THE

seneca

DUPLICATE

PILOT'S OPERATING MANUAL

BY

PIPER

This manual is incomplete without an APPROPRIATE FAA APPROVED AIRPLANE FLIGHT MANUAL and an APPROPRIATE WEIGHT AND BALANCE REPORT.

WARNING

EXTREME CARE MUST BE EXERCISED TO LIMIT THE USE OF THIS MANUAL TO APPLICABLE AIRCRAFT. THIS MANUAL REVISED AS INDICATED BELOW OR SUBSEQUENTLY REVISED IS VALID FOR USE WITH THE AIRPLANE IDENTIFIED BELOW WHEN APPROVED BY PIPER AIRCRAFT CORPORATION. SUBSEQUENT REVISIONS SUPPLIED BY PIPER AIRCRAFT CORPORATION MUST BE PROPERLY INSERTED.

MODEL PA-34-200

AIRCRAFT SERIAL NO. 34-7250128 REGISTRATION NO. 4542T

PILOT'S OPERATING MANUAL, PART NUMBER 761 506 REVISION PR871130

PIPER AIRCRAFT CORPORATION
APPROVAL SIGNATURE AND STAMP Anne M. Boyer
Anne M. Boyer

Assurance that the airplane is in an airworthy condition is the responsibility of the owner. The pilot in command is responsible for determining that the airplane is safe for flight. The pilot is also responsible for remaining within the operating limitations outlined by the Airplane Flight Manual, instrument markings, and placards.

This Pilot's Operating Manual is not designed as a substitute for adequate and competent flight instruction, knowledge of the current airworthiness directives, applicable federal air regulations, or advisory circulars. It is not intended to be a guide for basic flight instruction or a training manual for transition from single to multi-engine flying.

If an inconsistency of information exists between the Pilot's Operating Manual and the Airplane Flight Manual approved by the FAA, the Airplane Flight Manual shall be the authority.

A complete or partial replacement of this manual, Part No. 761 506, may be obtained only from Piper Customer Services.

Published by
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Piper Aircraft Corporation
761 506
Issued: March 1972

APPLICABILITY

This manual is applicable to Piper Model PA-34-200 aircraft having serial numbers 34-7250001 through 34-7250189 when Piper Kit 760 607 is installed, 34-7250190 through 34-7250214 when Piper Kit 760 611 is installed and 34-7250215 through 34-7350353. Contact Piper Customer Services for specific information on the application of this manual.

REVISIONS

The information compiled in the Pilot's Operating Manual will be kept current by revisions distributed to the airplane owners.

Revision material will consist of information necessary to update the text of the present manual and/or to add information to cover added airplane equipment.

I. Revisions

Revisions will be distributed whenever necessary as complete page replacements or additions and shall be inserted into the manual in accordance with the instructions given below:

1. Revision pages will replace only pages with the same page number.
2. Insert all additional pages in proper numerical order within each section.
3. Page numbers followed by a small letter shall be inserted in direct sequence with the same common numbered page.

II. Identification of Revised Material

Revised text and illustrations shall be indicated by a black vertical line along the left hand margin of the page, opposite revised, added or deleted material. A line opposite the page number or section title and printing date, will indicate that the text or illustration was unchanged but material was relocated to a different page or that an entire page was added.

Black lines will indicate only current revisions with changes and additions to or deletions of existing text and illustrations. Changes in capitalization, spelling, punctuation or the physical location of material on a page will not be identified by symbols.

III. Original Pages Issued

The original pages issued for this manual prior to revision are given below:

1-1 through 1-4, 2-1 through 2-22, 3-1 through 3-26, 4-1 through 4-34, 6-1 through 6-14, 7-1, 8-1 through 8-16, 9-1 through 9-11.

REVISIONS ISSUED

Current Permanent and Temporary Revisions to the PA-34 Pilot's Operating Manual issued March 10, 1972 are as follows:

761 506 (PR720508)	Permanent Revision to F/M	Dated May 8, 1972
761 506 (PR720707)	Permanent Revision	Dated July 7, 1972
761 506 (PR720802)	Permanent Revision to W/B	Dated August 2, 1972
761 506 (PR720802)	Permanent Revision to F/M General Specifications	Dated August 2, 1972
761 506 (PR720915)	Permanent Revision to F/M	Dated September 15, 1972
761 506 (PR721116)	Permanent Revision to F/M & W/B	Dated November 16, 1972
761 506 (PR721220)	Permanent Revision to F/M & P/O/M	Dated December 20, 1972
761 506 (PR721221)	Permanent Revision to W/B	Dated December 21, 1972
761 506 (PR730525)	Permanent Revision to F/M & W/B	Dated May 25, 1973
761 506 (PR730919)	Permanent Revision to F/M, W/B and P/O/M	Dated September 19, 1973
761 506 (PR731026)	Permanent Revision to P/O/M	Dated October 26, 1973
761 506 (PR740426)	Permanent Revision to F/M, W/B and P/O/M	Dated April 26, 1974
761 506 (PR741014)	Permanent Revision to F/M, W/B and P/O/M	Dated October 14, 1974
761 506 (PR750530)	Permanent Revision to F/M, W/B and P/O/M	Dated May 30, 1975
761 506 (PR750819)	Permanent Revision to F/M and P/O/M	Dated August 19, 1975
761 506 (PR770401)	Permanent Revision to F/M and P/O/M	Dated April 1, 1977
761 506 (PR790323)	Permanent Revision to W/B and P/O/M	Dated March 23, 1979
761 506 (PR830614)	Permanent Revision to F/M and P/O/M	Dated June 14, 1983

REVISIONS ISSUED (cont)

Current Permanent and Temporary Revisions to the PA-34 Pilot's Operating Manual issued March 10, 1972 are as follows (continued)

761 506 (PR871130)	Permanent Revision to W/B and P/O/M	Dated November 30, 1987

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GENERAL SPECIFICATIONS

GENERAL SPECIFICATIONS

PERFORMANCE

Published figures are for Standard PA-34* airplanes flown at gross weight under standard condition at sea level unless otherwise stated. Performance for a specific airplane may vary from published figures depending upon the equipment installed, the condition of engines, airplane and equipment, atmospheric conditions and piloting technique.

Gross Weight (pounds)	4000	4200
Take-off Run (ft) (short field effort, flaps 25)	750	800
Take-off Distance Over 50 ft Barrier (ft) (short field effort, flaps 25)	1140	1235
Minimum Controllable Single Engine Speed (mph)	80	80
Best Rate of Climb Speed (mph) (knots)	105 (91.5)	105 (91.5)
Best Rate of Climb (ft per min)	1460	1360
Best Angle of Climb Speed (mph) (knots)	90 (78)	90 (78)
Best Single Engine Rate of Climb Speed (mph) (knots)	105 (91.5)	105 (91.5)
Single Engine Rate of Climb @ S.L. (ft per min)	230	190
Service Ceiling (ft)	18,800	17,900
Absolute Ceiling (ft)	20,000	19,400
Single Engine Service Ceiling (50 fpm) (left engine out) (ft)**	5200	3650
Single Engine Absolute Ceiling (left engine out) (ft)	6600	5000
Top Speed (mph) (knots)	196 (170)	195.3 (169.8)
Cruising Speed (75% power at sea level) (mph) (knots)	173 (150)	171.6 (149.2)
Cruising Speed (75% power at 6000) (mph) (knots)	187 (162)	186.3 (162)
Optimum Cruising Speed (65% power at 9000) (mph) knots)	185 (160)	183.4 (159.5)
Stalling Speed (gear and flaps down) (power off) (mph) (knots)	67 (58)	69 (60)
Stalling Speed (gear down and flaps up) (power off) (mph) (knots)	73 (63.5)	76 (66)
Landing Roll (flaps down) (ft) (short field)	705***	–
Landing Over 50 ft Barrier (flaps down) (ft) (short field)	1335***	–
Fuel Consumption (75% power) (gph) (both engines)	20.6	20.6
Fuel Consumption (65% power) (gph) (both engines)	18.3	18.3
Cruising Range (75% power at 6000 ft) (mi)	804	804
Cruising Range (65% power at 9000 ft) (mi)	885	885

*200 BHP, Counter-Rotating Engines, 4200 lb. G.W., Maximum Take-off Weight
4000 lb. G.W., Maximum Landing Weight

**5000 Ft. Single Engine Service Ceiling Occurs at 4030 Pounds Gross Weight.

***This value applies only for the conditions stated on the Landing Distance vs Density Altitude Chart.

WEIGHTS

Gross Weight (lbs) Max. Take-off	4200
Max. Landing	4000
Empty Weight (Standard) (lbs)	2625*
USEFUL LOAD (Standard) (lbs)	1575*

*These weights are approximate

POWER PLANT

Right Engine - Lycoming	LIO-360-C1E6
Left Engine - Lycoming	IO-360-C1E6
Rated Horsepower	200
Rated Speed (rpm)	2700
Bore (in.)	5.125
Stroke (in.)	4.375
Displacement (cubic in.)	361.0
Compression Ratio	8.7:1
Dry Weight (lbs)	350.0

FUEL AND OIL

Fuel Capacity (U.S. gal)	98
Unusable fuel	5
Fuel, Aviation Grade (minimum octane)	100/130
Oil Capacity (qts) (each engine)	8

BAGGAGE AREA

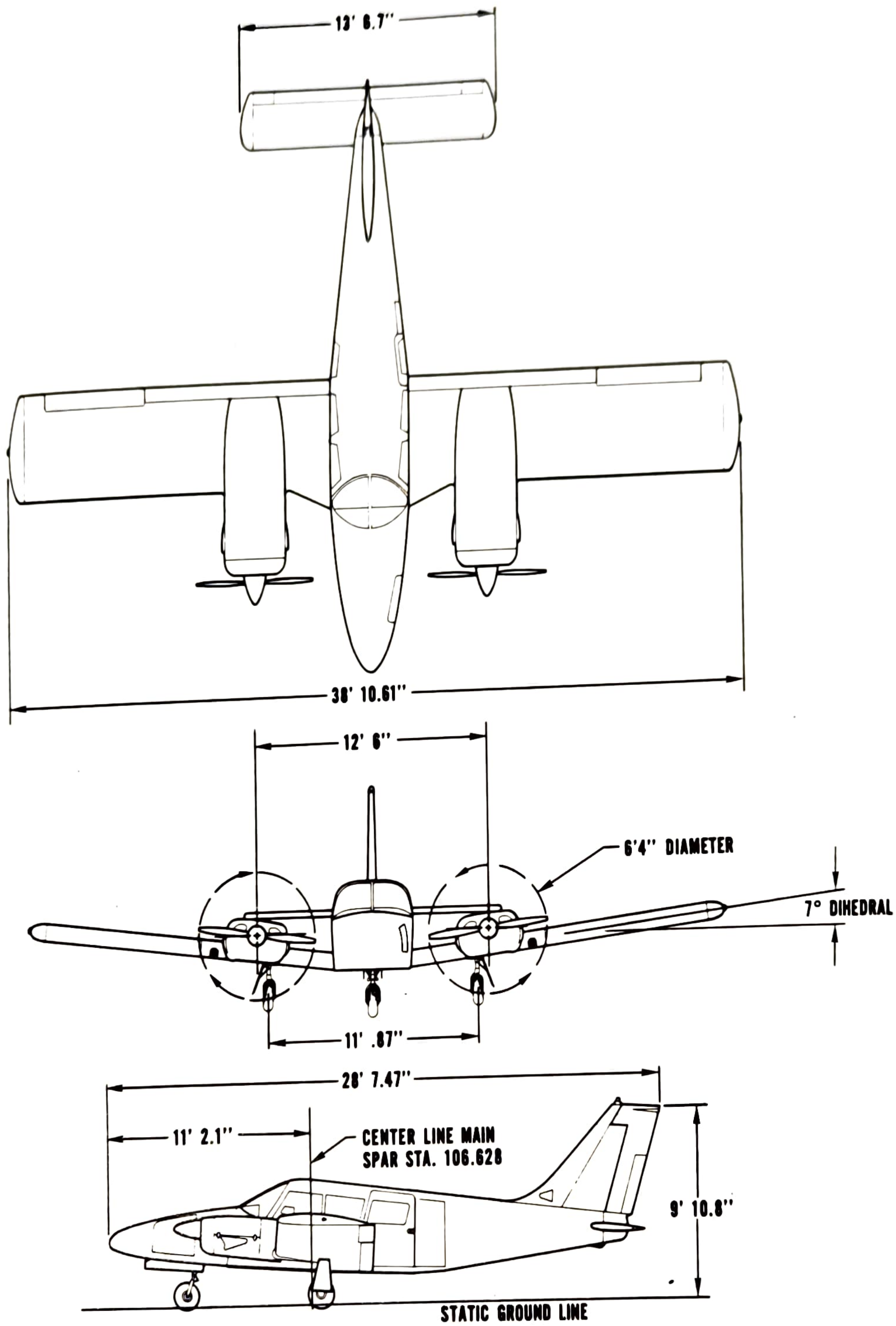
Maximum Baggage (lbs) Forward Compartment	100
Maximum Baggage (lbs) Rear Compartment	100
Baggage Space (cubic ft) Forward Compartment	15.3
Baggage Space (cubic ft) Rear Compartment	20
Baggage Door Size (in.) Forward Compartment	24 x 21

DIMENSIONS

Wing Span (ft)	38.88
Wing Area (sq ft)	208.7
Length (ft)	28.5
Height (ft)	9.9
Wing Loading (lbs per sq ft)	20.1
Power Loading (lbs per hp)	10.5
Propeller Diameter (in.)	76

LANDING GEAR

Wheel Base (ft)		7.0
Wheel Tread (ft)		11.1
Tire Pressure (psi)	Nose	31
	Main	50
Tire Size	Nose (six-ply rating)	6.00 x 6
	Main (eight-ply rating)	6.00 x 6


13' 6.7"
38' 10.61"
12' 6"
6'4" DIAMETER
7° DIHEDRAL
11' .87"
28' 7.47"
11' 2.1"
CENTER LINE MAIN
SPAR STA. 106.628
9' 10.8"
STATIC GROUND LINE

DESCRIPTION

AIRPLANE AND SYSTEM

DESCRIPTION

AIRPLANE AND SYSTEMS

THE AIRPLANE

The Seneca is a twin-engine, all metal retractable landing gear airplane. It has seating for up to seven occupants and two separate luggage compartments.

AIRFRAME

Except for the steel used in the engine mount and landing gear, and the fiberglass used in such portions as the nose and wing tips, the structural components of the airframe are made of aircraft aluminum alloy which has been heat treated and protected from corrosion. The airframe has been designed and tested to a limit positive load factor of 3.8. The Seneca is not designed for aerobatic flight, and consequently aerobatics are prohibited.

The fuselage is a conventional semi-monocoque structure, which has a front door on the right side and a rear door on the left. An additional large-size rear door, which facilitates the loading of large pieces of cargo, is available.

The wing is of conventional metal design using one main spar located at approximately 40% of the chord aft of the leading edge, to take bending loads, and a rear spar for mounting the flaps and ailerons and to assist in taking torque and drag loads. Slotted wing flaps, which are mechanically operated by a four-position handle located between the two front seats, are provided to reduce landing speed and to give the pilot a high degree of glide path control. Two interconnected fuel tanks form an integral part of each wing. Both tanks on one side are filled through a single filler neck located well outboard of the engine nacelle.

The wings are attached to each side of the fuselage by the butt ends of the main spars, which are bolted into a spar box carry through, an integral part of the fuselage structure. There are also fore and aft attachments at the rear spar and at an auxiliary front spar.

The empennage of the Seneca consists of a vertical stabilizer, a rudder, and a horizontal stabilator. The rudder has a trim tab capable of relieving the pilot of excessive pedal force during single-engine operation. The stabilator incorporates an anti-servo tab which improves longitudinal stability and provides longitudinal trim. This tab moves in the direction the stabilator moves but with increased travel.

ENGINES

The 400 total horsepower of the Seneca engines makes possible a high cruise speed and excellent climb performance. The aircraft is powered by two four-cylinder, Lycoming, fuel-injected engines, each rated at 200 horsepower at 2700 RPM. Asymmetric thrust is eliminated during take-off and climb by counter-rotation of the engines, the left engine rotating in a clockwise direction when viewed from the cockpit and the right engine rotating counterclockwise.

The engine compartments are easily accessible for inspection through top-hinged side panels on either side of the engine cowlings. The cowlings are cantilever structures, attached at the firewalls. Engine mounts are constructed of steel tubing, and dynafocal mounts are provided to reduce vibration.

The exhaust system is a crossover type, with exhaust gases directed outboard of the nacelles into muffler-heaters to minimize exhaust noise and provide heated air for the cabin and defroster.

The cowl flaps are located on the bottom of the engine nacelle and are manually operated by control levers below the throttle quadrant. The control levers have three positions: open, intermediate and closed. A lock, incorporated into each control lever, locks the cowl flap in the selected position. To operate, depress the lock and move the control to the desired position. Release the lock after initial movement of the control; the flap will then stop automatically in the next intermediate, open or closed position. The lock must be depressed for each selection of cowl flap.

An oil cooler for each engine is mounted on the forward side of the firewall. Air is picked up by air scoops on the side of the cowl, passed through the oil cooler and ducted overboard in the lower cowling.

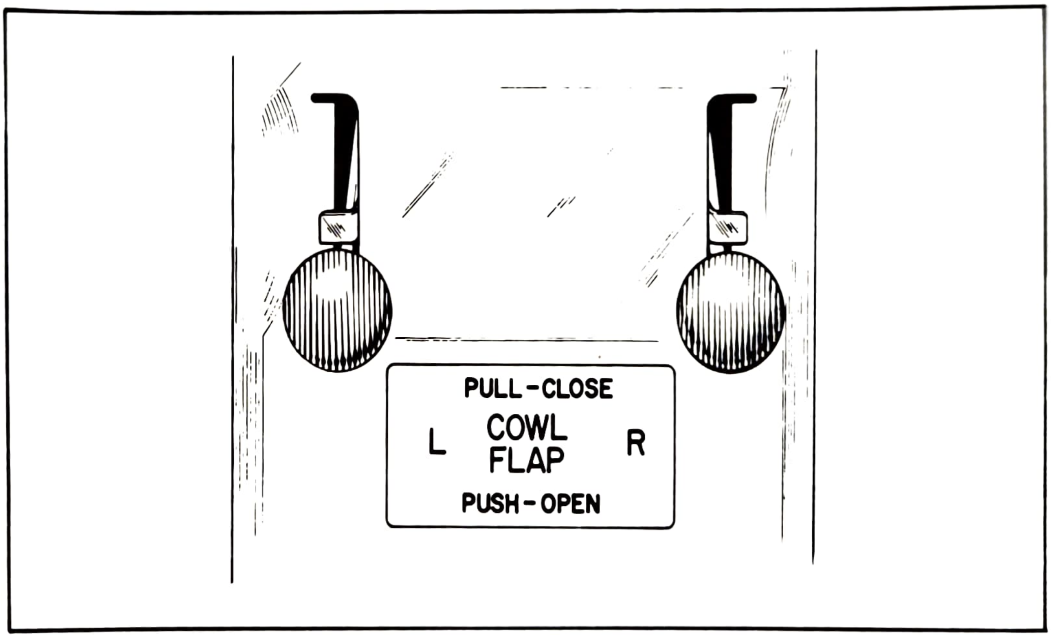
The fuel injection system reduces the possibility of induction system ice and provides better fuel distribution than does a carburetor system. Each engine is equipped with a Bendix RSA-5 fuel injection system, which operates on the principle of measuring engine air consumption and using the air flow to control fuel flow to the engine. Fuel pressure regulation by means of a servo valve causes a minimal drop in fuel pressure throughout the metering system. Metering pressure is maintained above vapor forming conditions, yet fuel inlet pressure is low enough to allow the use of a diaphragm fuel pump. Thus vapor lock and associated problems of difficult starting are minimized.

Mounted on top of the engine is the ported fuel flow divider with four nozzle lines routed to the cylinders. The divider contains a spring loaded positive shut-off valve. Within each cylinder are continuous-flow air bleed nozzles with provisions to eliminate the adverse effects of low manifold pressure when idling. Since fuel metering is provided by the servo regulator rather than the nozzles, more uniform cylinder head temperatures result and longer engine life is possible.

Induction air for the engine enters an air scoop located on the outboard side of the lower cowl. The air is directed through a filter and thence to the servo regulator. To prevent engine malfunction if the air filter becomes blocked, the induction system incorporates a method of providing heated alternate air which does not pass through the filter. Located in the air box between the filter and servo regulator is a valve which is manually operated by the alternate air control located below the power quadrant. Since the alternate air is heated by the crossover exhaust tube, it gives extra protection against icing in the system caused by snow or freezing rain. Alternate air should not be used during ground operation because the unfiltered air may contain dust and other contamination. The primary induction source should always be used for take-off.

All throttle operations should be made with a smooth, not-too-rapid movement to prevent unnecessary engine wear, or damage to dynamic counterweights on the engines.

The pilot should read and follow the procedures recommended in the Lycoming Operator's Manual for this engine, in order to obtain maximum engine efficiency and time between engine overhauls.



Cowl Flap Control

PROPELLERS

Counter-rotation of the propellers provides balanced thrust during take-off and climb and eliminates the "critical engine" factor in single-engine flight.

The propellers are constant speed, controllable pitch, full feathering Hartzell propellers, operated by oil and nitrogen pressure. Compressed air may be used instead of nitrogen, provided it contains no moisture. Oil pressure sends the propeller toward the high RPM or unfeather position, while nitrogen pressure sends the propeller toward the low RPM or feather position and keeps the propeller from overspeeding. The recommended nitrogen pressure to be used when charging the unit is listed on placards on the propeller dome and inside the spinner. This pressure varies with ambient temperature at the time of charging. A governor, mounted on each engine, supplies oil through the propeller shaft at various pressures to maintain constant RPM settings.

Each propeller is controlled by use of the propeller control lever located in the center of the power control quadrant. Feathering of a propeller is accomplished by moving the control fully aft through the low RPM detent, into the feather position. Feathering takes place in approximately six seconds. Unfeathering is accomplished by moving the propeller control ahead and engaging the starter until the propeller is windmilling.

A feathering lock, operated by centrifugal force, prevents feathering during engine shut-down, by making it impossible to feather any time the engine speed is less than 800 RPM. For this reason if an engine is being feathered to save it the pilot must be sure to move the control to feather position before the engine speed drops below 800 RPM.

LANDING GEAR SYSTEM

To increase cruise speed, climb and other performance, the Seneca is equipped with a retractable tricycle landing gear, which is hydraulically operated. Rugged gear construction and a heavy duty braking system permit operation from a wide variety of landing areas.

Hydraulic pressure for gear operation is furnished by an electrically-powered reversible pump controlled by a two-position selector switch located on the instrument panel to the left of the control quadrant. The gear selector switch, which has a wheel-shaped knob, must be pulled out before it is moved to the "UP" or "DOWN" position. When hydraulic pressure is exerted in one direction the gear is retracted; when it is exerted in the other direction the gear is extended. If the landing gear is in transit and the hydraulic pump is running, it is inadvisable to move the gear selector switch to the opposite direction before it has reached its travel limit, because this sudden reversal may be harmful to the electric pump. Retraction or extension normally takes six to seven seconds.

The gear system incorporates a number of features. Gear extension can be accomplished even in the event of hydraulic failure, since the gear is held up by hydraulic pressure. If the hydraulic system develops a leak or if the pressure is relieved for any reason, gravity will cause the gear to extend. Aerodynamic loads and springs assist in extending and locking the gear down. When the landing gear is retracted, the main wheels fold toward the centerline of the airplane and the nose gear retracts forward. Once the nose gear has started toward the down position, the airstream pushes against it and assists in moving it to the locked position. When the three gears are down and the downlock hooks engage, a spring maintains force on each hook in the locked position until it is released by hydraulic pressure.

To get tthe gear to extend and lock if the hydraulic pump fails, it is necessary only to relieve the hydraulic pressure. An emergency gear extension knob, located near the center of the instrument panel, is provided for this purpose. Pulling this knob releases the hydraulic pressure which holds the landing gear in the up position, and the gear can then fall free. A guard over the knob is provided to prevent inadvertent extension of the gear. Prior to pulling the emergency gear extension knob, it is advisable to place the gear selector in the DOWN position to prevent the pump from trying to raise the gear.

If the emergency gear knob has been pulled out to lower the gear by gravity, due to a gear system malfunction, leave the control in its extended position until the airplane has been put on jacks to check the proper function of the landing gears Hydraulic and Electrical systems. See Aircraft Service Manual for proper landing gear system check out procedures. If the airplane is being used for training purposes or a pilot check out mission, and the emergency gear extension has been pulled out, it may be pushed in again when desired if there has not been any apparent malfunction of the landing gear system.

When the gear is fully up or fully down and the selector is in the corresponding position, electrical limit switches stop the flow of current to the motor of the hydraulic pump. Three green lights indicate that the landing gear is down and locked, and a convex mirror on the left engine nacelle enables the pilot to confirm the position of the nose gear. When the gear is not in the full up or the full down position, a red warning light is illuminated on the instrument panel.

To add to the pilot's night vision comfort, the gear lights are automatically dimmed when the navigation lights are turned on. For this reason, if the navigation lights are unintentionally turned on in the daytime, it is difficult to see the landing gear lights. If the green lights are not observed after the landing gear switch is put in the DOWN position, the first thing to check is the position of the switch for the navigation lights.

If one or two of the three green lights do not illuminate when the gear down position has been selected, this could indicate that for each of the lights that is out, any of the following conditions might exist:

a. The gear is not locked down.
b. The bulb is burned out.
c. There is a malfunction in the indicating system.

The square indicating lights can be pulled out and moved around in order to check the bulbs.

A micro switch incorporated in the throttle quadrant activates a warning horn under the following conditions:

1. Gear up and manifold pressure reduced below 14 inches on either one or both engines.
2. Gear selector switch in the UP position when the airplane is on the ground.

If the gear selector knob is placed in the "UP" position when the airplane is on the ground, a safety switch located on the left main gear will prevent the hydraulic pump from actuating if the master switch should be turned on. On take-off, when the oleo extends in excess of eight inches, the safety switch closes to complete the circuit so that the hydraulic pump can raise the landing gear when the gear switch is moved to the "UP" position. On take-off the gear should be retracted before an airspeed of 125 MPH is exceeded. It may be extended at any speed up to 150 MPH.

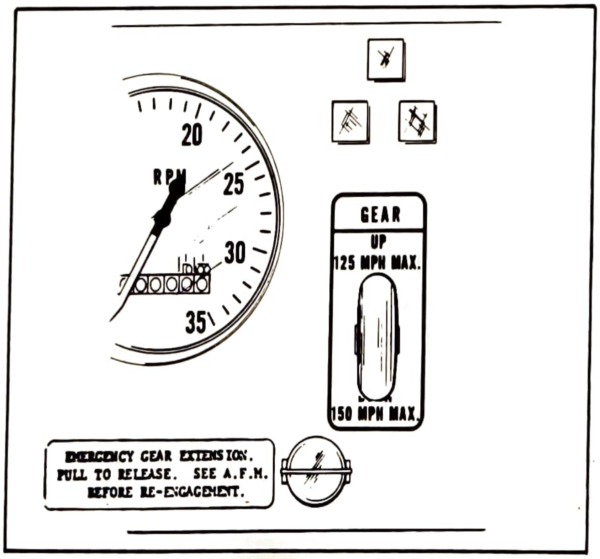
The nose gear is steerable through a 42-degree arc by use of the rudder pedals. As the gear retracts, the steering linkage disengages to reduce rudder pedal loads in flight and the nose wheel straightens as it enters the wheel well. A gear centering spring, incorporated in the nose gear steering system, prevents any tendency to shimmy.

The hydraulic reservoir for landing gear operation is an integral part of the gear hydraulic pump. Access to the combination pump and reservoir is through a panel in the nose baggage compartment. For filling instructions see the Seneca Service Manual.

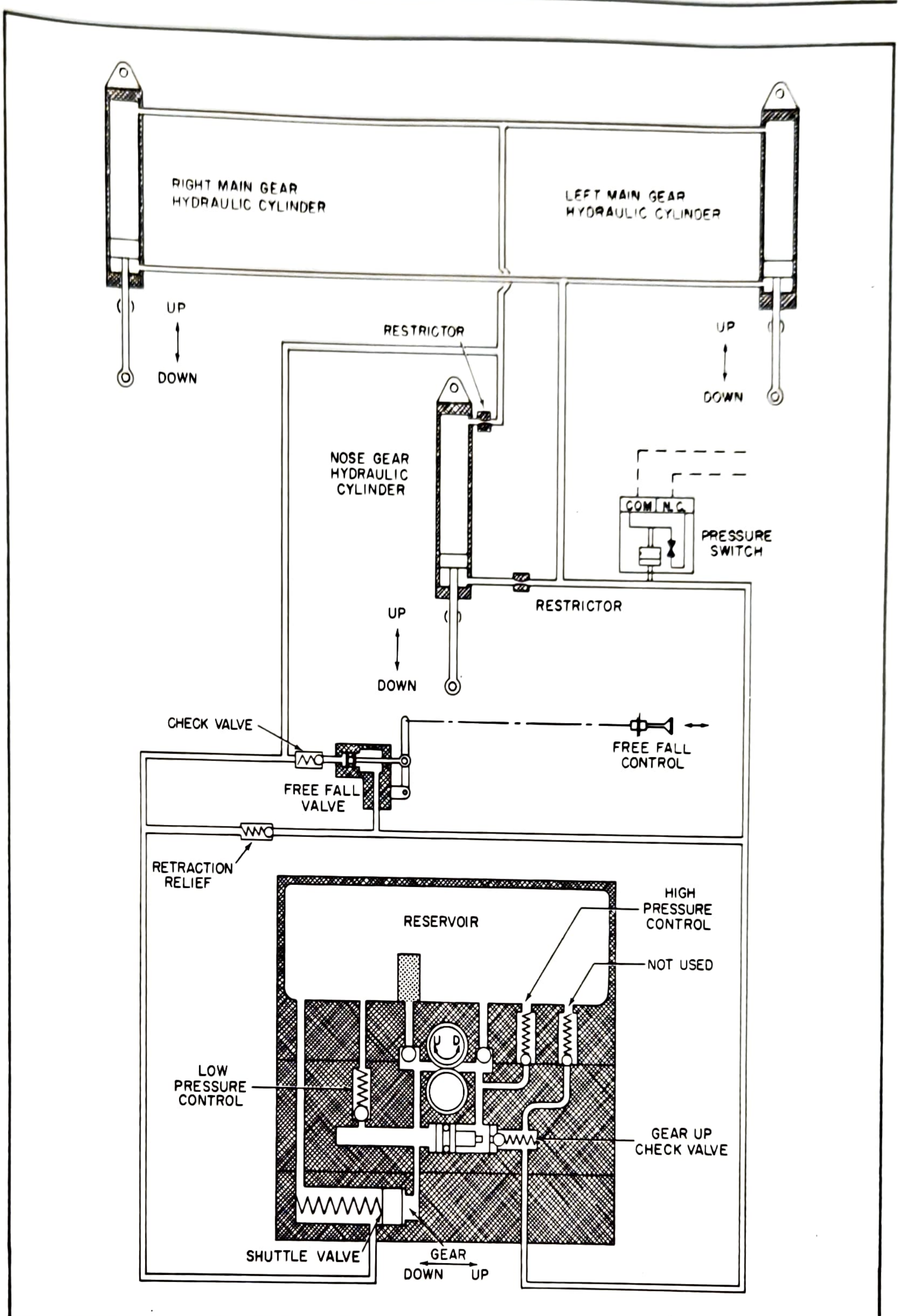
The three landing gear wheels are the same size - 6.00-6. The nose wheel has a 6-ply tire and the main gear has 8-ply tires. Struts for nose and main gear are air-oil assemblies.

The brake system, which incorporates a single-disc double puck brake assembly on each main gear strut, is designed to meet all normal braking needs and to assist in the exceptional short-field landing capabilities of the Seneca. A brake system hydraulic reservoir, independent of the landing gear hydraulic reservoir, is located behind a panel at the rear top of the nose baggage compartment. The fluid should be maintained at the level marked on the reservoir. The brake assemblies are actuated by individual toe brake cylinders mounted on the left (optional on the right) set of rudder pedals and a handle-operated brake cylinder located below and behind the left center of the instrument panel.

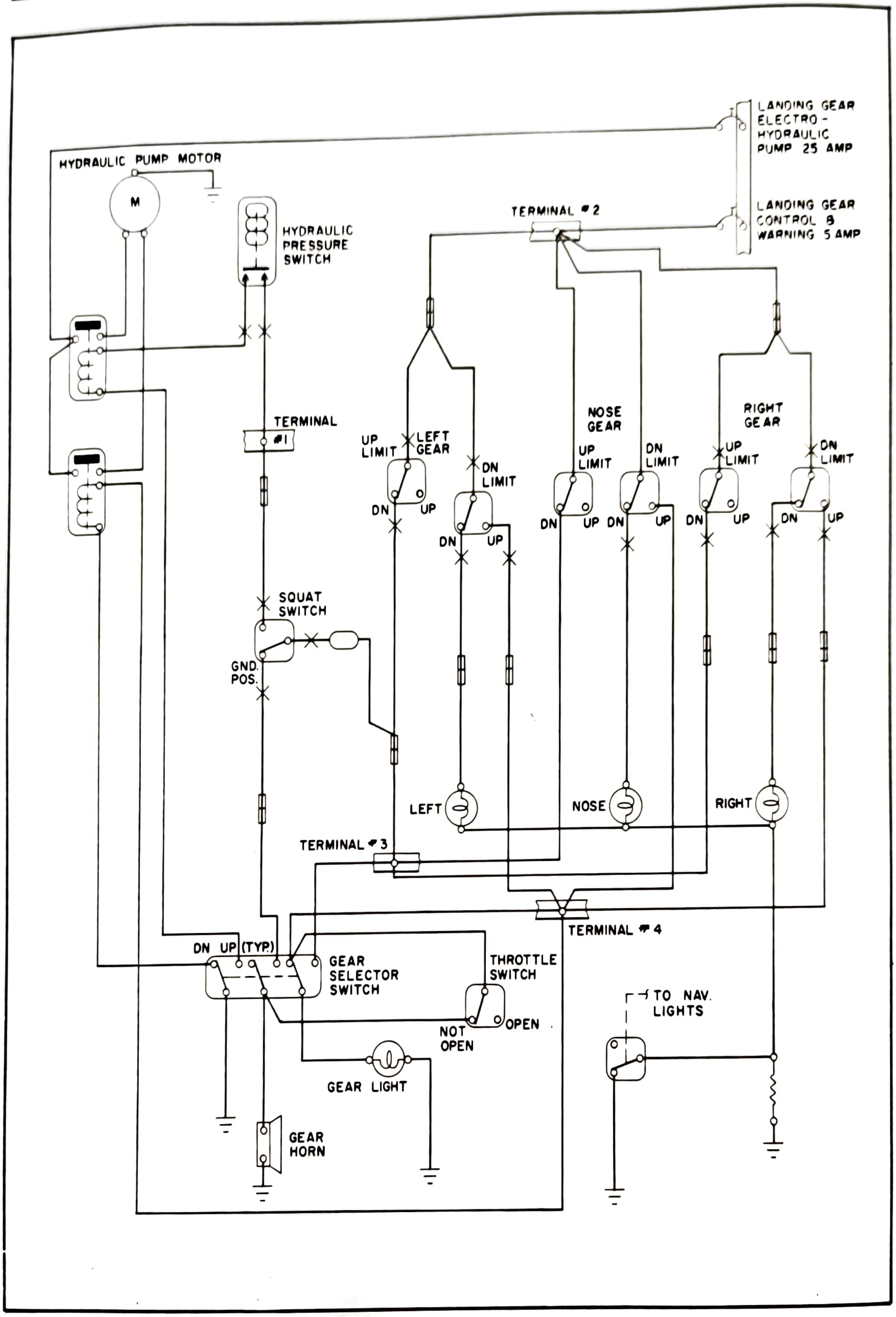
The parking brake is actuated by pulling back on the handle and pushing forward on the button to the left of the handle. The brake can be released by pulling aft on the handle without touching the button, and allowing the handle to swing forward.



Landing Gear Actuator



Hydraulic System Schematic

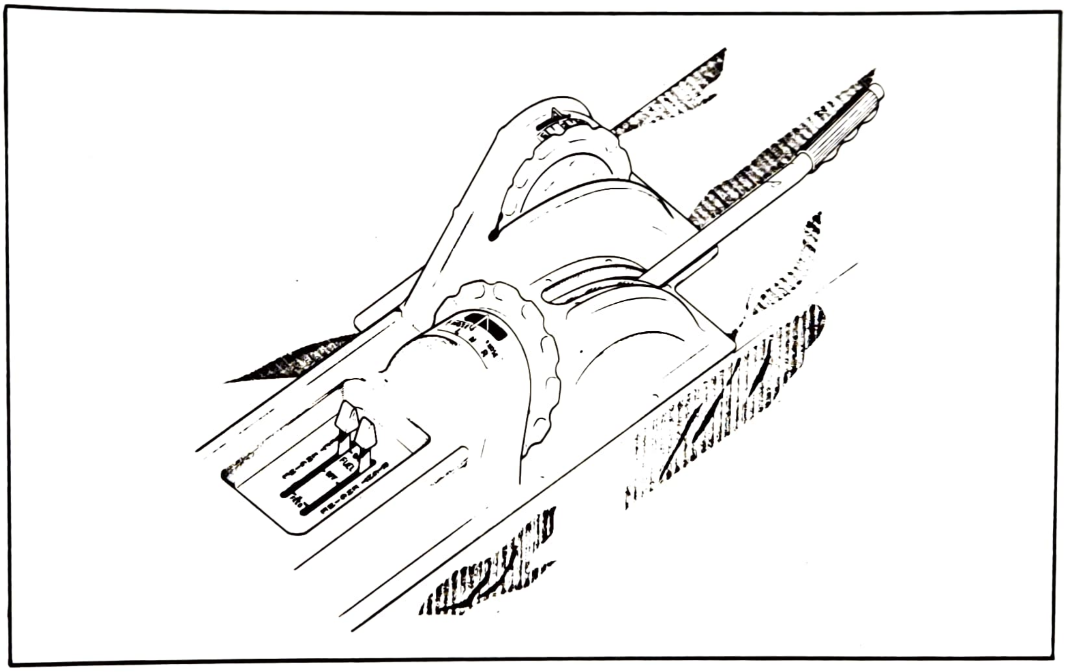


Landing Gear Electrical Schematic

FLIGHT CONTROL SYSTEMS

Dual controls are provided as standard equipment, with a cable system used between the controls and the surfaces. The horizontal tail (stabilator) is of the all movable slab type, with an anti-servo tab which also acts as a longitudinal trim tab, actuated by a control mounted on the control tunnel between the two front seats. The stabilator provides stability and controllability with less size, drag and weight than the more conventional horizontal stabilizer-elevator combination. The ailerons are provided with a differential action and are lightly interconnected by springs with the rudder. This arrangement tends to eliminate adverse yaw in turning maneuvers and to reduce the amount of coordination required in normal turns.

The flaps are manually extended, aerodynamically balanced for light operating forces and spring loaded to return to the retracted position. The flap control lever is located between the front seats on the floor. A button on the end of the lever must be depressed before moving the control. A past center lock incorporated in the actuating linkage holds the flap when it is in the retracted position so that it may be used as a step on the right side. Since the flap will not support a step load except when in the full retracted position, it should be completely retracted when people are entering and leaving the aircraft. The flaps have three extended positions, 10, 25 and 40 degrees.



Console

FUEL SYSTEM

The Seneca fuel system offers two 24.5 gallon aluminum tanks in each wing which are interconnected to eliminate probelms of tank selection and fuel management. Both tanks in each wing are filled with a single opening in the outboard tank, and fuel from the outboard tank flows into the inboard tank as the fuel from the inboard tank is consumed. The 98 gallon fuel capacity has only 2-1/2 unusable gallons on each side, making a total of 93 usable gallons. The fuel must to 100/130 octane (light green).

An engine-driven fuel pump is the primary means of supplying fuel for each engine. An electric fuel pump, located on the aft side of the firewall, is provided for each engine as a back-up in case of engine-driven fuel pump failure. The electric pump should be used during landings and take-offs to ensure sufficient fuel pressure in case of an engine-driven fuel pump failure during these portions of the flight sequence. Switches for the electric fuel pumps are conveniently located on the switch panel to the left of the pilot.

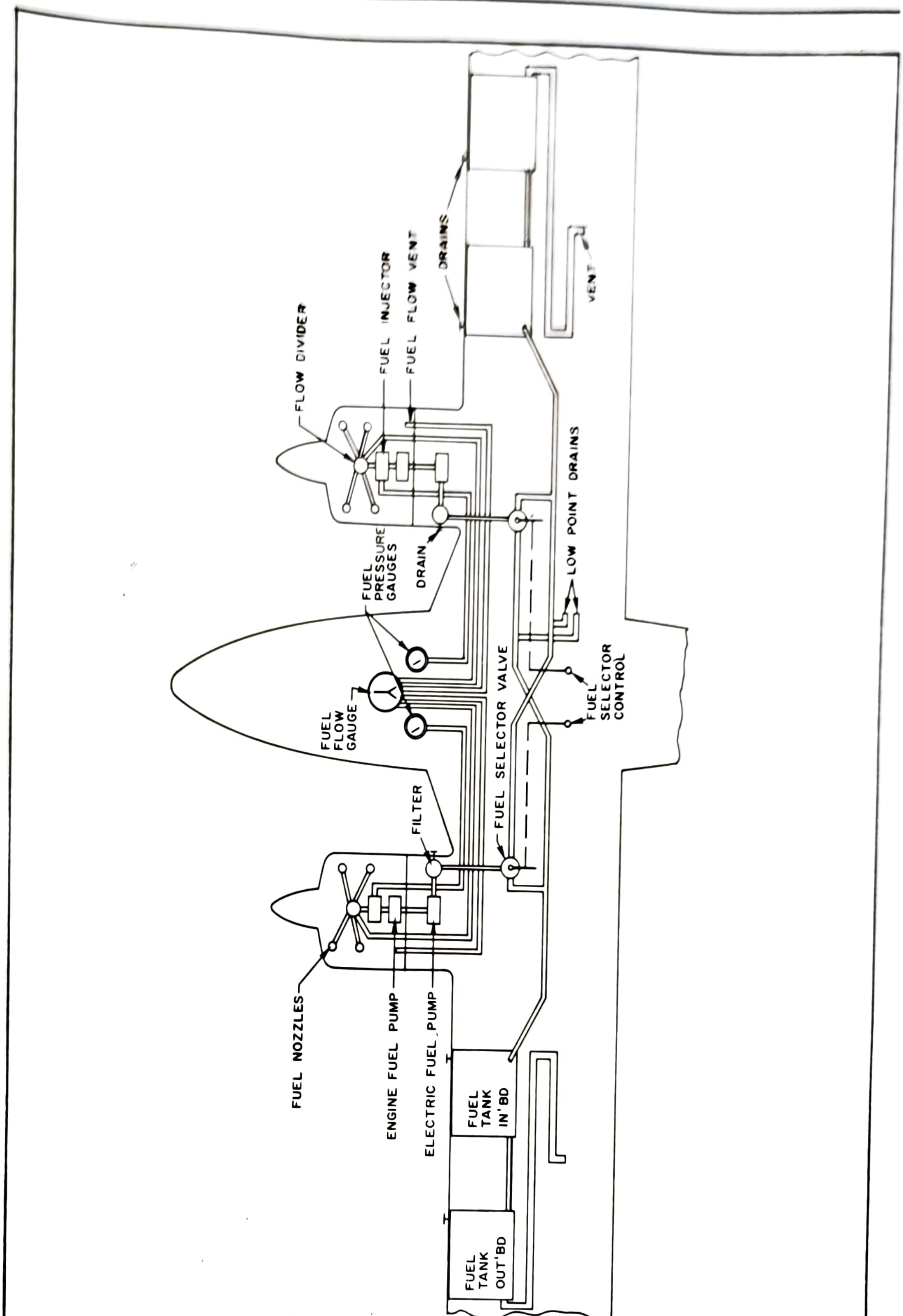
In normal operation, each engine operates with an independent fuel system, drawing fuel from the tanks in the wing on the same side as the engine. However, the two systems are interconnected by crossfeed lines which will permit an engine to use fuel from the tanks on the opposite side in order to extend single-engine range and to enable the pilot to keep fuel weight balanced. When crossfeed has been used during single-engine cruise operation, prior to landing the fuel selector should be positioned so that fuel is used from the same side as the operating engine. The fuel selectors, located on the funnel between the pilot and the copilot seats, reflect the simplified fuel system. Each lever has three positions: OFF, ON and CROSSFEED.

NOTE

Do not operate with both fuel selectors on CROSSFEED. Do not take off with a selector on CROSSFEED.

To permit the pilot to monitor the system, fuel pressure, fuel flow and fuel quantity gauges (a single fuel gauge for the two tanks in each wing) are mounted on the instrument panel. Fuel quantity sender units, one mounted in each fuel tank, transmit elelctrically the total quantity of fuel in each pair of tanks.

A gascolator (fuel filter) is located between the fuel selector valve and the electric fuel pump on each side. Quick drains are provided for the fuel gascolators (2), for each fuel tank (4) and each crossfeed line (2). Two fuel tank drains are located under each wing; crossfeed drains are located under the belly of the aircraft opposite the trailing edge of the right wing flap; gascolator drains are on the inboard side of the engine nacelles, forward and below the leading edge of the wing. The vent system for the fuel tanks consists of a vent in each fuel cap, a vent interconnect between the tanks in each wing, and an overflow line from the top of each filler neck.



Fuel Schematic

ELECTRICAL SYSTEM

The electrical system of the Seneca is capable of supplying current for complete night IFR equipment. Electrical power is supplied by two 60-ampere alternators, one mounted on each engine. A 35 ampere-hour 12 volt battery provides current for starting, for use when the engines are not running, and for a source of stored electrical power to back up the alternator output. The battery, which is located in the nose section and is accessible through the forward baggage compartment, is normally kept charged by the alternators. If it becomes necessary to charge the battery, it should be removed from the airplane.

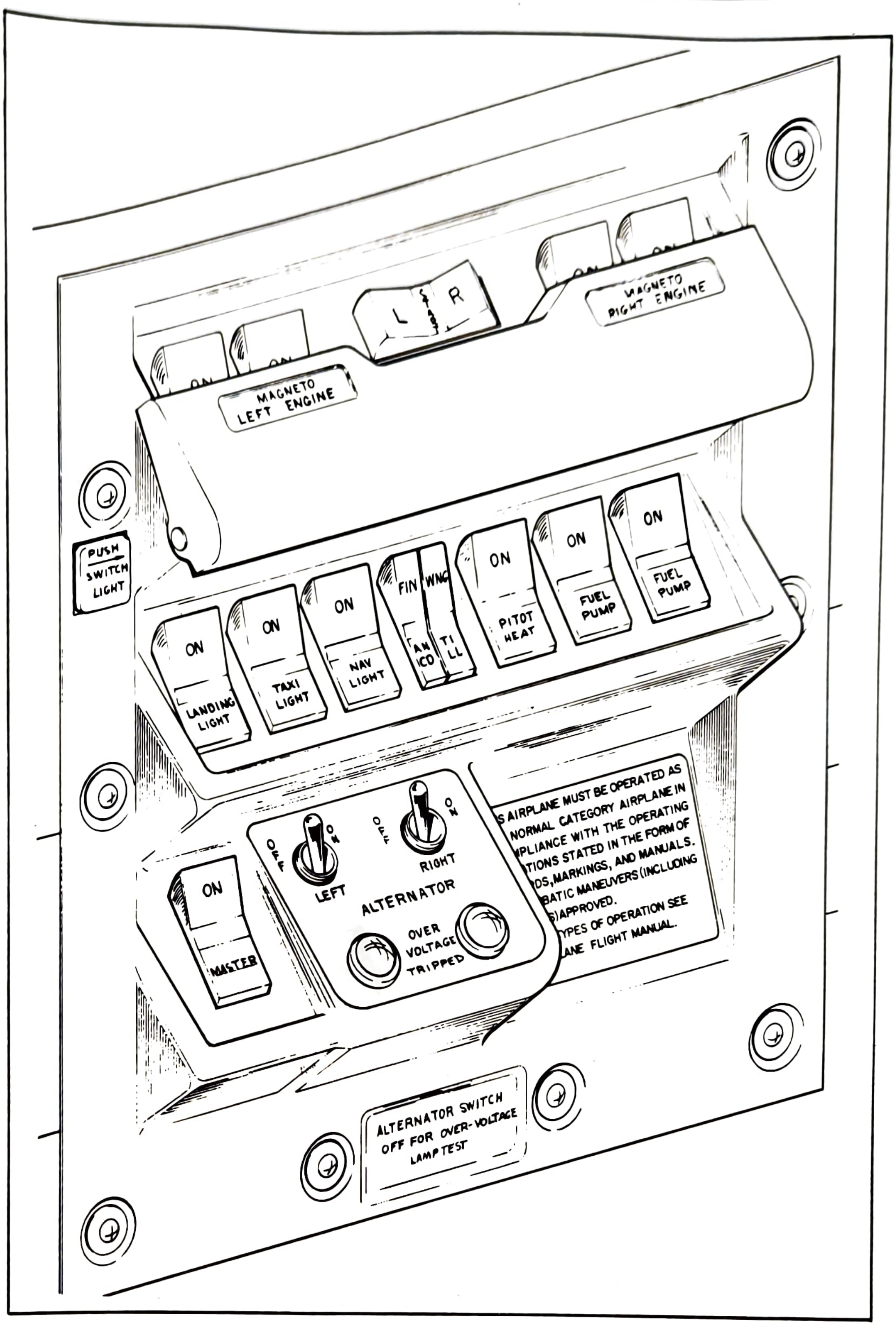
An external power source plug is available as optional equipment, and when installed is located on the lower left side of the nose. While an external 12-14 volt power source is being plugged in or unplugged, the master switch should be in the OFF position to prevent sparking. The master switch should be in the ON position, however, for engine starting with external power.

Two solid state voltage regulators are provided to maintain effective load sharing while regulating the electrical system bus voltage to 14.0 volts. In each alternator circuit an overvoltage relay is provided to prevent electrical damage to electrical and avionic equipment, by taking the alternator off the line if its output goes above 14.0 volts. When this occurs, a red light located on the left side switch panel illuminates to indicate that the overvoltage relay has tripped. This is the only finction of this light; it does not necessarily come on for other failures of the alternator system. Voltage regulators and overvoltage relays are mounted on the forward side of the bulkhead at station 49.5

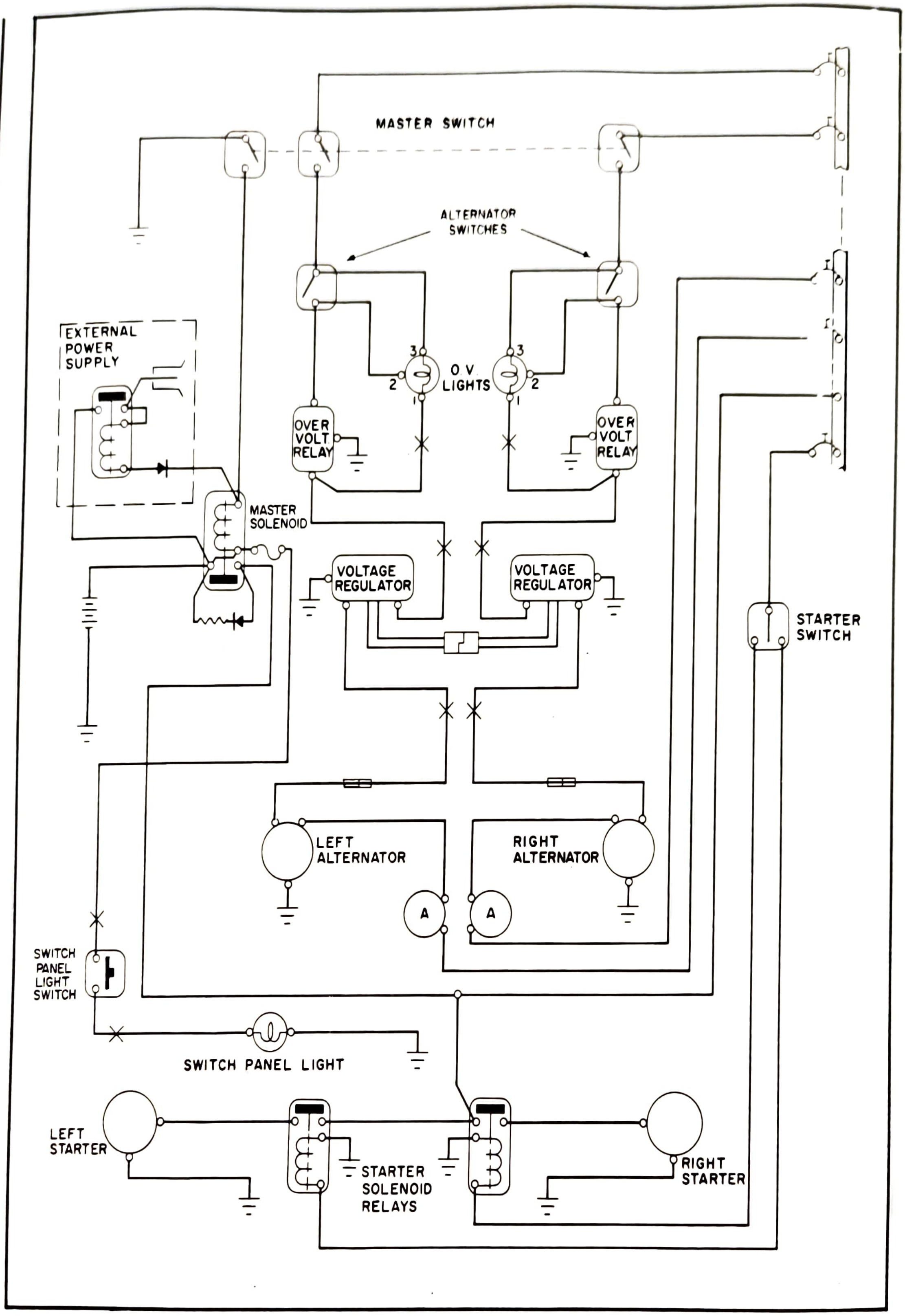
Circuit breakers are provided to protect equipment and the electical system. These are located on the lower right hand instrument panel, and there is room for additional circuit breakers if extra electrical equipment is installed. A circuit breaker may trip automatically in case of equipment malfunctions or a sudden surge of current. The pilot can then reset it by pushing it in (preferably after a few minutes cooling period). However, he cannot pull out a circuit breaker manually.

Most of the electrical switches, including the master switch and those for the magnetos, fuel pumps, starter, alternators, lights and pitot heat, are conveniently located on the switch panel to the left of the pilot. A press switch near the top of the alternator-master switch panel turns on a light which is wired around the master switch and which permits the pilot to inspect the panel at night before turning on the master switch.

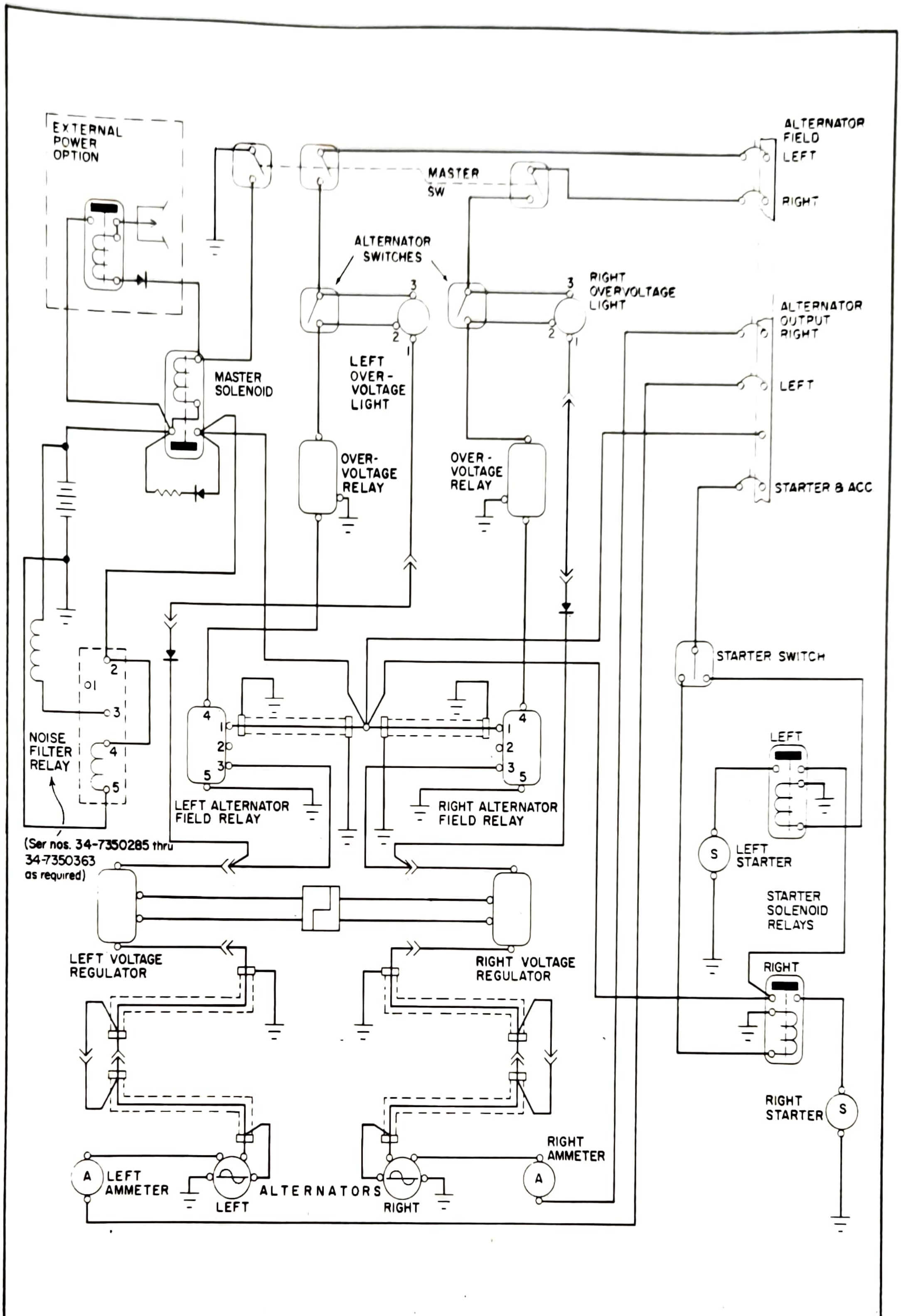
The alternator system has the advantage of being able to produce rated electrical output at low engine speed. The pilot of the Seneca is provided with an easy means of monitoring electrical system operation with dual ammeters and overvoltage warning lights. An ammeter is provided for each alternator. This acts as a load-meter, showing the amount of current being produced by the particular alternator. A zero reading would indicate that the alternator was not producing current. An indication near 60 would show that the electrical demand was taxing the alternator. In this case the pilot should turn off unnecessary electrical equipment to reduce the current required. When operating on a single engine, the pilot should be on guard against demanding too much from the one operating alternator because an overloaded alternator may burn out or its circuit breaker may trip.



Switch Panel



Alternator and Starter Schematic (Ser. Nos. 34-7250001 thru 34-7350135)



Alternator and Starter Schematic (Ser. Nos. 34-7350136 thru 34-7350363)

When all electrical equipment is turned off (except the master switch), the ammeters will indicate current being used to charge the battery and operate instrumentation. If the sum of the two readings is significant, this is an indication that the battery has a low charge. The pilot should try to determine why it is low, and if no cause is apparent the condition of the battery and the electrical system should be checked by a mechanic.

If during flight both alternators should fail, the battery becomes the only source of electrical power. Therefore all unnecessary equipment should be turned off. How long the battery will be able to supply the necessary equipment depends on the current drain of the equipment, time it took the pilot to notice the dual failure and the condition of the battery.

During night or instrument flight the pilot should continuously monitor the ammeters and warning lights so that he can take prompt corrective action if electrical malfunction occurs. Procedures for dealing with electrical malfunction are covered in the Airplane Flight Manual.

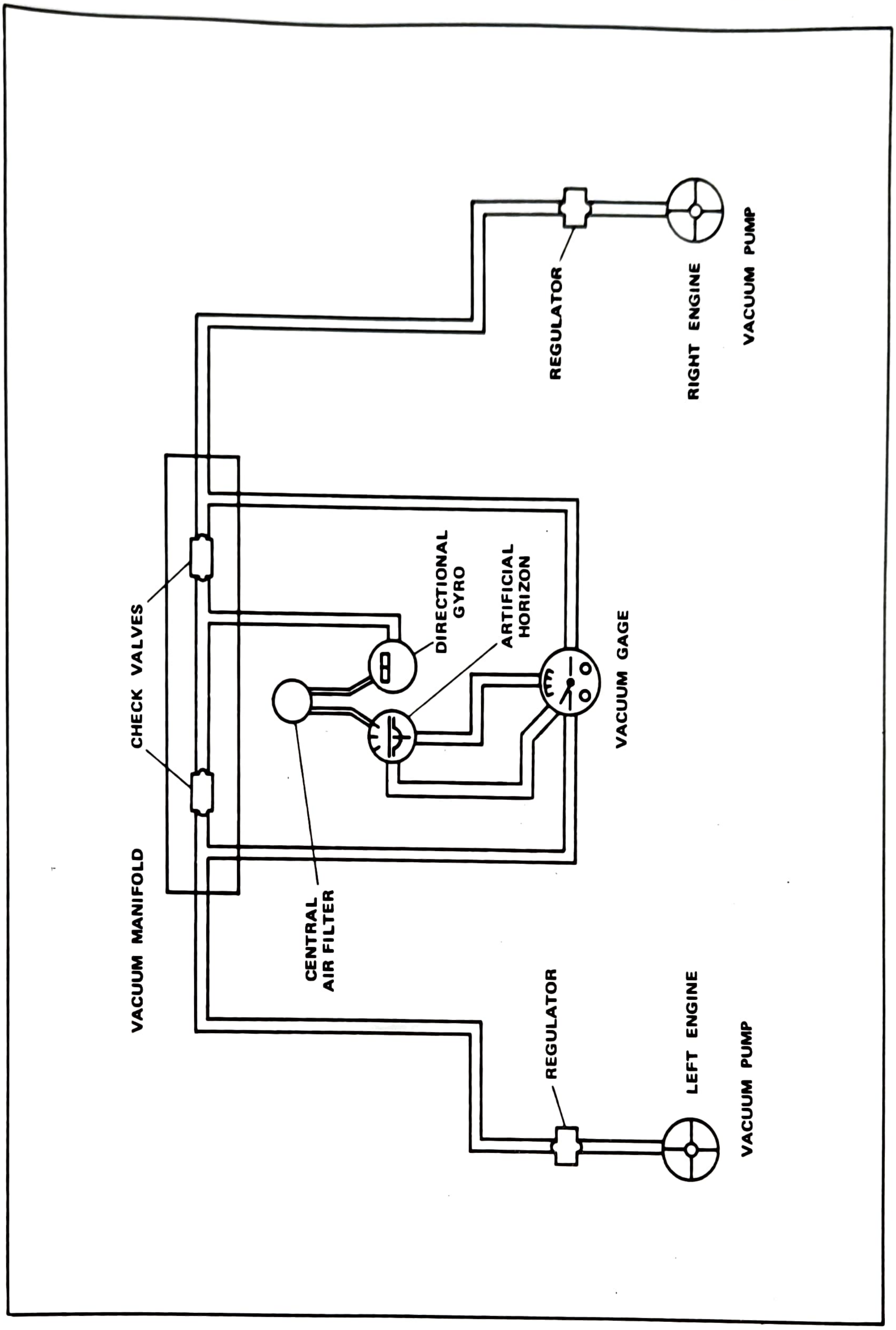
VACUUM SYSTEM*

The directional gyros and attitude indicators are operated by air drawn from the cabin through a filter and the instruments to the engine nacelle by a vacuum system. The vacuum system consists of one vacuum pump installed on each engine, plus plumbing and regulating hardware. If a second set of gyro instruments is installed, a second filter will be added for these instruments. The instruments are protected by a vacuum regulator mounted on the right aft side of each firewall. The regulators maintain a vacuum of 5.0 ± .1 inches of mercury at 2000 RPM. Suction is indicated by a vacuum gauge mounted to the left of the right control column. A vacuum less than 4.5 indicates a low air flow through the gyro instruments, with possibly inaccurate readings. Also incorporated in the system is a check valve, which is located behind the instrument panel on the upper right side of the baggage compartment bulkhead.

If suction is lost from either vacuum pump or from a leak in the hose of either side, the valve automatically closes and vacuum is supplied by one pump. In this case, one of two red malfunction buttons appears on the face of the vacuum gauge, indicating that vacuum is not available from that side. Each pump alone has sufficient capacity to operate a dual set of gyro instruments up to a 12,500-foot altitude. When operating with a single vacuum pump above that altitude, a high RPM setting must be maintained to get adequate suction for dual flight instruments.

Air filters are incorporated in the vacuum system to increase the life of the gyros. They are mounted behind the instrument panel in the upper corners of the baggage compartment and should be cleaned regularly.

*Optional Equipment



Vacuum Schematic

INSTRUMENT PANEL

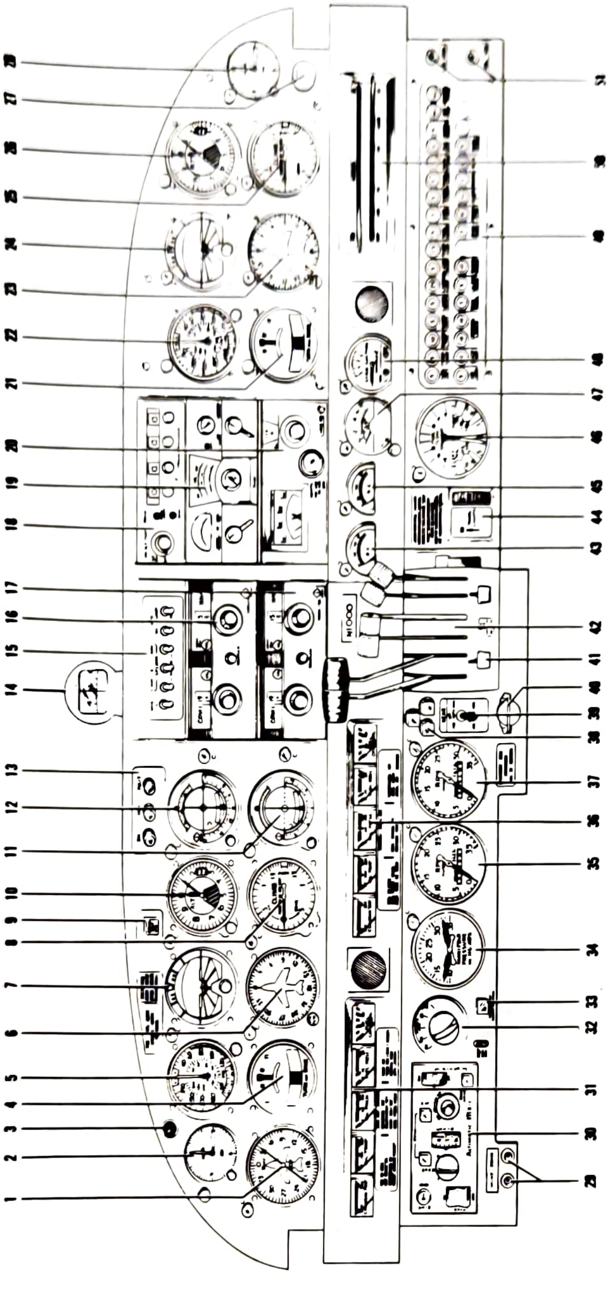
The wide instrument panel of the Seneca offers sufficient space for two complete sets of flight instruments plus engine instruments and avionics, with ideal grouping and no crowding. Dual flight instruments are optional, and a wide range of additional optional instruments and avionics permits an equipment selection uniquely suited to individual needs. Flight instruments and avionics are grouped in the upper panel, while engine instruments, autopilot, electrical instruments and circuit breakers are located on the lower panel. Left engine and right engine instruments are conveniently separated by the control wheel shaft on the left side. In spite of the large instrument panel, over-the-nose visibility is good. A combination of white post lights (optional) and red floodlights ensure easy reading of the instruments at night.

PITOT-STATIC SYSTEMS

Pitot (total) pressure for the airspeed indicator is sensed by the aluminum mast mounted under the left wing. Static pressure for the altimeter, vertical speed and airspeed indicators is sensed by two static pressure units, one located on each side of the rear part of the fuselage. Differences in static pressure caused by a slip or skid are balanced out by a connection of the two static sources inside the fuselage.

The pitot mast can be equipped with a heating element to eliminate problems from ice or heavy rain. The static pressure sensors are not heated because experience indicates they are not likely to ice up. An alternate static source control valve is located below the instrument panel, to the right of the power quadrant. When the valve is set to alternate position, the altimeter, vertical speed indicator and airspeed indicator will be using cabin pressure for static pressure. These instruments may then give slightly different readings, depending on the situation within the cabin. Airspeed, setting of the heating and ventilating controls, or position of the storm window can influence cabin pressure. A pilot can see how his alternate static pressure affects the instruments, by switching from one source to the other at different airspeeds and ventilation configurations (including open storm window below 150 MPH).

The holes in the sensors for pitot and static pressure must be fully open and free from dirt, bugs and polish. If one or more of the pitot-static instruments malfunctions these pressure systems should be checked for leaks, dirt or water. If moisture is present, the static system can be drained by turning on the alternate static system. The selector valve is located at the low point of the system. Another drain is provided in the lower left front side panel to drain moisture from the pressure line running between the pitot mast and the instrument panel.



1. ADF INDICATOR
2. CLOCK
3. STALL WARNING LIGHT
4. TURN AND BANK INDICATOR
5. AIRSPEED INDICATOR
6. DIRECTIONAL GYRO
7. ATTITUDE GYRO
8. VERTICAL SPEED INDICATOR
9. GEAR UP LIGHT
10. ALTIMETER
11. OMNI INDICATORS
12. OMNI AND GLIDE SLOPE INDICATORS
13. MARKER BEACON RECEIVER LIGHTS
14. MAGNETIC COMPASS
15. AUDIO CONTROL PANEL
16. COMMUNICATIONS AND NAVIGATION TRANSCEIVERS (NO.-1.)
17. COMMUNICATIONS AND NAVIGATION TRANSCEIVERS (NO.-2.)
18. TRANSPONDER
19. ADF RECEIVER
20. DME CONTROL AND INDICATOR
21. TURN AND BANK INDICATOR (COPILOTS)
22. AIRSPEED INDICATOR (COPILOTS)
23. DIRECTIONAL GYRO (COPILOTS)
24. ALTITUDE GYRO (COPILOTS)
25. VERTICAL SPEED INDICATOR (COPILOTS)
26. ALTIMETER (COPILOTS)
27. CIGAR LIGHTER
28. CLOCK (COPILOTS)
29. MIKE AND PHONE JACKS
30. ALTIMATIC IIIB-I AUTOPILOT
31. LEFT ENGINE AND FUEL INSTRUMENT CLUSTER
32. OMNI-COUPLER
33. PITCH TRIM
34. MANIFOLD PRESSURE GAUGE
35. LEFT ENGINE TACHOMETER
36. RIGHT ENGINE AND FUEL INSTRUMENT CLUSTER
37. RIGHT ENGINE TACHOMETER
38. LANDING GEAR DOWN LIGHTS
39. LANDING GEAR SELECTOR
40. LANDING GEAR FREE FALL VALVE CONTROL
41. ALTERNATE AIR CONTROL
42. CONTROL QUADRANT
43. LEFT AMP METER
44. PANEL LIGHT SWITCH
45. RIGHT AMP METER
46. FUEL FLOW AND PRESSURE GAUGE
47. EGT GAUGE
48. GYRO SUCTION GAUGE
49. CIRCUIT BREAKER PANEL
50. HEAT AND DEFROST CONTROLS
51. MIKE AND PHONE JACKS (COPILOTS)

Instrument Panel

HEATING, VENTILATING AND DEFROSTING SYSTEM

The heating and ventilating system is designed to provide maximum comfort and controllability for pilot and passengers, with variable temperature-fresh air controls on the instrument panel and individual fresh air outlets controlled by the occupants.

Cabin and defrost heat is provided by a heat exchanger mounted on the exhaust manifold of each engine. Air is taken in through a scoop on the outboard side of each cowling and is then ducted through the heater muff, where it is heated by the exhaust manifold. A heat and defrost valve located on the forward side of the firewall sends some of the air directly to the windshield outlets when defrost is selected and sends the rest of the air to the temperature-fresh air control box, which regulates the temperature of the air to be introduced into the cabin interior. Fresh air for the cabin interior is taken in through inlets located in the leading edge of each wing. The fresh air is forced into the temperature-fresh air control box where it is mixed with heated air from the heat exchanger (as selected) and then into the cabin interior.

The cabin heat and defroster controls are located on the right side of the instrument panel. The defroster is equipped with a blower for use during ground operation to defog the windshield. The blower is energized when the mechanical defroster control lever is placed in the "full on" or "hi" position. The blower can be turned off in flight by moving the control lever away from the "full on" or "hi" position approximately one inch. When cabin heat and defrost heat controls are in the "OFF" position, heated air from the heat exchanger is dumped overboard. If maximum defrosting is desired, the heat to the cabin interior should be turned off and the defroster turned full on. An outlet near the feet of each occupant permits a flow of either heated or ventilating air, as selected by the control on the instrument panel.

Individual overhead fresh air outlets supply fresh air from an inlet located on each side of the lower leading edge of the vertical fin. The air is ducted to a plenum chamber and then to each individual adjustable outlet located in the ceiling. The amount and direction of air can be regulated for individual comfort. Rotating the rim of the outlet regulates the amount of air (clockwise to decrease the amount, counterclockwise to increase it), and moving the outlet in the desired direction of the air flow regulates the direction.

COMBUSTION HEATER*

An optional Janitrol combustion heater installed in the aft fuselage provides added air for cabin heating and windshield defrosting. The combustion heater can be used to supplement the standard muff-heater system.

Operation of the combustion heater is controlled by a three position switch located on a heater control console between the pilot's and copilot's seats, and labeled FAN, OFF, and HEATER. The "FAN" position will operate the ventilation blower only and may be used for cabin ventilation or windshield defogging on the ground when heat is not desired.

The defroster control lever for the standard muff-heater system must be in the "HI" position in order to energize the defroster blower any time defrosting or defogging is desired, with or without heat.

*Optional Equipment

For cabin heat, the air intake lever located on the heater control console must be partially or fully open and the three position switch set to "HEATER." This will start fuel flow and ignite the burner simultaneously. With instant starting and no need for priming, heat should be felt within a few seconds. Two safety switches which are installed and activated by the intake valve located aft of the Janitrol heater unit are wired to prevent both fan and heater operation unless the air intake lever is moved off the closed position.

Regulating the combustion cabin heat and airflow is accomplished by adjusting levers on the heater control console between the pilot's and copilot's seats. The right hand lever regulates the air intake valve. The left hand lever regulates cabin temperature. Cabin temperature and air circulation can be maintained by using various combinations of lever settings to suit individual desires.

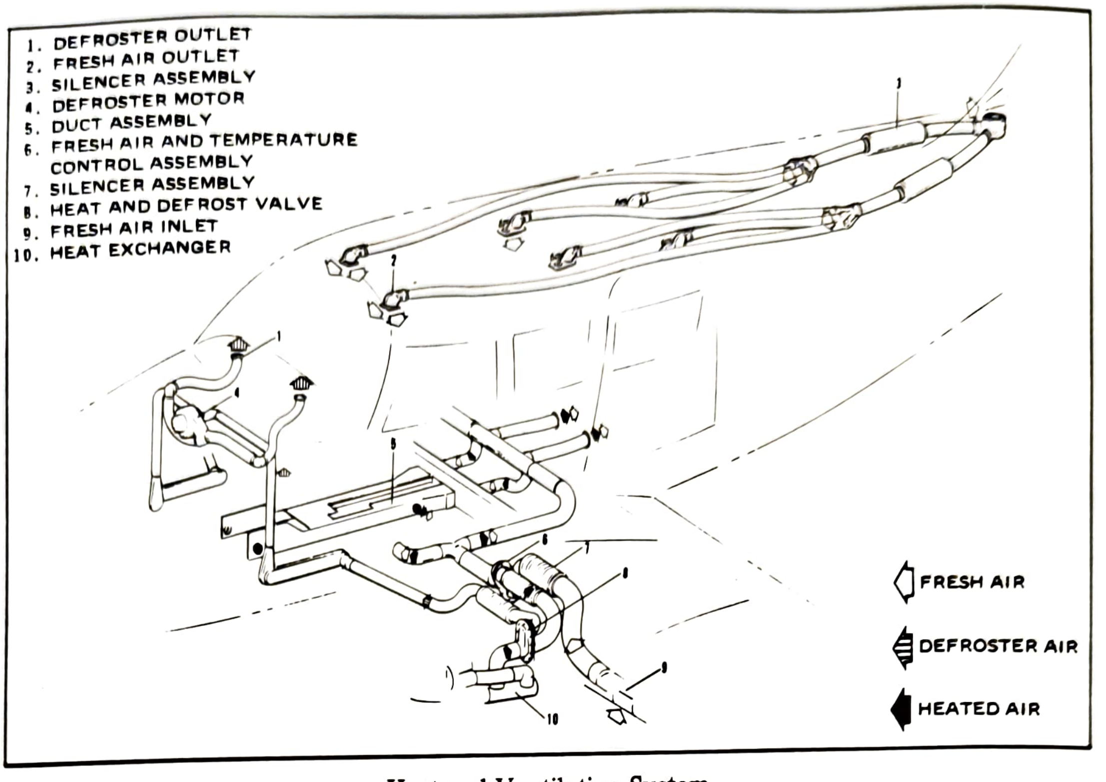
Heat may be supplied to warm the cabin before starting engines by turning on the master switch, insuring mixture in the idle cut-off position, turning on the right auxiliary fuel pump, opening the air intake lever and placing the three position switch in the HEATER position.

The combustion cabin heater uses gasoline from the fuel line between the engine driven pump and injector on the right engine. Heater fuel consumption is one half gallon per hour. Fuel used for heater operation should be considered for Flight Planning Purposes. If the right fuel selector is in the off position the heater is inoperative.

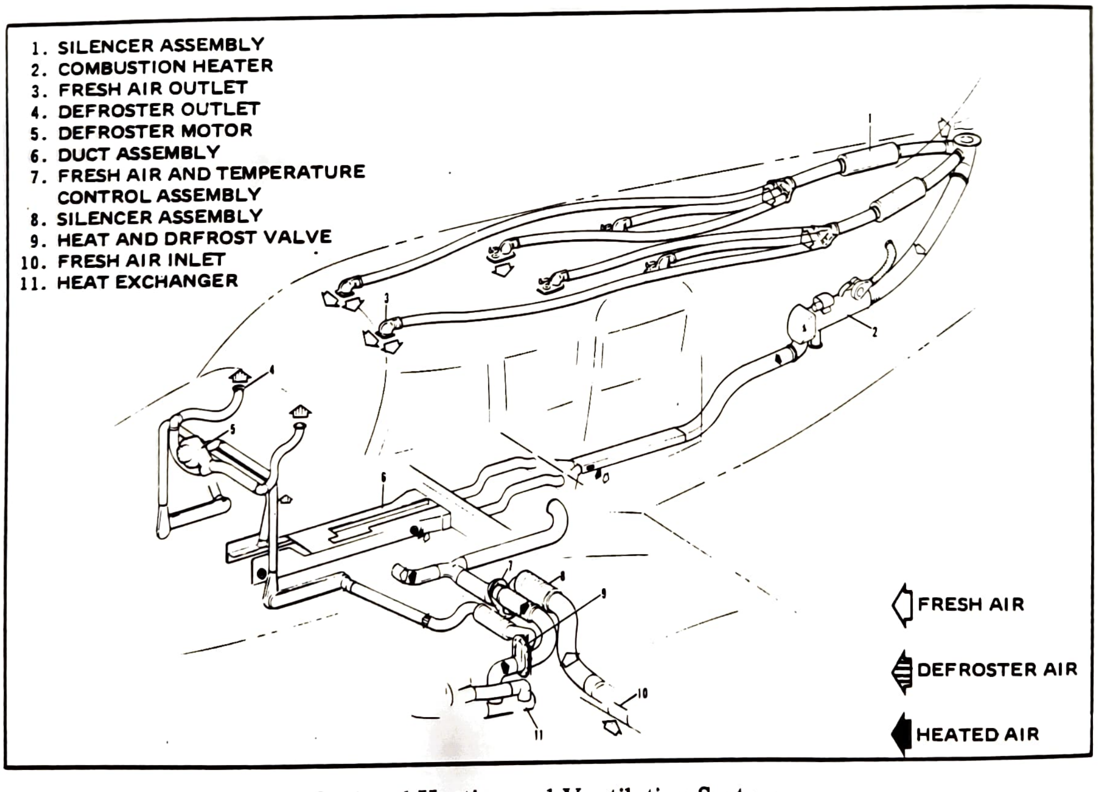
In case of right engine failure the heater can be operated by leaving the fuel selector on, insuring that the mixture control is in idle cut-off position, while operating the auxiliary fuel pump. Before the heater is operated under these conditions, determine that there are no fuel leaks between the tank and the engine.

Located in the heater is a heat limit overheat switch, which acts as a safety device to render the heater system inoperative if a malfunction should occur. Operation of this switch results in illumination of the overheat light located on the heater control console. The heat limit switch is located in the forward outboard end of the heater vent jacket, with a red reset button on the heater shroud and can be reached through the bulkhead access panel into the aft fuselage.

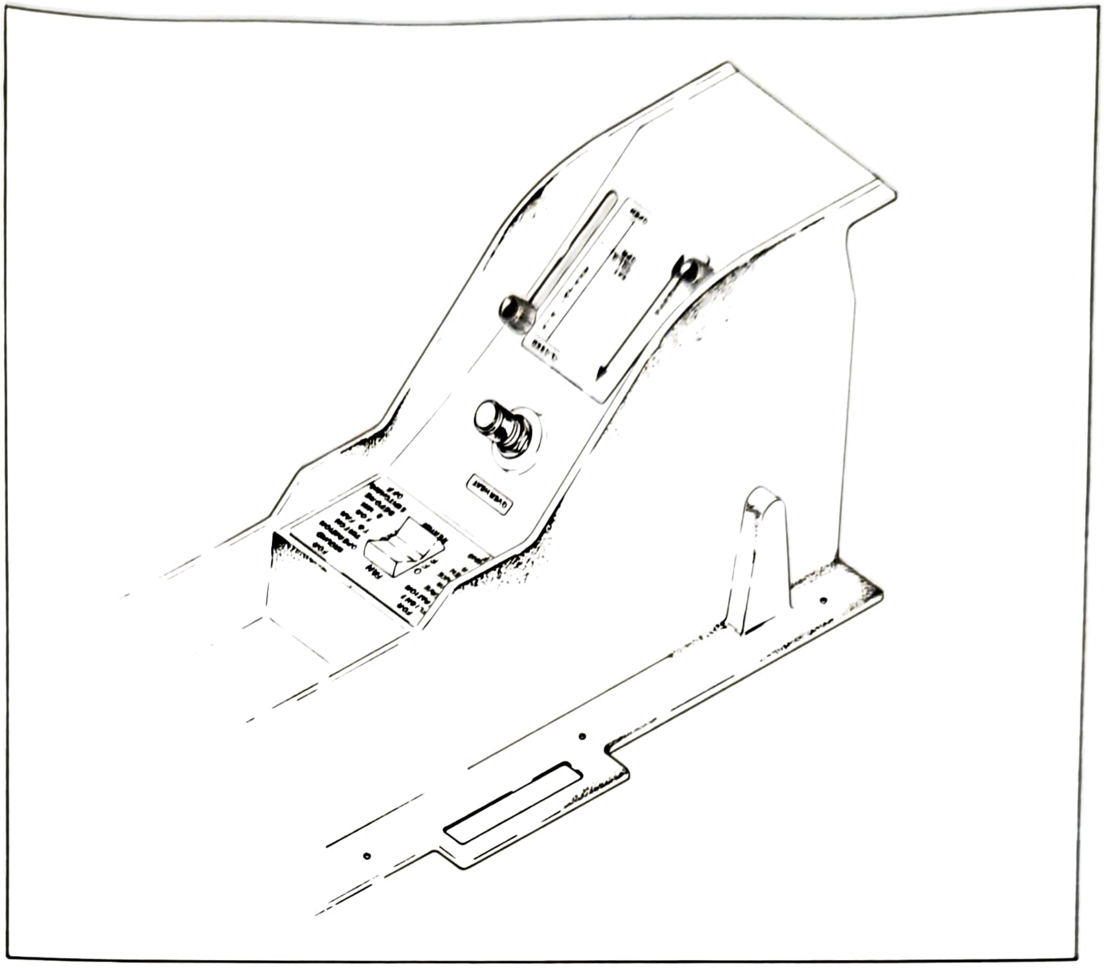
To prevent activation of the overheat limit switch upon normal heater shutdown during ground operation, turn the switch to "FAN" for two minutes, while leaving the air intake lever in the open position, before turning the switch to the "OFF" position. During flight leave the air intake lever open for a minimum of 15 seconds after turning "OFF" the heater switch.



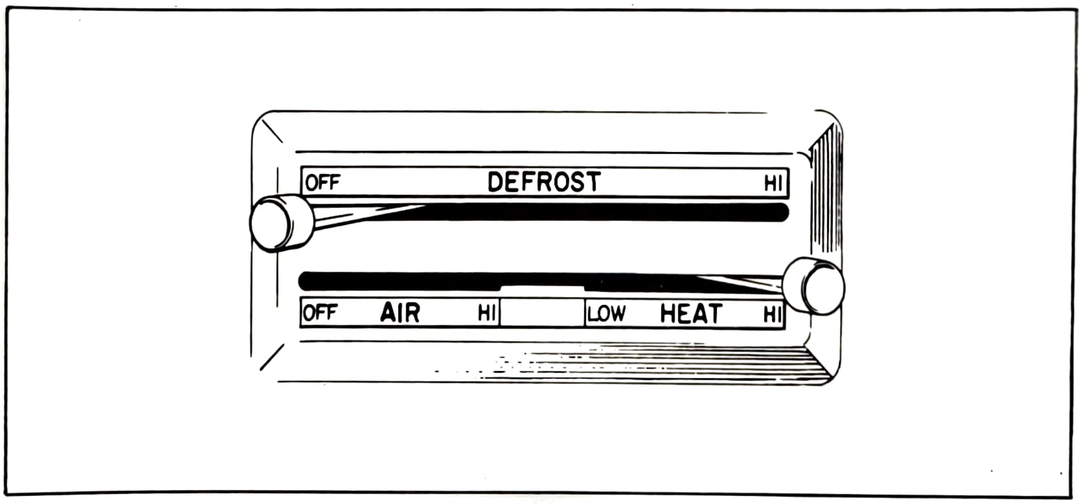
Heat and Ventilating System



Optional Heating and Ventilating System



Optional Combustion Heater Control Console



Heater and Defroster Controls

ICE PROTECTION SYSTEM*

A complete ice protection system is available as optional equipment in the Seneca to provide for flight into known icing conditions, when necessary.

This system consists of the following major components: pneumatic wing and empennage boots, wing ice detection light, electrothermal propeller deicer pads, electric windshield panel, heated stall warning transmitters, heated pitot head, anti-icing fuel tank vents, propeller governor shields and deflectors.

The pneumatic wing and empennage boots are installed on the leading edges of the wings, the vertical stabilizer and the horizontal stabilator. A constant suction is applied to all of the surface deicer boots from the engine driven vacuum pumps to provide smooth streamlined leading edges during normal operation with the surface deicer system off.

Deicer boots are inflated by a momentary "ON" type "SURFACE DE-ICE" switch located on the instrument panel directly above the control quadrant. Actuation of the "SURFACE DE-ICE" switch activates a system cycle timer which energizes the pneumatic pressure control valves for six seconds. The boot solenoid valves are activated and air pressure is released to the boots, inflating all surface deicers on the airplane. A "WING-TAIL DE-ICER" indicator light, with a "PRESS TO TEST" feature, illuminates when the surface deicer boots inflate. When the cycle is complete, the deicer solenoid valves permit automatic overboard exhaustion of pressurized air. Vacuum suction is then reapplied to the deicer boots. The deicer boots do not inflate during the "PRESS TO TEST" cycle.

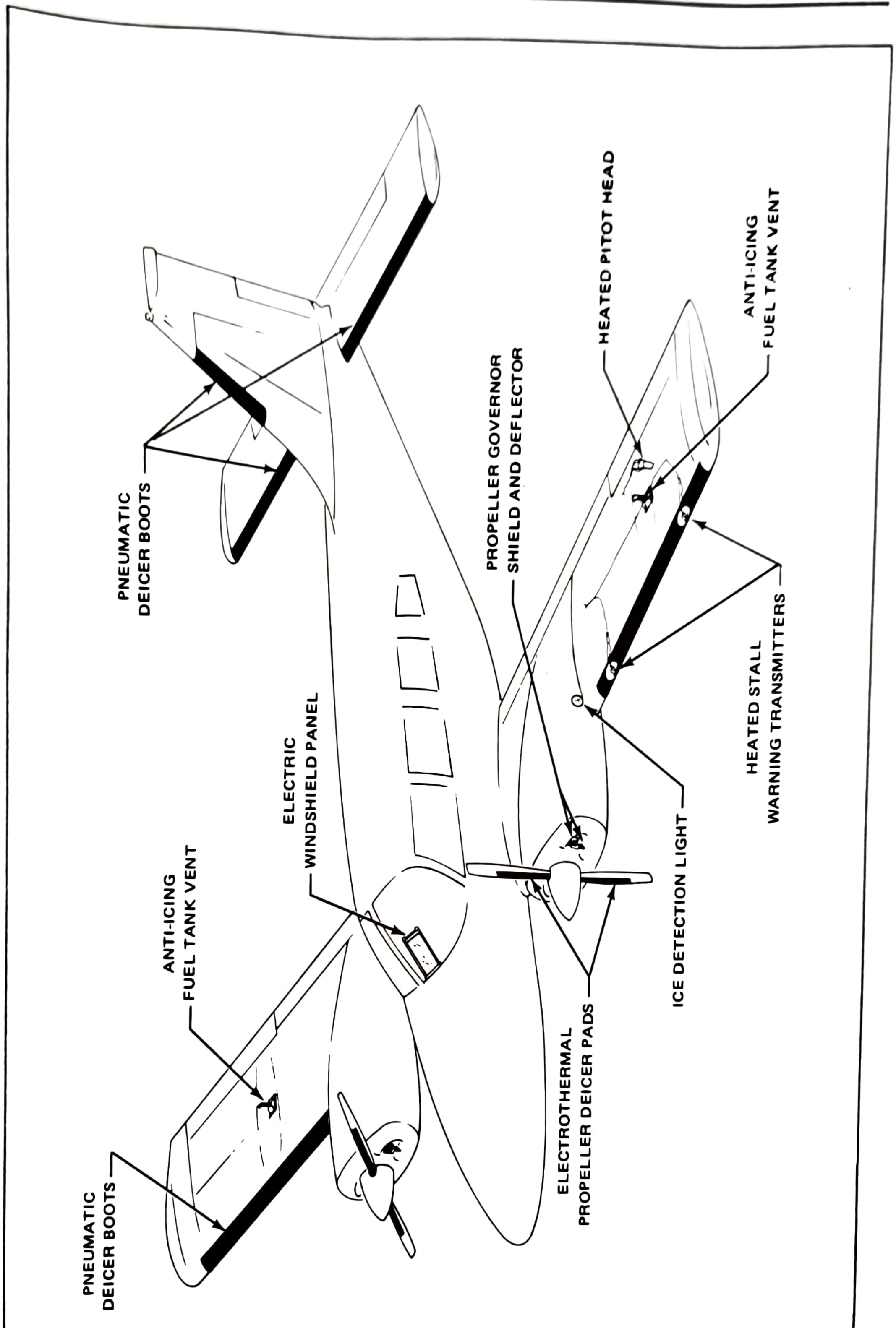
Circuit protection for the surface deicer system is provided by a "WING-TAIL DE-ICERS" circuit breaker located in the circuit breaker panel.

Wing icing conditions may be detected during night flight with the use of an ice detection light installed in the outboard side of the left engine nacelle. The light is controlled by an "ICE LIGHT" switch located on the instrument panel to the right of the "SURFACE DE-ICE" switch. A "WING ICE LIGHT" circuit breaker located in the circuit breaker panel provides circuit protection.

Electrothermal propeller deicer pads are bonded to the leading edges of the propeller blades. Each deicer pad has two separate heaters, one for the outboard and one for the inboard half.

The system is controlled by an "ON-OFF" type "PROP DE-ICE" switch located to the right of the "SURFACE DE-ICE" switch above the control quadrant. Power for the propeller deicers is supplied by the airplane's electrical system through a "PROP DE-ICE" circuit breaker, located in the circuit breaker panel, to the "PROP DE-ICE" switch. When the "PROP DE-ICE" switch is actuated, power is supplied to a timer through the "PROP DE-ICER" ammeter which monitors the current through the propeller deicing system. With the propeller deicing system "ON," the "PROP DE-ICER" ammeter needle should be within the shaded portion on the ammeter for a normal reading.

*Optional equipment



Ice Protection System

Power from the timer is cycled to brush assemblies which distribute power to modified starter ring gears incorporating slip rings. The current is then supplied from the slip rings directly to the electrothermal propeller deicer pads.

Deicing is accomplished by heating the outboard and then the inboard half of the deicer pads in a sequence controlled by the timer. The heating sequence of the deicer pads is according to the following cycle:

a. Outboard halves of the propeller deicer pads on the right engine.
b. Inboard halves of the propeller deicer pads on the right engine.
c. Outboard halves of the propeller deicer pads on the left engine.
d. Inboard halves of the propeller deicer pads on the left engine.

When the system is turned on, heating may begin on any one of the above steps, depending upon the positioning of the timer switch when the system was turned off from previous use. Once begun, cycling will proceed in the above sequence and will continue until the system is turned off.

A preflight check of the propeller deicers can be performed by turning the "PROP DE-ICE" switch "ON" and feeling the propeller deicer pads for proper heating sequence. The deicer pads should become warm to the touch.

The heat provided by the deicer pads reduces the adhesion between the ice and the propeller so that centrifugal force and the blast of airstream cause the ice to be thrown off the propeller blades in very small pieces.

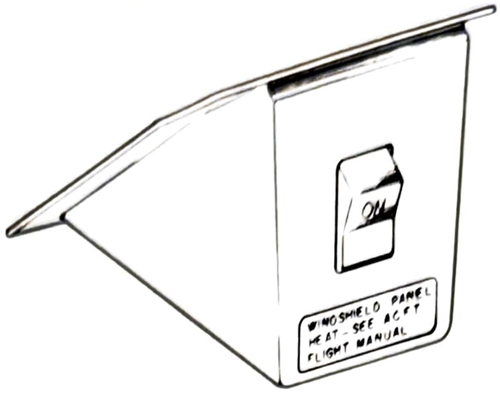
A heated glass panel is installed on the exterior of the pilot's windshield to provide visibility in icing conditions. The panel is heated by current from the airplane's electrical power supply and controlled by an "ON-OFF" control switch/circuit breaker. The control switch/circuit breaker is located on the console directly below the control quadrant and placarded "WINDSHIELD PANEL HEAT - SEE ACFT FLIGHT MANUAL."

An operational check may be performed by turning the heated windshield panel switch "ON" for a period not exceeding 30 seconds. Proper operation is indicated by the glass section being warm to the touch.

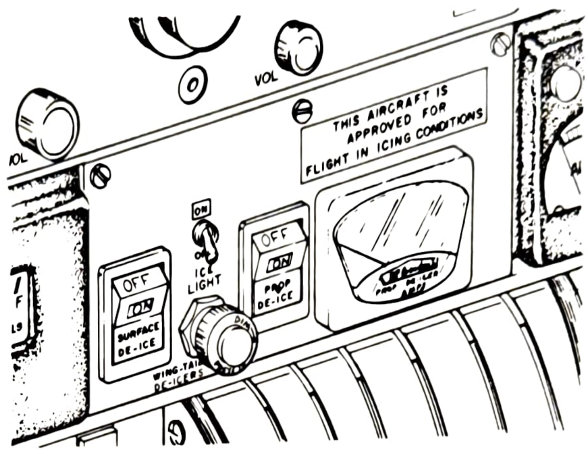
Two heated lift detectors and a heated pitot head installed on the left wing are controlled by a single "ON-OFF," "HEATED PITOT" switch located on the switch panel to the left of the pilot.

The heated lift detectors, one inboard and one outboard on the left wing, are installed to prevent icing conditions from interferring with operation of the stall warning transmitters. A "STALL WARN HEAT" circuit breaker in the circuit breaker panel protects the system against an overvoltage condition.

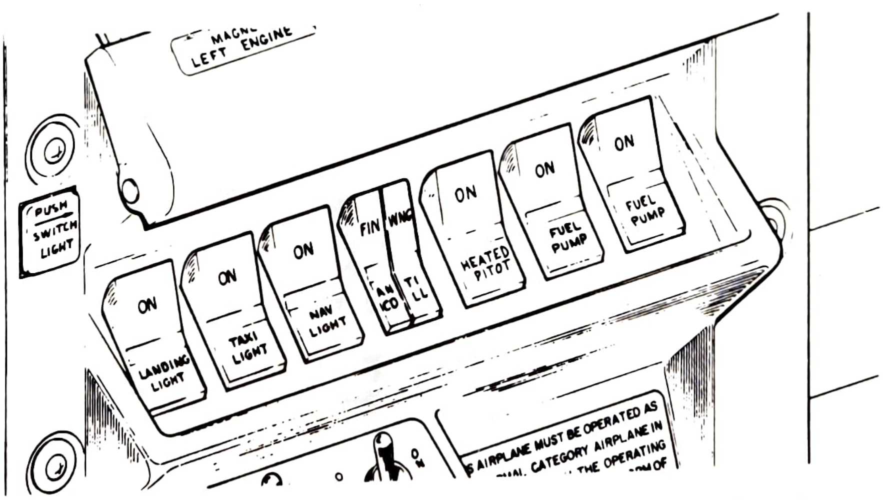
A heated pitot head, mounted under the left wing, is installed to provide pitot pressure for the airspeed indicator with heat to prevent ice accumulation from blocking the pressure intake. The heated pitot head also has a separate circuit breaker located in the circuit breaker panel and labeled "PITOT HEAT."



HEATED WINDSHIELD PANEL CONTROL SWITCH



ICE DETECTION LIGHT, SURFACE DEICER AND PROPELLER DEICER CONTROL SWITCHES



HEATED PITOT AND HEATED STALL WARNING TRANSMITTER CONTROL SWITCHES

Ice Protection System Control Switches

With the "HEATED PITOT" switch "ON," check the heated pitot head and heated lift detector for proper heating.

CAUTION

> Care should be taken when an operational check of the heated pitot head and the heated lift detectors is being performed. Both units become very hot.

Anti-icing fuel tank vents, one installed under each wing, are installed to prevent ice formations from blocking the fuel tank vent lines.

Propeller governor ice shields and deflectors are installed to prevent operational interference from ice and other particles entering through the opening in the front cowling.

SEATS

The front seats are adjustable fore and aft for pilot and passenger comfort. An easily accessible catch on the top of the right front seat permits one to slide that seat forward conveniently for ease of entry and exit. The center and rear seats are easily removable for added cargo space. Each seat is provided with an armrest and an adjustable back. Optional headrests and vertically adjustable front seats are also available. A jump seat, which may be mounted between the two middle seats, makes the Seneca a seven-place airplane. A shoulder harness with inertia reel is standard equipment for each of the two front seats and is available as optional equipment for the other seats except seventh seat.

FINISH

All sheet aluminum components are carefully finished to assure maximum service life. The exterior of the aircraft is finished with a durable acrylic lacquer in a variety of tasteful colors to suit individual owners. Economy size "Touch-Up" spray cans are available from Piper dealers.

BAGGAGE AREA

The large amount of available baggage space permits an exceptional flexibility of loading within the Seneca weight and balance envelope. Two separate baggage compartments are provided. One, located in the nose of the aircraft, is easily accessible through a baggage door on the left side of the aircraft. It has a maximum weight capacity of 100 pounds and a volume of 15.3 cubic feet. The other compartment is located aft of seats five and six and is accessible through the rear cabin door on the left side of the fuselage. It has a maximum weight capacity of 100 pounds and a volume of 20.0 cubic feet. This compartment is conveniently accessible during flight. Tie-down straps are provided in both the front and rear compartments and should be used whenever possible. An additional cargo loading door aft of the rear door is an optional feature which facilitates the loading of bulky items. All baggage and passenger loading doors use the same key.

STALL WARNING

An approaching stall is indicated by a stall warning light and horn, activated by two lift detectors installed on the leading edge of the left wing outboard of the engine nacelles. The inboard detector triggers the warning when the flaps are in the 25 and 40 degree positions, the outboard when the flaps are in the other positions. The stall warning horn has a different sound from that of the landing gear warning horn.

AIRPLANE FLIGHT MANUAL

AIRPLANE FLIGHT MANUAL

FOR

SENECA

APPLICABLE TO SERIAL NUMBERS 34-7250001 THRU 34-7250189 WHEN PIPER KIT 760607 IS INSTALLED, 34-7250190 THRU 34-7250214 WHEN PIPER KIT 760611 IS INSTALLED AND 34-7250215 THRU 34-7350353.

WARNING

EXTREME CARE MUST BE EXERCISED TO LIMIT THE USE OF THIS REPORT TO APPLICABLE AIRCRAFT. THIS REPORT REVISED AS INDICATED BELOW OR SUBSEQUENTLY REVISED IS VALID FOR USE WITH THE AIRPLANE IDENTIFIED BELOW WHEN APPROVED BY PIPER AIRCRAFT CORPORATION. SUBSEQUENT REVISIONS SUPPLIED BY PIPER AIRCRAFT CORPORATION MUST BE PROPERLY INSERTED.

MODEL PA-34-200

AIRCRAFT SERIAL NO. 34-7250128 REGISTRATION NO. 4542T

AIRPLANE FLIGHT MANUAL, REPORT NUMBER VB-423 REVISION 14

PIPER AIRCRAFT CORPORATION
APPROVAL SIGNATURE AND STAMP Anne M. Boyer
Anne M. Boyer

NOTE DUPLICATE

THIS MANUAL MUST BE KEPT IN THE AIRPLANE AT ALL TIMES

FAA APPROVED BY: H.W. Barnhouse
H. W. BARNHOUSE
PIPER AIRCRAFT CORPORATION
D. O. A. No. SO–1
VERO BEACH, FLORIDA

DATE OF APPROVAL: MARCH 10, 1972

APPROVAL BASIS: FAR 23 AND FAR PART 21, SUBPART J.

TABLE OF CONTENTS

LOG OF REVISIONS

Revision	Revised Pages	Description and Revision	FAA Approved Date
1	i, ii 9 14	Changed wording for Items II. B. 6. and II. C. 10. Changed Item 6. - Landing Gear Unsafe Warnings. Changed Item 10. - Landing Gear Unsafe Warnings.	May 8, 1972 H. W. Barnhouse
2	3-ii 3-21 3-26 3-27 3-28	Under Section IV added item D. Added AltiMatic V/FD Installation. Added entire contents of page. Added page. Added page.	July 7, 1972 for H. W. Barnhouse
3	3-ii 3-10 3-11 3-12	Changed page nos. under Item C., Section II. Note added. Contents rearranged. Contents rearranged.	August 2, 1972 H. W. Barnhouse
4	3-ii 3-6 3-21, 3-28	Added Item E. - Windshield Heating Installation to Section IV. Added Windshield Heating Placards. Added E. - Windshield Heating Installation.	Sept. 15, 1972
5	3-ii 3-21 3-26 3-27	Corrected Item D. under Section IV. Corrected Item D. Changed D. to V/FD-1 or V-1. Changed Item D. 2. b. to V/FD-1 or V-1 Information Manual.	Nov. 16, 1972 for H.W. Barnhouse
6	3-ii 3-21, 3-29	Added Supplement F. Added F. - Cabin Combustion Heater Instl.	Dec. 20, 1972 H. W. Barnhouse
7	3-i, 3-ii 3-9 3-10 3-11	Retyped Pages. Changed Item 6. - Landing Gear Unsafe Warnings. Contents moved to Page 3-11. Contents moved to Page 3-12.	May 25, 1973

LOG OF REVISIONS (cont)

Revision	Revised Pages	Description and Revision	FAA Approved Date
7 (cont)	3-12 3-12a 3-12b	Contents moved to Page 3-12a. Added Page. Added Page.	H. W. Barnhouse H. W. Barnhouse
8	Title 3-1 3-2	Added Serial No. effectivity. Revised Item C. Propeller Limitations. Revised Tachometer Limitations.	Sept. 19, 1973 H. W. Barnhouse H. W. Barnhouse
9	3-i 3-ii 3-3 3-4 3-6 3-9 3-15 3-17 3-18 3-19	Added Item M. - Flight Into Known Icing Conditions and Item B. 7 - Rear Cabin and Cargo Doors Removed. Added Item C. 16 - Engine Failure In Icing Conditions, Item C. 17 - Alternator Failure In Icing Conditions, Item C. 18 - Engine Failure With Rear Cabin and Cargo Doors Removed, Item D - Special Operating Procedures and Item D. 1 - Flight In Known Icing Conditions; Added Item C. - Aircraft Performance With Rear Cabin and Cargo Doors Removed. Added Icing Placard and relocated Weight Placard to page 3-4. Added Weight Placard from page 3-3. Added Placard for Aft Fuselage Doors Removed and Item M. - Flight Into Known Icing Conditions. Added Item 7. - Rear Cabin and Cargo Doors Removed. Revised Item c. Added Item 16. - Engine Failure In Icing Conditions, Item 17. - Alternator Failure In Icing Conditions and Item 18. - Engine Failure With Rear Cabin and Cargo Doors Removed. Added Item D. - Special Operating Procedures and Item D. 1 - Flight Into Known Icing Conditions. Added Item C. - Aircraft Performance With Rear Cabin and Cargo Doors Removed.	April 26, 1974 D H Trompler D. H. Trompler

LOG OF REVISIONS (cont)

Revision	Revised Pages	Description and Revision	FAA Approved Date
10	Title	Added PAC Approval Form (NOTE: AIRCRAFT DELIVERED WITH MANUALS PRIOR TO THIS REVISION DO NOT REQUIRE THIS REVISION.)	Oct. 14, 1974 Ward Evans Ward Evans
11	3-3	Revised usable fuel quantities - Item J. Usable Fuel.	May 30, 1975
	3-5	Revised usable fuel capacity - filler cap placard.	Ward Evans Ward Evans
12	3-ii	Added item 18., Propeller Overspeed; revised page nos.	
	3-1	Revised Oil Pressure Red Line (Minimum).	
	3-3	Added Maximum Landing Weight (item G.).	
	3-18	Added item 19. (Propeller Overspeed); relocated Special Operating Procedures.	August 19, 1975
	3-18a	Added page (Special Operating Procedures from page 3-18).	
	3-18b	Added page.	Ward Evans Ward Evans
13	3-4	Revised emergency gear extension placard.	
	3-8	Added item 4. b. (1) (c).	
	3-9	Deleted info under item 4. c.	April 1, 1977
	3-12	Added item 4. a. (3).	
	3-14	Added item 9. e. and Warning; relocated info to pg. 3-15.	
	3-15	Added items 12 (3) and (4) from pg. 3-14.	Ward Evans Ward Evans
14	3-18a	Added to Warning.	June 14, 1983
	3-18b	Added Caution.	Ward Evans Ward Evans

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LOG OF REVISIONS (cont)

Revision	Revised Pages	Description of Revision	Approved Date
14	1, 2	Revised general weight and balance introduction.	March 23, 1979 Hal Fletcher
15	16	Added Electrodelta voltage regulator.	November 30, 1987

SECTION I

LIMITATIONS

The following limitations must be observed in the operation of this airplane:

A. ENGINES

~~Lycoming IO-360-C1E6 with fuel injector Lycoming P/N LW-12586 (This engine installs~~
~~on L. H. side of aircraft)~~
Lycoming LIO-360-C1E6 ~~with fuel injector~~ Lycoming P/N LW-12586 (This engine installs
~~on R. H. side of aircraft)~~

ENGINE LIMITS
~~For all operation 2700 RPM, 200 HP~~

See STC
SA 2937 WE
Page 3 of 4

B. FUEL

100/130 Octane Aviation Gasoline (Minimum)

C. PROPELLERS

~~Hartzell HC-C2YK-2( )E/C7666A-0 or Hartzell HC-C2YK-2( )EF/FC7666A-0~~
~~Avoid continuous operation between 2200-2400 RPM~~
~~Or~~ Hartzell HC-C2YK-2CG( )/( )C7666A This model includes damper
(This model installs on L. H. side of aircraft) Constant Speed
Pitch Settings at 30 in. station:
High 79° - 81°, Low 13.5
Diameter: Not over 76 inches
Not under 74 inches (No further reduction permitted)

~~Hartzell HC-C2YK-2( )LE/JC7666A-0 or Hartzell HC-C2YK-2( )LEF/FJC7666A-0~~
~~Avoid continuous operation between 2200-2400 RPM~~
~~Or~~ Hartzell HC-C2YK-2CLG( )/( )JC7666A This model includes damper
(This model installs on R. H. side of aircraft) Constant Speed
Pitch Settings at 30 in. station:
High 79° - 81°, Low 13.5
Diameter: Not over 76 inches
Not under 74 inches (No further reduction permitted)

D. INSTRUMENT MARKINGS (POWER PLANT)

OIL TEMPERATURE

Green Arc (Normal Operating Range)	75° to 245°F
Red Line (Maximum)	245°F

OIL PRESSURE

Green Arc (Normal Operating Range)	60 PSI to 90 PSI
Yellow Arc (Caution)	25 PSI to 60 PSI
Red Line (Minimum)	25 PSI if installed or 60 PSI if installed
Red Line (Maximum)	90 PSI

TACHOMETER
~~For Hartzell HC-C2YK-2( )F, HC-C2YK-2( )EF, HC-C2YK-2( )LF or HC-C2YK-2( )LEF~~
propellers:

Green Arc (Normal operating Range)	500 RPM to 2200 RPM &2400 RPM to 2700 RPM
Red Arc (Avoid continuous operation)	2200 RPM to 2400 RPM
~~Red Line (Maximum)~~	~~2700 RPM~~

For Hartzell HC-C2YK-2CG( ) or HC-C2YK-2CLG( ) propeller with dampers:

Green Arc (Normal Operating Range)	500 RPM to 2700 RPM
Red Line (Maximum)	2700 RPM

FUEL PRESSURE

Green Arc (Normal Operating Range)	14 PSI to 35 PSI
Red Line (Maximum)	35 PSI
Red Line (Minimum)	14 PSI

FUEL FLOW

Red Line (Maximum)	19.2 GPH

CYLINDER HEAD TEMPERATURE

Green Arc (Normal Range)	200° to 475° F
Red Line (Maximum)	475° F

E. AIRSPEED LIMITATIONS AND INDICATOR MARKINGS (Calibrated Airspeed)

NEVER EXCEED SPEED	See STC SA 2937WE	~~217 MPH~~
MAXIMUM STRUCTURAL CRUISING SPEED		190 MPH
DESIGN MANEUVERING SPEEDS		
Minimum Weight (2743 lbs.)		133 MPH
Maximum Weight (4200 lbs.)		146 MPH
~~MAXIMUM FLAPS EXTENDED SPEED~~		~~125 MPH~~
MAXIMUM GEAR EXTENDED SPEED	See Robertson Supplement 1-28-75	150 MPH
MAXIMUM GEAR RETRACT SPEED		125 MPH
MINIMUM CONTROL SPEED (Single Engine)		80 MPH

AIRSPEED INDICATOR MARKINGS

Green Arc (Normal Operating Range)	76 MPH to 190 MPH
Yellow Arc (Caution Range - Smooth Air)	190 MPH to 217 MPH
~~White Arc (Flaps Extended Range)~~	~~69 MPH to 125 MPH~~
Radial Red Line (Never Exceed - Smooth Air)	217 MPH
~~Radial Red Line (Minimum Control Speed - Single Engine)~~	~~80 MPH~~
Radial Blue Line (Best R/C Speed Single Engine)	105 MPH

F. FLIGHT LOAD FACTORS (Flaps Up)

Positive Load Factor (Maximum)	3.8 G
Negative Load Factor (Maximum)	No inverted maneuvers approved

G. MAXIMUM WEIGHT 4200 LBS
MAXIMUM LANDING WEIGHT 4000 LBS.

H. C. G. RANGE

Weight Pounds	Forward Limit Inches Aft of Datum	Aft Limit Inches Aft of Datum
2780	80.7	94.6
3400	82.0	94.6
4200	87.9	94.6

NOTES

1. Straight line variation between the points given.
2. Datum is 78.4 inches forward of wing leading edge from the inboard edge of the inboard fuel tank.
3. It is the responsibility of the airplane owner and the pilot to assure that the airplane is properly loaded. Maximum allowable gross weight 4200 pounds. See "Weight and Balance Section" for proper loading instructions.

I. UNUSABLE FUEL
The unusable fuel in this aircraft has been determined as 2.5 gallons in each wing in critical flight attitudes. (2.5 gallons is the total per side, each side having two interconnected tanks)

J. USABLE FUEL
The usable fuel in this aircraft has been determined as 46.5 gallons in each wing (46.5 gallons is the total per side, each side having two interconnected tanks).

K. PLACARDS
In full view of the pilot:

THIS AIRPLANE MUST BE OPERATED AS A NORMAL CATEGORY AIRPLANE IN COMPLIANCE WITH THE OPERATING LIMITATIONS STATED IN THE FORM OF PLACARDS, MARKINGS, AND MANUALS. NO ACROBATIC MANEUVERS (INCLUDING SPINS) APPROVED.

THIS AIRCRAFT APPROVED FOR V.F.R., I.F.R., DAY AND NIGHT NON-ICING FLIGHT WHEN EQUIPPED IN ACCORDANCE WITH FAR 91 OR FAR 135.

When properly equipped the above placard shall read:

THIS AIRCRAFT APPROVED FOR V.F.R., I.F.R., DAY, NIGHT, AND ICING CONDITIONS WHEN EQUIPPED IN ACCORDANCE WITH FAR 91 OR FAR 135.

MAXIMUM TAKEOFF WEIGHT 4200 POUNDS
MAXIMUM LANDING WEIGHT 4000 POUNDS
ALL WEIGHT IN EXCESS OF 4000 POUNDS MUST CONSIST OF FUEL.

On instrument panel in full view of the pilot:

See Robertson Supplement 1-28-75

1. "DEMONSTRATED CROSSWIND COMPONENT 15 MPH"
2. "MINIMUM SINGLE ENGINE CONTROL SPEED ~~80 MPH~~"

Flaps 20°-67 m.p.h.
Flaps up - 78 m.p.h.

3. "ROUGH AIR OR MANEUVERING SPEEDS"
   "2743 LB GW - 133 MPH"
   "4200 LB GW - 146 MPH"
4. "GEAR DOWN 150 MPH MAX"
   "GEAR UP 125MPH MAX"
   "EXTENDED 150 MPH MAX"

Near emergency gear release:

EMERGENCY GEAR EXTENSION
PULL TO RELEASE. SEE A.F.M.
BEFORE RE-ENGAGEMENT.

Near gear selector switch:

"GEAR UP	125 MPH MAX"
"DOWN	150 MPH MAX"

Adjacent to upper door latch (Front and rear doors):

"ENGAGE LATCH BEFORE FLIGHT"

In full view of pilot:

WARNING - TURN OFF STROBE LIGHTS WHEN TAXIING IN VICINITY OF OTHER AIRCRAFT, OR DURING FLIGHT THROUGH CLOUD, FOG OR HAZE.

On the inside of forward baggage compartment door:

"MAXIMUM BAGGAGE THIS COMPARTMENT 100 LBS. SEE THE LIMITATIONS SECTION OF THE AIRPLANE FLIGHT MANUAL."

On aft baggage closeout:

"MAXIMUM BAGGAGE THIS COMPARTMENT 100 LBS. NO HEAVY OBJECTS ON HAT SHELF."

On instrument panel:

"SINGLE ENGINE STALLS NOT RECOMMENDED. CAN CAUSE 500 FT. LOSS OF ALTITUDE AND 15° PITCH ANGLE."

On instrument panel:

"TAKEOFF CHECKLIST
Fuel Selectors On
Electric Fuel Pumps On
Alternators On
Engine Gauges Checked
Mixtures Set
Propellers Set
Alt. Air Off
Cowl Flaps Set
Seat Backs Erect
Flaps Set 20°
Trim Set (Stab. & Rudder)
Fasten Belts/Harness
Controls Free - Full Travel
Doors Latched"

See Robertson Supplement 1-28-75

"LANDING CHECKLIST
Seat Backs Erect
Fasten Belts/Harness
Fuel Selectors On
Cowl Flaps Set
Electric Fuel Pumps On
Mixtures Rich
Propellers Set
Gear Down
Flaps Set - 125 MPH Max."

Adjacent to fuel tank filler cap:

"FUEL - 100/130 AVIATION GRADE - USABLE CAPACITY 46.5 GAL."

On storm window:

"DO NOT OPEN ABOVE 150 MPH."

On instrument panel:

"OIL COOLER WINTERIZATION PLATE TO BE REMOVED
WHEN AMBIENT TEMPERATURE EXCEEDS 50°F."

On switch located below engine control pedestal with windshield heating installation:

"WINDSHIELD PANEL HEAT - SEE AIRCRAFT FLIGHT
MANUAL."

On engine instrument panel cover to left of engine controls with windshield heating installation:

"WARNING - THIS AIRCRAFT IS NOT APPROVED FOR
FLIGHT IN ICING CONDITIONS."

In full view of the pilot for flight with the aft fuselage doors removed:

"FOR FLIGHT WITH AFT DOORS REMOVED, CONSULT
THE LIMITATIONS AND PROCEDURES SECTIONS OF THE
AIRPLANE FLIGHT MANUAL."

L. VACUUM GAUGE
The operating limits for the vacuum system are 4.5 to 5.2 inches of mercury for all operations.

~~M. FLIGHT INTO KNOWN ICING CONDITIONS~~
For flight in icing conditions the following equipment must be installed in accordance with Piper drawings or in an FAA approved manner:

1. Pneumatic wing and empennage boots.
2. Electrothermal propeller boots.
3. Electric windshield panel.
4. Heated pitot head.
5. Anti-icing fuel tank vents.
6. Propeller governor shield and deflectors.
7. Wing ice light.
8. ~~Heated Stall Warning Transmitters.~~

SECTION II

PROCEDURES

A. NORMAL PROCEDURES

1. WING FLAP SETTINGS

Take-Off ~~0°~~ 20°

Landing 40°

The flaps are ~~manually~~ electrically operated.

Flap deflection versus handle position is:

First notch	10 Degrees
Second notch	20 ~~25~~ Degrees
Third notch	40 Degrees

See Robertson Supplement 1-28-75

2. COWL FLAPS

Cowl flaps are provided to allow manual control of engine temperatures. The cowl flaps should be open during ground operations and in climbs. In no case should the cylinder head temperatures be allowed to exceed 475°F and the oil temperatures allowed to exceed 245°F.

3. GO-AROUND PROCEDURES

If a go-around from a normal landing with the airplane in the landing configuration becomes necessary:

~~a. Apply takeoff power to both engines.~~

b. Establish positive climb.

c. Retract wing flaps.

d. Retract landing gear.

~~e. Adjust cowl flaps for adequate engine cooling.~~

B. SYSTEM OPERATIONS AND CHECKS

1. ALTERNATOR SYSTEM DESCRIPTION

The two ammeters continuously indicate the alternator outputs.

Certain regulator failures can cause the alternator output voltage to increase uncontrollably. To prevent damage, overvoltage relays are installed to automatically shut-off the alternator(s). The overvoltage trip lights adjacent to the alternator switches on the switch panel illuminate to warn of the tripped condition.

The alternator switch must be OFF to use the press-to-test feature of the overvoltage trip lights.

2. ALTERNATOR SYSTEM OPERATION

Both alternator switches should be ON for normal operation.

A preflight check should assure operation of the overvoltage lights, and that both ammeters show approximately equal outputs when both engines are at 1500 RPM or more.

Alternator outputs will vary with the electrical equipment in use and the state of charge of the battery. Alternator outputs should not exceed 60 amperes each except during engine cranking.

3. CIRCUIT BREAKERS

All circuit breakers are grouped in the lower right corner of instrument panel. To reset the circuit breakers push in on the reset button.

4. FUEL MANAGEMENT

a. Normal Operation

Each engine is normally supplied with fuel from the two interconnected tanks on the same side of the airplane. These two interconnected tanks are considered a single tank for tank selection purposes.

(1) Take-off and landing
  (a) Fuel selectors in "ON" position
  (b) Electric fuel pumps "ON"

(2) Cruising
  (a) Fuel selectors in "ON" position
  (b) Electric fuel pumps "OFF"

b. Crossfeed Operation and Single Engine Operation

A crossfeed is provided to increase range during single engine operation. Fuel system operation is as follows:

(1) Cruising
  (a) When using fuel from tank on the same side as the operating engine:
    (1) Fuel selector of operating engine in "ON" position.
    (2) Fuel selector of inoperative engine in "OFF" position.
    (3) Electric fuel pumps "OFF" (except in case of engine driven pump failure, electric fuel pump on operating engine side must be used).
  (b) When using fuel from tank on the side opposite the operating engine:
    (1) Fuel selector of operating engine in "X-FEED" (CROSSFEED) position.
    (2) Fuel selector of inoperative engine in "OFF" position.
    (3) Electric fuel pumps "OFF" (except in case of engine driven pump failure, electric fuel pump on operating engine side must be used).
  (c) Use crossfeed in level flight only.

(2) Landing
   (a) Fuel selector of operating engine in ON position.
   (b) Fuel selector of inoperative engine in OFF position.
   (c) Electric fuel pump of operating engine ON.

c. Crossfeed Operation With Both Engines Operating

In cruising flight it is permissible to operate both engines from the same tank.

d. Turning takeoffs

Fast taxi turns immediately prior to takeoff run can cause temporary malfunction of one engine during takeoff if the electric boost pumps are not in the ON position.

5. LANDING GEAR DOWN LIGHTS

The green gear down lights on the instrument panel indicate when each landing gear is down and locked. GEAR INDICATOR LIGHTS ARE DIMMED WHILE THE NAVIGATION LIGHTS ARE ON.

6. LANDING GEAR UNSAFE WARNINGS

The red landing gear unsafe light will illuminate when the landing gear is in transition between the full up position and the down and locked position. Additionally, on aircraft with serial numbers 34-7250046 and up, the light will illuminate when the gear warning horn sounds. The gear warning horn will sound at low throttle settings with the gear in the up position.

The light is off when the landing gear is in either the full down and locked or full up positions.

7. REAR CABIN AND CARGO DOORS REMOVED

a. Limitations

The airplane is approved for flight with the rear cabin and cargo doors removed.

The following limitations must be observed in the operation of this airplane with the rear cabin and cargo doors removed:

(1) Maximum speed -150 MPH.
(2) Minimum single engine control speed - 81 MPH.
(3) No smoking.
(4) All loose articles must be tied down and stowed.
(5) Jumper's static lines must be kept free of pilot's controls and control surfaces.
(6) Operation approval for VFR non icing flight conditions only.

(b) Procedure

(1) When operating with the rear cabin and cargo doors removed, it is recommended that all occupants wear parachutes.

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C. EMERGENCY PROCEDURES

1. DETECTING A DEAD ENGINE
   a. Loss of Thrust
   b. Nose of aircraft will yaw in direction of dead engine (with coordinated controls)

2. FEATHERING PROCEDURE

The propellers can be feathered only while the engine is rotating above 800 RPM. Loss of centrifugal force due to slowing RPM will actuate a stop pin that keeps the propeller from feathering each time the engine is stopped on the ground. Single engine performance will decrease if the propeller of the inoperative engine is not feathered.

> **NOTE**
>
> If circumstances permit, in the event of an actual engine failure, the pilot may elect to attempt to restore power prior to feathering. The following actions are suggested:
> (1) Mixture - As Required
> (2) Fuel Boost Pump - On
> (3) Fuel Selector - Crossfeed
> (4) Magnetos - Select L or R only
> (5) Alternate Air - On

78 m.p.h. flaps up
67 m.p.h. flaps 20°

See Robertson Supplement 1-28-75

a. Minimum Control Speed - ~~80 MPH~~.
b. Best R/C Speed Single Engine - 105 MPH.
c. Maintain Direction and Airspeed above 90 MPH.
d. Mixture Controls - forward.
e. Propeller Controls - forward.
f. Throttle Controls - forward.
g. Flaps - retract.
h. Gear - retract.
i. Electric Fuel Pumps - "ON."
j. Identify inoperative engine.
k. Throttle of inoperative engine - retard to verify.
l. Propeller of inoperative engine - feather.
m. Mixture of inoperative engine - idle cut off.
n. Trim - as required.
o. Maintain 5° bank toward operating engine.
p. Electric Fuel Pump of inoperative engine - "OFF."
q. Magnetos of inoperative engine - "OFF."
r. Cowl Flaps - close on inoperative engine, use as required on operative engine.
s. Alternator of inoperative engine - "OFF."
t. Electrical Load - reduce to prevent battery depletion.
u. Fuel Management - fuel "OFF" inoperative engine; consider crossfeed use.
v. Electric fuel pump operative engine - "OFF."

3. UNFEATHERING PROCEDURE
   a. Fuel selector inoperative engine - "ON."
   b. Electric fuel pump inoperative engine - "OFF."
   c. Throttle - open 1/4 inch.
   d. Propeller control - forward to cruise RPM position.
   e. Mixture - rich.
   f. Magneto switches - "ON."
   g. Starter - engage till prop windmills.
   h. Throttle - reduced power till engine is warm.
   i. If engine does not start, prime by turning electric fuel pump of inoperative engine on for 3 seconds and then repeat steps g., h., and i.
   j. Alternator - "ON."

4. FUEL MANAGEMENT DURING SINGLE ENGINE OPERATION

A crossfeed is provided to increase range during single engine operation. Fuel system operation is as follows:

   a. Cruising
      (1) When using fuel from tank on the same side as the operating engine:
         (a) Fuel selector of operating engine in "ON" position.
         (b) Fuel selector of inoperative engine in "OFF" position.
         (c) Electric fuel pumps "OFF" (except in case of engine driven pump failure, electric fuel pump on operating engine side must be used).
      (2) When using fuel from tank on the side opposite the operating engine:
         (a) Fuel selector of operating engine in "X-FEED" (CROSSFEED) position.
         (b) Fuel selector of inoperative engine in "OFF" position.
         (c) Electric fuel pumps "OFF" (except in case of engine driven pump failure, electric fuel pump on operating engine side must be used).
      (3) Use crossfeed in level flight only.

   b. Landing
      (1) Fuel selector of operating engine in "ON" position.
      (2) Fuel selector of inoperative engine in "OFF" position.
      (3) Electric fuel pump of operating engine "ON."

5. ENGINE FAILURE DURING TAKEOFF

~~The single engine minimum control speed for this airplane is 80 mph (CAS)~~ under sea level standard conditions.

"See Robertson Supplement 1-28-75"

a. If engine failure occurs during takeoff ground roll and 100 mph (CAS) has not been attained, CLOSE BOTH THROTTLES IMMEDIATELY AND STOP STRAIGHT AHEAD. If inadequate runway remains to stop, then:
   (1) Throttles - CLOSED.
   (2) Brakes - apply maximum braking.
   (3) Master switch - OFF.
   (4) Fuel selectors - OFF.
   (5) Continue straight ahead, turning to avoid obstacles as necessary.

b. If engine failure occurs during take-off ground roll or after lift-off with gear still down and 100 mph (CAS) has been attained:
   (1) If adequate runway remains, CLOSE BOTH THROTTLES IMMEDIATELY, LAND IF AIRBORNE, AND STOP STRAIGHT AHEAD.
   (2) If the runway remaining is inadequate for stopping, the pilot must decide whether to abort the takeoff or to continue. The decision must be based on the pilot's judgement considering loading, density altitude, obstructions, the weather, and the pilot's competence. If the decision is made to continue, then:
      (a) Maintain heading and airspeed.
      (b) Retract landing gear when climb is established.
      ~~(c) Feather inoperative engine (see feathering procedure).~~

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6. ENGINE FAILURE DURING CLIMB

The single engine minimum control speed for this airplane is 80 mph (CAS) under sea level standard conditions.

a. If engine failure occurs when airspeed is below 80 mph (CAS) reduce the power on the good engine as required to maintain directional control. Reduce nose attitude to accelerate toward the single engine best rate of climb speed of 105 mph. Then feather inoperative engine (see feathering procedure).

b. If engine failure occurs when the airspeed is above 80 mph (CAS):
   (1) Maintain directional control.
   (2) Adjust airspeed toward the single engine best rate of climb speed of 105 mph.
   (3) Feather inoperative engine (see feathering procedure).

7. SINGLE ENGINE LANDING

a. Feather inoperative engine (see feathering procedure).
b. Do not extend landing gear until certain of making field.
c. Do not lower wing flaps until certain of making field.

Maintain additional altitude and speed during approach, keeping in mind that landing should be made right the first time and that a go-around may require the use of full power on the operating engine, making control more difficult.

A final approach speed of 105 miles per hour and the use of 25° rather than full wing flaps will place the airplane in the best configuration for a go-around should this be necessary, but it should be avoided if at all possible. Under some conditions of loading and density altitude a go-around may be impossible, and in any event the sudden application of power during single engine operation makes control of the airplane more difficult.

8. SINGLE ENGINE GO-AROUND

If a single engine go-around cannot be avoided proceed as follows:
a. Mixture - forward.
b. Propeller - forward.
c. Throttle - open.
d. Flaps - retract.
e. Landing Gear - retract.
f. Airspeed - one engine inoperative best rate-of-climb speed 105 MPH.
g. Trim - set.
h. Cowl Flap - as required (operating engine).

9. MANUAL EXTENSION OF LANDING GEAR

Check the following before extending the gear manually:

a. Circuit breakers - check.
b. Master switch - ON.
c. Alternators - check.
d. Navigation lights - OFF (daytime).

To extend the gear, reposition the clip covering the emergency disengage control downward, clear of the knob, and proceed as listed below:

a. Reduce power; airspeed not to exceed 100 MPH.
b. Place Landing Gear Selector Switch in "GEAR DOWN LOCKED" position.
c. Pull emergency gear extension knob.
d. Check for 3 green lights.
e. Leave emergency gear extension knob out.

WARNING

If the emergency gear extension knob has been pulled out to lower the gear due to a gear system malfunction, leave the control in its extended position until the airplane has been put on jacks to check the proper function of the landing gears hydraulic and electrical systems.

10. LANDING GEAR UNSAFE WARNINGS

The red landing gear light will illuminate when the landing gear is in transition between the full up position and the down and locked position. The pilot should recycle the landing gear if continued illumination of the light occurs. Additionally, on aircraft with serial numbers 34-72500046 and up, the light will illuminate when the gear warning horn sounds. The gear warning horn will sound at low throttle settings with the gear in the up and locked position.

11. GEAR-UP EMERGENCY LANDING

a. Approach with power at a normal airspeed.
b. Leave flaps up (to reduce wing and flap damage).
c. Close the throttles just before touchdown.
d. Turn off the master and ignition switches.
e. Turn fuel selector valves to "OFF."
f. Contact the surface at minimum airspeed.

12. ELECTRICAL FAILURES

a. In the event that both overvoltage lights illuminate:
   (1) Turn off all electrical loads, except the master switch.
   (2) Turn both alternator switches OFF to extinguish the warning lights.
      (a) Turn the alternator switches momentarily ON, one at a time while observing the ammeters.
      (b) Determine the alternator showing the LEAST output amperes and turn its switch ON.

(3) Turn electrical equipment on as required but do not exceed 50 amperes output.
(4) If both alternators show approximately equal output (less than 50 amperes each).
  (a) Turn both alternators "ON."
  (b) Turn equipment on as required.
  (c) Resume normal operation.

b. In the event that one overvoltage light illuminates:
  (1) Turn off all electrical loads, except the master switch.
  (2) Turn off the alternator switch associated with the overvoltage trip warning.
  (3) While observing ammeters, turn the alternator switch momentarily on to verify that the alternator output is excessive, then leave the alternator switch in the off position.
  (4) Turn electrical equipment on as required but do not exceed 50 amperes output.

c. In case the battery becomes depleted from a weakened condition or from excessive restart cranking, it may be necessary to perform the following procedure to get an operating alternator on the line if it has become disconnected for any reason.
  (1) Check alternator circuit breakers, reset if tripped.
  (2) Remove heavy electrical loads such as pitot head, lighting, blower motor; minimize radio load. (Do not use master switch to accomplish this.)
  (3) Turn operating alternator switch to on. Turn master switch to off. Wait a short time period, then cycle master switch to on. Observe ammeter for output.
  (4) If no output is noted, recycle step (3) using longer waiting periods.
  (5) When power is re-established, use electrical equipment so that 50 amperes is not exceeded.

d. In case of loss of output from one alternator:
  (1) Reduce electrical load as necessary to keep alternator output to 50 amperes or less.
  (2) Check alternator circuit breakers, reset if necessary.
  (3) Cycle the alternator switch for the inoperative alternator OFF, then ON.
  (4) If step (3) fails to restore output:
    (a) Maintain conditions of step (1) to continue flight.
    (b) Take corrective maintenance action before further flights.

e. In case of alternator output loss due to an engine failure, reduce the electrical load as necessary to keep the alternator output to 50 amperes or less.

WARNING

Compass error may exceed 10° with both alternators inoperative.

13. VACUUM SYSTEM FAILURES

a. A malfunction of the vacuum system will become apparent as a reduction of indication on the gauge. A red button annunciator will show in case of a feathered engine or vacuum pump failure.

b. In the event of vacuum system malfunction (vacuum lower than 4.5 inches of mercury):

(1) Increase engine RPM to 2700.
(2) Descend to an altitude, if possible, at which 4.5 inches of mercury vacuum can be maintained.
(3) Use Turn Indicator (Electric) to monitor the Direction Indicator and Attitude Indicator performance.

14. ENGINE FIRE

a. In case of engine fire in flight (on the affected engine)

(1) Fuel Selector - OFF
(2) Throttle - CLOSE
(3) Propeller - FEATHER
(4) Mixture - IDLE CUT OFF
(5) Heater - OFF (In all cases of fire)
(6) Defroster - OFF (In all cases of fire)
(7) If terrain permits - Land Immediately

The possibility of an engine fire in flight is extremely remote. The procedure given above is general and pilot judgement should be the deciding factor for action in such an emergency.

b. In case of engine fire on the ground

(1) If engine has not started
  (a) Mixture - IDLE CUT OFF
  (b) Throttle - OPEN
  (c) Turn engine with starter (This is an attempt to pull the fire into the engine.)
(2) If engine has already started and is running, continue operating to try pulling the fire into the engine.
(3) In either case stated in (1) and (2), if the fire continues longer than a few seconds, the fire should be extinguished by the best available external means.
(4) If external fire extinguishing is to be applied
  (a) Fuel Selector Valves - OFF
  (b) Mixture - IDLE CUT OFF

15. SPINS

Intentional spins are prohibited. In the event that an unintentional spin is encountered, recovery can be accomplished by immediately using the following procedures:

a. Retard both throttles to the idle position.
b. Apply full rudder in the direction opposite the spin rotation.
c. Let up all back pressure on the control wheel. If nose does not drop immediately push control wheel full forward.
d. Keep ailerons in neutral.
e. Maintain the controls in these positions until spin stops, then neutralize rudder.
f. Recover from the resulting dive with smooth back pressure on the control wheel. No abrupt control movement should be used during recovery from the dive, as the positive limit maneuvering load factor may be exceeded.

16. ENGINE FAILURE IN ICING CONDITIONS

If engine failure occurs during icing flight, select ALTERNATE AIR and attempt to restart engine. If unable to restart engine:

a. Feather inoperative propeller (see feathering procedure).
b. Maintain airspeed at or above 105 mph (CAS).
c. Descend if necessary to maintain airspeed.
d. Reduce electrical loads per alternator failure procedure below.
e. Avoid further icing conditions if possible.
f. Land as soon as practical.
g. Maintain at least 105 mph (CAS) during final approach.
h. Do not extend landing gear until certain of making field.
i. Do not lower wing flaps until certain of making field.
j. Use 25° flaps rather than full flaps for landing.

17. ALTERNATOR FAILURE IN ICING CONDITIONS

In the event of an alternator failure during flight in icing conditions:

a. Attempt to reset alternator overvoltage relay.
b. Check circuit breakers and reset if possible.

If unable to restore alternator:

c. Turn off all avionics except one NAVCOM and TRANSPONDER.
d. Turn off electric windshield to maintain 60 AMP load.
e. If icing conditions continue terminate flight as soon as practical.
f. Prior to landing electric windshield may be turned on if necessary. Battery may be depleted and gear may require free-fall extension.

18. ENGINE FAILURE WITH REAR CABIN AND CARGO DOORS REMOVED.

The single engine minimum control speed for this configuration is 81 mph (CAS). If engine failure occurs at an airspeed below 81 mph, reduce power as necessary on the operating engine to maintain directional control.

19. PROPELLER OVERSPEED

Loss of the air charge in the propeller dome may cause the propeller to overspeed if the throttle is advanced rapidly or airspeed is abruptly increased. If an overspeed condition is encountered, the propeller will not feather and the following procedure should be used.

a. Close throttle.
b. Slow aircraft to best rate of climb speed.
c. Pull propeller control back to low RPM.
d. Slowly increase throttle until propeller governor is engaged.
e. Slowly increase propeller and throttle to the desired power setting.
f. Continue flight at reduced speed and power and land as soon as practical.

If the throttle is retarded below 15-20 IN - MP at speeds above 105 MPH, the propeller may overspeed again upon reapplying power. If this occurs, follow the same procedure to regain propeller control.

D. SPECIAL OPERATING PROCEDURES

1. FLIGHT INTO KNOWN ICING CONDITIONS

Prior to dispatch into forecast icing conditions all ice protection should be functionally checked for proper operation. The windshield defroster should be turned on before entering icing conditions. Upon entering probable icing conditions accomplish the following:

a. Pitot heat - On (immediately).
b. Windshield heat - On (immediately).
c. Propeller Deice - On (immediately).
d. Wing Deice - On (after 1/4 to 1/2 inch accumulation).
e. Relieve propeller unbalance (if required) by increasing RPM briefly. Repeat as required.

WARNING

Do not cycle pneumatic boots with less than 1/4 inch of ice accumulation; operation of boots with less than 1/4 inch ice accumulation can result in failure to remove ice. Do not hold momentary deice switch ON. If wing-tail deicer panel light illuminates for more than 20 seconds pull surface deice circuit breaker.

Heat for the stall warning transmitters is activated by the pitot heat switch. When ice has accumulated on the unprotected surfaces of the airplane, aerodynamic buffet commences between 5 and 10 mph above the stall speed. A substantial margin of airspeed should be maintained above the normal stall speeds, since the stall speed may increase by up to 12 mph in prolonged icing encounters.

If ice is remaining on the unprotected surfaces of the airplane at the termination of the flight the landing should be made using full flaps and carrying a slight amount of power whenever practical, and approach speeds should be increased by 10 to 15 mph.

Cruise speed may be significantly reduced in prolonged icing encounters. If icing conditions are encountered at altitudes above 10,000 feet it may be necessary to descend in order to maintain airspeed above best rate of climb speed (105 mph - CAS).

NOTE

Pneumatic boots must be regularly cleaned and waxed for proper operation in icing conditions. Pitot, windshield and stall warning heat should be checked on the ground before dispatch into icing conditions.

Performance

Installation of ice protection equipment results in a 30 FPM decrease in single engine climb rate and a reduction of 850 feet in single engine service ceiling.

CAUTION

If the airplane is to be flown with the heated glass panel removed, rotate the receptacle plate 180° and replace it to cover the holes in the fuselage skin. Also replace the windshield collar screws.

SECTION III

PERFORMANCE

A. STALLS

1. POWER OFF STALLS

The loss of altitude during a power off stall with gear and flaps retracted may be as much as 450 feet. The loss of altitude with gear down and 40° of flaps may be as much as 450 feet.

2. POWER ON STALLS

The loss of altitude during a power on stall with gear and flaps retracted may be as much as 550 feet. The loss of altitude with gear down and 40° of flaps may be as much as 400 feet.

3. STALL WARNING SYSTEM

The stall warning system is inoperative with the master switch off.

B. STALLING SPEEDS (MPH, CALIBRATED AIRSPEED) VS ANGLE OF BANK

ANGLE OF BANK	0°	20°	40°	50°	60°
Flaps Up	~~76~~	~~78~~	~~87~~	~~95~~	~~108~~
Flaps 40°	~~69~~	~~71~~	~~79~~	~~86~~	~~98~~

C. AIRCRAFT PERFORMANCE WITH REAR CABIN AND CARGO DOORS REMOVED

All climb and cruise performance will be reduced by approximately five percent when the airplane is operated with the rear cabin and cargo doors removed.

"See Robertson
Supplement"
1-28-75

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SECTION IV

SUPPLEMENTS

NOTE

A FLIGHT MANUAL SUPPLEMENT IS REQUIRED TO BE IN THE AIRPLANE FLIGHT MANUAL ONLY IF THE EQUIPMENT WHICH IS THE SUBJECT OF THE SUPPLEMENT IS INSTALLED.

A. Electric Pitch Trim Installation

B. ~~AutoControl III Installation~~

C. ~~AltiMatic IIIB-1 Installation~~

D. AltiMatic V/FD-1 and AltiMatic V-1 Installation

E. ~~Windshield Heating Installation~~

F. ~~Cabin Combustion Heater Installation~~

G. Robertson STOL INstallation
H. SOI Fuel Flow Installation
I. B.F. Goodrich Propeller DE-Icing Installation.
J. RayJay Turbocharger Installation

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A. ELECTRIC PITCH TRIM INSTALLATION

1. LIMITATIONS

There are no limitations for this installation.

2. PROCEDURES

a. Preflight

(1) Circuit breaker - Set
(2) Depress center bar - Trim fore and aft
(3) Manually override electric trim
(4) Check manual trim operation
(5) Depress center bar - No operation
(6) Push rocker Fore/Aft only - No operation
(7) If trim fails preflight, disengage electric trim by operating push button trim switch on instrument panel until repaired. If trim does not disengage have unit repaired before further flight.

b. Inflight

(1) Depress center bar
(2) Activate rocker fore/aft for trim

3. EMERGENCY OPERATION

a. In Case Of Malfunction -

Disengage electric pitch trim by operating push button trim switch on instrument panel.

b. In Emergency -

Electric pitch trim may be overpowered using manual pitch trim.

B. AUTOCONTROL III INSTALLATION

1. LIMITATIONS
   a. Autopilot use is prohibited above 195 MPH-CAS
   b. Use of flaps is limited to 25° or less during autopilot operations
   c. Autopilot "OFF" for takeoff and landing

2. PROCEDURES
   a. Normal Operation -
      Refer to the current AutoControl III Owner's Handbook

   b. Emergency Operation
      (1) In an emergency
         (a) The AutoControl III can be disconnected by pushing the roll "ON-OFF" switch to "OFF."
         (b) The AutoControl III can be overpowered at either control wheel.
      (2) An autopilot runaway, with a 3 second delay in the initiation of recovery, while operating in a climb, cruise or descending flight could result in a 45° bank and a 175 foot altitude loss.
      (3) An autopilot runaway, with a 1 second delay in the initiation of recovery, during an approach operation, coupled or uncoupled, single or multi-engine, could result in an 18° bank and a 40 foot altitude loss.

3. PERFORMANCE
   The airplane performance remains unchanged.

C. ALTIMATIC IIIB-1 INSTALLATION

1. LIMITATIONS
   a. Autopilot use is prohibited above 195 MPH-CAS
   b. Use of flaps is limited to 25° or less during autopilot operations
   c. Autopilot "OFF" for takeoff and landing

2. PROCEDURES
   a. Preflight
      (1) Circuit breaker - Set
      (2) Depress center bar - Trim fore and aft
      (3) Manually override electric trim
      (4) Check manual trim operation
      (5) Depress center bar - No operation
      (6) Push rocker Fore/Aft only - No operation
      (7) If trim fails preflight, disengage electric trim by operating push button trim switch on instrument panel until repaired. If trim does not disengage have unit repaired before further flight.

   b. Normal Operation -
      Refer to the current AltiMatic IIIB-1 Owner's Handbook

   c. Emergency Operation -
      (1) In the event of malfunction, the autopilot can be
         (a) Disconnected by pushing the wheel disconnect switch (AP OFF)
         (b) Disconnected by pushing the roll rocker switch "OFF"
         (c) Overpowered manually in roll and pitch at either control wheel.
      (2) In the event of malfunction, the trim system can be
         (a) Disabled by operating the push button trim switch on the instrument panel
         (b) Overpowered manually at the trim wheel
      (3) Single engine operation
         (a) Disengage autopilot and retrim aircraft -
             Maintain aircraft in trim throughout all single engine operations. (Ball centered)
         (b) Perform normal engine out emergency procedure
         (c) Re-engage autopilot
      (4) An autopilot malfunction during climb, cruise or descent, either single or multi-engine, with a 3 second delay in the initiation of recovery could result in a 45° bank and a 600 foot altitude loss.
      (5) An autopilot malfunction during approach operations, either single or multi-engine, coupled or uncoupled, with a 1 second delay in the initiation of recovery could result in an 18° bank and a 60 foot altitude loss.

3. PERFORMANCE
   The airplane performance remains unchanged.

D. ALTIMATIC V/FD-1 OR ALTIMATIC V-1 INSTALLATION

1. LIMITATIONS
   a. Autopilot OFF during takeoff and landing.
   b. Do not engage autopilot if airplane is out of trim.
   c. Maximum airspeed for autopilot operation is 207 MPH, (180 KTS), CAS.
   d. During autopilot operation, the pilot must be in his seat with the belt fastened.
   e. Do not manually override autopilot to produce or prevent pitch attitude changes or to increase bank angle.
   f. If one engine becomes inoperative, adjust rudder trim for single engine operatio

"See Robertson Supplement" 1-28-75

   g. Maximum flap setting 20° with autopilot engaged.

2. PROCEDURES
   a. Prefligh'
      (1) Manual Electric Trim
         (a) Aircraft Master Switch - ON
         (b) Trim Warning Light - OUT
         (c) Manual Trim Wheel freedom of movement - CHECK
         (d) Actuate Electric Trim Switch and observe proper direction of movement of trim wheel - CHECK
         (e) Depress the test button next to the trim warning light. Light should light and trim should not run. If trim runs or if light does not illuminate, pull trim disconnect switch and do not reset until problem has been corrected. DO NOT ENGAGE AUTOPILOT WITH TRIM DISCONNECTED.
      (2) Autopilot
         (a) Start engines
         (b) Autopilot Master Switch - ON
         (c) Gyro Check - Check attitude gyro for proper erection. Set directional gyro if non-slaving type.
         (d) Before takeoff - Engage autopilot, apply force to controls (one axis at a time) to determine if the autopilot can be overpowered.
         (e) Press HDG, VOR, APPR, REV buttons one at a time, place pitch command disc in center detent position and check respective lights on the Flight Controller for operation.

NOTE

Automatic pitch trim will operate during this check and should be reset prior to takeoff.

   h. Placards: Adjacent to Autopilot controller: "Maximum flaps 20° with Autopilot engaged."

(f) AUTOPILOT RELEASE - Disengage the autopilot by operating trim switch on left side of pilot's control wheel. Ascertain that servos have disengaged by free movement of controls.

b. Normal Operation - Refer to Piper AltiMatic V/FD-1 or Piper AltiMatic V-1 Information Manual.

c. Emergency Operation
Autopilot
(1) In the event a malfunction in the autopilot performance is detected, the pilot must immediately disengage the autopilot by momentarily operating the trim switch on the left side of the pilot's control wheel.
(2) Maximum altitude loss during malfunction tests in the following flight configuration:

(a)	Cruise, Climb	170 Feet
(b)	Descent	250 Feet
(c)	ILS approach (Twin Engine)	90 Feet
(d)	ILS approach (Single Engine)	90 Feet

Pitch Trim
(3) If Trim Warning Light illuminates in flight, pull the Pitch Trim Disconnect switch and have system inspected prior to operation.
(4) If a runaway trim should occur with autopilot on, the electric trim circuit breaker will open with an out of trim condition of approximately 15 lbs.

3. PERFORMANCE
The airplane performance remains unchanged.

E. WINDSHIELD HEATING INSTALLATION

1. LIMITATIONS

UNDER NO CIRCUMSTANCES SHOULD THE UNIT BE TURNED ON FOR A PERIOD EXCEEDING 30 SECONDS UNLESS:

a. The aircraft is in flight, or
b. Ice exists on the heated panel.

2. PROCEDURES

An operational check is accomplished by turning the heated panel switch ON for a period not exceeding 30 SECONDS. Proper operation is indicated by the glass section being warm to the touch.

3. PERFORMANCE

NOTE

An additional compass deviation card is required with this installation. This card should indicate corrected readings with windshield heat and radios on.

F. CABIN COMBUSTION HEATER

1. LIMITATIONS
   a. The use of windshield electric anti-ice and cabin combustion heater at the same time is prohibited due to excessive compass error.

   b. Placards

      Near the heater controls in full view of the pilot "Operation of Combustion Heater prohibits the use of Windshield Heater due to excessive compass error".

   c. Operation of the combustion heater above 20,000 feet is not approved.

2. PROCEDURES
   a. Normal Operation

      Refer to Pilot's Operating Manual for normal operation.

   b. Emergency Operation

      In the event of an overheat condition, the fuel, air and ignition to the heater is automatically cut off. Do not attempt to restart the heater until it has been inspected and the cause of the malfunction has been determined and corrected.

3. PERFORMANCE

   The airplane performance remains unchanged.

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FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT OR SUPPLEMENTAL AIRPLANE FLIGHT MANUAL (INCLUDING POH AND FAA AFM)
(FOR THOSE AIRCRAFT WITHOUT A BASIC AIRPLANE FLIGHT MANUAL)

EDM-760 TEMPERATURE INDICATOR
FOR

Twin Reciprocating Engine Powered Aircraft as listed on Approved Model List of

STC SA00729SE.

REG. NO. N4542T

SER. NO. 34-7250128

This Supplement must be attached to the FAA Approved Airplane Flight Manual when the J.P. Instruments EDM-760 is installed in accordance with Supplemental Type Certificate SA00729SE. For those airplanes without a basic Airplane Flight Manual, the Supplemental AFM must be in the aircraft when the EDM-760 is installed.

The information contained in this Airplane Flight Manual Supplement/ Supplemental Aircraft Flight Manual supplements or supersedes the basic manual/ placards only in those areas listed. For limitations, procedures and performance information not contained in this supplement, consult the basic Airplane Flight manual, Markings and Placards.

FAA APPROVED:

Manager, Special Certification Branch, ANM-190S
Federal Aviation Administration
Seattle Aircraft Certification Office
Transport Airplane Certification Directorate

Date: August 31,1999

Revision No.	Description	Affected Pages	Approval
Original	Complete Flight Manual Supplement for EDM-760	1 thru 4	Mgr. Special Certification Branch, ANM-190S FAA, Seattle ACO Transport Airplane Directorate Date August 31 1999

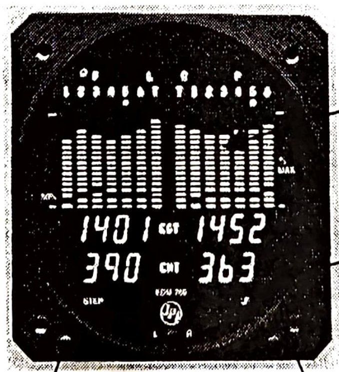
I GENERAL

The EDM-760 twin temperature indicator displays temperature digitally and in analog format for both Left and Right engines simultaneously. The EGT as displayed is based on probes located near the exhaust outlet for each cylinder and the TIT probe, if installed, in the turbo charger inlet. Before each flight during the run-up the pilot should verify that the left engine is displayed on the left display and the right engine on the right. . These probes are not necessarily collocated with the primary probes therefore, EDM-760 may not indicate the same as the aircraft primary instruments. The analog display is an electronic bar graph (vertical columns, one per cylinder) of EGT & TIT temperatures presented as a percentage of TIT. Below the vertical columns the specific value for EGT and CHT are displayed digitally. The dot over the column indicates which cylinder's digital information is presently displayed. The missing bars at the base of the columns indicates the hottest and coldest Cylinder Head temperature trend . Within a four bar range at the base of the column a trend is formed showing the hottest and the coldest cylinder with respect to the others. Depressing the LF and STEP button simultaneously brings up the adjustable Scan Rate, OAT in °F or °C. Depress the LF button until the desired scan time is ...hed. Exit by Depressing STEP.

If the EDM-760 buttons are not depressed for 10 minute the system will start scanning automatically. Depressing the STEP button will stop the automatic scan and index through all the functions available. During constant power cruise, if the LF button is depressed for five seconds the bar graph will level at mid scale and the letter "N" (normalize) will illuminate. The leveled bars represent the peaks of each column. Each bar represents 10 °F and now acts as an EGT & TIT trend monitor, quickly showing an increase or decrease in temperature. Depress again to return to normal illuminating the "P"(percentage); nothing else is affected. With the fuel flow option there is a three position toggle switch. The positions are: 1) **EGT**, digital and Bargraph display of temperatures, 2) **FF**, digital display of GPH, REM and USED Fuel. Temperature Bargraph remains. 3) **Both** , cycles through everything installed. The data port output, sends RS232 serial data every 6 sec.
Options of Fuel Flow, TIT, OAT, IAT (induction air temp. Carb temp.), OIL, BAT (voltage) are only displayed digitally with headlines after the number, as "230 OIL" or "14 GPH". A large value (50 +) of "CLD" indicates shock cooling usually associated with rapid descents at low power. Optional functions not installed will not display.

Alarm limits set for this instrument if different from JPI limits.

CHT________
OIL________
TIT________
DIF________
CLD________
BAT________
TECH________
DATE________



EDM-760

Analog Temperatures
EGT 1 thru 6
Percent of 1650 F

Digital Temperature

Switch

DATA

STEP

LeanFind

FAA APPROVED August 31 1999

J.P.INSTRUMENTS
PO BOX 7033
1
HUNTINGTON BEACH CA 92646

GENERAL (cont.)
An alarm causes the digital function to flash as soon as the particular limit is exceeded. Factory set alarm limits for CHT (450 °F) and OIL (230°F) are lower than the actual aircraft limits and can not be set by the pilot. The values may be adjusted to suit individual preference by a qualified technician. Other factory set alarm limits are: "BAT" Voltage 15.5/11.0 or 31.0/22.0 Hi/Lo as appropriate; "DIF" (differential Hi/Lo EGT) 500 °F, "TIT" 1650 °F Hi; "OIL" Lo 90 °F; "CLD" (Rate of change of cylinder head temperature in degrees per minute) -60 degrees/minute. The pilot should be aware of the setting of each alarm for his particular aircraft. An alarm is "Canceled" by holding the step button in for 5 seconds and seeing the word "OFF". Then, only that particular alarm is canceled. Canceled alarms will not appear again until the power has been removed and reapplied to the EDM-760. The entire display dims automatically depending on the ambient lighting.

The Cylinder Head with the Gasket probe and oil temperature will indicate generally higher temperatures than instruments provided by the aircraft manufacturer because the EDM-760 sensing thermocouples are not collocated with the primary instrument sensing probes. Therefore, airplane fl manual limitations based on primary instrument indication take precedence over those of the EDM-

II OPERATING LIMITATIONS

A. The EDM-760 may not replace any existing instrument or indicator required by the aircraft type design or operating limits.

B. The EDM-760 display may not be used in lieu of, or to supersede, engine operating limitations established by the airframe or engine manufacturer during certification.

III. EMERGENCY PROCEDURES

No change

IV. NORMAL PROCEDURES

<u>CAUTION</u>

Comply with manufacturer's Airplane
Flight Manual leaning procedure.
Do not exceed applicable engine
or aircraft limitations.

After establishing desired cruise power depress the LF button to activate the Lean Find Mode. As the mixture is leaned, one column on the EDM-760 display will begin blinking, indicating the exhaust gas temperature for that cylinder has peaked showing its digital value along with the fuel flow (option) at that time. Continue with the leaning procedure as recommended by the aircraft manufacturer while monitoring the primary engine instruments and the EDM-760 display. Once the leaning procedure has been completed, depress the Step button briefly to exit the Lean Find Mode and enter the Monitor Mode.

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GARMIN

GTX™ 327

Mode A/C Transponder

pilot's guide

This manual is written for software version 2.04, and is not suitable for earlier software versions. Information in this document is subject to change without notice. Visit the GARMIN web site (www.garmin.com) for current updates and supplemental information concerning the operation of this and other GARMIN products.

Software License Agreement

BY USING THE GTX 327, YOU AGREE TO BE BOUND BY THE TERMS AND CONDITIONS OF THE FOLLOWING SOFTWARE LICENSE AGREEMENT. PLEASE READ THIS AGREEMENT CAREFULLY.

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October 2002 Part Number 190-00187-00 Rev. B Printed in USA

Limited Warranty

This GARMIN product is warranted to be free from defects in materials or work[illegible] one year from the date of purchase. Within this period, GARMIN will at its sole [illegible] repair or replace any components that fail in normal use. Such repairs or replace[illegible] be made at no charge to the customer for parts or labor, provided that the custom[illegible] responsible for any transportation cost. This warranty does not cover failures due to [illegible] misuse, accident or unauthorized alteration or repairs.

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GARMIN retains the exclusive right to repair or replace the unit or software or offer a full refund of the purchase price at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

To obtain warranty service, contact your local GARMIN Authorized Service Center. For assistance in locating a Service Center near you, call GARMIN Customer Service at one of the numbers shown below.

GARMIN International, [illegible]
1200 East 151st Street
Olathe, Kansas 66062, U.[illegible]
Phone: 913/397.82[illegible]
FAX: 913/397.0836

GARMIN (Europe) Ltd.
Unit 4, The Quadrangle, Abbey Park
Industrial Estate, Rom[illegible] [illegible] AQ U.K.
Phone: 44[illegible]
FAX: 44[illegible]

NOTE: The GTX 327 owner accepts all responsibility [illegible] proper licensing before using the transponder.

NOTE: The coverage you can expect from the GTX 327 is limited to "line of sight". Low altitude or aircraft antenna shielding by the aircraft itself may result in reduced range. Range can be improved by climbing to a higher altitude. It may be possible to minimize antenna shielding by locating the antenna where dead spots are only noticed during abnormal flight attitudes.

CAUTION: The GTX 327 should be turned off before starting or shutting down aircraft engine(s).

*The GTX 327 transponder is powered on by pressing the **STBY**, **ALT** or **ON** keys, or by a remote avionics master switch (if applicable). After power on, a start-up page is displayed while the unit performs a self test. If the unit detects an internal failure, the screen displays SELF TEST FAILED. (See your GARMIN dealer for software upgrades.)*

Mode Selection Keys

OFF — Powers off the GTX 327. Pressing **STBY**, **ON** or **ALT** key powers on the transponder displaying the last active identification code.

STBY — Selects the standby mode. When in standby mode, the transponder will not reply to any interrogations.

ON — Selects Mode A. In this mode, the transponder replies to interrogations, as indicated by the Reply Symbol (R). Replies do not include altitude information.

ALT — Selects Mode A and Mode C. In **ALT** mode, the transponder replies to identification and altitude interrogations as indicated by the Reply Symbol (R). Replies to altitude interrogations include the standard pressure altitude received from an external altitude source, which is not adjusted for barometric pressure. The ALT mode may be selected in aircraft not equipped with an optional altitude encoder; however, the reply signal will not include altitude information.

Any time the function **ON** or **ALT** is selected the transponder becomes an active part of the Air Traffic Control Radar Beacon System (ATCRBS). The transponder also responds to interrogations from TCAS equipped aircraft.

Code Selection

Code selection is done with eight keys (**0 – 7**) providing 4,096 active identification codes. Pushing one of these keys begins the code selection sequence. The new code is not activated until the fourth digit is entered. Pressing the **CLR** key moves the cursor back to the previous digit. Pressing the **CLR** key when the cursor is on the first digit of the code, or pressing the **CRSR** key during code entry, removes the cursor and cancels data entry, restoring the previous code. You may press the **CLR** key up to five seconds after code entry is complete to return the cursor to the fourth digit. The numbers 8 and 9 are not used for code entry, only for entering a Count Down time, contrast and display brightness, and data selection in the Configuration Mode.

Important Codes:

1200— The VFR code for any altitude in the US (Refer to ICAO standards elsewhere)

7000— The VFR code commonly used in Europe (Refer to ICAO standards)

7500— Hijack code (Aircraft is subject to unlawful interference)

7600— Loss of communications

7700— Emergency

7777— Military interceptor operations (Never squawk this code)

0000— Military use (Not enterable)

Avoid selecting code 7500 and all codes in the 7600-7777 range. These codes trigger special indicators in automated facilities. An aircraft's transponder code is used for ATC tracking purposes, therefore exercise care when making routine code changes.

Keys for Other GTX 327 Functions

IDENT— Pressing the **IDENT** key activates the Special Position Identification (SPI) Pulse for 18 seconds, identifying your transponder return from others on the air traffic controller's screen. The word 'IDENT' will appear in the upper left corner of the display while the IDENT mode is active.

VFR— Sets the transponder code to the pre-programmed VFR code selected in Configuration Mode (this is set to 1200 at the factory). Pressing the **VFR** key again restores the previous identification code.

FUNC— Changes the page shown on the right side of the display. Display includes Pressure Altitude, Flight Time, Count Up and Count Down timers. In Configuration Mode, steps through the configuration pages.

START/STOP— Starts and stops the Count Up, Count Down and Flight timers. In Configuration Mode, steps through configuration pages in reverse.

CRSR— Initiates starting time entry for the Count Down timer and cancels transponder code entry. Selects changeable fields in Configuration Mode.

CLR— Resets the Count Up, Count Down and Flight timers. Cancels the previous keypress during code selection and Count Down entry. Returns cursor to the fourth code digit within five seconds after entry. Used in Configuration Mode.

8— Reduces Contrast and Display Brightness when the respective fields are displayed and enters the number eight into the Count Down timer. Used in Configuration Mode.

9— Increases Contrast and Display Brightness when the respective fields are displayed and enters the number nine into the Count Down timer. Used in Configuration Mode.

Function Display

PRESSURE ALT: Displays the altitude data supplied to the GTX 327 in feet, hundreds of feet (i.e., flight level), or meters, depending on configuration.

FLIGHT TIME: Displays the Flight Time, controlled by the **START/STOP** and **CLR** keys when Flight Timer is configured as manual. Under Automated Airborne Determination control, the timer begins when liftoff is sensed.

COUNT UP TIMER: Controlled by **START/STOP** and **CLR** keys.

COUNT DOWN TIMER: Controlled by **START/STOP**, **CLR**, and **CRSR** keys. The initial Count Down time is entered with the **0 – 9** keys.

CONTRAST: This page is only displayed if manual contrast mode is selected in Configuration Mode. Contrast is controlled by the **8** and **9** keys.

DISPLAY: This page is only displayed if manual backlighting mode is selected in Configuration Mode. Backlighting is controlled by the **8** and **9** keys.

GTX 327 Configuration Mode

The GTX 327's configuration is normally set at time of installation. To view or change any of the GTX 327 configuration parameters, you must access the GTX 327 Configuration Mode. Use caution when changing configuration. When in doubt, contact your authorized GARMIN Aviation Service Center. Your GARMIN dealer can assist in configuration changes. The Configuration Mode should not be used during flight.

To use the GTX 327 Configuration Mode:

1. Press and hold the **FUNC** key while powering on the unit using the **STBY**, **ON**, or **ALT** key (or using an avionics master switch).
2. Press the **FUNC** key to sequence through the configuration pages. Press the **START/STOP** key to sequence in reverse. Reverse sequence stops on the Display Mode page.
3. Use the **CRSR** key to highlight selectable fields on each page.
4. When a field is highlighted, use the **8** or **9** keys to select changeable fields or the **0 - 9** keys to enter numeric data.
5. Press the **CRSR** key to confirm list selections.

Altitude Trend Indicator

When the 'PRESSURE ALT' page is displayed, an arrow may be displayed to the right of the altitude, indicating that the altitude is increasing or decreasing. One of two sizes of arrows may be displayed depending on the rate of climb/descent. The sensitivity of these arrows is set using the GTX 327 Configuration Mode vertical speed rate.

Timer Operation

To operate the Flight Timer:

1. Press the **FUNC** key until 'FLIGHT TIME' is displayed.
2. If the GTX 327 Flight Timer is configured as ACCUMULATE or CLEAR, the timer will begin automatically when the unit senses that the aircraft has become airborne. The timer may be reset to zero at every liftoff (CLEAR), continue accumulating time at liftoff (ACCUMULATE) or may be controlled manually (MANUAL).
3. If desired, you may press **START/STOP** to pause or restart the timer.
4. Press **CLR** to reset the timer to zero.
5. If the timer is configured to stop automatically it will pause when the Automated Airborne Determination senses that the aircraft is on the ground.

To operate the Count Up timer:

1. Press the **FUNC** key until 'COUNT UP' is displayed.
2. If necessary, press **CLR** to reset the Count Up timer to zero.
3. Press **START/STOP** to count up.
4. Press **START/STOP** again to pause the timer.
5. Press **CLR** to reset the timer to zero.

To operate the Count Down timer:

1. Press the **FUNC** key until 'COUNT DOWN' is displayed.
2. Press **CRSR** and use the **0 - 9** keys to set the initial time. All digits must be entered (use the **0** key to enter leading zeros).
3. Press **START/STOP** to count down.
4. Press **START/STOP** again to pause the timer.
5. When the Count Down timer expires, the 'COUNT DOWN' banner is replaced with a flashing 'EXPIRED', and the time begins counting up.
6. Press **CLR** to reset the timer to the initial time value.

Automatic ALT/STBY Mode Switching

If the GTX 327 is configured with Automated Airborne Determination, ALT mode selection occurs when liftoff is sensed. When the aircraft is on the ground, the transponder automatically selects and displays STBY. The transponder does not respond to ATCRBS interrogations when STBY is annunciated. When a delay time is set in the Configuration Mode, the GTX 327 waits this additional length of time after landing before changing to STBY mode.

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Part Number 190-00187-00 Rev. B

S-TEC CORPORATION
MINERAL WELLS, TEXAS 76067

FAA/DAS APPROVED
PILOT'S OPERATING HANDBOOK AND/OR
AIRPLANE FLIGHT MANUAL SUPPLEMENT
FOR
PIPER MODELS PA-34-200T AND PA-34-220T
WITH
S-TEC SYSTEM 55/55X TWO AXIS
AUTOMATIC FLIGHT GUIDANCE SYSTEM
(14 VOLT SYSTEM)

REG. NO. N4542T

SER. NO. 34-7250128

This Supplement must be attached to the applicable FAA Approved Airplane Flight Manual, Pilot's Operating Handbook, or Pilot's Operating Handbook and FAA Approved Airplane Flight Manual for aircraft modified by the installation of S-TEC System 55/55X Autopilot Model ST-567 installed in accordance with STC SA8897SW-D. The information contained herein supplements or supersedes the basic manual. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook and/or Airplane Flight Manual.

SECTION I

GENERAL

This manual is to acquaint the pilot with the features and functions of the System 55/55X Two Axis Autopilot and to provide operating instructions for the system when installed in the listed aircraft model(s). The aircraft must be operated within the limitations herein provided when the autopilot is in use.

FAA/DAS APPROVED ____________
Walter F. Davis

SECTION VI.

APPENDIX

S-TEC CORPORATION
MINERAL WELLS, TEXAS 76067

FAA/DAS APPROVED
PILOT'S OPERATING HANDBOOK AND/OR
AIRPLANE FLIGHT MANUAL SUPPLEMENT
FOR
PIPER MODELS PA-34-200T AND PA-34-220T

LOG OF REVISIONS

REV. NO.	PAGES AFFECTED	DESCRIPTION	APPROVED	DATE
1	All	Added System 55X information. Removed Optional Equipment section. Updated Supplement to latest format.	UFD	5-16-01

SECTION II

OPERATING LIMITATIONS

1. S-TEC System 55 Pilot's Operating Handbook, P/N 8747, dated 10-16-00 or later, or S-TEC System 55X Pilot's Operating Handbook, P/N 87109, dated 11-08-00 or later, (as appropriate for your aircraft) must be carried in the aircraft and be available to the pilot while in flight.
2. Autopilot operation not authorized above 180 KIAS.
3. Flap extension limited to two (2) notches (25°) or less during autopilot operations.
4. Go-arounds or missed approach maneuvers not authorized during autopilot operation.
5. Autopilot use prohibited during take-off and landing.
6. Category I operations only.

SECTION III

EMERGENCY OPERATING PROCEDURES

In the event of an autopilot malfunction, or anytime the autopilot is not performing as expected or commanded, do not attempt to identify the system problem. Immediately regain control of the aircraft by overpowering the autopilot as necessary and then immediately disconnect the autopilot. Do not re-engage the autopilot until the problem has been identified and corrected.

1. The autopilot may be disconnected by:

   a. Depressing the "AP Disconnect" Switch on the left horn of the pilot's control wheel.
   b. Placing the "AP Master Switch" in the "OFF" position.
   c. Momentarily interrupting aircraft electrical power at the battery master switch.
   d. Pulling the autopilot circuit breaker.

2. Trim: (IF INSTALLED)

   a. In the event of a trim failure, manually control aircraft and DEPRESS AND HOLD "Trim Interrupt/AP Disconnect Switch" on control wheel.
   b. Place trim master switch in "OFF" position, pull circuit breaker, release interrupt switch.
   c. Retrim aircraft. Leave trim system OFF until corrected.

3. Altitude loss during a malfunction and recovery:

a. An autopilot or autotrim malfunction during climb, cruise or descent with a three second delay in recovery initiation could result in as much as 57° bank and a 380 ft. altitude loss. Maximum altitude loss recorded in descent.

b. An autopilot or autotrim malfunction during an approach with one second delay in recovery initiation could result in as much as a 20° bank and a 60 ft. altitude loss. Maximum altitude loss measured with flaps down 2 notches, gear down and operating coupled or uncoupled, single or multi-engine.

The above values are the worst case for all the models covered by this document.

4. Single Engine Operations - Autopilot Mode:

a. Engine failure during an autopilot approach operation: Disengage autopilot conduct remainder of approach manually.

b. Engine failure during normal climb, cruise, descent: Retrim aircraft, perform normal aircraft engine out procedures.

c. Maintain aircraft yaw trim throughout all single engine operations.

SECTION IV

NORMAL OPERATING PROCEDURES

For detailed normal operating procedures, including system description, pre-flight and in-flight procedures refer to S-TEC System 55 Pilot's Operating Handbook, P/N 8747, dated 10-16-00 or later, or S-TEC System 55X Pilot's Operating Handbook, P/N 87109, dated 11-08-00 or later, (as appropriate for your aircraft).

CAUTION: **When S-TEC Flight Director is installed and operating, the Flight Director Autopilot should be disconnected using the control wheel disconnect switch only. Any other means of disconnect (breaker, ON-OFF switch, etc.) may leave steering bars in view, but inoperable.**

ELECTRIC TRIM SYSTEM (IF INSTALLED)

The S-TEC Electric Trim System is designed to accept any single failure, either mechanical or electrical, without uncontrolled operation resulting during operations in the Manual Electric Trim Mode. During autotrim mode the system is designed to limit the effect of any failure causing trim operation. In order to assure proper operation of these safeguards, it is necessary to conduct a simple pre-flight test of the system. Following is the trim pre-flight test procedure:

ELECTRIC TRIM CHECK (IF OPTIONAL AUTOTRIM IS INSTALLED)

Manual Electric Trim - Test Prior to Each Flight

a. Trim Switch and A/P Master Switch - ON
b. Operate Trim Switch (Both Knob Sections) - Nose DN - Check trim moves nose down and trim in motion indicator ("TRIM") in A/P Programmer flashes. Operate trim switch - Nose UP - Check trim moves nose up and for "in motion" trim light.
c. With trim operating Nose UP and DN - grasp manual trim control and overpower electric trim to stop trim action.
d. Operate each half of the trim switch separately - trim should not operate unless both switch knob segments are moved together.
e. With Trim Operating - Depress trim interrupt switch - Trim motion should stop while interrupt switch is depressed - when released trim should operate normally.

Autotrim

a. Engage HDG and VS modes of the autopilot.
b. Grasp control and apply forward pressure (NOSE DOWN) - After approximately three (3) seconds trim should run NOSE UP.
c. Apply aft pressure (NOSE UP) to control wheel - after approximately three (3) seconds trim should run NOSE DOWN.
d. Move manual trim switch UP or DN - Autopilot should disconnect and trim operates in the commanded direction. (Trim Switch will disconnect autopilot only when pitch is engaged.)

e. Reengage autopilot HDG and VS Modes and depress Trim Interrupt/AP Disconnect Switch - Autopilot should disconnect.
f. Retrim aircraft for take-off - Check all controls for freedom of motion and to determine that the autopilot and trim have disconnected.

If either the manual electric or autotrim fails any portion of the above check procedure, move the Trim Master Switch "OFF" and do not attempt to use the trim system until the fault is corrected. With the Trim Master Switch "OFF" the autopilot trim indicators and audio system will return to operation. If the electric trim system suffers a power failure in flight the system will automatically revert to the indicator lights and audio horn. If this occurs turn the Trim Master Switch "OFF" and trim manually, using the indicators until the fault can be located and corrected.

GLIDE SLOPE FLIGHT PROCEDURE

Approach the glide slope intercept point (usually the OM) with the flaps set to approach deflection of 1-2 notches (See Limitations Section) and with the aircraft stabilized in altitude hold mode. At the glide slope intercept, lower the landing gear and adjust power for the desired descent speed. For best tracking results make power adjustments in small, smooth increments to maintain desired airspeed. At the missed approach point or the decision height, disconnect the autopilot for landing or for the go-around maneuver (See Limitations Section). If a missed approach is required, the autopilot may be reengaged after the aircraft has been reconfigured for and established in a stabilized climb.

SECTION V

PERFORMANCE

The text of this Section not affected by installation of this equipment.

SECTION VI

WEIGHT AND BALANCE

The text of this Section not affected by installation of this equipment.

SECTION VII

DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

The text of this Section not affected by installation of this equipment.

SECTION VIII

AIRPLANE HANDLING, SERVICING AND MAINTENANCE

The text of this Section not affected by installation of this equipment.

SECTION IX

SUPPLEMENTS

Refer to contents of this Supplement for operation of System 55/55X Automatic Flight Control System.

SECTION X

OPERATING TIPS

The text of this Section not affected by installation of this equipment.

GARMIN Ltd. or its subsidiaries
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FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for
GARMIN 500W SERIES GPS-WAAS NAVIGATION SYSTEM
as installed in

Piper PA34-200T
Make and Model Airplane

Reg. No. N4542T S/N 34-7250128

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped with the Garmin 500W Series unit. This document must be carried in the airplane at all times when the Garmin 500W Series unit is installed in accordance with STC SA01933LA.

The information contained herein supplements or supersedes the information made available to the operator by the manufacturer in the form of clearly stated placards, markings, or manuals or in the form of an FAA approved Airplane Flight Manual, only in those areas listed herein. For limitations, procedures and performance information not contained in this document, consult the basic placards, markings, or manuals or the basic FAA approved Airplane Flight Manual.

FAA APPROVED

Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration
Los Angeles Aircraft Certification Office
Transport Airplane Directorate

DATE: November 20, 2007

GARMIN Ltd. or its subsidiaries
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AIRPLANE FLIGHT MANUAL SUPPLEMENT
or SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for a Garmin 500W Series Navigation System

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	Page			
Rev. No.	No.	Date	Description	FAA Approved
A Original	All		Complete Supplement	Mgr. Flt. Test Br., ANM-160L FAA, Los Angeles ACO Transport Airplane Directorate Date NOV 20, 2007

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AIRPLANE FLIGHT MANUAL SUPPLEMENT
or SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for a Garmin 500W Series Navigation System

Table of Contents

Section 1. GENERAL

1.1 Garmin 500W Series GPS/WAAS Nav Com

The Garmin 500W Series GPS/WAAS Navigator is a panel-mounted product that contains a GPS/WAAS receiver for GPS approved primary navigation under TSO C146a, (plus optional VHF Com and VHF Nav radios) in an integrated unit with a moving map and color display. The 500W Series unit features a graphical display which may also be used to depict traffic, weather, or terrain data. Optional TAWS annunciation and audio is available in some installations.

The navigation functions are operated by dedicated keys and graphical menus which are controlled by the buttons and the dual concentric rotary knob along the bottom and right side of the display.

Optional VHF Com and VHF Nav radio functions are controlled via dedicated buttons and knobs on the left side of the display and adjacent to frequencies they are controlling.

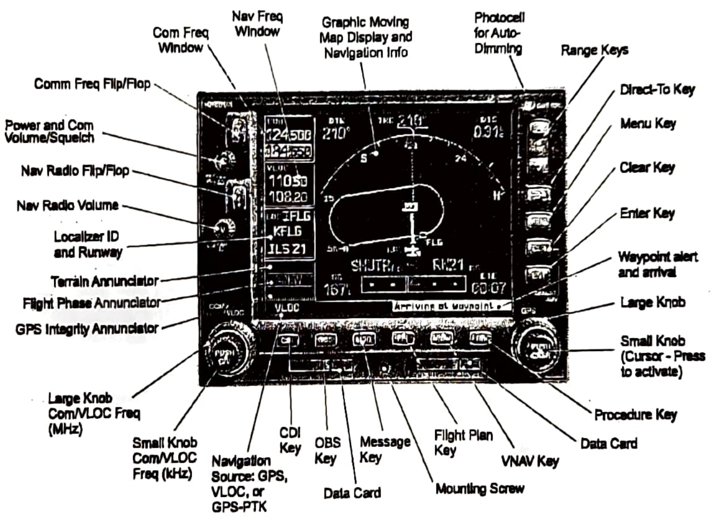

Figure 1 - 500W Series Control and Display Layout

1.2 Operation

GPS/WAAS TSO-C146a Class 3 Operation: The Garmin 500W Series unit, when installed in accordance with STC SA01933LA, uses GPS and WAAS (within the coverage of a Space-Based Augmentation System complying with ICAO Annex 10) for enroute, terminal area, non-precision approach operations (including "GPS", "or GPS", and "RNAV" approaches), and approach procedures with vertical guidance (including "LNAV/VNAV" and "LPV").

Navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. GPS navigation data is based upon use of only the Global Positioning System (GPS) operated by the United States of America.

1.3 Class II Oceanic, Remote, and other Operations:

The Garmin 500W Series, as installed, has been found to comply with the requirements for GPS primary means of Class II navigation in oceanic and remote airspace, when used in conjunction with WAAS Garmin Prediction Program part number 006-A0154-03. Oceanic operations are supported when the 500W Series unit annunciates OCN. This provides an alarm limit of four NMI and a mask angle of five degrees. The 500W series unit also has the ability to predict RAIM availability at any waypoint in the database or if WAAS corrections are expected to be absent or disabled. This AFMS does not constitute an operational approval for Oceanic or Remote area operations. Additional equipment installations or operational approvals may be required.

a) Oceanic navigation requires an additional approved long range oceanic and/or remote area navigation system with independent display, sensors, antenna, and power source. (It may be a second 400W/500W Series unit.)
b) Redundant VHF Com and VHF Nav systems may be required for other than U.S. 14 CFR Part 91 operations. Check foreign regulation requirements as applicable. (It may be a second 400W/500W Series unit.)
c) Operations approval *may* be granted for the use of the 500W Series unit RAIM prediction function in lieu of the Prediction Program for operators requiring this capability. Refer to your appropriate civil aviation authorities for these authorizations.

Section 2. LIMITATIONS

2.1 Pilot's Guide

The GARMIN 500W Series Pilot's Guide, part number and revision listed below (or later revisions), must be immediately available for the flight crew whenever navigation is predicated on the use of the 500W Series unit.

500W Series Pilot's Guide & Reference P/N 190-00357-00 Rev B
400W/500W Series Optional Displays P/N 190-00356-30 Rev B
400W/500W Series Display Interfaces P/N 190-00356-31 Rev B

This AFM supplement does not grant approval for IFR operations to aircraft limited to VFR operations. Additional aircraft systems may be required for IFR operational approval. Systems limited to VFR shall be placarded in close proximity to the 500W Series unit
"GPS LIMITED TO VFR USE ONLY".

2.2 System Software:

The system must utilize the Main and GPS software versions listed below (or later FAA approved versions). The software versions are displayed on the self-test page immediately after turn-on for approximately 5 seconds or they can be accessed in the AUX pages.

Subsequent software versions may support different functions. Check the 500W Series Pilot's Guide for further information.

Table 1 - Approved Software Versions

Software Item	**Approved Software Version** *(or later FAA approved versions)*	
	SW version	As displayed on unit
Main SW Version	3.00	3.00
GPS SW Version	3.0	3.0

2.3 Navigation Database

The 500W Series unit database cards listed in the following table must be installed. (IAW the TSO deviations granted to Garmin for the 500W unit, navigation database cards may not be marked with the part number. The software automatically precludes invalid databases for use by the 500W)

a) IFR enroute and terminal navigation is prohibited unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved data.

b) GPS instrument approaches using the 500W Series units are prohibited, unless the 500W Series unit's approach data is verified by the pilot or crew to be current. Instrument approaches must be accomplished in accordance with an approved instrument approach procedure that is loaded from the 500W Series unit database.

c) Installations with dual 400W/500W Series units will only crossfill between units when they contain the same database cycle. Updating of each database must be accomplished on the ground prior to flight.

Table 2 – Approved Navigation Database Cards

Part Number	Description
010-10546-00	Data Card, WAAS, IFR, World Wide
010-10546-01	Data Card, WAAS, IFR, Americas
010-10546-02	Data Card, WAAS, IFR, International

2.4 Terrain Database

The 500W Series unit supports Terrain or TAWS (optional) and requires a Terrain database card to be installed in order for either feature to operate. The table below lists compatible database cards for the 500W series. Each of the data base cards contains the following data:

a) The Terrain Database has an area of coverage from North 75° Latitude to South 60° Latitude in all longitudes.

b) The Airport Terrain Database has an area of coverage that includes the United States, Canada, Mexico, Latin America, and South America.

c) The Obstacle Database has an area of coverage that includes the United States, and is updated as frequently as every 56 days.

NOTE: The area of coverage may be modified as additional terrain data sources become available.

Table 3 – Approved Terrain Database Cards

Part Number	Description
010-10201-20	Data Card, TAWS / Terrain, 128MB
010-10201-21	Data Card, TAWS / Terrain, 256MB

2.5 Navigation

No navigation is authorized north of 89° (degrees) north latitude or south of 89° (degrees) south latitude.

2.6 Approaches

a) During GPS approaches, the pilot must verify the 500W Series unit is operating in the approach mode. (LNAV, LNAV+V, L/VNAV, or LPV)
b) When conducting approaches referenced to true North, the heading selection on the AUX pages must be adjusted to TRUE.
c) Accomplishment of an ILS, LOC, LOC-BC, LDA, SDF, MLS, VOR approach, or any other type of approach not approved for GPS overlay, is not authorized with GPS navigation guidance.
d) Use of the GNS 530W VOR/LOC/GS receiver to fly approaches not approved for GPS requires VOR/LOC/GS navigation data to be present on the external indicator (i.e. proper CDI source selection).
e) For aircraft with remote source selection annunciation or remote GPS navigation annunciations installed, conducting IFR approaches is prohibited if the remote annunciation is found to be inoperative during pre-flight. (This limitation does not prohibit the conduct of an IFR approach if the required remote annunciation fails during flight. The indications provided on the 500W Series unit display may be used as a backup).
f) Except in emergency conditions, IFR approaches are prohibited whenever any physical or visual obstruction (such as a throw-over yoke) restricts pilot view or access to the 500W Series unit or the affected CDI.

2.7 Autopilot Coupling

IFR installations of a Garmin 500W Series unit allow the operator to fly all phases of flight based on the navigation information presented to the pilot; however, not all modes may be coupled to the autopilot. All autopilots may be coupled in Oceanic (OCN), Enroute (ENR), and Terminal (TERM) modes; however, the FAA requires that vertical coupling of an autopilot for approaches be demonstrated to meet their intended function and provide safe and proper operation to published minimums. This installation is limited to:

☐ No limitations for autopilot coupling.

☐ Lateral GPS coupling (LNAV only). For 530W units: The GS of an ILS (VLOC) may be coupled to the autopilot without any limitations.

This limitation may be removed after an FAA Flight Test demonstration. Contact Garmin International, Tech Support for additional information.

2.8 Terrain Display [Units without TAWS]

Terrain refers to the display of terrain information. Pilots are NOT authorized to deviate from their current ATC clearance to comply with terrain/obstacle alerts. Terrain unit alerts are advisory only and are not equivalent to warnings provided by TAWS. Navigation must not be predicated upon the use of the terrain display.

The terrain display is intended to serve as a situational awareness tool only. By itself, it may not provide either the accuracy or the fidelity on which to base decisions and plan maneuvers to avoid terrain or obstacles.

2.9 TAWS Function [Units with TAWS]

TAWS is an optional extension of Terrain. Pilots are authorized to deviate from their current ATC clearance to the extent necessary to comply with TAWS warnings. Navigation must not be predicated upon the use of TAWS.

Display of the terrain and obstacles is supplemental data only. Maneuvering solely by reference to the terrain and obstacle display is not recommended or authorized.

2.10 VNAV

VNAV information may be utilized for advisory information only. Use of VNAV information for Instrument Approach Procedures does not guarantee Step-Down Fix altitude protection, or arrival at approach minimums in a normal position to land.

2.11 Weather Display

If an optional weather receiver is interfaced to the 500W Series unit, the weather information displayed is limited to supplemental use only and may not be used in lieu of an official weather data source.

2.12 Traffic Display

Traffic may be displayed on the 500W Series unit when connected to an approved optional TCAS, TAS, or TIS traffic device. These systems are capable of providing traffic monitoring and alerting to the pilot. Traffic shown on the display may or may not have traffic alerting available. The display of traffic is an aid to visual acquisition and may not be utilized for aircraft maneuvering. Display of this traffic data and related operations are described in the 500W Series unit Pilot's Guide.

Section 3. EMERGENCY PROCEDURES

3.1 Emergency Procedures
No change.

3.2 Abnormal Procedures
a) If the Garmin 500W Series unit GPS navigation information is not available, or is invalid, utilize other remaining operational navigation equipment installed in the airplane as appropriate. If the 500W Series unit loses GPS position and reverts to Dead Reckoning mode (indicated by the annunciation of "DR" in the lower left of the display), the moving map will continue to be displayed. Aircraft position will be based upon the last valid GPS position and estimated by Dead Reckoning methods. Changes in airspeed or winds aloft can affect the estimated position substantially. Dead Reckoning is only available in Enroute mode; Terminal and Approach modes do not support DR.

b) If a "Loss of Integrity" (INTEG) message is displayed during:

   Enroute/Terminal: continue to navigate using GPS equipment and periodically cross-check the GPS guidance to other approved means of navigation.

   GPS Approach: GPS approaches are not authorized under INTEG - Execute missed approach or revert to alternate navigation.

c) During a GPS LPV precision approach or GPS LNAV/VNAV approach, the 500W Series unit will downgrade the approach if the Vertical alarm limits are exceeded. This will cause the vertical guidance to flag as unavailable. The procedure may be continued using the LNAV only minimums.

d) During any GPS approach in which precision and non-precision alarm limits are exceeded, the 500W Series unit will flag the lateral guidance and generate a system message "ABORT APPROACH loss of navigation". Immediately upon viewing the message the unit will revert to Terminal alarm limits. If the position integrity is within these limits lateral guidance will be restored and the GPS may be used to execute the missed approach, otherwise alternate means of navigation should be utilized.

Section 4. NORMAL PROCEDURES

Refer to the 500W Series unit Pilot's Guide defined in paragraph 2.1 on page 6 of this document for normal operating procedures. This includes all GPS operations, VHF COM and NAV, and Multi-Function Display information. For information on TIS traffic, data linked weather, or TAWS see the Pilot's Guide addendum for optional displays. For information on active traffic sensor or Stormscope operation and displays see the Pilot's Guide addendum for display interfaces.

Although intuitive and user friendly the 500W Series unit requires a reasonable degree of familiarity to prevent operations without becoming too engrossed at the expense of basic instrument flying in IMC and basic see-and-avoid in VMC. Pilot workload will be higher for pilots with limited familiarity in using the unit in an IFR environment, particularly without the autopilot engaged. Garmin provides excellent training tools with the Pilot's Guide and PC based simulator. Pilots should take full advantage of these training tools to enhance system familiarization. Use of an autopilot is strongly encouraged when using the 500W Series unit in IMC conditions.

4.1 Approaches with Vertical Guidance

The 500W Series unit supports three types of GPS approaches with vertical guidance: LPV approaches, LNAV/VNAV (annunciated as L/VNAV) approaches, and LNAV approaches with advisory vertical guidance (annunciated as LNAV+V). For LNAV approaches with advisory vertical guidance, the 500W Series will annunciate LNAV+V indicating vertical guidance is available. LNAV minimums will be controlling in this case.

NOTE:

> If flying an LPV or LNAV/VNAV approach, be prepared to fly the LNAV only approach prior to reaching the final approach fix (FAF). If the GPS integrity is not within vertical approach limits, the system will flag the vertical guidance. This may be annunciated by a downgrade to LNAV message.

For additional information on approaches with vertical guidance refer to the 500W Series unit Pilot's Guide.

4.2 Autopilot Operation

The Garmin 500W Series may be coupled to an optional autopilot if installed in the aircraft when operating as prescribed in the LIMITATIONS section of this manual. For lateral guidance, some installations may utilize GPSS or GPS Roll Steering in lieu of the analog deviation information. If an HSI is used with GPSS engaged, the pilot should rotate the course pointer as prompted on the 500W Series unit to prevent loss of situational awareness and to prevent the aircraft from turning inappropriately if the autopilot is switched from digital (GPSS) to analog mode. For autopilot operational instructions, refer to the FAA approved Flight Manual or Flight Manual Supplement for the autopilot.

4.3 Coupling the Autopilot during approaches

The Garmin 500W Series supports analog and digital (GPSS) control interfaces to an optionally installed autopilot. Some autopilots revert to ROLL mode (wings level) and/or flag a NAV failure if the digital data becomes unavailable or is inhibited. The CDI selection of VLOC should inhibit the digital control interface. When switching between GPS and VLOC the pilot should be aware that the autopilot may need to be re-engaged into APR or NAV mode after changing the CDI source.

Autopilot coupling to GPS vertical guidance requires that the autopilot be engaged in an analog APR mode identical to coupling to an ILS. Some autopilots may revert to ROLL mode when the navigation outputs of the 500W Series unit sequence to the final approach fix. In these installations the unit will be configured to PROMPT the pilot to "Enable the autopilot approach outputs" in order to prevent the autopilot from entering ROLL mode without the pilot being aware of the transition.

- ☐ This installation prompts the pilot and requires the pilot to enable the A/P outputs just prior to engaging the autopilot in APR mode.
- ☐ This installation supports a seamless transition from digital (GPSS) to analog guidance for the autopilot. To capture the vertical guidance, the pilot may engage the autopilot in APR mode at any time when the GPS Glide Slope (VDI) becomes valid (displayed without a FLAG).
- ☐ This installation interfaces to the autopilot in analog mode only. To capture the vertical guidance, the pilot may engage the autopilot in APR mode at any time when the GPS Glide Slope (VDI) becomes valid.
- ☐ The autopilot does not support any vertical capture or tracking in this installation.

Analog only autopilots should use APR mode for coupling to LNAV approaches. Autopilots which support digital roll steering commands (GPSS) may utilize NAV mode and take advantage of the digital tracking during LNAV only approaches.

4.4 TAWS Cautions and Warning [if installed]

Should a terrain awareness Caution occur, take positive corrective action based on analysis of all the available information. If this elevates to a terrain awareness Warning, immediately initiate and continue a maximum rate climb until the alert ceases. Only vertical maneuvers are recommended, unless visual meteorological conditions (VMC) exist or the pilot can determine that turning in addition to the climbing maneuver is the safest course of action.

4.5 WFDE Prediction Program

The Garmin WAAS Fault Detection and Exclusion (WFDE) Prediction Program is required for Remote/Oceanic operations.

The Prediction Program should be used in conjunction with the Garmin 400W/500W Simulator. After entering the intended route of flight in the Simulator flight plan the pilot selects the FDE Prediction Program under the Options menu of the Simulator program.

For detailed information refer to the WFDE prediction program instructions (190-00643-01). The availability of FDE is only required for Oceanic or Remote operations.

Section 5. PERFORMANCE

No change.

Section 6. WEIGHT AND BALANCE

See current weight and balance data.

Section 7. SYSTEM DESCRIPTIONS

See Garmin 500W Series unit Pilot's Guide for a complete description of the 500W Series unit.

GARMIN Ltd. or its subsidiaries
c/o Garmin International
1200 E. 151st Street, Olathe, KS 66062 USA

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for
GARMIN 400W SERIES GPS-WAAS NAVIGATION SYSTEM
as installed in

Piper PA34-200T
Make and Model Airplane

Reg. No. N4542T S/N 34-7250128

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped with the Garmin 400W Series unit. This document must be carried in the airplane at all times when the Garmin 400W Series unit is installed in accordance with STC SA01933LA.

The information contained herein supplements or supersedes the information made available to the operator by the manufacturer in the form of clearly stated placards, markings, or manuals or in the form of an FAA approved Airplane Flight Manual, only in those areas listed herein. For limitations, procedures and performance information not contained in this document, consult the basic placards, markings, or manuals or the basic FAA approved Airplane Flight Manual.

FAA APPROVED

Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration
Los Angeles Aircraft Certification Office
Transport Airplane Directorate

DATE: November 20, 2007

GARMIN Ltd. or its subsidiaries
c/o Garmin International
1200 E. 151st Street, Olathe, KS 66062 USA

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for a Garmin 400W Series Navigation System

LOG OF REVISIONS				
Rev. No.	Page No.	Page Date	Description	FAA Approved
A Original	All		Complete Supplement	Mgr. Flt. Test Br., ANM-160L FAA, Los Angeles ACO Transport Airplane Directorate Date NOV 20, 2007

GARMIN Ltd. or its subsidiaries
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AIRPLANE FLIGHT MANUAL SUPPLEMENT
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for a Garmin 400W Series Navigation System

Section 1. GENERAL

1.1 Garmin 400W Series GPS/WAAS Nav Com

The Garmin 400W Series GPS/WAAS Navigator is a panel-mounted product that contains a GPS/WAAS receiver for GPS approved primary navigation, under TSO C146a (plus optional VHF Com and VHF Nav radios) in an integrated unit with a moving map and color display. The 400W Series unit features a graphical display which may also be used to depict traffic, weather, or terrain data.

The navigation functions are operated by dedicated keys and graphical menus which are controlled by the buttons and the dual concentric rotary knob along the bottom and right side of the display.

Optional VHF Com and VHF Nav radio functions are controlled via dedicated buttons and knobs on the left side of the display and adjacent to frequencies they are controlling.

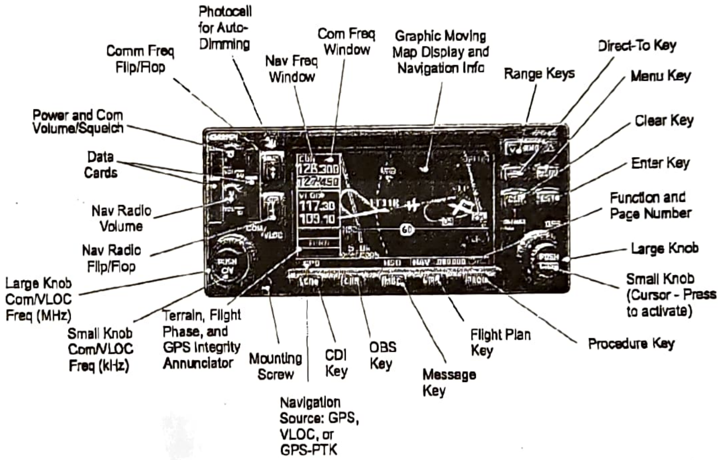

Figure 1 - 400W Series Control and Display Layout

1.2 Operation

GPS/WAAS TSO-C146a Class 3 Operation: The Garmin 400W Series unit, when installed in accordance with STC SA01933LA, uses GPS and WAAS (within the coverage of a Space-Based Augmentation System complying with ICAO Annex 10) for enroute, terminal area, non-precision approach operations (including "GPS", "or GPS", and "RNAV" approaches), and approach procedures with vertical guidance (including "LNAV/VNAV" and "LPV").

Navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. GPS navigation data is based upon use of only the Global Positioning System (GPS) operated by the United States of America.

1.3 Class II Oceanic, Remote, and other Operations:

The Garmin 400W Series, as installed, has been found to comply with the requirements for GPS primary means of Class II navigation in oceanic and remote airspace, when used in conjunction with WAAS Garmin Prediction Program part number 006-A0154-03. Oceanic operations are supported when the 400W Series unit annunciates OCN. This provides an alarm limit of four NMI and a mask angle of five degrees. The 400W series unit also has the ability to predict RAIM availability at any waypoint in the database or if WAAS corrections are expected to be absent or disabled. This AFMS does not constitute an operational approval for Oceanic or Remote area operations. Additional equipment installations or operational approvals may be required.

a) Oceanic navigation requires an additional approved long range oceanic and/or remote area navigation system with independent display, sensors, antenna, and power source. (It may be a second 400W/500W Series unit.)
b) Redundant VHF Com and VHF Nav systems may be required for other than U.S. 14 CFR Part 91 operations. Check foreign regulation requirements as applicable. (It may be a second 400W/500W Series unit.)
c) Operations approval *may* be granted for the use of the 400W Series unit RAIM prediction function in lieu of the Prediction Program for operators requiring this capability. Refer to your appropriate civil aviation authorities for these authorizations.

Section 2. LIMITATIONS

2.1 Pilot's Guide

The GARMIN 400W Series Pilot's Guide, part number and revision listed below (or later revisions), must be immediately available for the flight crew whenever navigation is predicated on the use of the 400W Series unit.

400W Series Pilot's Guide & Reference	P/N 190-00356-00 Rev B
400W/500W Series Optional Displays	P/N 190-00356-30 Rev B
400W/500W Series Display Interfaces	P/N 190-00356-31 Rev B

This AFM supplement does not grant approval for IFR operations to aircraft limited to VFR operations. Additional aircraft systems may be required for IFR operational approval. Systems limited to VFR shall be placarded in close proximity to the 400W Series unit
"GPS LIMITED TO VFR USE ONLY".

2.2 System Software:

The system must utilize the Main and GPS software versions listed below (or later FAA approved versions). The software versions are displayed on the self-test page immediately after turn-on for approximately 5 seconds or they can be accessed in the AUX pages.

Subsequent software versions may support different functions. Check the 400W Series Pilot's Guide for further information.

Table 1 - Approved Software Versions

Software Item	**Approved Software Version** *(or later FAA approved versions)*	
	SW version	As displayed on unit
Main SW Version	3.00	3.00
GPS SW Version	3.0	3.0

2.3 Navigation Database

The 400W Series unit database cards listed in the following table must be installed. (IAW the TSO deviations granted to Garmin for the 400W unit, navigation database cards may not be marked with the part number. The software automatically precludes invalid databases for use by the 400W)

a) IFR enroute and terminal navigation is prohibited unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved data.

b) GPS instrument approaches using the 400W Series units are prohibited, unless the 400W Series unit's approach data is verified by the pilot or crew to be current. Instrument approaches must be accomplished in accordance with an approved instrument approach procedure that is loaded from the 400W Series unit database.

c) Installations with dual 400W/500W Series units will only crossfill between units when they contain the same database cycle. Updating of each database must be accomplished on the ground prior to flight.

Table 2 – Approved Navigation Database Cards

Part Number	Description
010-10546-00	Data Card, IFRW, World Wide
010-10546-01	Data Card, IFRW, Americas
010-10546-02	Data Card, IFRW, International

2.4 Terrain Database

The 400W Series unit supports Terrain and requires a Terrain database card to be installed in order for the feature to operate. The table below lists compatible database cards for the 400W series. Each of the data base cards contains the following data:

a) The Terrain Database has an area of coverage from North 75° Latitude to South 60° Latitude in all longitudes.

b) The Airport Terrain Database has an area of coverage that includes the United States, Canada, Mexico, Latin America, and South America.

c) The Obstacle Database has an area of coverage that includes the United States, and is updated as frequently as every 56 days.

NOTE: The area of coverage may be modified as additional terrain data sources become available.

Table 3 – Approved Terrain Database Cards

Part Number	Description
010-10201-20	Data Card, TAWS / Terrain, 128MB
010-10201-21	Data Card, TAWS / Terrain, 256MB

2.5 Navigation

No navigation is authorized north of 89° (degrees) north latitude or south of 89° (degrees) south latitude.

2.6 Approaches

a) During GPS approaches, the pilot must verify the 400W Series unit is operating in the approach mode. (LNAV, LNAV+V, L/VNAV, or LPV)

b) When conducting approaches referenced to true North, the heading selection on the AUX pages must be adjusted to TRUE.

c) Accomplishment of an ILS, LOC, LOC-BC, LDA, SDF, MLS, VOR approach, or any other type of approach not approved for GPS overlay, is not authorized with GPS navigation guidance.

d) Use of the GNS 430W VOR/LOC/GS receiver to fly approaches not approved for GPS requires VOR/LOC/GS navigation data to be present on the external indicator (i.e. proper CDI source selection).

e) For aircraft with remote source selection annunciation or remote GPS navigation annunciations installed, conducting IFR approaches is prohibited if the remote annunciation is found to be inoperative during pre-flight. (This limitation does not prohibit the conduct of an IFR approach if the required remote annunciation fails during flight. The indications provided on the 400W Series unit display may be used as a backup).

f) Except in emergency conditions, IFR approaches are prohibited whenever any physical or visual obstruction (such as a throw-over yoke) restricts pilot view or access to the 400W Series unit or the affected CDI.

2.7 Autopilot Coupling

IFR installations of a Garmin 400W Series unit allow the operator to fly all phases of flight based on the navigation information presented to the pilot; however, not all modes may be coupled to the autopilot. All autopilots may be coupled in Oceanic (OCN), Enroute (ENR), and Terminal (TERM) modes; however, the FAA requires that vertical coupling of an autopilot for approaches be demonstrated to meet their intended function and provide safe and proper operation to published minimums. This installation is limited to:

☐ No limitations for autopilot coupling.

☐ Lateral GPS coupling (LNAV only). For 430W units: The GS of an ILS (VLOC) may be coupled to the autopilot without any limitations.

This limitation may be removed after an FAA Flight Test demonstration. Contact Garmin International, Tech Support for additional information.

2.8 Terrain Display

Terrain refers to the display of terrain information. Pilots are NOT authorized to deviate from their current ATC clearance to comply with terrain/obstacle alerts. Terrain unit alerts are advisory only and are not equivalent to warnings provided by TAWS. Navigation must not be predicated upon the use of the terrain display.

The terrain display is intended to serve as a situational awareness tool only. By itself, it may not provide either the accuracy or the fidelity on which to base decisions and plan maneuvers to avoid terrain or obstacles.

2.9 VNAV

VNAV information may be utilized for advisory information only. Use of VNAV information for Instrument Approach Procedures does not guarantee Step-Down Fix altitude protection, or arrival at approach minimums in a normal position to land.

2.10 Weather Display

If an optional weather receiver is interfaced to the 400W Series unit, the weather information displayed is limited to supplemental use only and may not be used in lieu of an official weather data source.

2.11 Traffic Display

Traffic may be displayed on the 400W Series unit when connected to an approved optional TCAS, TAS, or TIS traffic device. These systems are capable of providing traffic monitoring and alerting to the pilot. Traffic shown on the display may or may not have traffic alerting available. The display of traffic is an aid to visual acquisition and may not be utilized for aircraft maneuvering. Display of this traffic data and related operations are described in the 400W Series unit Pilot's Guide.

Section 3. EMERGENCY PROCEDURES

3.1 Emergency Procedures

No change.

3.2 Abnormal Procedures

a) If the Garmin 400W Series unit GPS navigation information is not available, or is invalid, utilize other remaining operational navigation equipment installed in the airplane as appropriate. If the 400W Series unit loses GPS position and reverts to Dead Reckoning mode (indicated by the annunciation of "DR" in the lower left of the display), the moving map will continue to be displayed. Aircraft position will be based upon the last valid GPS position and estimated by Dead Reckoning methods. Changes in airspeed or winds aloft can affect the estimated position substantially. Dead Reckoning is only available in Enroute mode; Terminal and Approach modes do not support DR.

b) If a "Loss of Integrity" (INTEG) message is displayed during:

    Enroute/Terminal: continue to navigate using GPS equipment and periodically cross-check the GPS guidance to other approved means of navigation.

    GPS Approach: GPS approaches are not authorized under INTEG - Execute missed approach or revert to alternate navigation.

c) During a GPS LPV precision approach or GPS LNAV/VNAV approach, the 400W Series unit will downgrade the approach if the Vertical alarm limits are exceeded. This will cause the vertical guidance to flag as unavailable. The procedure may be continued using the LNAV only minimums.

d) During any GPS approach in which precision and non-precision alarm limits are exceeded, the 400W Series unit will flag the lateral guidance and generate a system message "ABORT APPROACH loss of navigation". Immediately upon viewing the message the unit will revert to Terminal alarm limits. If the position integrity is within these limits lateral guidance will be restored and the GPS may be used to execute the missed approach, otherwise alternate means of navigation should be utilized.

Section 4. NORMAL PROCEDURES

Refer to the 400W Series unit Pilot's Guide defined in paragraph 2.1 on page 6 of this document for normal operating procedures. This includes all GPS operations, VHF COM and NAV, and Multi-Function Display information. For information on TIS traffic, or data linked weather see the Pilot's Guide addendum for optional displays. For information on active traffic sensor or Stormscope operation and displays see the Pilot's Guide addendum for display interfaces.

Although intuitive and user friendly the 400W Series unit requires a reasonable degree of familiarity to prevent operations without becoming too engrossed at the expense of basic instrument flying in IMC and basic see-and-avoid in VMC. Pilot workload will be higher for pilots with limited familiarity in using the unit in an IFR environment, particularly without the autopilot engaged. Garmin provides excellent training tools with the Pilot's Guide and PC based simulator. Pilots should take full advantage of these training tools to enhance system familiarization. Use of an autopilot is strongly encouraged when using the 400W Series unit in IMC conditions

4.1 Approaches with Vertical Guidance

The 400W Series unit supports three types of GPS approaches with vertical guidance: LPV approaches, LNAV/VNAV (annunciated as L/VNAV) approaches, and LNAV approaches with advisory vertical guidance (annunciated as LNAV+V). For LNAV approaches with advisory vertical guidance, the 400W Series will annunciate LNAV+V indicating vertical guidance is available. LNAV minimums will be controlling in this case.

NOTE:

If flying an LPV or LNAV/VNAV approach, be prepared to fly the LNAV only approach prior to reaching the final approach fix (FAF). If the GPS integrity is not within vertical approach limits, the system will flag the vertical guidance. This may be annunciated by a downgrade to LNAV message.

For additional information on approaches with vertical guidance refer to the 400W Series unit Pilot's Guide.

4.2 Autopilot Operation

The Garmin 400W Series may be coupled to an optional autopilot if installed in the aircraft when operating as prescribed in the LIMITATIONS section of this manual. For lateral guidance, some installations may utilize GPSS or GPS Roll Steering in lieu of the analog deviation information. If an HSI is used with GPSS engaged, the pilot should rotate the course pointer as prompted on the 400W Series unit to prevent loss of situational awareness and to prevent the aircraft from turning inappropriately if the autopilot is switched from digital (GPSS) to analog mode. For autopilot operational instructions, refer to the FAA approved Flight Manual or Flight Manual Supplement for the autopilot.

4.3 Coupling the Autopilot during approaches

The Garmin 400W Series supports analog and digital (GPSS) control interfaces to an optionally installed autopilot. Some autopilots revert to ROLL mode (wings level) and/or flag a NAV failure if the digital data becomes unavailable or is inhibited. The CDI selection of VLOC should inhibit the digital control interface. When switching between GPS and VLOC the pilot should be aware that the autopilot may need to be re-engaged into APR or NAV mode after changing the CDI source.

Autopilot coupling to GPS vertical guidance requires that the autopilot be engaged in an analog APR mode identical to coupling to an ILS. Some autopilots may revert to ROLL mode when the navigation outputs of the 400W Series unit sequence to the final approach fix. In these installations the unit will be configured to PROMPT the pilot to "Enable the autopilot approach outputs" in order to prevent the autopilot from entering ROLL mode without the pilot being aware of the transition.

☐ This installation prompts the pilot and requires the pilot to enable the A/P outputs just prior to engaging the autopilot in APR mode.

☐ This installation supports a seamless transition from digital (GPSS) to analog guidance for the autopilot. To capture the vertical guidance, the pilot may engage the autopilot in APR mode at any time when the GPS Glide Slope (VDI) becomes valid (displayed without a FLAG).

☐ This installation interfaces to the autopilot in analog mode only. To capture the vertical guidance, the pilot may engage the autopilot in APR mode at any time when the GPS Glide Slope (VDI) becomes valid.

☐ The autopilot does not support any vertical capture or tracking in this installation.

Analog only autopilots should use APR mode for coupling to LNAV approaches. Autopilots which support digital roll steering commands (GPSS) may utilize NAV mode and take advantage of the digital tracking during LNAV only approaches.

4.4 WFDE Prediction Program

The Garmin WAAS Fault Detection and Exclusion (WFDE) Prediction Program is required for Remote/Oceanic operations.

The Prediction Program should be used in conjunction with the Garmin 400W/500W Simulator. After entering the intended route of flight in the Simulator flight plan the pilot selects the FDE Prediction Program under the Options menu of the Simulator program.

For detailed information refer to the WFDE prediction program instructions (190-00643-01). The availability of FDE is only required for Oceanic or Remote operations.

Section 5. PERFORMANCE

No change.

Section 6. WEIGHT AND BALANCE

See current weight and balance data.

Section 7. SYSTEM DESCRIPTIONS

See Garmin 400W Series unit Pilot's Guide for a complete description of the 400W Series unit.

Aircraft Make and Model Designation	Type Certificate Number	Certification Basis	Required Approved Data & Added Model Specific Limitations	AML Revision Date
PA-30, PA-39, PA-40	A1EA	CAR 3	005-C0221-00 005-C0221-01	
PA-31, PA-31-300, PA-31-325, PA-31-350	A20SO	CAR 3	005-C0221-00 005-C0221-01	
PA-31P, PA-31T, PA-31T1, PA-31T2, PA-31T3, PA-31P-350	A8EA	CAR 3	005-C0221-00 005-C0221-01	
PA-32-260, PA-32-300, PA-32S-300, PA-32R-300, PA-32RT-300, PA-32RT-300T, PA-32R-301(SP), PA-32R-301(HP), PA-32R-301T, PA-32-301, PA-32-301T, PA-32-301FT, PA32-301XTC	A3SO	CAR 3	005-C0221-00 005-C0221-01	
PA-34-200, PA-34-200T, PA-34-220T	A7SO	CAR 3	005-C0221-00 005-C0221-01	
PA-42, PA-42-720, PA-42-1000	A23SO	FAR 23	005-C0221-00 005-C0221-01	
PA-42-720R	A32SO	FAR 23	005-C0221-00 005-C0221-01	
PA-44-180, PA-44-180T	A19SO	FAR 23	005-C0221-00 005-C0221-01	
PA-46-310P, PA-46-350P, PA-46-500TP	A25SO	FAR 23	005-C0221-00 005-C0221-01	
Prop-Jets, Inc.				
200, 200A, 200B, 200C, 200D, 400	3A18	CAR 3	005-C0221-00 005-C0221-01	
PZL (Panstwowe Zaklady Lotnicze)				
PZL-104 WILGA 80, PZL-104M WILGA 2000, PZL-WARSZAWA	A55EU	FAR 23	005-C0221-00 005-C0221-01	
PZL-KOLIBER 150A, PZL-KOLIBER 160A,	A69EU	FAR 23	005-C0221-00 005-C0221-01	
PZL (PZL Mielec)				
PZL M20 03	A68EU	FAR 23	005-C0221-00 005-C0221-01	
PZL M26 01	A44CE	FAR 23	005-C0221-00 005-C0221-01	
Raytheon (Beech)				
35-33, 35-A33, 35-B33, 35-C33, 35-C33A, E33, E33A, E33C, F33, F33A, F33C, G33, H35, J35, K35, M35, N35, P35, S35, V35, V35A, V35B, 36, A36, A36TC, B36TC	3A15	CAR 3	005-C0221-00 005-C0221-01	
35, A35, B35, C35, D35, E35, F35, G35, 35R	A-777	CAR 3	005-C0221-00 005-C0221-01	
F90	A31CE	FAR 23	005-C0221-00 005-C0221-01	
76	A29CE	FAR 23	005-C0221-00 005-C0221-01	

RAJAY INDUSTRIES, INC
2602 WARDLOW ROAD
LONG BEACH, CA.

FAA APPROVED AIRPLANE FLIGHT MANUAL SUPPLEMENT

TO

PIPER MODEL PA 34-200
REGISTRATION NO. N4542T
SERIAL NO. 34-7250128

THE INFORMATION IN THIS DOCUMENT IS FAA APPROVED MATERIAL WHICH, TOGETHER WITH THE BASIC AIRPLANE FLIGHT MANUAL IS APPLICABLE AND MUST BE CARRIED IN THE BASIC MANUAL WHEN THE AIRPLANE IS MODIFIED BY THE INSTALLATION OF RAJAY TURBOCHARGED ENGINES IN ACCORDANCE WITH SUPPLEMENTAL TYPE CERTIFICATE SA2937WE.

THE INFORMATION IN THIS DOCUMENT SUPERCEDES THE B IC MANUAL ONLY WHERE COVERED IN THE ITEMS CONTAINED HEREIN. FOR LIMITATIONS, PROCEDURES AND PERFORMANCE NOT CONTAINED IN THIS SUPPLEMENT, CONSULT THE MANUAL PROPER.

1. OPERATING LIMITATIONS

THE FOLLOWING LIMITATIONS MUST BE OBSERVED IN THE OPERATION OF THIS AIRPLANE:

ENGINE LIMITS – TURBOCHARGED: TAKE OFF AND MAX. CONTINUOUS 28.5 IN. MP @ 2700 RPM TO 20,000 FT.
DO NOT OPERATE TURBOCHARGERS BELOW 3500 FEET
MAX CONTINUOUS ABOVE 20,000 FT.
25.0 IN MP @ 2700 RPM

AIRSPEED LIMITATIONS

REDUCE VNE 5 MPH (4.3 KNOTS) PER 1,000 FEET ABOVE 19,200 FEET.

MINIMUM SPEED AT MAXIMUM TURBOCHARGED POWER – 112 MPH IAS PLUS 1 MPH PER 1000 FEET ABOVE 10,000 FEET.

ALTITUDE LIMITATIONS

MAXIMUM OPERATING ALTITUDE 25,000 FEET

2. OPERATING PROCEDURES

A. NORMAL PROCEDURES

2.A. ALTERNATE AIR INSTALLATION

ALTERNATE AIR IS AVAILABLE AUTOMATICALLY IN THE EVENT OF INLET FILTER STOPPAGE. ALTERNATE AIR IS EFFECTIVE ONLY FOR NATURALLY ASPIRATED OPERATION.

IN CONDITIONS OF SUSPECTED INDUCTION SYSTEM ICING, DURING NON-TURBOCHARGED OPERATION, THE TURBOCHARGER AIR SOURCE MAY BE USED AS AN ADDITIONAL HEAT SOURCE BY:

1. RETARD THROTTLE TO 15 IN. MP.
2. ENGAGE TURBOCHARGER CONTROL TO FULL "ON".
3. ADVANCE THROTTLE TO OBTAIN DESIRED PRESSURE.

   CAUTION: MONITOR MANIFOLD PRESSURE GAGE CLOSELY TO PREVENT OVER-BOOST DURING THROTTLE ADVANCE AND/OR DESCENDING TO LOWER ALTITUDES.

4. UPON APPROACHING POINT OF INTENDED LANDING OR EXITING ICING CONDITIONS, RETURN TURBOCHARGER CONTROLS AND THROTTLES TO NORMAL OPERATING SETTINGS. (SEE OPERATING LIMITATIONS AND LANDING)

   CAUTION: RETURN TO NORMAL OPERATING PROCEDURES IS REQUIRED IN NON-ICING CONDITIONS TO PREVENT EXCESSIVE INDUCTION AIR TEMPERATURES.

TURBOCHARGER INSTALLATION

BEFORE STARTING ENGINES

1. TURBOCHARGER CONTROLS - PULL "OFF" (SEE LANDING)

ENGINE RUNUP PROCEDURE - TURBOCHARGER CHECK

1. CHECK TURBOCHARGER OPERATION BY INCREASING ENGINE SPEED TO 2200 RPM, PUSH TURBOCHARGER CONTROL TOWARD ON UNTIL A POSITIVE INDICATION OF BOOST IS NOTED (AN INCREASE IN MP ON GAUGE). DO NOT EXCEED 28.5 IN. MP. PULL TURBOCHARGER CONTROL OFF. REPEAT FOR EACH ENGINE. (SEE TAKE-OFF)

TAKE-OFF

THE TURBOCHARGER SYSTEM MAY BE UTILIZED FOR POWER RECOVERY DURING TAKE-OFF FROM AIRFIELDS ABOVE 3,500 FEET ELEVATIONS. A RECOMMENDED AND APPROVED PROCEDURE THAT WILL PRODUCE SMOOTH POWER RESPONSE TO THROTTLE APPLICATION IS AS FOLLOWS:

AFTER THE NORMAL PRE-FLIGHT ENGINE CHECKS ARE COMPLETED, ADVANCE THE THROTTLE TO WIDE OPEN POSITION "MIXTURE FULL RICH" - PUSH TURBOCHARGER CONTROLS TOWARDS "ON" TO OBTAIN 27.5 IN MP. (USE VERNIER FEATURE FOR FINE ADJUSTMENT). AFTER MANIFOLD PRESSURE IS STABLE AT 27.5 IN., RETARD THROTTLE AS REQUIRED TO RUN ENGINE AT 1000-1200 RPM. REPEAT PROCEDURE FOR OTHER ENGINE. UPON RETURN OF THE THROTTLE CONTROLS TO THE WIDE OPEN POSITION THE MANIFOLD PRESSURE WILL RETURN TO 27.5 IN. (DURING THE TAKE-OFF ROLL, MANIFOLD PRESSURE WILL FURTHER ADVANCE TO 28.5 IN. DUE TO RAM RECOVERY).

AFTER TAKE-OFF

CLIMB POWER, UP TO MAXIMUM CONTINUOUS-MIXTURE FULL RICH.

LANDING

WHEN LANDING AT AIRFIELDS ABOVE 3,500 FEET ALTITUDE, THE TURBOCHARGER SYSTEM MAY BE PRE-SET IN THE AIR TO PROVIDE MAXIMUM POWER RECOVERY IN EVENT OF GO-AROUND. A RECOMMENDED AND APPROVED PROCEDURE THAT WILL PRODUCE SMOOTH POWER RESPONSE TO THROTTLE APPLICATION IS AS FOLLOWS:

DURING THE APPROACH TO A LANDING AT AN AIRFIELD ABOVE 3,500 FEET GROUND ELEVATION, ESTABLISH LEVEL FLIGHT AT AN ALTITUDE 1,000 FEET ABOVE THE AIRFIELD OF INTENDED LANDING; ADVANCE PROPELLER CONTROLS TO MAXIMUM RPM; ADVANCE THROTTLE CONTROLS TO WIDE OPEN POSITION; ADJUST TURBOCHARGER CONTROLS TO OBTAIN 27.5 IN. MANIFOLD PRESSURE; LEAVE TURBOCHARGER CON-

TROLS IN THIS POSITION FOR THE APPROACH AND LANDING. MANIPULATE THROTTLES IN NORMAL MANNER TO CONTINUE THE APPROACH AND LANDING. IN EVENT EXECUTION OF A GO-AROUND IS REQUIRED, ADVANCE THE THROTTLE LEVERS TO OBTAIN DESIRED MANIFOLD PRESSURE.

NOTE: THE TURBOCHARGER CONTROLS MAY BE LEFT IN THIS PRE-SET POSITION FOR DEPARTURE FROM THIS AIRPORT OF ARRIVAL WHEN THE AMBIENT TEMPERATURE AND PRESSURE REMAIN WITHIN +/- 10°F AND ½ IN. HGA AND THERE HAS BEEN NO POSSIBILITY OF INADVERTENT MOVEMENT OF THE TURBOCHARGER CONTROLS. (REFER TO "TAKE OFF" FOR GROUND PRE-SETTING).

B. EMERGENCY PROCEDURES

INLET ICING

SEE 2.A. ALTERNATE AIR INSTALLATION, ABOVE.

TURBOCHARGER BOOST FAILURE

IN EVENT LOSS OF TURBOCHARGER BOOST OCCURS DURING TAKE-OFF, CLIMB OR CRUISE, LOSS OF POWER ON THE EFFECTED ENGINE WILL OCCUR. PULL TURBOCHARGER CONTROL OFF AND LEAN MIXTURE AS REQUIRED FOR NATURALLY ASPIRATED OPERATION. THE FLIGHT MAY BE CONTINUED WITH THE EFFECTED ENGINE OPERATING AT NORMAL POWER. (MONITOR OIL PRESSURE AND TEMPERATURE)

EMERGENCY DESCENT

IDLE POWER, IAS 150 MPH, GEAR DOWN

3. PERFORMANCE

UNDER TURBOCHARGED CONDITIONS, ALL PERFORMANCE IS AS GOOD AS OR BETTER THAN THAT SHOWN IN THE BASIC MANUAL FOR CORRESPONDING POWER SETTINGS AND ALTITUDES.

FAA APPROVED: 10/22/74

Acting Rocco Lippis
CHIEF, A/C ENG. DIV.
DOT, FAA WESTERN REGION

ROBERTSON AIRCRAFT CORPORATION
Snohomish County Airport, North Complex C-72 Everett, Washington 98204 USA

ROBERTSON AIRCRAFT CORPORATION

FAA-Approved Airplane Flight Manual Supplement

to

Piper PA34-200

The information in this document is FAA-Approved material which, together with the basic AFM for the Piper PA34-200, is applicable and must be carried in the basic manual when the airplane is Robertson-equipped in accordance with STC S1154NW

The information in this document supersedes the basic manual only where covered in the items contained herein. For Limitations, Procedures, and Performance not contained in this supplement, consult the manual proper.

Aircraft Registration N4542T

Serial Number 34-7250128

FAA-Approved Charles C Schroeder
Chief

Engineering & Manufacturing Branch
Northwest Region

Date of Approval: 1/28/75

Tel: (206) 355-8702 TOLL FREE (800) 426-0192 TWX 910 455-2947

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SECTION I

LIMITATIONS

No change except:

"E. AIRSPEED LIMITATIONS AND INDICATOR MARKINGS (Calibrated Airspeed)

MAXIMUM SPEEDS FOR FLAPS EXTENDED	10°	160 MPH
	20°	140 MPH
	40°	125 MPH

"AIRSPEED INDICATOR MARKINGS"

White Arc (Flaps Extended Range)	66 MPH to 125 MPH
Radial Red Line (Minimum Control Speed - Single Engine) (Flaps 20°)	67 MPH

"K. PLACARDS"

"On Instrument Panel in Full View of the Pilot:"

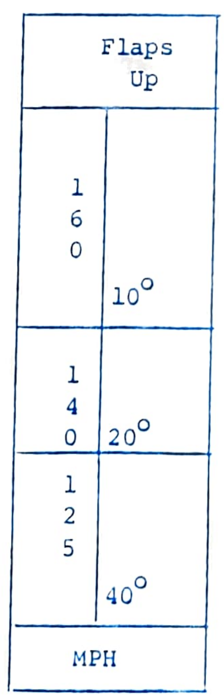
2. MINIMUM SINGLE ENGINE CONTROL SPEEDS

Flaps 20°	67 MPH
Flaps Up	78 MPH

"TAKEOFF CHECKLIST"

"Flaps Set - 20°"

"C. Flap Position Selector Switch Cover:



Takeoff

FAA Approved 1/28/75

ROBERTSON AIRCRAFT CORPORATION

FAA-Approved Airplane Flight Manual Supplement

to

Piper PA34-200

LOG OF PAGES

Revision 1

Approved D. R. Riggin
Chief, Engineering and
Manufacturing Branch,
Northwest Region

Date 7/16/75

Page	Approval Date
Title	
Table of Contents	
1	January 28, 1975
2	January 28, 1975
3	January 28, 1975
* 4	July 16, 1975

* Revised Pages

SECTION II

PROCEDURES

No change except:

"A. NORMAL PROCEDURES"

1. WING FLAP SETTINGS
   Takeoff 20°
   Landing 40°
   The flaps are electrically operated.
   Flap positions versus selector switch handle and position indicator pointer positions are as indicated on the placard on the selector switch cover between the pilot's and co-pilot's seats.

3. GO-AROUND PROCEDURES
   If a go-around from a normal landing with the airplane in the landing configuration with flaps at 40° becomes necessary:
   a. Apply takeoff power to both engines and rotate to climb attitude.
   b. Retract flaps to 20° and establish 77 MPH climb speed until obstacles are cleared.
   c. Retract landing gear when positive rate of climb is established.
   d. When obstacles are cleared, fully retract wing flaps after speed has increased to at least 90 MPH and accelerate toward 105 MPH. best rate of climb speed.
   e. Adjust cowl flaps for adequate engine cooling.

"C. EMERGENCY PROCEDURES"

"2. FEATHERING PROCEDURE"

a. Minimum Control Speed	Flaps 20°	- 67 MPH
	Flaps Up	- 78 MPH
b. Best R/C Speed Single Engine, Flaps Up		-105 MPH

"5. ENGINE FAILURE DURING TAKEOFF"
The single engine minimum control speed for this airplane in the takeoff configuration WITH THE FLAPS IN THE 20° TAKEOFF POSITION is 67 MPH (CAS). This increases to 78 MPH (CAS) when the flaps are raised to the fully retracted position.

a. If engine failure occurs during ground roll or after liftoff but before 75 MPH (CAS) has been attained, CLOSE BOTH THROTTLES IMMEDIATELY, LAND IF AIRBORNE, AND STOP STRAIGHT AHEAD. If inadequate runway remains to stop, then:
   (1) Throttles - CLOSED
   (2) Brakes - Apply maximum braking
   (3) Master Switch - OFF
   (4) Fuel Selectors - OFF
   (5) Continue straight ahead, turning to avoid obstacles as necessary.
b. If engine failure occurs after liftoff with gear still down and 75 MPH (CAS) has been attained:
   (1) If adequate runway remains, CLOSE BOTH THROTTLES IMMEDIATELY, LAND AND STOP STRAIGHT AHEAD.

(2) If the runway remaining is inadequate for stopping, the pilot must decide whether to abort the takeoff or to continue. The decision must be based on the pilot's judgement considering loading, density altitude, obstructions, the weather and the pilot's competence.

If the decision is made to continue, then:

(a) Maintain heading

(b) Maintain airspeed above 75 MPH (CAS)

(c) Maintain 20° wing flap setting

(d) Retract landing gear

(e) Feather propeller on inoperative engine
(See feathering procedure)

(f) Monitor cylinder head temperature on operating engine. If necessary to limit cylinder head temperature, retract wing flaps at any speed above 90 MPH and accelerate toward 105 MPH best rate of climb speed with flaps up.

(g) Land as soon as practical.

"6. ENGINE FAILURE DURING CLIMB"

With flaps retracted, the single engine minimum control speed is 78 MPH (CAS) under sea level standard conditions.

a. If engine failure occurs when airspeed is below 78 MPH (CAS) and the flaps have already been retracted:

(1) Reduce power on the good engine as required to maintain control.

(2) Lower the nose to increase airspeed and extend flaps back to the 20° takeoff position.

(3) Restore full power on the good engine.

(4) Accelerate to 90 MPH, fully retract wing flaps and accelerate toward the single engine best rate of climb speed of 105 MPH with flaps up.

(5) Feather propeller on inoperative engine.
(See feathering procedure)

b. If engine failure occurs when the airspeed is above 78 MPH (CAS):

(1) Maintain directional control.

(2) Allow airspeed to increase to 90 MPH and retract flaps.

(3) Accelerate toward single engine best rate of climb speed, flaps up, of 105 MPH.

(4) Feather propeller on inoperative engine.
(See feathering procedure)

"7. SINGLE ENGINE LANDING"

a. Select wing flap position of 20° since this position gives the best combination of single engine minimum control speed and single engine climb capability in case a go-around should become necessary.

b. Do not extend landing gear until certain of making field.

c. Maintain additional altitude during approach at 85 MPH.

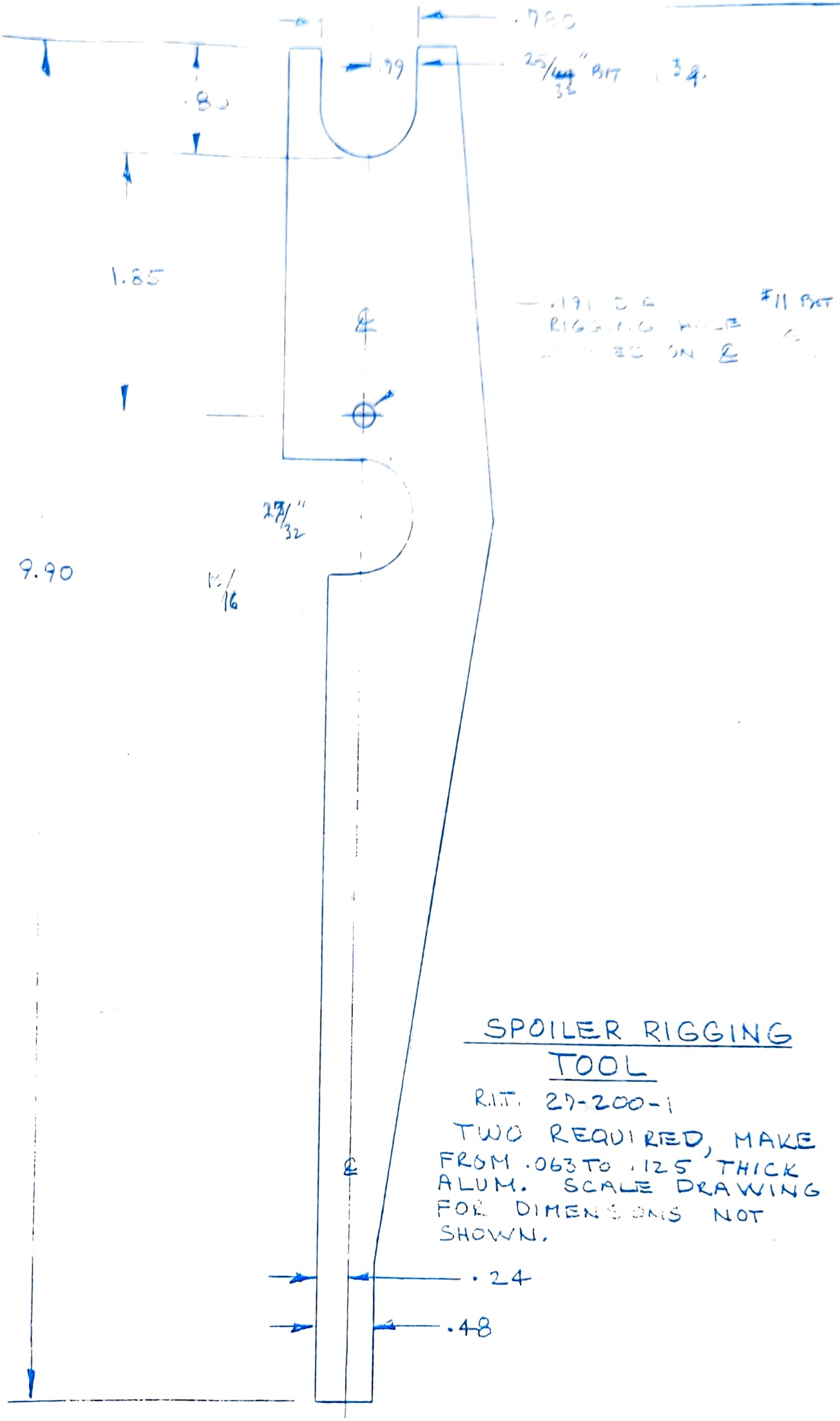
"8. SINGLE ENGINE GO-AROUND"

If a single engine go-around cannot be avoided, proceed as follows:

a. Mixture - Check - Forward

b. Propeller - Check - Forward

c. Throttle - Open



SPOILER RIGGING TOOL

R.I.T. 27-200-1

TWO REQUIRED, MAKE FROM .063 TO .125 THICK ALUM. SCALE DRAWING FOR DIMENSIONS NOT SHOWN.

d. Flaps - Maintain at 20° until airspeed is at least 90 MPH then retract.
e. Landing Gear - Retract
f. Airspeed - One engine inoperative best rate of climb speed with flaps up is 105 MPH.
g. Trim - Set
h. Cowl Flap - As required (operating engine).

SECTION III

PERFORMANCE

No changes except:

"B. STALLING SPEEDS (MPH, CALIBRATED AIRSPEED) VS. ANGLE OF BANK"

ANGLE OF BANK	0°	20°	40°	50°	60°
Flaps Up	76	78	87	95	108
Flaps 10°	71	73	81	89	100
Flaps 20°	68	70	78	85	96
Flaps 40°	66	68	75	82	93

SECTION IV

SUPPLEMENTS

No changes except:

A. Electric Pitch Trim Installation:
The Electric Pitch Trim Installation is compatible with this modification.

B. Altimatic III B-1 and Altimatic V/FD (Bendix FCS-810):
These installations are compatible with this modification with the following additional limitation and placard.

1. Limitation:
Maximum Flap Setting 20° with autopilot engaged.

2. Placard:
Adjacent to autopilot controller:
"Maximum Flaps 20° with autopilot engaged."

C. Rajay turbocharged engine installation per STC No. SA2937WE is compatible with this modification.

D. Robertson Tip Tank Installation per STC No. SA3002WE is compatible with this modification either singly or in combination with RaJay Turbocharged Engine Installation per STC No. SA2937WE.

OWNER'S MANUAL

AND

PARTS LIST

SENECA

PA 34-200

TURBO-CHARGER SYSTEM

TURBO-CHARGED BY RAJAY

DESIGNED AND MANUFACTURED BY

RAJAY INDUSTRIES, INC.

A Subsidiary of The Texstar Corporation

LONG BEACH MUNICIPAL AIRPORT

MAIL: P. O. BOX 207, LONG BEACH, CALIFORNIA 90801

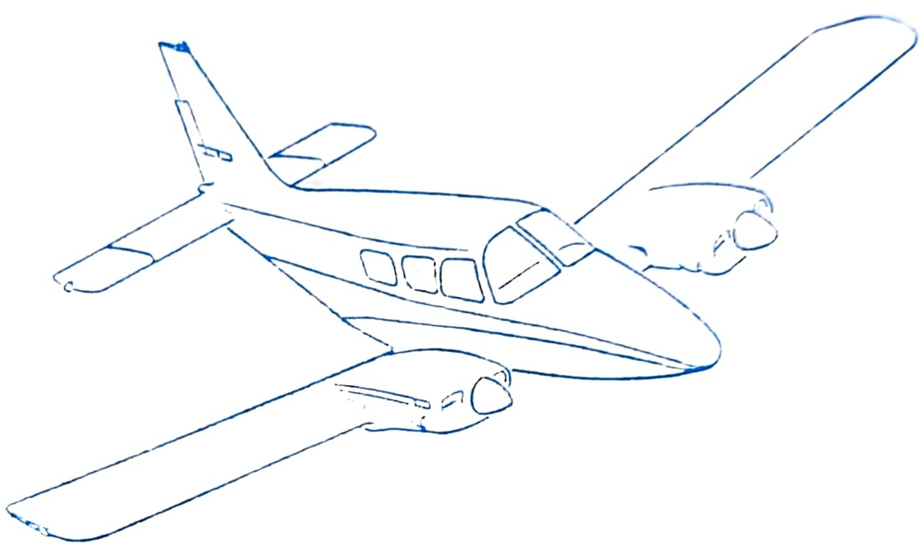
PHONE: (213) 426-0346

982-4300

THE WORLD'S LARGEST AND MOST EXPERIENCED MANUFACTURER OF RETROFIT TURBO-CHARGER SYSTEMS

RAJAY INDUSTRIES INC.

SENECA
PA 34-200



OWNERS MANUAL

CHAPTERS

1. OPERATION
2. SERVICE
3. ILLUSTRATED PARTS

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OPERATION

(form 32-nc)

SECTION III

TYPICAL "TURBONORMALIZED FLIGHT OPERATIONAL PROCEDURE

Since "TURBONORMALIZING" is a relatively new concept as applied to the civil aircraft industry, it is appropriate at this point to describe a typical flight operational procedure and installation. This is to acquaint the operator with some of the basic background thinking pertaining to this "TURBONORMALIZING" concept.

FLIGHT PROCEDURE

The operation of the turbocharger from the pilot's point of view is extremely simple. The projected typical flight operation sequence is as follows:

1. The pre-flight, take off and climb to 3,500 - 5,000 feet is as now prescribed for the aircraft.

2. During the climb at the above indicated altitude range, the pilot will have reached the full throttle position, the turbocharger will be put into operation to maintain the desired power (28.5" HgA/2700 RPM, METO) by closure of the exhaust gas waste gate valve with the control located on the powerplant control console. This diverts exhaust gases through the turbine section of the turbocharger. This in turn activates the turbocharger and allows the pilot to maintain the desired manifold pressure during climb to the selected cruising altitude. Typical engine conditions for climb should be;

   a. 2700 RPM Max. for all operating conditions.

   b. Manifold pressure - 22" to 28.5" HgA when turbocharged METO. (See AFM Supplement for Limitations)

   c. 350° to 450° F cylinder head temperature with turbocharger operating.

3. Upon obtaining the desired cruising altitude, reduce power to 22" - 27" HgA MAP and the RPM to 2200 - 2500 RPM cruise range. The aircraft will then be trimmed for cruise speed and the fuel air mixture adjusted for best economy. Note: Operating practice shows that leaning can readily be done below 75% rated power. Leaning should be done in the usual manner by pulling the mixture control back slowly, watching the manifold pressure rise to a peak; then advance (richen) the mixture for a loss of ¼ to ½" HgA - then readjust turbocharger control to return to the desired power setting. Other techniques such as leaning until unsteady engine operation, then enriching to smooth engine will work equally well. Leaning should always be done for sustained cruise

because the fuel saving can be as much as two or three gallons per hour. Use of Exhaust Gas Temp Indicator should be per engine manufacturer's recommendations.

4. The turbocharger may be utilized to obtain take-off power at high altitude airfields. (Observe Take-off Manifold Pressure Limit) Mixture Full Rich.

5. For descent, power is reduced in the reverse sequence as applying power; decrease manifold pressure by moving the Turbocharger Control toward "OFF". To further reduce power, retard the throttle. Note: Leaner mixture will be required at the higher altitudes with the turbocharger inoperative. In summary, the only additional duty the pilot has is to control the manifold pressure by the use of the Turbocharger Control after reaching the full throttle position during climbout.

SECTION IV

DETAILED DESCRIPTION

1. INDUCTION SYSTEM

The induction system is arranged to use the original engine throttle and fuel mixture controls. The inlet air box has been designed to accommodate the compressor discharge air for TURBONORMALIZING without penalizing the naturally aspirated take off power. Alternate air is available automatically in the event of normal inlet duct stoppage. Refer to Page 9 for air flow diagram.

As can be observed from the diagram, normal naturally aspirated power is automatically restored be the opening of the check valve door in the event the turbocompressor doesn't deliver boost pressure. The safety advantage of this feature is obvious. Another advantage of this inlet check valve is that it avoids the prohibitive throttling pressure drop (with corresponding loss of power) which would occur if all the engine' air for naturally aspirated operation is routed through the inoperative compressor.

2. EXHAUST SYSTEM

A. Exhaust Stacks

The exhaust system is modified to accommodate the waste gate, turbine inlet and exhaust ducting.

B. The Waste Gate

The waste gate assembly is shown in the diagram on Page 10. It is comprised of a housing, valve and control arm. The waste gate assembly is the primary control device for the turbocharger. Control is accomplished by varying positions of the waste gate valve, diverting a controlled amount of exhaust gas through the turbocharger thus compressing engine inlet air to the desired pressure.

C. The Turbocharger Turbine Ducting

As can be observed from the installation sketch, this is a very compact arrangement which provides light weight and reliable exhaust ducting. The turbine discharge ducts are routed into the existing collector and discharges through the existing cowl opening.

3. FUEL SYSTEM

A. The fuel system is one of the most critical systems in the power plant. A clear understanding of operation and good maintenance are necessary to get very best reliability and performance.

a. Fuel Pump

The new diaphragm fuel pump installed on each engine is required for satisfactory Turbocharger operation. The pressure regulating section of the engine driven pump is referenced to turbocompressor discharge pressure to insure proper fuel pressure programming when the engine is "TURBO-NORMALIZED".

B. Fuel Boost Pump

The existing fuel boost pump is adequate for all operations, so it is not changed.

4. TURBOCHARGER DESCRIPTION

The turbocharger is a 13 pound unit of high speed turbine equipment designed by Thompson Ramo Wooldridge Corporation primarily for use on small, high performance diesel engines. This basic turbocharger design has been modified to be compatible with the aircraft power plant application described herein. It consists of a precision balanced rotating shaft with a radial inflow turbine wheel on one end and a centrifugal compressor impeller on the other-each with its own housing. The turbine driven by the engine exhaust gases, powers the impeller which supplies air under pressure to the engine air inlet. This higher than ambient air pressure supplies more air by weight to the engine with the advantage of a proportionately higher power output with minimum increase in size and weight. This turbocharger represents the ultimate in product quality and performance. The rotating unit end bearings are designed for reliable service in excess of 1000 hours which equals the major overhaul period capabilities of most engines. The compressor and turbine component efficiencies are so superior that if the proper engine installation matching is done, the turbine inlet or engine exhaust pressure will be 10% to 15% less than the air throttle valve inlet pressure for recommended operating range. THIS MEANS THAT ENGINE HORSEPOWER IS NEVER USED TO DRIVE THE TURBOCHARGER. This, of course, says that no additional mechanical loads are imposed on the engine in the way of above normal present power. All of the work required to drive the turbine is recovered from the exhaust gases by in effect increasing the expansion ratio of the power portion of the basic engine cycle. Otherwise, if the turbocharger were not in that system, this portion of gas energy would be lost with discharged exhaust gases.

THE TURBOCHARGER BEARINGS ARE OF THE SEMI-FLOATING, SIMPLE SLEEVE JOURNAL TYPE WITH ENGINE OIL PRESSURE LUBRICATION FOR THE BEST RELIABILITY. THE TURBINE HOUSING AND TURBINE WHEEL ARE CAST OF HIGH TEMPERATURE RESISTANT MATERIALS; THE CENTRAL MAIN HOUSING, COMPRESSOR HOUSING AND IMPELLER ARE CAST OF ALUMINUM FOR LIGHT WEIGHT AND EXCELLENT THERMAL CHARACTERISTICS. AS A RESULT OF THIS SELECTION OF MATERIALS AND WITH CARE IN INSTALLATION, THE TURBOCHARGER IS COMPLETELY AIR COOLED.

IN SUMMARY, THE TURBOCHARGER USED IN THIS INSTALLATION REPRESENTS THE APPLIED RESULTS OF 20 YEARS OF TURBINE MATERIALS KNOWLEDGE AND THERMODYNAMIC STATE-OF-THE-ART. THE INDIVIDUAL DEVELOPMENT COST OF THIS LINE OF TURBOCHARGERS HAS EXCEEDED ONE MILLION DOLLARS.

5. TURBOCHARGER LUBRICATION AND LUBRICATION SCAVENGE SYSTEM

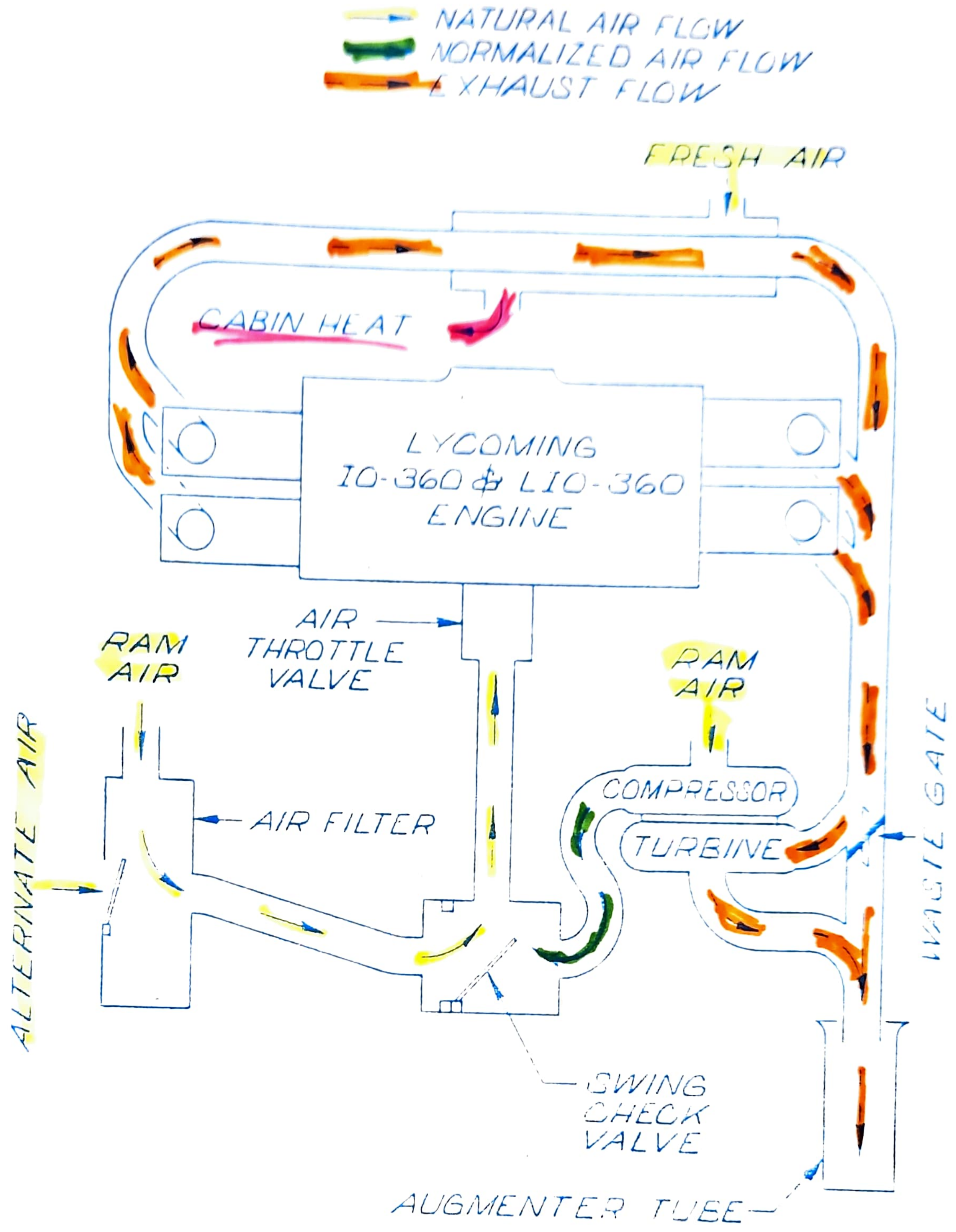
THE TURBOCHARGER IS DESIGNED TO BE LUBRICATED BY ENGINE LUBRICANT. THIS IS SUPPLIED TO THE TURBO OIL GALLERY FROM ENGINE OIL PUMP. A FITTING INCLUDED IN THIS LUBRICANT SUPPLY LINE INCORPORATES A PRESSURE REGULATOR POPPET VALVE TO REDUCE ENGINE GALLERY OIL PRESSURE FROM 60 - 80 PSI (REQUIRED FOR THE ENGINE) TO 40 - 60 PSI PRESSURE (AT NORMAL OIL OPERATING TEMPERATURES). BETWEEN 1 AND 2 QUARTS PER MINUTE OF LUBRICANT WILL BE SUPPLIED TO THE TURBOCHARGER. THIS QUANTITY OF OIL IS A VERY SMALL PERCENTAGE OF TOTAL ENGINE OIL PUMP CAPACITY. THE OIL QUANTITY WHICH IS SUPPLIED TO THE TURBOCHARGER IS NORMALLY RETURNED TO THE ENGINE SUMP BY WAY OF THE BY-PASS PRESSURE RELIEF VALVE. THE TURBOCHARGER LUBE SUMP IS SCAVENGED AND RETURNED TO THE ENGINE BY GRAVITY.

6. TURBOCHARGER CONTROLS

THE PRINCIPAL FACTOR IN TURBOCHARGER OPERATION IS EXHAUST GAS WASTE GATE DEGREE OF CLOSURE. THIS DETERMINES THE AMOUNT OF THE TOTAL ENGINE EXHAUST FLOW THROUGH THE TURBINE AND RESULTING LEVEL OF BOOST. TO PROVIDE THE PILOT WITH COMPLETE FREEDOM OF CHOICE IN TURBOCHARGER USE, A SEPARATE PUSH-PULL CONTROL WITH precise vernier adjustment is installed for actuation of the waste gate. This installation permits convenient, exact setting of manifold pressure for the engine. With respect to engine stability when using a turbocharger, tests conducted for this installation (and past similar installations) have clearly demonstrated that with a propeller governor or propeller type load, the engine is inherently stable. This is because the four cycle engine serves as a positive displacement device, thus controlling the air flow for steady power output. This means that control is a function of governed engine speed and exhaust waste gate valve position.

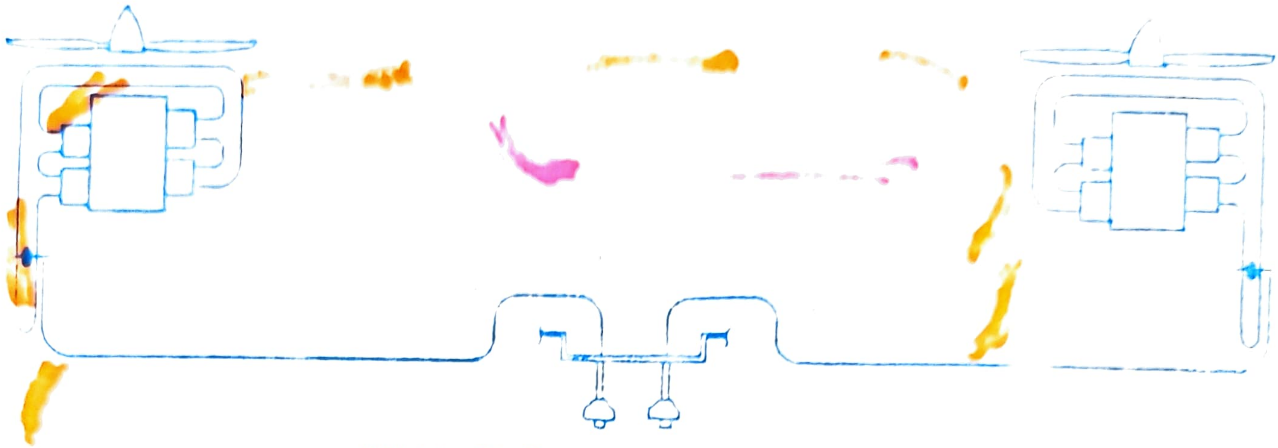
(form 9-nc)

AIR INDUCTION AND EXHAUST GAS FLOW SCHEMATIC

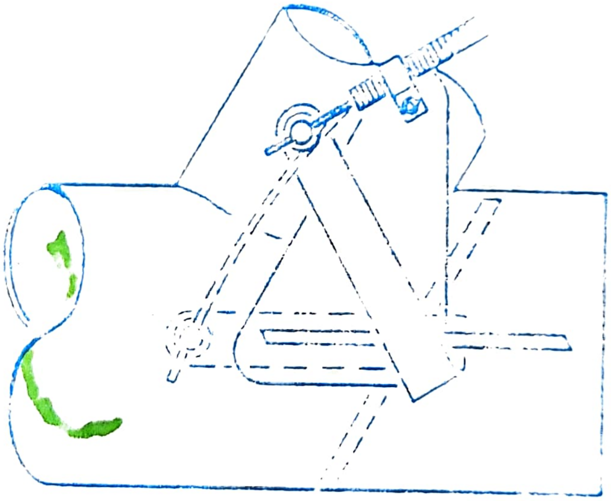


TURBO SENECA

TURBO SENECA
TURBOCHARGER WASTE GATE CONTROL SCHEMATIC



DUAL PUSH-PULL CONTROLS
WITH VERNIER ADJUSTMENT



SOLID LINES REPRESENT
NATURALLY ASPIRATED WASTE GATE POSITION

BROKEN LINES REPRESENT
TURBONORMALIZING WASTE GATE POSITION

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SERVICE

ROUTINE SERVICE AND INSPECTION

WHENEVER ROUTINE SERVICE OF THE ENGINE IS PERFORMED (25, 50 & 100 HOUR INSPECTION) INSPECT THE TURBOCHARGER INSTALLATION AS FOLLOWS:

1. Inspect all air inlet ducting and compressor discharge ducting for worn spots, loose clamps or leaks.

2. Inspect engine air inlet assembly for cracks, loose clamps and screws.

3. Inspect waste gate housing, exhaust ducting and exhaust stacks for signs of leaks or cracks. Check all clamps for tightness.

4. Carefully check all Turbo support brackets, struts, etc. for breakage, sagging or wear.

5. Check all oil lines, fuel lines and fittings for wear, leakage heat damage or fatigue.

6. Actuate waste gate control, check springs preload and examine control for any pending sign of breakage.

7. Inspect injector system for signs of fuel dye indicating leaks.
   NOTE: If dye stains are present, check for loose connections and proper installation of air bleed nozzle shrouds.

8. Clean Turbocharger oil filter with solvent or gasoline every oil change. An overnight soaking in carburetor cleaner may be necessary if heavy sludging is evident. (This is usually due to mixing detergent with non-detergent oils.) For checking Turbocharger lubrication system, see illustration, Page 6.

9. Run up engines, check all instruments for smooth, steady response.

1000 HOUR INSPECTION

1. Remove all Turbocharger components from the engine. Inspect and repair or replace as necessary. Check Turbocharger rotor for excessive play, carbon and dirt deposits. See trouble shooting section for rotor play limits. Remove turbine and compressor housings. Inspect turbine wheel and impeller for physical damage and excessive build up of deposits. If excessive, replace Turbocharger assembly.

TROUBLE IN FLIGHT OR GROUND RUN-UP	POSSIBLE CAUSE	FIX
1. LOSS OF, REDUCTION OF, OR FLUCTUATION OF MANIFOLD PRESSURE WHEN TURBOCHARGING	a. Malfunctioning manifold pressure gauge due to faulty gauge or possible oil in MAP reference line or gauge.	a. Repair or replace gauge. NOTE: If the engine changes in power level or the airspeed changes, then actual change in MAP has occurred due to one of the reasons listed below:
	b. Turbocharger inlet duct blocked.	b. Check ducting and remove obstruction.
	c. Turbocompressor discharge duct ruptured or disconnected.	c. Connect or replace ducting.
	d. Severe rupture on exhaust stacks causing waste gate to be ineffective.	d. Replace defective part.
	e. Turbocharger rotor jammed.	e. Replace Turbocharger.
	f. Ruptured manifold gauge line or fitting.	f. Repair leak.
	g. Broken waste gate control.	g. Replace control cable.
	h. Air inlet check valve not fully sealing or blocked partly open.	h. Inspect, repair or replace as needed.
2. LOSS OR REDUCTION OF FUEL PRESSURE WHEN TURBOCHARGING	a. Out of fuel.	a. Refuel.
	b. Partial fuel vapor lock at high altitude due to hot fuel and high power settings.	b. Turn on boost pump and/or reduce power.
	c. Malfunctioning fuel pressure regulating valve or fuel pump.	c. Turn on boost pump and/or reduce power.
	d. Ruptured fuel line or leaking ftg. or pump shaft seal.	d. Shut off fuel shut-off valve, full rich mixture until fuel fwd of fire-wall is consumed by engine. Secure engine.

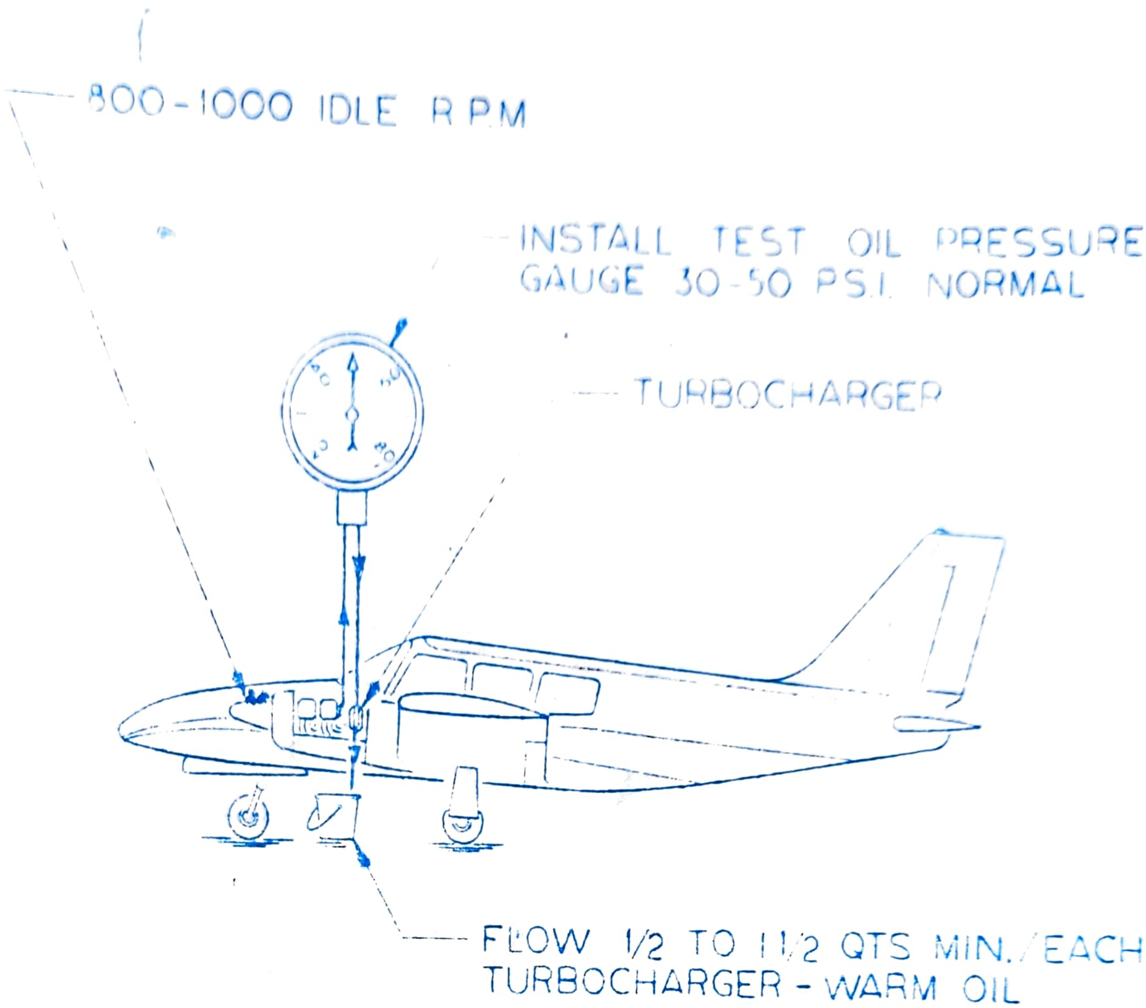
(form 12-nc))

TROUBLE IN FLIGHT OR GROUND RUN-UP	POSSIBLE CAUSE	FIX
2. LOSS OR REDUCTION OF FUEL PRESSURE WHEN TURBOCHARGING (Con't)	a. Ruptured boost pressure reference line to fuel pressure regulating valve.	a. Continue operation until [illegible] landing if engine is smooth; otherwise, return engine to naturally aspirated power. Ground check fuel system.
3. ENGINE RUNS HOT (460° OR MORE) WHEN TURBOCHARGING OR NATURALLY ASPIRATED.	a. May be due to extreme hot weather.	a. Reduce power.
	b. Cracked or loose cylinder cooling air baffles.	b. Repair or replace as required.
	c. During climb	c. Reduce power or increase Indicated Air Speed.
	d. Over-boost or RPM to high.	d. Reduce MAP or RPM.
	e. Fuel mixture too lean during very hot weather.	e. Enrichen mixture.
	f. Mis-timed ignition, either retarded or pre-ignition.	f. Check ignition timing, adjust as necessary.
	g. Detonation due to too low octane fuel or item "f" above.	g. Fuel mixture set too lean or fuel octane too low. Check mixture and fuel grade.
	h. Faulty cylinder head temperature gauge.	h. Replace instrument.
	i. Defective oil cooling system.	i. Inspect and repair as required.
	j. Combination of above.	j. Systematically eliminate by above steps.

TROUBLE IN FLIGHT OR GROUND RUN-UP	POSSIBLE CAUSE	FIX
4. AIRPLANE PERFORMANCE IS REDUCED FROM NORMAL.	a. May be due to hot weather.	a. Turbo aircraft speed will be reduced 2 to 4 mph for 10° F rise in temperature above standard day. This is because Turbochargers, like turbines, are heat sensitive as to performance.
	b. Tired engine, or out of tune.	b. Repair engine as required.
	c. Airplane may have additional drag due to radio antenna, sagging flaps, out of rig, etc.	c. Inspect airframe and repair as necessary.
5. FUEL CONSUMPTION IS HIGHER THAN NORMAL.	a. Mixture set too rich.	a. Develop proper leaning technique.
	b. Leak in fuel system.	b. Locate and repair leak.
	c. Prolonged high power at full rich mixture.	c. Reduce power and lean for economy.
	d. Hot weather.	d. Hot weather will naturally increase fuel consumption 2 to 4 GPH depending on power, leaning and temperature of the air. This is due to less dense air for the same MAP. Also it has been found from tests that slightly richer mixture should be used for extremely warm weather to maintain a lower head temperature. This will insure good engine life.

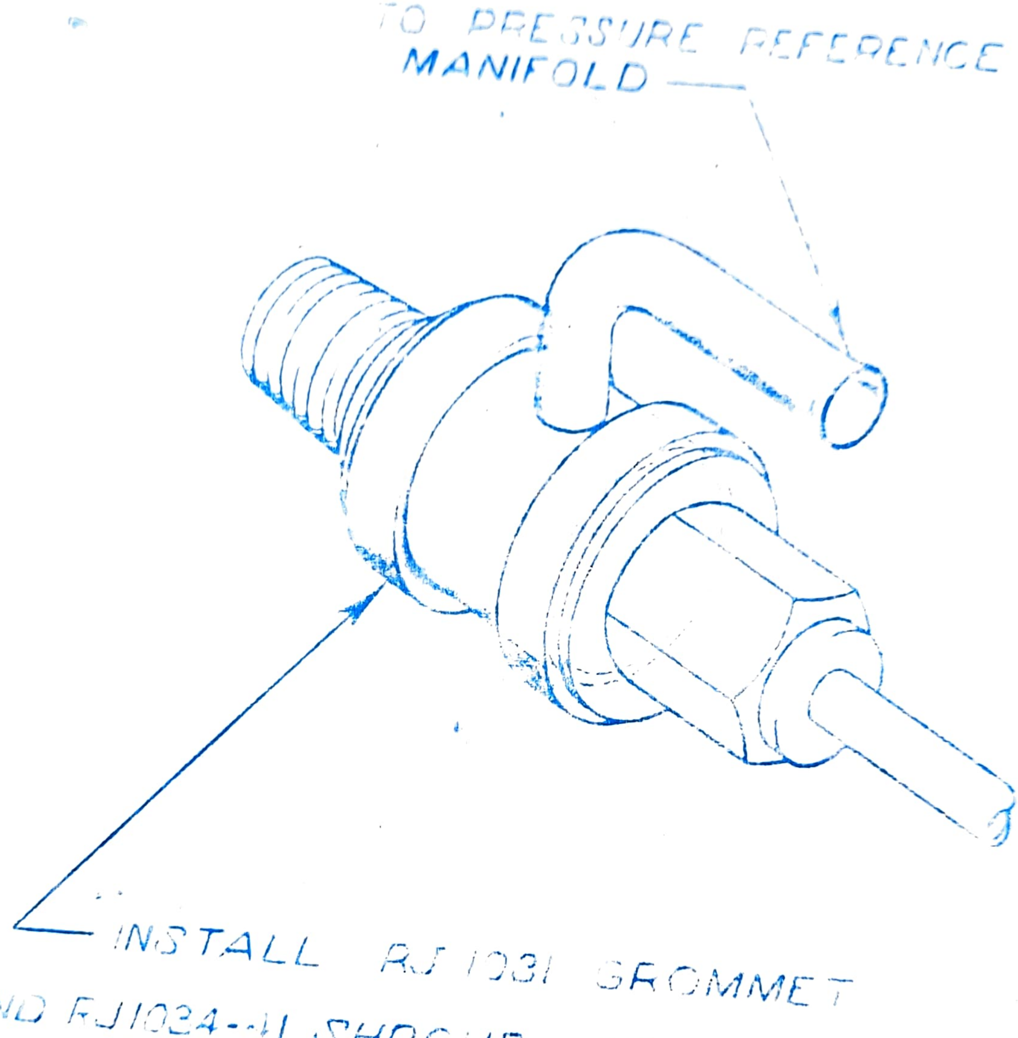
TROUBLE IN FLIGHT OR GROUND RUN-UP	POSSIBLE CAUSE	FIX
1. OIL LEAKING OUT OF ENGINE INLET BOX NOTE: CARE SHOULD BE TAKEN TO MAKE SURE OIL IS FROM INSIDE ENGINE IN-LET, NOT ON THE OUTSIDE FROM SOME OTHER POINT ON ENGINE.	a. Oil Sump or intake guide leaking into induction system.	a. Repair or replace sump or valve guide.
	b. Failed Turbocharger bear-ings and compressor seal.	b. Replace Turbocharger. NOTE: The Turbocharger seal will have to be in very poor condition to permit oil to pass the compressor impeller seal.
2. NOISY TURBOCHARGER ROTATING ASSEMBLY	a. Damaged bearings.	a. Replace unit.
	b. Rotating unit rubbing housing as a result of "a" above, distorted housings, dirt accumu-lation on impeller, carbon build-up on tur-bine or foreign object damage.	b. Replace unit. NOTE: Allowable shaft radial play is .017 to .028 inch due to semi-floating bearings. Allowable shaft axial play is .004 to .009 inch.

TURBO SENECA
TURBO OIL FLOW CHECK



1. UNFASTEN TURBO OIL RETURN HOSE AT TURBO END.
2. RUN TEST HOSE FROM TURBO DRAIN PORT TO TEST TANK.
3. PLACE PRESSURE GAUGE IN OIL LINE BETWEEN PRESSURE REDUCTION RELIEF CHECK VALVE AND TURBOCHARGER INLET.
4. RUN TEST. LIMIT TO 3 MINUTES.

AIR BLEED NOZZLE ASSY. SERVICE



TURBO SENECA PA34-200

TABLE OF CONTENTS

ILLUSTRATED PARTS

USED ON CODE

PARTS COMMON TO ALL AIRCRAFT ARE NOT CODED IN THE "USED ON CODE" COLUMN OF THESE PARTS LISTS. VARIATIONS IN PART USAGE ON AIRCRAFT ARE INDICATED BY THE FOLLOWING CODE LETTERS WHICH ARE USED CONSISTENTLY THROUGHOUT THIS CATALOG.

LETTER CODE	AIRCRAFT SERIAL NUMBER APPLICATION
A	S/N 34-7250001 TO 34-7350342 INCL. WITH ORIGINAL EXHAUST SYSTEM.
B	S/N 34-7350343 AND SUBS. OR PRECEDING SERIAL NO.'S MODIFIED PER PIPER SERVICE LETTER NO. 673, DATED SEPT. 28, 1973.

EXHAUST SYSTEM

Item No.	Part Number	No. Req'd Per A/C	Part Name	Used On Code
1	RJ 0114	2	Gasket	A
2	U4204SS-369M	4	Clamp	A
	4121E-369Z	4	Alt. Clamp	A
3	RJ 0904-11	1	Turbine Outlet - LH Eng.	A
	RJ 0904-12	1	Turbine Outlet - RH Eng.	A
4	AN3C-20	4	Bolt	A
5	AN381-2-16	4	Cotter Pin	A
6	AN960C10	8	Washer	A
7	CSD51258	4	Spring	A
8	AN310C3	4	Nut	A
9	RJ 0904-21	1	Overboard - LH Eng.	A
	RJ 0904-22	1	Overboard - RH Eng.	A
10	RJ 0115	2	Gasket	A
11	RJ 0905-1	1	Turbine Inlet Flange - LH Eng.	A
	RJ 0905-2	1	Turbine Inlet Flange - RH Eng.	A
12	RJ 0902-1	1	Waste Gate - LH Eng.	A
	RJ 0902-2	1	Waste Gate - RH Eng.	A
13	RJ 0903-41	1	Riser - LH Eng.	A
	RJ 0903-52	1	Riser - RH Eng.	A
14	65321	3	Gasket	A
15	RJ 0903-31	1	Riser - LH Eng.	A
	RJ 0903-62	1	Riser - RH Eng.	A
16	RJ 0903-1	1	Cabin Heat Exchanger - LH Eng.	A
	RJ 0903-2	1	Cabin Heat Exchanger - RH Eng.	A
17	AN737TW107	9	Clamp	A
	QS200M 44H	9	Alt. Clamp	A
18	RJ 9502-24-48	1	Flex Duct - LH Eng.	A
	RJ 9502-24-24	1	Flex Duct - RH Eng.	A
19	RJ 9502-24-128	1	Flex Duct - LH Eng.	A
	RJ 9502-24-168	1	Flex Duct - RH Eng.	A
20	RJ 0912-21	1	Cabin Heat Elbow - LH Eng.	A
21	RJ 9701-2	1	Heat Shield - LH Eng.	A
	RJ 9701-3	1	Heat Shield - LH Eng.	A

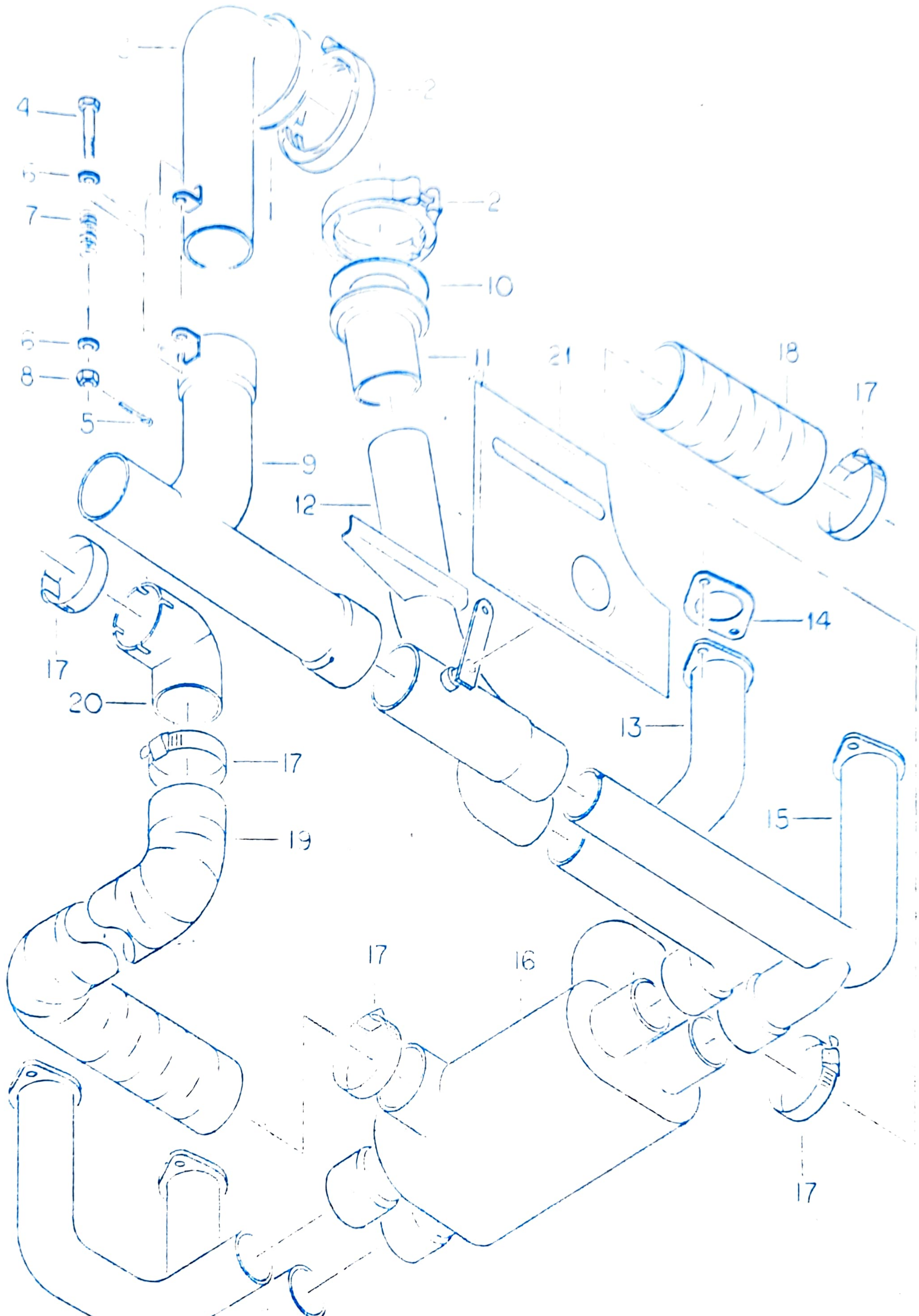


FIG. I

Air Induction System

Item No.	Part Number	No. Req'd Per A/C	Part Name
1	RJ 0923-1	1	Compressor Discharge Box Assy - LH Eng.
	RJ 0923-2	1	Compressor Discharge Box Assy - RH Eng.
*2	RJ 0506-41	2	Door Assy
3	AN365-1032	18	Nut
4	AN970-3	18	Washer
5	AN960-10	18	Washer
6	AN3-4A	18	Bolt
7	AN737TW82	7	Clamp
	QS200M 36H	7	Alt. Clamp
8	RJ 9502-18-44-6A	2	Flex Duct
9	RJ 0910-1	1	Air Inlet Tube - LH Eng.
	RJ 0910-2	1	Air Inlet Tube - RH Eng.
10	RJ 9507-18-10	1	Duct - LH Eng.
	RJ 9507-18-3	1	Sleeve - RH Eng.
11	AN737TW107	4	Clamp
	QS200M 44H	4	Alt. Clamp
12	RJ 0632	2	Flex Duct
13	AN742-50	2	Clamp
14	RJ 0917-1	1	Air Filter Box Assy - LH Eng.
	RJ 0917-2	1	Air Filter Box Assy - RH Eng.
15	AN737TW114	4	Clamp
	QS200M 56H	4	Alt. Clamp
16	RJ 9504-28-15	2	Duct
17	AN737TW91	4	Clamp
	QS200M 44H	4	Alt. Clamp
18	RJ 9504-20-19	2	Duct
19	RJ 0909	2	Servo Inlet Assy
20	RJ 0522	2	Gasket
21	AN74A7	2	Bolt
22	AN822-2D	2	Elbow
23	AN6270-2-10	2	Hose Assy - LH Eng.
24	AN822-3D	2	Elbow
25	AN6270-3-22	2	Hose Assy.
26	AN924-3D	2	Nut
27	AN960-616	4	Washer
28	AN834-3D	2	Tee
29	RJ 0924-1	2	Boost Ref. Manifold
30	RJ 0924-2	2	Boost Ref. Manifold
31	GC-4	16	Clamp
	65004	16	Alt. Clamp
32	RJ 1630	8	Hose
33	RJ 1034-41	8	Shroud Assy
34	RJ 1031	16	Grommet
35	AN960-516L	8	Washer

* RJ 0506-41 Door Assy is part of RJ 0923-1 & -2 Compressor Discharge Box Assy, but may be ordered by separately

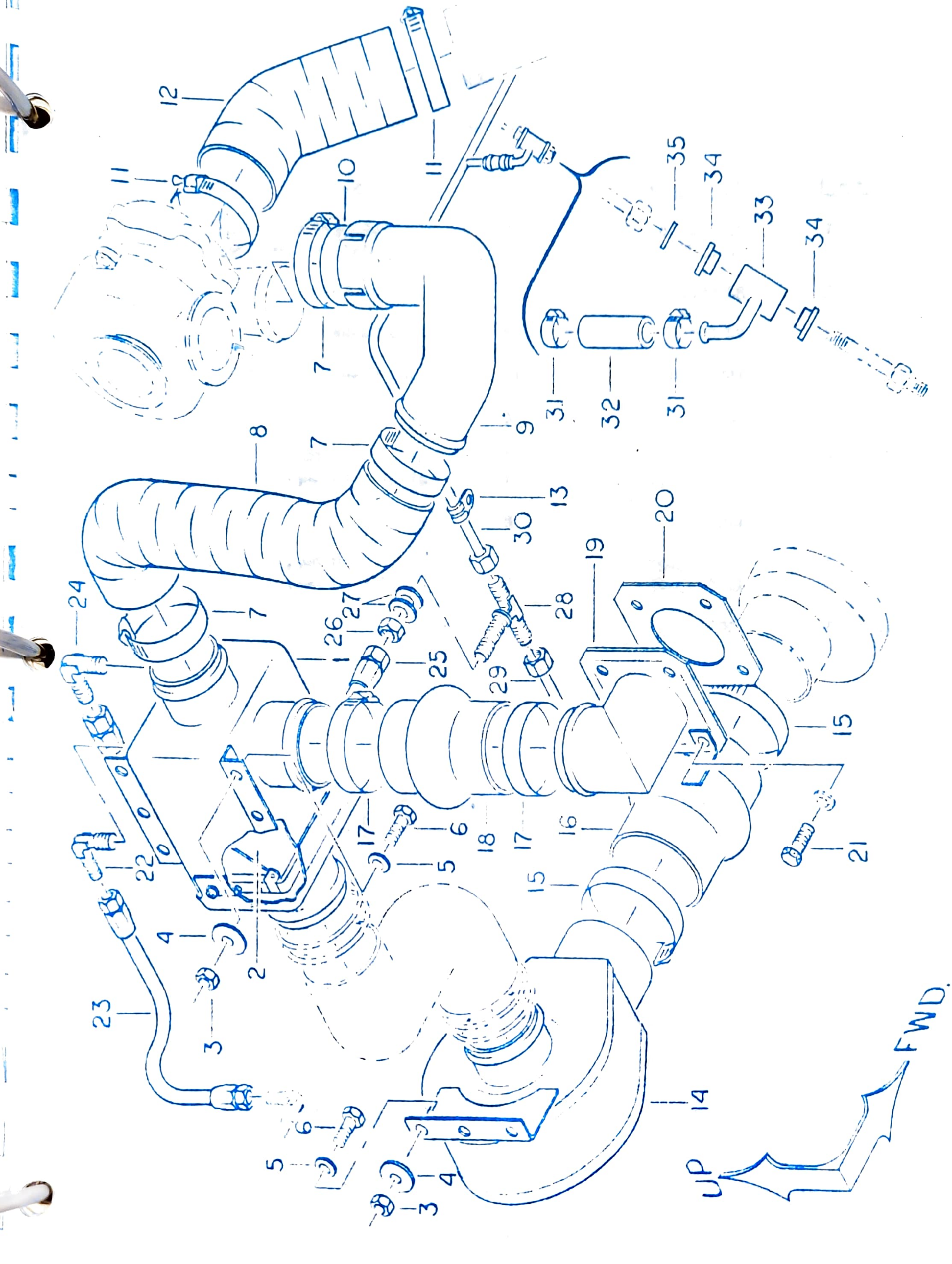


FIG. II

SENECA

T/C Mount System

Item No.	Part Number	No. Req'd Per A/C	Part Name
1	RJ 0329-6	1	Turbocharger - LH Eng.
	RJ 0329-8	1	Turbocharger - RH Eng.
2	RJ 9700	2	T/C Blanket
3	RJ 0918	12	Cone Washer
4	AN935-416	12	Lock Washer
5	AN74A6	4	Bolt
6	RJ 0913-11	1	Strut - LH Eng.
	RJ 0913-12	1	Strut - RH Eng.
7	AN74A7	8	Bolt
8	RJ 0913-21	1	Strut - LH Eng.
	RJ 0913-22	1	Strut - RH Eng.
9	AN960-716	4	Washer

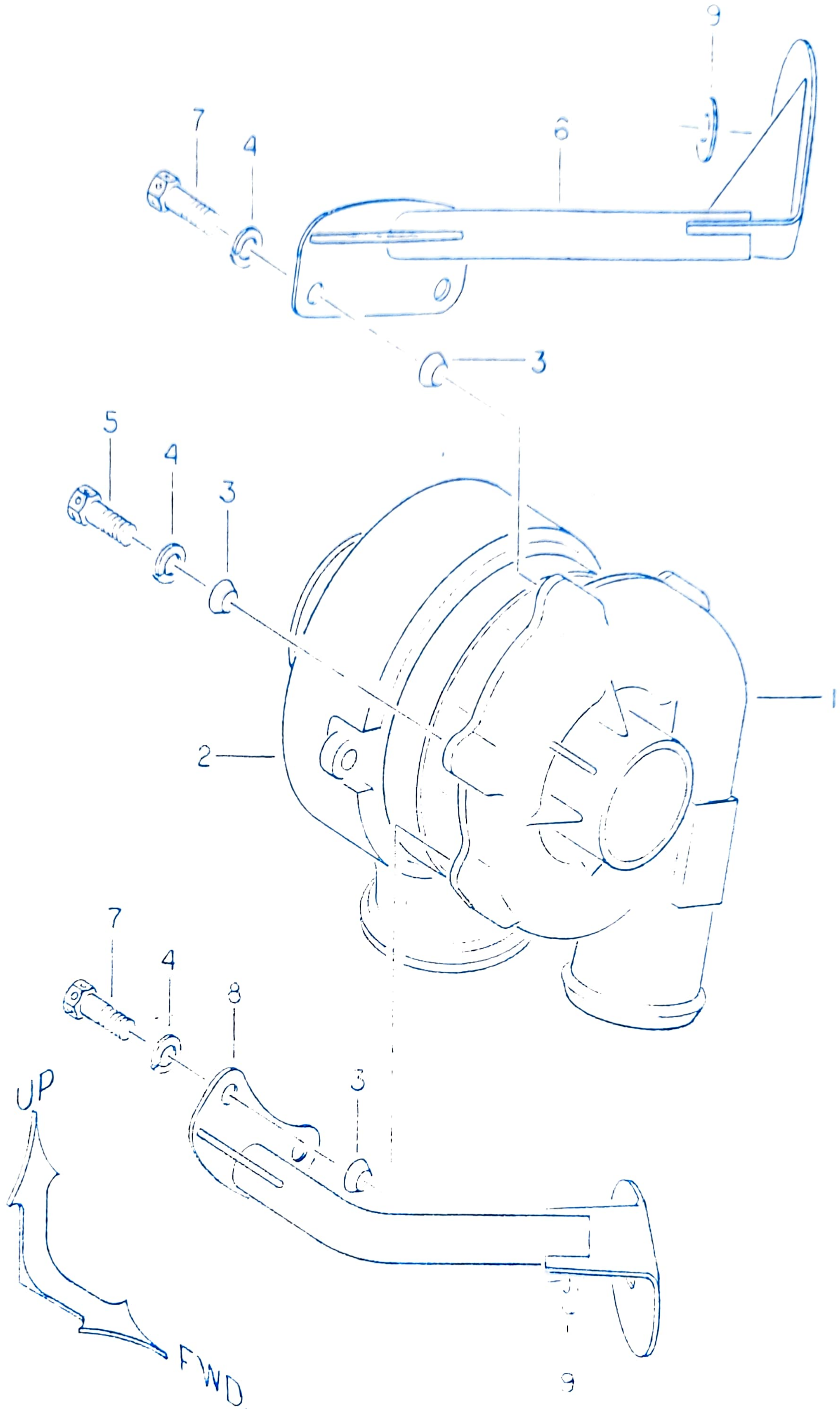


FIG. III

Oil & Fuel System

Item No.	Part Number	No. Req'd Per A/C	Part Name
1	AN822-4D	2	Elbow
2	624000-4-0120	3	Hose Assy
	111F417-4S-0120	3	Alt. Hose Assy
3	RJ 0190	2	Connector
4	532A-2MP-27	2	Check Valve
5	AN816-4-4D	2	Nipple
6	624000-4-0054	1	Hose Assy
	111F417-4S-0054	1	Alt. Hose Assy
7	4DTX-D	2	Elbow
8	RJ 0258-3	2	Nipple
9	RJ 0370	2	Gasket
10	RJ 0919-1	1	Oil Drain Flange - LH Eng.
	RJ 0919-2	1	Oil Drain Flange - RH Eng.
11	RJ 0926	1	Flat Head Screw
12	LL22B066J 16 x 2	3	Screw
13	AN737TW34	4	Clamp
14	MIL-H-6000-8 x 15"	1	Hose - LH Eng.
	MIL-H-6000-8 x 10"	1	Hose - RH Eng.
15	AN844-8D	2	Elbow
16	RJ 0920	2	Oil Return Plate
17	68315	2	Gasket
18	69551	2	Gasket
*19	AN822-8D	6	Elbow
**	AN822-8D	4	Elbow
20	624000-8-0380	2	Hose Assy
	111F417-8S-0380	2	Alt. Hose Assy
21	AN822-8D	1	Elbow - LH Eng.
	AN823-8D	1	Elbow - RH Eng.
22	624040-8-0450	1	Hose Assy - LH Eng.
	111F501-8S-0450	1	Alt. Hose Assy - LH Eng.
	624040-8-0240	1	Hose Assy - RH Eng.
	111F501-8S-0240	1	Alt. Hose Assy - RH Eng.
23	60096	2	Gasket
24	R00253-501	2	Fuel Pump
25	AN911-1D	2	Nipple
26	AN910-1D	2	Coupling
27	AN816-2D	2	Nipple
28	AN6270-2-1	2	Hose Assy
29	AN823-2D	2	Elbow
30	AN837-6D	1	Elbow - LH Eng.
31	AN4045-1	2	Gasket
32	61183	2	Gasket
33	AN6227-9	4	"O" Ring

* For aircraft equipped with Harrison radiator division oil cooler.

** For aircraft equipped with Stewart Warner oil cooler.

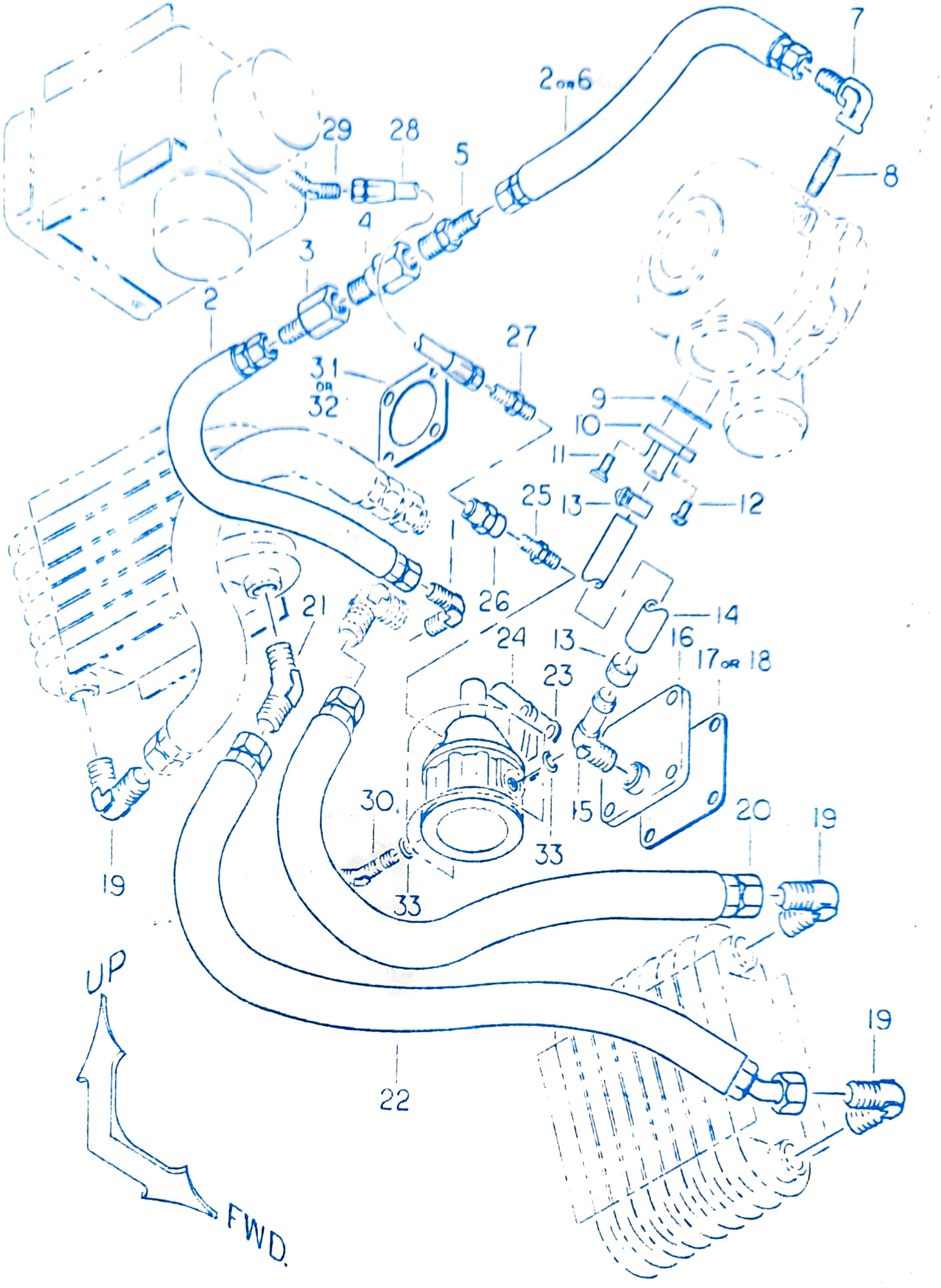

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FIG IV

Cockpit & Control System

Item No.	Part Number	No. Req'd Per A/C	Part Name
1	44193 x 13 Ft.	2	T/C Control Cable
2	RJ 0916	1	T/C Control Console
3	AN507-832-8	2	Screw
4	A8-75	2	Rivnut
5	RJ 0932	1	Angle
6	AN4-5A	2	Bolt
7	AN960-416	2	Washer
8	AN365-428	2	Nut
9	AN960-8L	2	Washer
10	AN526-832-8	2	Screw
11	AN936-A8	4	Lock Washer
12	RJ 0931-3	1	Placard - T/C Control
13	EJ 0931-5	1	Placard - Reduce Vne
14	RJ 0610-5	1	Placard - Boost Pump
15	NAS451-18	2	Button Plug
16	AN365-1032	4	Nut
17	AN960-10	8	Washer
18	22105-03	2	Gasket
19	MT840-x ¼	2	Grommet
20	MT340	2	Grommet Holder
21	AN526-1032-8	4	Screw
22	AN3-4A	2	Bolt
23	759S6	2	Clamp
24	AN363-1032	2	Nut
25	70371-03	2	Pin
26	70371-02	2	Bushing
27	AN960-10L	2	Washer
28	AN355-3	2	Nut
29	AN310-3	2	Nut
30	AN381-2-16	2	Cotter Pin

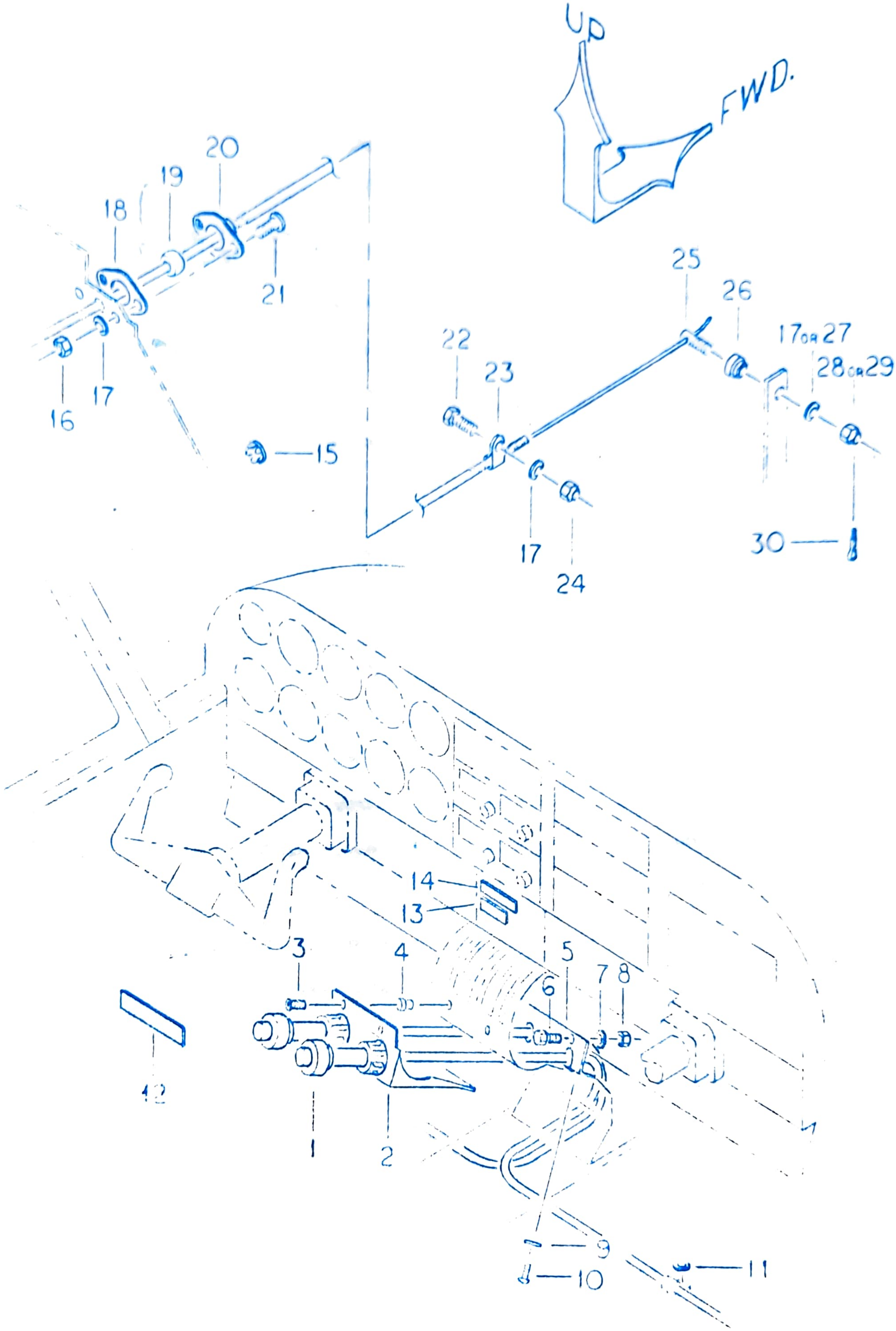
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FIG. V

Cowling Modifications

Item No.	Part Number	No. Req'd Per A/C	Part Name
1	AN526-632-8	47	Screw
2	RJ 0911-10 RJ 0911-11	1 1	Inlet Duct - RH Eng. Inlet Duct - LH Eng.
3	AN960-6	129	Washer
4	AN365-632	87	Nut
5	AN470AD4-5	32	Rivet
6	RJ 0922-3 RJ 0922-4	1 1	Louver - LH Eng. Louver - RH Eng.
7	AN960-4L	32	Washer
8	RJ 0911-31	2	Cap
9	QS200M 56H	2	Clamp
10	RJ 0911-20 RJ 0911-21	1 1	Inlet Duct - RH Eng. Inlet Duct - LH Eng.
11	RJ 0912-11	2	Cabin Heat Inlet
12	RJ 0922-5	4	Scoop
13	AN526-632-6	40	Screw
14	RJ 0922-11	1	Scoop - LH Eng.
15	RJ 0922-19	2	Patch
16	18.00 x 20.00	2	ALUM. ASBESTOS CLOTH
17	RJ 0936	2	STIFFENER

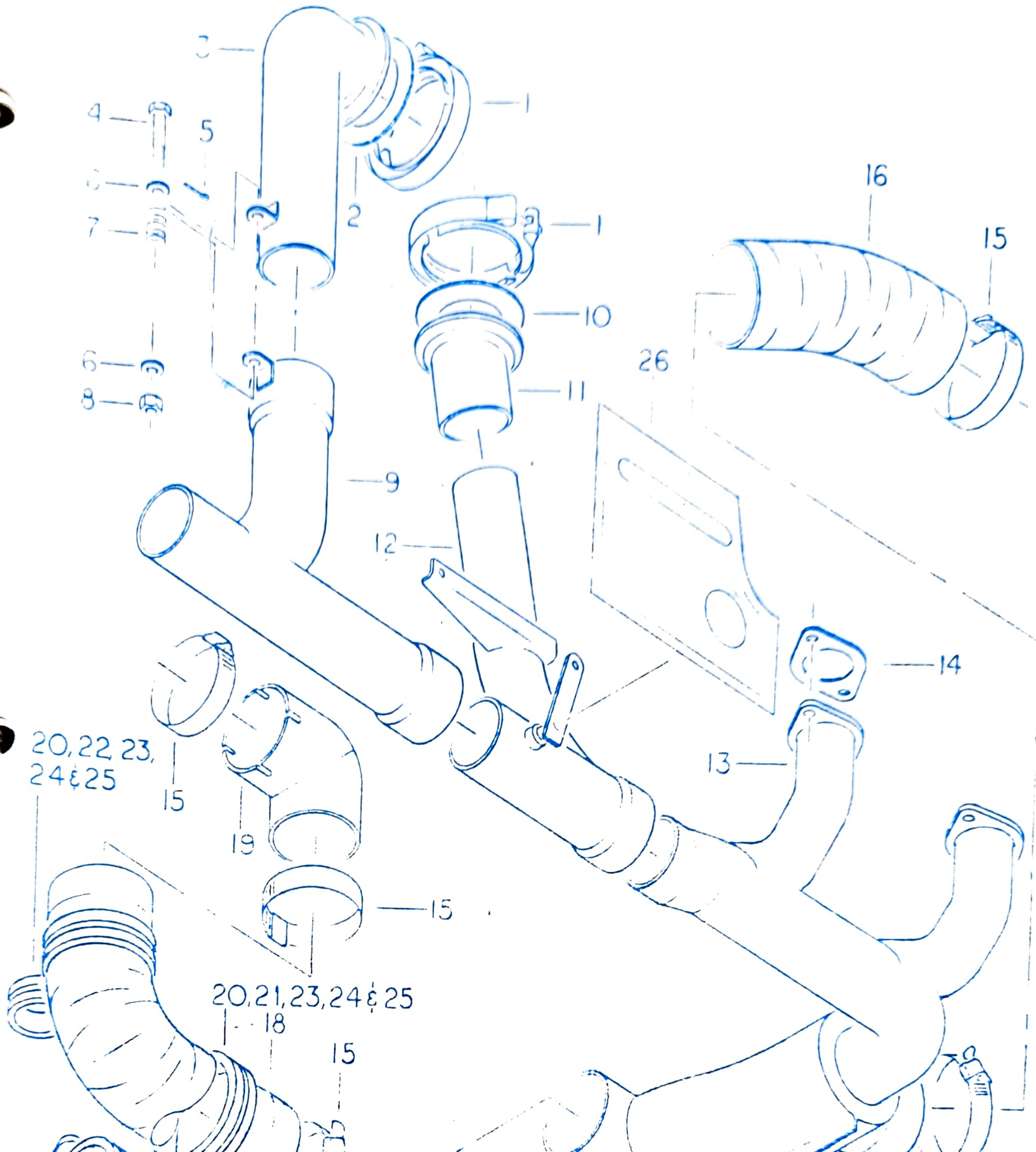
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FIG. VII

Oil Cooler Installation

Item No.	Part Number	No. Req'd Per A/C	Part Name	Used On Code
1	8526250	2	Oil Cooler	
2	AN365-1032	16	Nut	
3	AN960-10	24	Washer	
4	RJ 0929	1	Oil Cooler Bracket - LH Eng.	
	RJ 0930	1	Oil Cooler Bracket - RH Eng.	
5	AN3-3A	8	Bolt	
6	AN365-832	33	Nut	
7	AN960-8	33	Washer	
8	AN526-832-7	29	Screw	
9	RJ 0927-11	1	Baffle	
10	RJ 0921-5	1	Baffle - LH Eng.	
	RJ 0921-6	1	Baffle - RH Eng.	
11	RJ 0921-3	1	Baffle - LH Eng.	
	RJ 0921-8	1	Baffle - RH Eng.	
12	#6 x ¼	16	Sheet Metal Screw	
13	RJ 0928-3	2	Support	
14	RJ 0928-5	2	Support	A
	RJ 0928-5	1	Support - LH Eng.	B
	RJ 0928-6	1	Support - RH Eng.	B
15	RJ 0914-1	2	Oil Cooler Bracket	A
	RJ 0914-1	1	Oil Cooler Bracket - LH Eng.	B
	RJ 0914-2	1	Oil Cooler Bracket - RH Eng.	B
16=	AN3-41A	8	Bolt	
17	NAS43-3-222	8	Spacer	
18	RJ 0925-3	2	Bracket	
19	RJ 0925-5	2	Bracket	
20	AN4-17A	2	Bolt	
21	RJ 0915	2	Strut	
22	AN526-832-8	4	Screw	
*23	3/8" x 3/8" x 12.00"	1	Weatherstrip Tape	
24	RJ 0928-7	2	Spacer	
25	AN960-416	9	Washer	
***26	AN931-8-20	1	Grommet - RH Eng.	
27	AN526-632-7	4	Screw	
28	RJ 0934	1	Blast Nozzle - RH Eng.	
29	AN960-6	4	Washer	
30	AN365-632	4	Nut	
**31	350-4-0220	1	Hose Assy	
**32	350-4-0180	1	Hose Assy	
**33	AN837-4D	1	Bulkhead Elbow	
**34	AN924-4D	1	Nut	
**35	AN6290-4	1	O'Ring	

* Not illustrated - located between RJ 0930 bracket and 8526250 oil cooler on RH Eng. only.

** For installations 9-1-71 & subsequent (not illustrated)

*** Not required on installations 9-1-71 & subsequent

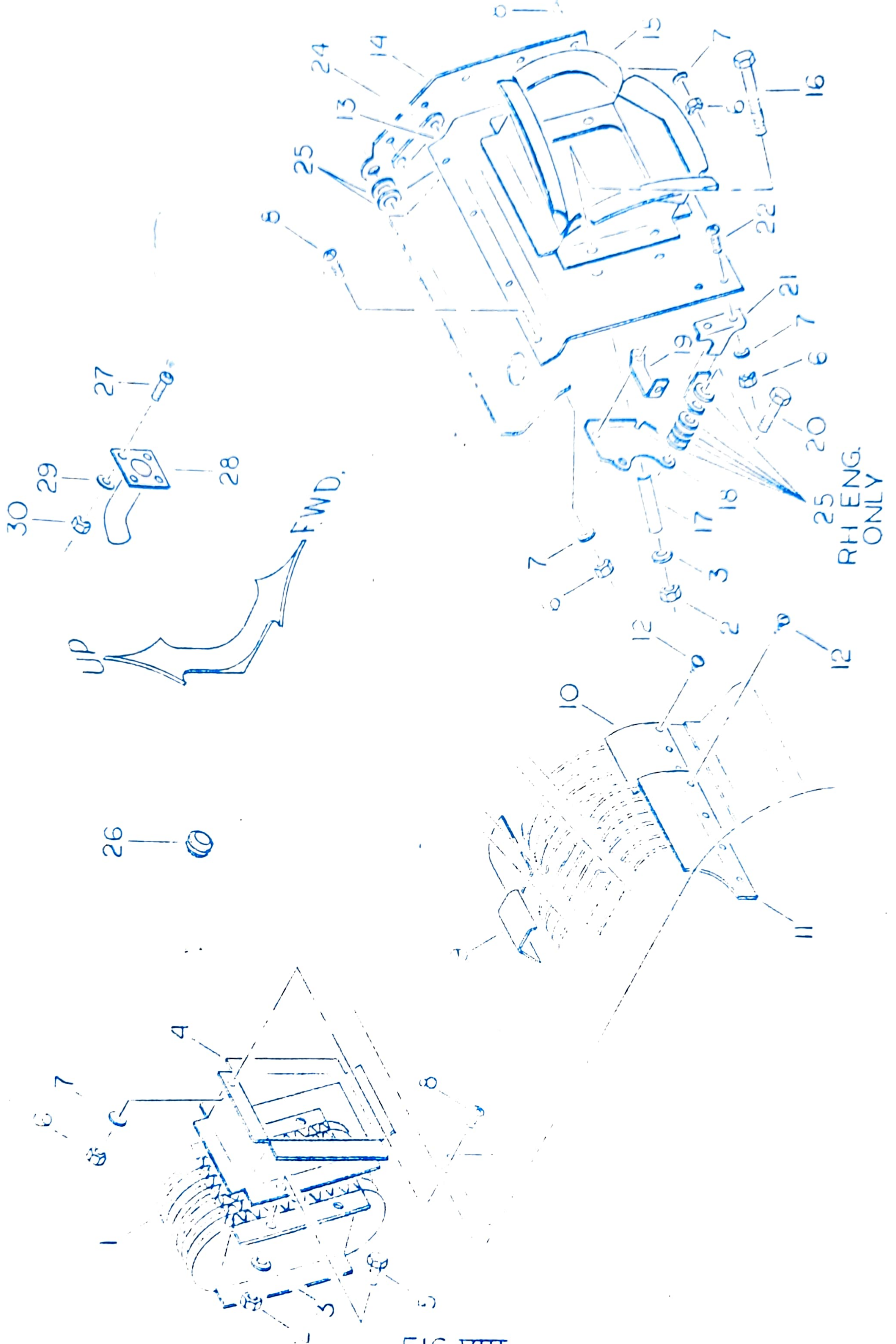

FIG. VIII

SENECA

Oxygen System

Item No.	Part Number	No. Req'd Per A/C	Part Name
1	2814-A	1	External Filler
2	SK0803-3	1	Filler Bracket
3	SKP-6	1	Placard-Oxygen Filler Valve
4	AN526-632-4	8	Screw
5	AN960-6	15	Washer
6	AN365-632	15	Nut
7	AN526-632-8	3	Screw
8	E-1	1	External Filler Line
9	AN742-5C	3	Clamp
10	SKM-1-K	1	Regulator - Pre Set
11	SKM-1-AC	1	Regulator - Alt. Compensating
12	SK-16-74-2	1	Cylinder Assy - 74 Cu. Ft.
	13221	2	Clamp
13	SK-16-111-2	1	Cylinder Assy - 111 Cu. Ft.
	13269	2	Clamp
14	SK0802-13	1	Angle
*15=	SK0802-15	1	Angle (Used with Item 13 only)
	SK0802-17	1	Angle (Used with Item 12 only)
16	SK0802-3	1	Gusset
17	SK0802-5	5	Gusset
18	SK0802-9	1	Gusset
19	SK0802-7	1	Gusset
20	SK0803-7	2	Shim
21	AN3-5A	24	Bolt
22	AN960-10	32	Washer
23	AN365-1032	24	Nut
24	AN470AD4-4	32	Rivet
25	AN742-4C	3	Clamp
26	F1	1	Gauge Line
27	200-7-2	1	Gauge Fitting
28	2770A	1	Gauge Assy
29	SK0803-5	1	Gauge Bracket
30	13-101	6	Tube Elbow
31	AN931-4-12	10	Grommet
32	SK8201	45'	Type "T" Nylaflow Line (¼" O.D.)
33	400-1-2	10	Connector Fitting
34	62-2763-1	6	Single Manifold
35	SKP-1	6	Front Plate
36	14-2753	5	Retainer Bushing (Passenger)
	14-2754	1	Retainer Bushing (Pilot)
37	2818-A	5	Filter Orifice Conn. Assy (Passenger)
	2820-A	1	Filter Orifice Conn. Assy (Pilot)
38	2757B	6	Quick Disconnect
39	TLW-2	6	Mask Tube
40	2250	6	Flow Indicator
41	SK-6	6	Mask
42	S-1	1	Mask Bag
43	AN742-6C	6	Clamp
44	400-3	1	Union Tee
45	AN426AD3-4	4	Rivet
46	AN913-1	2	Allen Plug
47	AN526-632-12	4	Screw

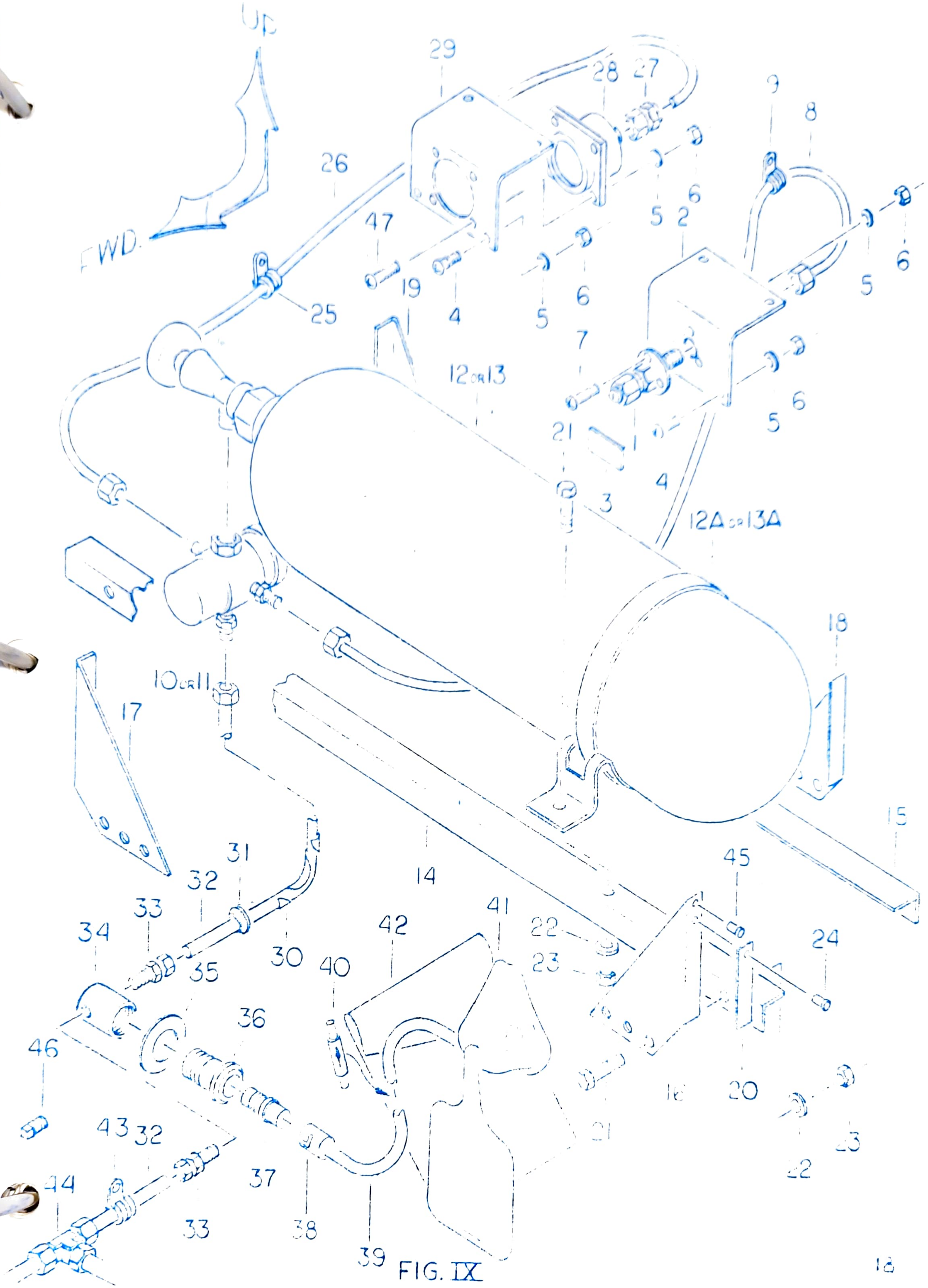
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FIG. IX

United States of America
Department of Transportation—Federal Aviation Administration

Supplemental Type Certificate

Number SA900EA

This certificate, issued to The B. F. Goodrich Company
Aerospace and Defense Products Division
Akron, Ohio 44318

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part 23 of the Federal Aviation Regulations.

Original Product—Type Certificate Number: A7SO
Make: Piper
Model: PA34-200

Description of Type Design Change:
Installation of B. F. Goodrich Electrothermal Propeller De-Icer System Kit No. 77-220 Revision No. 6 dated March 1, 1973, in accordance with B. F. Goodrich Report No.'s 70-04-700A dated August 1, 1972, 71-04-717E dated July 18, 1972, and 59-728F dated June 15, 1972.

Limitations and Conditions:
1. This STC is applicable to S/N's 34-7250001 and subsequent.
2. B. F. Goodrich Company Airplane Flight Manual Supplement No. 1, FAA Approved January 18, 1972, to the Piper PA34-200 Flight Manual is required with this installation

(See STC Continuation Sheets Pages 2 and 3)

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: October 4, 1971

Date of issuance: March 15, 1972

Date reissued:

Date amended: April 10, 1972, July 18, 1972
January 14, 1974

By direction of the Administrator

Keith D. Anderson
(Signature)
KEITH D. ANDERSON
Chief, Engineering and Manufacturing Br.
Great Lakes Region
(Title)

FEDERAL AVIATION ADMINISTRATION

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

This certificate may be transferred in accordance with FAR 21.47.

FAA Form 8110-2 (10-68)

United States of America
Department of Transportation—Federal Aviation Administration

Supplemental Type Certificate

(Continuation Sheet)

Number SA900EA
Date amended: January 14, 1974

Limitations and Conditions (Cont'd):

3. The following placard shall be prominently displayed in full view of the pilot:

"WARNING

THIS AIRCRAFT IS NOT APPROVED FOR FLIGHT IN ICING CONDITIONS".

4. This installation is applicable to the following propellers;

Left Engine

1 Hartzell, Hub Model HC-C2YK-2( )( )
Blade Model C7666A-0

or

1 Hartzell, Hub Model HC-C2YK-2( )( )F
Blade Model FC7666A-0

or

1 Hartzell, Hub Model HC-C2YK-2CG(F)
Blade Model (F)C7666A
(This Model includes the Hartzell Damper)

Right Engine

1 Hartzell, Hub Model HC-C2YK-2( )( )L
Blade Model JC7666A-0

or

1 Hartzell, Hub Model HC-C2YK-2( )( )LF
Blade Model FJC7666A-0

or

1 Hartzell, Hub Model HC-C2YK-2CLG(F)
Blade Model (F)JC7666A
(This Model includes the Hartzell Damper)

United States of America
Department of Transportation—Federal Aviation Administration

Supplemental Type Certificate

(Continuation Sheet)

Number SA900EA
Date amended: January 14, 1974

Limitations and Conditions (Cont'd):

Diameter: Not over 76", not under 74"
Spinner: Piper P/N 96388 spinner assembly and 96836 cap assembly, or 78359-0 spinner assembly and 96836-2 cap assembly are required.

5. This approval should not be incorporated in any aircraft of this specific model on which other approved modifications are incorporated, unless it is determined that the interrelationship between this change and any of those previously incorporated approved modifications will not introduce any adverse effect upon the airworthiness of the aircraft.

...END...

Department of Transportation — Federal Aviation Administration

Supplemental Type Certificate

Number SA2932WE

This certificate, issued to Rajay Industries, Inc.

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part 23* of the Federal Aviation Regulations. *Certification basis is set forth in Type Certificate Data Sheet A7SO, Revision 6.

Original Product — Type Certificate Number: A7SO

Make: Piper

Model: PA34-200

Description of Type Design Change: Installation of oxygen system in accordance with FAA sealed Rajay Industries Drawing 500183, Revision D, dated May 6, 1980, or later FAA sealed revision.

Limitations and Conditions: The approval of this change in type design applies basically to Piper PA34-200 aircraft only. This approval should not be extended to other aircraft of this model on which other previously approved modifications are incorporated unless it is determined by the installer that the interrelationship between this change and any of these other previously approved modifications will introduce no adverse effect upon the airworthiness of that aircraft.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: September 3, 1974

Date reissued:

Date of issuance: October 3, 1974

Date amended: October 17, 1978; August 12, 1980

By direction of the Administrator

(Signature)

Acting Chief, Aircraft Engineering Division

(Title)

FEDERAL AVIATION ADMINISTRATION

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

This certificate may be transferred in accordance with FAR 21.47.

FAA Form 8110-2 (10-68)

United States of America

Department of Transportation — Federal Aviation Administration

Supplemental Type Certificate

Number SA900EA

This certificate, issued to B. F. Goodrich Aerospace and Defense Products
A Division of the B. F. Goodrich Company
500 South Main Street
Akron, Ohio 44318

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part 23 of the Federal Aviation Regulations.

Original Product — Type Certificate Number: A7SO

Make: Piper

Model: PA34-200

Description of Type Design Change:

Installation of B. F. Goodrich Electrothermal Propeller De-Icer System Kit No. 77-220 in accordance with B. F. Goodrich Report No.'s 70-04-700 dated 1 May 1970, 71-04-717B dated 2 March 1972 and 59-728E dated 1 August 1970.

Limitations and Conditions:

1. **This STC is applicable to S/N's 34-7250001 and subsequent.**
2. **B. F. Goodrich Company Airplane Flight Manual Supplement No. 1, FAA Approved 18 January 1972 to the Piper PA34-200 Flight Manual is required with this installation.**

(See STC Continuation Sheet Page 2)

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: 4 October 1971

Date reissued:

Date of issuance: 15 March 1972

Date amended: 10 April 1972

By direction of the Administrator

for W. Oleksak

W. F. NORTON (Signature)

Chief, Engineering and Manufacturing Branch
(Title)

FEDERAL AVIATION ADMINISTRATION

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

This certificate may be transferred in accordance with FAR 21.47.

Supplemental Type Certificate
(Continuation Sheet)

Number SA900EA
Date amended: 10 April 1972

Limitations and Conditions (Cont'd):

3. The following placard shall be prominently displayed in full view of the pilot:

"WARNING

THIS AIRCRAFT IS NOT APPROVED FOR FLIGHT IN ICING CONDITIONS".

4. This installation is applicable to the following propellers;

Left Engine

1 Hartzell, Hub Model HC-C2YK-2( )( )
Blade Model C7666A-0

or

1 Hartzell, Hub Model HC-C2YK-2( )( )F
Blade Model FC7666A-0

Right Engine

1 Hartzell, Hub Model HC-C2YK-2( )( )L
Blade Model JC7666A-0

or

1 Hartzell, Hub Model HC-C2YK-2( )( )LF
Blade Model FJC7666A-0

Diameter: Not over 76", not under 74"
Spinner: Piper P/N 96388 spinner assembly and 96836 cap assembly are required.

5. This approval should not be incorporated in any aircraft of this specific model on which other approved modifications are incorporated, unless it is determined that the interrelationship between this change and any of those previously incorporated approved modifications will not introduce any adverse effect upon the airworthiness of the aircraft.

...END...

PIPER MODEL PA34-200
B.F.GOODRICH COMPANY
ELECTROTHERMAL TYPE PROPELLER DE-ICING SYSTEM

SUPPLEMENT NO. 1

PA34-200 SERIAL NO. 34-7250001 AND UP

This Supplement must be attached to the FAA Approved Flight Manual and kept aboard the aircraft at all times when the aircraft is equipped with the B.F.Goodrich Company's Electrothermal Type Propeller De-Icing System in accordance with STC No. SA900EA , of 23 February 1972.

This supplement contains the Limitations and Operating Procedures both normal and emergency for the Piper PA34-200 when equipped with the B.F.Goodrich Electrothermal Type Propeller De-Icing System. When operated in accordance with this Supplement, these limitations and operating procedures are in addition to, or in place of those contained in the basic FAA Approved Flight Manual.

FAA Approved: E. N. Weith, for
W. F. NORTON, Chief,
Eng. & Mfg. Branch, EA-210

Date: 18 JAN 1972

The following descriptive material is not to be considered as part of the FAA approved Flight Manual.

I. Description of De-Icing System

A. Components

The system consists of an electrically heated De-Icer bonded to each propeller blade and an electrical distribution system which utilizes existing electrical power generating equipment of the airplane. An "ON-OFF" switch, circuit breaker, and an ammeter are mounted on the instrument panel for control of the system.

B. Operation

When the prop De-Icer switch is placed in the "ON" position, electrical power is supplied to the propeller De-Icers from the airplane's power supply. De-Icing is accomplished by heating portions of the De-Icers in a sequence which is controlled by the timer. The heat reduces the adhesion between the ice and the De-Icers so that the centrifugal force and the blast of the airstream cause the ice to be thrown off the propeller blades. Cycling of the De-Icer heating is as follows:

1) 34 sec. - Outboard halves of propeller De-Icers on right engine.
2) 34 sec. - Inboard halves of propeller De-Icers on right engine.
3) 34 sec. - Outboard halves of propeller De-Icers on left engine.
4) 34 sec. - Inboard halves of propeller De-Icers on left engine.

When the system is turned on, heating may begin at any one of the cycles,depending upon the initial position of the timing mechanism. Once begun, cycling will proceed in the order of 1, 2, 3, 4, as indicated, until the system is turned off. The system may be operated continuously in flight. The propeller De-Icer ammeter will indicate a reading from 17 to 21 amps at normal aircraft voltage (14 V.D.C.). A small momentary deflection of the ammeter needle may be noticed every 34 seconds. This is due to the switching action of the timer and is completely normal.

I. Operating Limitations

A. This aircraft is not approved for flight in icing conditions.

B. Required Placard (in clear view of pilot).

WARNING: THIS AIRCRAFT IS NOT APPROVED FOR FLIGHT IN ICING CONDITIONS.

C. This system is applicable only to aircraft which have generator or alternator capacity sufficient to allow the addition of 21 amperes for continuous propeller de-icing. This is to be determined by electrical load analysis in accordance with FAA Advisory Circular 43.13-1, Chapter 11, Section 2, for each propeller De-Icer installation.

II. Operating Procedures

A. Normal Procedures

1) Place prop De-Icer switch in the "ON" position.

2) Note prop de-icing system ammeter reading which should be from 17 to 21 amperes, at normal aircraft voltage (14 V.D.C.).

3) Watch ammeter needle closely for at least 2.2 minutes. A small momentary deflection of the needle may be noticed approximately every 34 seconds. This is due to the switching action of the timer and is an indication of normal operation of the system.

4) In-flight Operation - Operate system by placing the propeller De-Icer switch in the "ON" position. Once turned on, the system will operate automatically until the switch is turned "OFF".

B. Emergency Operating Procedures

1) Loss of one generator or alternator or one engine inoperative, off-load all unnecessary electrical equipment. Monitor electrical loads so as not to exceed generator or alternator capacity.

2) Propeller unbalance may result from irregular ice "throw-offs". Propeller unbalance may be relieved by varying the rpm; increase rpm briefly and return to desired setting; repeat as necessary.

3) Abnormal Ammeter Readings (Prop De-Icer Ammeter)

   a) Zero Amps

   Check prop De-Icer circuit breaker. If the circuit breaker has tripped, a wait of approximately 30 seconds is necessary before resetting the circuit breaker in the "ON" position. If ammeter reads zero and circuit breaker has not tripped, or if ammeter still reads zero after the circuit breaker has been reset, turn the De-Icer System control switch off and consider the prop de-icing system inoperative.

   b) Zero to 17 Amps

   If prop De-Icer system ammeter occasionally or regularly indicates less than 17 amps, prop de-icing can continue unless serious propeller unbalance results from irregular ice "throw-offs".

c) <u>21 to 25 Amps</u>

If prop de-icing system ammeter occasionally or regularly indicates 21 to 25 amps, prop de-icing can continue unless serious propeller unbalance results from irregular ice "throw-offs".

d) <u>Greater than 25 Amps</u>

If prop de-icing system ammeter occasionally or regularly indicates more than 25 amps, the system should not be operated unless the need for prop de-icing is urgent.

4) <u>Precaution</u>

An electrical load analysis should be conducted for each specific airplane on which the propeller de-icing system is installed.

WEIGHT AND BALANCE

WEIGHT AND BALANCE

FOR

SENECA

APPLICABLE TO SERIAL NUMBERS 34-7250001 THRU 34-7250189 WHEN PIPER KIT 760607 IS INSTALLED, 34-7250190 THRU 34-7250214 WHEN PIPER KIT 760611 IS INSTALLED AND 34-7250215 THRU 34-7350353.

WARNING

EXTREME CARE MUST BE EXERCISED TO LIMIT THE USE OF THIS REPORT TO APPLICABLE AIRCRAFT. THIS REPORT REVISED AS INDICATED BELOW OR SUBSEQUENTLY REVISED IS VALID FOR USE WITH THE AIRPLANE IDENTIFIED BELOW WHEN APPROVED BY PIPER AIRCRAFT CORPORATION. SUBSEQUENT REVISIONS SUPPLIED BY PIPER AIRCRAFT CORPORATION MUST BE PROPERLY INSERTED.

MODEL PA-34-200

AIRCRAFT SERIAL NO. ____________________ REGISTRATION NO. ____________

WEIGHT AND BALANCE, REPORT NUMBER VB-424 REVISION ________________

PIPER AIRCRAFT CORPORATION
APPROVAL SIGNATURE AND STAMP ____

INDEX - WEIGHT AND BALANCE

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LOG OF REVISIONS

Revision	Revised Pages	Description	Approved Date
1	4-23 4-23a 4-23b 4-24	Corrected AltiMatic IIIB-1 totals. Added page. Added page. Added Narco Nav 14	July 7, 1972 John R McClean for H. W. Barnhouse
2	4-17 4-31 4-32	Correct Instrument Specification Numbers. Changed from Turn and Bank - Piper 99005 to Turn and Slip Indicator PS50030-2 or -3. Changed Instrument Specification Numbers.	July 10, 1972 John R McClean for H. W. Barnhouse
3	Title 4-15 4-16a 4-16b 4-19 4-21 4-22 4-26 4-28 4-33 4-34	Added page. Added New Nose Wheel (40-76B). Added page. Added page. Added Rear Seat Belts, Cargo Door, Right Front Seat 96806-5, Center Seats 96827-2, -3, Rear Seats 99730-2, -3, 96827-4, -5. Removed Lights (Landing, Navigation, Grimes 15-0083-1 Instrument and Forward Baggage). Removed Power Supply No. A412A-14, Fin Tip and Cable. Added King KX-175, King KN73 and KN77. Added King KT76/78 and KMA-20. Added Jumpseat 69595-5, Fire Extinguisher, Sun Visors & Tow Bar. Removed Rear Seats & Rear Seat Belts. Removed Fire Extinguisher, Sun Visors, Tow Bar & Cargo Door. Added Adjustable Front Seats 69568-2 & -3, and Headrests 96806-17.	August 2, 1972 V. Tennant
4	4-34	Added Windshield Heating Unit	Sept. 15, 1972 V. Tennant
5	4-23a 4-23b 4-24	Changed from V/FD to V/FD-1 AltiMatic. Changed from V to V-1 AltiMatic. Changed Comm Antenna Cable Arms and Moments, Added Anti Static Kit.	Nov. 16, 1972 V. Tennant

LOG OF REVISIONS

Revision	Revised Pages	Description	Approved Date
6	4-34 4-35 4-36	Added Combustion Heater. Added page. Added page.	Dec. 21, 1972 N. Ternant
7	4-34	Corrected Combustion Heater Weight and Moment.	Dec. 21, 1972 N. Ternant
8	4-25 4-26	Added King KX-175, KN-73, KN-77 and KN-520 Installations. Removed King KN-77 and KN-73 Installations. Added King KN-65 DME Installation.	May 25, 1973 N. Ternant
9	Title 4-13 4-17 4-34 4-35	Added Serial No. effectivity. Added Propellers with Dampers. Added -4, -5 Spinners. Added -9 Tachometer. Removed - Total Optional Equipment. Added Fire Extinguishers.	N. Ternant Sept. 19, 1973
10	4-23a 4-35	Revised Misc. Hardware Moment and Total Arm and Moment. Added Ice Protection System Instl.	April 26, 1974 R. Bernardy
11	Title	Added PAC Approval Form (NOTE: AIRCRAFT DELIVERED WITH MANUALS PRIOR TO THIS REVISION DO NOT REQUIRE THIS REVISION.)	Oct. 14, 1974 R. Bernardy
12	4-7	Revised fuel capacity - Sample Loading Problem.	May 30, 1975 J. Yangalay
13	4-15 4-35	Revised Type III Tube Cert. Basis. Added Heavy Duty Wheels, Brakes and Tires.	April 1, 1977 J. Yangalay

LOG OF REVISIONS (cont)

Revision	Revised Pages	Description of Revision	Approved Date
14	1, 2	Revised general weight and balance introduction.	March 23, 1979 Hal Fletcher
15	16	Added Electrodelta voltage regulator.	November 30, 1987

WEIGHT AND BALANCE

In order to achieve the performance and flying characteristics which are designed into the aircraft, the Seneca must be flown with the weight and center of gravity (C.G.) position within the approved envelope. The aircraft offers a tremendous flexibility of loading. You can carry a large payload (distributed in a variety of combinations of passengers and cargo) or a large amount of fuel. However, you cannot fill the aircraft with seven adults and full fuel tanks. With the flexibility comes responsibility. The pilot must insure that the airplane is loaded within the loading envelope before he makes a takeoff.

Misloading carries consequences for any aircraft. An overloaded airplane will not take off, climb or cruise as well as when it is properly loaded. The heavier the airplane is loaded the less single-engine climb performance it will have, and the pilot may be deprived of one of the advantages of twin-engine flight.

Center of gravity is a determining factor in flight characteristics. If the C.G. is too far forward in any airplane, it may be difficult to rotate for takeoff or landing. If the C.G. is too far aft, the airplane may rotate prematurely on takeoff or try to pitch up during climb. Longitudinal stability will be reduced. This can lead to inadvertent stalls and even spins; and spin recovery becomes more difficult as the center of gravity moves aft of the approved limit.

A properly loaded aircraft, however, will perform as intended. Before the aircraft is delivered, the Seneca is weighed and a basic weight and C.G. location computed. (Basic weight consists of the empty weight of the aircraft plus the unusable fuel and full oil capacity.) Using the basic weight and C.G. location, the pilot can easily determine the weight and C.G. position for the loaded airplane by means of a plotter which is furnished with the aircraft. If he wants more precise values or if the plotter is not available, he can compute the total weight and moment and then determine whether they are within the approved envelope.

The basic weight and C.G. location for a particular airplane are recorded on the plotter for the airplane. These values are also entered in the weight and balance section of the Airplane Flight Manual. The current values should always be used. Whenever new equipment is added or any modification work is done, the mechanic responsible for the work is required to compute a new basic weight and basic C.G. position and to write these in the aircraft log book. The owner should make sure he does, and should change these values on his plotter.

A weight and balance calculation is necessary in determining the best positions for locating passengers or cargo, and can guide the pilot in relocating people or baggage so as to keep within allowable limits. If is it necessary to remove some of the fuel or payload to stay within maximum allowable gross weight, the pilot should not hesitate to do so.

The following pages are forms used in weighing an airplane in production and in computing basic weight, basic C.G. position, and useful load. Note that the useful load includes fuel, oil, baggage, cargo and passengers. Following these are (1) a method for computing takeoff weight and C.G. if precision is desired, if a plotter is not available, or if cargo is carried, and (2) an explanation of how to use the weight and balance plotter.

On one side of the weight and balance plotter are some general loading recommendations which will assist the pilot in arranging his load. If these are followed much time can be saved without degrading safety.

WEIGHT AND BALANCE DATA

WEIGHING PROCEDURE

At the time of delivery, Piper Aircraft Corporation provides each airplane with the licensed empty weight and center of gravity location.

The removal or addition of an excessive amount of equipment or excessive airplane modifications can affect the licensed empty weight and empty weight center of gravity. The following is a weighing procedure to determine this licensed empty weight and center of gravity location:

1. PREPARATION

   a. Be certain that all items checked in the airplane equipment list are installed in the proper location in the airplane.

   b. Remove excessive dirt, grease, moisture, foreign items such as rags and tools from the airplane before weighing.

   c. Defuel airplane. Then open all fuel drains until all remaining fuel is drained. Operate each engine until all undrainable fuel is used and engine stops.

   d. Drain all oil from the engines, by means of the oil drain, with the airplane in ground attitude. This will leave the undrainable oil still in the system. Engine oil temperature should be in the normal operating range before draining.

   e. Place pilot and copilot seats in fourth (4th) notch, aft of forward position. Put flaps in the fully retracted position and all control surfaces in the neutral position. Tow bar should be in the proper location and all entrance and baggage doors closed.

   f. Weigh the airplane inside a closed building to prevent errors in scale readings due to wind.

2. LEVELING

   a. With airplane on scales, block main gear oleo pistons in the fully extended position.

   b. Level airplane (see diagram) deflating nose wheel tire, to center bubble on level.

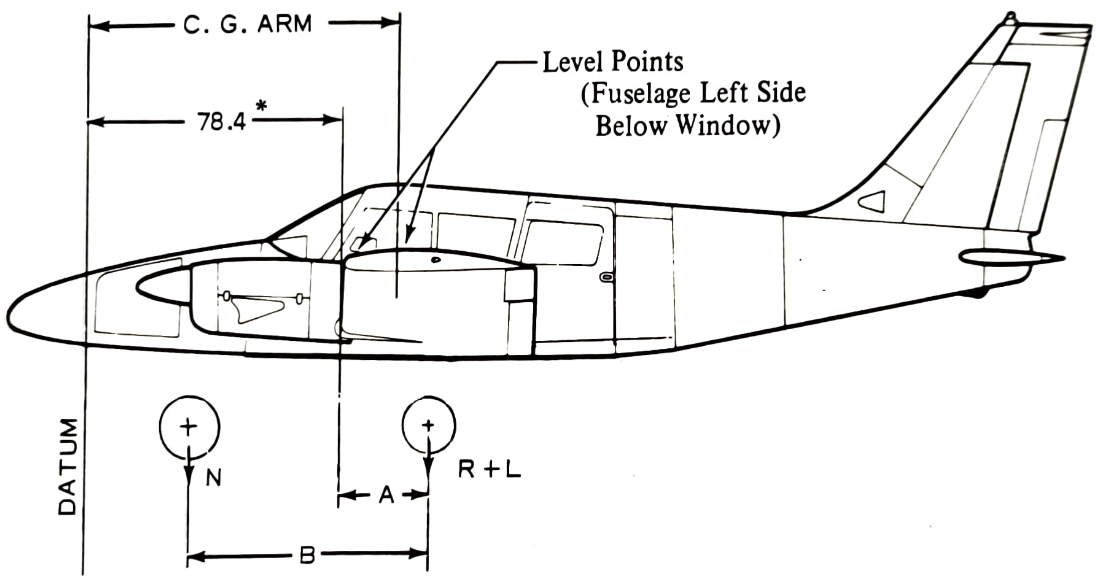
3. WEIGHING - AIRPLANE EMPTY WEIGHT

a. With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.

Scale Position and Symbol		Scale Reading	Tare	Net Weight
Nose Wheel	(N)			
Right Main Wheel	(R)			
Left Main Wheel	(L)			
Airplane Empty Weight, as Weighed (T)				

4. EMPTY WEIGHT CENTER OF GRAVITY

a. The following geometry applies to the PA-34-200 airplane when airplane is level. (See Item 2)



* The datum is 78.4 inches ahead of the wing leading edge at the inboard edge of the inboard fuel tank.

b. Obtain measurement "A" by measuring from a plumb bob dropped from the wing leading edge, at the intersection of the straight and tapered section, horizontally and parallel to the airplane centerline, to the main wheel centerline.

c. Obtain measurement "B" by measuring the distance from the main wheel centerline, horizontally and parallel to the airplane centerline, to each side of the nose wheel axle. Then average the measurements.

d. The empty weight center of gravity (as weighed including optional equipment and undrainable oil) can be determined by the following formula:

$$\text{C.G. Arm} = 78.4 + A - \frac{B(N)}{T}$$

$$\text{C. G. Arm} = 78.4 + (\quad\quad) - \frac{(\quad\quad)(\quad\quad)}{(\quad\quad)} = \quad\quad \text{inches}$$

5. LICENSED EMPTY WEIGHT AND EMPTY WEIGHT CENTER OF GRAVITY

	Weight	Arm	Moment
Empty Weight (as weighed)			
Unusable Fuel (5.0 gallon)	+30	103.0	+3090
Licensed Empty Weight			

WEIGHT AND BALANCE DATA

MODEL PA-34-200 SENECA

Airplane Serial Number 34-

Registration Number

Date

AIRPLANE BASIC WEIGHT

Item	Weight × (Lbs)	C. G. Arm (Inches Aft = of Datum)	Moment (In-Lbs)
Standard Empty Weight* Actual / Computed			
Optional Equipment			
Unusable Fuel (5 gallon)	30	103.0	3090
Licensed Empty Weight = Total of above items			
Oil (16 quarts)	30	49.0	1470
Basic Weight = Licensed Empty Weight Plus Oil	3151	83.12	
*Standard Empty Weight includes paint, hydraulic fluid and undrainable engine oil.			

AIRPLANE USEFUL LOAD - NORMAL CATEGORY OPERATION

(Gross Weight) - (Licensed Empty Weight) = Useful Load

(4200 lbs) - (3151 lbs) = 1049 lbs

THIS LICENSED EMPTY WEIGHT, C.G. AND USEFUL LOAD ARE FOR THE AIRPLANE AS DELIVERED FROM THE FACTORY. REFER TO APPROPRIATE AIRCRAFT RECORD WHEN ALTERATIONS HAVE BEEN MADE.

C. G. RANGE AND WEIGHT INSTRUCTIONS

1. Add the weight of all items to be loaded to the licensed empty weight.
2. Use the loading graph to determine the moment of all items to be carried in the airplane.
3. Add the moment of all items to be loaded to the licensed empty weight moment.
4. Divide the total moment by the total weight to determine the C.G. location.
5. By using the figures of Item 1 and Item 4, locate a point on the C.G. range and weight graph. If the point falls within the C.G. envelope, the loading meets the weight and balance requirements.

SAMPLE LOADING PROBLEM (Normal Category)

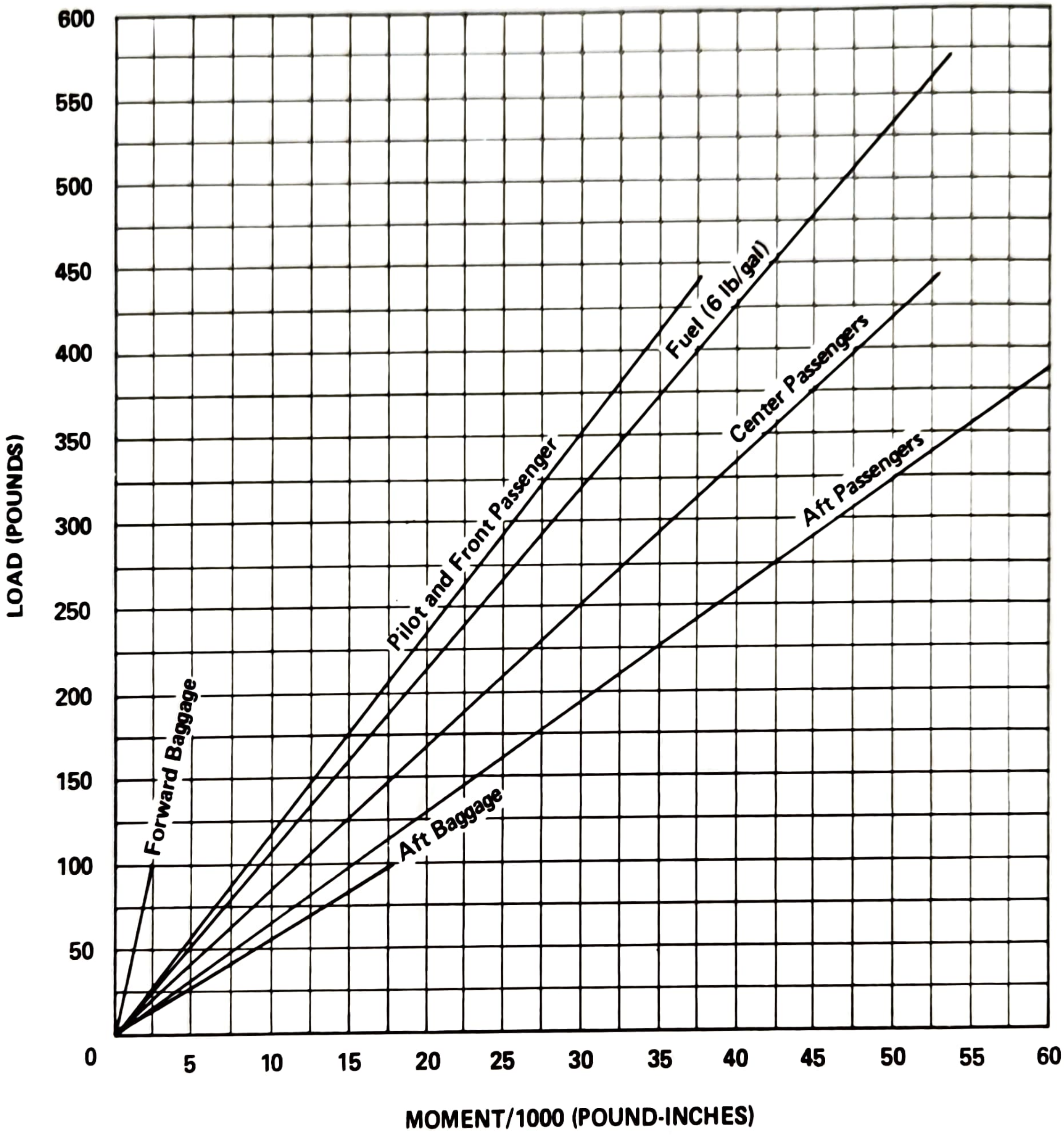
	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Licensed Basic Weight	3151	83.12	261,911
Pilot and Front Passenger	340.0	85.5	29070
Passengers (Center Seats)	340.0	118.1	40154
Passengers (Rear Seats)*		155.7	
Passenger (Jump Seat)*		118.1	
Fuel (93 Gallon Maximum)		93.6	
Baggage (Forward)		22.5	
Baggage (Aft)		178.7	
Total Loaded Airplane			

The center of gravity (C.G.) of this sample loading problem is at inches aft of the datum line. Locate this point ( ) on the C.G. range and weight graph. Since this point falls within the weight-C.G. envelope, this loading meets the weight and balance requirements.

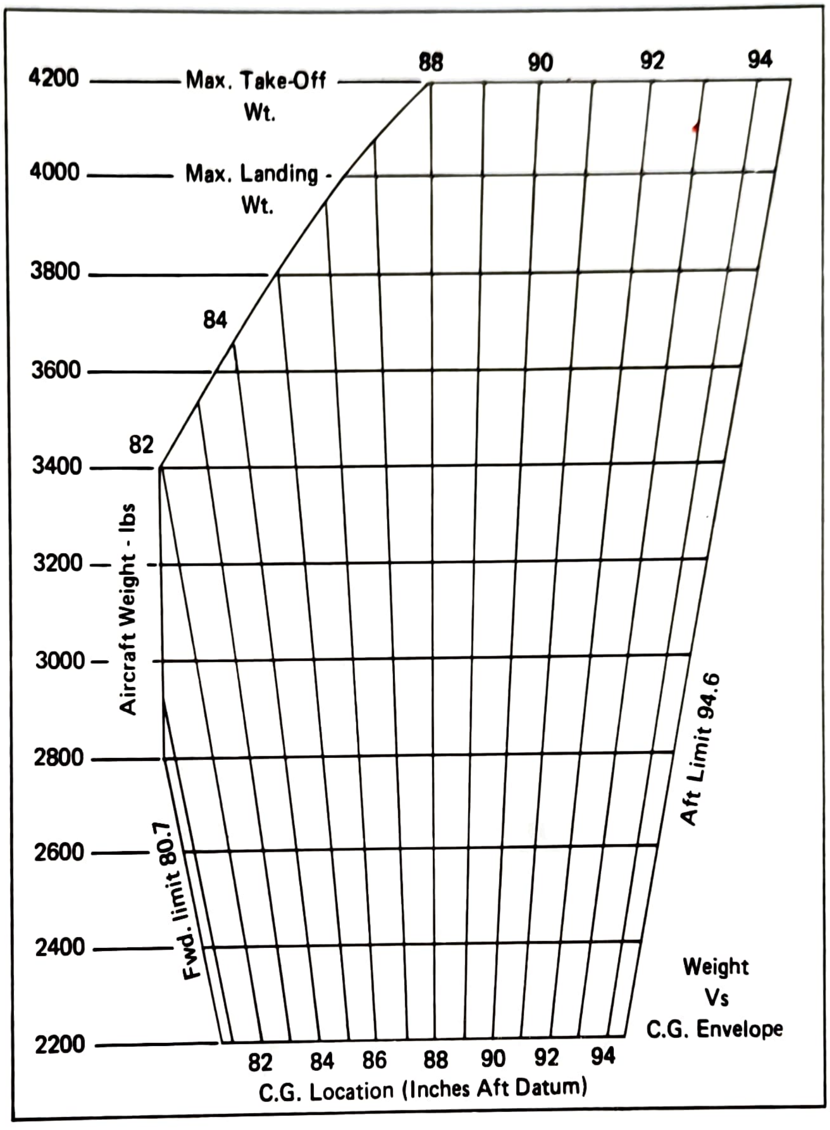
IT IS THE RESPONSIBILITY OF THE PILOT AND AIRCRAFT OWNER TO INSURE THAT THE AIRPLANE IS LOADED PROPERLY.

*Optional Equipment

LOADING GRAPH



IT IS THE RESPONSIBILITY OF THE OWNER AND PILOT TO ASCERTAIN THAT THE AIRPLANE ALWAYS REMAINS WITHIN THE ALLOWABLE WEIGHT VS. CENTER OF GRAVITY ENVELOPE WHILE IN FLIGHT.



Moment change due to retracting Landing Gear = - 32 in. -lbs.

INSTRUCTIONS FOR USING THE WEIGHT AND BALANCE PLOTTER

This plotter is provided to enable the pilot quickly and conveniently to:

(1) Determine the total weight and C.G. position.

(2) Decide how to change his load if his first loading is not within the allowable envelope.

Heat can warp or ruin the plotter if it is left in the sunlight. Replacement plotters may be purchased from Piper dealers and distributors.

When the airplane is delivered, the basic weight and basic C.G. will be recorded on the computer. These should be changed anytime the basic weight or C.G. location is changed.

The plotter enables the user to add weights and corresponding moments graphically. The effect of adding or disposing of useful load can easily be seen. The plotter does not cover the situation where cargo is loaded in locations other than on the seats or in the baggage compartments.

Brief instructions are given on the plotter itself. To use it, first plot a point on the grid to locate the basic weight and C.G. location. This can be put on more or less permanently because it will not change until the airplane is modified. Next, position the zero weight end of one of the six slots over this point. Using a pencil, draw a line along the slot to the weight which will be carried in that location. Then position the zero weight end of the next slot over the end of this line and draw another line representing the weight which will be located in this second position. When all the loads have been drawn in this manner, the final end of the segmented line locates the total load and the C.G. position of the airplane for take-off. If this point is not within the allowable envelope it will be necessary to offload fuel, baggage, or passengers and/or to rearrange baggage and passengers to get the final point to fall within the envelope.

Fuel burn-off and gear movement do not significantly affect the center of gravity.

SAMPLE PROBLEM

A sample problem will demonstrate the use of the weight and balance plotter.

Assume a basic weight and C.G. location of 2615 pounds at 82.0 inches respectively. We wish to carry a pilot and 5 passengers. Two men weighing 180 and 200 pounds will occupy the front seats, two women weighing 115 and 135 pounds will occupy the middle seats and two children weighing 80 and 100 pounds will ride in the rear. Two 25 pound suitcases will be tied down in the front baggage compartment and two suitcases weighing 25 pounds and 20 pounds respectively will be carried in the rear compartment. We wish to carry 60 gallons of fuel. Will we be within the safe envelope?

1. Place a dot on the plotter grid at 2615 pounds and 82.0 inches to represent the basic airplane. (See illustration.)

2. Slide the slotted plastic into position so that the dot is under the slot for the forward seats, at zero weight.

3. Draw a line up the slot to the 380 pound position (180 + 200) and put a dot.

4. Move the slotted plastic again to get the zero end of the middle seat slot over this dot.

5. Draw a line up this slot to the 250 pound position (115 + 135) and place the 3rd dot.

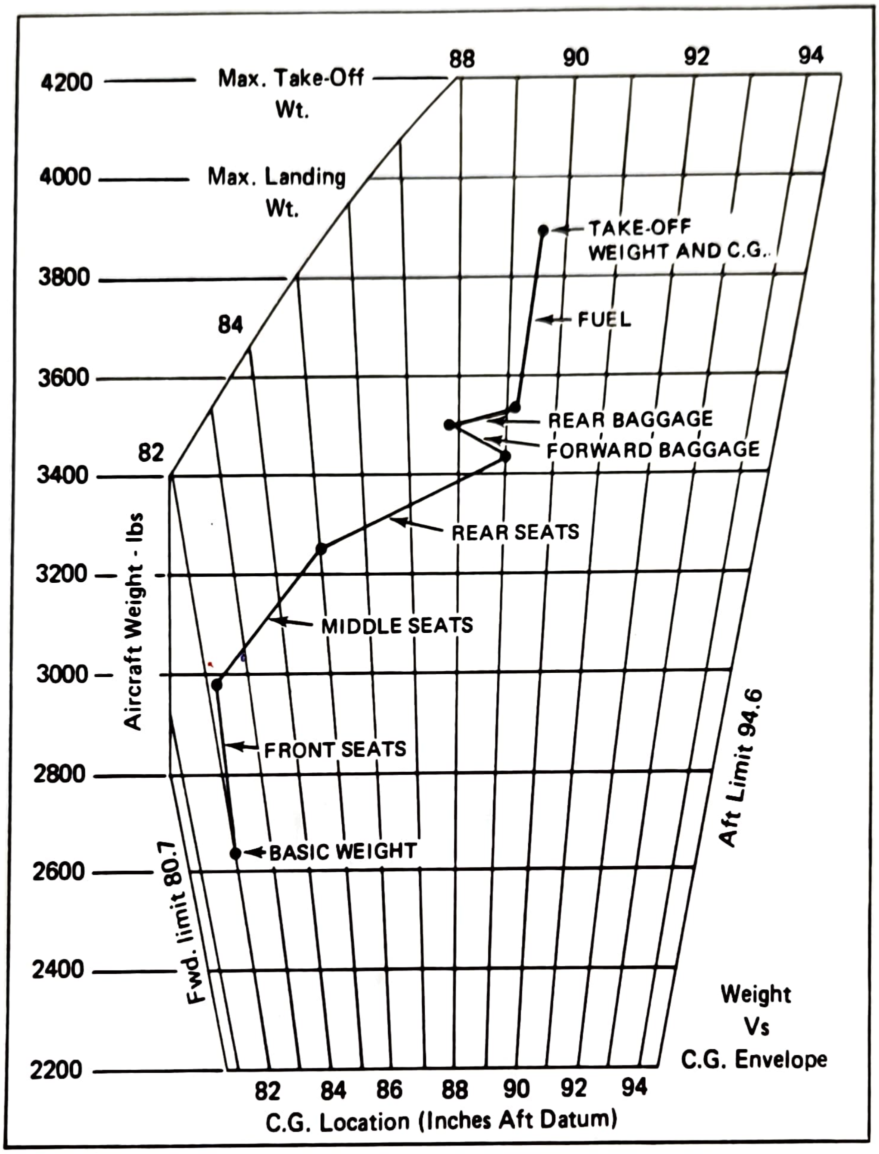
6. Continue moving the plastic and plotting points to account for weight in the rear seats (80 + 100), forward baggage compartment (50), rear baggage compartment (45), and fuel tanks (360).

7. As can be seen from the illustration, the final dot shows the total weight to be 3880 pounds with the C.G. at 89.52. This is well within the envelope.

8. There will be room for more fuel.

As fuel is burned off, the weight and C.G. will follow down the fuel line and stay within the envelope for landing.

SAMPLE PROBLEM



Moment change due to retracting Landing Gear = -32 in.-lbs.

EQUIPMENT LIST

The following is a list of equipment which may be installed in the PA-34. Items marked with an "X" are items installed when the airplane was delivered by the manufacturer.

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	A. Propellers and Propeller Accessories				
	Two Propellers				
____	Hartzell Model HC-C2YK-2( )E /C7666A-0 (Left Wing)	55.0	22.6	1243	TC P920
X	Hartzell Model HC-C2YK-2( )EF /FC7666A-0 (Left Wing)	55.0	22.6	1243	TC P920
____	Hartzell Model HC-C2YK-2( )LE /JC7666A-0 (Right Wing)	55.0	22.6	1243	TC P920
X	Hartzell Model HC-C2YK-2( )LEF /FJC7666A-0 (Right Wing)	55.0	22.6	1243	TC P920
____	Hartzell Model HC-C2YK-2CG( ) /( )C7666A (Includes Damper) (Left Wing)	62.9	23.2	1459	TC P920
____	Hartzell Model HC-C2YK-2CLG( ) /( )JC7666A (Includes Damper) (Right Wing)	62.9	23.2	1459	TC P920
	Two Spinners				
X	PAC Dwg. 96083-0 (Left Wing)	4.0	22.9	92	TC A7SO
X	PAC Dwg. 96083-1 (Right Wing)	4.0	22.9	92	TC A7SO
____	PAC Dwg. 96083-4 (Left Wing)	4.2	22.9	96	TC A7SO
____	PAC Dwg. 96083-5 (Right Wing)	4.2	22.9	96	TC A7SO
	Two Hydraulic Governors				
X	Hartzell Model F-6-18A (Left Wing)	5.5	33.6	185	TC P920
X	Hartzell Model F-6-18AL (Right Wing)	5.5	33.6	185	TC P920

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	B. Engine and Engine Accessories - Fuel and Oil Systems				
X	Two Engines Lycoming Model IO-360-C1E6 with Fuel Injector Lycoming P/N LW-12586 (Left Wing)	306	43.2	13219	TC 1E10
X	Lycoming Model LIO-360-C1E6 with Fuel Injector Lycoming P/N LW-12586 (Right Wing)	306	43.2	13219	TC 1E10
X	Two Fuel Pumps - Electric Auxiliary Airborne 1B5-6 (3.2 lbs. each)	6.4	70.0	448	TC A7SO
X	Two Induction Air Filters Fram Model CA-144PL (.5 lbs. each)	1.0	61.7	62	TC A7SO
X	Two Fuel Pumps - Engine Driven AC Type JT (1.6 lbs. each) Lycoming 75247	3.2	55.7	178	TC 1E10
X	Two Alternators 12V 60 Amp Prestolite ALY 6408 (13 lbs. each)	26.0	35.0	910	TC A7SO
X	Two Starters - 12V Prestolite Model MZ-4206 (Left Wing)	18.0	33.2	598	TC 1E10
X	Prestolite Model MZ-4216 (Right Wing)	18.0	33.2	598	TC 1E10
X	Two Oil Coolers PAC Dwg. 96809 Stewart-Warner Model 10557-A	5.2	64.2	334	TC A7SO

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	C. Landing Gear and Brakes				
	Two Main Wheel - Brake Assemblies				
	40-90 Wheel Assembly (Cleveland)				TSO C26a
	30-65 Brake Assembly (Cleveland)				TSO C26a
	Two Main 8 Ply Rating Tires				
	6.00-6 Type III with Regular Tubes				
X	(18.8 lbs. each)	37.6	109.8	4128	TSO C62
	One Nose Wheel Assembly				
	38501 Wheel Assembly (Cleveland)				TSO C26a
	One 6 Ply Rating Tire				
X	6.00-6 Type III Regular Tube	12.5	** 25.5	319	TSO C62
	One Nose Wheel Assembly				
	40-76B Wheel Assembly (Cleveland)				TSO C26a
	One 6 Ply Rating Tire				
	6.00-6 Type III Regular Tube	12.8	** 25.5	326	TSO C62

**Static position shown, retracted position is at sta. 5.6

Item	Item	Weight Lbs.	Arm Aft Datum	Momemt	Cert. Basis
D.	Electrical Equipment				
X	One Batterry 12V, 35 Amp Hour Rebat R-35	27.0	-7.8	-211	TC A7SO
X	Power Relay 63880-0	1.2	-7.8	-9	TC A73O
X	Stall Warning Detector, Safe Flight Inst. Corp. No. C52207-4 (.2 lbs. each)	.4	80.2	32	TC A7SO
X	Horn (Stall Warn) Safe Flight 53514-101	0.2	64.6	13	TSO C30b
X	Horn (Gear Warn) Safe Flight 2024-1	0.2	61.5	12	TSO C30b
X	Switch - Landing Gear Selector Cutler Hammer 8906 K 1736	0.1	67.7	7	TC A7SO
X	Two Voltage Regulators Wico Electric No. X18150 (1.0 lbs. each) or	2.0	49.4	99	TC A7SO
	Electrodelta No. VF 710 (0.5 lbs. each)	1.0	49.4	49.4	TC A7SO
X	Two Overvoltage Relays Piper NO. PS50034-1 (.5 lbs. each)	1.0	49.1	49	TC A7SO
X	Two Starter Relays Piper Dwg. 99130-2 (1.1 lbs. each)	2.2	41.5	91	TC A7SO

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	D. Electrical Equipment (cont)				
X	Two Landing Lights G. E. Model 4509 (.8 lbs. each)	1.6	27.0	43	TC A7SO
X	Forward Baggage Light Piper 66632-0	0.2	40.8	8	TC A7SO
X	Navigation Light (rear) Grimes A2064	0.2	316.0	63	TSO C30b
X	Navigation Light (Wing) (2) Grimes A1285 - G - 12 A1285 - R - 12 (0.2 lbs. each)	0.4	102.4	41	TSO C30b
X	Instrument Light, Grimes 15-0083-1 (2) .25 lbs. each	0.5	92.7	46	TC A7SO
	Anti-Collision Lights Whelen Engineering Co. Piper Dwg. 95267				
X	Power Supply, Model HS, No. A412A-14 (with fin light only)	2.3	127.5	293	TC A7SO
X	Light, Fin Tip, A408	0.4	289.5	116	TC A7SO
X	Cable, Fin Light, A417-1/300	0.4	260.1	104	TC A7SO

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Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	E. Instruments				
X	Compass - Piper Dwg. 67462	0.9	64.9	58	TSO C7c
X	Tachometer - Piper 62177-3 (2) .70 lbs. each	1.4	66.2	93	TC A7SO
	Tachometer - Piper 62177-9 (2) .70 lbs. each	1.4	66.2	93	TC A7SO
X	Engine Cluster - Piper 95241-8 (2) .95 lbs. each	1.9	67.4	128	TC A7SO
	Altimeter - Piper PS50008-2 or -3	1.0	65.9	66	TSO C10b
X	Manifold Pressure (Dual) - Piper PS50031-2	1.2	66.2	79	TSO C45
X	Fuel Flow Gauge (Dual) - Piper 96394-0	1.2	66.2	79	TSO C47 Type I
X	Ammeter - Piper 66696(2) .3 lbs. each	0.6	67.4	40	TC A7SO
	Tru-Speed Indicator - Piper PS50049-6 or -8	0.6	66.8	40	TSO C2b

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	F. Hydraulic Equipment				
X	Cylinder Hydraulic Nose Gear Piper Dwg. 96860-0	0.9	41.6	37	TC A7SO
X	Cylinder Hydraulic (2) Main Gear Piper Dwg. 96860-0 (0.9 lbs. each)	1.8	108.4	195	TC A7SO
X	Pump Assembly - Piper Dwg. 96110-0	9.0	-0.2	-2	TC A7SO
X	Switch, Pressure Consolidated Controls 211c243-12	0.2	48.9	10	TC A7SO
X	Valve - Relief AN6245AB4 (2350±50 PSI Opening Pressure)	0.2	43.3	9	TC A7SO
X	Valve - Free Fall Piper Dwg. 67522-2	0.3	43.3	13	TC A7SO
X	Valve - Check MS24593-4	0.05	42.4	2	TC A7SO

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	G. Miscellaneous				
X	Forward Seat Belts (2) PS50039-4-2 .75 lbs. each	1.5	86.9	130	TSO C22
X	Center Seat Belts (2) PS50039-4-3 .70 lbs. each	1.4	123.0	172	TSO C22
X	Rear Seat Belts (2) .75 lbs. each PS50039-4-4	1.5	163.0	245	TSO C22
X	Inertia Safety Belts, Front Seats (2) PS50039-4-8 0.9 lbs. each	1.8	120.1	216	TC A7SO
X	Toe Brakes (Left) Piper Dwg. 95392-0	5.0	54.6	273	TC A7SO
X	Rear Cabin Door Piper Dwg. 69373-5	16.5	152.2	2511	TC A7SO
X	Cargo Door Piper Dwg. 68999-11	6.8	179.0	1217	TC A7SO
X	Right Front Seat Piper Dwg. 99727-5	15.5	93.0	1442	TC A7SO
	Right Front Seat Piper Dwg. 96806-5	15.6	92.7	1446	TC A7SO
X	Center Seats (2) Piper Dwg. 99730-0 & -1 13.5 lbs. each	27.0	124.1	3351	TC A7SO
	Center Seats (2) Piper Dwg. 96827-2, -3 11.9 lbs. each	23.8	124.4	2961	TC A7SO
X	Rear Seats (2) 14.5 lbs. each 99730-2 & -3	29.0	160.7	4660	TC A7SO
X	Rear Seats (2) 12.3 lbs. each 96827-4 & -5	24.6	161.1	3963	TC A7SO
X	Flight Manual and Logs	2.6	95.1	247	TC A7SO
X	Alternate Static Source Piper Dwg. 95331-2, -4, -6, -8, or -10	.4	66.0	26	TC A7SO

Calibrated Alternate Static Source Placard Required: YES ____ NO X

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	H. Engine and Engine Accessories - Fuel and Oil System (Optional Equipment)				
	Two Vacuum Pumps				
X	Airborne Manufacturing Co. Model 201CC (Left Wing)	4.5	54.5	245	TC A7SO
X	Airborne Manufacturing Co. Model 202CW (Right Wing)	4.5	54.5	245	TC A7SO
	Two Oil Filters with Adapters				
X	AC 0F5578770 (3.3 lbs. each) (Lycoming #75528)	6.6	58.7	387	TC A7SO

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	I. Electrical Equipment (Optional Equipment)				
X	Auxiliary Power Receptacle Piper 62355-8	2.6	-7.8	-20	TC A7SO
X	External Power Cable Piper 62355-2	4.6	33.0	152	TC A7SO
X	Cabin Speaker Quincy Spkr. Co. 8B-15052 or Oaktron Ind. GEV 1937	0.8	97.5	78	TC A7SO
X	Instrument Lights (Post) GLAR-BAN 5952-3RH-CW	0.2	68.0	14	TC A7SO

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	I. Electrical Equipment (Optional Equipment)				
X	Heated Pitot Head - Piper 96392-0	0.4	100.0	40	TC A7SO
	Anti-Collision Lights Whelen Engineering Co. Piper Dwg. 95267				
X	Power Supply, Model HD, T3 No. A413 (with fin and wing lights)	3.0	127.5	383	TC A7SO
X	Lights, Wing Tip (2) 0.15 lbs. each, No. A429	0.3	102.4	31	TC A7SO
X	Cable, Wing Lights, A417-1/298 & A417-1/252	1.9	110.0	209	TC A7SO
	Manual Electric Trim Servo #1C345-4-321	2.3	196.0	451	TC A7SO
	Cable Assembly	.5	106.6	53	TC A7SO
X	Reading Light (2) Grimes 10-0154-1 .25 lbs. each	0.5	149.3	75	TC A7SO
X	Reading Light (2) Grimes 10-0154-1 .25 lbs. each	0.5	115.0	58	TC A7SO

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	L. Instruments (Optional Equipment)				
X	Suction Gauge - Piper 96395	0.5	67.2	34	TC A7SO
X	Vacuum Regulator, Airborne Mech. 133C3 (2) .7 lbs. each	1.4	70.2	98	TC A7SO
X	Vacuum Filter, Piper 66673	0.3	54.8	16	TC A7SO
	Indicator - Rate of Climb - Piper 99010-2, -4, or -5	1.0	65.9	66	TSO C8b
	Indicator - Rate of Climb - Piper 99010-3	.5	67.2	34	TSO C8b
	Attitude Gyro - Piper 99002-2, -3, -4, or -5	2.2	64.4	142	TSO C4c
	Directional Gyro - Piper 99003-2, -3, -4, or -5	2.6	64.7	168	TSO C5c
X	Air Temperature Gauge - Piper 99479-0 or -2	0.2	77.6	16	TC A7SO
	Clock AN5743-L2	0.4	62.9	25	TC A7SO
	Turn and Slip Indicator - Piper PS50030-2 or -3	2.6	64.7	168	TSO C3A Type II
	Exhaust Gas Temperature - Piper 99027-2	0.7	60.4	42	TC A7SO

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	L. Copilot's Advanced Instrumentation (Optional Equipment) (cont)				
____	Attitude Gyro - Piper 99002-2, -3, -4, or -5	2.2	64.4	142	TSO C4c
____	Directional Gyro, Piper 99003-2, -3, -4, or -5	2.6	64.7	168	TSO C5c
____	Tru-Speed Indicator - Piper PS50049-6 or -8	.6	66.8	40	TSO C2b
____	Turn and Slip Indicator - Piper PS50030-2 or -3	2.6	64.7	168	TSO C3a Type II
____	Altimeter - Piper PS50008-2 or -3	1.0	65.9	66	TSO C10b
____	Indicator Rate of Climb - Piper 99010-2, -4, or -5	1.0	65.9	66	TSO C8b
____	Indicator Rate of Climb - Piper 99010-3	.5	67.2	34	TSO C8b
____	Clock AN5743-L2	.4	62.9	25	TC A7SO

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	M. Miscellaneous (Optional Equipment)				
X	Assist Step Piper Dwg. 68014-0	1.5	147.5	221	TC A7SO
X	Toe Brakes (Right) Piper Dwg. 95391-0	5.0	54.6	273	TC A7SO
	Jumpseat Piper Dwg. 69068-15	7.8	122.3	954	TC A7SO
	Jumpseat Piper Dwg. 69595-5	8.1	122.3	991	TC A7SO
	Seat Belt (Jumpseat) PS50039-4-5	1.4	123.0	172	TSO C22
X	Assist Straps and Coat Hooks (2) Piper Dwg. 62353-5 .15 lbs. each	0.3	120.0	36	TC A7SO
X	Inertia Safety Belts Center Seats (2) PS50039-4-6 0.7 lbs. each	1.4	133.9	187	TC A7SO
	Inertia Safety Belts, Rear Seats (2) PS50039-4-7 (Std. Fuselage) 1.4 lbs. each	2.8	182.7	512	TC A7SO
	Inertia Safety Belts, Rear Seats (2) PS50039-4-7 (Fuselage w/Cargo Door) 1.4 and 1.6 lbs. each	3.0	181.5	545	TC A7SO
X	Lighter 200462 (12V Universal)	0.2	67.9	14	TC A7SO
X	Fire Extinguisher, Kiddie Compact VI (with brackets) Piper Dwg. 65337-0	5.3	85.0	451	TC A7SO
X	Sun Visors (2) 66991-2 1.05 lbs. each	2.1	79.0	166	TC A7SO
	Tow Bar Piper Dwg. 96331-0	4.4	168.0	739	TC A7SO

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	M. Miscellaneous (Optional Equipment) (cont)				
X	Adjustable Front Seat (Left) Piper Dwg. 99353-16	** 3.2	87.5	280	TC A7SO
	Adjustable Front Seat (Left) Piper Dwg. 69568-2	** 3.1	90.8	281	TC A7SO
X	Adjustable Front Seat (Right) Piper Dwg. 99353-17	** 3.2	87.5	280	TC A7SO
	Adjustable Front Seat (Right) Piper Dwg. 69568-3	** 2.4	90.8	218	TC A7SO
X	Headrests, Front (2) 99255-3 1.0 lbs. each	2.0	99.5	199	TC A7SO
	Headrests, Front (2) 96806-17 1.0 lbs. each	2.2	99.5	219	TC A7SO
X	Headrests, Center (2) 99255-3 1.0 lbs. each	2.0	132.1	264	TC A7SO
	Headrests, Center (2) 96806-17 1.0 lbs. each	2.2	132.1	291	TC A7SO
X	Headrests, Rear (2) 99255-3 1.0 lbs. each	2.0	169.7	339	TC A7SO
	Headrests, Rear (2) 96806-17 1.0 lbs. each	2.2	169.7	373	TC A7SO
	Windshield Heating Unit	2.6	59.6	155	TC A7SO
	Combustion Heater Piper Dwg. 78424	46.8	193.3	9046	TSO C20

**Weight and moment difference between standard and optional equipment.

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
M.	Miscellaneous (Optional Equipment) (cont)				
______	Fire Extinguisher, Scott Aviation (with Brackets) Piper Dwg. 78621-2	5.0	58.6	293	TC A7SO
______	Fire Extinguisher, Kiddie & Co. (with Brackets) Piper Dwg. 76167-0	5.3	71.0	376	TC A7SO
______	Fire Extinguisher, Scott Aviation (with Brackets) Piper Dwg. 76167-2	5.0	71.0	355	TC A7SO
______	Ice Protection System Instl. (includes Windshield Heating Unit, Heated Pitot Head and Two Vacuum Pumps) Piper Dwg. 78642	56.3	87.9	4949	TC A7SO
	Heavy Duty Wheels, Brakes and Tires				
	Two Main Wheel - Brake Assemblies				
	Piper PS50035-14 Wheel Assembly				TSO C26
	30-83 Brake Assembly (Cleveland)				TSO C26
______	Two Main 8 Ply Rating Tires (Goodrich) 6.00 x 6 Ribbed Type III with Tube	*2.9	109.8	318	TSO C62
	One Nose Wheel Assembly				
	Piper PS50035-11 Wheel Assembly				TSO C26
______	One 8 Ply Rating Tire (Goodrich) 6.00 x 6 Ribbed Type III with Tube	*2.0	25.5	51	TSO C62
	TOTAL OPTIONAL EQUIPMENT	______	______	______	

EXTERIOR FINISH

Base Color ____________________ Registration No. Color ____________________

Trim Color ____________________ Type Finish ____________________

Accent Color ____________________

*Weight and moment difference between standard and optional equipment.

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Lake Elmo Aero

3275 Manning Ave N
Lake Elmo, MN 55042

Aircraft Weight & Balance Revision
WITH CENTER SEATS REMOVED

Tail Number: N4542T
Make/Model: PA34-200
Year: 1972
Serial Number: 34-7250128

Date: 3/23/2023
Tach: 3561.3
Max Weight: 4200

New Empty Weight: 3039.0
New Empty CG: 85.52
New Useful Load: 1161.0

Description	Weight	Arm	Moment
AIRCRAFT AS RECEIVED	3066.0	85.86	263,246.7
REMOVE CENTER SEATS	-27.0	124.1	-3350.7
New Aircraft Values	3039.0	85.52	259,896.0

B. Laughery A&P 2225738
BOB LAUGHERY

Lake Elmo Aero

3275 Manning Ave N
Lake Elmo, MN 55042

Aircraft Weight & Balance Revision

Tail Number: N4542T
Make/Model: PIPER PA-34-200
Year: 1972
Serial Number: 34-7250128

Date: 11/19/2021
Total Time: 6228.75
Hobbs Time: 603.6
Max Weight: 4200

New Empty Weight: 3066
New Empty CG: 85.86
New Useful Load: 1134

Description	Weight	Arm	Moment
New W&B			
Nose wheel	859	25.4	21,818.6
Left main wheel	1100	109.4	120,340.0
Right main wheel	1107	109.4	121,105.8
New Aircraft Values	3066	85.86	263,264.4

Rafe Larson A&P 2731659

EQUIPMENT CHANGE - WEIGHT & BALANCE	HORTON AVIATION SERVICES LLC		
REG. NO.	**MODEL**		**Serial No.**
N4542T	PA34-200		34-7250128
Items: (Description / P/N / S/N)	**Weight Pounds**	**Arm Inches**	**Moments Inch/Pounds**
Previous Aircraft Empty Weight:	3151	87.33	275163.6
REMOVED; VERTICAL SPEED IND.	-1	65	-65
KMT 112 FLUX DETECTOR	-0.5	232	-116
KG 102A REMOTE GYRO	-5	202	-1010
AK550-6 POWER SUPPLY	-2.3	40	-92
SN3500 H.S.I.	-3	63	-189
ADDED;	0	0	0
DUAL G5 INDICATORS	1.96	65	127.4
GAD 29B	0.63	36	22.68
GMU 11	0.26	110	28.6
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
	0	0	0
Totals	3142.05		273870.28

SUPERSEDED BY DATE 11/19/2021

A. Old Empty Weight	3151	Pounds
B. Old Empty CG	87.33	Inches
C. Old Empty Weight CG Moment	275163.6	Inch/Pounds
D. Max Gross Weight	4200	Pounds
E. Old Useful Load	1049	Pounds

A. New Empty Weight	3142.05	Pounds
B. New Empty CG	87.162929	Inches
C. New Empty Weight CG Moment	273870.28	Inch/Pounds
D. Max Gross Weight	4200	Pounds
E. New Useful Load	1057.95	Pounds

This new weight & balance information superseads all previous weight and balance data.
For aircraft loading, see instructions in Weight & Balance Section of Aircraft Flight Manual.

FAA Form 337 Completed?	N/A
Equipment List Amended?	12/7/2020

BY; JAMES HORTON	**Date:**	12/7/2020
FAA REPAIR STATION YHSR284L		

SIGNATURE: James D. Horton

NOTES LEVEL ANALYSIS ON STC SA00118MC REDUCES MTOW TO 3750

Repair Station NO: YHSR284L
Name: HORTON AVIONIC SERVICES
Address: 2732 PERIMETER RD. STE. 101
N. LAS VEGAS, NEVADA 89032

AIRCRAFT WEIGHT AND BALANCE REPORT
AIRCRAFT N# N4542T
AIRCRAFT MODEL # PA34-200
AIRCRAFT S/N 34-7250128

	SCALE	ARM	MOMENT
NOSE	933	25.4	23,698.2
RIGHT MAIN	1381	109.4	151,081.4
LEFT MAIN	1395	109.4	152,613.0
TOTAL	3709	88.27	327392.6

FUEL	RIGHT ENGINE OIL	LEFT ENGINE OIL
FULL	8 QUARTS	8 QUARTS

TOTAL	3709	88.27	327392.6
LESS USEABLE FUEL	(558)	93.6	(52,229)
BASIC EMPTY WIEGHT	3151	87.33	275163.6

MAXIMUM GROSS WIEGHT	4200
BASIC EMPTY WIEGHT	3151
USEFUL LOAD	1049
EMPTY CG	87.33

Superceded 12/17/2020

X James D. Horton
JAMES D. HORTON
GENERAL MANAGER

8/8/2008

EQUIPMENT LIST
FAA APPROVED REPAIR STATION NO: YHSR284L
HORTON AVIATION SERVICES LLC
2732 PERIMETER RD STE. 101
N. LAS VEGAS, NV. 89032
N# N4542T A/C MFG. PIPER MODEL PA34-200 SERIAL NO. 34-7250128

ITEM			
AIRCRAFT EMPTY			
NOUN	S/N	WEIGHT	ARM
GI 106A INDICATOR	B08-10334	1.25	64.9
ELT ME406		2.5	262.0
ELT REMOTE SWITCH	345-6196-04	0.2	66.0
AIRSPEED INDICTOR	24618	1.0	65.0
FLIGHT DIRECTOR	1170	1.5	65.0
GDL 69A DATA LINK	47759191	2.0	202.0
TAS 600 PROCESSOR	0711210	5.5	202.0
PMA8000B AUDIO PANEL	S03463	1.4	64.0
GNS 530W GPS/COM/NAV	23802713	9.0	62.0
SYSTEM 55X AUTO PILOT	0801-13113	2.7	62.0
GTX 327 TRANSPONDER	83731263	3.1	64.0
GNS 430W GPS/COM/NAV	23404309	7.0	62.0
EDM-760 MONITOR	5-2004	3.0	63.0
TURN COORDINATOR	L07-11598	1.4	64.0
COMPASS	10873	0.6	66.0
ENCODER SSD120-RS232	SRA-13260	1.0	61.0
ENCODING / ALTIMETER	127122	2.0	63.0
MANIFOLD PRESSURE IND	53249	1.0	63.0
SHADIN FUEL FLOW	2306	1.0	63.0
RS08 NAV SWITCH	11382	1.0	36.0
RS08 NAV SWITCH	3848	1.0	36.0
ALTIMETER	5G855	1.1	64.0
HOBBS HOUR METER	85331	0.3	65.0
DUAL G5 INDICATERS	4JQ044974/4JQ044949	1.96	65.0
GAD 29B	5DL012790	.63	36.0
GMU 11	56J015109	.26	110

DATE: 12/07/2020 REVISED

EQUIPMENT LIST
FAA APPROVED REPAIR STATION NO; YHSR284L
HORTON AVIATION SERVICES LLC
2732 PERIMETER RD.STE. 101
N. LAS VEGAS, NV. 89032
N# N4542T A/C MFG. PIPER MODEL PA34-200 SERIAL NO. 34-7250128

ITEM			
AIRCRAFT EMPTY			
NOUN	S/N	WEIGHT	ARM
GI 106A INDICATOR	B08-10334	1.25	64.9
ELT ME406		2.5	262.0
ELT REMOTE SWITCH	345-6196-04	0.2	66.0
AIRSPEED INDICTOR	24618	1.0	65.0
VERTICAL SPEED IND.	E4718	1.0	65.0
FLIGHT DIRECTOR	1170	1.5	65.0
GDL 69A DATA LINK	47759191	2.0	202.0
TAS 600 PROCESSOR	0711210	5.5	202.0
AK550-6 POWER SUPPLY	477072	2.3	40.0
PMA8000B AUDIO PANEL	S03463	1.4	64.0
GNS 530W GPS/COM/NAV	23802713	9.0	62.0
SYSTEM 55X AUTO PILOT	0801-13113	2.7	62.0
GTX 327 TRANSPONDER	83731263	3.1	64.0
GNS 430W GPS/COM/NAV	23404309	7.0	62.0
HSI SN3500	5-2004	3.0	63.0
EDM-760 MONITOR	05329	2.0	63.0
TURN COORDINATOR	L07-11598	1.4	64.0
COMPASS	10873	0.6	66.0
ENCODER SSD120-RS232	SRA-13260	1.0	61.0
ENCODING / ALTIMETER	127122	2.0	63.0
MANIFOLD PRESSURE IND	53249	1.0	63.0
SHADIN FUEL FLOW	2306	1.0	63.0
RS08 NAV SWITCH	11382	1.0	36.0
RS08 NAV SWITCH	3848	1.0	36.0
KG 102A REMOTE GYRO	50802	5.0	202.0
ALTIMETER	5G855	1.1	64.0
HOBBS HOUR METER	85331	0.3	65.0
KMT 112 FLUX DETECTOR	75883	0.5	232.0

DATE: 08/03/08

Revised 12/07/2020

[signature]

Air'Zona Aircrft Services, Inc.
7100 Flightline Dr.
Kingman, Arizona 86401
(928) 757-7744

December 30, 2004

Registration No.	4542T	Total Time:	
Make & Model	Piper Seneca	Hobbs:	2356.4
Serial Number	34-7250128	Left Tach:	2860.86
Year	1972	Right Tach:	2855.04

Calculations: Scale Locations	Scale Readings	Tare	Net Weight	Arm	Moment	
Right Left Nose Unusable Fuel						
Totals As Weighed						
Minus Fluids						
Fuel Oil Other						
Basic Empty Weight as of 5/12/1988			3012.3	83.12	250372.75	

SUPERCEDED 8/18/2005

Description	Serial No.	Weight	Arm	Moment	
Bob Fields Door Seal Electric Pump		1.5	109.72	164.58	
New Aircraft Values		3013.82	83.13	250537.33	

Notes:

Anthony Keller A&P158588391IA

VEGAS RADIO. INC.
FAA CERTIFIED REPAIR STATION NO. 462-8A
2772 N. RANCHO RD., LAS VEGAS, NV 89103
5/12/88

RECORD: 2 REFERENCE WO#: 1018

REGISTERED OWNER:

WESTFIELD, KENNETH C. M.D.
2200 S. RANCHO RD.
LAS VEGAS, NV 89102

AIRCRAFT:
MAKE PIPER
MODEL PA 34-200
SERIAL NO. 34-7250128
REG NO. N4542T

AIRCRAFT DATA (FROM AIRCRAFT RECORDS):
WEIGHT: 3000.40 ARM: 83.20 MOMENT: 249633.28

MANUFACTURER	MODEL	WEIGHT	ARM	MOMENT
EQUIPMENT REMOVED:				
				0.00
				0.00
				0.00
				0.00
EQUIPMENT INSTALLED:				
KING	KMA 24	1.70	61.90	105.23
NORTHSTAR	M1-A LORAN	5.00	61.60	308.00
N-A-T	RS08	0.25	64.40	16.10
AV. WEST	EC-200	3.97	61.90	245.74

REPAIR STATION 462-8A

NEW AIRCRAFT EMPTY WEIGHT: 3012.32
NEW EMPTY WEIGHT C.G.: 83.12
NEW EMPTY WEIGHT MOMENT: 250372.75
NEW USEFUL LOAD: 1187.68

Richard D. Clarke
____
RICHARD D. CLARKE

Dec 30, 2004
Superceded

VEGAS RADIO. INC.
FAA CERTIFIED REPAIR STATION NO. 462-8A
2772 N. RANCHO RD., LAS VEGAS, NV 89103
5/12/88

RECORD: 2 REFERENCE WO#: 1018

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MODEL PA 34-200
SERIAL NO. 34-7250128
REG NO. N4542T

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				0.00
				0.00
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N-A-T	RS08	0.25	64.40	16.10
AV. WEST	EC-200	3.97	61.90	245.74

REPAIR STATION 462-8A

Richard D. Clarke

RICHARD D. CLARKE

NEW AIRCRAFT EMPTY WEIGHT: 3012.32
NEW EMPTY WEIGHT C.G.: 83.12
NEW EMPTY WEIGHT MOMENT: 250372.75
NEW USEFUL LOAD: 1137.68

CKD
12-22-94

DOES NOT INCLUDE
① DOOR SEAL KIT
4-4-87
②
7-28-86

Get Dick to put wt Data on proper form

A I R C R A F T   E Q U I P M E N T   L I S T

MANUFACTURER: PIPER   MODEL: PA-34-200   S/N: 34-7250128

REG: N-4542T

MFG	MODEL #	S/N	DESCRIPTON	WT	ARM
KING	KMA 24	25338	AUDIO PANEL	1.7	61.9
NORTHSTAR	M1-A	N16141	LORAN	5	61.6
N A T	RS08	3848	RELAY UNIT	.25	64.4
AV WEST	EC-200	05013657	AM FM STEREO	3.97	61.9
SIGTRONICS	ST-600	1100383 1050145	ICS STEREO SWITCHER	1	64.4

VEGAS RADIO INC.
CRS 462-8A

WORK ORDER # 1018

SIGNED: Richard D. Cll   DATE: 5-12-88

WEIGHT AND BALANCE SHEET

MANUFACTURER: PIPER MODEL: PA-34-200 S/N: 34-7250128

REG: N-4542T HRS: 686.8

ITEM	WEIGHT	ARM	MOMENT
AIRCRAFT EMPTY DATE: 5-1-86	2998.0	83.1	249163.6
WEIGHT INCREASE SEE REVISED EQUIPMENT LIST DATED: 1-15-87	2.4		465.2
TOTALS	3000.4		249628.8

NEW MOMENT / NEW WEIGHT = NEW EMPTY C.G.

249628.8 / 3000.4 = 83.2

~~NEW EMPTY WEIGHT 3000.4 LBS.~~

~~NEW USEFUL LOAD --- LBS.~~

~~NEW EMPTY C.G. 83.2 IN.~~

~~NEW MOMENT 249628.8 IN.- LBS.~~

SUPERCEDED 5-12-88

HUGHES AVIATION SERVICES
6005 LAS VEGAS BLVD. SOUTH
LAS VEGAS, NEVADA 89119
CRS 410-02

WORK ORDER: 3393

COMPUTED BY D [signature] DATE: 1-15-87

AIRCRAFT EQUIPMENT LIST

MANUFACTURER: PIPER MODEL: PA-34-200 S/N: 34-7250128

REG: N-4542T HRS: 686.8

#	MFGR	MODEL #	S/N	DESCRIPTION	WT	ARM	MOMENT
1	BENDIX	SG-832B	1060	DIR. GYRO	-3.0	194.5	-583.5
2	BENDIX	SG-832C	1997	DIR. GYRO	4.3	194.5	836.4
3	SPERRY	SPC-03	2091	PWR. CONV.	1.1	193.0	212.3
				TOTALS	2.4		465.2

HUGHES AVIATION SERVICES WORK ORDER: 3393
CRS 410-02

INITIALED BY DLG DATE: 1-15-87

FALCON AVIONICS, INC.
MESA, ARIZONA
FAA APPROVED R/S 407-10

05-01-1986

AIRCRAFT WEIGHT AND BALANCE SUPPLEMENT

AIRCRAFT DATA:
MAKE --------- PIPER
MODEL ------- PA34-200
SERIAL NO. -- 7250128
REG. NO. ---- N4542T

PREVIOUS W&B DATA:
WEIGHT -------- 3002
ARM ----------- 83.08
MOMENT -------- 249410

EQUIPMENT REMOVED	WEIGHT	ARM	MOMENT
KING KT75 TRANSPONDER	7	61.6	-431.2

EQUIPMENT INSTALLED	WEIGHT	ARM	MOMENT
NARCO AT-50A TRANSPONDER	3	61.6	184.8

NEW WEIGHT AND BALANCE DATA:
WEIGHT -------- 2998
ARM ----------- 83.10994
MOMENT ------- 249163.6

AUTHORIZED SIGNATURE
[signature]
R/S 407-10

SUPERCEDED
1-15-87
[signature]
WO 3393
HAS

OPERATING INSTRUCTIONS

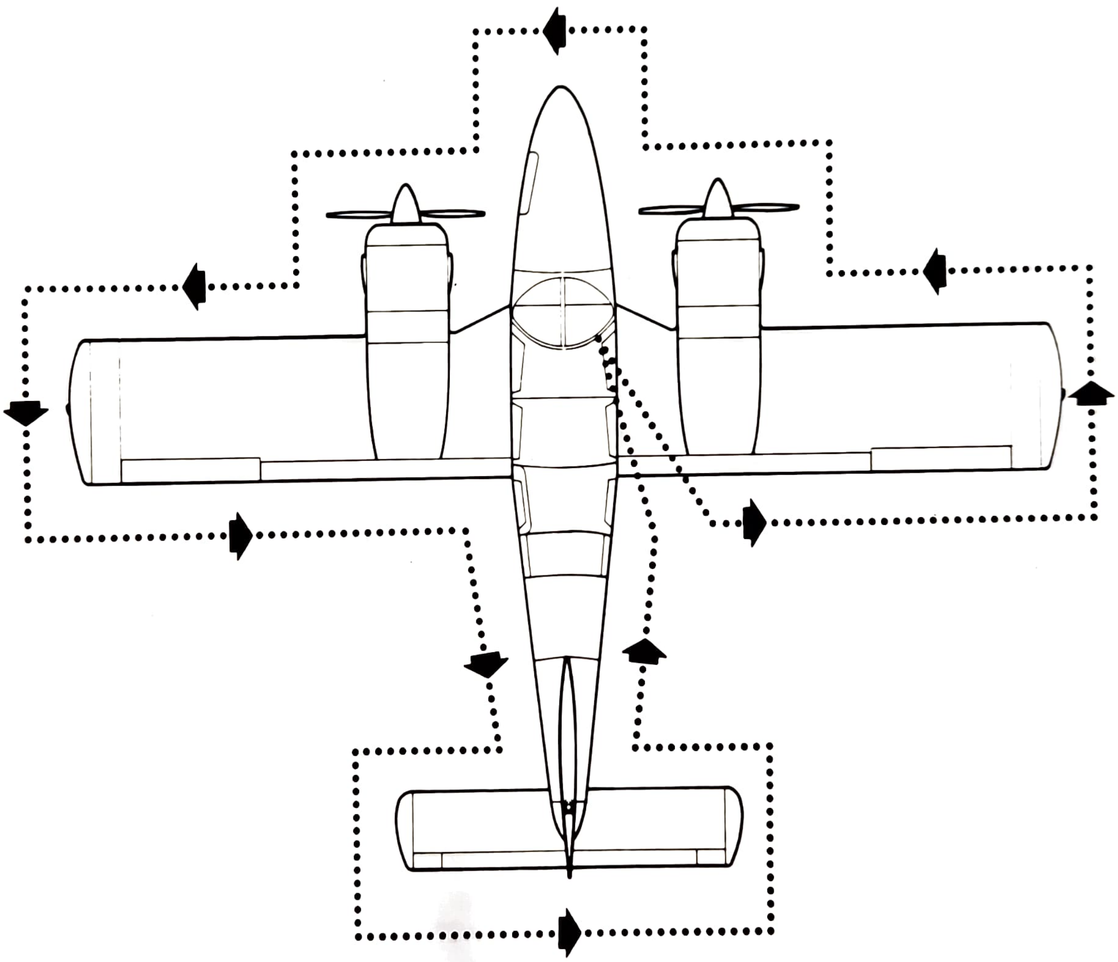
THIS SECTION IS DESIGNED: 1. To help you operate your Seneca with safety and confidence. 2. To more fully acquaint you with the basic performance and handling characteristics of the airplane. 3. To more fully explain your Seneca's operation than is permissible to set forth in the Airplane Flight Manual.

OPERATING INSTRUCTIONS

PREFLIGHT

If you are planning a flight in the Seneca:

1. Make sure the weather is suitable.
2. Plan the navigation (if going cross-country).
3. Check weight and balance for the flight. (See weight and balance section of this manual.)
4. Investigate performance and range. (See performance section of this manual.)



WALK-AROUND INSPECTION

In Cabin

1. Landing gear control - Ensure that it is in the "DOWN" position.
2. Avionics - Turn off, to save power and wear on the units.
3. Master switch - Turn on
4. Landing gear lights - Three green lights should be illuminated. No red light.
5. Fuel quantity - Ensure adequate for flight plus reserve.
6. Cowl flaps - Open to facilitate inspection and ensure cooling after engine start.
7. Master switch - Turn off to save battery.
8. Ignition switches - should be off to prevent inadvertent start during inspection of propeller.
9. Mix controls - should be in idle cut-off position, again to prevent inadvertent engine start.
10. Trim indicators - Set to neutral so that tabs may be checked for alignment.
11. Flaps - Extend and retract to check operation. This should be done before engine start so that you can hear any noise which might indicate binding.
12. Control locks - Unlock, and check control motion.
13. Fasten seat belts snugly on empty seats.
14. Drain pitot and static systems before flight.
15. Paperwork - Check that the proper aircraft papers are aboard and that the necessary inspections have been performed.

Outside Airplane

1. Right wing, aileron and flap - no damage, no ice. Check hinges.
2. Right main gear - no leaks, tires inflated and not excessively worn, 3-1/2 inches piston exposed under static load.
3. Right wing tip - no damage.
4. Right leading edge - no damage or ice.
5. Fuel cap - open to check quantity and color of fuel. Check cap vent, and then secure.
6. Right engine nacelle - Open doors to inspect engine. Check oil quantity - six to eight quarts. Secure both inspection doors.
7. Right propeller - no nicks or leaks, spinner secure and not cracked.
8. Cowl flaps - open and secure.
9. Fuel drains - Drain five on right side: two fuel tank drains (under wing), one gascolator drain (near bottom of engine nacelle), two crossfeed drains on bottom of fuselage inboard from wing flap.
10. Nose section - undamaged.
11. Nose gear - no leaks, tire inflated and not excessively worn, 2-1/2 inches piston exposed under satic load, tow bar removed, condition of landing light checked.
12. Forwward baggage door - secure and locked. (Key removable in locked position only.)
13. Windshield - clean and secure.
14. Left wing, engine nacelle and landing gear - inspect as on right side.
15. Pitot tube - hole unobstructed, heat checked by feel if need is anticipated.
16. Stall warning vanes - no damage, free movement.
17. Rear door - latched.
18. Left static vent - unobstructed.
19. Dorsal fin air scoop - free of obstruction.
20. Empennage - no damage, free of ice, hinges secure.
21. Stabilator - freedom of motion.
22. Right static vent - unobstructed.
23. Antennas - secure and undamaged.
24. Navigation and landing lights - check (after master switch and light switches have been turned on in cabin

BEFORE STARTING ENGINES

1. Seats adjusted
2. Seat belts, shoulder harness - fastened
3. Parking brake - set
4. Circuit breakers - in
5. Radios - off
6. Cowl flaps - open
7. Alternate air - off
8. Alternators - on

STARTING ENGINES

1. Mixture controls - idle cut-off
2. Throttle controls - open 1/2 inch
3. Propeller controls - forward
4. Master switch - on
5. Ignition switch - on
6. Electric fuel pumps - on
7. Mixture controls - Move to rich position until a fuel flow is indicated and stabilized; then move to idle cut-off.
8. Propeller - clear
9. Starter - engage
10. Mixture control - Advance as engine starts.
11. Oil pressure - Check to see that the oil pressure comes up within 30 seconds, (except in very cold weather, when it may take somewhat longer). If the oil pressure does not show an indication, shut down the engine and have it checked.
12. Repeat steps 8 through 11 with the other engine.
13. Electric fuel pumps - off; check fuel pressure.

HOT START

1. Mixture controls - idle cut-off
2. Throttle controls - open 1/2 inch
3. Propeller controls - forward
4. Master switch - on
5. Ignition switches - on
6. Electric fuel pumps - off
7. Propeller - clear
8. Starter - engage
9. Mixture control - Advance as engine starts.
10. Repeat steps 7 through 9 with the other engine.
11. If an engine does not start with the above method, which omits the priming, use the normal starting procedure, which includes priming.

NOTE

To prevent starter damage, limit starter cranking to 30-second periods. If the engine does not start within that time, allow a cooling period of several minutes before engaging starter again. Do not engage the starter immediately after releasing it. This practice may damage the starter mechanism.

FLOODED START

1. Mixture control - idle cut-off
2. Throttle control - full forward
3. Propeller control - forward
4. Master switch - on
5. Ignition switches - on
6. Electric fuel pump - off
7. Propeller - clear
8. Starter - engage
9. When engine fires, retard throttle and advance mixture slowly.

STARTING ENGINES WITH AID OF EXTERNAL ELECTRIC POWER

An optional feature known as Piper External Power (PEP) allows the operator to use an external battery to crank the engine without having to gain access to the aircraft battery.

The procedure is as follows:

1. Turn aircraft MASTER SWITCH to OFF.
2. Connect RED lead to PEP kit jumper cable to POSITIVE (+) terminal of external 12 volt battery and BLACK lead to NEGATIVE (-) terminal.
3. Insert plug of jumper cable into socket located on aircraft fuselage.
4. Turn aircraft MASTER SWTICH to ON and proceed with NORMAL engine starting technique.
5. After engine has been started, turn MASTER SWITCH to OFF and remove jumper cable plug from aircraft.
6. Turn aircraft MASTER SWTICH to ON and check alternator ammeter for indication of output. DO NOT ATTEMPT FLIGHT IF THERE IS NO INDICATION OF ALTERNATOR OUTPUT.

TAXI

Before taxiing, the brakes should be checked by moving forward a few feet, throttling back and applying pressure on the toe pedals. As much as possible, turns during taxiing should be made using rudder pedal motion and differential power (more power on the engine on the outside of the turn, less on the inside engine) rather than brakes. The following equipment may be checked during taxiing:

1. Instruments - turn indicator, directional gyro, coordination ball
2. Heater and defroster - especially important on a cold day
3. Fuel selector - Place each selector on "CROSSFEED" for a short time, while the other selector is in the "ON" position. Return selectors to the "ON" position. Do not attempt takeoff with selector on "CROSSFEED."

The autopilot, if installed, should be off during taxiing, and the electric fuel pump should be off in order to check the operation of the engine-driven fuel pump.

PRETAKE-OFF CHECK

A thorough check should be made before take-off, using a check list. Before advancing the throttle to check the magnetos and the propeller action, be sure that the engine is warm enough to accept the power if it is a cold day. If there is no hesitation in engine action when the throttle is advanced, the engine is warm enough.

1. Parking brake - on
2. Engine run-up
   a. Mixture controls - forward
   b. Propeller controls - forward
   c. Throttle controls - forward to 1500 RPM
   d. Propeller controls - Check the feather position by bringing the propeller controls fully back and then to the full forward position. The RPM should drop to 1000 RPM in 1 - 3 seconds. If more time is required, the propeller dome pressure may be excessively low resulting in a danger of propeller overspeed or loss of feathering capability.
   e. Throttle controls - forward to 2000 RPM
   f. Propeller controls - Exercise to check governor. Retard control until a 200 to 300 drop in RPM is indicated. This should be done three times on the first flight of the day. The governor can be checked by retarding the propeller control until a drop of 100 RPM to 200 RPM appears, then advancing the throttle to get a slight increase in manifold pressure. The propeller speed should stay the same when the throttle is advanced, thus showing that the governor is governing.
   g. Propeller controls - full forward
   h. Alternate air controls - on, then off again. There should be a drop in RPM when the control is placed in the "ON" position, since heated air is being supplied to the engine. Do not check the alternate air on the ground if dusty air conditions prevail.
   i. Magnetos - check
      Normal drop - 100 RPM
      Maximum drop - 175 RPM
      Maximum differential drop - 50 RPM
   j. Alternator output - check, approximately equal output for both alternators
   k. Throttles - 800-1000 RPM

3. Fuel - "ON" position
4. Alternators - on
5. Engine gauges - in the green
6. Vacuum gauge - 4.5 to 5.2 in. Hg.
7. Altimeter - set
8. Attitude indicator - set
9. Clock - wound and set
10. Mixtures - set
11. Propellers - set in forward position
12. Quadrant friction - adjusted
13. Alternate air - off
14. Cowl flaps - set
15. Seat backs - erect
16. Wing flaps - set
17. Trim (stabilator and rudder) - set
18. Seat belts and shoulder harness - fastened
19. Empty seats - seat belts snugly fastened
20. Controls - free, full travel
21. Doors - latched
22. Electric fuel pumps - on
23. Pitot heat - as required

The normally recommended procedure for sea level take-off is full throttle at 2700 RPM. During pretake-off check at a high elevation, lean the mixture to obtain maximum power. Apply full throttle; then lean the mixture until the fuel flow pointer stabilizes at a fuel consumption mark consistent with the density altitude (about 14.9 for 2000-foot elevation, 14.0 for 4000-foot elevation and 13.3 for 6000-foot elevation). Leave the mixture in this position for take-off. Do not overheat the engine when operating with mixture leaned. If overheating occurs, enrich the mixture enough that temperature returns to normal.

TAKE-OFF

Take-off should not be attempted with ice or frost on the wings. Take-off distances and 50-foot obstacle clearance distances are shown on charts in the Performance section of this manual. The performance shown on charts will be reduced by uphill gradient, tailwind component, or soft, wet, rough or grassy surface.

Avoid fast turns onto the runway, followed by immediate take-off, especially with a low fuel supply. As power is applied at the start of the take-off roll, look at the engine instruments to see that the engines are operating properly and putting out normal power, and at the airspeed indicator to see that it is functioning.

Normal Take-off (Flaps Up)

When obstacle clearance is no problem, a normal take-off may be used. Accelerate to 80-85 MPH and ease back on the wheel enough to let the airplane lift off. After lift-off, accelerate to the best rate of climb speed (105 MPH) or higher if desired, retracting the landing gear when a gear-down landing is no longer possible on the runway.

Short Field Take-off (Flaps Up)

When a short field effort is required but the situation presents a wide margin on obstacle clearance, the safest short field technique to use is with the flaps up. In the event of an engine failure, the airplane is in the best flight configuration to sustain altitude immediately after the gear is raised. Set the stabilator trim indicator in the take-off range. Set the brakes and bring the engines to full power before release. Accelerate to 80 MPH and rotate the airplane firmly so that the airspeed is approximately 85 MPH when passing through the 50-foot height. The airplane should then be allowed to accelerate to the best angle of climb speed (90 MPH at sea level) if obstacle clearance is necessary, or best rate of climb speed (105 MPH) if obstacles are not a problem. The landing gear should be retracted when a gear-down landing is no longer possible on the runway. The distances for this take-off procedure are given on a chart in the performance section of this manual.

Short Field Take-off (25-degree Flaps)

When the shortest possible ground roll and the greatest clearance distance over a 50-foot obstacle is desired, use a 25-degree flap setting (second notch). Set the stabilator trim indicator slightly nose up from the take-off range. Set the brakes and bring the engines to full power before release. Accelerate to 70 MPH and rotate firmly so that when when passing through the 50-foot height the airspeed is approximately 80 MPH. Retract the gear when a gear down landing is no longer possible on the runway.

It should be noted that the airplane is momentarily below Vmc when using the above procedure. IN THE EVENT THAT AN ENGINE FAILURE SHOULD OCCUR WHILE THE AIRPLANE IS BELOW Vmc IT IS MANDATORY THAT THE THROTTLE ON THE OPERATING ENGINE BE RETARDED AND THE NOSE LOWERED IMMEDIATELY TO MAINTAIN CONTROL OF THE AIRPLANE. It should also be noted that when a 25-degree flap setting is used on the take-off roll, an effort to hold the airplane on the runway too long may result in a "wheelbarrowing" tendency. This should be avoided.

The distances required using this take-off procedure are given on a chart in the Performance section of this manual.

DOOR OPEN ON TAKE-OFF

If either the main or rear cabin door is inadvertently left open or partially open on take-off, fly the airplane in a normal manner and return for a landing to close the door on the ground. If a landing cannot be made, it may be possible to close a door in flight in the following manner:

1. Maintain airspeed between 100 and 110 MPH.
2. Open the storm window.
3. Pull the door closed, making certain the upper latch is properly positioned.
4. Close the upper latch. It may be necessary to pull in on the upper portion of the door while the latch is being closed.

It is necessary to have someone in the airplane in addition to the pilot to carry out this procedure. If the door, either main or rear, cannot be closed in flight it is possible to continue safely for an extended period. In this case, the airspeed should be kept below 125 MPH and above 100 MPH to prevent buffeting as a result of the open door.

CLIMB

On climb-out after take-off, the best angle of climb speed (90 MPH at sea level) should be maintained until obstacles are cleared. The best rate of climb speed (105 MPH at sea level) should be maintained with full power on the engines until approximately 500 feet AGL. The best rate of climb speed decreases slightly with increased density altitude and the best angle of climb speed increases slightly. There is no time limit on full power engine operation. However, since full power requires a high fuel consumption and is unnecessary in most flight situations, it is advisable to reduce to a climb power setting any time after 500 feet AGL. When reducing power, the throttles should be retarded first, then the propeller controls. An en route climb speed of 120 MPH provides good visibility, climb performance and engine cooling.

Cylinder head temperatures should be monitored during climb and should be kept below 475° at all times. Better climb performance is attained with cowl flaps closed; however, cowl flap position should be adjusted for proper engine cooling during climb. The electric fuel pumps may be turned off one at a time above 500 feet AGL, and fuel pressure should be monitored as each pump is turned off, to see that the pressure stays in the green.

NORMAL CRUISE

When leveling off at cruise altitude, the pilot may reduce to a cruise power setting in accordance with the Power Setting Table in this manual. The mixture should be leaned in accordance with the recommendations for the IO-360-C engine in the Lycoming Operator's Manual which is provided with the aircraft.

For maximum service life, cylinder head temperature should be maintained below 435°F. during high performance cruise operation and below 400°F. during economy cruise operation. If cylinder head temperatures become too high during flight, reduce them by enriching the mixture, by opening cowl flaps, by reducing power, or by use of any combination of these methods.

Following level-off for cruise, the electric fuel pumps should be checked for being off. The cowl flaps should be closed or adjusted as necessary to maintain proper cylinder head temperatures, and the airplane should be trimmed to fly hands off.

The pilot should monitor weather conditions while flying and should be alert to conditions which might lead to induction system icing. Snow or freezing rain could result in icing of the air filter. Since alternate air is controlled manually by the pilot (not automatically), it should be turned on any time icing may occur. If the flight has been through rain in air that is above freezing and is then continued into an air mass which is below freezing, moisture which has collected in the air filter may subsequently freeze. Since the alternate air system of the Seneca supplies heated air, it is an excellent protection against induction icing if it is applied soon enough in an icing situation.

WARNING

Flight in icing conditions is prohibited unless aircraft is equipped with approved deicing equipment. If icing is encountered immediate action should be taken to fly out of icing conditions. Icing is hazardous due to greatly reduced performance, loss of forward visibility, possible longitudinal control difficulties due to increased control sensitivity, and impaired power plant and fuel system operation.

The ammeters for the electrical system should be monitored during flight, especially during night or instrument flight so that corrective measures can be taken in case of malfunction. The procedures for dealing with electrical failures are contained in the Airplane Flight Manual portion of this manual. The sooner a problem is recognized and corrective action taken, the greater is the chance of avoiding total electrical failure.

It is not recommended to take-off into IFR operation with a single alternator. During flight, electrical loads should be limited to 50 amperes for each alternator. Although the alternators are capable of 60 amperes output, limiting loads to 50 amperes will assure battery charging current.

Since the Seneca has one combined fuel tank per engine, it is advisable to feed the engines symmetrically during cruise so that approximately the same amount of fuel will be left in each side for the landing. A crossfeed is provided and can be used to even up the fuel should it be necessary.

During flight, keep account of time and fuel used in connection with power settings to determine how the fuel flow and fuel quantity gauging systems are operating. If the fuel flow indication is considerably higher than the fuel actually being consumed or an asymmetric flow gauge indication is observed, you may have a clogged fuel nozzle, which should be cleaned.

There are no mechanical uplocks in the landing gear system. In the event of a hydraulic system malfunction, the landing gear will free-fall to the gear down position. The true airspeed with gear down is approximately 75% of the gear retracted airspeed for any given power setting. Allowances for the reduction in airspeed and range should be made when planning extended flight between remote airfields or flight over water.

DESCENT

When power is reduced for descent, the mixtures should be enriched as altitude decreases. The propellers may be left at cruise setting; however if the propeller speed is reduced, it should be done after the throttles have been retarded.

APPROACH AND LANDING

Sometime during the approach for a landing, the throttle controls should be retarded to check the gear warning horn. Flying the airplane with the horn inoperative is not advisable. It can lead to a gear up landing as it is easy to forget the landing gear, especially when approaching for a single-engine landing, when other equipment is inoperative, or when attention is drawn to events outside the cabin.

Prior to entering the traffic pattern, the aircraft should be slowed to approximately 115 MPH, and this speed should be maintained on the downwind leg. The landing check should be performed on the downwind leg:

1. Seat backs - erect
2. Seat belts and shoulder harness - fastened
3. Fuel selectors - "ON"
4. Cowl flaps - set as required
5. Electric fuel pumps - on
6. Mixture controls - rich
7. Propellers - set to 2500 RPM
8. Landing gear - down (three green lights and nose wheel in mirror)
9. Flaps - set as required; 125 MPH maximum airspeed

The landing gear should be lowered at speeds below 150 MPH and the flaps at speeds as follows:

10° (first notch)	160 MPH maximum
25° (second notch)	140 MPH maximum
40° (third notch)	125 MPH maximum

Maintain a speed of 115 MPH on the downwind leg, 110 MPH on base leg, 110 MPH during the turn onto final approach, and 95 MPH on final approach. If the aircraft is lightly loaded, the final approach speed may be reduced to 90 MPH.

When the power is reduced on close final approach, the propeller controls may be advanced to the full forward position to provide maximum power in the event of a go-around.

The landing gear position should be checked on the downwind leg and again on final approach by checking the three green indicator lights on the instrument panel and looking at the external mirror to check that the nose gear is extended. Remember that when the navigation lights are on, the gear position lights are dimmed and are difficult to see in the daytime.

Flap position for landing will depend on runway length and surface wind. Full flaps will reduce stall speed during final approach and will permit contact with the runway at a slower speed. Good pattern management includes a smooth, gradual reduction of power on final approach, with the power fully off before the wheels touch the runway, to give the horn a chance to blow if the gear is not locked down. If electric trim is available, it can be used to assist a smooth back pressure during flare-out.

Maximum braking after touch-down is achieved by retracting the flaps, applying back pressure to the wheel and applying pressure on the brakes. However, unless extra braking is needed or unless a strong crosswind or gusty air condition exists, it is best to wait until turning off the runway to retract the flaps. This will avoid reaching for the gear handle instead of the flap handle by mistake and will permit full attention to be given to the landing and landing roll.

Normal Landing

Approach with full flaps (40 degrees) and partial power until shortly before touch-down. Hold the nose up as long as possible before and after contacting the ground with the main wheels.

Short Field Landing

Approach with full flaps at 87 MPH CAS. Immediately after touch-down, raise the flaps, apply back pressure to the wheel and apply brakes.

Crosswind or High-wind Landing

Approach with higher than normal speed and with zero to 25 degrees of flaps. Immediately after touch-down, raise the flaps. During a crosswind approach hold a crab angle into the wind until ready to flare out for the landing. Then lower the wing that is into the wind, to eliminate the crab angle without drifting, and use the rudder to keep the wheels aligned with the runway. Avoid prolonged side slips with a low fuel indication.

The maximum crosswind component for landing is 15 MPH.

POST LANDING

After leaving the runway:

1. Wing flaps - retract
2. Cowl flaps - fully open
3. Electric fuel pumps - off

SHUT DOWN

1. Radio and electrical equipment - off
2. Mixture controls - idle cut-off
3. Magneto switches - off
4. Master switch - off
5. Parking brake - on

AIRSPEED DATA

All airspeeds quoted in this manual are calibrated unless otherwise noted. Calibrated airspeed is indicated airspeed corrected for instrument and position errors. The following table gives the correlation between indicated airspeed and calibrated airspeed for the Seneca if zero instrument error is assumed. When below 90 MPH IAS, this calibration is valid only when level flight is maintained using power as required to prevent rapid altitude changes.

AIRSPEED CORRECTION TABLE

Flaps 0°										
IAS - MPH	70	80	90	100	120	140	160	180	200	218
CAS - MPH	72	82	92	102	122	142	161	181	200	217

Flaps 40°							
IAS - MPH	70	80	90	100	110	120	127
CAS - MPH	70	80	89	99	109	118	125

ROUGH AIR FLIGHT

In conditions of extreme turbulence, reduce power to slow the airplane to slightly below the design maneuvering speed, which varies from 133 MPH at light weight to 146 MPH at 4200 pounds gross weight. When flying in extreme turbulence or strong vertical currents and using the autopilot, the altitude-hold mode should not be used.

Vmc - MINIMUM SINGLE-ENGINE CONTROL SPEED

Vmc is the calibrated airspeed below which a twin-engine aircraft cannot be controlled in flight with one engine operating at take-off power at sea level density altitude and the other engine windmilling. Vmc for the Seneca has been determined to be 80 MPH. Under no circumstances should an attempt be made to fly at a speed below this Vmc with only one engine operating. As a safety precaution, when operating under single-engine flight conditions either in training or in emergency situations, maintain an indicated airspeed above 90 MPH.

The Vmc demonstration required for the FAA flight test for the multi-engine rating approaches an uncontrolled flight condition with power reduced on one engine. The demonstration should not be performed at an altitude of less than 3500 feet above the ground. Initiate recovery during the demonstration by immediately reducing power on the operating engine and promptly lowering the nose of the airplane.

More power is available on the operating engine at lower altitudes and hence there can be more asymmetric thrust. The Vmc is highest at low altitudes. Since Vmc decreases with altitude, at higher altitudes the airplane will approach a stall before reaching Vmc. The most critical situation occurs at the altitude where the stall speed and Vmc speed coincide. Care should be taken to avoid this flight condition because at this point loss of directional control occurs at the same time the airplane stalls and a spin could result.

NOTE

SINGLE ENGINE STALLS ARE NOT RECOMMENDED.

OPERATION IN KNOWN ICING CONDITIONS

The Piper Seneca is approved for flight into known icing conditions when equipped with the complete Piper Ice Protection System. Operating in icing conditions in excess of the Continuous Maximum and Intermittent Maximum as defined in FAR 25 Appendix C has been substantiated; however, there is no correlation between these conditions and forecast or reported "Light, Moderate and Severe" conditions. Therefore, on the basis of flight tests the following guidelines should be observed:

1. Flight into Severe icing is prohibited.
2. Moderate icing conditions above 10,000 ft. should be avoided whenever possible: if moderate icing conditions are encountered above 10,000 ft. a descent to a lower altitude should be initiated if practical.
3. Light icing is approved at all altitudes.

Icing conditions of any kind should be avoided wherever possible, since any minor malfunction which may occur is potentially more serious in icing conditions. Continuous attention of the pilot is required to monitor the rate of ice buildup in order to effect the boot cycle at the optimum time. Boots should be cycled when ice has built to between 1/4 and 1/2 inch thickness on the leading edge to assure proper ice removal. Repeated boot cycles at less than 1/4 inch can cause a cavity to form under the ice and prevent ice removal; boot cycles at thicknesses greater than 1/2 inch may also fail to remove ice.

Icing conditions can exist in any clouds when the temperature is below freezing; therefore it is necessary to closely monitor outside air temperature when flying in clouds or precipitation. Clouds which are dark and have sharply defined edges contain high water content and should be avoided whenever possible. Freezing rain must always be avoided.

The following listing contains a few of the more highly recommended operating procedures for flight in icing conditions.

1. Perform careful functional check of ice protection systems before flight. Turn on Pitot Heat, Windshield Heat and Propeller Heat for 30 seconds and feel for heat.
2. Avoid forecast icing conditions when possible.
3. When flying in clouds or precipitation monitor temperature closely.
4. Turn on windshield defroster and pitot heat before entering icing conditions.
5. Turn on Propeller Heat and Windshield Heat immediately upon entering icing conditions. Cycle boots as required.
6. Review Flight Manual procedures before any flight which might encounter icing conditions.
7. Plan an alternate airport whenever flying in ice.

EMERGENCY PROCEDURES

Procedures for handling in-flight emergencies and equipment malfunctions are detailed in the Airplane Flight Manual section. These should be read and followed by the pilot.

PIPER AUTOMATIC LOCATOR*

The Piper Automatic Locator, when installed, is located in the aft portion of the fuselage just below the stabilator leading edge and is accessible through a plate on the right side of the fuselage. If is an emergency locator transmitter which meets the requirments of FAR 91.52. The unit operates on a self contained battery.

The battery has a useful life of four years. However, it comply with FAA regulations, it must be replaced after two years of shelf life or service life. The battery should also be replaced if the transmitter has been used in an emergency situation or if the accumulated test time exceeds one hour. The replacement date is marked on the transmitter label.

The unit has a three position selector switch placarded OFF, ARM and ON. The ARM position is provided to set the unit to the automatic position so that it will transmit only after impact and continue to transmit until the battery power is drained to depletion or the switch is manually moved to the OFF position. The ARM position is selected when the locator is installed at the factory and should remain in that position whenever the unit is installed in the aircraft. The ON position is provided so the unit can be used as a portable transmitter or in the event the automatic feature was not triggered by impact or to check the function of the transmitter periodically.

The OFF position is provided for the purpose of changing the battery or to prolong the service life of the battery if used as a portable transmitter or rearming the unit if it should be activated for any reason.

NOTE

If the switch has been placed in the ON position for any reason, the OFF position has to be selected before selecting ARM. If ARM is selected directly from the ON position the transmitter will continue to transmit in the ARM position.

Attached to the unit is a portable antenna, provided so that the locator may be removed from the aircraft, in case of an emergency, and used as a portable signal transmitter.

The locator should be checked during the Ground Check to make certain the unit has not been accidently activated. Check by tuning a radio receiver to 121.5 MHz. If you hear an oscillating audio sound the locator may have been activated and should be turned off immediately. Reset to ARM position and check again to insure against outside interference.

*Optional eqiupment

OPERATING TIPS

OPERATING TIPS

The following Operating Tips are of particular value in the operation of the Seneca.

1. Learn to trim for take-off so that only a very light back pressure on the wheel is required to lift the airplane off the ground.
2. On take-off, do not retract the gear prematurely. The airplane may settle and make contact with the ground because of lack of flying speed, atmospheric conditions, or rolling terrain.
3. In high density areas where high traffic pattern speeds are necessary or when it is advantageous to extend the gear, it is permissible to extend the landing gear at speeds up to 150 MPH.
4. Flaps may be lowered at airspeeds up to 125 MPH. To reduce flap operating loads, it is desirable to have the airplane at a slower speed before extending the flaps.
5. Before attempting to reset any circuit breaker, allow a two to five minute cooling off period.
6. Always determine position of landing gear by checking the gear position lights.
7. Before starting the engine, check that all radio switches, light switches, and the pitot heat switch are in the off position so as not to create an overloaded condition when the starter is engaged.
8. A high fuel pressure indication on the fuel flow indicator is a possible sign of restricted fuel nozzles.
9. The vacuum gauge is provided to monitor the pressure available to assure the correct operating speed of the vacuum-driven gyroscopic flight instruments. It also monitors the condition of the common air filter by measuring the flow of air through the filter.

   If the vacuum gauge does not register 5" ± .10" Hg at 2000 RPM, the following items should be checked before flight:

   a. Common air filters, could be dirty or restricted.
   b. Vacuum lines, could be collasped or broken.
   c. Vacuum pumps, worn.
   d. Vacuum regulators, not adjusted correctly. The pressure, even though set correctly, can read lower under two conditions:
      (1) Very high altitude, above 12,000 feet.
      (2) Low engine RPM usually on approach or during training maneuvers. This is normal and should not be considered a malfunction.
10. The shape of the wing fuel tanks is such that in certain maneuvers the fuel may move away from the tank outlet. If the outlet is uncovered, the fuel flow will be interrupted and a temporary loss of power may result. Pilots can prevent inadvertent uncovering of the outlet by avoiding maneuvers which could result in uncovering the outlet.

    Extreme running turning takeoffs should be avoided as fuel flow interruption may occur.

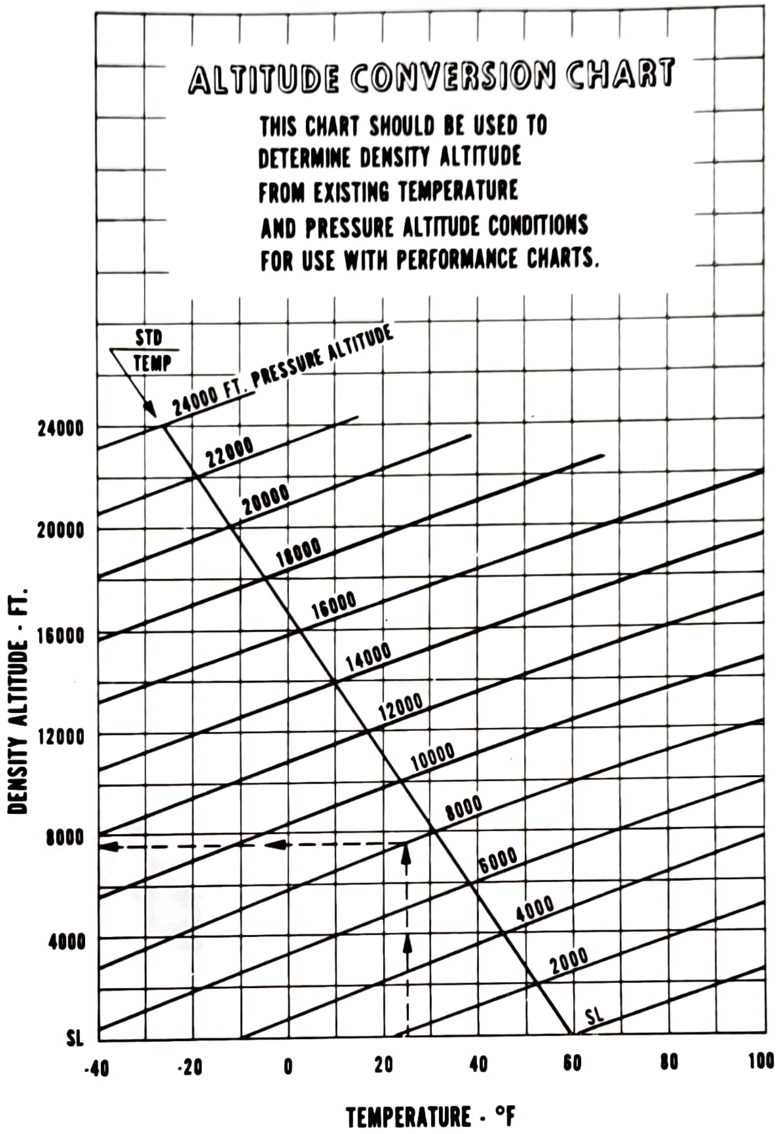
    Prolonged slips or skids which result in excess of 2000 feet of altitude loss, or other radical or extreme maneuvers which could cause uncovering of the fuel outlet must be avoided as fuel flow interruption may occur when tank being used is not full.
11. The rudder pedals are suspended from a torque tube which extends across the fuselage. The pilot should become familiar with the proper positioning of his feet on the rudder pedals so as to avoid interference with the torque tube when moving the rudder pedals or operating the toe brakes.
12. Anti-collision lights should not be operating when flying through overcast and clouds, since reflected light can produce spacial disorientation. Do not operate strobe lights when taxiing in the vicinity of other aircraft.

13. In an effort to avoid accidents, pilots should obtain and study the safety related information made available in FAA publications such as regulations, advisory circulars, Aviation News, AIM and safety aids.
14. Sluggish RPM control and propeller overspeed with poor RPM recovery after rapid throttle application are indications that nitrogen pressure in the propeller dome is low.
15. Experience has shown that the training advantage gained by pulling a mixture control or turning off the fuel to simulate engine failure at low altitude is not worth the risk assumed. Therefore, it is recommended that instead of using either of these procedures to simulate loss of power at low altitude, the throttle be retarded slowly to idle position. Fast reduction of power may be harmful to the engine.

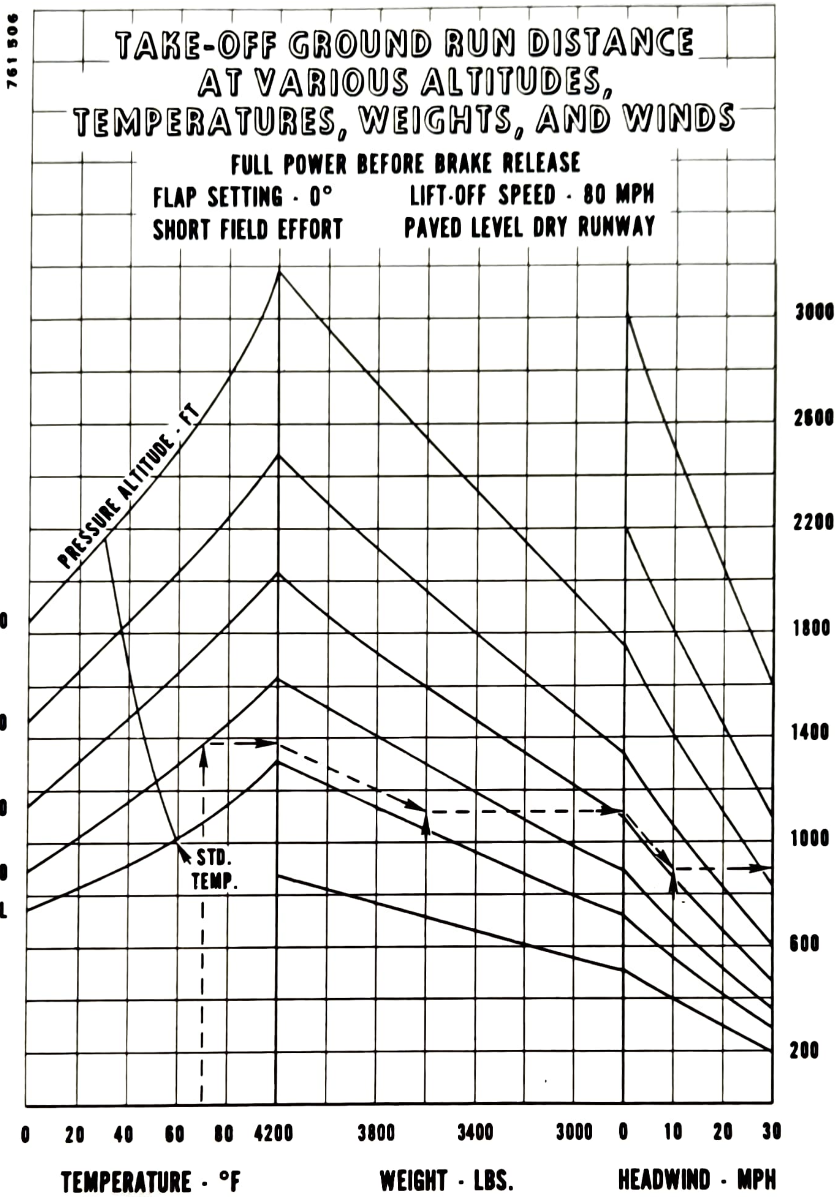
PERFORMANCE CHARTS

WARNING

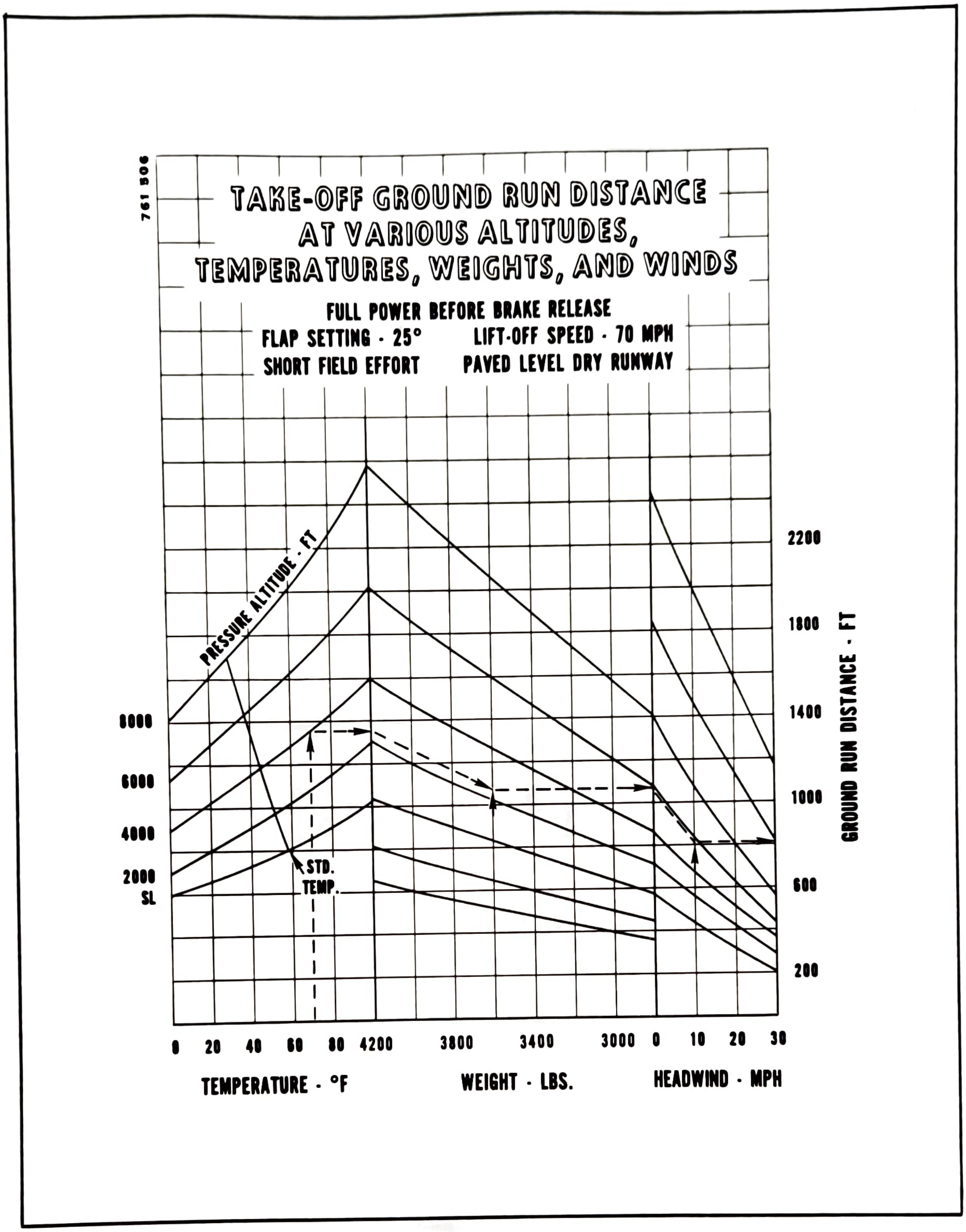
Performance information derived by extrapolation beyond the limits shown on the charts should not be used for flight planning purposes.



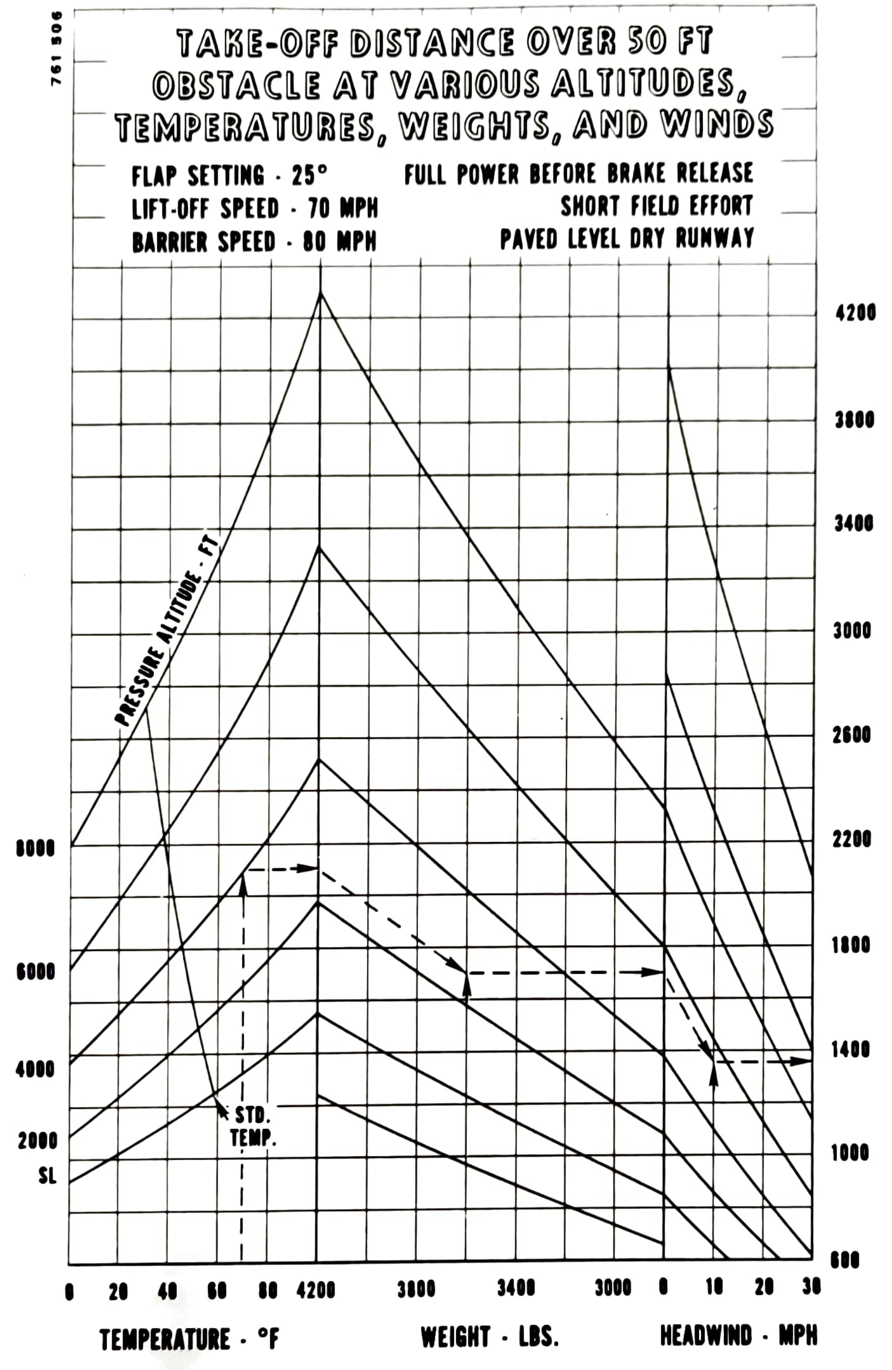
Example: Temp. 25° F   Press. Alt. 8000 Ft.
Density Alt. 7500 Ft.



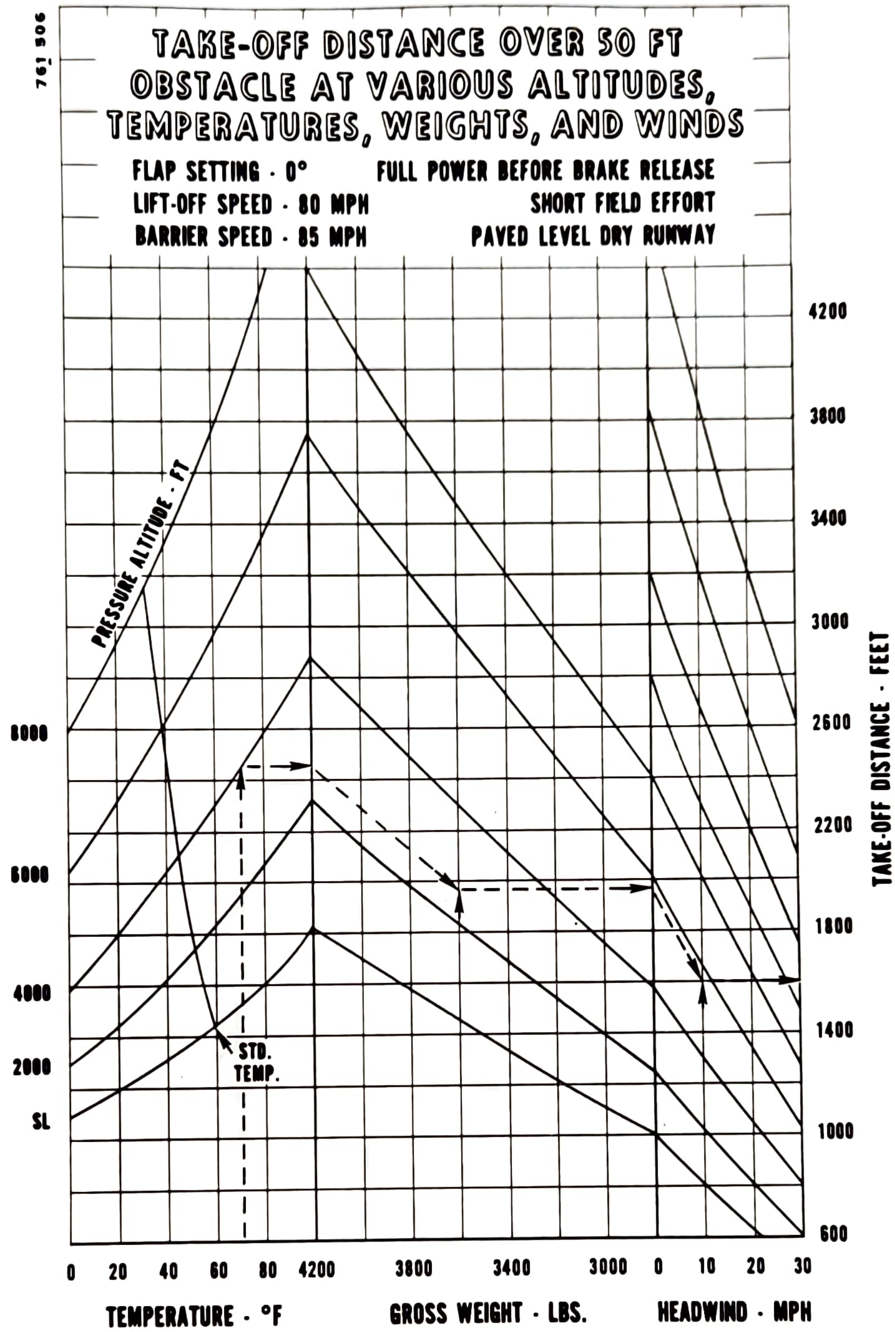
Example: Temp. 70° F
Press. Alt. 2000 Ft.
Wt. 3600 lbs.
Hd. wind 10 MPH
Ground run 900 ft



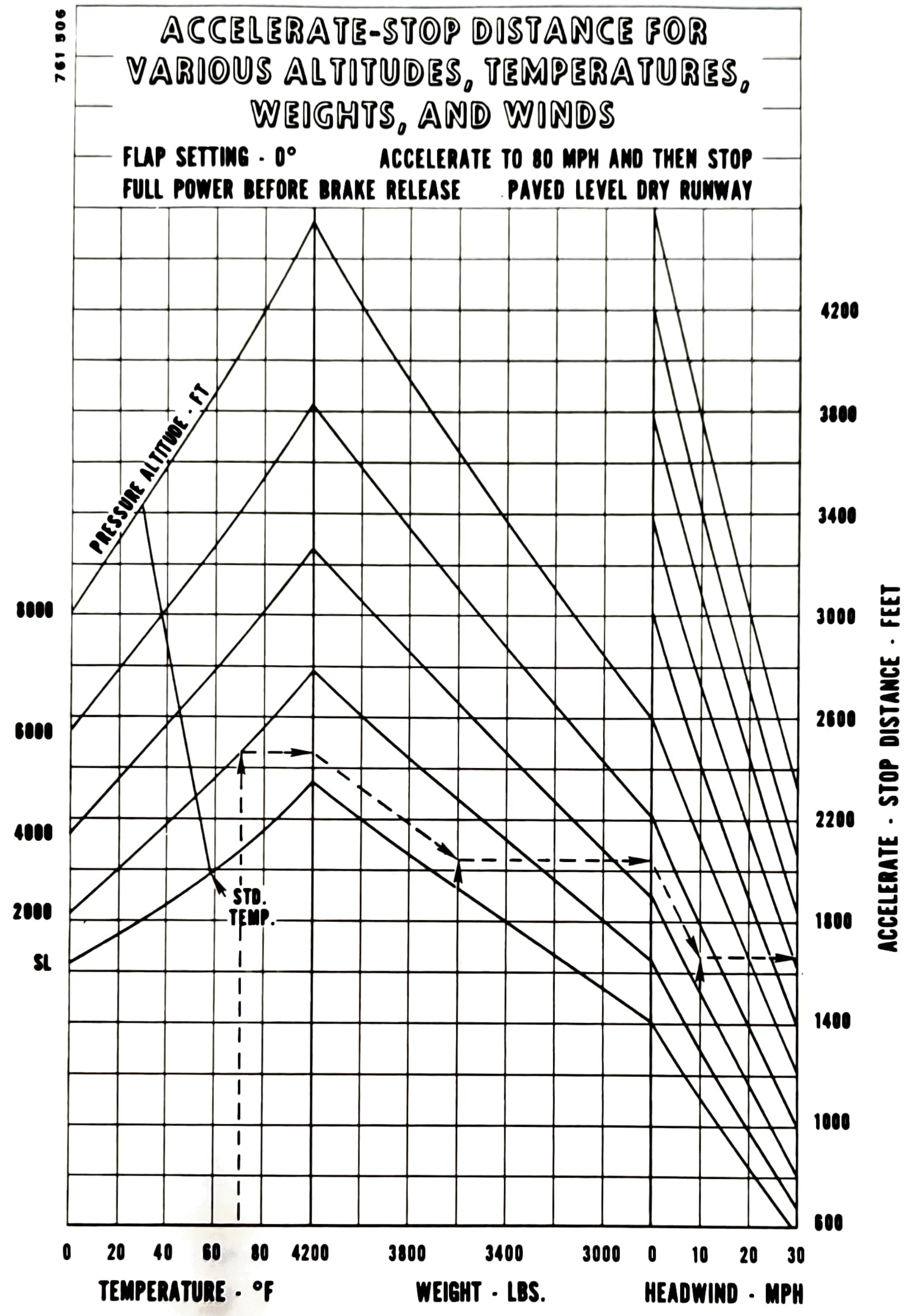
Example:	Temp. 70° F Press. Alt. 4000 ft	Wt. 3600 lbs Hd. wind 10 MPH	Ground Run 810 ft



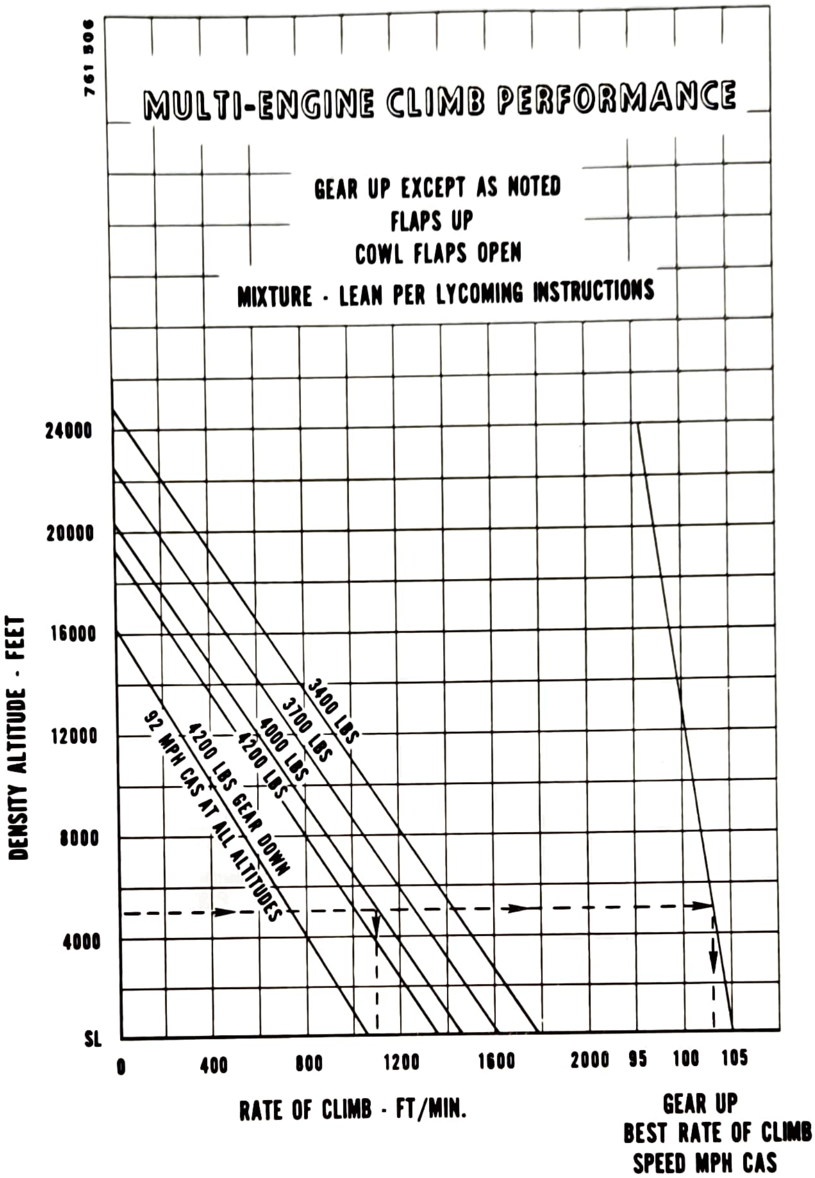
Example:	Temp. 70° F	Wt. 3600 lbs	T. O. Dist. 1350 ft
	Press. Alt. 4000 ft	Hd. wind 10 MPH	



Example:	Temp. 70° F Press. Alt. 4000 ft	Wt. 3600 lbs Hd. wind 10 MPH	T. O. Dist. 1600 ft

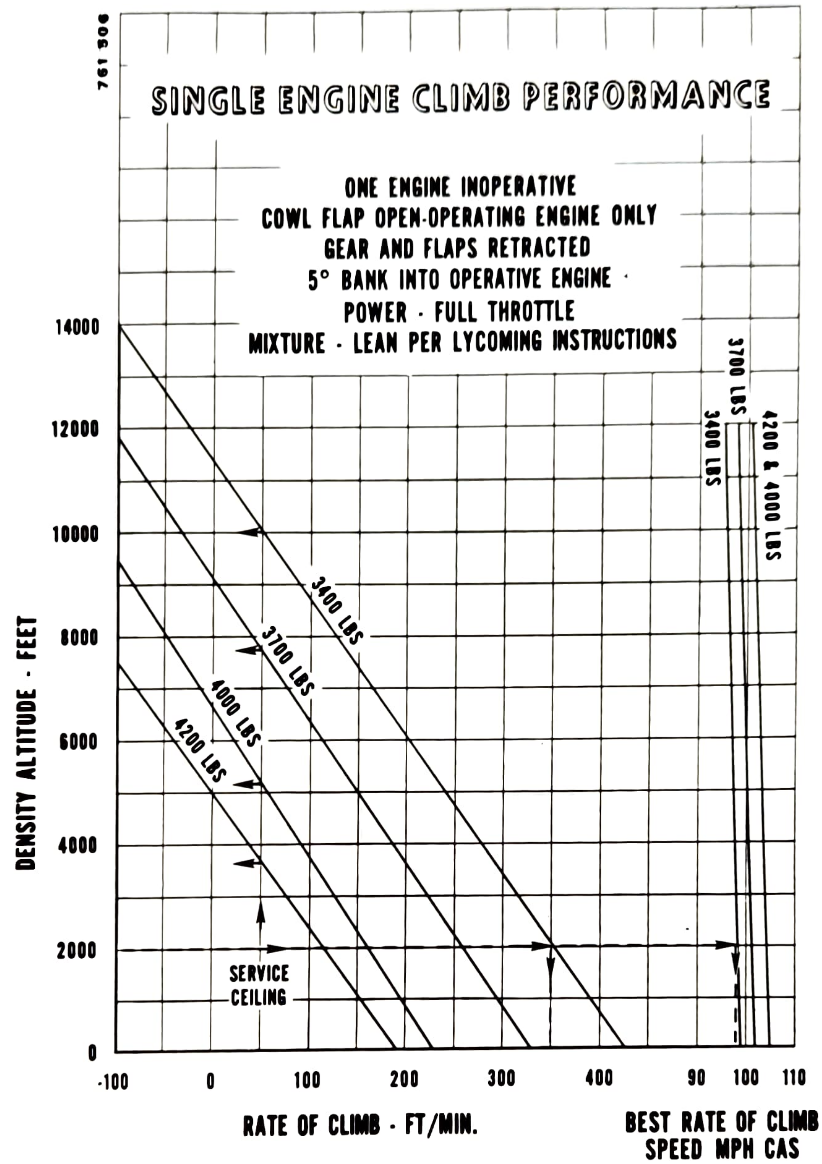


Example: Temp. 70° F Wt. 3600 lbs Accel. - Stop Dist. 1650 ft
Press. Alt. 2000 ft Hd. wind 10 MPH

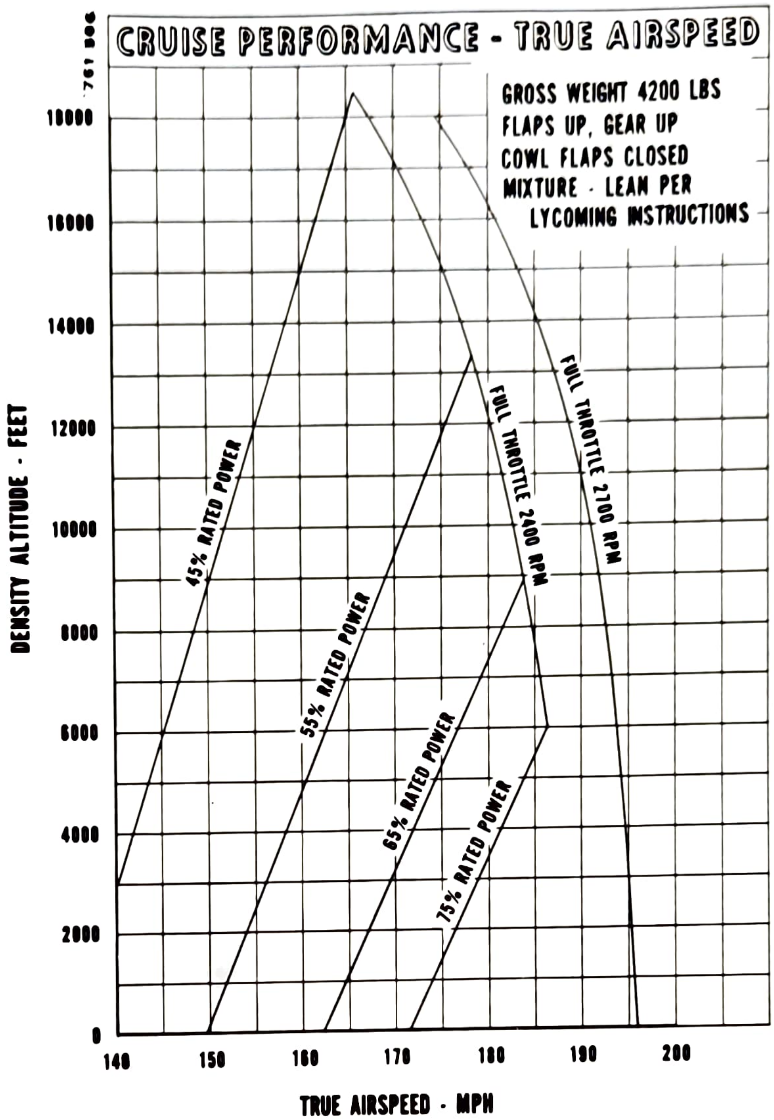


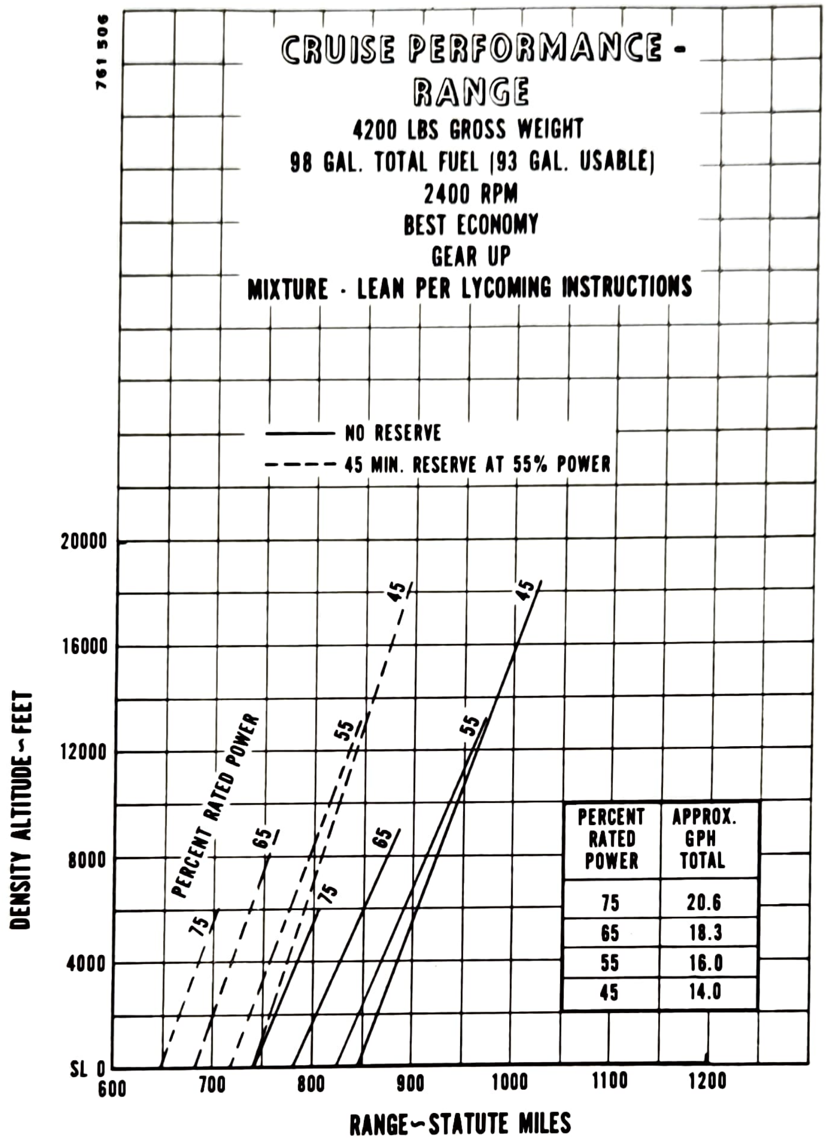
*Gear down best rate of climb speed is 92 MPH CAS at all altitudes.

Example:	Wt. 4000 lbs	Rate of Climb 1100 ft/min
	Den. Alt. 5000 ft	Best R/C Speed 103 MPH
	(Gear Up)	

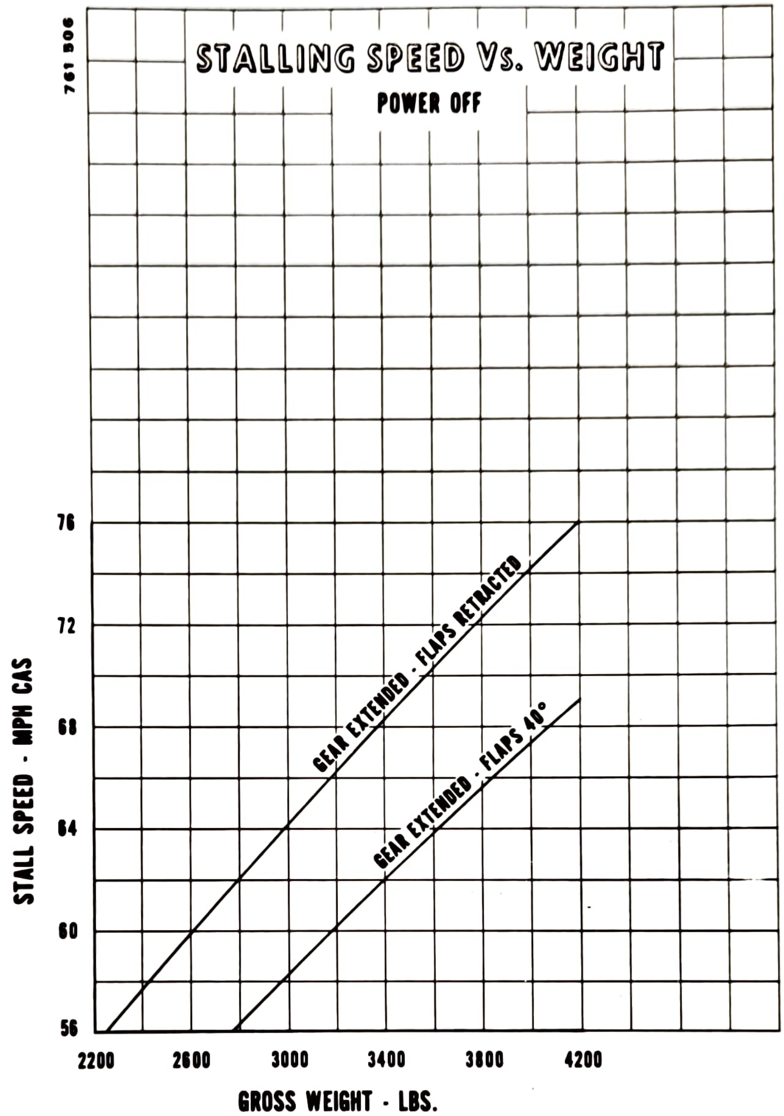


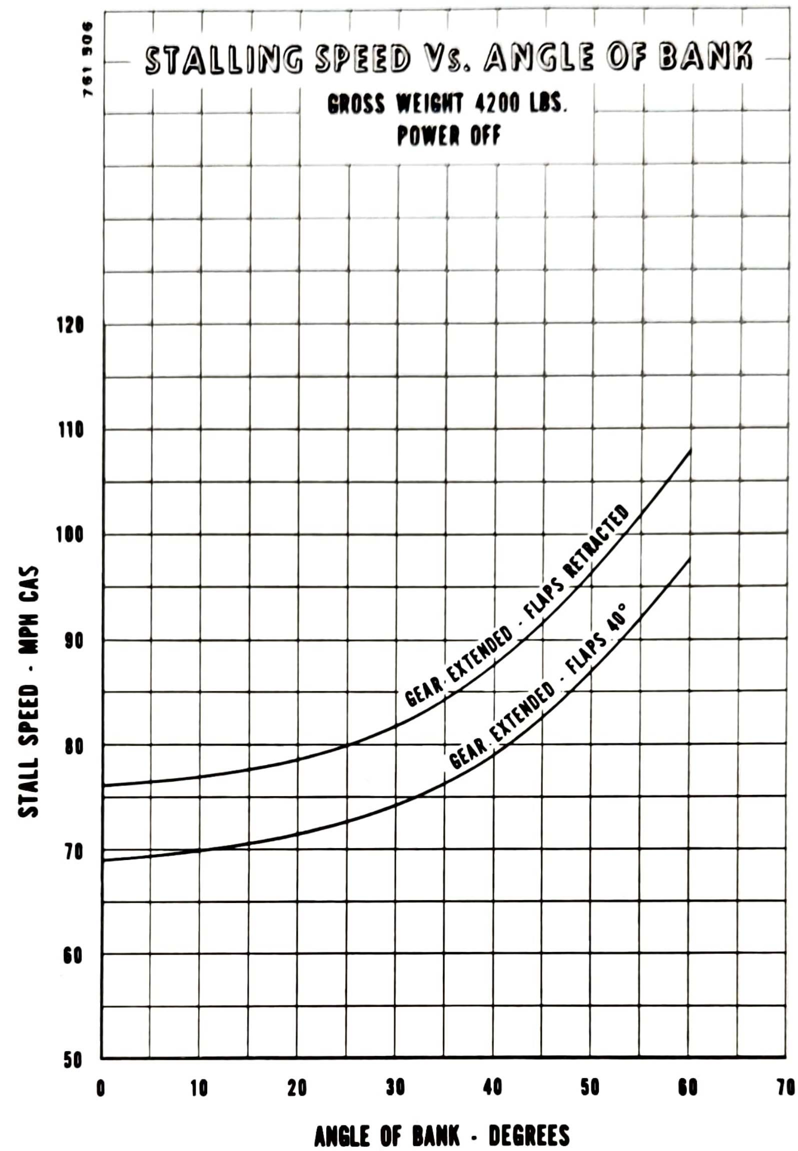
Example:	Wt. 3400 lbs	Rate of Climb 350 ft/min
	Den. Alt. 2000 ft	Best R/C Speed 98 MPH

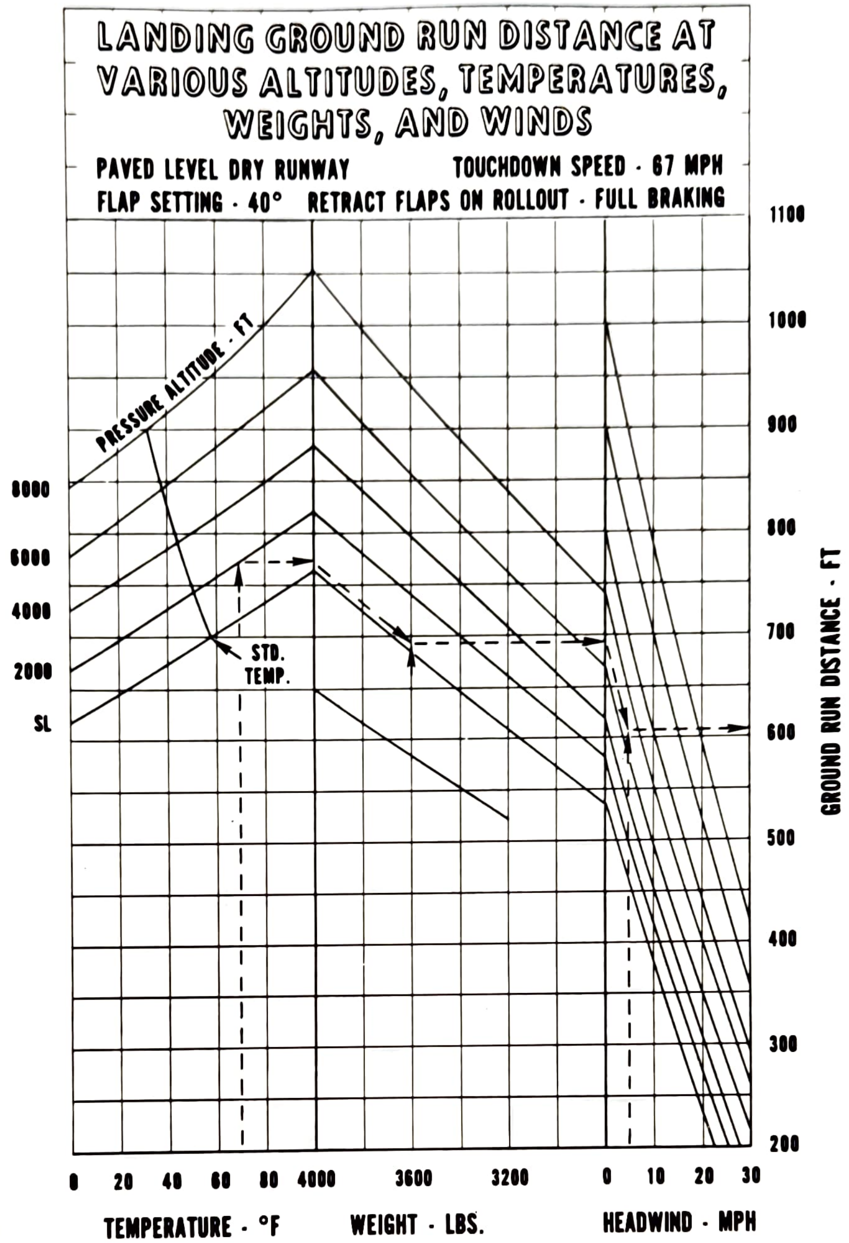

CRUISE PERFORMANCE - TRUE AIRSPEED
GROSS WEIGHT 4200 LBS
FLAPS UP, GEAR UP
COWL FLAPS CLOSED
MIXTURE - LEAN PER
LYCOMING INSTRUCTIONS
DENSITY ALTITUDE - FEET
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
45% RATED POWER
55% RATED POWER
65% RATED POWER
75% RATED POWER
FULL THROTTLE 2400 RPM
FULL THROTTLE 2700 RPM
140
150
160
170
180
190
200
TRUE AIRSPEED - MPH



PERCENT RATED POWER	APPROX. GPH TOTAL
75	20.6
65	18.3
55	16.0
45	14.0

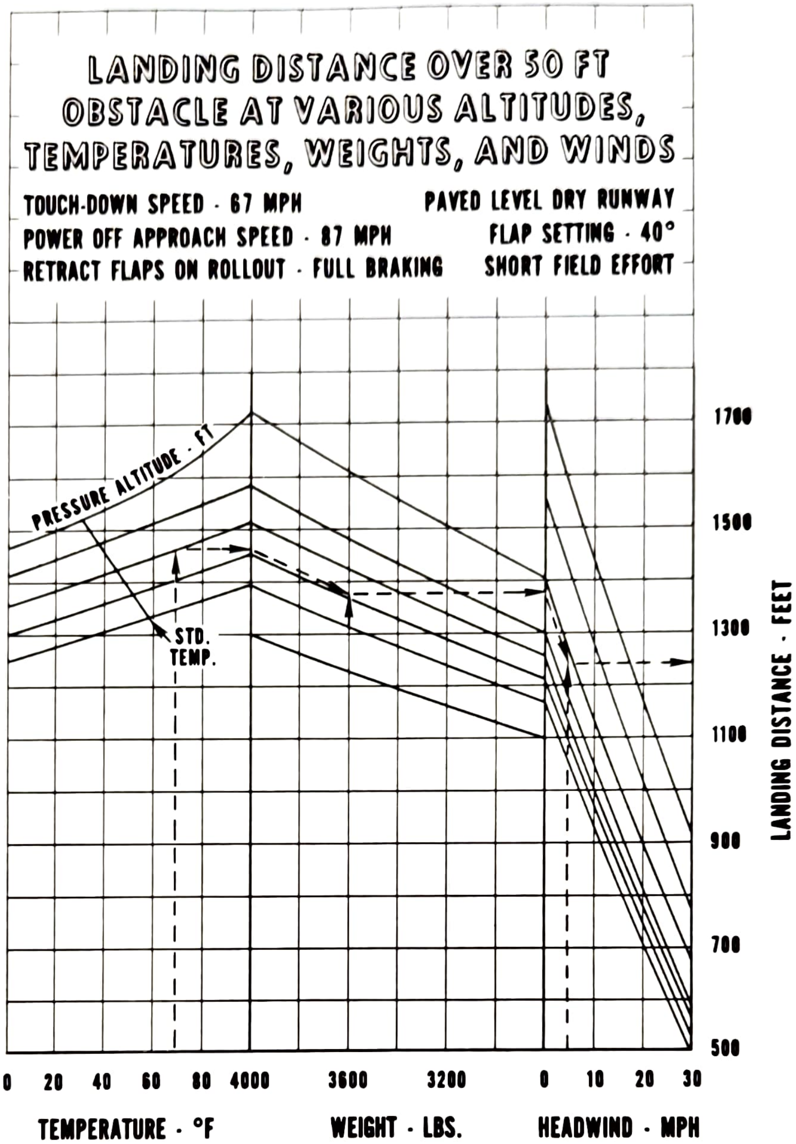

761 506
STALLING SPEED Vs. WEIGHT
POWER OFF
GEAR EXTENDED - FLAPS RETRACTED
GEAR EXTENDED - FLAPS 40°
STALL SPEED - MPH CAS
76
72
68
64
60
56
2200
2600
3000
3400
3800
4200
GROSS WEIGHT - LBS.


761 506
STALLING SPEED Vs. ANGLE OF BANK
GROSS WEIGHT 4200 LBS.
POWER OFF
GEAR EXTENDED - FLAPS RETRACTED
GEAR EXTENDED - FLAPS 40°
STALL SPEED - MPH CAS
50
60
70
80
90
100
110
120
0
10
20
30
40
50
60
70
ANGLE OF BANK - DEGREES



NOTE: The above distances may be reduced by approximately 25% when the aircraft is equipped with optional Heavy Duty Wheels, Brakes and Tires. (Reference Aircraft Equipment List in Weight and Balance Section of this Manual.)

Example:	Temp. 70° F	Wt. 3600 lbs	Ground Run 615 ft
	Press. Alt. 2000 ft	Hd. wind 5 MPH	



NOTE: The above distances may be reduced by approximately 12% when the aircraft is equipped with optional Heavy Duty Wheels, Brakes and Tires. (Reference Aircraft Equipment List in Weight and Balance Section of this Manual.)

Example:	Temp. 70° F	Wt. 3600 lbs.	Landing Dist. 1240 ft
	Press. Alt. 4000 ft	Hd. wind 5 MPH	

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Power Setting Table - Lycoming Model IO-360-C Series, 200 HP Engine

Press. Alt Feet	Std. Alt Temp °F	110 HP – 55% Rated RPM AND MAN. PRESS. 2100	2400	130 HP – 65% Rated RPM AND MAN. PRESS. 2100	2400	150 HP – 75% Rated RPM AND MAN. PRESS. 2400	Press. Alt Feet
SL	59	22.9	20.4	25.9	22.9	25.5	SL
1,000	55	22.7	20.2	25.6	22.7	25.2	1,000
2,000	52	22.4	20.0	25.4	22.5	25.0	2,000
3,000	48	22.2	19.8	25.1	22.2	24.7	3,000
4,000	45	21.9	19.5	24.8	22.0	24.4	4,000
5,000	41	21.7	19.3	FT	21.7	FT	5,000
6,000	38	21.4	19.1	--	21.5	--	6,000
7,000	34	21.2	18.9	--	21.3	--	7,000
8,000	31	21.0	18.7	--	21.0		8,000
9,000	27	FT	18.5	--	FT		9,000
10,000	23	--	18.3				10,000
11,000	19	--	18.1				11,000
12,000	16	--	17.8				12,000
13,000	12	--	17.6				13,000
14,000	9	--	FT				14,000

To maintain constant power, correct manifold pressure approximately 0.16" Hg for each 10° F variation in inlet air temperature from standard altitude temperature. Add manifold pressure for air temperatures above standard; subtract for temperatures below standard.

HANDLING AND SERVICING

HANDLING AND SERVICING

This section contains information on preventive maintenance. Refer to the Seneca Service Manual for further maintenance. Any complex repair or modification should be accomplished by a Piper Certified Service Center.

GROUND HANDLING

TOWING

The airplane may be moved by using the nose wheel steering bar provided, or power equipment that will not damage or cause excess strain to the nose gear assembly. The steering bar is stowed aft of the fifth and sixth seats.

CAUTION

When towing with power equipment, do not turn nose gear more than 20 degrees in either direction as this will result in damage to the nose gear and steering mechanism.

TAXIING

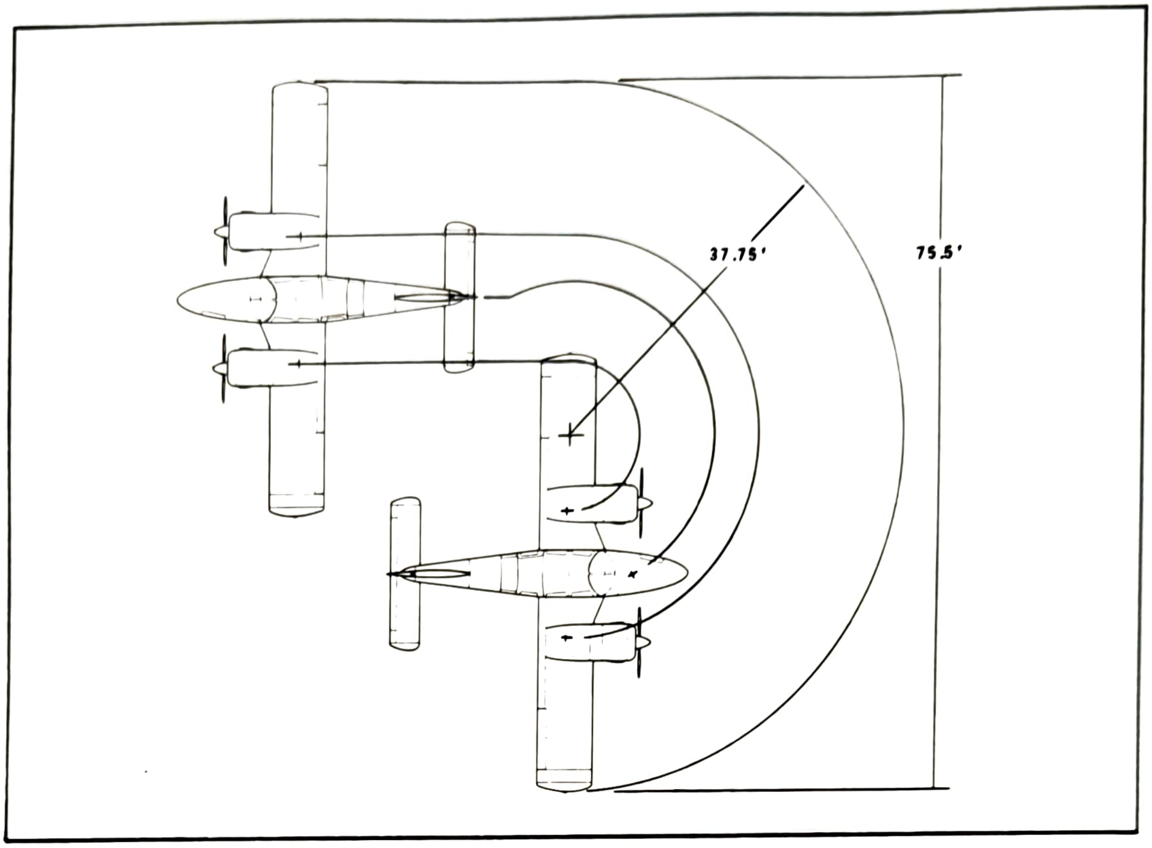
Before attempting to taxi the airplane, ground personnel should be checked out by a qualified pilot or other responsible person. Engine starting and shut-down procedures should be covered as well. When it is ascertained that the propeller back blast and taxi areas are clear, apply power to start the taxi roll and perform the following checks:

a. Taxi forward a few feet and apply brakes to determine their effectiveness.
b. Taxi with propeller set in low pitch, high RPM setting.
c. While taxiing, make slight turns to ascertain the effectiveness of steering.
d. Observe wing clearances when taxiing near buildings or other stationary objects. If possible, station a guide outside the airplane to observe.
e. When taxiing on uneven ground, look for holes and ruts.
f. Do not operate the engine at high RPM when running up or taxiing over ground containing loose stones, gravel or any loose material that may cause damage to the propeller blades.

PARKING

When parking the airplane, insure that it is sufficiently protected against adverse weather conditions and presents no danger to other aircraft. When parking the airplane for any length of time or overnight, it is recommended that it be moored securely.

a. To park the airplane, head it into the wind, if possible.
b. Set the parking brake.



Minimum Turning Radius

NOTE

Care should be taken when setting brakes that are overheated or during cold weather when accumulated moisture may freeze a brake.

MOORING

The airplane should be moored to insure its immovability, protection and security under varying weather conditions. The following procedure should be used for proper mooring of the airplane.

a. Head the airplane into the wind, if possible.
b. Lock the aileron and stabilator controls using the control wheel lock, or control surface blocks.
c. Block the wheels.
d. Secure tie-down ropes to the wing tie-down rings and the tail skid at approximately 45-degree angles to the ground.

CAUTION

Use bowline knots. Do not use slip knots.

NOTE

Additional preparations for high winds include using tie-down ropes from the landing gear forks, and securing the rudder.

e. Install pitot tube cover, if possible.

CLEANING

CLEANING ENGINE COMPARTMENT

Before cleaning the engine compartment, place a strip of tape on the magneto vents to prevent any solvent from entering these units.

a. Place a large pan under the engine to catch waste.
b. With the engine cowling removed, spray or brush the engine with solvent or a mixture of solvent and degreaser, as desired. It may be necessary to brush areas that were sprayed where heavy grease and dirt deposits have collected in order to clean them.

CAUTION

Do not spray solvent into the alternator, vacuum pump, starter or air intakes.

c. Allow the solvent to remain on the engine from five to ten minutes. Then rinse the engine clean with additional solvent and allow to dry.

CAUTION

Do not operate engine until excess solvent has evaporated or otherwise been removed.

d. Remove the protective covers from the magnetos.
e. Lubricate controls, bearing surfaces, etc., per Lubrication Chart.

CLEANING LANDING GEAR

Before cleaning the landing gear, place a plastic cover or similar material over the wheel and brake assembly.

a. Place a pan under the gear to catch waste.
b. Spray or brush the gear area with solvent or a mixture of solvent and degreaser, as desired. It may be necessary to brush areas that were sprayed where heavy grease and dirt deposits have collected in order to clean them.
c. Allow the solvent to remain on the gear from five to ten minutes. Then rinse the gear with additional solvent and allow to dry.
d. Remove the cover from the wheel and remove the catch pan.
e. Lubricate the gear per Lubrication Chart.
f. Caution: Do not brush the micro switches.

CLEANING EXTERIOR SURFACES

The airplane should be washed with a mild soap and water. Harsh abrasive or alkaline soaps or detergents used on painted or plastic surfaces could make scratches or cause corrosion of metal surfaces. Cover areas where cleaning solution could cause damage. To wash the airplane, the following procedure may be used:

a. Flush away loose dirt with water.
b. Apply cleaning solution with a rag, sponge or soft bristle brush.
c. To remove stubborn oil and grease, use a cloth dampened with naphtha.
d. Where exhaust stains exist, allow solution to remain on the surface longer.
e. Any good automotive wax may be used to preserve the painted surfaces. Soft cleaning cloths or a chamois should be used to prevent scratches when cleaning or polishing. A heavier coating of wax on the leading surfaces will reduce the abrasion problems in these areas.

CLEANING WINDSHIELD AND WINDOWS

a. Remove dirt, mud, and other marks from exterior surface with clean water.
b. Wash with mild soap and warm water or an aircraft plastic cleaner. Use a soft cloth or sponge using a straight rubbing motion. Do not rub surface harshly.
c. Remove oil and grease with a cloth moistened with kerosene.

NOTE

Do not use gasoline, alcohol, benzene, carbon tetrachloride, thinner, acetone, or window cleaning sprays.

d. After cleaning plastic surfaces, apply a thin coat of hard polishing wax. Rub lightly with a soft cloth. Do not use a circular motion.
e. A severe scratch or mar in plastic can be removed by using jeweler's rouge to rub out the scratch. Smooth both sides and apply wax.

CLEANING HEADLINER, SIDE PANELS AND SEATS

a. Clean headliner, side panels and seats with a stiff bristle brush, and vacuum where necessary.
b. Soiled upholstery, except leather, may be cleaned by using an approved foam upholstery cleaner. Carefully follow the manufacturer's instructions. Avoid soaking or harsh rubbing.

CAUTION

Solvent cleaners require adequate ventilation.

CLEANING CARPETS

Use a small whisk broom or vacuum to remove dirt. For soiled spots, use a non-inflammable dry cleaning fluid.

POWER PLANT INDUCTION AIR FILTER

The induction air filters must be cleaned at least once very 50 hours. Depending on the type of condition existing, it may be necessary to clean the filters more often.

REMOVAL OF INDUCTION AIR FILTER

a. Open the outboard section of the cowling to gain access to the air filter box.
b. Turn the three studs and remove the air filter box cover.
c. Lift the air filter from the filter box.

CLEANING INDUCTION AIR FILTER

a. Tap filter gently to remove dirt particles. Do not use compressed air or cleaning solvents.
b. Inspect filter. If paper element is torn or ruptured or gasket is damaged, the filter should be replaced. The usable life of the filter should be restricted to one year or 500 hours, whichever comes first.

INSTALLATION OF INDUCTION AIR FILTER

a. Place filter in air box and install cover.
b. Secure cover by turning studs. Close cowl.

BRAKE SERVICE

The brake system is filled with MIL-H-5606 (petroleum base) hydraulic brake fluid. This should be checked periodically or at every 100-hour inspection and replenished when necessary. The brake reservoir is located to the rear of the front baggage compartment. Remove the access panel marked "Brake Reservoir Behind" located at the top rear of the compartment. Keep the fluid level at the level marked on the reservoir.

No adjustment of brake clearance is necessary. Refer to Aircraft Service Manual for replacing brake linings.

LANDING GEAR SERVICE

Two jack points are provided for jacking the aircraft for servicing. One is located outboard of each main landing gear and one just aft of the nose gear.

Landing gear oleos should be serviced according to instruction on the units. The main oleo struts should be exposed three and one half inches and the nose oleo strut should be exposed two and one half inches in the static position. Refer to Aircraft Service Manual for servicing oleo struts.

PROPELLER SERVICE

The gas charge in the propeller cylinder should be kept at the pressure specified on the placard located in the spinner cap. The pressure in the cylinder will increase about one-third psi for every degree Fahrenheit increase in temperature. This effect should be considered when checking pressure. The charge maintained must be accurate and free of excessive moisture since moisture may freeze the piston during cold weather. Dry nitrogen gas is recommended.

CHAMBER PRESSURE REQUIREMENTS
WITH TEMPERATURE FOR COUNTERWEIGHT TYPE PROPELLERS

Temp. °F	Press. (PSI)	Temp. °F	Press. (PSI)
100	86	30	72
90	84	20	70
80	82	10	68
70	80	0	66
60	78	-10	64
50	76	-20	62
40	74	-30	60

NOTE: Do not check pressure or charge with propeller in feather position.

OIL REQUIREMENTS

The oil capacity of the Lycoming engines is 8 quarts with a minimum safe quantity of 2 quarts. It is recommended that engine oil be drained and renewed every 50 hours or sooner under unfavorable conditions. Intervals between oil changes can be increased as much as 100% on engines equipped with full flow cartridge type oil filters provided the element is replaced each 50 hours of operation. The following grades are required for temperatures:

Temperatures above 60° F	S.A.E. 50
Temperatures between 30° F and 90° F	S.A.E. 40
Temperatures between 0° F and 70° F	S.A.E. 30
Temperatures below 10° F	S.A.E. 20

FUEL SYSTEM

The fuel screens in the strainers require cleaning at 50 hour or 90 day intervals, whichever first occurs. The fuel gascolator strainers are located between the fuel selector valves and the auxiliary boost pumps in the nacelles. The fuel injector screen is located in the housing where the fuel inlet line connects to the injector. This screen should be cleaned every 50 hours of operation.

FUEL REQUIREMENTS

A minimum octane of 100/130 Aviation Grade fuel must be used in the Seneca. Since the use of lower grades of fuel can cause serious damage in a short period of time, the engine warranty is invalidated by use of lower octanes.

FILLING FUEL TANKS

Observe all required precautions for handling gasoline. Fill the fuel tanks to the bottom of the filler neck with 100/130 octane fuel. Each wing holds a maximum of 49 gallons giving a total of 98 gallons of fuel.

DRAINING FUEL VALVES AND LINES

Each gascolator strainer is provided with a quick drain which should be drained before the first flight of the day or after refueling, to check for fuel contamination. If contamination is found, fuel should be drained until the contamination stops. If contamination persists after draining fuel for a minute, contact a mechanic to check the fuel system.

Each fuel tank is provided with a fuel quick drain to check for contamination. Each tank should be checked for contamination in accordance with the above procedure. Crossfeed drains are located on the bottom of the fuselage inboard of the right flap.

DRAINING FUEL SYSTEM

The bulk of the fuel may be drained from the fuel cells by the use of a siphon hose placed in the cell or tank through the filler neck. The remainder of the fuel may be drained by opening all the drain valves.

TIRE INFLATION

For maximum service from the tires, keep them inflated to the proper pressure of 31 psi for nose tire and 53 psi for main tires. Interchange the tires periodically for even wear. All wheels and tires are balanced before original installation, and the relationship of tire, tube and wheel should be maintained upon reinstallation. In the installation of new components, it may be necessary to rebalance the wheels with the tires mounted. Out of balance wheels can cause extreme vibration in the landing gear.

BATTERY SERVICE

Access to the 12-volt 35 ampere hour battery is gained through the nose baggage compartment. It is located just forward of the nose baggage compartment. The battery container has a plastic drain tube which is normally closed off.

The battery fluid level must not be brought above the baffle plates. It should be checked every 30 days to determine that the fluid level is proper and the connections are tight and free of corrosion.

If the battery is not properly charged, recharge it starting with a rate of 4 amperes and finishing with a rate of 2 amperes. Quick charges are not recommended.

The external power receptacle, if installed, is located on the left side of the nose section. Be sure that master switch is off while inserting or removing a plug at this receptacle.

Refer to Aircraft Service Manual for servicing battery.

MAINTENANCE ADVICE TO OWNERS

Proper maintenance and servicing of the Seneca will ensure that it stays in good condition to provide years of satisfactory performance. It is usually best to have aircraft maintenance performed at an authorized Piper Service Center because such a shop has the tools, Service Manuals, parts and training to do the work properly. If the work is done elsewhere, be sure the mechanic uses a Piper Inspection Report form for the Seneca and a Seneca Service Manual. These are available from Piper dealers and distributors. When maintenance or repair work is done on the aircraft, the owner should make sure that the mechanic makes a complete and accurate record of the work performed, in the aircraft or engine log book.

Preventive maintenance is the key to dependable service. Every airplane must have an annual inspection by an FAA-authorized inspector. In addition, if the airplane is to be used commercially it must have an inspection every 100 hours. The Inspection Report form for the Seneca lists inspection and maintenance which should be performed every 50 hours in addition to items to be covered at 100 hours, 500 hours and 1000 hours.

When parts must be replaced, they should be replaced with Piper parts. Bogus parts, which are not exactly like or equivalent to the originals, are often less expensive than genuine parts. These may be made of a poor substitute material, they may not be properly heat treated, or dimensions may differ slightly. Because it is possible for a bogus part to look just like the real one and still be deficient, it is important to use only genuine Piper parts when servicing the Seneca.

The FAA occasionally publishes Airworthiness Directives, which are mandatory and should be complied with promptly. Piper Aircraft Corporation takes a continuing interest in having the owner get the most efficient use from his aircraft and in keeping it in the best mechanical condition. From time to time Piper issues Service Bulletins, Service Letters and Service Spares Letters relating to the aircraft. The Service Bulletins are of special importance and should be complied with promptly. Service Letters deal with product improvements and careful attention should be given to Service Letter information. The Service Spares Letters offer improved parts and operations which may be of interest to an owner.

From time to time, supplements to the Operating Manual will be distributed by the manufacturer. These revisions and additions should be studied and put into the Operating Manual.

If the owner desires to modify the aircraft, he must obtain FAA approval for the change. Minor changes may be accomplished by a mechanic who records and approves the change on an FAA Form 337, but major changes must be accomplished under a Supplemental Type Certificate (STC).

TYPE OF LUBRICANT

IDENTIFICATION LETTER	SPECIFICATION	LUBRICANT
A	MIL-L-7870	LUBRICATING OIL, GENERAL PURPOSE, LOW TEMPERATURE
B	MIL-L-6082 7	LUBRICATING OIL, AIRCRAFT RECIPROCATING ENGINE (PISTON) GRADE AS SPECIFIED SAE 50 ABOVE 60°F AIR TEMP. SAE 40 30° TO 90°F AIR TEMP. SAE 30 0° TO 70°F AIR TEMP. SAE 20 BELOW 10°F AIR TEMP.
C	MIL-H-5606 (NONE)	HYDRAULIC FLUID, PETROLEUM BASE (OR UNIVIS - 40 OR MOBIL AERO-HF).
D	MIL-G-23827	GREASE, AIRCRAFT AND INSTRUMENT, GREASE AND ACTUATOR SCREW
E		TEXACO MARFAX ALL PURPOSE GREASE OR MOBIL MOBIL GREASE 77 (OR MOBIL EP2 GREASE)
F	MIL-L-7711	GREASE - LUBRICATION, GENERAL PURPOSE, AIRCRAFT
G		FLUOROCARBON RELEASE AGENT DRY LUBRICANT #MS-122 (PURCH)
H		AERO LUBRIPLATE (PURCH) FISKE BROS. REFINING CO.

SPECIAL INSTRUCTIONS

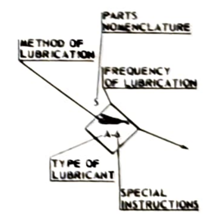
1. AIR FILTER - TO CLEAN FILTER, TAP GENTLY TO REMOVE DIRT PARTICLES. DO NOT BLOW OUT WITH COMPRESSED AIR OR USE OIL. REPLACE FILTER IF PUNCTURED OR DAMAGED.
2. BEARING AND BUSHINGS - CLEAN EXTERIOR WITH A DRY TYPE SOLVENT BEFORE LUBRICATING.
3. WHEEL BEARINGS - DISASSEMBLE AND CLEAN WITH A DRY TYPE SOLVENT. ASCERTAIN THAT GREASE IS PACKED BETWEEN THE BEARING ROLLER AND CONE. DO NOT PACK GREASE IN WHEEL HOUSING.
4. OLEO STRUTS, HYDRAULIC PUMP RESERVOIR AND BRAKE RESERVOIR - FILL PER INSTRUCTIONS ON UNIT OR CONTAINER, OR REFER TO SERVICE MANUAL.
5. PROPELLER - REMOVE ONE OF THE TWO GREASE FITTINGS FOR EACH BLADE. APPLY GREASE THROUGH FITTING UNTIL FRESH GREASE APPEARS AT HOLE OF REMOVED FITTING.
6. LUBRICATION POINTS - WIPE ALL LUBRICATION POINTS CLEAN OF OLD GREASE, OIL, DIRT, ETC. BEFORE LUBRICATING.

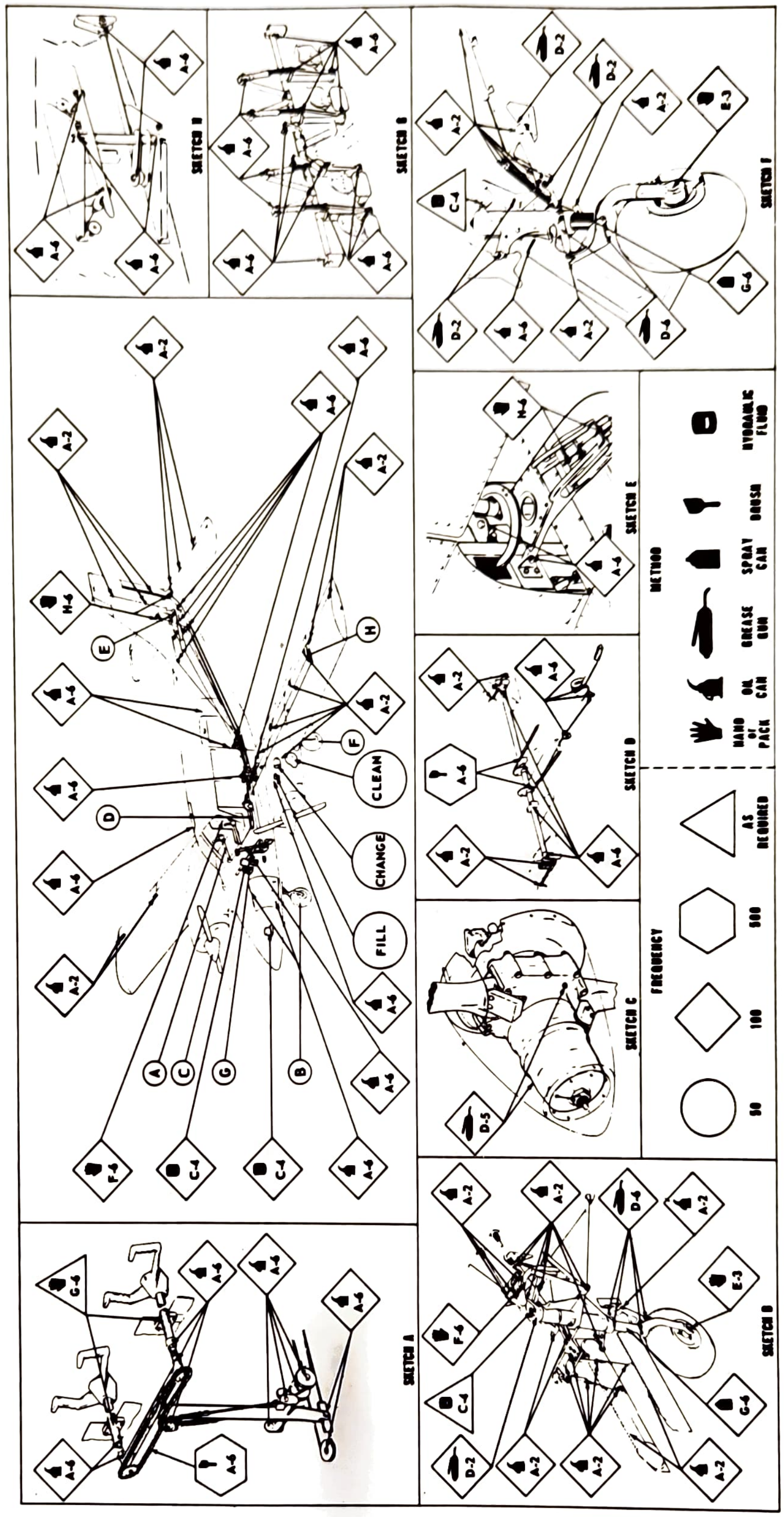
NOTES

1. PILOT AND PASSENGER SEATS - LUBRICATE TRACK ROLLERS AND STOP PINS AS REQUIRED (TYPE OF LUBRICANT: "A")
2. WHEEL BEARINGS REQUIRE CLEANING AND REPACKING AFTER EXPOSURE TO AN ABNORMAL QUANTITY OF WATER.
3. SEE LYCOMING SERVICE INSTRUCTIONS NO. 1014 FOR USE OF DETERGENT OIL.
4. FUEL SYSTEM - SERVICE REGULARLY - FUEL PUMP STRAINER INJECTOR SCREEN - FILTER BOWL - QUICK DRAIN UNIT.
5. BATTERY - FLUID LEVEL & CONDITION CHECK EVERY 25 HOURS
6. MIL-C-6529 TYPE 2/OIL IS THE OIL THE ENGINE IS SERVICED WITH AT INSTALLATION. THE ENGINE MUST OPERATE ON THIS OIL 25 HOURS MINIMUM, 50 HOURS MAXIMUM. (SEE LYCOMING SERVICE LETTER NO. L121A)
7. THIS CHART IS FOR INITIAL FACTORY LUBRICATION AND SERVICE.

CAUTIONS

1. DO NOT USE HYDRAULIC FLUID WITH A CASTOR OIL OR ESTER BASE.
2. DO NOT OVER-LUBRICATE COCKPIT CONTROLS.
3. DO NOT APPLY LUBRICANT TO RUBBER PARTS.
4. DO NOT LUBRICATE CABLES - THIS CAUSES SLIPPAGE.




SKETCH A
SKETCH B
SKETCH C
SKETCH D
SKETCH E
SKETCH F
SKETCH G
SKETCH H
CLEAN
CHANGE
FILL
FREQUENCY
50
100
500
AS REQUIRED
METHOD
HAND OR PACK
OIL CAN
GREASE GUN
SPRAY CAN
BRUSH
HYDRAULIC FLUID

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FAA Approved
AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for the
GARMIN G5 ELECTRONIC FLIGHT INSTRUMENT
as installed in

PIPER PA 34-200
Make and Model Airplane

Registration Number: N4542T Serial Number: 34-7250128

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped in accordance with Supplemental Type Certificate SA01818WI for the installation and operation of the Garmin G5 Electronic Flight Instrument. This document must be carried in the airplane at all times.

The information contained herein supplements or supersedes the information made available to the operator by the aircraft manufacturer in the form of clearly stated placards or markings, or in the form of an FAA approved Airplane Flight Manual, only in those areas listed herein. For limitations, procedures and performance information not contained in this document, consult the basic placards or markings, or the basic FAA approved Airplane Flight Manual.

FAA APPROVED BY: ______________________

Robert Murray
ODA STC Unit Administrator
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ODA-240087-CE

DATE: 12/20/2017

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or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
GARMIN G5 ELECTRONIC FLIGHT INSTRUMENT

REV NO.	PAGE NO(S)	DESCRIPTION	DATE OF APPROVAL	FAA APPROVED
1	ALL	Original Issue	7/22/2016	Robert Murray ODA STC Unit Administrator
2	ALL	Added information regarding G5 DG/HSI.	4/28/2017	Robert Murray ODA STC Unit Administrator
3	ALL	Added interface to 3rd party autopilots.	10/18/2017	Robert Murray ODA STC Unit Administrator
4	ALL	Added note to General section.	10/26/17	Paul Mast ODA STC Unit Administrator
5	ALL	Reformatted document. Updated system messages interface. Added DG/HSI reversion description.	See Cover	See Cover

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Table of Contents

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SECTION 1 – GENERAL

The G5 Electronic Flight Instrument can display the following information to the pilot depending on the installation and location of the G5 instrument:

- Primary attitude
- Primary slip and turn rate information
- Primary heading
- Secondary airspeed
- Secondary altimeter
- Secondary ground track

When installed in place of the attitude indicator, the primary function of the G5 is to provide attitude information to the pilot. When installed in place of the rate of turn indicator, the primary function of the G5 is to provide turn rate and slip ball information to the pilot. When installed in place of the directional gyro, the primary function of the G5 is to provide directional information to the pilot.

NOTE:

The pilot is reminded to perform appropriate flight and navigation instrument cross checks for the type of operation being conducted.

In case of a loss of aircraft electrical power, a backup battery (optional when installed as a DG/HSI) sustains the G5 Electronic Flight Instrument for up to four hours.

An optional GAD 29B may be installed to provide course and heading datum to an autopilot based on the data selected for display on the HSI.

Abbreviations and Terminology

The following glossary is applicable within the airplane flight manual supplement

ADI	Attitude Direction Indicator
AFMS	Airplane Flight Manual Supplement
ATT	Attitude
CDI	Course Deviation Indicator
DG	Directional Gyro
DR	Dead Reckoning
FAA	Federal Aviation Administration
GPS	Global Positioning System
GPSS	GPS Roll Steering
HDG	Heading
HSI	Horizontal Situation Indicator
ILS	Instrument Landing System
LOC	Localizer (no glideslope available)
LOI	Loss of Integrity
VFR	Visual Flight Rules
VHF	Very High Frequency
VOR	VHF Omni-directional Range

SECTION 2 – LIMITATIONS

System Software Requirements

The G5 must utilize the following or later FAA approved software versions for this AFMS revision to be applicable:

Component	Software Version
G5 Electronic Flight Instrument	5.00

Use of Secondary Instruments

The original type design approved instruments for airspeed, altitude and vertical speed remain the primary indications for these parameters.

If the G5 Electronic Flight Instrument is installed in place of the rate of turn indicator, the original type design approved instrument for attitude remains in the primary indication for attitude.

If the G5 Electronic Flight Instrument is installed in place of the directional gyro, the original type design approved instruments for attitude remains the primary indication for attitude.

NOTE:

For aircraft approved for VFR-only operations, the G5 Electronic Flight Instrument may be installed as an attitude indicator and rate of turn indicator.

Kinds of Operations

No Change

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SECTION 3 – EMERGENCY PROCEDURES

G5 Failure Indications

If a G5 function fails, a large red 'X' is typically displayed over the instrument(s) or data experiencing the failure. Upon G5 power-up, certain instruments remain invalid as equipment begins to initialize. All instruments should be operational within one minute of power-up. If any instrument remains flagged and it is not likely an installation related problem, the G5 should be serviced by a Garmin-authorized repair facility.

Attitude Failure

Attitude failure is indicated by removal of the sky/ground presentation, a red X, and a yellow "ATTITUDE FAIL" on the display.

Rate-of-turn and slip information will not be available.

1. Use standby instruments.
2. Seek VFR conditions or land as soon as practical.

Heading Failure, Loss of Magnetometer Data, or Magnetic Field Error

A heading failure, loss of magnetometer data, or magnetic field error is indicated by removal of the digital heading readout, a red X, and a yellow "HDG" on the display.

1. Use standby magnetic compass.

NOTE:

If the G5 DG/HSI has a valid GPS signal the G5 DG/HSI instrument will display the GPS track information in magenta.

GPS Failure

If GPS navigation receivers and/or navigation information are not available or invalid, the G5 will display Dead Reckoning mode (DR) or Loss of Integrity mode (LOI) on the HSI in the lower left corner.

If Alternate Navigation Sources (ILS, LOC, VOR) Are Available:

1. Use alternate navigation source.

If No Alternate Navigation Sources Are Available:

If DR is Displayed on HSI:

1. Use the amber CDI for course information.
2. Fly toward known visual conditions.

If LOI is Displayed on HSI:

1. Fly toward known visual conditions.

For aircraft equipped with a GAD 29B interfaced to an autopilot, GPSS will be displayed in amber text when GPSS emulation has been selected from the G5 menu.

1. Deselect GPSS from the G5 menu and select a different autopilot mode.

Attitude Aligning

During system initialization, the G5 displays the message 'ALIGNING' over the attitude indicator. The G5 will typically display valid attitude within the first minute of power-up. The G5 can also align itself while taxiing and during level flight.

If the "ALIGNING" indication occurs during flight and attitude remains displayed, the attitude display is acceptable for use for flight in instrument conditions. The message will clear when the attitude solution is within the systems internal accuracy tolerances. It is recommended to maintain wings level to reduce the time for the system to align.

Attitude Aligning / Keep Wings Level

If the "ALIGNING KEEP WINGS LEVEL" indication occurs during flight, the G5 has detected an invalid attitude solution and will not display any attitude information.

1. Use standby instruments to maintain wings level flight. The system will display attitude when internal accuracy tolerances have been met.
2. If attitude does not return, seek VFR conditions or land as soon as practical.

Loss of Electrical Power to the G5 Display

In the event of a loss of aircraft electrical power to the G5 attitude display, the indicator will continue to function on its internal battery. If an internal battery is installed on the optional G5 HSI, the indicator will continue to function on the internal battery if aircraft power is lost. Internal battery endurance is indicated on the G5 display in hours and minutes. The charging symbol will be removed and the internal battery will not be charged.

In the event the G5 attitude display powers down, the optional G5 HSI will automatically revert to displaying attitude information. It will not revert back to the DG/HSI format if the G5 attitude unit regains power. The DG/HSI presentation may be selected from the G5 menu on the G5 DG/HSI unit after reversion to the attitude display.

Loss of Electrical Power to the GAD 29B (If Installed)

In the event of a loss of aircraft electrical power to the optional GAD 29B, the heading and course datum will be unavailable to the autopilot and the autopilot may deviate from the intended path or may disconnect. GPS flight plan course information may be displayed on the HSI and VFR will be displayed in amber text on the HSI. GPSS will be displayed in amber text, if GPSS mode is selected.

1. Deselect GPSS from the G5 menu and select a different autopilot mode.
2. Lateral GPS course guidance may only be used in VFR conditions.

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SECTION 4 – NORMAL PROCEDURES

G5 Power Button and Knob

The G5 display will power on with the application of aircraft power. The G5 power button is used to turn the display on and off. Press and hold the power button to turn the display off.

The knob performs the following functions:

Press	Press to access the Menu. From the Menu, press to select the desired menu item. Press to accept the displayed value when editing numeric data or selecting from a list. Press to sync the heading or track bug for the HSI.
Turn	From the Menu, turn the Knob to move the cursor to the desired menu item. For the ADI, rotate to adjust the baro setting on the secondary altitude display. For the HSI, rotate to adjust the heading or track bug. Turn to select the desired value when editing numeric data or selecting from a list.

Backlight Intensity Adjustment

The power up state of the G5 backlight is in Auto adjustment mode.

To adjust the backlighting:

To select Manual mode from Auto mode:

1. While the unit is turned on, press the Power button.
2. Turn the knob to manually adjust the backlight intensity.
3. Press the knob to close the backlight page.

To select Auto mode from Manual mode:

1. While the unit is turned on, press the Power button.
2. Press the Power button again to select Auto.
3. Press the knob to close the backlight page.

Prior to Flight in Instrument Meteorological Conditions

1. Press the Power button on the G5 attitude indicator.
2. Verify the battery status indicator is green on the G5 attitude indicator.

Autopilot Operations with the G5 HSI

The G5 and optional GAD 29B offer various integration capabilities dependent upon the type of autopilot installed in a particular aircraft.

The G5 Electronic Flight Instrument installation in this aircraft provides the following autopilot functions (appropriate boxes will be checked):

- ☐ This installation does not interface with the autopilot (basic wing leveling autopilot or no autopilot is installed in the aircraft)
- ☐ A GAD 29B Adapter is installed in this aircraft
  - ☐ Course / NAV Selection coupling to the autopilot
  - ☐ Heading Bug coupling capability to the autopilot
  - ☐ Roll Steering (GPSS) emulated via heading mode

    OR

  - ☐ Roll Steering capable autopilot (GPSS menu function for emulation not applicable)

Course / NAV Selection Coupling to the Autopilot (If Configured)

When operating the autopilot in NAV mode, the deviation information from the installed navigation sources (i.e. GPS or NAV) is switched via the navigation source. The NAV source displayed on the HSI is the NAV source the autopilot is following. Many autopilots also use the course datum to determine the best intercept angles when operating in NAV mode.

Heading Bug Coupling Capability to the Autopilot (If Configured)

When operating the autopilot in HDG mode, the difference between the HDG bug location on the HSI and the actual aircraft heading creates an error signal which the autopilot will minimize by turning in the direction of the bug. If the bug is turned more than 180 degrees, the autopilot may turn the airplane in the opposite direction of the desired turn.

Roll Steering (GPSS) Emulated via HDG Mode (If Configured)

For autopilots that do not support digital GPSS signals, GPSS functionality may be emulated by operating the autopilot in HDG mode and selecting GPSS from the G5 menu. If the autopilot is already designed to receive roll steering information, the data is transmitted digitally from the navigator to the autopilot.

When GPSS is selected on the G5 menu, the heading bug on the HSI changes to a hollow outline and a crossed-out heading bug appears on the G5 HSI display indicating that the autopilot is not coupled to the heading bug. The bug is still controllable and may still be used for reference.

When GPSS is selected on the G5, GPSS turn commands are converted into a heading error signal to the autopilot. When the autopilot is operated in HDG mode, the autopilot will fly the turn commands from the GPS navigator. If the GPSS data is invalid (for example, if there is no active GPS leg) or the selected HSI source on the G5 HSI is not GPS, the annunciated GPSS text will be yellow and a zero turn command will be sent to the autopilot.

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SECTION 5 – PERFORMANCE

No change

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SECTION 6 – WEIGHT AND BALANCE

See current weight and balance data

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SECTION 7 – SYSTEM DESCRIPTION

Refer to **Garmin G5 Electronic Flight Instrument Pilot's Guide for Certified Aircraft, part number 190**-01112-12 Rev A (or later approved revisions), for a description of the G5 electronic flight instrument. This reference material is not required to be on board the aircraft but does contain a more in depth description of all the functions and capabilities of the G5.

The ATT circuit breaker supplies power to the G5 instrument for normal power operation and to charge the internal battery.

The DG circuit breaker supplies power to the G5 instrument for normal power operation when configured as a DG, and to charge the internal battery (if installed).

The HSI circuit breaker supplies power to the G5 instrument for normal power operation when configured as an HSI, and to charge the internal battery (if installed).

The GAD circuit breaker supplies power to the optional GAD 29 adapter for normal power operation.

System Messages

The G5 has the capability to display system messages to the crew along the bottom of the display. A system message is indicated through a white [!] indication on the G5.

Messages can be displayed by pressing the G5 knob, and selecting the Message menu item.

(For Reference Only)

The following table shows the meaning of each message. System messages are displayed in white text.

Message	Meaning
External Power Lost	Aircraft power has been removed from the G5.
Critical battery fault! Powering off	Battery has critical fault condition and the unit is about to power off to avoid damage to the battery.
Battery fault	Battery has a fault condition – unit needs service.
Battery charger fault	Battery charger has a fault condition – unit needs service.
Low battery	Battery charge level is low.
Hardware fault	Unit has a hardware fault – unit needs service.
Power supply fault	Unit power supply fault detected – unit needs service.
Unit temperature limit exceeded	Unit is too hot or too cold.
Network address conflict	Another G5 with the same address is detected on the network (most commonly a wiring error on one of the units).
Communication error	General communication error (most commonly appears in conjunction with Network Address Conflict message).
Factory calibration data invalid	Unit calibration data not valid – unit needs service.
Magnetic field model database out of date	Internal magnetic field database is out of date - software update required.
Magnetometer Hardware fault	The magnetometer has detected a fault – unit needs service. Heading data may not be available.
Using external GPS data	GPS data from another network LRU is being used. The unit's internal GPS receiver is enabled, but unable to establish a GPS fix.
Not receiving RS-232 data	The G5 is not receiving RS-232 data from the GPS navigator – system needs service.
Not receiving ARINC 429 data	The G5 is not receiving ARINC 429 data from the navigation source – system needs service.
GPS receiver fault	The G5 on-board GPS receiver has a fault.
ARINC 429 interface configuration error	The G5 ARINC 429 port is receiving information from an incorrect source – system needs service.
Software version mismatch	The G5 attitude indicator and the G5 HSI units have different software. Cross fill of baro, heading and altitude bugs is disabled.

These messages remain while the condition persists.