb at Full Power

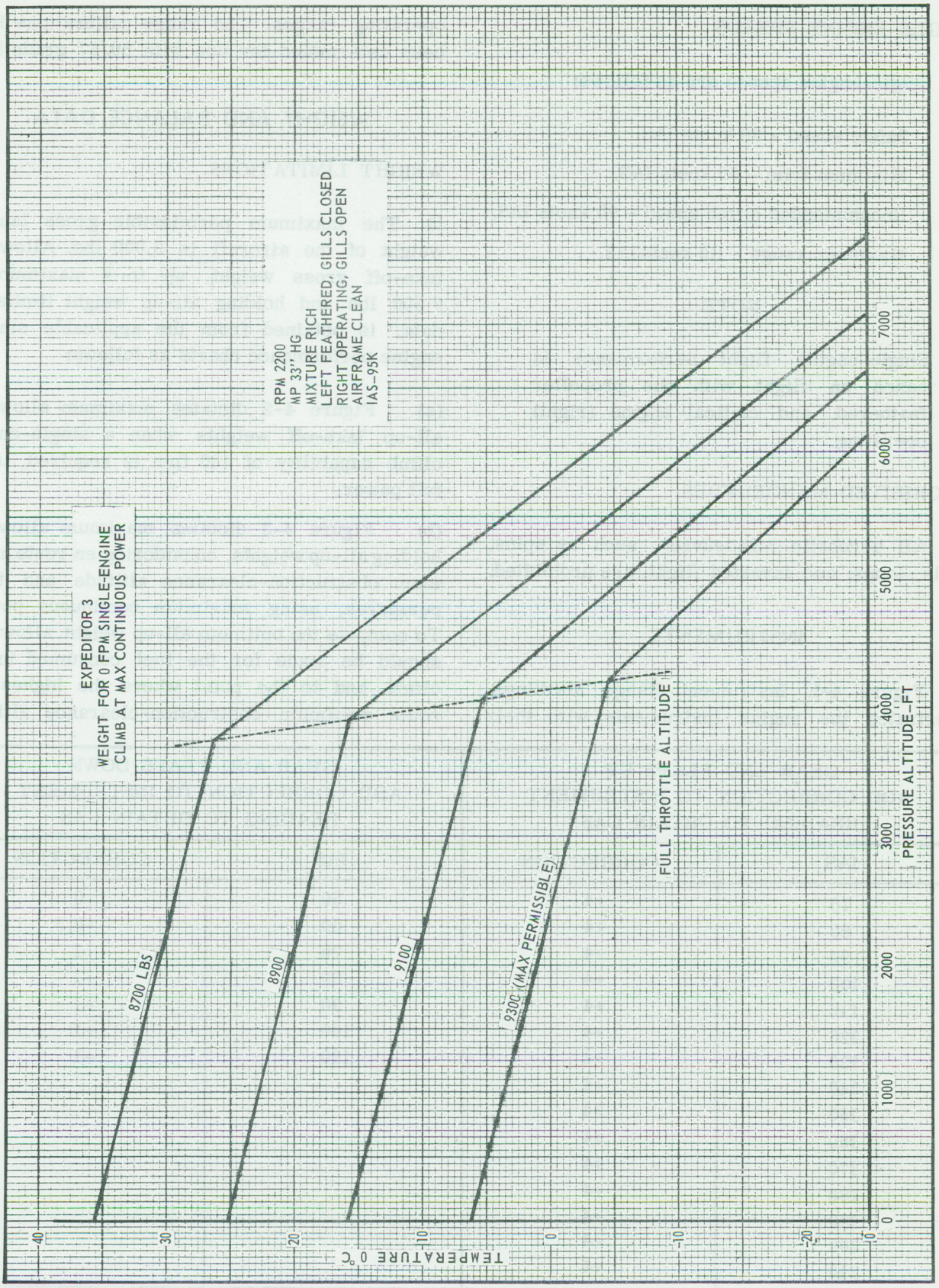


Figure 4-3 Weight for 0 FPM Single-Engine Climb at Maximum Continuous Power

SINGLE-ENGINE SPEEDS

9 Single-engine speeds are as follows:

(a) Safety speed - 90 knots IAS.

(b) Minimum trim - 90 knots IAS.

(c) Recommended climb speed - 95 knots IAS.

(d) Maximum range - 110 knots IAS.

NOTE

Single-engine flight performance is based on flight with one propeller feathered, and critical engine (right) operating.

PROHIBITED MANOEUVRES

10 All aerobatic manoeuvres, such as spins, rolls, loops, and inverted flight, are prohibited.

INSTRUMENTS

11 Figure 4-1, Instrument Range Markings, illustrates the engine instruments with their operating ranges. The range calibrations have been determined for use with 80/87 grade fuel.

WEIGHT AND BALANCE DATA

WEIGHT LIMITATIONS

12 The maximum permissible gross landing weight of the aircraft is 9,000 lbs. Allowable take-off gross weight, up to a maximum of 9,300 lbs and holding all-up weight limitation data, is obtained from the applicable single-engine performance charts as follows:

(a) Figure 4-2 dictates maximum allowable all-up take-off weights when a single-engine climb capability of 100 fpm is required, using full power.

(b) Figure 4-3 dictates maximum allowable holding all-up weights, considering en route minimum obstruction-clearance altitude and temperatures, using maximum continuous power. To compute the optimum all-up weight, allowance should be made for the fuel consumed in the climb and to the point where the highest en route minimum obstruction-clearance altitude

GEAR AND FLAPS UP ADD CORRECTION TO INSTRUMENT READING TO OBTAIN CAS		GEAR AND FLAPS DOWN ADD CORRECTION TO INSTRUMENT READING TO OBTAIN CAS	
IAS	CORRECTION	IAS	CORRECTION
70	+4	50	0
80	+4	60	+0.5
90	+4	70	+1
100	+4	80	+1
110	+4	90	+1
120	+4	100	+1
130	+4	110	+1
140	+4		
150	+4		
160	+4		
170	+4		
180	+4		
190	+4		
200	+4		
210	+4		

Figure 4-4 Position Error Correction Table

TAKE-OFF DISTANCES
(FEET)

MODEL: All Expeditor 3 models
ENGINES: Two R-985-AN-14B

Hard Dry Runway
No Flaps

CONFIGURATION AND GROSS WEIGHT (LBS)	PRESSURE ALTITUDE	-5 DEGREES CENTIGRADE				15 DEGREES CENTIGRADE				35 DEGREES CENTIGRADE				55 DEGREES CENTIGRADE			
		ZERO WIND		30 KNOT WIND		ZERO WIND		30 KNOT WIND		ZERO WIND		30 KNOT WIND		ZERO WIND		30 KNOT WIND	
		Ground Run	Clear 50 ft	Ground Run	Clear 50 ft	Ground Run	Clear 50 ft	Ground Run	Clear 50 ft	Ground Run	Clear 50 ft	Ground Run	Clear 50 ft	Ground Run	Clear 50 ft	Ground Run	Clear 50 ft
7500	SL	1166	1527	476	699	1226	1600	515	751	1359	1765	591	851	1659	2140	758	1073
	2000	1214	1587	515	749	1401	1816	620	888	1680	2160	771	1085	2050	2630	963	1349
	4000	1388	1800	614	879	1722	2220	790	1117	2135	2735	1007	1407	2550	3240	1244	1711
	6000	1743	2250	803	1136	2200	2815	1038	1448	2630	3340	1283	1765	3345	4240	1682	2299
	8000	2200	2810	1042	1450	2650	3360	1305	1738	3530	4460	1765	2408	4550	5730	2360	3188
8500	SL	1638	2013	718	958	1722	2106	783	1034	1910	2323	898	1173	2330	2817	1126	1455
	2000	1705	2087	764	1013	1967	2389	923	1204	2360	2850	1118	1449	2880	3462	1433	1832
	4000	1950	2370	915	1199	2420	2922	1175	1515	3000	3602	1500	1914	3580	4275	1840	2325
	6000	2450	2956	1200	1543	3090	3708	1552	1978	3690	4402	1905	2403	4700	5579	2480	3103
	8000	3090	3708	1554	1980	3720	4435	1925	2426	4960	5882	2650	3306	6400	7552	3490	4319
9300	SL	2090	2460	970	1200	2200	2570	1030	1300	2440	2840	1210	1460	2980	3440	1500	1810
	2000	2180	2550	1040	1300	2510	2910	1240	1500	3010	3480	1520	1800	3680	4230	1910	2270
	4000	2490	2890	1120	1500	3090	3560	1560	1900	3820	4390	1970	2350	4570	5210	2440	2900
	6000	3125	3580	1610	1900	3940	4490	2070	2450	4720	5360	2500	3000	6000	6830	3300	3880
	8000	3940	4530	2050	2450	4750	5420	2550	3000	6340	7180	3500	4100	8170	9200	4550	5400

DATA AS OF: 10-15-52
DATA BASIS: Flight Tests

FUEL GRADE: 80/87
FUEL DENSITY: 7.2 lb/Imp. gal

Figure 4-5 Take-Off Distances

is reached. Limitations imposed by this chart may be waived when suitable en route conditions exist.

NOTE

Full power may be used as long as required under emergency conditions.

C of G LIMITATIONS

13 The centre-of-gravity range, with the landing gear extended is 109.8 inches (18.9% MAC) to 117.7 inches (27.1% MAC) from the reference datum. As the landing gear is retracted, the C of G moves aft. Datum point is 102 inches forward of the centre line of the main spar.

WEIGHT AND BALANCE

14 For complete details of weight and balance for Expeditor aircraft, refer to EO 05-45B-8, Weight and Balance Data.

POSITION ERROR CORRECTION

15 Figure 4-4 shows the position error correction for the airspeed indicator.

PART 5

FLIGHT TESTING

INTRODUCTION

1 The procedures detailed in this part are to be observed during all flight testing of the aircraft and its systems. The flight profile is shown in Figure 5-1. The flight test card is shown in Figure 5-2. The following rules also apply:

(a) All maintenance flight testing shall be carried out in accordance with CFP 100, art 2.95; EO 00-50-20, Part 4; and Parts 2, 3, and 4 of this EO.

(b) All pertinent flight details shall be recorded on the test card.

(c) Weight and balance shall be checked as shown in EO 05-45B-8, ensuring they are within specified limits.

(d) Flight data readings shall be taken from the pilot's instruments.

NOTE

The test procedures detailed in this part do not relieve the test pilot from complying with the procedures and checks laid out in Parts 1 to 4 of this EO and the Expeditor Check List, CFP 146(3). Items that are checked in normal operations are not detailed in this part unless amplification is required.

BEFORE FLIGHT

PRE-EXTERNAL CHECK

2 Carry out the pre-external check as listed in Part 2. In addition check exterior lights; standby compass light (spare bulbs); instrument lighting; map, cabin, and extension lights.

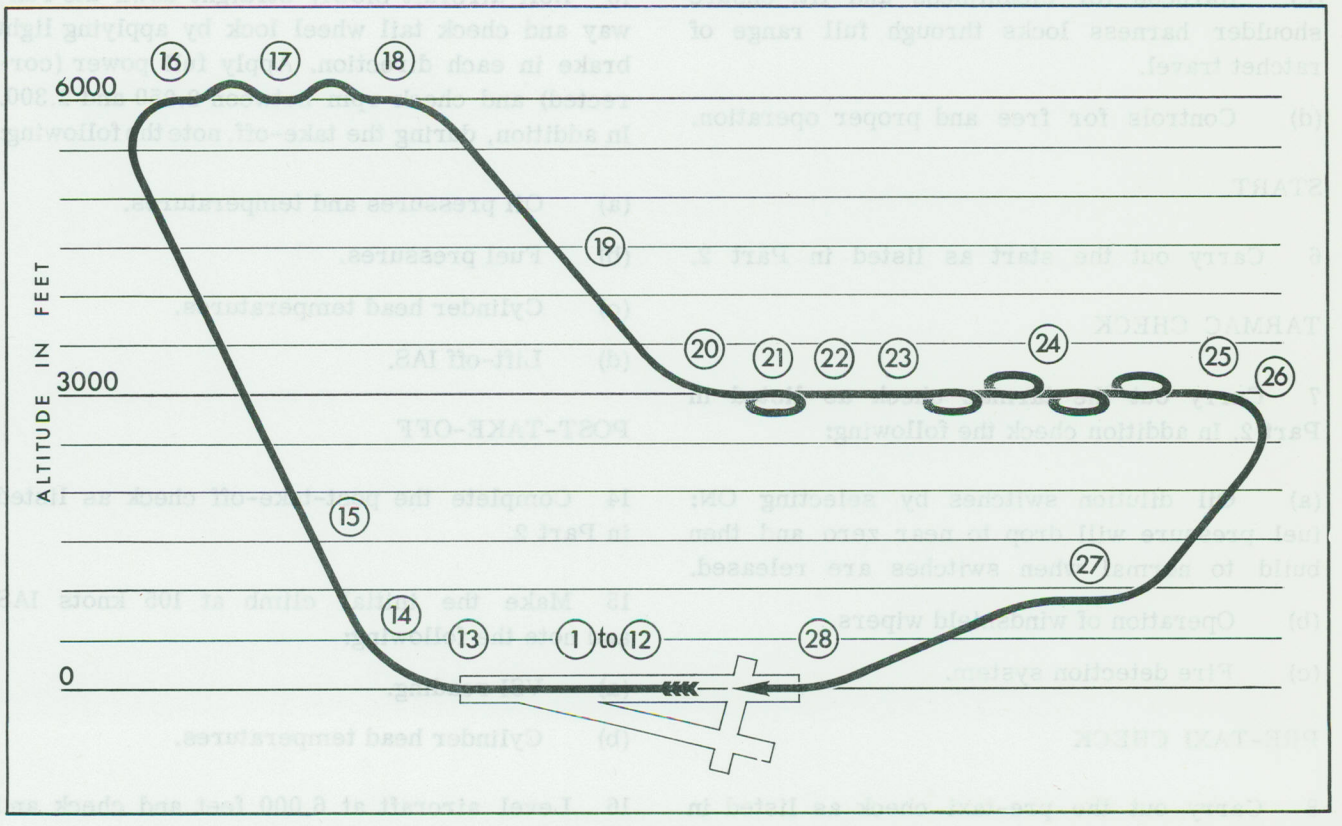


Figure 5-1 Flight Test Profile

EXTERNAL CHECK

3 Carry out the external check as listed in Part 2 and Figure 2-1. In addition, check and note the following:

(a) Excessive play in landing gear doors, control surfaces, or trim tabs.

(b) Condition of painted surfaces.

INTERNAL CHECK

4 Carry out internal check as listed in Part 2.

PRE-START CHECK

5 Carry out the pre-start check as listed in Part 2. In addition record/check the following:

(a) Difference between OAT and carburettor mixture temperature gauges.

(b) Pilot's and co-pilot's seats for full travel.

(c) Harness for cleanliness and fit; ensure shoulder harness locks through full range of ratchet travel.

(d) Controls for free and proper operation.

START

6 Carry out the start as listed in Part 2.

TARMAC CHECK

7 Carry out the tarmac check as listed in Part 2. In addition check the following:

(a) Oil dilution switches by selecting ON: fuel pressure will drop to near zero and then build to normal when switches are released.

(b) Operation of windshield wipers.

(c) Fire detection system.

PRE-TAXI CHECK

8 Carry out the pre-taxi check as listed in Part 2.

TAXIING

9 While taxiing, check brakes, operation of tail wheel lock, flight instruments, and navigation instruments. TACAN to be checked against a known radial and distance.

PRE-RUN-UP CHECK

10 Carry out the pre-run-up check as listed in Part 2.

RUN-UP

11 Carry out the run-up as listed in Part 2.

PRE-TAKE-OFF CHECK

12 Carry out the pre-take-off check as listed in Part 2.

IN FLIGHT

TAKE-OFF

13 Roll aircraft slowly straight down the runway and check tail wheel lock by applying light brake in each direction. Apply full power (corrected) and check rpm between 2,250 and 2,300. In addition, during the take-off, note the following:

(a) Oil pressures and temperatures.

(b) Fuel pressures.

(c) Cylinder head temperatures.

(d) Lift-off IAS.

POST-TAKE-OFF

14 Complete the post-take-off check as listed in Part 2.

15 Make the initial climb at 105 knots IAS and note the following:

(a) VSI reading.

(b) Cylinder head temperatures.

16 Level aircraft at 6,000 feet and check and note the following:

EXPEDITOR AIR TEST CARD

DATE	AIRCRAFT NO.	TESTED FOR	PILOT

TIME UP	TIME DOWN	TOTAL TIME	AERODROME ELEVATION	OAT

SPECIAL NOTICES

1 THIS CARD IS TO BE USED IN CONJUNCTION WITH EO 05-45B-1, PART 5 – FLIGHT TESTING. THE NUMBER BESIDE EACH SEQUENCE CORRESPONDS TO THE EQUIVALENT PARA NUMBER IN PART 5.

2 PRE-EXTERNAL		
FUEL CONT GAUGE (ACCURACY)		
AIRCRAFT LIGHTING		
CLEANLINESS (COCKPIT, CABIN)		
3 EXTERNAL		
HINGE PLAY		
LANDING GEAR DOORS		
CONTROL SURFACES		
TRIM TABS		
CONDITION OF PAINT		
4 INTERNAL		
5 PRE-START		
OAT & CARB MIX TEMP		
FIELD BAROMETRIC PRESS		
COCKPIT SEATS (TRAVEL)	L	R
HARNESSES	L	R
CONTROLS	L	R
6 START		
SUCTION RIGHT ENGINE		
7 TARMAC CHECK		
OIL DILUTION SWITCHES	L	R
WINDSHIELD WIPERS		
FIRE DETECTION SYSTEM		
8 PRE-TAXI		
9 TAXIING		
BRAKES, FLIGHT AND NAVIGATION INSTRUMENTS		

10 PRE-RUN-UP		
11 RUN-UP		
AT 1,500 RPM:		
PITCH	L	R
FEATHERING	L	R
MIXTURE	L	R
MANIFOLD HEAT	L	R
AT FBP:		
RPM	L	R
MAG DROP	L	R
OIL TEMP AND PRESSURE	L	R
FUEL PRESSURE	L	R
CHT	L	R
IDLE RPM (GENERATOR LIGHT ON)	L	R
12 PRE-TAKE-OFF		
13 TAKE-OFF		
TAIL WHEEL LOCK		
FULL POWER RPM	L	R
OIL PRESSURE	L	R
OIL TEMPERATURE	L	R
FUEL PRESSURE	L	R
CHT	L	R
IAS AT LIFT-OFF		
14 POST-TAKE-OFF		
15 CLIMB		
VSI	L	R
CHT	L	R

FTC-6

16 6,000 FEET		
TAS		
CONTROLS		
17 STALLS		
CLEAN		
LANDING ATTITUDE		
18 FEATHERING	L	R
19 MAX SPEED RUN		
RPM	L	R
DE-ICER BOOTS		
PANELS		
20 LEVEL 3,000 FEET		
21 PROP GOVERNING (TURNS)	L	R
22 ANCILLARIES		
THROTTLE SPLIT		
PITCH LEVER SPLIT		
MIXTURE LEVER SPLIT		
CROSS-FEED (FUEL PRESS)		
FUEL FEEDING	L	R
OIL COOLING	L	R
HEAT, VENT, & DEFROST	L	R
BOOTS	L	R
GENERATORS	L	R
23 TEMPERATURES AND PRESSURES		
CHT	L	R
FUEL	L	R
OIL PRESSURE	L	R
OAT		
SUCTION		
24 FLIGHT INSTRUMENTS		
COMPASSES		
T&S INDICATOR	L	R
ATTITUDE INDICATOR	L	R
DI		
VSI	L	R
ASI	L	R

25 RADIO AND NAVIGATION EQUIPMENT			
UHF/VHF			
MHF			
ARC			
TACAN			
26 LANDING GEAR			
EMERGENCY LOWERING			
WARNING HORN			
WARNING LIGHTS			
27 ILS			
AUDIO			
MARKER SENSITIVITY:			
AIRWAY	OUTER	INNER	
LOCALIZER FLAG			
GLIDE PATH FLAG			
28 POST-LANDING			
IDLE RPM	L	R	
SUCTION			
OIL LEAKS			
FLIGHT TEST CARD AND AIRCRAFT MAINTENANCE RECORD SET			

REMARKS

SERVICEABLE ☐ UNSERVICEABLE ☐

TEST PILOT

Figure 5-2 Flight Test Card

(a) 150 to 155 knots TAS with aircraft in stabilized cruising flight at 1,800 rpm and maximum permissible MP (mixture RICH and cowl gills closed).

(b) Flight controls and trims for smoothness of operation and travel. Both slip indicators should be centred when aircraft is fully trimmed (hands and feet off).

STALLS

17 Complete the pre-stall check as listed in Part 2, then carry out stalls in landing attitude and clean configuration; note stalling speeds.

FEATHERING

18 Propeller should normally feather within 5 to 7 seconds and should not rotate once feathered.

MAXIMUM SPEED RUN

19 Apply full power and dive aircraft to maximum speed (220 knots IAS). Ensure engines are not overboosted. During the dive check the following:

(a) Rpm for overspeeding.

(b) De-icer boots for rippling.

(c) Panels for security.

20 Level off at 3,000 feet.

PROPELLER GOVERNING

21 Set power at 2,000 rpm and 28" MP. Place the aircraft in a 60-degree bank turn and maintain altitude. If propellers do not stay synchronized, governors are not functioning properly and will have to be adjusted or changed.

ANCILLARIES

22 Set power at cruise and check the following:

(a) Maximum throttle lever split - 1/8 inch.

(b) Maximum pitch lever split - 1/2 inch.

(c) Maximum mixture lever split - 1/2 inch (mixtures properly leaned out).

(d) Cross-feed - For 1 to 2 minutes. There should be no drop or fluctuation of fuel pressure during cross-feeding. Record fuel pressures during the check.

(e) Fuel feeding - Ensure each engine is fed from its main and rear tanks and that both engines are fed from the nose tank.

(f) Oil cooler operation - Range should be 20 to 30 degrees between fully hot and fully cold. (Do not allow oil temperature to drop below 40° C or rise above 85° C. When the check is complete reset oil temperature at 65° C.)

(g) Heat, vent, and defrost systems for effectiveness.

(h) De-icer boot operation - Boots inflate properly and cycle in the following order: main wing outboard, main wing inboard, and horizontal stabilizer. Also ensure that the boots are inflating in pairs and note pressure.

(j) Generators - Balanced within 10%.

TEMPERATURES AND PRESSURES

23 Note these temperatures and pressures:

(a) CHT.

(b) Fuel pressure.

(c) Oil pressure (with oil temperature at 65° C).

(d) OAT.

(e) Suction 4.25 ±.25 lbs.

FLIGHT INSTRUMENTS

24 Check flight instruments as follows:

(a) Using known headings (i.e. section lines); compare C2, B16, and DRMI; maximum error: C2, ±3 degrees; B16, ±7 degrees. Before taking the reading the aircraft must be held steady at constant airspeed and altitude for 2 to 3 minutes. Also the following electrical equipment must be on:

(1) VHF and UHF radios.

(2) MHF (if carried).

(3) Isolation amplifier and interphone.

(4) Inverter.

(5) Gyro compass slaving switch.

(6) Generators.

(7) Compass light.

(8) TACAN (if carried).

(b) Turn-and-slip indicators by timing an indicated Rate 1 turn through 180 degrees in both directions. The tolerance on the pilot's turn-and-slip indicator is ±12 seconds, and on the co-pilot's ±6 seconds.

(c) Attitude indicator by completing a 45-degree bank turn through 180 degrees in each direction and checking annunciator on rolling out between turns.

(d) Directional indicator should not precess more than 3 degrees in 15 minutes.

(e) VSIs by comparing rates in climb and descent. VSIs should agree within 100 fpm and should read zero when aircraft is in straight and level flight.

(f) ASIs - Maximum acceptable difference is 3 knots.

RADIO AND NAVIGATION EQUIPMENT

25 Check radio and navigation equipment as follows:

(a) UHF and/or VHF transceivers on at least three channels.

(b) MHF (if carried) on at least two stations.

(c) Radio compass - Select antenna position and check calibration on at least two known stations (maximum error 3 kHz). Select compass position and ensure that pointer indicates correct bearing within 10 seconds. Pointer should not oscillate more than ±3 degrees once on the station. Select loop position and CW switch on; a clear, well-defined null should be obtainable. Check manual left/right switch in slow and fast speed positions.

(d) TACAN - Ensure that correct TACAN information is displayed continuously.

LANDING GEAR

26 Check landing gear system as follows:

(a) Reduce IAS to 110 knots or below and carry out an emergency landing gear lowering as listed in Part 3, ensuring that the system functions properly.

(b) Landing gear warning horn comes on at 12 to 15" MP with gear up.

(c) Landing gear warning lights give proper indication during lowering and retraction.

ILS SYSTEM

27 The following check can be completed during an ILS approach. Marker to be set at LOW.

(a) ILS audio - Free of static.

(b) Marker sensitivity - Audio should be satisfactory on each marker and should be activated for the following times:

Airway marker	10 - 15 sec.
Outer marker	7 - 13 sec.
Inner marker	3 - 7 sec.

(c) Localizer alarm flag - Not visible within 9 nm from O.M.

(d) Glide path alarm flag - Not visible within 3 nm from O.M.

POST-FLIGHT

28 After landing complete post-landing check as listed in Part 2. In addition, before and during shut-down, check the following:

(a) Idle rpm (500 - 600 rpm) - Record with aircraft stopped, throttles fully retarded, and pitch fully fine.

(b) Suction - On left engine (if right engine was started first).

(c) Oil leaks - In area of engines, propellers, and shock struts.

(d) Complete Flight Test Card and Aircraft Maintenance Record Set.

APPENDIX "A"

TELECOMMUNICATION AND NAVIGATION EQUIPMENT IN EXPEDITOR AIRCRAFT NOT EQUIPPED WITH TACAN

GENERAL DESCRIPTION

1 The aircraft has one 190-550 kilohertz range receiver, a radio compass receiver and indicator, a 24-channel VHF transceiver, a marker beacon receiver, ILS localizer and glide path receivers and indicator, an interphone system, and an isolation amplifier system. Radio controls are located on a master control panel, mounted overhead in the pilot's compartment. The electronic units are mounted on racks at the rear of the lavatory compartment. All antennae are external. Reception may be heard either through headphones or from speakers mounted behind the pilot's and co-pilot's seats. Spare miniature bulbs for instrument illumination are inserted into threaded holes in the panel.

COMMAND INSTALLATION

2 The equipment used in the Command installation consists of a range receiver. The installation provides an aural LF range signal for pilots and navigators. Under ideal conditions the range of the receiver is between 100 and 200 miles. The receiver has a three-position function switch, marked CW, OFF, and MCW, as well as a crank handle tuner and a volume control. MCW is selected for Command purposes and CW for navigational purposes and for increasing the range.

RADIO COMPASS (ARN7)

3 The radio compass is used for manually controlled or automatic radio direction finding. Automatic DF is accomplished by a null-seeking, closed-servo system, when the function switch is in the COMPASS position. The radio compass is operated by the pilot on all Expeditor versions, and also by the rear navigator on 3NM aircraft. The equipment can receive over a range of up to approximately 100 miles.

RADIO COMPASS TRANSFER BUTTON

4 When the compass transfer button is depressed, the control between the pilot and navigator alternates and may be used for either taking or giving control.

COMPASS FUNCTION SWITCH

5 The function switch has four positions: OFF, COMP, ANT, and LOOP. A green indicator to the left of the switch indicates that the compass is on. If it is not illuminated, depress the transfer switch.

TUNING DIAL

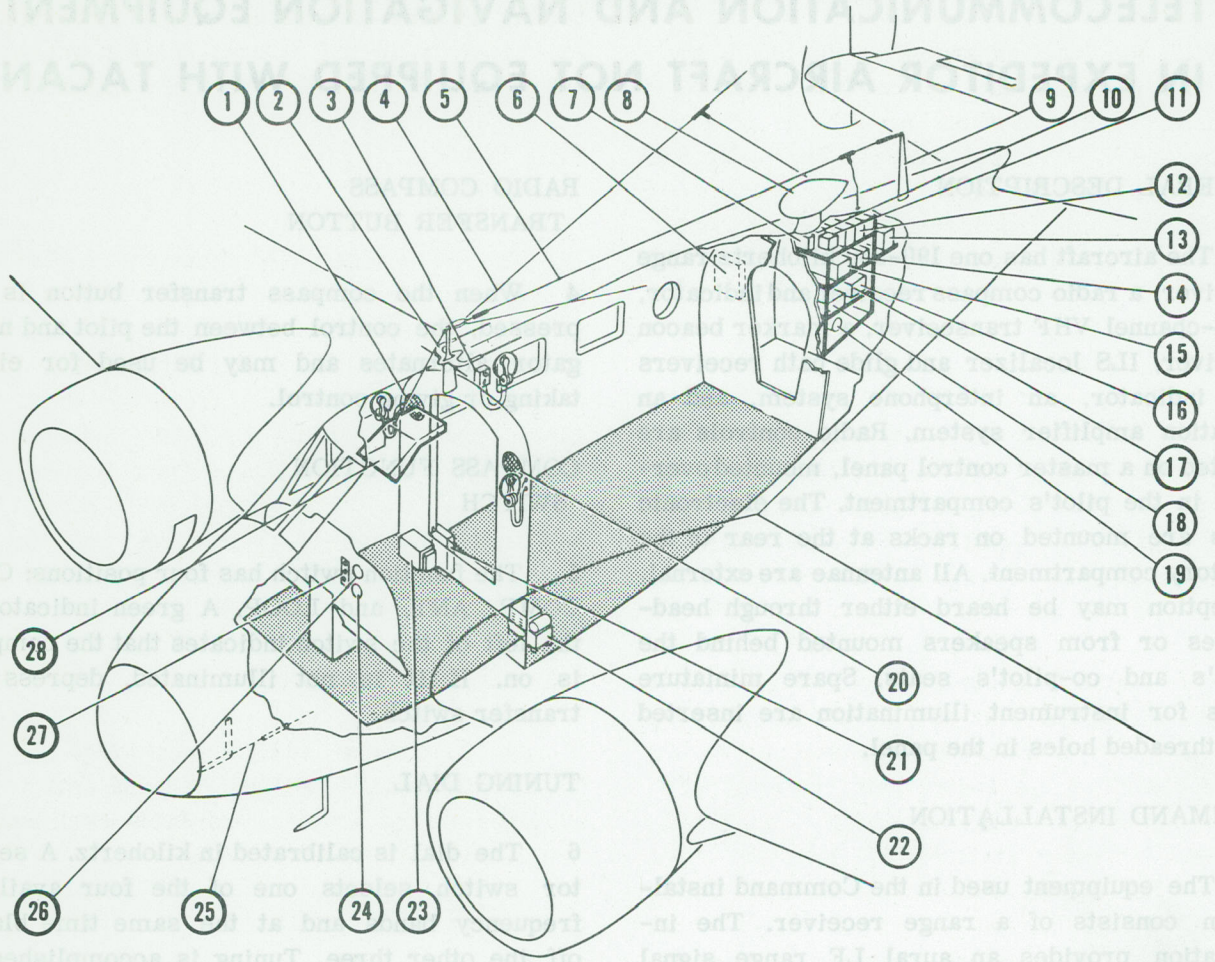
6 The dial is calibrated in kilohertz. A selector switch selects one of the four available frequency bands and at the same time blanks off the other three. Tuning is accomplished by a crank on the lower left corner of the panel.

COMPASS TUNING METER

7 With the function switch on COMP, station resonance may be obtained by adjusting the tuning crank until the tuning meter indicates a maximum deflection.

COMPASS CW AND VOICE SWITCH

8 Either selection may be made, depending on the type of the transmitting source. Selection of CW also increases the range of the equipment to receive distant stations. The light rheostat controls illumination of the two compass instruments, the tuning meter and the range dial. Receiver volume is adjusted by the AUDIO gain control.



1 CO-PILOT'S SPEAKER
2 LOCALIZER AND GLIDE PATH DI-POLE ANTENNA
3 FORWARD CABIN JUNCTION BOX
4 SCR274 ANTENNA (MHF)
5 RADIO COMPASS SENSE ANTENNA
6 NO. 9 BULKHEAD JUNCTION BOX
7 NO. 10 BULKHEAD JUNCTION BOX
8 RADIO COMPASS LOOP ANTENNA
9 ICA67 VHF ANTENNA
10 INTERPHONE AMPLIFIER
11 ANTENNA RELAY
12 RECEIVERS BC453B, BC454B, BC455B (PART OF SCR274 INSTALLATION)
13 MARKER RECEIVER MN53B
14 TRANSMITTERS BC458A AND BC696A OR BC457A (PART OF SCR274 INSTALLATION)
15 VHF TRANSCEIVER ICA67
16 MODULATOR BC456 (PART OF SCR274 INSTALLATION)
17 ISO-AMPLIFIER (OUTBOARD OF MODULATOR)
18 RADIO COMPASS RECEIVER
19 RADIO COMPASS INVERTER
20 PILOT'S SPEAKER
21 NO. 5 BULKHEAD JUNCTION BOX
22 LOCALIZER RECEIVER BC733
23 GLIDE PATH RECEIVER R89B
24 RADIO COMPASS INDICATOR
25 MARKER AND RANGE ANTENNA
26 LOCALIZER AND GLIDE PATH CROSS POINTER INDICATOR
27 MARKER INDICATOR LIGHTS
28 MASTER RADIO CONTROL PANEL

Figure A-1 Radio Equipment Location

LOOP L/R CONTROL

9 With the function switch in the LOOP position, the antenna may be rotated manually to obtain the "null" position. Rotation is governed by the LOOP left-right control. Two nulls will be received in 360 degrees. When this control is depressed and the desired direction selected, the loop is driven at a greater speed.

MARKER BEACON RECEIVER
(BENDIX MN53B)

10 The function of the marker beacon system is to detect either the cone (Z) beacons on the airways, fan markers, or the landing field approach beacons. The system may be controlled by either the pilot or the co-pilot. Reception is possible to the service ceiling of the aircraft.

11 The marker beacon receiver is pre-set to receive a 75-megahertz modulated signal. Power to the receiver is controlled by a selector switch in the centre of the switch bank, marked OFF, LOW, and HIGH. Selection of HIGH sensitivity in effect increases the area of reception of the beacon. The indicator lights mounted vertically in the centre of the main instrument panel illuminate upon detection of their appropriate beacon (blue - outer, white - airway, and amber - inner).

12 The audio portion of the beacon can be selected by an ON/OFF switch on the upper panel row. The volume is pre-adjusted and is constant with the isolation amplifier ON or OFF.

ILS RECEIVERS AND
INDICATORS

13 The instrument landing system incorporates two receivers, glide path (ARN5) and localizer (BC733), and a cross pointer indicator (ID48A) incorporating a flag alarm within each function which indicates either source or equipment failure. The range of the glide path receiver is at least 15 miles, and that of the localizer receiver at least 25 miles. An ILS OFF switch controls the installation and a six-position function switch (ILS SEL), marked U to Z, selects glide path and localizer frequencies for a particular runway approach. Also incorporated in the panel is an ILS volume control which may be used to adjust station identifier volume.

VHF TRANSCEIVER
(ARC502)

14 The 24-channel VHF transceiver (ARC502) is remotely controlled from the overhead VHF panel. Channels are marked 1 to 24 and correspond to installed crystal frequencies, which are recorded on a radio frequency card. The card, together with an ON/OFF switch, a DF tone button, and a master volume control knob are located on the overhead radio panel. Two subsidiary volume control knobs, one for the pilot and one for the co-pilot, are situated on the radio panel below the VHF selector knob.

INTERPHONE SYSTEM

15 An interphone system controlled by the INTERPHONE/OFF switch, located next to the compass tuning meter, facilitates communication between all crew members.

ISOLATION AMPLIFIER

16 The isolation amplifier, in conjunction with the individual audio selection switches, permits the pilot and co-pilot to select separately any desired combination of receivers. The switch for this unit is located midway along the right side of the radio panel; it should be selected ON whenever any of the radio equipment is to be used.

JACK BOX
(BC366)

17 In aircraft so equipped, both navigators and the instructor have jack boxes. A selector switch, mounted on the face of the box, is marked COMP, VHF, COMMAND, INTER, and CALL. The forward navigator and instructor have the use of INTER and CALL, and the rear navigator, in addition, can control the radio compass (COMP). Selection of CALL overrides all operating radio systems. A pair

of two-pin receptacles on the face of the box accommodates the headphones and microphones. The boxes contain individual volume controls.

OTHER CONTROLS

18 The SPEAKER/PHONE selector switches, marked PILOTS and CO-PILOTS, may be selected for use with any equipment. Selection of the microphone-operating switch automatically directs the side tone to the headphones. The microphone selector switch enables selection for transmission on any available system. The voice/range filter switches (five-position switches, one operated by the pilot and the other by the co-pilot) permit the selection of VOICE, RANGE, or both on compass and range receivers when listening to simultaneous range transmission.