BELLANCA
VIKING 300A

with the following effective
serial numbers:
73 Series
74 Series

OPERATIONS MANUAL

BELLANCA AIRCRAFT CORP.
ALEXANDRIA, MINNESOTA

FOREWORD

This manual has been prepared to acquaint the pilot with the features and systems incorporated in the Bellanca Viking 300A. Recommended operating procedures are provided so that maximum performance may be obtained with the utmost of safety, economy, and serviceability.

The words "Warning", "Caution" and "Note" are used throughout the manual, with the following definitions:

WARNING – An operating procedure, practice or condition, etc. which may result in injury or death, if not carefully observed or followed.

CAUTION – An operating procedure, practice or condition, etc. which if not strictly observed may damage the aircraft or equipment.

NOTE – An operating procedure, practice or condition, etc. which is essential to emphasize.

It is strongly recommended that the pilot be familiar with the aircraft and this manual prior to flight.

The manual applies only to the aircraft as indicated on the preceding title page. Use of this manual with other aircraft is not recommended.

This manual does not replace the F.A.A. Approved Airplane Flight Manual. If an inconsistency of information exists between the two manuals, the F.A.A. Approved Flight Manual is to be the authority.

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SECTION I

I. AIRCRAFT AND SYSTEMS DESCRIPTION

GENERAL

This section describes the aircraft, equipment and its operation. See Fig. 1–1, 2, 3 for an external view of the aircraft, principal dimensions and instrument panel layout. Information concerning the description and operation of equipment common to most aircraft, such as avionics is not provided. An exception to this is if additional information is required for installations peculiar to the Viking models only. Optional items will be identified by an asterisk (*). Consult the equipment list, which is a part of the aircraft's file to determine what equipment is installed in a specific aircraft.

AIRCRAFT FILE

The aircraft file consists of the required paper work that must be in the aircraft at all times. The paper work must reference the aircraft by serial number and the model number. The aircraft identification plate is attached to the aft panel of the baggage compartment.

The file consists of the following:

Airworthiness Certificate
Aircraft Registration
Aircraft Radio Station License

These items must be displayed inside the aircraft.

Equipment List
Weight and Balance Sheet
FAA Approved Airplane Flight Manual

These items must be in the aircraft but need not be displayed.

Engine Log Book
Aircraft Log Book

These items need not be in the aircraft but must be available.

NOTE

The Pilot's Operating Handbook should always be kept in the aircraft, readily accessible to the pilot during flight, but is not legally required.

AIRFRAME STRUCTURE

All components of the Viking are designed to meet or exceed the requirements set forth by the Federal Aviation Administration (FAA). The laminar flow wing is of conventional wood construction using spruce ribs and spars, covered with mahogany plywood. The entire wing is dipped in sealer and covered with a life time dacron fabric to insure complete protection from the worst weather conditions and provide a smooth surface for minimum aerodynamic drag. With the exception of the plywood skin, the wing flaps and ailerons are constructed in a similar manner.

The fuselage and empennage are constructed of tubular steel, providing maximum strength and protection under all conditions. The entire assembly is primed and covered with a heavy, fireproof, dacron fabric. The finish includes several coats of pigmented butyrate dope, which is durable, long lasting, and easy to care for.

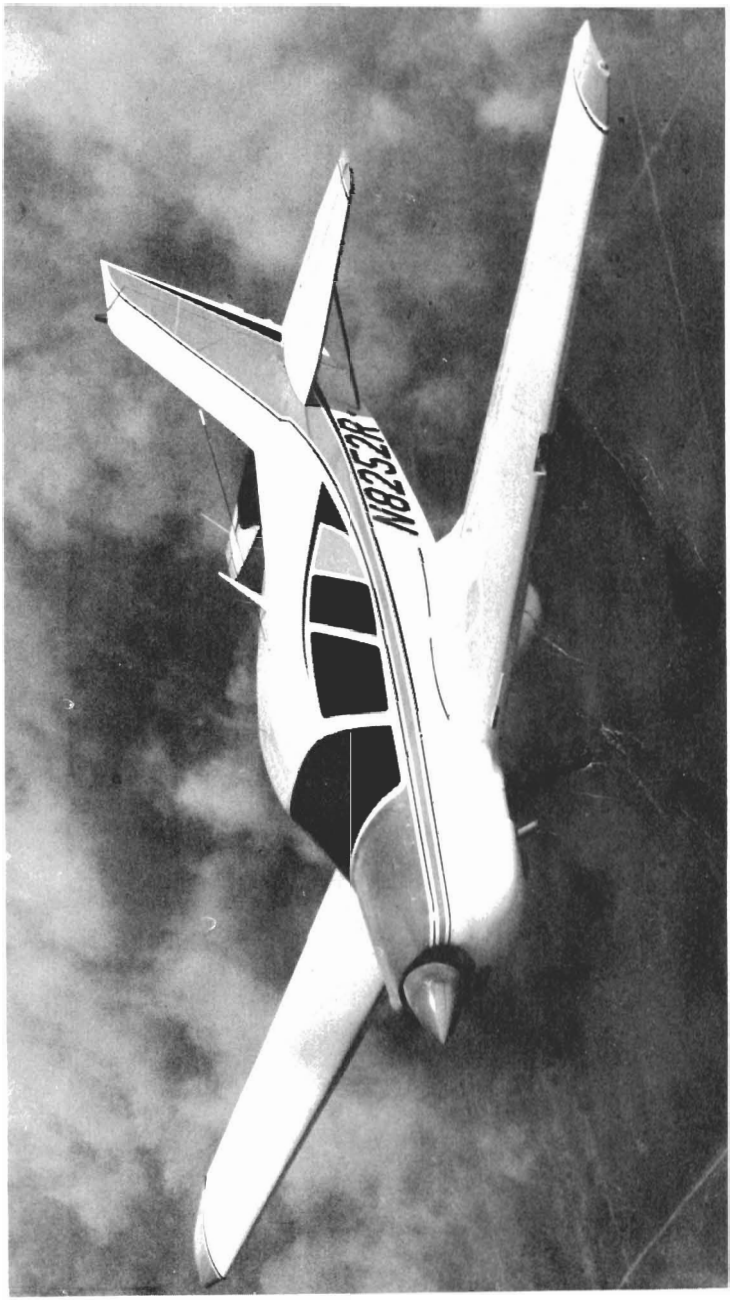


Fig. 1–1 Bellanca Super Viking 300A

Fig. 1–2 AIRCRAFT SPECIFICATIONS AND PRINCIPAL DIMENSIONS

MODEL DESIGNATION	SUPER VIKING 300A	SUPER VIKING 300A & TURBO
Model Number	17–30A	17–31A and 17–31ATC
F.A.A. Type Certificate	A18CE	A18CE
Engine	Continental I0–520K	Lycoming I0–540K1E5
Turbocharger		Rayjay (2) (17–31ATC)
Take–Off H. P.	300 H. P.	300 H. P.
Power Loading	11.8 lbs./ H. P.	11.8 lbs./ H. P.
Fuel Capacity (Standard)	60 gal.	60 gal.
(with auxiliary)	75 gal.	75 gal.
Gross Weight	3325 lbs.	3325 lbs.
Wing Span	34′ 2″	34′ 2″
Wing Area	161.5 sq. ft.	161.5 sq. ft.
Wing Loading	20.59 lbs./sq. ft.	20.59 lbs./sq. ft.
Fuselage Length	26′ 4″	26′ 4″
Fuselage Width	3′ 9″	3′ 9″
Tail Height	7′ 4″	7′ 4″
Tail Span	12′ 2″	12′ 2″
Wheel Tread Width	9′ 0″	9′ 0″
Wheel Base	7′ 4″	7′ 4″

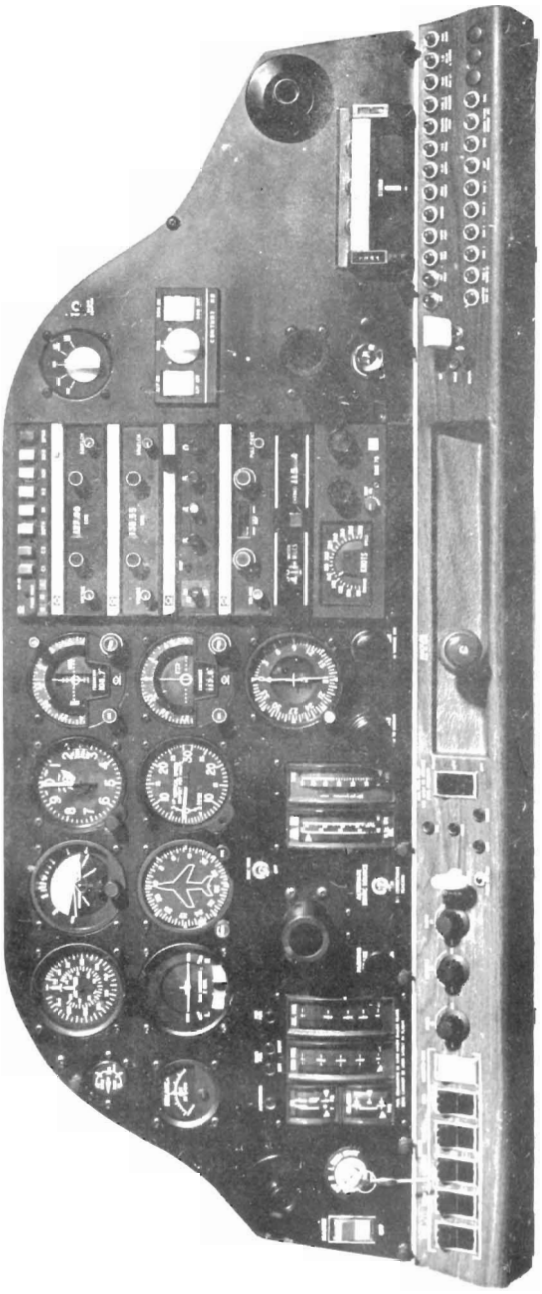


Fig. 1–3 INSTRUMENT PANEL

POWERPLANT AND PROPELLER

POWERPLANT

The Viking is equipped with either the Continental or the Lycoming engine. Both are six cylinder, direct drive, horizontally opposed, fuel injected and rated at 300 H.P. for take-off.

The air induction system is filtered and ice free. Should the filter become clogged, an automatic, spring-loaded, by-pass valve insures continuous operation of the engine.

The lubrication system is a wet sump type with a 12 qt. capacity. Oil temperature and pressure are automatically controlled, requiring no pilot action other than using standard ground and flight operating procedures.

The ignition system consists of two engine driven magnetos that are independent of each other and the aircraft electrical system. An electric direct cranking motor is used for starting.

POWERPLANT CONTROLS AND INSTRUMENTATION

All engine controls and instruments are conventional. The starter and ignition are combined in a key operated switch. Power is controlled by a vernier (twist) type throttle knob. Fuel is metered by a similar type red mixture control knob. Fine adjustments are made by rotating the control knobs in or out. Rapid changes of throttle or mixture are accomplished by depressing the button on the knob and pushing the control forward to increase or pulling aft, to decrease the desired setting.

Fuel pressure and flow gauges are the direct reading type, (fuel pressure gauge on model 17-31ATC is electric) as are the oil and manifold air pressure (MAP) gauges. Oil and cylinder head temperature (CHT) gauges are electrically operated, using the aircraft electrical system. The *exhaust gas temperature (EGT) and/or *analyzer system is electrical and independent of the aircraft electrical system. This is the primary reference for proper fuel leaning of the engine.

PROPELLER

The all metal propeller is a variable pitch, constant speed type and is available with two or *three blades. Performance with either propeller is the same, with the three bladed type being quieter. Propeller pitch is controlled by the propeller governor which meters engine oil to and from the propeller dome. A vernier propeller control knob is connected to the governor for setting the desired engine RPM. The tachometer and recording hour meter are mechanical, using a flexible drive cable.

PRIMARY FLIGHT CONTROLS

Dual controls are provided for the ailerons, elevator and rudder. The control surfaces are conventional in design and are mechanically connected to the control yoke and rudder pedals, using cables and/or push–pull rods.

ELEVATOR TRIM (Manual)

The trim tab is attached to the left half of the elevator control surface and is positioned by turning the overhead hand crank to the desired setting. See Fig. 1–4. The crank and tab are connected by a torque tube and jack screw arrangement providing a smooth and positive movement between the two components.

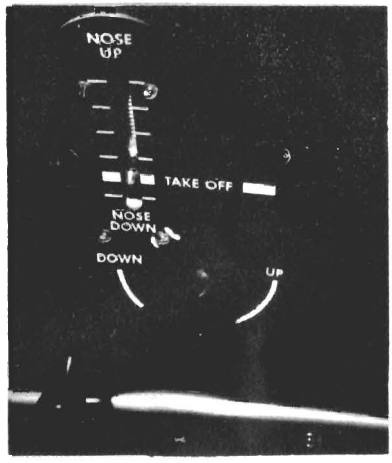


Fig. 1–4
Manual Elevator Trim

ELEVATOR TRIM *(Electric)

The electric trim is in addition to the manual system. The control switch is mounted on the left side of the pilots control yoke. Down and up trim is provided by depressing the switch and moving it fore or aft respectively. Operation of the electric trim can be monitored by the movement of the hand crank and indicator.

Should the electric trim malfunction, an electrical disconnect switch is located on the instrument panel directly above the control yoke. The manual trim is always operational.

FLAPS

The flaps are electrically operated by a powered jack screw and cable arrangement for extension and are retracted by springs. The control switch has three positions, UP, HALF, and DOWN with the actual setting indicated by colored position lights, green, amber and red respectively. Flap travel is 0^{o}, 23^{o}, and 45^{o}.

WARNING

Do not step on flaps for possible injury may result as no UP lock is provided for this system.

ELECTRICAL SYSTEM

ELECTRICAL SYSTEM DESCRIPTION

The electrical system is 12 volts, direct current, with a negative ground. A 60 ampere, self-exciting, engine driven alternator provides electrical power during normal operation and is capable of operating all electrical components simultaneously. A 35 ampere / hour battery supplies power for starting and emergency use for a limited time only, should the alternator fail in flight.

Electrical power is distributed by two bus bars, radio equipment and a utility equipment bus, with all circuits protected by resettable circuit breakers and an overvoltage relay. See Fig. 1–5.

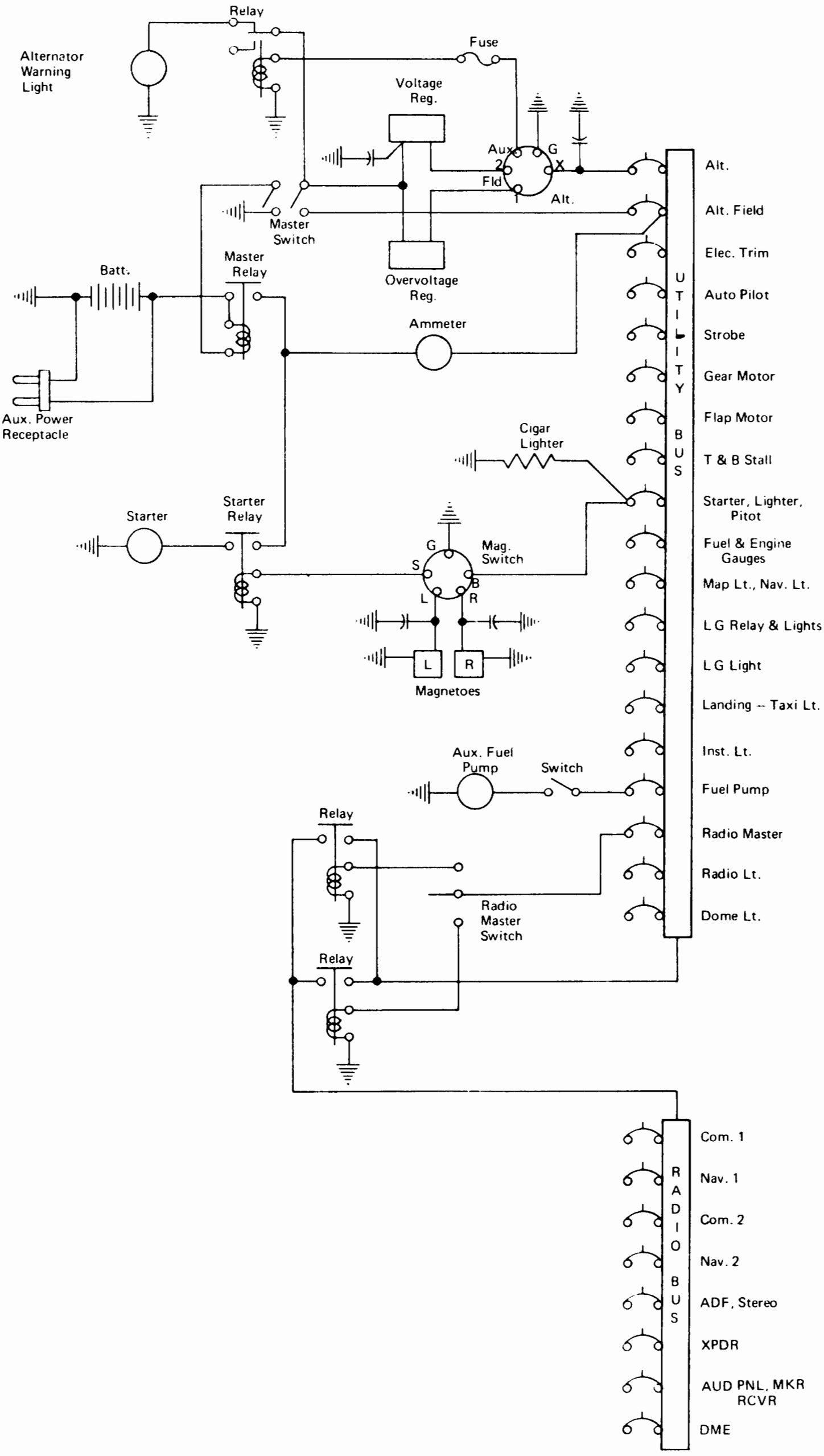


Fig. 1–5 Electrical System Schematic

ELECTRICAL SYSTEM OPERATION

The red master switch controls all electrical power from the battery and alternator to the bus bars, except for the engine ignition.

The alternator has a field and output circuit breaker. Either one or both may be manually pulled out, thus removing the alternator from the circuit. Battery power is still available.

The overvoltage relay provides added protection for the avionics by automatically removing the alternator from the system should an over-voltage condition occur. The relay may be reset by cycling the master switch. If the overvoltage condition was temporary, the alternator will continue to operate normally.

The ammeter indicates a charge or discharge condition of the battery. When the alternator is functioning properly, a charge condition should exist. A discharge indicates that the alternator is malfunctioning and the battery is carrying the electrical load.

NOTE

A discharge is normal at low idle RPM during operation of high current items such as landing and taxi lights.

The red alternator warning light will illuminate should electrical output go to zero, due to a mechanical failure such as a broken or loose drive belt.

NOTE

Under certain conditions loss of alternator output will only be indicated by a discharge condition on the ammeter.

An external power receptacle is located under the fuselage, aft of the wing step. This permits additional electrical power to be easily connected to the aircraft for starting purposes during cold weather operations or weak battery condition.

CAUTION

The power receptable is wired directly to the aircraft battery and is always live.

LANDING GEAR SYSTEM

LANDING GEAR DESCRIPTION

The Viking is equipped with a retractable, tricycle landing gear, hydraulically actuated by an electrically driven pump. An automatic landing gear lowering device Auto–Axtion, is incorporated into the system to prevent accidental gear UP landings. A provision to lower the landing gear should a hydraulic or electrical failure occur, is also provided. A safety ground switch prevents inadvertently retracting the landing gear while on the ground. See Fig. 1–6.

The landing gear struts are heavy duty air-oil-spring type with the nose strut connected to the rudder pedals for ground steering.

Hydraulic disc brakes are installed on both main wheels with each having an independent hydraulic system.

LANDING GEAR OPERATION

Placing the landing gear selector switch in the UP position activates the power pack, retracting the landing gear. With the landing gear fully UP (20 seconds maximum), hydraulic pressure continues to rise until a pre-set, pressure sensitive switch turns the power pack off.

NOTE

The landing gear will only retract if:
1) Aircraft is off the ground, and
2) Throttle is in the FULL OPEN position, or
3) Indicated airspeed (IAS) is greater than 105 MPH.

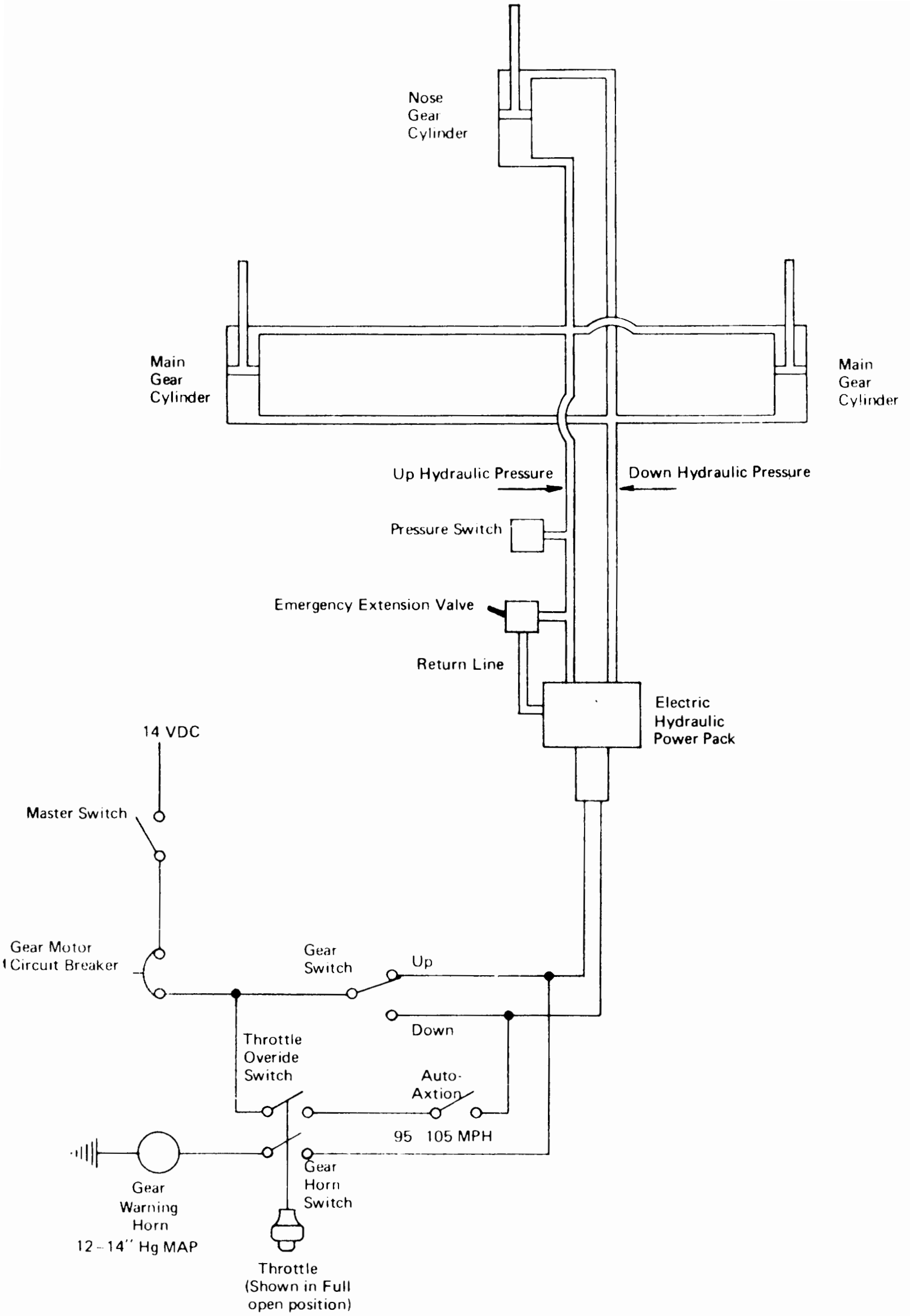
Placing the landing gear selector switch in the DOWN position, activates the power pack, extending the landing gear, (20 seconds maximum). The power pack is shut off by limit switches, one on each gear when all three are in the DOWN and LOCKED position.

Landing gear DOWN is indicated by three green lights located next to the gear selector switch. Illumination occurs when the respective gear leg is in the DOWN and LOCKED position.

A "Press to Test" feature is provided to determine whether or not a bulb is burned out.

NOTE

The gear position lights are dimmed when the navigation lights are ON, and may be difficult to see during daylight operation.



NOTE
This schematic has been simplified to show operation of the system only. The schematic is not technically correct and is not to be referred to when performing maintainence on the system.

Fig. 1–6 Landing Gear System Schematic

The red unsafe light will illuminate with the landing gear in transition from the UP or DOWN position or if the landing gear is not in the same position as the selector switch. If the gear is DOWN and LOCKED the three green lights will also be illuminated.

It is normal for the UNSAFE light to illuminate once or twice momentarily during flight of an hour or more. This is due to a slight hydraulic pressure loss, when the gear is in the UP position.

The Auto–Axtion system is a pilot back-up device to lower the landing gear automatically, regardless of the position of the landing gear selector switch, minimizing the possibility of an accidental gear UP landing. To operate, the following conditions are required.

1) Master Switch is ON
2) IAS below 95-105 MPH
3) Throttle less than FULL OPEN position

If the gear has been extended by the Auto-Axtion system and the throttle is positioned to FULL open or the IAS is increased above 105 MPH, the gear will retract automatically.

If it is desired to override the Auto–Axtion system for any reason, either turn the electrical master switch OFF or place the throttle in the FULL OPEN position.

NOTE

The Auto-Axtion is a back up device only. Operation of the system is indicated by the red UNSAFE light and the three green lights. If a landing is anticipated, the gear selector switch should be placed in the DOWN position.

Emergency landing gear extension with a hydraulic or electrical failure is accomplished by depressing the Emergency Gear Extension Lever DOWN. It is located below the fuel selector valve. This relieves the hydraulic pressure and allows the landing gear to free fall to the DOWN and LOCKED position. The time required is approximately the same as during normal operation. See Fig. 1–7

NOTE

The landing gear will not retract with the emergency gear extension lever in the DOWN position.

Fig. 1–7
Emergency Gear Extension Lever

A landing gear warning horn sounds intermittently whenever the throttle is reduced below 12" to 14" of manifold pressure depending on altitude and the landing gear is not in the DOWN and LOCKED position.

BRAKES

Wheel braking action is applied by exerting toe pressure on the top of the respective rudder pedal. The brake is set by pulling out the park brake knob located on the instrument panel next to the control yoke while applying toe pressure. To release the brake, push the park knob in and apply toe pressure. Brakes are optional on the co-pilot's rudder pedals.

FUEL SYSTEM

Fuel is contained in two main tanks, one in each wing, with each containing 30 gal. of useable fuel. A 15 gal. *auxiliary tank is located in the fuselage, aft of the rear seat. Fuel selection is determined by positioning the selector valve to the desired tank. See Fig. 1–8 and 1–9. Usable fuel quantity remaining in the tank is registered by a capacitance gauging system for the mains and a float system for the auxiliary tank. Both are electrical. A green status light below the respective fuel quantity gauge indicates the tank presently being used.

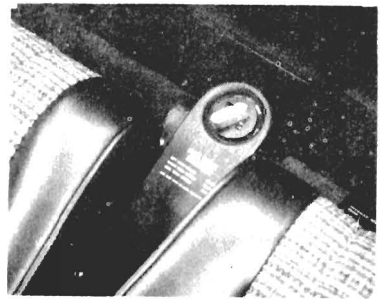


Fig. 1–8
Fuel Selector Valve

NOTE

The status lights are dimmed when the navigation lights are ON, and may be difficult to see during daylight operation.

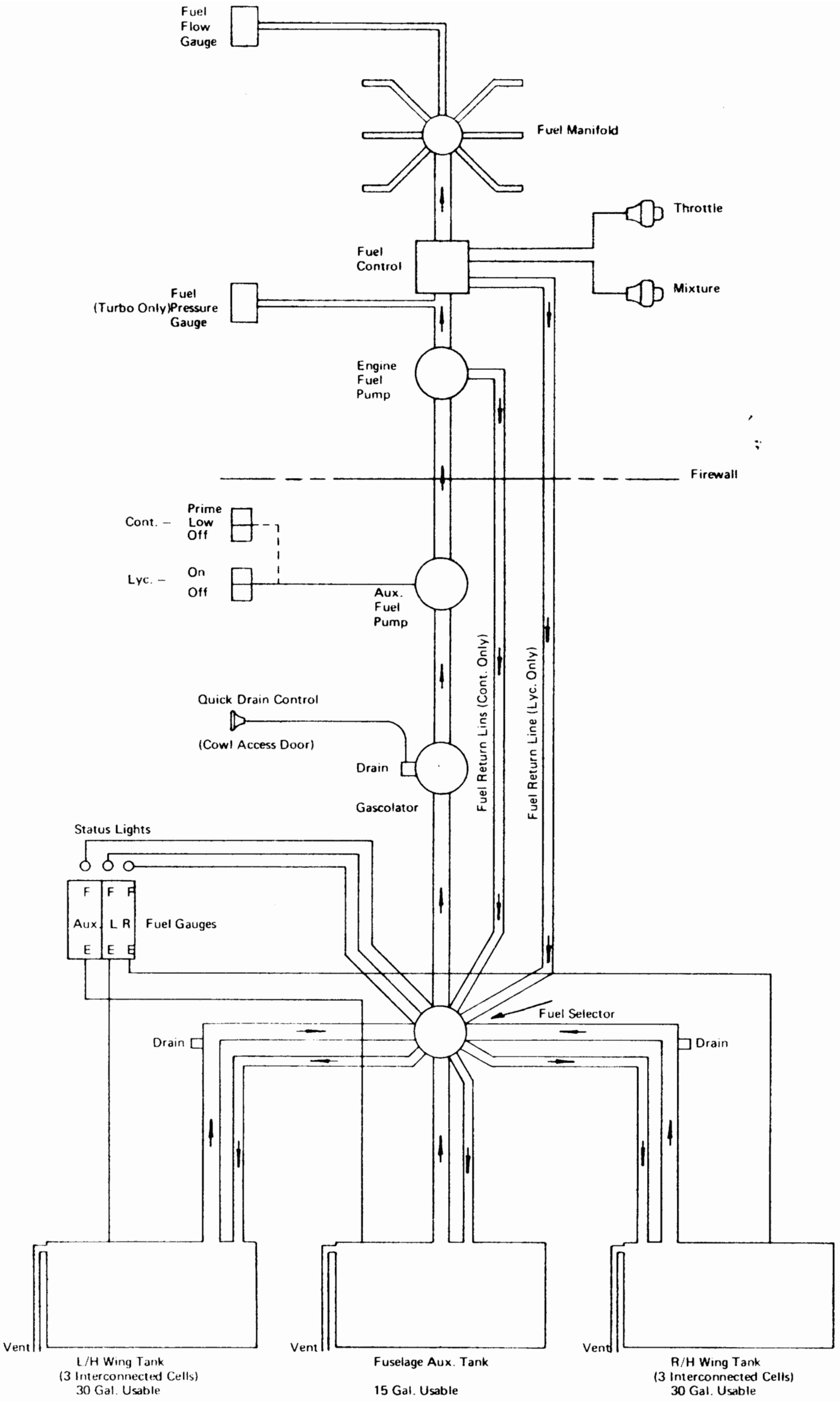


Fig. 1–9 Fuel System Schematic

An electric auxiliary fuel pump is provided for starting and in the event that the engine driven fuel pump fails. See Fig. 1–10

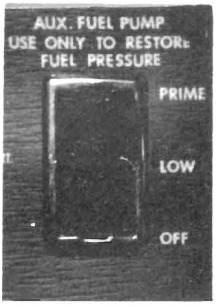


Fig. 1–10
Auxiliary Fuel Swutch

WARNING

On aircraft model 17-30A, Continental powered, the red auxiliary fuel pump switch has three positions, OFF, LOW, and PRIME. The PRIME positon is spring loaded, and must be held in place. Prime should be used only for starting or to restore lost fuel flow. Prolonged use of auxiliary pump in PRIME position may cause engine roughness and possible engine stoppage due to overly rich mixture during low power operation. The switch is illuminated when the pump is in operation.

Fuel drains are located under the fuselage below the front seats. A quick drain is provided at the gasolator, with access to the control knob through the aft inspection cover on the engine cowl.

NOTE

After using quick drain, insure that the drain is not leaking, by visually looking under the fuselage.

LIGHTING SYSTEM

All lighting switches are located on the pilot's lower console with the exception of the map light switch.

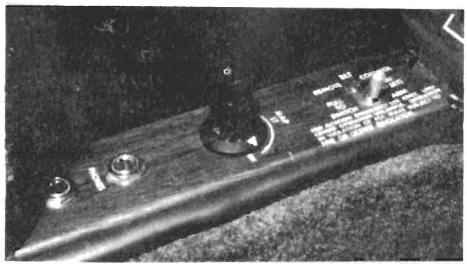
INTERIOR LIGHTING

The radios and instruments are internally lighted with the intensity of each group controlled by a separate rheostat.

The side and bottom consoles employ post lights, which are also rheostat controlled.

Two directional over head high intensity map lights are provided with a rheostat control located on the pilots side console. See Fig. 1–11.

Fig. 1–11
Pilot's Side Console



The dome light is controlled by an ON-OFF rocker switch and will also illuminate when the main or the baggage door is opened.* A Push-Pull circuit breaker is provided, if it is desired to deactivate this circuit.

EXTERIOR LIGHTING

The standard configuration navigation lights are controlled by a rocker switch. When the navigation lights are ON, the fuel status, flap, and landing gear position indicator lights are automatically dimmed for night flying.
The strobe* light(s) are available in several combinations and are controlled by a single or split-type rocker switch.

NOTE

The strobe lights should not be used during ground operation due to the high light intensity having a blinding effect on other aircraft and personnel in the area. This also holds true during flight through clouds, fog or haze because of the possible distraction to the pilot.

The landing and taxi lights are mounted in the leading edge of the left wing and are controlled by a three position rocker switch, OFF, TAXI, and LANDING.

HEATING AND VENTILATION SYSTEM

FRESH AIR VENTILATION

The Viking has a continuous airflow through the cabin section, providing excellent heating and ventilation. This is accomplished with an exhaust vent, that is located on the right side of the baggage compartment and ducted overboard. It is always open. See Fig. 1–12.

NOTE

Avoid placing baggage next to the exhaust vent. Obstructing airflow results in poor heating and ventilation.

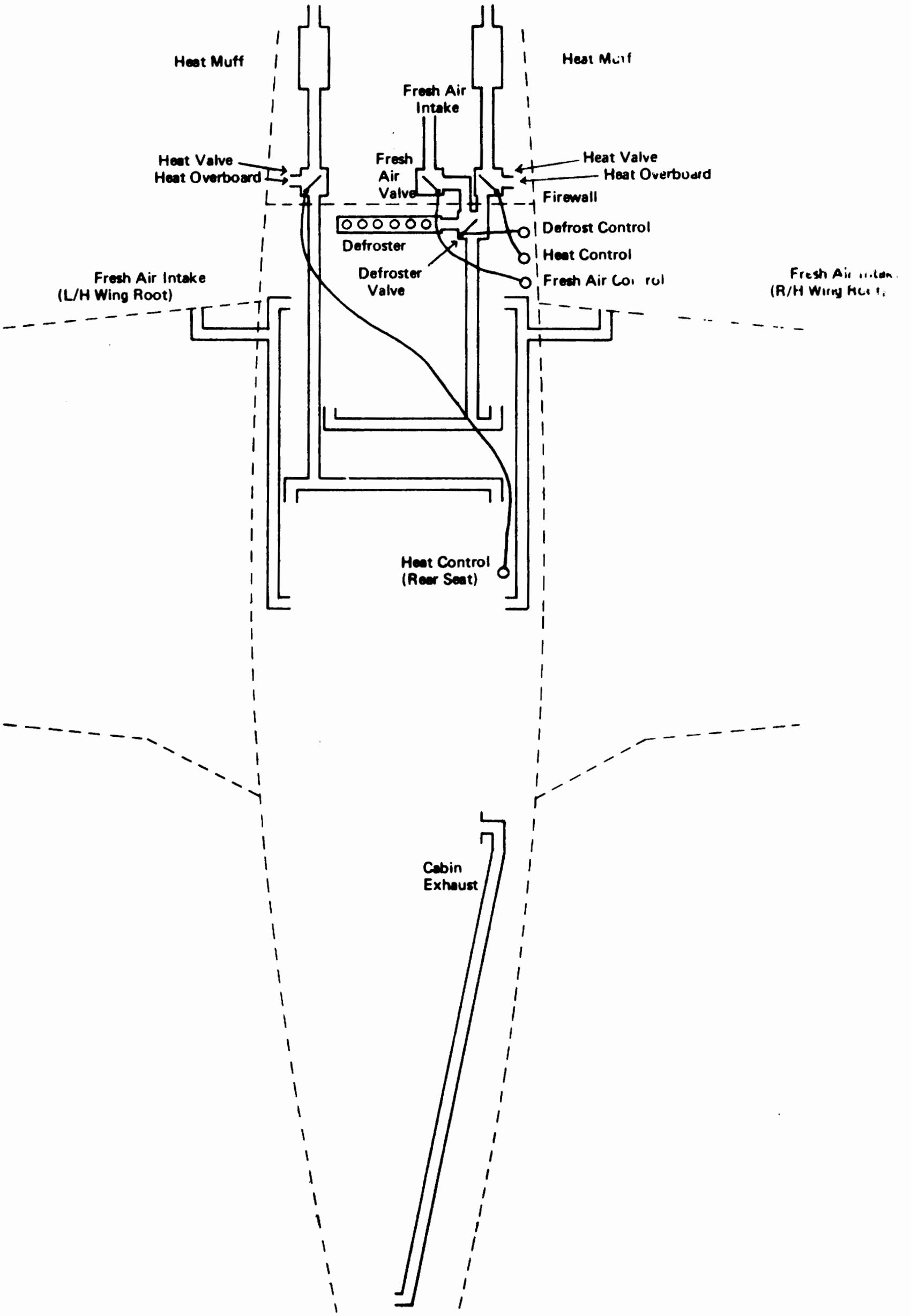


Fig. 1–12 Heating and Ventilating System Schematic

Fresh air enters the cabin through openings in each leading edge of the wing roots with the volume and direction controlled by adjustable eyelets located on both sides of the front and rear seats.

Additional fresh air is available through the heating system. Cool air enters through the engine compartment, is bypassed around the heat muffs and vented through the heat outlets below the front seats. This control is located on the co-pilots side console. See Fig. 1–13. During ground operations and flight below 140 MPH IAS the pilots side vent window may also be opened for better cooling and ventilation.

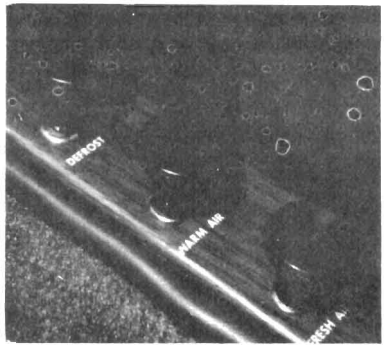


Fig. 1–13
Heating and
Ventilation Controls

HEATING AND DEFROSTING SYSTEM

Heat is obtained from two heat muffs located on the engine exhaust system. The right muff supplies heat for the front seats and windshield defrost and the left muff for the rear seats. Volume and temperature for the front seat is controlled by positioning the heat and fresh air controls on the co-pilots side console. Volume for the rear seat is adjusted by the control next to the right rear seat.

The windshield defrost utilizes the front seat heating system only. Heat is either directed to the defrost outlets on the instrument glare shield or under the seats and is controlled by the defrost control knob.

CAUTION

WARM AIR should always be mixed with cool FRESH AIR when the DEFROST is selected, or damage to the plexiglass will result. This also provides the greatest airflow for rapid clearing of the windshield.

FLIGHT INSTRUMENTS

The flight instruments are conventional in design and panel layout. See Fig. 1–3. The directional and attitude gyros are vacuum operated by an engine driven pump with a gauge indicating system vacuum pressure. The turn coordinator is electrically operated with a resettable type circuit breaker.

The airspeed with a *TAS converter, altimeter and vertical speed indicator operate off the pito-static system. Pitot heat is available and controlled by a rocker switch on the pilot's lower console. A static system drain is located under the left wing root. An *alternate static source in the cabin is available should the external source become obstructed. The manual switch is located below the pilots control yoke.

WARNING

When using the alternate static source see placard listing instrument error with pilots storm vent window open or closed.

A stall warning horn activated by a vane type switch on the leading edge of the left wing is provided to warn the pilot of an approaching stall. It is preset for 5 to 10 MPH above actual stall speed with engine power at idle. The master switch must be ON for operation.

AVIONICS

RADIO OPERATION

Radio operation is conventional with the exception that the radio master switch must be ON. The radio master switch controls electrical power to the radio equipment bus allowing quick and convenient shut-down of all avionics equipment. Dual electrical relays are utilized for safety with the switch positions, OFF, ALT, and ON.

NOTE

The battery master switch must also be ON for radio operation. To check the operation of each relay position the switch to ALT. and ON. The radios should function in either position.

Consult the radio manufacturer for specific operating instructions.
A radio speaker is installed in the headliner with additional jacks on the pilots side console and the *far right side of the instrument panel for extra microphones and headphones. A *mike button on the pilots control yoke is for use with a *boom mike, or when the *oxygen mask is worn. The *stereo is located to the right of the instrument panel with headphone jacks provided for all but the pilot.

EMERGENCY LOCATOR BEACON

The aircraft is equipped with an emergency locator beacon (ELT), located under the baggage compartment. It is self contained and is automatically activated to transit a homing signal on 121.5 MHz and 243.0 MHz should the aircraft be subjected to rapid or abrupt de–celeration.

An ELT switch is located on the pilot's side console and is labelled ARM and ON. See Fig. 1–11.

The switch should normally be in the ARM position if the automatic activation is desired. The ELT is manually activated in the ON position. Radio operation can then be checked by turning one of the main communication radios to 121.5 MHz. Normal operation is indicated by a variable pitch tone.

AUTOPILOT

The *Mitchell Century Series I, II, and III autopilots are used in the Viking with radio couplers. The Century I controls are an integral part of the turn coordinator with an electrical disconnect switch located on the instrument panel above the control yoke.

The Century II controls are located on the right side of the instrument panel and on the directional gyro.

The Century III controls are located in the same position as the Century II with an electrical disconnect feature in the electric trim switch mounted on the pilot's control yoke.

For detailed information and operating instructions, consult the manu-facturers operating manual.

OXYGEN SYSTEM

OXYGEN SYSTEM DESCRIPTION

The oxygen system utilizes a 48 or 63 cubic foot capacity cylinder with a pressure gauge, shut-off and refill valves. One of two regulators may be used. The *altitude compensating type 2900B, varies the flow of oxygen with the change of altitude while the other type, 2800B, has a constant flow rate. The overhead distribution manifold provides four outlets with each person using a rebreathing type mask with a flow indicator.

OXYGEN SYSTEM OPERATION

The main shut - off valve and pressure gauge are located on the aft panel of the baggage compartment. See Fig. 1–14. To use the system, the valve must be opened fully.

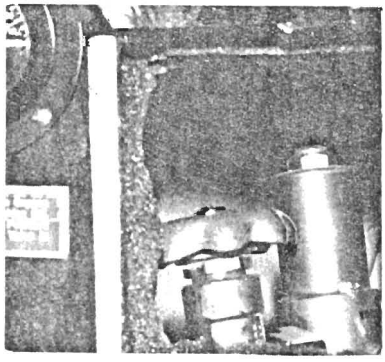


Fig. 1–14
Oxygen Shut-off Valve

NOTE

The pressure gauge should not be used to determine the position of the shut-off valve, as pressure may be indicated when in the CLOSED position.

WARNING

Do Not Smoke When Oxygen System Is In Use.

When oxygen is desired, push and rotate the hose fitting into the distributor manifold, with the pilot using the foremost outlet.

When oxygen is flowing, a green band should be visible in the flow indicator which is a part of the oxygen mask flow line.

NOTE

The altitude compensating regulator, 2900B, will not allow oxygen flow below approximately 3000 feet MSL.

The shut off valve should be closed after the flight to prevent possible leakage.

OXYGEN DURATION CHART

	48 Cu. Ft.	63 Cu. Ft.
Pilot	7.5 hrs.	9.5 hrs.
Pilot + 1 Passenger	4.3 hrs.	5.4 hrs.
Pilot + 2 passengers	2.9 hrs.	3.7 hrs.
Pilot + 3 Passengers	2.3 hrs.	2.9 hrs.

NOTE

Valves shown are maximum flow rates at 24,000 MSL with 1800 psi gauge pressure. With altitude compensating regulator increase time approximately 10% per 5,000 feet below 24,000 feet MSL. Duration time is in direct proportion to gauge pressure when less than 1800 psi. (eg. When gauge pressure is 900 psi, duration is half).

SEATS

The front bucket seats are adjustable fore and aft by pulling out the seat adjustment knob located below seat and sliding the seat to the desired position. The seat backs can also be *reclined by pulling the reclining lever up. All four *head rests are adjustable up and down for individual comfort.

Each seat is supplied with a lap belt and overhead shoulder harness with *inertia reels. It is strongly recommended that both the seat and shoulder harness be worn during take-off, landing and turbulent flight conditions.

BAGGAGE COMPARTMENT

The baggage compartment has a separate loading door with a cargo net, eliminating the possibility of loose baggage entering the cabin section during turbulence.

Aft of the baggage compartment is a *golf club/ski container permitting ample storage for lengthy items.

CAUTION

When using baggage and ski compartment, note weight and balance limitations. Also, cargo net is to be installed to prevent injury to passengers from loose baggage during turbulence.

FIRE EXTINGUISHER

The *fire extinguisher is mounted on the floor behind the pilot's seat and has a quick disconnect latch. It is a dry chemical type approved for electrical and fuel fires.

TURBO CHARGER

TURBO CHARGER DESCRIPTION

The powerplant in the Turbo Viking is identical to the Lycoming engine used in the standard Viking with the addition of two Rajay turbo-charger units.

Engine exhaust gas is used to drive the centrifugal type compressors, allowing high manifold pressure (MAP) to be maintained at altitudes in excess of 20,000 feet. This permits "over the weather" operation at higher true airspeeds due to the less dense air. See Fig. 1–15.

NOTE

This system is NOT designed to increase engine performance at low altitudes. It is only to maintain sea level performance at high altitudes.

To protect against overboosting the engine with excessive MAP an automatic pressure relief valve is provided. The pilot should still follow the prescribed engine operating recommendations and limitations.

The system uses engine oil for lubrication and is equipped with an additional oil filter and low pressure warning light.

TURBO CHARGER OPERATION AND CHARACTERISTICS

Engine operation is identical with the normal aspirated Lycoming engine. To engage the turbo, pull the turbo vernier control knob out until the desired manifold pressure is reached. The control is connected to the two waste-gates, which directs the exhaust gases to the turbos.

NOTE

Prior to engaging the turbo, the throttle must be in the FULL OPEN position, with the exception of checking the system prior to flight. When reducing manifold pressure, the turbo control must be FULL IN, prior to reducing the throttle.

The turbo has little or no response for the first half of the control movement. Sensitivity increases greatly, near the FULL OUT position.

It is recommended that the turbo be operated every flight to prolong the life of the seals and bearings. This can be accomplished during the ground check of the system or momentary use in flight, if continuous turbo operation is not desired.

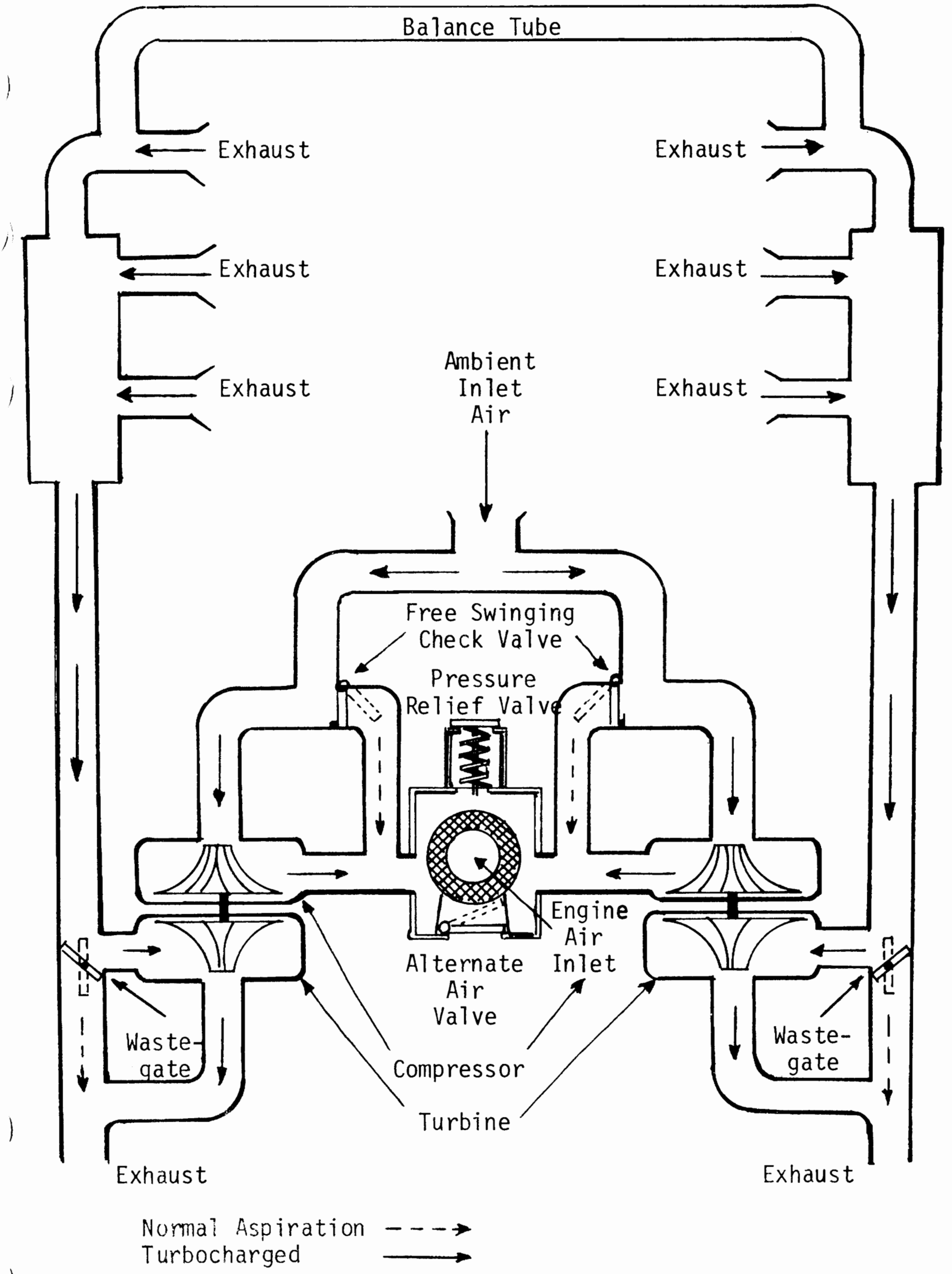


Fig. 1–15 Turbo–Charger System Schematic

During ground operations at low idle RPM the turbo low oil pressure light may illuminate, even though the turbo is not in use. This is normal. Should the light illuminate during flight the turbo should be shut down if it is being used. Thereafter, engine oil temperature and pressure should be closely monitored to determine whether the turbo oil filter is either clogged or an excessive oil leak exists. Follow procedures for "Turbo Oil Warning Light" listed in the emergency section of the manual.

When the turbo is in operation, the engine RPM has a definite effect on manifold pressure. With a constant throttle setting, an increase in RPM will increase the manifold pressure and vise-versa. With this in mind, to get the full benefit of the turbo charger it is recommended to keep the propeller RPM at or above 2300 RPM during high altitude operation.

During compression of the engine intake air by the turbo charger, heat is generated, increasing the inlet air temperature. It is therefore necessarv when turbo charged, to use an additional 2" of MAP over that used to maintain the same power setting when normally aspirated.

Fuel leaning procedures using the EGT, are identical to the normal aspirated engine. Mixture in the FULL RICH position is recommended for power settings above 75% regardless of altitude. Slight leaning may be used if engine roughness occurs. During leaning operations after cruise power has been set, the MAP may have to be readjusted due to a change in the exhaust gas pressure.

CAUTION

During turbo charged climb, monitor engine oil and cylinder head temperatures.

SECTION II
OPERATING LIMITATIONS
INDEX

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SECTION II
OPERATING LIMITATIONS

GENERAL

This section lists the powerplant and airframe limitations. These limitations are also indicated in the aircraft in the form of placards or instrument color markings and the FAA Approved Airplane Flight Manual.

Limitations pertaining to optional equipment, such as autopilots, must be obtained from the respective manufacturer or in the supplementary section of the FAA Approved Airplane Flight Manual for the aircraft.

AUTHORIZED OPERATION

This aircraft is licensed in the normal category with the following load factors:

+3.8 G @ 3325 lbs. gross weight
-1.5 G @ 3325 lbs. gross weight

The aircraft is approved for VFR, IFR, day or night operation if the required equipment is in proper operating condition as specified in F.A.R. Part 91.

WARNING

No aerobatic maneuvers including spins are approved. Flight into known icing conditions is also prohibited.

This aircraft has a demonstrated direct crosswind component of 20 MPH for take-off and landing.

LOADING LIMITATIONS

It is the pilot's responsibility to determine that the aircraft is loaded properly. Refer to Section IV, Weight and Balance, for loading information.

C. G. Range: +22.0" to †23.5 @3325 lbs. Maximum
+19.0" to 24.0" @3200 lbs.
+16.0" to 24.0" @2450 lbs. or less

NOTE

All measurements are in reference to the datum, which is the leading edge of wing rib number one. (23.5" outboard of aircraft center line).

Take off weight above 3200 lbs. must be carried in wing fuel.

Maximum total baggage compartment weight including the hat shelf and ski tube is 186 lb. A maximum of 20 lbs. baggage is allowed for the hat shelf and the ski tube.

FUEL SYSTEM LIMITATIONS

The auxiliary fuel pump is to be used only to restore fuel pressure (eg. starting and in the event of engine driver fuel pump failure).

The auxiliary fuel tank is to be used in level flight only.

AIRSPEED AND ALTITUDE LIMITATIONS

AIRSPEED LIMITATIONS BELOW 15,000 FEET MSL	M. P. H. CAS	IAS
Never Exceed	226	226
Caution Range (Yellow Arc — smooth air only)	190-226	192-226
Normal Operating Range (Green Arc)	79-190	76-192
Flap Operating Range (White Arc)	70-120	66-118
Maximum Design Cruising Speed	190	192
Maximum Design Maneuvering Speed	148	149
Maximum Landing Gear Operation Speed	140	140
Maximum Landing Gear Down Speed	144	144
Maximum Speed, Pilot Vent Window Open	140	140
ABOVE 15,000 FEET MSL		
Never Exceed	200	202
Normal Operating Range	72-165	78-166
Maximum Cruising Speed	165	166
Maximum Operating Altitude	24,000 ft. MSL	

NOTE

All instrument color markings are CAS limits, IAS limits assume zero instrument error.

ALTERNATE STATIC SOURCE CORRECTION

NORMAL STATIC SOURCE		ALTERNATE STATIC SOURCE Pilot's Vent Window Closed		Open	
C.A.S.	I.A.S.	I.A.S.	Ft.	I.A.S.	Ft.
80	75	75	- 5	86	— 70
90	86	86	-15	98	— 90
100	97	99	-25	110	—100
120	118	122	-35	133	—120
140	140	144	-40	155	—140
160	161	167	-50	178	—150
180	182	190	-65	—	--

NOTE

Subtract as indicated, the altitude correction to the observed altitude.

POWERPLANT LIMITATIONS

AIRCRAFT MODEL	17–30A	17-31A and 17-31ATC
Engine Manufacturer	Continental	Lycoming
Engine Model	IO-520K	IO-540-K1A5, K1B5, K1E5
Minimum Fuel Octane	100/130	100/130
T/O H.P. (5 minutes max.)	300 H.P.	300 H.P.
Max. Continuous H.P.	285 H.P.	300 H.P.
Max. Continuous H.P. (Turbo-Charged)	—	250 H.P.
OIL TEMPERATURE		
Normal - Green Arc	75°–225°F	75°–225°F
Maximum - Red Arc	240°F	245°F
OIL PRESSURE		
Minimum - Red Line	10 psi	25 psi
Normal - Green Arc	30-60 psi	60-90 psi
Maximum - Red Line	100 psi	100 psi
FUEL FLOW		
Minimum - Red Line	3.5 psi	—
Normal - Green Arc	3.5-18.5 psi 9.4-25 GPH	0-7.6 psi 9.6-24.6 GPH
Maximum - Red Line	—	13.0 psi
FUEL PRESSURE		
Minimum - Red Line	—	20 psi
Normal - Green Arc	—	20-26 psi
Maximum - Red Line	—	26 psi
CYLINDER HEAD TEMPERATURE		
Normal - Green Arc	250°–460°F	250°–475°F
Maximum - Red Line	460°F	475°F
TACHOMETER		
Maximum T/O RPM - Red Line	2850 RPM	2700 RPM
Max. Continuous RPM	2700 RPM	2700 RPM
Normal RPM - Green Arc	2200-2550 RPM	500-2700 RPM
Max. RPM (Turbo-Charged)	—	2400 RPM
Min. RPM (Turbo-Charged)	—	2200 RPM
MANIFOLD PRESSURE		
Normal - Green Arc	13.5-29.5" Hg	13.5-29.5" Hg
Maximum (Normal Aspirated)	29.5" Hg	29.5" Hg
Maximum (Turbo-Charged)	—	27.0" Hg

SECTION III
NORMAL OPERATING PROCEDURES
INDEX

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ABBREVIATED CHECKLIST

NOTE

A complete and more detailed checklist can be found in Section III of the Pilot's Operating Manual.

STARTING

1. Electrical Equipment – OFF
2. Gear Switch – DOWN
3. Master Switch – ON
4. Gear Lights – THREE GREEN
5. Throttle – FULL OPEN
6. Mixture – FULL RICH
7. Aux. Fuel pump – ON, or (PRIME with Continental) until fuel flow/pressure indicates in green arc then OFF.
8. Mixture – IDLE CUT OFF (Lycoming only)
9. Throttle –CRACKED OPEN ½"
10. Propeller – CLEAR Front and Rear
11. Brakes – CHECK Firm and Set
12. Starter – ENGAGE, release to BOTH after engine fires
13. Mixture – FULL RICH after engine fires (Lycoming only)
14. Throttle – 1000–1200 RPM
15. Engine Instruments – CHECK

BEFORE TAKE–OFF

1. Fuel Selector – FULLEST MAIN TANK
2. Mixture – FULL RICH
3. Propeller – FULL INCREASE RPM
4. Turbo-Control – FULL IN
5. Aux. Fuel Pump – OFF
6. Engine Instruments – CHECK
7. Engine Run-up – 1800 RPM
   A. Magnetos–CHECK (175 RPM max. drop, 50 RPM max. diff.)
   B. Propeller – CYCLE, then FULL INCREASE RPM
   C. Engine Instruments – CHECK
   D. Throttle – 1000-1200 RPM
8. Controls – CHECK freedom of movement
9. Trim – SET
10. Auto-pilot – OFF
11. Flaps – SET HALF or UP
12. Circuit Breakers – IN
13. Flight Instruments – CHECK and SET
14. Cabin Door – CHECK LOCKED
15. Seat and Shoulder Harness – FASTENED

CLIMB

Best Rate	Best Angle
Airspeed —110 MPH	Airspeed —75 MPH
Gear —UP	Gear —UP
Flaps —UP	Flaps —HALF

Normal Climb Airspeed – 120 - 130 MPH

Normal Climb Power – 2500 RPM, 25" MAP

CRUISE

1. Throttle – SET as desired
2. Propeller – SET as desired
3. Mixture – LEAN as recommended
4. Fuel Selector – AUX. TANK

LANDING

1. Seat and Shoulder Harness – FASTENED
2. Fuel Selector – FULLEST MAIN TANK
3. Mixture – RICH
4. Gear – DOWN
5. Flaps – SET as desired
6. Propeller – FULL INCREASE RPM

Recommended airspeed on final:

Full Flaps – 90 MPH
No Flaps – 100 MPH

AIR RESTART

1. Airspeed – 110 MPH Minimum Recommended
2. Ignition – BOTH
3. Fuel Selector – SWITCH TO OTHER FULLEST TANK
4. Aux. Fuel Pump – ON or (PRIME with Continental until fuel pressure/flow is restored, then Low or Off)

POWER OFF GLIDE – 10:1 Glide Ratio

1. Airspeed – 102 MPH IAS
2. Gear – UP
3. Flaps – UP
4. Throttle – FULL OPEN*
5. Propeller – FULL DECREASE RPM
6. Mixture – IDLE CUT–OFF

NOTE

The throttle must be FULL OPEN or the master switch OFF to prevent the landing gear from extending when airspeed is below 105 MPH.

NORMAL OPERATING PROCEDURES

GENERAL

This section covers all recommended normal operating procedures using a checklist format whenever possible, with additional information if further explanation is required. An abbreviated checklist covering only the essential items from "starting through landing" is provided and is detachable from the manual for convenient usage.

NOTE

All airspeeds in this section are indicated (IAS) unless stated otherwise and corrected to the nearest 5 MPH assuming maximum gross weight. See Section IV for exact airspeeds with various gross weights.

PREFLIGHT INSPECTION

1. CABIN
   a. Flight Controls – UNLOCKED
   b. Gear Switch – DOWN
   c. Fuel Selector – MAIN
   d. All Switches – OFF
2. RIGHT WING
   a. Flaps and Aileron – CHECK condition, freedom of movement, security
   b. Wing Tip and Light – CHECK condition
   c. Leading Edge – CHECK condition
   d. Fuel – – CHECK quantity, color green, cap secure
   e. Fresh Air Intake – CHECK unobstructed
3. RIGHT MAIN GEAR
   a. Chocks and Tie Down – REMOVE
   b. Tire – CHECK condition, inflation
   c. Brakes – CHECK condition, leakage
   d. Strut and Linkage – CHECK condition, leakage
   e. Strut Retract Cable – CHECK condition
   f. Electrical Switch and Wiring – CHECK condition, security
   g. Fairing Door & Wheel Well – CHECK condition, security
4. NOSE SECTION
   a. Exhaust Stack – CHECK secure and unobstructed
   b. Cowling – CHECK secure, oil and gas leakage
   c. Windshield – CHECK condition
   d. Propeller and Spinner – CHECK condition
   e. Air Intake – CHECK unobstructed
   f. Gear Strut – CHECK condition, leakage
   g. Tire – CHECK condition, inflation
   h. Fuel – DRAIN gasolator, CHECK leakage
   i. Oil – CHECK quantity, cap and inspection door secure
5. LEFT MAIN GEAR
   a. Same as right main gear in addition:
   b. Fuel – DRAIN using quick drain under fuselage, CHECK leakage, access door secure

6. LEFT WING
   a. Same as right wing in addition
   b. Static Drain – CLOSED
   c. Landing/Taxi Light – CHECK condition
   d. Pito-Static Tube – CHECK unobstructed
   e. Stall Warning Switch – CHECK freedom of movement

7. LEFT FUSELAGE
   a. Fabric – CHECK condition, oil, hyd. leakage
   b. Windows – CHECK condition
   c. Radio Antennas – CHECK secure

8. EMPENNAGE
   a. Horizontal Stabilizer and Struts – CHECK secure, condition
   b. Vertical Stabilizer – CHECK condition
   c. Rudder – CHECK condition, freedom of movement, nav. light
   d. Elevator and Trim Tab – CHECK condition, freedom of movement, tab secure
   e. Tail/Skid/Tie Down – CHECK condition, REMOVE tie down

9. RIGHT FUSELAGE
   a. Same as left side in addition:
   b. Baggage Compartment – CHECK oxygen valve OPEN, pressure gauge, cargo net, door secure
   c. Aux. Fuel – CHECK quantity, cap secure

BEFORE STARTING

1. Seat – ADJUST, CHECK locked
2. Shoulder Harness/Seat Belt – FASTENED
3. Master Switch – OFF
4. Ignition – OFF
5. Radio Master – OFF
6. Light Switches – OFF
7. Gear Switch – DOWN
8. Oxygen – CHECK operation
9. Mixture Control – IDLE CUT-OFF
10. Propeller Control – FULL INCREASE RPM
11. Turbo Control – FULL IN
12. Throttle Control – CLOSED
13. Flap Switch – UP
14. Circuit Breakers – IN
15. Fuel Selector – FULLEST MAIN TANK
16. Emergency Gear Extension Lever – UP
17. Master Switch – ON
18. Gear Lights – THREE GREEN
19. Fuel Gauges – OPERATING correctly
20. Alternator Warning Light – ILLUMINATED

STARTING

1. Throttle – FULL OPEN
2. Mixture – FULL RICH
3. Aux. Fuel Pump – ON or (PRIME with Continental) until fuel flow/ pressure indicates in green arc, then OFF
4. Mixture – IDLE CUT-OFF (Lycoming Only)
5. Throttle – CRACKED OPEN ½"
6. Propeller – CLEAR front and rear
7. Brakes – CHECK firm and SET
8. Starter – ENGAGE, release to BOTH after engine fires
9. Mixture – FULL RICH after engine fires (Lycoming only)
10. Throttle – 1000-1200 RPM
11. Oil Pressure – CHECK must indicate pressure within 30 seconds max.
12. Radio Master/Lights – AS DESIRED
13. Engine Instruments – CHECK

The use of auxiliary fuel pump for priming varies with each engine and temperature condition. Generally the colder the engine, the longer the priming period and in some cases, use of the aux. fuel pump must continue until engine RPM is steady. Avoid flooding, due to the resulting fire hazard.

To clear an engine that has been flooded due to excessive priming, proceed as follows:

1. Mixture – IDLE CUT-OFF
2. Throttle – FULL OPEN
3. Auxiliary Fuel Pump – OFF
4. Brakes – SET
5. Starter – ENGAGE until engine fires
6. Repeat normal starting procedures using little or no prime.

During cold weather operation (below 20°F) it is recommended that the engine be preheated prior to starting to insure a longer service life for the starter motor and engine. Direct warm air 175° max. through the opening in the bottom and/or the front of the cowl.

NOTE

After starting do not operate the engine above 1000-1200 RPM until oil temperature is in the green arc.

Should auxiliary power be required for starting, use the normal starting procedures. Connection of auxiliary power is described in Section VI.

TAXI

During ground operation the propeller control should always be in FULL INCREASE RPM position. Prolonged idle below 1000 RPM is not recommended due to plug fouling and insufficient engine cooling. High power operation and engine run up should be into the wind and kept to a minimum, expecially during high temperature conditions. Use the flight controls in the conventional manner during crosswind conditions

CAUTION

Avoid taxiing and high power operation on or near loose gravel or small stones as severe damage will result to the propeller and flaps, if in the DOWN position.

BEFORE TAKE–OFF

1. Brakes – SET
2. Fuel Selector – FULLEST MAIN TANK
3. Mixture Control – FULL RICH
4. Turbo Control – FULL IN
5. Propeller Control – FULL INCREASE RPM
6. Aux. Fuel Pump – OFF
7. Engine Instruments – CHECK normal indications
8. Engine Run Up – 1800 RPM
   a. Magnetos – CHECK (175 RPM max. drop, 50 RPM max. differential)
   b. Propeller – CYCLE full decrease RPM until 200 RPM drop, then FULL INCREASE RPM
   c. Engine Instruments – CHECK all in green arc
   d. Throttle – 1000-1200 RPM
9. Turbo Charger Check – 2200 RPM
   a. Turbo Warning Light – OUT
   b. Turbo Control – FULL AFT, note rise in MAP, then push FULL IN
   c. Throttle – 1000-1200 RPM
10. Controls – CHECK freedom of movement
11. Trim – CHECK operation and SET for take-off
12. Auto-pilot – OFF
13. Flaps – SET HALF or UP and CHECK
14. Circuit Breakers – IN
15. Flight Instruments – CHECK and SET
16. Pilot's Vent Window – CLOSED
17. Cabin Door – CHECK LOCKED
18. Seat and Shoulder Harness – FASTENED

TAKE–OFF (Normal)

1. Throttle – FULL OPEN applying smoothly
2. Engine Instruments – CHECK normal
3. Lift Off – 80 MPH
4. Gear – UP when clear of runway
5, Flaps – UP after reaching 100 MPH and clear of obstacle
6. Throttle – REDUCE 25" MAP after reaching 110 MPH IAS
7. Propeller – SET 2500 RPM

NOTE

Should the throttle be reduced prior to reaching 105 MPH the landing gear will automatically extend.

Aircraft take-off characteristics are conventional and can be made with flaps UP or at HALF. Half flaps are recommended except during strong crosswinds because of shorter ground run and less nose attitude required for lift-off. Take-off with flaps UP requires sufficient elevator back pressure to insure lift-off at a reasonable speed.

NOTE

Trimming aft of the take-off position in an attempt to reduce the required back pressure for lift-off is not recommended because of the resulting nose high attitude after take-off.

TAKE–OFF (Obstacle)

During an obstacle take-off use the normal take-off procedures with the following exceptions:

1. Flaps – SET HALF and CHECK
2. Lift-Off – 70 MPH
3. Climb – 75 MPH until clear of obstacle

WARNING

This procedure should be used only when necessary. Because of the high nose attitude required, the aircraft may stall if a power loss is experienced and the nose is not lowered immediately.

TAKE–OFF (Soft Field)

For a soft field take – off use the normal take - off procedures with the following exceptions:

1. Flaps – SET HALF and CHECK
2. Elevator Control – BACK raise nose wheel off ground as soon as possible
3. Lift-Off – ASSIST using elevator back pressure.
4. After Lift-Off – LEVEL FLIGHT to obtain safe margin of airspeed

WARNING

The aircraft will lift-off at a very low IAS but continued climb out immediately after lift-off is not recommended as a possible stall may result.

TAKE–OFF (High Altitude)

Use normal take-off procedures. If engine roughness is noted during full power application, leaning is permissible with the mixture control. Lean only that necessary to obtain smooth engine operation.

The use of the turbo-charger for improved high altitude take-off performance is acceptable. However, do not exceed the engine limitations for turbo charged operation.

CLIMB (Normal)

1. Throttle – 25" MAP
2. Propeller – 2500 RPM
3. Mixture – FULL RICH for power settings above 75%
4. Airspeed – 120 - 130 MPH below 10,000 ft.
   110 - 120 MPH above 10,000 ft.
5. Engine Instruments – CHECK in green arc.

Using the normal climb procedures provides a good rate of climb and ground speed in addition to better forward visibility and adequate engine cooling.

When the desired MAP can no longer be maintained, the turbo charger should be utilized. Allow an additional 2" of MAP over that used when normal aspirated.

CLIMB (Maximum Performance)

Maximum climb performance is obtained with full take-off power and the following conditions:

Best Rate of Climb	Best Angle of Climb
1. Flaps – UP 2. Gear – UP 3. Airspeed – 110 MPH	1. Flaps – HALF 2. Gear – UP 3. Airspeed – 75 MPH

CAUTION

Engine limitations must not be exceeded. For maximum engine service life, high power settings at low airspeeds must be kept to a minimum.

CRUISE

1. Level Off – TRIM
2. Airspeed – ACCELERATE to cruise
3. Throttle – SET to cruise MAP
4. Propeller – REDUCE to 2400 RPM or desired cruise RPM
5. Mixture – LEAN to rich side of peak
6. Fuel Selector – AUXILIARY TANK

When level off altitude is reached, allow aircraft to accelerate to cruise airspeed prior to reducing power. An engine power setting of 75% will deliver maximum cruise performance. If maximum range is desired a lower power range setting should be used. Consult the flight performance data.

The recommended propeller setting is 2400 RPM under most cruise conditions for maximum engine smoothness and lowest noise level. Lean when at or less than 75% power, using the exhaust gas temperature gauge as a primary reference. Recommended is $50^{O}F$ less than the peak temperature at 75% power settings and $25^{O}F$ less than the peak with 65% power and below. In all cases, lean on the rich side of the peak temperature. For additional information consult the engine operators manual

During high altitude operation above 10,000 ft. it may be necessary to use the auxiliary fuel pump should a fluctuation of fuel pressure or flow be noted. This is due to the increased fuel vaporization rate caused by low atmospheric pressure.

DESCENT

1. Mixture – FULL RICH or maintain rich side of peak EGT.
2. Throttle – REDUCE, maintain normal cylinder head and oil temperature.
3. Propeller – 2200 - 2400 RPM
4. Airspeed – AS DESIRED

Descent should be planned using a comfortable rate of descent with arrival at the destination and level-off altitude occuring at the same time.

The mixture should be FULL RICH when initiating the let down. Gradual richening is permissible, but the EGT must always be on the rich side of peak EGT.

The descent should be made with enough power to maintain cylinder head and oil temperature within the green arc. Do not allow the propeller to windmill the engine. If necessary, decrease propeller RPM and/or increase MAP.

LANDING (Normal)

1. Seat and Shoulder Harness – FASTENED
2. Fuel Selector – FULLEST MAIN TANK
3. Mixture – RICH
4. Downwind
   a. Propeller – 2200–2500 RPM
   b. Airspeed – 120-130 MPH
   c. Gear – DOWN, 140 MPH Max.
   d. Flaps – HALF, 120 MPH Max.
5. Base Leg – 100 MPH
6. Final
   a. Flaps – FULL DOWN on short final
   b. Airspeed – 90 MPH FULL FLAPS, 100 MPH no flaps
   c. Propeller – FULL INCREASE RPM
7. Touchdown
   a. Throttle – CLOSED
   b. Attitude – NOSE HIGH, contact runway, with main gear first
8. Roll – Out
   a. Flaps – UP
   b. Brakes – AS NEEDED

Aircraft landing characteristics are conventional and can be made with any desired flap setting. Full flaps are recommended, but due to high drag coefficient, they should not be fully extended until established on final approach. As the landing gear and flaps are extended, no abrupt or unusual pitch changes occur. However, it is recommended that the aircraft be kept in proper trim as the airspeed decreases.

Crosswind landings can be accomplished with or without flaps. The wing down, top rudder method is recommended, but the rudder pedals MUST be neutralized just prior to the nose wheel contacting the runway.

During a balked landing or go around, add full power and raise flaps to HALF if fully extended.

LANDING (Obstacle)

Landing over an obstacle is accomplished using the same procedures for the normal landing. On final approach the following is recommended.

1. Flaps – FULL DOWN
2. Propeller – FULL INCREASE RPM
3. Airspeed – ESTABLISHED 90 MPH
4. Throttle – AS DESIRED, to control rate of descent

WARNING

With the throttle fully CLOSED and the flaps FULL DOWN a high rate of descent develops very rapidly. If airspeed is allowed to decrease below 90 MPH, level-off is possible ONLY with an application of power.

SHUTDOWN

1. Brakes – SET
2. Propeller – FULL INCREASE RPM
3. Electrical Equipment – OFF
4. Throttle – CLOSED
5. Mixture – IDLE CUT–OFF
6. Magnetos – OFF, after propeller stops
7. Master Switch – OFF
8. Controls – SECURE, using seat belt
9. Wheels – CHOCKED
10. Wing/Tail Tie–Downs – SECURE

NOTE

If high winds are anticipated, the aircraft should be hangared. If the aircraft must be left out, head it into the wind, use additional tie-down ropes attached to each landing gear strut and block rudder pedals.

SECTION IV
WEIGHT AND BALANCE
INDEX

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GENERAL

It is the pilot's responsibility to insure that the aircraft is loaded properly and within the weight and balance limitations. All flight performance, procedures and characteristics are based on this prerequisite.

The actual licensed empty weight and the center of gravity (C.G.) of a specific aircraft can only be found on the Weight and Balance form that is a permanent part of the aircraft's file. All additional changes to the aircraft's weight and center of gravity after the time of manufacture must also be indicated on or attached to this form. From this information and the following instructions the pilot can easily determine the "Useful Load" and proper loading distribution for the aircraft.

LOADING PROCEDURES

1. Determine from the Weight and Balance sheet in the aircraft file, the licensed empty weight and the moment (lb.-in.). Enter these figures under "Your Airplane" of the Sample Loading Problem, Figure 4-1.

2. Full oil capacity can be assumed for all flights. For ease of future loading computations the new empty weight and the moment with oil should be determined and entered in the sample loading problem.

3. Using the loading graph, Figure 4-2, determine the weight and the moment of the following items and enter these figures on the sample loading problem.
   a. Pilot and front passenger
   b. Rear passenger (s)
   c. Baggage 186 lbs. max. including ski tube
   d. Ski-tube – 20 lbs. max.
   e. Wing Fuel – Usable @ 6 lbs./gal., 60 gals. max.
   f. Fuselage aux. fuel – Usable @6 lbs./gal., 15 gal. max.

4. Add the aircraft empty weight and moment with oil and all the items in Step 3 to determine the gross weight and moment.

5. Using the Flight Envelope, Fig. 4-3, determine that the gross take-off weight and moment are within limits.

WARNING

If the aircraft is not in the envelope, the aircraft must be reloaded. Under no circumstances should the aircraft be flown with an out of limits condition.

SAMPLE LOADING PROBLEM		SAMPLE AIRPLANE		your AIRPLAN	
	Arm	Weight	Moment	Weight	Moment
1. Licensed Empty Weight	16.1	~~2202.5~~	35,460		
2. Oil — 12 qts. @ 7.5 lbs./gal.	—41.1	22.5	—923	22.5	-923
Licensed Empty Weight and Moment With Oil		2225	34,538		
3. Pilot and Front Passengers	20.0	340	6,800		
Rear Passenger(s)	53.0	340	18,020		
Baggage - 186 lbs. Max. including Ski-tube	84.0	40	3,360		
Ski-tube - 20 lbs. Max.	120.0	~~20~~	~~2,400~~		
Wing Fuel - Usable 60 gal. Max. @ 6 lbs./gal.	29.0	360	10,440		
Aux. Fuel - Usable 15 gal. Max. @ 6 lbs./gal.	72.0	0	0		
Gross Take-Off Weight and Moment		3325	75,558		

NOTE

To determine Take-Off Center of Gravity (inches aft of datum), divide the Gross Take-Off Moment by the Gross Take-Off Weight.

Figure 4–1 SAMPLE LOADING PROBLEM

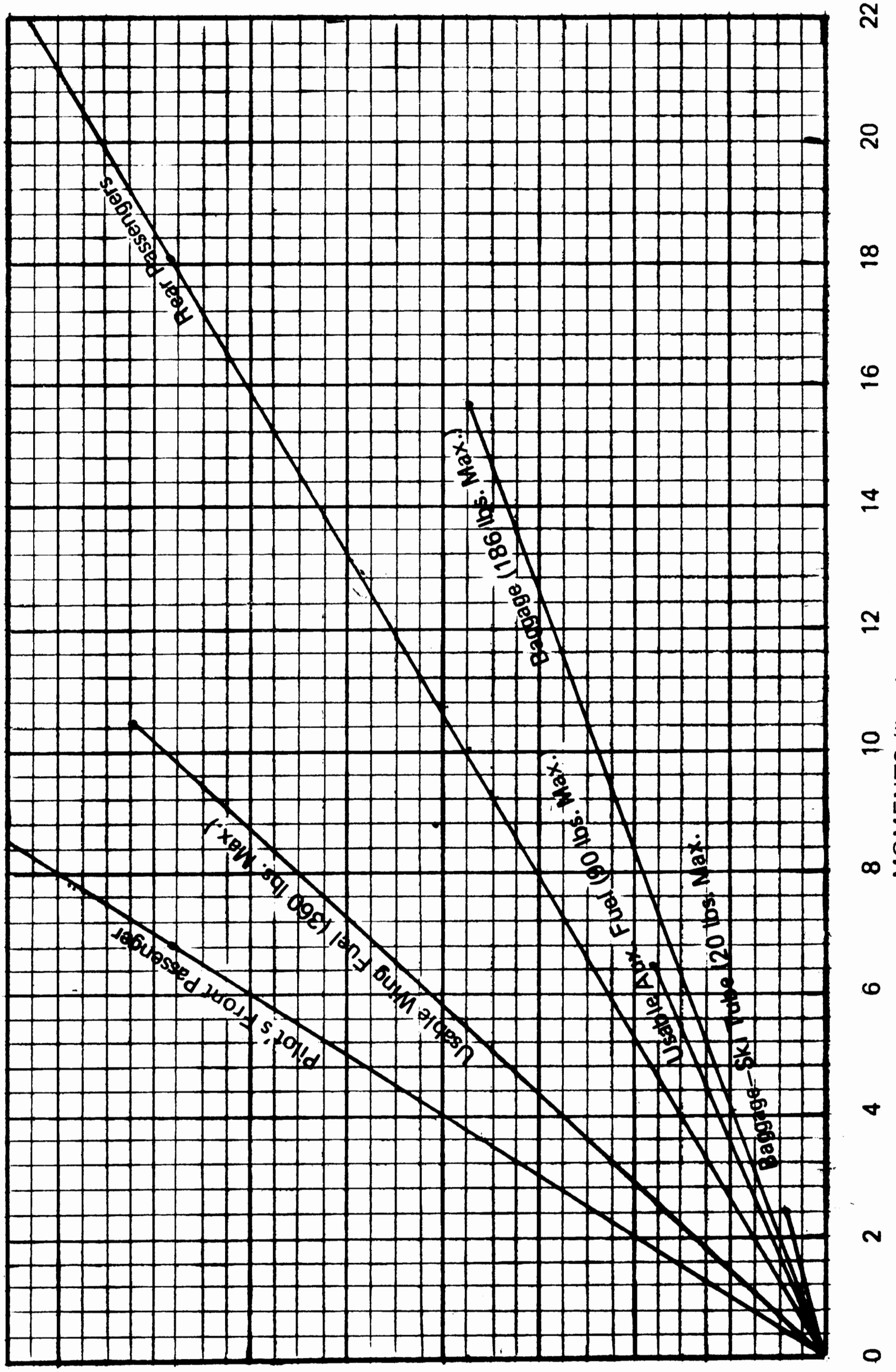
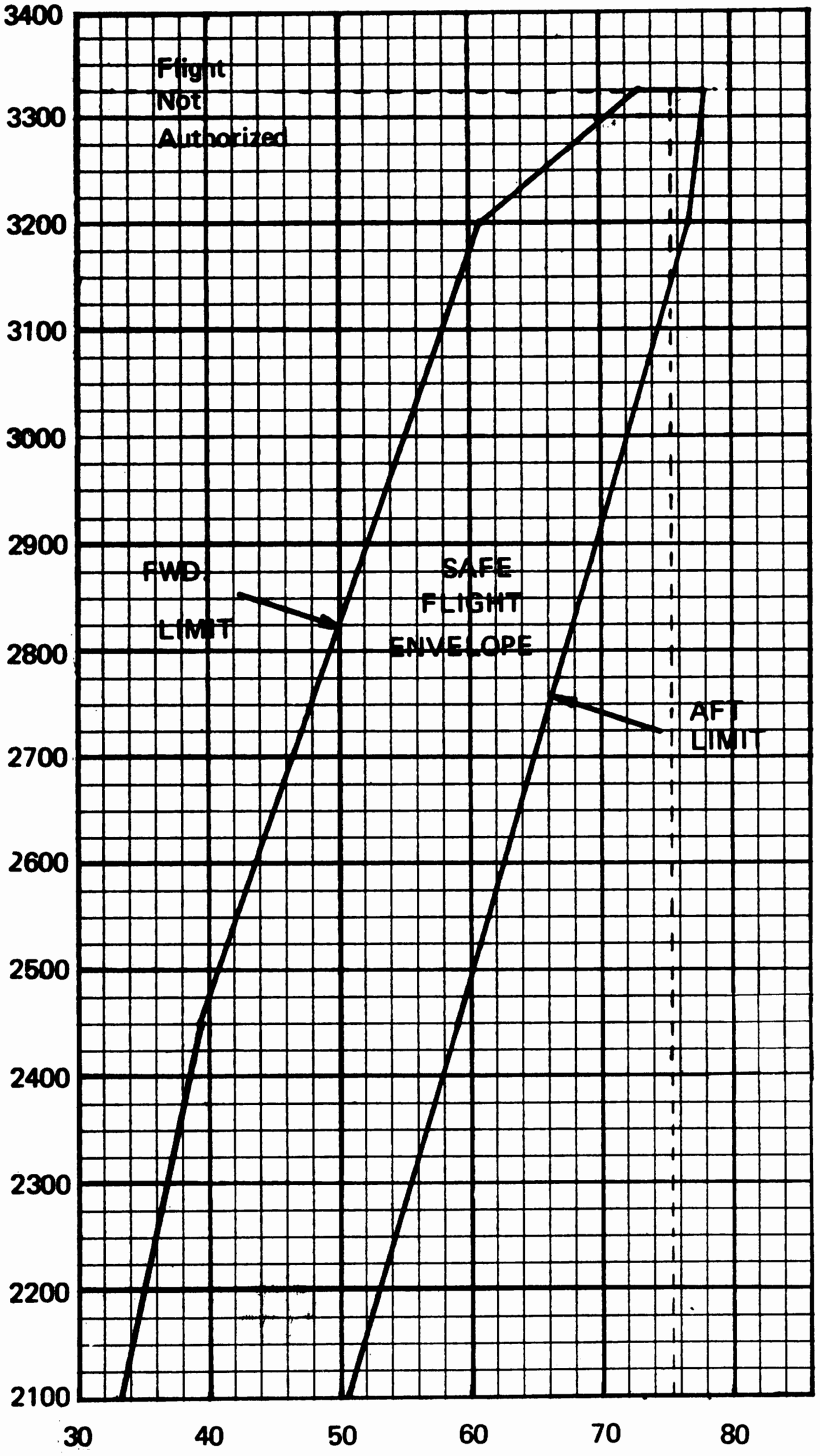


Fig. 4–2 LOADING GRAPH



LOADED AIRCRAFT MOMENTS – lbs. – in/1000

Fig. 4–3 FLIGHT ENVELOPE

SECTION V
FLIGHT PERFORMANCE
INDEX

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SECTION V
FLIGHT PERFORMANCE

GENERAL

This data is to inform the pilot as to what he can expect from the aircraft in the way of performance and to assist in preflight planning.

The data has been compiled from both estimated calculations and actual flight test using average piloting techniques, with an aircraft and engine in good operating conditions. All information is corrected for standard atmospheric conditions.

Flight performance data is included for all models, 17-30A, 17-31A, and 17-31ATC. Information that is not applicable to a specific model should be so marked or removed by the pilot to avoid confusion and possible error.

Performance may vary from the given data due to the many possible variables present with a specific aircraft and flight condition. The pilot is therefore encouraged to maintain a personal flight log for his aircraft This will not only provide more accurate preflight planning information for future flights, but also can be used as an indication in determining the general condition of a particular aircraft.

AIRSPEED CORRECTION

FLAPS UP	IAS	80	100	120	140	160	180	200
	CAS	85	103	122	140	159	178	198
FLAPS HALF	IAS	60	70	80	90	100	110	120
	CAS	65	75	84	93	103	112	122
FLAPS DOWN	IAS	60	70	80	90	100	110	120
	CAS	65	74	83	93	103	112	122

NOTE

1. All values are MPH
2. Assumes zero instrument error
3. Alternate Static Source – CLOSED
4. Pilot's Vent Window – CLOSED

STALL SPEEDS – IAS, MPH

CONFIGURATION	ANGLE OF BANK 0°	30° E OF	45°	60°
FLAPS UP	74	80	90	110
FLAPS HALF	67	72	82	99
FLAPS DOWN	66	71	80	96

NOTE

1. Gross Weight 3325 lbs.
2. Landing Gear – DOWN
3. Throttle – CLOSED
4. Loss of Altitude during stall recovery may exceed 250 ft.

TAKE–OFF PERFORMANCE – ALL MODELS (Normal Aspirated) *

Gross Weight Pounds	IAS @ 50 Ft.	Head Wind Knots	@ Sea Level & 59°F		@ 2500 Ft. & 50°F		@ 5000 Ft. & 41°F		@ 7500 Ft. & 32°F	
			Ground Run	Total To Clear 50 Ft. Obs.	Ground Run	Total To Clear 50 Ft. Obs.	Ground Run	Total To Clear 50 Ft. Obs.	Ground Run	Total To Clear 50 Ft. Obs.
3325	75	0	980	1420	1125	1680	1310	2110	1610	2965
		10	705	1075	785	1260	925	1610	1150	2305
		20	470	775	535	930	640	1210	810	1780
2900	70	0	705	1025	820	1220	1015	1595	1100	2135
		10	505	775	595	940	745	1240	865	1700
		20	340	555	410	690	515	1095	610	1585
2500	64	0	510	750	605	910	720	1160	880	1615
		10	340	535	405	660	495	830	610	1235
		20	210	365	255	455	320	590	405	915

NOTE

1. Throttle – FULL OPEN, Propeller – FULL INCREASE RPM
2. Flaps – HALF, Gear – DOWN
3. Hard Surface Runway
4. Increase Distance 10% for each 20°F above standard

* 5. With turbo-charger operation, decrease normal aspirated distance 5%/1000 ft. when above 5000 ft. altitude (2400 RPM, 27" MAP)

MAXIMUM CONTINUOUS RATE OF CLIMB – 17–30A (Cont.)

ALTITUDE MSL	GROSS WT.	IAS MPH	RATE OF CLIMB FT/Min.	FUEL USED FROM S.L. GAL.
S.L. & 59°F	3325	108	1085	2.0
	2900	102	1390	–
	2500	98	1675	–
5000 FT & 41°F	3325	108	780	5.0
	2900	102	1050	–
	2500	98	1320	–
10,000 FT & 23°F	3325	108	500	8.0
	2900	102	710	–
	2500	98	970	–
15,000 FT & 5°F	3325	108	210	10.0
	2900	102	390	–
	2500	98	620	–
Service Ceiling				
17,000 FT	3325	108	100	11.0
19,000 FT	2900	102	100	–
22,600 FT	2500	98	100	–

NOTE

1. Gear and Flaps – UP
2. Throttle – FULL OPEN, Propeller – 2700 RPM, Mixture recommended leaning schedule
3. Fuel includes warm up and take-off
4. Decrease rate of climb 45 FT/MIN for each 10°F above standard

MAXIMUM CONTINUOUS RATE OF CLIMB
17-31A and 17-31ATC (Normal Aspirated – Lyc.)

ALTITUDE MSL	GROSS WT. LBS.	IAS MPH	RATE OF CLIMB FT/Min.	FUEL USED FROM S.L. GALS.
S & L & 59°F	3325 29002 2500	108 102 98	1170 1470 1810	2.0 – –
5000 FT & 41°F	3325 2900 2500	108 102 98	880 1140 1460	4.5 – –
10,000 FT & 23°F	3325 2900 2500	108 102 98	580 810 1190	8.0 – –
15,000 FT & 5°F	3325 2900 2500	108 102 98	300 480 740	10.0 – –
Service Ceiling 18,200 20,000 24,000	3325 2900 2500 2500	108 102	100 100	11.0 –

NOTE

1. Gear and Flap – UP
2. Throttle – FULL OPEN, Propeller–2700 RPM
   Mixture recommended leaning schedule
3. Fuel includes warm-up and take-off
4. Decrease rate of climb 50 FT/Min for each 10°F above standard

MAXIMUM CONTINUOUS RATE OF CLIMB
17-31ATC (Turbo Charged)

ALTITUDE MSL	GROSS WT. LBS.	IAS MPH	RATE OF CLIMB FT/Min.	FUEL USED FROM S.L. GALS.
5000 FT & 41°F	3325 2900 2500	108 102 98	810 1060 1365	4.5 — —
10,000 FT & 23°F	3325 2900 2500	108 102 98	760 1015 1330	6.0 — —
15,000 FT & 5°F	3325 2900 2500	108 102 98	700 960 1275	8.0 — —
20,000 FT & −12°F	3325 2900 2500	108 102 98	640 895 1215	11.0 — —
24,000 FT	3325 2900 2500	108 102 98	575 845 1165	13.0 — —

NOTE

1. Gear and Flaps — UP
2. MAP — 27" Hg, 2400 RPM
3. Fuel includes warm-up and take-off
4. Decrease rate of climb 50 FT/Min. for each 10°F above standard

CRUISE PERFORMANCE

Standard Conditions, Zero Wind
Gross Wt. 3325 lbs.

2,500 FEET

Recommended Lean Mixture
No Reserve

RPM	M.P. IN. HG.	% BHP	TAS. M.P.H.	GAL./ HR.	60 Gal. Fuel		75 Gal. Fuel	
					Endurance	Range	Endurance	Range
2600	24	77	182	16.1	3.7	675	4.7	845
	23	73	178	15.3	3.9	700	4.9	875
	22	69	175	14.4	4.2	730	5.2	915
	21	65	170	13.1	4.4	750	5.5	940
2500	25	78	183	16.3	3.7	675	4.6	845
	24	74	179	15.4	3.9	695	4.9	870
	23	70	175	14.5	4.1	725	5.2	905
	22	65	170	13.6	4.4	750	5.5	940
2400	25	73	178	15.3	3.9	700	4.9	875
	24	70	175	14.5	4.1	725	5.2	905
	23	65	170	13.6	4.4	750	5.5	940
	22	62	166	12.9	4.7	770	5.8	965
2300	25	68	173	14.3	4.2	725	5.2	905
	24	65	170	13.6	4.4	750	5.5	940
	23	61	165	12.8	4.7	775	5.9	970
	22	58	160	12.0	5.0	800	6.2	1000
	21	54	154	11.3	5.3	820	6.6	1025
	20	51	146	10.8	5.6	810	6.9	1015
	19	47	137	10.3	5.8	800	7.3	1000
	18	44	125	9.5	6.3	790	7.9	985

CRUISE PERFORMANCE

Model No. 17-30A (Cont.)

Standard Conditions, Zero Wind
Gross Weight – 3325 lbs.

5,000 FEET

Recommended Lean Mixture
No Reserve

RPM	M. P. IN. HG.	% BHP	TAS. M.P.H.	GAL./ HR.	60 Gal. Fuel		75 Gal. Fuel	
					Endurance	Range	Endurance	Range
2600	27	79	188	16.5	3.6	685	4.6	855
	23	75	184	15.7	3.8	705	4.8	880
	22	72	180	15.0	4.0	720	5.0	900
	21	67	176	14.1	4.3	750	5.3	935
2500	24	75	184	15.7	3.8	705	4.8	880
	23	72	180	15.0	4.0	720	5.0	900
	22	67	176	14.1	4.3	750	5.3	935
	21	63	171	13.2	4.6	775	5.7	970
2400	24	72	180	15.0	4.0	720	5.0	900
	23	67	176	14.1	4.3	750	5.3	935
	22	64	172	13.4	4.5	775	5.6	965
	21	60	167	12.6	4.8	795	6.0	995
2300	24	67	176	14.1	4.3	750	5.3	935
	23	63	170	13.1	4.6	780	5.8	975
	22	60	166	12.5	4.8	800	6.0	1000
	21	56	161	11.7	5.1	825	6.4	1030
	20	53	153	11.0	5.5	835	6.8	1045
	19	49	144	10.5	5.7	825	7.1	1030
	18	46	133	10.0	6.0	800	7.5	1000
	17	42	113	9.2	6.5	735	8.2	920

CRUISE PERFORMANCE

Model No. 17-30A (Cont.)

Standard Conditions, Zero Wind
Gross Weight – 3325 lbs.

7,500 FEET

Recommended Lean Mixture
No Reserve

RPM	M.P. IN. HG.	% BHP	TAS. M.P.H.	GAL./ HR.	60 Gal. Fuel		75 Gal. Fuel	
					Endurance	Range	Endurance	Range
2600	22	73	186	15.3	3.9	730	4.9	915
	21	69	181	14.4	4.2	755	5.2	945
	20	65	177	13.6	4.4	780	5.5	975
2500	22	69	181	14.4	4.2	755	5.2	945
	21	65	176	13.6	4.4	780	5.5	975
	20	61	171	12.8	4.7	800	5.9	1000
	19	58	166	12.2	4.9	820	6.2	1025
2400	22	65	177	13.6	4.4	780	5.5	975
	21	61	170	12.8	4.7	800	5.9	1000
	20	58	165	12.0	5.0	825	6.2	1030
	19	54	158	11.3	5.3	840	6.6	1050
2300	22	61	170	12.8	4.7	800	5.9	1000
	21	58	165	12.0	5.0	825	6.2	1030
	20	54	158	11.3	5.3	840	6.6	1050
	19	51	149	10.8	5.6	830	6.9	1035
	18	48	139	10.2	5.9	820	7.4	1020
	17	44	118	9.7	6.2	735	7.8	915

CRUISE PERFORMANCE

Model No. 17-30A (Cont.)

Standard Conditions, Zero Wind
Gross Weight – 3325 lbs.

10,000 FEET

Recommended Lean Mixture
No Reserve

RPM	M.P. IN. HG.	% BHP	TAS. M.P.H.	GAL./ HR.	60 Gal. Fuel		75 Gal. Fuel	
					Endurance	Range	Endurance	Range
2600	20	67	183	13.9	4.3	790	5.4	985
	19	63	176	13.1	4.6	810	5.8	1010
	18	58	169	12.2	4.9	835	6.2	1040
	17	55	160	11.4	5.3	840	6.6	1050
2500	20	63	176	13.1	4.6	810	5.8	1010
	19	58	170	12.3	4.8	830	6.1	1035
	18	55	160	11.4	5.2	840	6.6	1050
	17	52	153	11.1	5.4	825	6.8	1035
2400	20	60	172	12.6	4.8	820	6.0	1025
	19	56	163	11.7	5.1	835	6.4	1040
	18	53	154	11.0	5.5	840	6.8	1050
	17	49	142	10.5	5.7	810	7.1	1015
2300	20	56	163	11.7	5.1	835	6.4	1040
	19	53	154	11.0	5.5	840	6.8	1050
	18	49	142	10,5	5.7	810	7.1	1015
	17	46	120	10.0	6.0	720	7.5	905

CRUISE PERFORMANCE

Model No. 17-30A (Cont.)

Standard Conditions, Zero Wind
Gross Weight — 3325 lbs.

15,000 FEET

Recommended Lean Mixture
No Reserve

RPM	M.P. IN. HG.	% BHP	TAS. M.P.H.	GAL./ HR.	60 Gal. Fuel		75 Gal. Fuel	
					Endurance	Range	Endurance	Range
2600	16	54	159	11.4	5.3	840	6.6	1050
	15	49	132	10.5	5.7	755	7.1	945
2500	16	51	145	11.0	5,5	795	6.9	995
2400	16	49	132	10.5	5.7	755	7.1	945

CRUISE PERFORMANCE — Model No. 17-31A & 17-31ATC (Normal Aspirated — Lyc.)

Standard Conditions, Zero Wind
Gross Weight — 3325 lbs.

2,500 FEET

Recommended Lean Mixture
No Reserve

RPM	M. P. IN. HG.	% BHP	TAS. M.P.H.	GAL./ HR.	60 Gal. Fuel		75 Gal. Fuel	
					Endurance	Range	Endurance	Range
2500	26	82	190	17.3	3.5	660	4.3	825
	24	74	183	15.6	3.8	705	4.8	875
	23	70	179	15.1	4.0	710	5.0	890
	22	66	178	14.3	4.2	750	5.3	935
2400	26	79	187	16.6	3.6	675	4.5	845
	25	75	184	15.8	3.8	700	4.7	870
	24	71	180	15.0	4.0	720	5.0	900
	23	67	175	14.5	4.1	725	5.2	905
	22	63	171	13.6	4.4	755	5.5	940
	21	59	166	13.1	4.6	765	5.8	955
	20	55	161	12.2	4.9	795	6.2	990
	19	51	154	11.6	5.2	800	6.5	1000
	18	47	145	11.1	5.4	780	6.7	980
2300	25	73	182	15.0	4.0	725	5.0	910
	24	68	177	14.3	4.2	740	5.2	925
	23	65	172	13.6	4.4	760	5.5	950
	22	61	168	12.8	4.7	785	5.9	985
	21	57	164	12.3	4.9	800	6.1	1000
	20	53	158	11.7	5.2	810	6.4	1010
	19	49	149	11.0	5.5	815	6.9	1020
	18	46	141	10.5	5.7	805	7.1	1005
2200	25	69	1771	14.1	4.3	755	5.3	940
	24	65	173	13.4	4.5	775	5.6	970
	23	62	169	13.0	4.6	785	5.8	980
	22	58	165	12.3	4.9	810	6.1	1010
	21	55	160	11.5	5.2	835	6.5	1045
	20	51	153	11.0	5.5	835	6.8	1045
	19	48	146	10.5	5.7	835	7.2	1045
	18	44	135	10.1	5.9	800	7.4	1000

CRUISE PERFORMANCE — Model No. 17-31A & 17-31ATC (Normal Aspirated – Lyc.)

Standard Conditions, Zero Wind
Gross Weight – 3325 lbs.

5,000 FEET

Recommended Lean Mixture
No Reserve

RPM	M.P. IN. HG.	% BHP	TAS. M.P.H.	GAL./ HR.	60 Gal. Fuel		75 Gal. Fuel	
					Endurance	Range	Endurance	Range
2500	25	82	194	17.2	3.5	675	4.4	845
	23	73	185	15.4	3.9	720	4.9	900
	21	65	177	14.0	4.3	760	5.4	950
	19	56	158	12.6	4.8	750	5.0	940
2400	26	81	193	17.1	3.5	680	4.4	845
	25	78	191	16.5	3.7	695	4.6	870
	24	74	186	15.5	3.9	720	4.8	900
	23	70	182	14.7	4.1	745	5.1	930
	22	66	178	14.3	4.2	750	5.3	935
	21	62	173	13.3	4.5	780	5.6	975
	20	58	167	12.7	4.7	790	5.9	985
	19	54	161	12.1	5.0	800	6.2	1000
	18	50	153	11.5	5.2	800	6.5	1000
2300	24	71	183	14.8	4.0	740	5.1	925
	23	67	178	14.1	4.2	755	5.3	945
	22	63	175	13.3	4.5	790	5.6	985
	21	60	169	12.8	4.7	790	5.9	990
	20	55	164	11.9	5.0	825	6.3	1035
	19	50	156	11.1	5.4	845	6.8	1055
	18	48	144	10.8	5.6	830	7.0	1035
2200	25	71	183	14.6	4.1	755	5.2	945
	24	67	180	13.8	4.4	785	5.4	980
	23	63	175	13.1	4.6	805	5.8	1005
	22	60	171	12.7	4.7	810	5.9	1010
	21	57	166	11.9	5.0	835	6.3	1045
	20	54	161	11.5	5.2	835	6.5	1045
	19	50	152	10.9	5.5	835	6.9	1045
	18	46	142	10.4	5.8	825	7.3	1030

CRUISE PERFORMANCE — Model No. 17-31A & 17-31ATC (Normal Aspirated – Lyc.)

Standard Conditions, Zero Wind
Gross Weight – 3325 lbs.

7,500 FEET

Recommended Lean Mixture
No Reserve

RPM	M.P. IN. HG.	% BHP	TAS. M.P.H.	GAL./ HR.	60 Gal. Fuel		75 Gal. Fuel	
					Endurance	Range	Endurance	Range
2500	22	72	189	15.1	4.0	755	5.0	940
	21	67	184	14.8	4.1	745	5.1	935
	20	62	177	13.4	4.5	795	5.6	990
	19	58	171	12.8	4.7	800	5.9	1000
2400	22	69	185	14.8	4.1	750	5.1	940
	21	64	179	13.8	4.3	775	5.4	970
	20	60	174	13.1	4.6	795	5.7	995
	19	56	167	12.3	4.9	815	6.1	1020
	18	52	158	11.6	5.2	815	6.5	1020
	17	48	149	11.0	5.4	810	6.8	1010
2300	22	66	181	13.8	4.4	790	5.4	985
	21	62	174	13.0	4.6	800	5.8	1000
	20	57	169	12.3	4.9	825	6.1	1035
	19	51	158	11.3	5.3	840	6.6	1050
	18	50	155	11.0	5.5	845	6.8	1055
	17	46	142	10.7	5.6	800	7.0	1000
2200	22	62	177	13.1	4.6	810	5.7	1015
	21	59	171	12.3	4.9	835	6.1	1040
	20	55	166	11.6	5.2	855	6.5	1070
	19	51	157	11.0	5.5	860	6.8	1075
	18	48	148	10.5	5.7	845	7.2	1060
	17	43	123	10.0	6.0	740	7.5	925

CRUISE PERFORMANCE

Model No. 17-31A & 17-31ATC (Normal Aspirated — Lyc.)

Standard Conditions, Zero Wind
Gross Weight — 3325 lbs.

10,000 FEET

Recommended Lean Mixture
No Reserve

RPM	M.P. IN. HG.	% BHP	TAS. M.P.H.	GAL./ HR.	60 Gal. Fuel		75 Gal. Fuel	
					Endurande	Range	Endurance	Range
2500	20	65	184	14.0	4.3	795	5.4	995
	19	54	165	12.5	4.8	800	6.1	1000
	18	57	171	12.8	4.7	805	5.9	1005
2400	20	62	180	13.3	4.5	810	5.6	1015
	19	58	174	12.8	4.7	820	5.9	1025
	18	54	165	12.2	4.9	815	6.2	1020
	17	50	155	11.5	5.2	810	6.5	1010
	16	46	137	10.9	5.5	755	6.9	945
2300	20	59	176	12.8	4.7	830	5.9	1035
	19	53	163	11.6	5.2	845	6.5	1055
	18	52	161	11.4	5.2	845	6.7	1055
	17	48	148	10.8	5.6	820	6.9	1030
	16	45	122	10.3	5.8	715	7.3	890
2200	20	57	172	12.0	5.0	855	6.2	1070
	19	53	163	11.5	5.2	855	6.5	1065
	18	50	154	10.9	5.5	845	6.9	1055
	17	45	128	10.4	5.8q	740	7.3	930

CRUISE PERFORMANCE

Model No. 17-31AA & 17-31ATC (Normally Aspirated)

Standard Conditions, Zero Wind
Gross Weight — 3325 lbs.

15,000 FEET

Recommended Lean Mixture
No Reserve

RPM	M.P. IN. HG.	% BHP	TAS. M.P.H.	GAL./ HR.	60 Gal Fuel		75 Gal Fuel	
					Endurance	Range	Endurance	Range
2500	17 16	56 50	173 149	12.6 11.8	4.8 5.1	825 760	6.0 6.4	1030 950
2400	17 16	54 50	167 145	12.1 11.4	5.0 5.3	830 760	6.2 6.5	1035 950
2300	17 16	51 48	156 132	11.3 10.7	5.3 5.6	830 740	6.6	1035
2200	17	48	132	10.5	5.7	755	7.2	945

CRUISE PERFORMANCE

Model No. 17-31ATC

Standard Conditions, Zero Wind
Gross Weight — 3325 lbs.

7,500 FEET

Recommended Lean Mixture
No Reserve

RPM	M.P. IN. HG.	% BHP	TAS. M.P.H.	GAL./ HR.	60 Gal. Fuel		75 Gal. Fuel	
					Endurance	Range	Endurance	Range
2400	27	79	196	16.6	3.6	710	4.5	885
	26	76	193	15.9	3.8	730	4.7	910
	25	73	189	15.3	3.9	740	4.9	930
	24	69	186	14.6	4.1	765	5.2	960
	23	66	183	14.3	4.2	770	5.3	960
	22	63	178	13.6	4.4	740	5.5	985
	21	60	174	12.9	4.7	810	5.8	1010
2300	27	76	193	16.0	3.8	725	4.7	905
	26	73	190	15.4	3.9	740	4.9	925
	25	71	187	14.8	4.0	755	5.1	945
	24	68	184	14.2	4.2	775	5.3	970
	23	65	180	13.7	4.4	790	5.5	990
	22	62	178	13.1	4.6	815	5.7	1020
	21	60	174	12.8	4.7	815	5.9	1015
2200	27	73	189	14.9	4.0	760	5.0	950
	26	70	187	14.4	4.2	780	5.2	975
	25	67	184	13.8	4.4	800	5.4	1000
	24	65	180	13.3	4.5	810	5.6	1015
	23	62	178	12.8	4.7	835	5.9	1045
	22	60	174	12.6	4.8	830	6.0	1035
	21	57	170	12.0	5.0	845	6.2	1060

CRUISE PERFORMANCE

Model No. 17-31ATC

Standard Conditions, Zero Wind
Gross Weight — 3325 lbs.

10,000 FEET

Recommended Lean Mixture
No Reserve

RPM	M.P. IN. HG.	% BHP	TAS. M.P.H.	GAL./ HR.	60 Gal. Fuel		75 Gal. Fuel	
					Endurance	Range	Endurance	Range
2400	27	79	201	16.6	3.6	725	4.5	910
	26	76	198	15.9	3.8	745	4.7	935
	25	73	193	15.3	3.9	755	4.9	945
	24	69	191	14.6	4.1	785	5.1	980
	23	66	186	14.3	4.2	780	5.2	975
	22	63	182	13.5	4.4	810	5.6	1010
	21	60	177	12.9	4.7	825	5.8	1030
2300	27	76	198	16.0	3.8	745	4.7	930
	26	73	194	15.4	3.9	755	4.9	945
	25	71	192	14.8	4.1	780	5.1	970
	24	68	189	14.2	4.2	800	5.3	1000
	23	65	185	13.7	4.4	810	5.5	1015
	22	62	180	13.1	4.6	825	5.7	1030
	21	60	177	12.8	4.7	830	5.9	1035
2200	27	73	193	14.9	4.0	775	5.0	970
	26	70	191	14.4	4.2	795	5.2	995
	25	67	189	13.8	4.4	820	5.4	1025
	24	65	185	13.3	4.5	835	5.6	1045
	23	62	180	12.8	4.7	845	5.9	1055
	22	60	177	12.6	4.8	845	6.0	1055
	21	57	171	12.0	5.0	855	6.3	1070

CRUISE PERFORMANCE

Model No. 17-31ATC

Standard Conditions, Zero Wind
Gross Weight — 3325 lbs.

15,000 FEET

Recommended Lean Mixture
No Reserve

RPM	M.P. IN. HG.	% BHP	TAS. M.P.H.	GAL./ HR.	60 Gal. Fuel		75 Gal. Fuel	
					Endurance	Range	Endurance	Range
2400	27	79	214	16.6	3.6	775	4.5	965
	26	76	207	15.9	3.8	780	4.7	975
	25	73	203	15.3	3.9	795	4.9	995
	24	69	198	14.6	4.1	815	5.1	1015
	23	66	194	14.3	4.2	815	5.2	1015
	22	63	188	13.5	4.4	835	5.6	1045
	21	60	183	12.9	4.7	850	5.8	1065
2300	27	76	207	16.0	3.8	775	4.7	970
	26	73	204	15.4	3.9	795	4.9	995
	25	71	199	14.8	4.1	805	5.1	1010
	24	68	195	14.2	4.2	825	5.3	1030
	23	65	192	13.7	4.4	840	5.5	1050
	22	62	187	13.1	4.6	855	5.7	1070
	21	60	182	12.8	4.7	855	5.9	1065
2200	27	73	203	14.9	4.0	815	5.0	1020
	26	70	199	14.9	4.2	830	5.2	1035
	25	67	195	13.8	4.4	850	5.4	1060
	24	65	192	13.3	4.5	865	5.6	1085
	23	62	187	12.8	4.7	875	5.9	1095
	22	60	183	12.6	4.8	870	6.0	1090
	21	57	175	12.0	5.0	875	6.3	1095

CRUISE PERFORMANCE

Model No. 17-31ATC

Standard Conditions, Zero Wind
Gross Weight — 3325 lbs.

20,000 FEET

Recommended Lean Mixture
No Reserve

RPM	M.P. IN. HG.	% BHP	TAS. M.P.H.	GAL./ HR.	60 Gal. Fuel		75 Gal. Fuel	
					Endurance	Range	Endurance	Range
2400	27	79	221	16.5	3.6	800	4.5	1000
	26	76	216	15.9	3.8	815	4.7	1020
	25	73	211	15.3	3.9	830	4.9	1035
	24	69	206	14.6	4.1	850	5.2	1060
	23	66	200	14.3	4.2	840	5.3	1050
	22	63	193	13.6	4.4	855	5.5	1070
	21	60	185	12.9	4.7	860	5.8	1075
2300	27	76	216	16.0	3.8	810	4.7	1015
	26	73	212	15.4	3.9	825	4.8	1030
	25	71	208	14.8	4.0	840	5.0	1050
	24	68	203	14.2	4.2	855	5.3	1070
	23	65	197	13.7	4.4	865	5.5	1080
	22	62	192	13.1	4.6	880	5.7	1100
	21	60	185	12.8	4.7	865	5.9	1080
2200	27	73	211	14.9	4.0	850	5.0	1060
	26	70	207	14.4	4.2	865	5.2	1080
	25	67	203	13.8	4.4	885	5.4	1105
	24	65	197	13.3	4.5	885	5.6	1110
	23	62	192	12.8	4.7	900	5.9	1125
	22	60	185	12.6	4.8	880	6.0	1100
	21	57	178	12.0	5.0	885	6.2	1110

CRUISE PERFORMANCE — Model No. 17-31ATC

Standard Conditions, Zero Wind
Gross Weight — 3325 lbs.

24,000 FEET

Recommended Lean Mixture
No Reserve

RPM	M.P. IN. HG.	% BHP	TAS. M.P.H.	GAL./ HR.	60 Gal. Fuel		75 Gal. Fuel	
					Endurance	Range	Endurance	Range
2400	27	79	228	16.6	3.6	825	4.5	1030
	26	76	223	15.9	3.8	840	4.7	1050
	25	73	219	15.3	3.9	860	4.9	1075
	24	69	211	14.7	4.1	870	5.1	1075
	23	66	204	14.3	4.2	855	5.2	1070
	22	63	195	13.5	4.4	865	5.6	1085
	21	60	184	12.9	4.7	855	5.8	1070
2300	27	76	223	16.0	3.8	835	4.7	1045
	26	73	220	15.4	3.7	855	4.9	1070
	25	71	213	14.8	4.1	865	5.1	1080
	24	68	207	14.2	4.2	875	5.3	1095
	23	65	200	13.7	4.4	875	5.5	1095
	22	62	191	13.1	4.6	875	5.7	1095
	21	60	182	12.8	4.7	855	5.9	1065
2200	27	73	217	14.9	4.0	880	5.0	1100
	26	70	213	14.4	4.2	885	5.2	1110
	25	67	207	13.8	4.4	900	5.4	1125
	24	65	200	13.3	4.5	900	5.6	1130
	23	62	191	12.8	4.7	895	5.9	1120
	22	60	184	12.6	4.8	875	6.0	1095
	21	57	162	12.0	5.0	810	6.3	1015

LANDING PERFORMANCE – ALL MODELS

GROSS WEIGHT LBS.	IAS @ 50 Ft.	SEA LEVEL & 59°F		2500 FT. & 50°F		5000 FT. & 41°F		7500 FT. & 32°F	
		Ground Roll	Total To Clear 50 Ft. Obs.	Ground Roll	Total To Clear 50 Ft. Obs.	Ground Roll	Total To Clear 50 Ft. Obs	Ground Roll	Total To Clear 50 Ft. Obs.
3325	90	835	1340	890	1425	950	1520	1015	1625

NOTE

1. Flaps – FULL DOWN
2. Power OFF and maximum braking
3. Sero wind
4. Reduce distance 10% for each 5 KTS of headwind

SECTION VI
SERVICE HANDLING AND CARE
INDEX

ENGINE

Fuel – Aviation grade 100/130 octane minimum

Oil – Aviation grade

Lycoming		Continental	
Above 60°F	SAE 50	Above 40°F	SAE 50
30° to 90°F	SAE 40	Below 40°F	SAE 30
0° to 70°F	SAE 30		
Below 10°F	SAE 20		

LANDING GEAR

Hydraulic Fluid – MIL-H-5606A

Pressure Accumulator – 800 - 900 psi nitrogen

Landing Gear Shock Struts – Compressed air

	Nose	Main
Aircraft on Jacks	60 psi	35 psi
Aircraft on Landing Gear	100 psi	70 psi

Main Gear Tire Pressure – 55 psi compressed air

Nose Gear Tire Pressure – 35 psi compressed air

Lubrication Oil – Machine or engine oil

Lubrication Grease – General purpose grease

Wheel Bearing Grease – High temperature bearing grease

Oxygen – MIL-0-2710 1800 psi at 70°F

SERVICING, HANDLING AND CARE

GENERAL

This section describes routine servicing procedures, ground handling and cleaning instructions.

No information is provided for making mechanical adjustments, repairs or replacement of components. This information is available in the Viking 300 Service Manual.

Consult your nearest Bellanca Service Center for full maintenance and services, as they have the latest factory service recommendations, experience and qualified personnel who are licensed by the F.A.A.

The FAA requires that the aircraft undergo an annual inspection performed by a properly designated individual or repair station. If the aircraft is flown for commercial reasons, an additional inspection is required every 100 hours and must be performed by an appropriately rated mechanic.

Bellanca Aircraft Corporation recommends the 100 hour inspection interval to provide the owner with the highest degree of aircraft utilization and safety at the most economical expense.

Additional inspections such as pre-flight and during routine servicing can be performed by the owner/pilot.

GROUND HANDLING

TOWING

A tow bar is provided with the aircraft and is attached to the nose wheel.

CAUTION

Should the aircraft be towed by a vehicle do not exceed the normal turning limits as damage to the strut will result.

JACKING

Jacking pads are located under the fuselage between the attach points of the forward wing spar. Use a suitable tail support approximately 16 inches high and place under the tail tie down/skid.

NOTE

The aircraft is tail heavy when on jacks. Both front seats may be occupied if necessary.

MOORING

In the event of high winds the aircraft should be properly secured.

1. Head aircraft into the wind if possible.
2. Attach tie-down chains or ropes to retractable wing tie-down fittings and the tail skid.
3. Attach additional ropes to the main and nose gear struts.
4. Secure control yoke using the seat belt and block the rudder pedals.
5. Install a pitot cover.

EXTERNAL POWER RECEPTACLE

The external power receptacle is located under the fuselage aft of the right wing and is wired directly to the aircraft battery. Only external power of 12-14 volts D.C. with negative ground should be used. Use normal starting procedures. It is recommended that the radio master switch be in the OFF position until after the external power is disconnected.

CAUTION

The external power receptable is always live and should not be shorted or connected in reverse polarity.

SERVICING PROCEDURES

See Fig. 6–1 Service Specifications

FUEL SYSTEM

Use 100/130 (green) octane fuel. Observe all required precautions when fueling the aircraft. Fill the wing tanks through the respective filler neck located on the top surface of each wing. The auxiliary fuselage filler neck is located forward of the baggage compartment door.

A fuel drain is provided on the gasolator. The control knob is located on the firewall with access through the rear inspection door on the engine cowling. This should be accomplished prior to each flight.

Additional (2) quick drains are located under the fuselage, midway aft of the wings. These are to be drained under unusually high moisture conditions or if water has been found in the gasolator.

WARNING

After using drains, insure that no leakage is evident.

BATTERY

The battery is located under the baggage compartment floor for easy access. It should be checked every 50 hours or 30 days for proper electrolyte level, which is even with the cell horizontal baffles. Add only distilled water.

If any corrosion is present neutralize with a solution of water and baking soda. Do not allow solution to come in contact with the electrolyte. If battery is to be removed, remove the ground cable first and reinstall last.

BRAKES

The brake fluid reservoir is an integral part of the master cylinder, with one attached to each of the pilot's rudder pedal. Spongy brake pedal action is most often a result of low fluid level. Fill with fluid by removing the filler cap screw on top of each master cylinder.

CAUTION

Use only MIL-H-5606 red hydraulic fluid.

LANDING GEAR HYDRAULIC SYSTEM

The hydraulic level should be checked every 25 hours of operation. A dip stick is located in front of the co–pilot's seat, and is covered with an inspection flap. Fluid level should be up to the "F" mark on the dip stick. Fill through the dip stick tube.

CAUTION

Use only MIL-H-5606 red hydraulic fluid.

LANDING GEAR STRUTS

The air-oil spring type struts require little attention. If retraction problems occur an air pressure reading should be taken using the filler valve located on the side of the struts. If either an air or hydraulic leak is present the strut should be disassembled, and new seals installed.

	Strut Air Pressure	
	NOSE	MAIN
AIRCRAFT ON JACKS	60 psi	35 psi
AIRCRAFT ON LANDING GEAR	100 psi	70 psi

CAUTION

Do not over inflate the struts as the landing gear will not retract. Air pressure can not be determined by strut extension.

ENGINE LUBRICATION

The oil level should be checked prior to each flight and oil added if below 9 qts. Under normal operating conditions, the oil should be changed every 25 hours of operation (Continental) without full flow filter) or every 50 hours of operation (Lycoming) if full flow filter is installed.

The oil is drained by pressing up on the quick drain which is located on the bottom of the oil sump. Access to the quick drain is through the nose wheel opening in the lower cowling.

The full flow oil filter (Lycoming) should be replaced during each oil change.

To change the filter proceed as follows:

1. Remove the top engine cowl.
2. Remove the oil cooler and air duct.
   a. Disconnect 2 oil lines going to oil cooler.
   b. Remove 4 bolts securing cooler to mounting bracket.
   c. Remove 2 bolts inside of air duct.
3. Remove filter assembly and change element.
4. Install using the reverse procedures for removal. The filter assembly must be safety wired to the engine. Check for leakage prior to installing the cowling.

It is recommended that the turbo oil filter be cleaned with solvent at each oil change. It is located on the right engine mount.

Use aviation grade oil only with the proper viscosity as listed in Table 6-1.

ENGINE AIR INTAKE FILTERS

The air filters should be visually inspected every 50 hours of normal operation and cleaned or replaced if dirty.

Lycoming Air Filter

1. Gain access through nose wheel opening in lower cowl.
2. Unsnap air filter fasteners and remove assembly.
3. Remove air filter element and clean with compressed air blowing from inside out. Replace with new element if necessary.
4. Install using the reverse procedures for removal.

Continental Air Filter

1. Remove upper engine cowl.
2. Remove top of air filter box by loosening the fasteners.
3. Replace the air filter element.
4. Install using the reverse procedures for removal.

TIRES

Tire condition should be checked during each preflight. If the tire tread is no longer visible, the tire should be changed. Inflate tire with compressed air.

Nose Tire – 35 psi
Main Tire – 55 psi

LANDING GEAR LUBRICATION

The landing gear should be kept clean and lubricated every 100 hours of operation. Use general purpose grease with grease fittings and machine or engine oil at all pivot points.

CAUTION

Do not use excessive lubricants as dirt will accumulate resulting in rapid wear.

VACUUM FILTER

The vacuum filter should be checked every 50 hours of operation or when the vacuum pressure is below limits. Location is above and to the right of the pilot's right rudder pedal and mounted to the firewall. Remove the 2 thumb screws and lower the filter element. Clean or replace as necessary.

OXYGEN SYSTEM

When replenishing the oxygen system use only Aviator's Breathing Oxygen, MIL-0-2710.

1. Open the main shut-off valve
2. Fill through filter valve to the recommended pressure.

TEMPERATURE	PRESSURE
40°F	1770 psi
70°F	1800 psi
80°F	1975 psi

WARNING

Use clean tools when servicing system. Oil and grease in contact with oxygen is extremely hazardous.

CLEANING

EXTERIOR SURFACE

Wash with a mild soap and water. Avoid the use of harsh abrasives or detergents. Remove grease and oil with solvent or non-leaded gas. The aircraft may be waxed using a good quality automotive wax.

NOTE

Ice may be removed from the wings, using a 50-50 solution of isopropyl alcohol and water, but keep solution away from plexiglass.

WINDSHIELD

The windshield and side windows can be cleaned with any cleanser approved for plastics. If dust or dirt is present, rinse with water prior to cleaning.

CAUTION

Do not use gasoline, benzine, alcohol, acetone, or carbon tetrachloride on plexiglass. Never rub with a dry cloth as scratching will result.

ENGINE AND LANDING GEAR

Wash down the engine compartment and the landing gear struts with a commercial engine solvent or kerosene base solvent. Avoid excessive contact of solvent on the magnetoes, alternator and starter.

INTERIOR

Use any commercial or household upholstery cleanser approved for nylon type materials, following the manufacturers recommendations. For vinyl and plastics, use a mild soap and water.

STORAGE OF AIRCRAFT

Aircraft placed in non-operational storage for long periods of time should be given a thorough cleaning. Approximately every 10 days the propeller should be pulled through several revolutions to reactivate the oil film to reduce corrosion.

WARNING

Check that all engine switches and controls are OFF prior to rotating propeller.

Once a month the aircraft should be flown with the engine reaching normal operating temperatures to reduce excessive moisture build-up in the engine.

Keep the fuel tanks full to prevent accumulation of moisture due to condensation.

SECTION VII
EMERGENCY PROCEDURES
INDEX

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EMERGENCY PROCEDURES

GENERAL

This section covers the recommended procedures to follow during adverse flight conditions. As it is not possible to have a procedure for all types of emergencies that may occur, it is the pilot's responsibility to use sound judgement based on experience and knowledge of the aircraft to determine the best course of action. Therefore, it is considered mandatory that the pilot read the entire manual, especially this section before flight.

NOTE

All airspeeds in this section are indicated (IAS) unless stated otherwise.

FIRE

ENGINE FIRE DURING START

If the fire is confined to intake or exhaust system:

1. Continue cranking engine with starter
2. Fuel Boost Pump – OFF
3. Mixture Control – IDLE CUT
4. Throttle – FULL OPEN
5. Inspect aircraft thoroughly for damage prior to restart

If fire persists, or is not limited to intake or exhaust system:

1. Mixture Control – IDLE CUT–OFF
2. Fuel Selector – OFF
3. Master Switch – OFF
4. Ignition Switch – OFF
5. Exit Aircraft
6. Direct fire extinguisher through the bottom of the nose cowl or through inspection doors on cowl.

ENGINE FIRE IN FLIGHT

1. Mixture Control – IDLE CUT
2. Fuel Selector – OFF
3. Ignition Switch – OFF
4. Master Switch – OFF
5. Cabin Heat – OFF to prevent smoke and fumes from entering cabin
7. Land immediately using "Forced Landing" Procedures
8. Do Not Attempt to restart the engine.

FUSELAGE FIRE IN FLIGHT

1. Reduce Airspeed
2. Cabin Heat and Fresh Air Controls – CLOSED
3. Master Switch – OFF
4; Use hand fire extinguisher if available
5. If fire continues, land immediately.

ELECTRICAL FIRE IN FLIGHT

An electrical fire is usually indicated by an odor of burning insulation.

1. Master Switch – OFF
2. Alternator Circuit Breakers – PULL OUT (2)
3. All Electrical Equipment – OFF
4. Cabin Heat and Ventilation – CLOSED
5. Use hand fire extinguisher if available

If fire continues, land immediately

If fire/smoke stops:

6. Master Switch – ON
7. Alternator Circuit Breakers – RESET
8. Turn on desired electrical equipment one at a time in attempt to isolate the faulty circuit.

SMOKE ELIMINATION FROM CABIN

1. Heating and Ventilation Controls – CLOSE
2. Fresh Air Eyelets – OPEN
3. Pilot's Side Vent – OPEN BELOW 140 MPH
4. Insure that ventilation exhaust vent in baggage compartemnt is clear
5. Cabin Main Door – OPEN to trail position if necessary.

ELECTRICAL MALFUNCTIONS

LOSS OF RADIO EQUIPMENT

1. Radio Master Switch – ALT. position
2. If necessary, cycle both master switches (radio and battery)
3. Check Circuit Breakers – IN

ALTERNATOR FAILURE

1. Check Alternator Circuit Breakers – IN
2. Master Switch – CYCLE OFF, then ON in attempt to reset overvoltage relay

If excessive battery discharge continues:

3. Shut off all nonessential electrical equipment to conserve battery power
4. Land as soon as practical.

COMPLETE ELECTRICAL FAILURE

1. Follow procedures for "Alternator Failure"
2. The following equipment will be inoperative if electrical power cannot be restored:
   a. All Lights, including Gear and Flap Position Lights
   b. All Avionics and Auto-Pilot except ELT
   c. Flap Operation
   d. Normal Gear Operation
   e. Auxiliary Fuel Pump
   f. Electric Trim
   g. Stall and Gear Warning Horn
   h. Fuel Quantity Gauges
   i. Fuel Pressure Gauge (Turbo Model Only)
   j. CHT, Oil Temperature Gauges
   k. Turn Coordinator
3. Land as soon as practical using Emergency Gear Extension procedures.

RUNAWAY ELECTRIC TRIM

Any time that a trim malfunction is suspected the Trim Disconnect Switch should be in the OFF position, using only the manual system.

1. Apply required force on the elevator to maintain desired flight attitude.
2. Electric Trim Disconnect Switch – OFF
3. Master Switch – OFF if necessary to stop trim movement
4. Retrim using manual system

AUTO–PILOT MALFUNCTION

The auto-pilot should not be engaged during take-offs, the final landing stage, or if a trim malfunction is suspected.

1. Apply required control forces to maintain desired flight attitude
2. Auto-pilot Disconnect Switch – OFF if applicable
3. Auto-pilot Engage Switch – OFF
4. Master Switch – OFF if necessary to disengage system

ENGINE MALFUNCTION

The most probable cause of complete or partial power loss in flight is due to fuel starvation or ignition malfunction. Engine indications should always be closely monitored, as most situations can be prevented if proper action is taken before hand.

ENGINE FAILURE ON TAKE–OFF

If sufficient runway remains:

1. Throttle – CLOSED
2. Use Maximum Braking

If airborne and insufficient runway remains for landing:

1. Fuel Selector – SWITCH TO OTHER MAIN TANK
2. Aux. Fuel Pump – PRIME, until fuel flow/pressure is restored then as required
3. Mixture – FULL RICH
4. Magnetos – CHECK BOTH

If no restart is possible:

5. Select most favorable landing area ahead
6. Gear – DOWN
7. Flaps – DOWN just prior to landing

WARNING

Maintain flying speed at all times and do not attempt to turn back to the runway unless sufficient altitude is achieved.

ENGINE AIR RESTART

1. Maintain Airspeed – 110 MPH minimum recommended
2. Ignition – ON BOTH
3. Mixture – FULL RICH or as required at high altitude
4. Fuel Selector – SWITCH TO OTHER FULLEST TANK
5. Auxiliary Fuel Pump – PRIME, until fuel flow/pressure is restored then as required
6. If engine driven pump failure is suspected, leave auxiliary fuel pump ON, otherwise OFF
7. If restart is not possible, change throttle and mixture settings in attempt to restart
8. Follow "Forced Landing" procedures if necessary.

PARTIAL POWER LOSS/ROUGH RUNNING

1. Airspeed – 110 MPH or more
2. Mixture – FULL RICH
3. Auxiliary Fuel Pump – ON
4. Ignition – CHECK both
5. If no improvement noted, change mixture, throttle and RPM settings and check ignition L & R, and BOTH.
6. Land as soon as practical using "Precautionary Landing Approach" procedures.

ABNORMAL OIL PRESSURE/TEMPERATURE INDICATION

Oil pressure and temperature problems are usually related, with one affecting the other. Before any drastic action is taken, cross check other engine instruments and control settings.

High oil temperatures is generally a result of loss of oil, overheating engine (note CHT) or malfunctioning oil cooler by-pass valve. If situations remain unchecked, oil pressure usually drops with possible damage to the engine. Power should be reduced, maintain cruise airspeed and land as soon as practical.

Little or no oil pressure indication is usually caused by a failed oil pressure regulator relief valve, pump, loss of oil, clogged oil passage, high engine temperature or faulty gauge. The result can be a loss of propeller control followed by complete engine failure. A landing should be made as soon as practical using as little throttle and RPM changes as possible. Plan a Precautionary Landing Approach as complete engine failure is imminent.

High oil pressure is normally caused by a malfunctioning pressure regulator valve or a clogged oil passage. Reduce RPM in attempt to lower pressure and land as soon as practical.

UNCONTROLLABLE OR RUNAWAY PROPELLER

This is usually a result of loss of engine oil pressure, governor control linkage or failed governor.

1. Throttle – REDUCE MAP to prevent overspeed
2. Airspeed – REDUCE by raising nose of aircraft
3. Propeller Control – CYCLE in attempt to regain control
4. Land as soon as practical using Precautionary Landing Approach Procedures.

TURBO OIL PRESSURE WARNING LIGHT

The light will illuminate under low oil pressure conditions to the turbo-charger units, due to a clogged turbo oil filter or ruptured oil line.

1. Turbo Control – FULL IN
2. Continue flight under normal aspirated power
3. Monitor oil pressure and temperature gauges.

WARNING

Oil may be pumped overboard due to a leaking or ruptured turbo oil line and will be indicated by rising oil temperatures and decreased oil pressure A landing should be made immediately using minimum RPM as loss of all engine oil may result within a 5-10 minute period.

TURBO–CHARGER OVERBOOST

1. Turbo Control – FULL IN
2. Throttle – REDUCE as necessary if turbo control has no affect on MAP
3. Land as soon as practical.

CAUTION

If an excessive overboost condition is suspected, the engine and induction system should be in–spected for possible internal damage, and blown seals/gaskets.

LANDING EMERGENCIES

PRECAUTIONARY LANDING APPROACH

A precautionary landing approach should be used whenever power is still available but a complete power failure is considered imminent.

Maintain a higher and closer than normal pattern, in an attempt to remain in gliding distance of the intended point of landing. Use the normal landing procedures with the following exceptions:

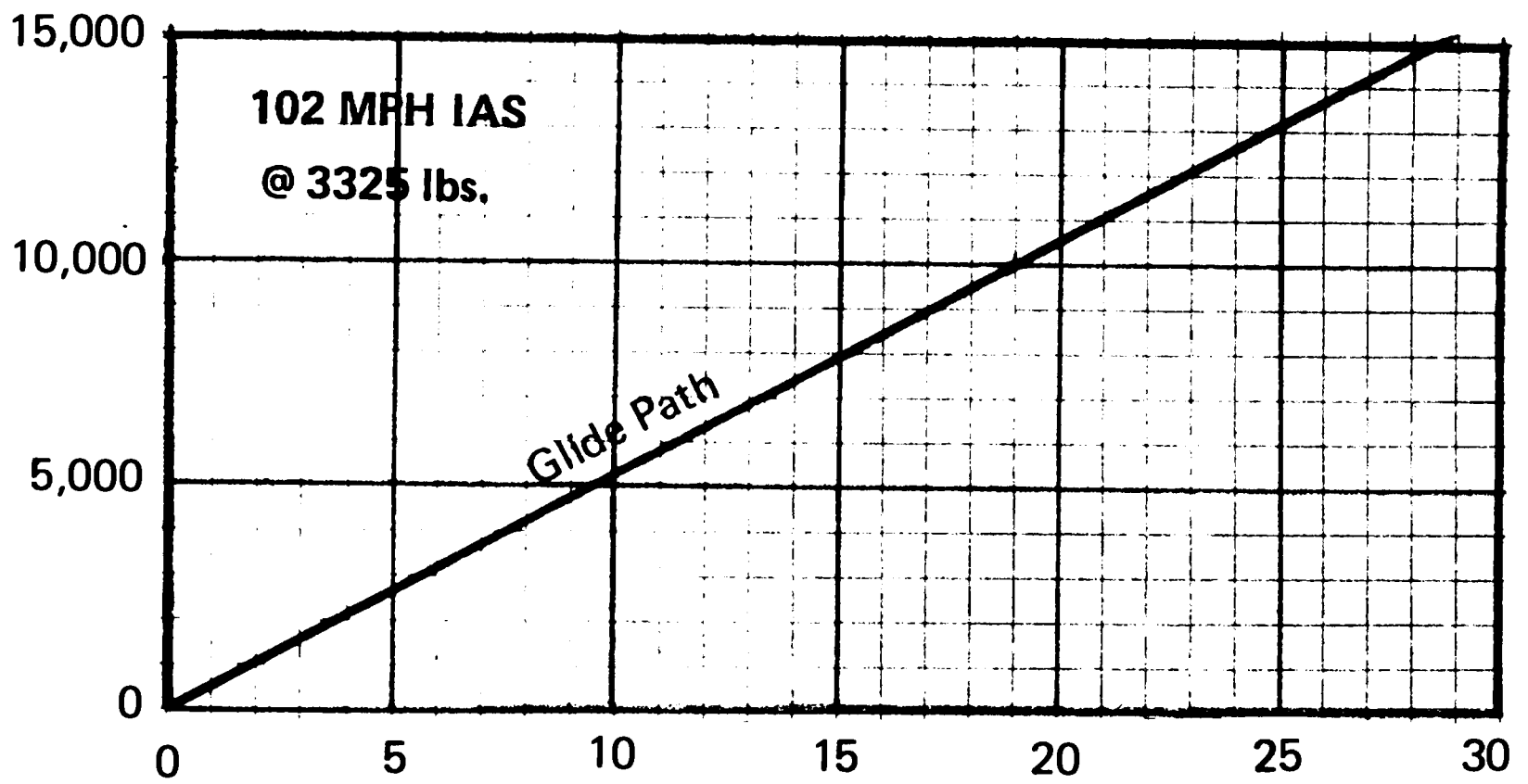
1. Gear – DOWN and LOCK when established downwind
2. Airspeed – 100 MPH minimum
3. Throttle – CLOSED when in gliding distance to runway
4. Flaps – LOWER AS NEEDED to increase approach descent angle.

FORCED LANDING (COMPLETE POWER FAILURE)

If a landing on rough terrain is anticipated, for the safety of the occupants, it is recommended that the landing gear and flaps be FULL DOWN. This will allow minimum touch-down speeds and a more gradual deceleration.

1. Airspeed – SLOW to 110 MPH, or BEST GLIDE SPEED
2. Mixture – IDLE CUT
3. Fuel Selector – OFF
4. Throttle – FULL OPEN, to reduce engine back pressure and prevent Auto-Axion gear from extending
5. Propeller – FULL DECREASE RPM to increase glide range
6. Master Switch – ON unless fire hazard exists
7. Flaps – UP to increase glide range
8. Radio – MAYDAY freq. 121.5 MHz
9. Attempt to position the aircraft 1500 feet AGL over the intended point of landing or 1000 feet AGL when downwind and abeam the intended point of landing with 100 MPH minimum.
10. Gear – DOWN use EMERGENCY EXTENSION LEVER if necessary
11. Cabin Door – OPEN in trail position
12. Flaps – FULL DOWN after intended point of landing is assured
13. Master Switch – OFF just prior to touchdown
14. Touchdown with minimum airspeed
15. After coming to a complete stop
    a. Emergency Locator Beacon -– ON
    b. Exit aircraft

MAXIMUM GLIDE (Power Off)



NOTE

1. Airspeed – 102 MPH @3325 lbs. Reduce 1 MPH/100 lbs. less than 3325 lbs.
2. Gear and Flaps – UP
3. Throttle – FULL OPEN to prevent gear from extending
4. Propeller – FULL DECREASE RPM
5. Mixture– IDLE CUT–OFF

DITCHING

Should it become necessary to make a forced landing over water, follow the procedures for "FORCED LANDING" with the exception:

1. Gear – UP
2. Land into wind if high winds are evident or parallel to swells with calm winds
3. Contact water with slight nose high attitude
4. DO NOT STALL prior to touchdown

NOTE

Land with power if available. The master switch must be OFF to prevent the auto-axion gear from extending.

FLIGHT INSTRUMENT MALFUNCTIONS

LOW VACUUM PRESSURE

Low vacuum pressure is usually due to a clogged vacuum filter resulting in sluggish operation of the attitude and directional gyro.

If the gyros are needed for flight, the filter may be removed in flight. It is located on the firewall to the right and above the pilot's right rudder pedal. Remove the two thumb screws on the bottom of the filter assembly and lower the filter element.

This is recommended only in emergency conditions as unfiltered air is harmful to the gyro instruments.

LOSS OF PITO–STATIC INSTRUMENTS

This includes airspeed, altimeter and the vertical speed indicator and is usually a result of an obstructed pito or static air opening.

1. Pitot Heat – ON
2. Alternate Static Source – ON if pitot heat has no affect

WARNING

If pilot's vent window is open while using alternate static source, note the alternate static source airspeed and altimeter corrections listed in Section II of the manual or on the placard located on the pilot's left console.

LANDING GEAR MALFUNCTIONS

LANDING GEAR EMERGENCY EXTENSION

This procedure is to be used if the landing gear does not extend by normal means, as a result of a hydraulic or electrical failure.

1. Airspeed – Slow to 90 MPH using HALF flaps
2. Gear Switch – DOWN
3. Emergency Gear Extension Lever – DEPRESS DOWN
4. Gear Position Lights – 3 GREEN if electrical power is available
5. If necessary make abrupt pull-ups at a safe altitude in attempt to drop gear down. Do not stall aircraft.

NOTE

If the event of complete electrical failure no light indications are available. However the gear can be considered DOWN after the nose gear 'thumps' into place. If possible, have another aircraft make a visual inflight check or make a low pass over the runway for a visual check by ground personnel, to determine the gear position.

LANDING GEAR UNSAFE INDICATIONS

1. Circuit Breakers – CHECK IN (2)
2. Gear Selector Switch – CYCLE
3. Follow procedures for "Landing Gear Emergency Extension"
4. Use "Press to Test" button to determine if bulb is burned out.
5. If "3 GREEN" are showing, gear can be considered DOWN and LOCKED regardless of red "UNSAFE" light.
6. Make a precautionary soft landing on a hard surfaced runway if possible, using little or no brakes.

LANDING WITH KNOWN GEAR MALFUNCTIONS

If the landing gear cannot be fully extended the landing should be made with the gear fully retracted. Whenever landing problems are anticipated, use the shoulder and lap belts and advise passengers to protect face and head. Use a hard surface runway whenever possible with rescue equipment standing by.

LANDING WITH GEAR FULLY RETRACTED

1. Use normal landing approach
2. Flaps – UP for hard surface runway to minimize aircraft damage
   – HALF for unimproved runway for lower airspeed
3. Cabin Door – OPEN in trail position
4. Master Switch – OFF
5. When touchdown area is in gliding distance
   a. Throttle – CLOSED
   b. Mixture – IDLE CUT OFF
   c. Fuel Selector – OFF
6. Touchdown at minimum airspeed
7. Exit aircraft immediately after coming to a complete stop.

LANDING WITH ONE MAIN GEAR RETRACTED

1. Use normal landing approach
2. Cabin Door – OPEN in trail position
3. Flaps – HALF
4. After Touchdown
   a. Mixture – IDLE CUT OFF
   b. Fuel Selector – OFF
   c. Master Switch – OFF
5. Hold wing with retracted gear off ground as long as possible with use of ailerons
6. Use max. braking action and rudder after wing contacts ground
7. Exit aircraft after coming to a complete stop

LANDING WITH NOSE GEAR RETRACTED

1. Use normal landing approach
2. Cabin Door – OPEN in trail position
3. Flaps – UP
4. After Touchdown
   a. Mixture – IDLE CUT OFF
   b. Fuel Selector – OFF
   c. Master Switch – OFF
5. Hold nose off runway as long as possible
6. Exit aircraft immediately after coming to a complete stop

OXYGEN FAILURE

1. Check hose connection
2. Descend to or below 10,000 feet

WARNING

If at or above 20,000 MSL a rapid descent should be made immediately to below 15,000 feet.

RAPID DESCENT

In nonturbulent flight conditions the Viking is capable of high rates of descent up to 4500 feet/minute. This manuver should be used only in emergencies as excessive engine cooling results.

1. Turbo Control – FULL IN
2. Throttle – CLOSED
3. Propeller – FULL INCREASE RPM
4. Airspeed – 200 MPH above 15,000 feet
   – 226 MPH below 15,000 feet

If turbulence is expected the descent should be made with the gear DOWN, and 144 MPH maximum.

CAUTION

If the landing gear airspeed limit is exceeded, damage to the gear doors may result. The landing gear should not be retracted until after a ground inspection is made.

UNLATCHED DOOR IN FLIGHT

If the cabin door is not properly locked, it normally will open to the trail position just after take-off. Flight characteristics are unchanged. Return to the field for a normal landing, rather than attempting to close the door in flight.

If the door must be closed in flight, proceed as follows:

1. Slow aircraft to 80 MPH with gear and flaps DOWN
2. Reduce power to idle
3. Bank to the right
4. Simultaneously apply left rudder pull and latch door closed
   Do not stall aircraft.

UNUSUAL FLIGHT CONDITIONS

SEVERE TURBULENCE

1. Airspeed – REDUCE TO 140 MPH or less
2. Maintain level flight attitude with reference to the gyro instruments rather than pitot-static instruments
3. Shoulder Harness and Lap Belt – SECURE
4. Change altitude in attempt to find smoother conditions.

STALLS

The Viking stall characteristics are conventional. The stall warning horn precedes aerodynamic buffeting by 5-10 MPH depending on power settings. Ailerons are still effective in well developed stall conditions. Stall recovery is also conventional, by lowering nose altitude and adding power.

WARNING

Loss of altitude during recovery may exceed 250 feet.

SPINS

Intentional spins are prohibited in this aircraft. Should an inadvertent spin occur use the following spin recovery technique:

1. Reduce throttle to idle
2. Neutralize ailerons, place elevators slightly forward of the neutral position
3. Apply full rudder opposite to the direction of rotation
4. As rotation stops, neutralize rudder and make a smooth recovery from dive.