AIRPLANE FLIGHT MANUAL

FOR

SENECA II

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-34-200T

AIRCRAFT SERIAL NO. 34-7670011 REGISTRATION NO. N3974X

AIRPLANE FLIGHT MANUAL, REPORT NUMBER VB-628 REVISION 5

PIPER AIRCRAFT CORPORATION
APPROVAL SIGNATURE AND STAMP M. Keller

NOTE

THIS MANUAL MUST BE KEPT IN THE AIRPLANE AT ALL TIMES

FAA APPROVED BY: D. H. Trompler

D. H. TROMPLER
PIPER AIRCRAFT CORPORATION
D. O. A. No. SO-1
VERO BEACH, FLORIDA

DATE OF APPROVAL: JULY 15, 1974

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

APPLICABILITY

This manual is applicable to Piper Model PA-34-200T aircraft commencing with serial number 34-7570001. The concluding limit to applicable serial numbers was not available at the time of printing. 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 2-31, 3-1 through 3-30, 5-1 through 5-42, 7-1 through 7-17, 8-1 through 8-2, 9-1 through 9-16, 10-1 through 10-13.

PILOT'S OPERATING MANUAL LOG OF REVISIONS

Current Revisions to the PA-34-200T Seneca II Pilot's Operating Manual, 761 593 issued July 15, 1974.

Revision	Revised Pages	Description	Date
Rev. 1 - 761 593 (PR740718)	A F/M	Added Rev. 1 to Report: VB-628.	July 18, 1974
Rev. 2 - 761 593 (PR740805)	A F/M	Added Rev. 2 to Report: VB-628.	August 5, 1974
Rev. 3 - 761 593 (PR741211)	1-1	Revised 65% Cruise altitude; revised 55% Range figures .	Dec. 11, 1974
	2-3	Revised alternate air control info.	
	A F/M	Added Rev. 3 to Report: VB-628.	
	W/B	Added Rev. 1 to Report: VB-629.	
	7-2	Added item 1. p.; added new item 2. a.; revised existing item letters; revised new item 2. j.	
	7-3	Revised existing item letters (2. u. thru 2. x.); under Starting Engines - revised items 3. and 7.; added new item 10.; revised existing item nos. 10. thru 13. and revised new item 12.	
	7-6	Revised items 2. e. and 2. i.	
	7-9	Revised info. under Normal Cruise.	
	7-14	Revised info. under VMC.	
	8-2	Added items 14. and 15.	
	9-i	Revised Range Chart Title; added Power Setting Tables.	
	9-10	Revised Time, Fuel and Distance to Climb Chart completely.	
	9-11	Revised Range Chart completely.	
	9-12	Revised Power altitude limits on Speed Power Chart.	
	9-17	Added page (Power Setting Table - 45%, 55%).	
	9-18	Added page (Power Setting Table - 65%, 75%).	
Rev. 4 - 761 593 (PR750129)	2-9	Added gear warning info.	Jan. 29, 1975
	2-25	Revised Stall Warning info.	

PILOT'S OPERATING MANUAL LOG OF REVISIONS (cont)

Revision	Revised Pages	Description	Date
Rev. 5 - 761 593 (PR750530)	1-1	Revised Range figures.	May 30, 1975
	1-2	Revised fuel consumption and fuel capacity figures.	
	2-1	Revised fuel capacity - The Airplane.	
	2-11	Revised fuel capacity and usable fuel - Fuel System.	
	2-21	Revised fuel quantity gauges - Instrument Panel.	
	A F/M	Added Rev. 4 to Report: VB-628.	
	W/B	Added Rev. 2 to Report: VB-629.	
	9-11	Revised Range Chart.	
	10-8	Revised fuel capacities - Filling Fuel Tanks.	
Rev. 6 - 761 593 (PR750716)	1-2	Revised Empty Weight and Useful Load; deleted footnote.	July 16, 1975
	2-i	Revised Electrical System page no.	
	2-9	Revised gear warning info.	
	2-12	Revised fuel pump callout.	
	2-12a	Added page (Fuel System info.).	
	2-12b	Added page (info from page 2-13 and 2-16).	
	2-13	Relocated info to page 2-12b; added revised Alt. and Starter Schematic from page 2-14.	
	2-14	Relocated schematic to page 2-13; added new Switch Panel illustration.	
	2-15	Revised Switch Panel title.	
	2-16	Relocated info to page 2-12b; revised annunciator panel desc.; added footnote.	
	2-17	Added radio power switch desc. to instrument panel info.	
	2-21	Added primer lights to annunciator; added radio power switch; revised callouts.	
	2-22	Revised heater info.	
	2-25	Revised Stall Warning info.	
	2-30	Revised fuel pump switches.	
	A F/M	Added Rev. 5 to Report: VB-628.	
	W/B	Added Rev. 3 to Report: VB-629.	
	7-3	Revised items 2 and 7 under Starting Engines; deleted existing item 10; added new item 10 and 11; revised existing item nos.; added footnote.	
	7-4	Revised item 6 under Flooded Start.	
	7-6	Revised Pretakeoff Check items 2. c. and 2. d.	

PILOT'S OPERATING MANUAL LOG OF REVISIONS (cont)

Revision	Revised Pages	Description	Date
Rev. 6 (cont)	7-7	Revised Pretakeoff Check item 23.	
	7-11	Revised Approach and Landing item 5.	
	7-16	Revised ELT info.	
	8-2	Added item 16.	
	9-i	Added Introduction to Performance.	
	9-iii, 9-iv, 9-v, 9-vi	Added pages (Introduction to Performance and Flight Plan).	
	9-11	Revised Range graph.	
	9-12	Revised Speed Power graph.	
Rev. 7 - 761 593 (PR751020)	1-1	Added Range figures for Optional Fuel Fuel Capacity.	Oct. 20, 1975
	1-2	Added Optional Fuel Tank Capacity.	
	2-1	Revised the Airplane desc.; revised Airframe desc.	
	2-2	Added optional fuel tank info to wing desc.	
	2-11	Added optional fuel tank info to Fuel System desc.	
	2-12	Added optional fuel tanks to Fuel System Schematic.	
	2-12a	Revised Fuel System info.	
	2-16	Revised auxiliary fuel pump annunciator light desc.	
	A F/M	Added Rev. 6 to Report: VB-628.	
	W/B	Added Rev. 4 to Report: VB-629.	
	7-6	Revised RPM figure in item 2. e.	
	8-1	Revised item 10.	
	8-2	Revised item 15.	
	9-i	Revised existing Range graph title; added new Range graph item and page no.	
	9-11	Revised Range graph.	
	9-12	Added Range graph for optional fuel tanks; relocated Speed Power graph to page 9-12a.	
	9-12a	Added page (Speed Power graph relocated from page 9-12).	
	9-12b	Added intentionally left blank page.	
Rev. 8 - 761 593 (PR751209)	W/B	Added Rev. 5 to Report: VB-629.	Dec. 9, 1975
	7-8	Revised Manifold Pressure Overboost Lights info.	
	7-17	Revised ELT info.	
	10-8	Revised Filling Fuel Tanks info.	

PILOT'S OPERATING MANUAL LOG OF REVISIONS (cont)

Revision	Revised Pages	Description	Date
Rev. 9 - 761 593 (PR760319)	2-2 A F/M W/B 7-i 7-3 7-4 7-5 9-14, 9-15, 9-16 10-i 10-10a 10-10b	Added Winterization info. to Engines. Added Rev. 7 to Report: VB-628. Added Rev. 6 to Report: VB-629. Added Starting Engines in Cold Weather. Revised item 10. (Starting Engines); added NOTE from page 7-4. Relocated NOTE to page 7-3; added Starting Engines in Cold Weather. Added CAUTION (Cold Start). Added note below graph. Added Winterization. Added page (Winterization info.) Added page.	March 19, 1976
Rev. 10 - 761 593 (PR760513)	A F/M W/B 10-7	Added Rev. 8 to Report: VB-628. Added Rev. 7 to Report: VB-629. Revised Propeller Chamber Pressure Table.	May 13, 1976
Rev. 11 - 761 593 (PR761119)	2-17 2-19 2-19a 2-19b 2-21 W/B 7-16 7-17	Revised Pitot Static System info. Revised illus. title. Added new illus. Added new page. Revised illus. callouts. Added Rev. 8 to Report: VB-629. Revised ELT info; relocated NOTE to page 7-17. Revised ELT pilot's remote switch info.	Nov. 19, 1976
Rev. 12 - 761 593 (PR770330)	2-3 2-19b 2-20 A F/M 7-6 7-17 8-2 10-10	Revised fuel injection system info. Added material from page 2-20; revised heated pitot head info. Relocated material to previous page; added manifold pressure line drain info and NOTE. Added Rev. 9 to Report: VB-628. Added item 2. d.; renumbered items in 2 accordingly. Revised ELT test transmission NOTE. Added item 17. Revised tire pressure in Tire Inflation.	March 30, 1977

PILOT'S OPERATING MANUAL LOG OF REVISIONS (cont)

Revision	Revised Pages	Description	Date
Rev. 13 - 761 593 (PR770808)	7-9	Revised Climb info.	August 8, 1977
Rev. 14 - 761 593 (PR790118)	1-2	Revised Power Plant info.	Jan. 18, 1979
	2-3	Deleted engine designation.	
	2-7	Revised Landing Gear Elect. Schematic.	
	A F/M	Added Rev. 10 to Report: VB-628.	
	7-7	Added Caution to Pretakeoff Check.	
	7-8	Relocated material.	
	7-9	Deleted engine designation from Normal Cruise.	
	7-16	Revised E.L.T. info.	

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GENERAL SPECIFICATIONS

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PERFORMANCE

Published figures are for standard airplanes flown at gross weight* under standard conditions at sea level, unless otherwise stated. Performance for a specific airplane may vary from published figures depending upon the equipment installed, the condition of engine, airplane and equipment, atmospheric conditions and piloting technique. Each performance figure below is subject to the same conditions as on the corresponding performance chart from which it is taken in the Performance Charts Section.

Gross Weight (pounds)	4570
Takeoff Run, flaps up, sea level (ft)	1100
Takeoff Distance Over 50-ft Obstacle, flaps up, sea level	1460
Takeoff Run (ft) (short field effort, flaps 25°)	900
Takeoff Distance Over 50-ft Barrier (ft) (short field effort, flaps 25°)	1240
Minimum Controllable Single Engine Speed (mph)	80
Rate of Climb, sea level (ft per min)	1340
Rate of Climb, sea level, single engine (ft per min)	225
Best Rate of Climb Speed (mph)	105
Best Rate of Climb Speed, sea level, single engine (mph)	105
Best Angle of Climb Speed, sea level (mph)	90
Best Angle of Climb Speed, sea level, single engine (mph)	93
Max Speed, sea level (mph)	197
Max Speed, 12,000 ft, (mph)	225
Max Speed Optimum Alt, 20,000 ft, 75% power (TAS) (mph)	218
Service Ceiling (ft)	25,000**
Service Ceiling, engine out (ft)	13,400
Absolute Ceiling (ft)	25,000**
Absolute Ceiling, engine out (ft)	14,800
Cruise Speed at best power mixture (mph)	
65% power, 24,000 ft	208
55% power, 25,000 ft	189

	STANDARD FUEL CAPACITY	OPTIONAL FUEL CAPACITY
Range at best power mixture (mi)		
75% power, 16,000 ft		
With 45 min. reserve	626	900
No reserve	742	1020
55% power, 16,000 ft		
With 45 min. reserve	701	1010
No reserve	830	1140

*4570 lbs Maximum Takeoff Weight; 4342 lbs Maximum Landing Weight
**Maximum Operating Altitude

PERFORMANCE (cont)

Stalling Speed, gear and flaps down, power off (mph)	69
Stalling Speed, gear down and flaps up, power off (mph)	76
Fuel Consumption, 75% power, both engines (gph)	23.6
Fuel Consumption, 65% power, both engines (gph)	20.5
Landing Roll (flaps down) (ft)	1380*
Landing Over 50-ft Barrier (flaps down) (short field effort) (ft)	2090*

*4342 lb G.W., Maximum Landing Weight

WEIGHTS

Gross Weight (lbs) Max. Takeoff	4570
Max. Landing	4342
Max Zero Fuel Weight (lbs)	4000
Standard Empty Weight (lbs)	2788
Maximum Useful Load (lbs) (All weight in excess of 4000 lbs must consist of fuel.)	1782

POWER PLANT

Right Engine (Continental)	LTSIO-360-E or LTSIO-360-EB
Left Engine (Continental)	TSIO-360-E or TSIO-360-EB
Rated Horsepower (sea level)	200
(12,000 ft)	215
Rated Speed (rpm)	2575
Max Manifold Pressure (in. Hg.)	40
Bore (in.)	4.438
Stroke (in.)	3.875
Displacement (cubic in.)	360
Compression Ratio	7.5:1

FUEL AND OIL

Fuel Capacity (U.S. gal)	
Standard	98
Optional	128
Unusable fuel (U.S. gal)	5
Fuel, Aviation Grade (minimum octane)	100/130
Oil Capacity (qts) (each engine)	8

BAGGAGE AREA

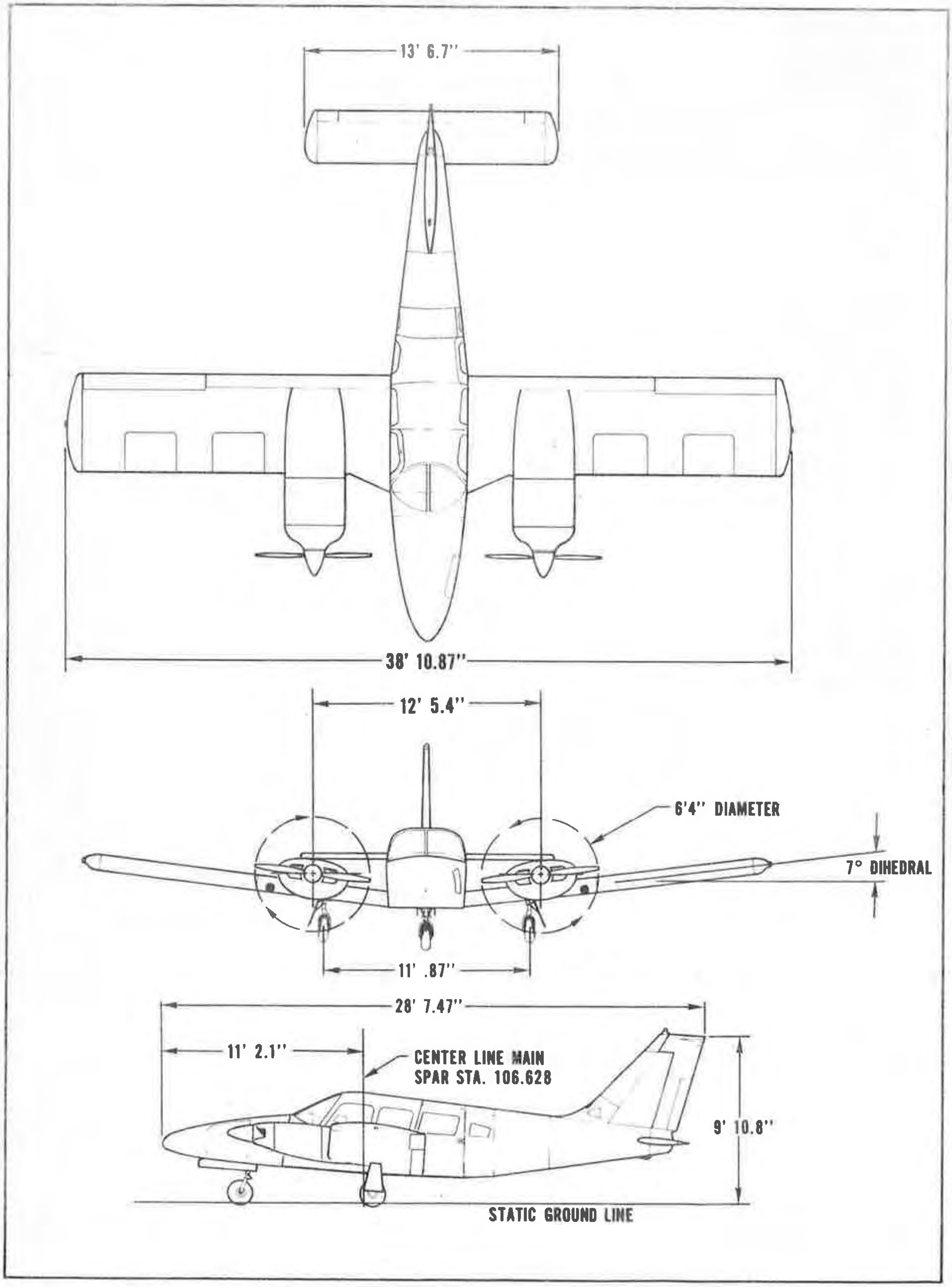
Maximum Baggage (lbs) Forward Compartment	100
Maximum Baggage (lbs) Rear Compartment	100
Baggage Space (cubic ft) Forward Compartment	15.3
Baggage Space (cubic ft) Rear Compartment	20
Baggage Door Size (in.) Forward Compartment	24 x 21

DIMENSIONS

Wing Span (ft)	38.9
Wing Area (sq ft)	208.7
Length (ft)	28.5
Height (ft)	9.9
Wing Loading (lbs per sq ft)	22
Power Loading (lbs per hp) (sea level)	11.4
(12,000 ft)	10.6
Propeller Diameter (in.)	76
Turn Radius (ft)	33.2

LANDING GEAR

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


13' 6.7"
38' 10.87"
12' 5.4"
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

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DESCRIPTION
AIRPLANE AND SYSTEMS

DESCRIPTION

AIRPLANE AND SYSTEMS

THE AIRPLANE

The Seneca II is a twin-engine, all metal, retractable landing gear, turbocharged airplane which combines multi-engine safety and efficiency with a spacious and comfortable cabin and Piper's traditional smooth, easy handling characteristics.

Seating for up to seven occupants, two separate one hundred pound luggage compartments, and a fuel capacity of ninety-eight gallons give the Seneca II a high degree of flexibility. As with any aircraft, the Seneca II requires proper loading; however a simple-to-use weight and balance calculator provided with each airplane makes the determination of acceptable fuel and payload combinations easy and uncomplicated. Large floor space, easily removable seats, a broad, well-placed cabin door and a nose section baggage compartment make the Seneca II a versatile aircraft for transporting passengers or cargo or a combination of both.

The simplicity of the Seneca II will be appreciated by both the novice multi-engine pilot and the veteran pilot experienced in flying many types of aircraft. Advantages of the Seneca II include, for example, its ability to get in and out of small airports, paved and unpaved; dependable flight characteristics; a back-up gear extension system which provides dependable gear extension by gravity free-fall; and counter-rotating propellers which eliminate the "P" factor and asymmetric forces which occur in airplanes with both propellers turning in the same direction.

AIRFRAME

With the exception of the steel engine mounts and landing gear, the reinforced fiberglass nose cone and cowling nose bowls, and the lightweight plastic extremities (tips of wings, tail fin, rudder and stabilator), the **basic airframe** is of heat treated, corrosion resistant aluminum alloy. Aerobatics are prohibited in this airplane since the structure is not designed for aerobatic loads.

The **fuselage** is a semi-monocoque structure. There is a front door on the right side and a rear door on the left. A cargo door is installed aft of the rear passenger door. When both rear doors are open, large pieces of cargo can be loaded through the extra-wide opening. A door on the left side of the nose section gives access to the nose section baggage compartment.

The **wing** is of a conventional design and employs a laminar flow NACA 65_2-415 airfoil section. The main spar is located at approximately 40% of the chord aft of the leading edge. The wings are attached to the fuselage by the insertion of the butt ends of the spar into a spar box carry-through, which is an integral part of the fuselage structure. The bolting of the spar ends into the spar box carry-through structure, which is located under the center seats, provides in effect a continuous main spar. The wings are also attached fore and aft of the main spar by an auxiliary front spar and a rear spar. The rear spar, in addition to taking torque and drag loads, provides a mount for flaps and ailerons. The four-position wing flaps are mechanically controlled by a handle located between the front seats. When fully retracted, the right flap locks into place to provide a step for cabin entry. Each wing contains two fuel tanks as standard equipment. An optional third tank may be installed on each side. The tanks on one side are filled through a single filler neck located well outboard of the engine nacelle.

A vertical stabilizer, an all-movable horizontal stabilator, and a rudder make up the **empennage.** The stabilator incorporates an anti-servo tab which improves longitudinal stability and provides longitudinal trim. This tab moves in the same direction as the stabilator, but with increased travel. Rudder effectiveness is increased by an anti-servo tab on the rudder.

ENGINES

The Seneca II is powered by two Teledyne Continental six-cylinder turbocharged engines, each rated at 200 horsepower at 2575 RPM at sea level. The engines are air cooled and fuel injected and are equipped with oil coolers with low temperature bypass systems and engine mounted oil filters. A winterization plate is provided to restrict air during winter operation (see Winterization in Handling and Servicing Section). Asymmetric thrust during takeoff and climb is eliminated by the 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 engines are easily accessible through doors in the cowlings, one on either side of each engine cowling. The cowlings are designed for maximum aerodynamic efficiency. Engine mounts are constructed of steel tubing, and dynafocal engine mounts are provided to reduce vibration.

A Ray-Jay **turbocharger** on each engine is operated by exhaust gases. Exhaust gases rotate a turbine wheel, which in turn drives an air compressor. Induction air is compressed (supercharged) and distributed into the engine air manifold, and the exhaust gases which drive the compressor are discharged overboard. Engine induction air is taken from within the cowling, is filtered, and is then directed into the turbocharger compressor inlet. Each engine cylinder is supplied with pressurized air in operation from sea level to maximum operating altitude. The pressure relief valve protects the engine from inadvertently exceeding 42 inches Hg; 40 inches Hg is manually set with the throttles. The turbo bypass orifice is preset for 40 inches Hg at 12,000 feet density altitude at full throttle.

The intake filter air box incorporates a manually operated two-way valve designed to allow induction air either to pass into the compressor through the filter or to bypass the filter and supply heated air directly to the turbocharger. There is a suck in door which opens in the event that the primary air source becomes blocked. **Alternate air** selection insures induction air flow should the filter become blocked. Since the air is heated, the alternate air system offers protection against induction system blockage caused by snow or freezing rain, or by the freezing of moisture accumulated in the induction air filter. Alternate air is unfiltered; therefore, it should not be used during ground operation when dust or other contaminants might enter the system. The primary (through the filter) induction source should always be used for takeoffs.

The **fuel injection system** incorporates a metering system which measures the rate at which turbocharged air is being used by the engine and dispenses fuel to the cylinders proportionally. Fuel is supplied to the injector pump at a greater rate than the engine requires. The fuel injection system is a "continuous flow" type which allows excess fuel and fuel vapor separated in the injector pump to be returned to the fuel tanks.

To obtain maximum efficiency and time from the engines, follow the procedures recommended in the Teledyne Continental Operator's Manual provided with the airplane.

Engine controls consist of a throttle, a propeller control and a mixture control lever for each engine. These controls are located on the **control quadrant** on the lower center of the instrument panel where they are accessible to both the pilot and the copilot. The controls utilize teflon-lined control cables to reduce friction and binding.

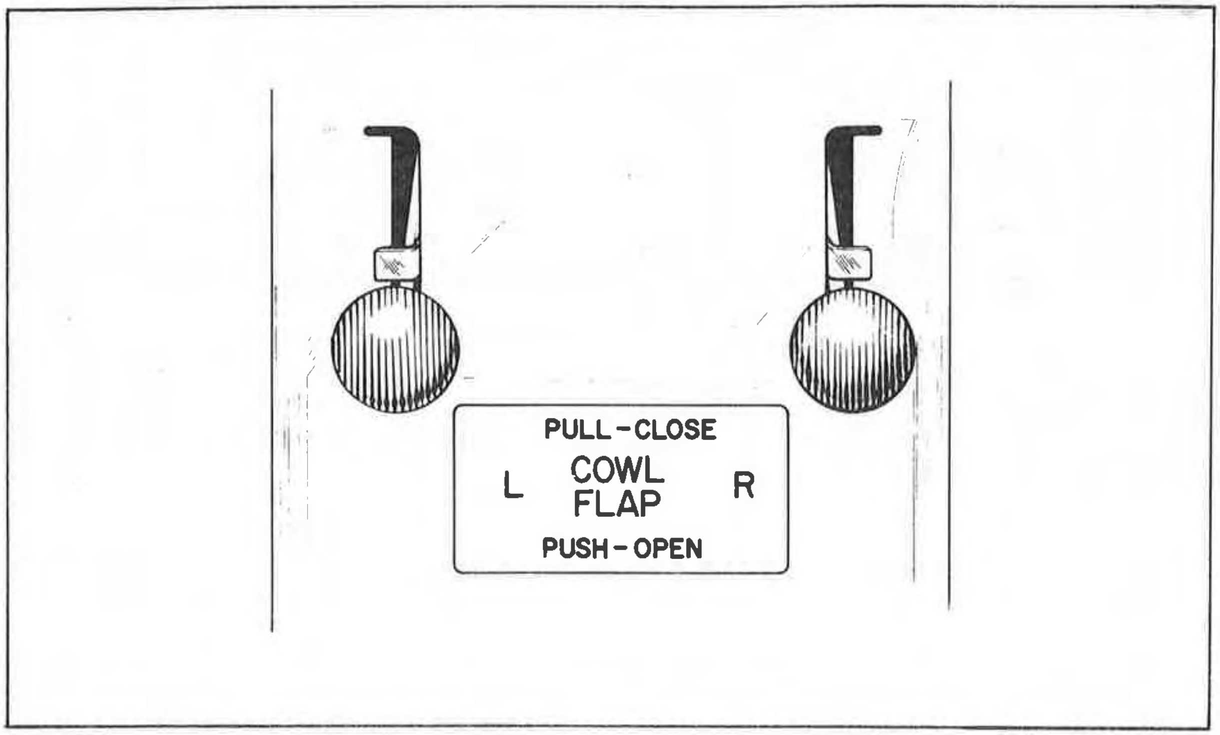
The **throttle levers** are used to adjust the manifold pressure. They incorporate a gear up warning horn switch which is activated during the last portion of travel of the throttle levers to the low power position. If the landing gear is not locked down, the horn will sound until the gear is down and locked or until the power setting is increased. This is a safety feature to prevent an inadvertent gear up landing.

The **propeller control levers** are used to adjust the propeller speed from high RPM to feather.

The **mixture control levers** are used to adjust the air to fuel ratio. An engine is shut down by the placing of the mixture control lever in the full lean position.

The **friction adjustment lever** on the left side of the control quadrant may be adjusted to increase or decrease the friction holding the throttle, propeller, and mixture controls or to lock the controls in a selected position.

The **alternate air controls** are located on the control quadrant just below the engine control levers. When an alternate air lever is in the up, or off, position the engine is operating on filtered air; when the lever is in the down, or on, position the engine is operating on unfiltered, heated air. Should the primary air source become blocked the suck in door will automatically select unfiltered heated air.



Cowl Flap Control

The **cowl flap control levers**, located below the control quadrant, are used to regulate cooling air for the engines. The levers have three positions: full open, full closed, and intermediate. A lock incorporated in each control lever locks the cowl flap in the selected position. To operate the cowl flaps, depress the lock and move the lever toward the desired setting. Release the lock after initial movement and continue movement of the lever. The control will stop and lock into place at the next setting. The lock must be depressed for each selection of a new cowl flap setting.

All throttle operations should be made with a smooth, not too rapid movement to prevent unnecessary engine wear or damage to the engines, and to allow time for the turbocharger speed to stabilize.

PROPELLERS

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

Constant speed, controllable pitch and feathering Hartzell **propellers** are installed as standard equipment. The propellers mount directly to the engine crankshafts. Pitch is controlled by oil and nitrogen pressure. Oil pressure sends a propeller toward the high RPM or unfeather position; nitrogen pressure sends a propeller toward the low RPM or feather position and also prevents propeller overspeeding. **Governors,** one on each engine, supply engine oil at various pressures through the propeller shafts to maintain constant RPM settings. A governor controls engine speed by varying the pitch of the propeller to match load torque to engine torque in response to changing flight conditions. The recommended nitrogen pressure to be used when charging the unit is listed on placards on the propeller domes and inside the spinners. This pressure varies with ambient temperature at the time of charging. Although dry nitrogen gas is recommended, compressed air may be used provided it contains no moisture. For more detailed instructions, see "Propeller Service" in the Handling and Servicing Section of this Manual.

Each propeller is controlled by the **propeller control levers** 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 forward 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 falls below 800 RPM. For this reason, when airborne, and the pilot wishes to feather a propeller to save an engine, he must be sure to move the propeller control into the "FEATHER" position before the engine speed drops below 800 RPM.

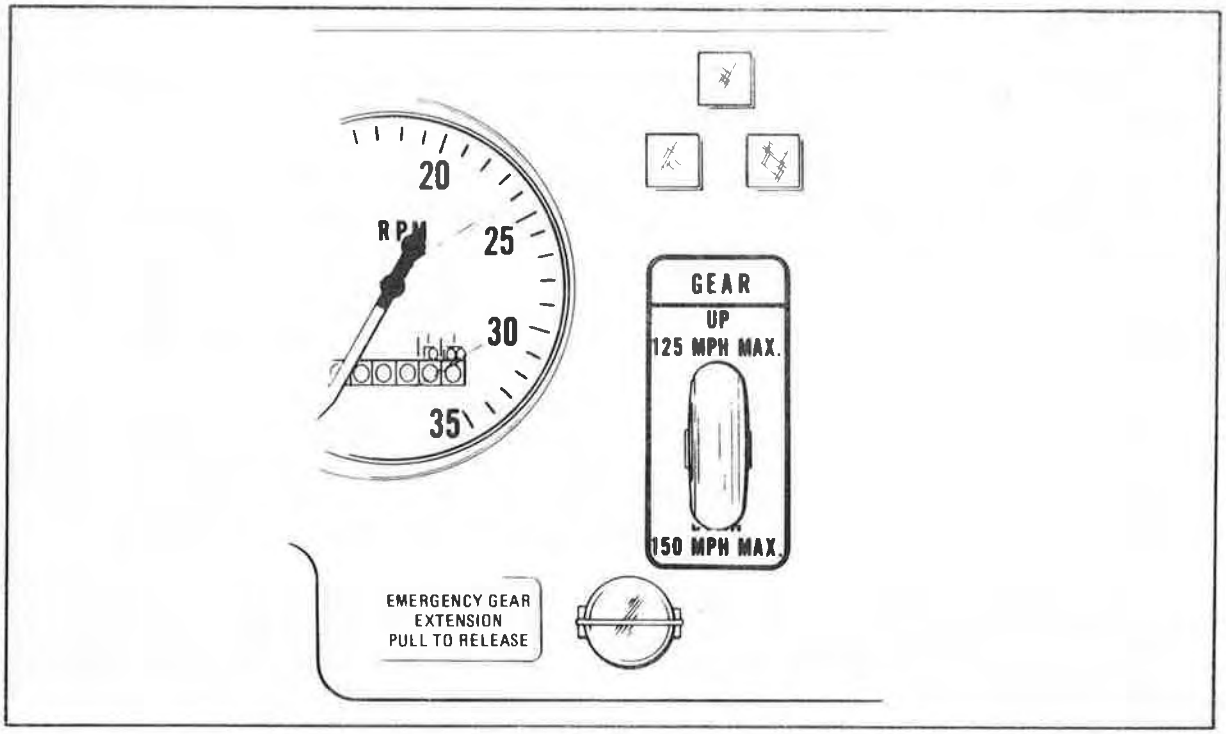
LANDING GEAR

To increase cruise speed, climb and other performance, the Seneca II is equipped with hydraulically operated, fully retractable, tricycle **landing gear**. Rugged gear construction and a heavy duty braking system permit operation on a wide variety of ground surfaces.

Hydraulic pressure for gear operation is furnished by an electrically powered, reversible **hydraulic pump**. The pump is activated by a two-position **gear selector switch** located to the left of the control quadrant on the instrument panel. 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. Gear extension or retraction normally takes six to seven seconds.

CAUTION

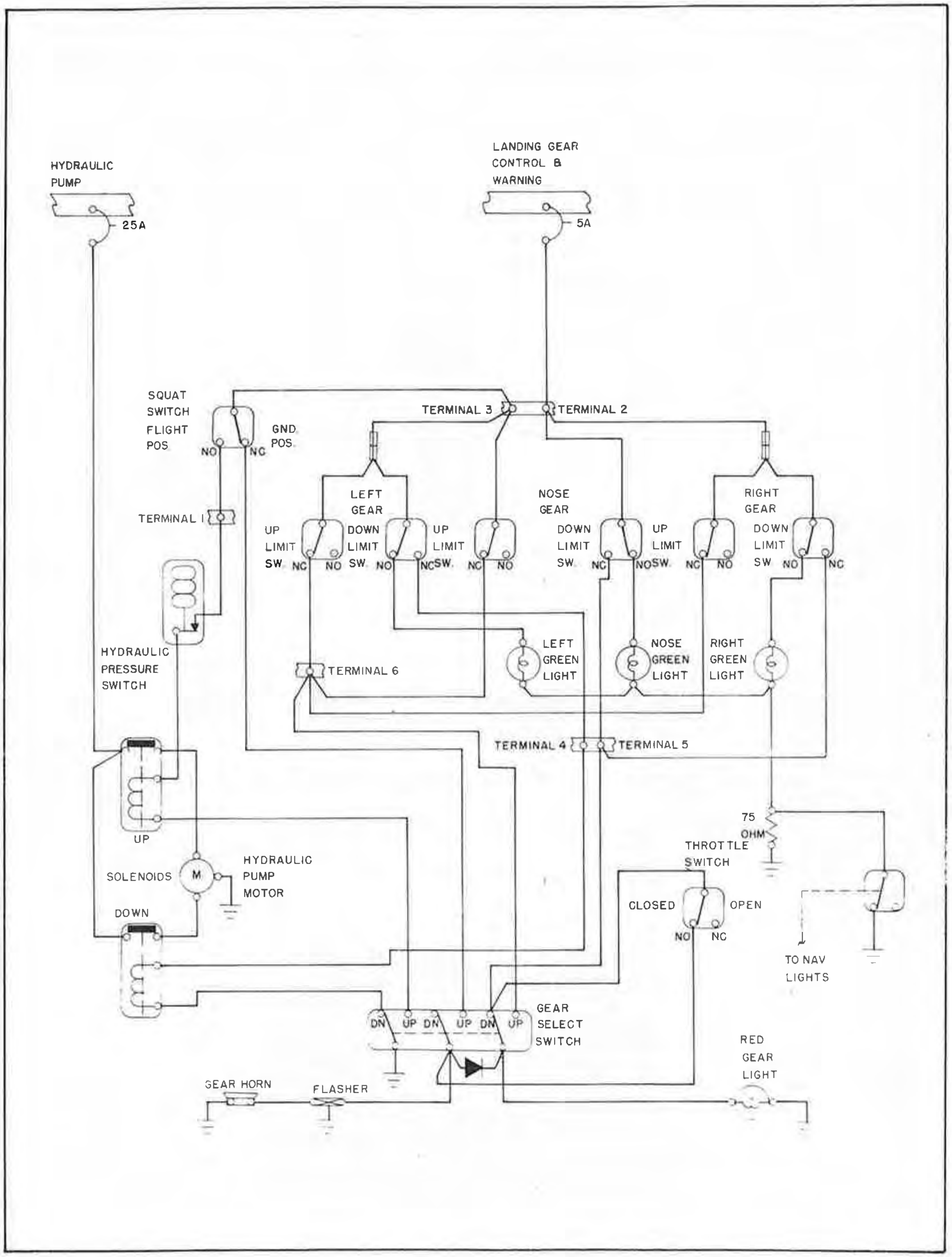
If the landing gear is in transit, and the hydraulic pump is running, it is NOT advisable to move the gear selector switch to the opposite position before the gear has reached its full travel limit, because a sudden reversal may damage the electric pump.



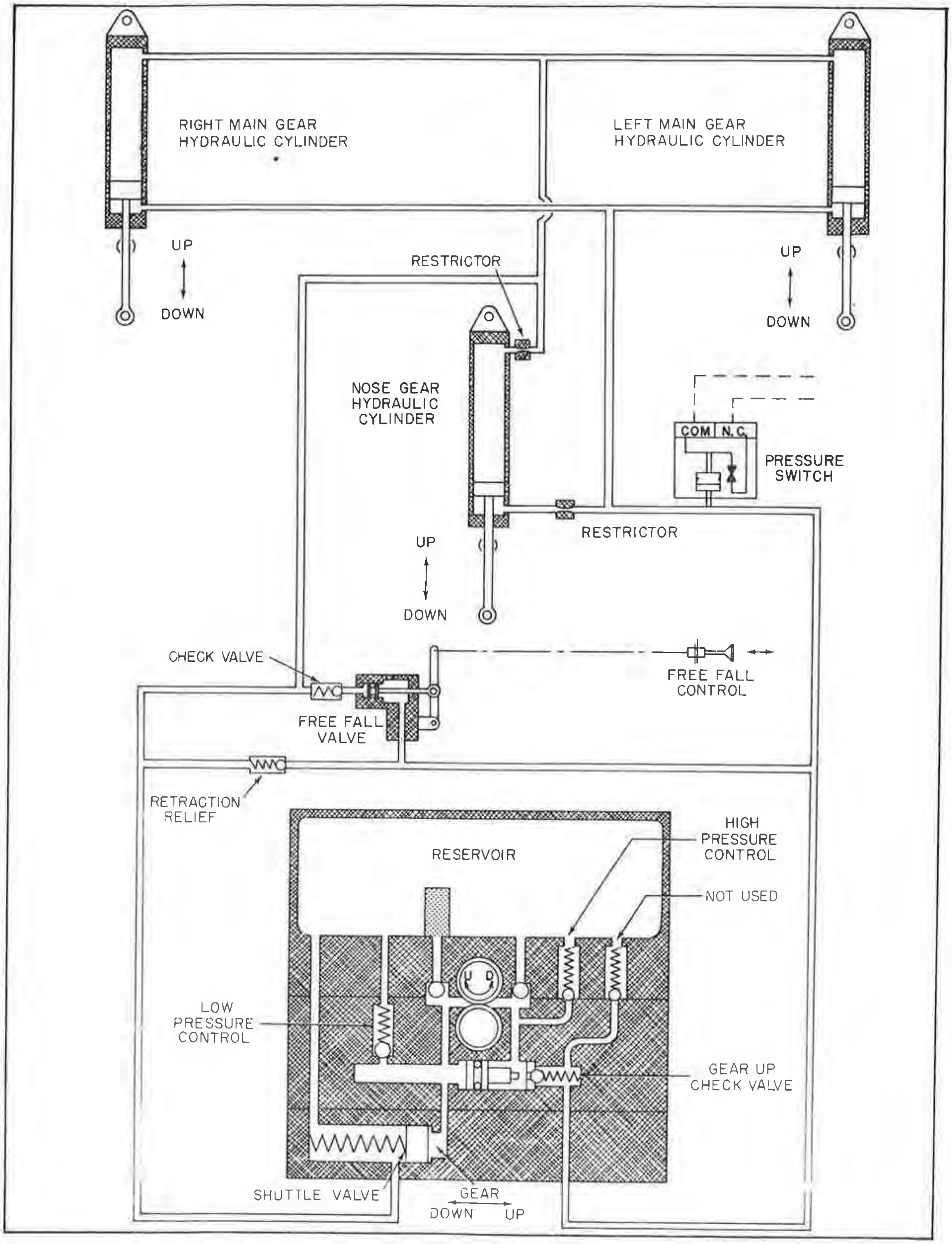
Landing Gear Selector

The landing gear system incorporates a number of **safety features** to insure gear extension even in the event of hydraulic failure. Since the gear is held in the retracted position by hydraulic pressure, should the hydraulic system fail for any reason, gravity will allow the gear to extend. When the landing gear is retracted, the main wheels retract inboard into the wings and the nose wheel retracts forward into the nose section. Aerodynamic loads and springs assist in gear extension and in locking the gear in the down position. During gear extension, once the nose gear has started toward the down position, the airstream pushes against it and assists in moving it to the downlocked position. After the gears are down and the downlock hooks engage, springs maintain force on each hook to keep it locked until it is released by hydraulic pressure.

To extend and lock the gears in the event of hydraulic failure, it is necessary only to relieve the hydraulic pressure. Emergency gear extension must not be attempted at airspeeds in excess of 100 MPH. An **emergency gear extension knob**, located directly beneath the gear selector switch is provided for this purpose. Pulling this knob releases the hydraulic pressure holding the gear in the up position and allows the gear to fall free. During normal operation, this knob is covered by a guard to prevent inadvertent extension of the gear. Before pulling the emergency gear extension knob, place the landing gear selector switch 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, it may be pushed in again after the landing is completed and the source of the problem is corrected. Be sure that the landing gear selector switch is in the "DOWN" position before the knob is pushed in.



Landing Gear Electrical System Schematic



Landing Gear Hydraulic System Schematic

When the gear is fully extended or fully retracted and the gear selector is in the corresponding position, electrical limit switches stop the flow of current to the motor of the hydraulic pump. The **three green lights** directly above the landing gear selector switch illuminate to indicate that each of the three landing gears is down and locked. A convex mirror on the left engine nacelle both serves as a taxiing aid and allows the pilot to visually confirm the condition of the nose gear. If the gear is in neither the full up nor the full down position, a **red warning light** on the instrument panel illuminates. Should the throttle be placed in a low setting - as for a landing approach - while the gear is retracted, a **warning horn** sounds to alert the pilot that the gear is retracted. The gear warning horn emits a continuous sound on earlier models and a 90 cycles per minute beeping sound on later models.

To add to the pilot's night vision comfort, the green gear lights are dimmed automatically when the navigation lights are turned on. For this reason, if the navigation lights are 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 selector switch is placed in the "DOWN" position, the first thing to check is the position of the navigation lights switch.

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

1. The gear is not locked down.
2. A bulb is burned out.
3. There is a malfunction in the indicating system.

In order to check the bulbs, the square indicator lights can be pulled out and interchanged.

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

1. The gear is up and the manifold pressure has fallen below 14 inches on either one or both engines.
2. The gear selector switch is in the "UP" position when the airplane is on the ground.

To prevent **inadvertent gear retraction** should the gear selector switch be placed in the "UP" position when the airplane is on the ground, a **squat switch** located on the left main gear will prevent the hydraulic pump from actuating if the master switch is turned on. On takeoff, when the landing gear oleo strut drops to its full extension, the safety switch closes to complete the circuit which allows the hydraulic pump to be activated to raise the landing gear when the gear selector is moved to the "UP" position. During the preflight check, be sure the landing gear selector is in the "DOWN" position and that the three green gear indicator lights are illuminated. On takeoff, the gear should be retracted before an airspeed of 125 MPH is exceeded. The landing gear may be lowered at any speed up to 150 MPH.

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 PA-34-200T Service Manual.

The nose gear is steerable through a 27 degree arc either side of center by use of a combination of full rudder pedal travel and brakes. A gear **centering spring**, incorporated in the nose gear steering system, prevents shimmy tendencies. A **bungee assembly** reduces ground steering effort and dampens shocks and bumps during taxiing. When the gear is retracted, the nose wheel centers as it enters the wheel well, and the steering linkage disengages to reduce pedal loads in flight. The landing light turns off automatically when the gear is retracted.

All three landing gears carry 6.00 x 6 **tires**. The nose wheel has a 6-ply tire and the main wheels have 8-ply tires. For information on servicing the tires, see "Tire Inflation" in the Handling and Servicing Section of this Manual.

Struts for the landing gear are **air-oil** assemblies. Strut exposure should be checked during each preflight inspection. If a need for service or adjustment is indicated, refer to the instructions printed on the units. Should more detailed landing gear service information be required, refer to the PA-34-200T Service Manual.

BRAKE SYSTEM

The brake system is designed to meet all normal braking needs and to assist in the short field landing capabilities of the Seneca II. Two single-disc, double puck **brake assemblies**, one on each main gear, are actuated either by **toe brake pedals** mounted on both the pilot's and the copilot's rudder pedals or by a **hand-operated brake lever** located below and behind the left center of the instrument panel. A brake system **hydraulic reservoir**, independent of the landing gear hydraulic reservoir, is located behind a panel in the rear top of the nose baggage compartment. Brake fluid should be maintained at the level marked on the reservoir. For further information see "Brake Service" in the Handling and Servicing Section of this Manual.

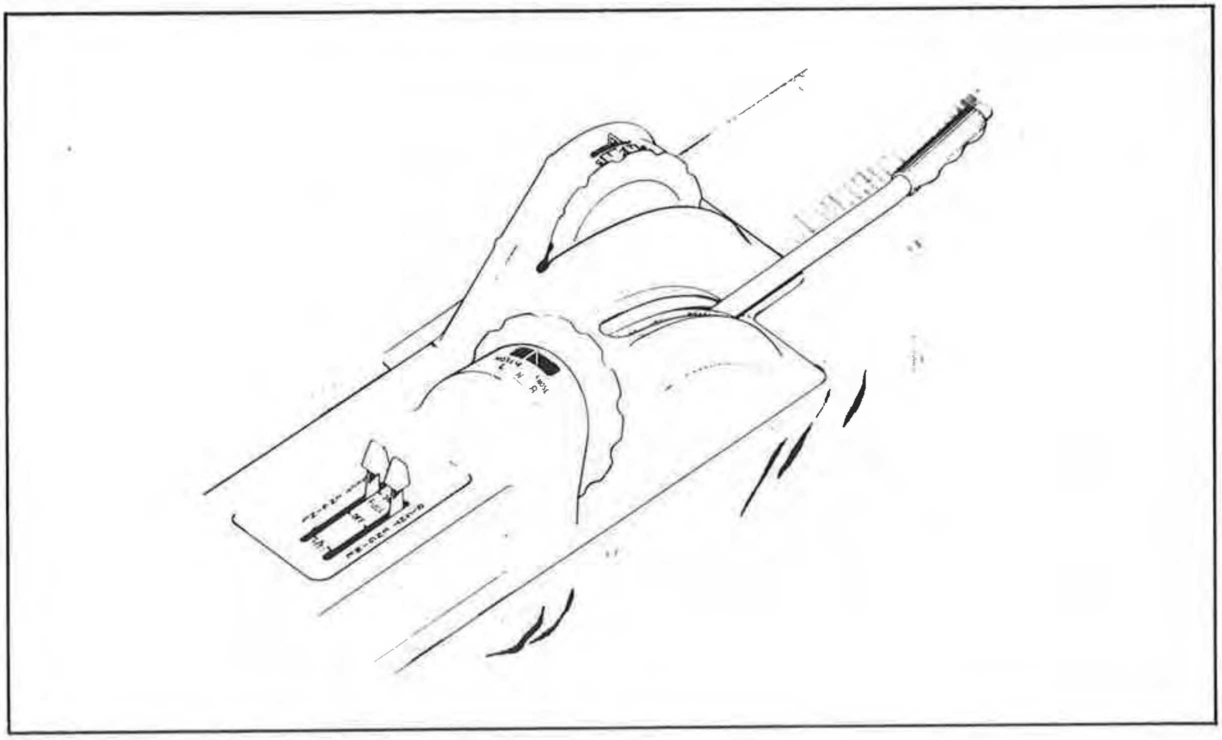
The **parking brake** is engaged by pulling back on the hand brake lever and depressing the button on the left of the handle. The parking brake is released by pulling back on the handle without touching the button and allowing the handle to swing forward.

FLIGHT CONTROL SYSTEM

Dual flight controls are installed in the Seneca II as standard equipment. The controls actuate the control surfaces through a cable system. The horizontal tail surface **(stabilator)** is of the all movable slab type with an anti-servo tab mounted on the trailing edge. This tab, actuated by a control mounted on the console between the front seats, also acts as a longitudinal trim tab.

The **ailerons** are of the Frise type. This design allows the leading edge of the aileron to extend further into the airstream to provide increased drag and improved roll control. The differential deflection of the ailerons tends to eliminate adverse yaw in turning maneuvers and to reduce the amount of coordination required in normal turns.

The vertical tail is fitted with a **rudder** which incorporates a combination rudder trim and anti-servo tab. The rudder trim control is located on the control console between the front seats.

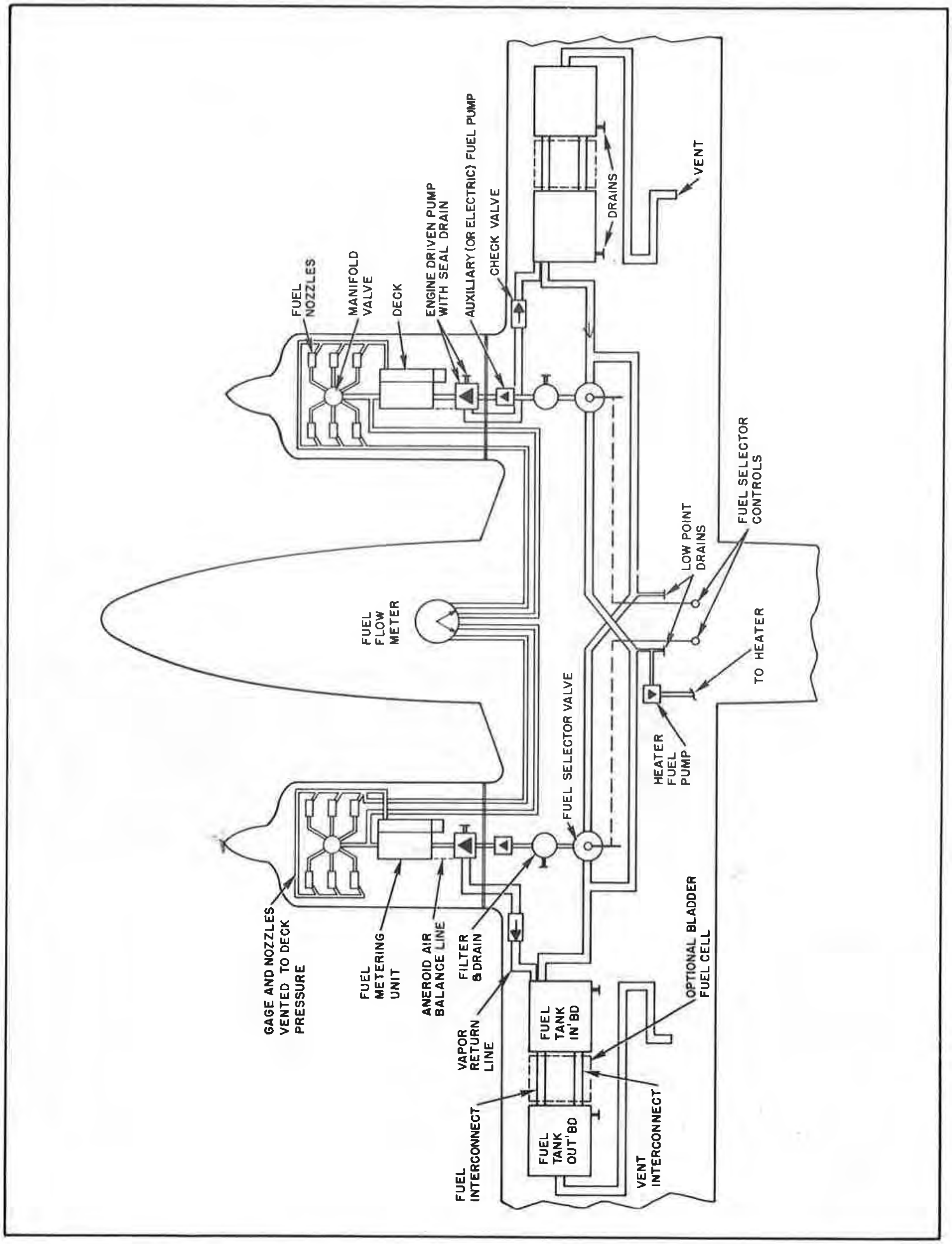


Console

The **flaps** are manually operated, aerodynamically balanced for light operating forces and spring loaded to return to the retracted position. A four-position flap control lever between the front seats adjusts the flaps for reduced landing speeds and a high degree of glide path control. The flaps have three extended positions - 10, 25 and 40 degrees - as well as the fully retracted position. A button on the end of the lever must be depressed before the control can be moved. 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 in the fully retracted position, the flaps should be retracted when people are entering or leaving the airplane.

FUEL SYSTEM

Fuel is stored in fuel tanks located in each wing. The tanks in each wing are interconnected to function as a single tank. All tanks on a side are filled through a single filler in the outboard tank, and as fuel is consumed from the inboard tank, it is replenished by fuel from outboard. Only two and one half gallons of fuel in each wing is unusable, giving the Seneca II a total of 93 usable gallons with standard fuel tanks or 123 usable gallons with the optional fuel tanks installed. The fuel must be 100/130 octane. The fuel tank vents, one installed under each wing, feature an anti-icing design to prevent ice formation from blocking the fuel tank vent lines.



Fuel System Schematic

The fuel injection system is a "continuous flow" type which utilizes a vapor return line leading back to the fuel tanks. This line provides a route back to the tanks for vapor laden fuel that has been separated in the injector pump swirl chamber. Each engine has an engine driven fuel pump that is a part of the fuel injection system. On models without a primer system* installation, switches for the electric fuel pumps are located on the switch panel to the left of the pilot. The electric fuel pumps pressurize fuel for priming and vapor suppression. An integral relief valve assures that activation of the electric fuel pump for vapor suppression will not flood the engine. On models with a primer system** installation an auxiliary fuel system is provided. The purpose of the electrically powered auxiliary fuel system is to supply fuel to the engine in case of engine driven fuel pump shaft failure or malfunction, for ground and inflight engine starting, and for vapor suppression. The two auxiliary fuel pump switches are located on the electrical side panel and are three position rocker switches; LO, HI and OFF. The LO auxiliary fuel pressure is selected by pushing the top of the switch. The HI auxiliary fuel pressure is selected by pushing the bottom of the switch, but this can be done only after unlatching the adjacent guard. When the HI auxiliary fuel pump is activated, an amber light near the annunciation panel is illuminated for each pump. These lights dim whenever the pump pressure reduces automatically and manifold pressure is below approximately 21 inches.

On models without a primer system* installation, in case of a failed engine-driven pump, partial (approximately 25%) power may be maintained by use of the corresponding electric fuel pump. This power will allow positive thrust which will result in better performance than can be obtained with the propeller feathered. On models with a primer system** installation, in case of a failed engine-driven fuel pump, auxiliary fuel pressure should be selected. Adequate pressure and fuel flow will be supplied for up to approximately 75% power. Manual leaning to the correct fuel flow will be required at altitudes above 15,000 feet and for engine speeds less than 2300 RPM. An absolute pressure switch automatically selects a lower fuel pressure when the throttle is reduced below 21" Hg manifold pressure and the HI auxiliary fuel pump is on.

NOTE

Excessive fuel pressure and very rich fuel/air mixtures will occur if the HI position is energized when the engine fuel injection system is functioning normally.

Low auxiliary fuel pressure is available and may be used during normal engine operation both on the ground and inflight for vapor suppression should it be necessary as evidenced by unstable engine operation during idle or at high altitudes.

Separate spring loaded OFF primer button switches, located adjacent to the starter switches are used to select HI auxiliary fuel pump operation for priming, irrespective of other switch positions. These primer buttons may be used for both hot or cold engine starts.

*Ser. nos. 34-7570001 through 34-7570308 when Piper Kit No. 760 926V is not installed.
**Ser. nos. 34-7570309 and up and 34-7570001 through 34-7570308 when Piper Kit No. 760 926V is installed.

Fuel management controls are located on the console between the front seats. There is a control lever for each of the engines, and each is placarded "ON" - "OFF" - "X FEED." During normal operation, the levers are in the "ON" position, and each engine draws fuel from the tanks on the same side as the engine. The two fuel systems are interconnected by crossfeed lines. When the "X FEED" position is selected, the engine will draw fuel from the tanks on the opposite side in order to extend range and keep fuel weight balanced during single-engine operation. The "OFF" position shuts off the fuel flow from a side.

NOTE

When one engine is inoperative and the fuel selector for the operating engine is on "X FEED" the selector for the inoperative engine must be in the "OFF" position. Do not operate with both selectors on "X FEED." Do not take off with a selector on "X FEED." Fuel and vapor are always returned to the tank on the same side as the operating engine.

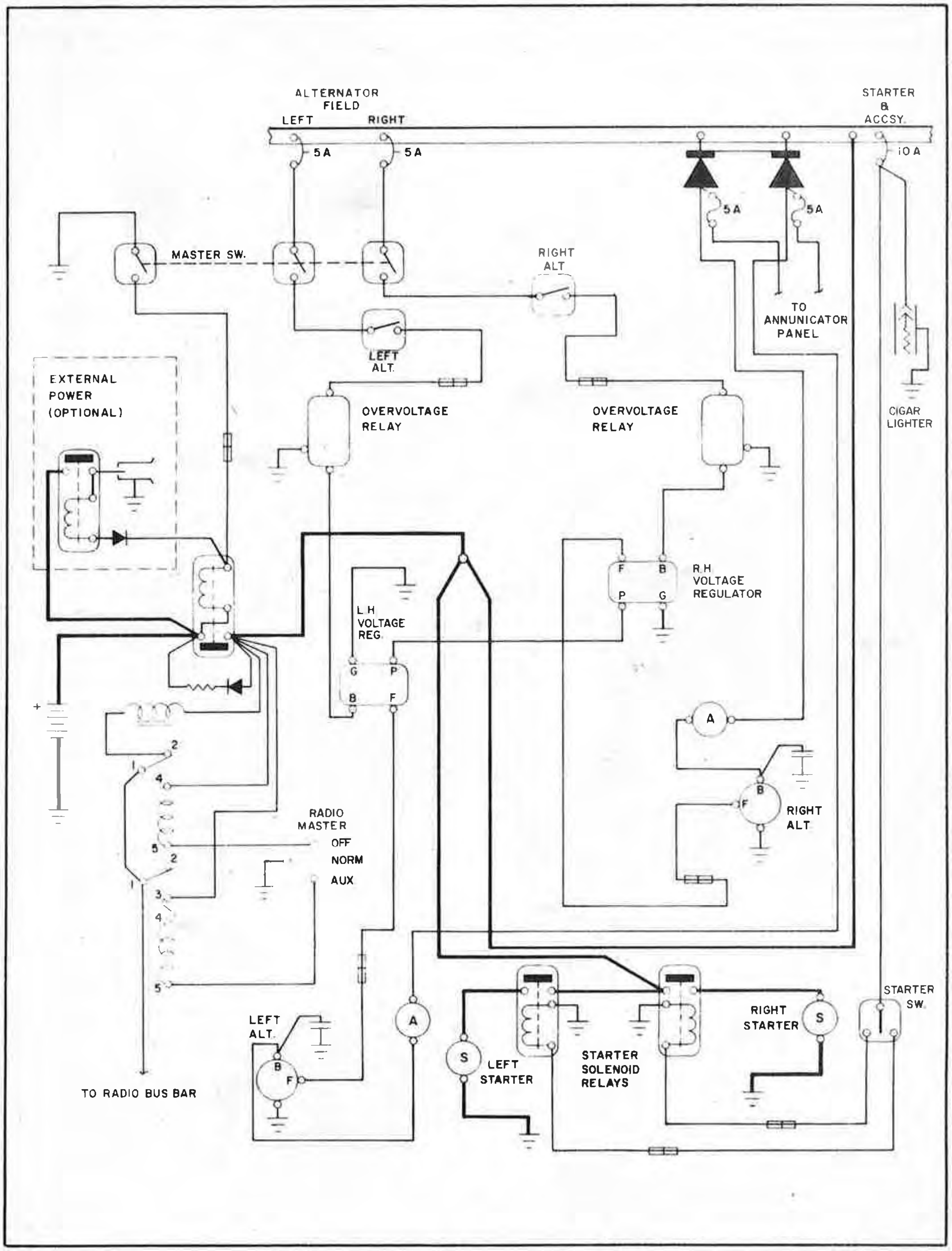
Before each flight, fuel must be drained from low points in the fuel system to ensure that any accumulation of moisture or sediment is removed from the system. **Fuel drains** are provided for each fuel filter (2), each fuel tank (4), and each crossfeed line(2). The fuel filter drains are located on the outboard underside of each engine nacelle; two fuel tank drains are located on the underside of each wing; fuel crossfeed drains are located at the lowest point in the fuel system, on the underside of the fuselage, just inboard of the trailing edge of the right wing flap.

ELECTRICAL SYSTEM

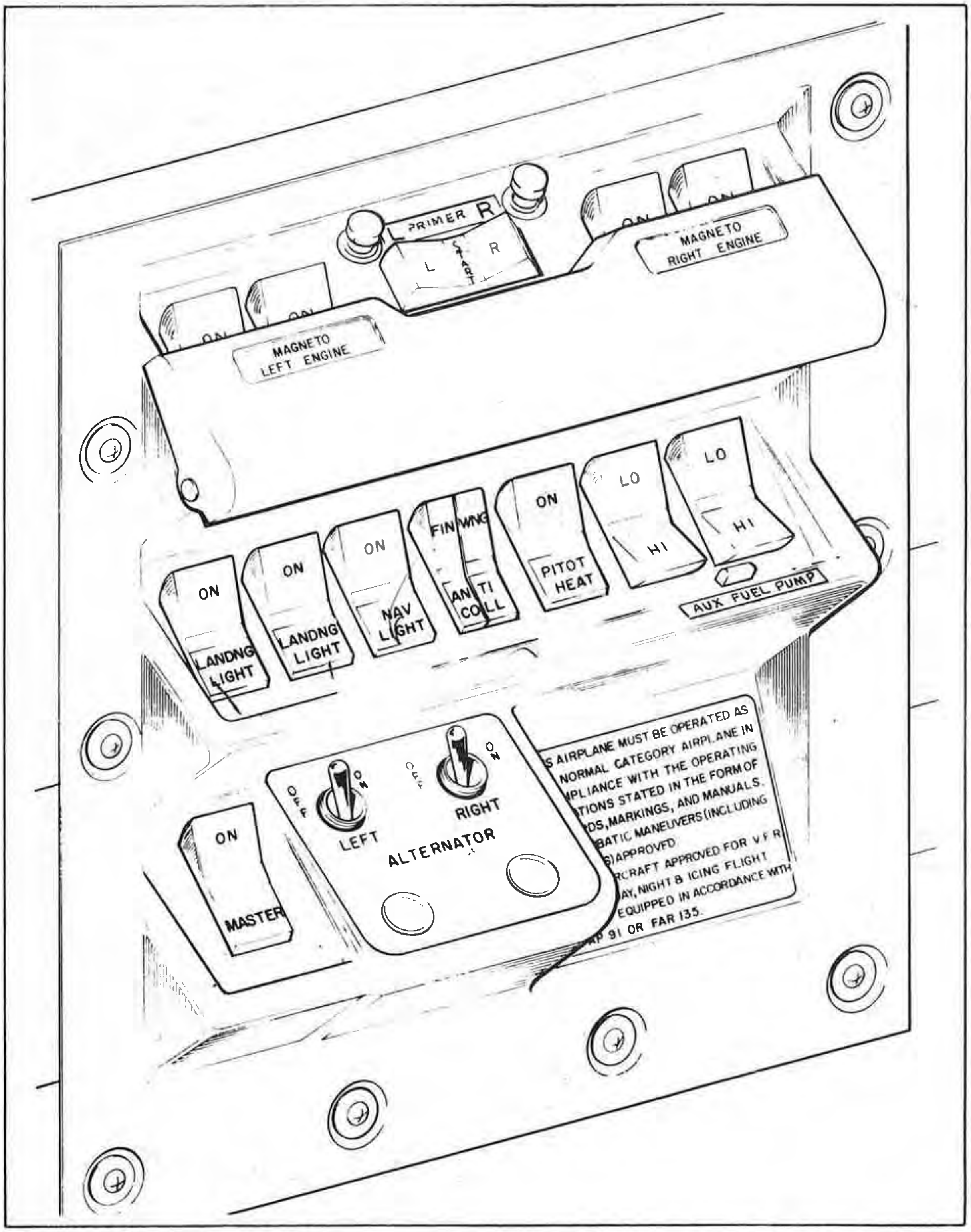
The **electrical system** of the Seneca II is capable of supplying sufficient current for complete night IFR equipment. Electrical power is supplied by two 65 ampere alternators, one mounted on each engine. A 35 ampere-hour, 12-volt battery provides current for starting, for use of electrical equipment 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.

When the optional **external power source plug** is installed, it is located on the lower left side of the nose section. While an external 12 or 14-volt power source is being plugged in or unplugged, the master switch should be turned off to prevent sparking. However, while the engine is being started with external power, the master switch should be turned on.

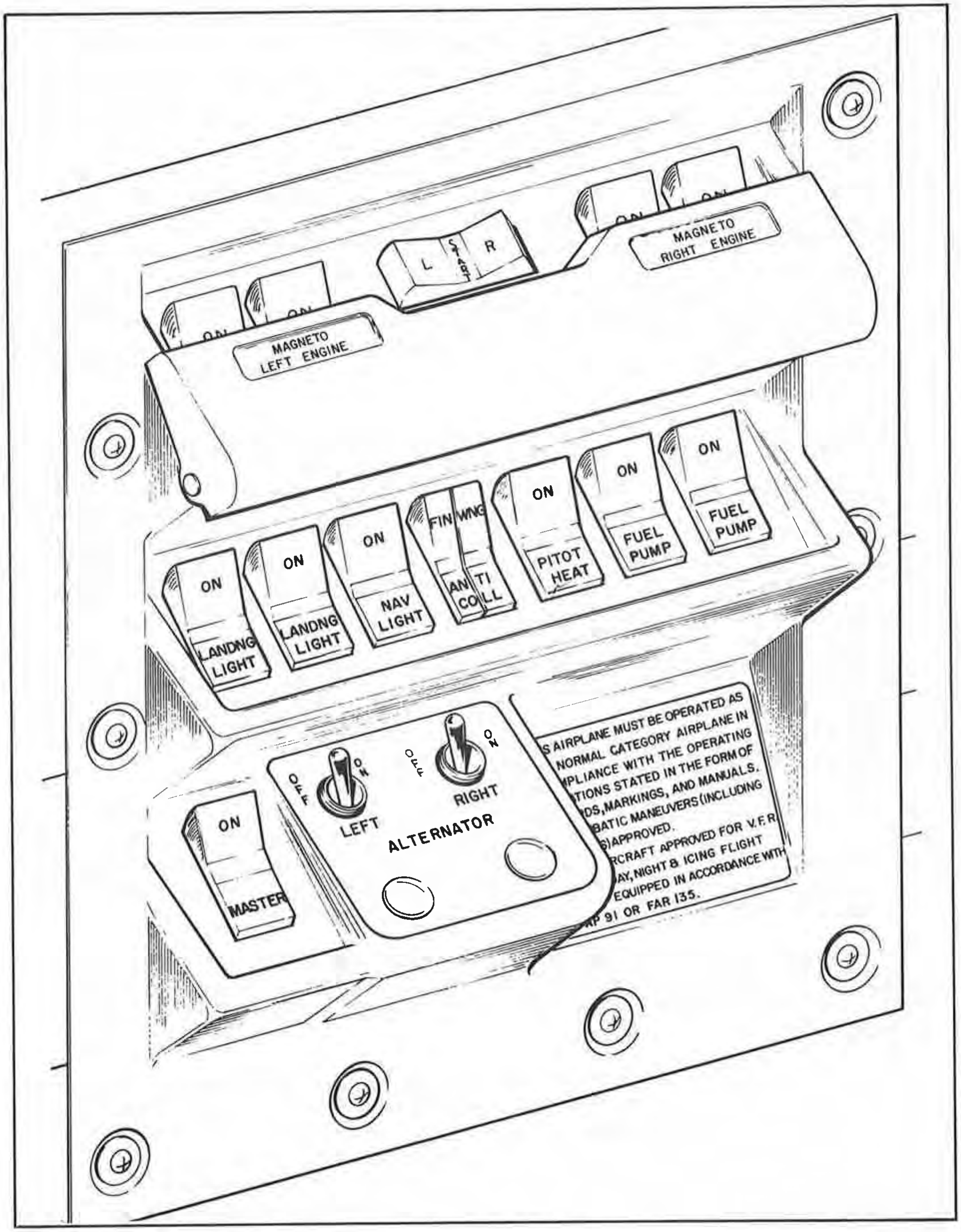
Two **solid state voltage regulators** maintain effective load sharing while regulating electrical system bus voltage to 14-volts. An **overvoltage relay** in each alternator circuit prevents damage to electrical and avionics equipment by taking an alternator off the line if its output exceeds 14-volts. If this should occur, the alternator light on the annunciator panel will illuminate. Voltage regulators and overvoltage relays are located forward of the bottom of the bulkhead separating the cabin section from the nose section.



Alternator and Starter Schematic



Switch Panel - With Primer System
(Ser. nos. 34-7570309 and up and 34-7570001 through 34-7570308
when Piper Kit No. 760 926V is installed.)



Switch Panel - Without Primer System
(Ser. nos. 34-7570001 through 34-7570308 when Piper Kit No. 760 926V is not installed.)

Approximately 2000 RPM or more is required to obtain full alternator output of 65 amperes. It is normal to have zero output at idle RPM. This is due to the reduced drive ratio from the engine. Dual ammeters and the ALT annunciator light provide an easy means of monitoring the electrical system operation. The two ammeters (load meters) indicate the output of the alternators. Should an ammeter indicate a load much higher than the known consumption of the electrical equipment in use, it should be suspected of a malfunction and turned off. In this event, the remaining alternator's ammeter should show a normal indication after approximately one minute. If both ammeters indicate a load much higher than the known consumption for more than approximately five minutes, an electrical defect other than the alternator system should be suspected because a discharged battery will reduce the alternator load as it approaches the charged conditions. A zero ammeter reading indicates an alternator is not producing current and should be accompanied by illumination of the ALT annunciator light. A single alternator is capable of supporting a continued flight in case of alternator or engine failure in most conditions; however, with deicing equipment and other high loads, care must be exercised to prevent the loads from exceeding the 65 ampere rating and subsequent depletion of the battery.

The annunciator panel on the upper left of the instrument panel is installed as an electrical accessory. It includes manifold pressure overboost, gyro pressure, oil pressure, and alternator indicator lights. Illumination of any light indicates that the pilot should monitor system gauges to determine if a failure has occurred and if corrective action is required. Light function may be tested with a "push to test" switch. In addition, on models with a primer system* installation, an amber light illuminates when the corresponding HI auxiliary fuel pump is energized. The auxiliary fuel pump annunciator lights will not illuminate when the "push to test" switch is actuated. Auxiliary fuel system light function is tested when the primer switches are actuated.

When all electrical equipment is turned off (except the master switch), the ammeters will indicate current being used to charge the battery and operate the instruments. 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 both alternators should fail during flight, the battery becomes the only source of electrical power; therefore, all unnecessary electrical equipment should be turned off. The length of time the battery will be able to supply power to the necessary equipment depends on the current drained by the equipment, the time it took for the pilot to notice the dual failure and to execute protective procedures, and the condition of the battery.

During night or instrument flight, the pilot should continuously monitor the ammeters and warning light so that prompt corrective action may be initiated if an electrical malfunction occurs. Procedures for dealing with electrical malfunction are covered in detail in the Airplane Flight Manual Section.

The electrical system and equipment are protected by **circuit breakers** located on a circuit breaker panel on the lower right side of the instrument panel. The circuit breaker panel is provided with enough blank spaces to accommodate additional circuit breakers if extra electrical equipment is installed. In the event of equipment malfunctions or a sudden surge of current, a circuit breaker can trip automatically. The pilot can reset the breaker by pressing it in (preferably after a few minutes cooling period). The circuit breakers can be pulled out manually.

*Ser. nos. 34-7570309 and up and 34-7570001 through 34-7570308 when Piper Kit No. 760 926V is installed.

Most of the **electrical switches**, including the master switch and switches for magnetos, fuel pumps, starters, alternators, lights and pitot heat, are conveniently located on the switch panel to the left of the pilot.

GYRO PRESSURE SYSTEM

The directional gyros and attitude indicators are driven by positive air pressure. The pressure system consists of a pressure pump on each engine, plus plumbing and regulating equipment. Air for the system is taken from the engine nacelle area through inlet filters and passed through pressure pumps installed on the engines. Pressure regulators mounted on the fire walls maintain the air at constant pressure to prevent damage to the instruments. Check valves, a pressure air manifold, and inline filters are mounted in the cabin at the forward bulkhead. The check valves close to allow pressure instruments to function during single-engine operation or in the event of malfunction of one of the pressure pumps. The instruments receive air from the manifold. A pressure gauge on the instrument panel, to the left of the pilot's control wheel shaft, is connected to the manifold and indicates the pressure the gyros are receiving. After air has passed through the gyro instruments, it is exhausted overboard through the forward bulkhead.

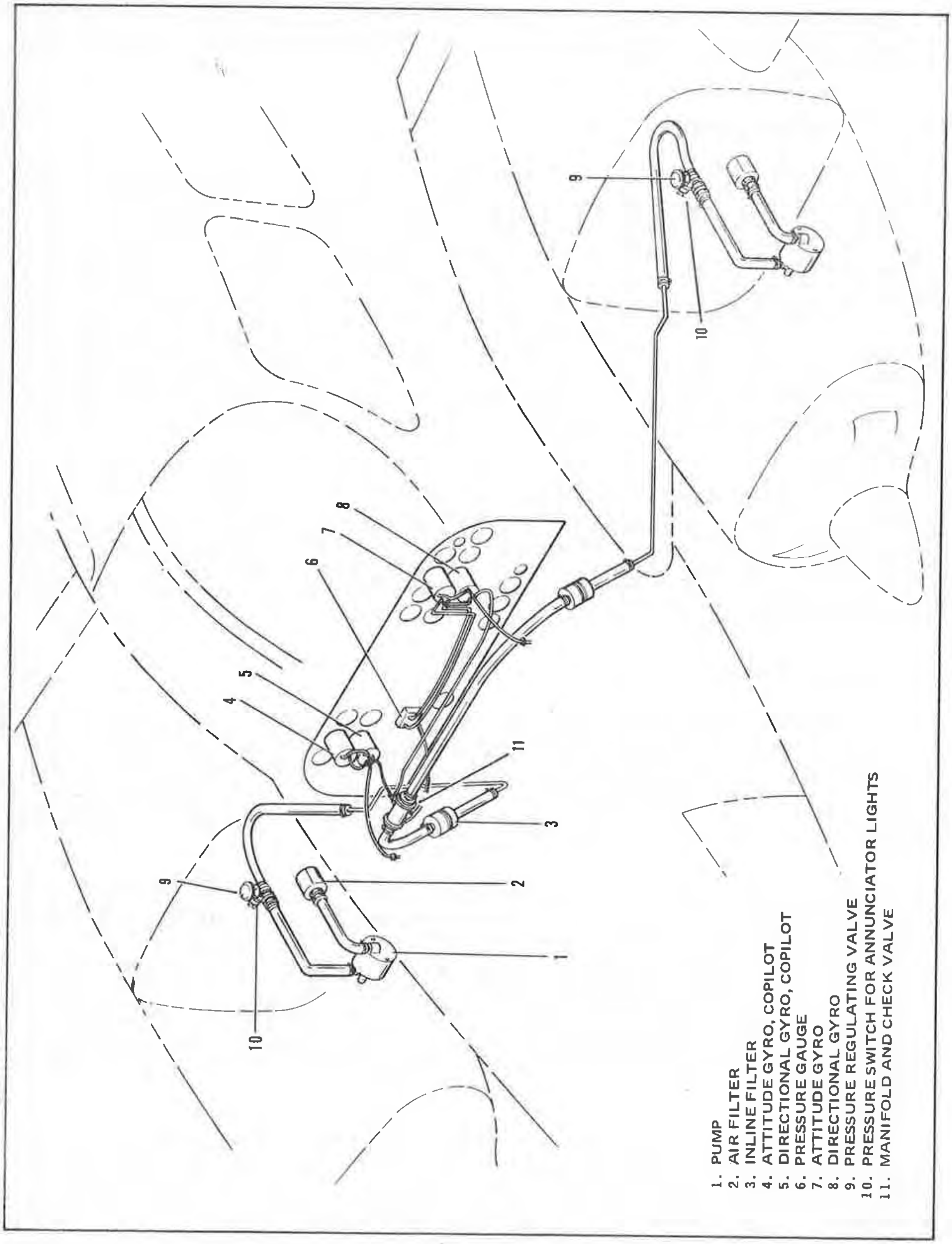
The operating limits for the gyro pressure system are 4.5 to 5.2 inches of mercury for all operations. Operation of the gyro pressure system can be monitored through a gyro pressure gauge mounted to the left of the copilot's control wheel. The two warning indicators mounted on the gauge serve to alert the pilot should one of the engines be producing less than sufficient pressure to operate the gyro instruments. Additional warning of a possible malfunction in the gyro pressure system is provided by a light in the annunciator panel.

PITOT STATIC SYSTEM

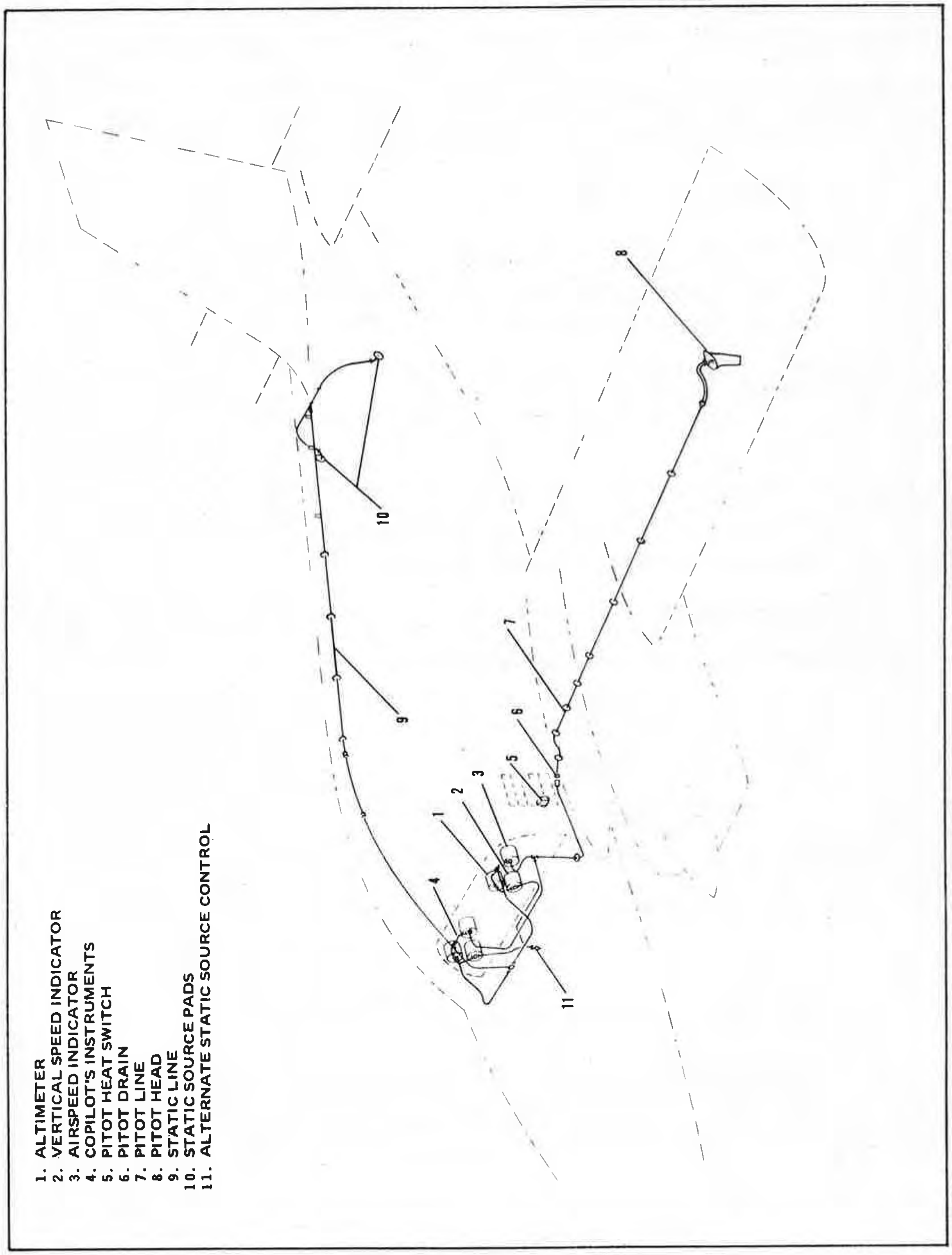
Pitot pressure for the airspeed indicator is sensed by an aluminum **pitot head** installed on the bottom of the left wing and carried through lines within the wing and fuselage to the gauge on the instrument panel. **Static pressure** for the altimeter, vertical speed and airspeed indicators is sensed by two **static source pads,** one on each side of the rear fuselage forward of the stabilator. They connect to a single line leading to the instruments. The dual pickups balance out differences in static pressure caused by side slips or skids.

An **alternate static source** control valve is located below the instrument panel to the right of the control quadrant. When the valve is set to the alternate position, the altimeter, vertical speed indicator and airspeed indicator will be using cabin air for static pressure. During alternate static source operation, these instruments may give slightly different reading, depending on conditions within the cabin. Airspeed, setting of heating and ventilating controls, or the position of the storm window can influence cabin air pressure. The pilot can determine the effects of the alternate static source on instrument readings by switching from standard to alternate sources at different airspeeds and heating and ventilating configurations (including open storm window below 150 MPH).

If one or more of the pitot static instruments malfunction, the system should be checked for dirt, leaks, or moisture. The pitot and the static lines may be drained through separate **drains.** A drain on the lower left front of the side panel may be used to drain moisture from the pressure line running from the pitot head to the instrument panel. Since the alternate static source control is at the low point in the system, selecting the alternate static source will drain the static pressure lines.



Gyro Pressure System



Pitot Static System

The holes in the sensors for pitot and static pressure must be fully open and free from dirt, bugs, or polish. Blocked sensor holes will give erratic or zero readings on the instruments.

A **heated pitot head,** which eliminates problems with icing and heavy rain, is available as optional equipment. Static source pads have been demonstrated to be non-icing; however, in the event icing does occur, selecting the alternate static source will alleviate the problem.

INSTRUMENT PANEL

The **instrument panel** is designed to be functional and professional. There is sufficient space for the pilot's flight instruments and complete engine instruments, plus optional copilot's flight instruments and a wide range of avionics and additional optional instruments. Equipment is available to allow the Seneca II to be uniquely suited to individual needs.

Flight instruments are grouped in the upper instrument panel; **engine and electrical system monitoring instruments,** the **autopilot,** and the **circuit breaker panel** are in the lower instrument panel. Left and right engine instruments are conveniently separated by the left control wheel shaft.

Radios are mounted in the center of the upper instrument panel. The **control quadrant** - throttles and propeller and mixture controls - is in the center of the lower instrument panel. To the left of the control quadrant is the **landing gear selector.** This arrangement makes these installations conveniently accessible to both pilot and copilot.

Various **warning lights** are located with the pilot's flight instruments on the left upper instrument panel. The **gear unsafe warning light** is to the left of the annunciator panel; and the **stall warning light** is to the far left of the pilot's flight instruments.

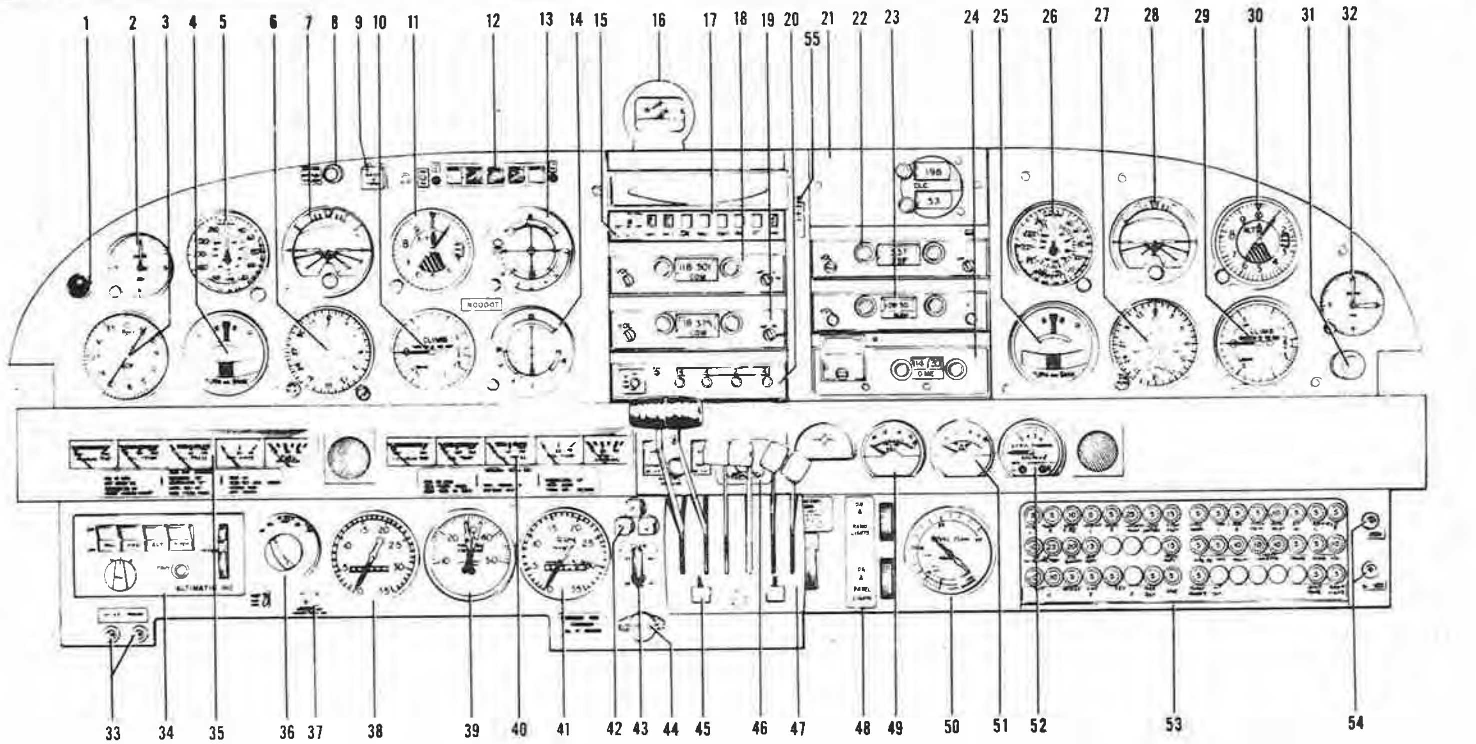
The **annunciator panel,** with manifold pressure overboost, oil pressure, gyro pressure and alternator lights, and incorporating a press-to-test feature, is located to the upper left of the radios. The illumination of these lights in flight is an indication of a possible system malfunction. The pilot should closely monitor instrument panel gauges to check the condition of a system whose corresponding light on the annunciator panel illuminates. Illumination of the manifold pressure overboost lights indicates manifold pressure at or above the maximum allowable 40 inches Hg. During preflight, the operational status of the annunciator panel, except auxiliary fuel pump lights, should be tested by use of the press-to-test button. When the button is depressed, all annunciator panel lights, execpt auxiliary fuel pump lights, should illuminate.

NOTE

> When an engine is feathered, the alternator, gyro air and oil pressure annunciator lights will remain illuminated.

Instrument panel **lighting** can be dimmed or brightened by rheostat switches to the right of the control quadrant. Back-lights are standard equipment, and map lights, and reading lights are available as options. When instrument panel lights are turned on, annunciator lights are dimmed. However, they will not show dim when the press-to-test switch is depressed.

Most of the electrical switches are located on the switch panel on the left side of the cockpit. In later models a radio power switch is located near the top of the instrument panel between the radio stacks. It controls the power to all radios through the aircraft MASTER switch. The radio power switch has an OFF, NORMAL and AUXILIARY position. The AUXILIARY position provides a secondary power circuit for all radios.



1. STALL WARNING LIGHT
2. CLOCK
3. ADF INDICATOR
4. TURN AND BANK INDICATOR
5. AIRSPEED INDICATOR
6. DIRECTIONAL GYRO
7. ATTITUDE GYRO
8. GLIDE SLOPE COUPLER ENGAGED
9. GEAR IN TRANSIT LIGHT
10. VERTICAL SPEED INDICATOR
11. ALTIMETER
12. ANNUNCIATOR PANEL (WITH PRIMER SYSTEM)
13. OMNI AND GLIDE SLOPE INDICATOR
14. OMNI INDICATOR
15. MARKER BEACON
16. COMPASS
17. AUDIO CONTROL PANEL
18. COMMUNICATIONS TRANSCEIVERS (NO. 1)
19. COMMUNICATIONS TRANSCEIVERS (NO. 2)
20. TRANSPONDER
21. R-NAV
22. ADF RECEIVER
23. NAVIGATION RECEIVER
24. DME
25. TURN AND BANK INDICATOR (COPILOT'S)
26. AIRSPEED INDICATOR (COPILOT'S)
27. DIRECTIONAL GYRO (COPILOT'S)
28. ATTITUDE GYRO (COPILOT'S)
29. VERTICAL SPEED INDICATOR (COPILOT'S)
30. ALTIMETER (COPILOT'S)
31. CIGAR LIGHTER
32. CLOCK (COPILOT'S)
33. MIKE AND PHONE JACKS
34. ALTIMATIC III C AUTOPILOT
35. LEFT ENGINE AND FUEL INSTRUMENT CLUSTER
36. OMNI COUPLER
37. PITCH TRIM
38. LEFT ENGINE TACHOMETER
39. DUAL MANIFOLD PRESSURE GAUGE
40. RIGHT ENGINE AND FUEL INSTRUMENT CLUSTER
41. RIGHT ENGINE TACHOMETER
42. LANDING GEAR DOWN LIGHTS
43. LANDING GEAR SELECTOR
44. LANDING GEAR FREE FALL VALVE CONTROL
45. ALTERNATE AIR CONTROL
46. PROP DEICE AMMETER
47. CONTROL QUADRANT
48. RADIO LIGHTS AND PANEL LIGHTS
49. LEFT ENGINE EGT GAUGE
50. FUEL FLOW GAUGE
51. RIGHT ENGINE EGT GAUGE
52. GYRO PRESSURE GAUGE
53. CIRCUIT BREAKER PANEL
54. MIKE AND PHONE JACKS (COPILOT'S)
55. RADIO POWER SWITCH (LATER MODELS ONLY)

Instrument Panel

HEATING, VENTILATING AND DEFROSTING SYSTEM

Heated air for cabin heat and windshield defrosting is provided by a Janitrol combustion heater located in the aft fuselage behind the cabin baggage compartment close-off. Air from the heater is ducted forward along the cabin floor to outlets at each seat and to the windshield area.

Operation of the combustion heater is controlled by a three-position switch located on the control console between the front seats and labeled FAN, OFF and HEATER. Airflow and temperature are regulated by the two levers on the console. The right-hand lever regulates air intake and the left-hand lever regulates cabin temperature. Cabin comfort can be maintained as desired through various combinations of lever positions. Passengers have secondary control over heat output by individually adjustable outlets at each seat location.

For cabin heat, the air intake lever on the heater control console must be partially or fully open and the three-position switch set to the HEATER position. This simultaneously starts fuel flow and ignites the heater; and, during ground operation, it also activates the ventilation blower which is an integral part of the combustion heater. With instant starting and no need for priming, heat should be felt within a few seconds. When cabin air reaches the temperature selected on the cabin temperature lever, ignition of the heater cycles automatically to maintain the selected temperature. Two safety switches activated by the intake valve and located aft of the heater unit prevent both fan and heater operation when the air intake lever is in the closed position. A micro switch, which actuates when the landing gear is retracted, turns off the ventilation blower so that in flight the cabin air is circulated by ram air pressure only.

When the three-position switch is in the FAN position during ground operation, the ventilation fan blows fresh air through the heater ductwork for cabin ventilation and windshield defogging when heat is not desired. When the heater controls are used either for cabin heat or for ventilation, air is automatically ducted to the windshield area for defrosting.

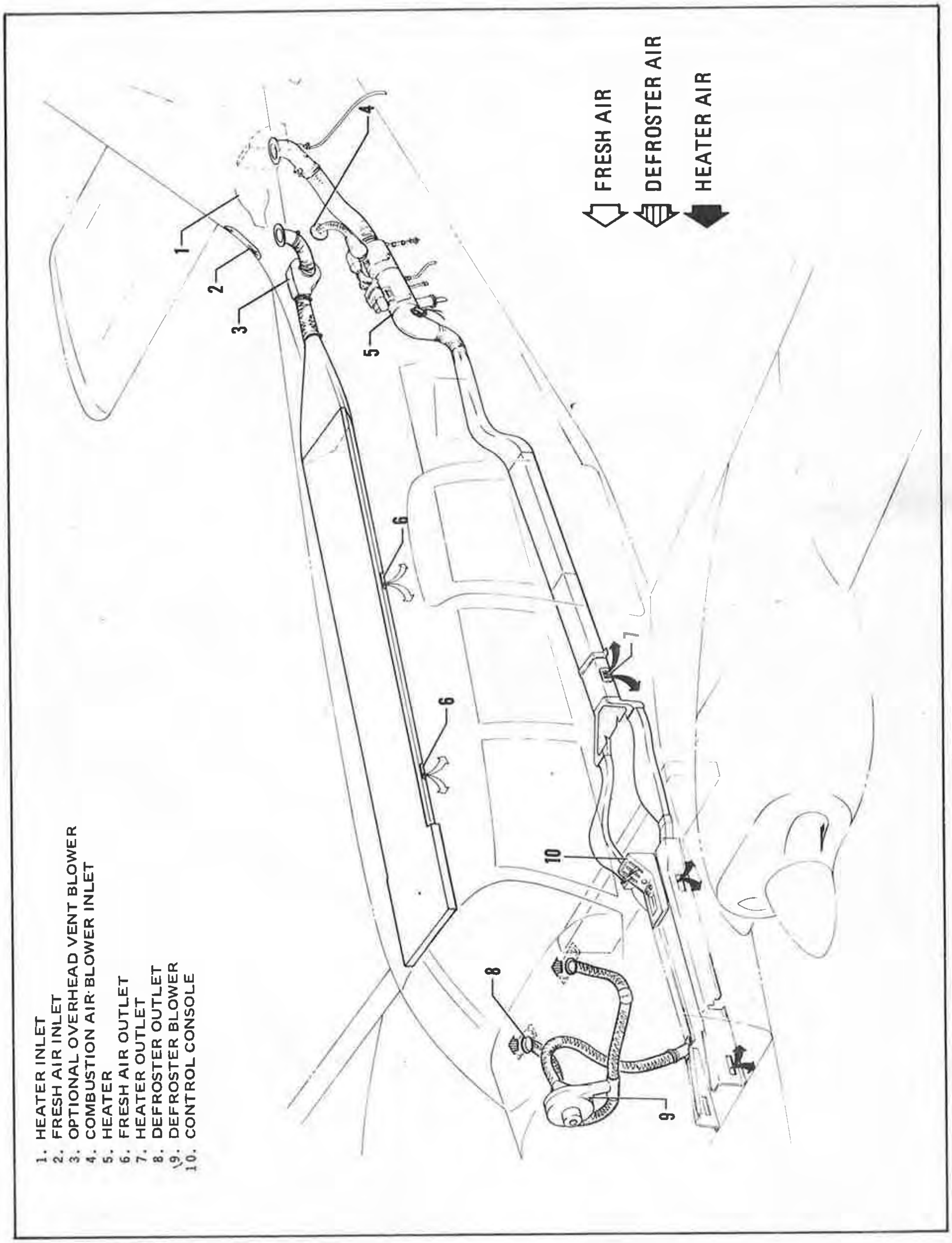
The flow of defroster air to the windshield area can be increased by the activation of a defroster fan. The fan is controlled by a defroster switch located on the control console between the two front seats.

To introduce fresh, unheated air into the cabin during flight, the air intake should be open and the heater off. Ram air enters the system and can be individually regulated at each floor outlet. Overhead outlets also supply fresh air for cabin ventilation. The occupant of each seat can manually adjust an outlet in the ceiling to regulate the flow of fresh air to that seat area. An optional fresh air blower may be installed in the overhead ventilation system to provide additional fresh air flow during ground operation.

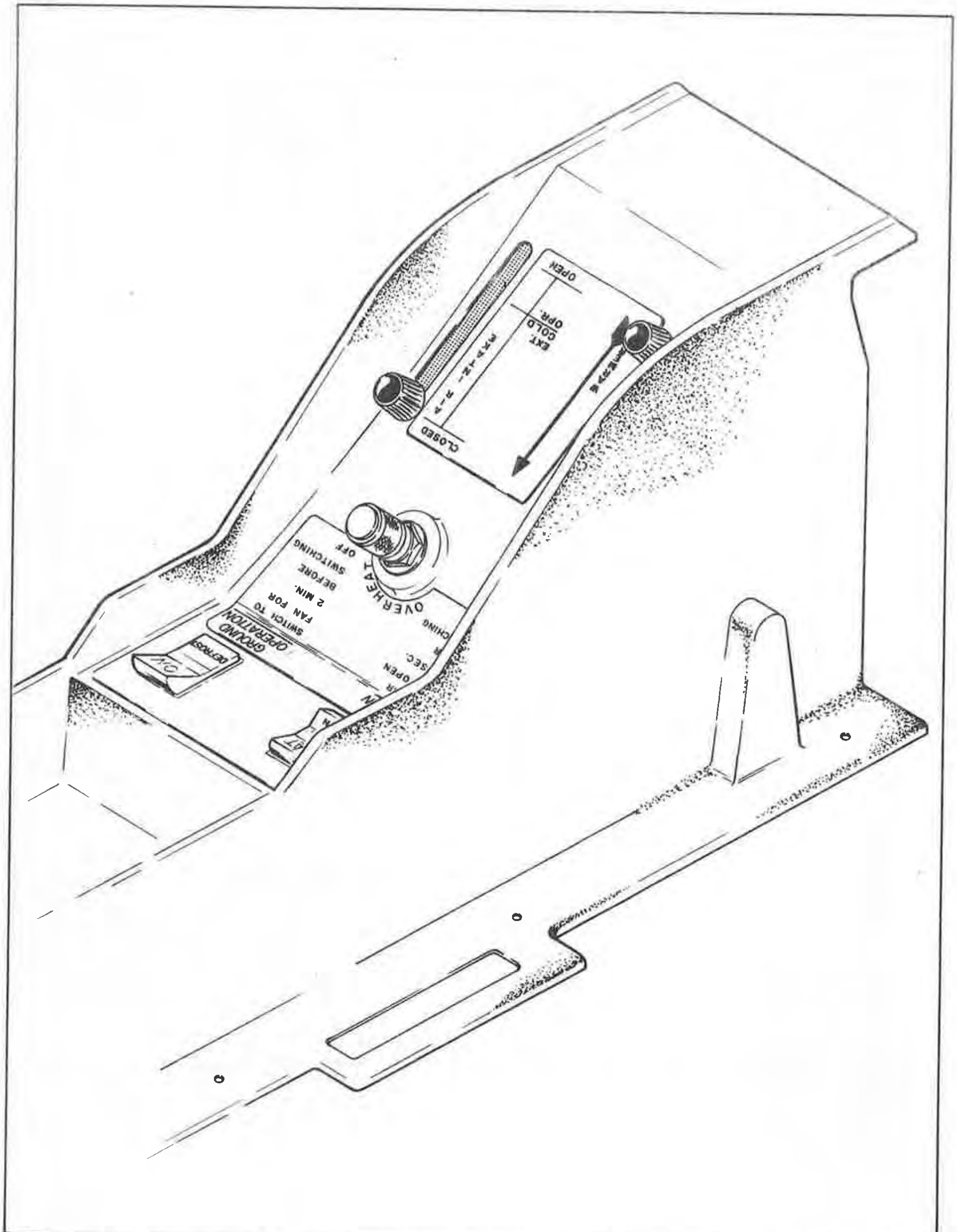
An overheat switch located in the heater unit acts as a safety device to render the heater inoperative if a malfunction should occur. Should the switch deactivate the heater, the OVERHEAT light on the control console will illuminate. The overheat switch is located on the forward outboard end of the heater vent jacket. The red reset button on the heater shroud can be reached through the bulkhead access panel in the aft cabin close-out panel.

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

The combustion heater uses fuel from the airplane fuel system. An electric fuel pump draws fuel from the left tank at a rate of approximately one-half gallon per hour. Fuel used for heater operation should be considered when planning for a flight.



Cabin Heating, Ventilating and Defrosting System



Heating, Ventilating and Defrosting Control Console

CABIN FEATURES

For pilot and passenger comfort, the front seats are adjustable fore and aft. To facilitate entry and exit through the cockpit door, an easily accessible latch on top of the right front seat allows the seat to be pushed forward. Each seat reclines and is provided with an armrest. The center and rear seats are easily removed to provide additional cargo space.

NOTE

> To remove the center and rear seats, retainers securing the back legs of the seats must be unlocked. This is accomplished by turning the slotted head aft of each back leg ninety degrees with a coin or a screwdriver. In the locked position, the slot on the head runs fore to aft. Any time the seats are installed in the airplane, the retainers should be in the locked position.

An optional jump seat, which can be mounted between the two center seats, gives the Seneca II seven-place capabilities.

Seat belts are standard on all seats, and the front seats are equipped with shoulder harnesses and inertia reels. These shoulder harnesses are optionally available for the two center and the two rear seats. The shoulder harness is routed over the shoulder adjacent to the window and attached to the seat belt in the general area of the occupant's inboard hip. A check of the inertia reel mechanism is made by pulling sharply on the strap. The reel should lock in place and prevent the strap from extending. For normal body movements, the strap will extend or retract as required. Other seat options include headrests and push-button vertically adjustable pilot and copilot seats. The seat belt should be snuggly fastened over each unoccupied seat.

Standard cabin features include a pilot's storm window, ashtrays, map pockets, coat hooks and assist straps, a cigar lighter, sun visors, and pockets on the front and center seat backs. Among the options which may be added to suit individual needs are headrests, a fire extinguisher, and a special cabin sound-proofing package.

STALL WARNING

An approaching stall is indicated by a stall warning indicator which is activated between five and ten miles per hour above stall speed. Mild airframe buffeting and gentle pitching may also precede the stall. Stall speeds are shown on a graph in the Performance Charts Section. The stall warning indicator consists of a red light located on the left side of the instrument panel and a continuous sounding horn located behind the instrument panel on earlier models. The stall warning red light is eliminated on later models. The stall warning horn has a different sound from that of the gear warning horn which also has a 90 cycles per minute beeping sound on later models. The stall warning indicators are activated by two lift detectors on the leading edge of the left wing, outboard of the engine nacelle. The inboard detector activates the indicators when* the flaps are in the 25 and 40 degree positions, the outboard when the flaps are in other positions.

BAGGAGE AREA

The large amount of baggage space permits an exceptional flexibility of loading within the Seneca II weight and balance envelope. There are **two separate baggage compartments.** One, the **nose section baggage compartment**, is accessible through a baggage door on the left side of the nose section. It has a maximum weight capacity of 100 pounds and a volume of 15.3 cubic feet. The **cabin baggage compartment,** located aft of seats five and six has a weight capacity of 100 pounds and a volume of 20 cubic feet. This compartment is loaded and unloaded through the rear cabin door, and it is conveniently accessible during flight. Tie-down straps are provided and they should be used at all times. A cargo loading door, installed aft of the rear door, facilitates the loading of bulky items. All cargo, baggage compartment and passenger doors use the same key.

NOTE

It is the pilot's responsibility to be sure when baggage is loaded that the airplane C.G. falls within the allowable C.G. range. (See Weight and Balance Section.)

FINISH

All sheet aluminum components are carefully fininished to assure maximum service life. All exterior surfaces are finished with a **durable acrylic lacquer** which is available in a variety of colors and combinations. To keep the finish attractive, economy size spray cans of touch-up paint are available from Piper Dealers.

EMERGENCY LOCATOR TRANSMITTER*

An **Emergency Locator Transmitter** (ELT), located in the aft section of the fuselage just below the stabilator leading edge, is accessible through a removable plate on the right side of the fuselage. It is a self-contained transmitter which is automatically activated by impact force when the switch is in the ARMED position. It can also be manually activated, either from the cockpit by a remote switch on the left side panel or by a switch on the unit itself. When the ELT is removed from the airplane and the antenna attached to the side of the case is installed in place, the unit becomes a completely portable locator transmitter. For detailed information see "Emergency Locator Transmitter" in the Operating Instructions Section of this Manual.

PIPER EXTERNAL POWER*

An optional starting installation known as **Piper External Power (PEP)** allows the airplane engine to be started from an external battery without the necessity of gaining access to the airplane battery. The cable from the external battery can be attached to a receptacle under the left side of the nose section of the fuselage. Instructions on a placard located on the cover of the receptacle should be followed when starting with external power. For instructions on the use of the PEP, see "Starting Engines With Aid of External Electric Power" in the Operating Instructions Section of this Manual.

*Optional Equipment

ICE PROTECTION SYSTEM*

For flight into known icing conditions, a complete ice protection system is available as optional equipment on the Seneca II.

The ice protection system consists of the following components: pneumatic wing and empennage boots, wing ice detection light, electrothermal propeller deicer pads, electric windshield panel, heated stall warning transmitters, and heated pitot head.

The pneumatic wing and empennage boots are installed on the leading edges of the wings, the vertical stabilizer and the horizontal stabilator. During normal operation, when the surface deicer system is turned off, the engine-driven pressure pumps apply a constant suction to the deicer boots to provide smooth, streamlined leading edges.

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 deice 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 Deicer" 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. Suction is then reapplied to the deicer boots. The deicer boots do not inflate during the press-to-test cycle.

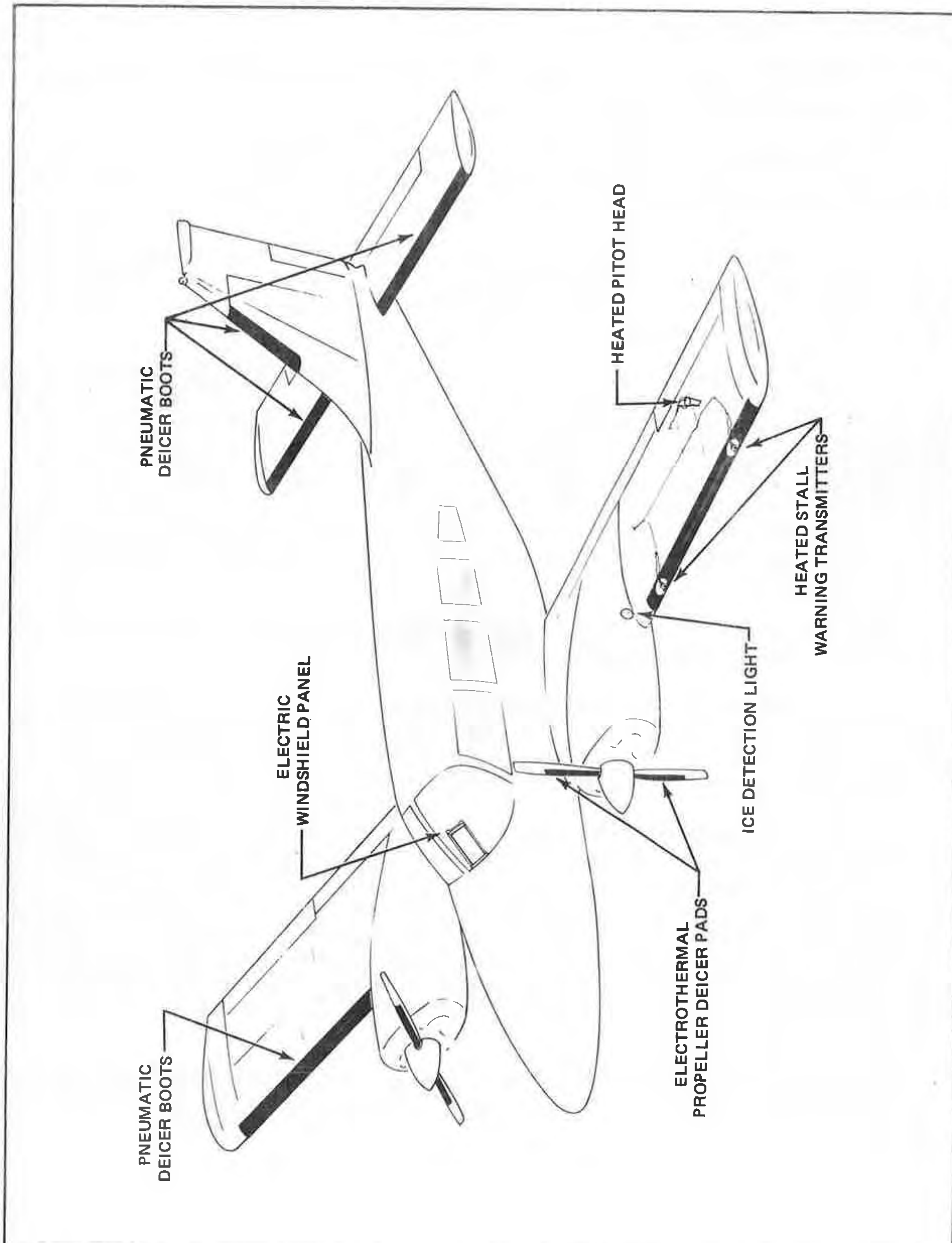
Circuit protection for the surface deicer system is provided by a "Wing-Tail De-icers" circuit breaker located on the circuit breaker panel.

Wing icing conditions may be detected during night flight by 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 deice 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 deice switch. Power for the propeller deicers is supplied by the airplane's electrical system through a "Prop De-ice" circuit breaker in the circuit breaker panel. When the prop deice switch is actuated, power is applied 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 deicer ammeter needle should indicate within the shaded portion of the ammeter for a normal reading.

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

*Optional Equipment



Ice Protection System

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 deice 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."

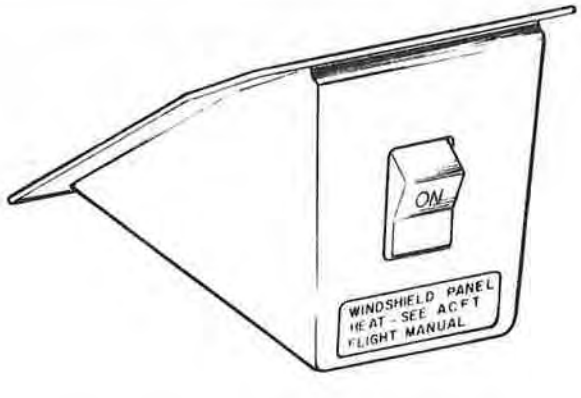
An operational check may be performed by turning the heated windshield panel switch on for a period not exceeding 30 seconds. Proper operation is indicated by the glass section being warm to the touch.

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

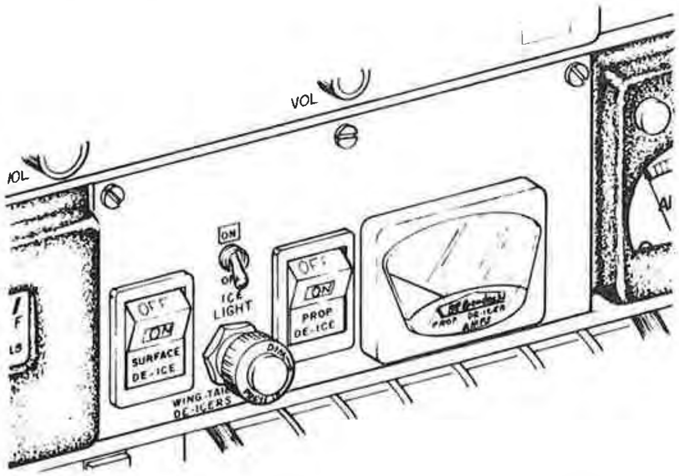
The heated lift detectors, one inboard and one outboard on the left wing, are installed to prevent icing conditions from interfering with operation of the stall warning transmitters. A "Stall Warn Heat" circuit breaker in the circuit breaker panel protects the system against an overvoltage conditon. The stall warning system should not be depended on when there is ice on the wing.

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."

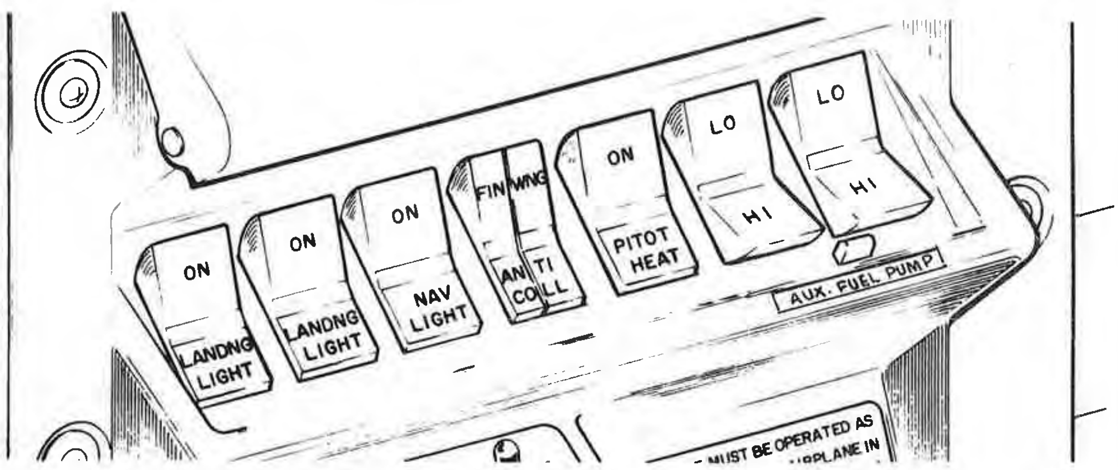
With the heated pitot switch on, check the heated pitot head and heated lift detector for proper heating.



HEATED WINDSHIELD PANEL CONTROL SWITCH



ICE DETECTION LIGHT, SURFACE DEICER AND PROPELLER DEICER CONTROL SWITCHES



HEATED PITOT AND HEATED STALL WARNING TRANSMITTER CONTROL SWITCHES
(Shown on model with primer system installation)

Ice Protection System Control Switches

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.

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AIRPLANE FLIGHT MANUAL

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AIRPLANE FLIGHT MANUAL LOG OF REVISIONS

Revision	Revised Pages	Description and Revision	FAA Approved Date
1	3-28	Revised Supplement B entirely.	D. H. Trompler July 18, 1974
2	3-i	Revised page nos. (items L., M., N., O.); added item B.8., Rear Cabin and Cargo Doors Removed.	
	3-ii	Added item C.21., Engine Failure with Rear Cabin and Cargo Doors Removed; added item C., Aircraft Performance with Rear Cabin and Cargo Doors Removed; revised Supplement item B.	
	3-6	Added placard for aft fuselage doors removed; relocated info. to page 3-6a. (items L., M., N., O.).	
	3-6a	Added page (added items L., M., N., O. from page 3-6; added item M.7.).	
	3-11	Added item 8., Rear Cabin and Cargo Doors Removed.	
	3-18	Revised item 14.b.(2).	
	3-20	Added item 21., Engine Failure with Rear Cabin and Cargo Doors Removed.	
	3-23	Added item C., Aircraft Performance with Rear Cabin and Cargo Doors Removed.	
	3-25	Revised item B.	
	3-28	Relocated Supplement B. to page 3-29	
	3-29	Added page (Supplement B. was revised entirely and added to this page).	D. H. Trompler August 5, 1974
	3-30	Added page (added remainder of Supplement B.).	
3	3-ii	Changed Section IV title from Supplements to Optional Equipment; added item C. - Piper AutoControl IIIB and item D. - Piper AltiMatic IIIC to Optional Equipment.	
	3-1	Revised info. under item C. - Propellers.	
	3-14	Revised info. under item 5. - Engine Driven Fuel Pump Failure.	

AIRPLANE FLIGHT MANUAL LOG OF REVISIONS (cont)

Revision	Revised Pages	Description and Revision	FAA Approved Date
3 (cont)	3-25	Changed Section IV title from Supplements to Optional Equipment; revised Note; added items C. and D.	
	3-31, 3-32, 3-33, 3-34	Added pages (AutoControl IIIB), remove Airplane Flight Manual Supplement Report No. VB-669 if attached to the Airplane Flight Manual.	Ward Evans Ward Evans Dec. 11, 1974
	3-35, 3-36, 3-37, 3-38, 3-39, 3-40, 3-41, 3-42	Added pages (AltiMatic IIIC), remove Airplane Flight Manual Supplement Report No. VB-668 if attached to the Airplane Flight Manual.	
4	3-3	Revised usable fuel quantities - Item J. Usable Fuel.	Ward Evans Ward Evans May 30, 1975
	3-6	Revised usable capacity - filler cap placard.	
5	3-1	Revised engine designation.	
	3-5	Added placard desc. no.; added Landing placard; added footnote.	
	3-6	Added new Takeoff and Landing Check List; added footnote.	
	3-9	Revised Fuel Management items a.(1) (b) and a. (2) (b).	
	3-10	Revised Cruising item (1) (a) 3. and (1) (b) 3.; revised Landing item (2) (c).	
	3-11	Added Annunciator Panel Lights info; added footnote.	
	3-13	Revised Note; deleted existing item i; revised existing item letters; added footnote; relocated info to page 3-14.	
	3-14	Added info from page 3-13; revised Unfeathering items 3. b. and 3. i.; revised S.E. Fuel Management items a. (1) (c) and a. (2) (c); relocated item 5 (Engine Driven Fuel Pump Failure) to page 3-14a; added footnote.	Ward Evans Ward Evans July 16, 1975
	3-14a	Added page (Engine Driven Fuel Pump Failure).	
	3-14b	Added page.	

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AIRPLANE FLIGHT MANUAL LOG OF REVISIONS (cont)

Revision	Revised Pages	Description	FAA Approved Date
6	3-3 3-6 3-14a	Revised item J. (Usable Fuel). Revised standard fuel placard desc.; added opt. fuel placard; revised windshield heat placard desc. Revised item 5. - Engine Driven Fuel Pump Failure.	Ward Evans Ward Evans Oct. 20, 1975
7	3-6a	Added Pitot Heat and Winterization Placards.	Ward Evans Ward Evans March 19, 1976
8	3-1	Added two propellers.	Ward Evans Ward Evans May 13, 1976
9	3-10 3-14	Added item b. (1) (c). Added item 4. a. (3).	Ward Evans Ward Evans March 30, 1977
10	3-1 3-35 thru 3-42	Revised item A. (Engines). Revised Alt. IIIC Autopilot Supplement.	Ward Evans Ward Evans Jan. 18, 1979
11	Title Page 3-21	Added serial numbers. Revised item D, added para.	Ward Evans Ward Evans June 10, 1983

SECTION I

LIMITATIONS

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

A. ENGINES
Continental TSIO-360-E or TSIO-360-EB, Left Side & LTSIO-360-E or LTSIO-360-EB, Right Side.

B. FUEL
100/130 Octane Aviation Gasoline (Minimum)

C. PROPELLERS
Hartzell BHC-C2YF-2CKF/FC8459-8R, Left Side & BHC-C2YF-2CLKF/FJC8459-8R, Right Side, or BHC-C2YF-2CKUF/FC8459-8R, Left Side & BHC-C2YF-2CLKUF/FJC8459-8R, Right Side.
When propeller deicing boots are installed:
Hartzell BHC-C2YF-2CKF/FC8459B-8R, Left Side & BHC-C2YF-2CLKF/FJC8459B-8R, Right Side.

Avoid continuous operation between 2000 and 2200 RPM above 32 In. Hg. manifold pressure.

Avoid continuous ground operation between 1700 and 2100 RPM in cross and tail winds of over 10 knots.

D. INSTRUMENT MARKINGS (POWER PLANT)

OIL TEMPERATURE	
Green Arc (Normal Operating Range)	75° F to 240°F
Red Line (Maximum)	240°F
OIL PRESSURE	
Green Arc (Normal Operating Range)	30 PSI to 80 PSI
Yellow Arc (Caution)	10 PSI to 30 PSI
Yellow Arc (Caution)	80 PSI to 100 PSI
Red Line (Minimum)	10 PSI
Red Line (Maximum)	100 PSI
TACHOMETER	
Green Arc (Normal Operating Range)	500 RPM to 2000 RPM & 2200 RPM to 2575 RPM
Yellow Arc (Avoid continuous operation above 32" Hg. manifold press.)	2000 RPM to 2200 RPM
Red Line (Maximum)	2575 RPM

FUEL FLOW AND FUEL PRESSURE	
Green Arc (Normal Operating Range)	3.5 PSI to 20 PSI
Red Line (Maximum)	25 GPH, 20 PSI
Red Line (Minimum)	3.5 PSI
CYLINDER HEAD TEMPERATURE	
Green Arc (Normal Range)	360°F to 460°F
Red Line (Maximum)	460°F
EXHAUST GAS TEMPERATURE	
Red Line	1650°F
MANIFOLD PRESSURE	
Green Arc (Normal Range)	10 IN. to 40 IN. HG.
Red Line (Maximum)	40 IN. HG.

E. AIRSPEED LIMITATIONS AND INDICATOR MARKINGS (Calibrated Airspeed)

NEVER EXCEED SPEED	224 MPH
MAXIMUM STRUCTURAL CRUISING SPEED	190 MPH
DESIGN MANEUVERING SPEED	140 MPH
MAXIMUM FLAPS EXTENDED SPEED	125 MPH
MAXIMUM GEAR EXTENDED SPEED	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 224 MPH
White Arc (Flaps Extended Range)	70 MPH to 125 MPH
Radial Red Line (Never Exceed - Smooth Air)	224 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 TAKEOFF WEIGHT	4570 LBS.
MAXIMUM LANDING WEIGHT	4342 LBS.
MAXIMUM ZERO FUEL WEIGHT	4000 LBS.

H. C. G. RANGE

Weight Pounds	Forward Limit Inches Aft of Datum	Aft Limit Inches Aft of Datum
3400	82.0	94.6
4570	90.6	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 is 4570 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 interconnected tanks).

J. USABLE FUEL
The usable fuel in this aircraft has been determined as 46.5 gallons in each wing or a total of 93 gallons with standard fuel tanks and 61.5 gallons in each wing or a total of 123 gallons with optional fuel tanks installed.

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, NIGHT AND ICING FLIGHT WHEN EQUIPPED IN ACCORDANCE WITH FAR 91 OR FAR 135.

In full view of the pilot:

MAXIMUM TAKEOFF WEIGHT 4570 POUNDS
MAXIMUM LANDING WEIGHT 4342 POUNDS
ALL WEIGHT IN EXCESS OF 4000 POUNDS MUST CONSIST OF FUEL.

On instrument panel in full view of the pilot:

1. "DEMONSTRATED CROSSWIND COMPONENT 20 MPH"
2. "MINIMUM SINGLE ENGINE CONTROL SPEED 80 MPH"
3. "ROUGH AIR OR MANEUVERING SPEED 140 MPH"
4. "GEAR DOWN 150 MPH MAX"
   "GEAR UP 125 MPH MAX"
   "EXTENDED 150 MPH MAX"

Near emergency gear release:

"EMERGENCY GEAR EXTENSION, PULL TO RELEASE"

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:

1. Models without primer system installation*

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

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

*Ser. nos. 34-7570001 through 34-7570308 when Piper Kit No. 760 926V is not installed.

2. Models with primer system installation*

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

"LANDING CHECK LIST
Seat Backs Erect
Fasten Belts/Harness
Fuel Selectors On
Cowl Flaps Set
Aux. Fuel Pumps Off
Mixtures Rich
Propeller Set
Gear Down
Flaps Set - 125 MPH Max."

Adjacent to fuel tank filler cap with standard fuel tanks alone installed:

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

Adjacent to fuel tank filler cap with optional fuel tanks installed:

"FUEL - 100/130 AVIATION GRADE - USABLE CAPACITY 61.5 GAL."

On storm window:

"DO NOT OPEN ABOVE 150 MPH"

Near windshield panel heat switch 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 without the entire Ice Protection System installed:

"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."

*Ser. nos. 34-7570309 and up and 34-7570001 through 34-7570308 when Piper Kit No. 760 926V is installed.

Beneath the pitot heat switch:

"GND. OPP. 3 MIN. MAX."

On the inside of both oil filler access doors:

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

L. GYRO PRESSURE GAUGE
The operating limits for the pressure 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. Wing ice light
6. Heated stall warning transmitters
7. Propeller spinners must be installed.

N. HEATER OPERATION
Operation of the combustion heater above 25,000 feet is not approved.

O. MAXIMUM OPERATING ALTITUDE
Flight above 25,000 feet is not approved. Flight up to and including 25,000 feet is approved if equipped with oxygen in accordance with FAR 23.1441 and avionics in accordance with FAR 91 or FAR 135.

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WARNING

Severe icing may result from environmental conditions outside of those for which the airplane is certificated. Flight in freezing rain, freezing drizzle, or mixed icing conditions (super-cooled liquid water and ice crystals) may result in ice build-up on protected surfaces exceeding the capability of the ice protection system, or may result in ice forming aft of the protected surfaces. This ice may not be shed using the ice protection systems, and may seriously degrade the performance and controllability of the airplane.

- During flight, severe icing conditions that exceed those for which cues. If one or more of these visual cues exists, immediately request priority handling from Air Traffic Control to facilitate a route or an altitude change to exit the icing conditions.

  - Unusually extensive ice accumulation on the airframe and windshield in areas not normally observed to collect ice.

  - Accumulation of ice on the upper surface of the wing, aft of the protected area.

  - Accumulation of ice on the engine nacelles and propeller spinners farther aft than normally observed

- Since the autopilot, when installed and operating, may mask tactile cues that indicate adverse changes in handling characteristics, use of the autopilot is prohibited when any of the visual cues specified above exist, or when unusual lateral trim requirements or autopilot trim warnings are encountered while the airplane is in icing conditions.

- All wing icing inspection lights must be operative prior to flight into known or forecast icing conditions at night. [NOTE: This supersedes any relief provided by the Master Minimum Equipment List (MMEL).]

SECTION II

PROCEDURES

A. NORMAL PROCEDURES

1. WING FLAP SETTINGS

Takeoff 0°
Landing 40°
The flaps are manually operated.
Flap deflection versus handle position is:

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

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 460° F and the oil temperatures allowed to exceed 240° F.

3. THROTTLE MANAGEMENT

Throttles must be manually adjusted for 40 inches manifold pressure on takeoff and during operation at maximum continuous power. Overboost annunciator lights will illuminate slightly before maximum allowable manifold pressure is attained.

4. 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 (not to exceed 40 inches manifold pressure).
b. Establish positive climb.
c. Retract wing flaps.
d. Retract landing gear.
e. Adjust cowl flaps for adequate engine cooling.

5. FLIGHT ABOVE 12,500 FEET

See FAR 91.32 requirements for oxygen for flight operations above 12,500 feet.

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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 alternator light on the annunciator panel will illuminate to warn of the tripped condition.

2. ALTERNATOR SYSTEM OPERATION

Both alternator switches should be ON for normal operation.

A preflight check should assure 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 65 amperes.

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. Any circuit can be shut off by pulling out its circuit breaker 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) Takeoff and landing
- (a) Fuel selectors - on
- (b) Auxiliary (or electric) fuel pumps - off (except in the case of engine driven pump failure)

(2) Cruising
- (a) Fuel selectors - on
- (b) Auxiliary (or 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 - on
    2. Fuel selector of inoperative engine - off
    3. Auxiliary (or electric) fuel pumps - off (except in case of engine driven pump failure, auxiliary (or electric) fuel pump on operating 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 - off
    3. Auxiliary (or electric) fuel pumps - off

NOTE

* A vapor return line from each engine will return a percentage of fuel back to the tank on the same side as that engine. Therefore, a minimum of 30 minutes of fuel should be used from this tank before selecting crossfeed. If the tank gauge approaches "FULL," go back to that tank and operate for 30 minutes to bring the fuel level down before returning to crossfeed or fuel may be pumped overboard through the fuel vent.

(2) Landing
  (a) Fuel selector of operating engine - on
  (b) Fuel selector of inoperative engine - off
  (c) Auxiliary (or electric) fuel pump of operating engine - off (except in the case of engine driven pump failure)

* c. Crossfeed Operation With Both Engines Operating

After 30 minutes flight, it is permissible to operate both engines from the same tank. Monitor fuel quantity in unused tank until full.

d. Turning Takeoffs

Fast taxi turns immediately prior to the takeoff run can cause temporary malfunction of one engine during takeoff.

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, the light will illuminate when the gear warning horn sounds. The gear warning horn will sound at low throttle settings if the gear is not down and locked.

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

7. ANNUNCIATOR PANEL LIGHTS

The annunciator panel contains warning lights for alternator failure, low oil pressure, instrument pressure pump failure, and manifold pressure overboost. Models with primer system* installed also have warning lights in the annunciator panel for operation of the auxiliary fuel pumps.

NOTE

When an engine is feathered the alternator, gyro air, and oil warning lights will remain illuminated.

8. 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.

*Ser. nos. 34-7570309 and up and 34-7570001 through 34-7570308 when Piper Kit No. 760 926V is installed.

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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:

Models Without Primer System* Installed –	Models With Primer System** Installed –
(1) Mixture - as required	(1) Mixture - as required
(2) Fuel boost pump - on	(2) Fuel selector - crossfeed
(3) Fuel selector - crossfeed	(3) Magnetos - select L or R only
(4) Magnetos - select L or R only	(4) Alternate air - on
(5) Alternate air - on	(5) Auxiliary fuel pump - unlatch, on HI, if power is not immediately restored, OFF

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 (not to exceed 40 inches manifold pressure)
g. Flaps - retract
h. Gear - retract
i. Identify inoperative engine
j. Throttle of inoperative engine - retard to verify
k. Mixture of inoperative engine - idle cut off
l. Propeller of inoperative engine - feather

*Ser. nos. 34-7570001 through 34-7570308 when Piper Kit No. 760 926V is not installed.
**Ser. nos. 34-7570309 and up and 34-7570001 through 34-7570308 when Piper Kit No. 760 926V is installed.

m. Trim - as required
n. Maintain 5° bank toward operating engine
o. Auxiliary (or electric) fuel pumps - off (except in the case of engine driven pump failure)
p. Magnetos of inoperative engine - off
q. Cowl flaps - close on inoperative engine, use as required on operative engine
r. Alternator of inoperative engine - off
s. Electrical load - reduce to prevent battery depletion
t. Fuel management - fuel off inoperative engine; consider crossfeed use

3. UNFEATHERING PROCEDURE
   a. Fuel selector inoperative engine - on
   b. Auxiliary (or 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 as required (for models without primer system* installed prime by turning electric fuel pump of inoperative engine on for 10 seconds)
   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 - on
      (b) Fuel selector of inoperative engine - off
      (c) Auxiliary (or electric) fuel pumps - off
   (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 - off
      (c) Auxiliary (or electric) fuel pumps - off

NOTE

Do not crossfeed with full fuel on same side as operating engine since vapor return flow will be lost through the vent system.

b. Landing
   (1) Fuel selector of operating engine - on
   (2) Fuel selector of inoperative engine - off

*Ser. nos. 34-7570001 through 34-7570308 when Piper Kit No. 760 926V is not installed.

5. ENGINE DRIVEN FUEL PUMP FAILURE

Models Without Primer System* Installed:

In the event that the engine driven fuel pump should fail in flight, partial (approx. 25%) power may be maintained by use of the corresponding electric fuel pump. This power will allow positive thrust which will result in better performance than can be obtained with the propeller feathered. The aircraft should be landed at the first opportunity.

Models With Primer System** Installed:

Should a malfunction of the engine driven fuel pump occur, the auxiliary fuel pump system can supply sufficient fuel pressure for engine power up to approximately 75%. Any combination of RPM and Manifold Pressure defined on the Power Setting Table may be used, but leaning may be required for smooth operation at altitudes above 15,000 feet or for RPM's below 2300. Normal cruise, descent and approach procedures should be used.

Loss of fuel pressure and engine power can be an indication of failure of the engine driven fuel pump. Should these occur and engine driven fuel pump failure is suspected, proceed as follows:

a. Throttle - retard
b. Auxiliary fuel pump - unlatch, on HI
c. Throttle - reset (75% power or below)

CAUTION

If normal engine operation and fuel flow is not immediately reestablished, the auxiliary fuel pump should be turned off. The lack of a fuel flow indication while on the HI auxiliary fuel pump position could indicate a leak in the fuel system, or fuel exhaustion.

DO NOT actuate the auxiliary fuel pumps unless vapor suppression is required (LO position) or the engine driven fuel pump fails (HI position). The auxiliary pumps have no standby function. Actuation of the HI switch position when the the engines are operating normally may cause engine roughness and/or power loss.

*Ser. nos. 34-7570001 through 34-7570308 when Piper Kit No. 760 926V is not installed.
**Ser. nos. 34-7570309 and up and 34-7570001 through 34-7570308 when Piper Kit No. 760 926V is installed.

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6. ENGINE FAILURE DURING TAKEOFF

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

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 takeoff 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).

7. ENGINE FAILURE DURING CLIMB

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

a. If engine failure occurs when airspeed is below 80 mph (CAS) reduce the power on the operating 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 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).

8. 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.

9. 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 slowly to 40 inches manifold pressure
   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)

10. 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.

11. 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, the light will illuminate when the gear warning horn sounds. The gear warning horn will sound at low throttle settings if the gear is not down and locked.

12. 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.

13. ELECTRICAL FAILURES

a. In the event that the ALT annunciator light illuminates:
   (1) Observe ammeters to determine which alternator is inoperative.
   (2) If both ammeters show zero output, reduce electrical loads to the minimum.
   (3) Turn off both alternator switches, then:
      (a) Turn them momentarily on one at a time while observing ammeters.
      (b) Determine the alternator showing the LEAST (but not zero) amperes and turn its switch on.
   (4) Turn electrical loads on as required but do not exceed 60 amperes.
   (5) If one ammeter shows zero output, cycle its switch off, then on. If this fails to restore output, check the circuit breakers; reset once if required.
      (a) If the alternator remains inoperative, reduce electrical loads if necessary, and continue flight.
      (b) Take corrective maintenance action before further flights.

WARNING

Compass error may exceed 10° with both alternators inoperative.

NOTE

The markings on the ammeters (loadmeters) require mental interpolations to estimate the ampere values noted. Operating the alternators at less than 65 amperes will assure that the battery will not be depleted.

14. GYRO PRESSURE FAILURES

a. A malfunction of the instrument pressure 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 pressure pump failure.

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

(1) Increase engine RPM to 2575.

(2) Descend to an altitude, if possible, at which 4.5 inches of mercury pressure can be maintained.

(3) Use Turn Indicator (Electric) to monitor the Direction Indicator and Attitude Indicator performance.

15. 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

16. COMBUSTION HEATER OVERHEAT

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.

17. 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.

18. 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.

19. 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 65 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.

20. EMERGENCY DESCENT

a. A malfunction of the oxygen system requires an immediate descent to an altitude at or below 12,500 feet. Note: Time of useful consciousness at 25,000 feet is approximately three minutes.

b. In the event an emergency descent becomes necessary, the following procedure is recommended:
   (1) Throttles - closed
   (2) Propellers - full forward
   (3) Mixture - as required for smooth operation
   (4) Landing gear - extend
   (5) Airspeed - 150 MPH

21. 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.

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 use the following procedures:

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.

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 the 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.

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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.

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SECTION III

PERFORMANCE

A. STALLS

X 1. POWER OFF STALLS

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

X2. POWER ON STALLS

The loss of altitude during a power on stall may be as much as 150 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°	70	72	80	87	99

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.

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SECTION IV

OPTIONAL EQUIPMENT

NOTE

THE INFORMATION CONTAINED IN THIS SECTION APPLIES WHEN THE RELATED EQUIPMENT IS INSTALLED IN THE AIRCRAFT.

A. Windshield Heating Installation

B. Oxygen Installation - Scott Aviation Products Executive Mark III Part Number 802180-00

C. Piper AutoControl IIIB Installation

D. Piper AltiMatic IIIC Installation (Includes Roll, Pitch and Pitch Trim Sections)

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A. 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.

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B. OXYGEN INSTALLATION - Scott Aviation Products Executive Mark III Part Number 802180-00.

1. LIMITATIONS
   a. No smoking allowed.
   b. The aircraft is restricted to six occupants with two (2) oxygen units installed.
   c. The aircraft is restricted to four occupants with one (1) oxygen unit installed.
   d. Oxygen duration:

DURATION IN HOURS AT ALTITUDE

Persons Using Each Unit	5,000	10,000	15,000	20,000	25,000
1	10.6	6.3	4.7	3.8	3.3
2	5.3	3.2	2.4	1.9	1.7
3	3.5	2.1	1.6	1.3	1.1
4	2.7	1.6	1.2	.95	.8

NOTE

For six occupants maximum duration will be obtained with three (3) persons utilizing each unit. See above chart for number of persons vs duration (per unit).

2. PROCEDURES
   a. Preflight
      (1) Check oxygen quantity.
      (2) Installation
         (a) Remove middle center seat and secure oxygen units to seat by use of belts provided.
         (b) Reinstall seat and secure seat by adjusting the middle seat belt tightly around seat aft of the oxygen units.
      (3) Turn on oxygen system and check flow indicators on all masks. Masks for the two aft seats are stowed in the seat pockets of the middle seats. All other masks are stowed in the oxygen system containers.

   b. Inflight
      (1) Adjust oxygen mask.
      (2) Turn on system.
      (3) Monitor flow indicators and quantity.

NOTE

Use of oxygen unit is prohibited when gauge approaches red area.

3. EMERGENCY OPERATION
   a. Time of useful consciousness at 25,000 feet is approximately 3 minutes.
   b. If oxygen flow is interrupted as evidenced by the flow indicators or hypoxic indications;
      (1) Install another mask unit.
      (2) Install mask connection in an unused outlet if available.
      (3) If flow is not restored, immediately descend to below 12,500 feet.

C. PIPER AUTOCONTROL IIIB INSTALLATION

*1. LIMITATIONS
   a. Autopilot use prohibited above 200 MPH CAS. (Autopilot Vmo)
   b. Autopilot "OFF" during takeoff and landing.

2. PROCEDURES
   a. PREFLIGHT

      Autopilot

      (1) Place Radio Coupler in "Heading" mode (if installed) and place A/P ON/OFF switch in the "ON" position to engage roll section. Rotate roll command knob left and right and observe that control wheel describes a corresponding left and right turn, then center knob.
      (2) Set proper D.G. Heading on D.G. and turn Heading Bug to aircraft heading. Engage "Heading" mode switch and rotate Heading Bug right and left. Aircraft control wheel should turn same direction as Bug. Grasp control wheel and manually override servo, both directions.

      Radio Coupler - (Optional)

      (1) Tune and identify VOR or VOT station. Position Radio Coupler to OMNI Mode. Place A/P ON/OFF and HDG mode rocker switches to the "ON" position. Set Heading Bug to aircraft heading and rotate O.B.S. to cause OMNI Indicator Needle to swing left and right slowly. Observe that control wheel rotates in direction of needle movement.
      (2) Disengage by placing A/P ON/OFF switch to the "OFF" position. Reset Radio Coupler to HDG mode.

   b. IN-FLIGHT
      (1) Trim airplane (ball centered).
      (2) Check pressure gauge to ascertain that the Directional Gyro and Attitude Gyro are receiving sufficient air.
      (3) Roll Section
         (a) To engage, center Roll Command Knob, place the A/P ON/OFF switch to the "ON" position. To turn rotate Roll Command Knob in desired direction. (Maximum angle of bank should not exceed 30°.)
         (b) For heading mode, set Directional Gyro with Magnetic Compass. Push directional gyro HDG knob in, rotate Bug to aircraft heading. Place the console HDG ON/OFF switch to the "ON" position. To select a new aircraft heading, push D.G. heading knob "IN" and rotate, in desired direction of turn, to the desired heading.

(4) Radio Coupling VOR/ILS with H.S.I. (Horizontal Situation Indicator) Type Instrument Display - (Optional)
VOR Navigation
  (a) Tune and identify VOR Station. Select desired course by rotating CRS knob of H.S.I.
  (b) Select OMNI mode on Radio Coupler.
  (c) Engage HDG mode on autopilot console to engage coupler. Aircraft will turn to a 45° intercept angle to intercept the selected VOR course. Intercept angle magnitude depends on radio needle off course magnitude, 100% needle deflection will result in 45° intercept with the intercept angle diminishing as the needle off set diminishes.
  (d) NAV mode - NAV mode provides reduced VOR sensitivity for tracking weak, or noisey, VOR signals. NAV mode should be selected after the aircraft is established on course.

ILS/LOC Front Course
  (a) Set inbound, front, localizer course on H.S.I.
  (b) Select LOC/NORM mode on Radio Coupler to intercept and track inbound on the localizer. Select LOC/REV to intercept and track the localizer course outbound to the procedure turn area.
  (c) Engage HDG mode on autopilot console to engage coupler.

ILS/Back Course
  (a) Set inbound, front, localizer course on H.S.I.
  (b) Select LOC/REV on Radio Coupler to intercept and track inbound on the back localizer course. Select LOC/NORM to intercept and track outbound on the back course to the procedure turn area.
  (c) Engage HDG mode on autopilot console to engage coupler.

(5) Radio Coupling VOR/ILS with Standard Directional Gyro - (Optional)

NOTE

Radio Coupler operation in conjunction with a standard Directional Gyro and VOR/LOC display differs from operation with an integrated display (H.S.I.) only in one respect. The Heading Bug is used as the radio course datum and therefore must be set to match the desired VOR course as selected on the O.B.S.

  (a) For VOR Intercepts and Tracking: Select the desired VOR course and set the Heading Bug to the same heading. Select OMNI mode on the coupler and engage the HDG mode on the autopilot console.
  (b) For ILS Front Course Intercepts and Tracking: Tune the localizer frequency and place the Heading Bug on the inbound front course heading. Select LOC/NORM on the coupler and engage HDG mode on the autopilot console.

(c) For LOC Back Course Intercepts and Tracking: Tune the localizer frequency and place the Heading Bug on the inbound course heading to the airport. Select LOC/REV mode on the coupler and engage HDG mode on the autopilot console.

3. EMERGENCY OPERATION
   a. In an emergency the AutoControl IIIB can be disconnected by:
      (1) Placing the A/P ON/OFF switch to the "OFF" position.
      (2) Pulling the A/P circuit breaker.
   b. The Autopilot can be overpowered at either control wheel.
   c. An Autopilot runaway, with a 3 second delay in the initiation of recovery while operating in climb, cruise or descending flight, could result in a 60° bank and 150 foot altitude loss.
   d. 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 20 foot altitude loss.

4. PERFORMANCE
   No change.

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D. PIPER ALTIMATIC IIIC INSTALLATION (Includes Roll, Pitch and Pitch Trim Sections)

1. LIMITATIONS
   a. The maximum speed for autopilot operation is 200 MPH CAS. (Autopilot Vmo)
   b. Autopilot operation not authorized with greater than 25° of flap extension.
   c. Autopilot "OFF" for takeoff and landing.
   d. Placard P/N 13A660 "Conduct Trim Check Prior to Flight (See AFM)" to be installed in clear view of pilot.
   e. During autopilot operation, the pilot must be in his seat with the safety belt fastened.

2. PROCEDURES
   a. PREFLIGHT
      (1) Roll Section
         (a) Place Radio Coupler in "Heading" mode and place Roll rocker switch in the "ON" position to engage roll section. Rotate Roll Command Knob left and right and observe that control wheel describes a corresponding left and right turn, then center Roll Command Knob.
         (b) Set proper D.G. Heading on D.G. and turn Heading Bug to aircraft heading. Engage HDG mode rocker switch and rotate Heading Bug right and left. Aircraft control wheel should turn same direction as Bug. Grasp control wheel and manually override servo, both directions.
         (c) Disengage Autopilot by depressing trim switch. Check Aileron operation is free and A/P is disconnected from controls.
      (2) Pitch Section
         (a) Engage "Roll" rocker switch.
         (b) Center pitch command disc and engage "Pitch" rocker switch.
         (c) Rotate pitch command disc up and then down and check control wheel moves same direction. Check to see that servo can be overridden by hand at control wheel.

NOTE

Autopilot might not be able to raise elevators on ground without assistance from pilot.

(d) Hold control wheel and disengage Autopilot by pressing Master A/P Disconnect/Trim Interrupt switch button. Check Roll and Pitch controls to assure autopilot has disconnected.

(3) Trim Section (General)

This aircraft is equipped with a Command Trim System designed to withstand any type of single malfunction, either mechanical or electrical, without uncontrolled operation resulting. This preflight check procedure is designed to uncover hidden failures that might otherwise go undetected. Proper operation of the electric elevator trim system is predicated on conducting the following preflight check before each flight. If the trim system fails any portion of the procedure, pull the trim circuit breaker out until the system is repaired. Substitution of any trim system component for another model is not authorized. For emergency interrupt information, refer to Section 2.d. of this supplement.

The Command Electric Trim Switch on the left hand portion of the pilot's control wheel has two functions:

(a) When the top bar (A/P off) is pressed, it disconnects the Autopilot.

(b) When the top bar is pressed and the rocker is moved forward, nose down trim will occur - when moved aft, nose up trim will occur.

PREFLIGHT: Command Trim - Before Each Flight

(a) Check trim circuit breaker - IN.

(b) Trim Master Switch - ON.

(c) A/P OFF - Check normal trim operation - UP. Grasp trim wheel and check override capability. Check nose DOWN operation. Recheck override.

(d) Activate center bar only - push rocker fore and aft - only. Trim should not operate with either separate action.

AUTOTRIM - Before Each Flight

(a) A/P ON - (Roll and Pitch Sections) Check automatic operation by activating A/P Pitch Command Disc UP, then DN. Observe trim operation follows Pitch Command Direction.

NOTE

In Autopilot Mode, there will be approximately a 3 second delay between operation of Pitch Command and operation of trim.

(b) Press center bar (A/P OFF) - release - check autopilot disengagement.

(c) Rotate trim wheel to check manual trim operation. Reset to takeoff position prior to takeoff.

b. IN-FLIGHT

(1) Trim airplane (ball centered).

(2) Check air pressure or vacuum to ascertain that the Directional Gyro and Attitude Gyro are receiving sufficient air.

(3) Roll Section

(a) To engage, center Roll Command Knob, push Roll rocker switch to "ON" position. To turn, rotate Console Roll Knob in desired direction. (Maximum angle of bank should not exceed 30°.)

(b) For heading mode, set Directional Gyro with Magnetic Compass. Push directional gyro HDG knob in, rotate to select desired heading. Push console heading rocker (HDG) to "ON" position. (Maximum angle of bank will be 20° with heading lock engaged.)

(4) Pitch Section - (Roll Section must be engaged prior to engaging Pitch Section engagement.)

(a) Center pitch trim indicator with the Pitch Command Disc.

(b) Engage pitch rocker switch. To change attitude, rotate Pitch Command Disc in the desired direction.

(5) Altitude Hold

Upon reaching desired or cruising altitude, engage Altitude Hold Mode rocker switch. As long as Altitude Hold Mode rocker switch is engaged, aircraft will maintain selected altitude. For maximum passenger comfort, rate of climb or descent should be reduced to approximately 500 FPM prior to Altitude Hold engagement. For accurate Altitude Holding below 110 MPH, lower up to 25° of flaps.

NOTE

Prior to disengaging Altitude Hold Mode, rotate Pitch Command Disc to center.

(6) Radio Coupling VOR/ILS with H.S.I. (Horizontal Situation Indicator) Type Instrument Display. (Optional)

VOR Navigation

(a) Tune and identify VOR Station. Select desired course with O.B.S. (Omni Bearing Selector) (Course Selector of H.S.I. Instrument).

(b) Select OMNI mode on Radio Coupler.

(c) Engage HDG mode on autopilot console to engage coupler. Aircraft will turn to a 45° intercept angle to intercept the selected VOR course. Intercept angle magnitude depends on radio needle off-course magnitude, 100% needle deflection will result in 45° intercept angle, diminishing as the needle off-set diminishes.

(d) NAV mode - NAV mode provides reduced VOR sensitivity for tracking weak, or noisy, VOR signals. NAV mode should be selected after the aircraft is established on course.

ILS/LOC Front Course
- (a) Set inbound, front, localizer course on O.B.S. (Course Selector Knob).
- (b) Select LOC-Normal mode on Radio Coupler to intercept and track inbound on the localizer. Select LOC-REV to intercept and track the localizer course outbound to the procedure turn area.
- (c) Select HDG mode on autopilot console to engage coupler.

ILS/Back Course
- (a) Set inbound, front, localizer course on O.B.S. (Course Selector Knob).
- (b) Select LOC/REV on Radio Coupler to intercept and track inbound on the back localizer course. Select LOC/NORM to intercept and track outbound on the back course to the procedure turn area.
- (c) Engage HDG mode on autopilot console to engage coupler.

(7) Radio Coupling VOR/ILS with Standard Directional Gyro

NOTE

Radio Coupler operation in conjunction with a standard Directional Gyro and VOR/LOC display differs from operation with an integrated display (H.S.I.) only in one respect. The HDG is used as the radio course datum and therefore must be set to match the desired VOR/ILS course as selected on the O.B.S.

- (a) For VOR Intercepts and Tracking: Select the desired VOR course and set the HDG to the same heading. Select OMNI mode on the coupler and engage the HDG mode on the autopilot console.
- (b) For ILS Front Course Intercepts and Tracking: Tune the localizer frequency and place the HDG on the inbound, front course heading. Select LOC-NOR mode on the coupler and engage HDG mode on the autopilot console.
- (c) For LOC Back Course Intercepts and Tracking: Tune the localizer frequency and place the HDG on the inbound course heading to the airport. Select LOC/REV mode with coupler and HDG mode on the autopilot console.

c. COUPLED APPROACH OPERATIONS

(1) VOR or LOC
- (a) After arrival at the VOR Station, track outbound to the procedure turn area as described in Section b.(6) or (7), as appropriate, and slow to 120-125 MPH CAS and extend flaps 10°.
- (b) Use HDG mode and Pitch or Altitude Hold modes as appropriate during procedure turn.

(c) At the F.A.F. inbound, return to pitch mode for control of descent and lower landing gear.

(d) At the M.D.A. select Altitude Hold mode and add power for level flight. Monitor Altimeter to assure accurate altitude control is being provided by the autopilot.

(e) Go-Around. For missed approach select desired pitch attitude with Pitch Command Disc and disengage Altitude Hold mode. This will initiate the pitch up attitude change. Immediately add takeoff power and monitor Altimeter and rate of climb for positive climb indication. After climb is established, retract landing gear and flaps. Adjust attitude as necessary for desired airspeed and select HDG mode for turn from the VOR final approach course.

(2) ILS - Front Course Approach with Glide Slope Capture (Optional)

(a) Track inbound to L.O.M. as described in Section b.(6) or (7) above and in Altitude Hold Mode.

(b) Inbound to L.O.M. slow to 120-125 MPH IAS and lower flaps 10°.

(c) Automatic Glide Slope capture will occur at Glide Slope Intercept if the following conditions are met:

1. Radio Coupler in LOC/NORM Mode.
2. Altitude Hold Mode engaged (Altitude rocker on console).
3. Under Glide Slope for more than 20 seconds.
4. Localizer radio frequency selected on NAV receiver.

(d) At Glide Slope Intercept immediately lower landing gear and reduce power to maintain 115-125 MPH CAS on final approach. Glide Slope capture is indicated by lighting of the green Glide Slope engage Annunciator Lamp and by a slight pitch down of the aircraft.

(e) Monitor localizer and Glide Slope raw data through out approach. Adjust power as necessary to maintain correct final approach airspeed. All power changes should be of small magnitude and smoothly applied for best tracking performance. Do not change aircraft configuration during approach while autopilot is engaged.

(f) Conduct missed approach maneuver as described in Section c.(1)(e) above.

NOTE

Glide Slope Coupler will not automatically decouple from Glide Slope. Decoupling may be accomplished by any of the following means:

(1) Disengage ALT Hold mode.
(2) Switch Radio Coupler to HDG mode.
(3) Disengage Autopilot.

d. EMERGENCY OPERATIONS

This aircraft is equipped with a Master Disconnect/Interrupt Switch on the pilot's control wheel. When the switch button is depressed it will disconnect the autopilot. When depressed and held it will interrupt all Electric Elevator Trim Operations. Trim operation will be restored when the switch is released. If an autopilot or trim emergency is encountered, do not attempt to determine which system is at fault. Immediately depress and hold the Master Disconnect/ Interrupt button. Turn off Autopilot and Trim Master Switch and retrim aircraft, then release the interrupt switch.

NOTE

During examination of this supplement, the pilot is advised to locate and identify the Autopilot controls, the Trim Master Switch and the Circuit Breakers for both systems.

(1) In the event of an Autopilot malfunction the Autopilot can be:
 (a) Overpowered at either control wheel.

CAUTION

Do not overpower Autopilot pitch axis for periods longer than 3 seconds because the Autotrim System will operate in a direction to oppose the pilot and will, thereby, cause an increase in the pitch overpower forces.

 (b) Disconnected by depressing the Master Disc/Inter Switch.
 (c) Disconnected by depressing the Trim Switch "A/P OFF" bar.
 (d) Disconnected by pushing the Roll rocker switch "OFF."

(2) In the event of a Trim malfunction:
 (a) Depress and hold the Master Trim Interrupt Switch.
 (b) Trim Master Switch - OFF. Retrim aircraft as necessary using manual trim system.
 (c) Release Master Trim Interrupt Switch - be alert for possible trim action.
 (d) Trim Circuit Breaker - Pull. Do not operate trim until problem is corrected.

(3) If a trim runaway occurs with the Autopilot operating, the above procedures will disconnect the Autopilot which will immediately result in higher control wheel forces. Be prepared to manually retrim, as necessary, to eliminate undesirable forces.

(4) Altitude Loss During Malfunction:
 (a) An Autopilot malfunction during climb or cruise with a 3 second delay in recovery initiation could result in as much as 60° of bank and a 200 foot altitude loss.
 (b) Altitude loss - high altitude descent - 3 second delay in recovery could result in a 60° bank and a 420 foot altitude loss.

(c) An Autopilot malfunction during an approach with a 1 second delay in recovery initiation could result in as much as 20° of bank and a 75 foot altitude loss. Maximum altitude loss measured in approach configuration gear down and operating either coupled or uncoupled, single or multi-engine.

(5) Single Engine Operations:

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

(b) Engine failure during go around: Disengage autopilot, retrim aircraft, perform normal aircraft engine out procedures then re-engage autopilot.

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

(d) Maintain aircraft yaw trim throughout all single engine operations.

(6) Emergency Operation With Optional NSD 360 and NSD 360A (HSI) Slaved and/or Non-Slaved

NSD 360

(a) Appearance of HDG Flag:

1. Check air supply gauge (vac or pressure) for adequate air supply (4 in. Hg. min.).
2. Check compass circuit breaker.
3. Observe display for proper operation.

(b) To disable heading card - pull circuit breaker and use magnetic compass for directional data.

NOTE

If heading card is not operational, autopilot should not be used.

(c) With card disabled:

1. VOR and Glide Slope displays are still functional; use card set to rotate card to aircraft heading for correct picture.
2. Localizer - left-right information still usable. Flag information is disabled - compare needle with No. 2 indicator for valid left-right needle operation.

(d) Slaving Failure - (i.e. failure to self-correct for gyro drift):

1. Check gyro slaving switch is set to No. 1 position.
2. Check for HDG Flag.
3. Check compass circuit breaker.
4. Reset heading card while observing slaving meter.
5. Select slaving amplifier No. 2 (gyro slaving switch is set to No. 2 position).
6. Reset heading card while checking slaving meter.
7. Switch to free gyro and periodically set card as unslaved gyro.

NSD 360 (Instrument with red-white striped NAV-HDG Flags)

(a) The emergency procedures for the NSD 360A remain identical to those listed for the NSD 360 (above), except that the presence of the NAV Flag on a localizer frequency invalidates the NAV left-right information. Useable navigation data will be indicated in both VOR and Localizer modes by the absence of the NAV Flag, whether the card is disabled or not.

(b) In the localizer mode the "TO-FROM" arrows may remain out of view, depending upon the design of the NAV converter used in the installation.

3. PERFORMANCE

No change.

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EMERGENCY PROCEDURES

REFER TO THE AIRPLANE FLIGHT MANUAL FOR FAA APPROVED EMERGENCY PROCEDURES

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WEIGHT AND BALANCE

FOR

SENECA II

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-34-200T

AIRCRAFT SERIAL NO. 34-7670011 REGISTRATION NO. N3974X

WEIGHT AND BALANCE, REPORT NUMBER VB-629 REVISION 3

PIPER AIRCRAFT CORPORATION
APPROVAL SIGNATURE AND STAMP M. Keller 22

INDEX - WEIGHT AND BALANCE

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WEIGHT AND BALANCE LOG OF REVISIONS

Revision	Revised Pages	Description and Revision	Approved Date
1	5-31	Revised AutoControl IIIB Console; revised AltiMatic IIIC Pitch Servo and Trim Amplifier; revised totals.	Dec. 11, 1974 R Bernard
	5-36	Added Carbon and Dynamic Microphones.	
	5-36a	Added page (added Headset and King KR-21 Marker Beacon and Lights).	
	5-36b	Added page.	
	5-40	Added Electrothermal Propeller Deicing and Ice Light Kit.	
2	5-7	Revised fuel capacity - Sample Loading Problem.	May 30, 1975 J. Vayaley
3	5-15	Added Auxiliary Fuel Pumps.	July 16, 1975 Landi Wetner
	5-21	Revised Tru-Speed Indicator desc.	
	5-25	Added 79337-5 Right Front Seat; relocated 37164-4 Combustion Heater to page 5-26.	
	5-26	Added 37164-4 Combustion Heater from page 5-25; added 37164-0 Combustion Heater; added footnotes.	
	5-31	Revised Alt. IIIC total Weight and Arm.	
	5-36a	Revised Headset Arm; added KI-213 indicator.	
	5-37	Added Engine Hour Meter MK10 Radar Alt.; NSD-360 Gyro and footnote.	
	5-38	Revised Tru-Speed Indicator desc.	
	5-39	Added Cabin Sound Proofing from page 5-40.	
	5-40	Relocated Cabin Sound Proofing to page 5-39; added 79592-0 Left Front Seat; added 79592-1 Right Front Seat; added 79337-18 Front, Center and Rear Headrests; added footnote for Combustion Heater.	
	5-41	Added Pneumatic Deicing System and Stainless Steel Control Cables.	

WEIGHT AND BALANCE LOG OF REVISIONS (cont)

Revision	Revised Pages	Description	Approved Date
4	5-7	Added optional fuel capacity to Sample Loading Problem.	Oct. 20, 1975
	5-8	Revised Loading Graph.	
	5-31	Revised Console 1D720 Weight and Moment.	
	5-37	Revised Clock AN5743-L2 Arm and Moment; relocated NSD-360 Gyro and footnote to page 5-38.	
	5-38	Relocated Copilot's Advanced Instrumentation to page 5-38a; added NSD-360 Gyro and footnote relocated from page 5-38; added Narco OC-110.	
	5-38a	Added page (relocated Copilot's Advanced Instrumentation from page 5-38; revised Clock AN5743-L2 Arm and Moment).	
	5-38b	Added intentionally left blank page.	
	5-40	Revised 79592-1 Right Front Seat Moment.	
	5-41	Added Fuel Cells.	
5	5-29	Deleted Heated Pitot Head and Stall Warning Detectors.	Dec. 9, 1975
	5-31	Revised AltiMatic IIIC TOTAL.	
	5-35	Added Low Frequency Antenna to Anti Static Kit.	
	5-36	Revised Arm and Moment of KA-41 Antenna of King KN-65 DME; revised Dwg. No. of PAL Transmitter 99890 to 79265-0; added PAL Transmitter 79265-6.	
	5-36a	Added King KN-61 DME and King KN-65A DME.	
	5-37	Removed Dwg. No. from Clock.	
	5-38a	Removed Dwg. No. from Clock.	
	5-40	Deleted Windshield Heat, Ice Protection System, Electrothermal Prop Deice, and Ice Light Kit; added Oxygen System, Control Cables, and Fuel Cells relocated from page 5-41.	
	5-41	Relocated Oxygen System, Control Cables, and Fuel Cells to page 5-40; deleted Pneumatic Deicing System; added Ice Protection System Instl. Dwg. 37700.	

WEIGHT AND BALANCE LOG OF REVISIONS (cont)

Revision	Revised Pages	Description and Revision	Approved Date
6	5-17	Revised Cert. Basis.	March 19, 1976
	5-37	Revised MK 10 Radar Alt. Arm and Moment.	
	5-41	Relocated Total Opt. Equip. and Finish to page 5-42.	
	5-42	Added Heavy Duty Wheels, Brakes and Tires; added information from page 5-41.	
7	5-13	Added two Propellers, two Hydraulic Governors and corrected Certification Basis for two existing Hydraulic Governors.	May 13, 1976

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WEIGHT AND BALANCE

In order to achieve the performance, safety and good 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 ensure 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 safety 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. The Seneca is designed to provide excellent performance and safety within the flight envelope. 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 aircraft logbook or 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 logbook. The owner should make sure he does, and should change these values on his plotter.

A weight and balance calculation can be helpful in determining the best positions for locating passengers or cargo, and can guide the pilot in relocating people or baggage so as to keep the C.G. within allowable limits. If it is 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 decreasing 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.

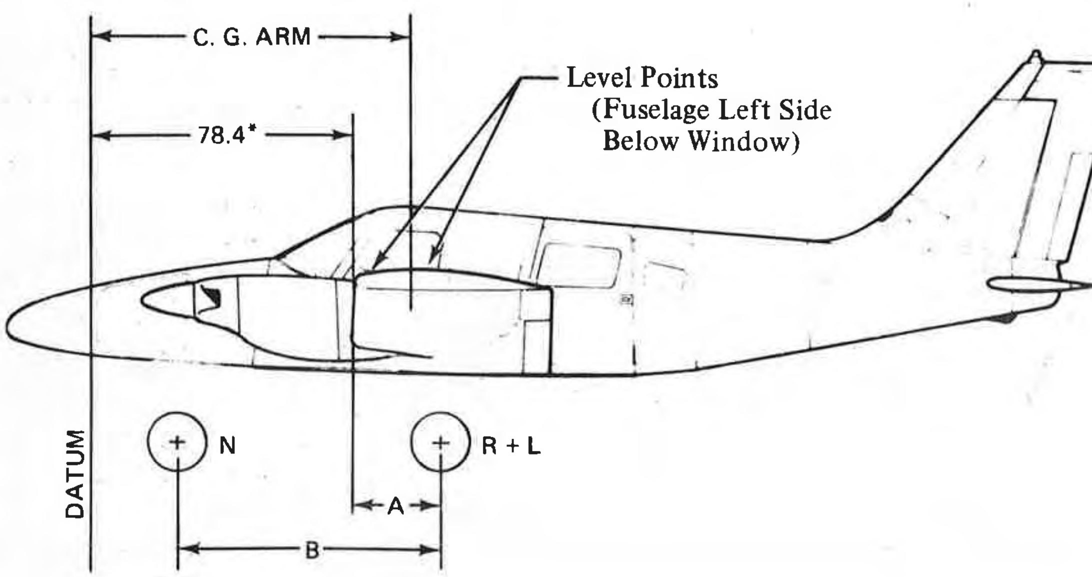
3. WEIGHING - AIRPLANE EMPTY WEIGHT

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-34-200T 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 center line, to the main wheel center line.

c. Obtain measurement "B" by measuring the distance from the main wheel center line, horizontally and parallel to the airplane center line, 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-34-200T SENECA

Airplane Serial Number 34- 7670011

Registration Number N3974X

Date 8/18/75

AIRPLANE BASIC WEIGHT

SUPERSEDED

Item		Weight (Lbs)	C. G. Arm (Inches Aft of Datum)	Moment (In-Lbs)
*Empty Weight	~~Actual~~ Computed	2758.0	86.0	237089
Unusable Fuel (5 gallons)		30	103.0	3090
Standard Empty Weight		2788.0	86.1	240179
Optional Equipment		197.6	100.1	19779
Licensed Empty Weight		2985.6	87.1	259958
Oil (16 quarts)		30	43.7	1311
Basic Weight		3015.6	86.6	261269

SUPERSEDED 4/8/76

*Empty weight is defined as dry empty weight (including paint and hydraulic fluid) plus 12.0 lbs undrainable engine oil.

AIRPLANE USEFUL LOAD - NORMAL CATEGORY OPERATION

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

(4570 lbs) - (2985.6 lbs) = 1584.4 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 basic 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 basic 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)

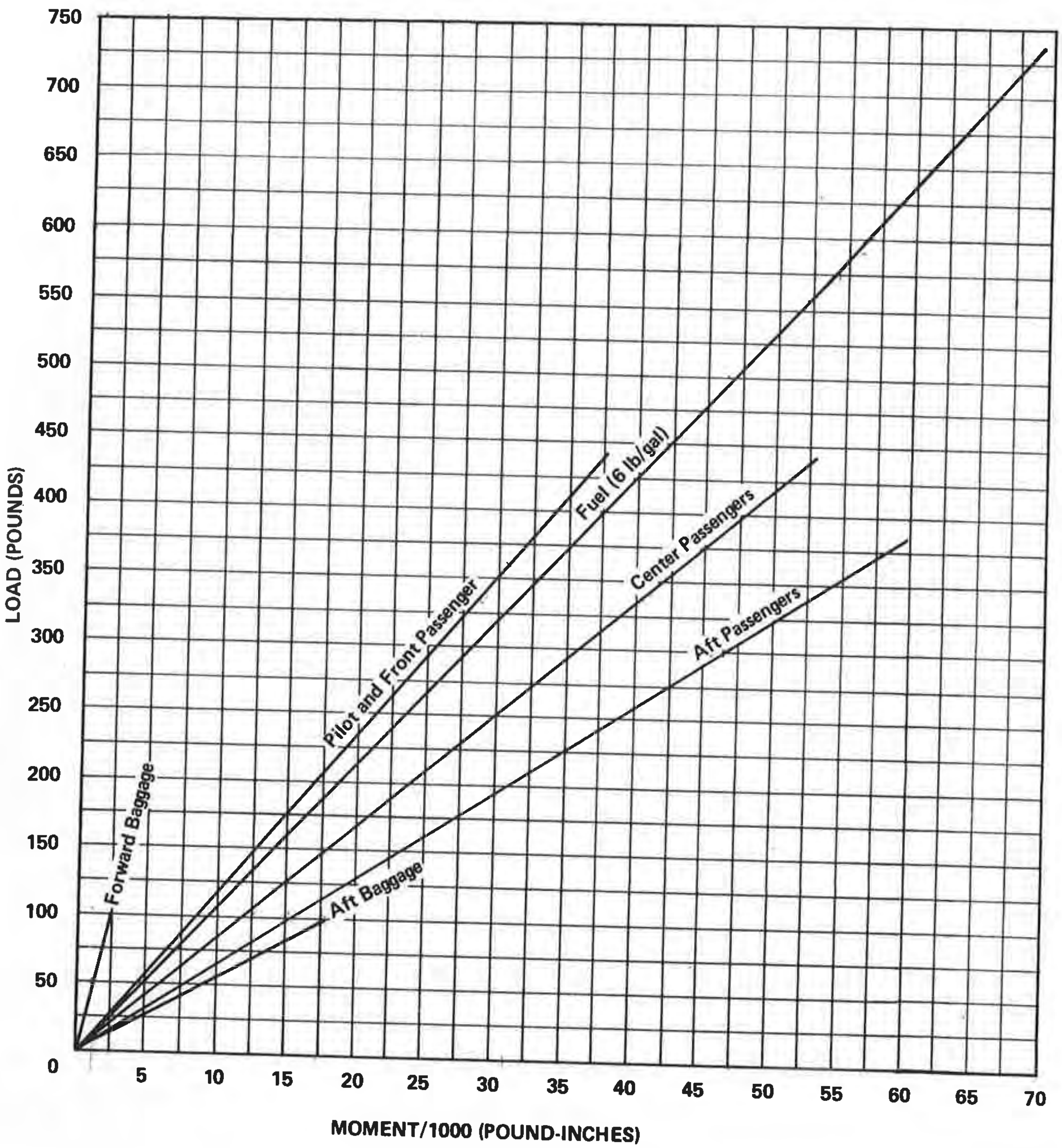
	Weight (Lbs)	Arm Aft Datum (Inches)	Moment (In-Lbs)
Basic Weight			
Pilot and Front Passenger	340.0	85.5	29070
Passengers (Center Seats)	340.0	118.1	40154
Passengers (Rear Seats)		155.7	
Passenger (Jump Seat)*		118.1	
Baggage (Forward)		22.5	
Baggage (Aft)		178.7	
4768 Zero Fuel Weight (4000 Lbs Max)			
Fuel (93 Gallons Maximum) - Standard (123) Gallons Maximum) - Optional		93.6	
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.

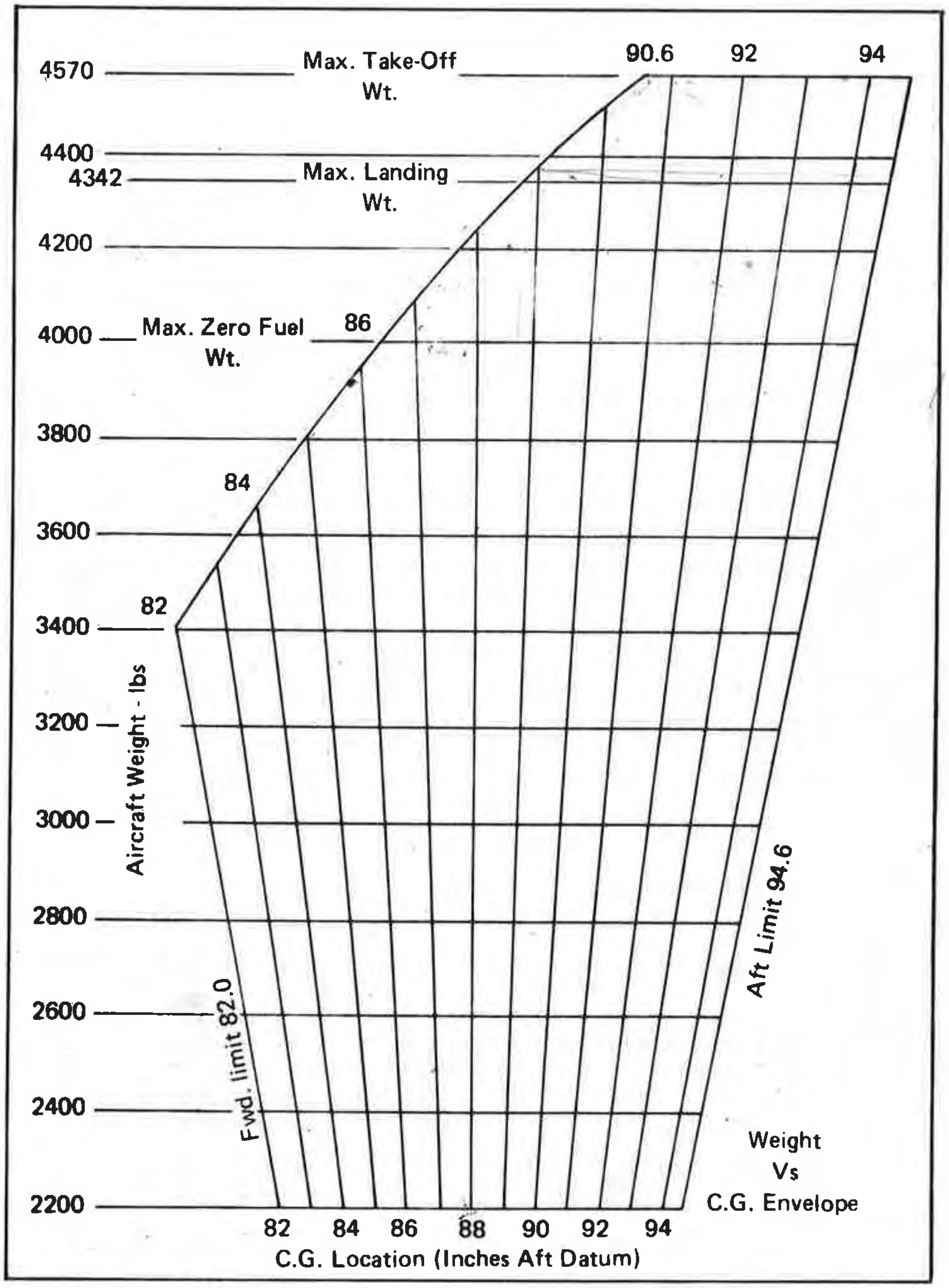
IT IS THE RESPONSIBILITY OF THE PILOT AND AIRCRAFT OWNER TO INSURE THAT THE AIRPLANE IS LOADED PROPERLY.

*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 any time 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 takeoff. If this point is not within the allowable envelope it will be necessary to remove 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 2850 pounds at 83.5 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 2850 pounds and 83.5 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.

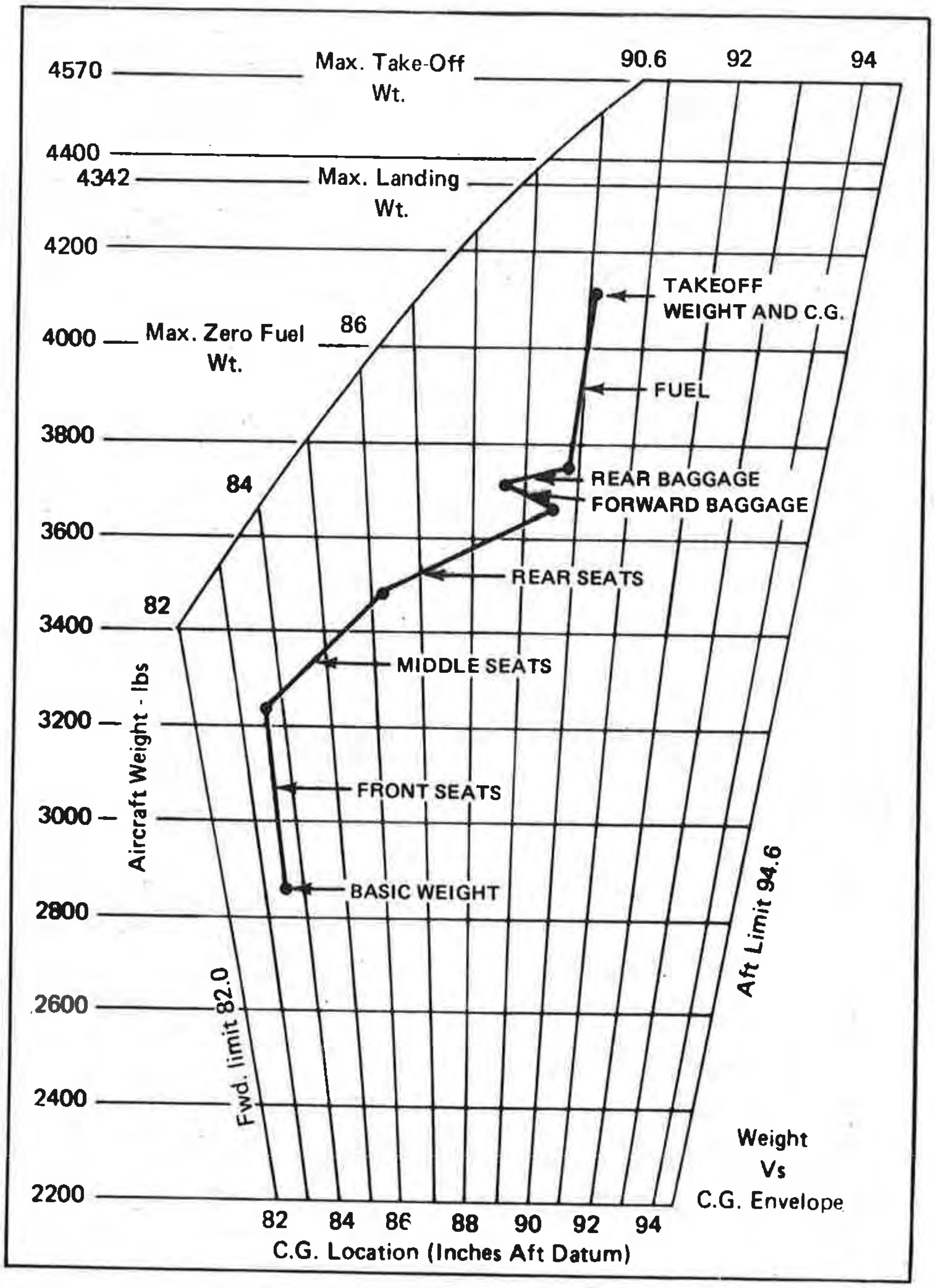
6. Continue moving the plastic and plotting points to account for weight in the rear seats (80 + 100), forward baggage compartment (50), rear baggage compartment (45), and fuel tanks (360).

7. As can be seen from the illustration, the final dot shows the total weight to be 4115 pounds with the C.G. at 90.1. 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-34-200T. 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				
Removed	Two Propellers				
X	Hartzell Model BHC-C2YF-2CKF/ FC8459-8R or FC8459B-8R (Left Wing)	56.4	20.3	1145	TC P920
Removed X	Hartzell Model BHC-C2YF-2CLKF/ FJC8459-8R or FJC8459B-8R (Right Wing)	56.4	20.3	1145	TC P920
	OR				
	Hartzell Model BHC-C2YF-2CKUF/ FC8459-8R (Left Wing)	60.3	20.3	1224	TC P920
	Hartzell Model BHC-C2YF-2CLKUF/ FJC8459-8R (Right Wing)	60.3	20.3	1224	TC P920
Removed	Two Spinners				
X	PAC Dwg. 37138-0 (Left Wing)	4.2	19.0	80	TC A7SO
Removed X	PAC Dwg. 37138-1 (Right Wing)	4.2	19.0	80	TC A7SO
	Two Hydraulic Governors				
X	Woodward Governor, Piper Dwg. 37476-0 (Left Wing)	2.7	28.1	76	TC P920
X	Woodward Governor, Piper Dwg. 37476-2 (Right Wing)	2.7	28.1	76	TC P920
	OR				
	Hartzell Governor Model E-3 (Left Wing)	3.9	28.1	110	TC P920
	Hartzell Governor Model E-3L (Right Wing)	3.9	28.1	110	TC P920

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Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	B. Engine and Engine Accessories - Fuel and Oil Systems				
X	Two Engines Teledyne Continental Model TSIO-360-E Fuel Injected TSIO360EB Turbocharged (Left Wing)	385	39.0	15015	TC E9CE
X	Teledyne Continental Model LTSIO-360-E Fuel Injected LTSIO360EB Turbocharged (Right Wing)	385	39.0	15015	TC E9CE
X	*Exhaust System (14 lbs. each)	28	50.5	1414	TC E9CE
X	*Two Alternators, 14V 65 Amps				
	Left Wing	11.5	56.5	650	TC E9CE
X	Right Wing	11.5	56.5	650	TC E9CE
X	*Two Starters, 14V				
	Left Wing	17.8	53.8	955	TC E9CE
X	Right Wing	17.8	53.8	955	TC E9CE
X	*Oil Filters, Two (2.5 lbs. each)	5.0	55.5	278	TC E9CE
	Two Fuel Pumps, Electric, Prime & Vapor Suppression Airborne 2B6-28 (3.2 lbs. each)	6.4	70.0	448	TC A7SO
X	Two Induction Air Filters (.5 lbs. each) BRACKETTBA104	1.0	59.0	59	TC A7SO
X	Two Fuel Pumps, Auxiliary Airborne 2B6-44 (3.2 lbs. each)	6.4	70.0	448	TC A7SO

*Included in engine weight

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

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

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Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	D. Electrical Equipment				
X	One Battery 12V, 35 Amp Hour Rebat R-35	27.2	-7.8	-212	TC A7SO
X	Power Relay 63880-0	1.2	-7.8	-9	TC A7SO
X	Stall Warning Detector, Safe Flight Inst. Corp. No. 186-1 (.1 lbs. each)	.2	80.2	16	TC A7SO
X	Horn (Stall Warn) Safe Flight 53514-101	0.2	64.6	13	TSO C30b
X	Horn (Gear Warn) Safe Flight 0204-1	0.2	61.5	12	TSO C30b
X	Switch - Landing Gear Selector Cutler Hammer 8906K 1736	0.1	67.7	7	TC A7SO
X	Two Voltage Regulators Lamar B-00288-1 (.9 lbs. each)	1.8	49.4	89	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
	Red Strobe Light Whelen Engineering Co. Piper Dwg. 95267				
	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

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 37629 (2) .70 lbs. each	1.4	66.2	93	TC A7SO
X	Engine Cluster - Piper 95241-18 (2) .95 lbs. each	1.9	67.4	128	TC A7SO
	Altimeter - Piper PS50008-4 or -5	1.0	65.9	66	TSO C10b
X	Manifold Pressure (Dual) - Piper 37554	1.1	66.2	73	TSO C45
X	Fuel Flow Gauge (Dual) - Piper 37341	1.2	66.2	79	TSO C47 Type I
X	Exhaust Gas Temp. Gauge 37238 (2) .3 lbs. each	0.7	60.4	42	TC A7SO
X	Tru-Speed Indicator - Piper PS50049-19 or -20	0.6	66.8	40	TSO C2b

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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

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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) PS50039-4-4 .75 lbs. each	1.5	163.0	245	TSO C22
X	Inertia Safety Belts, Front Seats (2) PS50039-4-16 0.8 lbs. each	1.6	119.6	191	TC A7SO
X	Toe Brakes (Dual) Piper Dwg. 78599-0	10.0	54.6	546	TC A7SO
X	Rear Cabin Door Piper Dwg. 69373-5	16.5	152.2	2511	TC A7SO
X	Cargo Door Piper Dwg. 76367	6.5	178.9	1163	TC A7SO
	Right Front Seat Piper Dwg. 96806-5 or	15.6	92.7	1446	TC A7SO
X	Piper Dwg. 79337-5	15.3	92.3	1412	TC A7SO
X	Center Seats (2) Piper Dwg. 96827-2, -3 11.9 lbs. each	23.8	124.4	2961	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
	G. Miscellaneous (cont)				
______	Combustion Heater* Piper Dwg. 37164-4	24.5	214.9	5265	TC A7SO
X ______	Combustion Heater** Piper Dwg. 37164-0 (45000 BTU)	26.0	215.0	5590	TC A7SO

*Ser. nos. 34-7570001 through 34-7570327
**Ser. nos. 34-7670001 and up

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
H.	Engine and Engine Accessories - Fuel and Oil System (Optional Equipment)				
	Two Vacuum Pumps				
	Airborne Mfg. Co.				
	Model 211CC (Left Wing)				
______	PAC 79399-0	2.3	54.5	125	TC A7SO
	Airborne Mfg. Co.				
	Model 212CW (Right Wing)				
______	PAC 79399-2	2.3	54.5	125	TC A7SO

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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
	Red/White Strobe 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
	Piper Pitch Trim * 1C373-6-487	2.1	196.0	412	STC SA3023 SW-D
	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

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Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	J. Autopilots (Optional Equipment)				
	Autocontrol IIIB				
____	Roll Servo *1C363-1-487R	2.5	121.8	305	STC SA3024SW-D
____	Console *1C338-3	1.2	65.0	78	STC SA3024SW-D
____	Attitude Gyro *52D66	2.3	64.9	149	STC SA3024SW-D
____	Directional Gyro * 52D54	3.2	63.8	204	STC SA3024SW-D
____	Cable Assys.	.7	95.5	67	STC SA3024SW-D
	TOTAL	9.9	81.1	803	
	Altimatic IIIC				
X	Roll Servo * 1C363-1-487R	2.5	121.8	305	STC SA3023SW-D
X	Pitch Servo *1C508-1-487P	2.5	117.6	294	STC SA3023SW-D
X	Trim Servo *1C373-6-487	2.1	196.0	412	STC SA3023SW-D
X	Trim Amplifier * 1C709-5	.7	116.1	81	STC SA3023SW-D
X	Relay Box * 1A526	.3	57.8	17	STC SA3023SW-D
X	Console *1D720	1.4	65.0	91	STC SA3023SW-D
X	Amplifier *1C515-3	2.6	126.2	328	STC SA3023SW-D
X	Attitude Hold * 1C407	.8	56.4	45	STC SA3023SW-D
X	Attitude Gyro * 52D67	2.7	64.9	175	STC SA3023SW-D
X	Directional Gyro * 52D54	3.2	63.8	204	STC SA3023SW-D
X	Cable Assys.	4.5	106.6	480	STC SA3023SW-D
	TOTAL	23.3	104.4	2432	
X	Omni Coupler *1C388P	.9	64.4	58	TC A7SO
X	Glide Slope Coupler *1C493	.9	60.1	54	TC A7SO

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Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	K. Radio Equipment (Optional Equipment)				
______	Narco Comm 11A	3.6	62.4	225	TC A7SO
______	Narco Dual Comm 11A	7.1	62.4	443	TC A7SO
______	Narco Comm 11B	3.9	62.4	243	TC A7SO
______	Narco Dual Comm 11B	7.7	62.4	480	TC A7SO
______	Narco Comm 111	3.0	62.4	187	TC A7SO
______	Narco Dual Comm 111	6.0	62.4	374	TC A7SO
______	Narco Comm 111B	3.9	62.4	243	TC A7SO
______	Narco Dual Comm 111B	7.8	62.4	487	TC A7SO
______	Narco Nav 11	2.8	63.6	178	TC A7SO
______	Narco Nav 12	3.4	63.6	216	TC A7SO
______	Narco Nav 14	2.5	63.6	159	TC A7SO
______	Narco Nav 111	2.5	63.6	159	TC A7SO
______	Narco Nav 112	3.3	58.6	193	TC A7SO
______	Narco Nav 114	2.5	63.6	159	TC A7SO
	Narco ADF-140				
______	Receiver	2.5	63.4	158	TC A7SO
______	Servo Indicator	1.3	64.4	84	TC A7SO
______	Loop Antenna	1.6	194.8	312	TC A7SO
______	Cable, Loop	0.6	124.0	74	TC A7SO
______	Sense Antenna and Cable	0.4	182.0	73	TC A7SO
	Narco DME-190				
______	Receiver	5.2	61.8	321	TC A7SO
______	Antenna	.3	113.9	34	TC A7SO
______	Cable, Antenna	.4	85.6	34	TC A7SO
	Narco UGR-3 Glide Slope				
______	Receiver	2.3	37.4	86	TC A7SO
______	Cable	0.6	49.5	30	TC A7SO
______	Antenna	0.4	92.4	37	TC A7SO
______	Cable, Antenna	0.5	100.0	50	TC A7SO
	Narco UGR-2A Glide Slope				
______	Receiver	2.4	37.4	90	TC A7SO
______	Cable	0.6	49.5	30	TC A7SO
______	Antenna	0.4	92.4	37	TC A7SO
______	Cable, Antenna	0.5	100.0	50	TC A7SO

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	K. Radio Equipment (Optional Equipment) (cont)				
	Narco Dual ADF-140				
______	Receivers	5.0	63.4	317	TC A7SO
______	Loop Antenna *1	1.6	194.8	312	TC A7SO
______	Dual Needle Indicator	3.5	66.4	232	TC A7SO
______	Loop Antenna *2	1.6	180.8	289	TC A7SO
______	Cable, Loop *1	0.6	124.0	74	TC A7SO
______	Cable, Loop *2	0.6	117.0	70	TC A7SO
______	Sense Antenna & Cable *1	1.5	130.1	195	TC A7SO
______	Sense Antenna & Cable *2	1.5	130.1	195	TC A7SO
______	Remote for Dual Ind.	2.0	19.5	39	TC A7SO
______	Narco AT-50A Transponder	* 3.0	62.3	187	TC A7SO
______	Narco MBT-12R Marker Beacon Receiver & Lights	4.2	77.4	325	TC A7SO
______	Narco CP-125 Audio Panel	2.2	76.2	168	TC A7SO
	Narco CLC-60A R Nav				
______	Display	1.6	65.6	105	TC A7SO
______	Offset Control Head	1.0	66.7	67	TC A7SO
______	Computer	3.8	204.3	776	TC A7SO
______	Cables	5.1	134.4	685	TC A7SO
______	Narco M-700A Microphone, Noise Cancelling	.6	69.9	42	TC A7SO
X	Nav. Receiving Antenna	0.5	283.1	142	TC A7SO
X	Cable, Nav. Antenna	1.1	172.0	189	TC A7SO
______	*1 VHF Comm. Antenna	0.3	190.6	57	TC A7SO
______	Cable, *1 VHF Comm. Antenna	0.5	122.0	61	TC A7SO
______	*2 VHF Comm. Antenna	0.3	225.2	68	TC A7SO
______	Cable, *2 VHF Comm. Antenna	0.6	139.0	83	TC A7SO

*Weight includes antenna and cable

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	K. Radio Equipment (Optional Equipment) (cont)				
	Anti Static Kit				
X	*1 VHF Comm. Antenna	1.0	190.6	191	TC A7SO
X	Cable, *1 VHF Comm. Antenna	0.5	122.0	61	TC A7SO
X	*2 VHF Comm. Antenna	1.0	225.2	225	TC A7SO
X	Cable, *2 VHF Comm. Antenna	0.6	139.0	83	TC A7SO
	Low Frequency Antenna	0.6	160.0	96	TC A7SO
	King KX 170 ( )/175 ( ) Nav/Comm	7.5	61.6	462	TC A7SO
X	King Dual KX 170 ( )/175 ( ) Nav/Comm	15.0	61.6	924	TC A7SO
X	King KI 201 ( ) VOR/LOC Indicator	2.5	64.9	162	TC A7SO
X	King KI 214 ( ) VOR/LOC/GS Indicator	3.3	64.9	214	TC A7SO
X	King KMA-~~20~~ 24 Audio Panel	2.8	65.2	183	TC A7SO
X	Antenna	.5	116.3	58	TC A7SO
X	Cable	.4	90.0	36	TC A7SO
	King KR-86 ADF				
X	Receiver	3.9	63.6	248	TC A7SO
X	Loop Antenna	1.5	193.2	290	TC A7SO
X	Loop Cable	1.3	124.0	161	TC A7SO
	Audio Amplifier	0.8	52.5	42	TC A7SO
X	Sense Antenna & Cable	0.4	160.0	64	TC A7SO
	King KR-86 ADF (Second)				
	Receiver	3.9	63.6	248	TC A7SO
	Loop Antenna	1.5	180.8	271	TC A7SO
	Loop Cable	1.3	117.0	152	TC A7SO
	Sense Antenna & Cable	3.0	130.1	390	TC A7SO
	King KR-85 Digital ADF				
	Receiver	4.3	64.4	277	TC A7SO
	Servo Indicator	1.2	66.3	79	TC A7SO
	Loop Antenna	1.3	193.2	251	TC A7SO
	Loop Cable	1.8	124.0	223	TC A7SO
	Audio Amplifier	.8	52.5	42	TC A7SO
	Sense Antenna & Cable	.4	160.0	64	TC A7SO

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	K. Radio Equipment (Optional Equipment) (cont)				
	King KN-74 R Nav				
______	Computer	3.7	62.6	232	TC A7SO
______	Cable Assembly	1.0	56.0	56	TC A7SO
	King KT76/78 Transponder				
X	Panel Unit	3.1	63.1	196	TC A7SO
X	Antenna & Cable	–	–	–	TC A7SO
	King KN-65 DME				TC A7SO
______	King KI-265 Indicator	1.0	65.4	65	TC A7SO
______	Remote Unit	8.4	27.2	228	TC A7SO
______	King KA-41 Antenna	0.2	110.7	22	TC A7SO
______	Cable Assy.	1.5	42.2	63	TC A7SO
	King KN60C DME				
______	Receiver	6.8	61.7	420	TC A7SO
______	Antenna	.15	112.1	17	TC A7SO
______	Cable, Antenna	0.3	85.6	26	TC A7SO
______	King KN-77 VOR/LOC Converter	2.2	12.0	26	TC A7SO
______	King KN-77 VOR/LOC Converter (Dual)	4.4	12.0	53	TC A7SO
______	King KNI-520 VOR/LOC/GS Indicator	2.8	65.5	183	TC A7SO
______	King KNI-520 VOR/LOC/GS Indicator (Dual)	5.6	65.5	367	TC A7SO
	Piper Automatic Locator				
X	Transmitter, Piper Dwg. 79265-0	1.7	267.2	454	TC A7SO
______	Transmitter, Piper Dwg. 79265-6	1.3	267.2	347	TC A7SO
X	Antenna & Coax	.2	255.4	51	TC A7SO
X	Shelf & Access Hole	.33	266.4	88	TC A7SO
______	King KN-73 Glide Slope Receiver	2.4	12.7	30	TC A7SO
X	Microphone (Carbon) Piper Dwg. 68856-10	.3	70.8	21	TC A7SO
______	Microphone (Dynamic)	.3	70.8	21	TC A7SO

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
K:	Radio Equipment (Optional Equipment) (cont)				
X	Headset	.5	65.0	33	TC A7SO
	King KR-21 Marker Beacon and Lights	1.1	65.5	72	TC A7SO
	Antenna	.5	245.0	123	TC A7SO
	Cable	.6	145.0	87	TC A7SO
	King KI-213 VOR/LOC/GS Indicator	2.5	64.9	162	TC A7SO
	King KN-61 DME	10.6	31.9	338	TC A7SO
	King KN-65A DME	10.8	34.3	370	TSO C66a

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Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	L. Instruments (Optional Equipment)				
X	Pressure Gauge - Piper 96395	0.5	67.2	34	TC A7SO
X	Pressure Regulator, Airborne Mech. (2) .7 lbs. each	1.4	70.2	98	TC A7SO
X	Instrument Air Filter, Piper 66673	0.3	54.8	16	TC A7SO
X	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 79316	0.2	77.6	16	TC A7SO
X	Clock	0.4	67.4	27	TC A7SO
X	Turn and Slip Indicator Piper PS50030-2 or -3	2.6	64.7	168	TSO C3A Type II
X	Encoding Altimeter PS50008-6 or -7 (Wt. = 1.9 lbs.)	* 0.9	65.9	59	TSO C10b & TSO C8b
X	Engine Hour Meter** Piper Dwg. 37731-0	.3	62.9	19	TC A7SO
	MK10 Radar Altimeter** Piper Dwg. 37693-2	5.4	181.3	979	TC A7SO

*Weight and moment difference between standard and optional equipment

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
L.	Instruments (Optional Equipment) (cont)				
———	NSD-360 Gyro*	5.0	77.8	389	TSO C52a TSO C5c
———	Narco OC-110* Converter and Mount	2.1	231.5	486	TSO C36c C40a

*Ser. nos. 34-7670001 and up

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 PS50049-18	.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 PS50008-4 or -5	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	.4	67.4	27	TC A7SO

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Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	M. Miscellaneous (Optional Equipment)				
	Jumpseat Piper Dwg. 78108-9	7.8	122.3	954	TC A7SO
	Seat Belt (Jumpseat) PS50039-4-5	1.4	123.0	172	TSO C22
X	Assist Straps (2) Piper Dwg. 79455 .15 lbs. each	0.3	120.0	36	TC A7SO
X	Inertia Safety Belts, Center Seats (2) PS50039-4-15 0.75 lbs. each	1.5	133.9	201	TC A7SO
X	Inertia Safety Belts, Rear Seats (2) PS50039-4-14 0.8 lbs. each	1.6	181.5	290	TC A7SO
X	Lighter 200462 (12V Universal)	0.2	67.9	14	TC A7SO
X	Fire Extinguisher, Scott Aviation * 42211-00 Piper Dwg. 78621-2	5.0	56.0	280	TC A7SO
X	Sun Visors (2) 66991-2 1.05 lbs. each	2.1	79.0	166	TC A7SO
Removed	Tow Bar Piper Dwg. 96331-0	4.4	168.0	739	TC A7SO
X	Ground Ventilating Blower Piper Dwg. 79273-5	7.2	205.1	1477	TC A7SO
X	Super Cabin Sound Proofing Piper Dwg. 78630-0	24.2	107.2	2594	TC A7SO

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	M. Miscellaneous (Optional Equipment) (cont)				
	Adjustable Front Seat				
X	(Left) Piper Dwg. 78360-0	* 6.6	85.1	562	TC A7SO
	(Left) Piper Dwg. 79592-0	* 4.6	84.7	390	TC A7SO
	Adjustable Front Seat				
	(Right) Piper Dwg. 78360-1	* 6.8	84.5	575	TC A7SO
	(Right) Piper Dwg. 79592-1	* 4.6	84.1	387	TC A7SO
X	Headrests, Front (2) 96806-17 or 79337-18 (1.0 lbs. each)	2.2	99.5	219	TC A7SO
X	Headrests, Center (2) 96806-17 or 79337-18 (1.0 lbs. each)	2.2	132.1	291	TC A7SO
X	Headrests, Rear (2) 96806-17 or 79337-18 (1.0 lbs. each)	2.2	169.7	373	TC A7SO
	Zinc Chromate Finish	6.0	172.0	1032	TC A7SO
	Corrosive Resistant Kit	3.0	106.0	318	TC A7SO
	Combustion Heater** (45,000 BTU) Piper Dwg. 37164-0	* 1.5	215	323	TC A7SO
	Oxygen System - Scott Aviation MK III (Incl. (1) Mike - Mask) Scott *802180-00 Piper Dwg. 37684	39.0	118.1	4606	TC A7SO
	Stainless Steel Control Cables		-	-	TC A7SO
	Fuel Cells Piper Dwg. 37077-3	6.2	93.6	580	TSO C80

*Weight and moment difference between standard and optional equipment
**Ser. nos. 34-7570001 through 34-7570327

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	M. Miscellaneous (Optional Equipment) (cont)				
	Ice Protection Sytem Instl. Piper Dwg. 37700				
X	Windshield Heating Unit, Piper Dwg. 78162-0	2.6	59.6	155	TC A7SO
X	Heated Pitot Head and Stall Warning Detectors	0.4	100.0	40	TC A7SO
X	Ice Light Kit, Piper Dwg. 37700-4	0.4	72.0	29	TC A7SO
X	Electrothermal Propeller Deicing System, Piper Dwg. 37700-3	11.6	39.2	455	TC A7SO
	Pneumatic Deicing System With Airborne Mfg. Vacuum Pumps 431CC-7 & 432CW-6	39.6	104.8	4152	TC A7SO
	or				
X	With Airborne Mfg. Vacuum Pumps 441CC-7 & 442CW-6	34.3	111.9	3839	TC A7SO
	Miscellaneous	0.9	73.3	66	TC A7SO

Item	Item	Weight Lbs.	Arm Aft Datum	Moment	Cert. Basis
	M. Miscellaneous (Optional Equipment) (cont)				
	Heavy Duty Wheels, Brakes and Tires				
	a. Cleveland Aircraft Products 40-120 Wheel Assembly (2) 30-83 Brake Assembly (2)				TSO C26 TSO C26
______	Goodrich 6.00 x 6 Ribbed Type III 8 Ply Rating Tire with Tube (2)	*2.9	109.8	318	TSO C62
	b. Cleveland Aircraft Products 40-76F Wheel Assembly				TSO C26
______	Goodrich 6.00 x 6 Ribbed Type III 8 Ply Rating Tire with Tube	(same as standard equipment)			TSO C62

TOTAL OPTIONAL EQUIPMENT 197.6 100.1 19779

EXTERIOR FINISH

Base Color ______________ Registration No. Color ______________

Trim Color ______________ Type Finish ______________

Accent Color ______________

*Weight and moment difference between standard and optional equipment.

AIRCRAFT EMPTY WEIGHT BALANCE DATA SHEET

Make PIPER Model PA 34-200T Serial # 34-7670011 N# 3974X

1. Datum is located ; 78.4 " FWD OF THE LE
2. The Leveling Means ; SCREWS ON LH SIDE OF FUSELAGE
3. Main Wheel weight point is ; ______ Fwd. 109.8 Aft of datum.
4. Actual measured distance from the main weight point center line to the tail (or nose) point center line is ; 109.8
5. Oil above "zero" reading is ; FULL
6. Nose or tail wheel weighing point is ; ______ forward 25.5 aft of datum.

Reaction wheel Jack point	Scale Reading	Tare	Net Weight	Arm	Moment
Left Main	1365	0	1365	109.8	149877.00
Right Main	1456	0	1456	109.8	159868.80
Subtotal both Mains	0	0	2821		309745.80
Nose	1032	0	1032	25.5	26316.00
Total as Weighed	0		3853		336061.80

If useful load items are in aircraft as weighed, they should be subtracted in space below.
If all empty weight item are not in aircraft as weighed they should be added in the space below.

Remove useable fuel	93.0 GAL	-558	93.9	-52396.20
				0.00
		0	0	0.00
		0	0	0.00
		0	0	0.00
		0	0	0.00
		0	0	0.00
Corrected Empty Wt.		3295	86.09	283665.60
Unuseable Oil				
Unuseable Fuel				
Certificated Wt. (Actual)		3295	86.09	283665.60

Repair Agent ; Bill's Aircraft Number AP-1515915 Date ; 29-Oct-15

Signature ; Wm. J. Roff Work Order No.# 3974X

Wm. J. Roff 918-408-7633

Aircraft Weight and Balance Revision

Tail Number: **N3974X**	Date: 6/10/2014
Prepared by: Kenneth Morgan III c/o Glendale Aero Services 6841 N. Glen Harbor Blvd. Glendale, AZ 85307	Work Order No: 6000926 Type Certificate Data No: A7SO

Aircraft Make:	Model:	Serial No:	Time:
Piper	PA-34-200T	34-7670011	2001.0

Registered Owner: Angel Aviation Inc.	Address: 7904 W. Acoma Dr. Peoria, AZ 85381

Maximum Weight **4570** | CG Range FWD **90.6** AFT **94.6**

As Received; Date of Previous Weight and Balance:	**Useful Load:**	**EW:**	**EWCG:**	**Moment:**
12/19/2011	1431	3139	83.9	263571.7

Notes: Aircraft weighed in basic empty configuration using calibrated scales IAW Seneca II AFM Section 5

	Weight	**Arm**	**Moment**
Nose wheel scale reading	761.0	25.9	19709.90
Left main wheel scale reading	1112	110.0	122320.00
Right main scale reading	1116	110.0	122760.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00

SUPERCEDED 10/29/15

		New Empty Weight CG	**New Useful Load**
☐ As Calculated ☒ As Weighed	Moment 264789.90 Weight 2989.00	**88.59**	**1581.00**

Signature Kenneth Morgan III

Kenneth Morgan III

Repair Agency or License No: 322829269 A&P / IA

Aircraft Weigh Work Sheet

Tail Number: N3974X		Date: 6/10/2014	
Prepared by: Kenneth Morgan III c/o Glendale Aero Services 6841 N. Glen Harbor Blvd. Glendale, AZ 85307		Work Order No: 6000926 Type Certificate Data No: A7SO	
Aircraft Make: Piper	Model: PA-34-200T	Serial No: 34-7670011	Time: 2001.0
Method of Weighing: Basic empty configuration using calibrated scales IAW Seneca II AFM Section 5			
Equipment Make: Longacre		Model No: Accuset	Serial No: 033475
Last Calibration Date: 6/6/2014			
Leveling Means: Bubble level installed at left fuselage below cabin window			
Category: Normal		Gross Weight: 4570	

Weigh Point	Scale Reading	Tare	Net Weight
Nose	761	0	761.00
Left	1112	0	1112.00
Right	1116	0	1116.00
Tail	0	0	0.00
		Total	2989.00

Notes:

SUPERCEDED 10/29/16

Signature Kenneth Morgan III 322829269 IA

Kenneth Morgan III

Aircraft Weight & Balance Changes/ Equipment List Revisions

Date: 12-19-2011

Registration #: 3974X

Make/Model: Piper PA-34-200T

Serial #: 34-7670011

Date of previous weight and balance: 12-03-2008

Old Empty Weight:	3141.8 Pounds
Old Empty CG:	83.61 Inches
Old Empty Weight CG Moment:	**262674.4 Inch/Pounds**
Max Gross Weight:	**4570 Pounds**
Old Useful Load:	1428.2 Pounds

Superceded 6/10/2014

New Empty Weight:	3139 Pounds
New Empty CG:	83.9 Inches
New Empty Weight CG Moment:	263571.7 Inch/Pounds
Max Gross Weight:	4570 Pounds
New Useful Load:	1431 Pounds

This aircraft weight & balance change supersedes all previous weight & balance data.

Al Merrill Al Merrill 2642299 A&P

Comments:

Windshield Heater Assembly not installed. (Weight: 2.6 lbs, Arm: 59.6 inches, Moment: 154.96 in/lbs)

Registration:	N3974X	Date:	9-2-15
Aircraft Make:	PIPER	Tach/Hobbs:	MX-2864.8
Aircraft Model:	PA34-200T	Work Order:	IN15-416
Aircraft S/N:	34-7670011		INSTALLED EQUIPMENT

Description	Manufacturer	Model	P/N	S/N	Weight
GDL88	GARMIN	ADS-B	011-02369-00	22T003275	
GTX330ES	GARMIN	TRANSPONDER	011-00455-60	84149705	
GMA340	GARMIN	AUDIO PANEL	011-00401-10	96296498	
ISOLATION COUPLER	DAC		1049-4801-01	20648	
STEERING CONVERTER	DAC		1049-4000-03	20679	
NAV2 INDICATOR	KING	KI-209	066-3056-01	54340	CUSTOMER SUPPLIED
NAV/COM	KING	KX155	069-1024-31	15641	CUSTOMER SUPPLIED
CLOCK	MID-CONTINENT		MD93	S15-10083	

Registration:	N3974X	Date:	9-2-15
Aircraft Make:	PIPER	Tach/Hobbs:	MX - 2364.8
Aircraft Model:	PA34-200T	Work Order:	IN15-416
Aircraft S/N:	34-7670011		REMOVED EQUIPMENT

Removed Items

Description	Manufacturer	Model	P/N	S/N	Weight
AUDIO PANEL	KING	KMA24	066-1055-03	14909	
TRANSPONDER	KING	KT76A	066-1062-00	060833	
INTERCOM	PSE	PM3000	1193-2	F13542-CR	
NAV2 INDICATOR	KING	KI-214	066-3025-01	B213	
NAV/COM	KING	KX175B	069-1019-00	33887	

EQUIPMENT LIST

Revised 2-2-08

Currently installed items at time of weighing on this date. This list does not show repeat every item from original list was generated from *Piper* factory, but reflects most major items which have been changed or kits which have been installed. For additional details of installed equipment, refer to original *Piper* Equipment List.

	Item	Qty
	Interior Furnishings	
1	Fire Extinguisher, *H3R* RT A400	1
2	Headrest, Seatback	5
	Components	
3	Propeller, *Hartzell Propeller, Inc. PHC-C3YF-2(L)KUF (STC installation)*	2
	Avionics	
4	GPS, *Garmin* GNS530	1
5	Com/Nav 2, *King* KX-175B	1
6	Transponder, *King* KT-76A	1
7	DME, *King* KN-64	1
8	Audio Panel, *King* KMA-24	1
9	Intercom, *PS Engineering* PM-3000	1
10	Auto Pilot, *Century* Altimatic IIIC	1
11	Avionics Cooling Fan, *Troll Avionics, Inc.* FN-200	
	Kits added by STC	
12	Vortex Generator Kit, Option 2, *Aeronautical Testing Service*	1
13	Wingtips w/ Landing Lights, *Aircraft Lighting & Components*	2
14	Nacelle Auxiliary Fuel Cell (15 gal.), *Nayak AviationCorp.*	2

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Section 6

NOT USED IN THIS AIRCRAFT

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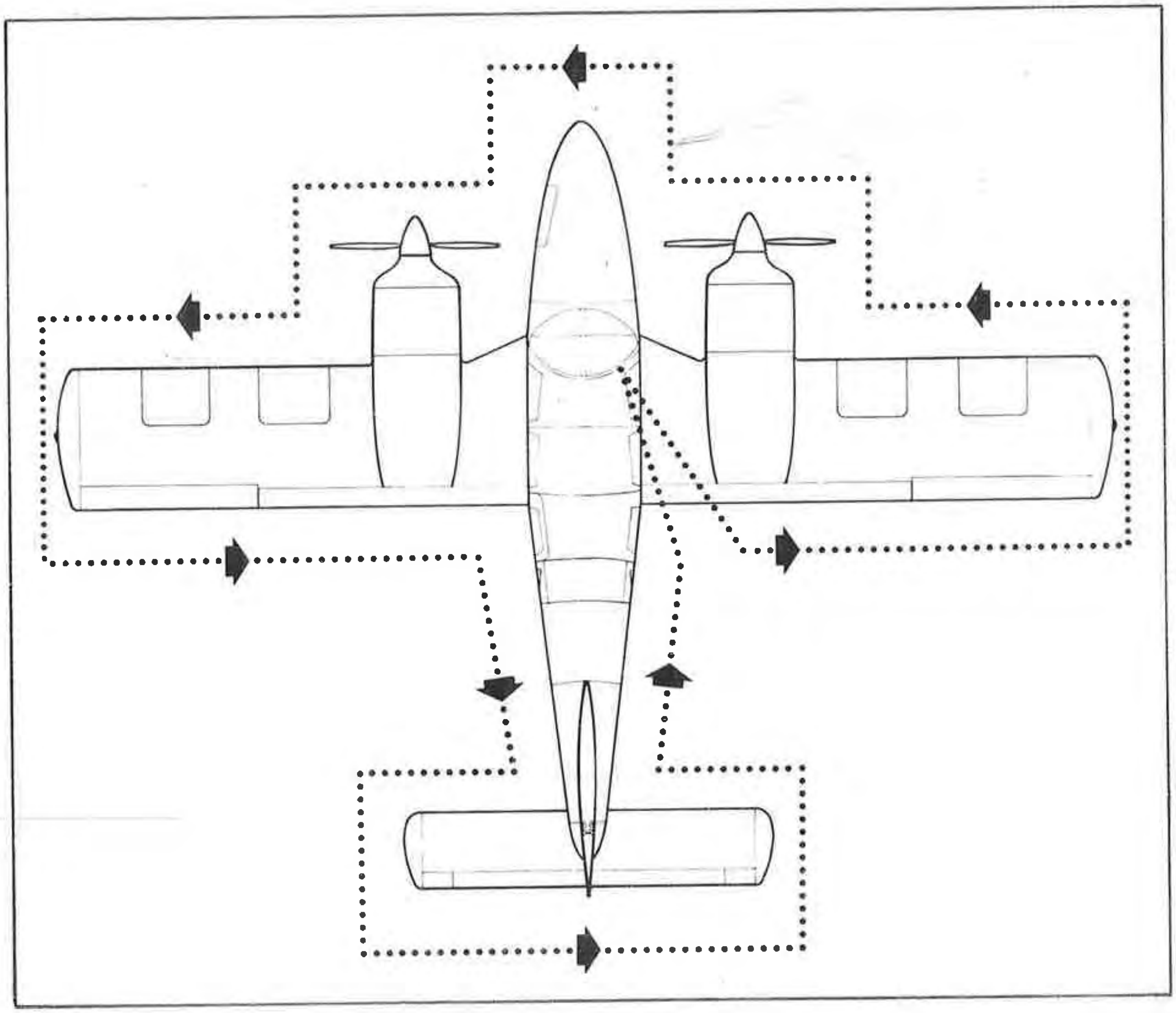
OPERATING INSTRUCTIONS

OPERATING INSTRUCTIONS

PREFLIGHT

When planning a flight in the Seneca II:

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 Charts Section of this Manual.)



WALK-AROUND INSPECTION

1. In Cabin
   a. Landing gear control - "DOWN" position
   b. Avionics - off (to save power and prevent wear on the units)
   c. Master switch - on
   d. Landing gear lights - three green lights (no red light)
   e. Fuel quantity - adequate for flight plus reserve
   f. Cowl flaps - open (to facilitate inspection and ensure cooling after engine start)
   g. Master switch - off (to save battery)
   h. Ignition switches - off (to prevent inadvertent start during inspection of propeller)
   i. Mixture controls - idle cut-off position (again to prevent inadvertent engine start)
   j. Trim indicators - neutral (so that tabs may be checked for alignment)
   k. 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.)
   l. Controls - free (Check for proper movement.)
   m. Pitot and static systems - drain
   n. Fasten seat belts on empty seats.
   o. Paperwork - Check that the proper aircraft papers are aboard and that the necessary inspections have been performed.
   p. Drain two crossfeed drains on forward side of spar box.

2. Outside Airplane
   a. Check crossfeed drains to insure they are closed
   b. Right wing, aileron and flap - no damage, no ice (Check hinges.)
   c. Right main gear - no leaks, tires inflated and not excessively worn, 3-1/2 inches piston exposed under static load
   d. Right wing tip - no damage
   e. Right leading edge - no damage or ice
   f. Fuel cap - Open to check quantity and color of fuel (light green). Check cap vent, and then secure.
   g. Right engine nacelle - Check oil quantity (six to eight quarts). Secure inspection door.
   h. Right propeller - no nicks or leaks, spinner secure and not cracked
   i. Cowl flaps - open and secure
   j. Fuel drains - Drain three on right side: two fuel tanks drains (under wing), one gascolator drain (near bottom of engine nacelle).
   k. Nose section - undamaged
   l. Nose gear - no leaks, tire inflated and not excessively worn, 2-1/2 inches piston exposed under static load, tow bar removed, condition of landing light checked
   m. Forward baggage door - secure and locked
   n. Windshield - clean and secure
   o. Left wing, engine nacelle and landing gear - Inspect as on right side.
   p. Pitot tube - hole unobstructed, heat checked by feel if need is anticipated
   q. Stall warning vanes - no damage, free movement
   r. Rear door - latched securely
   s. Left static vent - unobstructed
   t. Dorsal fin air scoop - free from obstruction
   u. Empennage - no damage, free of ice, hinges secure

v. Stabilator - freedom of motion
w. Right static vent - unobstructed
x. Antennas - secure and undamaged
y. Navigation and landing lights - Check (after master switch and light switches have been turned on in cabin).

STARTING ENGINES

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. Fuel selector - on
2. Mixture control - rich
3. Throttle control - open half way
4. Propeller control - forward
5. Master switch - on
6. Ignition switches - on
7. Electric fuel pump - (for models without primer system installed only)* on for 10 sec. when cold (5 sec. when hot) - then off
8. Propeller - clear
9. Starter - engage
10. Primer button - (for models with primer system installed only)** on as required (for cold weather operations - see cold weather starting procedure)
11. Throttle - retard when engine starts
12. Oil pressure - up within 30 seconds (except in very cold weather, when it may take somewhat longer) if no pressure indication, shut down engine and have checked
13. Repeat steps 1 through 11 with the other engine
14. Alternators - checked
15. Gyro pressure - checked

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.

*Ser. nos. 34-7570001 through 34-7570308 when Piper Kit No. 760 926V is not installed.
**Ser. nos. 34-7570309 and up and 34-7570001 through 34-7570308 when Piper Kit No. 760 926V is installed.

STARTING ENGINES WHEN FLOODED

1. Mixture control - idle cut-off
2. Throttle control - full forward
3. Propeller control - forward
4. Master switch - on
5. Ignition switches - on
6. Auxiliary (or electric) fuel pump - off
7. Propeller - clear
8. Starter - engage
9. When engine fires, retard throttle and advance mixture slowly.

STARTING ENGINES IN COLD WEATHER (32°F and below)

NOTE

As cold weather engine operations are decidedly more demanding, it may become necessary to utilize the starting procedure listed below in low ambient temperatures. (In temperatures below 15°F engine preheat before starting is recommended.)

NOTE

It may be necessary to apply an external power source to facilitate engine cranking if the aircraft's battery is deficient of charge.

1. Check ignition switches (mags) - OFF.
2. Turn props through by hand (3 times).
3. Fuel selector - ON.
4. Mixture control - FULL RICH.
5. Throttle control - FULL FORWARD.
6. Prop control - FULL FORWARD.
7. Master switch - ON.
8. Ignition switch (mag) - ON.
9. Electric fuel boost pump - on LOW BOOST.
10. Primer - ON and engage starter simultaneously.
11. Begin moving throttle control back and forth from full forward to full aft.
12. Release primer button after about 3 seconds of cranking. Leave primer off for about 3 seconds of cranking then re-apply primer for about 3 seconds, etc. until engine begins firing.
13. When engine begins firing, leave starter engaged and tap primer periodically until a rhythmic firing pattern is observed and then release starter switch and position throttle at half travel.
14. Tap primer button if engine falters during this period and adjust throttle to a 1000 RPM idle speed.
15. Electric fuel boost pump may be turned off as soon as it is determined that the engine will continue running without it.

CAUTION

Engine boost pump "ON" with mixture "RICH" or over-priming can cause excessive fuel flow to the engine, which will drain through the overboard vent when the engine is not operating. Turn boost pump "OFF" when engine is not running or not being turned over with the starter. Additional fire precautions should also be observed.

In the event that the procedures shown here are not successful, operators should insure that power plant systems and components are in the highest state of maintenance: i.e., magneto "E" gap, mag timing, mag point condition, fuel injection pressures, proper oil visocity, fully charged battery, etc.

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 off.
2. Turn radios off.
3. Connect RED lead of PEP kit jumper cable to POSITIVE (+) terminal of external 12 volt battery and BLACK lead to NEGATIVE (-) terminal.
4. Insert plug of jumper cable into socket located on aircraft fuselage.
5. Turn aircraft master switch on and proceed with normal engine starting technique.
6. After engine has been started, turn master switch off, and remove jumper cable plug from aircraft.
7. Turn aircraft master switch 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 should be checked during taxiing:

1. Instruments - turn indicator, directional gyro, coordination ball, compass
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.

*Optional equipment

PRETAKEOFF CHECK

A thorough check should be made before takeoff, 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. Head airplane into the wind if possible. (See crosswind limits for propellers.)
2. Engine run-up
   a. Mixture controls - forward
   b. Propeller controls - forward
   c. Throttle control - forward to 1000 RPM
   d. Propeller controls - Check the feather position by bringing the propeller controls fully back and then to the full forward position. Do not allow more than a 300 RPM drop during the feathering check.
   e. Throttle controls - forward to 1900 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
   i. Magnetos - check
      Normal drop - 100 RPM
      Maximum drop - 150 RPM
      Maximum differential drop - 50 RPM
   j. Alternator output - check, approximately equal output for both alternators
   k. Gyro pressure gauge - 4.5 to 5.2 in. Hg.
   l. Throttles - 800-1000 RPM
3. Fuel selectors - on
4. Alternators - on
5. Engine gauges - in the green
6. Annunciator panel - press-to-test; all lights on
7. Altimeter - set
8. Attitude indicator - set
9. Directional gyro - set
10. Clock - wound and set
11. Mixtures - set
12. Propellers - set in forward position
13. Quadrant friction - adjusted
14. Alternate air - off
15. Cowl flaps - set
16. Seat backs - erect
17. Wing flaps - set
18. Trim (stabilator and rudder) - set
19. Seat belts and shoulder harness - fastened
20. Empty seats - seat belts fastened
21. Controls - free, full travel

22. Doors - latched
23. Auxiliary (or electric) fuel pumps - off
24. Pitot heat - as required

The normally recommended procedure for sea level takeoff is to advance the throttle until a manifold pressure of 39 in. Hg. is indicated at 2575 RPM. During pretakeoff check at a high elevation, lean the mixture to obtain maximum power. Apply 40 in. Hg. manifold pressure; then lean the mixture until the fuel flow pointer stabilizes at a fuel consumption mark consistent with the altitude as shown on the green takeoff range on the gauge. Leave the mixture in this position for takeoff. Do not overheat the engine when operating with mixture leaned. If overheating occurs, enrich the mixture enough that temperature returns to normal.

NOTE

The "overboost" indicator lights on the annunciator panel will illuminate at approximately 39.8 in. Hg. manifold pressure. Do not exceed 40 in. Hg. manifold pressure.

CAUTION

Insure that the alternators are not indicating full charge prior to takeoff.

TAKEOFF

Takeoff should not be attempted with ice or frost on the wings. Takeoff distances and 50-foot obstacle clearance distances are shown on charts in the Performance Charts Section of this Manual. The performance shown on charts will be reduced by uphill gradient, tailwind component, or soft, wet, rough or grassy surface, or poor pilot technique.

Avoid fast turns onto the runway, followed by immediate takeoff, especially with a low fuel supply. As power is applied at the start of the takeoff 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. Apply throttle smoothly until 40 in. Hg. manifold pressure is obtained. **DO NOT APPLY ADDITIONAL THROTTLES.**

NOTE

At altitudes below 12,000 feet, normal takeoffs are made with less than full throttle - use throttle only as required to obtain 40 in. Hg. manifold pressure. **DO NOT EXCEED 40 IN. HG. MANIFOLD PRESSURE.**

Normal Takeoff (Flaps Up):

When obstacle clearance is no problem, a normal takeoff 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 Takeoff (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 takeoff 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 takeoff procedure are given on a chart in the Performance Charts Section of this Manual.

Short Field Takeoff (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 takeoff range. Set the brakes and bring the engines to full power before release. Accelerate to 70 MPH and rotate firmly so that 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 takeoff 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 takeoff procedure are given on a chart in the Performance Charts Section of this Manual.

DOOR OPEN ON TAKEOFF

If either the main or rear cabin door is inadvertently left open or partially open on takeoff, 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.

MANIFOLD PRESSURE OVERBOOST LIGHTS

Illumination of the overboost light on the annunciator panel does not indicate a malfunction. The overboost lights illuminate when manifold pressure approaches the maximum limit. The overboost lights should be monitored during takeoff to insure that an overboost condition does not persist.

CLIMB

On climb-out after takeoff, it is recommended that the best angle of climb speed (90 MPH) be maintained only if obstacle clearance is a consideration. The best rate of climb speed (105 MPH) should be maintained with full power on the engines until adequate terrain clearance is obtained. At this point, engine power should be reduced to 31.5 inches manifold pressure and 2450 RPM (approximately 75% power) for cruise climb. A cruise climb speed of 120 MPH or higher is also recommended. This combination of reduced power and increased climb speed provides better engine cooling, less engine wear, reduced fuel consumption, lower cabin noise level, and better forward visibility.

When reducing engine power the throttles should be retarded first, followed by the propeller controls. The mixture controls should remain at full rich during the climb. Cowl flaps should be adjusted to maintain cylinder head and oil temperatures within the normal ranges specified for the engine. During climbs under hot weather conditions, it may be necessary to use the electric fuel pump for vapor suppression.

Consistent operational use of cruise climb power settings is strongly recommended since this practice will make a substantial contribution to fuel economy and increased engine life, and will reduce the incidence of premature engine overhauls.

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 engine in the Teledyne Continental 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 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 icing. If induction system icing is expected, place the alternate air control in the "ON" position.

WARNING

Flight in icing conditions is prohibited unless aircraft is equipped with the approved and complete Piper ice protection system. 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 takeoff 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 65 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, if 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 if an asymmetric flow gauge indication is observed, a fuel nozzle may be clogged and require cleaning.

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. Cowl flaps should normally be closed to keep the engines at the proper operating temperature.

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. Doing so can lead to a gear up landing as it is easy to forget the landing gear, especially when approaching for a single-engine landing, or 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. Auxiliary (or electric) fuel pumps - off
6. Mixture controls - set
7. Propellers - set to 2250 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 should 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. This gives the gear warning 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 permit full attention to be given to the landing and landing roll, and will also prevent the pilot's accidentally reaching for the gear handle instead of the flap handle.

1. 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.

2. 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.

3. 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 demonstrated crosswind component for landing is 20 MPH.

POST LANDING

After leaving the runway:

1. Wing flaps - retract
2. Cowl flaps - fully open
3. Alternate air - off

SHUT DOWN

1. Heater (if on) - switch to **FAN** for 2 minutes, then **OFF**
2. Radio and electrical equipment - off
3. Mixture controls - idle cut-off
4. Magneto switches - off
5. Master switch - off
6. Parking brake - on if required

MOORING

The airplane can be moved on the ground with the aid of the optional nose wheel tow bar stowed aft of the fifth and sixth seats. Tie-down ropes may be attached to mooring rings under each wing and to the tail skid. The ailerons and stabilator should be secured by looping the seat belt through the control wheel and pulling it snug. The rudder need not be secured under normal conditions, as its connection to the nose wheel holds it in position. The flaps are locked when in the fully retracted position.

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 II if zero instrument error is assumed. See Airspeed Calibration Chart in Performance Chart section.

TURBULENT AIR OPERATION

In keeping with good operating practice used with all aircraft, it is recommended that in conditions of extreme turbulence, power be reduced to slow the airplane to slightly below the design maneuvering speed of 140 MPH. 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 takeoff power and the other engine windmilling. Vmc for the Seneca II 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.

In the Seneca II, more power is available on the operating engine at higher altitudes with the same manifold pressure; hence, there can be more asymmetric thrust. The Vmc in the Seneca II is lowest at low altitudes, and 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 spin could result.

NOTE

SINGLE-ENGINE STALLS ARE NOT RECOMMENDED.

OPERATION IN KNOWN ICING CONDITIONS See also page 7-16a

The Piper Seneca II 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. Operation in 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 have 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 Airplane Flight Manual procedures before any flight in which icing conditions might be encountered.
7. Plan an alternate airport whenever flying in ice.

*Optional equipment

EMERGENCY PROCEDURES

Procedures for handling in-flight emergencies and equipment malfunction are detailed in the Airplane Flight Manual Section. These should be read and followed by the pilot.

WEIGHT AND BALANCE

It is the responsibility of the owner and/or pilot to determine that the airplane remains within the acceptable weight vs. center of gravity envelope while in flight. For weight and balance data see the Weight and Balance Section of this Manual.

EMERGENCY LOCATOR TRANSMITTER* See supplemental information for new ELT.

The Emergency Locator Transmitter (ELT) 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. (On aircraft manufactured prior to mid-1975, this plate is retained by three steel Phillips head screws. On aircraft manufactured from mid-1975 and on, this plate is attached with three slotted-head nylon screws for ease of removal; these screws may be readily removed with a variety of common items such as a dime, a key, a knife blade, etc. If there are no tools available in an emergency the screw heads may be broken off by any means.) It is an emergency locator transmitter which meets the requirements of FAR 91.52. The unit operates on a self-contained battery. The replacement date as required by FAA regulations is marked on the transmitter label. The battery should also be replaced if the transmitter has been used in an emergency situation or if accumulated test time exceeds one hour. The unit is equipped with a portable antenna to allow the locator to be removed from the airplane in case of an emergency and used as a portable signal transmitter.

The battery has a useful life of four years. However, to 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 accumulated test time exceeds one hour. The replacement date is marked on the transmitter label.

On the unit itself is 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 will continue to transmit until the battery is drained to depletion or until the switch is manually moved to the "OFF" position. The "ARM" position is selected when the transmitter is installed at the factory and the switch should remain in that position whenever the unit is installed in the airplane. 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 periodically test the function of the transmitter.

Select the "OFF" position when changing the battery, when rearming the unit if it has been activated for any reason, or to discontinue transmission.

*Optional equipment

THE FOLLOWING WEATHER CONDITIONS MAY BE CONDUCIVE TO SEVERE IN-FLIGHT ICING:

- Visible rain at temperatures below 0 degrees Celsius ambient air temperature.
- Droplets that splash or splatter on impact at temperatures below 0 degrees Celsius ambient air temperature.

PROCEDURES FOR EXITING THE SEVERE ICING ENVIRONMENT:

These procedures are applicable to all flight phases from takeoff to landing. Monitor the ambient air temperature. While severe icing may form at temperatures as cold as -18 degrees Celsius, increased vigilance is warranted at temperatures around freezing with visible moisture present. If the visual cues specified in the Limitations Section of the AFM for identifying severe icing conditions are observed, accomplish the following:

- Immediately request priority handling from Air Traffic Control to facilitate a route or an altitude change to exit the severe icing conditions in order to avoid extended exposure to flight conditions more severe than those for which the airplane has been certificated.
- Avoid abrupt and excessive maneuvering that may exacerbate control difficulties.
- Do not engage the autopilot.
- If the autopilot is engaged, hold the control wheel firmly and disengage the autopilot.
- If an unusual roll response or uncommanded roll control movement is observed, reduce the angle-of-attack.
- Do not extend flaps when holding in icing conditions. Operation with flaps extended can result in a reduced wing angle-of-attack, with the possibility of ice forming on the upper surface further aft on the wing than normal, possibly aft of the protected area.
- If the flaps are extended, do not retract them until the airframe is clear of ice.
- Report these weather conditions to Air Traffic Control.

A pilot's remote switch, located on the left side panel, is provided to allow the transmitter to be controlled from inside the cabin. On early models the pilot's remote switch is placarded "ON," "ARM," "OFF RESET." If the pilot's remote switch has been placed in the "ON" position for any reason, the "OFF RESET" position must be selected for one second before the switch is placed in the "ARM" position. On later models the pilot's remote switch is placarded "ON/RESET" and "ARM (NORMAL POSITION)." The switch is normally left in the down or "ARM" position. To turn the transmitter off, move the switch to the "ON/RESET" position for one second then return it to the "ARM" position. To actuate the transmitter for tests or other reasons, move the switch upward to the "ON/RESET" position and leave it in that position as long as transmission is desired.

The unit is equipped with a portable antenna to allow the locator to be removed from the airplane 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 accidentally activated. Check by tuning a radio receiver to 121.5 MHz. If there is an oscillating sound, the locator may have been activated and should be turned off immediately. Reset to the "ARM" position and check again to insure against outside interference.

NOTE

If for any reason a test transmission is necessary, the operator must first obtain permission from a local FAA/FCC representative (or other applicable Authority). Test transmission should be kept to a minimal duration.

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OPERATING TIPS

OPERATING TIPS

The following Operating Tips are of particular value in the operation of the Seneca II.

1. Learn to trim for takeoff so that only a very light back pressure on the wheel is required to lift the airplane off the ground.
2. On takeoff, 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 gyro pressure gauge is provided to monitor the pressure available to assure the correct operating speed of the pressure 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 pressure 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. Pressure lines could be loose or broken.
   c. Pressure pumps could be worn.
   d. Pressure regulators may not be adjusted correctly. The pressure, even though set correctly, can read lower under two conditions:
      (1) Very high altitude, above 25,000 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 the 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. On takeoff, advance throttles smoothly, pausing momentarily at approximately 30 inches Hg of manifold pressure to allow time for the turbocharger speed to increase. Maintain manifold pressure at or below 40 inches Hg.
14. In an effort to avoid accidents, pilots should obtain and study the safety related information made avialable in FAA publications such as regulations, advisory circulars, Aviation News, AIM and safety aids.
15. Pilots who fly above 10,000 feet should be aware of the need for special physiological training. Appropriate training is available at approximately twenty-three Air Force Bases throughout the United States for a small fee. The training is free at the NASA Center in Houston and at the FAA Aeronautical Center in Oklahoma.

    Forms to be completed (Physiological Training Application and Agreement) for application for the training course may be obtained by writing to the following address:

    Chief of Physiological Training, AAC-143
    FAA Aeronautical Center
    P. O. Box 25082
    Oklahoma City, Oklahoma 73125

    It is recommended that all pilots who plan to fly above 10,000 feet take this training before flying this high and then take refresher training every two or three years.
16. 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.

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PERFORMANCE CHARTS

INTRODUCTION

PERFORMANCE SECTION

The example on the following introductory pages outlines a detailed flight plan using the performance charts in this section. Each chart includes its own example to show how it is used.

Due to the altitude capability of turbocharged airplanes, the pilot should always consider the possibility of encountering icing conditions.

Pilots and owners of the Seneca II are encouraged to use this information to ensure safe and efficient utilization of the aircraft.

FLIGHT PLAN

I. AIRCRAFT LOADING:

(A)	Basic Weight	2790 Lbs.
(B)	Occupants (3)	510 Lbs.
(C)	Baggage & Cargo	420 Lb.
(D)	Zero Fuel Wt.	4000 Lbs. (Max. Allowable 4,000 Lbs.) I(A) + (I)B + I(C)
(E)	Fuel	570 Lbs.
(F)	T. O. Weight	4570 Lbs. (Max. Allowable 4,570 Lbs.) I(D) + I(E)
(G)	T. O. Center of Gravity	93.3 Inches Aft of Datum
(H)	Landing Weight	4274 Lbs. (Max. Allowable 4,342 Lbs.) (Item X)

II. TAKEOFF:

		DEPARTURE AIRPORT
(A)	Elevation	7586 Ft.
(B)	Temperature	40 °F
(C)	Surface Wind	Calm Kts. @ ____ °
(D)	Runway Length Available	7400 Ft.
(E)	Runway Length Required: (Ref. Pages 9-4 to 9-8)	
	(1) T. O.	2100 Ft.
	(2) Accelerate & Stop	4400 Ft.

III. EN ROUTE:

(A) Highest Obstruction 11200 Ft.
(B) Cruise Altitude 16500 Ft.
(C) Temp. at Altitude (Forecast) 8 °F
(D) Total Distance 453 Statute Miles
(E) Power 55%
(F) Weather Consideration
 (1) VFR
 (2) IFR
 (3) Icing Conditions None Forecast
 (4) Winds Aloft 12000' - 030 @ 8 Kts; 15000' - 020 @ 11 Kts;
 18000' - 020 @ 24 Kts

IV. CLIMB: (Ref. Page 9-10)

(A) Time	15	-	6	=	9	Min. = 0.15 Hrs.
(B) Fuel	12.5	-	5	=	7.5	Gal.
(C) Distance	34	-	13	=	21	Statute Miles

V. DESCENT: (Ref. Page 9-13)

(A) Time	17	-	5	=	12	Min. = 0.20 Hrs.
(B) Fuel	4.7	-	1.3	=	3.4	Gal.
(C) Distance	50	-	15	=	35	Statute Miles

VI. CRUISE:

(A) Distance = Total Dist. - Climb Dist. - Descent Dist. = III (D) - IV (C) - V (C)
 = 453 - 21 - 35 = 397 Statute Miles
(B) Speed = 186 MPH TAS (Ref. Page 9-12) Wind Correction X - Wind.
 Corrected Cruise Speed = 186 MPH TAS
(C) Time = Cruise Dist./Cruise Speed = VI (A)/VI (B)
 = 397 / 186 = 2.1 3 Hrs.
(D) Fuel = Cruise Time x Cruise Fuel Consumption VI (C) x
 = 2.13 x 18 = 38.4 Gallons
(E) Oxygen (Oxygen required for flight above 12,500 feet).
 (1) Number of people 3
 (2) Duration of flight above 12,500 Ft. 2.48 Hrs. (or Item VIII)
 (3) Oxygen Required 2 Full Bottles (Ref. Supplement B of A. F. M.)
 (4) Oxygen on Board 2 Full Bottles

VII. LANDING:

	DESTINATION AIRPORT
(A) Elevation	4411 Ft.
(B) Temperature	50 °F
(C) Surface Wind	5 Kts. @ 340°
(D) Runway Length Available	9000 Ft.
(E) Runway Length Required (Item X for Landing Weight - Page 9-14 to 9-16 for Landing Distance)	1500 Ft.

VIII. Total Flight Time = Climb Time + Cruise Time + Descent Time
= IV (A) + VI (C) + V (A)
= .15 + 2.13 + .20 = 2.48 Hrs.

IX. Total Fuel Required = Climb Fuel + Cruise Fuel + Descent Fuel
= IV (B) + VI (D) + V (B)
= 7.5 + 38.4 + 3.4 = 49.3 Gal. x 6 = 296 Lbs.

X. Landing Weight = T. O. Weight - Total Fuel Consumption = I (F) - IX
= 4570 - 296 = 4274 Lbs.

NOTES:

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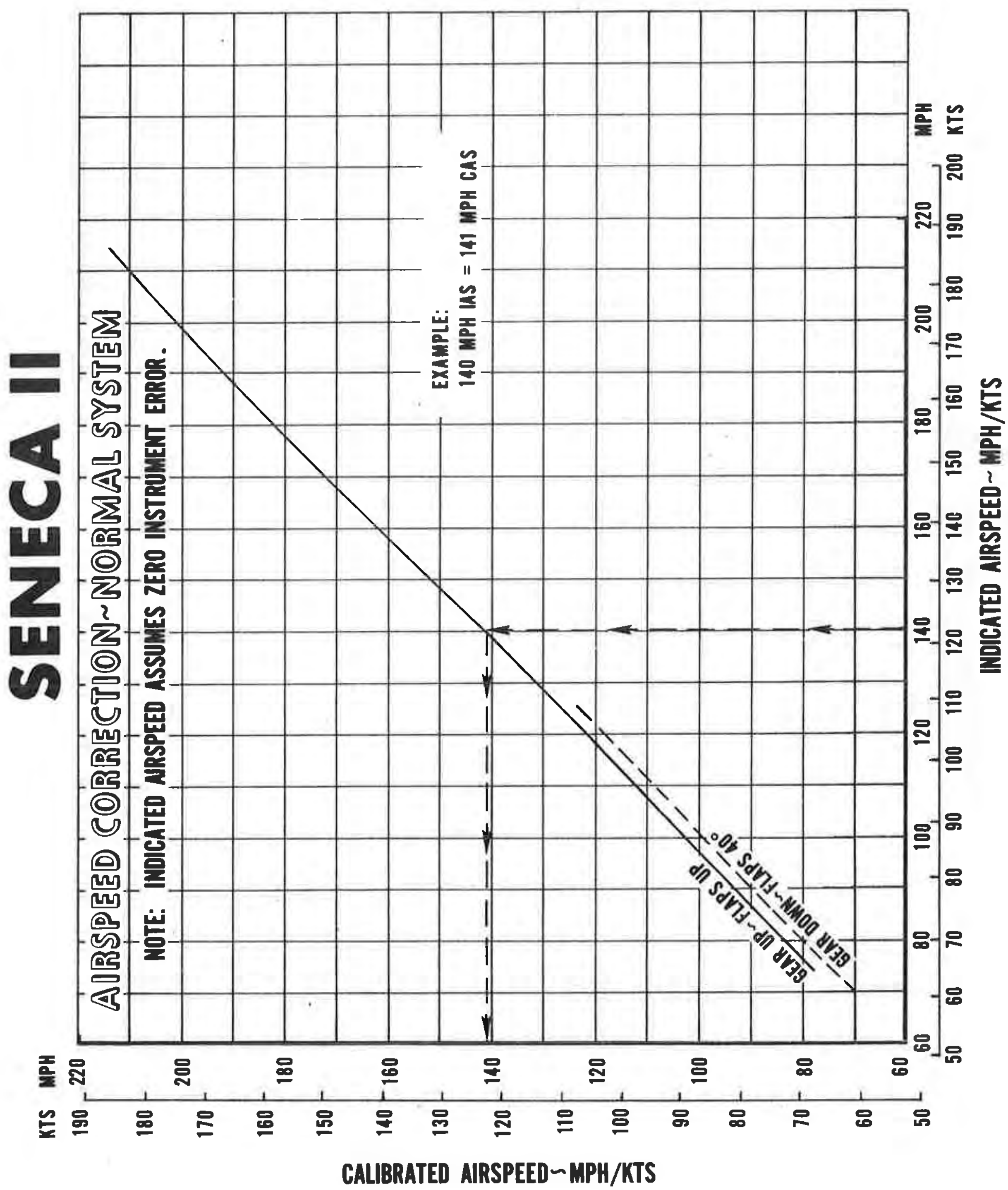
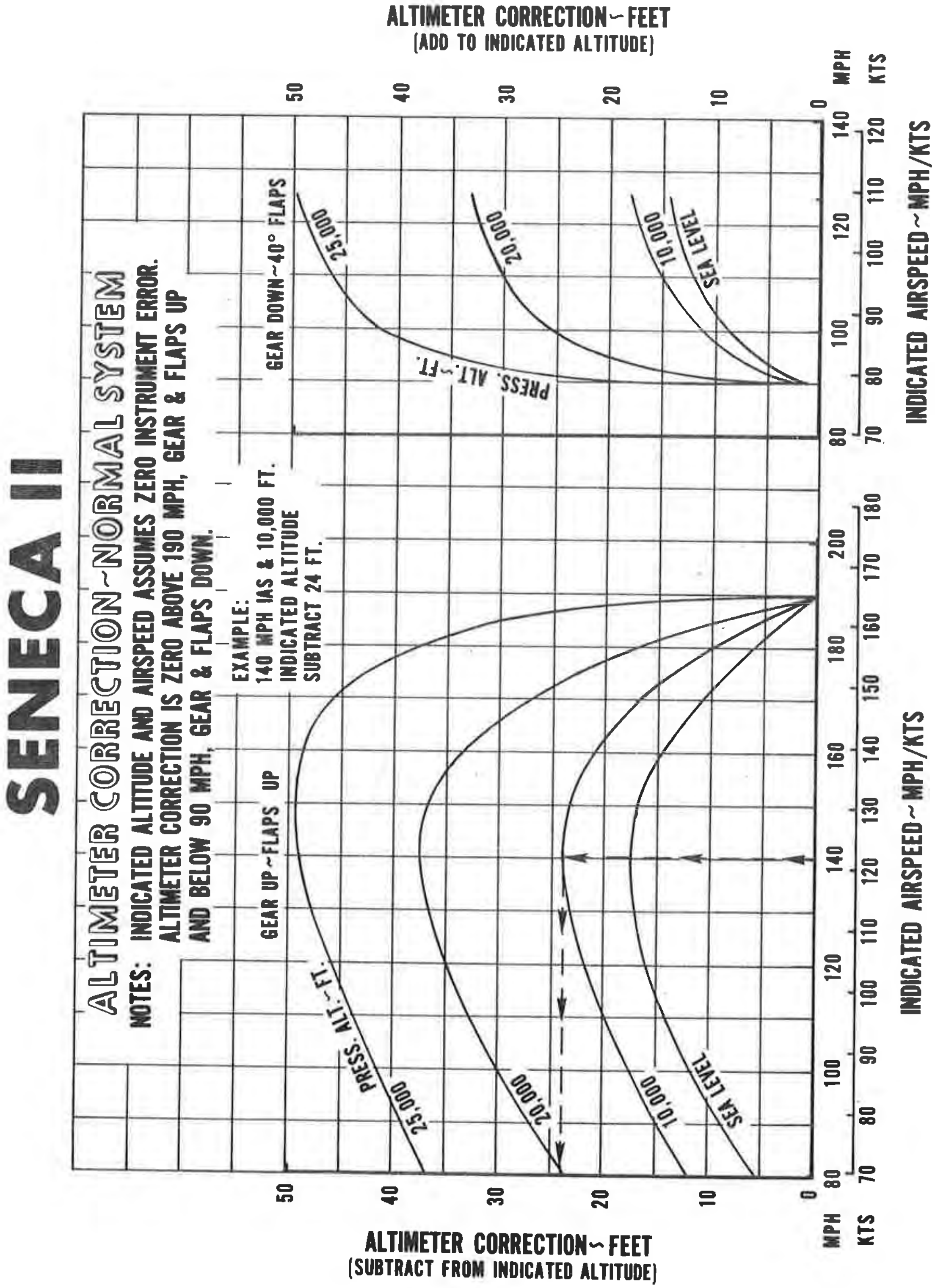
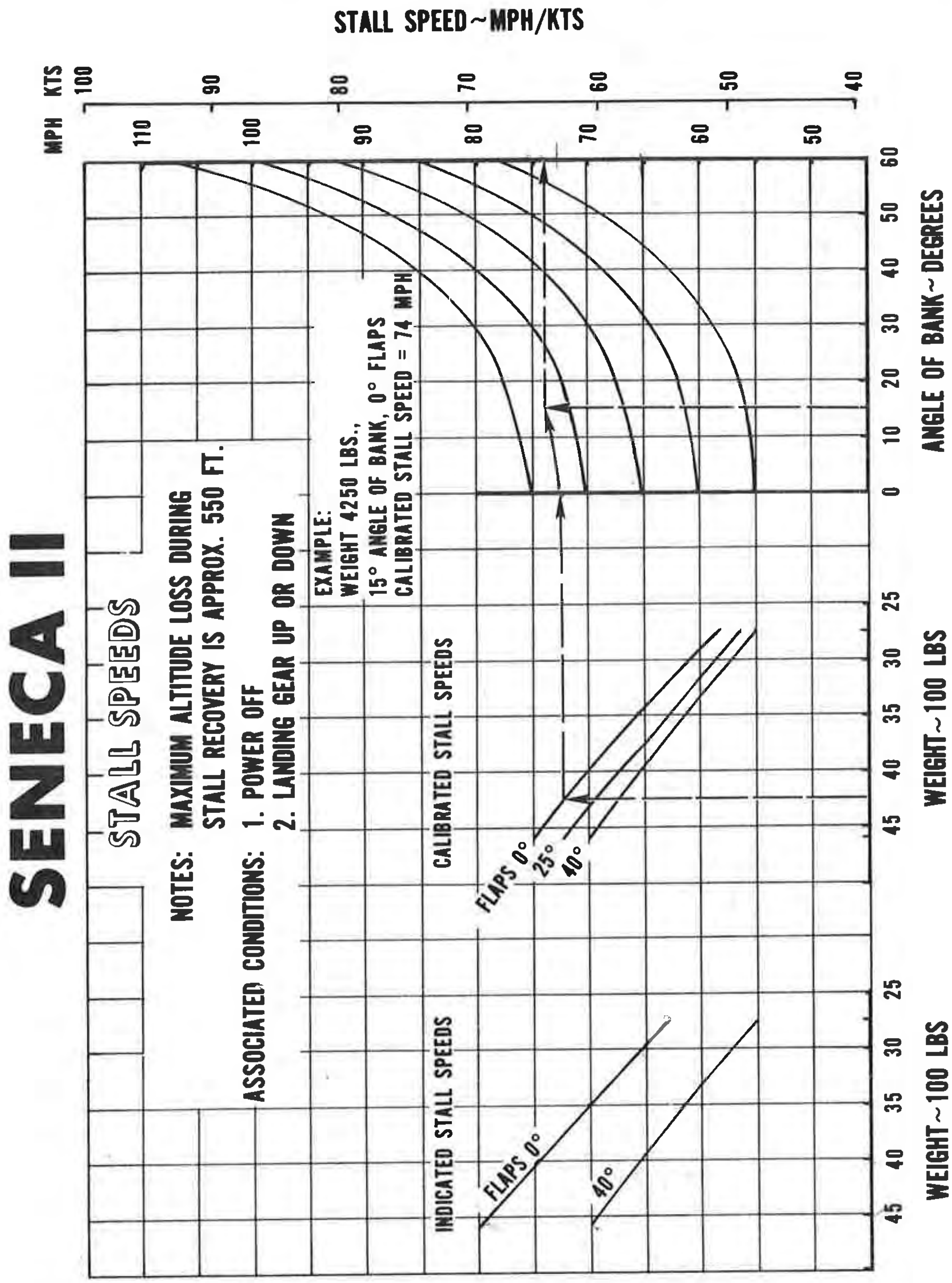
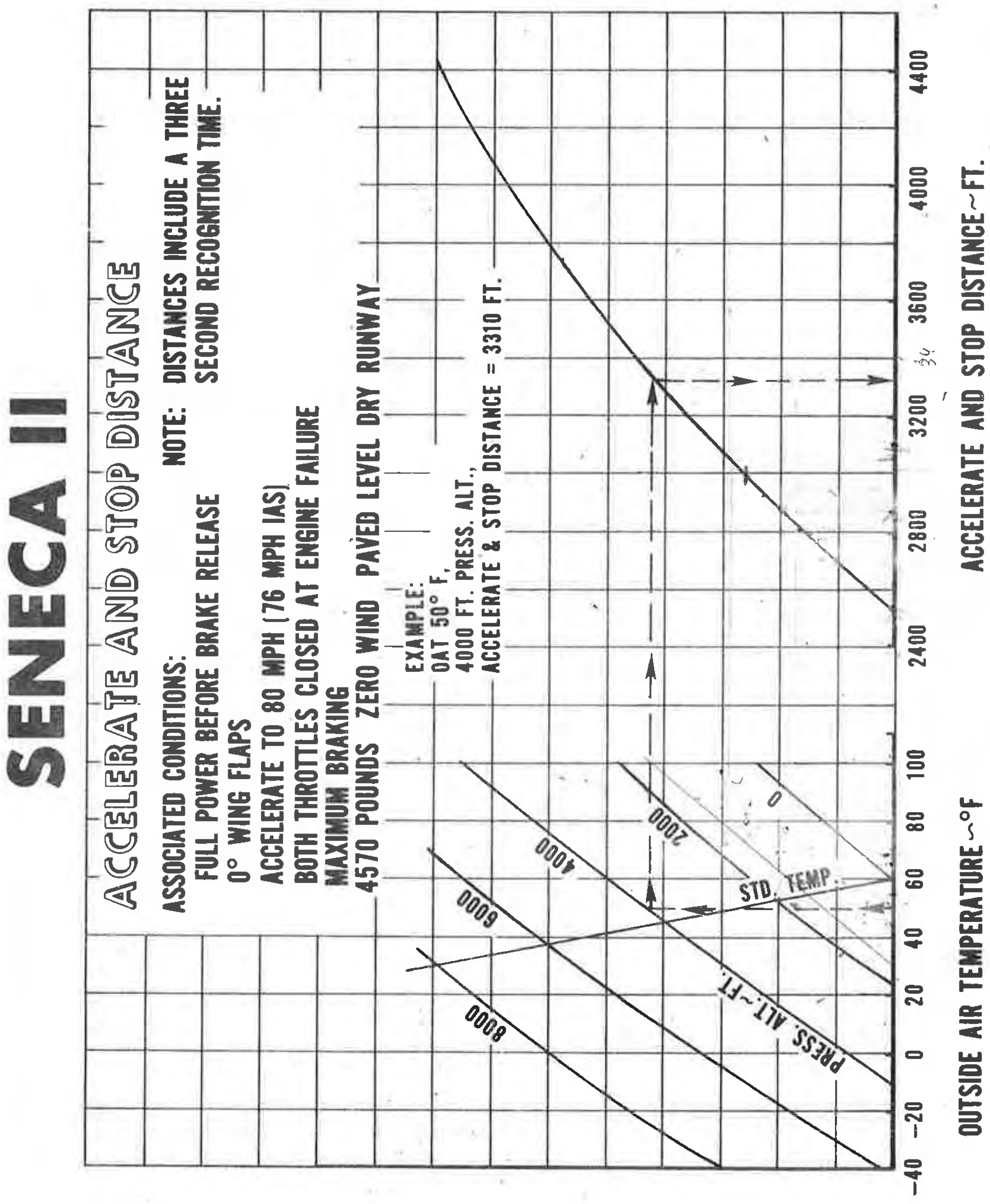
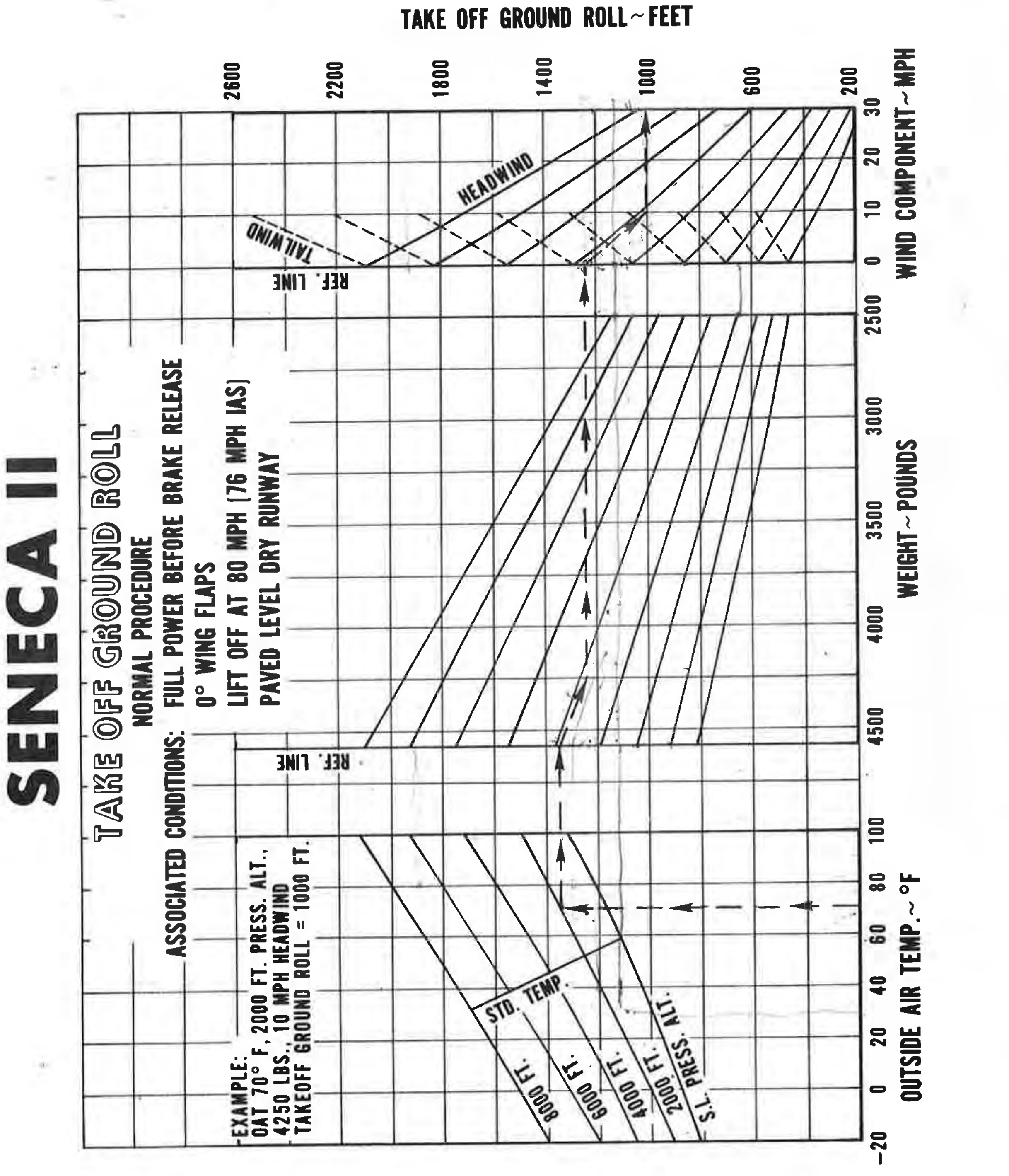

SENECA II
AIRSPEED CORRECTION~NORMAL SYSTEM
NOTE: INDICATED AIRSPEED ASSUMES ZERO INSTRUMENT ERROR.
EXAMPLE:
140 MPH IAS = 141 MPH CAS
GEAR UP~FLAPS UP
GEAR DOWN~FLAPS 40°
INDICATED AIRSPEED~MPH/KTS
CALIBRATED AIRSPEED~MPH/KTS
MPH
KTS

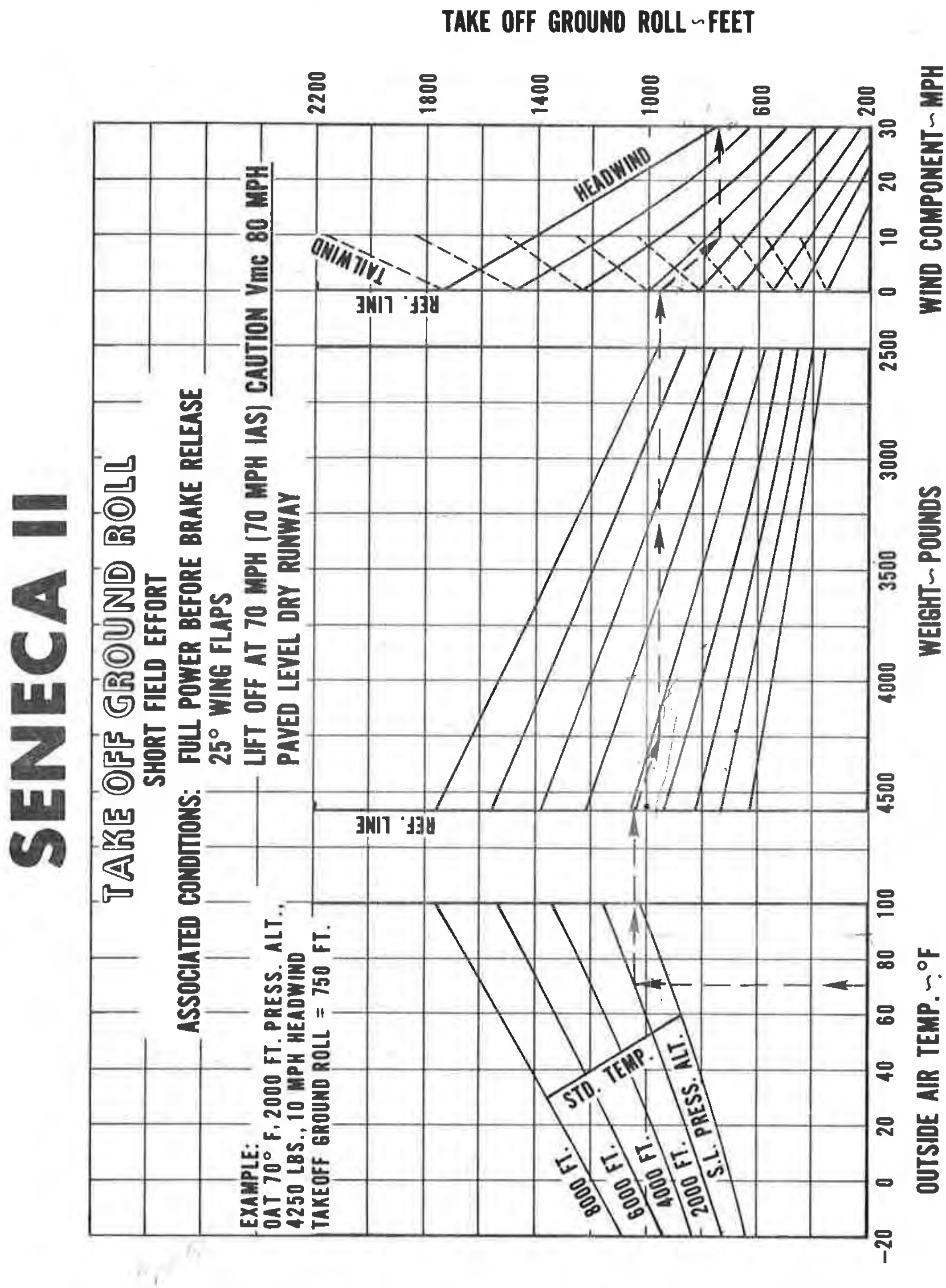

SENECA II
ALTIMETER CORRECTION~NORMAL SYSTEM
NOTES: INDICATED ALTITUDE AND AIRSPEED ASSUMES ZERO INSTRUMENT ERROR.
ALTIMETER CORRECTION IS ZERO ABOVE 190 MPH, GEAR & FLAPS UP
AND BELOW 90 MPH, GEAR & FLAPS DOWN.
EXAMPLE:
140 MPH IAS & 10,000 FT.
INDICATED ALTITUDE
SUBTRACT 24 FT.
GEAR UP~FLAPS UP
GEAR DOWN~40° FLAPS
PRESS. ALT.~FT.
25,000
20,000
10,000
SEA LEVEL
PRESS. ALT.~FT.
25,000
20,000
10,000
SEA LEVEL
ALTIMETER CORRECTION~FEET
(ADD TO INDICATED ALTITUDE)
50 40 30 20 10 0
MPH KTS
140 120 100 80
120 110 100 90 80 70
INDICATED AIRSPEED~MPH/KTS
200 180 160 140 120 100 80
180 170 160 150 140 130 120 110 100 90 80 70
INDICATED AIRSPEED~MPH/KTS
50 40 30 20 10 0
MPH KTS
ALTIMETER CORRECTION~FEET
(SUBTRACT FROM INDICATED ALTITUDE)

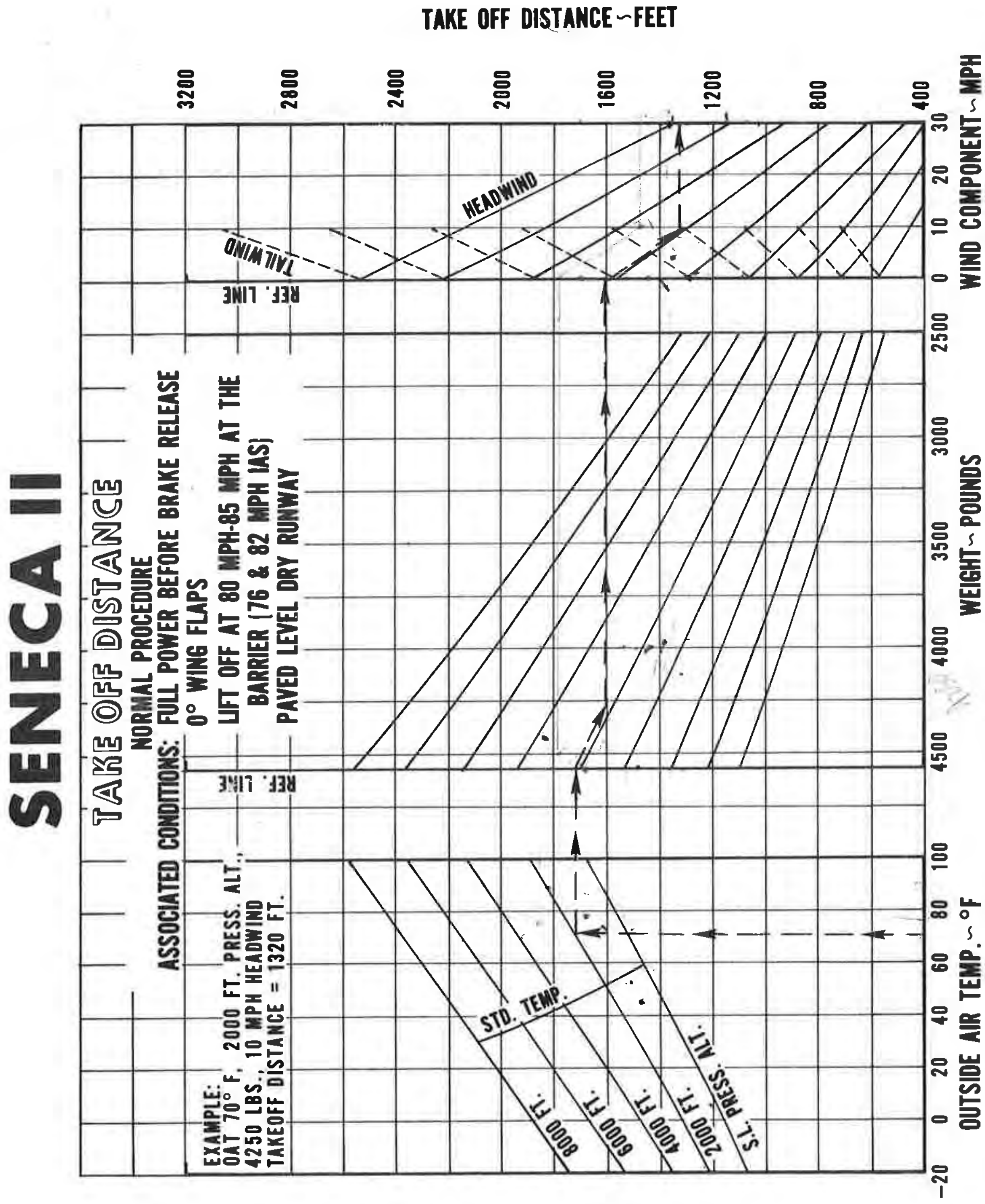
N3974X 202

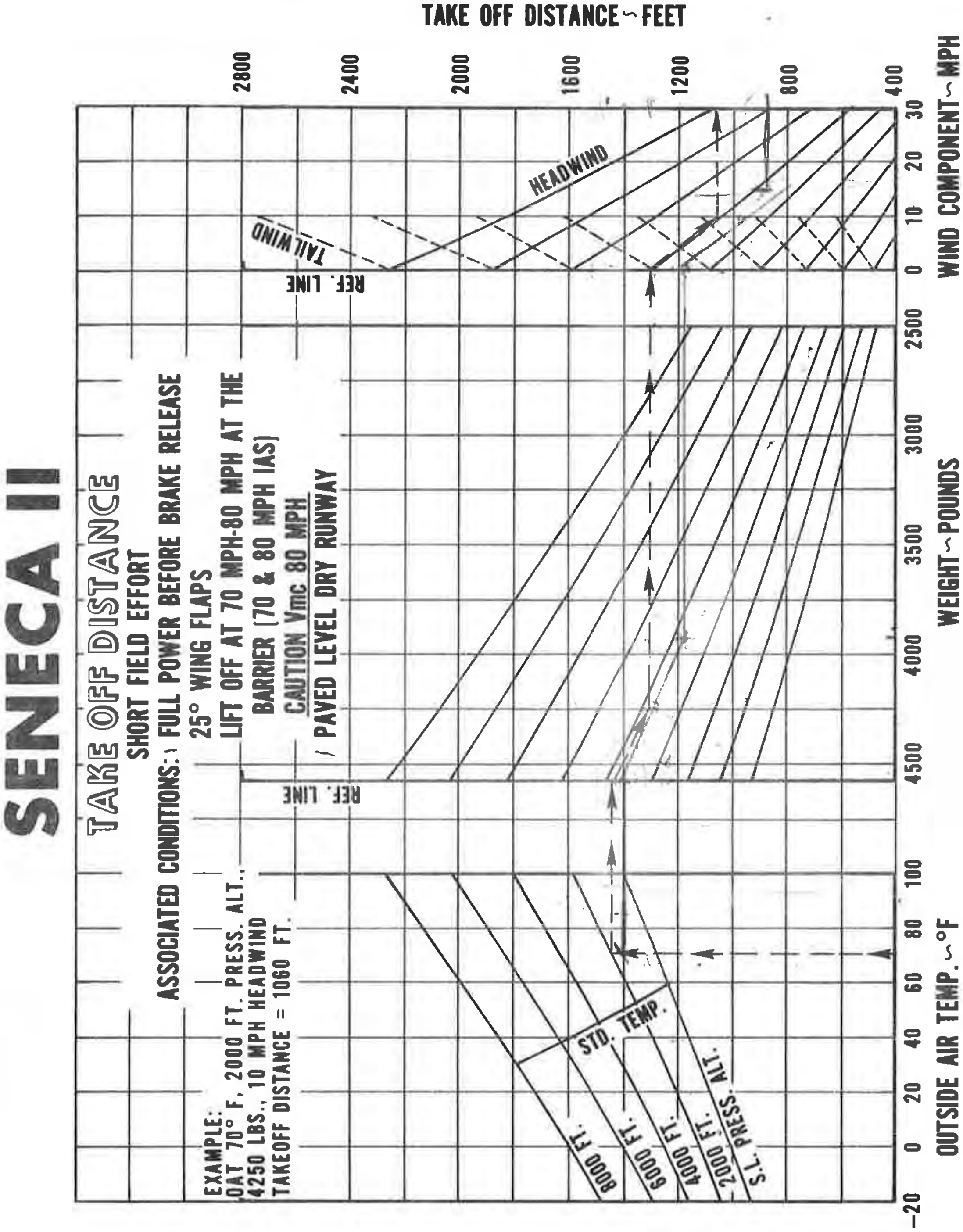

SENECA II
STALL SPEEDS
NOTES: MAXIMUM ALTITUDE LOSS DURING STALL RECOVERY IS APPROX. 550 FT.
ASSOCIATED CONDITIONS: 1. POWER OFF
2. LANDING GEAR UP OR DOWN
EXAMPLE:
WEIGHT 4250 LBS.,
15° ANGLE OF BANK, 0° FLAPS
CALIBRATED STALL SPEED = 74 MPH
STALL SPEED~MPH/KTS
MPH
KTS
100
90
80
70
60
50
40
110
100
90
80
70
60
50
ANGLE OF BANK~DEGREES
0
10
20
30
40
50
60
CALIBRATED STALL SPEEDS
FLAPS 0°
25°
40°
WEIGHT~100 LBS
25
30
35
40
45
INDICATED STALL SPEEDS
FLAPS 0°
40°
WEIGHT~100 LBS
25
30
35
40
45

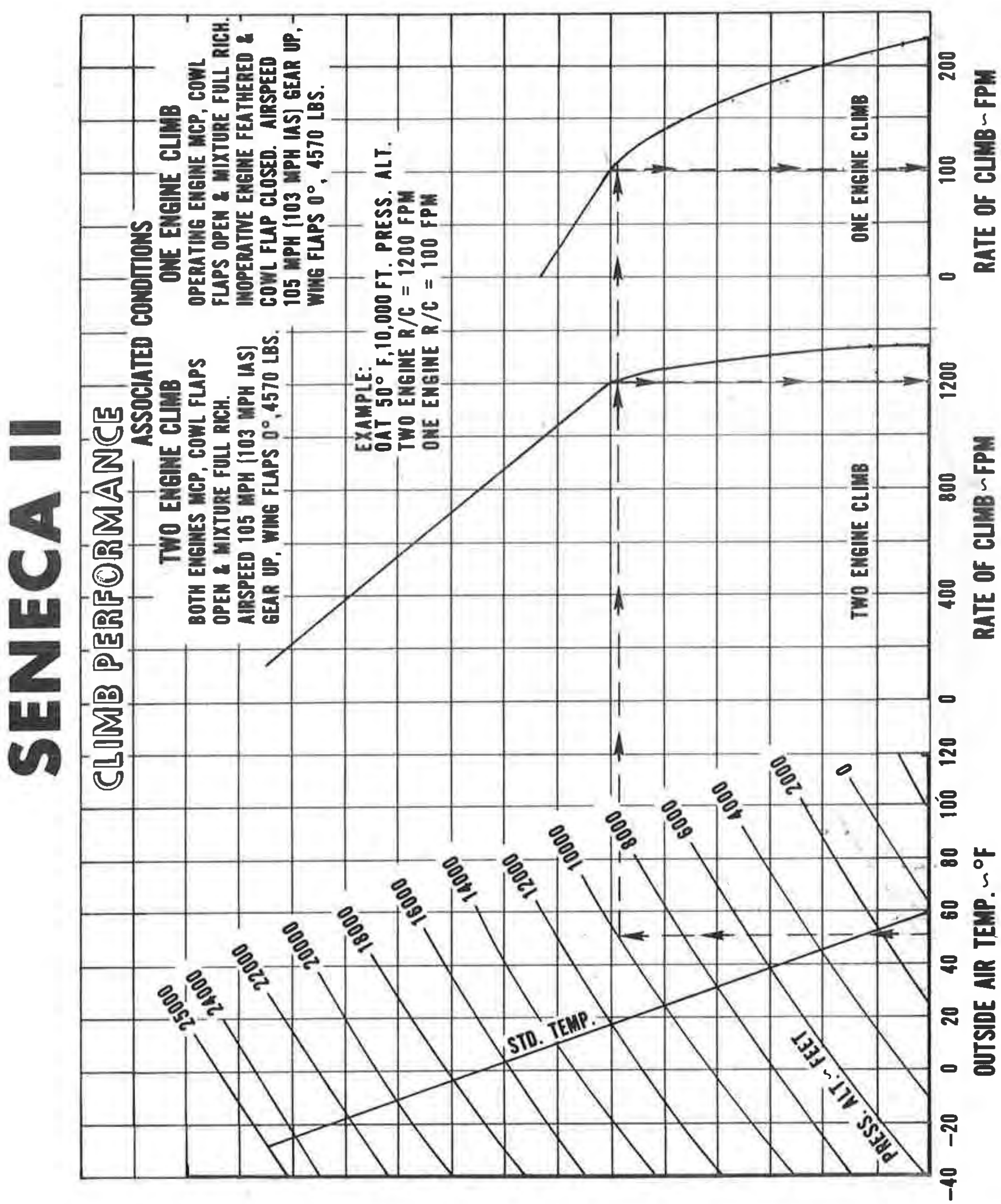

SENECA II
ACCELERATE AND STOP DISTANCE
ASSOCIATED CONDITIONS:
FULL POWER BEFORE BRAKE RELEASE
0° WING FLAPS
ACCELERATE TO 80 MPH (76 MPH IAS)
BOTH THROTTLES CLOSED AT ENGINE FAILURE
MAXIMUM BRAKING
4570 POUNDS ZERO WIND PAVED LEVEL DRY RUNWAY
NOTE: DISTANCES INCLUDE A THREE SECOND RECOGNITION TIME.
EXAMPLE:
OAT 50° F,
4000 FT. PRESS. ALT.,
ACCELERATE & STOP DISTANCE = 3310 FT.
8000
6000
4000
2000
0
STD. TEMP.
PRESS. ALT.~FT.
-40 -20 0 20 40 60 80 100
OUTSIDE AIR TEMPERATURE ~°F
2400 2800 3200 3600 4000 4400
ACCELERATE AND STOP DISTANCE~FT.


SENECA II
TAKE OFF GROUND ROLL
NORMAL PROCEDURE
ASSOCIATED CONDITIONS: FULL POWER BEFORE BRAKE RELEASE
0° WING FLAPS
LIFT OFF AT 80 MPH (76 MPH IAS)
PAVED LEVEL DRY RUNWAY
EXAMPLE:
OAT 70° F, 2000 FT. PRESS. ALT.,
4250 LBS., 10 MPH HEADWIND
TAKEOFF GROUND ROLL = 1000 FT.
TAKE OFF GROUND ROLL ~ FEET
2600
2200
1800
1400
1000
600
200
HEADWIND
TAILWIND
REF. LINE
REF. LINE
STD. TEMP.
8000 FT.
6000 FT.
4000 FT.
2000 FT.
S.L. PRESS. ALT.
-20
0
20
40
60
80
100
OUTSIDE AIR TEMP. ~ °F
4500
4000
3500
3000
2500
WEIGHT ~ POUNDS
0
10
20
30
WIND COMPONENT ~ MPH

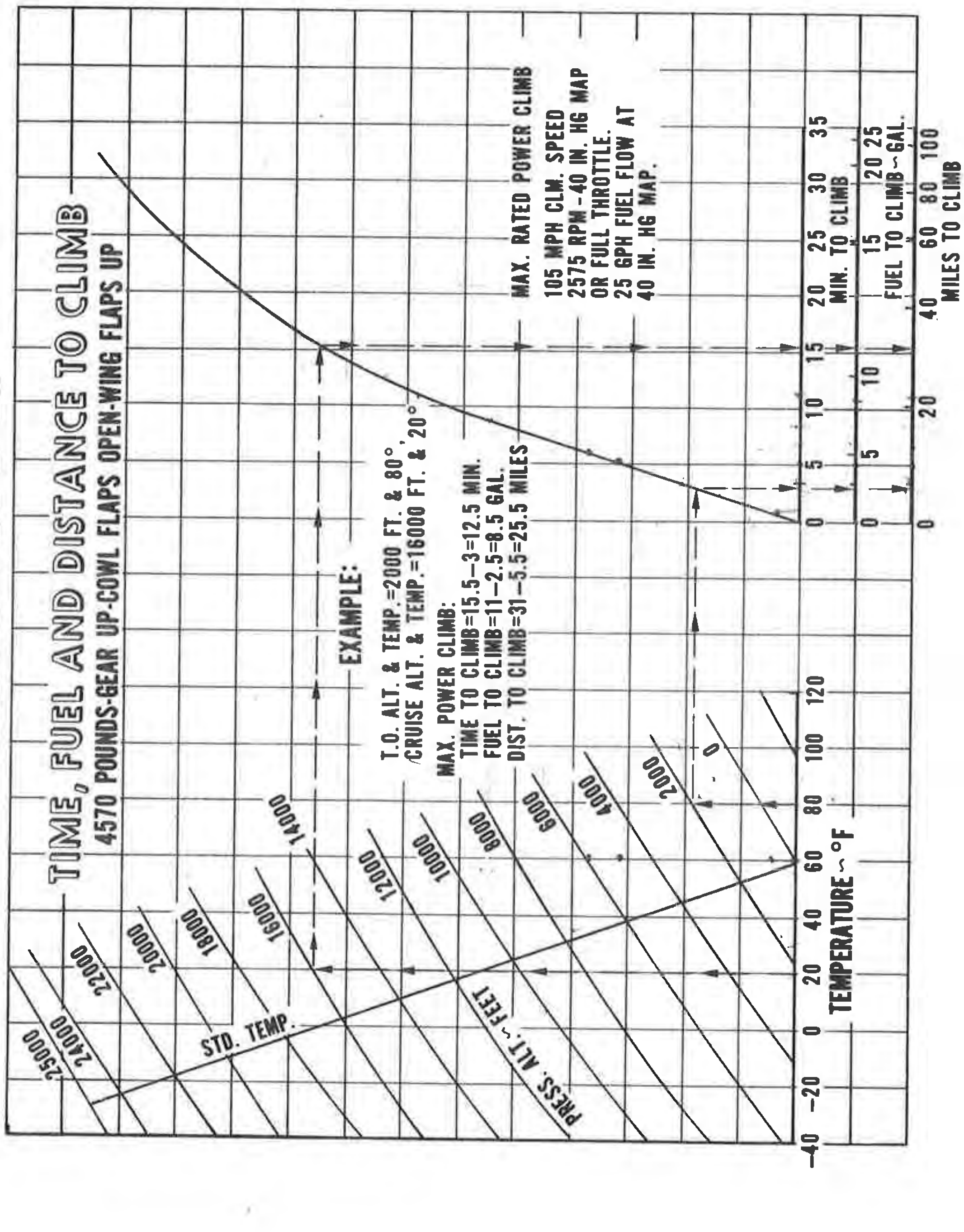

SENECA II
TAKE OFF GROUND ROLL
SHORT FIELD EFFORT
ASSOCIATED CONDITIONS: FULL POWER BEFORE BRAKE RELEASE
25° WING FLAPS
LIFT OFF AT 70 MPH (70 MPH IAS) CAUTION Vmc 80 MPH
PAVED LEVEL DRY RUNWAY
EXAMPLE:
OAT 70° F, 2000 FT. PRESS. ALT.,
4250 LBS., 10 MPH HEADWIND
TAKEOFF GROUND ROLL = 750 FT.
TAKE OFF GROUND ROLL ~ FEET
2200
1800
1400
1000
600
200
HEADWIND
TAILWIND
REF. LINE
REF. LINE
STD. TEMP.
8000 FT.
6000 FT.
4000 FT.
2000 FT.
S.L. PRESS. ALT.
-20
0
20
40
60
80
100
OUTSIDE AIR TEMP. ~ °F
4500
4000
3500
3000
2500
WEIGHT ~ POUNDS
0
10
20
30
WIND COMPONENT ~ MPH

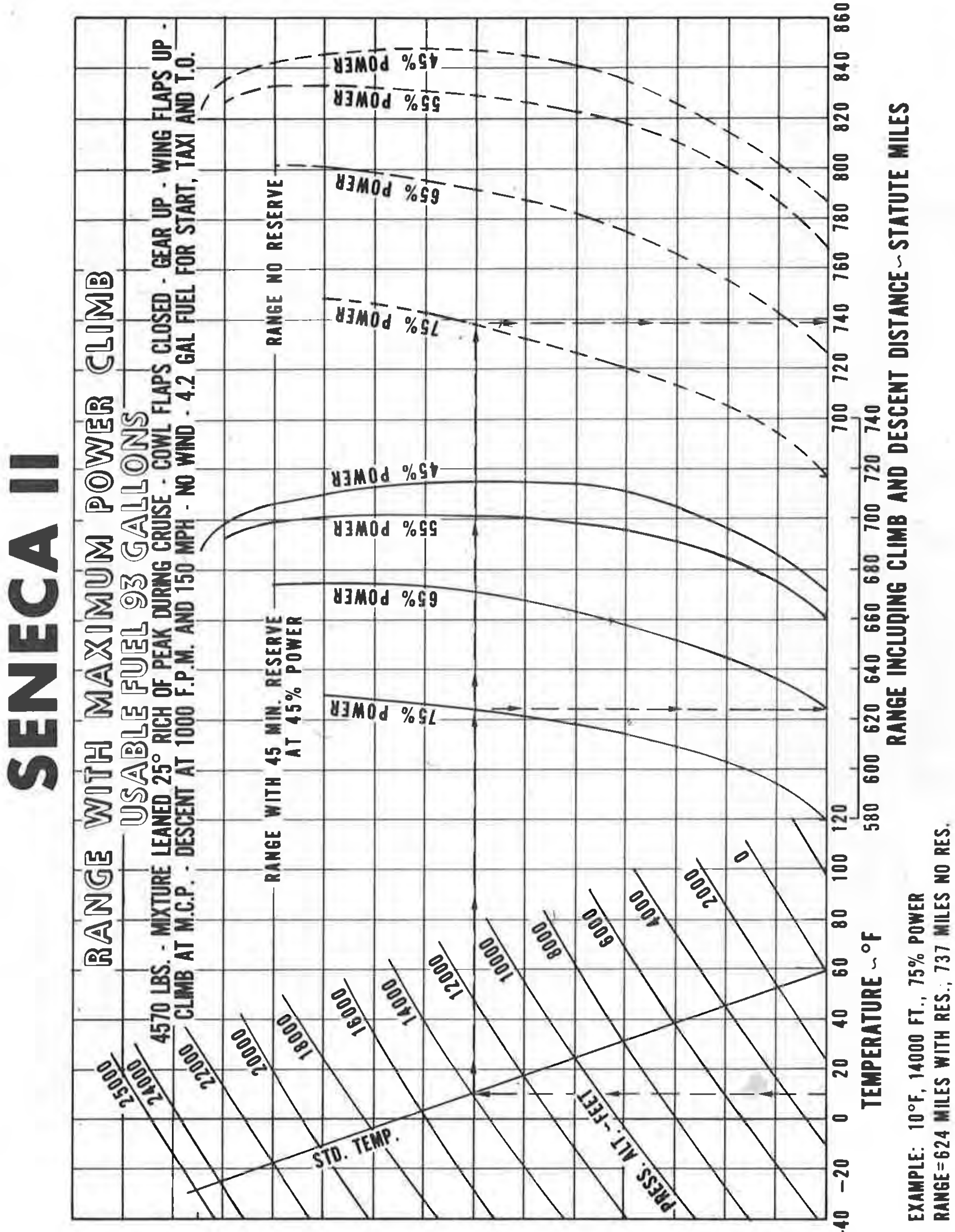

SENECA II
TAKE OFF DISTANCE
NORMAL PROCEDURE
ASSOCIATED CONDITIONS: FULL POWER BEFORE BRAKE RELEASE
0° WING FLAPS
LIFT OFF AT 80 MPH-85 MPH AT THE BARRIER (76 & 82 MPH IAS)
PAVED LEVEL DRY RUNWAY
EXAMPLE:
OAT 70° F., 2000 FT. PRESS. ALT.,
4250 LBS., 10 MPH HEADWIND
TAKEOFF DISTANCE = 1320 FT.
TAKE OFF DISTANCE~FEET
3200
2800
2400
2000
1600
1200
800
400
HEADWIND
TAIL WIND
REF. LINE
REF. LINE
STD. TEMP.
8000 FT.
6000 FT.
4000 FT.
2000 FT.
S.L. PRESS. ALT.
WIND COMPONENT~MPH
30
20
10
0
WEIGHT~POUNDS
2500
3000
3500
4000
4500
OUTSIDE AIR TEMP.~°F
100
80
60
40
20
0
-20

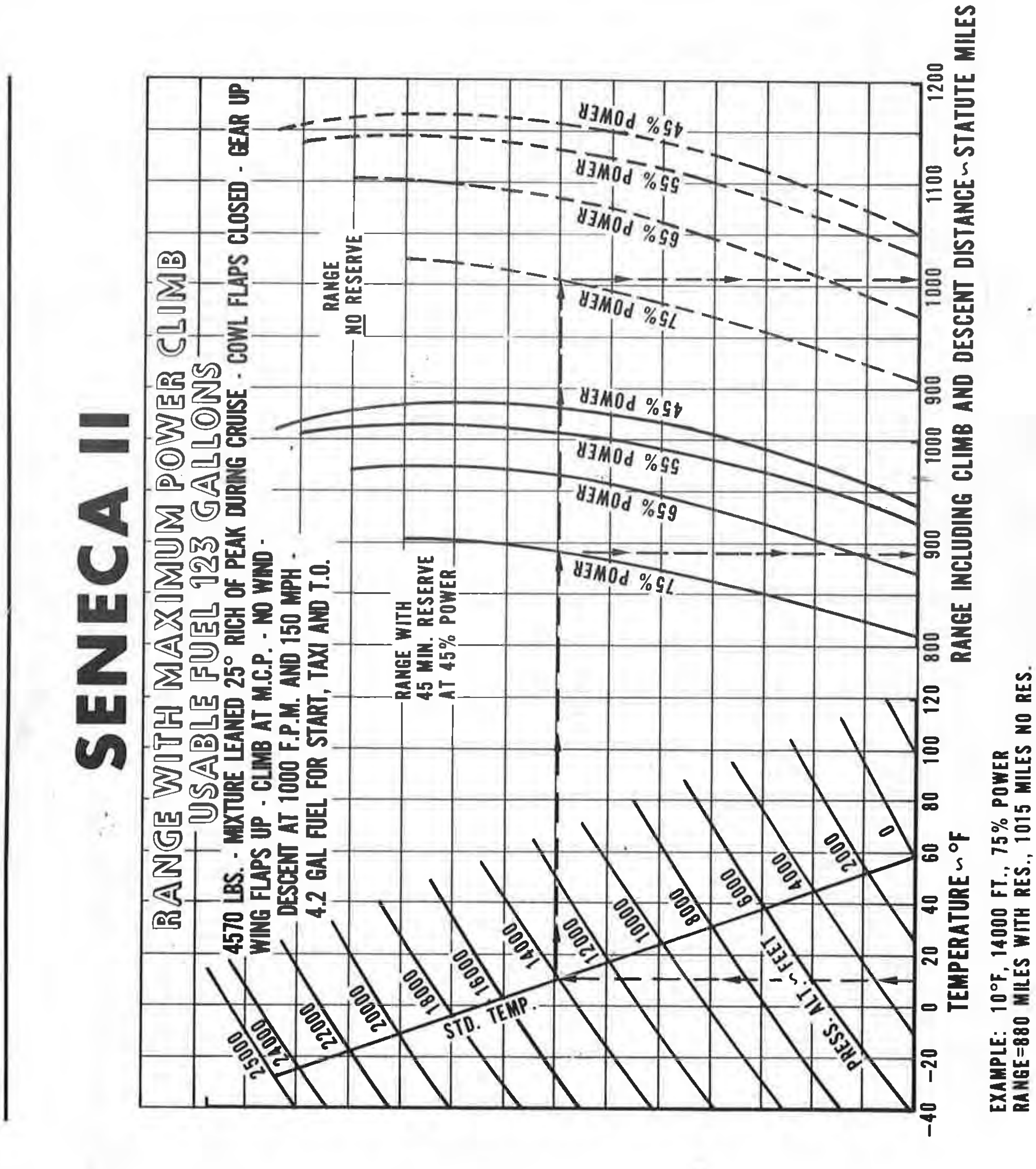

SENECA II
TAKE OFF DISTANCE
SHORT FIELD EFFORT
ASSOCIATED CONDITIONS: FULL POWER BEFORE BRAKE RELEASE
25° WING FLAPS
LIFT OFF AT 70 MPH-80 MPH AT THE BARRIER (70 & 80 MPH IAS)
CAUTION Vmc 80 MPH
PAVED LEVEL DRY RUNWAY
EXAMPLE:
OAT 70° F, 2000 FT. PRESS. ALT.,
4250 LBS., 10 MPH HEADWIND
TAKEOFF DISTANCE = 1060 FT.
TAKE OFF DISTANCE ~ FEET
2800
2400
2000
1600
1200
800
400
HEADWIND
TAILWIND
REF. LINE
REF. LINE
STD. TEMP.
8000 FT.
6000 FT.
4000 FT.
2000 FT.
S.L. PRESS. ALT.
-20
0
20
40
60
80
100
OUTSIDE AIR TEMP. ~°F
4500
4000
3500
3000
2500
WEIGHT ~ POUNDS
0
10
20
30
WIND COMPONENT ~ MPH

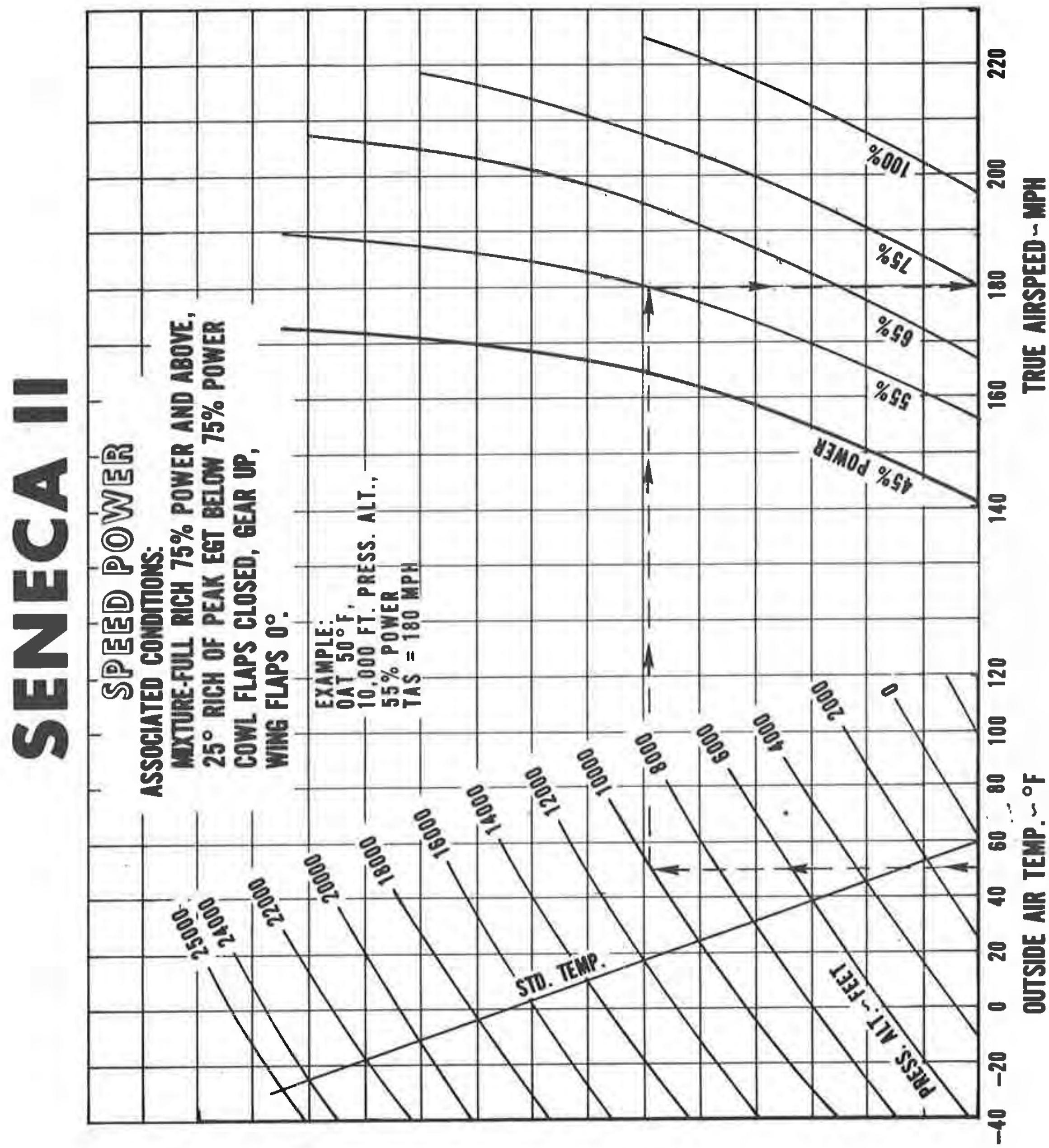

SENECA II
CLIMB PERFORMANCE
ASSOCIATED CONDITIONS
TWO ENGINE CLIMB
BOTH ENGINES MCP, COWL FLAPS OPEN & MIXTURE FULL RICH.
AIRSPEED 105 MPH (103 MPH IAS)
GEAR UP, WING FLAPS 0°, 4570 LBS.
ONE ENGINE CLIMB
OPERATING ENGINE MCP, COWL FLAPS OPEN & MIXTURE FULL RICH.
INOPERATIVE ENGINE FEATHERED & COWL FLAP CLOSED. AIRSPEED 105 MPH (103 MPH IAS) GEAR UP, WING FLAPS 0°, 4570 LBS.
EXAMPLE:
OAT 50° F, 10,000 FT. PRESS. ALT.
TWO ENGINE R/C = 1200 FPM
ONE ENGINE R/C = 100 FPM
TWO ENGINE CLIMB
ONE ENGINE CLIMB
STD. TEMP.
PRESS. ALT. ~ FEET
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
22000
24000
25000
OUTSIDE AIR TEMP. ~°F
-40 -20 0 20 40 60 80 100 120
RATE OF CLIMB ~ FPM
0 400 800 1200
RATE OF CLIMB ~ FPM
0 100 200

SENECA II


TIME, FUEL AND DISTANCE TO CLIMB
4570 POUNDS-GEAR UP-COWL FLAPS OPEN-WING FLAPS UP
EXAMPLE:
T.O. ALT. & TEMP.=2000 FT. & 80°
CRUISE ALT. & TEMP.=16000 FT. & 20°
MAX. POWER CLIMB:
TIME TO CLIMB=15.5−3=12.5 MIN.
FUEL TO CLIMB=11−2.5=8.5 GAL.
DIST. TO CLIMB=31−5.5=25.5 MILES
MAX. RATED POWER CLIMB
105 MPH CLM. SPEED
2575 RPM-40 IN. HG MAP
OR FULL THROTTLE.
25 GPH FUEL FLOW AT
40 IN. HG MAP.
STD. TEMP.
PRESS. ALT. ~ FEET
25000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
−40 −20 0 20 40 60 80 100 120
TEMPERATURE ~ °F
0 5 10 15 20 25 30 35
MIN. TO CLIMB
0 5 10 15 20 25
FUEL TO CLIMB ~ GAL.
0 20 40 60 80 100
MILES TO CLIMB


SENECA II
RANGE WITH MAXIMUM POWER CLIMB
USABLE FUEL 93 GALLONS
4570 LBS. - MIXTURE LEANED 25° RICH OF PEAK DURING CRUISE - COWL FLAPS CLOSED - GEAR UP - WING FLAPS UP -
CLIMB AT M.C.P. - DESCENT AT 1000 F.P.M. AND 150 MPH - NO WIND - 4.2 GAL FUEL FOR START, TAXI AND T.O.
RANGE NO RESERVE
RANGE WITH 45 MIN. RESERVE AT 45% POWER
45% POWER
55% POWER
65% POWER
75% POWER
PRESS. ALT.~FEET
STD. TEMP.
25000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-40 -20 0 20 40 60 80 100 120
TEMPERATURE ~°F
580 600 620 640 660 680 700 720 740 760 780 800 820 840 860
RANGE INCLUDING CLIMB AND DESCENT DISTANCE~STATUTE MILES
EXAMPLE: 10°F, 14000 FT., 75% POWER
RANGE=624 MILES WITH RES., 737 MILES NO RES.


SENECA II
RANGE WITH MAXIMUM POWER CLIMB
USABLE FUEL 123 GALLONS
4570 LBS. - MIXTURE LEANED 25° RICH OF PEAK DURING CRUISE - COWL FLAPS CLOSED - GEAR UP
WING FLAPS UP - CLIMB AT M.C.P. - NO WIND -
DESCENT AT 1000 F.P.M. AND 150 MPH -
4.2 GAL FUEL FOR START, TAXI AND T.O.
RANGE NO RESERVE
RANGE WITH 45 MIN. RESERVE AT 45% POWER
45% POWER
55% POWER
65% POWER
75% POWER
STD. TEMP.
PRESS. ALT.~FEET
25000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
-40
-20
0
20
40
60
80
100
120
800
900
1000
900
1000
1100
1200
TEMPERATURE ~ °F
RANGE INCLUDING CLIMB AND DESCENT DISTANCE ~ STATUTE MILES
EXAMPLE: 10°F, 14000 FT., 75% POWER
RANGE=880 MILES WITH RES., 1015 MILES NO RES.


SENECA II
SPEED POWER
ASSOCIATED CONDITIONS:
MIXTURE-FULL RICH 75% POWER AND ABOVE,
25° RICH OF PEAK EGT BELOW 75% POWER
COWL FLAPS CLOSED, GEAR UP,
WING FLAPS 0°.
EXAMPLE:
OAT 50°F,
10,000 FT. PRESS. ALT.,
55% POWER
TAS = 180 MPH
100%
75%
65%
55%
45% POWER
STD. TEMP.
PRESS. ALT. ~ FEET
25000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
−40 −20 0 20 40 60 80 100 120
OUTSIDE AIR TEMP. ~ °F
140 160 180 200 220
TRUE AIRSPEED ~ MPH

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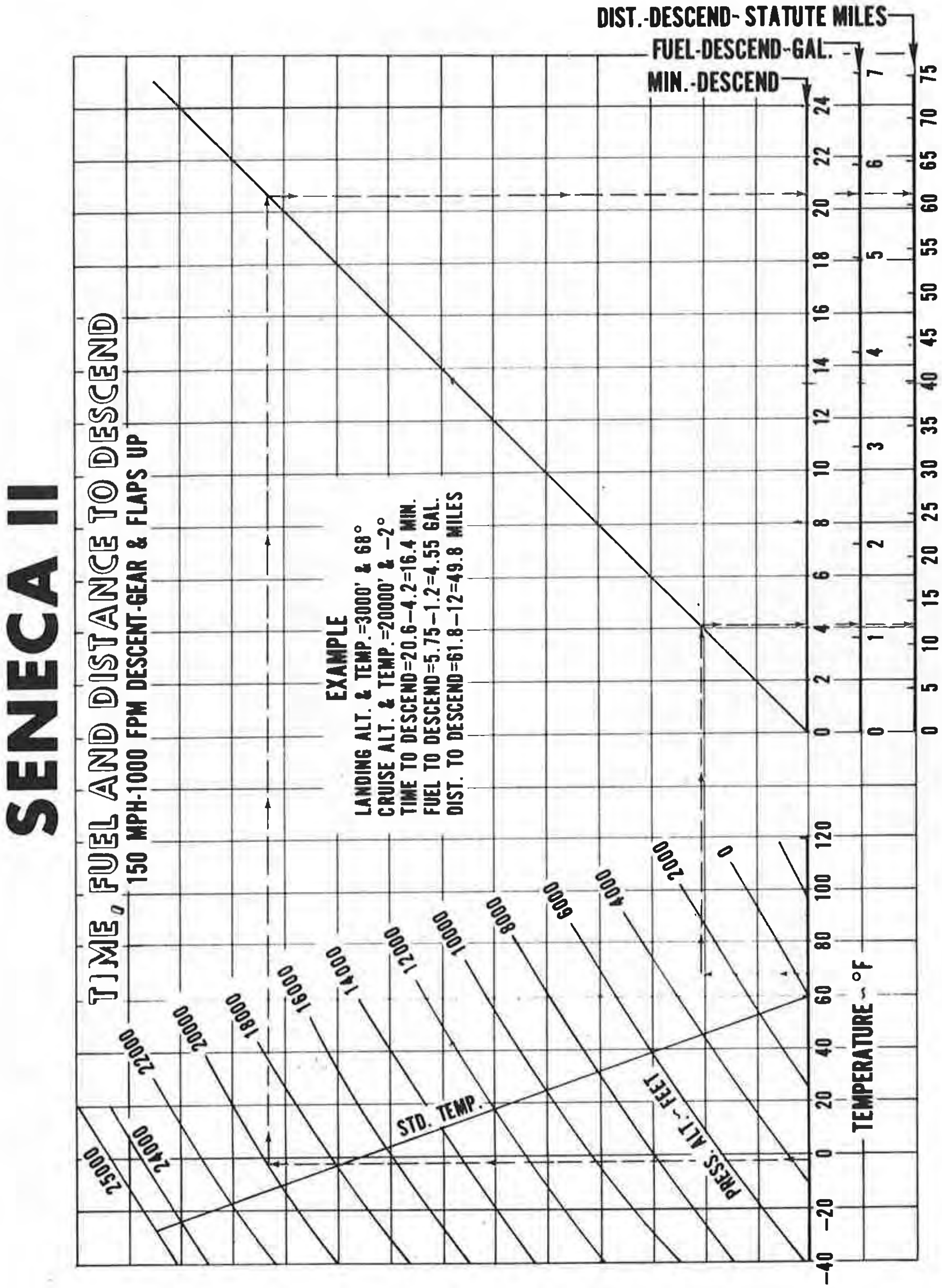
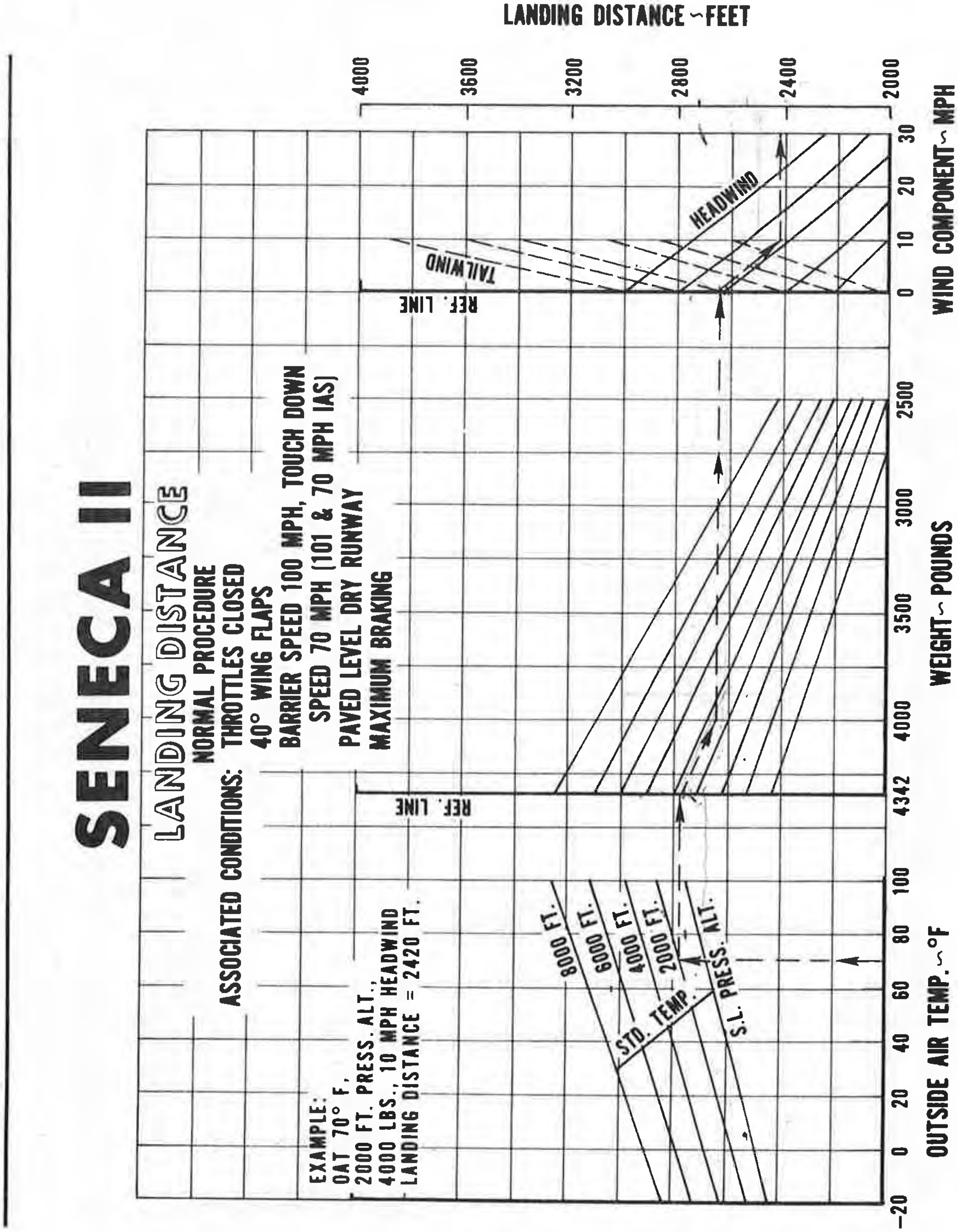
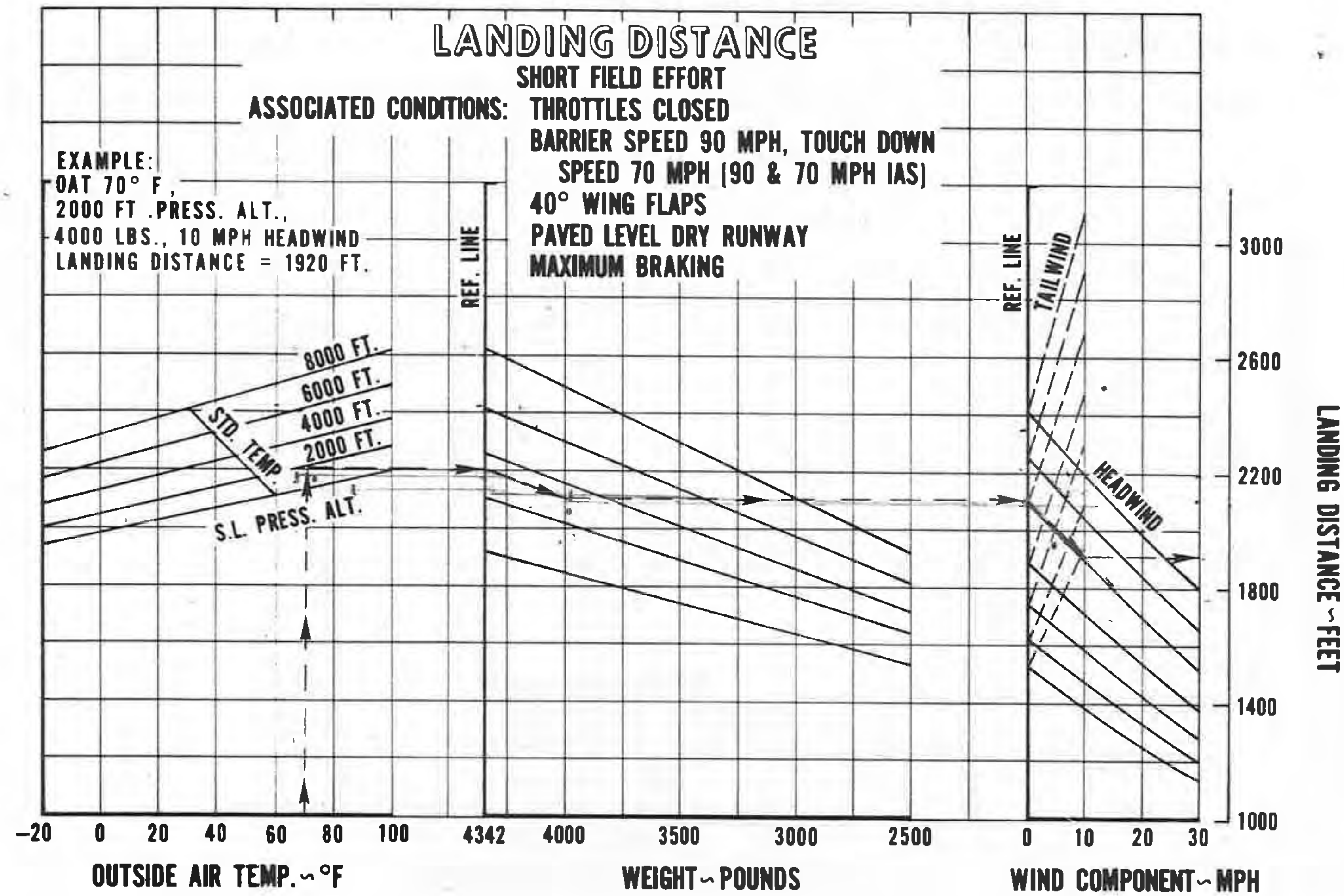

SENECA II
TIME, FUEL AND DISTANCE TO DESCEND
150 MPH-1000 FPM DESCENT-GEAR & FLAPS UP
EXAMPLE
LANDING ALT. & TEMP.=3000' & 68°
CRUISE ALT. & TEMP.=20000' & −2°
TIME TO DESCEND=20.6−4.2=16.4 MIN.
FUEL TO DESCEND=5.75−1.2=4.55 GAL.
DIST. TO DESCEND=61.8−12=49.8 MILES
DIST.-DESCEND- STATUTE MILES
FUEL-DESCEND-GAL.
MIN.-DESCEND
STD. TEMP.
PRESS. ALT.~FEET
TEMPERATURE ~ °F
25000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0

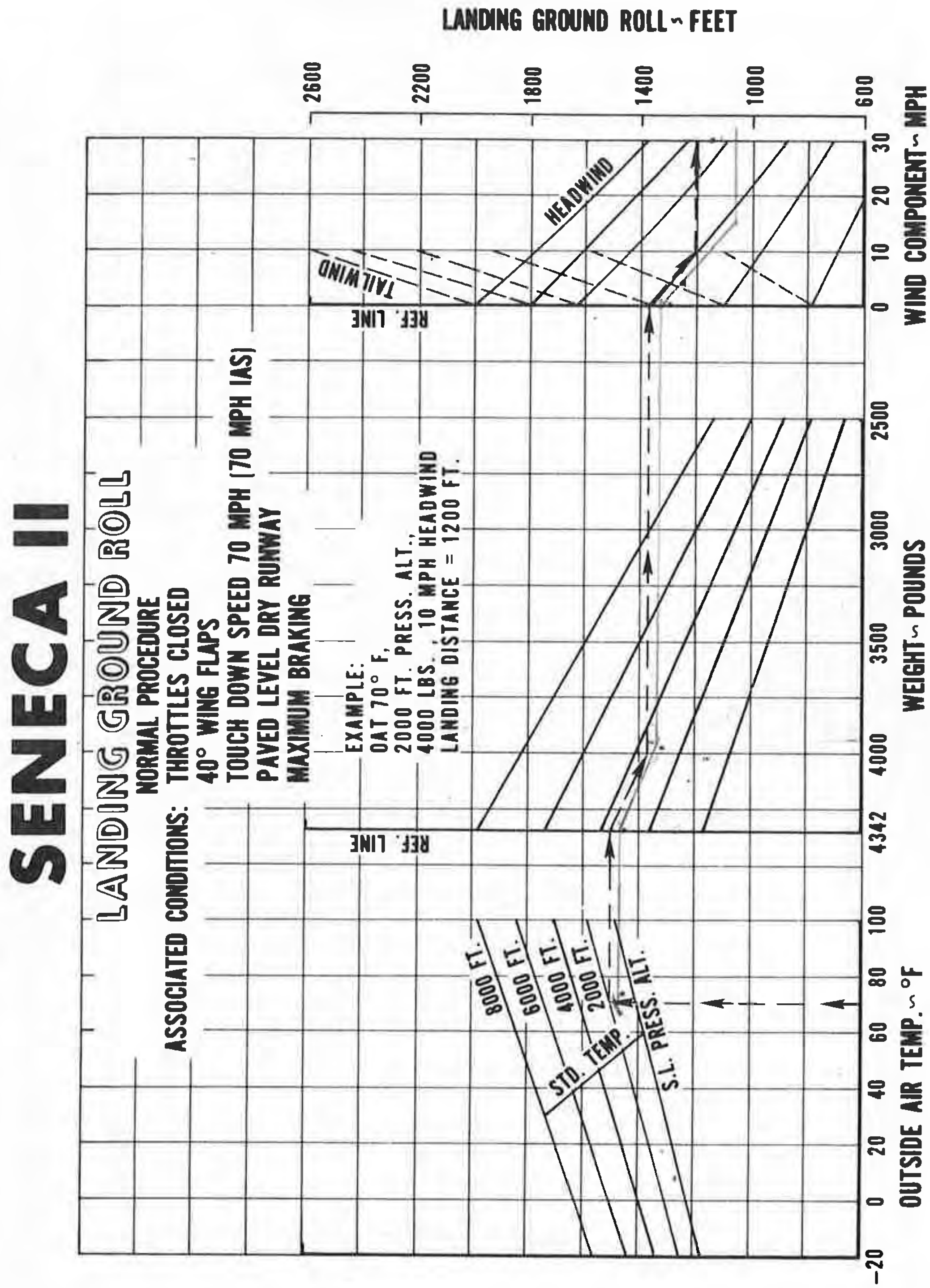


"The above distances may be reduced by approximately 12% when the aircraft is equipped with optional Heavy Duty Wheels, Tires and Brakes. (Reference Aircraft Equipment List in Weight and Balance Section of this manual.)"

SENECA II



"The above distances may be reduced by approximately 12% when the aircraft is equipped with optional Heavy Duty Wheels. Tires and Brakes. (Reference Aircraft Equipment List in Weight and Balance Section of this manual.)"



"The above distances may be reduced by approximately 25% when the aircraft is equipped with optional Heavy Duty Wheels, Tires and Brakes. (Reference Aircraft Equipment List in Weight and Balance Section of this manual.)"

POWER SETTING TABLE – T.C.M. TSIO 360E SERIES

PRESS. ALT. FEET	STD. ALT. TEMP. °F	RPM	45% POWER (APPROX. 16.1 GPH FUEL CONS.) 2000	2100	2200	2300	55% POWER (APPROX. 18 GPH FUEL CONS.) 2000	2200	2300	2400	2500	2575
			MANIFOLD PRESSURE – INCHES MERCURY									
S.L.	60		27.6	26.4	25.6	24.6	31.8	29.6	28.4	27.0	26.0	25.6
2000	52		26.8	25.6	25.0	24.0	30.8	28.5	27.6	26.4	25.4	25.0
4000	45		26.0	25.0	24.0	23.4	29.8	28.0	27.0	25.8	25.0	24.6
6000	38		25.0	24.4	23.6	22.8	29.0	27.4	26.4	25.2	24.4	24.0
8000	30		24.6	23.6	22.8	22.3		26.6	25.6	24.8	24.0	23.8
10000	23		23.8	23.0	22.4	21.8		26.0	25.0	24.2	23.6	23.2
12000	16		23.0	22.4	21.7	21.0		25.0	24.4	23.8	23.0	22.8
14000	9		22.6	21.8	21.0	20.6		24.5	23.8	23.0	22.6	22.4
16000	2			21.0	20.4	20.0		24.0	23.4	22.6	22.0	22.0
18000	-5				19.8	19.4			22.8	22.0	21.0	21.7
20000	-12					18.8				21.6	20.8	21.0
22000	-19										20.6	20.8
24000	-27										20.4	20.4
25000	-30										20.0	20.0

For each 6 °F above std. temp. add 0.4" MAP.
For each 6 °F below std. temp. subtract 0.4" MAP.

POWER SETTING TABLE – T.C.M. TSIO 360E SERIES

PRESS. ALT. FEET	STD. ALT. TEMP. °F	65% POWER (APPROX. 20.5 GPH FUEL CONS.)					75% POWER (APPROX. 23.6 GPH FUEL CONS.)			
	RPM	2200	2300	2400	2500	2575	2300	2400	2500	2575
		MANIFOLD PRESSURE – INCHES MERCURY								
S.L.	60	33.5	32.0	30.6	29.8	29.2	35.5	34.0	33.0	32.8
2000	52	32.8	31.5	30.0	29.0	28.8	35.0	33.4	32.6	32.0
4000	45	32.0	30.8	29.6	28.6	28.2	34.4	32.8	32.0	31.6
6000	38	31.4	30.0	29.0	28.0	27.8	33.6	32.0	31.4	30.9
8000	30	30.6	29.6	28.4	27.6	27.4	33.0	31.6	30.8	30.3
10000	23		28.8	27.8	27.0	27.0	32.4	31.0	30.2	29.8
12000	16		28.0	27.2	26.6	26.4	31.6	30.4	29.8	29.3
14000	9		27.4	26.6	26.0	26.0		29.8	29.2	29.0
16000	2		26.7	26.0	25.8	25.6		29.4	28.8	28.6
18000	-5			25.6	25.2	25.0			28.4	28.3
20000	-12				24.8	24.8				28.0
22000	-19				24.4	24.4				
24000	-27					24.0				
25000	-30									

For each 6 °F above std. temp. add 0.4" MAP.
For each 6 °F below std. temp. subtract 0.4" MAP.

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HANDLING AND SERVICING

HANDLING AND SERVICING

This section contains information on preventive maintenance. Refer to the **PA-34-200T Service Manual** for further maintenance procedures. Any complex repair or modification should be accomplished by a Piper Certified Service Center.

GROUND HANDLING

TOWING

The airplane may be moved by using an optional nose wheel tow bar available with the airplane, or by power equipment that will not damage or cause excess strain to the nose gear assembly. The tow bar is stowed aft of the fifth and sixth seats.

CAUTION

When towing with power equipment, do not turn the nose gear beyond its turning radius in either direction as this will result in damage to the nose gear and steering mechanism.

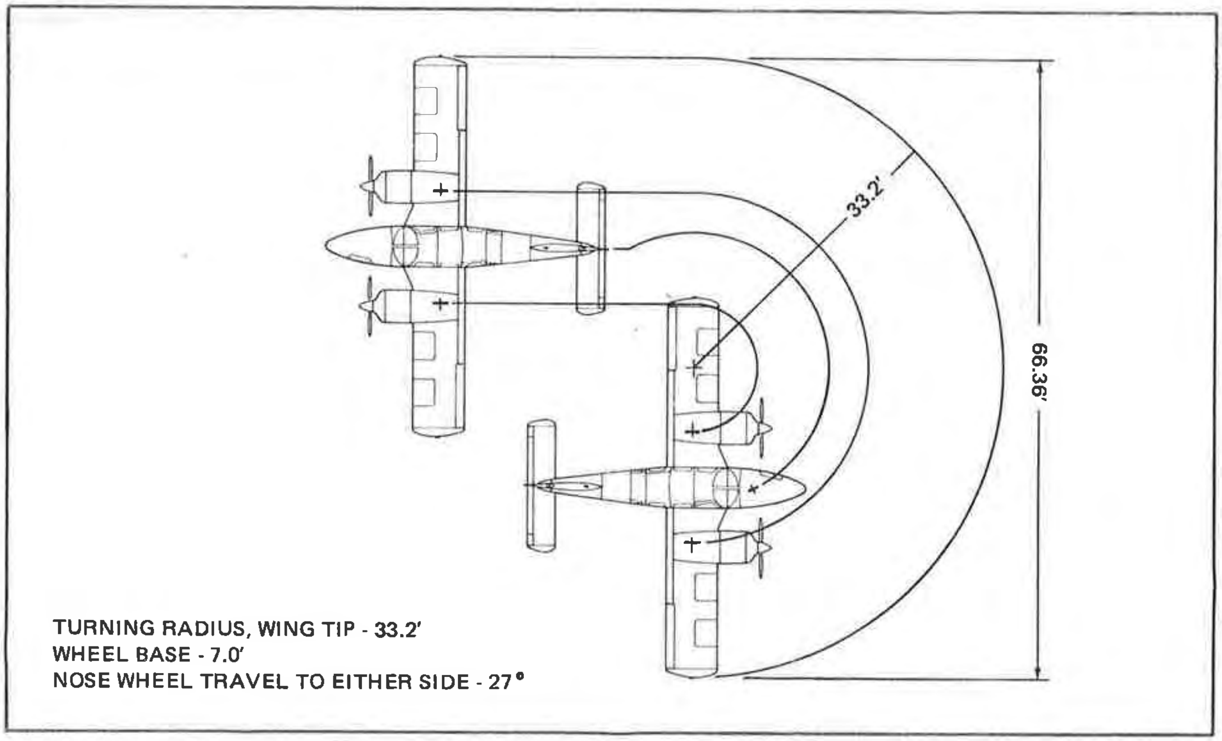
CAUTION

Do not tow the airplane when the controls are secured.

TAXIING

Before attempting to taxi the airplane, ground personnel should be instructed and approved by a qualified person authorized by the owner. Engine starting and shut-down procedures and taxiing techniques should be covered. When it is ascertained that the propeller back blast and taxi areas are clear, power should be applied to start the taxi roll and the following checks should be performed:

a. Taxi forward a few feet and apply the brakes to determine their effectiveness.
b. While taxiing, make slight turns to ascertain the effectiveness of the steering.
c. Observe wing clearances when taxiing near buildings or other stationary objects. If possible, station an observer outside to guide the airplane.
d. When taxiing on uneven ground, avoid holes and ruts.
e. Do not operate the engines at high RPM when running up or taxiing over ground containing loose stones, gravel, or any loose material that might cause damage to the propeller blades. Be sure alternate air is not being used.



Turning Radius

PARKING

When parking the airplane, be sure that it is sufficiently protected against adverse weather conditions and that it presents no danger to other aircraft. When parking the airplane for any length of time or overnight, it is suggested that it be moored securely.

a. To park the airplane, head it into the wind if possible.
b. Set the parking brake by pulling back on the brake lever and depressing the knob on the left side of the handle. To release the parking brake, pull back on the brake lever until the catch disengages; then allow the handle to swing forward.

CAUTION

Care should be exercised when setting brakes that are overheated or during cold weather when accumulated moisture may freeze a brake.

c. Aileron and stabilator controls may be secured with the front seat belt. Wheel chocks should be used if they are available.

MOORING

The airplane should be moored for immovability, security, and protection. The following procedures should be used for the proper mooring of the airplane:

a. Head the airplane into the wind, if possible.
b. Retract the flaps.
c. Immobilize the ailerons and stabilator by looping the seat belt through the control wheel and pulling it snug.
d. Block the wheels.
e. Secure tie-down ropes to the wing tie-down rings and to the tail skid at approximately 45 degree angles to the ground. When using rope of non-synthetic material, leave sufficient slack to avoid damage to the airplane should the ropes contract.

CAUTION

Use bowline knots, square knots, or locked slip knots. Do not use plain slip knots.

NOTE

Additional preparations for high winds include using tie-down ropes from the landing gear forks and securing the rudder.

f. Install a pitot head cover if one is available. Be sure to remove the pitot head cover before flight.
g. Cabin and baggage doors should be locked when the airplane is unattended.

CLEANING

CLEANING ENGINE COMPARTMENTS

Before cleaning an engine compartment, place a strip of tape over 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. In order to remove especially heavy dirt and grease deposits, it may be necessary to brush areas that were sprayed.

CAUTION

Do not spray solvent into the alternator, pressure pump, starter, air intakes, or alternate air inlets.

c. Allow the solvent to remain on the engine from five to ten minutes. Then rinse the engine clean with additional solvent and allow it to dry.

CAUTION

Do not operate the engines until excess solvent has evaporated or otherwise been removed.

d. Remove the protective tape from the magnetos.
e. Lubricate the controls, bearing surfaces, etc., in accordance with the Lubrication Chart in the **PA-34-200T Service Manual.**

CLEANING LANDING GEAR

Before cleaning the landing gear, place a cover of plastic or a similar waterproof 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. In order to remove especially heavy dirt and grease deposits, it may be necessary to brush areas that were sprayed.

CAUTION

Do not brush the micro switches.

c. Allow the solvent to remain on the gear from five to ten minutes. Then rinse the gear with additional solvent and allow it to dry.
d. Remove the cover from the wheel and remove the catch pan.
e. Lubricate the gear in accordance with the Lubrication Chart in the **PA-34-200T Service Manual.**

CLEANING EXTERIOR SURFACES

The airplane should be washed with a mild soap and water. Harsh abrasives or alkaline soaps or detergents could make scratches on painted or plastic surfaces or could cause corrosion of metal. Cover areas where cleaning solution could cause damage. To wash the airplane, use the following procedure:

a. Flush away loose dirt with water.
b. Apply cleaning solution with a sponge, a soft cloth, or a soft bristle brush.
c. To remove exhaust stains, allow the solution to remain on the surface longer.
d. To remove stubborn oil and grease stains use a cloth dampened with naphtha.
e. Rinse all surfaces thoroughly.
f. Any good automotive wax may be used to protect and preserve 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 DEICING EQUIPMENT*

Clean the deicer boots when the airplane is washed, using a mild soap and water solution. Boots should be waxed or coated with one of several available boot care products for proper operation in icing conditions.

In cold weather, wash the boots while the airplane is in a warm hangar if possible. If the cleaning is to be done outdoors, heat the soap and water solution before taking it to the airplane. If difficulty is encountered with water freezing on the boots, use a portable type ground heater to direct a blast of warm air along the area being cleaned.

Cleaning the boots with petroleum products such as benzol or nonleaded gasoline is not recommended, since such products are injurious to rubber. If such solvents are employed, they should be used sparingly and wiped off the surface with a clean dry cloth before the cleaner has time to soak into the rubber.

CLEANING WINDSHIELD AND WINDOWS

A certain amount of care is needed to keep the windows clean and unmarred. The following procedure is recommended:

a. Remove dirt, mud, and other loose particles from exterior surfaces with clean water.
b. Wash with mild soap and clean water or with aircraft plastic cleaner. Use a soft cloth or sponge in a straight back and forth motion. Do not rub harshly.
c. Remove oil or grease with a cloth moistened with kerosene.

CAUTION

Do not use gasoline, alcohol, benzene, carbon tetrachoride, 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 rubbing out the scratch with jeweler's rouge. Smooth both sides and apply wax.

CLEANING HEADLINER, SIDE PANELS AND SEATS

a. Clean headliner, side panels and seats with a whisk broom, dusting cloth, or a vacuum cleaner.
b. Soiled upholstery may be cleaned with a good upholstery cleaner suitable for the material. Carefully follow the manufacturer's instructions. Avoid soaking or harsh rubbing.

CAUTION

Solvent cleaners require adequate ventilation.

*Optional equipment

CLEANING CARPETS

To clean carpets, first remove loose dirt with a vacuum or a whisk broom. For soiled spots and stubborn stains use a noninflammable dry cleaning fluid. Floor carpets may be removed and cleaned like any household carpet.

POWER PLANT INDUCTION AIR FILTERS

The induction air filters must be cleaned at least once every 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. Remove the right hand section of the cowling to gain access to the air filter box.
b. Turn the four 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. Replace 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 50-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 the **PA-34-200T Service Manual** for brake lining replacment instructions.

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. Before jacking, attach a tail support to the tail skid. Approximately 500 pounds of ballast should be placed on the tail support.

CAUTION

Be sure to apply sufficient support ballast; otherwise the airplane may tip forward, and the nose section could be damaged.

Landing gear oleos should be serviced according to instruction on the units. Under normal static load (empty weight of airplane plus full fuel and oil), main oleo struts should be exposed three and one half inches and the nose oleo strut should be exposed two and one half inches. Refer to **PA-34-200T Service Manual** for complete information on 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	PRESSURE (psi)	
	FOR PROPELLER HUBS: BHC-C2YF-2CKF and BHC-C2YF-2CLKF	FOR PROPELLER HUBS: BHC-C2YF-2CKUF and BHC-C2YF-2CLKUF
70 to 100	62 ± 2	22 ± 2
40 to 70	57 ± 2	17 ± 2
0 to 40	54 ± 2	14 ± 2
-30 to 0	49 ± 2	9 ± 2
NOTE: Do not check pressure or charge with propeller in feather position.		

The spinner and backing plate should be cleaned and inspected for cracks frequently. Before each flight the propeller should be inspected for nicks, scratches, or corrosion. If found, they should be repaired as soon as possible by a rated mechanic, since a nick or scratch causes an area of increased stress which can lead to serious cracks or the loss of a propeller tip. The back face of the blades should be painted when necessary with flat black paint to retard glare. To prevent corrosion, all surfaces should be cleaned and waxed periodically.

OIL REQUIREMENTS

The oil capacity of the Teledyne Continental engines is 8 quarts per engine with a minimum safe quantity of 3 quarts per engine. It is recommended that oil be added if the quantity falls to 6 quarts. It is recommended that engine oil be drained and renewed every 100 hours, or sooner under unfavorable conditions. Full flow cartridge type oil filters should be 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

SERVICING FUEL SYSTEM

The fuel screens in the strainers require cleaning at 50 hour or 90 day intervals, whichever occurs first. The fuel gascolator strainers are located in the wing between the fuel selector valves and the auxiliary 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

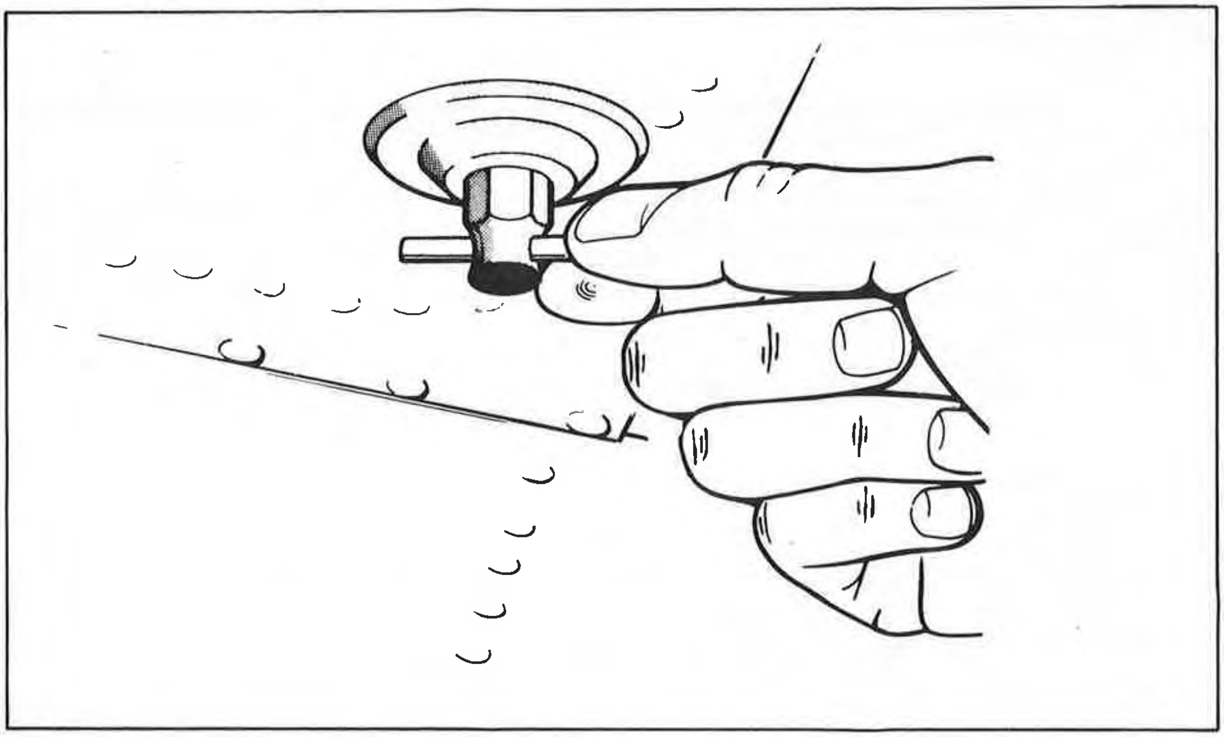
A minimum octane of 100/130 Aviation Grade fuel (light green) must be used in the Seneca II. Since the use of lower grades of fuel can cause serious damage in a short period of time, the engine warranty is invalidated by use of lower octanes.

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. With optional fuel tanks installed, the total fuel capacity is increased to 128 gallons.

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.



Fuel Drain

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. The fuel drained at each quick drain should be collected in a transparent container and examined for contamination.

CAUTION

When draining fuel, be sure that no fire hazard exists before starting the engines.

DRAINING FUEL SYSTEM

The bulk of the fuel may be drained either by opening the valve at the inboard end of each tank or by siphoning. The remaining fuel in the lines may be drained through the gascolators and the two drains located on the bottom of the fuselage, inboard of the right flap.

TIRE INFLATION

For maximum service from the tires, keep them inflated to the proper pressures. The main gear tires should be inflated to 50 psi and the nose gear should be inflated to 31 psi.

Interchange the tires on the main wheels if necessary to produce even wear. All wheels and tires are balanced before original installation, and the relationship of the tire, tube, and wheel should be maintained if at all possible. Unbalanced wheels can cause extreme vibration on takeoff. In the installation of new components, it may be necessary to rebalance the wheel with the tire mounted.

When checking the pressure, examine the tires for wear, cuts, bruises, and slippage.

BATTERY SERVICE

Access to the 12-volt 35 ampere hour battery is gained through the nose baggage compartment. It is located under the floor panel of the nose baggage compartment. The battery container has a plastic drain tube which is normally closed off. This tube should be opened occasionally to drain off any accumulation of liquid.

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. DO NOT fill the battery above the baffle plates. DO NOT fill the battery with acid - use distilled water only. A hydrometer check will determine the percent of charge in the battery.

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 receptable, 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 the **PA-34-200T Service Manual** for detailed procedures for cleaning and servicing the battery.

SERIAL NUMBER PLATES

The serial number plate is located on the left side of the fuselage near the leading edge of the stabilator. The serial number should always be used when referring to the airplane on service or warranty matters.

LUBRICATION

Lubrication at regular intervals is an essential part of the maintenance of an airplane. For lubrication instructions and a chart showing lubrication points, types of lubricants to be used, lubrication methods and recommended frequencies, refer to the **PA-34-200T Service Manual.**

WINTERIZATION

In winter operation a winterization kit is installed on the inlet opening of the oil cooler outboard chamber of the plenum chamber. This kit should be installed whenever ambient temperature is 50°F or less. When the kit is not being used it can be stowed in the nose cone compartment, left hand side, forward of the door, using the strap provided.

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FACTS YOU SHOULD KNOW

The Federal Aviation Administration (FAA) occasionally publishes **Airworthiness Directives (ADs)** that apply to specific groups of aircraft. They are mandatory changes and are to be complied with within a time limit set by the FAA. When an AD is issued, it is sent to the latest registered owner of the affected aircraft and also to subscribers of the service. The owner should periodically check with his Piper dealer or A & P mechanic to see whether he has the latest issued AD against his aircraft.

Piper Aircraft Corporation takes a **continuing interest** in having the owner get the most efficient use from his aircraft and keeping it in the best mechanical condition. Consequently, Piper Aircraft from time to time issues Service Bulletins, Service Letters and Service Spares Letters relating to the aircraft.

Service Bulletins are of special importance and should be complied with promptly. These are sent to the latest registered owners, distributors and dealers. Depending on the nature of the bulletin, material and labor allowances are usually applicable.

Service Letters deal with product improvements and service hints pertaining to the aircraft. They are sent to dealers and distributors so they can properly service the aircraft and keep it up to date with the latest changes. Owners should give careful attention to the Service Letter information.

Service Spares Letters offer improved parts, kits and optional equipment which were not available originally and which may be of interest to the owner.

If an owner is not having his aircraft serviced by an **Authorized Piper Service Center**, he should periodically check with a Piper dealer or distributor to find out the latest information to keep his aircraft up to date.

Piper Aircraft Corporation has a **Subscription Service** for the Service Bulletins, Service Letters and Service Spares Letters. This service is offered to interested persons such as owners, pilots and mechanics at a nominal fee, and may be obtained through Piper dealers and distributors. A Service Manual and revisions are available from a Piper dealer.

Pilot's Operating Manual supplements are distributed by the manufacturer as necessary. These revisions and additions should be studied and put into the operating manual to keep it up to date. This manual contains important information about the operation of the aircraft and should be kept with the aircraft at all times, even after resale. Every owner, to avail himself of the Piper Aircraft Service Back-Up, should stay in close contact with his Piper dealer or distributor so that he can receive the latest information.

If the owner desires to have his aircraft modified, he must obtain FAA approval for the alteration. **Major alterations** accomplished in accordance with Advisory Circular 43.13-2, when performed by an A & P mechanic, may be approved by the local FAA office. Major alterations to the basic airframe or systems not covered by AC 43.13-2 require a Supplemental Type Certificate.

The owner or pilot is required to ascertain that the following **Aircraft Papers** are in order and in the aircraft.

a. To be displayed in the aircraft at all times:
   1. Aircraft Airworthiness Certificate Form FAA-1362B.
   2. Aircraft Registration Certificate Form FAA-500A.
   3. Aircraft Radio Station License Form FCC-404A, if transmitters are installed.
b. To be carried in the aircraft at all times:
   1. Aircraft Flight Manual.
   2. Weight and Balance data plus a copy of the latest Repair and Alteration Form FAA-337, if applicable.
   3. Aircraft equipment list.

Although the aircraft and engine log books are not required to be in the aircraft, they should be made available upon request. Log books should be complete and up to date. Good records will reduce maintenance cost by giving the mechanic information about what has or has not been accomplished.

PREVENTIVE MAINTENANCE

The holder of a Pilot Certificate issued under FAR Part 61 may perform certain preventive maintenance described in FAR Part 43. This maintenance may be performed only on an aircraft which the pilot owns or operates and which is not used in air carrier service. The following is a list of the maintenance which the pilot may perform:

1. Repair or change tires and tubes.
2. Service landing gear wheel bearings, such as cleaning, greasing or replacing.
3. Service landing gear shock struts by adding air, oil or both.
4. Replace defective safety wire and cotter keys.
5. Lubrication not requiring disassembly other than removal of non-structural items such as cover plates, cowling or fairings.
6. Replenish hydraulic fluid in the hydraulic reservoirs.
7. Refinish the exterior or interior of the aircraft (excluding balanced control surfaces) when removal or disassembly of any primary structure or operating system is not required.
8. Replace side windows and safety belts.
9. Replace seats or seat parts with replacement parts approved for the aircraft.
10. Replace bulbs, reflectors and lenses of position and landing lights.
11. Replace cowling not requiring removal of the propeller.
12. Replace, clean or set spark plug clearance.
13. Replace any hose connection, except hydraulic connections, with replacement hoses.
14. Replace pre-fabricated fuel lines.
15. Replace the battery and check fluid level and specific gravity.

Although the above work is allowed by law, each individual should make a self analysis as to whether he has the ability to perform the work. A Service Manual may be purchased for guidance in the performance of preventive maintenance.

If the above work is accomplished, an entry must be made in the appropriate log book. The entry should contain:

1. The date the work was accomplished.
2. Description of the work.
3. Number of hours on the aircraft.
4. The certificate number of pilot performing the work.
5. Signature of the individual doing the work.

REQUIRED SERVICE AND INSPECTION PERIODS

Piper Aircraft Corporation provides for the initial and first 50-hour inspection, at no charge to the owner. The **Owner Service Agreement** which the owner receives upon delivery of the aircraft should be kept in the aircraft at all times. This identifies him to authorized Piper dealers and entitles the owner to receive service in accordance with the regular service agreement terms. This agreement also entitles the transient owner full warranty by any Piper dealer in the world.

One hundred hour inspections are required by law if the aircraft is used commercially. Otherwise this inspection is left to the discretion of the owner. This inspection is a complete check of the aircraft and its systems, and should be accomplished by a Piper Authorized Service Center or by a qualified aircraft and power plant mechanic who owns or works for a reputable repair shop. The inspection is listed, in detail, in the inspection report of the appropriate Service Manual.

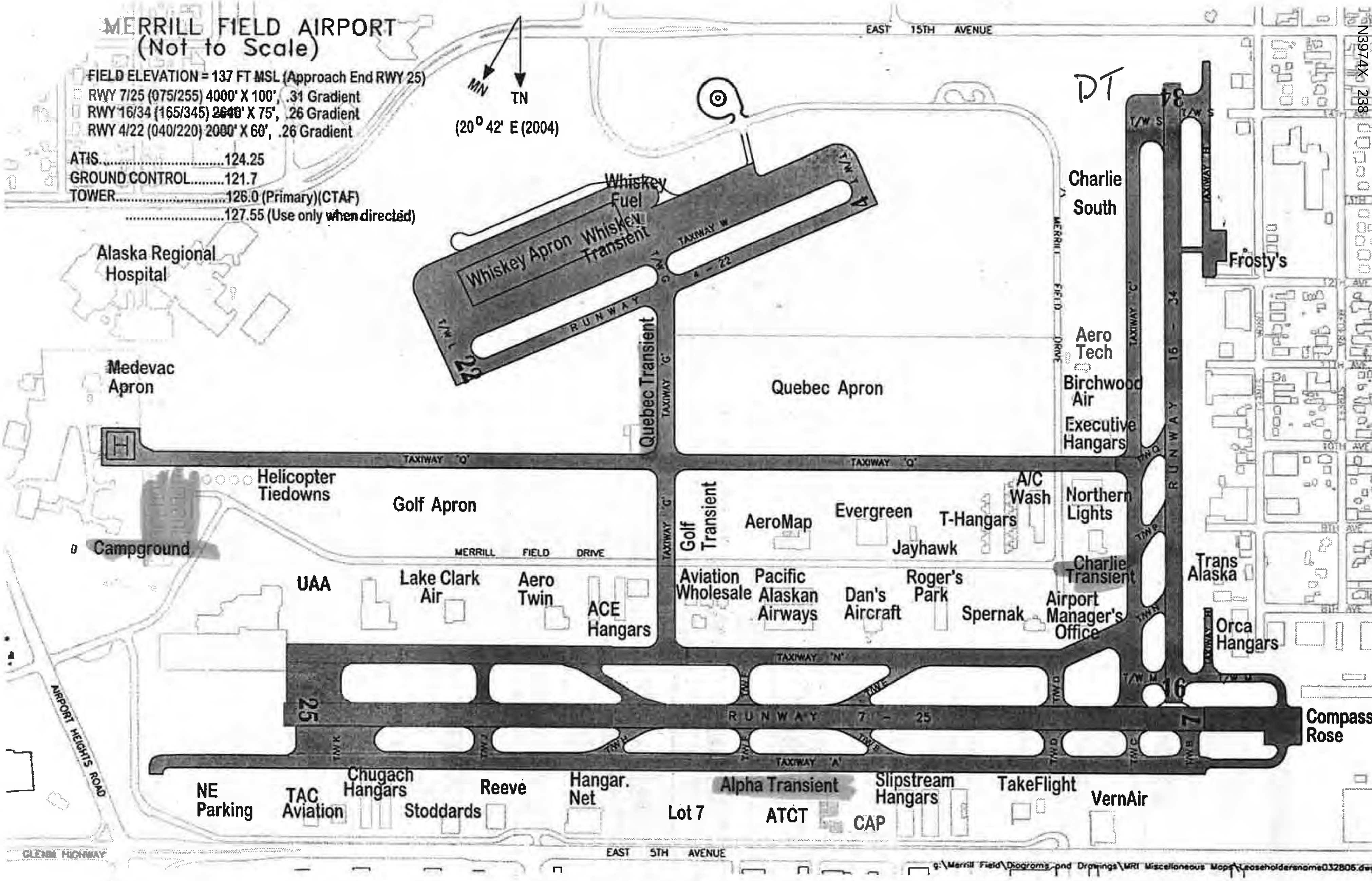
An **annual inspection** is required once a year to keep the Airworthiness Certificate in effect. It is the same as a 100-hour inspection except that it must be signed by an Inspection Authorized (IA) mechanic or a General Aviation District Office (GADO) representative. This inspection is required whether the aircraft is operated commercially or for pleasure.

A **Progressive Maintenance** program is approved by the FAA and is available to the owner. It involves routine and detailed inspections at 50-hour intervals. The purpose of the program is to allow maximum utilization of the aircraft, to reduce maintenance inspection cost and to maintain a maximum standard of continuous airworthiness. Complete details are available from Piper dealers.

A **spectographic analysis** of the oil is available from several sources. This system, if used intelligently, provides a good check of the internal condition of the engine. For this system to be accurate, oil samples must be sent in at regular intervals, and induction air filters must be cleaned or changed regularly.

10/21/76	PTK VOR Ground		#1 TO +1 FROM +1	#2 TO 0 FROM +1	[illegible]
11/21/76	PTK VOR Ground		#1 -1 TO -1 FR	#2 0 TO +1 FR	[illegible]
11-27-76	PTK VOR	342.0 hrs.	#1 -1F ±0T	#2 ±0 TO ±0 FR	[illegible]
1/ /77	PTK [illegible]	36.5	#1 T -1 F -2	#2 T 0 F 0	[illegible]
2/16/77	PTK [illegible]	409	#1 T -2 F -1	#2 T 0 T 0	JWC[illegible]
3/31/77	PTK VOR	456.6	#1 F ±0 T ±0	#2 F +1 T +1	D. Joe[illegible]
4-7-77	PTK VOR GR	475.9	#1 F ±0		T. [illegible]
4-17-77	PTK VOR	535.73	#1 ±0 T ±0 F	#2 +1 T -1 F	T. [illegible]
6-29-77	PTK VOR	594.64 LH	1 ±0	2 +1 T -1 F	[illegible]
8-23-77	PTK VOR	669.7	#1 ±0	#2 +1 FR	[illegible]
8-27-77	PTK VOR	670.49	#1 ±0	#2 ±0 +1 TO	W. P. K[illegible] A&P 2039294
5-17-78	PTK VOR	892.00	#1 ±0	#2 +1 -1	P. G. Berda[illegible]
3-1-79	PTK VOR	1028.45	±2	±2	J DAVIS
11-12-79	JXN - [illegible]	[illegible]	#1 ±2°	#2 0+	Ronald V[illegible]
9-9-80	LFD	1452.00	ATECK #1 -1		Waldie

210
200
180
30
1484



MARK RENNER
(907) 622-5162

MERRILL FIELD BUSINESSES

PHONE	FAX	BUSINESS NAME	ADDRESS
222-3000	222-3001	ACE Hangars/Fuels	2301 Merrill Field Drive
272-4495	274-3265	Aero-Metric, Inc.	2014 Merrill Field Drive
279-6558	279-2818	Aero Tech Flight School	1100 Merrill Field Drive
274-6166	274-4285	Aero Twin, Inc.	2403 Merrill Field Drive
343-8800	243-8832	ALASCO Aviation	2424 East 5th Avenue
277-0071	277-0072	Alaska Air Carriers	2301 Merrill Field Drive
276-5422	276-5400	Alaska Air Transit	2331 Merrill Field Drive
279-1850	279-1852	Alaska Skycraft	2301 Merrill Field Drive
272-3581	272-3592	Alaskan Aircraft Engines, Inc.	2425 Merrill Field Drive
274-2990		Aviation Fuel Services	900 Merrill Field Drive
276-0402	276-0403	Birchwood Air Service	1000 Merrill Field Drive
272-7227	277-7227	CAP	1910 East 5th Avenue
240-8188	278-5779	Chugach Hangars Owners Assoc.	2570 E. 5th Ave.
278-9516	278-9517	Dan's Aircraft Repair	1931 Merrill Field Drive
373-2313	357-2313	Dimond D Partners	1841 Merrill Field Drive
279-5275		Empire Rent A Car	2301 Merrill Field Drive
257-1500	279-6816	Evergreen Helicopters of Alaska, Inc.	1935 Merrill Field Drive
222-3000	222-3001	Executive Hangars	980 Merrill Field Drive
274-4333		Hangar.net	2400 Merrill Field Drive
338-7001		Hayden Aero	1841 Merrill Field Drivie
276-4404	276-0883	Jay-Hawk Air	1842 Merrill Field Drive
258-5752		Johnson, Bob	1841 Merrill Field Drive
278-5004		Jon Kelley, Sheet Metal	2400 East 5th Avenue
276-7974	688-1257	Kevin's Upholstery	1704 East 5th Avenue
278-2054	278-7030	Lake Clark Air Service, Inc.	2425 Merrill Field Drive
222-3210	222-3206	Medallion Foundation	2301 Merrill Field Drive
274-1244 x 23		Merrill Field Hangars Assoc.	Lot 22, Orca Street
278-5277	279-0717	Merrill Field Instruments	900 Merrill Field Drive
279-7097		Merrill Field Maintenance	2115 Merrill Field Drive
276-2002		Merrill Field Upholstery	2400 East 5th Avenue
277-4811	278-6651	Northern Lights Avionics	900 Merrill Field Drive
349-2571	349-8571	Pacific Alaskan Airways	2015 Merrill Field Drive
277-4811	278-6651	Pilot Shop	900 Merrill Field Drive
274-2990	272-3209	Pratt Aviation Services	900 Merrill Field Drive
272-8522	272-8524	Reeve Air Motive	2425 East 5th Avenue
272-9475	272-0993	Spernak Airways, Inc.	1707 Merrill Field Drive
272-2327	272-5801	Stoddard's Aero Service Inc.	2550 East 5th Avenue
222-1889	274-1787	TAC Aviation	2600 East 5th Avenue
274-9943	272-3486	Take Flight Alaska, Inc.	1740 East 5th Avenue
264-7400/7407	264-7404	University of Alaska, Anchorage	2811 Merrill Field Drive
279-2002		Unusual Attitudes	2400 East 5th Avenue
258-7822	258-0909	Vernair	1704 East 5th Avenue
277-8205	258-7435	Ward's	1707 Merrill Field Drive

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DAC International
6702 McNeil Dr.
Austin, Texas 78729

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR AIRCRAFT PA34-200T
Listed on DAC International GDC31 Approved Model List

WITH

DAC GDC31 ROLL STEERING COMPUTER

Reg. No. N3974X
Serial No. 34-7670011

RELEASED

This supplement must be attached to the FAA approved Airplane Flight Manual when the DAC International Model GDC31 Roll Steering Converter has been installed in accordance with FAA STC **SA10236SC** .

The information contained herein supplements or supersedes the basic Airplane Flight Manual only in those areas listed. For limitations, procedures, and performance information not contained in this supplement, consult the basic Airplane Flight Manual.

FAA APPROVED: ______________________

for S. Frances Cox, Manager
Special Certification Office
Federal Aviation Administration
Fort Worth, Texas 76193-0190

TABLE OF CONTENTS

DAC International
6702 McNeil Drive
Austin, Texas, 78729

LOG OF REVISIONS

Revision	Page	Subject	Approval	Date
IR	All	Initial Release	Rick Ritz	6/25/04
A	1	Reference Approved Model List	J.R. Holton	10/17/05

SECTION 1 - GENERAL

A. GENERAL

The GDC31 Roll Steering Converter provides autopilot coupling of the aircraft GPS unit to the aircraft autopilot's heading error channel. When the autopilot is operated in the Heading mode, a pilot operated switch selects between HSI /DG heading selector and GDC31 steering.

Provided the DAC GDC31 Roll Steering Converter (RSC) is receiving adequate data from the GPS, the RSC will provide lateral steering commands to the autopilot under these conditions:

1. GPS is selected on the A/P SEL switch.
2. Autopilot is in HDG mode.

GPS to autopilot coupling may be used for enroute, terminal and approach phases of flight.

SECTION 2 - OPERATING LIMITATIONS

A. Do not use the GDC31 below the published MDA during an approach.

NOTE:

1) The GDC31 does not reduce or otherwise alter any existing safety features of the autopilot, such as bank limiting, rate limiting and protection from a hard over. The GDC31 provides lateral (roll) data only (no pitch data is supplied by the GDC31).

2) Refer to the autopilot AFMS for autopilot operating limitations. Operation of the GDC31 is subjected to the same autopilot limitations that apply to use of heading select, if any.

B. If the GPS does not support full guidance of course reversals and holding patterns, refer to Section 4, C and D. (Refer to the GPS Airplane Flight Manual Supplement.)

SECTION 4 - NORMAL OPERATING PROCEDURES

A. ANNUNCIATOR / SWITCH

1. A two-position toggle switch / annunciator labeled A/P SEL, located near the autopilot controller, selects the steering signal used by the Autopilot. Press the switch to toggle between HDG and GPS.

   HDG
   GPS When the HDG annunciator is illuminated and HDG is selected on the Autopilot controller, steering is from the HSI heading selector.

   HDG
   GPS When the GPS annunciator is illuminated, the autopilot is coupled to the GPS and the HSI heading selector is disconnected.

B. OPERATION

1. Couple the GPS to the HSI / CDI.

2. Select GPS on the A/P SEL switch.
   Observe that GPS illuminates and is not blinking.

3. Engage the autopilot in the HDG mode.

CAUTION:

The autopilot immediately begins tracking the GPS course. Expect up to a standard rate turn if the aircraft is not established on course when the mode is engaged.

NOTE:

To provide proper HSI display, set the HSI course selector to the Desired Track indicated by the GPS.

SECTION 4 - NORMAL OPERATING PROCEDURES Continued.

C. COURSE REVERSAL

1. Couple the GPS to the HSI / CDI.

2. Select GPS on the A/P SEL switch.
Observe that GPS illuminates and is not blinking.

3. Engage the autopilot in the HDG mode. Confirm that the autopilot tracks toward the FAF.

CAUTION:

The autopilot immediately begins tracking the GPS course. Expect up to a standard rate turn if the aircraft is not established on course when the mode is engaged.

4. At the FAF, the autopilot will track outbound from the FAF.

5. Select HDG on the A/P SEL switch. Use the HDG bug to maneuver the aircraft around the course reversal.

6. After the GPS track changes to the inbound course, select GPS on the A/P SEL switch.

7. Monitor tracking to the FAF then MAP.

NOTE:

To provide proper HSI display, set the HSI course selector to the Desired Track indicated by the GPS.

SECTION 4 - NORMAL OPERATING PROCEDURES Continued.

D. HOLDING

1. Couple the GPS to the HSI / CDI.

2. Select GPS on the A/P SEL switch.
   Observe that GPS illuminates and is not blinking.

3. Engage the autopilot in the HDG mode. Confirm that the autopilot tracks toward the holding fix.

CAUTION:

The autopilot immediately begins tracking the GPS course. Expect up to a standard rate turn if the aircraft is not established on course when the mode is engaged.

4. Crossing the holding fix, select HDG on the A/P SEL switch. Use the HDG bug to maneuver the aircraft around the outbound leg of the holding pattern.

5. After turning to within 90° of the inbound course, select GPS on the A/P SEL switch. Confirm that the autopilot tracks toward the holding fix.

6. Repeat 4 and 5.

NOTE:

To provide proper HSI display, set the HSI course selector to the Desired Track of the inbound course as indicated on the GPS.

E. Power:

1. A 2-amp circuit breaker labeled **RSC** powers the GDC31.

SECTION 5 - PERFORMANCE

No Change

SECTION 6 - SYSTEM DESCRIPTION

A. EQUIPMENT DESCRIPTION

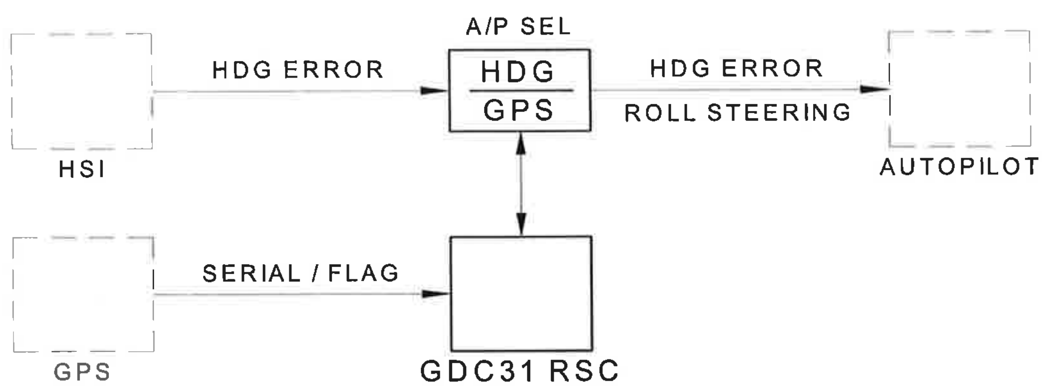
The GDC31 Roll Steering Converter provides autopilot coupling of the GPS to the autopilot.

When the autopilot is operated in heading mode, (HDG) annunciated on the autopilot controller, the pilot may select either heading bug or GPS as the steering source used by the autopilot. Mode selection is accomplished with the A/P SEL switch/annunciator located near the autopilot controller.

When A/P SEL annunciates HDG, the autopilot is coupled to the heading bug located in the HSI / DG.

When the A/P SEL annunciates GPS, the autopilot is coupled to the GPS course guidance through the GDC31 RSC. In the case of a fault, the GPS annunciator blinks when GPS mode is selected with the A/P SEL switch.

The GDC31 uses digital data received from the GPS to produce a commanded turn signal for use by the autopilot. The GDC31 does not reduce or otherwise alter any existing safety features of the autopilot, such as bank limiting, rate limiting and protection from a hard over. The GDC31 provides lateral (roll) data only (no pitch data is supplied by the GDC31).



Block Diagram

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for the
Garmin GDL 84/88 ADS-B Transceiver
as installed in

PA34-200T

Make and Model Airplane

Registration Number: N3974X Serial Number: 34-7670011

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 SA02119SE for the installation and operation of the Garmin GDL 84/88 ADS-B Transceiver. This document must be incorporated into the FAA Approved Airplane Flight Manual or provided as an FAA Approved Supplemental Airplane Flight Manual.

The information contained herein supplements the information in the FAA Approved Airplane Flight Manual. For limitations, procedures, loading and performance information not contained in this document, refer to the FAA Approved Airplane Flight Manual, markings, or placards.

FAA APPROVED 22-OCT-2015

Michael Warren
ODA STC Unit Administrator
GARMIN International, Inc
ODA-240087-CE

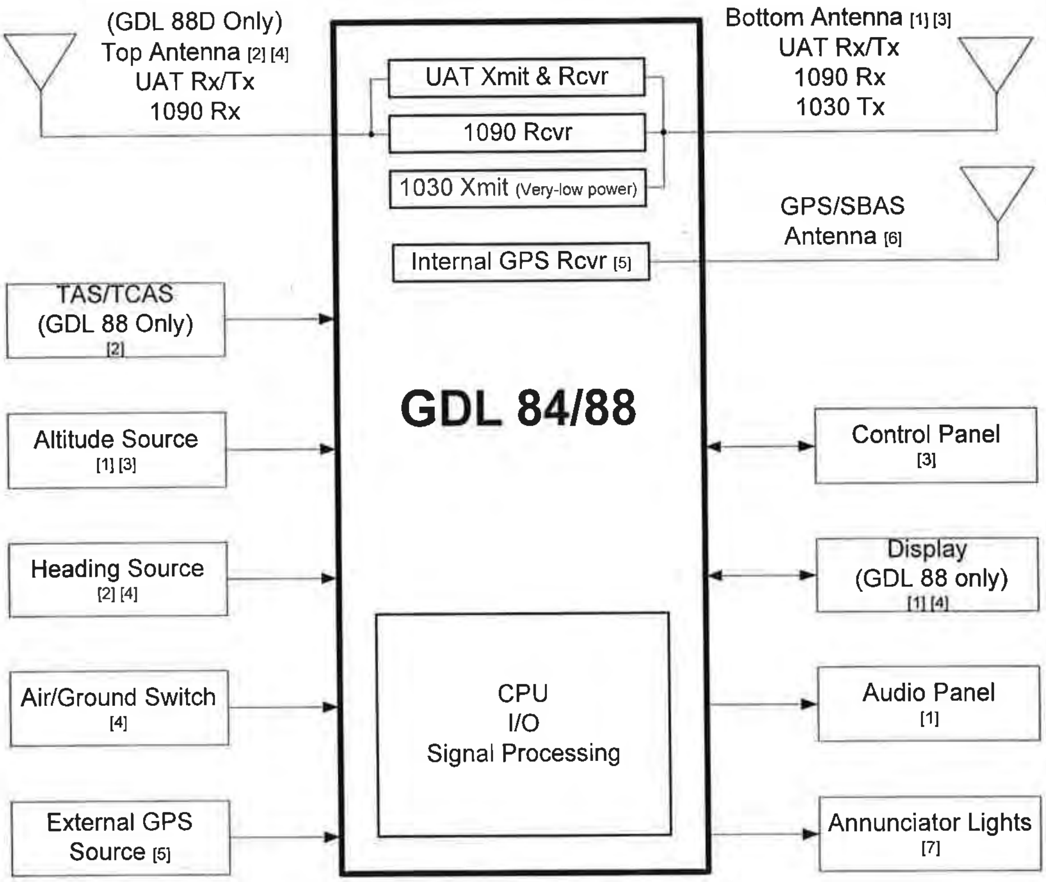
LOG OF REVISIONS		
Revision Number	Date	Description
1	12/18/2012	Complete Supplement
2	01/07/2015	Updated document to include "GDL 84" where applicable.
3	10/22/2015	Updated document to include data for the following: • GDL 88 software v3.32 • Single lamp ADS-B annunciator • Added Barometric Altitude Source to required equipment table • Removed External ADS-B annunciators from GDL 84 required equipment table • Removed ABNORMAL PROCEDURE steps to verify valid position when GDL 84/88 annunciates a loss of position data • Clarified System Descriptions • Changed labeling for circuit breakers and switches.

Table of Contents

Section 1. GENERAL

1.1 Garmin GDL 84/88 UAT Transceiver

The Garmin GDL 84/88 UAT Transceiver is an ADS-B system comprised of a Garmin TSO-C154c GDL 84/88, one or two UAT/1090 antenna(s), optional Garmin approved GPS/SBAS antenna, optional Garmin GPS/SBAS position source, and other interfaces as shown in the following block diagram.



NOTES:
[1] Required for ADS-B In
[2] Optional for ADS-B In
[3] Required for ADS-B Out
[4] Optional for ADS-B Out
[5] Internal or External GPS Source Required
[6] Required for Internal GPS Source
[7] Panel mounted ADS-B Out annunciations required for GDL 88 installations without a Display.

Figure 1 – GDL 84/88 Block Diagram

The GDL 84/88 system performs following functions:

- Transmission of ADS-B out data on UAT (978 MHz)
  - Integration of data from internal and external sources to transmit the following data per 14 CFR 91.227
    - GPS Position, Altitude, and Position Integrity
    - Ground Track and/or Heading, Ground Speed, and Velocity Integrity
    - Air Ground Status
    - Flight ID, Call Sign, ICAO Registration Number
    - Capability and Status Information
  - Transponder squawk code, IDENT, and emergency status
  - Anonymous Mode (When not installed in conjunction with a Mode S transponder)
  - Pressure Altitude Broadcast Inhibit
- Reception of ADS-B In data on UAT (978 MHz)
  - ADS-B (Data directly from another transmitting aircraft)
  - ADS-R (Rebroadcast of ADS-B data from a ground station)
  - TIS-B (Broadcast of secondary surveillance radar (SSR)-derived traffic information from a ground station)
  - FIS-B (Broadcast of aviation data from a ground station)
- Reception of ADS-B In data on 1090 MHz
  - ADS-B (Data directly from another transmitting aircraft)
  - ADS-R (Rebroadcast of ADS-B data from a ground station)
- Provide traffic alerting to the pilot via an optional annunciator lamp and audio output.

The GDL 88 system performs the following additional functions:

- Provide traffic information and alerting to the pilot via an optional display
  - Correlation and consolidation of traffic data from multiple traffic sources
    - Output of traffic data to an external display
    - Aural and visual traffic alerting
- Provide FIS-B data to the pilot via an optional display
  - Processing and output of FIS-B data to an external display
    - Graphical and textual weather products
      - NEXRAD
      - PIREPs
      - AIRMET/SIGMETs
      - METARs
      - TAFs
      - Winds Aloft

- Aviation Data
    - TFRs
    - NOTAMs

The GDL 84/88 may be installed as a stand-alone ADS-B Out system. The GDL 88 may be, optionally, integrated with a compatible display for the display and control of traffic, FIS-B weather, and aviation data. Capabilities of the interfaced display determines which of the above listed functions are provided.

1.2 Capabilities

The GDL 84/88 ADS-B OUT system meets the equipment requirements of 14 CFR 91.227 when operating in accordance with Sections 2.1 and 2.2 of this supplement.

As installed in this aircraft, the Garmin GDL 84/88 system complies with the requirements of AC 20-165A.

The GDL 84/88 meets the requirements of TSO-C154c for ADS-B Out operation.

> ***Applicable to installations consisting of a GDL 88 interfaced with one or more GTNs with software version 3.00 or later:***
>
> The GDL 88 meets the requirements of TSO-C195a Class C1, C2, C3, C5, TIS-B Services TSO-C166b Class A1, and FIS-B TSO-C157a for ADS-B In Operation and AC 20-172A for Airworthiness Approval for ADS-B In Systems and Applications

1.3 Installation Configuration

This aircraft is equipped with a GDL 84/88 system with the following interfaces/ features:

Equipment Installed:

☐ GDL 84

☐ GDL 88

Interfaced Active Traffic System (GDL 88 Only):

☐ None

☐ TCAD

☐ TAS/TCAS I

Interfaced Transponder(s):

☐ Single Transponder serially interfaced to the GDL 88

☐ Dual Transponders serially interfaced to the GDL 88

☐ Single Transponder interfaced to the GDL 88 via self-interrogation

Interfaced GPS/SBAS Position Source(s):

GPS #1:

☐ GNS 400W/500W Series Unit

☐ GTN 6XX/7XX

☐ GNS 480

☐ None

GPS #2:

☐ GNS 400W/500W Series Unit

☐ GTN 6XX/7XX

☐ GNS 480

☐ None

PABI Control

☐ External Switch

☐ Transponder control (ALT vs. ON)

☐ Controlled via display

Anonymous Mode

- ☐ Not Available
- ☐ External Switch
- ☐ Controlled via display

Definitions

The following terminology is used within this document:

ADS-B:	Automatic Dependent Surveillance-Broadcast
ADS-R:	Automatic Dependent Surveillance-Rebroadcast
CSA:	Conflict Situational Awareness
FIS-B:	Flight Information Service-Broadcast
GDL:	Garmin Datalink
GPS:	Global Positioning System
GTN:	Garmin Touchscreen Navigator
LRU:	Line Replaceable Unit
PABI:	Pressure Altitude Broadcast Inhibit
SBAS:	Satellite-Based Augmentation System
TAS:	Traffic Awareness System
TCAD:	Traffic Collision Avoidance Device
TCAS:	Traffic Collision Avoidance System
TIS-B:	Traffic Information Service-Broadcast
UAT:	Universal Access Transceiver
VFR:	Visual Flight Rules

Section 2. LIMITATIONS

2.1 Minimum Equipment

The **GDL 84** must have the following system interfaces fully functional in order to be compliant with the requirements for 14 CFR 91.227 ADS-B Out operations:

Interfaced Equipment	Number Installed	Number Required
Transponder	1 or more	1
Barometric altitude source	1 or more	1

Table 1 – Required Equipment

The **GDL 88** must have the following system interfaces fully functional in order to be compliant with the requirements for 14 CFR 91.227 ADS-B Out operations:

Interfaced Equipment	Number Installed	Number Required
GPS SBAS Position Source (Interfaced or internal)	1 or more	1
Transponder	1 or more	1
Barometric altitude source	1 or more	1

Table 2 – Required Equipment

2.2 ADS-B Out

The GDL 84/88 only complies with 14 CFR 91.227 for ADS-B Out when all required functions are operational as indicated by external annunciators not illuminated or interfaced display ADS-B messages not being present.

2.3 Anonymous Mode

Anonymous Mode must only be operated while operating under VFR while squawking a VFR code. If requested by Air Traffic Control, Anonymous Mode must be turned off.

2.4 Applicable System Software

This AFMS/SAFM is applicable to the software versions shown in Table 3.

The Main software version is displayed on the External LRU page available on some interfaced display devices.

Software Version *(or later FAA Approved versions for this STC)*
3.32

Table 3 - Software Versions

2.5 Pressure Altitude Broadcast Inhibit (PABI)

While operating within airspace requiring an ADS-B Out compliant transmitter, per 14 CFR 91.227, Pressure Altitude Broadcast Inhibit shall only be enabled when requested by Air Traffic Control.

2.6 Traffic Alerting

Traffic alerting is an aid to visual acquisition and may not be used as the sole basis for aircraft maneuvering.

Section 3. EMERGENCY PROCEDURES

3.1 Emergency Procedures
None.

3.2 Abnormal Procedures

3.2.1 Abnormal Indications
The loss of an interfaced input to the GDL 84/88 may cause the GDL 84/88 to stop transmitting ADS-B Out data or providing ADS-B In function.

Depending on the nature of the fault or failure, the GDL 84/88 may no longer be transmitting all of the required data in the ADS-B Out messages and Traffic Alerts may not be provided by the system.

- For GDL 84 and No Display GDL 88 installations:

  If the GDL 84/88 detects any internal faults or failures, the GDL 84/88 will annunciate this event via the external annunciation (if installed).

  ADS-B annunciator illuminated:

  Transponder...**VERIFY ON**
  ADS-B Circuit Breaker..**VERIFY CLOSED**

  For configurations with two annunciator lamps:

  Using two lights, three messages/states are capable of being conveyed to the flight crew: NO POSN, FAULT, and TX FAIL.

  If the GDL 84/88 detects any failures that affect compliance of 91.227, the following annunciations are provided:

  - NO POSN illuminated - the GDL 88 has detected that it does not have a valid position from the internal or any of the external GPS/SBAS sources. (See Section 3.2.3 for further information.)
  - Both NO POSN and FAULT illuminated- the GDL 84/88 is annunciating TX FAIL.

The following annunciation indicates that the requirements of 91.227 may not be met:

- FAULT - the GDL 84/88 has detected a loss of an input or internal fault resulting in the GDL 84/88 not transmitting full ADS-B information or degradation in performance. Contact service to resolve the fault.

For configurations with one ADS-B annunciator lamp:

If the GDL 84/88 detects any failures that affect compliance with the requirements of 91.227, the ADS-B annunciator will be steadily illuminated.

When the GDL 84/88 detects a FAULT that does not affect compliance with requirements of 91.227 this will be annunciated to flight crew at the beginning of subsequent power cycles by flashing the ADS-B annunciator on/off for approximately 20 seconds after power up. Contact service to resolve the fault.

- For GDL 88 Installations with an interfaced display:

  Reference Display Device documentation for applicable annunciations.

3.2.2 LOSS OF AIRCRAFT ELECTRICAL POWER GENERATION

Loss of electrical power generation.....**REMOVE POWER FROM GDL 84/88**

If the GDL 84/88 is load shed due to a loss of electrical power generation, ADS-B Out, ADS-B In, and the display of interfaced traffic system data will no longer be available.

NOTE

This guidance is supplementary to any guidance provided in the POH or AFM for the installed aircraft for loss of power generation.

3.2.3 LOSS OF GPS/SBAS POSITION DATA

When the GPS/SBAS receiver is inoperative or GPS position information is not available or invalid, the GDL 84/88 will no longer be transmitting ADS-B Out data and ADS-B traffic alerting functions will be unavailable.

3.2.4 VISUAL/AURAL TRAFFIC ALERT

Traffic Alert Annunciation and Aural

Traffic...**VISUALLY ACQUIRE**

Section 4. NORMAL PROCEDURES

The procedures described below are specific only to the GDL 88. Cockpit Reference Guides and Pilot Guides for interfaced displays will provide additional operating information specific to the displays or other traffic systems.

4.1 Unit Power On

GDL 84/88 Annunciations.. **CONSIDERED**

NOTE

If installed, the GDL 84/88 single lamp ADS-B Annunciator will flash on/off for approximately 20 seconds after power up if a fault was present during a previous power cycle. This indicates the unit requires service but does not indicate that the unit will not comply with 91.227.

The GDL 84/88 only complies with 14 CFR 91.227 for ADS-B Out when all required functions are operational as indicated by external annunciators not illuminated.

4.2 Before Takeoff

GDL 84/88 Annunciations.. **CONSIDERED**

Section 5. PERFORMANCE

No change.

Section 6. WEIGHT AND BALANCE

See current weight and balance data.

Section 7. SYSTEM DESCRIPTIONS

7.1 Pilot's Guide

The Garmin GDL 84/88 Pilot's Guide, part number and revision listed below, contain additional information regarding GDL 84/88 system description, control, and function. Cockpit Reference Guides and Pilot Guides for interfaced displays provide additional operating information.

- GDL 84/88 ADS-B Transceiver Pilot's Guide
  P/N 190-01122-03 Rev E or later

7.2 Mode 3/A Code, IDENT, and Emergency Status

Mode 3/A Code, IDENT, and Emergency Status data that is included in the ADS-B OUT message is obtained automatically by the GDL 84/88. No pilot action except normal use of the transponder is required.

7.3 Flight ID

Flight Identification will default to the aircraft registration. If interfaced with a Garmin transponder or GTN an alternate Flight ID can be entered via those interfaces and will automatically be updated at the GDL 84/88.

7.4 Pressure Altitude Broadcast Inhibit

For aircraft with an interfaced Garmin GTX 33/330/32/327 or SL 70 transponder the broadcast of pressure altitude is controlled by the transponder mode. Turning the transponder to ALT will also broadcast pressure altitude in the ADS-B output. Turning the transponder to ON will inhibit pressure altitude from being broadcast.

For aircraft without a Garmin GTX 33/330/32/327 or SL 70 transponder pressure altitude broadcast is controlled via a separate switch or interfaced GNS or GTN display.

7.5 Traffic Sources and Alerting

The GDL 84/88 is capable of receiving ADS-B, ADS-R, and TIS-B traffic reports in order to track traffic around the aircraft and provide alerts to the flight crew to aid in visual acquisition and avoidance.

Traffic alerting is provided via a visual annunciation and audio callouts for these alerts. The audio callout will include any available information regarding the intruder, to include direction, range, and relative altitude (high, low, same altitude).

Due to the nature of TIS-B, its service volumes, and incomplete equipage/adoption of ADS-B Out equipment, not all traffic will be tracked by the GDL 84/88. This is much like an active traffic system and does not track non-transponder equipped aircraft. The flight crew must use "see and avoid" procedures to visually acquire and avoid other aircraft.

7.6 Interfaced Active Traffic System (Optional, GDL 88 Only)

When an active traffic system is interfaced with a GDL 88, the GDL 88 receives traffic from the active traffic system and attempts to correlate – or match – this traffic with ADS-B traffic the GDL 88 has received and is already tracking. When a correlation is made, the active traffic system or ADS-B target with the most accurate information is displayed to the flight crew. Any active traffic system or ADS-B traffic that is not correlated will also be displayed for the flight crew. The correlation of traffic by the GDL 88 ensures that only the most accurate, and no duplicate, traffic targets are displayed for the flight crew's situational awareness.

In addition, the GDL 88 will use its air-ground logic or inputs to automatically switch the active traffic from Standby to Operate when transitioning from ground to air, and from Operate to Standby when transitioning from air to ground.

If the GDL 88 fails then external traffic device data is no longer sent to the display, however aural traffic alerts from these traffic systems may continue to be received.

When interfaced to an active traffic system, traffic alerts are provided as follows:

- Alerts will be provided by the TCAS system for targets tracked solely via TCAS AND targets that are tracked via TCAS and ADS-B which are correlated.
- Alerts will be provided by the GDL 84/88 for targets that are tracked solely by ADS-B.

The optional interfaced display's Pilot's Guides and supplements provide additional information regarding the functionality and control of the traffic device.

7.7 Power

Power to the GDL 84/88 is provided through a circuit breaker labeled "ADS-B" or "UAT"

7.8 External Switches

External switches may be installed in conjunction with the GDL 84/88. Table 4 lists the switches and function they perform:

Switch Label	Function
UAT ALT RPTG ON/OFF	Enables and disables Pressure Altitude Broadcast Inhibit functionality.
UAT ANONYMOUS ENABLED / DISABLED	Enables and disables Anonymous Mode functionality.
TRAFFIC MUTE	Acknowledges and mutes a currently playing aural Traffic Alert.
BRT/DIM	Enables GDL 88 annunciators to be dimmed appropriately for lighting conditions.

Table 4 – External Switches

Garmin International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062 U.S.A.

FAA Approved

AIRPLANE FLIGHT MANUAL SUPPLEMENT

or

SUPPLEMENTAL AIRPLANE FLIGHT MANUAL

Garmin GTX 330/33 with ADS-B Out

Dwg. Number: 190-00734-15 Rev. 1

This document serves as an FAA Approved Airplane Flight Manual Supplement or Supplemental Airplane Flight Manual when the GTX 330/33 with ADS-B Out is installed in accordance with Supplemental Type Certificate SA01714WI. This document must be incorporated into the FAA Approved Airplane Flight Manual or provided as an FAA Approved Supplemental Airplane Flight Manual.

The information contained herein supplements the FAA approved Airplane Flight Manual. For limitations, procedures, loading and performance information not contained in this document, refer to the FAA approved Airplane Flight Manual, markings, or placards.

Make and Model Airplane: PIPER 34-200T

Airplane Serial Number: 34-7670011

Airplane Registration Number: N3974X

FAA Approved:

RJ Murray

Robert Murray
ODA STC Unit Administrator
Garmin International, Inc
ODA-240087-CE

Date: 5/1/2013

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Garmin International
1200 E. 151st Street
Olathe, KS 66062 USA

Garmin International, Inc.

FAA Approved Airplane Flight Manual Supplement or

Supplemental Airplane Flight Manual

for

Garmin GTX 330/33 with ADS-B Out

Log of Revisions

REV NO.	PAGE NO(S)	DESCRIPTION	DATE OF APPROVAL	FAA APPROVED
1	ALL	Original Issue	See Cover	See Cover

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Garmin International
1200 E. 151st Street
Olathe, KS 66062 USA

Table of Contents

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Section 1. General

1.1 GTX 330/33 ES

The Garmin GTX family consists of the GTX 330 and GTX 33 (Non-Diversity Mode S Transponders) and the GTX 330D and GTX 33D (Diversity Mode S Transponders). The ES option of any of the transponders provides ADS-B extended Squitter functionality.

All Garmin GTX transponders are a radio transmitter/receiver that operates on radar frequencies, receiving ground radar or TCAS interrogations at 1030 MHz and transmitting a coded response of pulses to ground-based radar on a frequency of 1090 MHz. Each unit is equipped with IDENT capability and will reply to ATCRBS Mode A, Mode C and Mode S All-Call interrogation. Interfaces to the GTX 330/33 are shown in the following block diagrams.

Figure 1. GTX 330 or GTX 330D Interface Summary

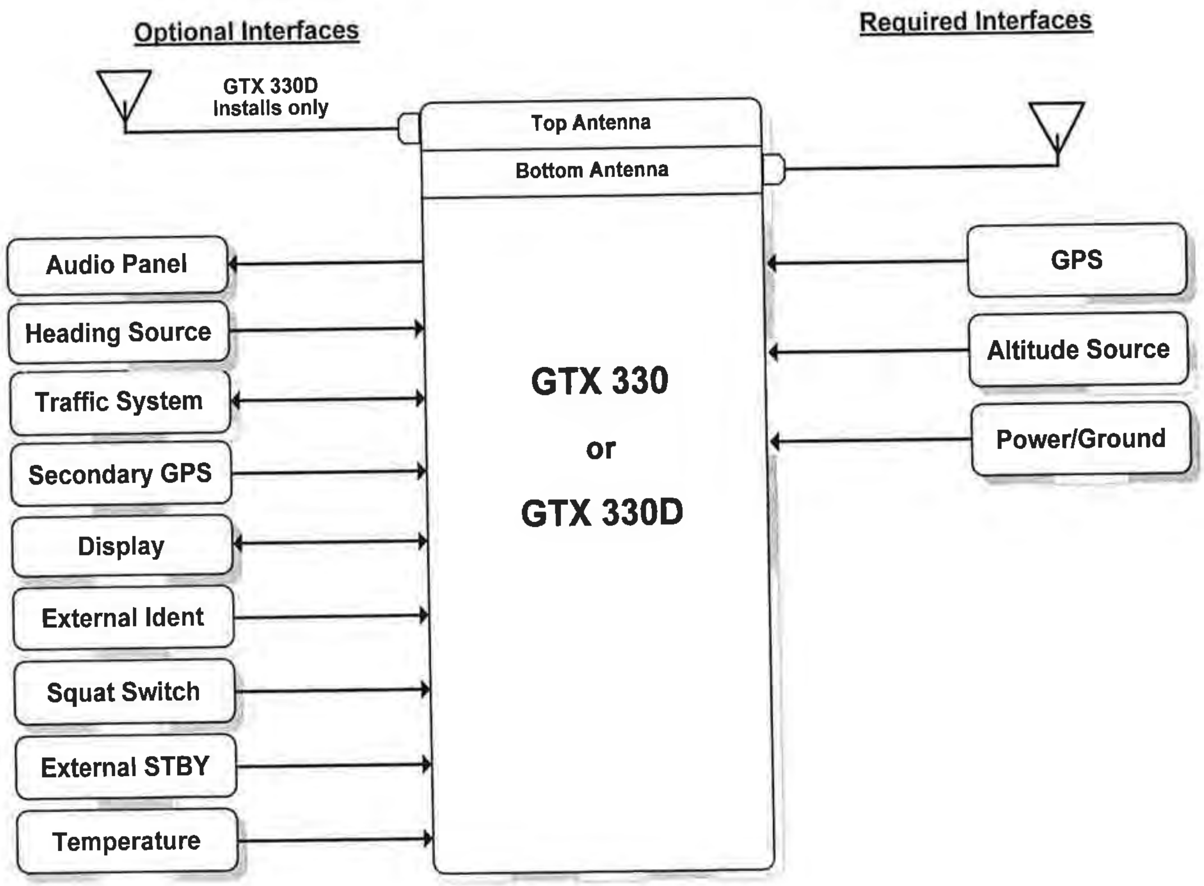
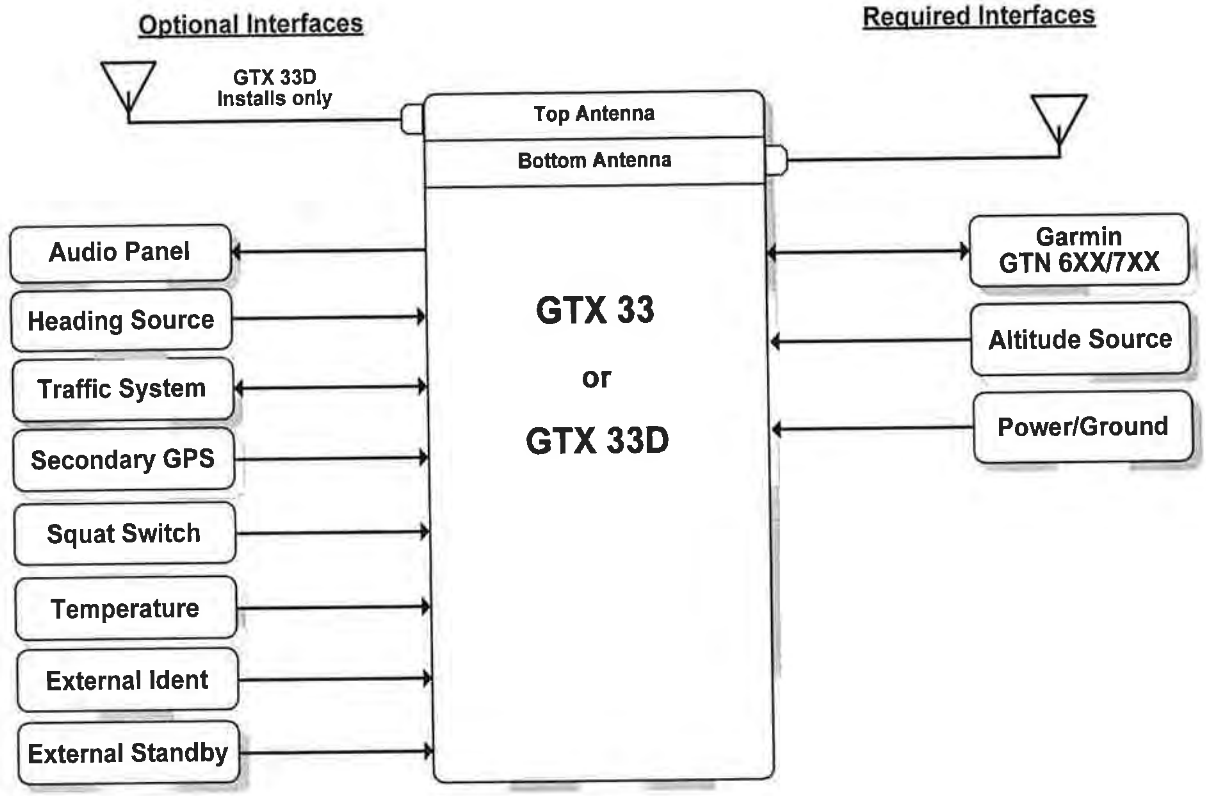


Figure 2. GTX 33 or GTX 33D Interface Summary



The GTX 330/33 performs the following ADS-B Out functions:

- Transmission of ADS-B out data on 1090 extended squitter (1090ES) (1090 MHz)
- Integration of data from internal and external sources to transmit the following data per 14 CFR 91.227:
  - GPS Position, Altitude, and Position Integrity
  - Ground Track and/or Heading, Ground Speed, and Velocity Integrity
  - Air Ground Status
  - Flight ID, Call Sign, ICAO Registration Number
  - Capability and Status Information
  - Transponder squawk code, IDENT, and emergency status
- Pressure Altitude Broadcast Inhibit

1.2 Capabilities

The Garmin GTX 330/33 with ADS-B Out functionality as installed in this aircraft has been shown to meet the equipment requirements of 14 CFR § 91.227.

1.3 Installation Configuration

This aircraft is equipped with a GTX 330/33 with ADS-B Out system with the following interfaces/ features:

Equipment Installed:

☐ #1 GTX 330	☐ #1 GTX 33
☐ #1 GTX 330D	☐ #1 GTX 33D
☐ #2 GTX 330	☐ #2 GTX 33
☐ #2 GTX 330D	☐ #2 GTX 33D

Interfaced GTN 6XX/7XX or GNS 4XX/5XX Position Source(s):

	Transponder (#1 or #2)		**Transponder (#1 or #2)**		**Transponder (#1 or #2)**
☐ GTN 725	______	☐ GNS 430AW	______	☐ GNS 530AW	______
☐ GTN 750	______	☐ GNS 430W	______	☐ GNS 530W	______
☐ GTN 625	______	☐ GNC 420AW	______	☐ GPS 500W	______
☐ GTN 635	______	☐ GNC 420W	______		
☐ GTN 650	______	☐ GPS 400W	______		

Section 2. Limitations

2.1 Minimum Equipment

The GTX 330/33 with ADS-B Out must have the following system interfaces fully functional in order to be compliant with the requirements for 14 CFR 91.227 ADS-B Out operations:

Table 1. Required Equipment

Interfaced Equipment	Number Installed	Number Required
Uncorrected Pressure Altitude Source	1	1
GPS SBAS Position Source	1 or more	1
GTN series navigator (for aircraft equipped with GTX 33/33D only)	1 or more	1

2.2 ADS-B Out

The GTX 330/33 only complies with 14 CFR 91.227 for ADS-B Out when all required functions are operational. When the system is not operational, ADS-B Out transmit failure messages will be present on the GTN control interface, or GTX 330 display.

2.3 Applicable System Software

This AFMS/AFM is applicable to the software versions shown in Table 2.

The Main GTX software version is displayed on the splash screen during start up, for the GTX 330, and the external LRU page on the GTN for the GTX 33.

Table 2. Software Versions

Software Item	Software Version *(or later FAA Approved versions for this STC)*
Main SW Version	7.02

2.4 Pressure Altitude Broadcast Inhibit (PABI)

Pressure Altitude Broadcast Inhibit shall only be enabled when requested by Air Traffic Control while operating within airspace requiring an ADS-B Out compliant transmitter, per 14 CFR 91.227. PABI is enabled by selecting the GTX to ON mode.

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Section 3. Emergency Procedures

3.1 Emergency Procedures

None

3.2 Abnormal Procedures

3.2.1 Abnormal Indications

The loss of an interfaced input to the GTX 330/33 may cause the transponder to stop transmitting ADS-B Out data. Depending on the nature of the fault or failure, the GTX may no longer be transmitting all of the required data in the ADS-B Out messages.

For GTX 330 installations:

If the GTX 330 detects any internal faults or failures with the ADS-B Out functionality, the GTX 330 will annunciate this event via the NO ADSB annunciator on the GTX 330 display screen. When the GTX 330 annunciates the NO ADSB annunciation, one of the following failures or faults have occurred:

- Loss of adequate GPS position data
- ADS-B TX (transmit) is selected OFF

When the GTX 330 annunciates FAIL to the flight crew, the GTX 330 has detected an internal failure and no transponder data is transmitted.

When a GTX 330 NO ADSB, or FAIL annunciation is received, verify proper operation of all interfaced equipment (refer to Section 1.3) as the failure of one of these devices could be the cause of the abnormal indication.

For GTX 33 installations:

Reference Display Device documentation for applicable annunciations.

3.2.2 Loss of Aircraft Electrical Power Generation

Loss of electrical power generation .... **REMOVE POWER FROM GTX**

If the GTX should be load shed due to a loss of electrical power generation, ADS-B Out data will no longer be available.

NOTE

This guidance is supplementary to any guidance provided in the POH or AFM for the installed aircraft for loss of power generation.

3.2.3 Loss of GPS/SBAS Navigation Data

When the GPS/SBAS receiver is inoperative or GPS position information is not available or invalid, the GTX will no longer be transmitting ADS-B Out data.

For GTX 330 installations:

NO ADSB annunciator illuminated:

Interfaced GPS position sources.. **VERIFY VALID POSITION**

For GTX 33 installations:

Reference Display Device documentation for applicable annunciation:

Interfaced GPS position sources.. **VERIFY VALID POSITION**

Section 4. Normal Procedures

The procedures described below are specific only to the GTX 330. Cockpit Reference Guides and Pilot Guides for interfaced displays will provide additional operating information specific to the displays or other traffic systems.

ADS-B Out functionality resides within the GTX transponders thereby providing a single point of entry for Mode 3/A code, Flight ID, IDENT functionality and activating or deactivating emergency status for both transponder and ADS-B Out functions. Details on performing these procedures are located in the GTX 330/330D Pilot's Guide.

4.1 Unit Power On

NO ADSB .... **CONSIDERED**

NOTE

The NO ADS-B Annunciation (or associated display annunciations) may illuminate as the unit powers on and begins to receive input from external systems, to include the SBAS position source.

4.2 Before Takeoff

NO ADSB .... **EXTINGUISHED**

NOTE

The NO ADS-B Annunciation (or associated display annunciations) must be **EXTINGUISHED** for the system to meet the requirements specified in 14 CFR 91.227. This system must be operational (NO ADSB annunciator **EXTINGUISHED**) in certain airspaces after January 1, 2020 as specified by 14 CFR 91.225.

Section 5. Performance

No Change

Section 6. Weight and Balance

See current Weight and Balance data

Section 7. Systems Description

The Garmin GTX 330 Pilot's Guide, part number and revision listed below, contain additional information regarding GTX system description, control, and function. Pilots Guides for interfaced displays, part number and revision listed below, provide additional operating information for the Garmin GTX 33.

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Title	Part Number	Revision
GTX 330 Pilot's Guide	190-00207-00	Rev G (or later)
Garmin GTN 725/750 Pilot's Guide	190-01007-03	Rev. E (or later)
Garmin GTN 625/635/650 Pilot's Guide	190-01004-03	Rev. E (or later)

Section 8. Handling, Service, and Maintenance

No Change

Instructions for Continued Airworthiness
GDL 84/88 Part 23 AML STC

as installed in

PA34-200T

(Make and Model Airplane)

Reg. No. N3974X S/N 34-7670011

Dwg. Number:
190-01310-01 Rev. 3

Garmin International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062 USA

Record of Revision

Rev.	Date	Description of Change
1	11/21/2012	Initial Release
2	1/7/2015	Updated to add GDL 84
3	10/22/2015	Update to add Flight Stream

GARMIN

Company Proprietary Information

GARMIN

Garmin International, Inc.
1200 E. 151st Street
Olathe, Kansas 66062 U.S.A.

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1. INTRODUCTION

1.1 Purpose

This document is designed for use by the installing agency of the Garmin GDL 84/88 as Instructions for Continued Airworthiness in response to 14 CFR §23.1529, and Part 23 Appendix G. This ICA includes information required by the operator to adequately maintain the Garmin GDL 84/88 with optional Flight Stream 110/210 installed under Approved Model List (AML) STC.

1.2 Scope

This document provides the Instructions for Continued Airworthiness for aircraft modified by the installation of the Garmin GDL 84/88 with optional Flight Stream 110/210 under AML STC.

1.3 Document Control

This document shall be released, archived, and controlled in accordance with the Garmin document control system. When this document is revised, refer to Section 2.15 for information on how to gain FAA acceptance or approval and how to notify customers of changes.

1.4 Permission to Use Certain Documents

Permission is granted to any corporation or person applying for approval of a Garmin GDL 84/88 with optional Flight Stream 110/210 to use and reference appropriate STC documents to accomplish the Instructions for Continued Airworthiness and show compliance with STC engineering data. It is the responsibility of the applicant to determine the suitability of the documents for the ICA.

1.5 Definitions

The following terminology is used within this document:

1) **ADS-B:** Automatic Dependent Surveillance-Broadcast
2) **AML:** Approved Model List
3) **BIT:** Built-In Test
4) **CDTI:** Cockpit Display of Traffic Information
5) **CFR:** Code of Federal Regulations
6) **CPU:** Central Processing Unit
7) **FAA:** Federal Aviation Administration
8) **GDL:** Garmin Datalink Transceiver
9) **GPS:** Global Positioning System
10) **ICA:** Instructions for Continued Airworthiness
11) **IM:** Installation Manual
12) **I/O:** Input/Output
13) **LRU:** Line Replaceable Unit
14) **MHz:** Mega Hertz
15) **PMI:** Principal Maintenance Inspector
16) **RX:** Receive
17) **SBAS:** Satellite-Based Augmentation System
18) **STC:** Supplemental Type Certificate
19) **TAS:** Traffic Awareness System
20) **TCAS:** Traffic Collision Avoidance System
21) **TSO:** Technical Standard Order
22) **TX:** Transmit
23) **UAT:** Universal Access Transceiver

1.6 Terminology

The GDL 84 is a remote-mounted unit available in one variant that does not support diversity (TSO-C154c Class A1S) and contains an internal GPS/SBAS receiver.

The GDL 88 is a remote-mounted unit available in four variants. The variants support diversity (TSO-C154c Class A1H) or do not support diversity (TSO-C154c Class A1S) and contain internal GPS/SBAS receiver or utilizes external GPS/SBAS source.

Except where specifically noted, references made to the 'GDL 84/88' apply equally to all units: GDL 84, GDL 88, GDL 88D, GDL 88 with GPS/SBAS, and GDL 88D with GPS/SBAS.

The Flight Stream 110 and Flight Stream 210 bring Bluetooth® connectivity to the cockpit, allowing portable electronics to stream data to and from the installed avionics. Specific to the interface to the GDL 84/88, the Flight Stream 110 and Flight Stream 210 provide FIS-B weather, ADS-B traffic, and GPS position from the GDL 84/88 to portable electronics.

Except where specifically noted, references made to the 'Flight Stream 110/210' applies equally to the Flight Stream 110 and Flight Stream 210.

2. INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

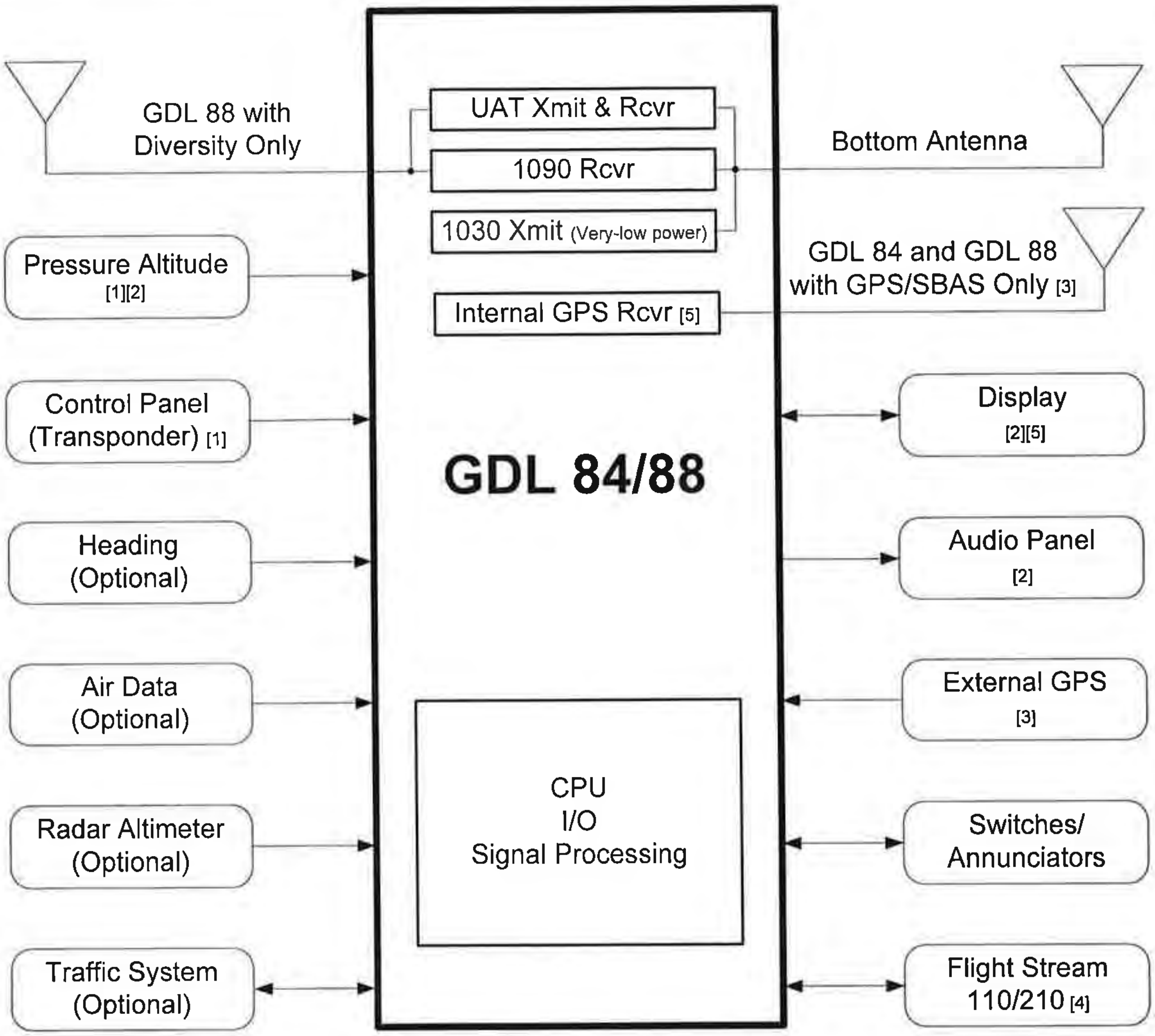
2.1 Introduction

Content, Scope, Purpose and Arrangement:	This document identifies the Instructions for Continued Airworthiness for the modification of the aircraft by installation of the Garmin GDL 84/88 and optional Flight Stream 110/210.
Applicability:	Applies to aircraft altered by installation of the Garmin GDL 84/88 and optional Flight Stream 110/210.
Definition of Abbreviations:	See Section 1.5 and Section 1.6.
Precautions:	None
Units of measurement:	None
Referenced publications:	Garmin 190-01310-00 Rev. 6, "Installation Manual, GDL 84/88 Part 23 AML STC" or later revisions; Garmin 190-01122-03 Rev. E, "GDL 84/88 ADS-B Transceiver Pilot's Guide" or later revisions.
Retention:	This document, or the information contained within, will be included in the aircraft's permanent records.

The GDL 84/88 AML STC Installation Manual (190-01310-00) is referenced extensively throughout this document. To improve readability, references to the installation manual are abbreviated as GDL-IM.

2.2 Description of Alteration

The GDL 84/88 is a remote-mounted UAT Datalink Transceiver that provide ADS-B functionality as part of an ADS-B Out configuration, ADS-B In configuration, or ADS-B Out and In configuration. ADS-B Out transmissions are via 978 MHz UAT and ADS-B In reception is via 978 MHz UAT and 1090 MHz extended squitter. In addition, the GDL 88 correlates traffic from multiple sources and provides traffic to a cockpit display (CDTI). The Flight Stream 110/210 interfaces with the GDL 84/88 through RS-422. Installation configuration is dependent on desired functionality and access to required sensors and equipment and also antenna inputs. The GDL 84/88 System Block Diagram in Figure 1 shows the various interfaces for the GDL 84/88.



NOTES:
[1] Required for ADS-B Out
[2] Required for ADS-B In
[3] Internal or external GPS source required
[4] GDL 84/88 Software v3.00 or later
[5] Applicable to GDL 88 only

Figure 1. GDL 84/88 System Block Diagram

2.3 Control, Operating, and Testing Information

See the *GDL 84/88 Pilot's Guide* for system operating information. See Section 2.1 for document part numbers. See *GDL-IM* for a system description and system limitations.

See *GDL-IM*, Section 5 for system configuration and checkout information. See *GDL-IM,* Sections 5.7 and 5.8 for general ground checks and system test procedures.

2.4 Servicing Information

The GDL 84/88 and optional Flight Stream 110/210 do not require servicing.

2.5 Periodic Maintenance

All maintenance associated with the GDL 84/88 AML STC installation is on condition. The GDL 84/88 is designed to detect internal failures. A thorough self-test is executed automatically upon application of power to the unit, and built-in tests (BIT) are continuously executed. Detected errors are indicated as failure annunciations, system messages, or a combination of the two.

Operation of the GDL 84/88 is not permitted unless the inspections described in this section have been completed within time intervals prescribed in Table 1. All antennas connected to the GDL 84/88 should be maintained in accordance with appropriate inspection data for the antenna installation.

Table 1. Maintenance Intervals

Item	Description/Procedure	Interval
Equipment Removal & Replacement	Removal and replacement instructions for the GDL 84/88 are contained in Section 2.7 of this document and in *GDL-IM* Section 4.1.7.	**On Condition**
Equipment Visual Check (Metallic Aircraft)	Conduct a visual check of the GDL 84/88 unit, optional Flight Stream 110/210, and associated wire harness to ensure continued installation integrity. 1. Inspect the GDL 84/88 unit for security of attachment, including visual inspection of mounting rack and other supporting structure attaching the rack to aircraft structure. For installations using countersunk fasteners, verify the fastener heads are in full contact with unit mounting rack holes. Re-torque mounting fasteners to 12-15 in-lbs if required. If the Flight Stream 110/210 is installed and screws are not securely attached, tighten any loose Flight Stream 110/210 mounting screws as necessary to snug plus one-quarter turn. If required, re-torque bonding strap hardware to 12-15 in-lbs. Note: Care should be taken when tightening the mounting screws of the Flight Stream 110/210. Excessive tightening may damage the mounting flange. 2. Inspect for signs of corrosion. 3. Inspect condition of wiring, shield terminations, routing, and attachment/clamping. 4. Inspect any bonding straps for corrosion, loose connections, or signs of lightning damage. Rework as needed.	**12 Calendar Months**

Item	Description/Procedure	Interval
Equipment Visual Check (Non-metallic Aircraft)	Conduct a visual check of the GDL 84/88 unit, optional Flight Stream 110/210, and associated wire harness to ensure continued installation integrity. 1. Inspect the GDL 84/88 unit for security of attachment, including visual inspection of mounting rack and other supporting structure attaching the rack to aircraft structure. For installations using countersunk fasteners, verify the fastener heads are in full contact with unit mounting rack holes. Re-torque mounting fasteners to 12-15 in-lbs if required. If the Flight Stream 110/210 is installed and screws are not securely attached, tighten any loose Flight Stream 110/210 mounting screws as necessary to snug plus one-quarter turn. If required, re-torque bonding strap hardware to 12-15 in-lbs. Note: Care should be taken when tightening the mounting screws of the Flight Stream 110/210. Excessive tightening may damage the mounting flange. 2. Inspect for signs of corrosion. 3. Inspect condition of wiring, shield terminations, routing, and attachment/clamping. 4. For composite aircraft, inspect any aluminum foil tape used to ground the GDL 84/88 and verify that it is not torn, damaged or showing signs of corrosion. If any of these occurs then the tape must be replaced. 5. Inspect any bonding straps for corrosion, loose connections, or signs of lightning damage. Rework or replace as needed. Bonding straps must be replaced after a known or suspected lightning strike.	**12 Calendar Months**

Item	Description/Procedure	Interval
Electrical Bonding Check	Perform an electrical bonding check for the GDL 84/88: 1. Perform electrical bond check between the GDL 84/88 and nearby exposed portion of the aircraft metallic structure (or instrument panel for composite aircraft), and verify that it is less than or equal to 10 milliohms. 2. Remove GDL 84/88 unit from mounting rack. 3. Measure the resistance between the mounting rack and nearby exposed portion of aircraft metallic structure (or instrument panel for composite aircraft), and verify it is less than or equal to 10 milliohms. 4. Reinstall the GDL 84/88 unit in the mounting rack. In the event of bonding test failure, remove the GDL 84/88 rack and clean the attachment points at both the GDL 84/88 rack and the aircraft structure per Section 3.5.3 of the *GDL-IM* and reattach the rack. Re-verify the resistance between the mounting rack and nearby exposed portion of aircraft metallic structure (or instrument panel for composite aircraft), and ensure it is less than or equal to 2.5 milliohms (for metallic aircraft) or 5.0 milliohms (for composite aircraft). Perform an electrical bonding check for the Flight Stream 110/210, if installed in metallic or tube/fabric aircraft: 1. Disconnect the shield terminations from the Flight Stream connector backshell. 2. Measure the resistance between the connector and nearby exposed portion of aircraft metallic structure and check that it is less than or equal to 20 milliohms. In the event of bonding test failure, remove the Flight Stream connector bonding strap from the aircraft ground plane and clean the attachment point with a bonding brush. Re-attach the bonding strap to the aircraft ground plane, torque to 12-15 in-lbs. Re-check the resistance between the Flight Stream connector and aircraft structure, ensuring that the resistance is less than or equal to 10 milliohms. If cleaning the far side of the strap is not enough, remove, clean, and reattach on the Flight Stream 110/210 side. 3. Connect the shield terminations to the Flight Stream connector backshell.	**Every 2000 flight hours or ten (10) years, whichever is first**

Item	Description/Procedure	Interval
	Perform an electrical bonding check for the Flight Stream 110/210, if installed in composite aircraft: 1. Disconnect the shield terminations from the Flight Stream connector backshell. 2. Measure the resistance between the connector and instrument panel (or other aircraft ground) and check that it is less than or equal to 20 milliohms. In the event of bonding test failure, remove the Flight Stream connector bonding strap from the aircraft ground plane and clean the attachment point with a bonding brush. Re-attach the bonding strap to the aircraft ground plane, torque to 12-15 in-lbs. Re-check the resistance between the Flight Stream connector and aircraft ground, ensuring that the resistance is less than or equal to 10 milliohms. If cleaning the far side of the strap is not enough, remove, clean, and reattach on the Flight Stream 110/210 side. 3. Connect the shield terminations to the Flight Stream connector backshell.	

2.6 Troubleshooting Information

If error indications are displayed on the GDL 84/88 annunciator, refer to the *GDL-IM*, Section 6, Troubleshooting. Refer to the GDL 84/88 System Configuration and Checkout Log retained in the aircraft permanent records for a list of the interfaced equipment and system configuration data (example log provided in *GDL-IM*).

2.7 Removal and Replacement Information

For GDL 84/88 removal and replacement instructions, refer to *GDL-IM* Section 4.1.7.

If the GDL 84/88 is removed and reinstalled, verify that the power-up self-test sequence is successfully completed and no failure messages are annunciated. If any work has been done on the aircraft that could affect the system wiring, or any interconnected equipment, verify the GDL 84/88 system unit power-up self-test sequence is successfully completed and no failure messages are annunciated. Also, if any work has been done on the GDL 84/88 mounting rack, verify the integrity of electrical bonding is maintained in accordance with Section 2.5 of this document.

For ADS-B annunciator removal and replacement instructions, refer to *GDL-IM*, Section 4.1.8.

For Flight Stream 110/210 removal and replacement instructions, refer to *GDL-IM* Section 4.1.9.

Refer to Appendix A of this document or the GDL 84/88 System Configuration and Checkout Log retained in the aircraft permanent records for GDL 84/88 and Flight Stream 110/210 (if installed) equipment locations.

Refer to the *GDL-IM* for removal/installation procedures and special handling precautions.

2.8 Diagrams

The installing agency should document aircraft specific locations for all LRUs, optional equipment, and antennas installed by this STC. The installing agency should also provide wire routing diagram sketches for all GDL 84/88 system wiring and cables installed by this STC.

GDL-IM Section 4 provides diagrams showing sample installation for LRU locations. Appendix B provides point-to-point wiring diagrams for the GDL 84/88 and interfaced equipment.

Refer to the GDL 84/88 System Configuration and Checkout Log retained in the aircraft permanent records for a list of the interfaced equipment and unit configuration data (example log provided in *GDL-IM*).

2.9 Special Inspection Requirements

After a suspected lightning strike, the following actions must be performed (if applicable):

- Verify proper operation of ADS-B equipment and Traffic annunciators (if installed) following procedures in accordance with *GDL-IM* Section 5.7.9.2 Discrete Outputs.
- Inspect any aluminum foil used for grounding (if installed) in accordance with *GDL-IM* Sections 3.5.1, 3.5.2, or Appendix G.
- Inspect any GDL 84/88 bonding strap (if installed) in accordance with *GDL-IM* Sections 3.5 or Appendix G.

2.10 Application of Protective Treatments

The GDL 84/88 installation does not require the application of protective treatments.

2.11 Data Relative to Structural Fasteners

Refer to the *GDL-IM*, Appendix E, for structural fastener information.

2.12 Special Tools

A milliohm meter is required for electrical bonding checks.

2.13 Additional Instructions

Refer to the *GDL-IM*, Section 3.6, for electrical load information.

2.14 Overhaul Period

The system does not require overhaul at a specific time period. Power on self-test and continuous BIT will monitor the health of the GDL 84/88 system. If an internal failure is detected, the unit may be removed and replaced. Reference the *GDL-IM*, Section 6, for troubleshooting information.

2.15 ICA Revision and Distribution

To revise this ICA, Garmin will follow the Garmin *ODA Procedures Manual* SOP-0055/ACP-0016 for Instructions for Continued Airworthiness. The latest revision of this ICA document is available on the Garmin website (www.flyGarmin.com). A Garmin Service Bulletin describing ICA revision will be sent to Garmin dealers if a revision is determined to be significant.

2.16 Assistance

Flight Standards Inspectors or the certificate holder's PMI have the required resources to respond to questions regarding this ICA. In addition, the customer may contact Garmin with questions regarding this equipment and its installation. Garmin Customer Support may be contacted during normal business hours via telephone 913-397-8200 or from the Garmin web site at www.flyGarmin.com.

2.17 Implementation and Record Keeping

Modification of an aircraft by this Supplemental Type Certificate obligates the aircraft operator to include the maintenance information provided by this document in the operator's aircraft maintenance manual and/or the operator's aircraft scheduled maintenance program.

3. AIRWORTHINESS LIMITATIONS SECTION

There are no additional Airworthiness Limitations as defined in 14 CFR § 23, Appendix G, G23.4 that result from this modification.

The Airworthiness Limitations section is FAA approved and specifies maintenance required under §§43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

10/22/2015

FAA APPROVED

Michael Warren — Date

ODA STC Unit Administrator

ODA-240087-CE

APPENDIX A EQUIPMENT LOCATIONS AND WIRE ROUTING

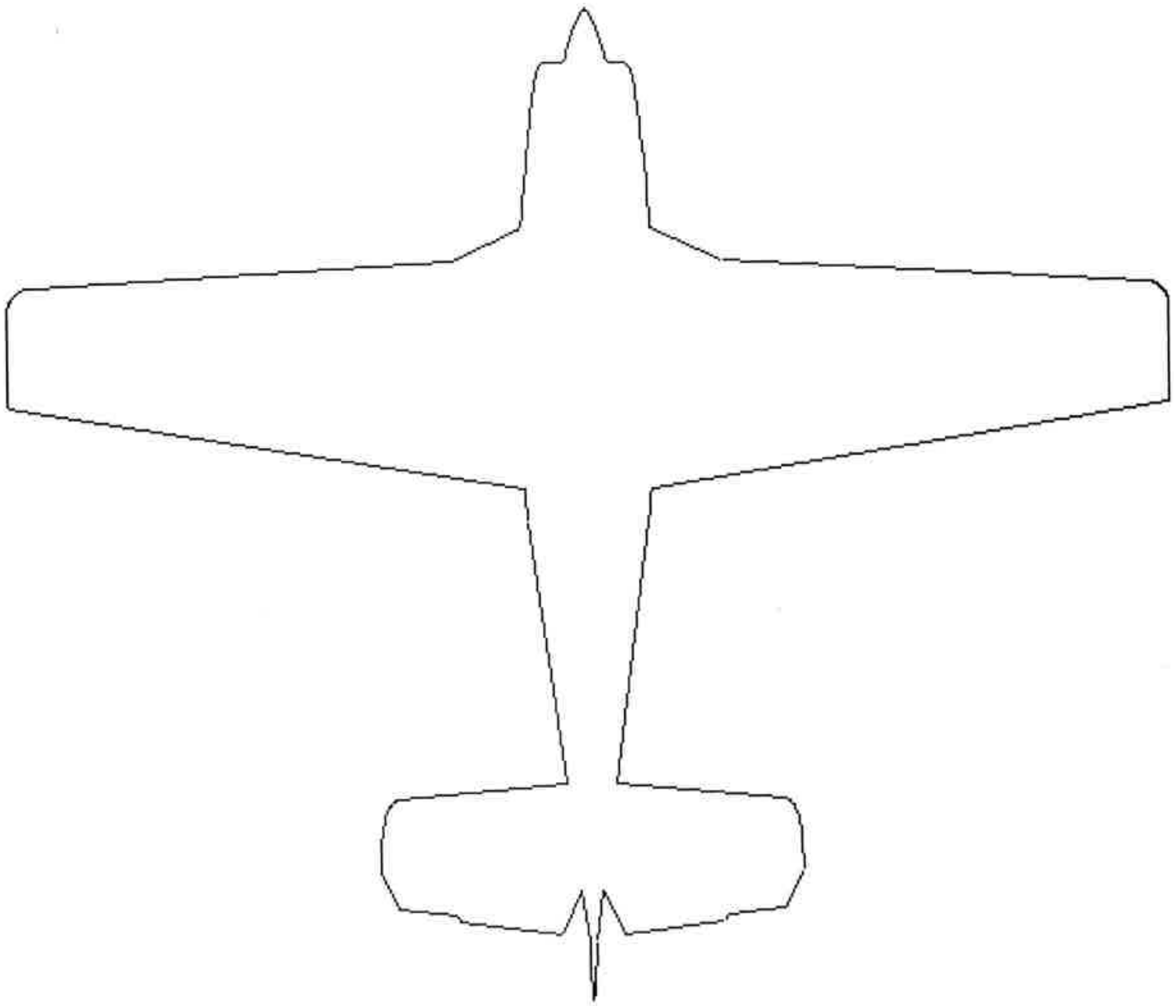
A.1 Equipment Locations

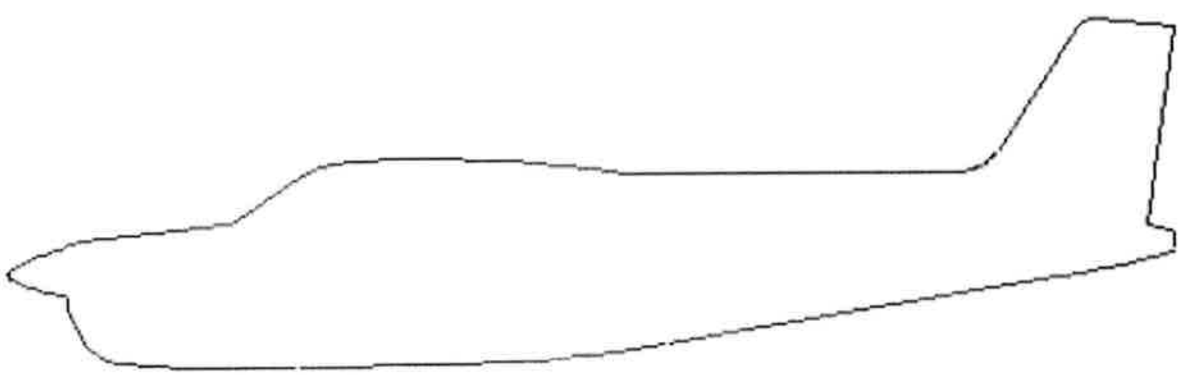
The table below describes the location of the GDL 84/88, antennas, and interfaced equipment. Document all interfaced equipment (model/part number) and installed locations in the following table. Also sketch equipment locations and wire routing on the diagrams in A.2 or A.3 as appropriate.

LRU	Installed Location (F.S.)	Description of Location
GDL 84/88		

A.2 GDL 84/88 Installation – Single Engine

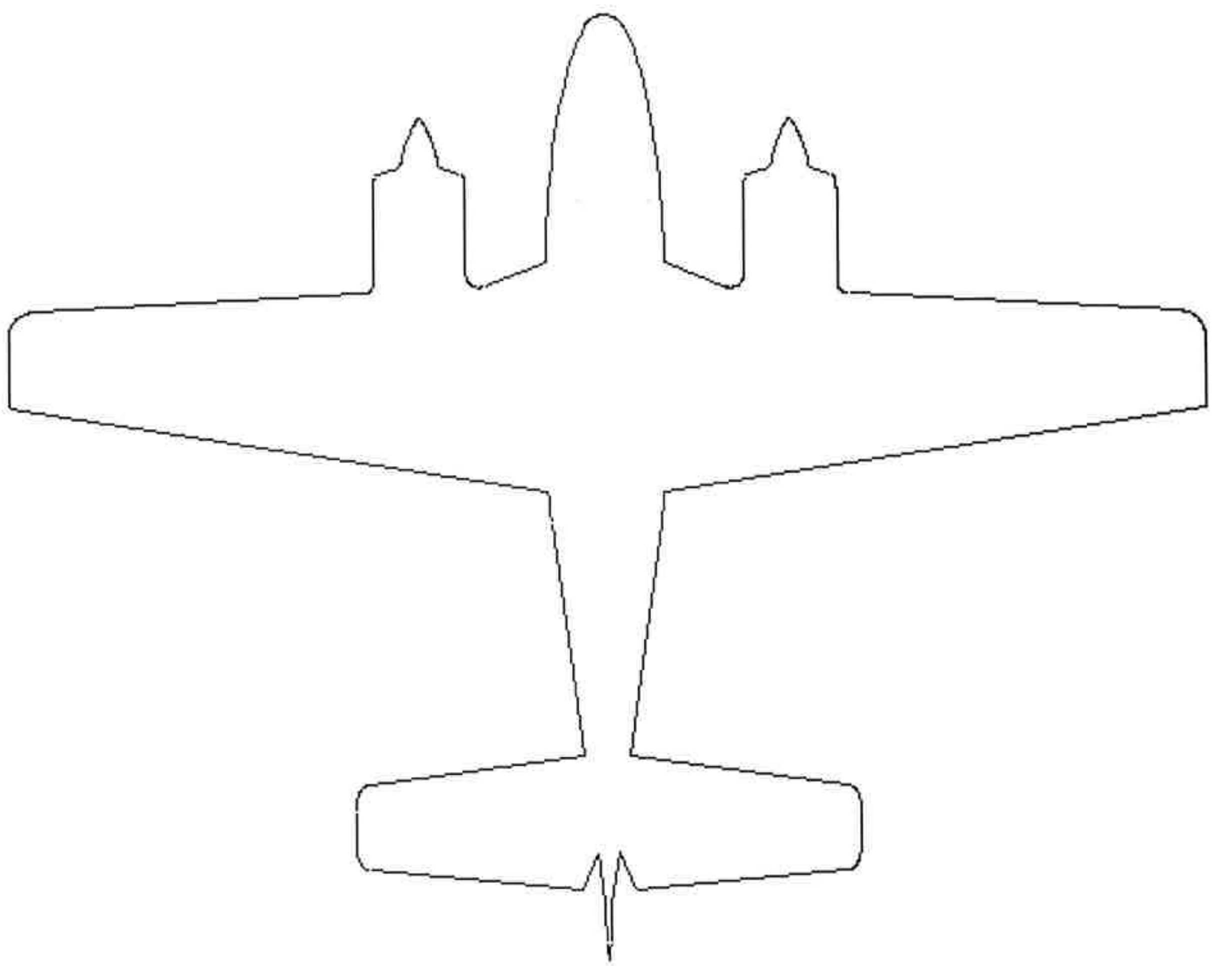
The following diagram depicts approximate location of all LRUs and antenna(s) along with the wire routing for the GDL 84/88 and Flight Stream 110/210 (if installed) throughout the aircraft structure for a single-engine aircraft.

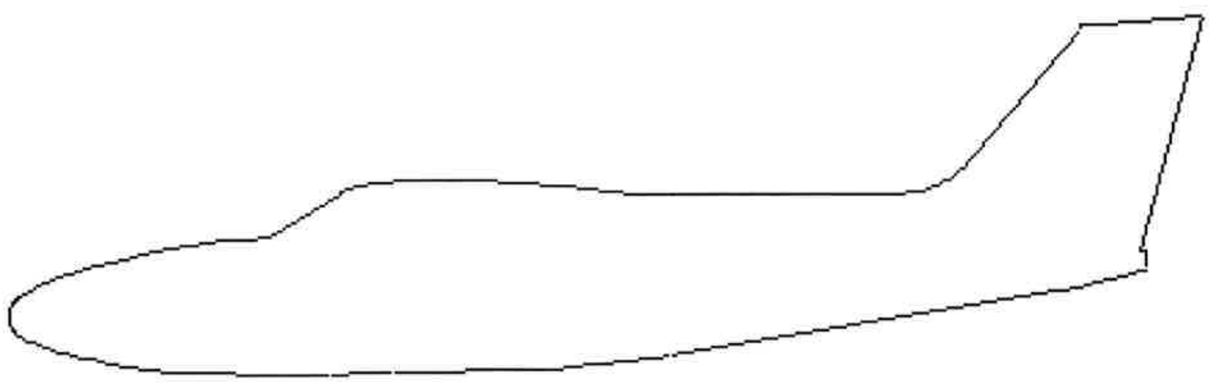




A.3 GDL 84/88 Installation – Twin Engine

The following diagram depicts approximate location of all LRUs and antenna(s) along with the wire routing for the GDL 84/88 and Flight Stream 110/210 (if installed) throughout the aircraft structure for a twin-engine aircraft:





INSTRUCTIONS for CONTINUED AIRWORTHINESS

GDC31 Roll Steering Converter

1049-2170-02

REV B

RELEASED

6702 McNeil Drive
Austin, Texas 78729
(512) 331-5323 Phone
(512) 331-4516 Fax

Record of Revisions

REV	DESCRIPTION	DATE	APPROVED
IR	INITIAL RELEASE E294-01	5/26/04	LW
A	Add data for T210, PA46, 58P and follow-on E390-02	3/30/05	LW
B	Correct Appendix D wiring diagram to reflect 429 data out from Garmin 400 Series GPS Recvr & add jumper between pins 11 & 21 E557	8/22/06	LW

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LIST OF EFFECTIVE PAGES

When updated, this document is changed in its entirety.

A current revision of this ICA is available on the DAC website at http://www.dacint.com/dacecd.htm (Technical Data section).

1. INTRODUCTION

This procedure provides instructions for the continued airworthiness of the GDC31Roll Steering Converter.

1.1 Scope

This document identifies the Instructions for Continued Airworthiness (ICA) for the modification of aircraft under the above referenced STC and accompanying Approved Model List (AML). Appendixes B through G provide wiring and equipment location drawings for aircraft models Cessna T210M, Piper PA46-310P Malibu and Beech 58P Baron. Appendix A provides an equipment location form and generic wiring diagram for use in follow-on approvals of the GDC31 Roll Steering Converter into aircraft listed on the AML.

1.2 Follow-On Installations

Reference Approved Model List of DAC International STC SA10236SC. Complete the data in Appendix A for follow-on installations into aircraft on the AML.

1.2.1 Equipment Location

Refer to the block diagram in section 2 of this document.

The AP/SEL switch is located near the autopilot control panel or near the HSI, in the pilot's primary field of view and easily accessible by the pilot.

The GDC31 Roll Steering Converter can mount in the avionics bay, shelf or other suitable structure. It can be mounted in any orientation. Refer to the data in Appendix A through G for specific location details. Also refer to the Equipment Installation manual, 1049-2510-01, for additional details and equipment limitations regarding equipment location.

1.2.2 Wire Routing

Route wires along existing wire bundles where practical. For installations where the GDC31 RSC is not located behind the instrument panel, describe the wire routing details using the form in Appendix A.

1.2.3 Mounting

For mounting the annunciator switch, refer to the Equipment Installation manual, 1049-2510-01, for details regarding panel cutout.

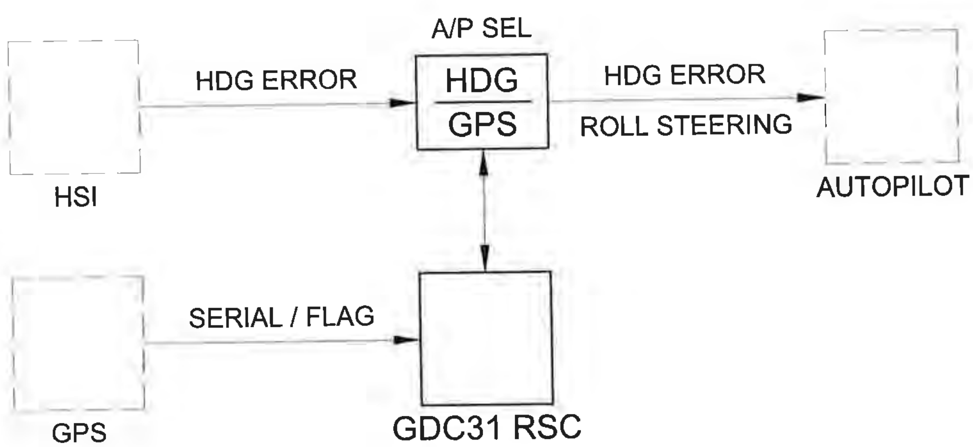
Mount the GDC31 RSC using four sets of #8 hardware described in section 4 of this ICA. MS or AN locking nut plates may be substituted for nuts and lock washers.

2. DESCRIPTION

The GDC31 Roll Steering Converter is designed to receive RS232 or RS422 serial data from a GPS Navigation System to produce both an analog Roll Sum Steering (RSS) signal and ARINC 429 labels bank angle command and ground speed.

The GDC31 output signal connects to the heading error input of the aircraft's existing autopilot. The GDC31 mimics the heading error signal of the aircraft's installed HSI or DG. The GDC31 does not reduce or otherwise alter any existing safety features of the autopilot, such as bank limiting, rate limiting and protection from a hard over. The GDC31 provides lateral (roll) data only (no pitch data is supplied by the GDC31). The ARINC 429 output can drive digital autopilots or converters.

The pilot selects between existing heading mode or GPS mode using a switch / annunciator. In heading mode, the autopilot operates as always, tracking the heading bug. In GPS mode, the GDC31 output signal supplies the autopilot's heading channel. The GDC31 calculates the correct course intercept angle from data supplied by the GPS to guide the aircraft onto course then maintain that course.



Block Diagram

(Dashed items represent existing aircraft equipment)

3. OPERATION

3.1 Control

The GDC31 provides conversion of Serial data from a GPS receiver into a steering signal connected to the autopilot heading channel through switching controlled by the HDG/GPS mode selector switch. There are no other operator controls associated with the GDC31 unit.

3.2 Equipment Checkout

The GPS receiver and the Autopilot must both be operational in order to perform this ground functional checkout.

1. Insure that all control surfaces are clear and that the control wheel is centered in roll.
2. Apply power to the GPS Receiver and Autopilot.
3. Set the HDG/GPS Mode selector to HDG.
4. On the HSI, center the heading bug.
5. Engage the autopilot in Heading Mode.
6. Operate the heading bug, observe that the control wheel turns left and right in response to the heading bug operation.
7. Center the control wheel using the heading bug.
8. Place the HDG/GPS Mode selector in the GPS position. For installations using an ARINC 429 data source, the GPS annunciator blinks until ground speed is greater than 40 knots. For installations using and RS232 data source, observe GPS illuminates and is not blinking.
9. Verify that the control wheel remains centered (very slow displacement is acceptable).
10. Disengage the autopilot.
11. Ground test complete. Secure aircraft power.

4. SERVICING INFORMATION

All servicing of the GDC31 must be accomplished by an approved service facility using DAC International approved maintenance manual, P/N 1049-2500-01. On aircraft servicing is limited to removal and replacement of the GDC31 and repair of the interconnect wiring. Refer to the following tables and lists, and appendices A through G.

All wiring is 22 to 24AWG.

- Single Wire: MIL-W-22759/16 or equivalent
- Shielded Wire: MIL-C-27500 or equivalent
- Circuit Breaker: Klixon 7277-2-2 or equivalent

Mounting Hardware and Replacement Parts:

Part Number	Description
1049-4000-03*	GDC31, ROLL STEERING CONVERTER
MS35206-245	SCREW, PAN HD, CROSS POINT, 8/32 X .5
MS35338-42	WASHER, LOCK, #8, CAD PLTD
AN960-8L	WASHER, FLAT, STEEL, #8
MS35649-282	NUT, PLAIN HEX, STEEL, 8/32
M24308/2-3F	CONNECTOR, RECEPTACLE, 25 PIN D-SUB
M39029/63-368	SOCKET, CRIMP, FEMALE
P10219*	SLIDE LATCH KIT
P10220*	BACKSHELL, 25 PIN D-SUB, SIZE 3
P10280*	MODE ANNUNCIATOR/SWITCH WITH 28V LAMPS
P10301*	LAMP, 14V

*Available through DAC International

5. MAINTENANCE INSTRUCTIONS

Condition and airworthiness inspections of the GDC31 will coincide with each Annual and/or 100-hour inspection. Other than regular periodic inspections and functional checks outlined here, maintenance of the GDC31 is "on condition" with no specific overhaul period.

At each Annual and/or 100-hour inspection:

1. The GDC31 will be inspected for security and attachment.
2. The switch/annunciator will be inspected for legibility and attachment.
3. Wiring integrity will be inspected according to AC 43.13-1B, Paragraph 11-96. Refer to wiring diagrams in the appendices.
4. Perform a functional test in accordance with paragraph 3.2.

6. TROUBLESHOOTING INFORMATION

SYMPTOM	RESOLUTION
GPS annunciator fails to turn on.	1. Check Avionics Master Switch in the ON position. 2. Check RSC circuit breaker set. 3. Verify Mode annunciator lamps are serviceable. 4. Remove GDC31 and check wiring IAW wiring diagram. 5. Remove and replace GDC31.
GPS annunciator blinks.	1. Verify GPS receiver is on and operational. 2. Remove GDC31 and check wiring IAW wiring diagram. 3. Remove and replace GDC31.
Aircraft overshoots or undershoot when intercepting GPS course.	1. Verify program pin wiring is according to wiring diagram. 2. Verify Reference input voltage is present according to wiring. 3. Check remaining wiring IAW wiring diagram. 4. Remove and replace GDC31.

7. REMOVAL AND REPLACEMENT INFORMATION

7.1 Equipment Removal

7.1.1 GDC31 Removal

1. Open the circuit breaker powering the GDC31.
2. Disengage connector slide-latch, unplug connector.
3. Remove 4 retaining screws and related hardware (retain hardware for later installation).

7.1.2 Mode Annunciator Removal

1. Open the circuit breaker powering the GDC31.
2. Pull firmly on the edges of the lens to disengage the lamp assembly from the body. The lamp assembly will hinge out and away from the body.
3. Release the two (2) pawls by unscrewing the flat-head screws located inside the body.
4. Unplug the lamp module from the sleeve.

7.2 EQUIPMENT INSTALLATION

7.2.1 GDC31 Installation

1. Open the circuit breaker powering the GDC31.
2. Attach GDC31 using 4 retaining screws and other hardware from removal procedure.
3. Attach connector and secure using slide-latch.
4. Close the circuit breaker.
5. Perform Equipment Checkout per 3.2.

7.2.2 Mode Annunciator Installation

1. Open the circuit breaker powering the GDC31.
2. Plug the lamp module into the sleeve.
3. Secure by engaging the two (2) pawls to the sleeve.
4. Plug the lamp module into the body - it will snap into place.
5. Close the circuit breaker.
6. Perform Equipment Checkout per 3.2.

8. DIAGRAMS

See appendices for wiring and equipment location diagrams.

9. SPECIAL INSPECTION REQUIREMENTS

NONE

10. APPLICATION OF SPECIAL TREATMENTS

NONE

11. DATA

Refer to Master Drawing List 1049-0000-XX.

12. SPECIAL TOOLS

Use the following crimp tool to ensure reliable crimp contact connections to connector J1.

- Crimp tool M22520/2-01
- Positioner M22520/2-08

13. RECOMMENDED OVERHAUL PERIODS

NONE

14. AIRWORTHINESS LIMITATION SECTION

The Airworthiness Limitations section is FAA approved and specifies maintenance required under Sections 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

NONE

15. REVISIONS

The Design Change Notification Procedure outlined in the DAC International Quality Assurance Manual will be used to inform service centers, distributors and the FAA of significant changes to this ICA. For further information, contact DAC International at (512) 331-5323 or www.dacint.com. In addition, the latest approved revision of this ICA is available at http://www.dacint.com/ecd/ecdtech.htm

APPENDIX A – Follow-On Installation Data Instructions

For follow-on installations, complete the data sheet and wiring diagram found on the following pages.

On the data sheet, complete the aircraft make and model, registration number and serial number sections. Then describe the location of the GDC31 converter in sufficient detail, using station location numbers or other common reference points. For example, "GDC31 located under the instrument panel, right outboard side." Use of sketches is recommended. Likewise describe the location of the annunciator/ switch. Describe or sketch the wire bundle routing.

Mark-up the Follow-on Installation Wiring Diagram to reflect the aircraft wiring. Use of wiring diagrams extracted from the installation manual, 1049-2510-01, or sketches are also acceptable.

Include a copy of this document along with the data sheet and wiring diagram with the aircraft records.

APPENDIX A – Follow-On Installation Data Sheet

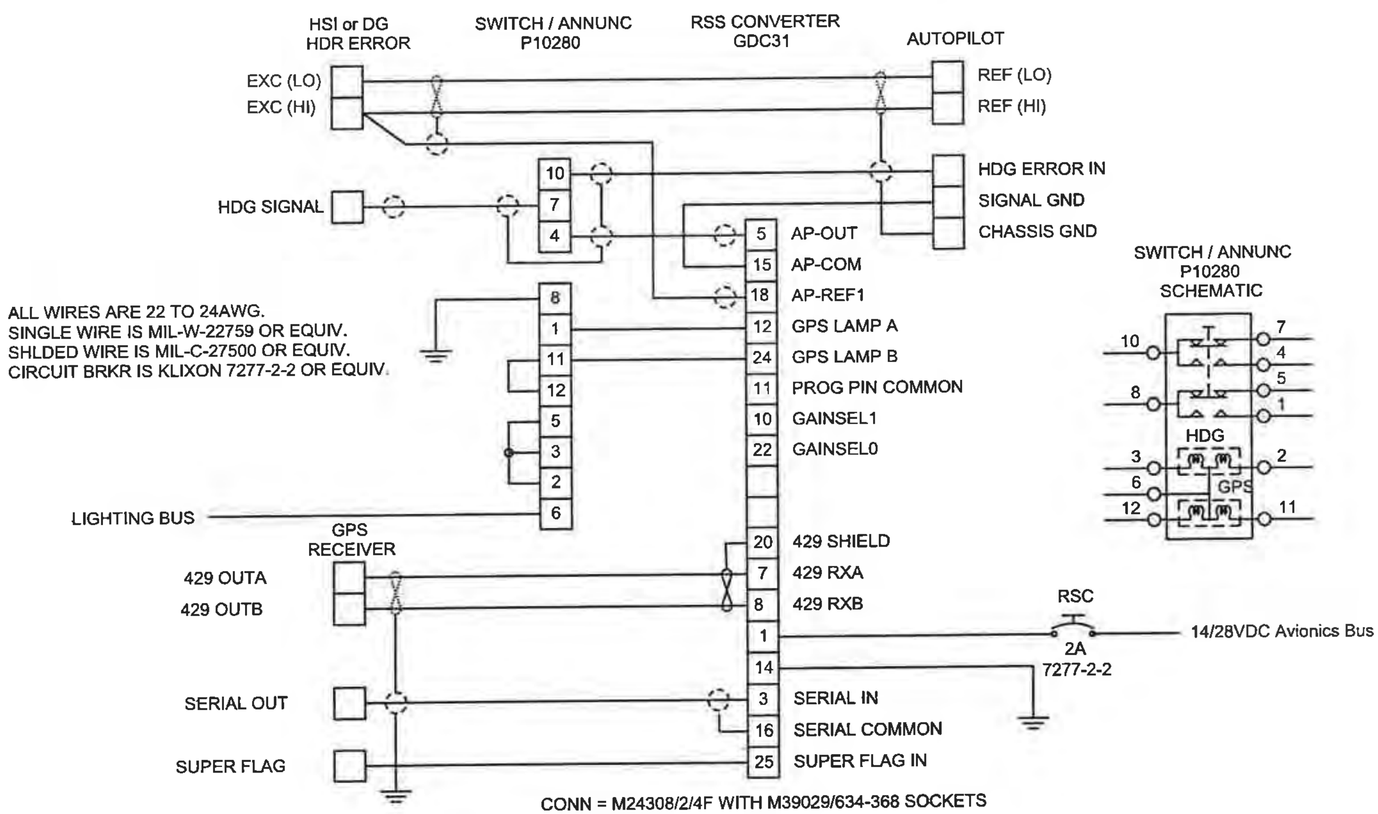
AIRCRAFT MAKE AND MODEL: ______________________________

AIRCRAFT TAIL NUMBER: ______________________________

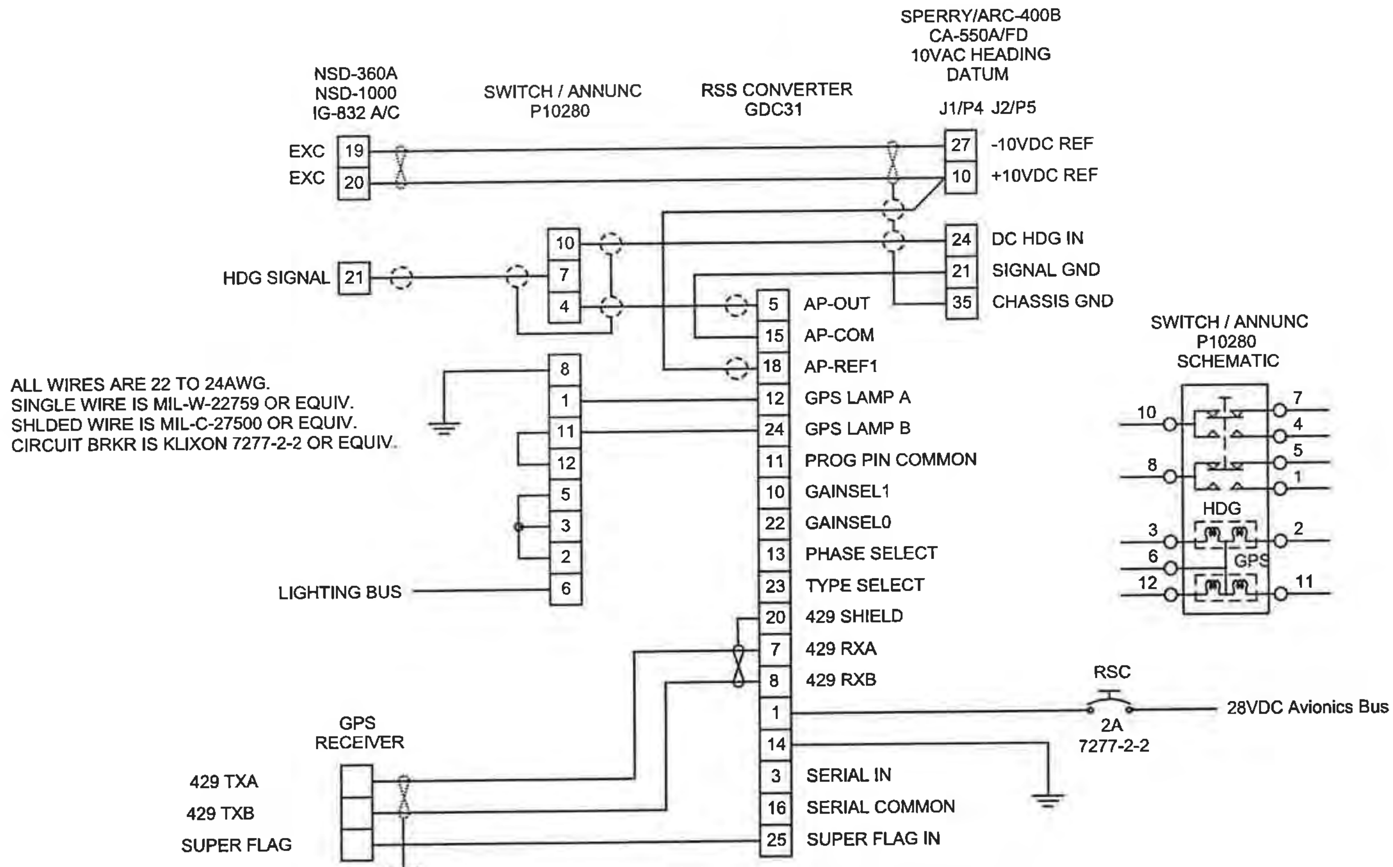
AIRCRAFT SERIAL NUMBER: ______________________________

LOCATION DESCRIPTION of GDC31 ROLL STEERING CONVERTER:
LOCATION DESCRIPTION of MODE/ANNUNCIATOR switch:
WIRE ROUTING:

APPENDIX A – Follow-On Installation Wiring Diagram

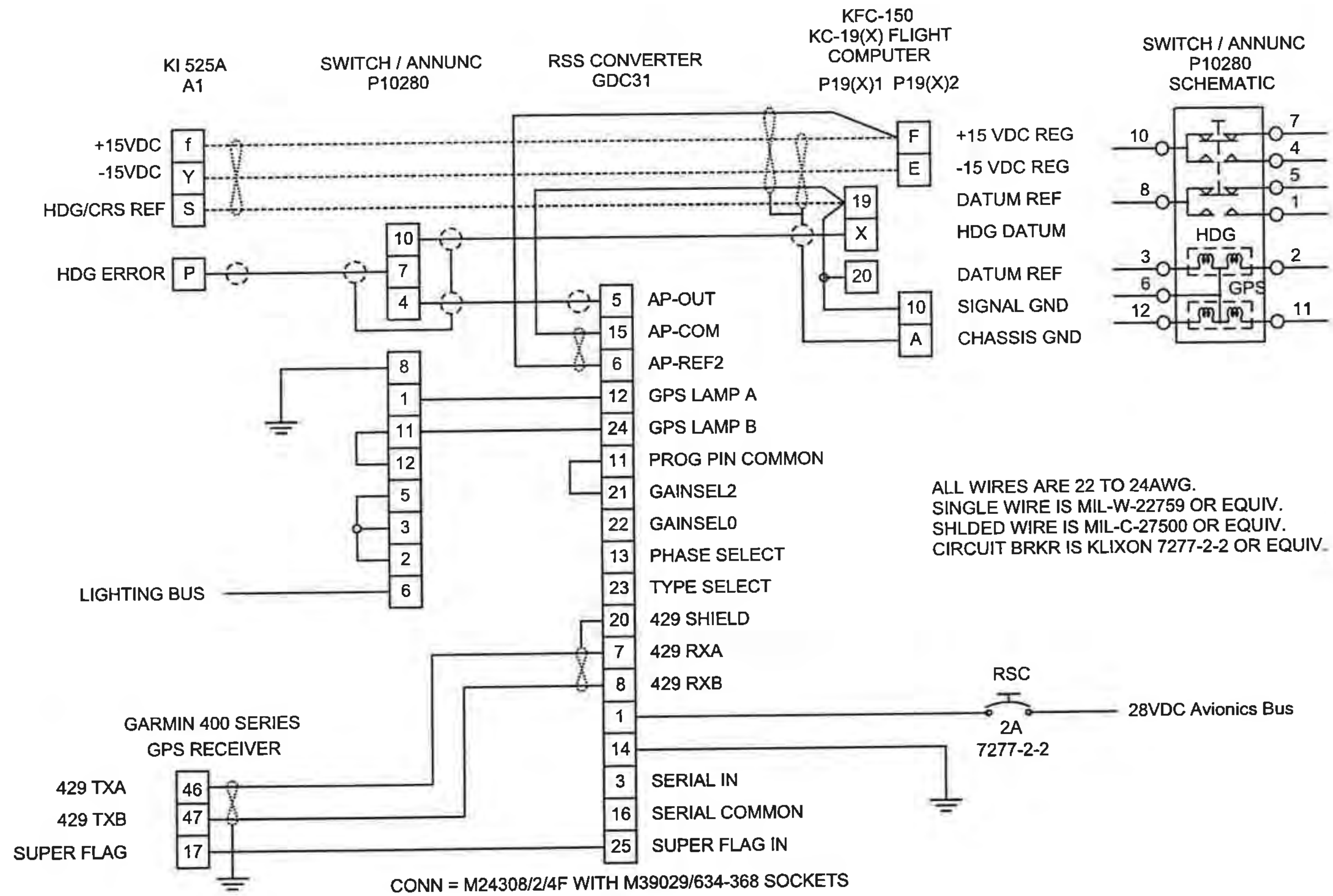


APPENDIX B – Wiring Diagram for the Cessna T210M Centurion

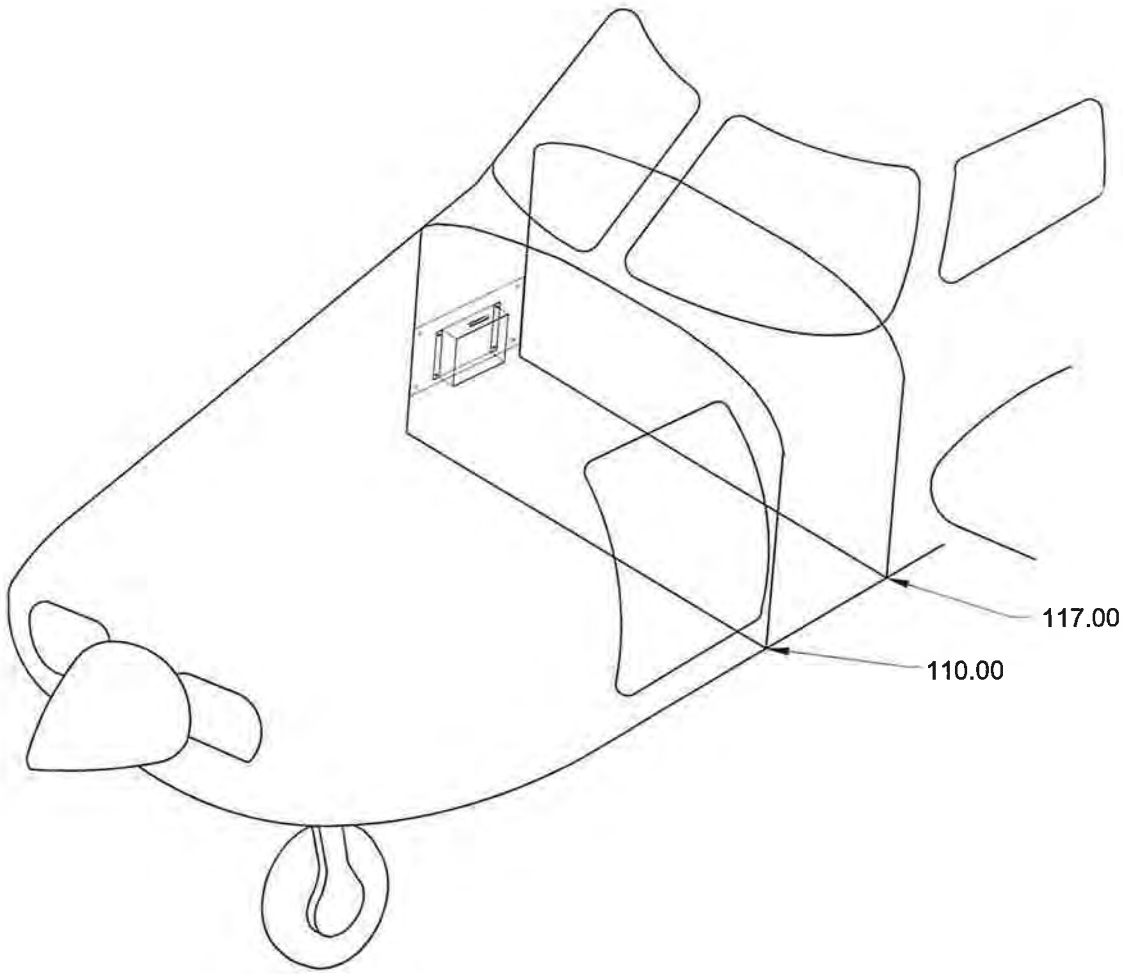


CONN = M24308/2/4F WITH M39029/634-368 SOCKETS

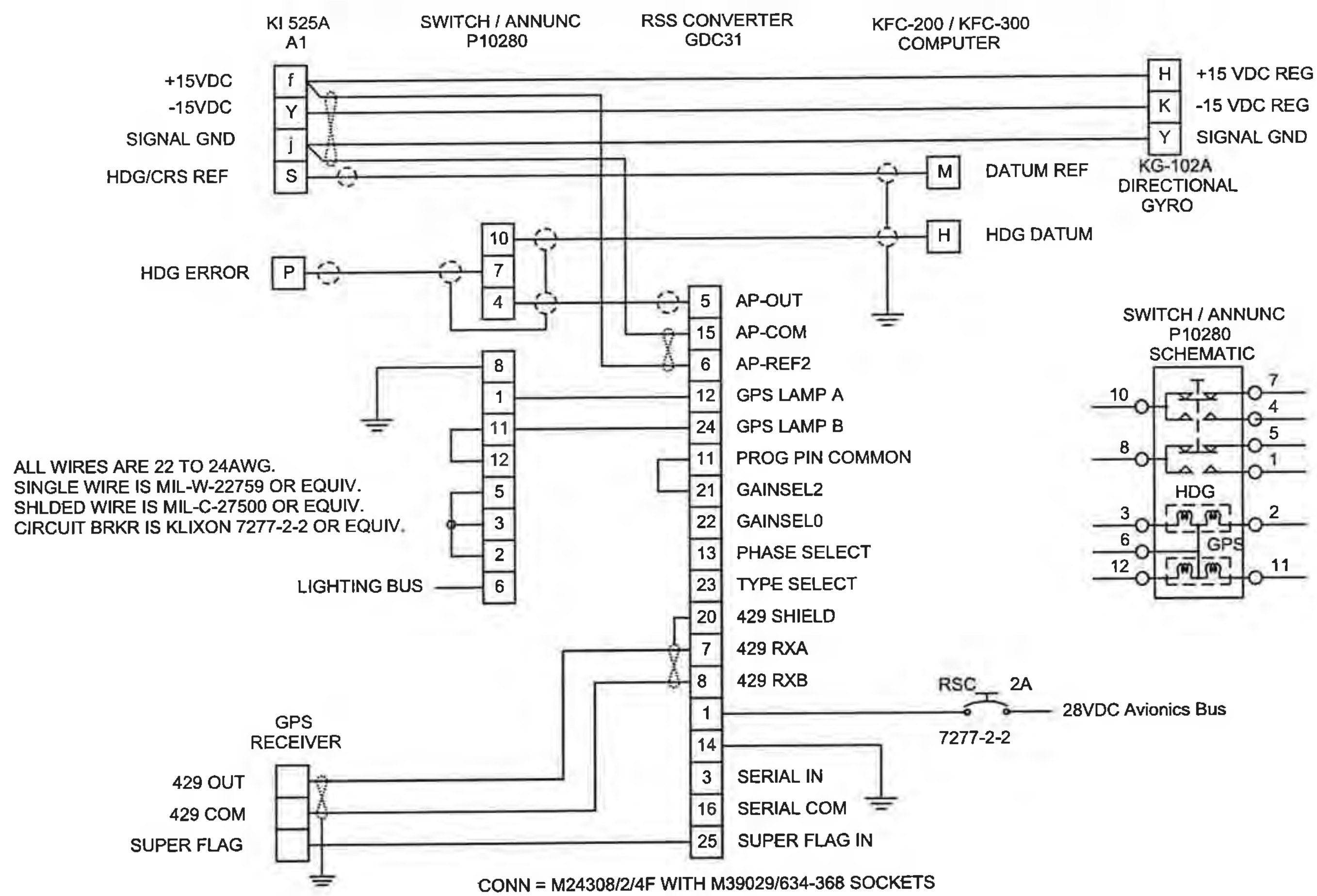
APPENDIX D – Wiring Diagram for the Piper PA46-310P Malibu



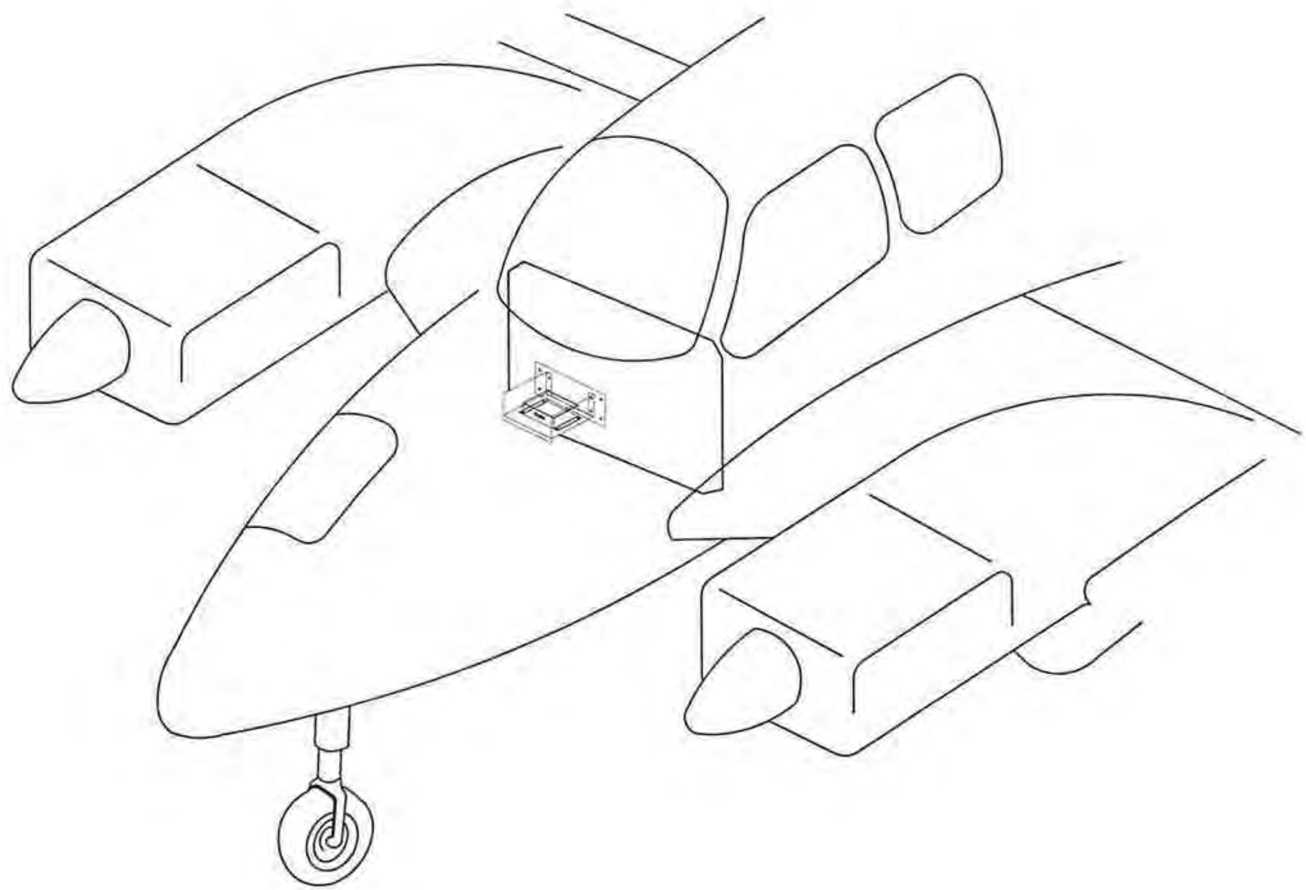
APPENDIX E – Equipment Locations for the Piper PA46-310P Mailbu



APPENDIX F – Wiring Diagram for the Beech 58P Baron



APPENDIX G – Equipment Locations for the Beech 58P Baron



NAYAK AVIATION CORPORATION
9410 E. Terminal Dr.
San Antonio, Texas 78216

S/N____________

R/N____________

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

FOR

PIPER PA-34-200T SENECA, SERIAL NUMBERS 34-7570001 AND UP, WITH PIPER FLIGHT MANUAL REPORT VB-628

This supplement must be attached to the Airplane Flight Manual when the Nayak Aviation Corporation Nacelle Fuel Tank Installation is installed in accordance with STC #SA2205SW. The information contained herein supplements the information of the basic aircraft flight manual; for limitations, procedures and performance data not contained in this document, consult the manual proper.

I. LIMITATIONS:

A. Do not transfer fuel until main tanks are at one-half full or less.

B. Transfer fuel in level flight only.

~~C. Previously approved operation in icing conditions prohibited unless Piper non-icing vents #43910-00 and #43910-01 are installed at Nayak vent locations under this STC.~~

Nayak vents are plumbed into main tank vent system

PLACARDS: as per SB#3

A. Adjacent to switches

Do not transfer until main tank is below half full.

II. PROCEDURES:

Transfer control switches are located on instrument panel.

Approximately 30 minutes are required to transfer all the fuel out of the Nacelle tanks.

III. PERFORMANCE:

No change.

IV. WEIGHT AND BALANCE DATA:

Nacelle tanks C.G. Location: 90.1 in. aft datum

FAA Approved: 6-26-75

Revised: 11-3-76

FUEL MOMENT

GALS.	WT.	MOMENT
30	180	16218
20	120	10812
10	60	5406
5	30	2703

FAA APPROVED: Jack E. Owens
for Don P. Watson
Chief, Engineering and
Manufacturing Branch
Southwest Region
Ft. Worth, Texas 76101

DATE: June 26, 1975

REVISED: November 3, 1976

NAYAK AVIATION CORPORATION
1403 Northern Blvd.
San Antonio, Texas 78216

S/N 34-7670011

R/N 3974X

FAA APPROVED SUPPLEMENT
TO
PILOT'S OPERATING HANDBOOK AND/OR
FAA APPROVED AIRPLANE FLIGHT MANUAL
FOR
PIPER PA-34-200T, S/N 34-7570001 AND UP
PIPER PA-34-220T, S/N 34-8133001 AND UP

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 when the Nayak Aviation Corporation Nacelle Fuel Tank is installed in accordance with STC No. SA2205SW. The information contained herein supplements the information of the basic POH and/or AFM; for limitations, procedures and performance information not contained in this Supplement, consult the basic POH and/or AFM.

I. LIMITATIONS:

A. Do not transfer fuel until main tanks are one-half full or less.

B. Transfer fuel in level flight only.

PLACARDS

Adjacent to switches

DO NOT TRANSFER UNTIL MAIN TANK IS BELOW HALF FULL.

II. PROCEDURES:

Transfer control switches are located on instrument panel.

Approximately 30 minutes are required to transfer all the fuel out of the nacelle tanks.

III. PERFORMANCE:

No Change.

FAA APPROVED: MAR 20 1986

IV. WEIGHT AND BALANCE DATA:

Nacelle tanks C.G. location: 90.1 in. aft. datum

FUEL MOMENT

GALLONS	WEIGHT	MOMENT
30	180	16218
20	120	10812
10	60	5406
5	30	2703

FAA APPROVED: [signature]

for Don P. Watson
Manager, Aircraft
Certification Division
Southwest Region, FAA
Fort Worth, Texas 76101

DATE: MAR 20 1986

Hartzell Propeller, Inc.
350 Washington Avenue
Piqua, Ohio 45356

FAA APPROVED

PILOT'S OPERATING HANDBOOK SUPPLEMENT

FOR

PIPER PA-34-200T

REGISTRATION NO. N3974X

SERIAL NO. 34-7670011

This Supplement must be attached to the Pilot's Operating Handbook dated August 23, 1976 when Hartzell three-bladed propellers are installed in accordance with Hartzell Drawing Number B-4060.

The information contained herein supplements or supersedes the basic handbook only in those areas listed herein. For limitations, procedures and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook.

FAA APPROVED Francis C Hook
Assistant Chief, Engineering and
Manufacturing Branch
Southern Region, FAA

DATE: December 21, 1979

Hartzell Propeller, Inc.
350 Washington Avenue
Piqua, Ohio 45356

SECTION I GENERAL

1.5 Propellers

This P.O.H. Supplement is required when Hartzell three-bladed propellers are installed in accordance with drawing B-4060.

SECTION II LIMITATIONS

2.7 Powerplant Limitations

(i) Propeller Manufacturer

Hartzell
Hub and Blade Models:

(a) Left: PHC-C3YF-2( )UF/FC7663-2R
Right: PHC-C3YF-2L( )UF/FJC7663-2R

OR

(b) Left: PHC-C3YF-2( )UF/FC7663B-2R
Right: PHC-C3YF-2L( )UF/FJC7663B-2R

(j) Propeller Diameter (inches)

Maximum	76 inches
Minimum	75 inches

2.9 Powerplant Instrument Markings

(a) Tachometer

Green Arc (Normal Operating Range)	500 RPM to 2575 RPM
Red Line (Maximum)	2575 RPM

No additional RPM Limitations.

2.33 Placards

The following placards are no longer applicable:

AVOID CONTINUOUS GROUND OPERATION 1700-2100 RPM IN CROSS/TAIL WIND OVER 10 KT.

AVOID CONTINUOUS OPERATIONS 2000-2200 RPM ABOVE 32" MANIFOLD PRESSURE.

SECTION III EMERGENCY PROCEDURES

No change

SECTION IV NORMAL PROCEDURES

No change

SECTION V PERFORMANCE

No change

FAA APPROVED December 21, 1979

Hartzell Propeller, Inc.
350 Washington Avenue
Piqua, Ohio 45356

Hartzell P.O.H. Supplement
No. B-4060
Piper PA-34-200T

SECTION VI WEIGHT AND BALANCE

Correct the aircraft weight and balance records to agree with the replaced items of the Bill of Material as below:

ITEMS INSTALLED ON THE AIRCRAFT	FOR HARTZELL TWO-BLADED PROPELLER CHANGE WEIGHT AND BALANCE CORRECTION WT. (LB.)	ARM (IN.)	MOMENT (LB-IN)
PHC-C3YF-2( )UF/FC7663-2R and PHC-C3YF-2L( )UF/FJC7663-2R	+32	20.3	+650
PHC-C3YF-2( )UF/FC7663B-2R and PHC-C3YF-2L( )UF/FJC7663B-2R	+34	20.3	+690
E-3 and E-3L or E-3 and E-8L (if Woodward governors are replaced)	+2.4	28.1	+67
C-4558 and C-4558-1	No significant change		

	FOR McCAULEY THREE-BLADED PROPELLER CHANGE		
PHC-C3YF-2( )UF/FC7663-2R and PHC-C3YF-2L( )UF/FJC7663-2R	-5.2	20.3	-106
PHC-C3YF-2( )UF/FC7663B-2R and PHC-C3YF-2L( )UF/FJC7663B-2R	-3.2	20.3	-65
E-3 and E-3L or E-3 and E-8L (if Woodward governors are replaced)	+2.4	28.1	+67
C-4558 and C-4558-1	No significant change		

SECTION VII DESCRIPTION AND OPERATION OF THE AIRPLANE AND ITS SYSTEMS

No change

SECTION VIII HANDLING, SERVICING AND MAINTENANCE

See applicable Hartzell and B. F. Goodrich Service Manuals supplied with propellers.

DATE

AIRPLANE FLIGHT MANUAL SUPPLEMENT

For

Aircraft Lighting & Components, LTD

Wingtip Landing Lights

THIS DOCUMENT TO BE KEPT WITH THE A.F.M. (or equivalent) AT ALL TIMES

Day or Night Operation: Turn Control Switch **ON.**

Caution: Lights may cause spatial disorientation if operated while in clouds

PRODUCTION DATA:
Model PA100
Serial no.
____

Lamp Replacement: Replace with GE 4509, 4595, H7604 lamp

AIRCRAFT LIGHTING & COMPONENTS, LTD
156 BUNKER CREEK ROAD, CHEHALIS, WA 98532 360-748-4089

Aeronautical Testing Service, Inc.
18820 59th Drive NE
Arlington, WA 98223
STC SA00109SE

STC SA00109SE

Report ATS 94-04a

AERONAUTICAL TESTING SERVICE, INC.

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT

for

PIPER SENECA II

SERIAL NUMBERS 34-7570001 THROUGH 34-7670393

N3974X
34-76700511

This Airplane Flight Manual Supplement must be carried in the airplane when an ATS, Inc. Vortex Generator Kit is installed in accordance with STC SA00109SE. The information contained herein supplements or supersedes the information in the airplane markings, placards, and manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this supplement, consult the airplane markings, placards, and manual.

FAA Approved: ______________________

Manager, Aircraft Modification Branch
Seattle Aircraft Certification Office

Date: August 3, 1994

Airplane Flight Manual Supplement Log of Revisions

Revision	Revised Pages	Description of Revision	FAA Approval and Date

04a

Airplane Flight Manual Supplement Log of Pages

Pages	Revision Number	Date
Title Page	Original Issue	August 3, 1994
i	"	"
ii	"	"
iii	"	"
1-1	"	"
1-2	"	"
2-1	"	"
6-1	"	"

ATS 94-04a

TABLE OF CONTENTS

J4a

SECTION 1

LIMITATIONS

NO CHANGES EXCEPT:

INTRODUCTION

The purpose of the ATS, Inc. VG Kit is to improve stall characteristics and to reduce V_{MCA} through control of boundary layer airflow. Although the ATS, Inc. VG Kit reduces V_{MCA}, the pilot is encouraged to fly by reference to the performance specifications in the airplane markings, placards, and manual to provide an increased margin of safety. The ATS, Inc. modification consists of fifty (50) vortex generators mounted on the wings and vertical fin and a split flap at the trailing edge of the flap. If more than four vortex generators are missing or damaged, the aircraft must be flown in accordance with the original markings, placards, and manual. If more than six vortex generators are missing or damaged, the aircraft is not airworthy and must be repaired before flight.

E. AIRSPEED LIMITATIONS
AND INDICATOR MARKINGS (Calibrated Airspeed)

MINIMUM CONTROL SPEED (Single Engine) — 72 MPH
The lowest airspeed at which the airplane is controllable with one engine operating, flaps up, and a five degree bank into the operating engine.

AIRSPEED INDICATOR MARKINGS

Radial Red Line (Minimum Control Speed - Single Engine) — 72 MPH

G. MAXIMUM ZERO FUEL WEIGHT — 4168 LBS

The new Zero Fuel Weight envelope is:

CG Postion (inches)	Weight (lbs)
94.60	4168
86.41 to 94.60	4000
82.00 to 94.60	3400

Straight line variation between the points above.

NO CHANGES EXCEPT:

K. PLACARDS

In full view of the pilot:

MAXIMUM TAKEOFF WEIGHT 4570 POUNDS
MAXIMUM LANDING WEIGHT 4342 POUNDS
MAXIMUM ZERO FUEL WEIGHT VARIES
WITH CENTER OF GRAVITY POSITION
CONSULT AFM SUPPLEMENT

In full view of the pilot:

MINIMUM SINGLE ENGINE CONTROL SPEED 72 MPH

SECTION 2

PROCEDURES

NO CHANGES EXCEPT:

C. EMERGENCY PROCEDURES

7. ENGINE FAILURE DURING CLIMB
   The single engine minimum control speed for this airplane is 72 mph (CAS) under standard contiions.

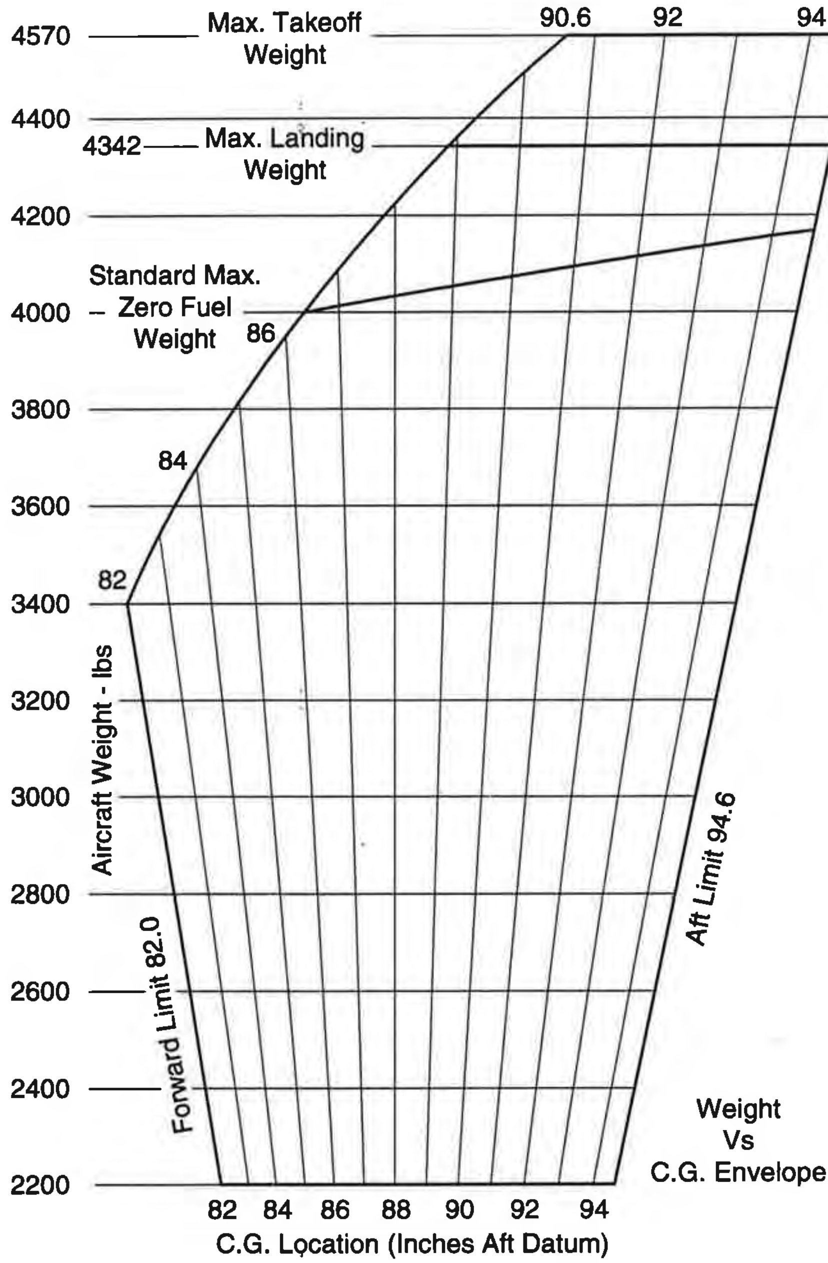
J4a

SECTION 6

WEIGHT AND BALANCE

NO CHANGES EXCEPT:

The addition of the ATS, Inc. Vortex Generator Kit increases the Zero Fuel Weight of Seneca II aircraft. Use the following C.G. Envelope Diagram



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

C.G. RANGE AND WEIGHT

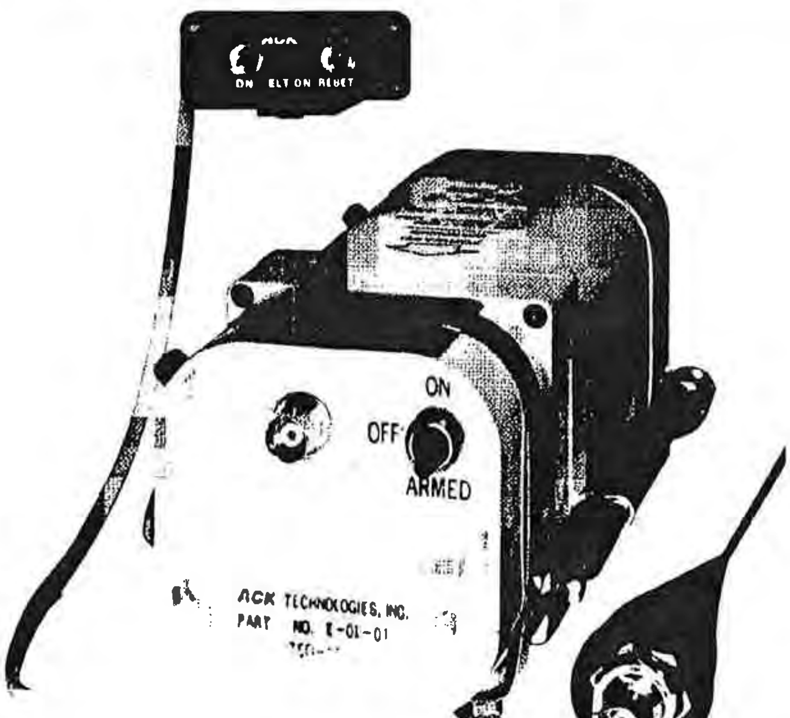
N3974X 335

ACK TECHNOLOGIES INC.

MODEL E-01 ELT

OPERATION MANUAL

"The conditions and test required for TSO authorization of this article are minimum performance standards. It is the responsibility of those desiring to install the article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. The article may be installed only when further evaluation by the applicant documents an acceptable installation and is approved by the Administrator."



IMPORTANT

WHEN INSTALLING DURACELL BATTERIES WITH POWER TEST STRIPS SEE PAGE 2 PARAGRAPH 3 AND FIG. 3 THE BOTTOM BATTERIES ARE DESIGNED TO BE A TIGHT FIT IN THE CASE. APPLY A LIGHT COAT OF AUTOMOTIVE PASTE WAX TO THE CELLS TO FACILITATE INSTALLATION. PLACE ALL FOUR LOWER CELLS IN THEIR PROPER POSITION AT THE TOP OF THE CASE AND PUSH INTO POSITION ALL AT THE SAME TIME.

REV. DATE 05/07/2002

SECTION 8 OPERATING INSTRUCTIONS

THE MODEL E-01 ELT IS AUTOMATICALLY ACTIVATED UPON SENSING A CHANGE OF VELOCITY, ALONG IT'S LONGITUDINAL AXIS, EXCEEDING 3.5 FEET PER SECOND. IT IS DESIGNED TO BE REMOVED FROM THE AIRCRAFT AND USED AS A PERSONAL LOCATING DEVICE WHEN IT IS NECESSARY TO LEAVE THE SCENE OF THE ACCIDENT.

THE FOLLOWING FUNCTION TEST MUST BE DONE EVERY 3 MONTHS TO VERIFY THAT THE TRANSMITTER, LATCH CIRCUIT, BATTERIES AND ASSOCIATED EQUIPMENT ARE OPERATING PROPERLY. REGULATIONS REQUIRE THAT TRANSMITTER TESTS ONLY BE DONE DURING THE FIRST 5 MINUTES OF EACH HOUR AND MUST NOT LAST FOR MORE THAN 3 AUDIO SWEEPS (1.5 SECONDS). IF YOU ARE AT A LOCATION WHERE THERE IS AN FAA CONTROL TOWER OR OTHER MONITORING FACILITY NOTIFY THE FACILITY BEFORE BEGINNING THE TESTS. **NEVER ACTIVATE THE ELT WHILE AIRBORNE FOR ANY REASON.**

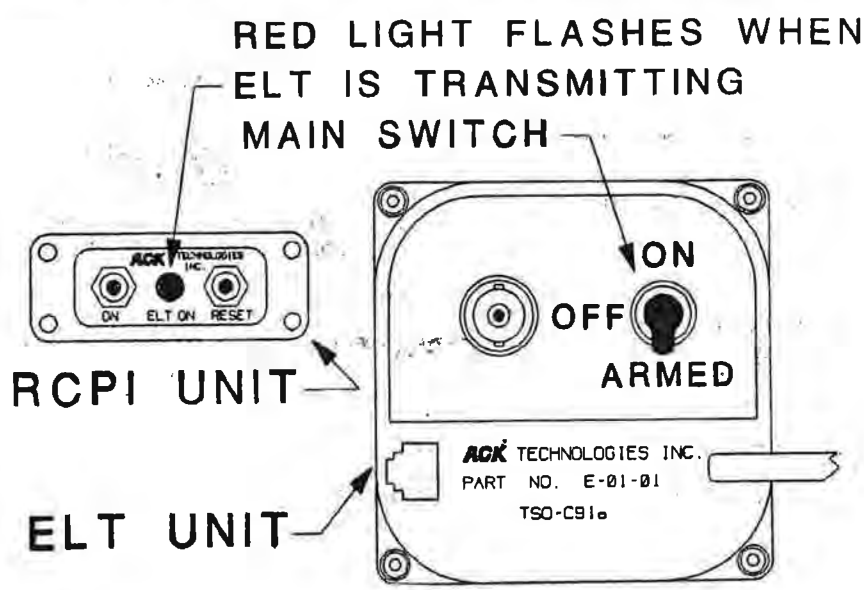
1. MONITOR 121.5 Mhz USING THE AIRCRAFT COM RECEIVER OR PORTABLE HAND HELD RECEIVER. **TURN THE SQUELCH ALL THE WAY DOWN OR OFF.**

2. PRESS THE "ON" BUTTON ON THE RCPI UNIT **(SEE FIGURE 12)** VERIFY THAT THE RED LED FLASHES. VERIFY THAT THE AUDIO SWEEP TONE CAN BE HEARD ON THE COM RECEIVER. PUSH THE "RESET" BUTTON ON THE RCPI UNIT. THE LED SHOULD STOP FLASHING AND THE AUDIO SWEEP TONE SHOULD STOP.

THE RED LED ON THE RCPI WILL FLASH ON AND OFF INDICATING THE ELT IS TRANSMITTING SHOULD THE ELT BE ACCIDENTLY ACTIVATED BY TURBULENCE, HARD LANDING, ETC. SHOULD THIS OCCUR UNDER ANY CONDITIONS OTHER THAN AN ACCIDENT REQUIRING IMMEDIATE ASSISTANCE, THE ELT SHOULD BE RESET BY PRESSING THE "RESET" BUTTON ON THE RCPI UNIT. **(SEE FIGURE 12)** IF THE AIRCRAFT IS ON THE GROUND AND THE "RESET" BUTTON DOES NOT CAUSE THE LED TO STOP FLASHING THE MAIN SWITCH ON THE ELT UNIT SHOULD BE SET TO THE OFF POSITION **(SEE FIGURE 12)**. IF AIRBORNE AND THE "RESET" BUTTON DOES NOT CAUSE THE LED TO STOP FLASHING. THE MAIN SWITCH ON THE ELT SHOULD BE SET TO THE OFF POSITION IF THE ELT IS ACCESSIBLE. IF THE ELT IS NOT ACCESSIBLE IN FLIGHT YOU SHOULD LAND AT THE NEAREST SUITABLE AIRPORT AND SET THE MAIN SWITCH TO THE OFF POSITION. IN EITHER CASE THE UNIT SHOULD BE INSPECTED BY A QUALIFIED FACILITY AS SOON AS POSSIBLE. THE AIRCRAFT MAY BE OPERATED WITH THE ELT REMOVED FOR INSPECTION OR REPAIR SUBJECT TO THE CONDITIONS OF FAR 91.207.

IN THE EVENT OF AN ACCIDENT THE EXTERNAL AIRCRAFT ANTENNA SHOULD BE INSPECTED FOR DAMAGE. IF THE ANTENNA IS BROKEN OFF OF THE AIRCRAFT THE ELT UNIT SHOULD BE REMOVED AND THE PORTABLE ANTENNA USED IN IT'S FULLY EXTENDED POSITION. IF THE ELT UNIT IS TO REMAIN AT THE AIRCRAFT SITE IT SHOULD BE PLACED ON A LARGE METALLIC PORTION OF THE AIRFRAME WITH IT'S ANTENNA POINTING SKYWARD. THE LED INDICATOR SHOULD BE FLASHING ON THE RCPI UNIT AFTER THE ACCIDENT. **IF THE ELT IS ACCESSIBLE AFTER THE ACCIDENT PLACE THE MAIN SWITCH IN THE ON POSITION AND MONITOR IT ON 121.5 Mhz FOR PROPER OPERATION IF POSSIBLE.**

IF THE ELT IS TO BE TAKEN ALONG AS A PORTABLE UNIT WHEN LEAVING THE SCENE OF THE ACCIDENT PLACE THE MAIN SWITCH IN THE ON POSITION AND KEEP THE ANTENNA VERTICALLY ORIENTED AS MUCH AS POSSIBLE. THE MODULAR CABLE ASSEMBLY PLUGS BACK INTO THE FRONT OF THE ELT UNIT TO FORM A HANDLE OR FOR USE AS A TETHER. WHEN USED AS A PORTABLE UNIT IN COLD WEATHER THE ELT UNIT SHOULD BE KEPT AS WARM AS POSSIBLE BY PLACING IT INSIDE YOUR CLOTHING WITH THE ANTENNA PROTRUDING.



A&P #	526797588
Name:	Rudy Tilman
Address:	14830 N. Black Canyon Hwy, #2081
	Phoenix, AZ 85053

FAA APPROVED FLIGHT MANUAL SUPPLEMENT
GARMIN GNS 530 VHF COMMUNICATIONS TRANSCEIVER / VOR/ILS RECEIVER / GPS RECEIVER / TAWS

AIRCRAFT MAKE: PIPER

AIRCRAFT MODEL: PA-34-200T

AIRCRAFT SERIAL NO.: 34-7670011

This document must be carried in the aircraft at all times. It describes the operating procedures for the Garmin GNS 530 navigation system when it has been installed in accordance with Garmin Installation Manual 190-00181-02 Rev. P and FAA Form 337 dated 12-15-2006.

For aircraft with an FAA Approved Airplane Flight Manual, this document serves as the FAA Approved Flight Manual Supplement for the Garmin GNS 530. For aircraft that do not have an approved flight manual, this document serves as the FAA Approved Supplemental Flight Manual for the Garmin GNS 530.

The Information contained herein supplements or supersedes the basic Airplane Flight Manual only in those areas listed herein. For limitations, procedures, and performance information not contained in this document, consult the basic Airplane Flight Manual.

FAA APPROVED

wp07 Date: 7/23/2008

Manager, Aircraft Certification Office
Federal Aviation Administration

City: SCOTTSDALE, State: AZ

LOG OF REVISIONS			
Revision Number	Revision Date	Description	ECO Number
A	4/25/00	Initial Release	-----
B	8/17/00	Remove reference to the Pilot's Guide Addendum for traffic and weather interfaces. Add a note to Normal Procedures about legs not flown by the GNS 530.	13932
C	3/23/01	Removed remaining references to traffic and weather interface pilot guide addendums. Corrected grammatical errors.	15429
D	9/12/02	Add primary oceanic/remote approval basis	19042
E	12/16/02	Add GTX 330 TIS interface	19780
F	9/08/04	Add North Atlantic MNPS with two GNS 530 units. Change AMJ 20X2 to ACJ 20X4. Add P-RNAV. Add Pilot's Guide Addendum statement. Add Terrain Awareness and Warning System (TAWS).	27340
G	10/25/04	Delete P-RNAV, Delete TAWS Abnormal Procedures for Loss of RAIM, Update SW versions of TAWS	28051

Aircraft Make: Piper
Aircraft Model: PA-34-200T
Aircraft Serial Number: 34-7670011

GARMIN GNS 530 VHF Communications Transceiver / VOR/ILS Receiver / GPS Receiver / TAWS

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SECTION I
GENERAL

1. The GNS 530 System is a fully integrated, panel mounted instrument, which contains a VHF Communications Transceiver, a VOR/ILS receiver, and a Global Positioning System (GPS) Navigation computer and a Terrain Awareness and Warning System (TAWS). The system consists of a GPS antenna, GPS Receiver, VHF VOR/LOC/GS antenna, VOR/ILS receiver, VHF COMM antenna and a VHF Communications Transceiver. The primary function of the VHF Communication portion of the equipment is to facilitate communication with Air Traffic Control. The primary function of the VOR/ILS Receiver portion of the equipment is to receive and demodulate VOR, Localizer, and Glide Slope signals. The primary function of the GPS portion of the system is to acquire signals from the GPS system satellites, recover orbital data, make range and Doppler measurements, and process this information in real-time to obtain the user's position, velocity, and time. The primary function of the TAWS portion of the system is to provide terrain situational awareness.

2. Provided the Garmin GNS 530's GPS receiver is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications for:

    - VFR/IFR enroute, terminal, and non-precision instrument approach (GPS, Loran-C, VOR, VOR-DME, TACAN, NDB, NDB-DME, and RNAV) operation within the U.S. National Airspace System in accordance with AC 20-138.

    - North Atlantic Minimum Navigation Performance Specification (MNPS) Airspace in accordance with AC 91-49, AC 91-70 and AC 120-33 provided two GNS 530 systems are installed or a single GNS 530 installation in combination with another approved sensor and are operable and receiving valid GPS signals. The GPS sensor meets the requirements of FAA Notice 8110.60 for primary navigation sensors. This does not constitute an operational approval.

    - The system meets RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138 and JAA GAI-20 ACJ 20X4 provided it is receiving usable navigation information from the GPS receiver.

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- The equipment as installed has been found to comply with the requirements for GPS primary means of navigation in oceanic and remote airspace, when used in conjunction with the 500 Series Trainer Program incorporating the FDE Prediction Program. This does not constitute an operational approval.

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

SECTION II
LIMITATIONS

1. The Garmin GNS 530 Pilot's Guide, P/N 190-00181-00, Rev. C, dated April 2003 or later appropriate revision must be immediately available to the flight crew whenever navigation is predicated on the use of the system. In addition to the Pilot's Guide, the 400/500 Series Garmin Display Interfaces Pilot's Guide Addendum, P/N 190-00140-13, Rev B, dated September 2004 also must be immediately available to the flight crew if lightning detection, Traffic Information Service (TIS), or TAWS is interfaced to the system or if primary means oceanic/remote navigation is conducted.

2. The GNS 530 must utilize the following or later FAA approved software versions:

Function	Sub-System Version				
	Main	GPS	COM	VOR/LOC	G/S
Initial Approval	2.00	2.00	1.22	1.25	2.00
Traffic / Weather Interface	2.00	2.00	1.22	1.25	2.00
Primary Oceanic/Remote	3.00	3.00	1.22	1.25	2.00
TIS Interface	4.00	2.00	1.22	1.25	2.00
TAWS	5.02	3.01	6.00	3.01	2.03

The Main software version is displayed on the GNS 530 self test page immediately after turn-on for 5 seconds. The remaining system software versions can be verified on the AUX group sub-page 2, "Software / Database Versions".

1. IFR enroute and terminal navigation predicated upon the GNS 530's GPS Receiver is prohibited unless the pilot verifies the currency of the data base or verifies each selected waypoint for accuracy by reference to current approved data.

2. Instrument approach navigation predicated upon the GNS 530's GPS Receiver must be accomplished in accordance with approved instrument approach procedures that are

retrieved from the GPS equipment data base. The GPS equipment database must incorporate the current update cycle.

(a) Instrument approaches utilizing the GPS receiver must be conducted in the approach mode and Receiver Autonomous Integrity Monitoring (RAIM) must be available at the Final Approach Fix.

(b) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay with the GNS 530's GPS receiver is not authorized.

(c) Use of the GNS 530 VOR/ILS receiver to fly approaches not approved for GPS requires VOR/ILS navigation data to be present on the external indicator.

(d) When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS or Loran-C navigation, the aircraft must have the operational equipment capable of using that navigation aid, and the required navigation aid must be operational.

(e) 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 normal position to land.

1. If not previously defined, the following default settings must be made in the "AUX Pages, SETUP Page, UNITS/POSITION" menu option of the GNS 530 prior to operation (refer to the Garmin GNS 530 Pilot's Guide, P/N 190-00181-00, Rev. C, dated April 2003 or later appropriate revision for procedure if necessary):

(a) **dis, spd** .... ^{n}m ^{k}t (sets navigation units to "nautical miles" and "knots")
(b) **alt, vs** .... ^{f}t fpm (sets altitude units to "feet" and "feet per minute")
(c) **map datum** ... WGS 84 (sets map datum to WGS-84, see note below)
(d) **posn** .... deg-min (sets navigation grid units to decimal minutes)

NOTE: In some areas outside the United States, datum's other than WGS-84 or NAD-83 may be used. If the GNS 530 is authorized for use by the appropriate Airworthiness authority, the required geodetic datum must be set in the GNS 530 prior to its use for navigation.

2. Navigation must not be predicated upon the use of the TAWS.

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

3. To avoid giving unwanted alerts, the TAWS must be inhibited when landing at an airport that is not included in the airport database.

4. Pilots are authorized to deviate from their current ATC clearance to the extent necessary to comply with TAWS warnings.

5. The TAWS databases have an area of coverage as detailed below:

   (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.

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

SECTION III
EMERGENCY PROCEDURES

ABNORMAL PROCEDURES

1. If Garmin GNS 530 navigation information is not available or invalid, utilize remaining operational navigation equipment as required. If the TAWS option is installed, TAWS will not be available. A white 'TER N/A' or red 'TER FAIL' annunciator will be displayed in the lower left corner of the GNS 530 display.

2. If "RAIM position warning" message is displayed the system will flag and no longer provide GPS based navigational guidance. The crew should revert to the GNS 530 VOR/ILS receiver or an alternate means of navigation other than the GNS 530's GPS Receiver. If the TAWS option is installed, TAWS will not be available and a white 'TER N/A' status annunciator will be displayed by the GNS 530.

3. If "RAIM is not available" message is displayed in the enroute, terminal, or initial approach phase of flight, continue to navigate using the GPS equipment or revert to an alternate means of navigation other than the GNS 530's GPS receiver appropriate to the route and phase of flight. When continuing to use GPS navigation, lateral position must be verified every 15 minutes using the GNS 530's VOR/ILS receiver or another IFR-approved navigation system.

4. If " RAIM is not available " message is displayed while on the final approach segment, GPS based navigation will continue for up to 5 minutes with approach CDI sensitivity (0.3 nautical mile). After 5 minutes the system will flag and no longer provide course guidance with approach sensitivity. Missed approach course guidance may still be available with 1 nautical mile CDI sensitivity by executing the missed approach. If flying a GPS based approach, execute the appropriate missed approach procedure. After completing the missed approach procedure, refer to paragraph 3 above before using GPS based navigation.

5. In an in-flight emergency, depressing and holding the Comm transfer button for 2 seconds will select the emergency frequency of 121.500 MHz into the "Active" frequency window.

6. If the white "TER N/A" status annunciator is displayed by the GNS 530, the system will no longer provide TAWS alerting or display relative terrain elevations. The crew must maintain compliance with procedures that ensure minimum terrain separation.

7. If the red "TER FAIL" status annunciator is displayed by the GNS 530, the system will no longer provide TAWS alerting or display relative terrain elevations. The crew must maintain compliance with procedures that ensure minimum terrain separation.

8. If a "TAWS has failed" message is displayed by the GNS 530, the system will no longer provide TAWS alerting or display relative terrain elevations. The crew must maintain compliance with procedures that ensure minimum terrain separation

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SECTION IV
NORMAL PROCEDURES

1. DETAILED OPERATING PROCEDURES

Normal operating procedures are described in the GARMIN GNS 530 Pilot's Guide, P/N 190-00181-00, Rev. C, dated April 2003, or later appropriate revision. Normal operating procedures for the Traffic Information Service (TIS) Interface, the Weather Data Link Interface, and the Terrain Awareness and Warning System (TAWS) Interface are described in the 400/500 Series GARMIN Display Interfaces Pilot's Guide Addendum, P/N 190-00140-13, Rev B, dated September 2004.

2. PILOT'S DISPLAY

The GNS 530 System data will appear on the Pilot's CDI/HSI. The source of data is either GPS or VLOC as annunciated on the display above the CDI key.

NOTE: It is the pilot's responsibility to assure that published or assigned procedures are correctly complied with. Course guidance is not provided for all possible ARINC 424 leg types. See the GNS 530 Pilot's Guide for detailed operating procedures regarding navigation capabilities for specific ARINC 424 leg types.

3. AUTOPILOT / FLIGHT DIRECTOR OPERATION

Coupling of the GNS 530 System steering information to the autopilot/flight director can be accomplished by engaging the autopilot/flight director in the NAV or APR mode.

When the autopilot/flight director system is using course information supplied by the GNS 530 System and the course pointer is not automatically driven to the desired track, the course pointer on the HSI must be manually set to the desired track (DTK) indicated by the GNS 530. For detailed autopilot/flight director operational instructions, refer to the FAA Approved Flight Manual Supplement for the autopilot/flight director.

4. CROSSFILL OPERATIONS

Crossfill capabilities exist between the GNS 530 and GNC 500/GNC 400 Product Series. Refer to the Garmin GNS 530 Pilot's Guide for detailed crossfill operating instructions for dual product series installations.

5. AUTOMATIC LOCALIZER COURSE CAPTURE

By default, the GNS 530 automatic localizer course capture feature is enabled. This feature provides a method for system navigation data present on the external indicators to be switched automatically from GPS guidance to localizer / glide slope guidance as the aircraft approaches the localizer course inbound to the final approach fix. If an offset from the final approach course is being flown, it is possible that the automatic switch from GPS course guidance to localizer / glide slope course guidance will not occur. It is the pilot's responsibility to ensure correct system navigation data is present on the external indicator before continuing a localizer based approach beyond the final approach fix. Refer to the GNS 530 Pilot's Guide for detailed operating instructions.

6. DISPLAY OF LIGHTNING STRIKE DATA

Lightning strike data detected by the BFGoodrich WX-500 Stormscope will appear on the moving map and weather pages of the GNS 530. For detailed operating instructions regarding the interface of the GNS 530 with the WX-500, refer to the WX-500 Pilot's Guide and the 400/500 Series Garmin Display Interfaces Pilot's Guide Addendum, P/N 190-00140-13, Rev B, dated September 2004 for the WX-500 Stormscope interface.

7. DISPLAY OF TRAFFIC INFORMATION SERVICE DATA

TIS surveillance data uplinked by Air Traffic Control (ATC) radar through the GTX 330 Mode S Transponder will appear on the moving map and traffic display pages of the GNS 530. For detailed operating instructions regarding the interface of the GNS 530 with the GTX 330, refer to the 400/500 Series Garmin Display Interfaces Pilot's Guide Addendum, P/N 190-00140-13, Rev B, dated September 2004 for the TIS System interface.

8. TERRAIN AWARENESS CAUTION

When a terrain awareness CAUTION occurs, take positive corrective action until the alert ceases. Stop descending or initiate either a climb or a turn, or both, as necessary, based on analysis of all available instruments and information.

9. TERRAIN AWARENESS WARNING

If a terrain awareness WARNING occurs, immediately initiate and continue a climb that will provide maximum terrain clearance, or any similar approved vertical terrain escape maneuver, until all alerts cease. Only vertical maneuvers are recommended, unless either operating in visual meteorological conditions (VMC), or the pilot determines, based on all available information, that turning in addition to the vertical escape maneuver is the safest course of action, or both.

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10. TERRAIN INHIBIT

The TAWS Forward Looking Terrain Avoidance (FLTA) and Premature Descent Alerts (PDA) functions may be inhibited to stop alerting for acceptable flight conditions (such as below glideslope maneuvers). For detailed operating instructions regarding the GNS 530 TAWS interface, refer to the 400/500 Series Garmin Display Interfaces Pilot's Guide Addendum, P/N 190-00140-13, Rev B, dated September 2004 for the TAWS System interface.

SECTION V
PERFORMANCE

No change.

SECTION VI
WEIGHT AND BALANCE

See current weight and balance data.

SECTION VII
AIRPLANE & SYSTEM DESCRIPTIONS

See The Garmin GNS 530 Pilot's Guide, P/N 190-00181-00, Rev. C, dated April 2003 or later appropriate revision for a complete description of the GNS 530 system.

See the 400/500 Series Garmin Display Interfaces Pilot's Guide Addendum, P/N 190-00140-13, Rev B, dated September 2004 for information pertaining to the Traffic Information Service (TIS) Interface, the Weather Data Link Interface, and the Terrain Awareness and Warning System (TAWS) Interface.