Cessna L19 Bird Dog
Aircraft Operating Instructions

OPI – RCA Ops (Pac)

Version 4.1
11 February 2011

RECORD OF REVISION

Version Number	Revision Date	Change	Amendments Entered	
			Date	Entered By
1.0	01 Jun 05	Revision - Full Issue	N/A	
2.0	01 Jun 06	Limited Revision	N/A	
3.0	01 Jun 08	Revision – Full Issue	N/A	
4.0	26 Nov 10	Revision – Full Issue	N/A	
4.1	11 Feb 11	Revision – Full Issue	N/A	

NOTES TO USERS

AUTHORITY

1. This document is an official Canadian Forces Publication.

2. This Aircraft Operating Instruction (AOI) is issued in compliance with the Canadian Forces Operational Airworthiness Manual, B-GA-104-000/FP-001. It is the authoritative document for operation of the L19 Bird Dog within the Canadian Forces Air Cadet Gliding Program (ACGP) in Pacific Region. It consolidates all relevant data and information including the following:

   a. all relevant data from the Pilot Operating Handbook (POH) for the model years in use;

   b. all placard data from Original Equipment Manufacturers (OEM);

   c. relevant data associated with the various Supplemental Type Certificates for modifications incorporated on the aircraft;

   d. relevant information from other OEM publications; and

   e. procedures and performance data unique to ACGP operations that have been validated through Operational Test and Evaluation (OT&E) conducted by Regional Cadet Air Operations (Pacific).

APPLICABILITY

2. These Aircraft Operating Instructions (AOI) and the associated Pilot's Checklist pertain exclusively to Cessna L19 Bird Dog aircraft as modified for operation in the Air Cadet Gliding Program in Pacific Region.

Identification Number	Aircraft Registration	Model	Year of Manufacture
Tug 4	C-FTGA	A	1954
Tug 5	C-GKNK	A	1953
Tug 6	C-GRGS	A	1952
Tug 7	C-FTAL	C	1956

3. There are some configuration differences between the L19 "A" Model and L19"C" Model. Unless otherwise indicated, information provided is applicable to both Models. Any information unique to either Model is highlighted as such in this publication.

STRUCTURE

4. This AOI is divided into four Parts and one Annex:

   a. PART I – GENERAL DESCRIPTION – describes and illustrates the controls, systems and equipment with which the pilot should be familiar.

   b. PART II – NORMAL OPERATING PROCEDURES – describes the normal handling of the aircraft by the pilot.

   c. PART III – EMERGENCY OPERATING PROCEDURES – details the emergency handling of the aircraft by the pilot.

   d. PART IV – OPERATING DATA AND LIMITATIONS – gives the flying and engine limitations and includes information on fuel consumption, range, and endurance under various conditions of flight.

   f. ANNEX A - PILOT'S GUIDE – GARMIN GNC-25-XL – OEM manual for GPS/COM radio

5 As a general rule, words written in capital letters throughout the text indicate actual markings on the controls concerned.

REVISION PROCESS

6. This publication is subject to annual review and revision. Comments and suggestions for changes to this publication should be forwarded in writing to the Regional Cadet Air Operations Officer (Pacific).

CAUTIONARY INFORMATION

7. Where appropriate, cautionary information is provided. Such information will be preceded by a highlighted header of **Danger**, **Warning**, **Caution**, or **Note**. These headers are defined as follows:

DANGER

To draw attention to a condition that poses an extreme, violent and continuous hazard to human life.

WARNING

To emphasize operating procedures, practices, etc, which, if not correctly followed, could result in personal injury or loss of life.

CAUTION

To emphasize operating procedures, practices, etc, which, if not correctly followed, could result in damage to or destruction of equipment or legal claims or actions against the crown.

NOTE

To point out a procedure, event or practice which it is desirable or essential to highlight.

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PART I

GENERAL DESCRIPTION

GENERAL

1. The L19 is an all-metal, tandem, two-place high-wing monoplane. It was developed for the military as a multipurpose aircraft designed primarily for reconnaissance / observation. Its common military designation was **L-19 “Birddog”,** but it is also known by the military designator **O-1** and by the civilian designator **Cessna 305**. Several variants of the aircraft were produced, and RCA Ops (Pac) operates the L19A and L19C model aircraft.

2. This aircraft does not have a certified Pilot Operating Handbook (POH). This AOI incorporates OEM placard data, supplemental POH data associated with the various Supplemental Type Certificates incorporated and additional relevant information from Cessna Company publications.

Aircraft Dimensions and Weights

Length	25 ft 9 ½ in
Wingspan	36 ft
Height	7 ft 6 in
Maximum All Up Weight – L19 ”A”	2300 lbs
Maximum All Up Weight – L19 “C”	2400 lbs
Basic Empty Weight	IAW Aircraft Weight and Balance Record

Table 1-1 Aircraft Dimensions and Weights

Fuel Tank Capacities

	Total Fuel		Useable Fuel	
	Litres	US Gal	Litres	US Gal
Main Tank	77.6	20.5	68.1	18.00
Auxiliary Tank	77.6	20.5	68.1	18.00
Total	155.2	41.0	136.2	36.00

Table 1-2 Fuel Tank Capacities

Oil Capacities

	Quarts / Litres
Max Oil Capacity	10 / 9.5
Normal Oil Level	8-9 / 7.6-8.5
Minimum Oil Level	8 / 8.5

Table 1-3 Oil Capacity

AIRFRAME

General Layout

3. Exterior and interior layout is detailed in Figures 1-1 through 1-4.

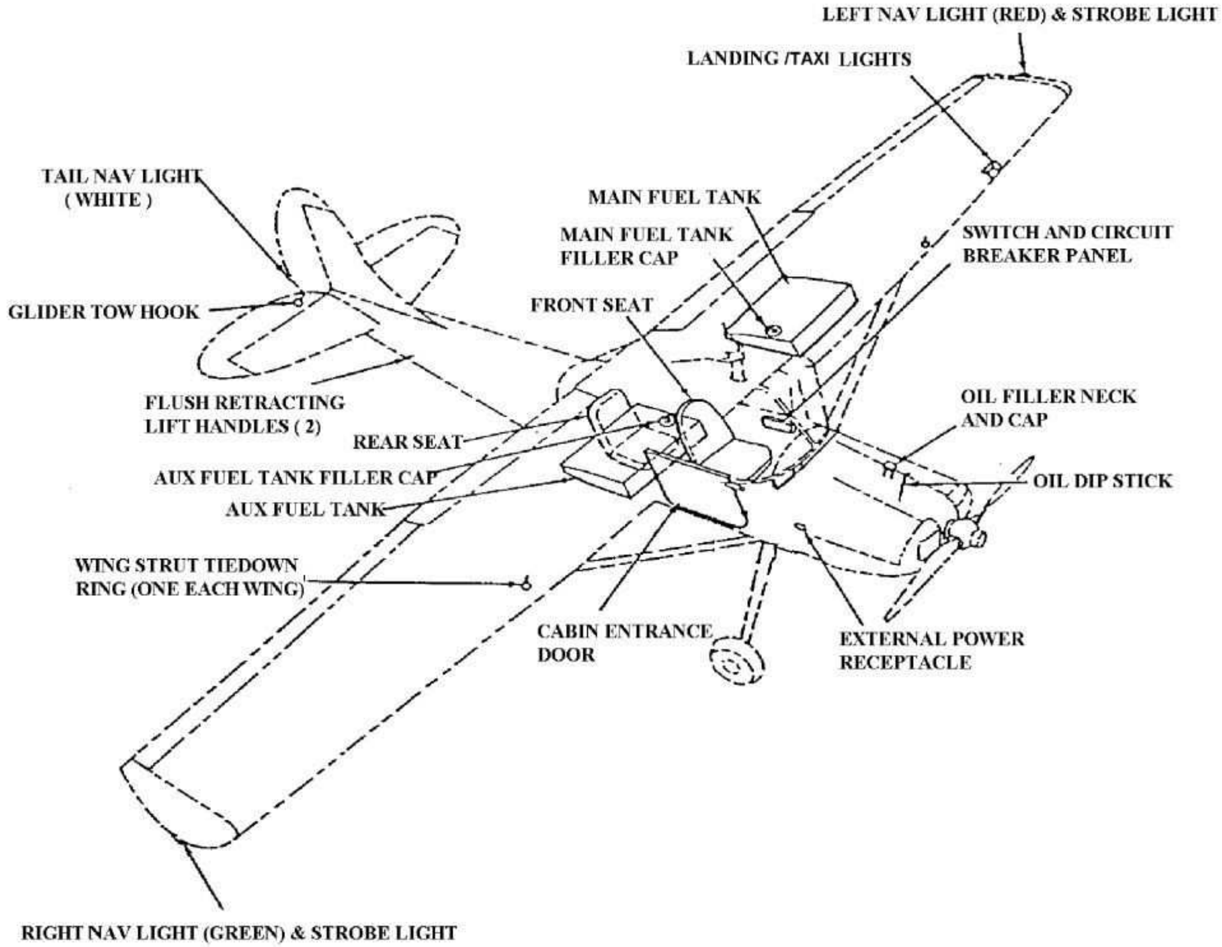


Figure 1-1 General Arrangement

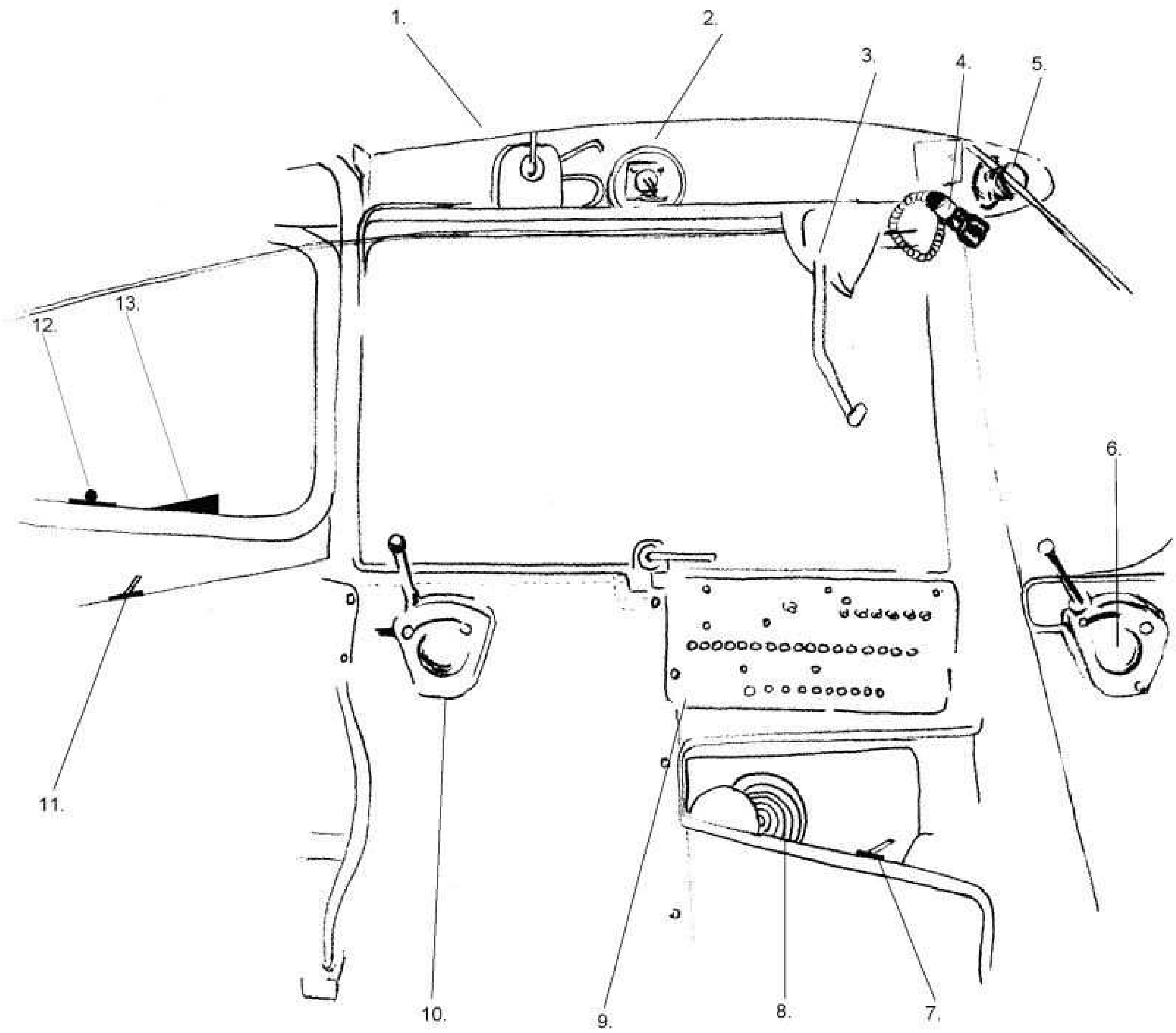


Figure 1-2   Cockpit Layout – Left Side

1. Fuel Selector Valve
2. Main Fuel Tank Gauge
3. Tow Release Handle
4. Map Light
5. Fresh Air Vent
6. Front Throttle Quadrant
7. Front Shoulder Harness Lock
8. Elevator Trim Control Wheel
9. Circuit Breaker Panel
10. Rear Throttle Quadrant
11. Rear Shoulder Harness Lock
12. Rear Radio Transmit Switch
13. Rear Flap Switch

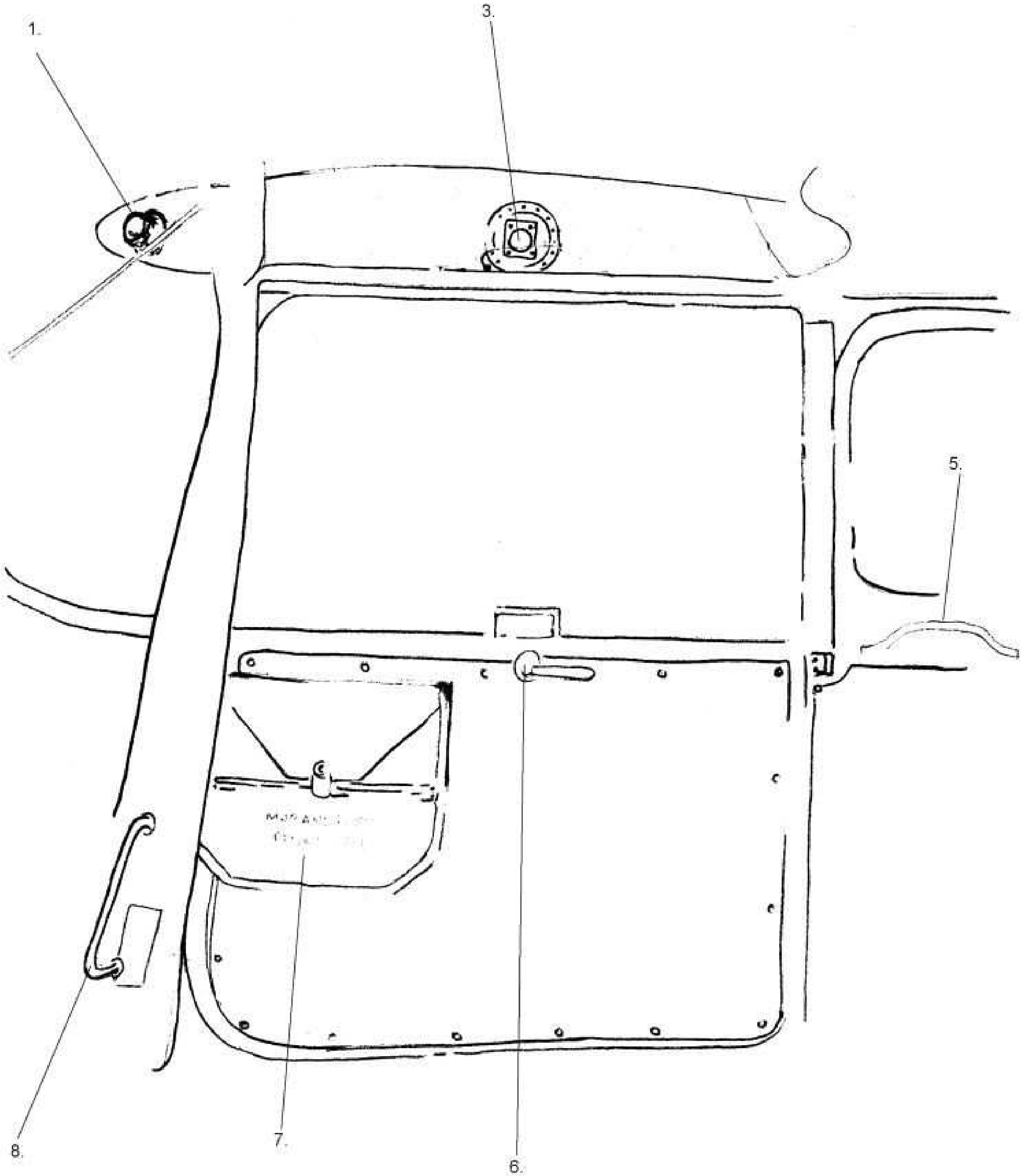


Figure 1-3   Cockpit Layout – Right Side

1. Fresh Air Vent
2. Deleted
3. Auxiliary Fuel Tank Gauge
4. Deleted
5. Rear Control Column Storage
6. Door/Window Handle
7. Map Case
8. Emergency Door Jettison Handle

Figure 1- 4 Cockpit Layout - Front

1. Clock
2. Air Speed Indicator
3. Attitude Indicator
4. Alternator Warning Light
5. Altimeter
6. Engine RPM
7. Oil Temperature Gauge
8. Oil Pressure Gauge
9. Volt/Ammeter
10. ELT Switch
11. Fuel Pressure Gauge
12. Suction Gauge
13. Transponder
14. Cylinder Head Temperature
15. Fuel Boost Pump
16. Battery Master Switch
17. Alternator Switch
18. Magneto Switch
19. Starter Button
20. Radio Master Switch
21. Intercom Panel
22. Directional Indicator
23. Landing/Taxi Light Switch
24. Engine Fuel Primer Switch
25. Nav/Com Panel
26. Turn and Slip Indicator
27. Vertical Speed Indicator
28. Rudder Pedals
29. Fuel Pump
30. Fire Extinguisher

Windows

4. In addition to the cabin door, there are two moveable windows in the cabin area. The window adjacent to the pilot on the left side of the aircraft is hinged at the top and opens out and up. To open this window, turn the handle counter-clockwise until the window swings free. A catch is mounted on the lower surface on the left wing for securing the window in the open position.

5. The rear right window opens in and up. To open, turn the DZUS fasteners on the window frame a half-turn counter-clockwise. A canvas strap, which hangs from the cabin ceiling, holds this window open. The strap is fitted with a snap fastener, which engages a snap fastener on the window. The left hand rear window is prevented from opening by the tow release cable and wire bundles.

WARNING

Maximum allowable airspeed with window(s) open is 120 MPH.

NOTE

Use only cleaner/polishing products certified for use on acrylic plastic to clean the windscreen or windows. Apply with micro fibre or flannel cloth

Cabin Door

6. The cabin door is mounted on the right side of the aircraft for entrance and exit. The door is composed of two sections. The upper section is a window, hinged on the top edge that opens, up and out. The lower section is hinged along the forward edge. Handles are provided on both the inside and outside of the lower door section. To open the window section of the door the handle is rotated down approximately 60 degrees until the window swings free. The window can be held open by engaging a catch located on the under surface of the wing. Rotate the handle further until the door is unlatched. The door will now swing forward until it contacts a stop located on the right hand wing strut.

CAUTION

Do not slam the door to close it, as this can damage the latching mechanism. The door is closed by smoothly and firmly pulling it shut.

Pilots Seat

7. The pilot's seat is mounted on two rails in the forward section of the cabin. A seat adjustment lever is provided below the right side of the pilot's seat. The pilot's seat may be adjusted fore or aft by raising the lever up, sliding the seat to the desired position, releasing the lever, and moving the seat fore and aft a short distance until the seat locking pins engage in the holes in the seat rails. The seat position shall be adjusted prior to engine start.

WARNING

If the seat retaining pins are not positively locked in position, the seat may suddenly move aft when power is applied resulting in possible loss of aircraft control.

Rear Seat

8. The rear-seat backrest is removable and it can be installed in either the fore or aft position moving the pilot approximately four inches further forward or aft. It is normally installed in the aft position.

Safety Belts and Harnesses

9. A safety belt and shoulder harness with associated locking mechanism mounted under the floor aft of each seat is provided for both front and rear seats. A two-position (LOCKED and UNLOCKED) shoulder harness lock lever is located on the left cabin wall adjacent to each seat. A latch is provided for positively retaining the lever at either position of the quadrant. By pressing down on the top of the lever, the latch is released and the lever may be moved freely from one position to the other. The inertia reel will automatically lock with the application of approximately 2-3g of forward acceleration.

Baggage Compartment

10. A baggage compartment is located behind the rear seat. Maximum weight limit for this area is 100 lbs. The baggage compartment is accessible over the rear seat

CAUTION

Ensure that any items stowed in the baggage compartment are properly secured prior to flight.

FLIGHT CONTROLS

General

11. The aircraft is equipped with conventional flight controls that can be operated from both the front and rear cockpit.

Control Columns

12. The elevator and aileron surfaces are operated by conventional movement of either one of the two control columns. The rear control column is removable by pulling out a control column release knob and lifting the control column from its socket. Two clips for storage of the rear control column are mounted on the right rear window ledge.

WARNING

The rear control column must be removed for solo flight. When installing the rear control column, the slot at the base of the control column must face aft, and ensure that the locking pin is engaged.

Rudder Pedals

13. Two sets of rudder pedals are provided to mechanically operate the rudder and the steerable tail wheel.

14. The front pedals are located just aft of the firewall adjacent to the cabin floor and are equipped with brake-system master cylinders.

15. The rear pedals are located just aft of the front seat and can be folded flat on the floor by pulling up on the locking pin of each pedal and pushing the pedals down and aft. In this position, the pedals do not interfere with the normal operation of the front rudder pedals. The pedals can be raised to the operating position by pulling them up and forward. Toe pressure on these pedals is mechanically transmitted to the front pedals, which will, in turn, hydraulically actuate the main wheel brakes.

WARNING

The rear rudder pedals must be stowed for solo flight.

WARNING

If not properly secured by the locking pins the rear rudder pedals may fold when foot pressure is applied resulting in loss of rudder control from the rear seat.

Elevator Trim

16. An elevator trim-tab control wheel (Figure 1-2) is located on the left cabin wall. The tab control wheel is mechanically connected to the elevator tab by chains, cables, and a screw-jack actuator. A tab position indicator is incorporated to indicate the trim tab position. The indicator is labelled **NOSE UP**, **NOSE DN**, and **TAKE OFF**.

Control Lock / Parking Brake

17. A simple, positive control lock for rudder, elevators and ailerons is located on the cabin floor in front of the forward control column. The lock is a welded U shaped tube that pivots inside the front rudder pedal torque tubes. The controls are locked and parking brakes are set simultaneously, by raising the U-tube and placing the locking pin, fixed to the front of the control column, into the hole on the underside of the tube. To unlock the controls and release the parking brake, lift the tube from the locking pin and lower the tube to the cockpit floor.

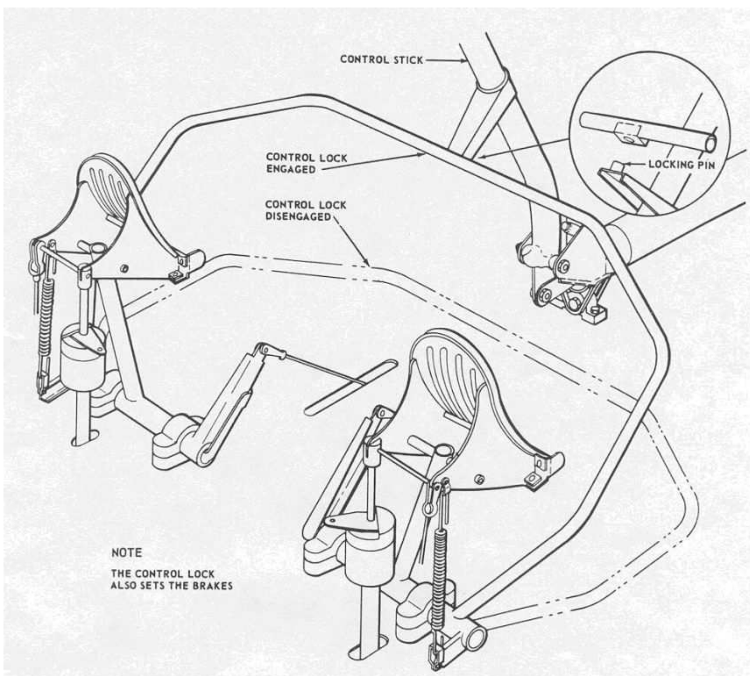


Figure 1- 5 Control Lock / Parking Brake

CAUTION

When parking the aircraft with control locks engaged for an extended period, ensure that the aircraft wheels are chocked. Reliance on the parking brake when the aircraft is unattended could result in aircraft movement in the unlikely event that brake pressure is lost.

Wing Flaps

18. Single-slotted, electrically actuated high-lift flaps extend from the fuselage to the aileron on each wing. Two separate wing-flap switches located in the front and rear cockpits control the flaps. The wing flaps can be moved electrically to any setting between 0 and 60 degrees, and locked in that position by releasing the switch and allowing it to return to OFF. When either the up or down flap limits are reached, the flap actuator motor is automatically turned off by limit switches.

NOTE

In some circumstances where the flaps are selected DOWN to 10 degrees or less, the up limit switch may prevent activation of the flap motor when the flaps are subsequently selected UP. Should this occur, simply lower the flaps an additional 5-10 degrees, and then re-select the flaps UP.

19. The front cockpit has a three-position, spring-loaded wing flap switch mounted on the window ledge adjacent to the engine control quadrant (Figure 1-6). The switch positions are labelled FLAPS UP (forward) and FLAPS DOWN (aft). The centre position of the switch is the OFF position.

20. The rear cockpit switch is a four-position spring-loaded and guarded switch installed on the left hand side of the rear cockpit window ledge (Figure 1-2). When the switch is moved from the NORMAL (down and guarded) position, to the OFF (unguarded and up) position, power to the flap selector switch in the front cockpit is cut off. The rear cockpit pilot is then able to adjust the flaps to the desired setting by moving the switch to either the FLAPS UP or FLAPS DOWN position. The rear cockpit flap switch should remain in the NORMAL position when not in use.

CAUTION

The rear cockpit flap switch must be in the NORMAL position for solo flight.

Wing Flap Position Indicator

21. The position of the flaps can be ascertained by looking at the markings on the rear cockpit window frame. There are witness marks at **10**, **20**, **30**, **45**, and **60** degrees and flaps can be selected at these settings or any setting in between.

LANDING GEAR

General

22. The aircraft is equipped with a conventional landing gear system consisting of a fixed main landing gear and a steerable tail wheel:

a. the main landing gear incorporates a single tapered spring-steel leaf supporting each main wheel;

b. the tail wheel is supported by a multi-leaf spring. The tail wheel steering arms are connected to the rudder by flexible cables and springs, and steering is controlled through normal operation of the rudder pedals; and

c. tire inflation pressures are 21 psi (main wheels) and 35 psi (tail wheel).

Tail Wheel Steering

23. The tail wheel is steerable through an arc of 16 degrees each side of neutral. Beyond this travel the tail wheel becomes free swivelling.

CAUTION

If the tail wheel is allowed to turn through 16 degrees or more, the tail wheel unlocks and the tail will swing rapidly as the main wheels are ahead of the centre of gravity. Care should be taken to avoid this condition developing into a ground loop.

Brakes

24. Hydraulic brakes on the main wheels are conventionally operated by applying toe pressure to the top of either front or rear rudder pedals. The rotation of the pedals actuates the hydraulic brake cylinders, resulting in a braking action on the main wheels.

Parking Brake

25. Engaging the control lock sets the parking brake (see Figure 1-5)

POWER UNIT

Engine

26. The aircraft power plant is a Teledyne-Continental O-470-11, six-cylinder, horizontally opposed, air-cooled engine with a pressure carburettor. At the maximum allowable engine speed of 2600 RPM, the engine is capable of developing 213 HP for a maximum of 5 minutes. Maximum continuous operation is limited to 2300 RPM where the engine is capable of generating 190 HP.

Propeller

27. The aircraft is normally equipped with a fixed-pitch McCauley two bladed, all metal propeller 90 in. in diameter. A Hoffman four bladed, wooden propeller is also certified as an alternate configuration.

CAUTION

When configured with the Hoffman propeller, Vne is reduced to 150 MPH. Care must also be taken to ensure that propeller speed does not exceed 2600 RPM.

NOTE

The Hoffman propeller does provide some reduction in noise levels, but takeoff & climb performance are adversely affected.

Engine Controls

28. The engine controls consist of a throttle, mixture lever, and carburettor heat lever- mounted on each of two quadrants. The front quadrant is located on the left side of the fuselage slightly forward of the front seat. The rear quadrant is located in a similar position just forward of the rear seat. These quadrants are mechanically inter-connected to provide simultaneous control of the engine from either cockpit.

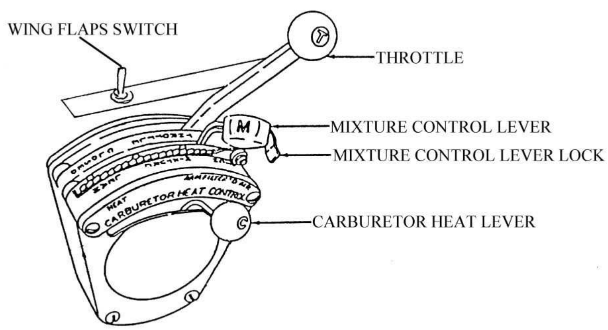


Figure 1-6 Engine Control Quadrant

Throttle Control

29. The throttle is the outboard lever on each quadrant and is mechanically connected to the carburetor by a flexible push-pull type cable. The full forward position of the throttle is OPEN and the full aft position is CLOSED.

Mixture Control

30. The mixture lever is the centre lever on each quadrant. These levers enable the pilot to regulate the fuel-air mixture to the engine to obtain efficient engine operation and maximum fuel economy at cruise. The RICH position is full forward, full aft is IDLE CUT-OFF (ICO). Manual leaning is accomplished by placing the lever between the RICH and ICO positions. The mixture lever on the front quadrant is equipped with a spring-loaded lock. When either mixture lever is moved forward, the lock is automatically released. However, before either mixture lever can be moved aft, the lock on the front quadrant must be released by pressing forward on the lock lever. When pulled full aft, to the ICO position, the mixture lever shuts off all fuel flow at the carburettor to stop the engine.

Air Induction and Carburettor Heat

31. The carburettor heat lever is the inboard lever on each quadrant. The carburettor heat positions are labelled COLD (forward) and HOT (aft). When the lever is in the COLD position, cold air is admitted to the carburettor through the air intake scoop and air filter on the front lower side of the cowl. When the lever is moved to the HOT position, a gate valve closes off the cold-air intake opening from the carburettor. With the gate valve closed, a partial vacuum is created in the carburettor air box, causing a spring-loaded valve to automatically open, thereby admitting unfiltered hot air from around the cylinders to the carburettor. If the engine should backfire when the lever is in the HOT position, the spring-loaded valve in the carburettor air box will automatically close, causing the gate valve to be forced slightly open, allowing the backfire gases to escape past the gate valve and through the carburettor air filter. Figure 1-7 illustrates system operation.

CAUTION

The carburettor heat lever should be set only in the full COLD or full HOT positions. DO NOT use any intermediate positions. With the lever in an intermediate position, the gate valve in the carburettor air box is partially closed, restricting the entrance of cold filtered air into the carburetor. However, unless the gate valve is completely closed, the partial vacuum produced in the carburetor air box is not adequate to open the spring-loaded valve, which permits the entrance of heated air into the air induction system. This results in the engine putting out less power because it is not getting its normal air supply.

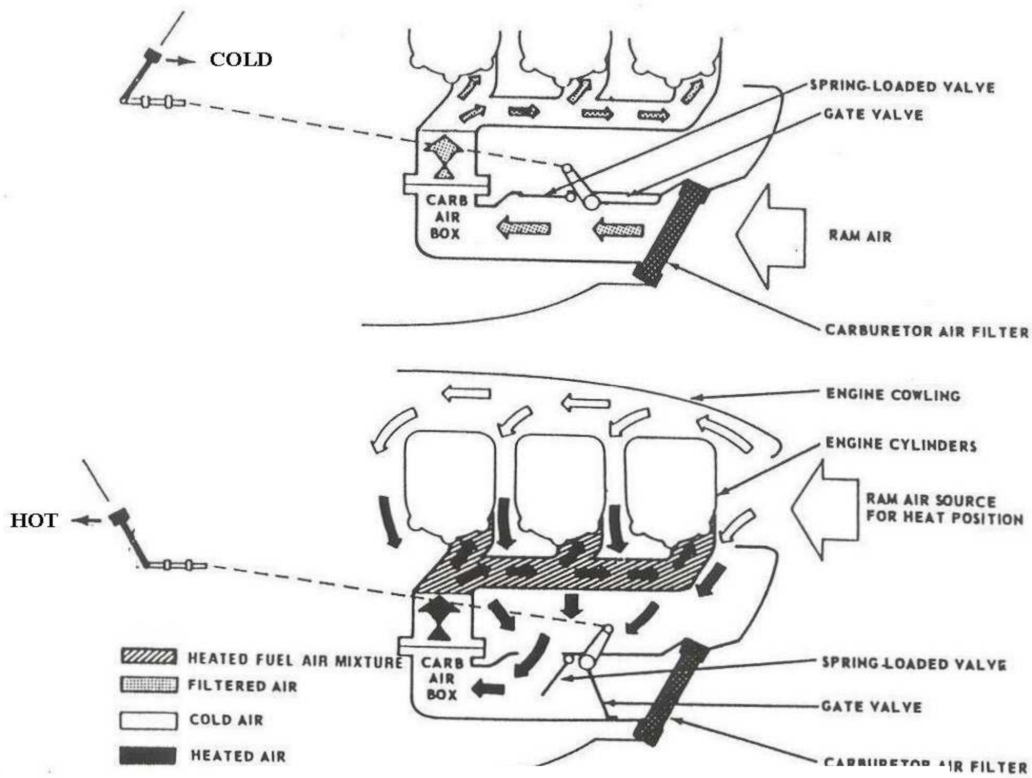


Figure 1-7 Air Induction System

Engine Cooling

32. Engine cooling is primarily by means of ram air entering the front of the cowling and is then directed through and around the cylinders and oil cooler by baffles and then exhausted through the lower aft edge of the cowling.

Oil System

33. The engine oil supply system consists of a cooler, pump, sump, air/oil separator on the crankcase breather line and interconnecting hoses. The sump serves as an oil tank at the bottom of the engine. The filler neck is located on the left rear side of the engine. The filler cap is a twist-type, which is attached to the filler neck with a length of chain and secured with a locking safety clip. Total system capacity is 10 quarts with a normal maximum operating level of 9 quarts, as indicated on the dipstick. The oil quantity in the sump is measured with a dipstick located at the left rear side of the engine accessory case.

34. The mil specification is MIL-L-2285-1D. The preferred grade of oil is 25W60 with 20W50 acceptable.

CAUTION

The oil filler cap is in a position where it is prone to not being replaced. For this reason the filler cap chain is long enough to permit the cap to hang outside the cowling when it is removed.

NOTE

Operating the engine with oil levels in excess of 9 quarts may result in excessive venting of oil from the crankcase breather. Do not overfill.

NOTE

Prior to adding oil, check the Journey Log to confirm the correct type and grade of oil is being added.

Ignition System

35. Engine ignition is provided by two engine driven magnetos which fire two spark plugs per cylinder. The engine magneto switch is a rotary switch that controls the dual magneto system. There are four switch positions, designated counter-clockwise as follows; BOTH, L, R and OFF. The engine is started and operated with the switch in the BOTH position.

Exhaust System

36. Exhaust gases from the cylinders pass through riser assemblies to a muffler and tailpipe. The muffler is contained within a shroud which forms a heating chamber for cabin heat.

FUEL SYSTEM

General

37. Fuel is supplied to the engine from two aluminium fuel tanks; the main fuel tank located in the inboard end of the left wing and the auxiliary fuel tank similarly located in the right wing. From these tanks, fuel flows through a fuel selector valve, a boost pump, a fuel strainer, and an engine-driven fuel pump to the carburettor. A vapour return line from the carburettor carries excess fuel and vapour back through the rear half of the fuel selector valve to the tank being used.

Fuel Capacity

38. The aircraft fuel capacity is provided at Table 1-2.

Fuel Specification and Grade

39. The only acceptable fuel is 100 LL (CAN/CGSB-3.25)

Fuel Quantity Indicators

40. A direct reading, mechanically actuated float-type fuel quantity indicator is mounted in each fuel tank at the wing root. Each indicator shows, in relation to a full tank, the amount of fuel remaining in its respective fuel tank. The indicators display 1/16 tank increments and have been calibrated so as to maximize their accuracy at quantities below ½ tank. A red arc, extending from **E** to just below the **1/4-**full on the face of each indicator is labelled **NO TAKE-OFF** and indicates that fuel flow from the tank may be disrupted when the aircraft is in a three-point attitude.

CAUTION

Fuel gauge indications are not to be considered reliable. Engine failures due to fuel starvation can occur when the selected tank indicates less that ¼ full and the aircraft is not maintained in level, un-accelerated flight

Fuel Selector Valve

41. A rotary type fuel-tank selector-valve handle is incorporated in the fuel system. The fuel-tank selector-valve handle, which controls the fuel-selector valve through mechanical linkage, has three positions: MAIN TANK, AUX TANK and FUEL OFF. The MAIN TANK and AUX TANK positions allow fuel to flow from the port and starboard tanks respectively, to the engine. The FUEL OFF position seals both tanks off from the rest of the fuel system and allows no fuel to pass beyond the selector valve. The valve is designed so that the fuel flowing through the vapour return line is routed back into the fuel tank from which fuel is being used.

42. The fuel selector valve is located on the left side of the fuselage at the wing root and is readily accessible only from the front seat.

WARNING

> Ensure that the fuel selector valve is properly seated in the detent for the selected tank. Positioning the valve out of the detent by as little as 1/8” can result in fuel starvation and engine failure.

Primer

43. The engine is primed by activating a primer switch located on the instrument panel. The switch is spring-loaded to the OFF position. When the switch is moved up, to the PRIME position, an electrically-activated primer solenoid allows fuel from the fuel strainer to enter all six cylinders directly via six primer fuel lines, provided that the electric fuel-boost pump has pressurized the fuel system.

Fuel Boost Pump

44. The boost pump is controlled by an ON / OFF switch located on the right-hand side of the instrument panel. It is used to pressurize the fuel system for priming and starting and to provide a back up for the engine-driven fuel pump during take-off and landing, and as an emergency fuel pressure source should the engine driven fuel pump fail. The boost pump is provided with a drain, which opens to the outside surface of the cabin skin on the port side, just forward of the boost pump. In the event of a pump seal failure, any fuel escaping through the seal will flow overboard instead of entering the pump motor where it would create a fire hazard in the cockpit.

Fuel Pressure Gauge

45. A fuel pressure gauge indicates the fuel pressure at the carburettor. It is pressure activated and is calibrated in 1-PSI increments from 0-30 PSI.

Fuel Drain Valves

46. Three spring-loaded, self-sealing drain valves are provided in the fuel system (Figure 1-4). A valve is located in the bottom of each wing tank and one is incorporated in the fuel filter under the engine. These valves are used to drain fuel from the system in order to check for the presence of water and sediment in the fuel.

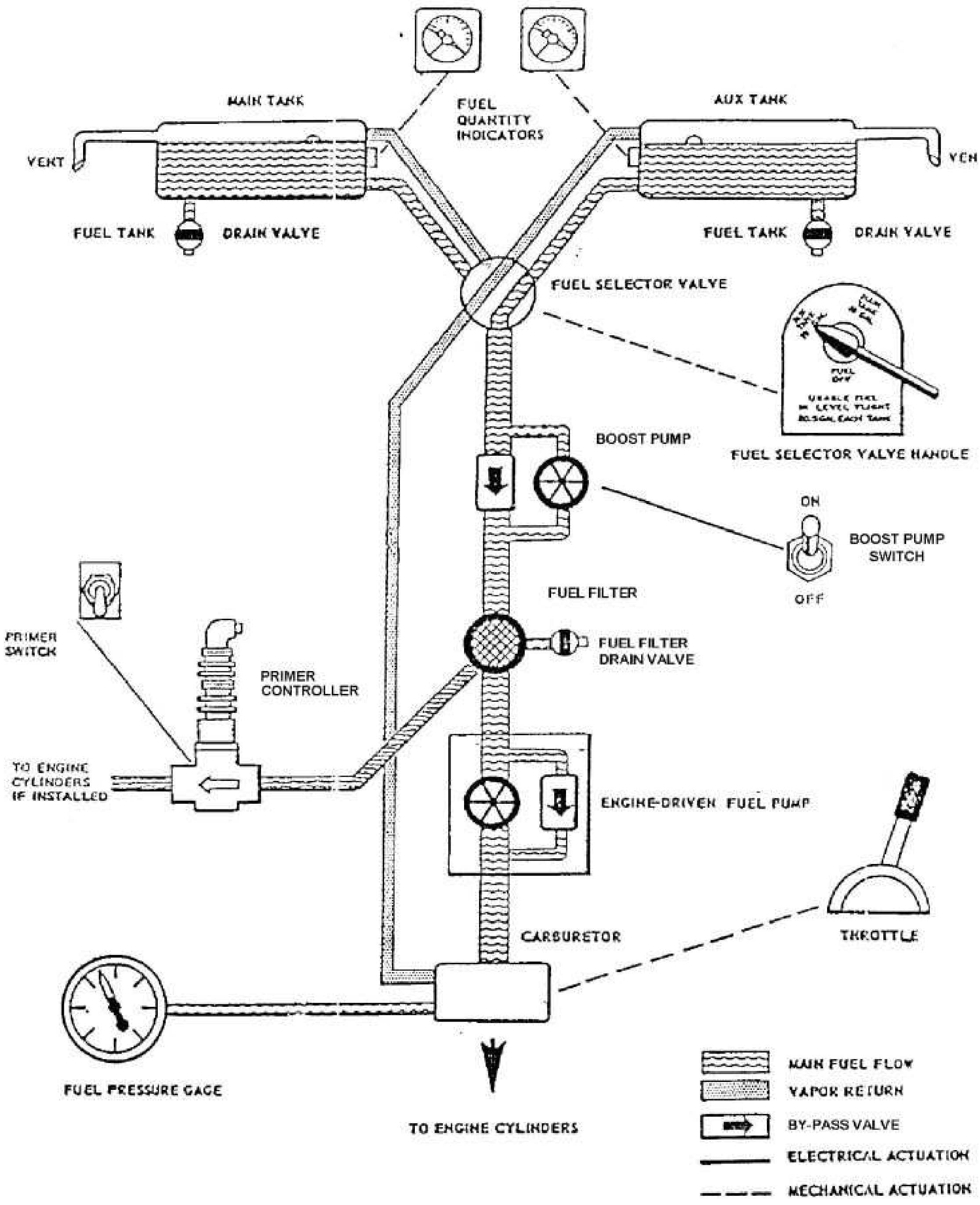


Figure 1-8 Fuel System Schematic

ELECTRICAL SYSTEM

General

47. The aircraft has a 24-28 volt DC, electrical system:

    a. power is generated by an engine-driven 24-volt, 70-ampere alternator;

    b. a 24-volt storage battery provides reserve power for engine starting, and as a standby source of power when the alternator is inoperative;

    c. on most aircraft, the battery is mounted under the rear seat. On C-FTAL ("C" Model aircraft), the battery is mounted at the aft side of the engine firewall between the pilot's feet.

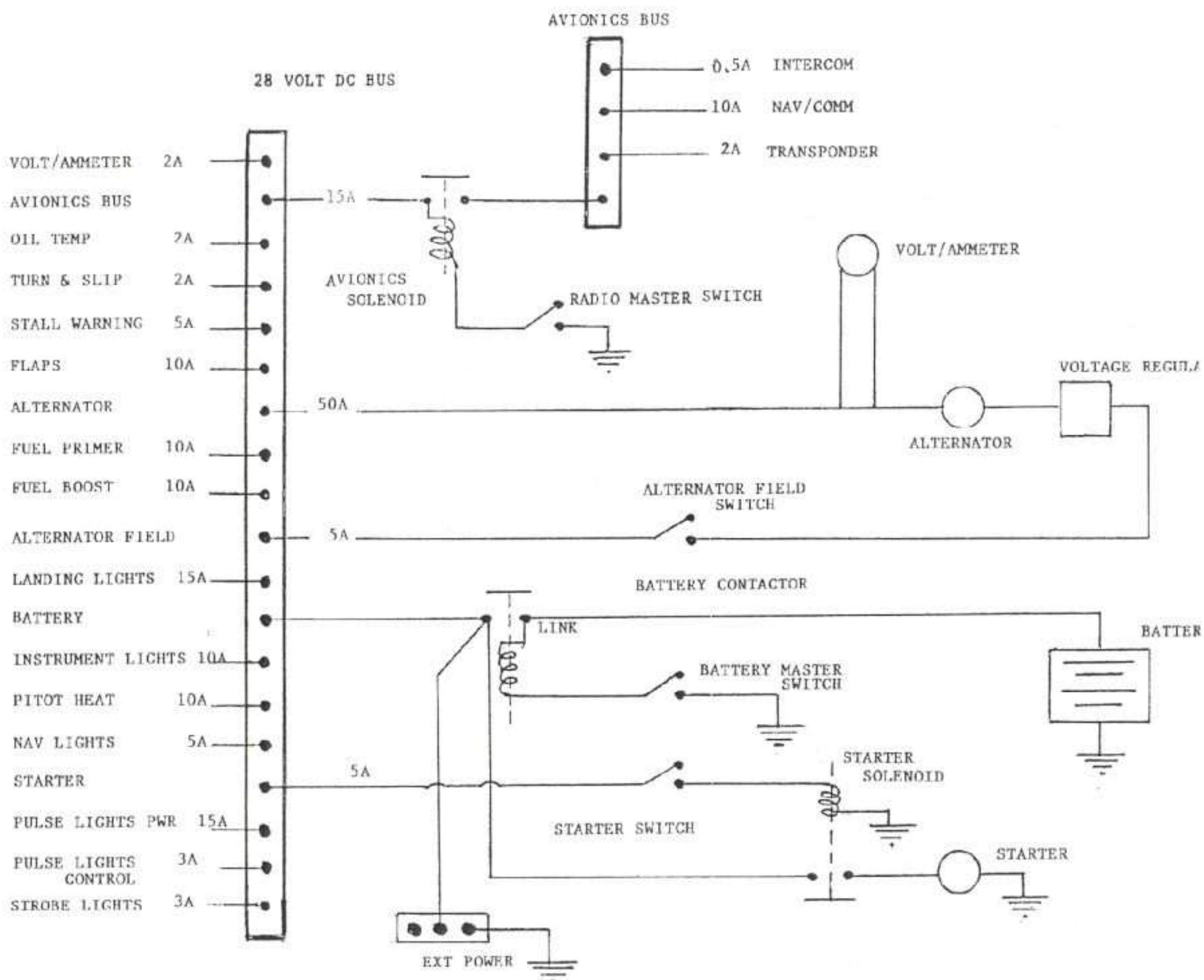


Figure 1-9 Electrical System Schematic

External Power

48. An external power receptacle with a spring-loaded access door is located on the right side of the fuselage exterior immediately aft of the firewall. It is a 28-volt, AN standard type receptacle, and is used to connect an external 28 volt, DC source for starting the engine or for electrical ground checks. It is not normally utilized.

Battery Switch

49. The battery switch located on the instrument panel energizes the DC battery bus.

Alternator

50. The alternator-field switch, marked ALT, is located on the instrument panel. When selected ON the alternator will come on the line at approximately 1100 RPM, supplying approx 10 amps to the bus bar. As the engine RPM increases, the alternator output will increase to maximum output at 1600 RPM and above.

CAUTION

Power is supplied to the alternator field circuit from the battery, through the bus and alternator-field switch. The alternator cannot produce any output power without battery power being supplied first to the field circuit. Consequently if both the alternator and the battery master switches are selected OFF, and only the alternator is selected back ON, the alternator will not produce any output power. However, once the alternator is producing output power, the field circuit is self-exciting and the battery switch may be turned OFF.

Starter

51. A starter button operates the electric starter motor. The spring-loaded starter button is housed within a circular recess to avoid inadvertent operation. When the starter button is pushed in, a solenoid connects the starter to the bus bar. Power for energizing the starter is derived from either the aircraft battery or an external power source.

Circuit Breakers

52. All electrical circuits are protected by circuit breakers. The starter and oil temperature circuits are protected by automatic reset circuit breakers and the remainder are protected by "push to reset" type circuit breakers located on the electrical panel.

CAUTION

To preclude the possibility of an electrical fire, circuit breakers should not be reset more than once. Circuit breakers must never be held in.

CAUTION

To preclude the possibility of a fuel fed fire, circuit breakers for the electrically powered fuel primer and fuel boost pump should never be reset.

Voltage Regulator

53. A solid-state voltage regulator located on the engine firewall controls the alternator output.

Digital Voltmeter / Ammeter

54. When selected to VOLTS the voltmeter indicates battery voltage (24.2 – 25.0 volts, fully charged) before the engine is started. After start-up and with ALT switch is turned on, it will indicate the alternator voltage (27.0 – 29.6 volts). If the voltage regulator malfunctions and the voltage rises to 30.6 volts the bright red HIGH VOLTS light will illuminate.

CAUTION

A high voltage condition could cause electronic equipment failure and lead to electrical fire. The alternator should be turned off as soon as the HIGH VOLTS light illuminates.

CAUTION

When the battery voltage drops below 22 volts the electronic equipment will begin to malfunction. To prevent the battery from being discharged prematurely and losing all electrical services turn all unnecessary equipment off immediately.

55. When AMPS is selected it will display the electrical system load on the aircraft plus the battery charging current. Since the alternator is supplying all of the current, the bright yellow DISCHARGE light will be off. Should the there be a malfunction in the alternator and/or the voltage regulator precluding the battery from being charged, the DISCHARGE will illuminate.

Alternator Warning Light

56. The Alternator Warning Light, in addition to indicating an alternator failure, will illuminates when engine is below 1100 RPM (off line), a tripped alternator circuit breaker or the ALT switch selected OFF.

CAUTION

To prevent excessive drain on the battery, unnecessary electrics should be selected OFF during extended ground operations with RPM below 1100.

LIGHTING SYSTEMS

Landing / Taxi Lights

57. The 3-position landing/taxi light switch is mounted on the lower left instrument panel. Two landing lights are mounted in the leading edge of the left wing. Selecting the switch to the TAXI position turns the inboard light ON; selecting the LANDING position turns both lights ON. Selection of the TAXI or LANDING position over-rides any selection of the pulse switch.

Pulse Lights

58. Selecting the pulse switch ON when the landing light/taxi light switch is OFF will cause both lights to pulse on and off simultaneously. If the taxi light or landing light is ON the pulse option is deactivated.

Navigation Lights

59. The aircraft are fitted with standard navigation lights controlled by a switch on the electrical panel. These lights are always on steady when selected ON.

Strobe Lights

60. A strobe light is fixed on each wing tip and a switch on the electrical panel controls them. When turned ON they flash with an intense, white light.

Instrument Lights

61. The aircraft have four white lights mounted underneath the instrument panel combing, which floodlight the panel and its instruments. An ON/OFF switch on the electrical panel, which also provides power to a compass light, controls them. The light intensity is fixed.

Map Light

62. A map light is located on the top of the left-hand windscreen post. It is controlled by a rheostat on the back end of the light. This light is energized when the instrument lights are selected ON. It can be swivelled around as required or removed from its bracket for use.

HEATING AND VENTILATION SYSTEM

General

63. Ram air is picked up from the front of the engine cowling, is heated in shrouds around the exhaust stacks, and is ducted into the front and rear cabin compartments. Heated air enters the front cabin compartment through three outlets: two aluminium elbows mounted just inboard and forward of the front rudder pedals, and a defroster duct located at the base of the windscreen. The rear cabin compartment is heated through a register mounted on the aft cabin floor. Two push-pull type controls are provided to regulate the flow of heated air into the cabin. The heated air emanating from the defroster is used to de-ice and de-fog the windscreen. No means are provided for indicating the temperature of the heated air.

Cabin Heat

64. The cabin heat is controlled by operating a flexible push-pull type cabin heat knob (Figure 1-9) located on a bracket just beneath the instrument panel on the left side of the cabin. The knob is labelled CABIN HEAT PULL. If the knob is pulled to its full aft position, heat is emitted to both cabin compartments. Pushing the knob in all the way stops the flow of heated air.

Defroster and Pilot Heat

65. The windscreen defrosting and front compartment heat is controlled by operating a flexible push-pull type control (Figure 1-9) located on a bracket just beneath the instrument panel on the right side of the cabin. The knob is labelled DEFROSTER AND PILOT HEAT PULL. When the knob is pulled out, heat is ducted to the defroster and front compartment. Pushing the knob in all the way stops the flow of heated air.

Cabin Ventilation

66. Ventilation is provided by ram air ducted from intakes in the leading edge of the wings to two adjustable air vents. The vents are located on the upper corners of the windscreen. These vents are manually operated by moving them in or out to control the volume of airflow and can be rotated through 360 degrees to direct the flow of air in the desired direction. Supplementary ventilation is supplied through two snap vents located on each side window.

INSTRUMENTS

General

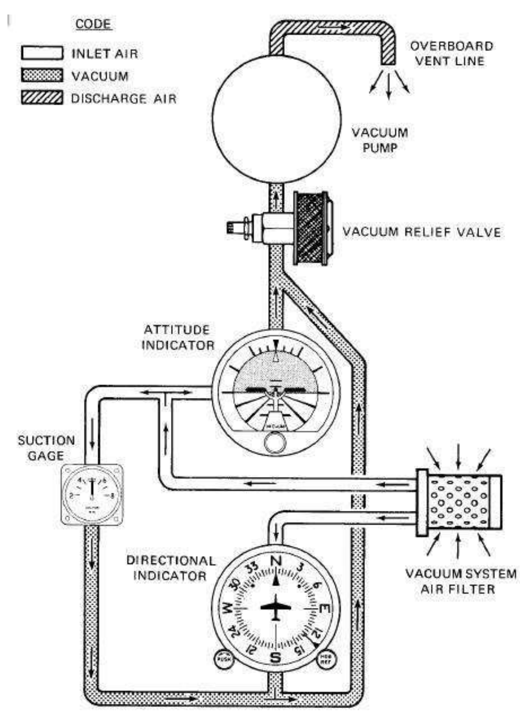
67. All instruments are mounted on a shock-mounted instrument panel in the front cockpit with the exception of the free-air temperature gauge and the magnetic compass, which are mounted on the centre strip of the windscreen. All aircraft have a tachometer, altimeter, airspeed indicator, and a turn-and-slip indicator mounted below the roof on the windscreen pillars of the pilot's cockpit for use by the rear seat pilot.

Pitot Static System

68. A heated pitot tube on the left wing supplies pitot pressure to the airspeed indicator. Two static pressure vents located on both sides of the aft fuselage supply static pressure to the airspeed indictor, altimeter and VSI.

Vacuum System

69. An engine driven vacuum pump provides the suction necessary to operate the attitude indicator and directional indicator. A suction gauge located on the instrument panel is calibrated in inches of mercury and indicates the suction currently available.



Flight Instruments

70. A conventional cluster of flight instruments is installed in the instrument panel. The suite of flight instruments includes the following:

a. **Airspeed Indicator (ASI)** – calibrated in MPH

b. **Attitude Indicator (AI)** – Vacuum operated with an adjustable split bar (miniature airplane).

c. **Altimeter** – a standard barometric type altimeter with encoding capability and altimeter setting subscale.

d. **Turn and Slip Indicator** – An electrically driven gyro, powered whenever the BATTERY SWITCH is selected ON. This instrument provides rate of turn indications, with the ball providing indication of slip or skid.

e. **Directional Indicator** – Vacuum operated, with rotating compass rose.

f. **Vertical Speed Indicator (VSI)** - Instrument is actuated by static pressure changes and depicts rate of climb or descent in feet per min.

Engine Instruments

71. The aircraft is equipped with the following engine instruments:

a. **Engine Tachometer** – The engine tachometer is powered by a tachometer-generator separate from the aircraft electrical system. It is calibrated in 100-RPM increments from 0 to 4500 RPM;

b. **Cylinder Head Temperature** – The cylinder-head temperature gauge is calibrated in 25º increments from 0 to 350 degrees Celsius. It is an electrical instrument, however, its sole source of power is generated by a bayonet-type thermocouple installed in the number-four engine cylinder therefore no power is required from the aircraft electrical system;

c. **Oil Temperature** – The electrical, resistance type, oil temperature gauge (Figure 1-9) is calibrated in 10-degree increments from -70 to +150 degrees Celsius. The gauge receives its power from the bus bar; and

d. **Oil Pressure** – An oil pressure gauge (Figure 1-9) is pressure activated and is calibrated in 10 PSI increments from 0 to 150 PSI.

Stall Warning System

72. A vane type stall warning unit is located in the left wing which electrically activates a stall warning horn located under the instrument panel. The horn is activated at speeds 5-10 mph above the stall in all configurations. The warning horn is powered through the 28V DC bus.

NOTE

The stall warning horn is not connected to the intercom.

Clock

73. An eight-day, stem-wound, aircraft clock (Figure 1-9) is mounted on the instrument panel.

AVIONICS

74. Avionics consists of a Garmin GNC 250XL GPS / VHF transceiver, a Garmin GTX 327 transponder, and an Intercom System. All avionics are controlled through the RADIO MASTER switch on the instrument panel.

CAUTION

To prevent voltage spikes from damaging the avionics, the RADIO MASTER switch must be selected OFF during engine start or when ground power is supplied.

Microphone Buttons

75. A microphone transmit button is mounted on the front control column grip. This button is only effective when the pilot uses a boom-type microphone headset. There is a transmit button on the left rear window ledge for use by the rear seat occupant.

Intercom System

76. The radio system incorporates a voice-activated intercom system. The intercom system can only be utilized when boom-type microphone headsets are used. The intercom control panel is mounted on the instrument panel and consists of a pilot isolate/intercom switch, a volume control knob, and a squelch knob. The PILOT ISOLATE position cuts off intercom and eliminates all intercom side tone and the INTERCOM position allows voice-activated conversation between aircraft occupants.

GPS / COM

77. A Garmin GNC 250 XL is installed. Basic capabilities are summarized below. Refer to Annex A for pilot operating instructions:

a. GPS. The GPS is certified for VFR navigation only. The navigational database includes data for airports, aerodromes and navigation aids. The unit is capable of point-to-point navigation and route navigation;

CAUTION

Do not enter navigational data during critical phases of flight where the risk of a loss of situational awareness is high, in particular take-off, final approach, and landing.

b. COM. The VHF transceiver is available for normal radio communications;

Transponder

78. A Garmin GTX 327 solid state mode C digital transponder is installed. Pressing the STBY, ALT or ON keys turns the unit on, after which it performs an internal self-test. If an internal failure is detected, the screen will display SELF TEST FAILED and the unit must be removed for repair. No warm-up period is required.

a. **OFF** – powers off the unit. Must be held for three seconds.

b. **STBY** – selects standby mode

c. **ON** – selects Mode A only (no altitude information). Replies to interrogations are indicated by a flashing ® in the display.

d. **ALT** – selects Mode A and C (interrogation replies include altitude output from encoding altimeter). ALT appears in the display.

e. **Code Selection Keys 0-7** – provide 4096 identification codes. Pressing any one begins the code selection process and the new code is active as soon as the fourth digit is entered. The 8 and 9 keys are not used for code entry.

f. **IDENT** – activates special position identifier (SPI) pulse for 18 sec. IDENT appears in the display.

g. **VFR** – selects pre-programmed code (set to 1200). Pressing key again restores previous code.

h. **FUNC** – Cycles between Pressure Altitude, Flight Time, Count Up and Count Down Timers.

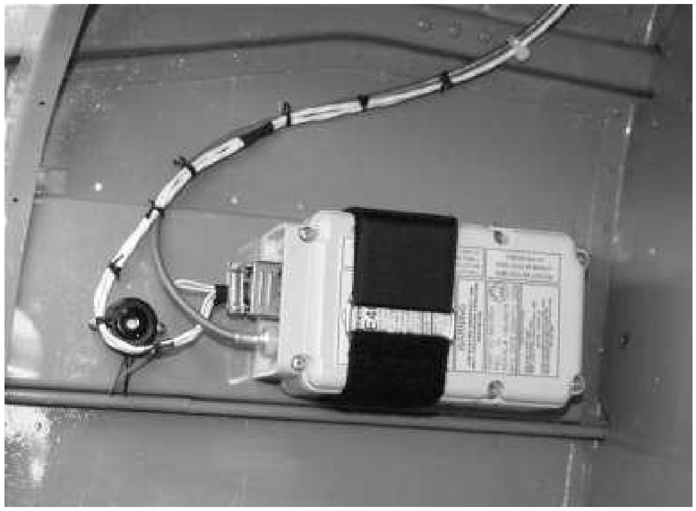
j. **START/STOP** – Starts and stops the timers.

k. **CRSR** - Initiates time entry for count down timer and cancels transponder code entry.

l. **CLR** – Resets timers, or cancels previous key selection

ELT

79. An Artex ME406 ELT is installed in the aft section of the fuselage.



80 Powered through the aircraft 28V system or two D-sized lithium batteries, this beacon when activated transmits a swept tone on 121.5 MHz until battery exhaustion and 440 msec data bursts at 50 second intervals for the first 24 hrs. Received by the COSPAS-SARSAT satellite system, the data burst contains aircraft identification data programmed into the beacon and provides location accuracy of approximately 3 km.

81. The ELT is activated either automatically during a crash (a change in velocity or deceleration >4.5 fps ±0.5) or manually by selecting the instrument panel remote switch to ON. Once activated, the ELT may be switched off by selecting either the remote switch or the switch on the ELT case to the ON position and then back to ARM.

NOTE

406 ELTs are individually registered to specific aircraft and are not interchangeable.

MISCELLANEOUS EQUIPMENT

Glider Tow Hook

82. A Schweizer-type tow hook mounted on the tail wheel strut. The tow hook is connected by cable to a release handle in the pilot's cockpit above the left window. To release the tow hook, the release handle is pulled to the rear.

Tow Mirrors

83. Two ground-adjustable mirrors are mounted at the mid-point of each strut.

Refuelling Steps

84. To facilitate fuelling, steps are provided on each wing strut and on each side of the fuselage front section. An assist handle is mounted at the lower juncture of the windscreen centre strip and the fuselage. A refuelling hose grounding point is located adjacent to the fuel tank cap on each wing.

Tie-Down Rings

85. Tie-down rings are provided, on each wing strut; the tow hook may be used to tie down the tail.

Fuselage Lift Handles

86. Two retractable lift handles are incorporated in the fuselage, one on each side just forward of the stabilizer. They are very useful for pushing the aircraft around on the ground. Each handle can be extended by inserting a finger into the handle and pulling it out as far as it will go. When not in use, the handles should be retracted flush with the fuselage by pushing them in.

Map Case

87. A map case is located on the cabin door adjacent to the pilot's seat. This case contains all aircraft documents as well as navigational materials.

SAFETY EQUIPMENT

Door Emergency Release Handle

88. A door emergency-release handle is located just forward of the door on the right side of the cabin. The cabin door can be jettisoned by disengaging the bottom end of the door emergency release handle and turning it counter-clockwise.

Fire Extinguisher

89. A five-pound dry chemical fire extinguisher is mounted on the right cabin wall just ahead of the front seat. To release the extinguisher, rotate the over-centre latch on the retaining band forward/down then pivot the bottle forward to disengage it from the mounting lug on the nozzle assembly. Remove safety pin prior to use.

Life Preservers

90. Two life preservers are Velcro-mounted under both seats. Life preservers are for emergency use only. Mustang constant-wear PFDs are utilized for normal operations.

First Aid Kit

91. A first aid kit is carried on board.

Carbon Monoxide Detector

92. An adhesive card type CO detector is mounted on the instrument panel. The spot turns gray/black in the presence of CO.

PART II

NORMAL OPERATING PROCEDURES

GENERAL

1. The following procedures and checks are an expansion of the Pilot's Checklist. While the checklist is the in-flight reference document, a complete understanding of this manual is critical for the safe operation of the aircraft.

PRE-FLIGHT / DAILY INSPECTION

Pre-External Inspection

2. Perform the Pre-External portion of the pre-flight inspection follows:

Table 2-1	PRE-EXTERNAL INSPECTION	
ACTION	**CHECK**	**NOTES**
1. Journey Log	Check maintenance status, snags, deferred defects, and hours to next inspection	
2. Chocks	In place	
3. Covers, Plugs, Tiedowns	Remove and stow	
4. First Aid Kit	Confirm in place and secure	
5. Survival Kit	Carry if required. Ensure secure	
6. Mags / Switches	All Off	
7. Control Lock	Remove and Secure	
8. Controls	Confirm free and correct	
9. Trim	Check function and set to Takeoff position	
10. Fire Extinguisher	Check fully charged and confirm secure	
11. Pubs / Docs / Maps	Confirm all required documents and navigational materials are present and current	
12. Fuel Gauges	Check Quantity	
13. Battery Switch	Select ON	
14. Flaps	Set to Full Down	
15. Interior / Exterior Lights	Check Function	

Table 2-1	PRE-EXTERNAL INSPECTION	
ACTION	**CHECK**	**NOTES**
16. Stall Vane	Check Function	
17. Pitot Heat	Check Function	
18. Battery Switch	Select OFF	
19. Fuel Status	Check fuel Quantity. Dip tanks to confirm fuel state if required Confirm fuel caps secure Check fuel samples from both fuel tanks and strainer for water or sediment	
For Solo Flight		
1. Rear Rudder Pedals	Stowed	**WARNING** Rear rudder pedals must be stowed, rear stick removed, and rear harness secured prior to solo flight. Failure to do so may cause restricted flight control movements and loss of control
2. Rear Stick	Removed and Stowed	
3. Rear Harness	Secured	

External Inspection

3. Perform the external pre-flight inspection by starting at the left main landing gear and proceeding clockwise around the aircraft as follows:

Table 2-2	EXTERNAL INSPECTION	
ACTION	**CHECK**	**NOTES**
LEFT MAIN GEAR		
1. Brake line	Condition	
2. Brake rotor and pads	Condition and wear	Refer to min pad thickness notch
3. Tire	Inflation and wear	Tires may be worn to base of any groove. Check for exposed cord, cracks, cuts or bulges.
FUSELAGE - FRONT		
4. Fuel Pump Vent	Clear, no leaks, no fuel stains	
5. Cowl – Left Side	Open	
6. Oil Level	Check, Top Up as required	**Oil Qty (Quarts)** Max Capacity: 10 Norm Oil Level: 8-9 Min Oil Level: 8
7. Oil Cap	Secure, Safety Pin in place	

Table 2-2	EXTERNAL INSPECTION	
ACTION	**CHECK**	**NOTES**
8. Engine	Check general condition, leaks, etc	
9. Muffler	Check for play	
10. Cowl – Left Side	Close, Latch, Install Safety Pins	
11. Propeller	Check condition	
12. Air Intakes	Confirm open and clear	**CAUTION** During nesting season, use a flashlight & carry out a thorough visual check inside the cowl flaps
13. Air Filter	Check condition	
14. Cowl – Right Side	Open	
15. Engine	Check general condition, leaks, etc	
16. Muffler	Check for free play	
17. Cowl – Right Side	Close, Latch, Install Safety Pins	
RIGHT MAIN GEAR		
18. Brake line	Condition	Check for security, wear, chafing or leaking
19. Brake rotor and pads	Condition and wear	
20. Tire	Inflation and wear	
RIGHT WING		
21. Strut and tow mirror	Condition and security	
22. Leading edge	Condition	
23. Fuel Tank Vent	Clear	
24. Wing surfaces – upper and lower	Condition	
25. Wing tip	Condition	
26. Aileron and flap	Movement, condition, hinge points, actuators, static wicks	
27. Fuel filler cap	Secure and in-line	
FUSELAGE – RIGHT REAR		
28. Fuselage skin	Condition	
29. Antennae	Condition and security	
30. Battery vent and drain	Clear	**NOTE** On A model aircraft the battery vent/drains are located on the lower fuselage under the rear seat. On C model aircraft they are located on the lower fuselage behind the engine firewall.

Table 2-2	EXTERNAL INSPECTION	
ACTION	**CHECK**	**NOTES**
31. Static Port	Clear	
32. Lift Handle	Retracted	
TAIL SECTION		
33. Vertical and horizontal stabilizers	Condition and security	
34. Elevators and rudder	Condition, movement, hinge points and actuators, static wicks	
35. Trim tab	Condition and security, set in takeoff position.	
36. Tow hook	Condition and security, release mechanism for function	
37. Tail Wheel	Check tire condition, inflation, wear, steering chains, & security	
FUSELAGE – LEFT REAR		
38. Fuselage skin	Condition	
39. Belly	Check for oil	
40. Static Port	Clear	
41. Lift Handle	Retracted	
LEFT WING		
42. Fuel filler cap	Secure and in-line	
43. Aileron and flap	Movement, condition, hinge points, actuators	
44. Wing tip	Condition	
45. Wing surfaces – upper and lower	Condition	
46. Fuel Tank Vent	Clear	
47. Pitot Tube	Clear	
48. Leading edge	Condition	
49. Strut and mirror	Condition and security	
CHOCKS		
50. Left and Right	Remove and Stow	
WEIGHT AND BALANCE VERIFICATION		
51. Weight and Balance	Check	Confirm that the loaded aircraft is within weight and balance limits

WARNING

Pilots shall verify that the loaded aircraft is within weight and balance limits prior to flight. Operation of the aircraft outside of published weight and balance limits will adversely affect the stability and control characteristics of the aircraft, and will invalidate the Certificate of Airworthiness.

Between Flight Inspection (BFI)

4. When conducting multiple flights, or when conducting a pilot change during flight operations, the pilot shall conduct a Between Flight Inspection as follows:

Table 2-3	BETWEEN FLIGHT INSPECTION (BFI)	
ACTION	**CHECK**	**NOTES**
1. Engine	Fuel and Oil Leaks	If checking engine oil shortly after shutdown, oil may appear to be 1-2 quarts low as oil has not yet drained into the sump
2. Oil	Check Qty, Cap Secure, Cowlings Secure, Pins Installed	
3. Fuel	Check Qty, Caps Secure and In-Line	
4. Main Wheels	Check Condition	
5. Tail Wheel	Check Condition	
6. If Night Flying	Check all lights	

PRE-START CHECK

5. After entering the cockpit, proceed as follows:

Table 2-4	PRE-START	
ACTION	**CHECK**	**NOTES**
1. Doors	Close and lock	Hold door closed – do not slam. Ensure handle rotates 90º
2. Control Lock	Off and Stowed	
3. Seat	Adjusted and locked.	Ensure seat rail locking pins engaged.
4. Seat harnesses	Adjust and secure	
5. Trim	Elevator trim set for takeoff	Reference t/o trim index mark
6. Fuel selector	Lowest Tank	
7. Carb heat	Select COLD	
8. Throttle	Closed	
9. Mixture	ICO	
10. Circuit breakers	All in	
11. Lights	All off	
12. Pitot Heat	OFF	
13. Radio Master	OFF	
14. Alternator Switch	OFF	
15. Battery Switch	OFF	
16. Boost Pump	OFF	
17. Clock	Wind / Set	
18. Altimeter	Set	Set to field elevation

STARTING ENGINE

Start

6. For a normal engine start, proceed as follows:

Table 2-5	START CLEARANCE (If Required)	
For engine start at military aerodromes, first obtain engine start clearance from ATC		
1. Battery Switch	On	
2. Radio Master Switch	On	
3. Radio	On and Set to Ground Freq	
4. Start Clearance	Obtain	
5. Radio Master Switch	Off	

Table 2-6	START	
ACTION	**CHECK**	**NOTES**
CAUTION - If external power is used for starting, the battery and alternator must be left off until the engine is running. If the switch is left on, a weak battery will draw power from the external source, resulting reduced energy to the starter motor.		
1. Battery Switch	Select ON	
2. Strobe lights	On	Strobe lights to remain on whenever engine is running
3. Boost Pump	ON	Check pressure normal
4. Primer	Actuate as required	OAT below 0℃ – 3 secs OAT 0-10°- 2 sec OAT 10-20°- 1-2 sec OAT above 20°– 1 sec Warm Engine – no prime
5. Boost Pump	OFF	**CAUTION** If the boost pump is left on with the mixture not in ICO position (engine not running), carburettor and inlet duct flooding will occur, creating a fire hazard
6. Throttle	Open ¼ inch	
7. Mixture	RICH	
8. Magnetos	BOTH	

Table 2-6	START	
ACTION	**CHECK**	**NOTES**
9. Brakes	Apply	
10. Prop area	All clear	
11. Starter	Engage	**CAUTION** Continuous cranking shall not exceed 30 seconds. Allow starter to cool for at least 30 seconds before re-attempting start
12. Throttle	Set to 1000 rpm	
13. Oil pressure	Normal Indication	**CAUTION** If there is no indication of oil pressure within 30 seconds of start, shut the engine down and have the cause investigated
14. External Power	Remove if used	
15. Alternator Switch	On	
16. Radio Master	On	Needed to activate intercom
17. Radio	On	
18. Intercom	On	
If Engine Flooded on Start:		
CAUTION Visually confirm that fuel is not pooling below aircraft or in engine cowling prior to attempting start. Failure to do so may result in an engine fire.		
1. Mixture	ICO	
2. Mags	OFF	
3. Throttle	Full Open	
4. Starter	Engage for 30 seconds	Attempt to clear fuel from carburettor
5. Normal Start	Reattempt	

NOTE

If the engine is running roughly, rapidly move the mixture lever through its full range of travel several times. Occasionally dirt becomes lodged under the mixture poppet valve.

Pre-Taxi

7. After engine is running smoothly and prior to taxiing, perform the pre-taxi check as follows:

Table 2-7	PRE-TAXI	
ACTION	**CHECK**	**NOTES**
1. Throttle	700 RPM	
2. Mags	Live Mag Check	Switch momentarily to OFF then back to BOTH
3. Flap	Retract	Select UP or as required for takeoff.
4. Radios	On and Set	
5. GPS	Initializing	
6. Transponder	ON / Standby	
7. Taxi Lights	Turn ON for Night Ops only	
8. Nav Lights	Turn ON for Night Ops only	

Taxi

8. While taxiing, perform the following actions:

Table 2-8	TAXI	
ACTION	**CHECK**	**NOTES**
1. Brakes	Ensure functional	
2. Tail wheel steering	Ensure functional	
3. Flight instruments	Ensure functional	In turns, ensure that turn coordinator, ball, directional gyro function correctly, compass moves freely and artificial horizon remains steady.

GROUND OPERATIONS

9. Like most tail wheel equipped aircraft, the L19 exhibits reduced directional stability on the ground. Directional control on the ground is achieved through appropriate use of tail wheel steering and differential brake. Under normal circumstances, directional control can be maintained almost entirely without the use of brakes. It is good airmanship to taxi with heels on the floor to avoid “dragging” brakes, which can cause unnecessary brake wear and damage, as well as possible engine overheating. Care must be taken during ground handling, takeoff, and landing to avoid directional control problems. Specific precautions include the following:

a. taxi at minimum safe speeds, especially when taxiing with a crosswind or tailwind condition;

b. avoid continuous use of brake during taxiing. Use power settings that do not require continuous use of brake to control speed;

NOTE

When taxiing in very strong crosswinds, some brake may be required to maintain directional control.

c. avoid abrupt changes in direction;

CAUTION

Abrupt changes in direction during ground manoeuvring may result in loss of directional control and a low speed ground loop.

d. avoid abrupt application of brakes. Brake application should be smooth and progressive;

CAUTION

Abrupt application of excessive brake may cause the tail to come off the ground, and if not properly controlled can result in the propeller striking the ground or a nose-over.

e. Avoid taxiing with flaps down, especially in strong wind conditions;

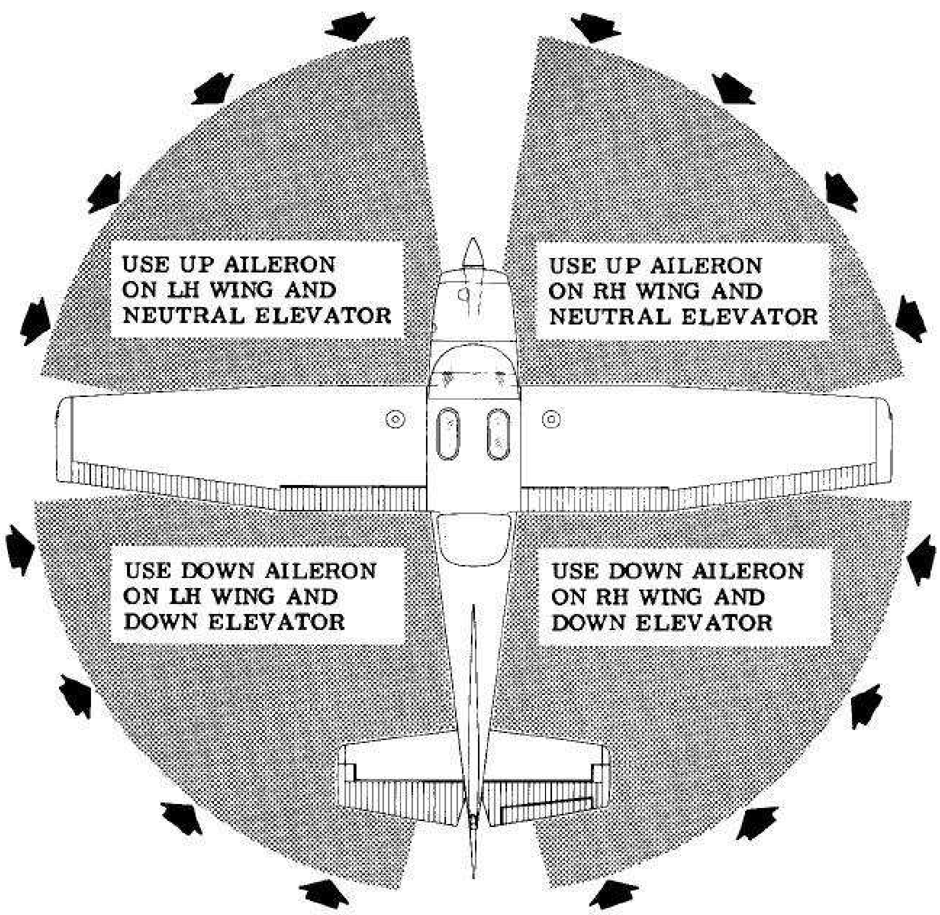
CAUTION

Flaps exposed to strong crosswinds during taxi introduce a yawing moment that can contribute to a loss of directional control and can lead to a ground loop.

f. position flight controls appropriate to the wind direction;

CAUTION

Failure to properly position flight controls for wind direction, particularly in strong winds, can contribute to a loss of directional control or a nose-over.



RUN-UP

10. Position the aircraft so that the prop wash will not create a hazard, ensure the tail wheel is straight, apply and hold the brakes firmly and perform the run-up check as follows:

Table 2-9	**RUN-UP**	
ACTION	**CHECK**	**NOTES**
1. Area	All Clear	Ensure area behind aircraft is clear
2. Brakes	Apply	
3. Fuel Selector	Switch tanks	To ensure fuel feeds independently from each tank prior to takeoff.
4. Mixture	FULL RICH	
5. Temperatures and pressures	As required for run-up	Min Oil Temp ------- 15° C Min Oil Press ------- 30 PSI Min CHT -------------- 80° C
6. Control Column	Full Aft	Ensure stick remains full aft when power is applied
7. Throttle	Set 1700 rpm	
8. Magnetos	Select LEFT – BOTH – RIGHT - BOTH	Check normal rpm drop 100 RPM, max differential of 50 RPM
9. Carb heat	Select full HOT, then back to COLD	Confirm RPM drop and recovery
10. Suction	Confirm 4.5– 5.5 in HG	
11. Voltmeter	26-29 Volts	26-29 Volts are normal to confirm proper operation of alternator
12. Ammeter	Confirm Charging	Switch Voltmeter/Ammeter to Amps and confirm charging
13. Throttle	Full	Full power check, min RPM 2200
14. Idle Check	Confirm correct idle RPM and smooth running	Summer 600 – 700 RPM Winter 700 – 800 RPM
15. Mixture	Function	Lean until engine falters, then select full rich
16. Throttle	Set 1000 RPM	

PRE-TAKEOFF CHECK

11. Perform pre-takeoff check as follows:

Table 2-10	PRE-TAKE OFF	
ACTION	**CHECK**	**NOTES**
1. Doors and windows	Secure	a. door handles fully forward b. latches on window secure
2. Harnesses	Secure and adjusted	
3. Trim	Set for takeoff	
4. Fuel Selector	Fullest Tank	
5. Circuit breakers	All IN	
6. Pulse Light	Turn ON for Daytime ops only	
7. Landing Light	Turn ON For Night Ops Only	
8. Pitot heat	OFF	Takeoff shall not be attempted in conditions that require pitot heat
9. Carb heat	COLD	
10. Mixture	FULL RICH	
11. Flaps	As required	
12. Gyro instruments	Set	
13. Altimeter	Set	
14. Magnetos	BOTH	
15. Alternator Switch	ON	
16. Battery Switch	ON	
17. Boost Pump	ON	
18. ELT Switch	Set to ARM	
19. Temps and pressures	NORMAL	In the green
20. Radio	Set as required	
21. GPS	Set as required	
22. Transponder	Code Set / Alt	
23. Controls	Free	
24. Pre Take-Off Brief	Carry Out / Complete	

TAKEOFF

Normal Takeoff

12. A normal takeoff is used when no special considerations exist. A normal takeoff is accomplished as follows:

a. set trim for takeoff and set flaps as required between 0º to 10º;

b. line up on the centre of the runway or takeoff path;

c. holding the stick fully aft, smoothly apply full throttle to commence the takeoff roll, releasing the brakes as throttle is advanced. Avoid dragging brakes by ensuring heels are on the floor;

d. the aircraft will tend to swing left on the initial takeoff roll due to asymmetric thrust effect. Maintain directional control with tail wheel steering and rudder. Counter any swings that develop using immediate positive control inputs of rudder, and then differential brake if required;

e. after achieving sufficient forward speed to ensure that the rudder and elevator are effective, gently relax aft pressure on the control column to allow the tail to lift slightly off the ground. As tail comes up, nose will swing left due to gyroscopic effect. Counter with rudder as required;

WARNING

Do no use excessive or aggressive control inputs to lift the tail off the ground prematurely. Such actions combined with a premature release or rope brake during glider towing could result in a nose-over.

CAUTION

Abort the takeoff if directional control is difficult to maintain.

f. establish a slightly tail low attitude. Keep sufficient weight on main wheels to prevent skipping. The aircraft should lift off between 50-60 MPH;

g. adjust control column position to set required climb attitude; and

WARNING

h.

Do not allow the aircraft to climb out of ground effect until safe flying speed of 60 MPH is achieved. Premature climb could result in a stall.

i. complete the post-takeoff check.

Short Field and Obstacle Clearance Takeoff

13. The short field takeoff technique is used when the available takeoff surface is limited in length, or when a departure end obstacle is present. The determination of whether the available field length is "short" must be based on calculated takeoff performance, with due consideration for aircraft weight, winds, and density altitude. As a general guideline, takeoff surfaces less than 1,800 ft long should be carefully assessed. A short field takeoff is accomplished as follows:

a. set trim for takeoff and **set flaps to 30º**;

b. line up on the centre of the runway or takeoff path, positioning the aircraft to provide maximum takeoff surface;

c. holding the stick fully aft, apply brakes and smoothly apply full throttle against braking. Once full throttle is applied, release brakes to commence the takeoff roll. Avoid dragging brakes by ensuring heels are on the floor;

d. the aircraft will tend to swing left on the initial takeoff roll due to asymmetric thrust effect . Maintain directional control with tail wheel steering and rudder. Counter any swings that develop using immediate positive control inputs of rudder, and then differential brake if required;

e. after achieving sufficient forward speed to ensure that the rudder and elevator are effective, gently relax aft pressure on the control column to allow the tail to lift slightly off the ground. As tail comes up, nose will swing left due to gyroscopic effect. Counter with rudder as required;

WARNING

Do not use excessive control inputs to lift the tail off the ground prematurely. A premature release or rope brake during glider towing could result in a nose-over.

CAUTION

Abort the takeoff if directional control is difficult to maintain.

f. establish a slightly tail low attitude and maintain sufficient weight on main wheels to prevent skipping. Lift-off should occur between 50-60 MPH, and climb at 60 MPH until clear of all obstacles; and

WARNING

g.

Do not allow the aircraft to climb out of ground effect until safe flying speed of 60 MPH is achieved. Premature climb could result in a stall.

h. complete the post-takeoff check.

Soft / Rough Field Takeoff

14. A soft / rough field takeoff is used when operating from grass, dirt, or gravel strips. The objective is to get the aircraft off the ground as quickly as possible, and accelerating to safe climb speed in ground effect. A soft / rough field takeoff is essentially identical to a normal takeoff, with a slightly lower tail attitude to achieve an earlier lift off, with sufficient weight on the main wheels to prevent skipping or bouncing.

WARNING

Do no use excessive or aggressive control inputs to lift the tail off the ground prematurely. Such actions combined with a premature release or rope brake during glider towing could result in a nose-over.

WARNING

Do not allow the aircraft to climb out of ground effect until safe flying speed of 60 MPH is achieved. Premature climb could result in a stall.

Crosswind Takeoff

15. Takeoffs in moderate to strong crosswinds will require appropriate modifications to the selected takeoff technique:

a. crosswind takeoffs are performed with minimum flaps necessary, with due consideration for field type, field length, and departure end obstacles;

b. maintain into-wind aileron during the takeoff roll;

c. slightly delay action to lift the tail off the ground to ensure sufficient rudder authority is present for the crosswind conditions;

d. bring the tail to a slightly higher position and accelerate to a slightly higher speed before rotating to ensure a positive lift-off; and

e. once airborne, make a coordinated turn into wind to correct for drift.

WARNING

Crosswind takeoffs in the L19 are much easier to accomplish than crosswind landings. Prior to commencing a cross wind takeoff, ensure that the subsequent crosswind landing will be within both aircraft limits as well as your personal limits.

Post- Takeoff

16. The Post-Takeoff Check is completed once a safe altitude (minimum 100 ft) and safe airspeed (60 MPH) have been achieved and a positive rate of climb has been confirmed.

Table 2-11	POST- TAKE OFF	
ACTION	**CHECK**	**NOTES**
1. Flaps	UP	Raise flaps in stages / steps to prevent settling or loss of altitude **If towing, maintain flaps**
2. Climb Power	Set	Use desired climb profile settings
3. Climb Airspeed	Set	
4. Trim	Set	
5. Boost Pump	Off	
6. Landing Light	Off during night time ops	Applicable to night operations

NOTE

The post-takeoff check shall be committed to memory

CLIMB PROFILES

17. Several climb profile options exist, depending on the operational requirement. With the exception of maximum performance climbs, these profiles are recommended to provide an optimum combination of performance, visibility, engine cooling, economy and passenger comfort. When climbing to altitudes above 2000' AGL, lean the engine in accordance with the Leaning Procedures

Climb Profiles			
Type	**RPM**	**MPH**	**Notes**
Normal	2300	80	The normal climb allows for the optimum combination of rate of climb, ground speed, forward visibility and engine cooling
Best Rate of Climb	FT	65	
Best Angle of Climb	FT	60	Flaps must be set 30 degrees for Best Angle Climbs
Towing	FT	65-70	

Table 2-12 Climb Profiles

CRUISE

Cruise Profiles

18. Select a cruising speed appropriate to the in-flight conditions (i.e. turbulence) and desired range and economy. Refer to the performance charts in Part 4 for detailed cruise settings or use one of the following generic settings (5,000 MSL):

Cruise Performance (5,000 ft MSL)						
Cruise	**RPM**	**TAS (KTS)**	**Litres/hr**	**GPH**	**Endur**	**Range (NM)**
Fast Cruise	2300	93	33.3	8.8	3:35	335
Normal Cruise	2100	87	26.5	7.0	4:35	400
Endurance	1800	70	21.2	5.6	5:55	410
X/C Towing	2300	85	33.3	8.8	3:35	305
X/C Towing	2200	80	29.1	7.7	4:05	325
Towing Ops	A/R	A/R	40.0	10.5	2:45	n/a
Notes: 1. Endurance to 30 minute fuel reserve 2. Range based on still air with 30 min reserve						

Table 2-13 Cruise Profiles

Level-Off / Cruise

19. After stabilizing in cruise, perform level-off check as follows:

Table 2-14	**LEVEL-OFF / CRUISE CHECK**	
ACTION	**CHECK**	**NOTES**
1. Power	SET	a. Refer to performance data chart for normal and fast cruise and maximum endurance settings.
2. Flaps	UP for cross country towing	
3. Trim	As required	
4. Mixture	Lean	Lean mixture as required for smooth, efficient engine operation. Refer to Part 2 “Management of Ancillary Controls” for details
5. Carb Heat	As required	Use carb heat if indications of carb ice are present

FLIGHT MANOEUVRES / FLIGHT CHARACTERISTICS

Turns

20. It is almost impossible to make a co-ordinated turn in the L19 by use of ailerons alone; aileron drag creates an adverse yaw situation whereby the nose tends to yaw away from the turn in a slipping motion. To counter this, all turns should be initiated with rudder pressure in the direction of intended turn prior to, or together with the application of aileron. Steep turns will require the addition of power and aft control column pressure plus a slightly raised nose attitude to maintain level flight.

Slow Flight

21. Slow flight is a proficiency manoeuvre, which can be practised flaps up or with any reasonable amount of flap. Establish a trimmed, level-flight attitude and reduce power. Adjust attitude to maintain altitude as the airspeed falls and when the stall warning horn blows, note the horn speed and maintain that speed. Maintain that speed using power as necessary. Fine trim adjustments are required to produce the accuracy desired. Slow flight is flown with emphasis on attitude flying-particularly during turns.

Stalls

22. The power off stall characteristics of the L19 are conventional and mild. As the aircraft approaches stall conditions there is an increasing loss of control effectiveness. As the aircraft stalls the nose will drop and there may be a slight wing drop or wallowing. If the flaps are down there may be minor elevator buffet otherwise flaps do not alter the stall characteristics.

23. The power on stall characteristics of the L19 exhibits a tendency to immediately transition into an incipient spin if yaw is not carefully controlled during the stall.

24. The Stall Speed Chart below provides the stall speeds at various gross weights, bank angles and configurations.

Stall Speeds - M.P.H. (I.A.S.) – Power Off									
Degree of Flap	0			30			60		
Gross Weight (Lbs)	1800	2100	2400	1800	2100	2400	1800	2100	2400
Level Flight	47	54	59	44	51	56	41	48	54
30 Degrees of Bank	54	60	65	51	58	62	49	55	60
60 Degrees of Bank	74	81	87	70	76	81	69	74	80

Table 2-16 Stall Speeds

Stall Recovery

25. Stall recoveries are emergencies demanding prompt action and a minimum loss of altitude. While just lowering the nose will recover the aircraft from a stall, the loss of altitude will usually be unacceptable. The application of power will reduce the altitude loss to almost zero with very little attitude change. The stall recovery procedure for this aircraft is consistent with most general aviation aircraft and follows the acronym PP (Push – Power) is as follows:

a. **P - Push** - Lower the nose when the stall is detected. If the wing drops during the stall, correct with opposite rudder;

b. **P - Power** – Apply full power simultaneously with lowering the nose;

c. after recovering from the stall, raise any flaps in steps and establish a climb to a safe altitude; and

NOTE

If more than 30 degrees of flap are down at the time of the stall, raise the flap to 30 degrees in small increments during the recovery to improve acceleration.

NOTE

While they are not an aircraft specific emergency checklist, stall recovery is a critical emergency procedure and shall be committed to memory.

Spins

26. In a clean, power-off configuration the L19 does not exhibit any dangerous spin characteristics. The spin is relatively mild except for a rapid rate of rotation. Altitude lost per turn is 200-250 feet
.

CAUTION

Spins are not approved in the L19. The following information is provided for use in the event an unintentional spin is encountered.

27. Spin recovery procedure is consistent with most general aviation aircraft and follows the acronym PARE (Power – Aileron – Rudder – Elevator). Spin recovery is accomplished as follows:

a. **P – Power** – bring throttle to idle.

b. **A – Ailerons** – centralize the control column. Raise flaps if req'd

c. **R – Rudder** – apply full rudder opposite to the direction of rotation;

d. **E – Elevator** – ease control column forward to break the stall; and

e. once rotation stops, centralize the rudders, level the wings, ease out of the ensuing dive, and establish a climb to a safe altitude.

NOTE

While it is not an aircraft specific emergency checklist, spin recovery is a critical emergency procedure and shall be committed to memory.

Spiral Dives

28. Spiral dives are steep descending turns characterized by rapidly increasing airspeed and rate of descent (in a spin, the airspeed and rate of descent remain relatively low and constant). Left uncorrected, a spiral dive usually leads to structural failure. Attempts to recover using aft control column will only tighten the spiral.

29. The spiral dive recovery procedure for this aircraft is consistent with most general aviation aircraft and is as follows the acronym PRP (Power – Roll – Pull):

a. **P – Power** – reduce power to idle;

b. **R – Roll** – roll to a wings level attitude with full aileron deflection;

c. **P – Pull** – pull the nose up to ease out of the ensuing dive; and

d. after recovery from the spiral dive, apply power as required to establish a climb to a safe altitude.

NOTE

While it is not an aircraft specific emergency checklist, spiral dive recovery is a critical emergency procedure and shall be committed to memory.

Forward Slips

30. Forward slips may be used to increase aircraft rate of descent. The L19 may be forward slipped at any airspeed and flap setting.

PRE-STALL CHECK

31. Prior to practising stalls, spiral dives, or unusual attitude recoveries, perform the following (ASCOT) check:

Table 2-15	PRE-STALL (ASCOT)	
ACTION	**CHECK**	**NOTES**
1. Altitude	As required	Ensure recovery can be c/o above min designated altitudes
2. Straps	tight	Ensure unused straps secure
3. Cockpit/configuration	• Fuel ---- **FULLEST TANK** • Carb Heat --- **ICE CHECK** • Mixture ---------------- **RICH** • Flaps ----------- **AS REQD** • Temp/Press ------ **GREEN** • Door/Windows - **SECURE**	
4. Objects	Secure loose objects	
5. Traffic/Terrain	Clear	Check for conflicting traffic and ensure clear of built-up areas

DESCENT

32. Prior to commencing descent, perform descent check as follows:

Table 2-17	PRE-DESCENT	
ACTION	**CHECK**	**NOTES**
1. Mixture	FULL RICH	May be done progressively in “cruise” descents
2. Carb heat	As required	
3. Power	Reduce As required	
Descent After Tow – To avoid shock cooling of cylinders, use the following procedures 1. Slowly reduce power to 1800 RPM 2. Do not exceed 80 MPH in descent 3. Do not further reduce power for 2 minutes, or until CHT is below 160°C		

TRAFFIC PATTERN

33. Normal traffic pattern entry procedures apply.

34. For easy transition to final approach speeds, it is recommended that pilots slow to 80 mph upon entering traffic pattern. This can be accomplished with power settings of approximately 1900 RPM. Higher throttle settings may be used, but will require careful circuit planning to permit deceleration to Vfe (maximum flap speed) without resulting in a higher than normal approach.

35. Prior to turning base, perform the pre-landing check as follows:

Table 2-18	PRE-LANDING	
ACTION	**CHECK**	**NOTES**
1. Fuel selector	On fullest tank	
2. Harnesses	Secure and locked	
3. Carb heat	As required	
4. Mixture	Full RICH	
5. Temperatures and pressures	Normal	“in the green”
6. Boost Pump	ON	
7. Brakes	Check pressure	
8. Landing Light	ON for night ops only	

NOTE

The pre-landing check shall be committed to memory

FINAL APPROACH

36. The final approach path flown will depend on the type of landing to be carried and the presence of any approach end obstacles. Establish and maintain the correct glide path with throttle changes while maintaining airspeed with pitch angle. Drift may be eliminated using either the crab or wing down/top rudder techniques. Always use the wing down/top rudder technique during the final approach, flare and landing

a. Normal Approach. Normal approaches are flown with 0-40 degrees of flaps, an approach speed of 70 MPH ISA, with some engine power to provide a margin for glide path control;

b. Obstacle Clearance Approach. When approach end obstacles exist, the final approach will be executed with with 40 – 60 degrees of flap, an approach speed of 70 MPH IAS, and power at idle to ensure the steepest possible approach.

LANDING

General

37. Landings may be accomplished using a three point landing or a wheel landing. These techniques are discussed in detail in C-CR-CCP-244/PT-005:

a. a three point landing involves landing the aircraft in such a manner that the main wheels and tail wheel touchdown simultaneously. This is the standard landing attitude for ACGP operations, and shall be used except when circumstances dictate the use of a wheel landing; and

b. a "wheel landing", which involves landing the aircraft in such a manner that initial contact is on the main wheels only. This technique may be appropriate when strong or gusty crosswind conditions exist.

WARNING

Wheel landings should not be attempted by pilots who are not proficient with the technique. Hard landings, bounces, and porpoising can occur when wheel landings are executed without adequate precision, and may result in landing gear damage or a propeller strike.

38. As with all a tail wheel equipped aircraft, the L19 is directionally unstable on the ground. It is critical that all landings be accomplished with the aircraft longitudinal axis properly aligned with the landing surface and with no lateral drift.

WARNING

Failure to ensure proper alignment and drift elimination on landing can result in an uncontrolled ground loop.

39. Care must be taken when applying brakes during the landing roll. Brake application must be smooth and progressive, and any tendency for the tail to lift must immediately be countered with full aft stick and the release of brake pressure.

WARNING

Abrupt / excessive application brake and / or failure to maintain full aft stick after touchdown may result in a nose-over.

Normal Landing

40. Normal landings are accomplished in the three point landing attitude, using moderate flap settings (0-40 degrees, with 30 degrees of flap being typical):

a. establish a final approach with **0-40º flaps** (30º flaps typical) and a speed of 70 MPH IAS;

b. as the aircraft is flared for landing, smoothly reduce power to idle and pitch the nose up gently to achieve level flight just above the runway;

c. smoothly increase backpressure on the stick to bring the aircraft to a normal three point attitude as airspeed decreases;

d. touchdown should occur in the three point attitude just as the stalling speed is reached;

e. if the flare height has been badly misjudged and major corrections will be necessary in order to salvage the landing, consider aborting the landing, as large corrections at this point will almost invariably result in a bad landing and subsequent directional control problems on the ground; and

f. once the aircraft is on the ground, ease the control column full aft and use rudder/tail wheel steering, brake, aileron, and power as necessary to maintain a straight rollout down the middle of the landing surface.

Short Field Landing

41. A short field landing is used when the available landing surface is of limited length. The determination of whether the available field length is "short" must be based on calculated landing performance, with due consideration for aircraft weight, winds, and density altitude. As a general guideline, takeoff surfaces less than 1,500 ft long should be carefully assessed. Short field landings are accomplished with flaps set from 40 to 60 degree, with maximum performance achieved at 60 degrees of flaps:

a. establish a final approach with **40 - 60º flaps** and an approach speed of 70 MPH IAS;

b. conduct the final approach with an aim point just prior to the threshold, so as to touch down close to the threshold of the usable landing surface;

c. as the aircraft is flared for landing, smoothly reduce power to idle;

d. smoothly increase backpressure on the stick to bring the aircraft to a normal three point attitude as airspeed decreases;

WARNING

Due to the high drag associate with the flap setting, airspeed will decrease rapidly in the flare. Be prepared to cushion the landing with power if required.

e. touchdown should occur in the three point attitude just as the stalling speed is reached;

f. if the flare height has been badly misjudged and major corrections will be necessary in order to salvage the landing, consider aborting the landing, as large corrections at this point will almost invariably result in a bad landing and subsequent directional control problems on the ground;

g. once the aircraft is on the ground, ease the control column full aft and use rudder/tail wheel steering, brake, aileron, and power as necessary to maintain a straight rollout down the middle of the landing surface;

h. once directional control is confirmed, hold the stick aft, raise the flaps, and smoothly apply brakes as required.

WARNING

Abrupt or excessive application of brake and / or failure to maintain full aft stick after touchdown may result in a nose-over.

Soft / Rough Field Landing

42. Landings on Soft / Rough surfaces such as grass are accomplished using the Normal Landing technique.

43. A suitably sized, well-maintained grass landing surface, free of soft spots, rocks or depressions offers one of the best landing surfaces for the L19. A grass surface helps absorb the shock of landing and is more tolerant of landings made without sufficient compensation for drift or imprudent application of brake. Also even short clipped grass will offer significant resistance to the roll potential of the wheels, this resistance becomes greater as the aircraft decelerates. The end result is that a grassy surface, which is suitable in other respects, will afford a much shorter landing roll than on a paved runway surface.

44. When making a landing onto a shorter grassy surface that will require the use of brakes, it is important to know if the grass is wet from rain or even dew. The wheels could skid very easily and provide up to 30 % less braking capability than a wet paved surface.

WARNING

The condition of the grass surface must be cautiously monitored when it begins to dry out, as the braking action could become sporadic. Judicious use of brakes is required to ensure that the brakes do not lock up on wet patches and then suddenly increase the braking effect when a dry patch is encountered. The sudden deceleration can cause the aircraft to tip over onto the nose before the pilot is able to take corrective action.

Crosswind Landing

45. When landing in a strong crosswind, use the minimum flap setting required for the field type / length. The wing-low method of crosswind compensation gives the best aircraft control.

WARNING

Flaps exposed to strong crosswinds during landing introduce a yawing moment that can contribute to a loss of directional control and can lead to a ground loop.

46. Crosswind landings may be accomplished using the 3 point landing or wheel landing technique, depending on the conditions encountered.

WARNING

Wheel landings under challenging crosswind conditions require precise control. Pilots who are not proficient in wheel landings are strongly discouraged from using this technique in strong or gusty crosswinds.

Overshoot

47. If necessary to abort a landing, execute an overshoot as follows:

    a. smoothly apply full power, close carb heat, and establish a climb attitude;

    b. immediately raise flaps to 30º to reduce drag; and

    c. after safely clearing any obstacles and a positive rate of climb has been established, raise any remaining flaps in stages and trim for the climb.

WARNING

Premature retraction of the last 30º of flaps can result in the aircraft "settling" and a loss of altitude.

CONTINUOUS CIRCUIT OPERATIONS

Touch and Go Landings

48. When the landing roll is fully controlled, smoothly advance the throttle to **FULL** power. Bring the tail up promptly to normal take-off attitude. The more flap selected the more forward control pressure will be required to achieve this attitude. Trimming forward will ease the amount of pressure required. Use normal take-off techniques and once airborne perform the Post Take-Off Check.

CAUTION

If the landing was made with more than 30 degrees of flap selected, perform a stop and go reselecting a maximum of 30 degrees of flap before continuing with the go.

Stop and Go Landings

49. When conducting multiple circuits, use the Stop and Go check as follows:

Table 2-19	STOP AND GO	
ACTION	**CHECK**	**NOTES**
1. Trim	Set for Takeoff	
2. Fuel Selector	Set on Fullest Tank	
3. Flaps	Set as required	
4. Carb Heat	Cold	
5. Mixture	Rich	
7. Temperatures and pressures	Normal	
8. Boost Pump	On	

POST LANDING CHECK

50. Upon termination of a flight and when clear of the active runway, complete the post-landing check as follows:

Table 2-20	POST - LANDING	
ACTION	**CHECK**	**NOTES**
1. Flaps	Select UP	
2. Boost Pump	OFF	
3. Carb Heat	COLD	
4. Pulse Light	OFF (Daytime Ops)	
5. Taxi Light	ON (Night Ops Only)	
6. Pitot Heat	OFF	
7. Transponder	OFF	

SHUT-DOWN CHECK

51. Shut-down the aircraft as follows:

Table 2-21	SHUT-DOWN	
ACTION	**CHECK**	**NOTES**
1. Ground idle	1 min @ 1000 RPM	To stabilize engine temps prior to shutdown (taxi time may be used).
2. Radio master	OFF	
3. Throttle	700 RPM	
4. Magnetos	Live mag check	Select both Mags OFF momentarily
5. Mixture	ICO	
6. Magnetos	OFF	
7. All switches	OFF	
8. Battery switch	OFF	
9. Alternator Switch	OFF	
9. Control lock	install	
10. Secure Aircraft	• Chocks - In • Tie downs - Secure • Plugs - Install • Covers – Install as req'd	**CAUTION** During bird nesting season, install engine plugs during any shutdown of significant duration

MANAGEMENT OF ANCILLARY CONTROLS

Mixture Control

52. To prevent fouled plugs, rough running and/or engine damage, correct leaning procedures must be followed during all phases of flight. Proceed as follows:

a. **Ground Handling** – mixture full rich. If extended ground idling is anticipated, the mixture should be aggressively leaned. Return to full rich prior to run-up or takeoff.

b. **Takeoff** – mixture full rich unless taking off at high altitude (> 3000' MSL). For high altitude takeoffs, hold brakes, apply full power then lean mixture as necessary for smooth running and maximum power.

c. **Climb** – full rich

d. **Cruise** – after altitude, airspeed and power settings have stabilized, lean the mixture to slightly Rich of Peak (RoP) using the Peak RPM Method;

e. **Descent, Circuit** – mixture full rich.

Carburetor Heat

53. Carburettor heat should be applied when carb ice is suspected, or when operating in conditions where the risk of carb ice is high.

CAUTION

Apply FULL carb heat whenever icing is suspected and leave it in this position long enough to take effect. Anticipate that engine performance may further degrade (loss of power, roughness) as the ice melts and water is ingested.

CAUTION

The carburettor heat lever should be set only in the full COLD or full HOT positions. DO NOT use any intermediate positions.

FUEL MANAGEMENT

Pre-Flight Fuel Planning

54. Pre-flight fuel planning for cross country operations is essential. Pre-flight planning shall incorporate the following:

a. allow for fuel consumed during start, run-up, taxi, and takeoff. A typical planning figure is 1.0 USG;

b. allow for fuel consumed during the climb to cruising altitude. The fuel consumption rate during a full power climb will be 13.0 GPH or 50 litres/hr;

c. allow for winds aloft and the effect on ground speed;

d. allow for fuel that may be consumed by reasonably foreseeable contingencies such as en-route altitude changes, en-route course variations, routing changes directed by ATC, etc;

e. incorporate an appropriate VFR fuel reserve. Regulations require that pre-flight planning allows for a ***minimum*** fuel reserve of:

   (1) 30 minutes for daytime operations, and
   (2) 45 minutes for night operations.

f. identify en-route locations for possible fuel stops; and

g. when operating in areas with long distances between aerodromes with fuel services, determine a “point-of-no-return” (PNR) beyond which you are committed to continuing to your destination. PNR represents a critical decision gate for en-route fuel management.

En-Route Fuel Management

55. This aircraft is equipped with several tools to assist the pilot with the task of fuel management. Of particular significance / use are the following:

a. Fuel Quantity Gauges. Fuel quantity gauges show the ***useable fuel*** in each tank:

i) the fuel gauges are considered reliable only when the tanks are completely full, or when fuel levels are below 1/4.

CAUTION

Fuel gauge indications are not to be considered reliable. Engine failures due to fuel starvation can occur when the selected tank indicates less that ¼ full and the aircraft is not maintained in level, un-accelerated flight

ii) A red arc, extending from **E** to just below the **1/4-**full on the face of each indicator is labelled **NO TAKE-OFF** and indicates that fuel flow from the tank may be disrupted when the aircraft is in a three-point attitude.

WARNING

Takeoff shall not be commenced when either fuel tank is indicating in the NO TAKEOFF range

b. Garmin GPS. When conducting cross country operations, the GPS will provide Estimated Time Enroute (ETE) to the final destination. Using this feature, the pilot can compare planned versus actual ETE and monitor the adequacy of planned fuel reserves throughout the flight.

GLIDER TOWING OPERATIONS

Aircraft Performance on Tow

56. Aircraft performance is significantly different when conducting glider towing operations. Actual performance will depend on variables such as tow aircraft weight, glider weight, winds, runway surface type and density altitude. In general terms, pilots can expect the following:

a. slower acceleration;

b. longer takeoff roll; and

c. lower rate of climb.

Prior to First Tow

57. During the pre-flight inspection, inspect the condition and operation of the tow release mechanism and ensure that the mirrors are properly adjusted. Perform a tow rope release check prior to the first tow. Normal pre-takeoff checks are performed prior to the first tow

Continuous Towing Operations

58. During continuous towing operations, the following Stop and Go Check is performed prior to each subsequent tow:

Table 2-19	**STOP AND GO**	
ACTION	**CHECK**	**NOTES**
1. Trim	Set for Takeoff	
2. Fuel Selector	Set on Fullest Tank	
3. Flaps	Set as required	
4. Carb Heat	Cold	
5. Mixture	Rich	
7. Temperatures and pressures	Normal	
8. Boost Pump	On	

Takeoffs with Glider on Tow

59. Take-off with glider in tow is accomplished as follows:

a. complete pre-takeoff or stop & go check, set flaps between 10 º to 15 º;

b. at the TAKE UP SLACK signal, ensure the control column is fully aft, relax pressure on the brakes and advance power slightly to achieve a slow forward crawl. Control speed with brakes until ALL OUT signal;

c. at the ALL OUT signal, release the brakes and smoothly apply full throttle, maintaining directional control with tail wheel steering and rudder;

d. as the aircraft accelerates under good directional control, move the control stick gently forward to lift the tail to a slightly tail-low attitude;

WARNING

Do no use excessive or aggressive control inputs to lift the tail off the ground prematurely. Such action combined with a premature release or rope brake could result in a nose-over.

e. accelerate until the aircraft lifts off at between 50 and 60 MPH;

f. smoothly adjust pitch attitude to establish a climb at 65-70 MPH; and

g. at a safe altitude, perform the Post Takeoff Check.

Glider Tow

60. Complete the tow to altitude as follows:

a. maintain a climb speed of 65 - 70 MPH;

b. expect rudder and elevator trim changes during the tow as the glider moves around. Counter these changes by manually maintaining co-ordinated flight and trimming off elevator pressure;

WARNING

Rapid movement of the glider to an extreme tow position may result in tow ship upset. When a glider on tow rapidly diverges to an extreme tow position sufficient to produce forces on the tail that cannot be countered with elevator or rudder, release the glider.

c. use a maximum of 15-20 degrees of bank in the turns Enter and exit each turn smoothly and positively maintaining rudder co-ordination; and

d. plan your pattern to arrive at the designated release point at the same time you reach release altitude without having to orbit if possible.

Glider Release

61. Approaching the planned release altitude, gradually reduce power to 2000 RPM while maintaining 70 MPH. This will result in the tow aircraft levelling off or maintaining a gentle climb. Await glider release.

62. As the glider prepares to release it will climb slightly then dive slightly to ease the tension on the tow rope. This will be felt in the tow aircraft through pitch changes - counter the changes manually;

63. Visual confirmation of glider release is essential. Positive procedural separation from the glider (tow plane down and left, glider up and right) is essential.

Descent after Release

64. Descent / recovery profiles are designed to minimize the effects of shock cooling on the engine.

65. Slowly throttle back to 1800 RPM, begin a descending left turn, adjust flap as necessary for the pattern to be flown (up to 60 degrees of flap may be used if necessary). Note the time of release and establish a descent at 80 MPH until 2 minutes after release or CHT drops below 160 degrees C.

NOTE

The preferred technique to minimize thermal shock is to gradually reduce the throttle to 1800 RPM (i.e. 2300 – 1800 in approx 15 sec) while maintaining airspeed below 80 mph. Normal engine handling can be resumed when CHT drops below 160ºC.

Approach and Landing

66. Conduct the approach and landing using techniques appropriate to the landing surface. Pilots must adjust the approach to ensure that the trailing tow rope remains clear of all obstacles.

WARNING

The tow rope will trail behind and below the aircraft, and will “flail” both vertically and laterally. Impact by the glider tow ring can cause serious damage to materiel and serious injury to personnel. Ensure that the rope will be clear of any approach obstacles, equipment, or personnel.

Cross Country Towing Operations

67. To optimize aircraft performance and control during the cruise phase of the cross country tow, the aircraft should be configured as follows:

a. When towing in smooth atmospheric conditions, the aircraft should normally be configured as follows:

(1) flaps up
(2) throttle set for IAS between 85 – 90 MPH

b. When towing in rough atmospheric conditions, the aircraft should normally be configured as follows:

(1) flaps up
(2) throttle set for IAS between 80– 85 MPH

68. When conducting cross country towing in areas of significant lift or convective activity, do not attempt to maintain a constant altitude. This will make it extremely difficult for the glider pilot to avoid slack-rope situations. If traffic, terrain, and airspace considerations allow, it is generally best to maintain a constant airspeed and “ride out” the convective activity, accepting moderate variations in altitude.

SEVERE WEATHER OPERATIONS

Rain

69. No special precautions need to be taken during flight in rain other than remaining vigilant for icing conditions and unexpected reductions to visibility. During take-off and landing, directional control may be more difficult as a result of reduced friction both on paved and grass surfaces. Both take-off and landing should be flown tail low on grass surfaces as unseen heavy wet grass or deep puddles could cause nosing over.

Icing Conditions

70. ***Flights into conditions where icing should reasonably be expected are prohibited***. This includes flight in freezing rain or freezing drizzle, flight in wet snow, or flight in cloud. Should icing conditions be inadvertently encountered, consider the following:

a. the aircraft has no anti-icing or de-icing equipment at all for the airframes, propeller, or air induction ducts. Limited icing protection is offered by pitot heat for the pilot/static system, a defroster for the windshield, and carburettor heat for the engine;

b. be aware that any snow, frost or ice build-up on the aircraft can increase the stalling speed by 20-30 %. In flight the aircraft will become heavy and sluggish as ice is accumulated;

c. cycling the engine through the RPM range may shed the propeller of some ice, but also could put the propeller into dangerous imbalance;

d. ice may impede control movement so frequent control movements should be made to keep the controls free; and

e. when landing, plan on an approach speed up to 30% above normal.

Turbulence and Thunderstorms

71. Flights into strong turbulence are discouraged. If strong turbulence is accidentally encountered, set airspeed as close to manoeuvring speed as practical and fly a constant pitch attitude. This technique combats the tendency to chase wildly fluctuating airspeeds and altitudes caused by differential barometric pressures in the storm.

72. Flights into thunderstorms are prohibited.

COLD WEATHER OPERATIONS

73. Operating the L19 in cold weather involves greater than normal care of the airframe if it is stored outside, and more concern with the strains put on the engine:

a. the external check must ensure all ice, snow and frost is carefully removed from the airframe. The preferred method is by de-ice fluid but careful sweeping is acceptable. Do not attempt to remove surface contamination by scraping or chipping;

b. in extremely cold temperatures, it may be necessary to pre-heat the engine using an approved ground heater;

c. with the Magneto switch **OFF**, pull the propeller through for a seven blade count. This will help lubricate each cylinder prior to start;

d. when priming the engine prior to start, use about 1 second at – 20 degrees C to 4 seconds at –40 degrees C. If the engine will not continue running, continue to prime intermittently after start until the engine runs smoothly;

e. monitor oil pressure / temperature and cylinder heat temperatures closely to ensure operating minimum’s and maximums are maintained. Warm the engine slowly at 1000 - 1200 RPM. In extreme cold temperatures, apply carb heat to help warm up the air induction system;

f. when taxiing, be alert for slippery conditions and check that all instruments are operating properly;

g. prior to take-off ensure no snow / frost has accumulated on wings and tail;

h. carburettor heat may be used during take-off and at any time during flight. It is wise to use it early to prevent carburettor ice rather than try to melt it after it has formed;

i. avoid power-off descents, but if they are used, clear the engine by applying moderate power settings every 30 seconds;

j. use carburettor heat on approach and land normally with due concern for the surface conditions;

k. during landings, make allowances for reduced braking effectiveness on snow or ice covered runways; and

l. put the aircraft away making sure snow and ice will be prevented from entering critical areas.

PART III

EMERGENCY OPERATING PROCEDURES

GENERAL

Priorities

1. In any emergency, the first priority is to maintain aircraft control, and then take the necessary actions to eliminate or mitigate the problem.

2. The ability of a pilot to react quickly and correctly in a stressful emergency situation will depend in large measure by how well these emergency procedures have been reviewed, practiced, and committed to memory.

3. It should also be noted that in these emergency procedures "as soon as possible" means immediately, i.e., land in the nearest field, while "as soon as practicable" means at the nearest suitable aerodrome.

Non-Critical Emergencies

4. Non-critical emergencies are those that do not pose an immediate threat to the safety of the aircraft or the personnel on board. These are circumstances where there is sufficient time available to assess the situation, consider available options, and determine a suitable course of action. Non-critical emergencies are also referred to as "Yellow Page Emergencies" as they are printed on yellow paper in the aircraft checklist.

5. Pilots are expected to refer to written checklists in responding to a non-critical emergency.

Critical Emergencies

6. Critical emergencies are those that pose an immediate threat to the safety of the aircraft or the personnel on board and require immediate and correct response by the pilot. Critical emergencies are also referred to as "Red Page Emergencies" as they are printed on red paper in the aircraft checklist.

7. Pilots are expected to commit critical emergency checklists to memory.

NON-CRITICAL EMERGENCIES

Alternator Failure

8. Since alternator failure may lead to a complete electrical failure, the checklist deals with both problems. By virtue of the fact that the operation is virtually a day, VFR operation, the L19 is quite easily recovered without electrics. The services lost, which may affect the landing are: flaps, radio/nav equipment, boost pump and oil temperature gauge

9. Malfunctions in the electrical system can usually be detected by monitoring the voltage and ampere displays.

10. For an alternator failure, proceed as follows:

Table 3-1	**ALTERNATOR FAILURE**	
ACTION	**CHECK**	**NOTES**
1. Battery Switch	ON	
2. Alternator Circuit Breakers	IN	
3. Alternator	ON	
If Alternator Does Not Reset:		
4. All Electrics	OFF	
If Electrical Services Needed for Safe Recovery:		
5. Battery Switch	ON	
6. Essential Services	ON	
7. Battery Voltage	MONITOR	
8. Land	As Soon As Practicable	

NOTE

Consider turning off battery to conserve electrical power for landing.

NOTE

Battery power is sufficient for normal (VFR) operations for approximately 30 minutes.

Low Oil Pressure

11. A low oil level due to normal engine usage, leaks, or an oil pump failure, may cause low oil pressure. It may be difficult to discern which of these is the problem, so the prudent approach is to reduce the strain on the engine and land promptly. Low pressure and high or rising oil temperatures however is indicative of oil starvation and imminent engine failure. Fluctuating pressure is indicative of oil pump cavitation and imminent oil exhaustion.

Table 3-2	**LOW / FLUCTUATING OIL PRESSURE**	
ACTION	**CHECK**	**NOTES**
1. Power	reduce	Continue flight at lowest feasible power setting.
2. Land	As soon as practicable	
CAUTION If oil temperature is high or rising rapidly, engine failure may be imminent. Such circumstances will increase the urgency and may require landing as soon as possible.		

Low Fuel Pressure

12. The most likely cause is failure of the engine driven fuel pump. While gravity may feed sufficient fuel to maintain engine operations when throttle settings are low, the boost pump should be used to restore normal fuel pressure.

Table 3-3	**LOW FUEL PRESSURE**	
ACTION	**CHECK**	**NOTES**
1. Boost Pump	ON	
2. Land	As soon as practicable	

Split Flap

14. The most likely cause is failure of one of the flex drive cables to the flaps. If this is the problem there should be little difficulty in matching the setting by moving the other flap. If the setting cannot be matched, the problem becomes one of control due to the unequal lift/drag between wings. Since the problem becomes more acute as speed is reduced, some testing must be carried out at an altitude where loss of control can be safely regained. The minimum safe speed determined during this testing must be maintained or exceeded for the rest of the flight.

Table 3-4	**SPLIT FLAP**	
ACTION	**CHECK**	**NOTES**
1. Reverse cycle to attempt to equalize flaps		
If Unable to Equalize Flaps:		
2. Carry out a controllability check at a safe altitude and determine minimum safe airspeed		
3. Fly the approach and landing at airspeed 5 MPH above The minimum safe airspeed		
CAUTION Do not allow IAS to fall below calculated minimum safe airspeed prior to touchdown.		

CRITICAL EMERGENCIES

Engine Fire on Start / on Ground

15. The most likely cause of a fire on start is over-priming with subsequent backfiring igniting the excess fuel in the air induction system. The best way of containing such a fire is to continue cranking the engine so as to suck the flames and accumulated fuel into the engine. In this circumstance, evidence of fire will likely only be apparent upon shutdown and investigation. If at any time (on the ground) that an engine fire is evident from the cockpit, the aircraft should be abandoned as soon as possible.

Table 3-5	**ENGINE FIRE ON START**	
ACTION	**CHECK**	**NOTES**
1. Starter	Continue cranking	Sucks flames and accumulated fuel into carburettor and engine
2. Throttle	OPEN - full	
3. Mixture	ICO	
If no further evidence of fire:		
Complete normal shutdown and investigate		
If fire continues:		
Perform engine fire on ground check		

Table 3-6	**ENGINE FIRE ON GROUND**	
ACTION	**CHECK**	**NOTES**
1. Throttle	Closed	
2. Mixture	ICO	
3. Fuel Selector	OFF	
4. Boost Pump	OFF	
5. Magnetos	OFF	
6. Alt / Batt Switches	OFF	
7. Abandon aircraft	ASAP	
8. Use fire extinguisher	Discharge extinguisher into carb air intake and cowl flaps	Exercise caution

In Flight Fires

16. In flight fires may be engine fires, cabin fires, electrical fires, or wing fires. Fires can result from a variety of causes. An appropriate emergency response must therefore address all potential causes.

Table 3-7	ENGINE FIRE IN FLIGHT	
ACTION	**CHECK**	**NOTES**
1. Mixture	ICO	Shuts off fuel at carb
2. Fuel selector	OFF	Shuts off fuel to engine compartment
3. Boost Pump	OFF	
3. Cabin heat controls	CLOSE (Fully in to close)	Minimizes ingestion of smoke/fumes into cockpit
4. Magnetos	OFF	Eliminates source of ignition
5. Batt / Alt Switches	OFF (after flap selection)	Eliminates source of electrical fire
6. Airspeed	100 mph	Adjust speed as required to find a speed which will ensure an incombustible fuel/air mixture
7. Carry out a forced landing		Do not attempt to restart engine.

Table 3-8	CABIN FIRE	
ACTION	**CHECK**	**NOTES**
1. Alt / Batt Switches	OFF	
2. Cabin Heat/Air, all vents	CLOSE	
3. Fire extinguisher	Activate, as required	
4. Ventilate Cabin	As required	
5. Land	ASAP	As soon as practicable or possible, depending on circumstances.

Table 3-9	ELECTRICAL FIRE	
ACTION	**CHECK**	**NOTES**
1. Batt / Alt Switches	OFF	
2. All electrics	OFF	
3. If Cabin Fire Evident	C/O Cabin Fire Checklist	
If flight cannot be safely completed without electrics:		
4. Battery switch	ON	
5. Essential Systems	ON, as required	Select systems sequentially, allowing a short pause to confirm that each system is functioning normally. Monitor ammeter
6. Land	As soon as practicable	

Table 3-10	WING FIRE	
ACTION	**CHECK**	**NOTES**
1. Slip away from burning wing		
2. All lights	OFF	
3. Pitot heat	OFF	
4. Land	As soon as possible	

Engine Failures

17. Engine failures may occur at any point during the flight and with little or no warning. An appropriate emergency response must consider the altitude, airspeed, and location where the engine failure occurs. Prior to initiating take-off, pilots should have established a course of action to deal with time-critical engine failures.

Table 3-11	**ENGINE FAILURE ON TAKEOFF**	
ACTION	**CHECK**	**NOTES**
1. Throttle	CLOSE	
2. Brakes	APPLY, as required	
3. If towing	Release glider, move left	

Table 3-12	**ENGINE FAILURE AFTER TAKEOFF**	
ACTION	**CHECK**	**NOTES**
1. Establish Glide	72 MPH	
2. If towing	Release glider	
3. Throttle	CLOSE	
4. Select landing area	Fly to it	
5. Shutdown FMS	Complete the Engine Shutdown FMS Check ***IF TIME PERMITS***	

Table 3-13	ENGINE FAILURE IN FLIGHT	
ACTION	**CHECK**	**NOTES**
1. Establish Glide	72 MPH	
2. If towing	Release glider	
3. Throttle	CLOSE	
4. Select landing area	Fly to it	
5. If Time Permits, attempt engine restart as follows using **FMS** Check		
F - Fuel Fuel selector	Fullest Tank	
Boost Pump	ON	
Throttle	Open ½"	
M - Mixture Mixture	RICH	
Carb Heat	HOT	
S - Switches Magnetos	On BOTH	
6. If propeller has stopped – engage starter		
7. If unable to restart engine – carry out Forced Landing Check		

Forced Landing

18. Critical emergencies that result in a total loss of engine power will necessitate a Forced Landing, which shall be accomplished as follows:

Table 3-14	FORCED LANDING	
ACTION	**CHECK**	**NOTES**
1. Glide	72 mph	
2. ELT	ON	
3. MAYDAY	Transmit	
4. Transponder	Set 7700	
5. Landing area	Recheck	Re-assess for suitability and approach obstacles, estimate MSL altitude and wind direction and speed
6. Perform Engine Shutdown **FMS** Check if time permits		
F - Fuel Fuel Selector	OFF	
Boost Pump	OFF	
M - Mixture Mixture	ICO	
S - Switches Magnetos	OFF	
Alternator Switch	OFF	
7. Harness	Ensure tight	
8. Brakes	Check	
9. Cabin doors and windows	Unlatch	If landing on unprepared surface
10. Flaps	Select the maximum flaps practical for the situation	
11. Battery switch	OFF	After last flap selection
For Ditching **In light winds,** land parallel to swells. **In strong winds,** land into wind, tail low on or past crest of wave.		

WARNING

Following a water landing, do not inflate life vest until clear of the aircraft

PART IV

OPERATING DATA AND LIMITATIONS

GENERAL

1. The operating parameters detailed in this part provide for the safe and optimum operation of the aircraft. Except in an emergency, these limitations shall be observed.

2. Conventional instrument markings are utilized: white and red marks indicating minimum and maximum limits, green arcs indicating normal operating ranges, and yellow indicating cautionary ranges. These markings are for quick reference only; the precise limitations can be found on the type certificate data sheet, the Supplemental Type Certificates (STCs) which apply and the various placards mounted in the cockpit.

GENERAL SPECIFICATIONS

Weight Limitations

3. The following weight limitations are applicable:

Maximum All Up Weight – “A” Model	2300 lbs
Maximum All Up Weight – “C” Model	2400 lbs
Full fuel (41 US Gal @ 15º C)	246 lbs
Max baggage compartment weight	100 lbs

Table 4-1 Weight Limitations

Engine Limitations

4. The following engine limitations are applicable:

RPM	Maximum (5 minutes)	2600
	Maximum (continuous)	2300
	Normal Operating Range	1800 - 2300
Oil Pressure	Minimum (at idle)	30 psi
	Normal operating range	40 – 60 psi
	Maximum (cold oil)	95 psi
Oil Temperature	Minimum for run-up	15 º C
	Minimum for takeoff	24 º C
	Normal Range	38 º C – 108 º C
	Maximum	108 C
Cylinder Head Temp (CHT)	Minimum for run-up	80 º C
	Minimum for take-off	110 º C
	Minimum for Glide	70 º C
	Normal Range	110 - 200 º C
	Cautionary Range	200 - 230 º C
	Maximum	230 º C
Fuel Pressure	Minimum	11 psi
	Normal Range	11 – 13 psi
	Maximum	15 psi
Suction	Minimum	4.5 in Hg
	Maximum	5.5 in Hg

Table 4-2 Engine Limitations

Airspeed Limitations

5. The following airspeed limitations are applicable:

	Speed	IAS (MPH)	Remarks
V_{NE}	Never Exceed Epeed	158	Do not exceed this speed in any operation.
	With Gomolzig Muffler	150	
	With Hoffman Prop	150	
V_A	Manoeuvring Speed	113	Do not make full or abrupt control movements above this speed
V_{FE}	Maximum Speed with Flaps Extended	100	
	Maximum Speed with Flaps in Transit	80	
	Maximum Speed with Window(s) Open	120	
	Max Crosswind Landing		10 knots
	Max Crosswind Landing (Stds Pilot)		15 knots

Table 4-3 Airspeed Limitations

Normal Operating Speeds

6. The following are the normal operating airspeeds:

		IAS (MPH)	Remarks
Takeoff	Normal takeoff All weights, 0-30º flap	50-60	
	Max performance All weights, 30º flap	50-60	
Climb	Normal climb V_Y - Best rate V_X - Best angle - 30º flap Glider tow	80 65 60 65-70	
Traffic Pattern	Normal downwind speed Final approach - 0º flap - 30º flap - 60º flap	80 70 70 70	
Gliding	Optimum glide – zero wind, prop windmilling, flaps up	72	

Table 4-4 Normal Operating Speeds

Stalling Speeds

7. The following stalling speeds are applicable:

Stall Speeds - M.P.H. (I.A.S.) – Power Off									
Degree of Flap	0			30			60		
Gross Weight (Lbs)	1800	2100	2400	1800	2100	2400	1800	2100	2400
Level Flight	47	54	59	44	51	56	41	48	54
30 Degrees of Bank	54	60	65	51	58	62	49	55	60
60 Degrees of Bank	74	81	87	70	76	81	69	74	80

Table 4-5 Stall Speeds

Airspeed Correction Chart

8. The following is the airspeed correction chart. All speeds are in MPH:

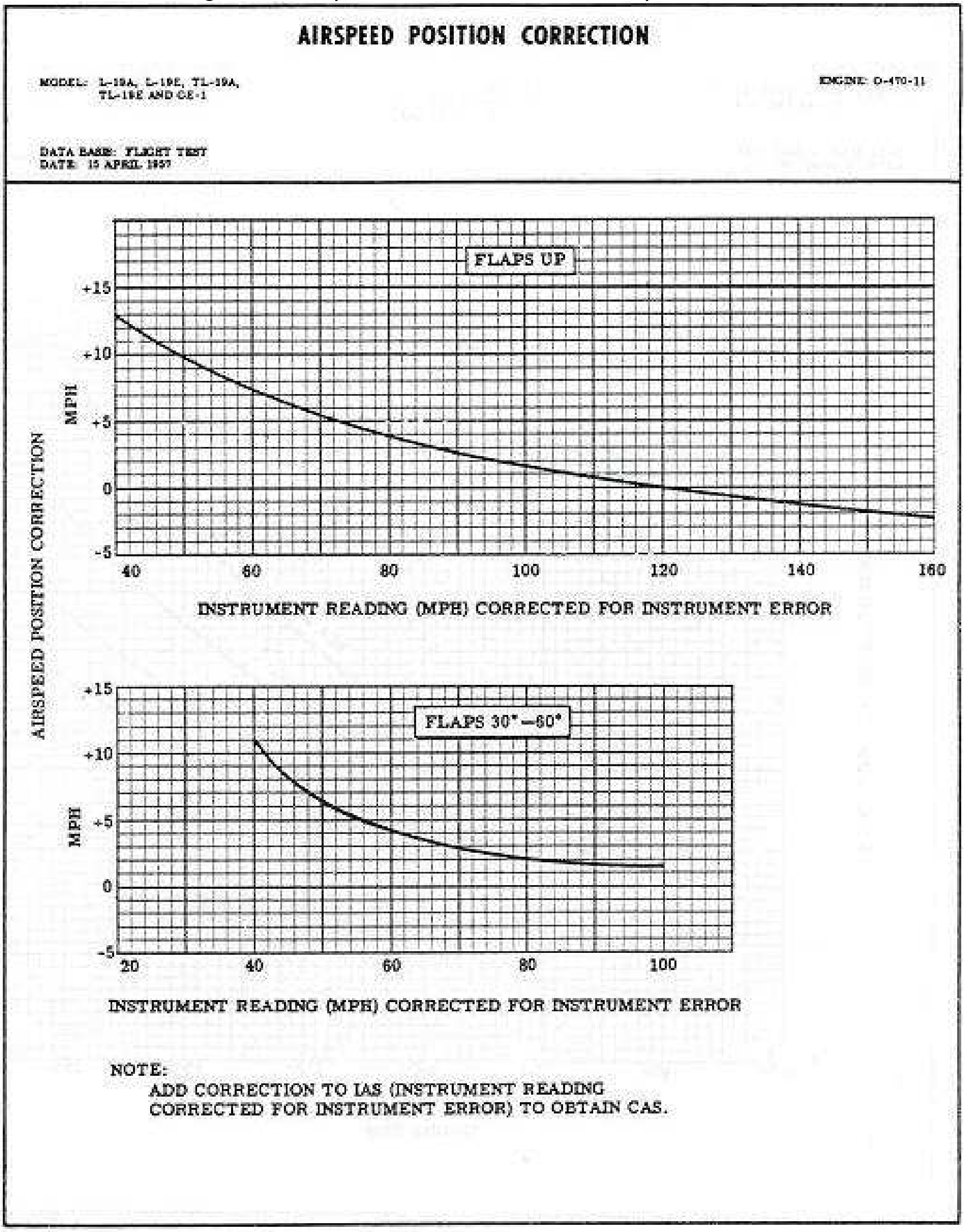


Figure 4-1 Airspeed Correction Chart

FLIGHT RESTRICTIONS

General

9. The following basic operating limits apply:

   a. the aircraft is certified for operation in the NORMAL category;

   b. the aircraft is certified for a maximum of two occupants;

   c. aerobatic manoeuvres, including deliberate spins, are prohibited.

Flight Load Factors

10. The following are the load factor limits:

Flaps Up	+3.8g
Flaps Extended	+2.0g

Table 4-6 Load Factor Limits

PERFORMANCE DATA

Takeoff Speeds

11. The standard configurations and liftoff speeds for specific takeoff techniques are as follows:

Takeoff	Flaps	Liftoff Speed (MPH IAS)
Normal	0-30°	50-60
Towing	15°	50-60
Short Field	30°	50-60
Soft Field	30°	50-60

Table 4-7 Takeoff Configurations

Takeoff Distance

12. The following chart details Minimum Takeoff Distances:

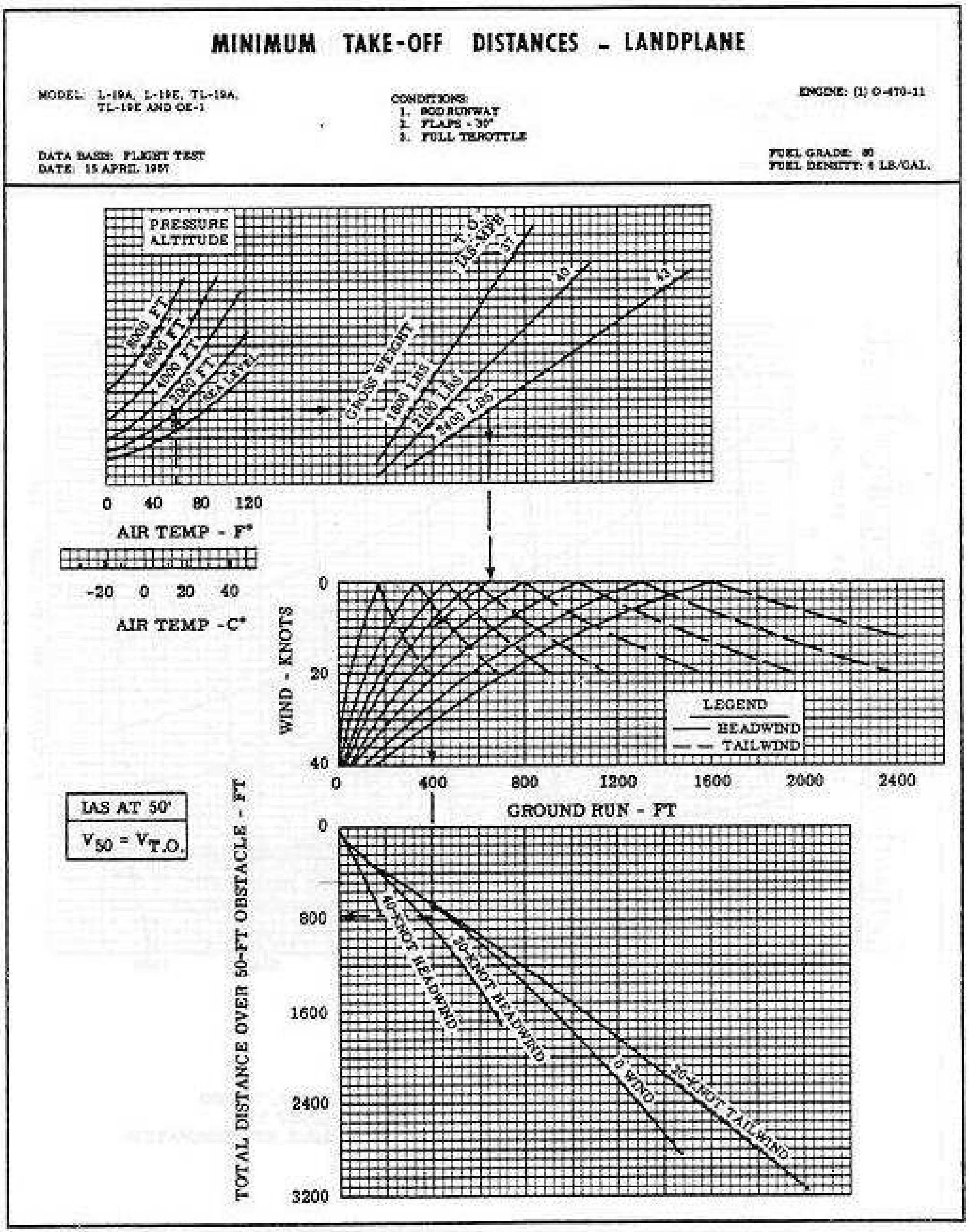


Figure 4-2 Takeoff Distance Data

Climb Performance Data

13. The following chart details Rate of Climb Performance:

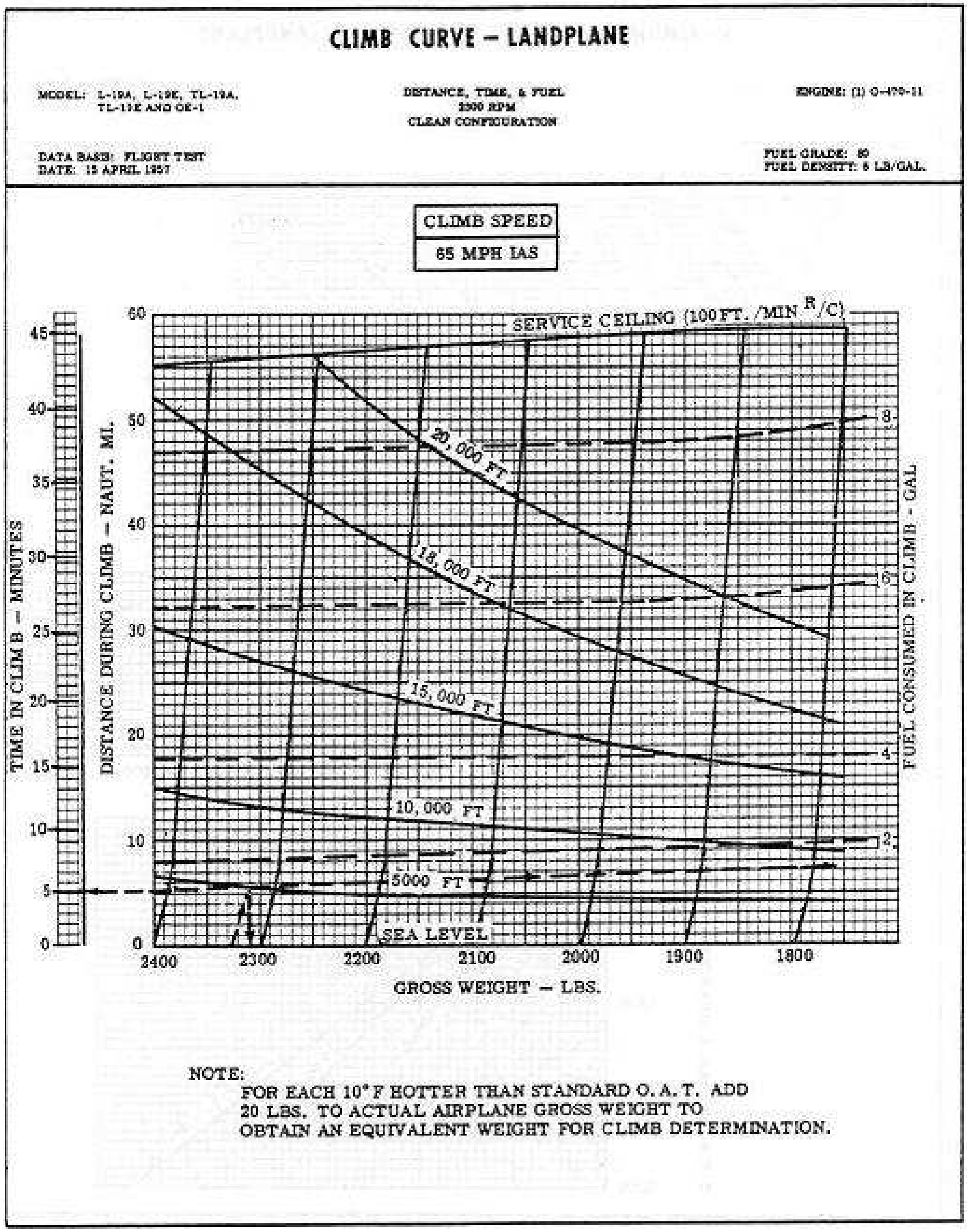


Figure 4-3 Rate of Climb Data

Cruise Performance Data

14. The following four charts provide cruise performance and specific fuel consumption data for the L19 at Sea Level, 5,000 ft ASL, and 10,000 ft ASL:

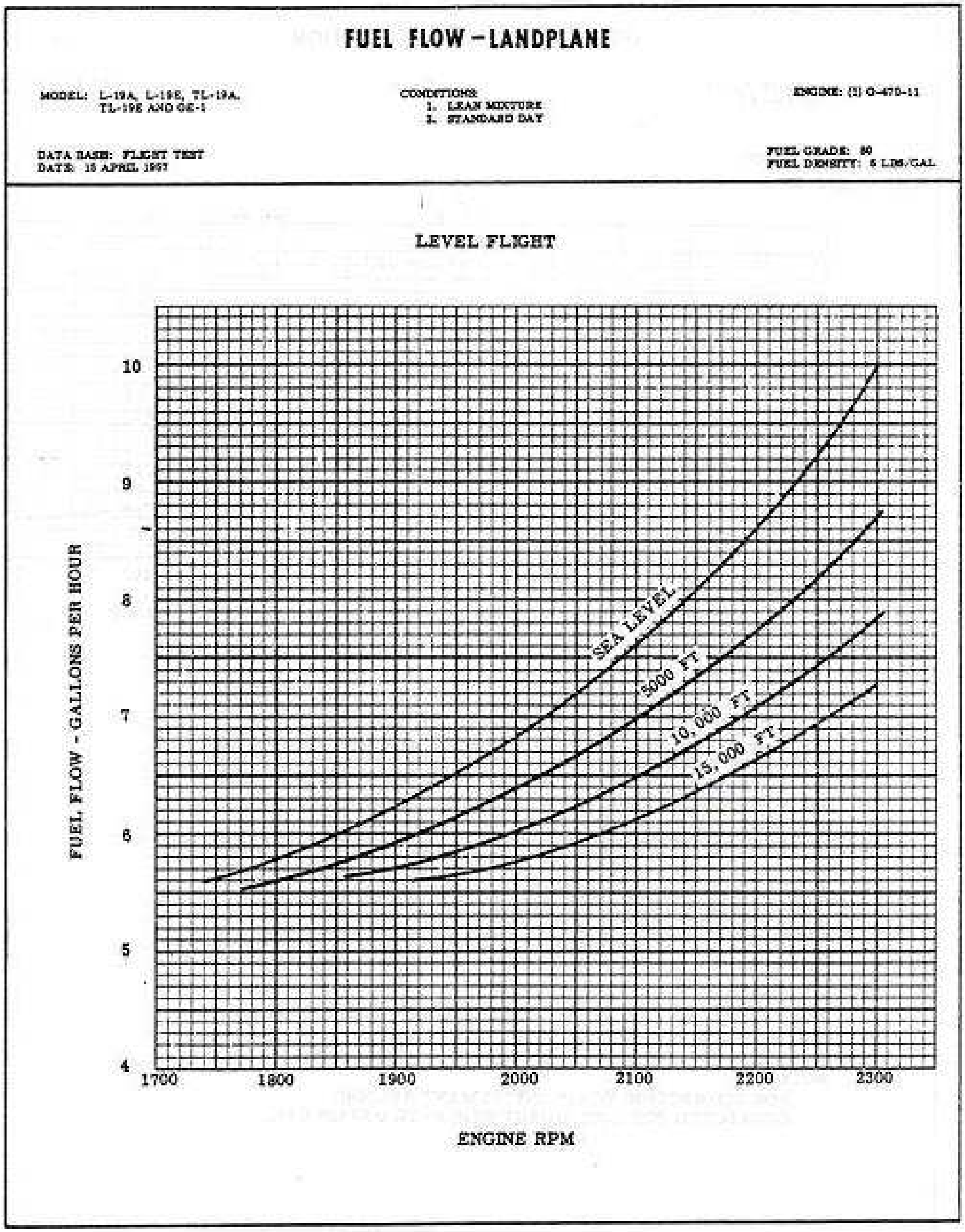


Figure 4-4 Fuel Flow Rates

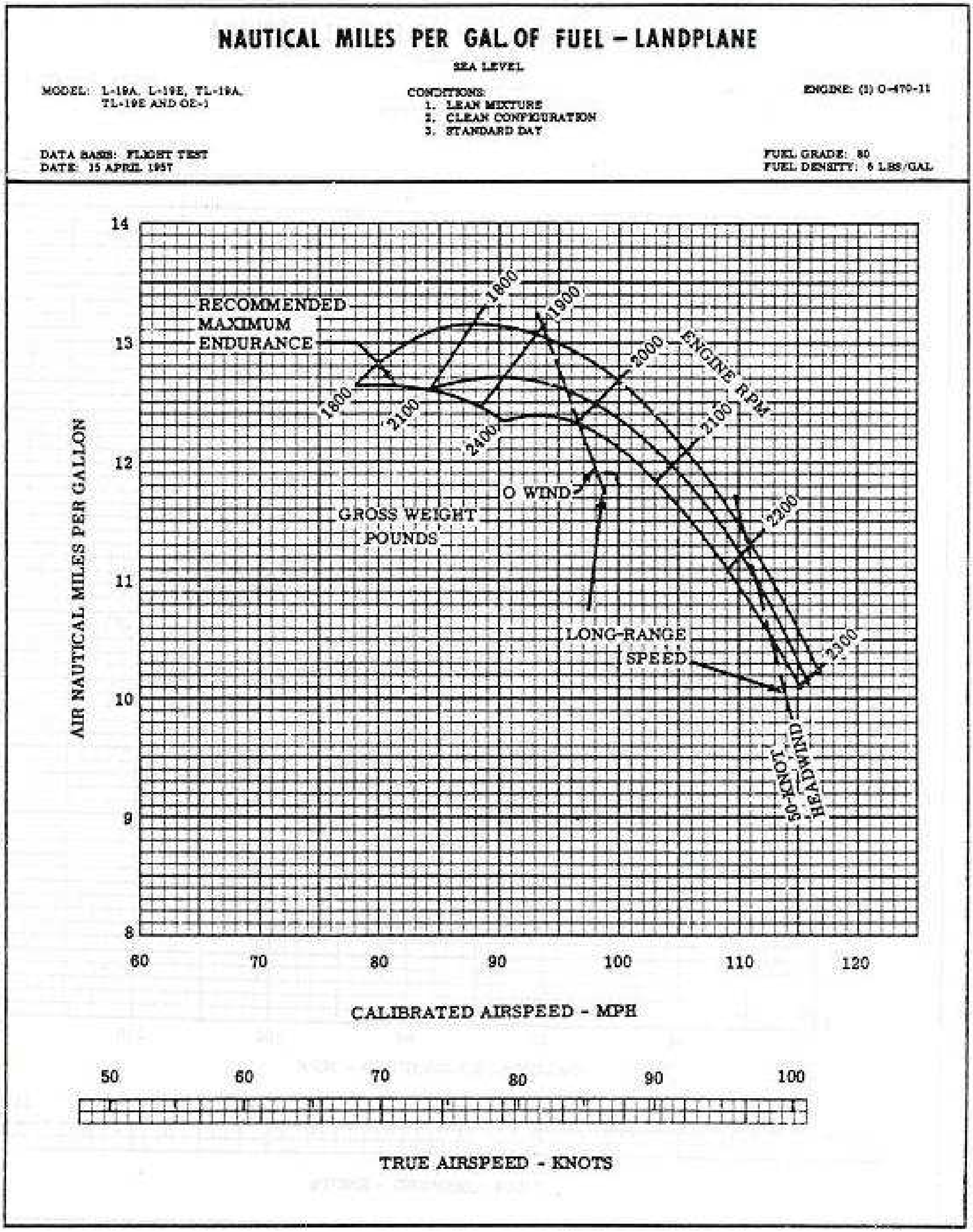


Figure 4-5 Specific Fuel Consumption / Cruise Data (Sea Level)

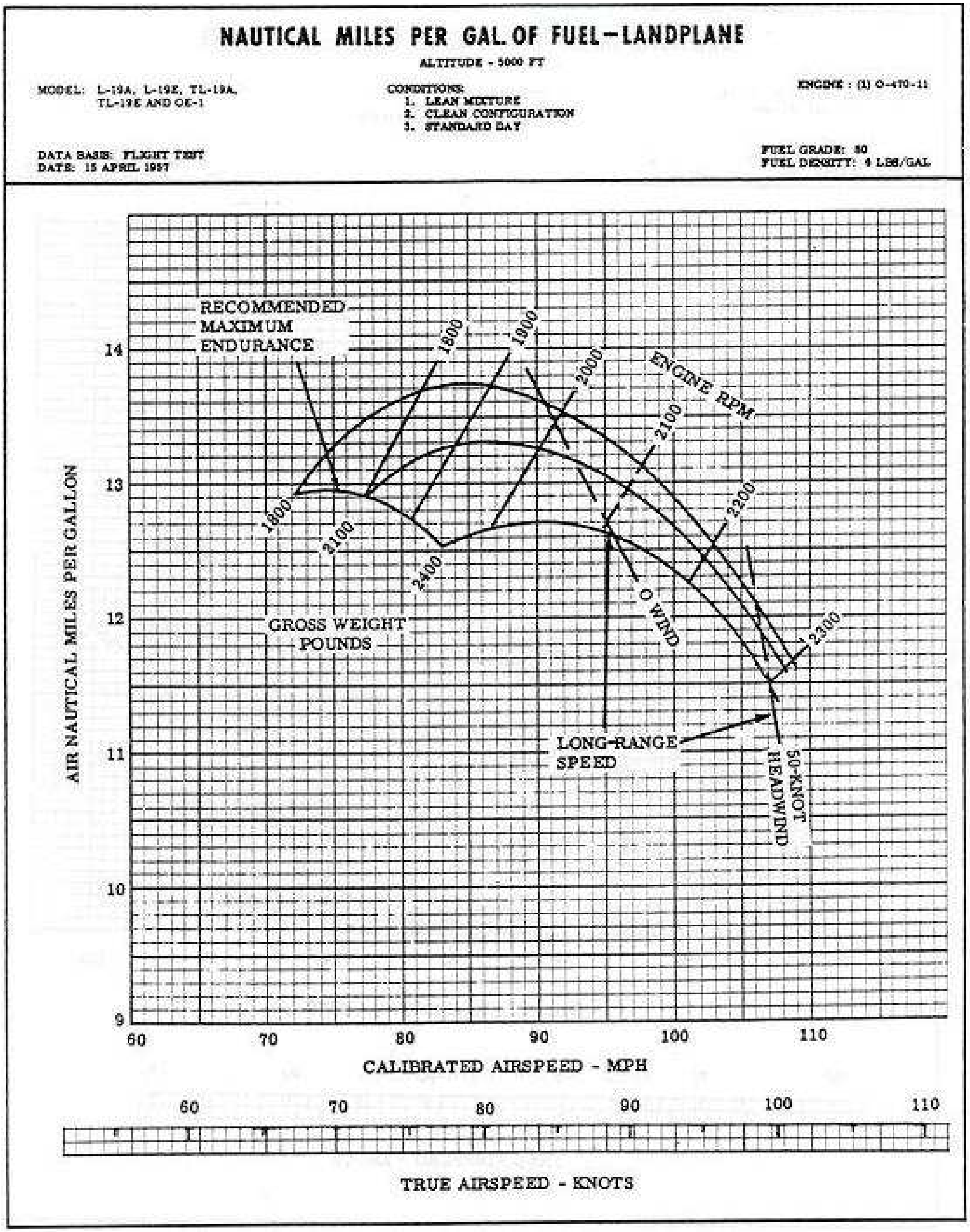


Figure 4-6 Specific Fuel Consumption / Cruise Data (5,000 ft ASL)

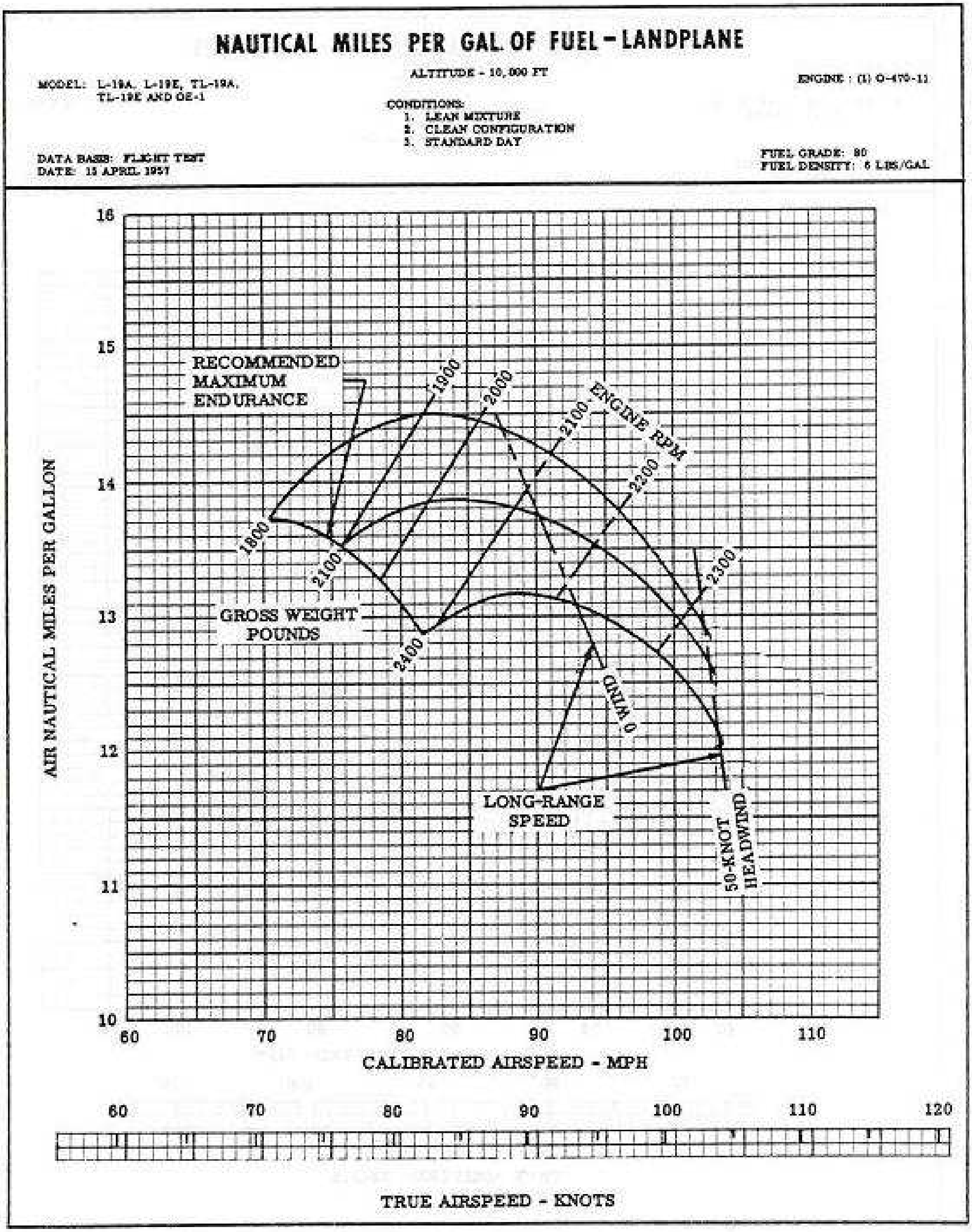


Figure 4-7 Specific Fuel Consumption / Cruise Data (10,000 ft ASL)

Landing Approach Speeds

15. Normal circuit, approach and landing speeds are based on the selected flap setting, and are detailed below:

Condition	IAS (MPH)
Downwind - Approx 1900 RPM	80
Approach - 0^{o} Flap	70
Approach - 30^{o} Flap	70
Approach - 60^{o} Flap	70
Best Glide - 0^{o} Flap	72

Table 4-8 Landing Approach Speeds

Landing Distances

16. Landing distances are provided in the table below.

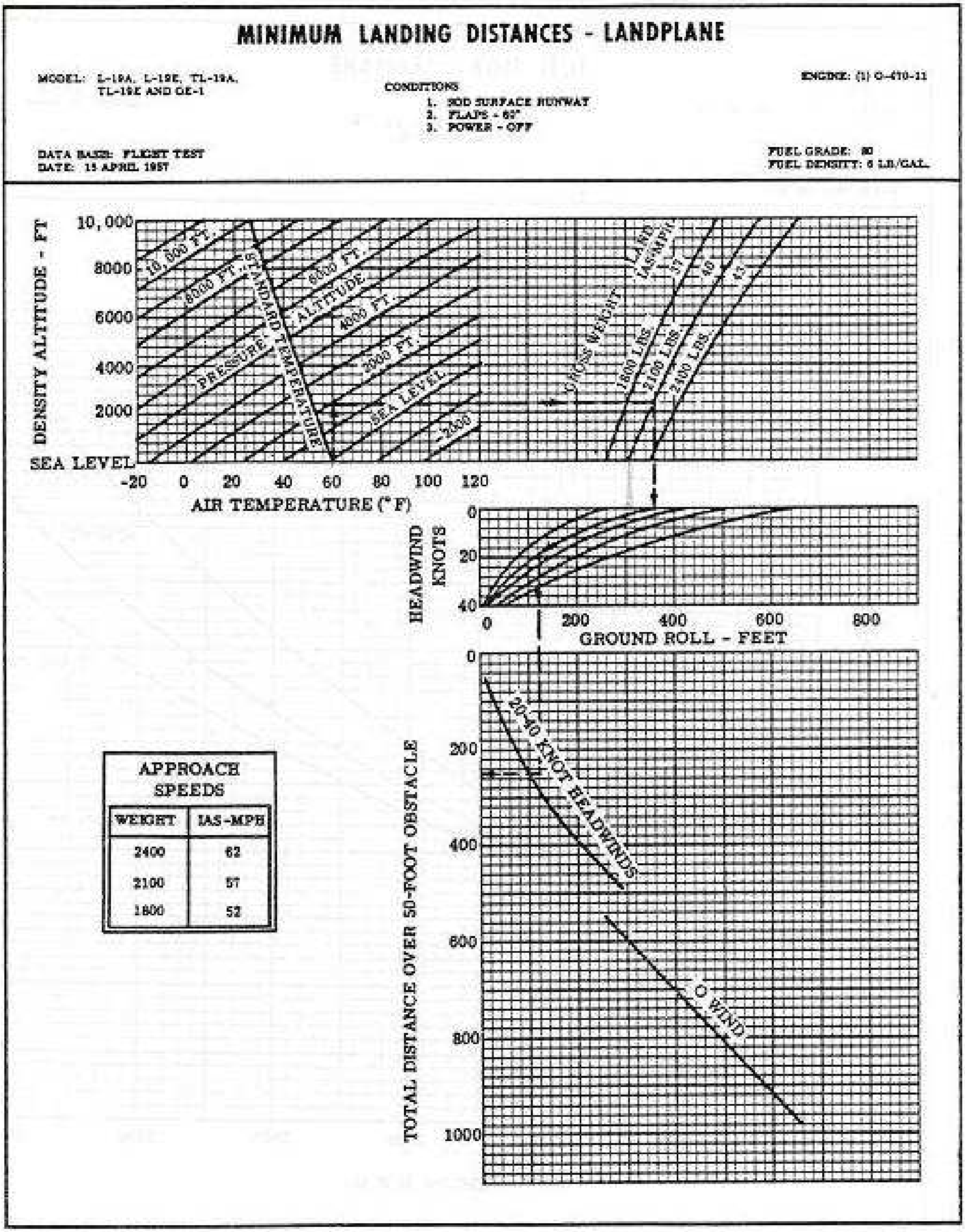


Figure 4-8 Landing Distances

WEIGHT AND BALANCE

Model Variations

17. The Maximum All Up Weight (MAUW) limits are:

   a. MAUW – L19"A" – 2300 lbs

   b. MAUW – L19"C" – 2400 lbs

18. The centre of gravity limits are different for the L19 "A" Model and the L19 "C" Model, which are depicted graphically on at Figures 4-9 and 4-10 respectively.

General

19. The weight and balance calculation for any particular load is computed as follows, utilizing the Worksheet at Table 4-9 and Centre of Gravity Charts at Figures 4-9 and 4-10:

   a. In the worksheet, enter the current empty weight and moment as recorded in the Aircraft Weight and Balance Certificate or the Aircraft Journey Log,

   b. Calculate total fuel in US gallons, calculate the fuel weight, and then calculate the fuel moment on worksheet,

   c. Enter weights for front and rear seat occupants and cargo in the baggage compartment. Calculate the moment for each on the worksheet, then

   c. Calculate total weight and moment for the loaded aircraft, enter on worksheet, calculate the CG position (loaded moment divided by loaded weight) and plot centre of gravity position on Centre of Gravity Limit Chart.

   d. Pilots shall check loaded weight and balance for both the takeoff weight as well as the anticipated landing weight to ensure that CG shift associated with fuel burn will not put the aircraft out of limits.

WARNING

Operation of the aircraft outside of published weight and balance limits will adversely affect the stability and control characteristics of the aircraft.

NOTE

Aircraft Empty Weight, as shown on the Aircraft Weight & Balance report, includes the following: 9qts Oil, 5 USG Unusable Fuel, Life Jackets, Charts, and First Aid Kit.

Weight and Balance Worksheet

	Takeoff Condition			Landing Condition		
	Weight (lbs)	Arm (in)	Moment (in-lb)	Weight (lbs)	Arm (in)	Moment (in-lb)
Empty Weight and Moment		----			----	
Useable Fuel @ 6.0 lb / USG		44.0			44.0	
Front Seat Occupant		36.0			36.0	
Rear Seat Occupant		76.0			76.0	
Baggage Area		100.0			100.0	
Total Weight and Moment						

Table 4-9 Weight and Balance Worksheet

Centre of Gravity Limits – "A" Model

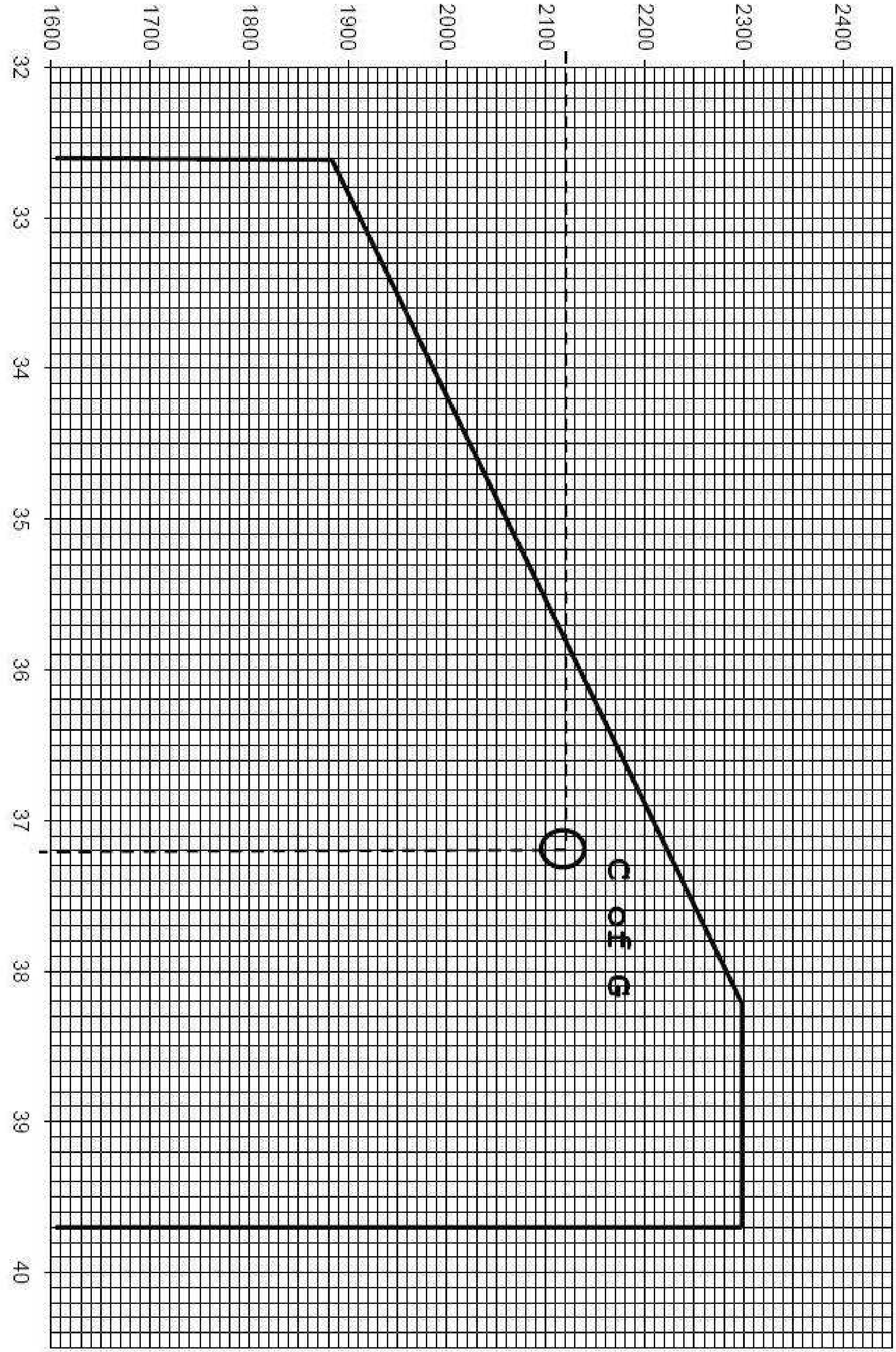


Figure 4-9 Centre of Gravity Limit Chart – L19 "A"

Centre of Gravity Limits – "C" Model

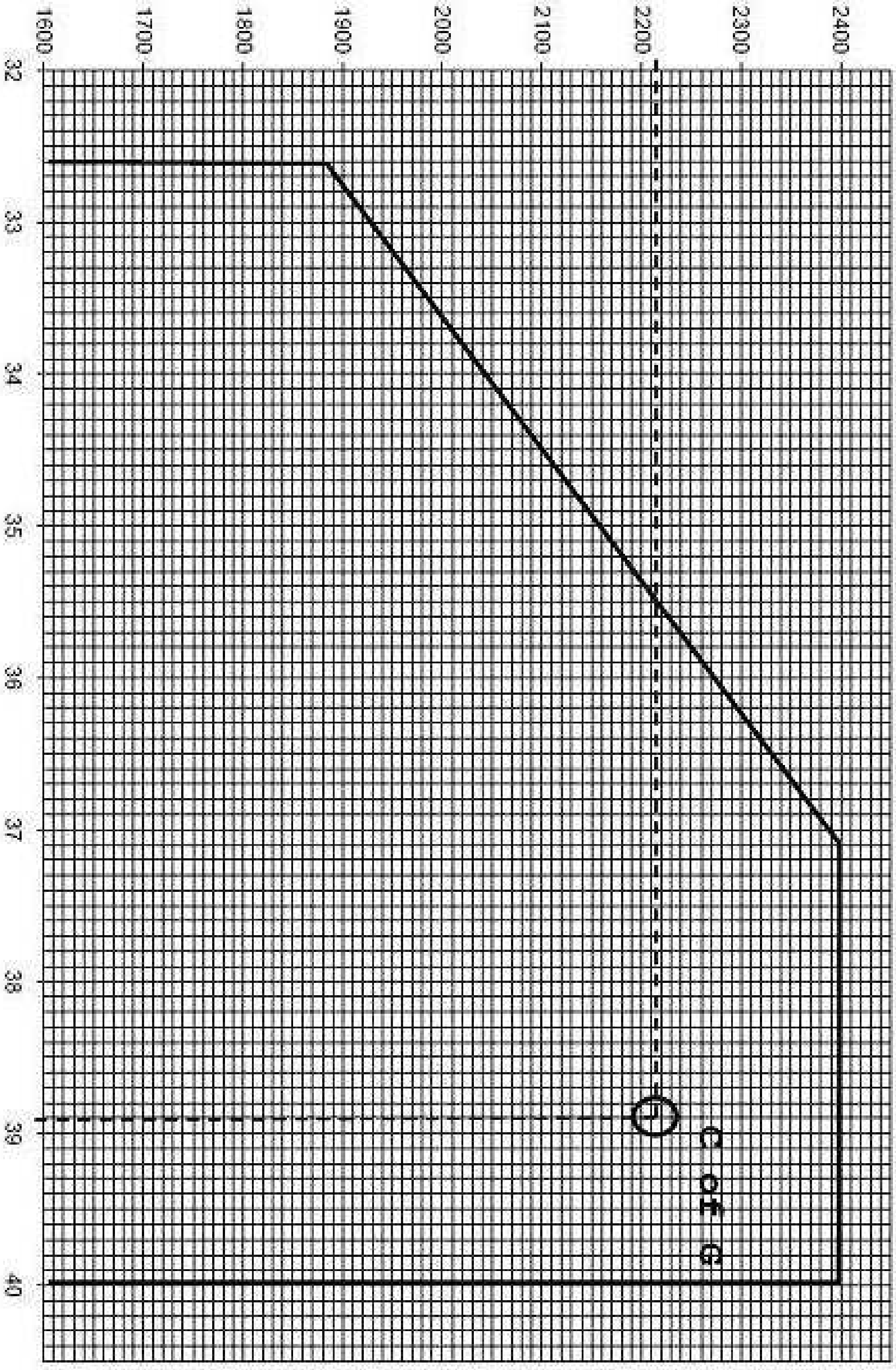


Figure 4-10 Centre of Gravity Limit Chart – L19 "C"

ANNEX A

PILOT'S GUIDE

GARMIN GNC-250XL GPS / COM