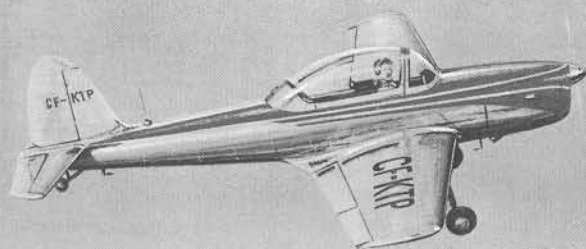




Chipmunk

DHC-1B-2

**FLIGHT
MANUAL**

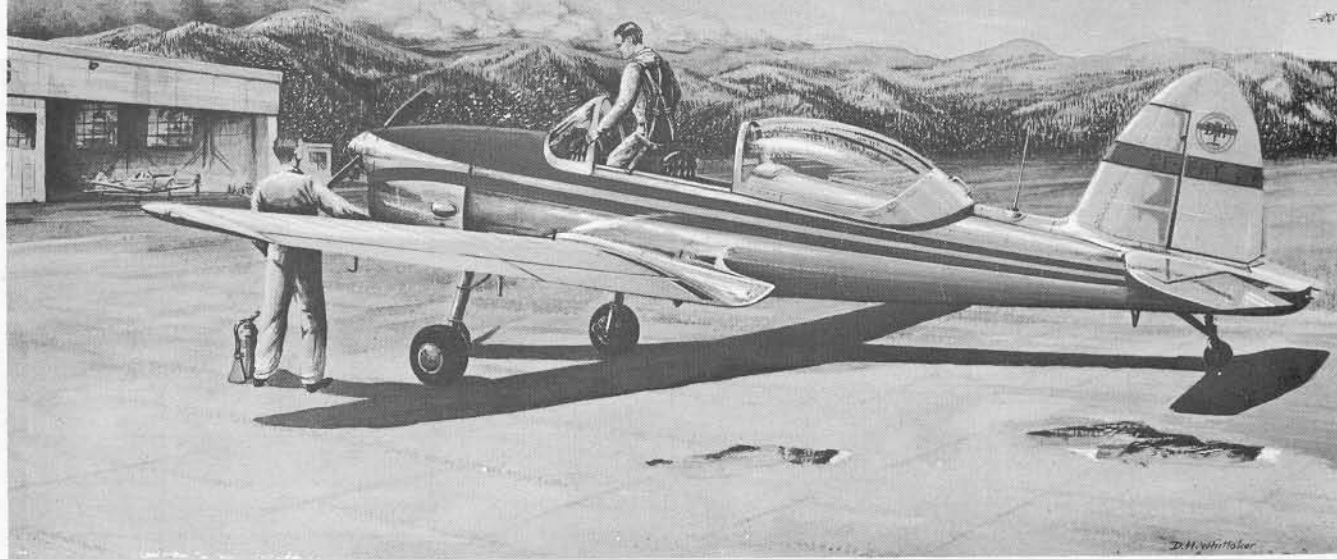


The de Havilland

Chipmunk

FLIGHT MANUAL

THE DE HAVILLAND AIRCRAFT OF CANADA LTD.
POSTAL STATION 'L' TORONTO, ONTARIO



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INTRODUCTION

This manual has been compiled to familiarize the pilot, in all relevant aspects, with the airplane. For convenience of use the manual has been divided into four Parts and an Appendix as follows:-

PART I DESCRIPTION

This part describes in detail, the aircraft, its systems and all controls that are essential for flight.

PART II HANDLING

This part contains normal handling operating instructions arranged in sequence from the time the pilot approaches the aircraft until he leaves at the end of a flight.

PART III EMERGENCY HANDLING

This part contains operating instructions arranged in sequence for the emergency handling of the aircraft.

PART IV OPERATING DATA

This part details the operating limitations and performance data which must be adhered to for safe operation of the aircraft.

APPENDIX WEIGHT AND BALANCE CHARTS

These charts should be consulted before every flight to ensure that the aircraft is loaded with as safe limits.

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WEIGHT AND BALANCE TABLES AND CHARTS

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A-2	Safe Moments Table
A-3	Operational Load Table
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Part
1



DESCRIPTION

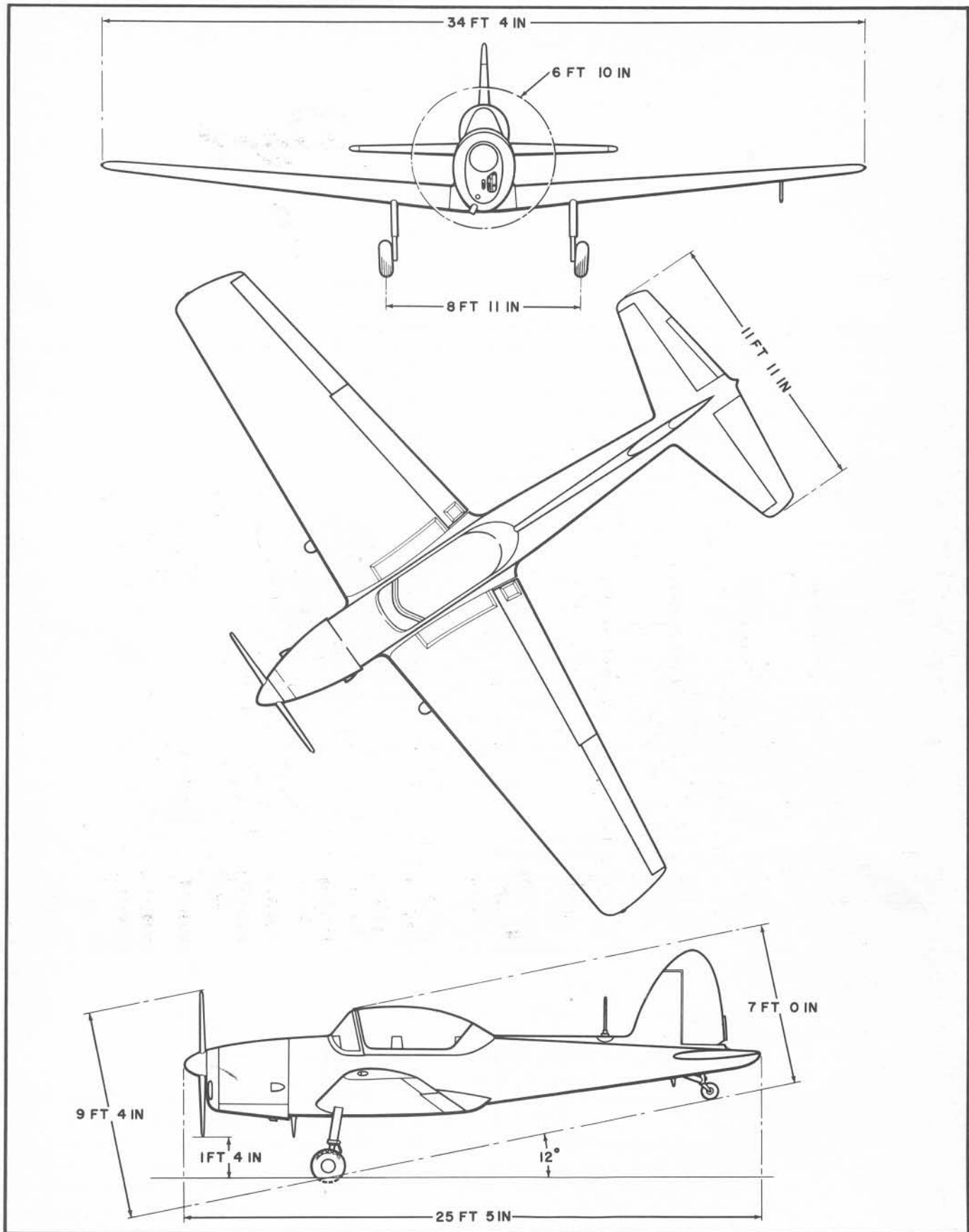


Figure 1-1 Aircraft Dimensions

PART 1

DESCRIPTION

INTRODUCTION

General

1 The DHC-1B Chipmunk is low wing, single engine monoplane of metal construction designed for elementary flying instruction. It accommodates two in tandem arrangement with duplicate controls and instruments in each cockpit. The landing gear is non-retractable, with a fully castoring tailwheel. The main wheels are fitted with hydraulically operated brakes.

Power Plant

2 The aircraft is powered by either a DH Gipsy Major C1G, or 10 Mk 1-3 engine. Both of these series are four cylinder in line, inverted, air cooled engines developing 140 bhp at sea level. The engine has a direct drive to the propeller.

3 The aircraft is equipped with a fixed pitch Fairey Reid metal propeller.

Airframe

4 The fuselage is of all metal semi-monocoque construction. The forward section contains the two cockpits which are covered by a single hood. The windshield structure serves as a crash pylon to protect the occupants in case of a roll-over.

5 The wings are of cantilever construction incorporating an all metal "D" nose box beam which carries flight and landing loads. A fabric covered rear section containing a false spar supports the flaps and ailerons.

6 The tail assembly comprises an all metal horizontal stabilizer and fin, and fabric covered elevators and rudder. The right elevator is fitted with a trim tab adjustable in flight from either cockpit, the rudder is fitted with a trim tab adjustable on the ground.

Hood

7 The one piece Plexiglas bubble type hood (Figure 1-6) slides on three rails. The hood may be locked in four positions, open, 1/4 open, 1/2 open or closed, by a lock pin which engages in corresponding holes in the centre rail. The lock is operated by handles which are accessible from inside the aircraft, or an external pushbutton at the rear of the hood.

LEADING PARTICULARS

Overall Dimensions

8 The main dimensions are as follows:

Length	25 ft 5 in.
Span	34 ft 4 in.
Height	7 ft 0 in.
Wheel Track	8 ft 11 in.

Weight

9 The maximum gross weight of the aircraft is 2000 lb.

Tank Capacities

10 Tank Capacities are as follows:

Fuel	27 Imp gal (32.4 U.S. gal)
Oil	2 2/3 Imp gal (3.2 U.S. gal)

FUEL SYSTEM

General (See Figure 1-2)

11 Fuel is contained in two Pliocel synthetic rubber fuel cells located in the "D" nose of the wing roots. Each cell has a capacity of 13 1/2 Imp gal and is equipped with a mechanically operated float type fuel contents gauge, the indicator being mounted flush with the upper surface of the wing. The cells are not interconnected.

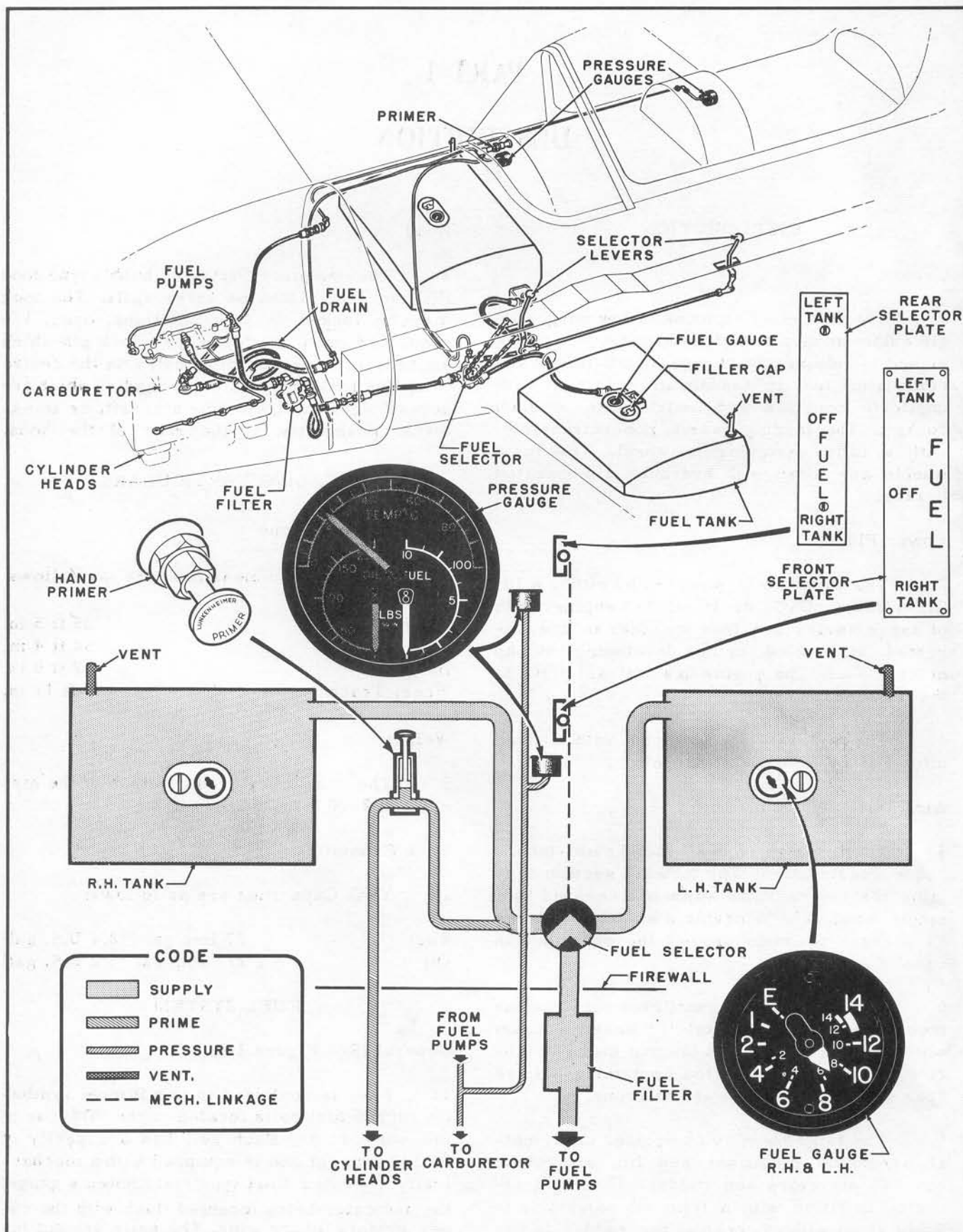


Figure 1-2 Fuel System

Fuel Selector Lever

12 A fuel selector lever (35, Figure 1-5) is located forward and left of the control column base in each cockpit. The levers are interconnected and operate the fuel selector valve through a mechanical linkage. The positions are marked RIGHT TANK, OFF, and LEFT TANK.

Fuel Pressure Gauge

13 A combined fuel pressure and oil temperature and pressure gauge (18, Figure 1-5) is located on the right hand side of the instrument panel.

Fuel Contents Gauge

14 The fuel contents gauges (50, Figure 1-5), located one on each wing, are graduated in white and green figures. The white figures indicate contents in flying attitude while the green figures indicate contents in the 3 point attitude. When night flying the gauges can be illuminated by pressing the push button (1, Figure 1-5) to the left of the instrument panel (front cockpit only) provided that the navigation and fuel gauge light switch (12, Figure 1-5) is on.

Primer Pump

15 The hand-operated cylinder primer pump (23, Figure 1-5) is located to the right of the instrument panel in the front cockpit. The pump draws fuel from the fuel selector valve and injects it into the induction manifold at four points.

Fuel Specifications

16 The following fuel specifications with a grade of 80/87 are recommended:

Canadian	British
3-GP-25c	DED 2485

OIL SYSTEM

General (See Figure 1-3)

17 The oil for engine lubrication is supplied from a 2 2/3 Imp gal + 1 gal air space tank which is mounted on the forward face of the firewall. Cooling air is scooped in on the left side of the cowl, ducted around the oil tank and exhausted through a louvre on the right side. Access to the combined filler cap and dipstick is gained through a quick release panel in the oil tank cooling shroud at the right side.

Oil Specification

18 The following specifications are recommended:

	Canadian	British
Summer	3-GP-100a	DED 2472B/0
Winter	3-GP-80a	DED 2472A/0

ELECTRICAL SYSTEM

General

19 Electrical power is direct current supplied by a 17 amp 24 volt generator in conjunction with a pair of 12 volt, 25 ampere hours, batteries connected in series to provide 24 volts. The generator output is controlled by an automatic voltage regulator and the charge rate is indicated on the voltmeter on the electrical panel, (Figure 1-7).

Electrically Operated Equipment

20 The following equipment is operated by the electrical system: - starter, interior lights, navigation lights, landing light, intercomm, radio.

External Power Receptacle

21 A receptacle (Figure 1-4) for connecting an external power supply is located on the left side of the fuselage above the trailing edge of the wing.

Generator Switch

22 The generator switch is located on the electrical panel, (Figure 1-7). A generator circuit breaker switch on the top of the panel trips to the off position when the maximum (17 amps) generator output is exceeded.

Battery MASTER Switch

23 The battery MASTER switch is located on the electrical panel, (Figure 1-7).

NOTE

When an external power supply is connected, the MASTER switch must be left in the OFF position otherwise the batteries will parallel the external supply.

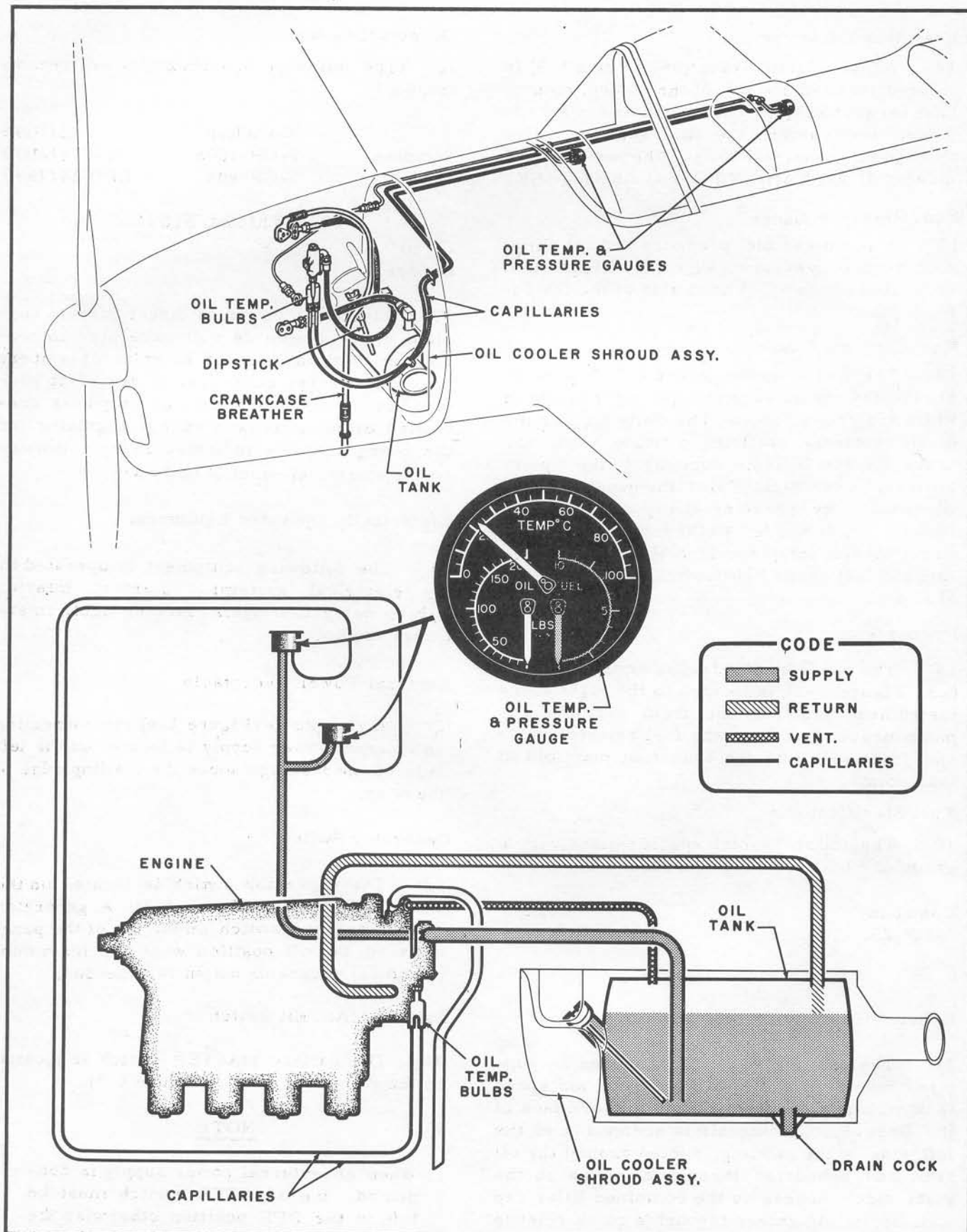


Figure 1-3 Oil System

Electrical System Indicator

24 A voltmeter (10, Figure 1-5) is located centrally in the electrical panel and indicates only when the generator is operating.

ENGINE CONTROLS

Throttle Lever

25 The throttle levers (46, Figure 1-5), located on the left side in the cockpits, are interconnected with each other. A push-pull rod connects the throttle levers to the carburettor throttle valve. A friction control knob (43, Figure 1-5) on each quadrant, when rotated clockwise, increases the friction on the levers.

Mixture Control

26 The fuel-air mixture is manually controlled by the mixture control levers (44, Figure 1-5) mounted inboard of the throttle levers. The levers are connected to the car-

burettor by a push-pull rod linkage and are moved aft for rich and forward for lean mixture. The friction control knob (43, Figure 1-5) is common to both throttle and mixture control levers.

Carburettor Heat Control

27 Hot air for the carburettor is drawn from the crankcase wall, between the inter-cylinder baffles and passed into the mixing chamber. The mixing chamber contains a flap valve which is operated by a push-pull control (21, Figure 1-5) in each cockpit. A flame trap fitted in the hot air inlet ensures that any hot gases passing through in case of engine back-firing, are cooled below their ignition temperature.

Engine Ignition Switches

28 There are two sets of magneto switches, (4, Figure 1-5) one set on the front fuselage deck, the other set on the left side of the fuselage deck between the two cockpits.

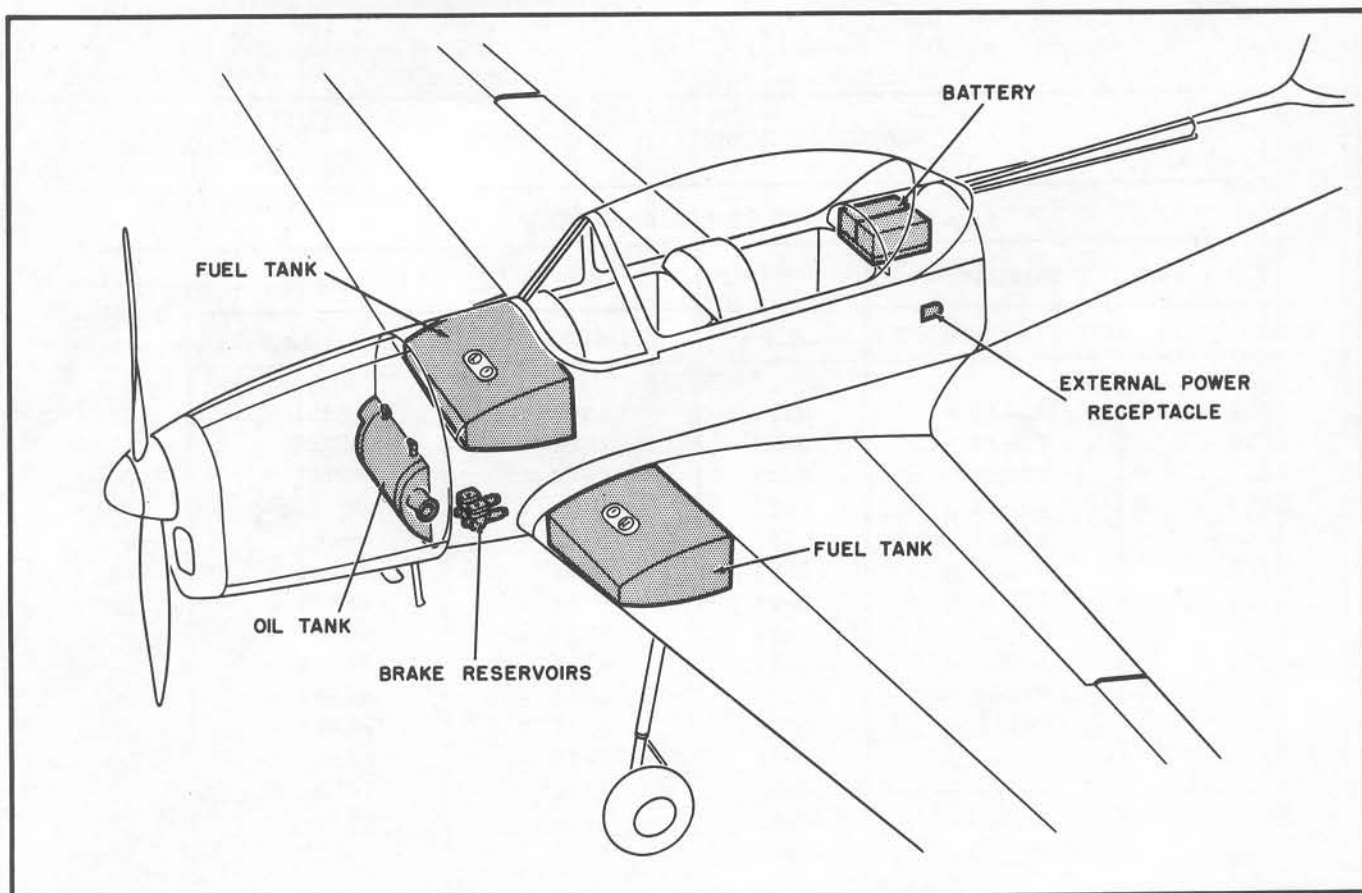


Figure 1-4 Servicing Points

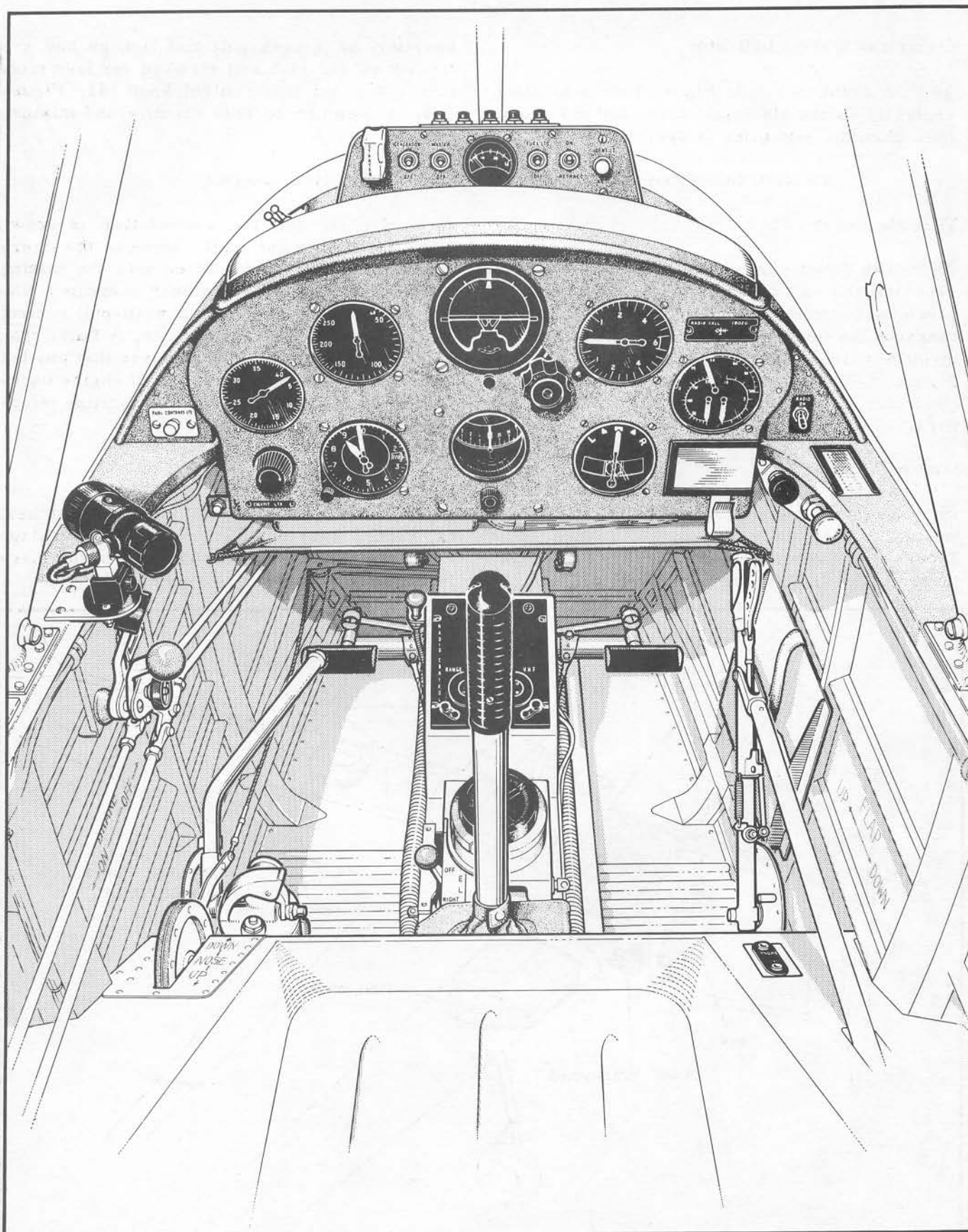
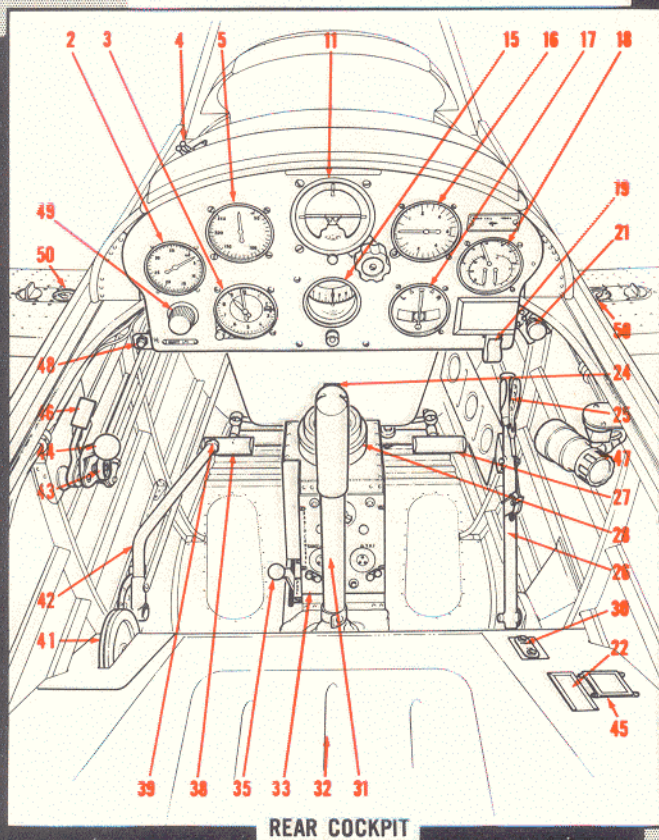
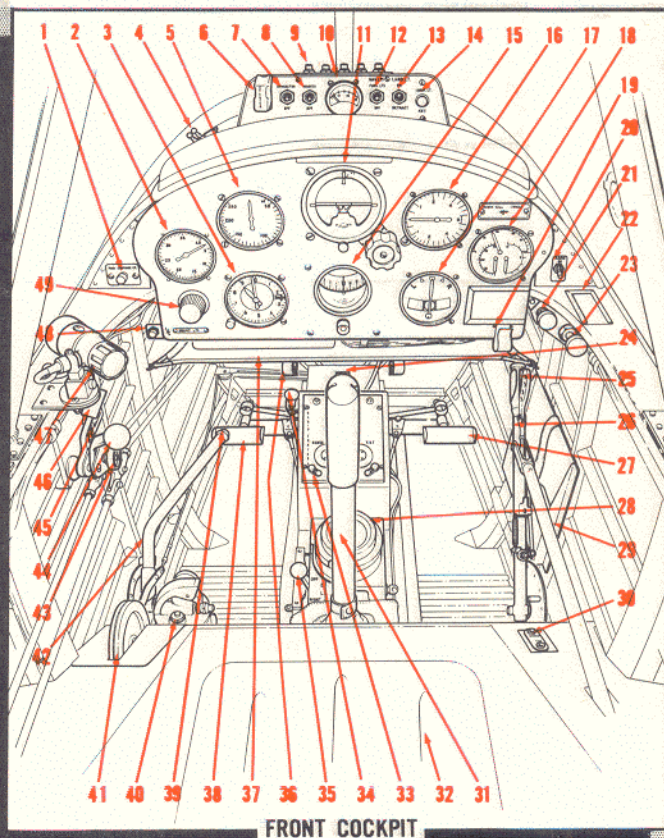


Figure 1-5 Cockpits Layout (Sheet 1 of 2)

1. Fuel Contents Lights Switch
2. Tachometer
3. Altimeter
4. Ignition Switches
5. Airspeed Indicator
6. Starter Switch
7. Generator Switch
8. Battery Master Switch
9. Circuit Breakers
10. Voltmeter
11. Artificial Horizon
12. Navigation & Fuel Gauge
13. Landing Light Switch
14. Identification Lights Switch
15. Direction Indicator
16. Rate Of Climb Indicator
17. Turn & Bank Indicator
18. Oil Temp. Pressure & Fuel Pressure Gauge
19. Headset Stowage
20. Radio Master Switch
21. Carburettor Heat Control
22. Radio Frequency Card Holder
23. Primer Pump
24. I/C Transmit Switch



25. Flap Selector Lever Release
26. Flap Selector Lever
27. Right Hand Rudder Pedal
28. Magnetic Compass
29. Map Stowage
30. Microphone & Headset Jacks
31. Control Column
32. Cockpit Seat
33. Radio Control Panel
34. Cockpit Heat Control
35. Fuel Selector
36. Control Locks Stowage
37. Luggage Rack
38. Left Hand Rudder Pedal
39. Parking Brake Release Button
40. Fire Extinguisher
41. Elevator Trim Wheel
42. Brake Lever
43. Friction Control Knob
44. Mixture Lever
45. Compass Deviation Card Holder
46. Throttle Lever
47. Instrument U/V Light
48. I/C Button
49. Cockpit Lights Rheostat
50. Fuel Contents Gauge

Figure 1-5 Cockpits Layout (Sheet 2 of 2)

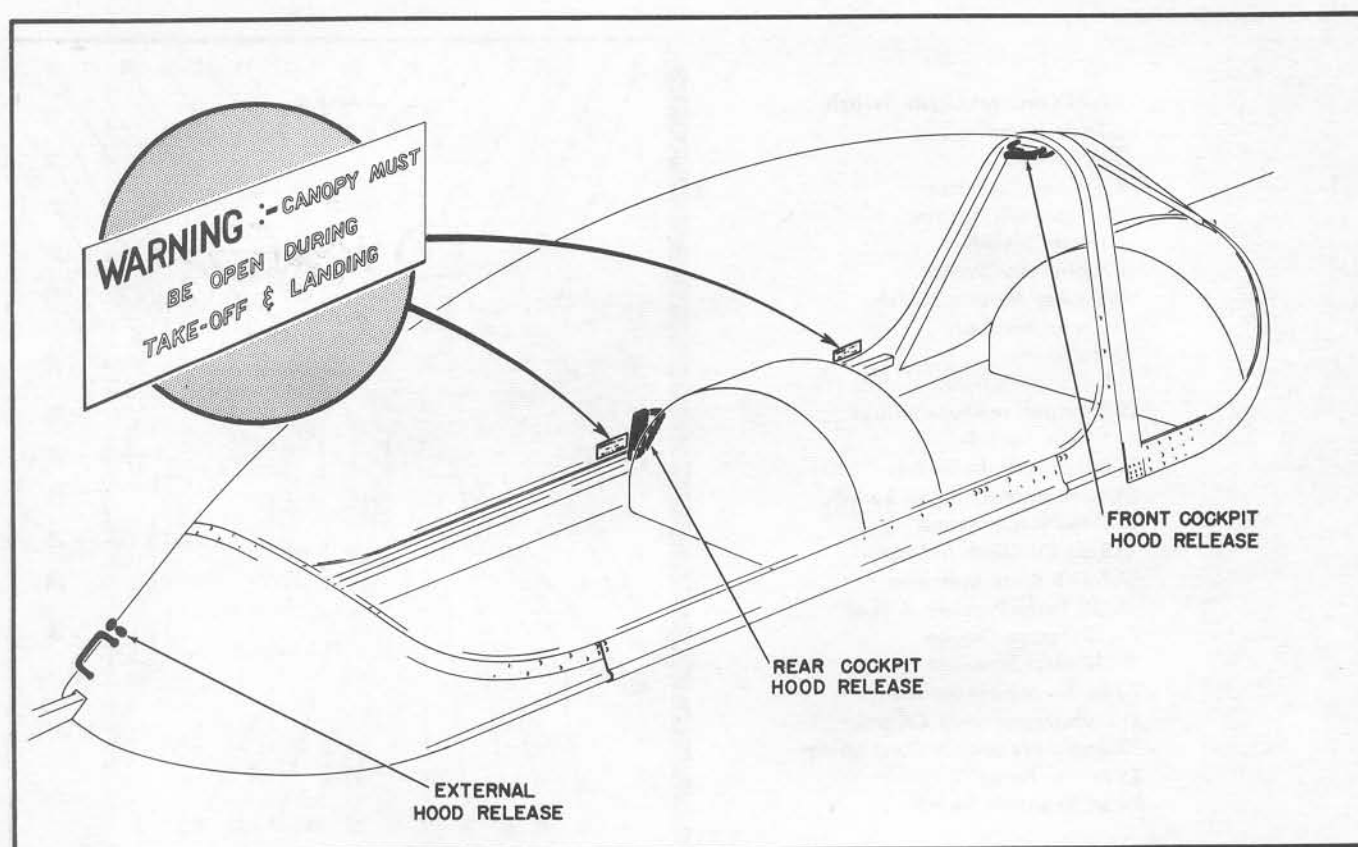


Figure 1-6 Cockpit Hood

Starter Switch

29 The starter switch (6, Figure 1-5) is located on the electrical panel on the front fuselage deck. The switch is protected by a guard to prevent inadvertent operation.

Engine Indicators

30 The engine indicators are situated on the left and right hand sides of the instrument panels and consist of a tachometer (2, Figure 1-5) and an oil temperature, oil pressure and fuel pressure gauge (18, Figure 1-5).

FLIGHT CONTROLS

General

31 The control surfaces are conventionally operated by a control column and rudder pedals from either cockpit. Movement of the controls is transmitted to the surfaces by cables and mechanical linkages. Longitudinal trim may be accomplished in flight by a trim tab on the right hand elevator controllable from a trimwheel in each cockpit.

Control Columns

32 The control columns are of the conventional stick type. A transmit - Intercomm switch (24, Figure 1-5) is installed in the handgrip of each control column.

Rudder Pedals

33 The rudder pedals may be adjusted for reach by removing the lock pin, Figure 1-10, and sliding the pedal in or out as required and replacing the lock pin in any of the three positions. The rudder pedals also provide the differential braking action in conjunction with the position of the hand brake lever, (42, Figure 1-5).

Elevator Trim Wheels

34 The elevator trim tabs are actuated by trimwheels (41, Figure 1-5) from either cockpit. The trimwheel label is marked NOSE and DOWN and UP. A nose down change in trim is produced by rotating the top of the wheel in the forward direction.

Control Locks

35 Control locks may be fitted to secure the control column and rudder pedals. The rudder control lock also locks the fuel selector in the OFF position, see Figure 1-8.

Wing Flaps System (See Figure 1-9)

36 The wing flaps are of the trailing edge type and extend from the wing roots to the inboard ends of the ailerons. They are operated mechanically from either cockpit by interconnected levers located on the right side. The levers are fitted with catch release handles which enable the flaps to be locked in any of three positions: UP, half flap or DOWN. There is no indicator in the cockpits apart from the position of the levers.

LANDING GEAR

General

37 The landing gear is a nonretractable in-

stallation consisting of two main wheel units and a fully castoring tail wheel. Springing of the main wheel legs is achieved through a series of rubber compression and rebound blocks contained within the cantilever legs.

Brake System (See Figure 1-10)

38 The main landing gear wheels are fitted with hydraulic brake units which are actuated through independent hydraulic lines emanating from brake master cylinders having integral fluid reservoirs. To provide for partial braking the master cylinders are connected by a differential pulley and cable arrangement to the front cockpit rudder bar which in turn is mechanically connected to the rear cockpit rudder bar. With the rudder pedals centralized, operation of the hand lever actuates the pistons in the master cylinders causing an equal pressure to be applied to the wheel brake units. Differential braking when taxiing is accomplished by movement of the rudder pedals in conjunction with partial application of the hand lever.

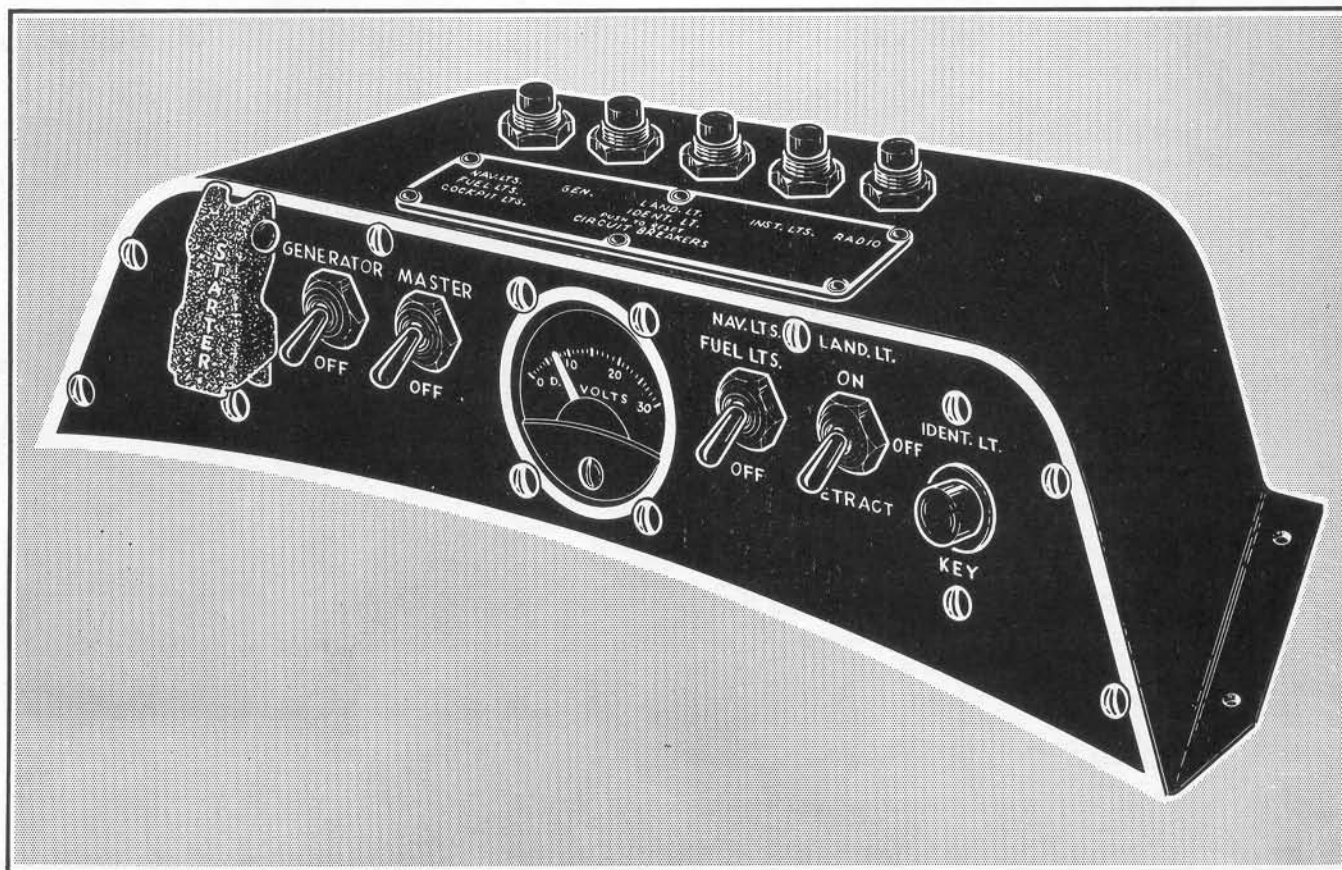


Figure 1-7 Electrical Panel

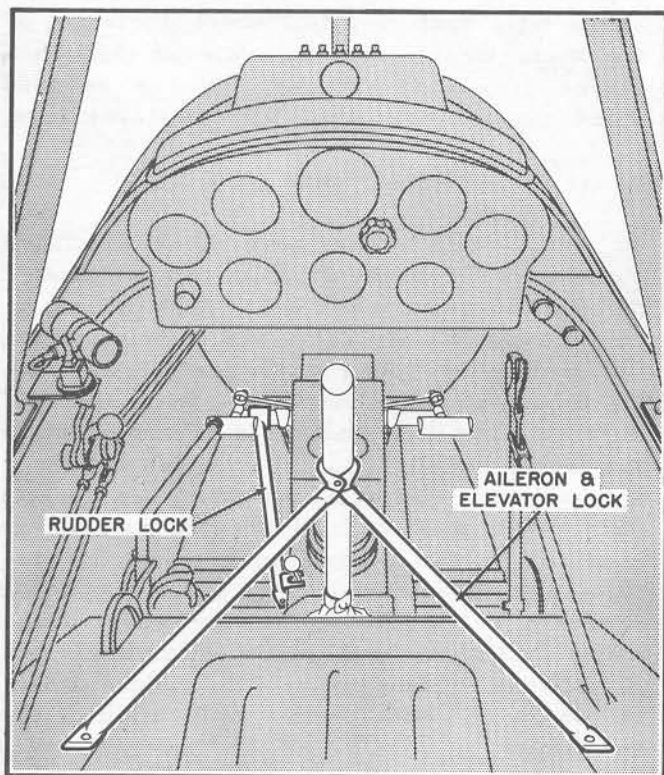


Figure 1-8 Control Locks

Hand Brake Levers

39 The hand brake levers are located to the left, one in each cockpit. A counterbalanced pawl which is operated by a plunger at the top of the lever provides for positive locking of the brakes in any position. The brake lever can be applied fully to prevent the wheels from turning, as for parking and when running up the engine, or partially to allow for differential braking when taxiing.

NOTE

To lock the brake in any position, press down the plunger. Do not depress the plunger whilst pulling the lever to set the brakes. To unlock the brake, first pull back further to release the pawl, then move lever forward without touching the plunger.

HEATING AND VENTILATION SYSTEM

General (See Figure 1-12)

40 Air circulation in the cockpit enclosures

is provided by an outside ventilator on the right side of the windshield. Warm air to the cockpits is provided by a heater tube located inside the engine exhaust manifold. Cold air enters the tube through the nose cowl and after being heated is passed to the cockpits through flexible ducting. A dump valve containing a flap valve regulates the amount of heated air to the cockpits. The flap valve is operated by the cockpit heat control (34, Figure 1-5) in front cockpit.

INSTRUMENTS

General

41 Shock mounted instrument panels are provided in both cockpits; each contains the following instruments: (see Figure 1-11)

Airspeed Indicator	Directional Gyro
Altimeter	Artificial Horizon
Turn and Bank	Rate of Climb
Oil Temperature - Oil	Tachometer
Pressure - Fuel Pressure	

Both panels are illuminated by ultra-violet lights for night flying.

Pitot-Static Operated Instruments

42 The airspeed indicator, altimeter and rate of climb indicator are operated by the pitot-static system.

Vacuum Operated Instruments

43 The directional gyro, artificial horizon and turn and bank indicator are operated by the vacuum system.

Magnetic Compass

44 A magnetic compass (28, Figure 1-5) is mounted on top of the radio remote control panel in the rear cockpit. In the front cockpit, the magnetic compass is mounted on the floor between the radio remote control panel and the control column.

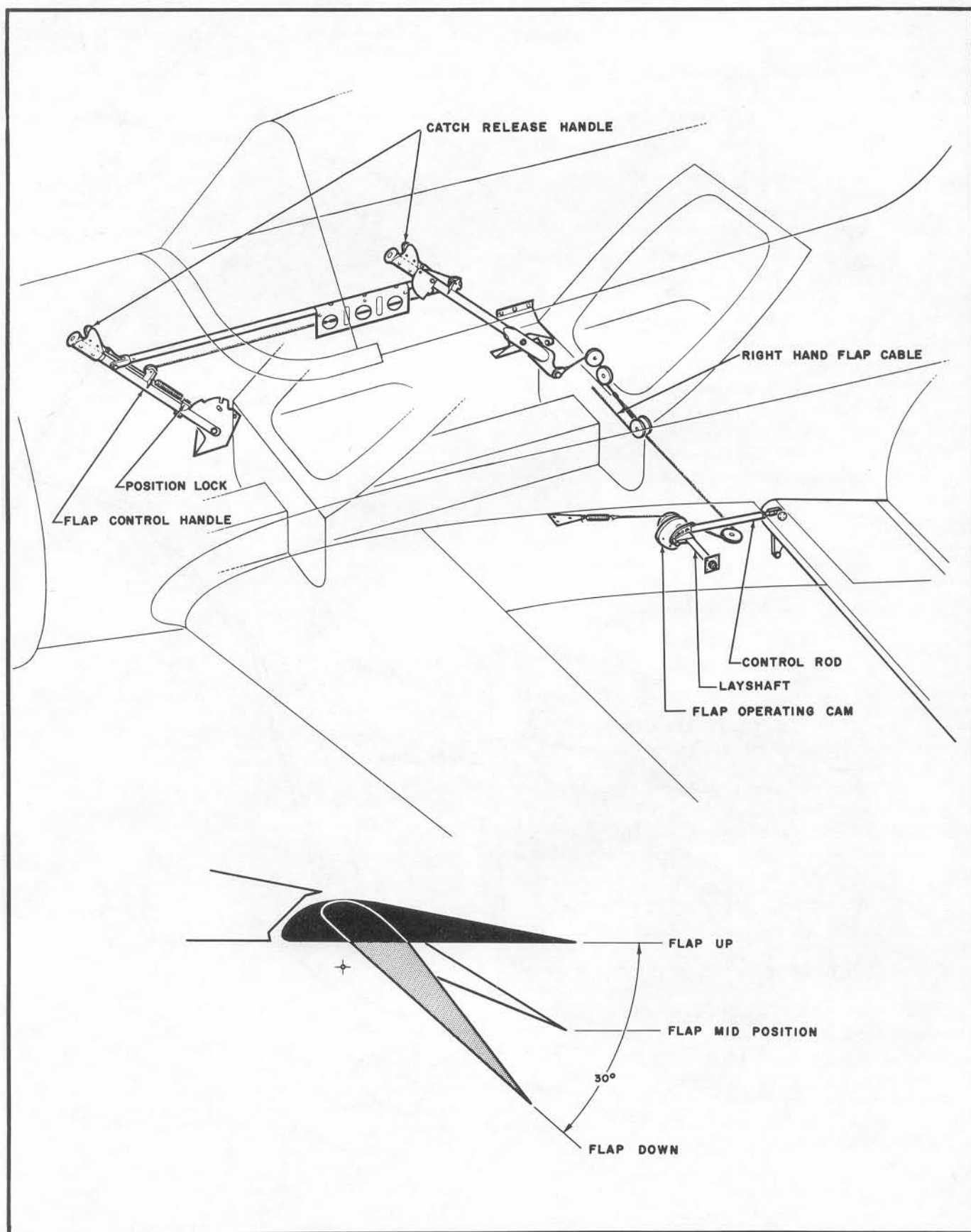


Figure 1-9 Flap System

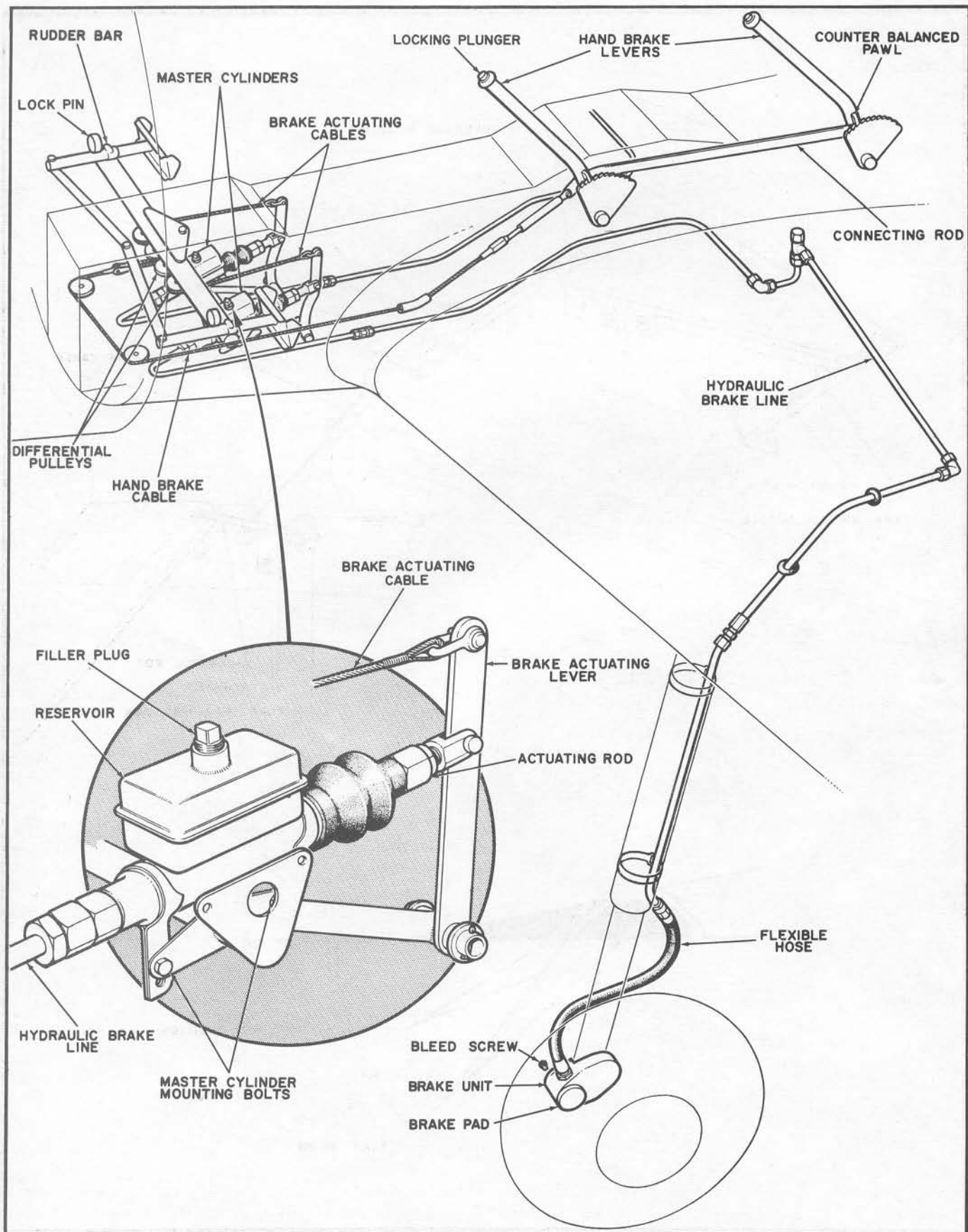


Figure 1-10 Brake System

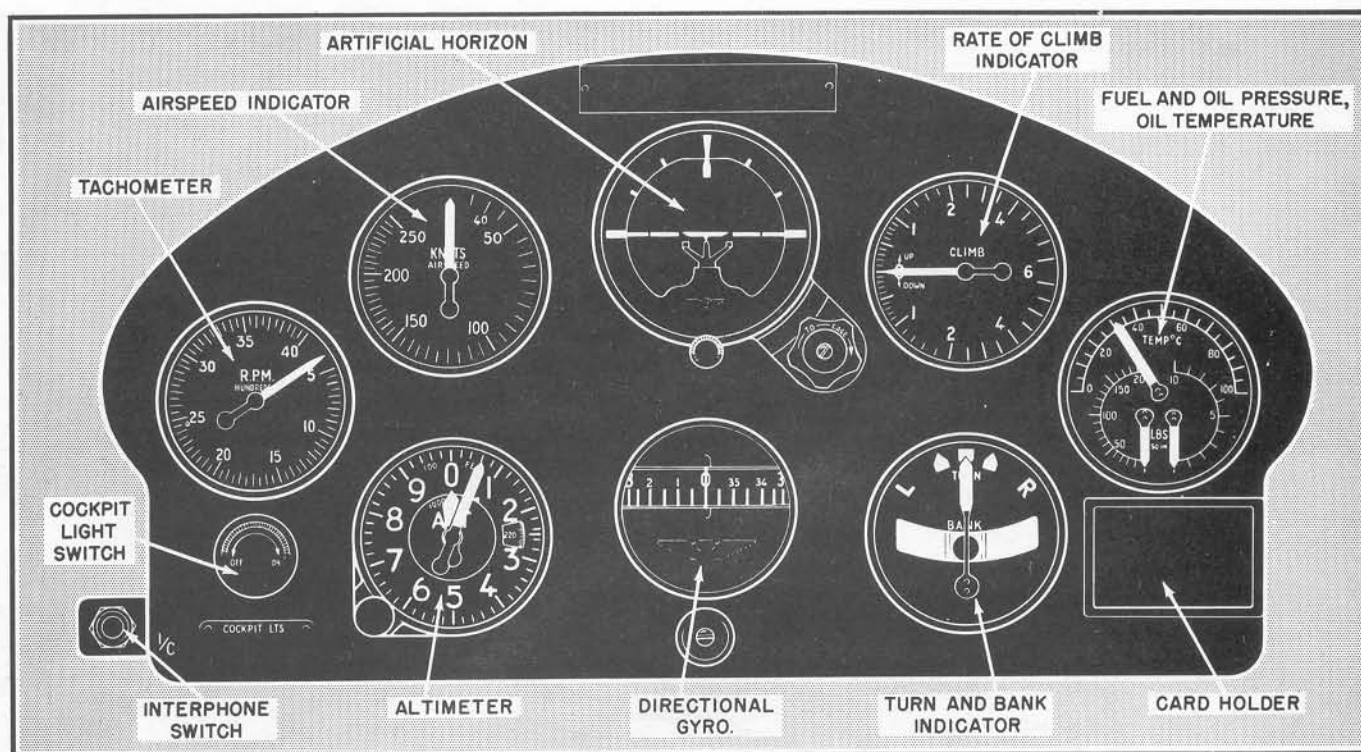


Figure 1-11 Instrument Panel

LIGHTING SYSTEM

General (See Figure 1-13)

45 All circuits are protected by circuit breakers located on top of the electrical panel, (Figure 1-7). The circuits are routed through the MASTER switch, this switch must therefore be on before any light can be operated.

Navigation Lights

46 The aircraft is equipped with standard navigation or warning lights mounted in the wingtips and tailcone. They are controlled by a NAV. LTS. switch on the electrical panel, which also controls the circuit for the fuel gauge lights.

Cockpit and Instrument Lights

47 The cockpit and instrument lights are individually controlled by rheostats and circuit breaker switches on the electrical panel.

Fuel Gauge Lights

48 The fuel gauge lights can only be operated when the navigation lights are on. To illuminate the gauges press the FUEL CONTENTS LTS. button on the left side of the instrument board in the front cockpit.

Landing Light

49 A retractable landing light is fitted in the lower surface of the left wing. The light is operated by the LAND LT. switch (13, Figure 1-5) on the electric panel, marked ON, OFF and RETRACT. The ON position extends and illuminates the light.

Identification Light

50 The identification light is illuminated by pushing the IDENT. LT. KEY button (14, Figure 1-5) on the electrical panel; the navigation lights do not have to be on, but the middle circuit breaker must be pushed in.

COCKPIT EQUIPMENT

General (See Figure 1-15)

51 The equipment is identical for each cockpit and consists of a bucket type seat designed to accommodate a seat type parachute and a safety harness. A map case and a canvas luggage rack, slung under the instrument panel, are provided in the front cockpit.

Miscellaneous Equipment

52 Lumerith flying screens can be installed in the front cockpit if required. The screens are secured to the windshield with press stud fasteners; the side screens slide into channels in the canopy.

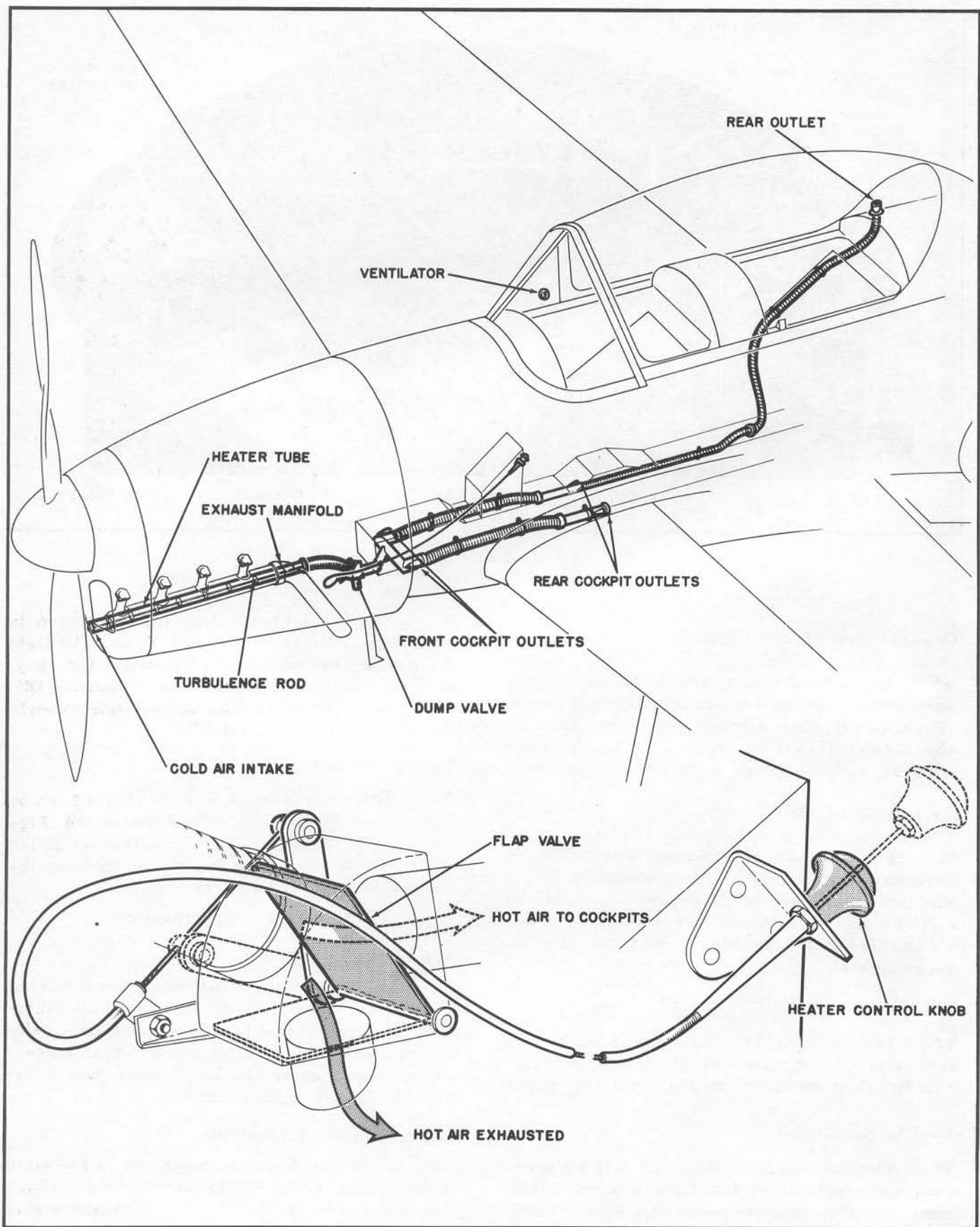


Figure 1-12 Heating and Ventilating System

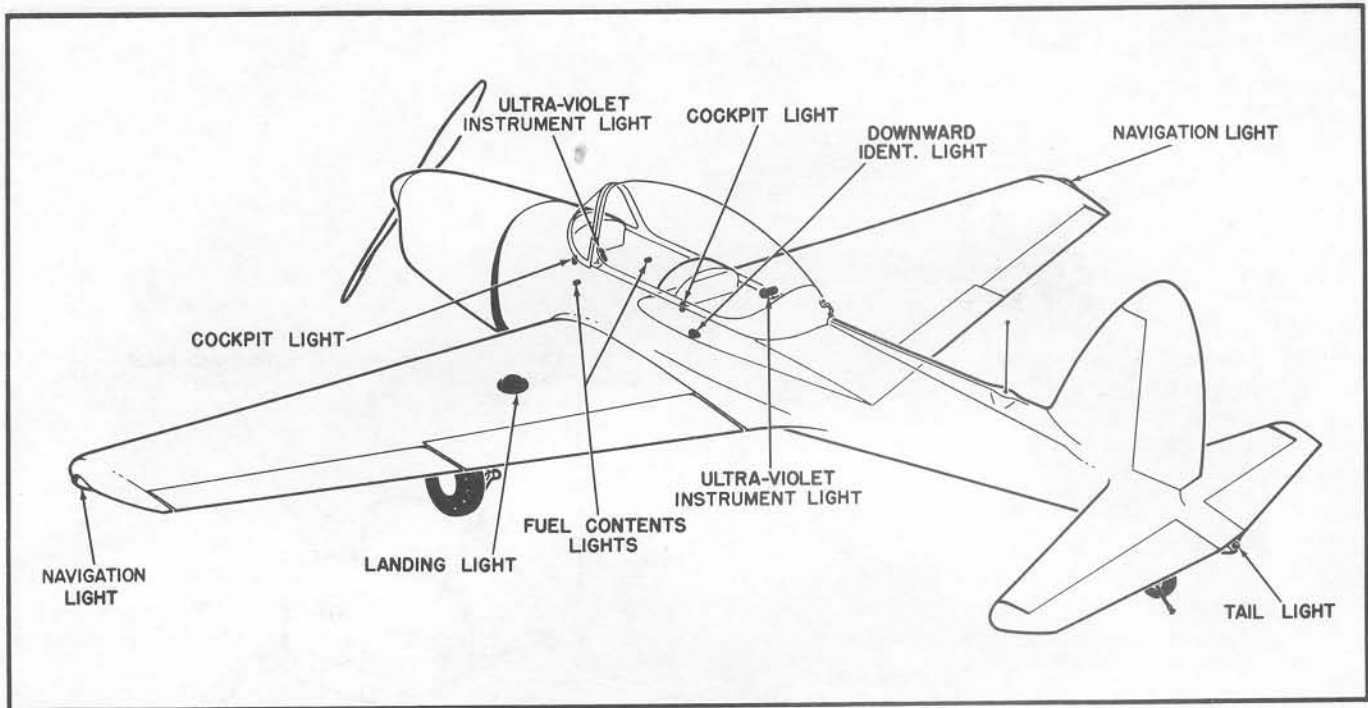


Figure 1-13 Aircraft Lighting

EMERGENCY EQUIPMENT

Fire Extinguisher

53 A hand operated type A20 fire extinguisher is mounted on a quick release bracket on the left side of the front seat diaphragm, see Figure 1-5.

First Aid Kit

54 The first aid kit is either stored on the top of the fuselage just above and behind the rear cockpit on the battery access panel, see Figure 1-15, or on the right side of the fuselage just above and aft of the wing flaps lever in the front cockpit.

COMMUNICATION EQUIPMENT

Radio

55 The aircraft is equipped with an AN/ARC-12 communication system which operates on 28 volts and has a frequency range of 116-148 mcs on R/T. It may also be used on Radio Range frequencies between 200 and 550 kcs. The transmitters and the R-19 receiver are located behind the seat in the rear cockpit and the R-11A receiver is located aft of the firewall, see Figure 1-16. The set is controlled from either cockpit by means of remote control panels, (33, Figure 1-5) installed forward of each control column. The R/T antenna is a

standard 1/4 whip type mounted on top of the fuselage just forward of the fin. The range antenna is a non-directional fixed wire type installed beneath the fuselage between the wing and tailwheel. See paragraph 58 for alternative radio equipment.

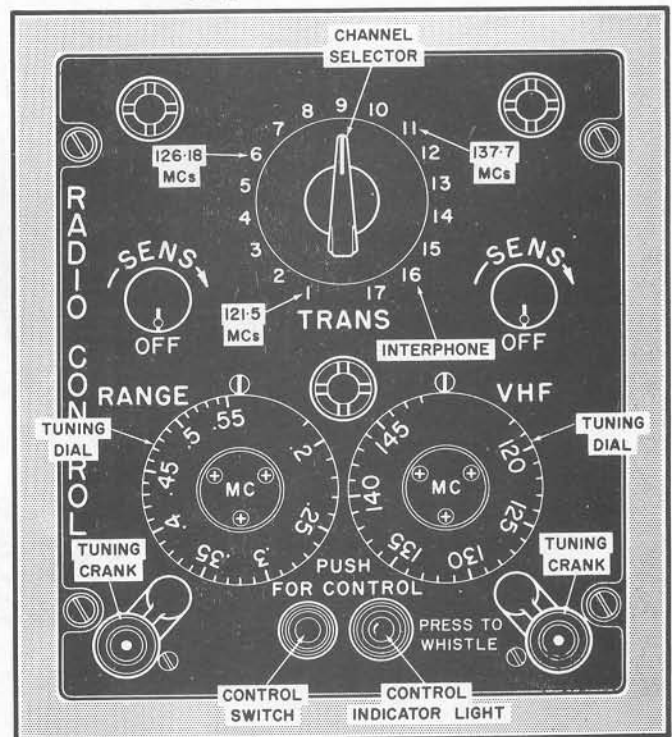


Figure 1-14 Radio Panel

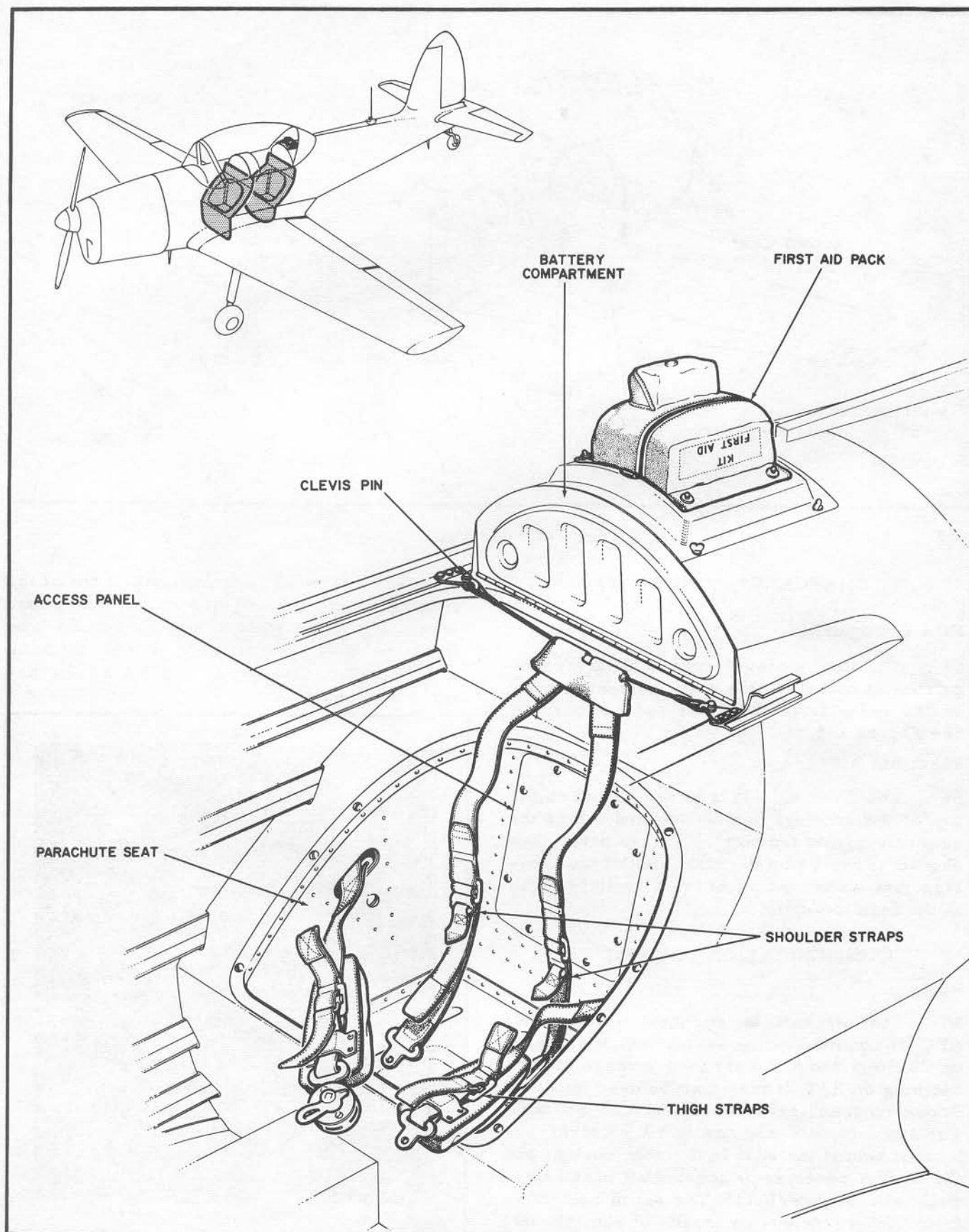


Figure 1-15 Harness and Seating Arrangement

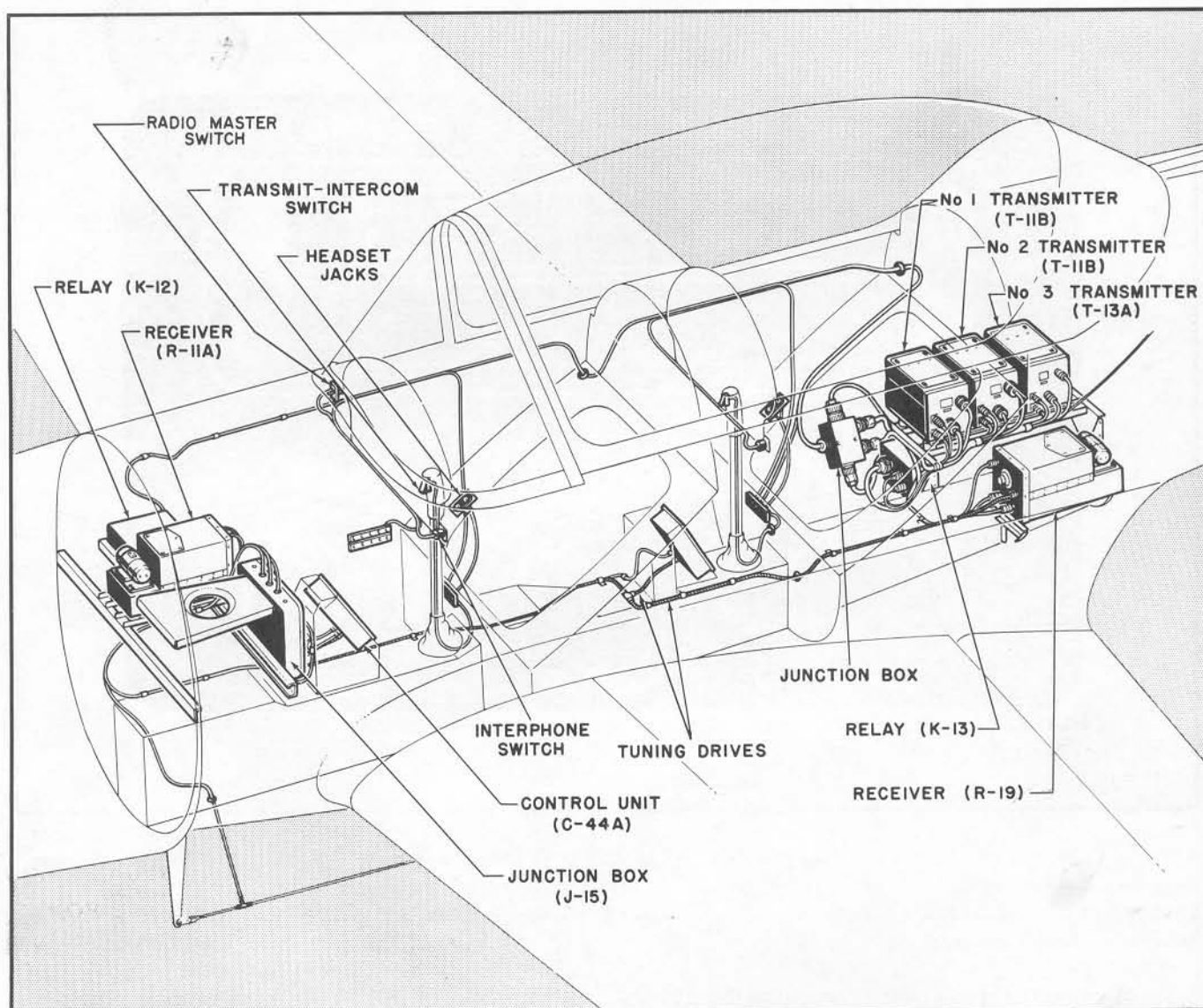


Figure 1-16 Radio Installation

Intercomm

56 The intercomm, which is fed through channel 16 of the radio, can be selected by means of an I/C push button switch (48, Figure 1-5) on the lower left hand corner of the instrument panel or the press to talk button (24, Figure 1-5) on the control column. If used for intercomm, the transmit switch on the control column should be applied to the first pressure before speaking.

Radio Operation

57 To operate the radio proceed as follows: (see Figure 1-14)

(a) To supply power, operate the RADIO switch (20, Figure 1-5) to the right of the in-

strument panel, front cockpit.

(b) To establish communications on R/T, press the control switch on the remote control panel then turn the VHF SENS control to maximum volume. While the set is warming up, turn the VHF tuning crank to the desired frequency. To fine tune the frequency, press in the tuning crank and the transmit switch then, still pressing in the tuning crank, tune to maximum whistle. Release the transmit switch before releasing the pressure on the tuning crank. The Range receiver is tuned by turning the RANGE SENS control to maximum volume, allowing the set to warm up, then turning the tuning crank to the desired frequency.

(c) By applying the second pressure to the

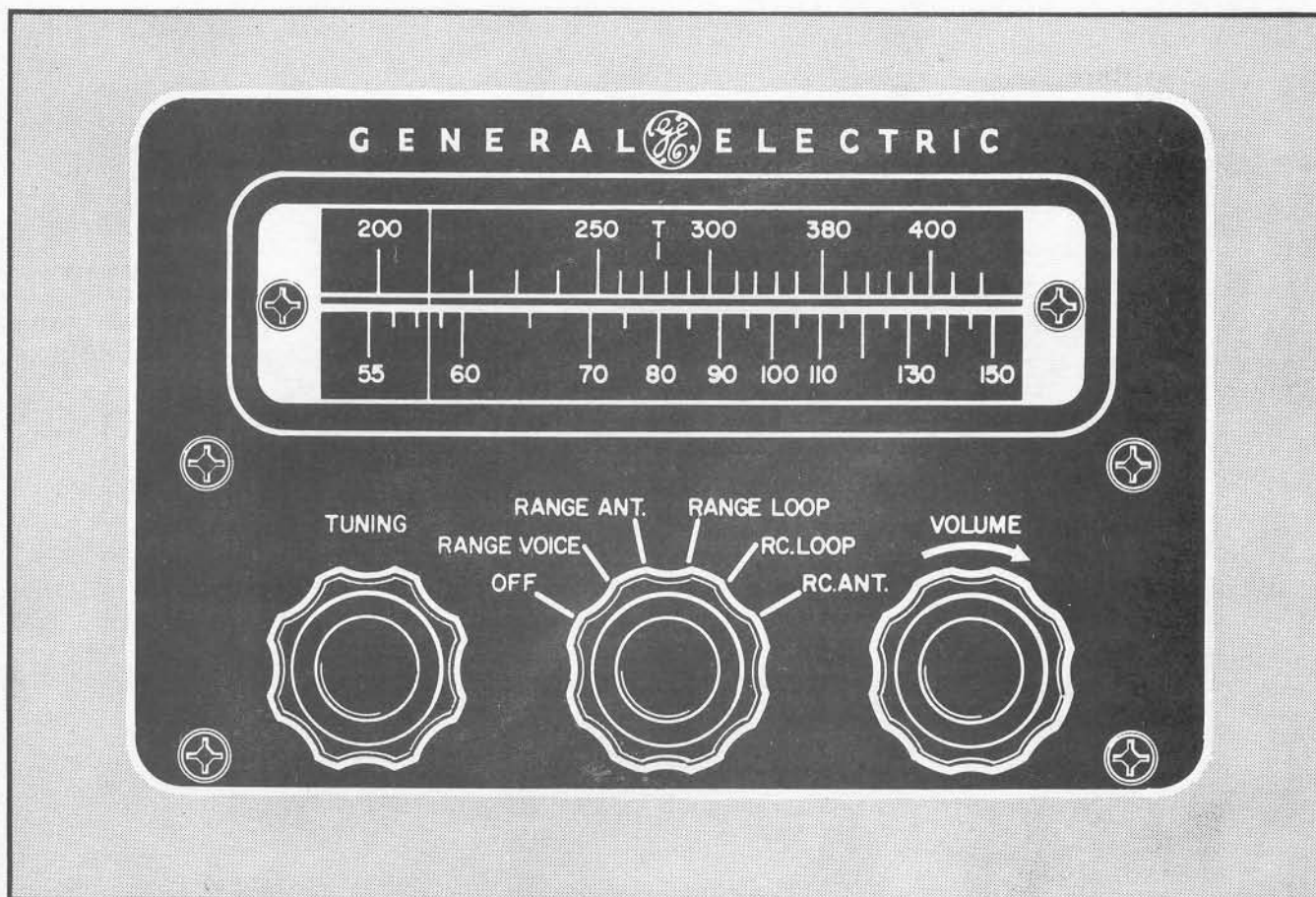


Figure 1-17 Radio Panel (Alternative)

transmit switch, on the control column, transmission can be made.

(d) Transference of radio control to the other cockpit is made by pressing the control switch on the remote control panel in the other cockpit and selecting the desired frequency.

Alternative Radio Equipment

58 Some aircraft are equipped with the GE H. F. Transceiver 28AK30 (modified for dynamotor supply), having a frequency range of 200-1500 kcs. The receiver is remotely controlled from a radio panel (Figure 1-17) forward of the control column in each cockpit, and the transmitter is controlled by selection of the XMT switch on the instrument panel and actuation of the transmit switch on the control column. To power the radio, rotate the BAND SWITCH clockwise and select the

desired band:- 1. - OFF, 2. - RANGE VOICE, 3. - RANGE ANT, 4. - RANGE LOOP (not used), 5. - BC LOOP (not used), or 6. - BC ANT. Band 6 (550-1500 kcs) is connected to a non-directional fixed wire antenna. In bands 2 and 3 (200-420 kcs) the band 3 is used for operation with the non-directional fixed wire antenna; band 2 is used when it is necessary to insert the voice filter for listening to range stations which are simultaneously transmitting range and voice signals.

Intercomm.

59 An electrical intercommunication system is provided, if the GE H. F. transceiver is installed, which operates in conjunction with the radio earphones. The intercomm system is energized from either cockpit by actuating the control column transmit switch and the I/C switch on the instrument panel.

Part
2



HANDLING

PART 2

HANDLING

PRELIMINARIES

Fitness of the Aircraft for Flight

1 Determine whether any limitations have been imposed on the aircraft and abide by them. Insure that the aircraft is fit for the flight and check that baggage and load distributions are within the CG limitations.

NOTE

With two occupants, the total fuel load is at present restricted to 17 Imperial gallons.

External Check (See Figure 2-1)

2 Inspect the aircraft externally starting from the cockpit on the left side.

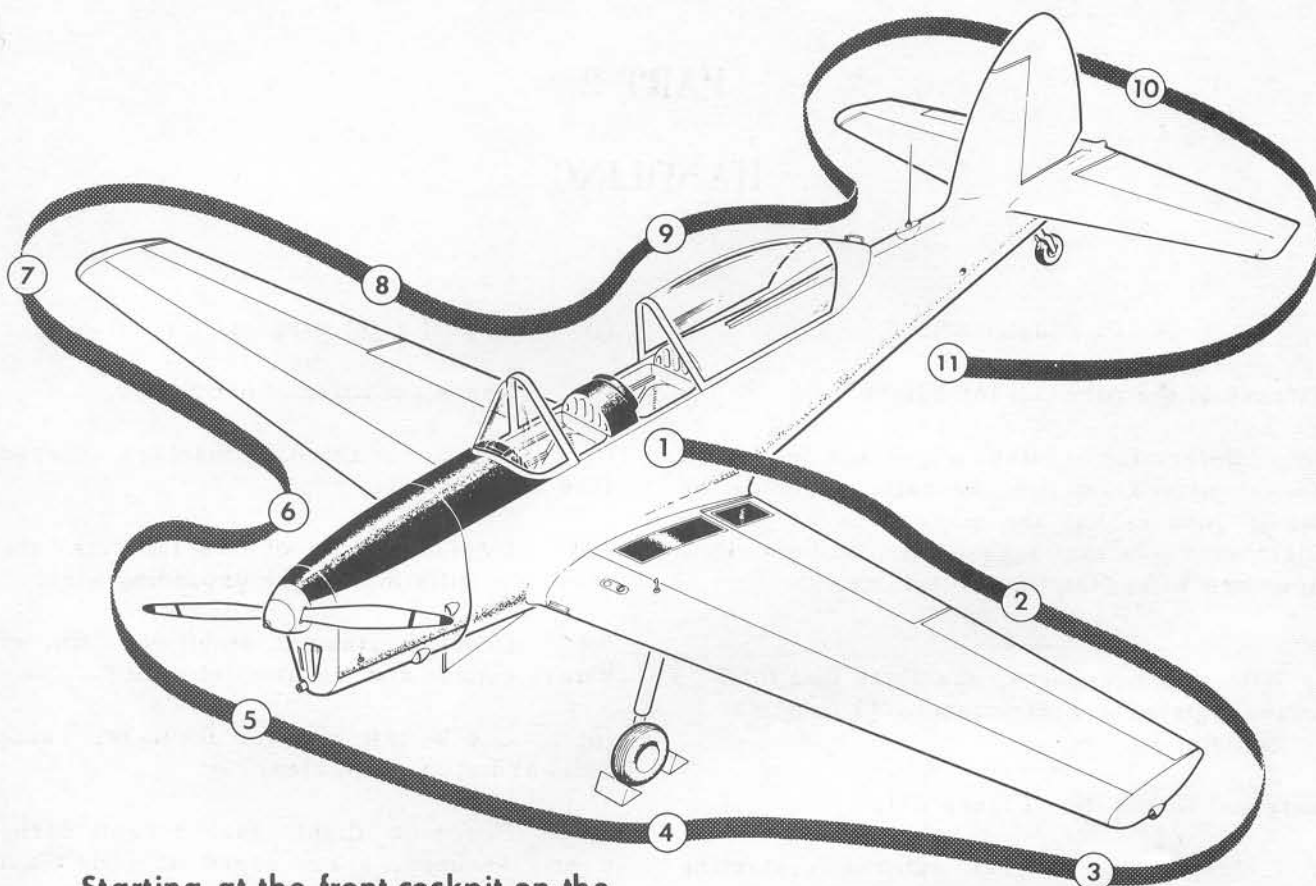
- (a) Open hood.
- (b) Battery MASTER and ignition switches OFF.
- (c) Wheels chocked. Parking brakes OFF. Control locks off, and stowed.
- (d) Fuel filler cap in position; check contents by the gauge, and check fuel vent clear.
- (e) Check surfaces of left wing, flap and aileron for general condition; no cracks or fractures. Check wing tip and navigation light. Pitot tube clear. Insure zipper panels closed and wired secure.
- (f) Inspect landing gear; proper inflation of tire, no cuts or abrasions, wheels properly chocked.
- (g) Engine cowling secure; no blockage of air intakes.
- (h) Propeller condition; no cuts or cracks, check fore and aft movement of tips to ensure sound fixture of the propeller.

- (j) Inspect right wing, as for left wing.
- (k) Check condition of hood rails.
- (l) Check condition of fuselage undersurface and antennae.
- (m) Inspect tail wheel tire for cuts, abrasions and inflation. Check grounding wire.
- (n) Check horizontal stabilizer, fin, elevator, rudder and elevator trim tabs.
- (p) Check left side of fuselage, canopy, rails and static vent clear.
- (q) For solo flight, rear cockpit harness tightly secured, gyros caged, throttle tension slackened, no loose articles.
- (r) Check First Aid Kit and battery cover secure. Crash instructions in place.

Pre-starting Check

3 On entering the aircraft proceed as follows:-

- (a) Adjust reach of rudder pedals and safety harness.
- (b) Check flight controls for correct actuation and range of travel.
- (c) Ignition switches OFF.
- (d) Select fuel tank required.
- (e) Elevator trim for freedom over full range. Set tail heavy.
- (f) Hand brake fully ON, wheels chocked.
- (g) Have external battery connected.



Starting at the front cockpit on the left side make the following checks

- ➊ **COCKPIT** Hood open. Ignition and battery master switch off. Brakes off. Flap lever up. Fuel contents and filler caps secure. Unlock controls.
- ➋ **LEFT WING** Flap position corresponds to lever selection. Condition of upper and lower wing surfaces, flap and aileron. All hinges clear. No fuel leakage.
- ➌ Condition of wing tip, navigation light and landing light. Pitot tube unobstructed and cover removed. Leading edge for damage. Zipper panels closed and wired secure.
- ➍ **LEFT LANDING GEAR** Wheel chocked. Landing gear for damage. Brake pipes and hose for fluid leaks. Tire for cuts, bruises, slippage and proper inflation.
- ➎ **POWER PLANT** Cowlings for damage and security. Carburettor and oil cooler intakes clear. Exhaust manifold for condition. Propeller blades for nicks and fairing for condition.

- ➏ **RIGHT LANDING GEAR** Wheel chocked. Strut for damage. Brake pipes and hose for fluid leaks. Tire for cuts, bruises, slippage and proper inflation.
- ➐ **RIGHT WING** Leading edge for damage. Condition of wing tip and navigation light. Zippers closed and wired secure.
- ➑ All hinges clear. Condition of upper and lower surfaces of aileron, flap and wing. Flap position corresponds to lever selection. No fuel leakage.
- ➒ **RIGHT FUSELAGE** Condition of surface, no dents or wrinkles. Antenna for security. Dorsal and vertical fin for condition.
- ➓ **EMPENNAGE** Leading edges and surfaces for condition. All hinges clear. Elevator trim tabs correspond to handwheel selection. Condition of navigation light. Tailwheel tire for cuts, bruises, slippage and proper inflation. Shock strut extension. Check grounding wire.
- ➙ **LEFT FUSELAGE** Condition of surface. No dents or wrinkles. Dorsal and vertical fin for condition. Hood for security and smoothness of operation. External power receptacle clean. Static vent clear. First Aid kit and battery cover secure, crash instructions in place.

Figure 2-1 Exterior Inspection Diagram

STARTING AND WARMING UP PROCEDURES

Starting Engine

4 Proceed as follows:-

- (a) Prime engine - six or seven positive pressure strokes when engine is cold, less when warm.
- (b) Open throttle $1/2$ inch.
- (c) Call "All clear" and place ignition switches ON.
- (d) Press starter button until engine starts, do not press for more than 5 seconds at a time. Allow 1 minute to elapse between attempts.

CAUTION

If oil pressure does not register within 30 seconds, stop the engine immediately and have the cause investigated.



Failure to Start

5 If engine fails to start, due to over-priming, proceed as follows:-

- (a) Switch ignition OFF.
- (b) Open throttle wide.
- (c) Have propeller rotated backwards 6 complete revolutions.
- (d) Repeat starting procedure, but do not prime.

Warming Up Engine

6 As soon as the engine is started and external power is disconnected check the following:-

- (a) Battery MASTER switch ON.
- (b) Generator switch and circuit breaker ON.
- (c) Run the engine slowly at first, 600-800 rpm. The oil pressure gauge should indicate 30-40 psi when cold. Provided that the oil pressure is satisfactory, run the engine at 1000-1200 rpm in order that the oil may be warmed up to give a free circulation. Continue until the oil temperature reaches a minimum of 15°C . Check that the oil pressure is registering at 40-45 psi normal. Minimum oil pressure should not be less than 30 psi.

GROUND CHECKS AND TAXIING

Tarmac Check

7 Before commencing to taxi the aircraft complete the following:-

- (a) Test radio transmission and reception.
- (b) Adjust fitting of safety harness.
- (c) Test flying controls for correct actuation and full and free movement.
- (d) Ensure there are no loose articles in the aircraft.
- (e) Check stowage of hand fire extinguisher.
- (f) Test elevator trim for full, free and correct movement
- (g) Check brake for correct functioning.

- (h) Check instruments are reading within specified range. Set D1 to compass.
- (j) Carburettor heat off. Check lever for freedom of movement.
- (k) Ensure primer is fully in and locked.
- (l) Test flap actuation and return to UP position.
- (m) Check emergency maps.
- (n) Check fuel contents and change tanks.
- (o) Check magnetos for dead cut.
- (p) Check unnecessary switches off, circuit breakers in.
- (q) Landing light retracted and OFF.

Taxiing

8 Apply hand brake lever approximately four notches to obtain proper control on the wheel brakes. Adjust setting as required for strong wind conditions. Taxi with control column fully back, particularly over rough ground.

Run Up

9 Proceed as follows:-

- (a) Taxi to run-up position and apply brakes fully with aircraft pointing into wind.
- (b) Fuel selector on take-off tank.
- (c) Check oil temperature 15-100°C, oil pressure above 30 psi, fuel pressure 0.5-1.5 psi.
- (d) Ensure that the areas ahead and behind are clear.
- (e) Hold control column fully back.
- (f) Open throttle to give 1600 rpm and check each magneto in turn. Drop should not exceed 100 rpm on either magneto.
- (g) Select generator switch OFF then on. Check voltmeter for indication that the generator is functioning.
- (h) Apply full carburettor heat for approximately 30 seconds. Return to off position and note slight change in rpm.
- (j) Open throttle fully and check rpm which should be approximately 1925. Check oil pressure 40-45 psi. Oil temperature 15-100°C and fuel pressure 0.5-1.5 psi.
- (k) If a drop of more than 100 rpm was indicated on the initial magneto check, throttle back to 1600 rpm and check again, before

throttling fully back. Drop should not exceed 100 rpm on either magneto. Check slow running 650-750 rpm.

CAUTION

Engine must not be run with full throttle for more than 30 sec.



TAKE-OFF PROCEDURES

Pre Take-off Checks

10 Prior to taking up position for take-off carry out the following checks.

- H - Harness - Adjusted.
- Hood - Fully open if dual; 1/2 open if solo.
- T - Trim - Elevator trim to neutral. Slightly tail heavy for solo flying from front cockpit.
- Temperatures and pressures - Check indications.
- Throttle friction - Adjust tension.
- M - Mixture - Rich position for all take-offs (carburettor air cold).
- F - Fuel - On fullest tank.
- Flaps - Up (15° for take-off on short strip).
- G - Gyros - Uncaged.
- S - Switches - Ignition, Master and generator ON.
- B - Brakes - Fully off.

Take-Off

11 Proceed as follows:

- (a) Line the aircraft up on the take-off strip, making sure that it is clear and insure brakes are fully off.
- (b) Open the throttle smoothly to the fully open position.
- (c) Keep straight initially by coarse use of the rudder, decreasing coarseness as speed increases. There is a tendency to swing to the right if the throttle is advanced too quickly.
- (d) Raise the tail into flying attitude by gently easing the control column forward.
- (e) At ⁶¹53 knots IAS ease the aircraft off the ground by gently moving the control column back.
- (f) Climb away at 70 knots IAS.
- (g) Raise the flaps (if used) and adjust the elevator trim.
- (h) Close the hood.

Climbing

12 The aircraft should be climbed at 70 knots IAS using full throttle.

NOTE

During the climb the oil temperature should not exceed 85°C.

Cruising

13 Below 3000 ft the mixture control should be left in rich position. Above 3000 ft the mixture control can be adjusted to give a leaner mixture but care must be taken to ensure that the engine does not overheat or run roughly. Refer to Part 4, paragraph 6 for recommended cruising speeds.

NOTE

Use carburettor heat when ambient air temperatures are below 10°C.

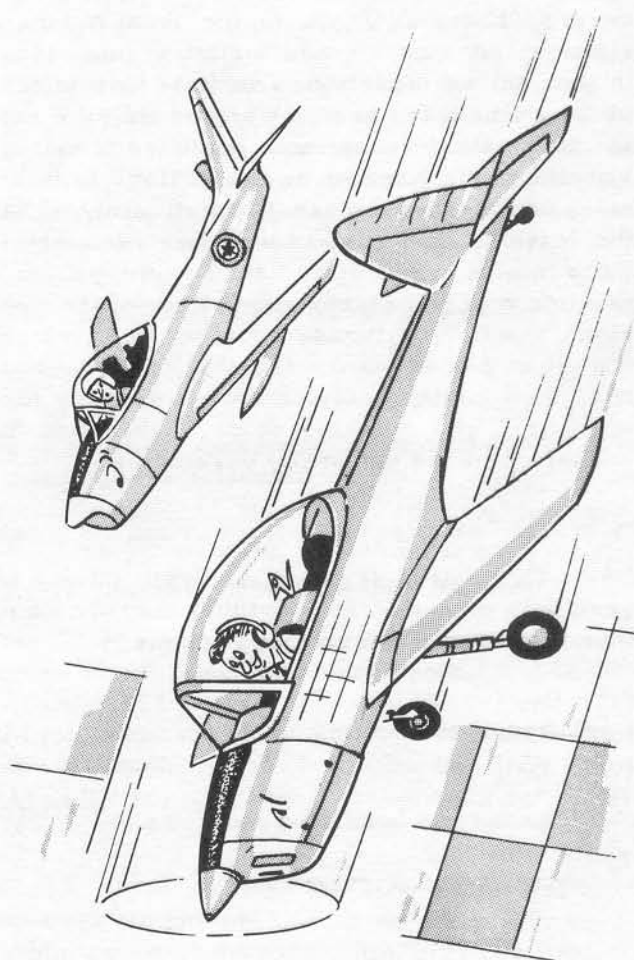
FLIGHT CHARACTERISTICS

General

14 The aircraft is reasonably stable, the controls are well harmonized, light and have good response. During a dive the controls tend to tighten up, but not excessively. Care should be exercised when practising spinning solo. The C.G. being forward, there is a tendency at the stall to develop a tight spiral dive instead of a spin. Recovery can be effected, however, with less loss of height than in a spin.

NOTE

Do not confuse this spiral dive with spinning. Airspeed in a spiral dive increases; in a spin the airspeed remains reasonably constant at, or near, the stalling speed.



Stalling

15 Since the controls are effective down to the point of stall there is little warning of a stall, therefore care must be exercised during slow flying. The stall without flaps is very gentle, the control column must be moved fully back in order to demonstrate the nose drop at the point of stall. With flaps fully extended the stall is more positive. In all cases recovery is normal - move control column forward until the aircraft recovers and gently ease out of the ensuing dive. Without power there is a slight tendency for a wing to drop during the stall. With power on, this tendency is more pronounced. The stalling speeds, with engine idling, at an all up weight of 2000 lbs are:-

- | | |
|--------------------|-------------------|
| (a) Flaps UP | 57 - 49 knots IAS |
| (b) Half flap | 51 - 44 knots IAS |
| (c) Flaps DOWN 30° | 50 - 43 knots IAS |

Spinning

16 Spins should always be commenced at a safe altitude, allowing plenty of height for recovery. Entry is made in the usual manner, stalling the aircraft and applying full rudder in the desired direction. The first turn is very slow, the next two are fast after which the rate of turn diminishes and becomes constant. For the first three turns the attitude is fairly steep and then becomes approximately 45° to the vertical. The initial dive after recovery is quite steep. The spin can be stopped in a maximum of 1 1/2 turns regardless of the previous number of turns, provided positive recovery action is taken - i.e. full opposite rudder, then control column moved steadily forward until the spinning stops. Centralize the rudder and ease out of the ensuing dive.

Aerobatics

17 The aircraft handles well during all aerobatic manoeuvres providing they are commenced at the recommended speeds.

- | | |
|-------------------------------|---------------------|
| (a) Roll | 110 - 120 knots IAS |
| (b) Loop | 115 - 125 knots IAS |
| (c) Half roll off top of loop | 130 - 135 knots IAS |

NOTE

Hood should be closed during all aerobatics and spinning. Elevator trim should be neutral during all aerobatics.

Diving

18 Before diving the aircraft place the elevator trim in the neutral position. The engine tends to overspeed in a dive at 175 knots IAS even when the throttle is fully closed.

CAUTION

At no time must the engine speed be permitted to exceed a maximum of 2675 rpm.

LANDING PROCEDURES

Descending

19 During all prolonged descents the pilot should exercise the engine in order to prevent the plugs from fouling and to keep the oil temperature within the operating limits.

Pre Landing Check

20 During the final approach or let down to the airfield, carry out the following checks:-

- | | |
|---------------|--|
| (a) Fuel - | Select fullest tank. |
| (b) Brakes - | Fully OFF. |
| (c) Mixture - | RICH. Carburettor air - COLD. |
| (d) Harness - | Tight. |
| (e) Hood - | Fully open if dual, half open if solo. |
| (f) Flaps - | As required. |

Approach and Landing

21 Proceed as follows:-

- (a) Reduce speed to ⁷⁴64 knots IAS for the final approach.
- (b) Lower flaps for landing (if required) and adjust elevator trim.
- (c) Normally a three point landing will be made. Be prepared to correct any tendency to swing by use of coarse rudder; the aircraft should be allowed its full landing run, without braking, unless landing on a short strip.

Post Landing Check

22 When safely clear of the runway complete the following checks:-

- (a) Flaps - UP.
- (b) Elevator trim - neutral.
- (c) Reduce friction on the throttle lever.
- (d) Carburettor heat - Cold.

Stopping the Engine

23 When stopping the engine, proceed as follows:-

- (a) Apply parking brake fully.
- (b) Idle engine at 700 to 800 rpm for 30 seconds under normal conditions or for one minute in extremely hot conditions.
- (c) Switch ignition OFF.
- (d) Immediately open throttle fully.

NOTE

This sequence of switching off will reduce any tendency to backfire and will also eliminate continued running due to auto-ignition. Should auto-ignition occur on the initial switch off, the engine should be switched on again and idled at 800 rpm for a further 30 seconds before attempting to switch off again.

Action After Stopping Engine

24 After stopping engine, proceed as follows:-

- (a) Turn off fuel.
- (b) Close throttle.
- (c) Set all switches - OFF.
- (d) Cage gyro.
- (e) Switch radio - OFF.

COLD WEATHER OPERATION

General

25 Ensure that the airframe is thoroughly cleared of all snow and ice, in particular the control surfaces and hinges.

Starting the Engine

26 When starting the engine observe the following:-

- (a) After completing the customary checks of the aircraft, have the propeller turned through at least six revolutions by hand to guard against hydraulic locks in the engine.
- (b) It may be necessary to use the primer pump to keep the engine running until the carburettor can pick up. The warming up period will take longer than usual but no attempt should be made to rush the process.
- (c) Thoroughly check the rpm at full throttle (30 sec. only) and investigate should the rpm read low. Keep a continual check on the oil temperature and pressure throughout the run up.

NOTE

Low rpm may be caused by snow or ice accumulation in the air intake.



Taxiing

27 Taxi slower than normal to prevent snow, ice or slush being sprayed over the control surfaces and freezing.

Take-off

28 Beware of sprayed control surfaces on take-off as they may freeze up after the aircraft becomes airborne.

CAUTION

The use of carburettor hot air for take-off is not recommended as it reduces the full-throttle power output of the engine by a considerable amount.

NOTE

When ambient air temperatures are below 10°C in flight, apply carburettor heat at all times to prevent carburettor icing. If engine roughness occurs during flight at or above 10°C, carburettor icing should be suspected and carburettor heat applied. In case of a go-around return to cold air to ensure full power available.

Landing Check

29 Inspect the aircraft as soon as possible after the engine is stopped and have the control surfaces and hinges cleared of possible accumulations of snow and ice.

Part
3



EMERGENCY HANDLING

PART 3

EMERGENCY HANDLING

ENGINE FAILURE PROCEDURES

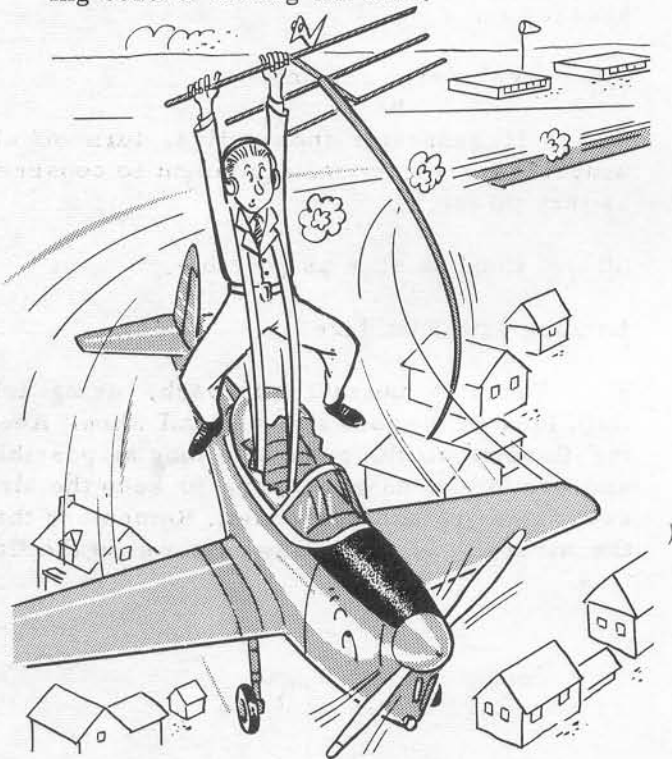
Engine Failure During Take-off

1 Proceed as follows:-

- (a) If the aircraft is not airborne, carefully apply brakes and stop in the shortest safe distance.
- (b) If the aircraft is airborne; depress the nose and assume gliding airspeed, 67 knots IAS, and land straight ahead making only essential manoeuvres in order to avoid obstacles. Before touching down select fuel and all switches OFF.

CAUTION

Never turn back to the airfield as this entails a downwind landing, at greater ground speed with the possibility of losing control during the turn.



Engine Failure in Flight

2 Should failure occur at a reasonable altitude, gain height with excess airspeed then depress the nose and assume a normal gliding airspeed of 67 knots IAS, then:-

- (a) Check fuel pressure, contents and select fullest tank.
- (b) Check mixture and carburettor heat selections.
- (c) Check ignition switches On.
- (d) Tighten safety harness and position hood as desired.
- (e) Attempt to restart the engine if practicable, otherwise switch OFF fuel, ignition and generator.
- (f) Trim elevators for glide.

Forced Landing

3 With the engine inoperative the landing area should be selected with extra care. A normal glide approach should be made, gently sideslip the aircraft as necessary to avoid rough areas. Aim directly into wind to reduce the landing run to a minimum and touch down in the three point attitude. On final approach insure that the following actions are accomplished.

- (a) Fuel - OFF.
- (b) All switches - OFF.
- (c) Safety harness - tight.
- (d) Hood - fully open.
- (e) Flaps - as required.

FIRE

Action in Event of Fire

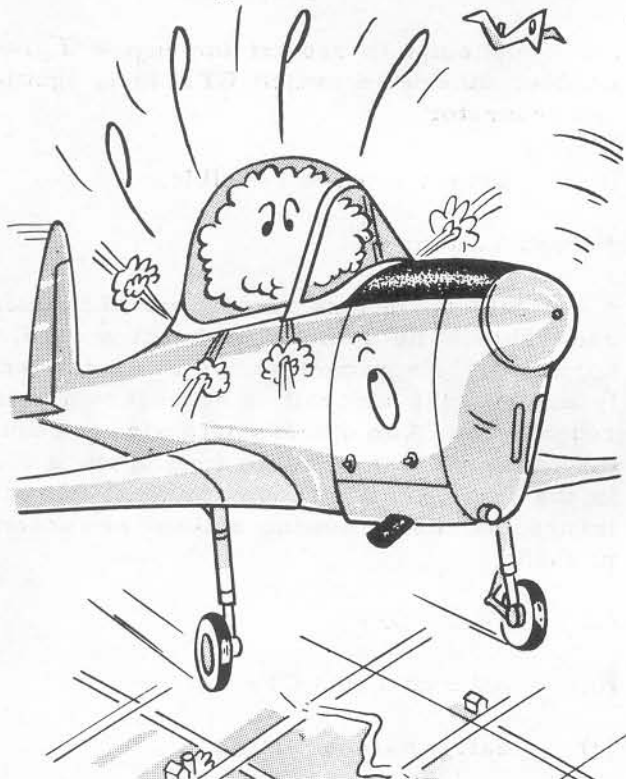
4 No fire extinguisher system is fitted in this aircraft therefore in the event of engine fire sideslip the aircraft so that flames and fumes are not directed at the cockpit, and select fuel and all switches OFF. Close throttle and bail out.

Cockpit Fire

5 Operate the hand fire extinguisher if it is obvious that the fire can be so controlled and make a landing as soon as possible, otherwise abandon the aircraft in flight.

WARNING

Care should be taken to avoid a dangerous concentration of fumes in the cockpit. Open the canopy as far as possible after the fire is extinguished, to dissipate fumes. Prolonged exposure to these fumes is dangerous.



Abandoning Aircraft in Flight

6 Proceed as follows:-

- (a) Open hood fully.
- (b) Ensure that student or passenger abandons the aircraft.
- (c) Turn fuel OFF.
- (d) Place all switches OFF.
- (e) Undo safety harness.
- (f) Trim aircraft for normal glide and away from inhabited areas.
- (g) Vacate the cockpit, step out on the wing and dive over the trailing edge away from the aircraft.

Ditching

7 Ditching this aircraft is not recommended.

Electrical Failure

8 In the event of electrical failure check:

- (a) Generator switch is ON and circuit breaker in.
- (b) Voltmeter reading.
- (c) If generator inoperative, turn off all unnecessary electrical equipment to conserve battery power.
- (d) Land as soon as possible.

Landing with Flat Tire

9 From a normal approach, using full flap, land on the good tire and tail wheel. Keep the flat tire off the ground as long as possible and use brake as necessary to keep the aircraft straight and slow down. Remember that the aircraft will tend to swing towards the flat tire.

Part
4



OPERATING DATA

PART 4

OPERATING DATA

RESTRICTIONS

General

1 The aircraft must be operated according to the limitations and instructions given in this part.

NOTE

With two occupants, the fuel load is at present restricted to 17 Imp. gal.

Weight and Balance

2 The maximum gross weight is 2000 lb for take-off and landing. Refer also to paragraph 13 and Appendix charts.

Instrument Markings

3 Instrument markings showing operating limits are found in Figure 4-1.

Maximum Speeds

4 The following chart shows the maximum speeds under various conditions of flight.

MAXIMUM SPEEDS

CONDITION	SPEED (Knots) IAS
For Lowering Flaps	85 74
For Lowering Landing Light	75 65
Diving - rpm max. 2675 (20 sec. limit)	200 174
Level at S. L. (Full throttle)	140 122
Level at 1000 ft (Full throttle)	136 118
Level at 5000 ft (Full throttle)	124 108

Recommended Speeds

5 The following Chart shows the recommended speeds under various conditions of flight.

RECOMMENDED SPEEDS

CONDITION	SPEED (Knots) IAS
Take-off	61 53
Rough Air	98 80
Climb to 5000 ft	81 70
Glide	11 67
Approach	74 64
Go-around (any selection of flaps)	15 65
Cruising at S. L. (2100 RPM)	123 107
Cruising at 5000 ft (2100 RPM)	112 97
Aerobatics	
Roll	127 110-120 138
Loop	137 115-125 144
Half roll off top of loop	150 130-135 156

Stalling Speeds

6 The following stalling speeds are for an all up weight of 2000 lb with Power Off.

STALLING SPEEDS

CONDITION	SPEED (Knots) IAS
Flaps UP	57 49
Half flaps	51 44
Flaps DOWN	50 43

POWER LIMITS BASED ON FUEL GRADE 80/87

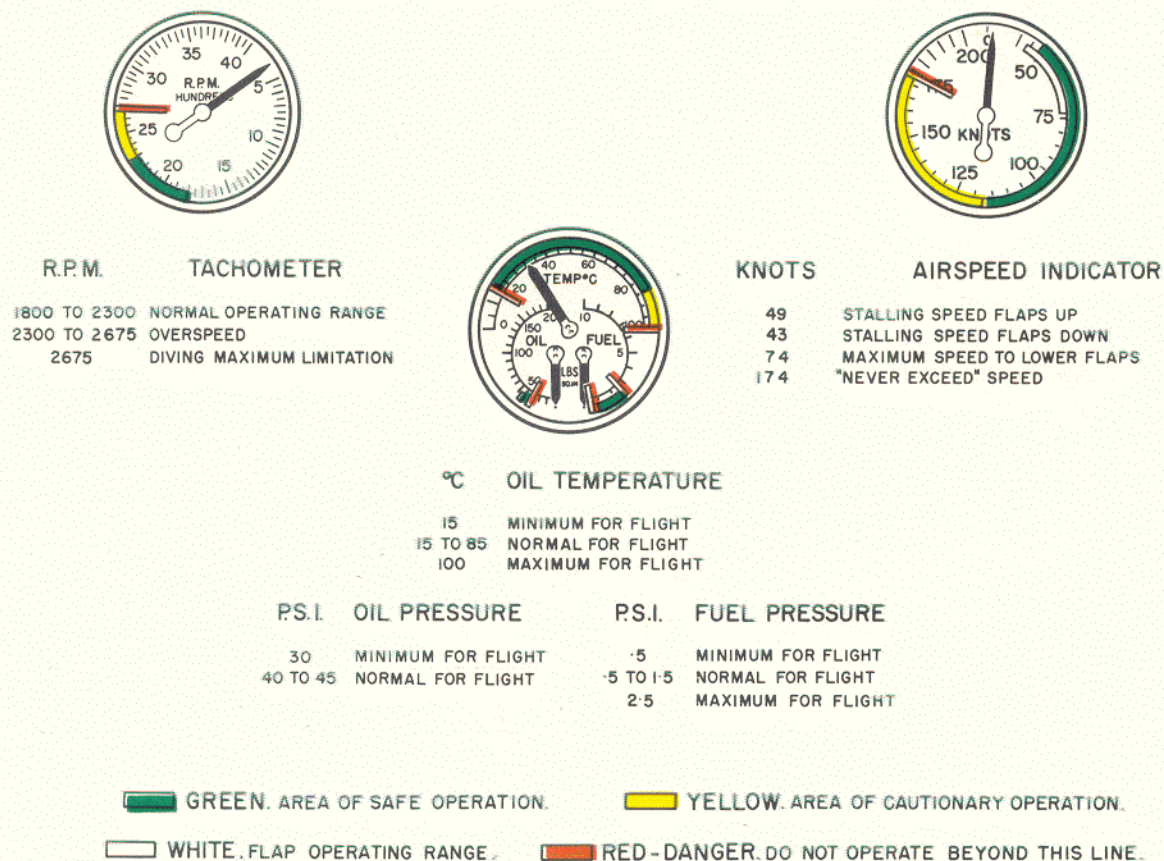


Figure 4-1 Instrument Markings

Acceleration Limits

7 The Operating Flight Strength Diagram, Figure 4-2, gives the maximum g-values to which the airframe may be safely subjected in flight under various conditions.

Engine Limitations

8 The following chart gives the limitations for the Gipsy Major CIG and 10 Mk 1-3 engines as recommended by the manufacturer and should not be exceeded.

ENGINE LIMITATIONS

CONDITION	RPM	OIL TEMP.	MIXTURE
Max for Take-off	2400 (Full Throttle)	100 °C (5 min limit)	Rich
Max for Climbing	2400 (Full Throttle) (60 min limit)	85 °C	Rich
Max for Cruising	2300	85 °C	Rich
Max for Diving	2675 (20 sec limit)		Rich

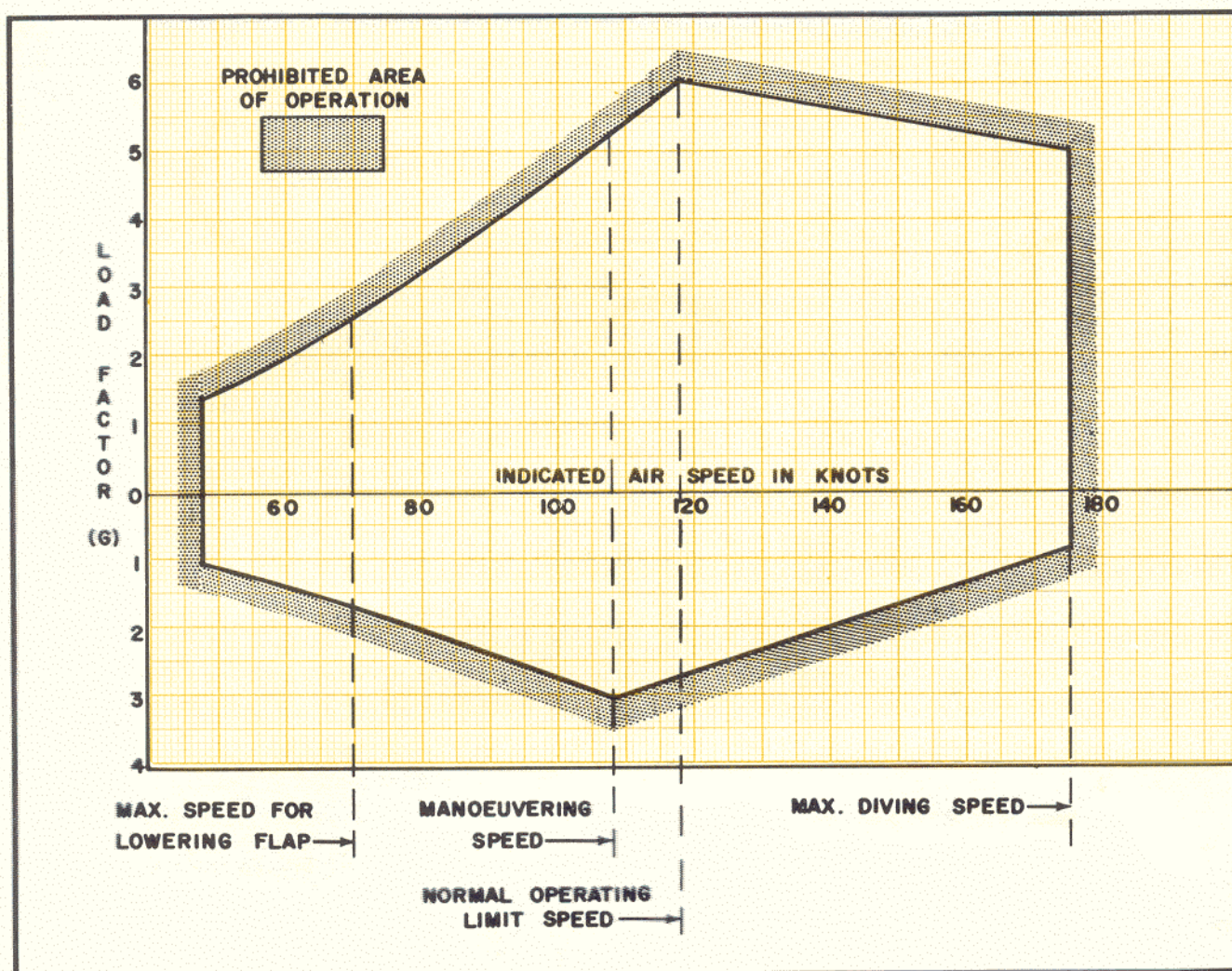


Figure 4-2 Operating Flight Strength Diagram

Position Error Correction

9 The correction for position error is negligible.

Fuel Consumption

10 The following chart gives the fuel consumption for various power settings.

FUEL CONSUMPTION

CONDITION	RPM	Imp gal per hour
Economical Cruising (Below 3000 ft)	2100	6.75
Economical Cruising (Above 3000 ft)	1800/2100	5.5-6.4

Oil Consumption

11 The oil consumption varies from 4.5 pints per hour at full throttle to 2.0 pints per hour at economical cruising.

Flight Data

12 The following data is based on ICAN standard atmosphere, with an aircraft all up weight of 2000 lbs.

FLIGHT DATA

Take-off to Clear 50 ft in Zero Wind	1040 ft
Landing over 50 ft in Zero Wind With Brakes Ground Roll	960 ft 490 ft
Rate of Climb at Sea Level	825 fpm
Service Ceiling	16,000 ft
Absolute Ceiling	18,200 ft
*Cruising Range at 5000 ft (17 Imp gal. fuel capacity)	235 nms
*Endurance, cruising at 5000 ft (17 Imp gal. fuel capacity)	2-1/4 hrs
*Based on an allowance of approx. 2 Imp gal. fuel for warming up, take-off and climb to 5000 ft. With one occupant only the fuel capacity is 27 Imp gal. Range and endurance increases accordingly.	

Weight and Balance Limitations

13 The Design Gross Weight of the aircraft is 2000 lb, at this weight it complies with the general performance and strength criteria. In the interest of airworthiness it is important that the weight and balance limits for this airplane be adhered to in accordance with the recommendations and information given in the following paragraphs and the tables and charts in the Appendix.

Weight Definitions

14 Tare Weight is the weight of the aircraft with the minimum equipment essential to airworthiness, e.g., cockpit seats, flight and engine instruments, etc. Hence equipment changes in the field, therefore, will not normally effect the tare weight.

Basic Weight includes all other installed equipment both fixed and removable, e.g., radio, exterior finish (paint), furnishings and such equipment as defined by the items ticked off in the Weight and Balance Report under the heading "Equipment Check List" and "Basic Weight Change Record".

Operational Load comprises crew, oil and fuel weights. The maximum fuel capacity that can be carried is restricted by the weight of the oc-

cupants and the basic weight of the aircraft so that the A.U.W. does not exceed 2000 lb. Figure A-4, Fuel Quantity vs Occupants, is provided for plotting these weights to determine the permissible maximum fuel quantity for the flight.

All Up Weight (A.U.W.) is the sum of basic weight plus operational load and must not exceed 2000 lbs.

Weight and Balance Report

15 This report defines the equipment that was in the aircraft "as weighed" and "as delivered" and gives weight, arms and moments as well as the Tare and Basic Moment. If the equipment is changed, the Basic Weight changes also. Changes should be recorded in the "Basic Weight Change Record" which must be kept up-to-date at all times. The appropriate items of the "Equipment Check List" should be ticked off on receipt of the aircraft and periodically cross-checked. If the configuration of the aircraft is altered at any time, e.g., changing from wheels to skis, such alteration must be duly recorded in the "Basic Weight Change Record". The obligation that all changes must be recorded applies also to modifications of all sorts e.g., repair of damages suffered in the field, in which case all parts removed from, or added to, the aircraft must be weighed separately

and their Moment Arms measured so that the "Weight and Balance Report" can be properly brought up-to-date. The Balance Diagram (Figure A-1) may be used to determine the Arms of any equipment not yet listed.

Preparation for Flight

16 The A.U.W. and Total Moment (i.e. CG position) should be checked for conditions at the beginning and at the end of the flight by reference to the current "Basic Weight Change Record" and the "Operational Load Table". The A.U.W. must not exceed 2000 lbs at any time. The sum total of all moment values must conform to the safe moment limits given for different gross weights in the Safe Moments Table. For establishing conditions at the beginning of the flight, use A.U.W. To arrive at conditions prevailing at the end of a flight, subtract the moments and weights of the fuel and oil consumed, during flight, from the initial A.U.W. and total moments.

Centre of Gravity

17 The CG datum line lies 42.0 inches aft of the engine firewall; see Balance Diagram, Figure A-1. The loads are measured in pounds and the arms of these loads in inches. If the load is forward of the datum line its arm is negative; if the load is aft of the datum line its arm is positive. The effect of displacement of the CG above or below the horizontal datum is negligible in this aircraft and can be ignored.

NOTE

To determine the CG position, the aircraft must be weighed with the tops of the canopy rails level laterally and longitudinally. It is important that, after leveling the aircraft, the canopy is closed before weighing.

Typical Loading Example

18 Sample loading calculations for location of the CG for take-off and landing are shown below.

The CG position for take-off with one occupant, and full fuel and oil tanks is as follows:-

Item	Weight Pounds	Arm Inches	Moment In. lb.
Aircraft Empty	1405	-6.25	-8781.25
Oil (2 1/2 Imp. gal.)	22.5	-44.4	-990
Fuel (25 Imp. gal.)	180	-11.7	-2106
Pilot with chute in front cockpit.	190	-0.75	-142.5
	1797.5		-11919.75
CG position =	$\frac{-11919.75}{1797.5} =$	-6.57 inches	

The CG position at the completion of the flight with minimum fuel and oil will be as follows:-

Item	Weight Pounds	Arm Inches	Moment In. lb.
Aircraft Empty	1405	-6.25	-8781.25

Part 4

Oil (1/2 Imp. gal.)	4.5	-44.4	-199.8
Fuel (1 Imp. gal.)	7.2	-11.7	-84.24
Pilot with chute in front cockpit.	$\frac{190}{1606.7}$	$\frac{-0.75}{-}$	$\frac{-142.5}{-9207.79}$

$$\text{CG position} = \frac{-9207.79}{1606.7} = -5.7 \text{ inches}$$

The permissible CG limits are -8.91 and -0.72 inches forward of the datum line. Since the CG positions calculated in the two examples above

are within these limits and the gross weight is less than 2000 lbs the aircraft loading is satisfactory for the flight.

Appendix



APPENDIX

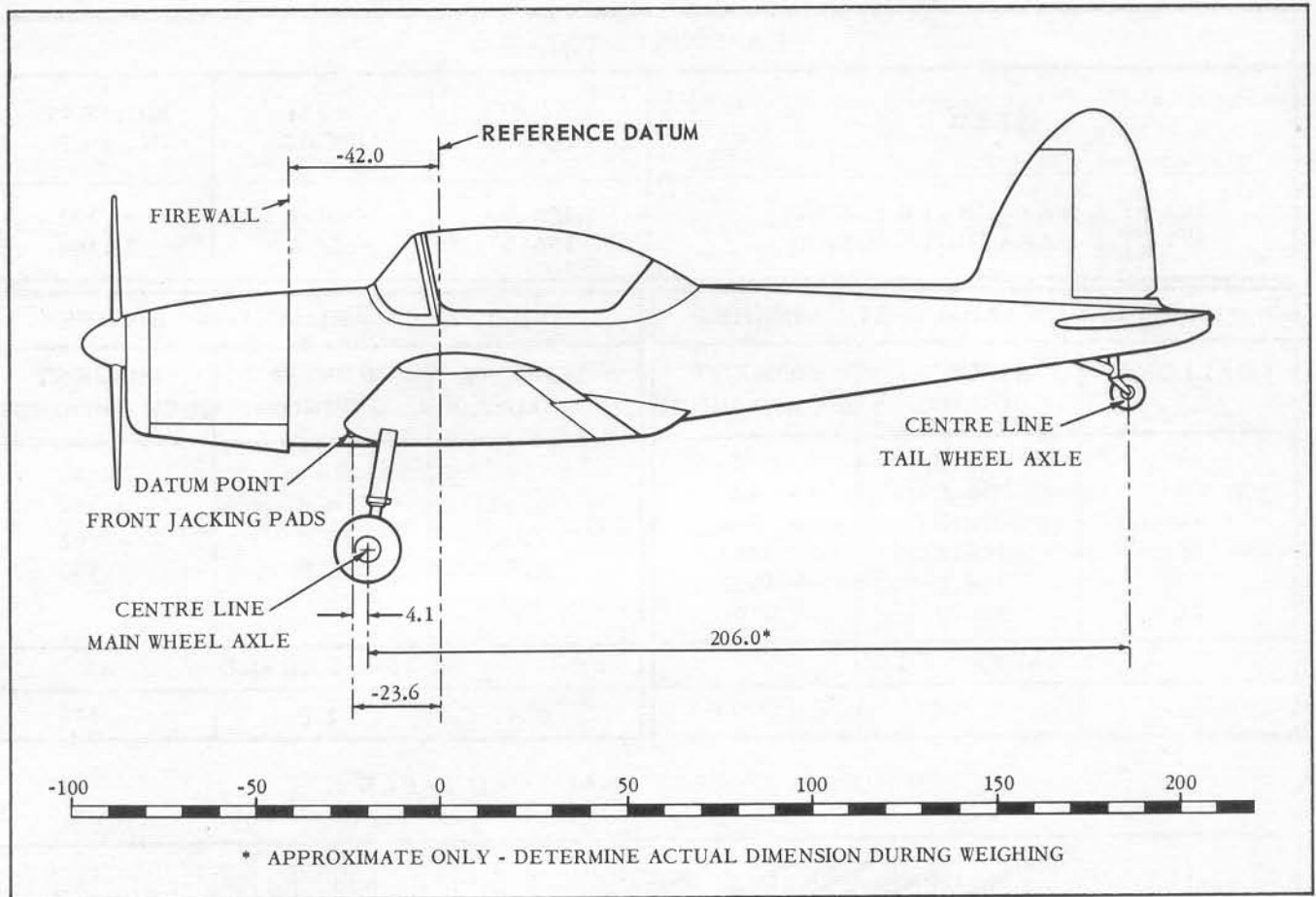


FIG. A - 1 BALANCE DIAGRAM

SAFE MOMENTS TABLE					
GROSS WEIGHT LB.	MOMENT IN. - LB.		GROSS WEIGHT LB.	MOMENT IN. - LB.	
	FORWARD LIMIT	AFT LIMIT		FORWARD LIMIT	AFT LIMIT
1420	- 12652	- 1022	1720	- 15325	- 1238
1440	- 12830	- 1037	1740	- 15503	- 1253
1460	- 13009	- 1051	1760	- 15682	- 1267
1480	- 13187	- 1066	1780	- 15860	- 1282
1500	- 13365	- 1080	1800	- 16038	- 1296
1520	- 13543	- 1094	1820	- 16216	- 1310
1540	- 13721	- 1109	1840	- 16394	- 1325
1560	- 13900	- 1123	1860	- 16573	- 1339
1580	- 14078	- 1138	1880	- 16751	- 1354
1600	- 14256	- 1152	1900	- 16929	- 1368
1620	- 14434	- 1166	1920	- 17107	- 1382
1640	- 14612	- 1191	1940	- 17285	- 1397
1660	- 14791	- 1195	1960	- 17464	- 1441
1680	- 14969	- 1210	1980	- 17642	- 1426
1700	- 15147	- 1224	2000	- 17820	- 1440

FIG. A - 2 SAFE MOMENTS TABLE

PERSONNEL TABLE					
ITEM		WEIGHT POUNDS	ARM INCHES	MOMENT IN. - LB.	
PILOT & PARACHUTE (FRONT)		190.0	- 0.7	- 133	
PILOT & PARACHUTE (REAR)		190.0	+ 32.6	+ 6194	

FUEL TABLE ARM = -11.7 INCHES			OIL TABLE ARM = -44.0 INCHES		
GALLONS IMP.	WEIGHT POUNDS	MOMENT INCH-POUNDS	GALLONS IMP.	WEIGHT POUNDS	MOMENT INCH - POUNDS
1	7.2	- 84			
5	36.0	- 421			
10	72.0	- 842	1.0	9.0	- 396
15	108.0	- 1264	2.0	18.0	- 792
20	144.0	- 1685	2.5	22.5	- 990
25	180.0	- 2106			
TRAPPED FUEL			TRAPPED OIL		
1	7.2	- 84	0.4	4.0	- 176

FIG. A-3 OPERATIONAL LOAD TABLE

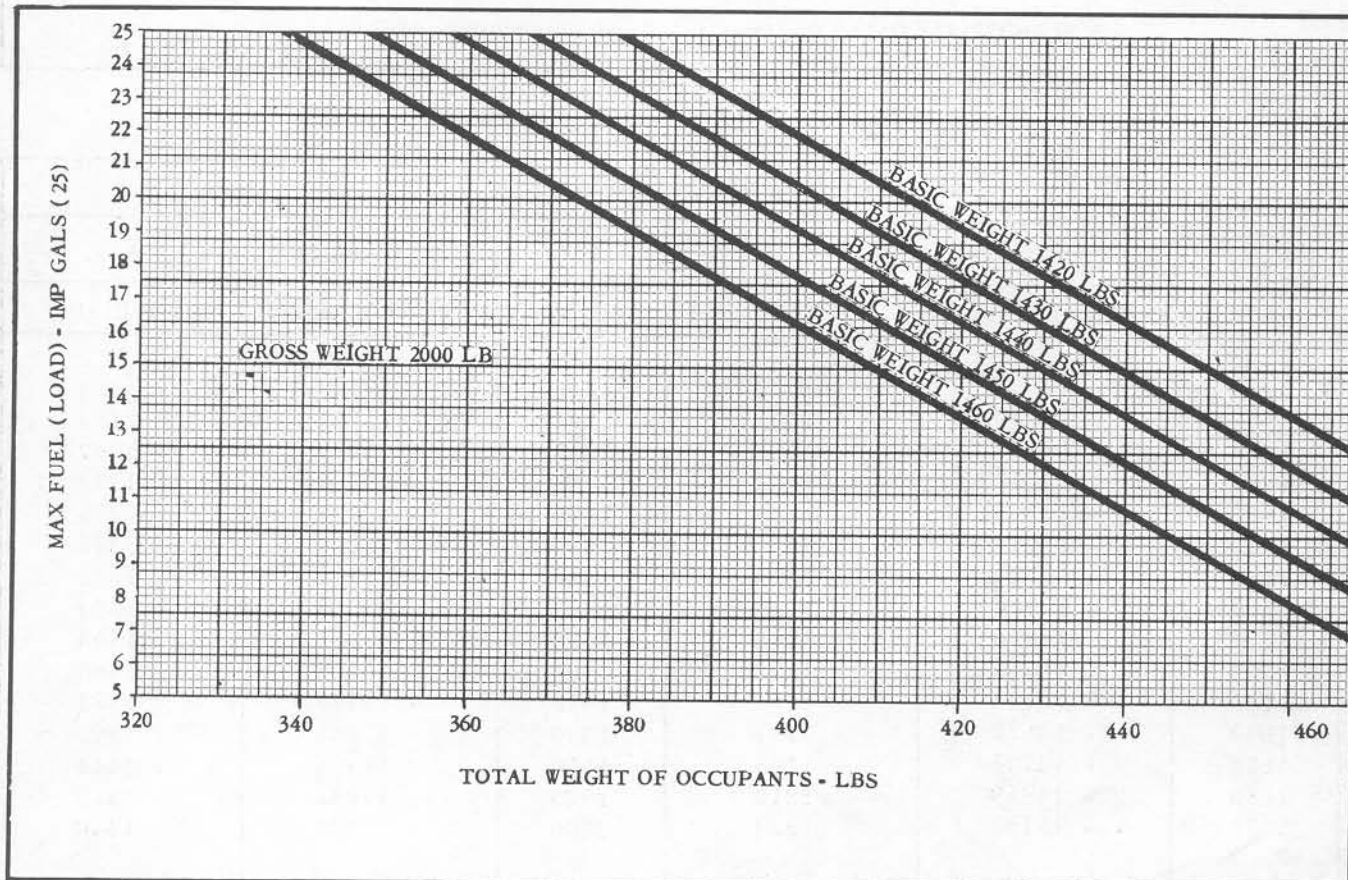


FIG. A-4 FUEL QUANTITY VS OCCUPANTS

