Cessna®

1963

205

MODEL 205

OWNER'S MANUAL

PERFORMANCE - SPECIFICATIONS

	MODEL 206
GROSS WEIGHT	3600 lbs
SPEED, BEST POWER MIXTURE:	
Top Speed at Sea Level	173 mph
Cruise, 75% Power at 6500 ft	163 mph
RANGE, NORMAL LEAN MIXTURE:	
Cruise, 75% Power at 6500 ft	730 mi
63.5 Gallons, No Reserve	4.5 hrs
	162 mph
Cruise, 75% Power at 6500 ft	920 mi
80 Gallons, No Reserve	5.7 hrs
	162 mph
Optimum Range at 10,000 ft	1015 mi
63.5 Gallons, No Reserve	8.9 hrs
	114 mph
Optimum Range at 10,000 ft	1275 mi
80 Gallons, No Reserve	11.2 hrs
	114 mph
RATE OF CLIMB AT SEA LEVEL	965 fpm
SERVICE CEILING	16,100 ft
TAKE-OFF:	
Ground Run	686 ft
Total Distance Over 50-foot Obstacle	1465 ft
LANDING:	
Landing Roll	625 ft
Total Distance Over 50-foot Obstacle	1510 ft
EMPTY WEIGHT (6-passenger version)	1750 lbs
USEFUL LOAD	1550 lbs
WING LOADING: Pounds/Sq Foot	18.8 lbs
POWER LOADING: Pounds/HP	12.7 lbs
FUEL CAPACITY: Total	
Standard Tanks	65 gal.
Optional Long Range Tanks	84 gal.
OIL CAPACITY: Total	12 qts
PROPELLER: Constant Speed, Dia	82 inches
POWER:	
Continental Fuel Injection Engine	IO-470-S
260 rated HP at 2625 RPM	

D1-13/A-D/2000/7-15-62

Congratulations . . . . . .

Welcome to the ranks of Cessna owners! Your Cessna has been designed and constructed to give you the most in performance, economy, and comfort. You will find flying it, either for business or pleasure, a pleasant and profitable experience.

This Owner's Manual has been prepared as a guide to help you get the most pleasure and utility from your airplane. It contains information about your Cessna's equipment, operating procedures, and performance; and suggestions for its servicing and care. We urge you to read it from cover to cover, and to refer to it frequently.

Our interest in your flying pleasure has not ceased with your purchase of a Cessna. World-wide, the Cessna Dealer Organization backed by the Cessna Service Department stands ready to serve you. The following services are offered only by your Cessna Dealer:

FACTORY TRAINED MECHANICS to provide you with courteous expert service.

FACTORY APPROVED SERVICE EQUIPMENT to provide you with the most efficient and accurate workmanship possible.

A STOCK OF GENUINE CESSNA SERVICE PARTS on hand when you need them.

THE LATEST AUTHORITATIVE INFORMATION FOR SERVICING GESSNA AIRPLANES, since Cessna Dealers have all of the Service Manuals and Parts Catalogs, kept current by Service Letters and Service News Letters published by Cessna Aircraft Company.

We urge all Cessna owners to use the Cessna Dealer Organization to the fullest.

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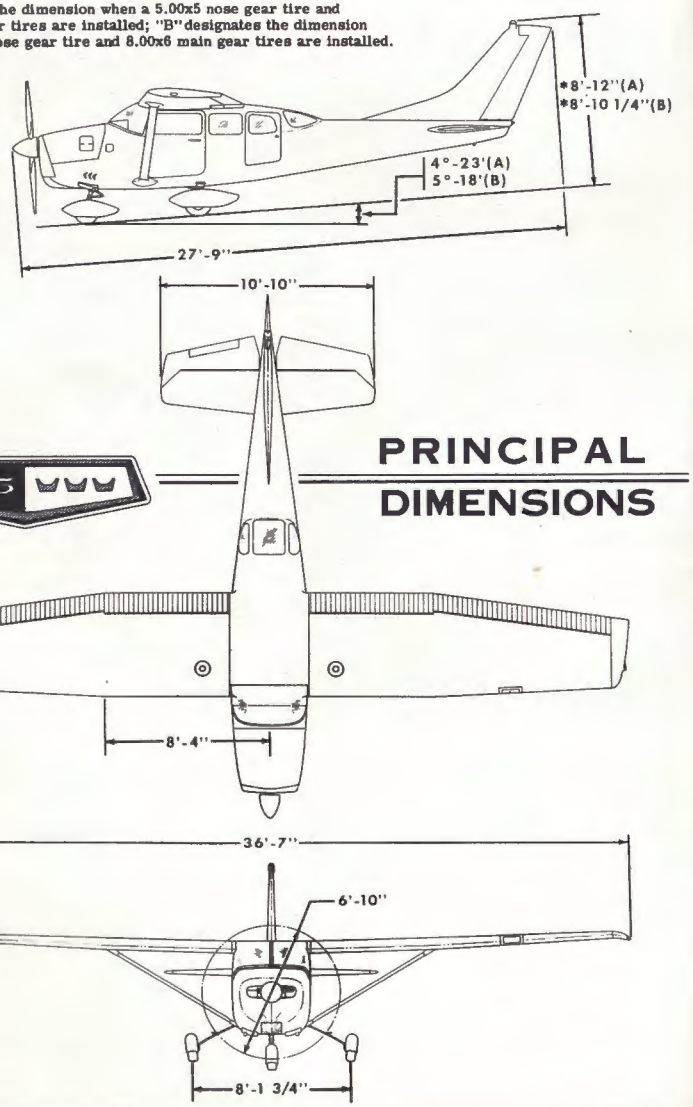
*Height of airplane with optional rotating beacon installed.

"A" designates the dimension when a 5.00x5 nose gear tire and 6.00x6 main gear tires are installed; "B" designates the dimension when a 6.00x6 nose gear tire and 8.00x6 main gear tires are installed.



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PRINCIPAL DIMENSIONS

Section 1

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DESCRIPTION

One of the first steps in obtaining the utmost performance, service, and flying enjoyment from your Cessna is to familiarize yourself with your airplane's equipment, systems, and controls. This can best be done by reviewing this equipment while sitting in the airplane. Those items whose function and operation are not obvious are covered herein.

ENGINE CONTROLS.

THROTTLE, MIXTURE AND PROPELLER CONTROLS.

The push-pull throttle incorporates a lock button to secure it in any desired setting. To operate the throttle, depress the lock button, then adjust the control knob as necessary. Release pressure on the lock button to lock the control. To make minor adjustments simply screw the control in or out without pressing the button.

The push-pull mixture control incorporates a lock button to prevent inadvertent leaning or shutting off the fuel supply. To operate the control, depress the lock button, then push the knob in for rich mixture or pull it out for lean mixture. Pulling the knob all the way out is idle cut-off for stopping the engine. Release pressure on the lock button to lock the control. To make minor adjustments simply screw the control in or out without pressing the button.

The propeller control is the push-pull type and changes the setting of the propeller governor to regulate engine speed. It is identical, in operation, to the mixture control. Pushing the knob forward increases RPM; pulling the knob out decreases RPM.

For all ground operations, and for take-off, the propeller control should be full in (high RPM). After take-off, reduce throttle first, then reduce RPM. Since a small control movement will produce a considerable RPM change, you should set up climb and cruise RPM by screwing the knob in or out.

Propeller surging (RPM variation up and down several times before engine smooths out and becomes steady) can be prevented by smooth throttle and propeller control knob operation. Do not change the throttle and propeller control settings with jerky and rapid motions.

INDUCTION HOT AIR KNOB.

The induction hot air knob is used

to select either filtered cold air from the induction air scoop or heated air. In the unlikely event that ice should form in the induction system, as evidenced by an unexplained drop in manifold pressure, pull the induction hot air knob full out. Do not use an intermediate position.

IGNITION-STARTER SWITCH.

A five-position ignition-starter switch controls the dual magneto ignition and starter systems. The switch positions are labeled clockwise as follows: "OFF," "R," "L," "BOTH" and "START."

The engine should be operated on both magnetos ("BOTH" position). The "R" and "L" positions are for checking purposes only. When the switch is turned to the spring-loaded "START" position, the starter turns over the engine for starting. As the switch is released, it automatically returns to "BOTH."

Refer to Sections II and III for further discussion on the use of the ignition-starter switch.

ENGINE INSTRUMENTS.

FUEL FLOW INDICATOR.

The fuel flow indicator used with the Continental fuel injection system is a fuel pressure gage calibrated to indicate the approximate gallons per hour of fuel being metered to the engine.

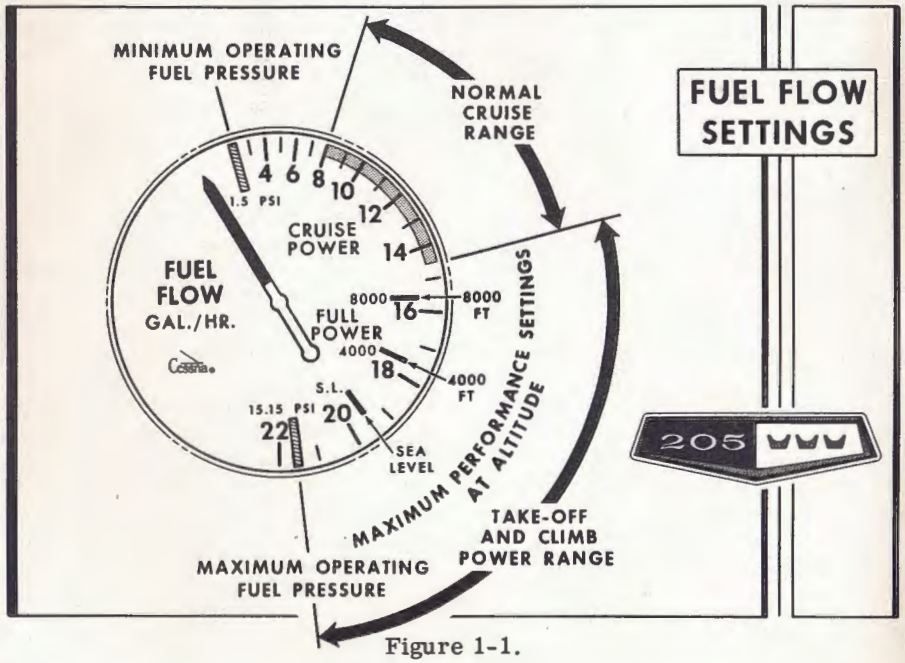


Figure 1-1.

The indicator dial is marked with red radials at the minimum and maximum allowable operating fuel pressures. The low flow range of the indicator has a green arc for normal cruise fuel flows while the high flow portion has white radial lines for take-off and climb settings for full power at various altitudes. The full power markings represent maximum performance mixtures for the altitudes shown, making it practical to lean the mixture on a high altitude take-off and during full power climbs for maximum power and performance.

In the cruise power range the green arc covers the normal lean fuel flow required from 45 to 75% power. Your Cessna Power Computer or the cruise performance tables on pages 6-4 thru 6-8 show the normal lean fuel flow for cruising power settings.

NOTE

Best power mixture can be obtained for any power setting shown on your Cessna Power Computer by adding 1 GPH to the normal lean fuel flow on the computer.

Cruising climbs (page 3-5) should be conducted at approximately 15 GPH up to 6500 feet and at 1 GPH more than the normal lean fuel flow shown on the Cessna Power Computer at higher altitudes and lower powers.

COWL FLAPS.

Cowl flaps, adjusted to the need, will meter enough air for the adequate cooling and maximum efficiency of the engine under varying conditions. Opening the cowl flaps, while on the ground, steps up the volume of air necessary for engine cooling. In flight, closing the cowl flaps, as required, restricts the flow of air through the engine compartment, thereby reducing the cooling and cowl flap drag to a minimum.

The cowl flaps are controlled by a lever on the control pedestal. Nine positions, including full open and full closed, are provided by means of locking holes in the lever mechanism. To change the cowl flap settings, move the lever to the left, out of the locking hole, then reposition. Make sure the lever moves into the locking hole at the new setting.

FUEL SYSTEM.

Fuel is supplied to the engine from two tanks, one in each wing (refer to figure 1-3). From each tank, fuel flows by gravity through a fuel reservoir tank to the fuel selector valve. Depending upon the setting of the selector valve, fuel from the left or right tank flows through a fuel strainer and check valve in the electric auxiliary fuel pump to the engine-driven fuel pump, by-passing the electric fuel pump when it is not operating. Pressurized fuel from the engine-driven fuel pump then flows through a fuel unit to a distributor manifold which disperses the fuel to a fuel nozzle on each engine cylinder.

FUEL QUANTITY DATA (U.S. GALLONS)

SELECTOR VALVE POSITION	USABLE FUEL (ALL FLIGHT CONDITIONS)	USABLE FUEL (LEVEL FLIGHT ONLY)	USABLE FUEL (CLIMBING-DESCENDING)	TOTAL VOLUME
STANDARD TANKS				
LEFT TANK	31.7	31.9	32.4	32.5
RIGHT TANK	31.7	31.9	32.4	32.5
LONG RANGE TANKS (OPTIONAL)				
LEFT TANK	40.0	41.0	41.9	42.0
RIGHT TANK	40.0	41.0	41.9	42.0

DECREASE IN USABLE FUEL IN ALL FLIGHT CONDITIONS IS DUE TO DETRIMENTAL EFFECTS OF UNCOORDINATED FLIGHT (SLIPS OR SKIDS) OR TURBULENT AIR THAT MAY BE ENCOUNTERED IN NORMAL FLYING CONDITIONS.

Figure 1-2.

Vapor and excess fuel from the engine-driven fuel pump and fuel metering unit are returned to the main tank being used by way of the selector valve and reservoir tank.

Refer to figure 1-2 for fuel quantity data. See the Servicing Diagram (figure 5-1) for a summary of fuel system servicing information.

FUEL SELECTOR VALVE.

The rotary-type fuel selector valve has three positions, labeled "BOTH OFF," "LEFT ON" and "RIGHT ON." The "BOTH OFF" position seals both wing tanks off from the rest of the fuel system and allows no fuel to pass beyond the selector valve. The "LEFT ON" position provides fuel flow from the left tank to the engine. Similarly, the "RIGHT ON" position provides flow from the right tank to the engine. Both the fuel feed and vapor return lines for each tank go through the selector valve, so that fuel returns to the tank from which it is drawn. Fuel cannot be used from both tanks simultaneously.

NOTE

The fuel selector valve handle indicates the setting of the valve by its position above the dial. Take-off and land with the handle turned to the fullest tank.

AUXILIARY FUEL PUMP SWITCH.

The auxiliary fuel pump switch controls the electric auxiliary pump which supplies fuel flow for starting and for engine operation if the engine-driven pump should fail.

The switch is a split rocker type.

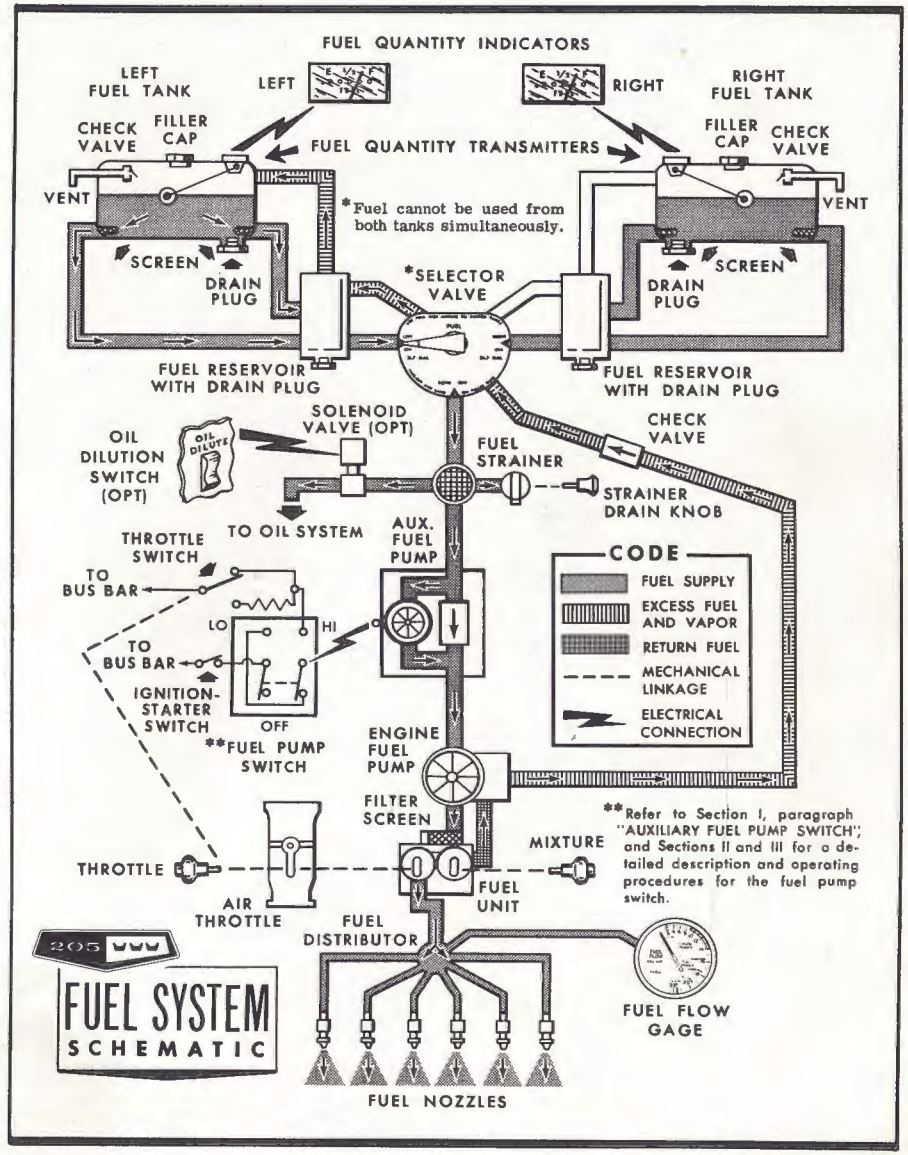


Figure 1-3.

The right half of the switch, labeled "LO," is used for starting. With the switch in the "LO" position, and the ignition-starter switch turned to "START," the auxiliary fuel pump will operate at a low flow rate (providing proper fuel mixture for starting) as the engine is being turned over with the starter.

NOTE

The auxiliary fuel pump will not operate in the "LO" position until the ignition switch is turned to the "START" position.

The left half of the switch, labeled "HI," is used for engine operation if the engine-driven pump should fail. When the switch is in this position, the pump can operate at two flow rates depending upon the setting of the throttle. With the throttle at a cruise setting, the pump is operating at maximum capacity, supplying sufficient fuel flow to maintain flight. When the throttle is moved toward the closed position, as during letdown, landing and taxiing, a mechanically-actuated switch electrically reduces the auxiliary fuel pump flow rate by means of a resistor in the pump power circuit. This action automatically prevents an excessively rich mixture during these periods of reduced engine speed.

The auxiliary fuel pump is not to be turned on "HI" during normal operation, because, with the engine driven pump functioning, a fuel/air ratio considerably richer than best power is produced.

NOTE

If the auxiliary fuel pump switch is accidentally turned on "HI" (with master switch on) with the engine stopped, intake manifolds will be flooded unless the mixture is in idle cut-off.

FUEL QUANTITY INDICATORS.

Two electrically-operated fuel quantity indicators are provided, each working in conjunction with an electric fuel level transmitter in its respective fuel tank. Turned on by the master switch, the indicators continue to function until the master switch is turned off.

FUEL STRAINER DRAIN KNOB.

The fuel strainer drain knob marked "STRAINER DRAIN" provides a quick, convenient method of draining water and sediment that may have collected in the fuel strainer. The strainer is located below the engine just aft of the radio compartment.

About two ounces of fuel (3 to 4 seconds of drain knob operation) should be drained from the strainer before the initial flight of the day to insure against the presence of water or sediment in the fuel.

The spring-loaded drain valve in the strainer is open when the fuel strainer drain knob is pulled out all the way. The valve automatically closes when the knob is released.

ELECTRICAL SYSTEM.

Electrical energy is supplied by

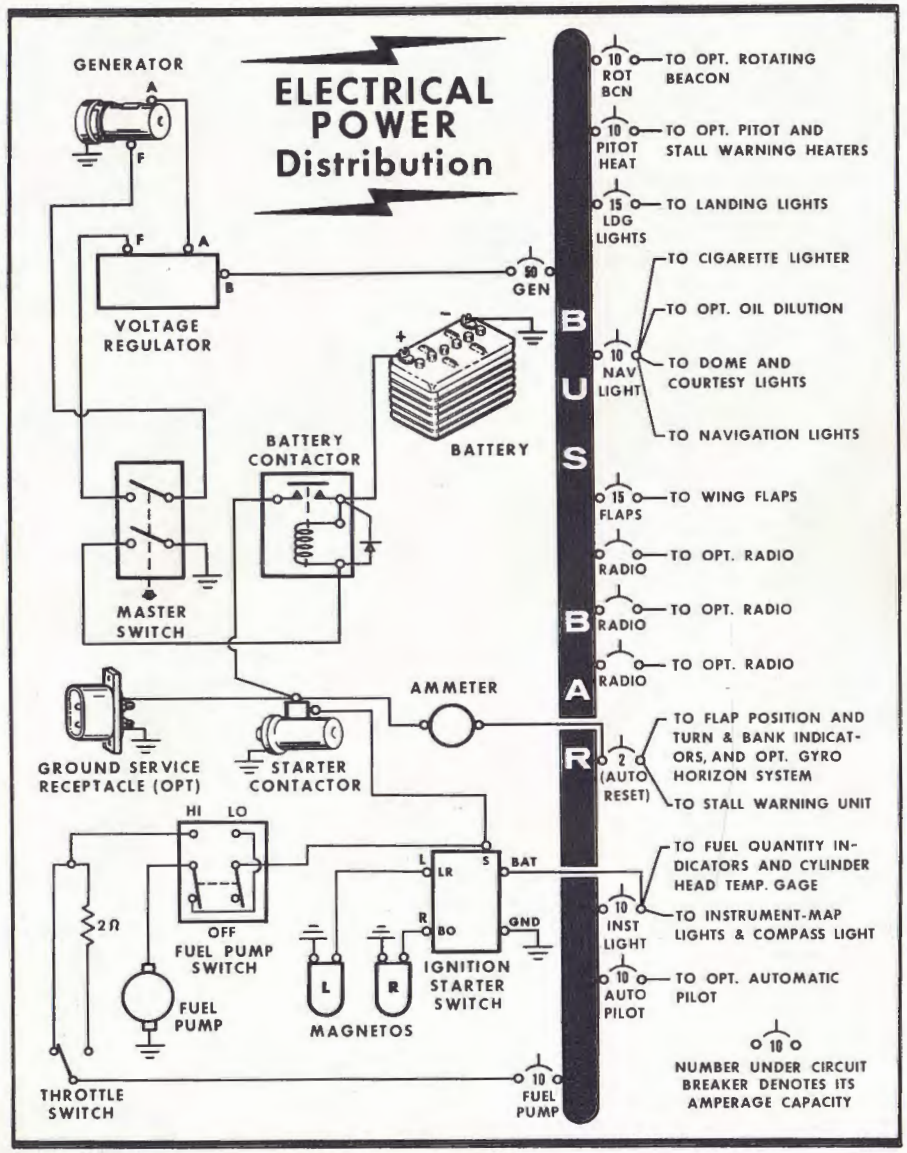


Figure 1-4.

a 12-volt, direct-current system powered by a 50-ampere engine-driven generator. The 12-volt storage battery is located on the upper right-hand forward portion of the firewall.

CIRCUIT BREAKERS.

All electrical circuits in the airplane are protected by circuit breakers. The stall warning unit, flap position indicator, turn-and-bank indicator and the optional gyro horizon test lights circuits are protected by a single automatically resetting circuit breaker mounted behind the instrument panel. The remaining circuits are protected by "push-to-reset" breakers on the instrument panel. These can be pulled out to isolate the circuit. The name of the circuit is shown above each circuit breaker.

LANDING LIGHTS.

The landing lights switch is the split rocker type. To turn on one lamp for taxiing, push the right half of the switch "ON." To turn on both lamps for landing, push the left half of the switch "ON."

NAVIGATION LIGHTS.

The navigation light switch is the split rocker type. For flashing navigation lights, push the right half of the switch "ON." For steady navigation lights, push the left half of the switch "ON." To switch from steady to flashing, push the left half of the switch "OFF."

STALL WARNING INDICATOR.

The stall warning indicator is an electric horn controlled by a transmitter unit in the leading edge of the left wing. This system is in operation whenever the master switch is turned on. The transmitter responds to changes in the airflow over the leading edge of the wing as a stall is approached. In straight-ahead and turning flight, the warning horn will sound 5 to 10 MPH ahead of the stall.

Under safe flight conditions, the only time you may hear the warning horn will be a short beep as you land.

WING FLAPS.

The wing flaps switch controls the position of the electrically-operated wing flaps. The "UP" and "DOWN" positions of the switch are momentary hold-on positions; the switch automatically returns to the center (off) position when released. The flaps can be lowered or raised to any position between 0° and 40°, and stopped at any position by allowing the switch to return to the centered (off) position. The flaps will remain in the selected position until the switch is moved to raise or lower them. Flap position is shown by an electric flap position indicator on the instrument panel.

CABIN HEATING AND VENTILATING SYSTEM.

Fresh air for heating and ventilating the cabin is supplied by a manifold cabin heater and two ventilating air scoops, one on each side of the fuselage just forward of the cabin door.

The temperature and amount of air entering the cabin is controlled by three knobs on the instrument panel. The "CABIN HEAT" knob operates a heat inlet valve at the firewall to regulate the amount of heat entering the cabin from the manifold heater. The "CABIN AIR" knob operates the air scoop on the left side of the fuselage to regulate the amount of fresh air entering the cabin. Fresh air from this air scoop is used in conjunction with heat from the manifold heater for mixing the correct amount of heat and airflow into the cabin. The "AUX. CABIN AIR" knob operates the air scoop on the right side of the fuselage providing additional outside air for summer ventilation. All three control knobs are the double-button type having friction locks to permit intermediate settings. To operate the control knobs, squeeze the buttons, releasing the locks; then adjust the knobs.

For cabin ventilation, pull the "CABIN AIR" knob out. To raise the air temperature, pull the "CABIN HEAT" knob out approximately 1/2" for a small amount of heat. Additional heat is available by pulling the "CABIN HEAT" knob out farther; maximum heat is available with the "CABIN HEAT" knob pulled full out and the "CABIN AIR" knob pushed full in. The temperature and amount of flow into the cabin can be regulated to any degree desired by manipulation of these two controls in relation to each other. When additional ventilating air is desired, pull the "AUX. CABIN AIR" knob out.

A rotary type control knob, labeled "DEFROST" regulates the airflow for windshield defrosting. With the control knob rotated full counterclockwise, the flow of defrosting air is shut off; rotation of the knob clockwise permits air flow to the windshield, the amount depending upon the degree of rotation toward full open. The temperature of defrosting air is dependent upon the setting of the "CABIN AIR" and "CABIN HEAT" knob.

Two ventilators, one in each upper corner of the windshield, are provided to supply additional ventilating air for the pilot and front seat passenger. To operate, pull the ventilator out and rotate to the desired position. Four additional ball and socket ventilators are installed in the ceiling of the rear cabin area, for ventilation to the rear seat passengers. To regulate the flow of air, turn the knurled ring on the rim of the ventilator.

CABIN AND BAGGAGE DOORS.

Two cabin doors are provided, each incorporating a flush-type door handle on the outside and a conventional door handle on the inside. Both doors can be locked from the inside by rotating the inside door handles forward and down as far as they will go. Also, the left door can be locked from the outside by means of a key-operated lock. The same key that is used for the ignition also locks the cabin door, as well as the baggage door.

A door stop in the front edge of each

cabin door will hold the door open for easy loading. To engage the door stop, swing the door out to the limit of its travel and release. The stop disengages as the door is pulled shut.

The baggage compartment is accessible from outside the aircraft through a door in the left side of the fuselage. The door is hinged at the front and the latch is fitted with a flush-type outside handle similar to the cabin door handle. An inside door latch handle is also provided. The door is large and quite suitable for loading and unloading of passengers in the fifth and sixth seats. As an added safety factor when children are occupying these seats, the door may be locked from the outside to prevent them opening the door from the inside.

A limit cable at the top of the baggage door allows the door to be opened approximately 90°, thus preventing its being opened against the fuselage.

SEATS.

All seats are quickly and easily removed for custom loading of the airplane. To remove the two front seats; first, remove the stops at each end of the tracks, pull up on the seat position lever and slide the seat forward until the front legs can be raised slightly above the tracks, then slide the seat aft to the end of the track and lift the seat out. To remove the center seats; remove the front stops, pull up on the seat position lever and slide the seat forward free of the track. To remove the aft seats; pull up on the locking handle, push the seat back about one inch to disengage the aft legs from the anchor plates, align the front outboard leg of the seat with the notch in the track and lift the seat.

To install the front and center seats reverse the removal procedure. Check to be sure all stops are installed. To install the aft seats; position the seat with the aft legs just behind the anchor plates, align the front outboard leg with the notch in the aft outboard seat rail, pull up on the lock handle and slide the seat forward on the rail until the locking pin engages the hole in the track. Check to see that the aft legs are secure in the anchor plates. The aft seat position is not adjustable; the locking handle should not be pulled except to remove the seat.

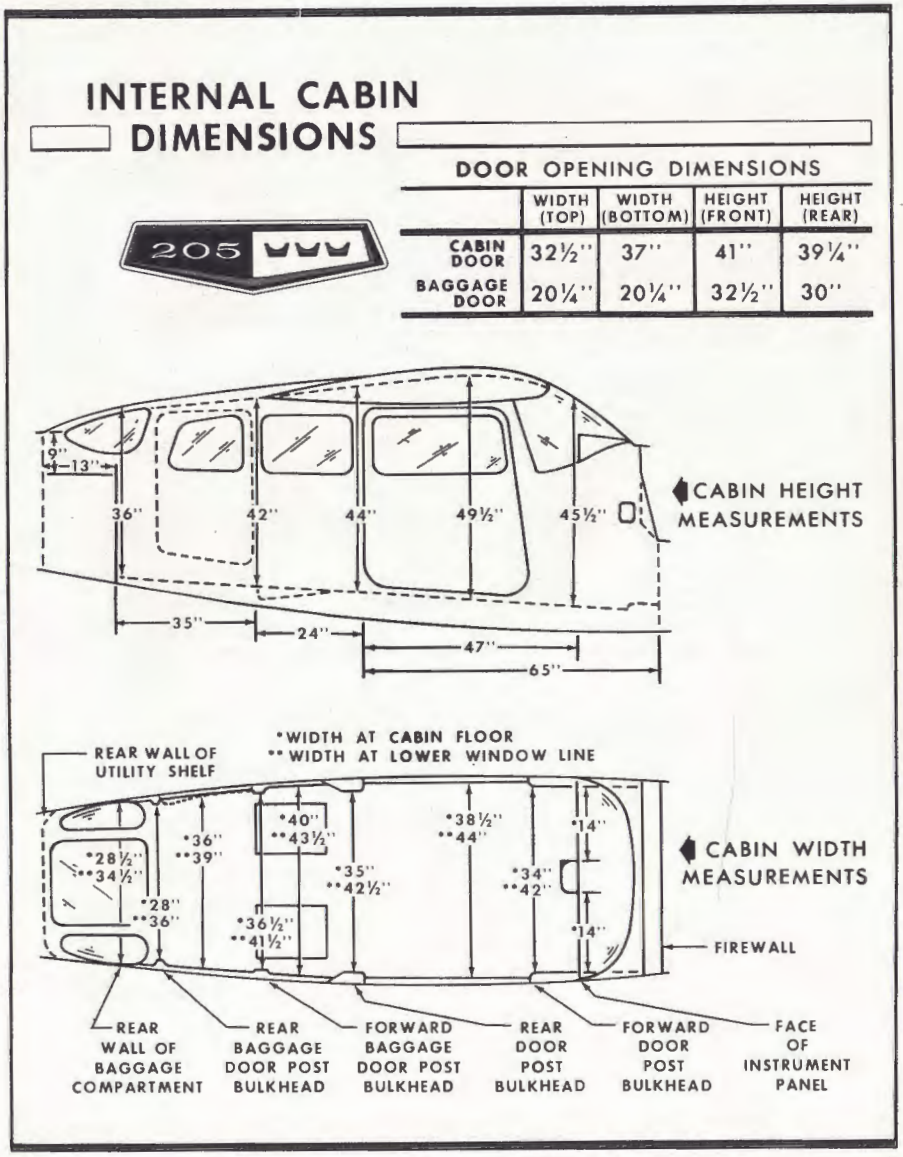
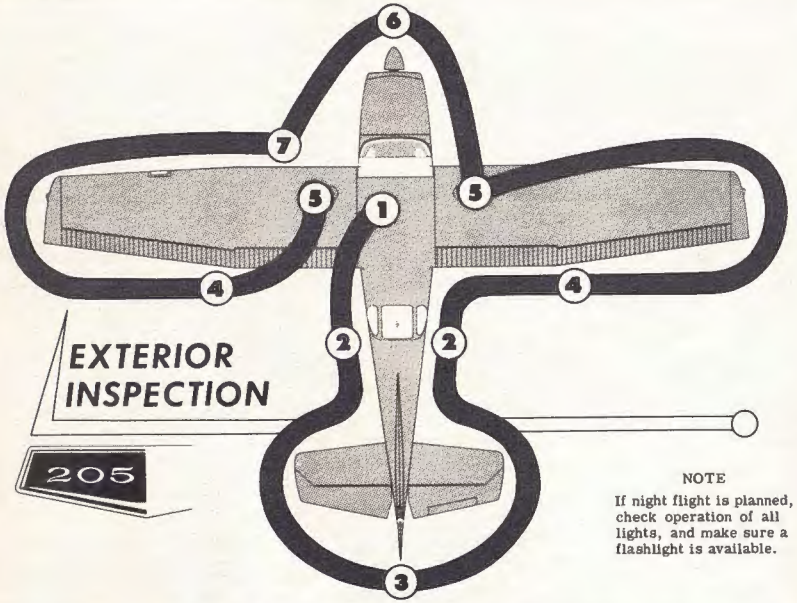


Figure 1-5.



(1) a. Turn on master switch and check fuel quantity indicators.
b. With master switch "ON," check operation of stall warning transmitter tab and warning horn.
c. Turn off master switch, check ignition switch "OFF," and check that fuel tank selector valve handle is on fullest tank.
d. On first flight of day and after each refueling, pull out strainer drain knob for about four seconds, to clear fuel strainer of possible water and sediment.
e. Remove control wheel lock, if installed.

(2) a. Check baggage door securely latched (left side only).
b. Inspect airspeed static source holes on sides of fuselage for stoppage.

(3) a. Remove gust locks, if installed.
b. Inspect tail surface hinges and hinge bolts.
c. Check trim tab for security.
d. Disconnect tie-down rope or chain.

(4) a. Check aileron and flap hinges.
b. Check navigation light for damage.

(5) a. Check main wheel tire for cuts, bruises and proper inflation.
b. Remove fuel tank cap and check fuel level for agreement with gage reading. Secure cap.
c. Disconnect tie-down rope or chain.
d. Check fuel tank vent opening for stoppage.
e. Check courtesy light for damage.

(6) a. Check windshield for cleanliness.
b. Check propeller and spinner for nicks and security.
c. Examine propeller for oil leaks.
d. Make visual check to insure that fuel strainer drain valve is closed after draining operation.
e. Check nose wheel strut for proper inflation.
f. Check nose wheel tire for cuts, bruises and proper inflation.
g. Disconnect tie-down rope.
h. Check oil level. Do not operate with less than nine quarts. Fill for extended flight.
i. Inspect cowl access doors for security.
j. Inspect radio ventilation air intake scoop on side of fuselage for stoppage (left side only).

(7) a. Remove pitot tube cover, if installed.
b. Inspect pitot tube opening for stoppage.

Figure 2-1.

Section 2

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OPERATING CHECK LIST

This section lists, in Pilot's Check List form, the steps necessary to operate your airplane efficiently and safely. It is not a check list in its true form as it is considerably longer, but it does cover briefly all of the points that you would want to or should know concerning the information you need for a typical flight.

The flight and operational characteristics of your airplane are normal in all respects. There are no "unconventional" characteristics or operations that need to be mastered. All controls respond in the normal way within the entire range of operation. All airspeeds mentioned in Sections II and III are indicated airspeeds. Corresponding true indicated airspeeds may be obtained from the Airspeed Correction Table in Section VI.

BEFORE ENTERING THE AIRPLANE.

(1) Make an exterior inspection in accordance with figure 2-1.

BEFORE STARTING THE ENGINE.

(1) Seats and Seat Belts -- Adjust and lock.
(2) Flight Controls -- Check.
(3) Brakes -- Test and set.
(4) Master Switch -- On.
(5) Cowl Flaps -- "OPEN."
(6) Elevator and Rudder Trim -- Set.
(7) Fuel Selector -- Fullest tank.

STARTING ENGINE.

(1) Mixture - Full Rich.
(2) Propeller - High RPM.
(3) Throttle - Closed.
(4) Auxiliary Fuel Pump Switch - On "LO."

NOTE

The auxiliary fuel pump will not operate until the ignition switch is turned to the "START" position.

(5) Crank engine.
(6) Slowly advance throttle with vernier.
(7) Release ignition key when engine starts.

NOTE

If engine fails to continue running, start again from step (3).

(8) Reset throttle to desired idle speed.
(9) Auxiliary Fuel Pump Switch - "OFF."

BEFORE TAKE-OFF.

(1) Induction Air -- Cold.
(2) Throttle Setting -- 1700 RPM.
(3) Engine Instruments -- Within green arc.
(4) Ammeter -- Check.
(5) Magnetos -- Check (50 RPM maximum differential between magnetos).
(6) Propeller -- Check.
(7) Flight Controls -- Recheck.
(8) Wing Flaps -- 0° to 20°.
(9) Cowl Flaps -- Full "OPEN."
(10) Elevator and Rudder Trim -- Take-off setting.
(11) Cabin Doors -- Closed and locked.
(12) Flight Instruments and Radios -- Set.

TAKE-OFF.

NORMAL TAKE-OFF.

(1) Power -- Full throttle.
(2) Elevator Control -- Lift nosewheel at 60 MPH.
(3) Brakes -- Apply momentarily (when airborne).
(4) Climb Speed -- 100 MPH until all obstacles are cleared, then set up climb speed as shown in "NORMAL CLIMB" paragraph.
(5) Wing Flaps -- Retract (if extended).

MAXIMUM PERFORMANCE TAKE-OFF.

(1) Wing Flaps -- 20°.

(2) Brakes -- Apply.
(3) Power -- Full throttle and 2625 RPM.
(4) Mixture -- Lean for field elevation.
(5) Brakes -- Release.
(6) Elevator Control -- Maintain slightly tail-low attitude.
(7) Climb Speed -- 78 MPH until all obstacles are cleared, then set up climb speed as shown in "MAXIMUM PERFORMANCE CLIMB" paragraph.
(8) Wing Flaps -- Retract after obstacles are cleared.

CLIMB.

NORMAL CLIMB.

(1) Air Speed -- 110 to 120 MPH.
(2) Power -- 24 inches and 2450 RPM.
(3) Mixture -- Lean for altitude as necessary.
(4) Cowl Flaps -- 1/2 to full "OPEN," as required.

MAXIMUM PERFORMANCE CLIMB.

(1) Air Speed -- 99 MPH (sea level) to 91 MPH (10, 000 feet).
(2) Power -- Full throttle and 2625 RPM.
(3) Mixture -- Lean for altitude.
(4) Cowl Flaps -- Full "OPEN."

CRUISING.

(1) Power -- 15-24 inches of manifold pressure and 2200-2450 RPM.
(2) Cowl Flaps -- Adjust to maintain normal cylinder head temperature.
(3) Elevator and Rudder Trim -- Adjust.
(4) Mixture -- Lean for cruise fuel flow as determined from your Cessna Power Computer or from the tables on pages 6-4 thru 6-8.

LET-DOWN.

(1) Mixture -- Rich.
(2) Power -- As desired.

BEFORE LANDING.

(1) Fuel Selector -- Fullest tank.
(2) Mixture -- Rich.
(3) Airspeed -- 90-100 MPH (flaps retracted).
(4) Propeller -- High RPM.

(5) Flaps -- Down 10° - 40° (below 110 MPH).
(6) Airspeed -- 80-90 MPH (flaps extended).
(7) Elevator and Rudder Trim -- Adjust.

NORMAL LANDING.

(1) Landing Technique -- Conventional for all flap settings.

AFTER LANDING.

(1) Cowl Flaps -- "OPEN."
(2) Wing Flaps -- Retract.
(3) Mixture -- Idle cut-off.
(4) Ignition Switch -- "OFF."
(5) Master Switch -- Off.
(6) Brakes -- Set.

OPERATING DETAILS

The following paragraphs cover in somewhat greater detail the items entered as a Check List in Section II. Not every item in the list is discussed here. Only those items of the Check List that require further explanation will be found in this section.

PREFLIGHT CHECK.

The exterior inspection described in Section II is recommended for the first flight of the day. Inspection procedures for subsequent flights normally are limited to brief checks of the tail surface hinges, fuel and oil quantity, and security of fuel and oil filler caps. If the airplane has been subjected to long-term storage, recent major maintenance, or operation from marginal airports, a more extensive exterior inspection is recommended.

After major maintenance has been performed, the flight and trim controls should be double-checked for free and correct movement.

The security of all inspection plates on the airplane should be checked following periodic inspections. If the airplane has been waxed and polished, it is a good practice to check the external static pressure source holes for stoppage.

If the airplane has been exposed to much ground handling in a crowded hangar, it should be checked for dents and scratches on wings, fuselage, and tail surfaces, as well as damage to navigation and landing lights, and radio antennas. Outside storage for long periods may result in water and obstructions in the airspeed system lines, condensation in fuel tanks, and dust and dirt on the intake air filter and engine cooling fins.

Operation from a gravel or cinder field will require extra attention to propeller tips and abrasion on leading edges of the horizontal tail. Stone damage to the outer six inches of the propeller tips can seriously reduce the fatigue life of the blades.

Airplanes that are operated from rough fields, especially at high altitudes, are subjected to abnormal landing gear abuse. A frequent check of all components of the landing gear, tires, and brakes is important.

The interior inspection will vary according to the mission and the optional equipment installed. Before high altitude flights, it is important to check the condition and

quantity of oxygen face masks and hoses. The oxygen supply system should be functionally checked to insure that it is in working order. The oxygen pressure gage should indicate between 300 and 1800 psi, depending upon the anticipated requirements.

Satisfactory operation of the pitot tube and stall warning transmitter heating elements is determined by turning on the heater and cautiously feeling the heat of both devices.

If night flying is anticipated, all exterior and interior lights should be checked for proper illumination.

STARTING ENGINE.

The use of an external power source is recommended for starting in cold weather. Before connecting a generator type external power source it is important that the master switch be turned on. This will enable the battery to absorb transient voltages which might damage the transistors in the audio amplifier. When using a battery type cart the master switch should be turned off.

Proper fuel management and throttle adjustments are the determining factors in securing an easy start from your continuous-flow fuel-injection engine. The procedure outlined in Section II should be followed closely as it is effective under nearly all operating conditions, including hot and cold weather conditions. Slight variations from this procedure may be necessary at times to compensate for extreme conditions.

Conventional full rich mixture and high RPM propeller settings are used for starting; the throttle, however, should be fully closed initially. When ready to start, depress the right half of the auxiliary fuel pump switch to "LO" and turn the ignition-starter switch to the "START" position. At the same time the starter engages and turns the engine, the auxiliary fuel pump will operate at a low flow rate, supplying the fuel for starting. While cranking, slowly advance the throttle with the vernier until the engine starts. Slow throttle advancement is essential since the engine will start readily when the correct fuel/air ratio is obtained. On the other hand, fast throttle movement may prevent starting since an excessively rich mixture will be obtained due to the greater fuel flow metered by the throttle position. In this case, another starting attempt must be made. When the engine has started, reset the throttle to the desired idle speed and turn the auxiliary fuel pump switch "OFF."

If prolonged cranking is necessary, allow the starter motor to cool at frequent intervals, since excessive heat may damage the armature.

TAXIING.

The induction hot air knob should be pushed full in during all ground operations unless heat is absolutely necessary for smooth engine operation. When the knob is pulled out to the heat position, air entering the engine is not filtered.

Release the parking brake before taxiing and use the minimum amount of power necessary to start the airplane moving. During taxi, and especially when taxiing downwind, the RPM should be held down to prevent excessive taxi speeds. Taxiing should be done at a speed slow enough to make the use of brakes almost entirely unnecessary. Using the brakes as sparingly as possible will prevent undue wear and strain on tires, brakes, and landing gear. Normal steering is accomplished by applying pressure to the rudder pedal in the direction the airplane is to be turned. For smaller radius turns, at slow speed, the brakes may be used on the inside wheel. At slow taxi speed, this airplane may be pivoted about the outboard strut fitting without sliding the tires. When taxiing in crosswinds it is important that speed and use of brakes be held to a minimum and that all controls be utilized to maintain directional control and balance.

NOTE

Caution should be used when taxiing over rough fields to avoid excessive loads on the nosewheel. Rough use of brakes and power also add to nosewheel load. A good rule of thumb: "Use minimum speed, power, and brakes."

Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller tips. Full throttle run-ups over loose gravel are especially harmful to propeller tips. When take-offs must be made over a gravel surface, it is very important that the throttle be advanced slowly. This allows the airplane to start rolling before high RPM is developed, and the gravel will be blown back of the propeller rather than pulled into it.

BEFORE TAKE-OFF.

Most of the warm up will have been conducted during taxi, and additional warm up before take-off should be restricted to the checks outlined in Section II. Since the engine is closely cowled for efficient in-flight cooling, precautions should be taken to avoid overheating on the ground. Full throttle checks on the ground are not recommended unless the pilot has good reason to suspect that the engine is not turning up properly.

An operational check of the magneto ignition system is important before take-off. An RPM drop on single ignition is a natural characteristic of dual ignition design in modern engines. The purpose of the magneto check is to determine that all cylinders are firing. If all cylinders are not firing, the engine will run extremely rough and cause for investigation will be quite apparent. The amount of RPM drop is not necessarily significant and will be influenced by ambient air temperature, humidity, airport altitude, and other factors. An absence of RPM drop may be an indication of faulty grounding of one side of the ignition system or should be cause for suspicion that the magneto timing has been "bumped-up" and is set in advance of the setting specified. Magneto checks should be performed on a comparative basis between individual right and left magneto performance.

The magneto check should be made at 1700 RPM with the propeller in flat pitch as follows: Move the ignition switch first to "R" position and note RPM. Then move switch back to "BOTH" position to clear the other set of plugs. Then move switch to "L" position and note RPM. The difference between the two magnetos operated singularly should not be more than 50 RPM. If there is a doubt concerning the operation of the ignition system, RPM checks at a higher engine speed will usually confirm whether a deficiency exists.

If instrument or night flights are contemplated, a careful check should be made of vacuum pump operation. A suction of 4.5 inches of mercury is desirable for gyro instruments. However, a range of 3.75 to 5.0 inches of mercury is considered acceptable. On aircraft having an optional pictorial gyro horizon and azimuth card directional gyro, a suction gage is not installed. The suction gage is unnecessary since the gyro horizon incorporates two lights used for warning of high or low suction. When neither light is on, the suction rate is acceptable. A vacuum lights test switch in the system provides a means of testing the lights electrically. The condition of the generator is also important since satisfactory operation of all radio equipment and electrical instruments is essential to instrument flight. The condition of the generator is checked by noting that the ammeter is not showing a discharge with the engine speed above 1000 RPM.

A simple last-minute recheck of important items should include a glance to see that the mixture and propeller pitch knobs are full in, all flight controls have free and correct movement, and the fuel selector is on the fullest tank.

TAKE-OFF.

It is important to check full-throttle engine operation early in the take-off run. Any signs of rough engine operation or sluggish engine acceleration is good cause for discontinuing the take-off.

For maximum engine power, the mixture should be adjusted during the initial take-off roll to the fuel flow corresponding to the field elevation. The power increase is significant above 3000 feet and this procedure always should be employed for field elevations greater than 5000 feet above sea level.

Using 20° wing flaps reduces the ground run and total distance over the obstacle by approximately 10 per cent. Soft field take-offs are performed with 20° flaps by lifting the nosewheel off the ground as soon as practical and leaving the ground in a slightly tail-low attitude. However, the airplane should be leveled off immediately to accelerate to a safe climb speed of 75 MPH.

Take-offs into strong crosswinds normally are performed with the minimum flap setting necessary for the field length, to minimize the drift angle immediately after take-off. The airplane is accelerated to a speed slightly higher than normal, then pulled off abruptly to prevent possible settling back to the runway

while drifting. When clear of the ground, make a coordinated turn into the wind to correct for drift.

AFTER TAKE-OFF.

To set up the airplane in climb configuration, adjust power for climb, retract the wing flaps at a safe altitude and airspeed (90 MPH), and adjust the mixture for the power setting selected.

Power reduction will vary according to the requirements of the traffic pattern, surrounding terrain, gross weight, field elevation, temperature, and engine condition. However, a normal "after-take-off" power setting is 24 inches of manifold pressure and 2450 RPM.

CLIMB.

A cruising climb at 24 inches of manifold pressure, 2450 RPM (approximately 75% power) and 110 to 120 MPH is recommended to save time and fuel for the overall trip. In addition, this type of climb provides better engine cooling, less engine wear, and more passenger comfort due to lower noise level.

The mixture should be leaned as necessary for the lower powers available at altitude.

If it is necessary to climb rapidly to clear mountains or reach favorable winds at high altitudes, the best rate-of-climb speed should be used with maximum power. This speed is 99 MPH at sea level, decreasing approximately 1 MPH for each 1000 feet above sea level. During maximum-performance climbs, the mixture should be leaned in accordance with the altitude scale of the take-off and climb dial range to assure maximum power and sufficient engine cooling.

If an obstruction ahead requires a steep climb angle, the airplane should be flown at the best angle-of-climb with flaps up and maximum power. This speed is 75 MPH at sea level, increasing 1/2 MPH for each 1000 feet above sea level.

CRUISE.

Tabulated cruising information for normal cruising power and altitudes is presented in Section VI. These charts are based on both 63.5 gallons and 80 gallons (optional) of fuel for cruise, normal lean mixture, 3300 pounds gross weight, zero wind, and no fuel reserve. Allowances for warm-up, take-off, and climb (see page 6-3), headwinds, variations in mixture leaning technique, and fuel reserve should be estimated, and the endurance and range shown in the charts should be modified accordingly.

Since the main advantage of the airplane over ground transportation is speed, you usually will prefer high cruising speeds. However, if a destination is slightly out of reach in one flight at normal cruising speeds, it may save time and money to make the trip non-stop at lower speed. The cruising charts show the long ranges obtainable with lower cruising speeds.

Normal cruising is done between 65% and 75% power. The power settings required to obtain these powers at various altitudes and outside air

OPTIMUM CRUISE PERFORMANCE

% BHP	GAL/HR	ALTITUDE	TRUE AIRSPEED	RANGE (STD. TANKS)
75	14.1	6500	162	730
70	13.2	8000	160	770
65	12.2	10,000	158	820

Figure 3-1.

temperatures can be determined by using your Cessna Power Computer.

Cruising power of approximately 75% is obtained with 24 inches of manifold pressure and 2450 RPM. Various percent powers can be obtained with an infinite number of combinations of manifold pressures, engine speeds, altitudes, and outside air temperatures. However, at full throttle, a constant engine speed and a standard air temperature, a specific power may be obtained at only one altitude. For example, at full throttle, 2450 RPM and normal lean mixture, the Optimum Cruise Performance table (figure 3-1) shows speed and range figures for various powers and optimum altitudes.

This table shows that cruising can be done most efficiently at higher altitudes because very nearly the same cruising speed can be maintained at much less power. This means a saving in fuel consumption and engine wear.

To achieve level-flight performance shown in the cruising charts in Section VI, the mixture should be leaned to the correct fuel flow as determined from your Cessna Power Computer or the charts, pages 6-4 thru 6-8.

This should result in normal lean mixtures which will yield airspeeds only slightly below those available at best power. For example, at 75% power at 6500 feet, the cruising speed is 163 MPH with best power mixture and 162 MPH with the recommended normal lean mixture. Since normal lean mixture gives considerably lower fuel consumption and, therefore, longer range, this technique offers an optimum compromise between speed and fuel consumption for normal cruising flight.

Should maximum speed be desirable for short flights where range and fuel consumption are less important, the mixture should be set approximately 1 GPH above the fuel flow shown on your Cessna Power Computer for any normal power range. This setting will give approximately best power mixture and will result in a 1 MPH increase in airspeed.

The cowl flaps should be adjusted

to maintain the cylinder head temperature near the middle of the normal operating (green arc) range to assure prolonged engine life.

For a given throttle setting, select the lowest engine speed in the green arc range that will give smooth engine operation with no evidence of engine laboring.

The fuel injection system employed on this engine is considered to be non-icing. An induction air heat system is incorporated, however, to assure satisfactory operation in the event that unusual atmospheric conditions should cause intake system icing. The induction hot air knob should be left in the full cold position for all normal operations. Should intake system icing be encountered, the knob should be pulled out to the full heat position.

STALLS.

The stall characteristics are conventional and aural warning is provided by a stall warning horn which sounds between 5 and 10 MPH above the stall in all configurations.

Power-off stall speeds at maximum gross weight and aft c.g. position are presented on page 6-2 as true indicated airspeeds because indicated airspeeds are inaccurate near the stall.

SPINS.

Intentional spins are prohibited in this airplane. Should an inadvertent spin occur, standard light plane recovery techniques should be used.

LET-DOWN.

Let-downs should be initiated sufficiently before the destination is reached to permit a gradual rate of descent at cruising speed, using just enough power to hold engine temperature in the green arc range.

LANDING.

Landings are simple and conventional in all respects. Either power-off or power-approach type landings can be executed with any flap setting. Although power-off approaches with full flaps are adequately steep, slips are permissible if necessary.

Approach speeds should be approximately 90-100 MPH with flaps up and 80-90 MPH with flaps extended.

Landings are usually made on the main wheels first to reduce the landing speed and subsequent need for braking in the landing roll. The nose wheel is lowered to the runway after the speed has diminished to avoid unnecessary nose gear load. This procedure is especially important in rough field landings.

Heavy braking in the normal landing roll is not recommended because of the probability of skidding the main wheels, with resulting loss of braking effectiveness and damage to the tires.

For short field landings, make a power-off approach at 83 MPH with 40° flaps and land on main wheels first. Immediately after touchdown, lower the nose gear and apply heavy braking as required. For maximum brake effectiveness after all three wheels are on the ground, retract the

flaps, hold full nose up elevator and apply maximum possible brake pressure without sliding the tires.

COLD WEATHER OPERATION.

When very cold temperatures are anticipated, the oil should be diluted before stopping the engine if external pre-heat is not available.

The use of an external pre-heater and an external power source is recommended whenever possible to reduce wear and abuse to the engine and the electrical system. In addition, pre-heat will thaw the oil trapped in the oil cooler, which probably will be congealed prior to starting in extremely cold temperatures. If external pre-heat is used, the warm-up should be held to a minimum to prevent recongealing the oil in the oil cooler.

In very cold weather, no oil temperature indication need be apparent before take-off. After a suitable warm-up period (2 to 5 minutes at 1000 RPM), the airplane is ready for take-off if it accelerates smoothly and the oil pressure is normal and steady.

During let-down, observe engine temperatures closely and carry sufficient power to maintain them in the recommended operating range.

For continuous operation in temperatures consistently below 20° F, the Cessna winterization kit, available from your Cessna Dealer, should be installed to improve engine operation.

OIL DILUTION SYSTEM.

If your airplane is equipped with an oil dilution system and very low temperatures are anticipated, dilute the oil prior to engine shut down by energizing the oil dilution switch with the engine operating at 1000 RPM, and with the auxiliary fuel pump switch in the "HI" position. (Refer to figure 3-2 for dilution time for the anticipated temperature).

OIL DILUTION TABLE

	TEMPERATURE 0°F	-10°F	-20°F
DILUTION TIME	2 min.	5 min.	8 min.
FUEL ADDED	1 qt.	2.5 qt.	4 qt.

Maximum Sump Capacity - 16 quarts
Maximum for Take-off - 13 quarts

Figure 3-2.

While diluting the oil, the oil pressure should be watched for any unusual fluctuations that might indicate a screen being clogged with sludge washed down by the fuel.

NOTE

On the first operation of the oil dilution system each season, use the full dilution period, drain the oil, clean the screen, refill with new oil and redilute as required.

If the full dilution time was used, beginning with a full oil sump (12 quarts), subsequent starts and engine warm-up should be prolonged to evaporate enough of the fuel to lower the oil sump level to 13 quarts prior to take-off. Otherwise, the sump may overflow when the airplane is nosed up for climb.

To avoid progressive dilution of the oil, flights of at least one hour's duration should be made between oil dilution operations.

NOTES

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OPERATING LIMITATIONS

OPERATIONS AUTHORIZED.

Your Cessna with standard equipment, as certificated under FAA Type Certificate No. 3A21, is approved for day and night operation under VFR.

Additional optional equipment is available to increase its utility and to make it authorized for use under IFR day and night. An owner of a properly-equipped Cessna is eligible to obtain approval for its operation on single-engine scheduled airline service under VFR. Your Cessna Dealer will be happy to assist you in selecting equipment best suited to your needs.

MANEUVERS—NORMAL CATEGORY.

The airplane exceeds the requirements for airworthiness of the Civil Air Regulations, Part 3, set forth by the United States Government. Spins and aerobatic maneuvers are not permitted in normal category airplanes in compliance with these regulations. In connection with the foregoing, the following gross weight and flight load factors apply:

Maximum Gross Weight . . . . . 3300 lbs.
Flight Load Factor *Flaps Up . . . . . +3.8, -1.52
Flight Load Factor *Flaps Down . . . . . +3.0
*The design load factors are 150% of the above, and, in all cases, the structure meets or exceeds design loads.

Your airplane must be operated in accordance with all FAA-approved markings, placards, and check lists in the airplane. If there is any information in this section which contradicts the FAA-approved markings, placards, and check lists, it is to be disregarded.

AIRSPEED LIMITATIONS.

The following are the certificated true indicated airspeed limits for your Cessna:

Never Exceed (Glide or dive, smooth air) . . . . 210 MPH (red line)
Caution Range . . . . . 170-210 MPH (yellow arc)

Maximum Structural Cruising Speed . . . . . .170 MPH
(Level flight or climb)
Normal Operating Range. . . . . .70-170 MPH (green arc)
Maximum Speed, Flaps Extended 40° . . . . . .110 MPH
Flap Operating Range . . . . . 61-110 MPH (white arc)
Maneuvering Speed*. . . . . .138 MPH

*The maximum speed at which abrupt control travel can be used without exceeding the design load factor.

ENGINE OPERATION LIMITATIONS.

Power and Speed . . . . . .260 BHP at 2625 RPM

ENGINE INSTRUMENT MARKINGS.

OIL TEMPERATURE INDICATOR.

Normal Operating Range. . . . . Green Arc
Do Not Exceed . . . . . Red Line

OIL PRESSURE GAGE.

Idling Pressure . . . . . 10 psi (red line)
Normal Operating Range . . . . . 30-60 psi (green arc)
Maximum Pressure . . . . . 100 psi (red line)

MANIFOLD PRESSURE GAGE.

Normal Operating Range . . . . . .15-24 in. Hg (green arc)

CYLINDER HEAD TEMPERATURE GAGE.

Normal Operating Range . . . . . 300-460°F (green arc)
Do Not Exceed . . . . . .460°F (red line)

TACHOMETER.

Normal Operating Range. . . . . 2200-2450 rpm (green arc)
Maximum (Engine rated speed). . . . . 2625 rpm (red line)

FUEL QUANTITY INDICATORS.

Empty (.7 gallon unusable each tank) . . . . . E (red line)

FUEL FLOW INDICATOR.

Normal Operating Range . . . . . 8.0-14.5 gal/hr (green arc)
Minimum and Maximum . . . . . .2.0 and 21.4 gal/hr (red lines)
Maximum Performance Take-Off and Climb Settings at Altitude:
Sea Level . . . . . 19.5 gal/hr (white radial)
4000 Ft . . . . . 17.6 gal/hr (white radial)
8000 Ft . . . . . 15.8 gal/hr (white radial)

WEIGHT AND BALANCE.

The information presented in this section will enable you to operate your Cessna within the prescribed weight and center of gravity limitations.

In figuring your loading problems be certain that you use the Licensed Empty Weight of your particular airplane as shown on its Weight and Balance Data sheet. This sheet, plus an Equipment List, is included with each airplane as it leaves the factory. The FAA requires that any change in the original equipment affecting the empty weight center of gravity be recorded on a Repair and Alteration Form FAA-337.

READ BEFORE WORKING LOADING PROBLEM FOR YOUR AIRPLANE

To figure the weight for your airplane in the same manner as the sample problem on page 4-4, proceed as follows:

Step 1. Take the licensed Empty Weight and Moment/1000 from the Weight and Balance Data Sheet, plus any changes noted on forms FAA-337, carried in your airplane and write them down in two columns in the manner shown in the sample problem. These figures are non-variables and, unless your airplane or equipment is modified, these figures may be used every time you figure your weight and balance.

Step 2. Write down the weight and moment/1000 for the oil in the proper columns. Since you usually have a full load of oil for a trip, you figure 12 qts. at 22.5 lbs. and a moment of -0.4. You may use these same figures every time and consider this also a non-variable.

Step 3. Add the weight of yourself and the front passenger. Refer to the Loading Graph on page 4-5 and find this weight at the left side of the graph, then go across the graph horizontally to the right until you intersect the line identified as "PILOT AND FRONT PASSEN-

SAMPLE LOADING PROBLEM

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	Sample Airplane		Your Airplane	
	Weight (lbs)	Moment (lb.-ins. /1000)	Weight	Moment
1. Licensed Empty Weight (Sample Airplane)	1800.5	60.4	1896.5	66.5
2. Oil - 12 Qts.*	22.5	-0.4	22.5	-0.4
3. Pilot & Front Passenger	340.0	12.2	300	10.0
4. Fuel - (63.5 Gal. at 6#/Gal.)	381.0	18.3	480	23.0
5. Center Passengers	340.0	23.5	300	22.0
6. Aft Passengers	340.0	34.0	300	30.0
7. Total Aircraft Weight (Loaded)	3224.0	147.9	3299	151.1

8. Locate this point (3224.0 at 147.9) on the center of gravity envelope, and since this point falls within the envelope the loading is acceptable.

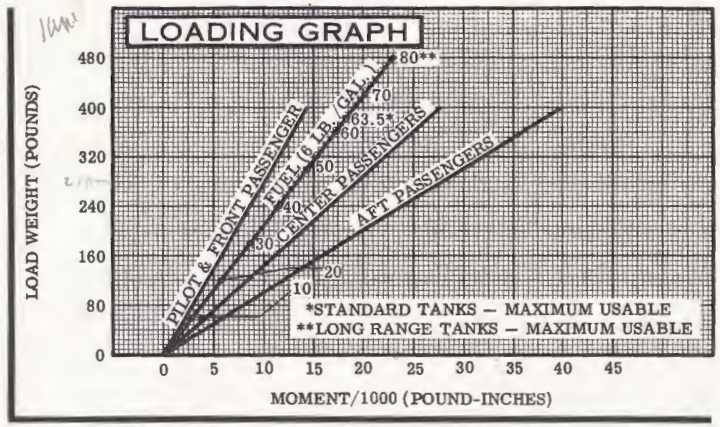
*Note: Normally full oil may be assumed for all flights. Useful load 1403.5

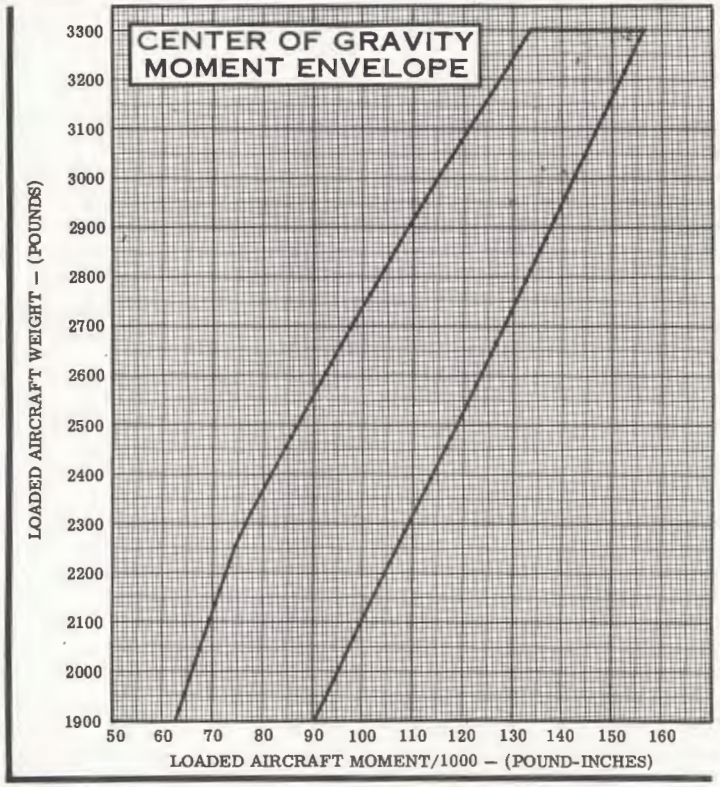
GER." After intersecting the line, drop down vertically to the bottom line and read the moment/1000 given on the scale. Now write down this weight and moment/1000 for you and the front passenger in the proper columns.

Step 4. Proceed as you did in step 3, except use the line identified as "FUEL" and 6 lbs. per gallon for the amount of gasoline you are carrying, and read the moment/1000 from the Loading Graph. Write the weight and moment/1000 in the proper columns.

Step 5. Proceed as you did in step 3, except use the line identified as "CENTER PASSENGERS," and read the moment/1000 for the combined weight of the center seat passengers being carried. Write the weight and moment/1000 in the proper columns.

Step 6. Proceed as you did in step 3, except use the line identified as "AFT PASSENGERS," and read the moment/1000 for the combined weight of the aft seat passengers being carried. Write the weight and moment/1000 in the proper columns.





Step 7. Add the weight column. The total must be 3300 lbs., or below, or you must lighten your aircraft load. Add the moment column (remember to subtract rather than add the oil moment because it is a minus quantity).

Step 8. Refer to the Center of Gravity Moment Envelope. Locate the total weight on the scale on the left hand side of the graph and, from this point, follow a line horizontally to the right. Locate the total moment/1000 on the scale running across the bottom of the graph and, from this point, follow a line vertically up until you intersect the line running horizontally from your total weight. If the point where the two lines intersect is within the envelope, your airplane is loaded within approved limits. If the point of intersection falls outside the envelope, your load must be adjusted before flight.

CARE OF THE AIRPLANE

If your airplane is to retain that new-plane performance and dependability, certain inspection and maintenance requirements must be followed. It is wise to follow a planned schedule of lubrication and preventative maintenance based on climatic and flying conditions encountered in your locality.

Keep in touch with your Cessna Dealer, and take advantage of his knowledge and experience. He knows your airplane and how to maintain it. He will remind you when lubrications and oil changes are necessary, and about other seasonal and periodic services.

GROUND HANDLING.

The airplane is most easily and safely maneuvered during ground handling by the tow-bar attached to the nosewheel.

NOTE

When using the tow-bar, do not exceed the nosewheel turning radius of 35° either side of center.

When moving the airplane by hand and no tow-bar is available, push down at the front spar of the stabilizer beside the fuselage to raise the nosewheel off the ground. With the nosewheel clear of the ground the airplane can be turned readily in any direction by pivoting it around the main gear. Do not push down on the empennage by the tip of the elevator; nor shove sidewise on the upper portion of the fin. When moving the airplane forward, push at the wing strut root fitting or at the main gear strut.

MOORING YOUR AIRPLANE.

Proper tie-down procedure is your best precaution against damage to your parked airplane by gusty or strong winds. To tie-down your airplane securely, proceed as follows:

(1) Tie sufficiently strong ropes or chains (700 pounds tensile strength) to the wing tie-down fittings at the upper end of each wing strut. Secure the opposite ends of these ropes or chains to tie-down rings.
(2) Tie a rope through the nose gear torque link and secure the opposite end to a tie-down ring.
(3) Securely tie the middle of a length of rope to the ring at the tail. Pull each end of the rope

away at a 45° angle and secure it to tie-down rings positioned on each side of the tail.

(4) Install a surface control lock over the fin and rudder. Do not use external locks between the flaps and ailerons, because accidental operation of the flaps could cause structural damage to both flaps and ailerons.

(5) Install the control lock in the control wheel shaft.

STORAGE.

The all-metal construction of your Cessna makes outside storage of it practical, although inside storage will increase its life just as it increases the life of your car. If your airplane must remain inactive for a time, cleanliness is probably the most important consideration — whether your airplane is inside or out. A small investment in cleanliness will repay you many times, not only in keeping your airplane looking like new but in keeping it new. A later paragraph in this section covers the subject in greater detail.

Do not neglect the engine when storing the airplane. Turn the propeller over by hand or have it turned over every few days to keep the engine bearings, cylinder walls and internal parts lubricated. If storage is to be for an extended period, and turning the propeller is impractical, see your Cessna Dealer for suggestions on preserving the engine. If the airplane is stored outside, leave the propeller in a horizontal position to prevent water seepage into the hub mechanism. Filling the fuel tanks will help prevent condensation.

Regular use helps keep airplanes in good condition. An airplane left standing idle for any great length of time is likely to deteriorate more rapidly than if it is flown regularly, and should be carefully checked before being put back into active service.

WINDSHIELD-WINDOWS.

The plastic windshield and windows should be kept clean and waxed at all times. To prevent scratches and crazing, wash them carefully with plenty of soap and water, using the palm of the hand to feel and dislodge dirt and mud. A soft cloth, chamois or sponge may be used, but only to carry water to the surface. Rinse thoroughly, then dry with a clean, moist chamois. Rubbing the surface of the plastic with a dry cloth builds up an electrostatic charge so that it attracts dust particles in the air. Wiping with a moist chamois will remove both the dust and this charge.

Remove oil and grease with a cloth moistened with kerosene. Never use gasoline, benzine, alcohol, acetone, carbon tetrachloride, fire extinguisher or anti-ice fluid, lacquer thinner or glass cleaner. These materials will soften the plastic and may cause it to craze.

After removing dirt and grease, if the surface is not badly scratched it should be waxed with a good grade of commercial wax. The wax will fill in minor scratches and help prevent further scratching. Apply a thin, even coat of wax and bring it to a high

polish by rubbing lightly with a clean, dry, soft flannel cloth. Do not use a power buffer; the heat generated by the buffing pad may soften the plastic.

Do not use a canvas cover on the windshield unless freezing rain or sleet is anticipated. Canvas covers may scratch the plastic surface.

PAINTED SURFACES.

The painted exterior surfaces of your new Cessna have been finished with high grade synthetic materials selected for their toughness, elasticity, and excellent adhesion. With a minimum of care, they will retain their original beauty for many years.

As with any paint applied to a metal surface, the desired qualities of the paint develop slowly throughout an initial curing period which may be as long as 90 days after the finish is applied. During this curing period some precautions should be taken to avoid damaging the finish or interfering with the curing process. The finish should be cleaned only by washing with clean, cold water and mild soap, followed by a rinse with cold water and drying with cloths or a chamois. Do not use polish or wax, which would exclude air from the surface. Do not rub or buff the finish and avoid flying through rain, hail or sleet. Once the finish has cured completely, it may be waxed with a good automotive wax. A heavier coating of wax on the leading edges of the wings and tail and on the nose cap and propeller spinner will help reduce the abrasion encountered in these areas.

Fluids containing dyes, such as fuel and hydraulic oil, accidentally spilled on the painted surface, should be flushed away at once to avoid a permanent stain. Battery electrolyte must be flushed off at once, and the area neutralized with an alkali such as baking soda solution, followed by a thorough rinse with clear water.

PROPELLER CARE.

Preflight inspection of propeller blades for nicks, and wiping them occasionally with an oily cloth to clean off grass and bug stains will assure long, trouble-free service. It is vital that small nicks on the propeller, particularly near the tips and on the leading edges, are dressed out as soon as possible since these nicks produce stress concentrations, and if ignored, may result in cracks. Never use an alkaline cleaner on the blades; remove grease and dirt with carbon tetrachloride or Stoddard solvent.

Your Cessna Dealer should be consulted about other repair and maintenance work. Civil Air Regulations require that all maintenance except dressing small blade nicks, cleaning, minor repairs to the spinner, and lubrication which does not require disassembly, be done by an FAA - authorized propeller repair station.

INTERIOR CARE.

To remove dust and loose dirt from the upholstery and carpet, clean the interior regularly with a vacuum cleaner.

Blot up any spilled liquid promptly, with cleansing tissue or rags. Don't pat the spot - press the blotting material firmly and hold it for several seconds. Continue blotting until no more liquid is taken up. Scrape off sticky materials with a dull knife, then spot-clean the area.

Oily spots may be cleaned with household spot removers, used sparingly. Before using any solvent read the instructions on the container and test it on an obscure place in the fabric to be cleaned. Never saturate the fabric with a volatile solvent; it may damage the padding and backing materials.

Soiled upholstery and carpet may be cleaned with foam-type detergent, used according to the manufacturer's instructions. To minimize wetting the fabric, keep the foam as dry as possible and remove it with a vacuum cleaner.

The plastic trim, headliner, instrument panel and control knobs need only be wiped off with a damp cloth. Oil and grease on the control wheel and control knobs can be removed with a cloth moistened with kerosene. Volatile solvents, such as mentioned in paragraphs on care of the windshield, must never be used since they soften and craze the plastic.

INSPECTION SERVICE AND INSPECTION PERIODS.

With your airplane you will receive an Owner's Service Policy. Coupons attached to the policy entitle you to an initial inspection and the first 100-hour inspection at no charge. If you take delivery from your Dealer, he will perform the initial inspection before delivery of the airplane to you. If you pick up the airplane at the factory, plan to take it to your Dealer reasonably soon after you take delivery on it. This will permit him to check it over and to make any minor adjustments that may appear necessary. Also, plan an inspection by your Dealer at 100 hours or 90 days, whichever comes first. This inspection also is performed by your Dealer for you at no charge. While these important inspections will be performed for you by any Cessna Dealer, in most cases you will prefer to have the Dealer from whom you purchase the airplane accomplish this work.

Civil Air Regulations require that all airplanes have a periodic (annual) inspection as prescribed by the administrator, and performed by a person designated by the administrator. In addition, 100-hour periodic inspections made by an "appropriately-rated mechanic" are required if the airplane is flown for hire. The Cessna Aircraft Company recommends the 100-hour periodic inspection for your airplane. The procedure for this 100-hour inspection has been carefully worked out by the factory and is followed by the Cessna Dealer Organization. The complete familiarity of the Cessna Dealer Organization with Cessna equipment and with factory-approved procedures provides the highest type of service possible at lower cost.

Time studies of the 100-hour inspection at the factory and in the field have developed a standard flat-

rate charge for this inspection at any Cessna Dealer. Points which the inspection reveals require modification or repairs will be brought to the owner's attention by the Dealer, and quotations or charges will be made accordingly. The inspection charge does not include the oil required for the oil change.

Every effort is made to attract the best mechanics in each community to Cessna service facilities. Many Dealers' mechanics have attended Cessna Aircraft Company schools and have received specialized instructions in maintenance and care of Cessna airplanes. Cessna service instruction activity in the form of service bulletins and letters is constantly being carried on so that when you have your Cessna inspected and serviced by Cessna Dealers' mechanics, the work will be complete and done in accordance with the latest approved method.

Cessna Dealers carry a full complement of Cessna service parts and have complete repair and service facilities, including such specialized jigs and tools as may be necessary.

Your Cessna Dealer will be glad to give you current price quotations on all parts that you might need and advise you on the practicality of parts replacement versus repairs that may be necessary from time to time.

AIRPLANE FILE.

There are miscellaneous data, information and licenses that are a part of the airplane file. The following is a check list for that file. In addition, a periodic check should be made of the latest Civil Air Regulations to insure that all data requirements are met.

A. To be displayed in the airplane at all times:
(1) Aircraft Airworthiness Certificate (Form FAA-1362).
(2) Aircraft Registration Certificate (Form FAA-500A).

B. To be carried in the airplane at all times:
(1) Airplane Radio Station License (if transmitter installed).
(2) Weight and Balance Report or latest copy of the Repair and Alteration Form (Form FAA-337).
(3) Airplane Equipment List.
(4) Airplane Log Book.
(5) Engine Log Book.

C. To be maintained but not necessarily carried in the airplane at all times:
(1) A form containing the following information: Model, Registration Number, Factory Serial Number, Date of Manufacture, Engine Number, and Key Numbers (duplicate keys are available through your Cessna Dealer).

Most of the items listed are required by the United States Civil Air Regulations. Since the regulations of other nations may require other documents and data, owners of exported airplanes should check with their own aviation officials to determine their individual requirements.

LUBRICATION AND SERVICING

Specific lubrication and servicing information is presented in the Servicing Diagram (figure 5-1). For quick reference, specifications and quantities of fuel, oil, etc., are contained in a table on the inside back cover. In addition to those items specified in the Servicing Diagram, all pulleys, the trim tab actuator rod, bellcrank clevis bolts, brake pedal pivots, rudder pedal crossbars, shimmy dampener pivot bushings, door hinges and latches, Bowden controls (with the exception of their friction locking devices), engine control linkage, and any other friction points should be lubricated every 1000 hours, or oftener, with SAE 20 engine oil. Do not lubricate friction locks.

Generally, roller chains (aileron, elevator trim tab wheel and tab actuator) and control cables collect dust, sand and grit if they are greased or oiled. Except under seacoast conditions, chains and cables should be merely wiped clean occasionally with a dry cloth.

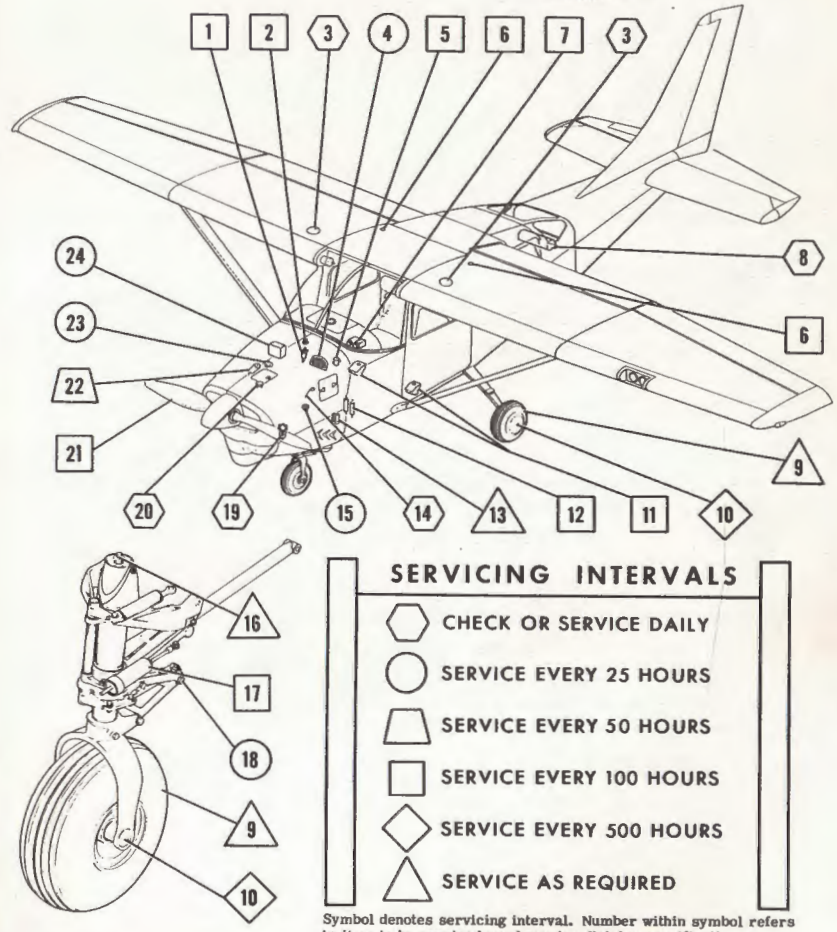
DEALER FOLLOW-UP SYSTEM

Your Cessna Dealer has an owner follow-up system to notify you when he receives information that applies to your Cessna. In addition, if you wish, you may choose to receive similar notification directly from the Cessna Service Department. A subscription card is supplied in your airplane file for your use, should you choose to request this service. Your Cessna Dealer will be glad to supply you with details concerning these follow-up programs, and stands ready through his Service Department to supply you with fast, efficient, low cost service.

SERVICING DIAGRAM

RECOMMENDED FUEL:
AVIATION GRADE--100/130 MINIMUM GRADE
RECOMMENDED ENGINE OIL:
AVIATION GRADE--SAE 30 BELOW 40° F.
SAE 50 ABOVE 40° F.

HYDRAULIC FLUID:
SPEC. NO. MIL-H-5606
OXYGEN:
SPEC. NO. BB-O-925



SERVICING INTERVALS

- CHECK OR SERVICE DAILY
- SERVICE EVERY 25 HOURS
- SERVICE EVERY 50 HOURS
- SERVICE EVERY 100 HOURS
- SERVICE EVERY 500 HOURS
- SERVICE AS REQUIRED

Symbol denotes servicing interval. Number within symbol refers to item to be serviced as shown in adjoining specifications.

Figure 5-1 (Sheet 1 of 6).

SERVICING PROCEDURES

For convenience, the items below are segregated into servicing intervals; that is, all items which must be checked or serviced daily are listed, then items requiring 25 hour service are listed, etc. The numbered symbol at each item refers to the item as shown in the Servicing Diagram.

⬡ DAILY

(3) FUEL TANK FILLERS
Service after each flight with 100/130 minimum grade fuel. The capacity of each tank is 32.5 gallons. When optional long range fuel tanks are installed, the capacity of each tank is 42.0 gallons.

(8) OXYGEN CYLINDER AND FILLER VALVE (OPT)
Check oxygen pressure gage for anticipated requirements before each flight. Whenever pressure drops below 300 psi, use filler valve on left side of utility shelf and refill cylinder with aviator's breathing oxygen (Spec. No. BB-O-925). Maximum pressure, 1800 psi.

(14) OIL DIPSTICK
Check oil level before each flight. Do not operate on less than 9 quarts and fill if an extended flight is planned. The oil capacity is 12 quarts (13 quarts capacity if an optional oil filter is installed).

(19) FUEL STRAINER
Drain approximately two ounces of fuel before each flight and after refueling to remove water and sediment. Make sure drain valve is closed after draining. Disassemble and clean bowl and screen every 100 hours.

(20) OIL FILLER
When preflight check shows low oil level, service with aviation grade engine oil; SAE 30 below 40° F. and SAE 50 above 40° F. Your Cessna was delivered from the factory with straight mineral oil (non-detergent) and should be operated with straight mineral oil for the first 25 hours. The use of mineral oil during the 25-hour break-in period will help seat the piston rings and will result in less oil consumption. After the first 25 hours, either mineral oil or detergent oil may be used. If a detergent oil is used it must conform to Continental Motors Corporation Specification MHS-24. Your Cessna Dealer can supply an approved brand.

Figure 5-1 (Sheet 2 of 6).

○ 25 HOURS

(4) INDUCTION AIR FILTER
Service every 25 hours or oftener when operating in dusty conditions. Under extremely dusty conditions, daily maintenance of the filter is recommended. Service filter in accordance with instructions on the filter frame.

(15) OIL SUMP DRAIN
Every 25 hours, change engine oil. Drain oil by removing plug in oil sump. Provide protection for engine nacelle when draining. (See item 22 for servicing interval on aircraft equipped with an optional oil filter.)

(18) NOSE GEAR TORQUE LINKS
Every 25 hours, lubricate through grease fittings with MIL-G-7711 general purpose grease. Wipe off excess.

(23) ENGINE OIL SCREEN
Remove and wash screen (located on right rear side of engine accessory section) with Stoddard solvent (Fed. Spec. P-S-661) whenever engine oil is changed. (On aircraft equipped with an optional oil filter, the engine oil screen has been removed and replaced with an adapter unit for oil filtration.)

(24) BATTERY
Check level of electrolyte every 25 hours (or at least every 30 days), oftener in hot weather. Maintain level by adding distilled water. DO NOT overfill. Immediately neutralize spilled electrolyte with baking soda solution, then flush with water. Keep battery clean and connections tight. Neutralize corrosion deposits with baking soda solution, then rinse thoroughly.

Figure 5-1 (Sheet 3 of 6).

50 HOURS

22 OIL FILTER (OPT)
Change engine oil and replace filter element every 50 hours. Oil should be changed at least every four months even though less than 50 hours have accumulated. If the engine is operated in extremely dusty areas, in cold climates where sludging conditions exist, or where short flights and long idle periods are encountered which cause sludging conditions, the interval for changing oil should be reduced from the 50 hour interval outlined above.

100 HOURS

1 VACUUM SYSTEM OIL SEPARATOR (OPT)
Every 100 hours, remove separator and flush with Stoddard solvent (Fed. Spec. P-S-661), then dry with compressed air and reinstall.

2 FUEL/AIR CONTROL UNIT SCREEN
Every 100 hours, remove and clean the screen in the bottom of the fuel/air control unit, reinstall and resafety.

5 SUCTION RELIEF VALVE INLET SCREEN (OPT)
Every 100 hours, check inlet screen for dirt or obstructions if suction gage readings appear high. Remove screen and clean with compressed air or wash with Stoddard solvent (Fed. Spec. P-S-661).

6 FUEL TANK SUMP DRAINS
Every 100 hours, remove drain plugs, drain off water and sediment, and reinstall plugs. Safety wire plugs to adjacent safety screws.

7 GYRO INSTRUMENT AIR FILTERS (OPT)
Replace every 100 hours and when erratic or sluggish responses are noted with normal suction gage readings.

11 FUEL RESERVOIR DRAIN PLUGS
Every 100 hours, remove drain plug from bottom of each fuel

Figure 5-1 (Sheet 4 of 6).

reservoir, drain off water and sediment, and reinstall plug. Safety wire plug to adjacent fuselage structure.

12 BRAKE MASTER CYLINDERS
Every 100 hours, check fluid level in brake master cylinders. Fill with MIL-H-5606 (red) hydraulic fluid. Filling with a pressure pot connected to the brake bleeder ports is preferable, although fluid may be poured through the plugs on the top of the master cylinders.

17 SHIMMY DAMPENER
Every 100 hours, check fluid level in shimmy dampener. Fill with MIL-H-5606 hydraulic fluid.

21 PROPELLER
The McCauley propeller mechanism is sealed and does not require lubrication between overhauls. Grease the Hartzell propeller every 100 hours, using any good quality general purpose lithium base waterproof grease. To prevent entrapping air and high pressure, remove one of the grease fittings at each blade, then fill with grease through the opposite fitting at each blade. Fill the fittings until grease oozes from the holes from which the fittings were removed.

500 HOURS

10 WHEEL BEARINGS
Repack with MIL-G-7711 or aircraft wheel bearing grease at first 100 hours, 500 hours thereafter; oftener if more than the usual amount of water, mud, ice or snow is encountered.

AS REQUIRED

9 TIRES
Maintain pressure of 45 psi on the 5.00 × 5 nosewheel tire (35 psi on optional 6.00 × 6 tire) and 53 psi on the 6.00 × 6 main wheel tires (35 psi on optional 8.00 × 6 tires). Remove

Figure 5-1 (Sheet 5 of 6).

oil and grease from tires with soap and water; periodically inspect them for cuts, bruises and wear.

13 GROUND SERVICE RECEPTACLE (OPT)

Connect to 12-volt, DC, negative-ground power unit for cold weather starting and lengthy ground maintenance of the electrical system. Review Section III, paragraph "STARTING ENGINE" for position of master switch when using various external power sources.

16 NOSE GEAR SHOCK STRUT

Keep strut inflated and filled with MIL-H-5606 (red) hydraulic fluid. See Service Manual for detailed instructions.

The military specifications listed are not mandatory, but are intended as guides in choosing satisfactory materials. Products of most reputable manufacturers meet or exceed these specifications.

Figure 5-1 (Sheet 6 of 6).

OPERATIONAL DATA

The operational data charts on the following pages are presented for two purposes: first, so that you may know what to expect from your airplane under various conditions; and second, to enable you to plan your flights in detail and with reasonable accuracy.

A power setting selected from the range charts usually will be more efficient than a random setting, since it will permit accurate fuel flow settings and your fuel consumption can be estimated closely. You will find that using the charts and your Power Computer will pay dividends in over-all efficiency.

The data in the charts has been compiled from actual flight tests with the airplane and engine in good condition and using average piloting techniques. Note also that the range charts make no allowances for wind, navigational errors, warm-up, take-off, climb, etc. You must estimate these variables for yourself and make allowances accordingly.

AIRSPEED CORRECTION TABLE

FLAPS 0°							
IAS - MPH	60	80	100	120	140	160	180
TIAS - MPH	70	82	101	121	141	161	181
*FLAPS 20°							
IAS - MPH	50	60	70	80	90	100	110
TIAS - MPH	63	66	71	79	88	98	109
*FLAPS 40°							
IAS - MPH	50	60	70	80	90	100	110
TIAS - MPH	55	60	68	77	86	96	107

*Maximum flap speed 110 MPH-TIAS

Figure 6-1.

205
Best Glide Speed 85 IAS 87 TIAS

STALL SPEED, POWER OFF

GROSS WEIGHT 3300 LBS.	ANGLE OF BANK			
CONFIGURATION	0°	20°	40°	60°
FLAPS UP	67	69	77	95
FLAPS 20°	60	62	68	84
FLAPS 40°	57	59	65	81

SPEEDS ARE MPH, TIAS

Figure 6-2.

TAKE-OFF

1. Add 10% per 1000 ft pressure altitude
2. Add 10% per 15° F above standard for that pressure altitude
3. Add 10% for short grass
4. Add about 10% for uphill slope
5. a 10% increase in wt. = 20% increase in roll;
   a 20% " " " = 40% " " "
   (i.e., square wt. increase %)
6. Take off roll with wind = 90% minus the ratio of the wind velocity to normal take off velocity in %; i.e., $90\% - \frac{15 \text{ wind}}{60 \text{ take off}} (25\%) = 65\%$

TAKE-OFF DATA

TAKEOFF DISTANCE WITH 20° FLAPS FROM HARD-SURFACED RUNWAY, NO WIND

GROSS WEIGHT POUNDS	IAS @ 50 FT	HEAD WIND MPH	@ SEA LEVEL & 59°F		@ 2500 FT. & 50°F		@ 5000 FT. & 41°F		@ 7500 FT. & 32°F	
			GROUND RUN	TO CLEAR 50' OBSTACLE (INCLUDES GRD RUN)	GROUND RUN	TO CLEAR 50' OBSTACLE (INCLUDES GRD RUN)	GROUND RUN	TO CLEAR 50' OBSTACLE (INCLUDES GRD RUN)	GROUND RUN	TO CLEAR 50' OBSTACLE (INCLUDES GRD RUN)
2300	65	0	360	750	425	865	510	1020	620	1245
		15	195	485	240	570	290	680	365	850
		30	80	270	100	325	130	400	170	510
2800	72	0	505	1040	595	1230	710	1510	870	1960
		15	290	705	355	850	430	1060	540	1405
		30	135	425	170	525	220	675	285	925
3300	78	0	685	1465	815	1805	980	2390	1205	3745
		15	420	1030	505	1295	620	1755	780	2835
		30	215	660	265	850	340	1195	440	2015

NOTE: INCREASE DISTANCES 10% FOR EACH 20°F ABOVE STANDARD TEMPERATURE FOR PARTICULAR ALTITUDE.

CLIMB DATA

GROSS WEIGHT POUNDS	@ SEA LEVEL & 59°F			@ 5000 FT. & 41°F			@ 10,000 FT. & 23°F			@ 15,000 FT. & 5°F			@ 20,000FT. & -12°F		
	BEST CLIMB IAS MPH	RATE OF CLIMB FT/MIN	GAL OF FUEL USED	BEST CLIMB IAS MPH	RATE OF CLIMB FT/MIN	GAL OF FUEL USED	BEST CLIMB IAS MPH	RATE OF CLIMB FT/MIN	GAL OF FUEL USED	BEST CLIMB IAS MPH	RATE OF CLIMB FT/MIN	GAL OF FUEL USED	BEST CLIMB IAS MPH	RATE OF CLIMB FT/MIN	GAL OF FUEL USED
2300	95	1670	2.0	90	1320	3.0	85	975	4.2	80	630	5.7	73	385	8.0
2800	97	1260	2.0	93	965	3.4	88	665	5.1	83	370	7.5	78	70	12.7
3300	99	965	2.0	95	695	3.9	90	425	6.4	87	160	10.8	--	--	--

NOTE: FULL THROTTLE, 2625 RPM, MIXTURE AT RECOMMENDED LEANING SCHEDULE, FLAPS UP. FUEL USED INCLUDES WARM-UP AND TAKEOFF ALLOWANCE.

Figure 6-3.

CRUISE PERFORMANCE

NORMAL LEAN MIXTURE

Standard Conditions — Zero Wind — Gross Weight-3300 Pounds

2500 FEET

					63.5 GAL(NO RESERVE)		80 GAL(NO RESERVE)	
RPM	MP	% BHP	TAS MPH	GAL/ HOUR	ENDR. HOURS	RANGE MILES	ENDR. HOURS	RANGE MILES
2450	24	74	156	14.0	4.5	705	5.7	890
	23	70	152	13.2	4.8	730	6.1	925
	22	66	149	12.4	5.1	760	6.4	960
	21	62	145	11.7	5.4	790	6.9	995
2300	24	68	151	12.8	5.0	745	6.2	940
	23	65	147	12.1	5.2	770	6.6	970
	22	61	144	11.4	5.6	800	7.0	1005
	21	57	140	10.8	5.9	825	7.4	1040
2200	23	60	143	11.3	5.6	805	7.1	1015
	22	57	140	10.7	6.0	830	7.5	1045
	21	53	136	10.1	6.3	855	7.9	1080
	20	50	132	9.5	6.7	880	8.4	1110
2100	22	52	135	9.9	6.4	865	8.1	1090
	21	49	131	9.3	6.8	890	8.6	1120
	20	46	127	8.8	7.2	910	9.1	1150
	19	42	122	8.4	7.6	930	9.6	1170
	18	39	118	7.9	8.1	945	10.1	1195
	17	36	112	7.4	8.5	960	10.8	1210
	16	33	107	7.0	9.1	970	11.5	1220

Figure 6-4 (Sheet 1 of 5).

CRUISE PERFORMANCE

NORMAL LEAN MIXTURE

Standard Conditions — Zero Wind — Gross Weight-3300 Pounds

5000 FEET

					63.5 GAL(NO RESERVE)		80 GAL(NO RESERVE)	
RPM	MP	% BHP	TAS MPH	GAL/ HOUR	ENDR. HOURS	RANGE MILES	ENDR. HOURS	RANGE MILES
2450	24	77	162	14.5	4.4	705	5.5	890
	23	73	158	13.7	4.6	735	5.9	925
	22	68	154	12.9	4.9	760	6.2	960
	21	64	151	12.1	5.3	790	6.6	995
2300	24	70	156	13.2	4.8	750	6.0	945
	23	67	153	12.5	5.1	775	6.4	975
	22	63	149	11.8	5.4	800	6.8	1010
	21	59	145	11.1	5.7	830	7.2	1045
2200	23	62	148	11.6	5.5	810	6.9	1020
	22	58	145	11.0	5.8	835	7.3	1055
	21	55	141	10.4	6.1	860	7.7	1085
	20	51	137	9.8	6.5	890	8.2	1120
2100	22	53	139	10.1	6.3	875	7.9	1100
	21	50	136	9.6	6.6	895	8.3	1130
	20	47	131	9.1	7.0	920	8.8	1160
	19	44	127	8.6	7.4	940	9.3	1185
	18	41	122	8.1	7.8	955	9.9	1205
	17	37	117	7.6	8.3	970	10.5	1225
	16	34	111	7.2	8.8	980	11.1	1235

Figure 6-4 (Sheet 2 of 5).

CRUISE PERFORMANCE

NORMAL LEAN MIXTURE

Standard Conditions — Zero Wind — Gross Weight-3300 Pounds

7500 FEET

RPM	MP	% BHP	TAS MPH	GAL/ HOUR	63.5 GAL(NO RESERVE)		80 GAL (NO RESERVE)	
					ENDR. HOURS	RANGE MILES	ENDR. HOURS	RANGE MILES
2450	22	71	160	13.3	4.8	765	6.0	960
	21	66	156	12.5	5.1	795	6.4	1000
	20	62	152	11.7	5.4	825	6.8	1040
	19	58	148	10.9	5.8	855	7.3	1080
2300	22	65	154	12.2	5.2	805	6.6	1015
	21	61	151	11.5	5.6	835	7.0	1050
	20	57	146	10.8	5.9	865	7.4	1090
	19	53	142	10.1	6.3	895	7.9	1125
2200	22	60	150	11.3	5.6	840	7.1	1060
	21	57	146	10.7	6.0	870	7.5	1095
	20	53	142	10.1	6.3	895	8.0	1125
	19	50	137	9.5	6.7	920	8.4	1160
2100	21	52	140	9.9	6.4	905	8.1	1140
	20	49	136	9.3	6.8	925	8.6	1165
	19	45	132	8.8	7.2	950	9.1	1195
	18	42	127	8.3	7.6	965	9.6	1220
	17	39	122	7.9	8.1	980	10.2	1240
	16	36	116	7.4	8.6	995	10.8	1250
	15	32	109	6.9	9.2	1000	11.6	1260

Figure 6-4 (Sheet 3 of 5).

CRUISE PERFORMANCE

NORMAL LEAN MIXTURE

Standard Conditions — Zero Wind — Gross Weight-3300 Pounds

10,000 FEET

RPM	MP	% BHP	TAS MPH	GAL/ HOUR	63.5 GAL(NO RESERVE)		80 GAL (NO RESERVE)	
					ENDR. HOURS	RANGE MILES	ENDR. HOURS	RANGE MILES
2450	20	64	158	12.1	5.3	830	6.6	1045
	19	60	153	11.3	5.6	860	7.1	1085
	18	56	148	10.5	6.0	895	7.6	1125
	17	52	143	9.8	6.5	925	8.2	1165
2300	20	59	152	11.1	5.7	870	7.2	1095
	19	55	147	10.4	6.1	900	7.7	1135
	18	51	142	9.7	6.5	930	8.2	1170
	17	47	137	9.1	7.0	955	8.8	1205
2200	20	55	147	10.4	6.1	900	7.7	1135
	19	51	142	9.7	6.5	930	8.2	1170
	18	48	137	9.2	6.9	955	8.7	1200
	17	44	132	8.6	7.4	975	9.3	1230
2100	20	50	141	9.6	6.6	935	8.3	1175
	19	47	137	9.1	7.0	955	8.8	1205
	18	44	132	8.6	7.4	975	9.4	1230
	17	40	126	8.1	7.9	995	9.9	1250
	16	37	120	7.6	8.4	1005	10.6	1270
	15	34	114	7.1	8.9	1015	11.2	1275

Figure 6-4 (Sheet 4 of 5).

CRUISE PERFORMANCE

NORMAL LEAN MIXTURE

Standard Conditions — Zero Wind — Gross Weight-3300 Pounds

15,000 FEET

RPM	MP	% BHP	TAS MPH	GAL/ HOUR	63.5 GAL(NO RESERVE) ENDR. HOURS	63.5 GAL(NO RESERVE) RANGE MILES	80 GAL(NO RESERVE) ENDR. HOURS	80 GAL(NO RESERVE) RANGE MILES
2450	16	51	148	9.7	6.6	970	8.3	1220
	15	47	141	9.0	7.1	1000	8.9	1255
	14	42	134	8.3	7.6	1020	9.6	1285
	13	38	126	7.7	8.3	1040	10.4	1310
2300	16	47	141	9.0	7.1	1000	8.9	1255
	15	43	135	8.4	7.6	1020	9.6	1285
	14	38	127	7.8	8.2	1035	10.3	1305
	13	34	119	7.2	8.8	1045	11.1	1315
2200	16	43	136	8.5	7.5	1015	9.4	1280
	15	39	129	7.9	8.0	1035	10.1	1300
	14	36	121	7.4	8.6	1045	10.8	1315
2100	16	40	130	8.0	7.9	1030	10.0	1300
	15	36	123	7.5	8.5	1040	10.7	1315

Figure 6-4 (Sheet 5 of 5).

LANDING DISTANCE TABLE

HARD-SURFACED RUNWAY, NO WIND

GROSS WEIGHT LBS.	APPROACH IAS MPH	AT SEA LEVEL & 59°F		AT 2500 FT & 50°F		AT 5000 FT & 41°F		AT 7500 FT & 32°F	
		GROUND ROLL	TO CLEAR 50' OBSTACLE (INCLUDES GRD ROLL)	GROUND ROLL	TO CLEAR 50' OBSTACLE (INCLUDES GRD ROLL)	GROUND ROLL	TO CLEAR 50' OBSTACLE (INCLUDES GRD ROLL)	GROUND ROLL	TO CLEAR 50' OBSTACLE (INCLUDES GRD ROLL)
2300	69	435	915	470	965	505	1020	545	1080
2800	77	530	1215	570	1280	615	1350	665	1425
3300	83	625	1510	675	1590	725	1675	785	1770

NOTE: REDUCE LANDING DISTANCES 10% FOR EACH 6 MPH HEADWIND. FLAPS 40° AND POWER OFF.

Figure 6-5.

NOTES

Section 7

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OPTIONAL SYSTEMS

This section contains a description, operating procedures, and performance data (when applicable) for the "major item" optional equipment systems in your airplane. Only optional equipment requiring detailed coverage, for efficient utilization of the system, is discussed here. Optional equipment of a more simple nature is discussed in other portions of this manual.

RADIO SELECTOR SWITCHES

RADIO SELECTOR SWITCH OPERATION.

Operation of the radio equipment is normal as covered in the respective radio manuals. When more than one radio is installed, an audio switching system is necessary. The operation of this switching system is described below.

TRANSMITTER SELECTOR SWITCH.

The transmitter selector switch has two positions. When two transmitters are installed, it is necessary to switch the microphone and antenna to the radio unit the pilot desires to use for transmission. This is accomplished by placing the transmitter selector switch in position 1 or 2 corresponding to the radio unit which is to be used.

SPEAKER-PHONE SWITCHES.

The speaker-phone switches determine whether the output of the receiver in use is fed to the headphones or through the audio amplifier to the speaker. Place the switch for the desired receiving system either in the up position for speaker operation or in the down position for headphones.

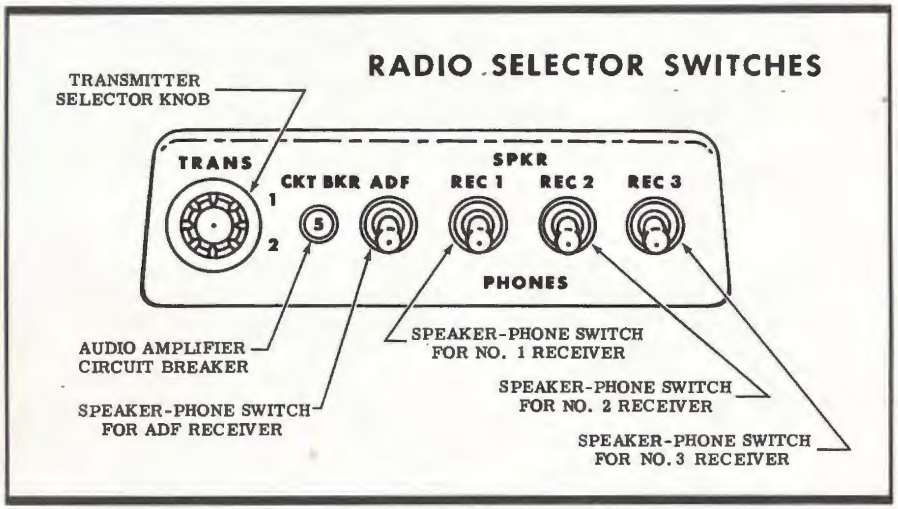

Figure 7-1.

AUDIO AMPLIFIER CIRCUIT BREAKER.

A "push-to-reset" type circuit breaker protects the audio amplifier circuit. Should a malfunction occur, the circuit breaker will pop out. If the malfunction was of a temporary nature, the breaker may be pushed in to reactivate the circuit; however, repeated popping out of the breaker indicates a more serious trouble and no further attempt should be made to reset the breaker and use the cabin speaker. Reposition the speaker-phone switches to "PHONES" for headphone operation which is unaffected by a malfunction in the audio amplifier.

NAV-O-MATIC

DESCRIPTION

NAV-O-MATIC.

The Cessna NAV-O-MATIC flight controller is an electronic, single-axis autopilot featuring a transistorized heading hold circuit.

The NAV-O-MATIC provides complete lateral stability, thereby giving the pilot additional time for navigational and visual flight operation by relieving him of most control duties between take-off and landing. The NAV-O-MATIC also provides heading holding capability. When the autopilot is engaged and trimmed, the airplane will hold a desired heading automatically. System components include a control unit, mounted on the instrument panel (see figure 7-2), an inclined rate gyro, mounted

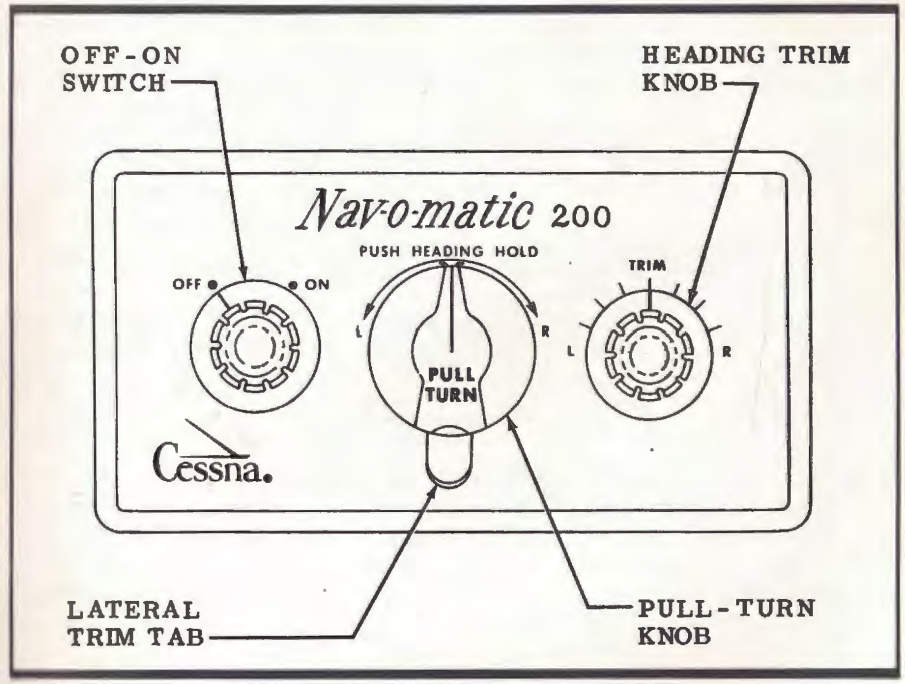

Figure 7-2.

behind the instrument panel, and a motor driven actuator connected to the right aileron bell crank.

OPERATING CHECK LIST

PREFLIGHT CHECK.

NOTE

A pre-flight check need not be performed before each flight. It is primarily used for ground checking the NAV-O-MATIC when a malfunction is suspected or as a periodic, preventive maintenance check. (See page 7-7 for Pre-Flight Ground Check procedure.

TAKE-OFF.

(1) NAV-O-MATIC "OFF-ON" switch in OFF position.

CRUISE.

(1) Trim aircraft for straight flight.
(2) Center all NAV-O-MATIC controls and turn NAV-O-MATIC "OFF-ON" switch ON.
(3) Pull out "PULL-TURN" knob and adjust lateral trim tab as required to level aircraft.
(4) Push in "PULL-TURN" knob to engage heading hold.
(5) Make fine adjustments to hold heading by use of the "TRIM" knob. After each new trim setting, disengage and re-engage "PULL-TURN" knob.

NOTE

Refer to paragraph entitled "USE OF THE NAV-O-MATIC TRIM KNOB" for additional details.

(6) To turn to new heading, pull out "PULL-TURN" knob and rotate it in the desired direction. Center knob and push in when aircraft is on new heading and wings are level.

BEFORE LANDING.

(1) NAV-O-MATIC "OFF-ON" switch in OFF position before entering traffic pattern.

OPERATING DETAILS

It is recommended that the NAV-O-MATIC not be engaged prior to take-off. Forces applied to the control system by the autopilot are easily overpowered; however, these forces could significantly alter the "feel" of the aircraft controls.

The NAV-O-MATIC requires no warm-up period before engagement since the system employs transistors and the rate gyro is operating when the aircraft's master switch is on. It is not mandatory that the procedure listed in the Operating Check List for engaging the autopilot be used, but it will result in the smoothest engagement. If the setting of the autopilot is different from the trim of the aircraft at the time the autopilot is engaged, it will cause a brisk change of attitude; however, no excessive loads will be imposed on the airplane.

Although the autopilot may be easily overpowered at any time, this practice should be minimized since some servo clutch wear will result from long periods of manually overpowering the system.

An aircraft out of trim condition will result in the NAV-O-MATIC causing the aircraft to fly with one wing low to maintain a heading. If objectional, this can be corrected by centering the ball in the turn and bank indicator with the rudder pedals or the rudder trim control.

The "PULL-TURN" knob can be used to turn to a new heading by pulling out to disengage the heading hold circuit and turning in the desired direction. When the aircraft is on the new heading, center the knob and push in to re-engage the heading circuit.

USE OF THE NAV-O-MATIC TRIM KNOB.

The heading "TRIM" knob is used to balance the internal electrical circuits of the NAV-O-MATIC system. Temperature changes or environmental conditions may cause the internal circuitry of the system to become electrically unbalanced. Through use of the "TRIM" knob, the internal circuitry can be adjusted so that the airplane has no tendency to drift due to unbalanced electrical signals.

With the "TRIM" knob adjusted so that the internal circuits are balanced, the autopilot will make corrective action only on airplane attitude changes. In this condition, the NAV-O-MATIC will hold a heading for extended periods of time.

The heading "TRIM" knob is used as follows:

(1) With aircraft trimmed for level flight at desired heading, push "PULL-TURN" knob in.

NOTE

The heading "TRIM" knob should be in centered position.

(2) Note initial heading and observe any noticeable heading drift. Do not be hasty about adjusting "TRIM" knob. Allow several minutes to determine the rate-of-drift.

NOTE

Use the magnetic compass to check drift. A precessing gyro compass would give a false indication of airplane drift.

(3) If airplane is drifting, turn heading "TRIM" knob one half graduation in the opposite direction from turn. Allow several minutes to determine new rate and direction of drift.

NOTE

After each new trim setting, dis-

engage and re-engage "PULL-TURN" knob. This erases the original electrical memory circuit and speeds up autopilot response for the new setting.

(4) If aircraft continues to drift in the same direction, continue to move heading "TRIM" knob in opposite direction of turn.

NOTE

The knob usually will not require as large a movement as before. For example, if rate-of-drift appears to be half that originally experienced, move knob one-fourth graduation; if drift rate is approximately one fourth, move knob one eighth graduation; etc.

(5) If aircraft starts to drift in the opposite direction, too much corrective trim has been applied. Rotate the heading "TRIM" knob in the opposite direction from the turn a distance proportionate to the turn rate.
(6) Make subsequent corrections of heading "TRIM" knob settings until the aircraft is holding the heading.

NOTE

Progressively finer adjustments of the heading "TRIM" knob will be required as the aircraft drift rate diminishes. Accurate judgment as to the amount of progressive knob movements required is quickly gained thru experience using the NAV-O-MATIC.

(7) Once the "TRIM" knob has been set to hold a heading, the unit should operate for extended periods of time without changing the knob setting. Do not touch the "TRIM" knob unless you are sure that the aircraft is drifting, in level flight, in respect to the magnetic compass. Do not be impatient. The NAV-O-MATIC temporarily may drift 1° to 5° to one side of course due to rough air. But, it should correct with an opposite drift to the other side and then return to your original heading. In rough air, the NAV-O-MATIC will "average out" on your heading. Temporary oscillation from course is normal.
(8) Changes in power settings or altitude should not affect the "TRIM" knob setting. During the time that power is being reduced or increased, or while the airplane is diving or climbing, the NAV-O-MATIC may change heading. However, once the aircraft has stabilized in level flight, at the new altitude or power setting, the NAV-O-MATIC will again hold a heading within the same accuracy that it held the original heading before the power or altitude change. If heading has changed, steer aircraft back onto original heading with the "PULL-TURN" knob and push knob in to re-engage heading hold. Do not move the heading "TRIM" knob.

EMERGENCY PROCEDURES

If a malfunction should occur in any of the autopilot units, it can be overridden merely with pressure on the normal flight controls, and the entire autopilot may be disengaged by turning the NAV-O-MATIC "OFF-ON" switch OFF.

PREFLIGHT GROUND CHECK.

To ground check the NAV-O-MATIC, start the engine and proceed as follows:

(1) Center all NAV-O-MATIC controls and pull "PULL-TURN" knob out. Allow 3-5 minutes for gyro to stabilize at operating speed.

NOTE

Check that master switch and circuit breaker are ON.

(2) Turn "OFF-ON" switch ON. Actuator should move ailerons to level flight position (control wheels slightly deflected to right).
(3) Turn "PULL-TURN" knob to full right. Note aileron response. Rotate knob full left. Control wheels should rotate in direction of turn and then slowly return to a setting part way back to level flight attitude. Reset "PULL-TURN" knob to center position.
(4) Over-ride actuator by manually turning control wheel to left and then right. When released from each position, the wheel should return to level flight position.

NOTE

On some aircraft, ailerons may not return to level flight attitude if control wheel is deflected to full left position. This is due to the variation in control system rigging permitting the follow-up potentiometer of the NAV-O-MATIC to be rotated more than 180 degrees. By slightly turning control wheel toward neutral, the NAV-O-MATIC will return the ailerons to level flight position. This condition cannot occur in flight due to air loads.

(5) Push "PULL-TURN" knob in and turn heading "TRIM" knob full left. Control wheel should rotate slowly to left. Turn "TRIM" knob full right. Control wheel should rotate slowly to right.
(6) Turn the aircraft left and right, while taxiing, and observe control wheel motion. As the aircraft is turned right, the control wheel should turn to the left. As the aircraft is turned left, the control wheel should turn right.

OXYGEN SYSTEM

An oxygen system, supplying oxygen through seven individual outlets, is available as optional equipment. The system is completely automatic and requires no manual regulation for change of altitude or flow shut-off when the system is not in use.

The system consists of an oxygen cylinder, filler valve, pressure gage, pressure regulator, outlet couplings, and six disposable oxygen face masks, complete with vinyl plastic hoses and flow indicators. The face masks and hoses are stored in a plastic bag, normally stowed on the utility shelf when use is not anticipated.

The oxygen cylinder and shut-off valve are located behind the baggage compartment wall. Oxygen, under high pressure, flows from the cylinder to a pressure gage and an automatic pressure regulator which supplies filtered, low pressure oxygen to the seven individual outlet couplings. The pressure gage, regulator, and five of the outlet couplings are located in the overhead console panel. The two remaining couplings are mounted in the aft cabin ceiling. When the oxygen mask hoses are plugged into the quick-disconnect outlet couplings, a continuous flow of oxygen is supplied to each mask. A flow indicator in each mask supply line shows if oxygen is flowing.

IMPORTANT

Permit no smoking when using oxygen. Oil, grease, soap and other fatty materials in contact with oxygen constitute a serious fire hazard. Be sure hands and clothing are oil-free before handling oxygen equipment.

OXYGEN SYSTEM OPERATION.

Prior to flight, check to be sure that there is an adequate oxygen supply for the trip, by noting the oxygen pressure gage reading. Refer to the Oxygen Duration Chart (figure 7-4). See that the plastic bag containing the face masks and hoses is accessible, and that the masks and hoses are in good condition.

To use the oxygen system, proceed as follows:

(1) Select mask and hose from plastic bag.
(2) If mask is not connected to hose, attach by inserting plastic tube on mask into rubber hose connector on delivery hose.
(3) Attach mask to face.
(4) Select oxygen outlet coupling in overhead console panel or two-port outlet manifold, and plug delivery hose into it. Oxygen will flow continuously at the proper rate-of-flow for any altitude without any manual adjustments.
(5) Check the flow indicator in the face mask hose. Oxygen is flowing if the red indicator compresses its return spring.

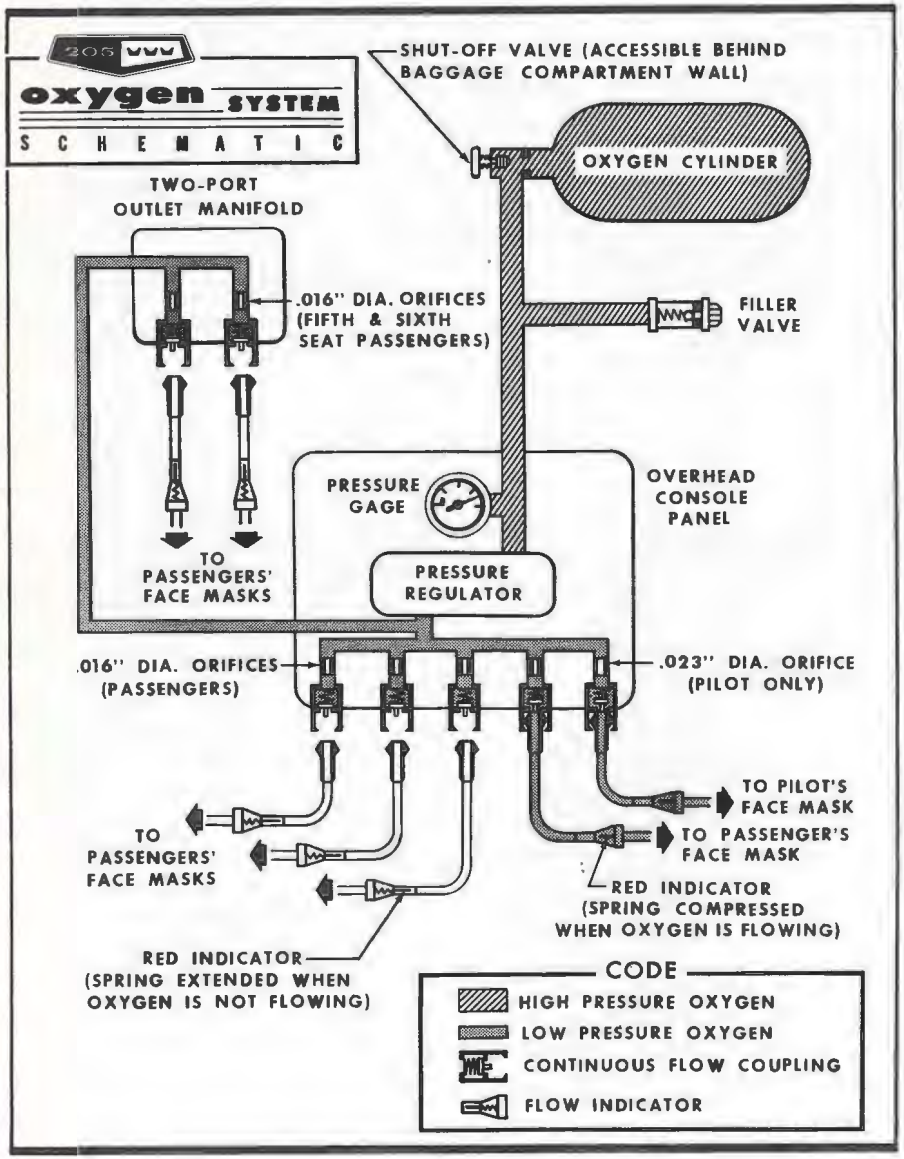

Figure 7-3.

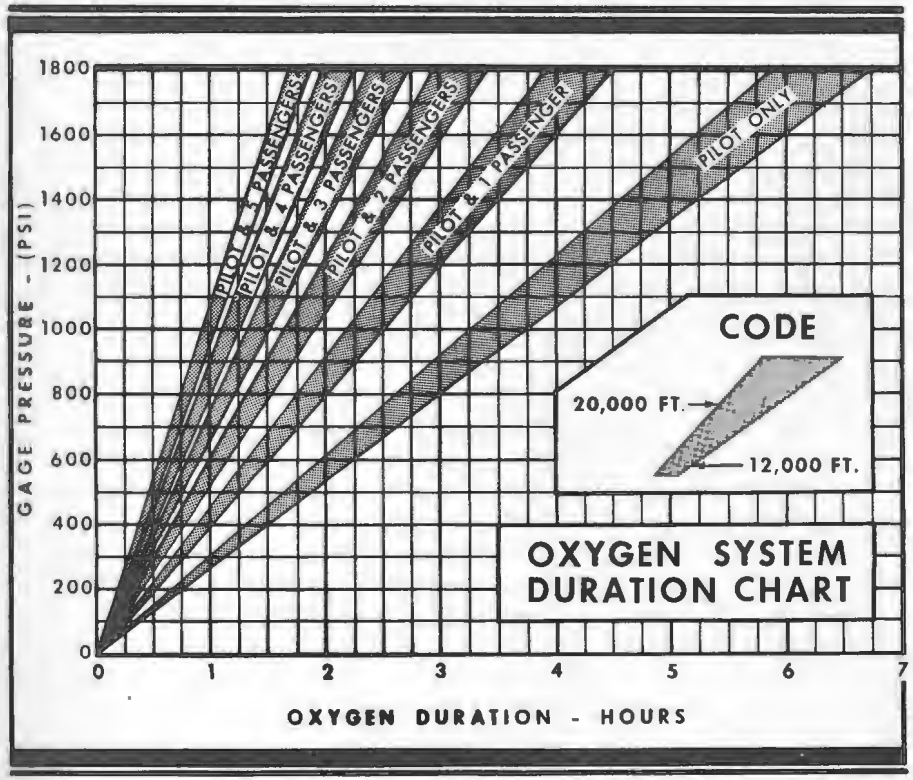

Figure 7-4.

NOTE

The left console outlet (labeled "PILOT") meters approximately twice the volume of oxygen metered by the other outlets.

(6) Unplug the delivery hose from the overhead console and two-port outlet manifold when discontinuing use of the oxygen system. This automatically stops the flow of oxygen.

OXYGEN SYSTEM SERVICING.

The oxygen cylinder, when fully charged, contains 48 cubic feet of oxygen, under a pressure of 1800 psi at 70°F. It should be refilled, whenever the oxygen pressure gage indicates less than 300 psi, with aviator's breathing oxygen (Fed. Spec. No. BB-O-925, or equivalent). For servicing convenience, a filler valve is located on the left side of

the utility shelf near the baggage door.

IMPORTANT

Oil, grease, or other lubricants in contact with oxygen create a serious fire hazard, and such contact must be avoided. Only a thread compound approved under MIL-T-5542 can be used safely on oxygen systems. Apply only to the first three threads of male fittings to prevent thread seizure.

The face masks used with the oxygen system are the partial-rebreathing, disposable type. The masks are durable and the frequent user can mark his mask for identification and reuse it many times. Additional masks and hoses are available from your Cessna Dealer.

ALPHABETICAL INDEX

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WARRANTY

■ The Cessna Aircraft Company warrants each new aircraft manufactured by it to be free from defects in material and workmanship under normal use and service, provided, however, that this warranty is limited to making good at The Cessna Aircraft Company's factory any part or parts thereof which shall, within six (6) months after delivery of such aircraft to the original purchaser, be returned to Cessna with transportation charges prepaid, and which upon Cessna's examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and all other obligations or liabilities on the part of Cessna, and Cessna neither assumes nor authorizes any other person to assume for it any other liability in connection with the sale of its aircraft.

■ This warranty shall not apply to any aircraft which shall have been repaired or altered outside Cessna's factory in any way so as, in Cessna's judgment, to affect the aircraft's stability or reliability, or which aircraft has been subject to misuse, negligence or accident.

SERVICING REQUIREMENTS

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FUEL:

AVIATION GRADE -- 100/130 MINIMUM GRADE
CAPACITY EACH STANDARD TANK -- 32.5 GALLONS
CAPACITY EACH LONG RANGE TANK -- 42.0 GALLONS

ENGINE OIL:

AVIATION GRADE -- SAE 30 BELOW 40° F.
SAE 50 ABOVE 40° F.
CAPACITY OF ENGINE SUMP -- 12 QUARTS
(DO NOT OPERATE ON LESS THAN 9 QUARTS AND FILL IF EXTENDED FLIGHT IS PLANNED)

HYDRAULIC FLUID:

MIL-H-5606 (RED) HYDRAULIC FLUID

OXYGEN:

AVIATOR'S BREATHING OXYGEN --
SPECIFICATION NO. BB-O-925
MAXIMUM PRESSURE -- 1800 PSI

TIRE PRESSURE:

MAIN WHEELS -- 53 PSI ON 6.00 × 6 TIRES
-- 35 PSI ON 8.00 × 6 TIRES
NOSE WHEEL -- 45 PSI ON 5.00 × 5 TIRE
-- 35 PSI ON 6.00 × 6 TIRE

Cessna®

"LOOK FOR THE RED AND BLUE CESSNA PENNANTS FOR THAT EXTRA SERVICE WHERE IT COUNTS WHEN YOU NEED IT".

CESSNA AIRCRAFT COMPANY

WICHITA, KANSAS

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

FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL

for the

Garmin GTN 625, 635, 650, 725, or 750 GPS/SBAS Navigation System

as installed in

Cessna 210-5

Make and Model Airplane

Registration Number: N205NB Serial Number: 205-0151

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 SA02019SE-D for the installation and operation of the Garmin GTN 625, 635, 650, 725, or 750 GPS/SBAS Navigation System. 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 by: Erik Frisk

Erik Frisk
ODA STC Unit Administrator
Garmin International, Inc.
ODA-240087-CE

Date: 2-NOV-2017

LOG OF REVISIONS				
	Page			
Revision Number	Date	Number	Description	FAA Approved
1	03/18/11	All	Complete Supplement	*Robert Grove* ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date: *03/18/2011*
2	12/18/12		See Revision 3	*Michael Warren* ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date: *12/18/2012*
3	03/26/13		See Revision 4	*Michael Warren* ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date: *04/12/2013*
4	11/24/14	7 11 16 18 20 20 & 21 26 27 32 34	Table 1 • Added new functions Section 1.4 • New section Section 2.7 • Modified limitation Section 2.12 • Added wire obstacles Section 2.21 • Modified limitation Section 2.22 & 2.23 • Added limitations Section 3.2.10 • Added Flight Stream 210 to procedure Section 4.1 • Removed telephone audio deactivation procedure Section 7.5 • Added wire obstacles Section 7.9 • Added Flight Stream 210	*Michael Warren* ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date : *11/25/2014*

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Revision Number	Date	Number	Description	FAA Approved
		34 37	Section 7.10 • Added wire obstacles Section 7.17 • Added section	
5	02/25/16	All	All Sections • Reformatted and updated sections to better coincide with the VFR AFMS. Section 2 • Added RF leg description and limitations • Added QFE limitations • Added Autopilot limitations • Added polar operation limitation • Added text regarding new data units in the GTN • Added Fuel Range Ring description and limitations • Added Flight Stream 210 limitation Section 4 • Added autopilot capability assessment regarding RF legs • Updated installer descriptions of configuration checkboxes • Added Search and Rescue autopilot note • Added RNP 1.0 installation options Section 7 • Added GMA 35c information • Removed references to GDL 88 and replaced with generic ADS-B	*Michael Warren* ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date : *02/25/2016*

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	Page			
Revision Number	Date	Number	Description	FAA Approved
			• Added GWX 70 turbulence detection note • Added GTN crossfill information	
6	09/09/16	1	Table 1 • Added Flight Stream 510 data	*Michael Warren* ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date : *09/09/2016*
		5	Section 1.2 • Removed text	
		6-8	Section 1.5 • Added definitions	
		9	Section 2.1 • Updated CRG Revisions	
		12	Table 3 • Added Flight Stream 510 line	
		12	Section 2.7 • MMC additions	
		12	Section 2.8 • Added reference to section 2.29	
		18	Section 2.28 • Fixed error	
		18	Sections 2.29-2.31 • New Sections	
		22	Section 3.2.8 • Reworded and added additional text	
		23	Sections 3.2.9-3.2.13 • New Sections • Renumbered sections	
		27	Section 4.7 • New section	
		29	Section 7.1 • New revision numbers	

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Revision Number	Date	Number	Description	FAA Approved
		32	Section 7.9 • Added Flight Stream 510	
		33	Section 7.10 • Reworded	
		34	Table 4 • Added PTC	
		38	Section 7.19 • Flight Stream 510 content added	
		41-42	Sections 7.25-7.26 • New sections	
7	10/17/17	6-8	Sections 1.5 • New definitions	See Page i
		9	Section 2.1 • Updated CRG Revisions	
		10	Section 2.4 • Updated FDE compliance text	
		12	Section 2.6 • Updated software grid	
		13	Section 2.10 • Renamed section	
		19-20	Section 2.32-2.33 • New sections	
		22	Section 3.2.1-2 • Updated text	
		32	Section 7.27 • Updated PG Revisions	
		45	Section 7.27 • New section	

Table of Contents

Section 1. General

1.1 Garmin GTN Navigators

The Garmin GTN navigation system is a GPS system with a Satellite Based Augmentation System (SBAS), comprised of one or more Garmin TSO-C146c GTN 625, 635, 650, 725, or 750 navigator(s) and one or more Garmin approved GPS/SBAS antenna(s). The GTN navigation system is installed in accordance with AC 20-138A.

	GTN 625	GTN 635	GTN 650	GTN 725	GTN 750
GPS SBAS Navigation: • Oceanic, enroute, terminal, and non-precision approach guidance • Precision approach guidance (LP, LPV)	X	X	X	X	X
VHF Com Radio, 118.00 to 136.990, MHz, 8.33 or 25 kHz increments		X	X		X
VHF Nav Radio, 108.00 to 117.95 MHz, 50 kHz increments			X		X
LOC and Glideslope non-precision and precision approach guidance for Cat 1 minimums, 328.6 to 335.4 MHz tuning range			X		X
Moving map including topographic, terrain, aviation, and geopolitical data	X	X	X	X	X
Display of datalink weather products, SiriusXM, FIS-B, Connext (all optional)	X	X	X	X	X
Control and display of airborne weather radar (optional)				X	X
Display of terminal procedures data (optional)				X	X
Display of traffic data, including ADS-B (optional)	X	X	X	X	X
Display of StormScope® data (optional)	X	X	X	X	X
Display of marker beacon annunciators (optional)	X*	X*	X*	X	X
Remote audio panel control (optional)				X	X
Remote transponder control (optional)	X	X	X	X	X
Remote audio entertainment datalink control (optional)	X	X	X	X	X
TSO-C151c Class B TAWS (optional)	X	X	X	X	X
Supplemental calculators and timers	X	X	X	X	X
Control of GSR 56 Iridium Satellite Phone and SMS Text	X	X	X	X	X
Control of Flight Stream 210 (optional)	X	X	X	X	X
Control of Flight Stream 510 (optional)	X	X	X	X	X

* Display of marker beacon annunciations on the GTN 6XX is only possible when installed with a Garmin GMA 350 audio panel.

Table 1 – GTN Functions

The GPS navigation functions and optional VHF communication and navigation radio functions are operated by dedicated hard keys, a dual concentric rotary knob, or the touchscreen.

Figure 1 - GTN 750 Control and Display Layout

Figure 2 - GTN 635/650 Control and Display Layout

1.2 System Capabilities

This Flight Manual Supplement documents the installed capabilities of the GTN specific to the aircraft for which this manual is created.

NOTE

In sections which contain a square checkbox (□) the installer will have placed an "X" in the boxes next to the capabilities applicable to the installation.

The GTN system and associated navigation interface in this aircraft have the following capabilities, in addition to the core multifunction display capability:

- ☒ VHF Communication Radio
- ☒ Primary VHF Navigation
- ☒ Primary GPS Navigation (Enroute) and Approach Capability (LP/LNAV) – See below
- ☒ Primary GPS Approach Capability with Vertical Guidance (LNAV/VNAV, LPV) – See below
- ☐ TSO-C151c Terrain Awareness and Warning System – See section 2.15

GPS/SBAS TSO-C146c Class 3 Operation

The GTN complies with AC 20-138A and has airworthiness approval for navigation using GPS and SBAS (within the coverage of a Satellite Based Augmentation System complying with ICAO Annex 10) for IFR enroute, terminal area, and non-precision approach operations (including those approaches titled "GPS", "or GPS", and "RNAV (GPS)" approaches). The Garmin GNSS navigation system is composed of the GTN navigator and antenna, and is approved for approach procedures with vertical guidance including "LPV" and "LNAV/VNAV" and without vertical guidance including "LP" and "LNAV".

The Garmin GNSS navigation system complies with the equipment requirements of AC 90-105 and meets the equipment performance and functional requirements to conduct RNP terminal departure and arrival procedures and RNP approach procedures including procedures with RF legs subject to the limitations herein. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval from the FAA.

The Garmin GNSS navigation system complies with the equipment requirements of AC 90-100A for RNAV 2 and RNAV 1 operations. In accordance with AC 90-100A, Part 91 operators (except subpart K) following the aircraft and training guidance in AC 90-100A are authorized to fly RNAV 2 and RNAV 1 procedures. Part 91 subpart K, 121, 125, 129, and 135 operators require operational approval from the FAA.

Applicable to dual installations consisting of two Garmin GNSS units: The Garmin GNSS navigation system has been found to comply with the requirements for GPS Class II oceanic and remote navigation (RNP-10) without time limitations in accordance with AC 20-138A and FAA Order 8400.12A. The Garmin GNSS navigation system can be used without reliance on other long-range navigation systems. This does not constitute an operational approval.

The Garmin GNSS navigation system has been found to comply with the navigation requirements for GPS Class II oceanic and remote navigation (RNP-4) in accordance with AC 20-138A and FAA Order 8400.33. The Garmin GNSS navigation system can be used without reliance on other long-range navigation systems. Additional equipment may be required to obtain operational approval to utilize RNP-4 performance. This does not constitute an operational approval.

The Garmin GNSS navigation system complies with the accuracy, integrity, and continuity of function, and contains the minimum system functions required for P-RNAV operations in accordance with JAA Administrative & Guidance Material Section One: General Part 3: Temporary Guidance Leaflets, Leaflet No 10 (JAA TGL-10 Rev 1). The GNSS navigation system consists of one or more TSO-C146c Class 3 approved Garmin GTN Navigation Systems. The Garmin GNSS navigation system complies with the accuracy, integrity, and continuity of function, and contains the minimum system functions required for B-RNAV operations in accordance with EASA AMC 20-4. The Garmin GNSS navigation system complies with the equipment requirements for P-RNAV and B-RNAV/RNAV-5 operations in accordance with AC 90-96A CHG 1. This does not constitute an operational approval.

Garmin International holds an FAA Type 2 Letter of Acceptance (LOA) in accordance with AC 20-153 for database integrity, quality, and database management practices for the navigation database. Flight crew and operators can view the LOA status at FlyGarmin.com then select "Type 2 LOA Status."

Navigation information is referenced to the WGS-84 reference system.

Note that for some types of aircraft operation and for operation in non-U.S. airspace, separate operational approval(s) may be required in addition to equipment installation and airworthiness approval.

Advanced RNP Capabilities

The GTN includes 3 out of 6 of the features required for operations in airspace requiring Advance RNP based on the *ICAO document 9613 Performance Based Navigation (PBN) Manual, fourth edition, 2013* and is therefore not approved for Advanced RNP operations. The following table describes the six Advanced RNP capabilities and the GTN capabilities.

Advanced RNP Feature	GTN Capability
RF legs	Available if enabled for installation. See Section 2.12 for limitations.
Parallel offsets	Available.
Scalable RNP	GTN provides CDI scalability in compliance with TSO-C146c. RNP scalability is not available.
RNAV holding	Available.
Fixed radius transitions	Not available in GTN.
Time of arrival control (TOAC)	Not available in GTN.

1.3 Electronic Flight Bag

The GTN 750/725 are operationally suitable as Class 3 Hardware, Type B Software in accordance with AC 120-76B EFB electronic aeronautical information when using current FliteChart or ChartView data.

Use of the Flight Stream interface and data for the purpose of Electronic Flight Bag applications is not approved as part of this STC. Additional approval may be required to obtain operational approval for use of the Flight Stream and supplied data to supplement EFB systems.

1.4 Electronic Checklists

The GTN checklist functions are designed to DO-178B software design assurance level B and support a minor failure classification. While this STC does not grant operational approval for operators requiring such approval, there are no limitations precluding operators from obtaining their own operational approval for the checklist function.

1.5 Definitions

The following terminology is used within this document:

ADF:	Automatic Direction Finder
ADS-B:	Automatic Dependent Surveillance Broadcast
AEG:	Aircraft Evaluation Group (FAA)
APR:	Approach
CDI:	Course Deviation Indicator
DME:	Distance Measuring Equipment
ECAC:	European Civil Aviation Conference
EFB:	Electronic Flight Bag
EGNOS:	European Geostationary Navigation Overlay Service
EHSI:	Electronic Horizontal Situation Indicator
FIS-B:	Flight Information Services Broadcast
GAGAN:	GPS Aided GEO Augmented Navigation
GNSS:	Global Navigation Satellite System
GPA:	Glidepath Angle
GPS:	Global Positioning System
GPSS:	GPS Roll Steering
GTN:	Garmin Touchscreen Navigator
HOT:	Hazardous Obstacle Transmission wires
HSI:	Horizontal Situation Indicator
IAP:	Instrument Approach Procedure
IFR:	Instrument Flight Rules
ILS:	Instrument Landing System

IMC: Instrument Meteorological Conditions
LDA: Localizer Directional Aid
LNAV: Lateral Navigation
LNAV +V: Lateral Navigation with advisory Vertical Guidance
L/VNAV: Lateral/Vertical Navigation
LOC: Localizer
LOC-BC: Localizer Backcourse
LP: Localizer Performance
LPV: Localizer Performance with Vertical Guidance
LP +V: Localizer Performance with Advisory Vertical Guidance
MLS: Microwave Landing System
MMC: Multi-Media Card
NOTAM: Notice to Airmen
OBS: Omni Bearing Selector
PED: Portable Electronic Device
RAIM: Receiver Autonomous Integrity Monitoring
RF Leg: Radius-To-Fix Leg of a Charted Instrument Procedure
RMT: Remote
RNAV: Area Navigation
RNP: Required Navigational Performance
SAR: Search and Rescue
SBAS: Satellite Based Augmentation System
SD: Secure Digital
SDF: Simplified Directional Facility
SUSP: Suspend
TACAN: Tactical Air Navigation System
TAS: Traffic Awareness System
TAWS: Terrain Awareness and Warning System
TCAS: Traffic Collision Avoidance System
TCH: Threshold Crossing Height
TFR: Temporary Flight Restriction
TIS: Traffic Information Service
VHF: Very High Frequency
VFR: Visual Flight Rules
VGSI: Visual Glide-Slope Indicator
VLOC: VOR/Localizer
VMC: Visual Meteorological Conditions

VOR:	VHF Omnidirectional Range
VRP:	Visual Reporting Point
WAAS:	Wide Area Augmentation System
WFDE:	WAAS Fault Data Exclusion
XFR:	Transfer

Section 2. LIMITATIONS

2.1 Cockpit Reference Guide

The Garmin GTN 6XX or GTN 7XX Cockpit Reference Guide, part number and revision listed below (or later revisions), *must* be immediately available to the flight crew whenever navigation is predicated on the use of the GTN.

- GTN 6XX Cockpit Reference Guide P/N 190-01004-04 Rev L
- GTN 7XX Cockpit Reference Guide P/N 190-01007-04 Rev K

2.2 Kinds of Operation

This AFM supplement does not grant approval for IFR operations to aircraft limited to VFR operations.

2.3 Minimum Equipment

The GTN must have the following system interfaces fully functional in order to be used for primary navigation during IFR operations:

Interfaced Equipment	Number installed	Number Required for IFR
External HSI/CDI/EHSI	1 or more	1
External GPS Annunciator	See Note 1	1

Table 2 – Required Equipment

Note 1: Certain installations require an external GPS annunciator panel. If installed, this annunciator must be fully functional to use the GTN GPS navigation for IFR operations.

Single engine piston aircraft under 6,000 lbs. maximum takeoff weight:
Required Equipment for IFR operations utilizing GPS navigation: Single GTN Navigator

All other aircraft:
Required Equipment for IFR operations utilizing GPS navigation: Single GTN Navigator plus a second source of GPS navigation or a separate source of VHF navigation. The separate source of VHF navigation must not be the primary GTN, but it may be a secondary GTN.

Operation in remote or oceanic operation requires two sources of GPS navigation.

2.4 Flight Planning

For flight planning purposes, in areas where SBAS coverage is not available, the flight crew must check RAIM availability. An acceptable means of compliance for FDE prediction programs is to use a certified service which meets the requirements of FAA AC 20-138 and FAA AC 90-105A for prediction.

The following table describes some of the available RAIM prediction programs.

Prediction Program	Internet address or program details	Coverage Area
Garmin RAIM Prediction Tool	https://fly.garmin.com/fly-garmin/support/raim/	Worldwide
Garmin WFDE Prediction program	PC-based program included in GTN trainer v3.00 – 6.30. Instructions provided via Garmin part number 190-00643-01	Worldwide
FAA Service Availability Prediction Tool	http://sapt.faa.gov	US Only
Flight Service Station	1-800-WXBRIEF https://www.1800wxbrief.com	US Only
AUGER GPS RAIM Prediction Tool	http://augur.ecacnav.com/augur/app/home	ECAC Airspace Only

This RAIM availability requirement is not necessary if SBAS coverage is confirmed to be available along the entire route of flight.

For flight planning purposes, for operations within the U.S. National Airspace System on RNP and RNAV procedures when SBAS signals are not available, the availability of GPS RAIM shall be confirmed for the intended route of flight. In the event of a predicted continuous loss of RAIM of more than five minutes for any part of the intended route of flight, the flight shall be delayed, canceled, or rerouted on a track where RAIM requirements can be met. The flight may also be re-planned using non-GPS based navigational capabilities.

For flight planning purposes for operations within European B-RNAV/RNAV-5 and P-RNAV airspace, if more than one satellite is scheduled to be out of service, then the availability of GPS RAIM shall be confirmed for the intended flight (route and time). In the event of a predicted continuous loss of RAIM of more than five minutes for any part of the intended flight, the flight shall be delayed, canceled, or rerouted on a track where RAIM requirements can be met.

Applicable to dual installations consisting of two Garmin GNSS units:

> For flight planning purposes, for operations where the route requires Class II navigation the aircraft's operator or flight crew must use the Garmin WFDE Prediction program to demonstrate that there are no

outages on the specified route that would prevent the Garmin GNSS navigation system to provide GPS Class II navigation in oceanic and remote areas of operation that requires RNP-10 or RNP-4 capability. If the Garmin WFDE Prediction program indicates fault exclusion (FDE) will be unavailable for more than 34 minutes in accordance with FAA Order 8400.12A for RNP-10 requirements, or 25 minutes in accordance with FAA Order 8400.33 for RNP-4 requirements, then the operation must be rescheduled when FDE is available.

Both Garmin GPS navigation receivers must be operating and providing GPS navigation guidance for operations requiring RNP-4 performance.

North Atlantic (NAT) Minimum Navigational Performance Specifications (MNPS) Airspace operations per AC 91-49 and AC 120-33 require both GPS/SBAS receivers to be operating and receiving usable signals except for routes requiring only one Long Range Navigation sensor. Each display computes an independent navigation solution based on its internal GPS receiver.

Whenever possible, RNP and RNAV routes including Standard Instrument Departures (SIDs), Standard Terminal Arrival (STAR), and enroute RNAV "Q" and RNAV "T" routes should be loaded into the flight plan from the database in their entirety, rather than loading route waypoints from the database into the flight plan individually. Selecting and inserting individual named fixes from the database is permitted, provided all fixes along the published route to be flown are inserted. Manual entry of waypoints using latitude/longitude or place/bearing is prohibited.

It is not acceptable to flight plan a required alternate airport based on RNAV(GPS) LP/LPV or LNAV/VNAV approach minimums. The required alternate airport must be flight planned using an LNAV approach minimums or available ground-based approach aid.

Navigation information is referenced to the WGS-84 reference system, and should only be used where the Aeronautical Information Publication (including electronic data and aeronautical charts) conform to WGS-84 or equivalent.

2.5 System Use

In installations with two GTNs and an external GPS annunciator (See Table 2) the GTN connected to the external GPS annunciator must be used as the navigation source for all IFR operations.

The only approved sources of course guidance are on the external CDI, HSI, or EHSI display. The moving map and CDI depiction on the GTN display are for situational awareness only and are not approved for course guidance.

2.6 Applicable System Software

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

The Main and GPS software versions are displayed on the start-up page immediately after power-on. All software versions displayed in Table 3 can be viewed on the System – System Status or Connext Setup pages.

Software Item	Software Version *(or later FAA Approved versions for this STC)*
Main SW Version	6.41
GPS SW Version	5.2
Com SW Version	2.20
Nav SW Version	6.03
Flight Stream 210	2.70
Flight Stream 510	2.30

Table 3 - Software Versions

2.7 MMC / SD Database Cards

It is required that the SD database card or Flight Stream 510 (MMC) be present in the GTN at all times. The SD or MMC device must not be removed or inserted during flight or while the GTN is powered on.

NOTE

Removal of the SD or MMC device will result in certain features and databases not being available and may slow system performance.

2.8 Navigation Database

GPS/SBAS based IFR enroute, oceanic, and terminal navigation is prohibited unless the flight crew verifies and uses a valid, compatible, and current navigation database or verifies each waypoint for accuracy by reference to current approved data.

"GPS", "or GPS", and "RNAV (GPS)" instrument approaches using the Garmin navigation system are prohibited unless the flight crew verifies and uses the current navigation database. GPS based instrument approaches must be flown in accordance with an approved instrument approach procedure that is loaded from the navigation database.

Discrepancies that invalidate a procedure should be reported to Garmin International. The affected procedure is prohibited from being flown using data from the navigation database until a new navigation database is installed in the aircraft and verified that the discrepancy has been corrected. Navigation database discrepancies can be reported at FlyGarmin.com by selecting "Aviation Data Error Report." Flight crew and operators can view navigation database alerts at FlyGarmin.com then select "NavData Alerts."

If the navigation database cycle will change during flight, the flight crew must ensure the accuracy of navigation data, including suitability of navigation facilities used to define the routes and procedures for flight. If an amended chart affecting navigation data is published for the procedure, the database must not be used to conduct the procedure.

See Section 2.29 for limitations regarding database update procedures.

2.9 Ground Operations

Do not use SafeTaxi or ChartView functions as the basis for ground maneuvering. SafeTaxi and ChartView functions do not comply with the requirements of AC 20-159 and are not qualified to be used as an airport moving map display (AMMD). SafeTaxi and ChartView are to be used by the flight crew to orient themselves on the airport surface to improve flight crew situational awareness during ground operations.

2.10 Instrument Approaches

a) Instrument approaches using GPS guidance may only be conducted when the GTN is operating in the approach mode. (LNAV, LNAV +V, L/VNAV, LPV, LP, or LP +V)
b) When conducting instrument approaches referenced to true North, the NAV Angle on the System -Units page must be set to **True**.
c) The navigation equipment required to join and fly an instrument approach procedure is indicated by the title of the procedure and notes on the IAP chart. Navigating the final approach segment (that segment from the final approach fix to the missed approach point) of an ILS, LOC, LOC-BC, LDA, SDF, MLS, VOR, TACAN approach, or any other type of approach not approved for GPS, is not authorized with GPS navigation guidance. GPS guidance can only be used for approach procedures with GPS or RNAV in the procedure title. When using the Garmin VOR/LOC/GS receivers to fly the final approach segment, VOR/LOC/GS navigation data must be selected and presented on the CDI of the pilot flying.
d) Advisory vertical guidance deviation is provided when the GTN annunciates LNAV + V or LP +V. Vertical guidance information displayed on the VDI in this mode is only an aid to help flight crews comply with altitude restrictions. When using advisory vertical guidance, the flight crew must use the primary barometric altimeter to ensure compliance with all altitude restrictions.
e) Not all published Instrument Approach Procedures (IAP) are in the navigation database. Flight crews planning to fly an RNAV instrument approach must ensure that the navigation database contains the planned RNAV Instrument Approach Procedure and that approach procedure must be loaded from the navigation database into the GTN system flight plan by its name. Pilots are prohibited from flying any approach path that contains manually entered waypoints.
f) IFR approaches are prohibited whenever any physical or visual obstruction (such as a throw-over yoke) restricts pilot view or access to the GTN and/or the CDI.

2.11 Barometric Setting

The barometric altimeter setting used for any barometric corrected altitude source interfaced to the GTN must be set appropriate to the altitude type depicted on the procedure (QNH or QFE).

2.12 RF Legs

This STC does not grant operational approval for RF leg navigation for those operators requiring operational approval. Additional FAA approval may be required for those aircraft intending to use the GTN as a means to provide RNP 1 navigation in accordance with FAA Advisory Circular AC 90-105.

The following limitations apply to procedures with RF legs:

- Aircraft is limited to 180 KIAS while on the RF leg
- RF legs are limited to RNP 1 procedures. RNP AR and RNP <1 are not approved
- Primary navigation guidance on RF legs must be shown on an EHSI indicator with auto-slew capability turned ON
- GTN Moving Map, EHSI Map, or Distance to Next Waypoint information must be displayed to the pilot during the RF leg when flying without the aid of the autopilot or flight director.
- The active waypoint must be displayed in the pilot's primary field of view.

2.13 Autopilot Coupling

The flight crew may fly all phases of flight based on the navigation information presented to the flight crew; however, not all modes may be coupled to the autopilot. All autopilots may be coupled in Oceanic (OCN), Enroute (ENR), and Terminal (TERM) modes.

This installation is limited to:

☒ Lateral coupling only for GPS approaches. Coupling to the vertical path for GPS approaches is not authorized.

It is possible to create flight plan waypoint sequences, including Search and Rescue patterns, which exceed the autopilot's bank angle capabilities. The pilot shall monitor autopilot performance with regard to flight path deviation.

2.13.1 RNP 1.0 RF Leg Types

AC 90-105 states that procedures with RF legs must be flown using either a flight director or coupled to the autopilot.

This STC has demonstrated acceptable crew workload and Flight Technical Error for hand flown procedures with RF legs when the GTN installation complies with limitation set forth in Section 2.12 of this document. It is recommended to couple the autopilot for RF procedures, if available, but it is

not required to do so. See section 4.5 of this manual to determine if this capability is supported in this installation.

2.14 Terrain Proximity Function (All Units)

Terrain, point obstacle, and wire obstacle information appears on the map and terrain display pages as red and amber terrain, obstacles, or wires and is depicted for advisory use only. Aircraft maneuvers and navigation must not be predicated upon the use of the terrain display. Terrain, obstacle and wire information is advisory only and is not equivalent to warnings provided by TAWS.

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

NOTE

Terrain and TAWS are separate features and mutually exclusive. If "TAWS B" is shown on the bottom right of the dedicated terrain page, then TAWS is installed.

2.15 TAWS Function (Optional)

Flight crews are authorized to deviate from their current ATC clearance to the extent necessary to comply with TAWS warnings. Navigation must not be predicated upon the use of TAWS.

TAWS shall be inhibited when landing at an airport that is not included in the airport database.

If an external TAWS annunciator panel is installed in the aircraft, this annunciator panel must be fully functional in order to use the TAWS system.

NOTE

Terrain and TAWS are separate features and mutually exclusive. If "TAWS B" is shown on the bottom right of the dedicated terrain page, then TAWS is installed.

2.16 Polar Operations

Use of the GTN for primary navigation for latitudes above 89.00° N and below 89.00° S is prohibited.

2.17 Datalink Weather Display (Optional)

This limitation applies to datalink weather products from SiriusXM via a GDL 69/69A, FIS-B via a GDL 88 or GTX 345, and Connext via a GSR 56.

Do not use data link weather information for maneuvering in, near, or around areas of hazardous weather. Information provided by data link weather products may not accurately depict current weather conditions.

Do not use the indicated data link weather product age to determine the age of the weather information shown by the data link weather product. Due to time delays inherent in gathering and processing weather data for data link transmission, the weather information shown by the data link weather product may be significantly older than the indicated weather product age.

Do not rely solely upon data link services to provide Temporary Flight Restriction (TFR) or Notice to Airmen (NOTAM) information. Not all TFRs and NOTAMS can be depicted on the GTN.

Datalink text weather is decoded for the convenience of the pilot, however it is possible that the decoding may be affected by anomalies in the data or differences in the units of measure between the decoding system and the text weather source. All text weather displayed on the GTN also includes the raw weather text for pilot review.

2.18 Traffic Display (Optional)

Traffic may be displayed on the GTN when connected to an approved optional TCAS I, TAS, TIS, or ADS-B traffic device. These systems are capable of providing traffic monitoring and alerting to the flight crew. Traffic shown on the display may or may not have traffic alerting available. The display of traffic is an aid to visual acquisition and may not be utilized for aircraft maneuvering.

Traffic is displayed in feet regardless of the unit settings for altitude. If the units for altitude are different than feet, a "FT" label will appear on the traffic icon on and main map page, and the dedicated traffic page will include an "ALT IN FT" notification.

2.19 StormScope® Display (Optional)

StormScope® lightning information displayed by the GTN is limited to supplemental use only. The use of the StormScope® lightning data on the display for hazardous weather (thunderstorm) penetration is prohibited. StormScope® lightning data on the display is intended only as an aid to enhance situational awareness of hazardous weather, not penetration. It is the flight crew's responsibility to avoid hazardous weather using official weather data sources.

When the GTN StormScope® page is operating without a heading source, as indicated by the "HDG N/A" label at the upper right corner of the StormScope® page, strikes must be cleared after each heading change.

2.20 Flight Planner/Calculator Functions

The Fuel Planning page uses Fuel on Board or Fuel Flow as received from an on board fuel totalizer, as entered by the pilot at system startup, or as entered by the pilot when on the Fuel Planning page. This *is not* a direct indication of actual aircraft fuel flow or fuel on board and those values are only used for the Fuel Planning page. The fuel required to destination is only a calculated and predicted value based on the data entered into the planner. It is not a direct indication of how much fuel the aircraft will have upon reaching the destination.

2.21 Fuel Range Rings

The fuel range rings displayed on the moving map are intended for situational awareness and do not represent a direct indication of endurance or fuel remaining. The distance between the segmented green reserve ring and the yellow zero fuel ring is 45 minutes by default. The reserve value can be changed from the GTN map setup menu.

Fuel range data is derived by the interfaced fuel totalizer data. Data entered in the Fuel Planning pages will not update the fuel range ring.

2.22 Glove Use / Covered Fingers

No device may be used to cover fingers used to operate the GTN unless the Glove Qualification Procedure located in the Pilot's Guide/Cockpit Reference Guide has been successfully completed. The Glove Qualification Procedure is specific to a pilot / glove / GTN 725, 750 or GTN 625, 635, 650 combinations.

2.23 Demo Mode

Demo mode may not be used in flight under any circumstances.

2.24 Active Weather Radar

Radar is broadcasting energy while in Weather or Ground mapping modes. If the GTN 750/725 system is configured to control an airborne weather radar unit, observe all safety precautions, including:

- Do not operate in the vicinity of refueling operations.
- Do not operate while personnel are in the vicinity (approximately 20 feet) of the radar sweep area.

CAUTION

If a radar system is installed, it generates microwave radiation and improper use, or exposure, may cause serious bodily injury. Do not operate the radar equipment until you have read and carefully followed the safety precautions and instructions in the weather radar user manual and/or pilot's guide.

2.25 Telephone Audio

Telephone audio must not be distributed to the pilot or co-pilot unless a phone call is active.

CAUTION

Failure to turn off telephone audio when the telephone is not in use may result in telephone ringer or text message aural notifications being received during critical phases of flight.

2.26 Multi Crew Aircraft (GMA 35 Only)*

For aircraft type certified with more than one required pilot, or operations requiring more than one pilot, the "Group Co-Pilot with Passenger" audio panel option shall not be activated. This option is found in the Intercom Setup Menu when a Garmin GMA 35 audio panel is installed.

2.27 Wire Obstacle Database

Only the "Obstacle/HOT Line" database may be used. Use of the "Obstacle/Wire" database is prohibited. The database version can be viewed on the start-up database verification or System- System Status pages.

2.28 Portable Electronic Devices

This STC does not relieve the operator from complying with the requirements of 91.21 or any other operational regulation regarding portable electronic devices.

The Flight Stream interface and data provided to a portable electronic device is not approved to replace any aircraft display equipment, including navigation or traffic/weather display equipment.

2.29 Database Updates

Database updates via MMC / SD card or Flight Stream wireless transfers must be done while the aircraft is on the ground and stationary. In-flight database transfers or updates are prohibited in flight unless part of the Database SYNC function that occurs in the background to move databases from one LRU to another.

2.30 Charts Database (Dual GTN7XX)

When the aircraft installation includes 2 GTNs capable of displaying charts (GTN 700, 725 or 750) and crossfill is enabled between the GTNs, the GTNs must have identical charts types (ChartView or FliteCharts) and charts cycles installed. Failure to have identical charts could affect the chart lookup features and automatic chart selection.

2.31 Automatic Speech Recognition

Pilots may not use the ASR function to operate the GTN/GMA unless they have completed the ASR Qualification Procedure located in the GTN Cockpit Reference Guide successfully. The ASR Qualification Procedure is specific to each pilot / headset / aircraft combination.

2.32 OBS Mode

Use of OBS mode for flight plan segments greater than 250NM is prohibited.

* Includes GMA 35 and GMA 35c Audio Panels

2.33 Advisory Visual Approaches

All advisory visual approaches shall be conducted in VMC. Advisory visual approaches are intended to be used as an aid to situational awareness and do not guarantee terrain or obstruction clearance along the approach path. Use of advisory visual approaches in IMC is prohibited.

3.1 Emergency Procedures

3.1.1 TAWS WARNING

Red annunciator and aural "PULL UP":

Autopilot ..... **DISCONNECT**
Aircraft Controls ..... **INITIATE MAXIMUM POWER CLIMB**
Airspeed ..... **BEST ANGLE OF CLIMB SPEED**

After Warning Ceases:

Altitude ..... **CLIMB AND MAINTAIN SAFE ALTITUDE**
Advise ATC of Altitude Deviation, if appropriate.

NOTE

Only vertical maneuvers are recommended, unless either operating in visual meteorological conditions (VMC), or the flight crew determines, based on all available information, that turning in addition to the vertical escape maneuver is the safest course of action, or both.

NOTE

TAWS annunciators external to the GTN may not indicate the exact threat causing the alert. Example: WIRE alerts may be annunciated as TERR or OBSTACLE on external devices.

3.2 Abnormal Procedures

3.2.1 LOSS OF GPS/SBAS NAVIGATION DATA

When the GPS/SBAS receiver is inoperative or GPS navigation information is not available or invalid, the GTN will enter one of two modes: Dead Reckoning mode (DR) or Loss Of Integrity mode (LOI). The mode is indicated on the GTN by an amber "DR" and/or "LOI".

If the LOI annunciation is displayed, revert to an alternate means of navigation appropriate to the route and phase of flight. If LOI occurs while the GTN is in the ENR or OCN phase of flight, it may also display DR.

If the DR annunciation is displayed, the map will continue to be displayed with an amber "DR" overwriting the ownship icon. Course guidance will be removed on the CDI. Aircraft position will be based upon the last valid GPS position, then estimated by Dead Reckoning methods. Changes in true airspeed, altitude, heading, or winds aloft can affect the estimated position substantially.

If Alternate Navigation Sources (ILS, LOC, VOR, DME, ADF) Are Available:

Navigation ..... **USE ALTERNATE SOURCES**

If No Alternate Navigation Sources Are Available:

DEAD RECKONING (DR) MODE:

Navigation ..... **USE GTN**

NOTE

All information normally derived from GPS will become less accurate over time.

LOSS OF INTEGRITY (LOI) MODE (no DR annunciated on the GTN):

Navigation .....**FLY TOWARDS KNOWN VISUAL CONDITIONS**

NOTE

All information derived from GPS will be removed.

NOTE

The airplane symbol is removed from all maps. The map will remain centered at the last known position. "NO GPS POSITION" will be annunciated in the center of the map.

3.2.2 GPS APPROACH DOWNGRADE

During a LPV, LP +V, LNAV/VNAV, or LNAV +V approach, if GPS accuracy requirements cannot be met by the GPS receiver, the GTN will downgrade the approach. The downgrade will remove vertical deviation indication from the VDI and change the approach annunciation to LNAV. The approach may be continued using the LNAV only minimums. If the VISUAL approach is downgraded, the GTN will remove the vertical deviation indication from the VDI, but continue to annunciate VISUAL in amber.

During a GPS approach in which GPS accuracy requirements cannot be met by the GPS receiver for any GPS approach type, the GTN will flag all CDI guidance and display a system message "ABORT APPROACH-GPS approach no longer available". Immediately upon viewing the message, the unit will revert to Terminal navigation mode alarm limits. If the position integrity is within these limits lateral guidance will be restored and the GPS may be used to execute the missed approach, otherwise alternate means of navigation must be utilized.

3.2.3 LOSS OF COM RADIO TUNING FUNCTIONS

If alternate COM is available:
Communications ..... **USE ALTERNATE COM**

If no alternate COM is available:
COM RMT XFR key (if installed).....**PRESS AND HOLD FOR 2 SECONDS**

NOTE

This procedure will tune the active COM radio the emergency frequency 121.5, regardless of what frequency is displayed on the GTN. Certain failures of the tuning system will automatically tune 121.5 without flight crew action.

3.2.4 LOSS OF AUDIO PANEL FUNCTIONS (GMA 35 Only)†

Audio Panel Circuit Breaker .....**PULL**

NOTE

This procedure will force the audio panel into fail safe mode which provides only the pilot with communications and only on a single COM radio. If any non GTN 750 COM is installed, communication will be only on that radio. If only a GTN 750 is installed in the aircraft, then the pilot will have only the GTN 750 COM available. No other audio panel functions including aural alerting and the crew and passenger intercom will function.

† Includes GMA 35 and GMA 35c Audio Panels

3.2.5 TAWS CAUTION (Terrain or Obstacle Ahead, Sink Rate, Don't Sink)

When a TAWS CAUTION occurs, take 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.

NOTE

TAWS annunciators external to the GTN may not indicate the exact threat causing the alert. Example: WIRE alerts may be annunciated as TERR or OBSTACLE on external devices.

3.2.6 TAWS INHIBIT

The TAWS Forward Looking Terrain Avoidance (FLTA) and Premature Descent Alerts (PDA) functions may be inhibited to prevent alerting, if desired. Refer to GTN Cockpit Reference Guide for additional information.

To Inhibit TAWS:

Home Hardkey ..... **PRESS**
Terrain Button ..... **PRESS**
Menu Button ..... **PRESS**
TAWS Inhibit Button ..... **PRESS TO ACTIVATE**

3.2.7 TER N/A and TER FAIL

If the amber **TER N/A** or **TER FAIL** status annunciator is displayed, the system will no longer provide TAWS alerting or display relative terrain and obstacle elevations. The crew must maintain compliance with procedures that ensure minimum terrain and obstacle separation.

3.2.8 DATA SOURCE - HEADING SOURCE INOPERATIVE OR CONNECTION TO GTN LOST MESSAGE

Without a heading source to the GTN, the following limitations apply:

- Roll steering will not be provided to the autopilot for heading legs. The autopilot must be placed in HDG mode for heading legs.
- Map cannot be oriented to Heading Up.
- Overlaying traffic data from a TAS/TCAS I or Garmin ADS-B-IN unit interfaced to an on board traffic system will not be displayed on the main map display. The flight crew must use the dedicated traffic page on the GTN system to display TAS/TCAS I or Garmin ADS-B-IN traffic data.
- All overlaying StormScope® data on the main map display will be removed. The flight crew must use the dedicated StormScope® page on the GTN system to display StormScope® data.
- Onboard weather radar overlay on the main map will not be displayed. The flight crew must utilize the dedicated weather radar page on the GTN system to view weather radar data from the onboard weather radar.

StormScope® must be operated in accordance with Section 7.8 when no heading is available.

3.2.9 ASR (VOICE COMMAND) SYSTEM FAILURES

In the event the ASR system fails and there is a need to disable the voice command inputs to the GTN:

To Disable ASR:

Home Hardkey ..... **PRESS**
System Button ..... **PRESS**
Voice Commands Button ..... **PRESS**
Voice Commands Enable Button ..... **TOGGLE OFF**

3.2.10 LOSS OF GTN TOUCH CONTROL

In the event the GTN becomes unusable due to uncommanded page changes, the ASR function may be the source.

To Disable ASR:

Audio Panel Circuit Breaker ..... **PULL**
Home Hardkey ..... **PRESS**
System Button ..... **PRESS**
Voice Commands Button ..... **PRESS**
Voice Commands Enable Button ..... **TOGGLE OFF**
Audio Panel Circuit Breaker ..... **PUSH**

3.2.11 DATA SOURCE – PRESSURE ALTITUDE SOURCE INOPERATIVE OR CONNECTION TO GTN LOST MESSAGE

Without a barometric corrected altitude source to the GTN, the following features will not operate:

- Automatic leg sequencing of legs requiring an altitude source. The flight crew must manually sequence altitude legs, as prompted by the system.

3.2.12 UNRECOVERABLE LOSS OF ALL ELECTRICAL GENERATORS OR ALTERNATORS

Remove power from all equipment which is not necessary for flight, including GTN #2 (NAV/GPS 2, COM 2) and the Flight Stream 210 (BT LINK), if installed.

3.2.13 IN-AIR RESTART OF GTN

In the event of a GTN restart in the air, the crew should utilize the CANCEL button if presented with the database update screen after the GTN is restarted. This will ensure restoration of the navigation functions as soon as possible.

Section 4. NORMAL PROCEDURES

Refer to the GTN Cockpit Reference Guide defined in Section 2.1 of this document or the Pilot's Guide defined in Section 7.1 for normal operating procedures and a complete list of system messages and associated flight crew actions. This includes all GPS operations, VHF communication and navigation, traffic, data linked weather, StormScope®, TAWS, and Multi-Function Display information.

The GTN requires a reasonable degree of familiarity to avoid becoming too engrossed at the expense of basic instrument flying in IMC and basic see-and-avoid in VMC. Garmin provides training tools with the Pilot's Guide and PC based simulator. Pilots should take full advantage of these training tools to enhance system familiarization.

4.1 Unit Power On

Databases ..... **REVIEW DATES**
Self-Test..... **VERIFY OUTPUTS TO NAV INDICATORS**
Self-Test - TAWS Remote Annunciator:
- PULL UP ..... **ILLUMINATED**
- TERR..... **ILLUMINATED**
- TERR N/A ..... **ILLUMINATED**
- TERR INHB ..... **ILLUMINATED**

Self-Test - GPS Remote Annunciator:
- VLOC ..... **ILLUMINATED**
- GPS..... **ILLUMINATED**
- LOI or INTG..... **ILLUMINATED**
- TERM ..... **ILLUMINATED**
- WPT..... **ILLUMINATED**
- APR ..... **ILLUMINATED**
- MSG ..... **ILLUMINATED**
- SUSP or OBS ..... **ILLUMINATED**

4.2 Before Takeoff

System Messages and Annunciators ..... **CONSIDERED**

4.3 HSI and EHSI Operation

If an HSI is used to display navigation data from the GTN the pilot should rotate the course pointer as prompted on the GTN.

If an EHSI is used to display navigation data from the GTN the course pointer may autoslew to the correct course when using GPS navigation. When using VLOC navigation the course pointer will not autoslew and must be rotated to the correct course by the pilot. For detailed information about the functionality of the EHSI system, refer to the FAA approved Flight Manual or Flight Manual Supplement for that system.

CAUTION

The pilot must verify the active course and waypoint for each flight plan leg. The pilot must verify proper course selection each time the CDI source is changed from GPS to VLOC.

See Section 4.5 for RF leg capabilities related to EHSI.

4.4 Autopilot Operation

The GTN may be coupled to an optional autopilot, if installed in the aircraft, when operating as prescribed in the LIMITATIONS section of this manual.

Autopilots coupled to the GTN system in an analog (NAV) mode will follow GPS or VHF navigation guidance as they would with existing VOR receivers.

Autopilots that support GPSS or GPS Roll Steering in addition to the analog course guidance will lead course changes, fly arcing procedures, procedure turns, and holding patterns if coupled in a roll steering mode.

The GTN supports autopilot roll steering for heading legs when an approved heading source is interfaced to the GTN. This heading interface can also provide map orientation, traffic and StormScope heading data and wind calculations.

CAUTION

The GTN does not provide course deviation to the autopilot for heading legs. Some autopilots do not allow the use of roll steering when course deviation is not provided.

☒ This installation *has* a heading source. The GTN will provide roll steering on heading legs for the autopilot.

☐ This installation *does not have* a heading source. The crew cannot use the GTN roll steering to fly heading legs with the autopilot.

For autopilot operating instructions, refer to the FAA approved Flight Manual or Flight Manual Supplement for the autopilot.

4.5 Coupling the Autopilot during approaches

CAUTION

When the CDI source is changed on the GTN, autopilot mode may change. Confirm autopilot mode selection after CDI source change on the GTN. Refer to the FAA approved Flight Manual or Flight Manual Supplement for the autopilot.

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

☐ This installation prompts the flight crew and requires the pilot to enable the approach outputs just prior to engaging the autopilot in APR mode.

To couple an approach:
Once established on the final approach course with the final approach fix as the active waypoint, the GTN will issue a flashing message indication.

Flashing Message Button ..... **PRESS**
"Enable APR Output" Button..... **PRESS**

If coupled, Autopilot will revert to ROL mode at this time.

Autopilot..... **ENGAGE APPROACH MODE**

☐ This installation supports coupling to the autopilot in approach mode once vertical guidance is available.

To couple an approach:
Once established on the final approach course with the final approach fix as the active waypoint, the GTN will enable vertical guidance.

Vertical Guidance.....**CONFIRM AVAILABLE**
Autopilot..... **ENGAGE APPROACH MODE**

☒ The installation *does not* support any vertical capture or vertical tracking.

The GTN allows for the utilization of IFR procedures that include RF (Radius to Fix) legs as part of RNP 1.0 capabilities.

- ☐ This installation is equipped to support coupled RF leg navigation up to RNP 1.0.
- ☐ This installation is equipped to support *un-coupled* RF leg navigation up to RNP 1.0.
- ☐ This installation *does not* support RF leg navigation.

4.6 Coupling the Autopilot during Search and Rescue Operations

Search and Rescue (SAR) patterns created in the GTN flight plan may include turns that cannot be accomplished with standard autopilot turn rates. Monitor autopilot performance relative to the desired path if coupled when using Search and Rescue patterns.

4.7 Database Conflict Resolution

When a conflict occurs between databases on different GTNs that are utilizing Database SYNC the pilot should resolve that conflict by pressing the "Resolve Conflict" button on the GTN that has the desired databases. This would be the GTN with the newest database on the SD card or Flight Stream 510. After initiating the conflict resolution, the pilot can view the SYNC status of the database on the other GTN by viewing the System -> Standby Database page. Once the database SYNC is complete, the receiving GTN must be restarted to install the new database and complete the conflict resolution process.

NOTE

The databases on the receiving LRU will be overwritten by the databases from the LRU from which the "Resolve Conflicts" action was initiated.

Section 5. PERFORMANCE

No change.

Section 6. WEIGHT AND BALANCE

See current weight and balance data.

7.1 Pilot's Guide

The Garmin GTN 6XX or GTN 7XX Pilot's Guide, part number and revision listed below, contain additional information regarding GTN system description, control and function. The Pilot's Guides *do not* need to be immediately available to the flight crew.

- GTN 6XX Pilot's Guide — P/N 190-01004-03 Rev L or later
- GTN 7XX Pilot's Guide — P/N 190-01007-03 Rev N or later

7.2 Leg Sequencing

The GTN supports all ARINC 424 leg types. Certain leg types require altitude input in order to sequence (course to altitude, for example). If a barometric corrected altitude source is not interfaced to the GTN, a popup will appear prompting the flight crew to manually sequence the leg once the altitude prescribed in the procedure is reached.

☐ This installation *has* a barometric corrected altitude source. The GTN will automatically sequence altitude legs.

☒ This installation *does not have* a barometric corrected altitude source. The flight crew will be prompted to manually sequence altitude legs.

7.3 Auto ILS CDI Capture

Auto ILS CDI Capture will not automatically switch from GPS to VLOC for LOC-BC or VOR approaches.

7.4 Activate GPS Missed Approach

☒ This installation *will* autoswitch from VLOC to GPS when the "Activate GPS Missed Approach" button is pressed.

☐ This installation *will not* autoswitch from VLOC to GPS when the "Activate GPS Missed Approach" button is pressed. The pilot must manually switch from VLOC to GPS if GPS guidance is desired after the missed approach point.

7.5 Terrain Proximity and TAWS

CAUTION

Not all obstacles and wires are contained in the Obstacle/HOT Line database. The system provides depiction (and alerts, if TAWS is installed) only for obstacles and wires contained in the database.

NOTE

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

☒ This installation supports *Terrain Proximity. No aural or visual alerts* for terrain or obstacles are provided. Terrain Proximity *does not* satisfy the TAWS requirement of 91.223.

☐ This installation supports *TAWS B.* Aural and visual alerts *will be* provided. This installation *does* support the TAWS requirement of 91.223.

Terrain on the dedicated terrain page or main map overlay is depicted in the following manner:

- Terrain more than 1,000 feet below the aircraft is not depicted, or depicted as black.
- Terrain between 1,000 feet and 100 feet below the aircraft is depicted as amber.
- Terrain within 100 feet below the aircraft, or above the aircraft, is depicted as red.

Obstacles and wires on the dedicated terrain page or main map are depicted in the following manner:

- Obstacles and wires more than 2,000 feet below the aircraft are not depicted.
- Obstacles and wires between 2,000 feet and 1,000 feet below the aircraft are depicted as white.
- Obstacles and wires between 1,000 feet and 100 feet below the aircraft are depicted as amber.
- Obstacles and wires within 100 feet below the aircraft, or above the aircraft, are depicted as red.

Multiple obstacles may be depicted using a single obstacle icon and an asterisk to indicate obstacle grouping is occurring. The color of the asterisk indicates the relative altitude of the tallest obstacle in the group. The asterisk does not indicate any information about the relative altitude or number of obstacles not being displayed in the obstacle group.

The Garmin GTN 6XX or GTN 7XX Cockpit Reference Guide or Garmin GTN 6XX or GTN 7XX Pilot's Guide provides additional information regarding terrain and obstacle colors and grouped obstacle icons.

7.6 GMA 35/35c Audio Panel (Optional)

The GTN 725 and 750 can interface to a GMA 35/35c remotely mounted audio panel and marker beacon receiver. Controls for listening to various radios, activating the cabin speaker, clearance playback control, and marker beacon are accessed by pressing the "Audio Panel" button on the GTN display screen. Optional Bluetooth pairing functionality can be accessed from the associated System /Connext Setup page (GMA 35c only). Volume controls for the audio panel are accessed by pressing the "Intercom" button on the GTN display screen.

Aircraft alerting audio may be routed through the GMA 35/35c audio panel. There are no pilot controls for alert audio volumes. In the event of a loss of GMA35/35c function alert audio routed through the audio panel may not be heard.

7.7 Traffic System (Optional)

This system is configured for the following type of traffic system. The Garmin GTN 6XX or GTN 7XX Cockpit Reference Guide or Garmin GTN 6XX or GTN 7XX Pilot's Guide provides additional information regarding the functionality of the traffic device.

- ☐ No traffic system is interfaced to the GTN.
- ☐ A TAS/TCAS I traffic system is interfaced to the GTN.
- ☐ A TIS traffic system is interfaced to the GTN.
- ☐ A TCAD traffic system is interfaced to the GTN.
- ☒ A Garmin ADS-B traffic system is interfaced to the GTN.
- ☐ A Garmin ADS-B traffic system is interfaced to the GTN. The ADS-B traffic system is also interfaced to an on board traffic system.

7.8 StormScope® (Optional)

When optionally interfaced to a StormScope® weather detection system, the GTN may be used to display the StormScope® information. Weather information supplied by the StormScope® will be displayed on the StormScope® page of the GTN system. For detailed information about the capabilities and limitations of the StormScope® system, refer to the documentation provided with that system.

Heading Up mode:

If the GTN system is receiving valid heading information, the StormScope® page will operate in the heading up mode as indicated by the label "HDG UP" presented at the upper right corner of the display. In this mode, information provided by the StormScope® system is displayed relative to the nose of the aircraft and *is* automatically rotated to the correct relative position as the aircraft turns.

Heading Not Available mode:

If the GTN system is not receiving valid heading information, either because a compatible heading system is not installed, or the interfaced heading system has malfunctioned, the StormScope® page will continue to operate without a heading source and indicate "HDG N/A" in the upper right corner of the GTN display. In this mode, information provided by the StormScope® system is displayed relative to the nose of the aircraft but *is not* automatically rotated to the correct relative position as the aircraft turns. When operating in this mode, StormScope® strikes must be cleared after each turn the aircraft performs.

7.9 Power

- Power to the GTN is provided through a circuit breaker labeled NAV/GPS (1/2).
- Power to the optional GTN COM is provided through a circuit breaker labeled COM (1/2).
- Power to the optional GMA 35 is provided through a circuit breaker labeled AUDIO.
- Power to the optional Flight Stream 210 is provided through a circuit breaker labeled BT LINK.
- Power to the optional Flight Stream 510 is provided through the GTN MMC/SD card slot and protected via the GTN circuit breaker.

7.10 Databases and Flight Plan Waypoints/Procedures

Database versions (or cycles) and effective dates are displayed on the start-up database verification page immediately after power-on for those databases with an effective or expiration date. Databases with no effective or expiration date (e.g. - terrain database) are considered effective upon installation in the GTN. Database information can also be viewed on the System – System Status page.

The Obstacle Database has an area of coverage that includes the United States and Europe, and is updated as frequently as every 56 days. The HOT Line wire database only includes the continental United States and portions of Canada/Mexico.

Only the Obstacle/HOT Line wire database may be used in accordance with the limitation found in Section 2.27.

If a stored flight plan contains a waypoint or procedure that does not correspond to a waypoint or procedure in the navigation database in use, the waypoint or procedure will become locked (depicted as "lockd") in the flight plan. Flight plans with locked waypoints may be placed in the active flight plan portion of the system but no navigation will be provided. The locked waypoint/procedure must be resolved by removing or replacing it with the correct waypoint/procedures in the flight plan before the system will provide navigation.

7.11 External Switches

External switches may be installed and interfaced to the GTN. These switches may be stand alone, or integrated with a TAWS or GPS annunciator. Table 4 lists the switches and function they perform:

Switch Label	Function
CDI	Toggles between GPS / VLOC sources. This switch may be part of an external annunciator panel.
COM CHAN DN	Toggles down through the preset com frequencies.
COM CHAN UP	Toggles up through the preset com frequencies.
COM RMT XFR	Transfers the COM active / standby frequencies.
NAV RMT XFR	Transfers the NAV active / standby frequencies.
OBS	Performs an OBS or SUSP function. This switch is part of an external annunciator panel and is placarded with the following: "Green OBS indicates OBS or SUSP mode – GTN annunciator bar indicates which is active. Push OBS button to change OBS or SUSP mode."
OBS/SUSP	Performs an OBS or SUSP function.
TERR INHB	Toggles the TAWS Inhibit function on/off. This switch is part of an external annunciator panel. The terrain display is still presented if TAWS is Inhibited.
PTC	Push-to-Command switch for Voice Command input to the GMA and the GTN.

Table 4 – External Switches

7.12 Airspace Depiction and Alerts

The GTN aides the flight crew in avoiding certain airspaces with Smart Airspace and airspace alerts. Smart Airspace de-emphasizes depicted airspace that is not near the aircraft's current altitude. Airspace Alerts provide a message indication to the flight crew when the aircraft's current ground track will intercept an airspace type that has been selected for alerting.

NOTE

Smart Airspace and Airspace Alerts are separate features. Turning on/off Smart Airspace does not affect Airspace Alerts, and vice versa.

7.13 Garmin ADS-B Traffic System Interface (Optional)

A Garmin ADS-B traffic system may be interfaced to the GTN. The *nose* of the ownship symbol on both the GTN main map page and dedicated traffic page serves as the actual location of your aircraft. The *center* of the traffic target icon serves as the reported location for the target aircraft. Motion vectors for traffic may be displayed in either absolute or relative motion. The location of the traffic targets relative to the ownship are the same, regardless of the selected motion vector.

Absolute motion vectors are colored either cyan or white, depending on unit configuration. Absolute motion vectors depict the reported track of the traffic target referenced to the ground. An absolute motion vector pointed towards your ownship symbol *does not* necessarily mean the traffic target is getting closer to your aircraft.

Relative motion vectors are always colored green and depict the motion of the traffic target relative to your ownship symbol. The direction the traffic target is pointed may vary greatly from the motion vector and a target may be getting closer to your aircraft independent of the direction the target is pointed. A green relative motion vector pointed towards your ownship indicates that the traffic target *is* converging on your aircraft.

If more than one target is occupying the same area of the screen, the GTN will combine the two or more traffic targets into one traffic group. The presence of an asterisk to the left of a target indicates that traffic has been grouped. The highest priority traffic target in the group is displayed to the pilot. When applied to airborne targets the asterisk will be displayed in white or cyan depending on the traffic depiction color used in the installation. The asterisk will be brown for grouped ground targets. The asterisk will not turn amber, even if an alerted target is included in the group.

An alerted target may be placed in the same group as non-alerted targets. In this case, the alerted target will be displayed. Two alerted targets will not be placed in the same group. All alerted targets will be displayed on the screen.

Traffic targets displayed on the dedicated traffic page may be selected in order to obtain additional information about a traffic target or to view all targets in a grouped target. When a grouped target is selected, the "Next" button on the dedicated traffic page will cycle through all targets located in close proximity to where the screen has been touched.

7.14 GWX 70 Weather Radar (Optional)

The GWX 70 Weather Radar uses Doppler technology to optionally provide advanced features to the flight crew such as turbulence detection and ground clutter suppression. Turbulence detection can detect turbulence up to 40nm from the aircraft and will be displayed at radar ranges of 160nm or less.

NOTE

Turbulence detection does not detect all turbulence especially that which is occurring in clear air. The display of turbulence indicates the possibility of severe or greater turbulence, as defined in the Aeronautical Information Manual.

7.15 Charts (Optional)

The GTN 750/725 can display both procedure charts and weather data on the main map page at the same time. When datalink NEXRAD or Precipitation is overlaid on the main map page, the weather data is displayed *below* an overlaid procedure chart. When airborne weather radar is overlaid on the main map page, the radar data is displayed *above* an overlaid procedure chart.

7.16 Transponder Control (Optional)

The GTN can be interfaced to a Garmin transponder for control and display of squawk code, mode, and additional transponder functions. The activation of the "Enable ES" button on the transponder page does not indicate the aircraft is in full compliance with an ADS-B Out solution in accordance with TSO-C166b (1090ES). Consult your transponder documentation for additional information.

7.17 Telephone Audio (Optional)

Telephone audio distribution to the crew defaults to OFF on each power cycle of the GTN. Prior to utilizing the telephone function, the crew must distribute telephone audio to the desired recipients. If the crew is utilizing the telephone function it is required that the telephone audio be turned off upon completing telephone usage.

7.18 Depiction of Obstacles and Wires

7.18.1 Dedicated Terrain Page

The dedicated Terrain page will always depict point obstacles at zoom scales of 10 nm or less and depict wire obstacles at zoom scales of 5 nm or less. The obstacle or wire overlay icon (see Figure 3) will be shown near the bottom of the display when the obstacle or wire depiction is active based on the zoom scale.

NOTE

Only obstacles and wires within 2,000 feet vertically of the aircraft will be drawn on the Terrain page. It is therefore possible to have an obstacle or wire overlay icon displayed with no obstacles or wires being depicted on the display.

Figure 3 – Obstacle Overlay Icon (Left), Wire Overlay Icon (Right)

7.18.2 Map Page

The Map page may be configured to depict point obstacles and wire obstacles at various zoom scales by the pilot by using the Map page menu. The obstacle or wire overlay icon (see Figure 4) will be shown near the bottom of the display when the obstacle or wire overlay is active based on the current zoom scale and setting selected by the pilot.

The settings chosen by the pilot on the Map page menu (including obstacle and wire display ranges) are saved over a power cycle.

NOTE

Only obstacles and wires within 2,000 feet vertically of the aircraft will be drawn on the Map page. It is therefore possible to have an obstacle or wire overlay icon displayed with no obstacles or wires being depicted on the display.

NOTE

The Map page may be configured by the pilot to not show any obstacles or wires at any zoom scale.

Figure 4 – Obstacle Overlay Icon (Left), Wire Overlay Icon (Right)

7.19 Flight Stream 210/510 (Optional)

The Flight Stream product line uses a wireless transceiver to provide data to and from a GTN to personal electronic devices (PEDs).

The Flight Stream 210 is a remotely mounted unit that provides the capability to interface Portable Electronic Devices (PEDs) to the GTN via Bluetooth. The Flight Stream 510 is mounted in the GTN SD card slot and includes a Bluetooth and Wi-Fi transceiver.

Data such as traffic, flight plan, datalink weather, entertainment audio information, and attitude information is sent from the Flight Stream to the PED. The PED is capable of sending flight plans and databases (510 only) to the Flight Stream which will then be available on the GTN. Limitations regarding database operations are found in Section 2.29.

Garmin provides a list of tested and compatible devices that can be used with the Flight Stream. Connection to the Flight Stream may be possible with devices other than those on the supported device list, but Bluetooth® and/or Wi-Fi stability and wireless data integrity cannot be guaranteed.

For details about the Garmin supported devices and apps for use with the Flight Stream product line, please visit: http://garmin.com/connext/supported_devices

7.20 Map Page

7.20.1 Configuration

The moving map and weather pages are capable of displaying a large quantity and variety of data. Map data is layered to ensure that data which is typically more critical is drawn above less critical data, however at some zoom scales and configurations the map may be cluttered with large amounts of data. Controls are provided on the Map and Weather pages for the pilot to select which data displayed, the declutter level, and the zoom scales at which data is added to or removed from the display. It is the responsibility of the pilot to select settings for the map page that will provide the display of data most appropriate to the operation being conducted.

7.20.2 Flight Plan Depiction

The map page depicts the current active flight plan. When an off-route Direct To is active the flight plan will no longer be depicted on the map.

7.20.3 Fuel Range Ring

The distance between the segmented green reserve ring and the yellow zero fuel ring is 45 minutes at the current aircraft groundspeed by default. The pilot may change the fuel reserve time value on the map setup menu. Changes to the fuel reserve time are persisted over GTN power cycles.

Visibility of the fuel range ring may be affected by the underlying map data selectable by the pilot. The pilot may make changes to the topographic or terrain data in order or more clearly observe the fuel range ring at any time.

Fuel range data is derived from the interfaced fuel totalizer data. Data entered in the Fuel Planning pages will not update the fuel range ring.

7.21 User Defined Waypoints

When a User Defined Waypoint is created a default name will automatically be provided and the pilot is given the option to provide a different name for the waypoint. Pages which have the autofill function will prevent some waypoint names from being used. If it is desired to name the waypoint with a subset of the name of an existing waypoint in the database then this must be accomplished on the Waypoint Info / User Waypoints page.

Waypoints which are created when a Search and Rescue pattern is created are not considered User Waypoints and therefore functions associated with User Waypoints are not provided for these waypoints.

7.22 Times and Distances

Time and Distance data to the next waypoint is always calculated from the present position to that waypoint and does not account for the path which may be flown (such as intercepting a course) to reach the waypoint.

When navigating using GPS guidance most legs are TO type legs where distance to the next waypoint decreases along the route. However, some procedures include FROM type legs. When navigating on a leg that is a FROM leg indications that it is a FROM leg include the TO/FROM flag indicating FROM and distances increasing in distance fields.

7.23 GTN-GTN Crossfill

Certain data will sync between GTNs when installed in a dual GTN configuration. The following data will crossfill between the two GTNs with CROSSFILL ON or OFF:

- User Waypoints
- FPL Catalog
- Traffic Alerts
- Missed Approach Popups
- Altitude Leg Popups
- Heading
- Date/Time Conventions
- CDI Scale

The following unit changes will crossfill:

- Temperature
- NAV Angle
- Fuel

The following items are crossfilled only when the GTNs are set to CROSSFILL ON:

- User Holds
- Approaches
- Flight Plan Changes
- Direct-To
- Selected OBS Course Changes

7.24 Direct-To Operations

When conducting Direct-To operations the Flight Plan tab provides a list of waypoints in the flight plan for which Direct-To is available. Some entries in the flight plan such as Holds and Course Reversals are not eligible for Direct-To and the pilot must instead select the associated waypoint if Direct-To operation is desired.

7.25 Automatic Speech Recognition (ASR)

ASR allows the pilot to interact with the GMA and GTN via voice commands. Commands are constructed around the "Verb – Noun – (Suffix)" syntax for most ASR commands.

- **"SHOW"** Commands – Used to show pages or data fields on the GTN
- **"SAY"** Commands – Used to instruct the ASR engine to say certain phrases related to the flight
- **"TUNE"** Commands – Used to tune certain frequencies into the standby position of the ASR GTN (usually GTN #1)

The "Page" suffix is used in conjunction with the "Show" phrase to command pages to be displayed on the GTN. (e.g.- "Show Main Map Page")

Audio Panel commands are available to switch audio sources.

- **"SELECT"** to choose which radio the MIC will be selected
- **"TOGGLE"** to toggle the monitor of a specific NAV/COM radio
- **"DISTRIBUTE"** to change the source of audio for the respective seat positions
- **"MUTE"** to mute audio inputs on the audio panel for the respective seat positions

Supplemental commands that allow map zooming, and page navigation are also available.

- **"BACK"**
- **"CANCEL"**
- **"ZOOM IN"**
- **"ZOOM OUT"**

Each command is initiated via the Push-to-Command (PTC) switch. Aural tones will indicate to the pilot the status of the command. A positive tone (low to high) will indicate the system executed a command. A negative tone (high to low) will indicate the system did not understand the command or could not execute due to system state or configuration. "SAY" commands do not provide aural tones as feedback.

The pilot must maintain vigilance regarding ASR command information. Due to the nature of voice recognition, there are times when ASR will interpret a command differently than the pilot intended. The pilot should always cross check the ASR response to the information contained within the GTN as appropriate to ensure in-flight information is accurately understood. If a conflict exists between information gathered via ASR and that available in the GTN system, the pilot should defer to the GTN system information.

Prior to using ASR, the pilot must complete the ASR Qualification Procedure from the GTN Cockpit Reference Guide.

The Command History Page details the commands received by ASR for that power cycle. A full list of commands and a tips for using ASR can be found in the *GTN 6XX/7XX Telligence Voice Command Guide,* 190-01007-50.

When using ASR for "TUNE" commands, it is recommended that the pilot enable Reverse Frequency Lookup (RFL) on the associated GTN.

7.26 European Visual Reporting Points

If the GTN is interfaced with a G500/600 PFD/MFD, and a flight plan in the GTN contains a VRP, the G500/600 must have a database that contains the VRP in order to appropriately display the VRP on the MFD map. If the database on the PFD/MFD does not contain the VRP, the VRP will display on the MFD map as an intersection.

7.27 Advisory Visual Approaches

The GTN will provide advisory visual approaches to many runways in the aviation database. Lateral guidance for the visual approach is aligned with the runway bearing. Vertical guidance is provided for those runways with VGSI information for distances up to 4.0NM from the runway. If a terrain database is installed in the GTN, the GTN provides vertical guidance up to 28NM from the runway end unless the computed glideslope would impact terrain or obstacles from the database. If the projected impact point is under 28NM and greater than 4NM, the flight plan line for the approach is shortened to indicate where vertical guidance is active for the approach. If the terrain impact point is less than 4NM from the runway and there is no VGSI data available, vertical guidance is not provided for that approach. Lateral guidance is still available when vertical guidance is removed.

CDI and VDI indications are equivalent to those of other GPS-based approaches (e.g.- LPV or LNAV+V). The GTN annunciates "VISUAL" in the annunciator bar to indicate a visual approach is active.

When loading, or activating the approach, the GPA and TCH information for that approach will be displayed on a popup. If there is no vertical guidance available, the popup will display "(NO VERTICAL GUIDANCE)".

Visual approaches are intended to be used as an aid to situational awareness. Visual approaches are advisory in nature and do not guarantee terrain and obstacle clearance for the approach runway.

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FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for the
Garmin GTX 33X and GTX 3X5 Transponders with ADS-B
as installed in

Cessna 210-5
Make and Model Airplane

Registration Number: N205NB Serial Number: 205-0151

This document serves as an FAA Approved Airplane Flight Manual Supplement or Supplemental Airplane Flight Manual when the GTX 33X or GTX 3X5 with ADS-B 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.

FAA Approved By: Erik Frisk

Erik Frisk
ODA STC Unit Administrator
Garmin International, Inc.
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Revision Number	Date	Number	Description	FAA Approved
1	05/01/2013	All	Complete Supplement	*Robert Murray* Robert Murray ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date: *05/01/2013*
2	03/08/2016	All	New supplement format with GTX 3X5 added.	*Michael Warren* Michael Warren ODA STC Unit Administrator Garmin International, Inc. ODA-240087-CE Date: *03/08/2016*
3	12/07/2017	All	Updated SW versions and removed section 3.2.3. Updated section 2.2 Corrected PED FAR reference and additional minor corrections.	See cover page

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Section 1. GENERAL

1.1 GTX 33X

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

All Garmin GTX 33X 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 to initiate the SPI (special position identification) pulse for 18 seconds and will reply to ATCRBS Mode A, Mode C and Mode S All-Call interrogation. Interfaces to the GTX 33X are shown in the following block diagrams.

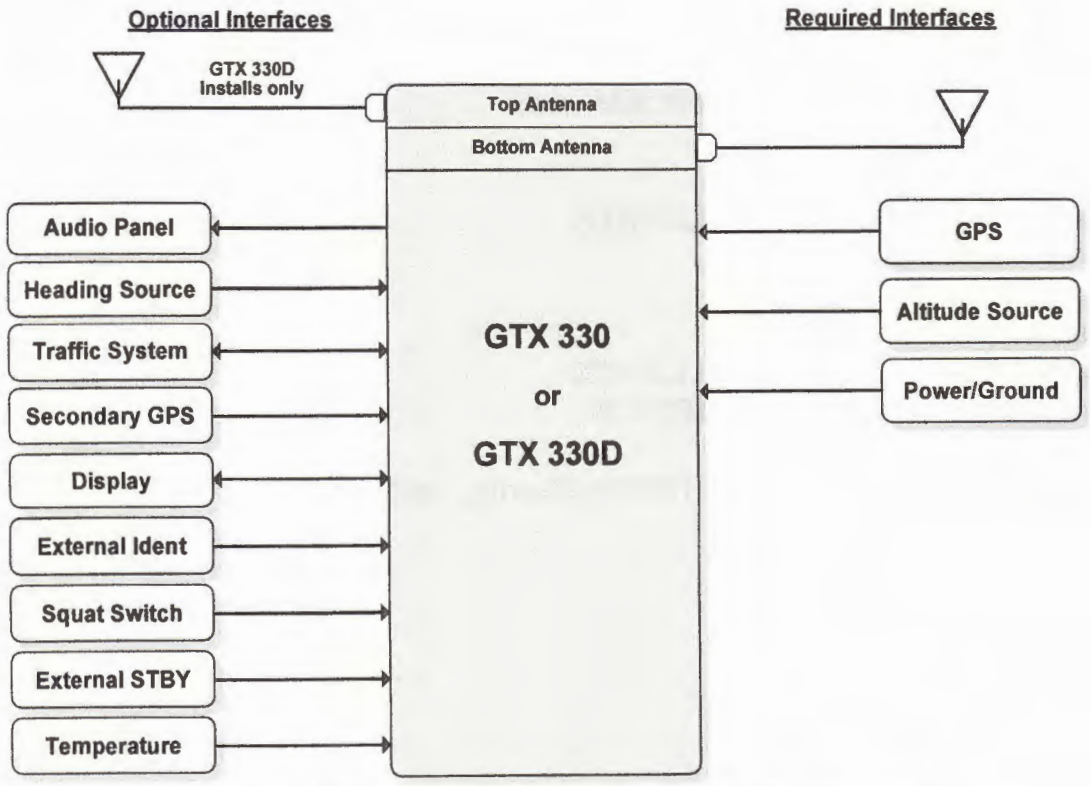

Figure 1 – GTX 330 or GTX 33D Interface Summary

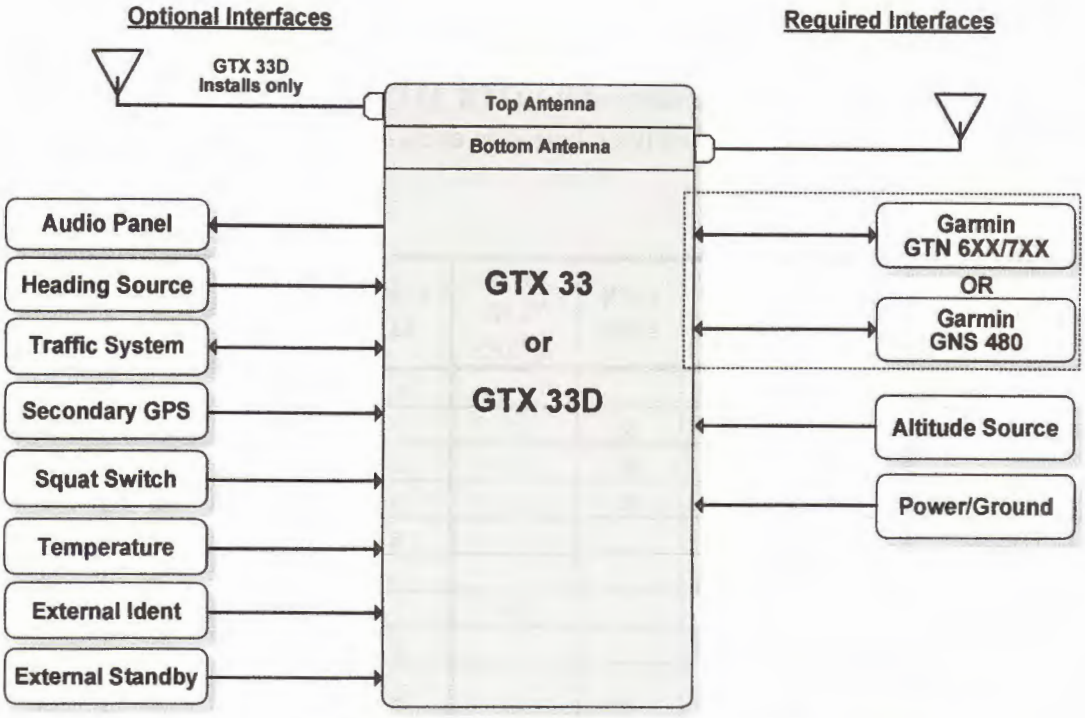

Figure 2 – GTX 33 or GTX 33D Interface Summary

The GTX 33X performs the following functions:

- Transmission of ADS-B out data on 1090 extended squitter (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 Codes between 0000-7777.
    - Emergency Status
    - IDENT - initiates SPI (special position identification) pulse for 18 seconds
  - Pressure Altitude Broadcast Inhibit
- Reception of TIS-A traffic data from a ground station
- Provides TIS-A traffic alerting to the pilot via interfaced display and audio output

1.2 GTX 3X5

The Garmin GTX 3X5 family consists of the GTX 335, 335R, 345, and 345R transponders. The functional differences between each of these transponders are described in Table 1.

Function	GTX 335	GTX 335 w/GPS	GTX 335R	GTX 335R w/GPS	GTX 345	GTX 345 w/GPS	GTX 345R	GTX 345R w/GPS
Panel mount	x	x			x	x		
Remote mount			x	x			x	x
Mode S	x	x	x	x	x	x	x	x
ADS-B (out)	x	x	x	x	x	x	x	x
ADS-B Traffic					x	x	x	x
FIS-B					x	x	x	x
Internal GPS		x		x		x		x
Bluetooth					x	x	x	x
Optional Garmin Altitude Encoder	x	x	x	x	x	x	x	x

Table 1 – GTX 3X5 Unit Configurations

Interfaces to the GTX 3X5 are shown in Figure 3.

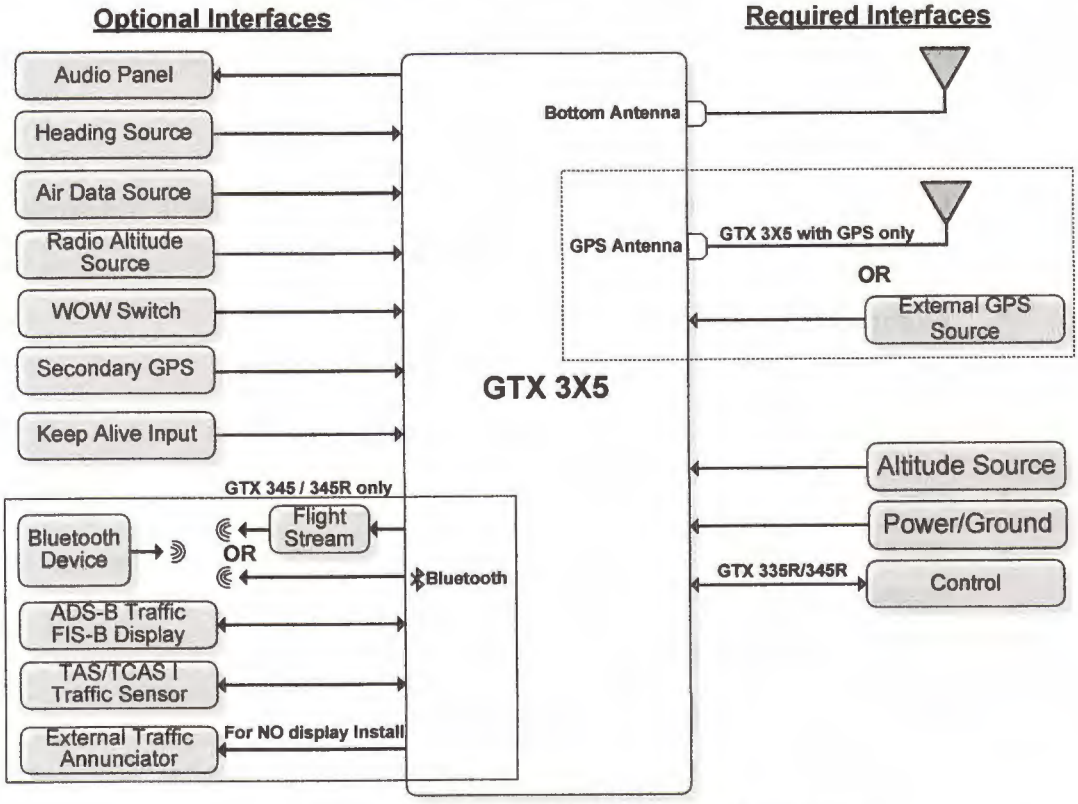

Figure 3 – GTX 3X5 Interface Summary

The GTX 3X5 performs the following functions:

- Transmission of ADS-B out data on 1090 extended squitter (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 Codes between 0000-7777.
    - Emergency Status
    - IDENT - initiates SPI (special position identification) pulse for 18 seconds
  - Pressure Altitude Broadcast Inhibit

The GTX 335 performs the following additional functions:

- Reception of TIS-A traffic data from a ground station
- Provide TIS-A traffic alerting to the pilot via interfaced display and audio output.

The GTX 345 performs the following additional functions:

- 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)
- 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)
- Provide ADS-B traffic information and alerting to the pilot via an interfaced display

- Correlation and consolidation of traffic data from multiple traffic sources
- Aural and visual traffic alerting

- Provide FIS-B data to the pilot via an interfaced display
  - Graphical and textual weather products
    - NEXRAD
    - PIREPs
    - AIRMET/SIGMETs
    - METARs
    - TAFs
    - Winds Aloft
  - Aviation Data
    - TFRs
    - NOTAMs

1.3 Capabilities

The Garmin GTX 33X and GTX 3X5 as installed in this aircraft have been shown to meet the equipment requirements of 14 CFR § 91.227 when operating in accordance with sections 2.1 and 2.2 of this supplement.

1.4 Installation Configuration

This aircraft is equipped with a GTX 33X and/or GTX 3X5 with the following interfaces/ features:

Equipment Installed:

Transponder #1	Transponder #2 (if installed)
☐ GTX 330	☐ GTX 330
☐ GTX 330D	☐ GTX 330D
☐ GTX 33	☐ GTX 33
☐ GTX 33D	☐ GTX 33D
☐ GTX 335	☐ GTX 335
☐ GTX 335R	☐ GTX 335R
☒ GTX 345	☐ GTX 345
☐ GTX 345R	☐ GTX 345R

Interfaced GPS/SBAS Position Source(s):

GPS #1	GPS #2 (if installed)
☐ Internal	☐ Internal
☒ GTN 6XX/7XX Series	☐ GTN 6XX/7XX Series
☐ GNS 400W/500W Series	☐ GNS 400W/500W Series
☐ GNS 480	☐ GNS 480
☐ GIA 63W	☐ GIA 63W
☐ GDL 88 (GTX 330 only)	☐ GDL 88 (GTX 330 only)

Interfaced Pressure Altitude Source:

Pressure Altitude Source #1	Pressure Altitude Source #2 (if installed)
☐ _____	☐ _____
☒ Garmin Altitude Encoder	☐ Garmin Altitude Encoder

Interfaced Remote Control Display (Required for remotely mounted GTX variants):

Transponder #1 Remote Control Display	Transponder #2 Remote Control Display (if installed)
☒ GTN 6XX/7XX	☐ GTN 6XX/7XX
☐ GNS 480	☐ GNS 480
☐ G950/1000 Display	☐ G950/1000 Display
☐ Gables 7534 Controller	☐ Gables 7534 Controller

Interfaced Active Traffic System:

☒ None

☐ TCAD

☐ TAS/TCAS

NOTE

If the system includes all of the following components:

- GTX 345R,
- G950/1000 Display, and
- TCAD or TAS/TCAS

Then the aircraft is no longer equipped with a TSO compliant active TCAD, TAS or TCAS system. Any operational requirement to be equipped with such system is no longer met.

1.5 Definitions

The following terminology is used within this document:

ADS-B: Automatic Dependent Surveillance-Broadcast

AFM: Airplane Flight Manual

AFMS: Airplane Flight Manual Supplement

ATCRBS: Air Traffic Control Radar Beacon System

CFR: Code of Federal Regulations

ES: Extended Squitter

GNSS: Global Navigation Satellite System

GNS: Garmin Navigation System

GPS: Global Positioning System

GTX: Garmin Transponder

GTN: Garmin Touchscreen Navigator

ICAO: International Civil Aviation Organization

LRU: Line Replaceable Unit

PABI: Pressure Altitude Broadcast Inhibit

POH: Pilot Operating Handbook

SBAS: Satellite-Based Augmentation System

SW: Software

TCAS: Traffic Collision Avoidance System

TIS: Traffic Information Service

TX: Transmit

Section 2. LIMITATIONS

2.1 Minimum Equipment

The GTX 33X and GTX 3X5 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
Uncorrected Pressure Altitude Source	1	1
GPS SBAS Position Source	1 or more	1
Remote Control Display (for remotely mounted transponders)	1 or more	1

Table 2 – Required Equipment

2.2 ADS-B Out

The GTX 33X and GTX 3X5 only comply 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 remote control display interface, or the GTX 330 or GTX 3X5 panel display. If a Gables 7534 controller is being used the ADS-B equipment failure condition will be annunciated on the Gables display "Transponder Fail" while the ADS-B Out Position failure will be annunciated by the remotely installed "ADS-B POSN FAIL" Annunciator.

2.3 TIS Traffic Display with User Navigation Angle

Display of TIS traffic from a GTX 33/330 or GTX 335 is not permitted with an interfacing display configured for a navigation angle of "user".

2.4 Applicable System Software

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

The Main GTX software version is displayed on the splash screen during start up for the GTX 330 and GTX 3X5 panel mounted units, and the External LRU or System page on the interfaced remote control display for remotely mounted GTX transponders.

Software Item	**Software Version** *(or later FAA Approved versions for this STC)*
GTX 33X Main SW Version	8.04
GTX 3X5 Main SW Version	2.12

Table 3 - Software Versions

2.5 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. PABI is enabled by selecting the GTX to ON mode.

2.6 Datalinked Weather Display (GTX 345 Only)

Do not use datalink weather information for maneuvering in, near, or around areas of hazardous weather. Information provided by datalink weather products may not accurately depict current weather conditions.

Do not use the indicated datalink weather product age to determine the age of the weather information shown by the datalink weather product. Due to time delays inherent in gathering and processing weather data for datalink transmission, the weather information shown by the datalink weather product may be significantly older than the indicated weather product age.

Do not rely solely upon datalink services to provide Temporary Flight Restriction (TFR) or Notice to Airmen (NOTAM) information.

2.7 Portable Electronic Devices

This STC does not relieve the operator from complying with the requirements of 91.21 or any other operational regulation regarding portable electronic devices.

Section 3. EMERGENCY PROCEDURES

3.1 Emergency Procedures

No Change.

3.2 Abnormal Procedures

3.2.1 LOSS OF AIRCRAFT ELECTRICAL POWER GENERATION

XPDR Circuit Breaker ..... **PULL**

Transponder and ADS-B Out functions 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.

3.2.2 LOSS OF GPS/SBAS POSITION 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 3X5 installations:

NO 1090ES TX annunciator illuminated:

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

For GTX 33 and GTX 3X5R 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 panel mounted GTX 330 or GTX 3X5 transponders. Cockpit Reference Guides and Pilot Guides for interfaced remote control 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 and GTX 3X5 Series Transponder Pilot's Guide.

4.1 Unit Power On

For GTX 330 installations:

GTX Mode ..... **VERIFY ALT**
NO ADSB ..... **CONSIDERED**

For GTX 3X5 installations:

GTX Mode ..... **VERIFY ALT**
NO 1090ES TX ..... **CONSIDERED**

NOTE

The NO ADS-B or NO 1090ES TX 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

For GTX 330 installations:

ADS-B TX ..... **VERIFY ON**
NO ADSB ..... **EXTINGUISHED**

For GTX 3X5 installations:

1090ES TX CTL ..... **VERIFY ON**
NO 1090ES TX ..... **EXTINGUISHED**

NOTE

The ADS-B TX or 1090ES TX CTL must be turned on and the NO ADS-B or NO 1090ES TX 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 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. SYSTEM DESCRIPTION

The Garmin GTX 330 and GTX 3X5 Pilot's Guides, part numbers, and revisions listed below contain additional information regarding GTX system description, control, and function.

Title	Part Number	Revision
GTX 330 Pilot's Guide GTX 3X5 Pilot's Guide	190-00207-00 190-01499-00	Rev. G (or later) Rev. A (or later)

Pilot's Guides for interfaced displays, part numbers and revisions listed below, provide additional operating information for the Garmin GTX 33 and GTX 3X5R.

Title	Part Number	Revision
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)
GNS 480 Pilot's Guide	190-00502-00	Rev. D (or later)
GTX 3X5 Series Transponder G1000 Pilot's Guide	190-01499-01	Rev. A (or later)

7.1 GTX TIS Behavior

The TIS Standby/Operate controls for GTX 33/330 and GTX 335 units only function when the aircraft is airborne.

7.2 GTX 345R and G950/1000 No Bearing Traffic Alerts

No visual indication is provided for no bearing traffic alerts. Only an aural indication of the no bearing traffic alert is provided. If an aural alert for no bearing traffic has been previously issued, a "no bearing traffic clear" aural indication will be provided once all traffic alerts are resolved.

All aural alerts are inhibited below 500' AGL, therefore a "no bearing traffic clear" aural may not be heard in a landing or touch and go flight scenario.

S-TEC

Pilot's Operating Handbook

Twenty | Thirty | Thirty Alt

COBHAM

List of Effective Pages	* Asterisk indicates pages changed, added, or deleted by current revision.

Record of Revisions	Retain this record in front of handbook. Upon receipt of a revision, insert changes and complete table below.	
Revision Number	**Revision Date**	**Insertion Date/Initials**
1st Ed.	Feb 01, 00	
2nd Ed.	Jun 24, 02	
3rd Ed.	Feb 15, 07	

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OVERVIEW

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1.1 Document Organization

Section 1 Overview

Section 2 Pre-Flight Procedures

Section 3 In-Flight Procedures

Section 4 Operating Parameters

Section 5 Glossary

1.2 Purpose

This Pilot's Operating Handbook (POH) provides Pre-Flight and In-Flight operating procedures for the S-TEC System Twenty / Thirty / Thirty ALT Autopilot (AP).

Note:

This POH must be carried in the aircraft and made available to the pilot at all times. It can only be used in conjunction with the Federal Aviation Administration (FAA) approved Aircraft Flight Manual (AFM) or Aircraft Flight Manual Supplement (AFMS). Refer to the applicable AFM or AFMS for aircraft specific information, such as unique ground tests, limitations, and emergency procedures.

Note:

The System Twenty / Thirty / Thirty ALT autopilot is a tool provided to aircraft owners, that serves to assist them with cockpit workload management. The ability of the autopilot to provide optimum assistance and performance is directly proportional to the pilot's knowledge of its operating procedures. Therefore, it is highly recommended that the pilot develop a thorough understanding of the autopilot, its modes, and operating procedures in Visual Meteorological Conditions (VMC), prior to using it under Instrument Flight Rules (IFR).

1.3 General Control Theory

The System Twenty / Thirty / Thirty ALT is a rate based autopilot. When in control of the roll axis, the autopilot senses turn rate, along with the non-rate quantities of heading error and course deviation indication. When in control of the pitch axis, the autopilot senses acceleration, along with the non-rate quantity of altitude. These sensed data provide feedback to the autopilot, which processes them in order to control the aircraft through the use of mechanisms coupled to the control system. The roll servo is typically coupled to the ailerons, and the pitch servo is coupled to the elevator.

The System Twenty controls only the roll axis.

The System Thirty controls both the roll axis and pitch axis. Activation of roll axis control must always precede activation of pitch axis control.

The System Thirty ALT controls only the pitch axis.

The optional Yaw Damper senses excessive adverse yaw about the yaw axis, and responds by driving the yaw servo in the proper direction to provide damping. The yaw servo is coupled to the rudder.

1.4 Modes of Operation

1.4.1 Roll Axis Control

Each press/release of the optional MODE SEL Switch typically located on the Control Wheel, or PUSH MODE Switch located on the bezel, successively engages the roll modes below.

Stabilizer (ST) Mode

Used to Hold Wings Level

Heading (HD) Mode

Used to Turn onto a Selected Heading and Hold it

Low Track (LO TRK) Mode

Used to Track a VOR Course

High Track (HI TRK) Mode

Used to Track a LOC Course

Note:

A heading system (HSI or DG) is optional. If the aircraft is equipped with a heading system, then the heading mode can be engaged. Otherwise, the heading mode cannot be engaged (i.e., it will be skipped over).

1.4.2 Pitch Axis Control

Each press of the ALT ENG/DSNG Switch typically located on the Control Wheel (optional for System Thirty ALT only), or ALT HOLD ON/OFF Switch located on the instrument panel (System Thirty ALT only), successively engages and disengages the single pitch mode below.

Altitude Hold (ALT HOLD) Mode

Used to Hold Altitude

1.5 Block Diagrams

The System Twenty Block Diagram is shown in Fig. 1-1.

The System Thirty Block Diagram is shown in Fig. 1-2.

The System Thirty ALT Block Diagram is shown in Fig. 1-3.

The Yaw Damper Block Diagram is shown in Fig. 1-4.

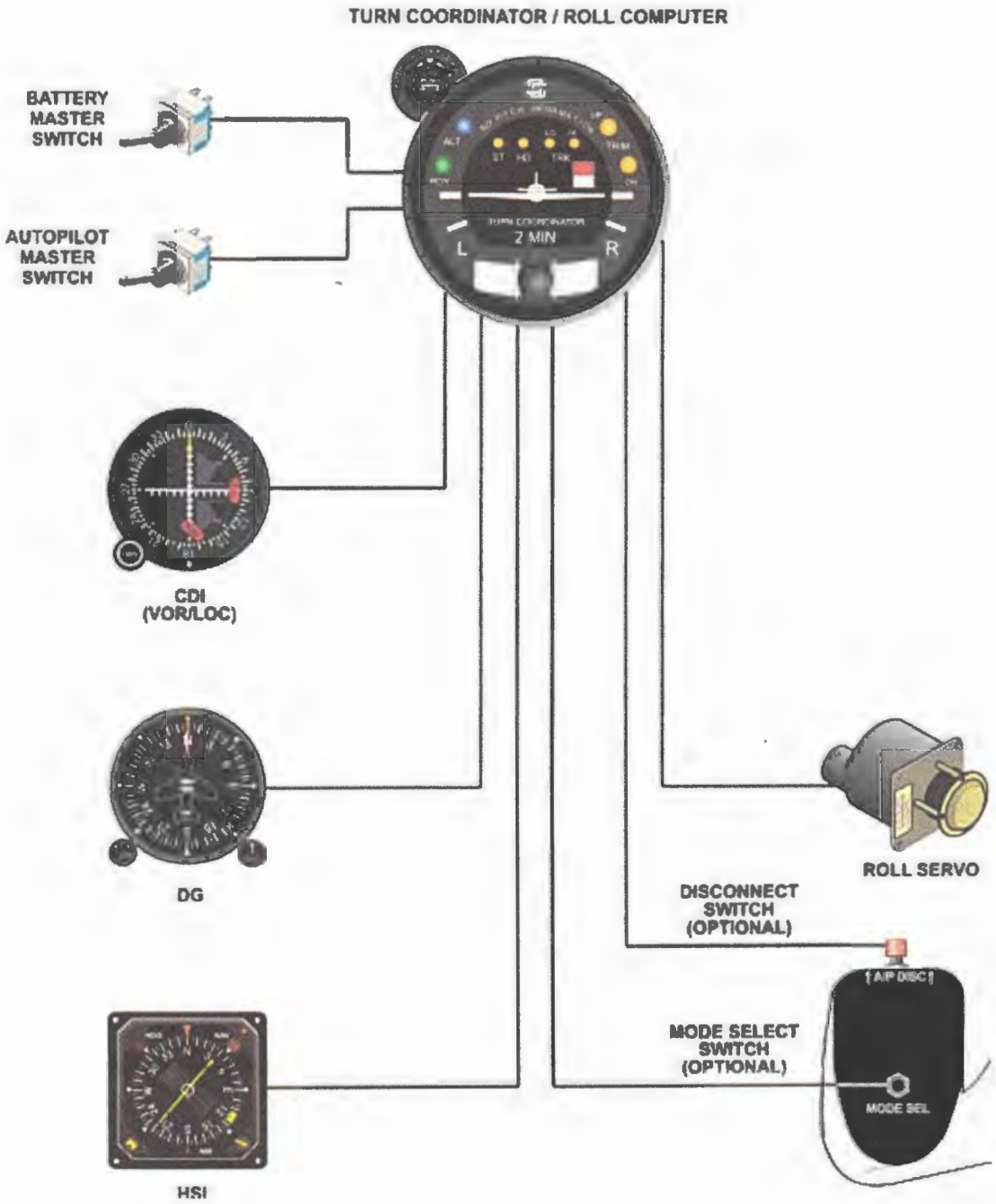

Fig. 1-1. System Twenty Block Diagram

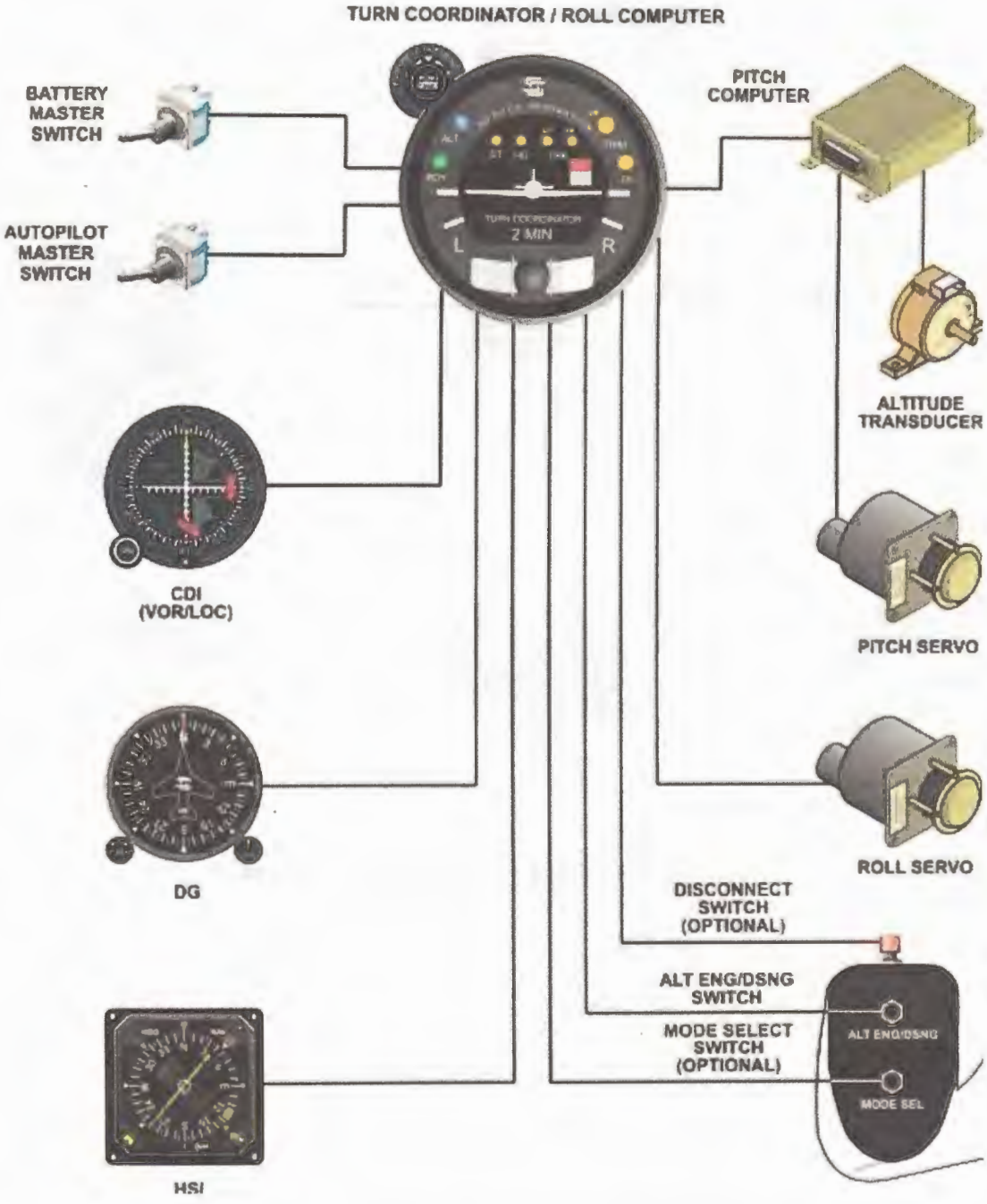

Fig. 1-2. System Thirty Block Diagram

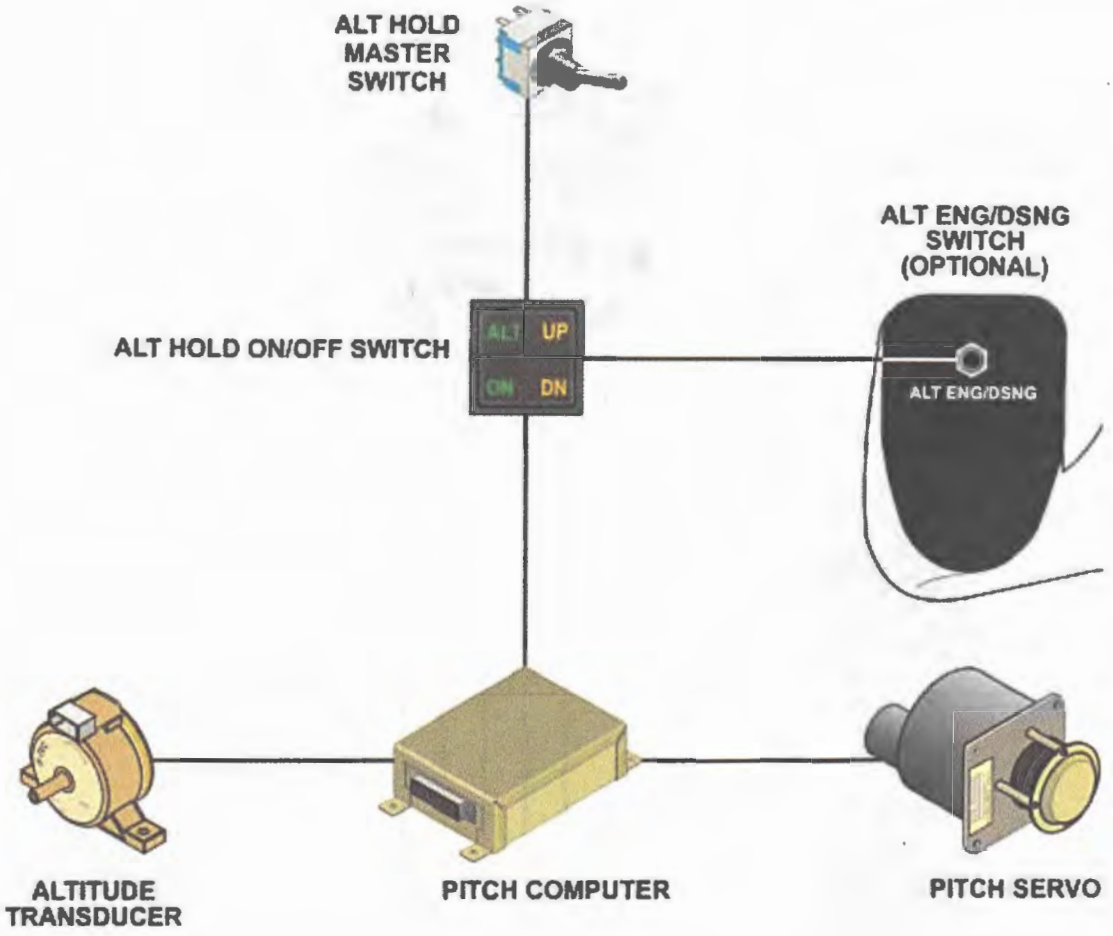

Fig. 1-3. System Thirty ALT Block Diagram

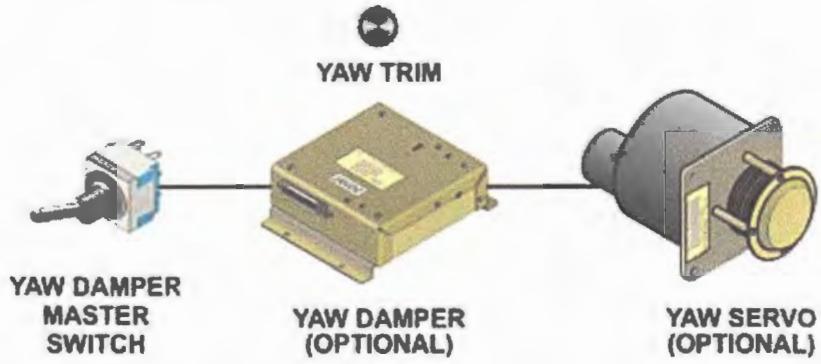

Fig. 1-4. Yaw Damper Block Diagram

SECTION 2
PRE-FLIGHT PROCEDURES

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2.1 Power-Up Test

2.1.1 System Twenty

Perform the actions shown in Table 2-1. For each action, verify the corresponding response where applicable.

Table 2-1. Power-Up Test, System Twenty

ACTION	RESPONSE
1. Set Yaw Damper Master Switch to OFF position (if installed).	------
2. Set Battery Master Switch to ON position.	------
3. Set Avionics Master Switch to ON position.	------
4. Set Autopilot Master Switch to ON position.	RDY, ST, HD, LO TRK, and HI TRK lamps illuminate on AP display as shown in Fig. 2-1 for 7 seconds, and then extinguish as shown in Fig. 2-2. RDY lamp alone re-illuminates on AP display within 3 minutes, as shown in Fig. 2-3 *(Note 1)*.

Notes:

1. Should a Turn Coordinator failure be detected, the RDY lamp on the AP display will not re-illuminate as shown in Fig. 2-4, and the autopilot will not operate.

2. Should T&B A+ be 30% below its rated value, the Low Voltage Flag will be in view on the AP display as shown in Fig. 2-5.

Fig. 2-1. AP Display, RDY, ST, HD, LO TRK, HI TRK Lamps Illuminated at Power-Up (System Twenty)

Fig. 2-2. AP Display, All Lamps Extinguished (System Twenty)

Fig. 2-3. AP Display, RDY for Operation (System Twenty)

Fig. 2-4. AP Display, Turn Coordinator Failure (System Twenty)

Fig. 2-5. AP Display, Low Voltage Flag (System Twenty)

2.1.2 System Thirty

Perform the actions shown in Table 2-2. For each action, verify the corresponding response where applicable.

Table 2-2. Power-Up Test, System Thirty

ACTION	RESPONSE
1. Set Yaw Damper Master Switch to OFF position (if installed).	------
2. Set Battery Master Switch to ON position.	------
3. Set Avionics Master Switch to ON position.	------
4. Set Autopilot Master Switch to ON position.	RDY, ALT, ST, HD, LO TRK, HI TRK, TRIM UP, and TRIM DN lamps illuminate on AP display as shown in Fig. 2-6. TRIM UP lamp extinguishes after 2 seconds, as shown in Fig. 2-7. RDY, ST, HD, LO TRK, HI TRK, and TRIM DN lamps extinguish after 7 seconds, as shown in Fig. 2-8. ALT lamp extinguishes after 10 seconds, as shown in Fig. 2-9. RDY lamp alone re-illuminates on AP display within 3 minutes, as shown in Fig. 2-10 *(Note 1)*.

Notes:

1. Should a Turn Coordinator failure be detected, the RDY lamp on the AP display will not re-illuminate as shown in Fig. 2-11, and the autopilot will not operate.

2. Should T&B A+ be 30% below its rated value, the Low Voltage Flag will be in view on the AP display as shown in Fig. 2-12.

Fig. 2-6. AP Display, RDY, ALT, ST, HD, LO TRK, HI TRK, TRIM UP, TRIM DN Lamps Illuminated at Power-Up (System Thirty)

Fig. 2-7. AP Display, TRIM UP Lamp Extinguished (System Thirty)

Fig. 2-8. AP Display, ALT Lamp Only Illuminated (System Thirty)

Fig. 2-9. AP Display, All Lamps Extinguished (System Thirty)

Fig. 2-10. AP Display, RDY for Operation (System Thirty)

Fig. 2-11. AP Display, Turn Coordinator Failure (System Thirty)

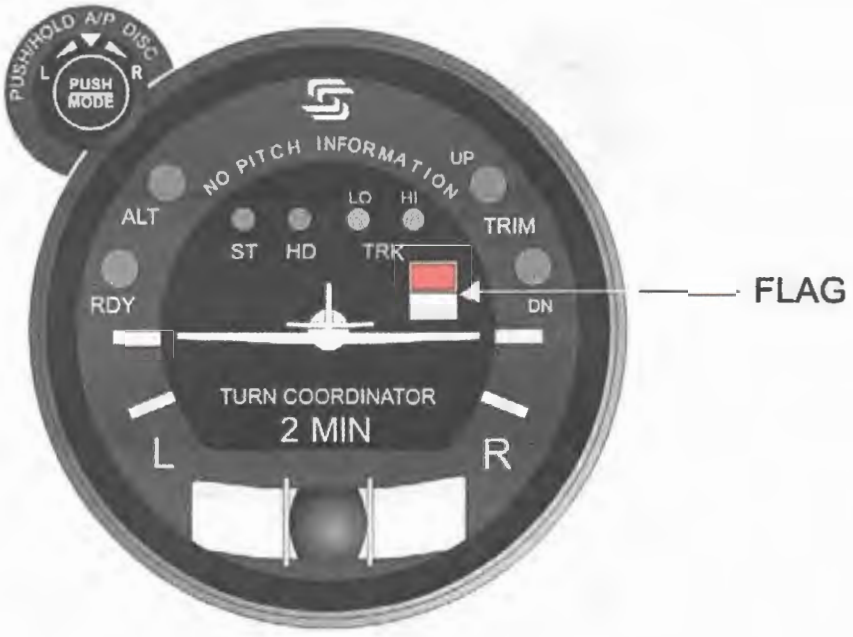

Fig. 2-12. AP Display, Low Voltage Flag (System Thirty)

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2.1.3 System Thirty ALT

Perform the actions shown in Table 2-3. For each action, verify the corresponding response where applicable.

Table 2-3. Power-Up Test, System Thirty ALT

ACTION	RESPONSE
1. Set Yaw Damper Master Switch to OFF position (if installed).	------
2. Set Battery Master Switch to ON position.	------
3. Set Avionics Master Switch to ON position.	------
4. Set ALT HOLD Master Switch to ON position.	ALT ON, UP, and DN lamps illuminate on ALT HOLD ON/OFF Switch display, as shown in Fig. 2-13. UP lamp extinguishes after 2 seconds, as shown in Fig. 2-14. DN lamp extinguishes after 7 seconds, as shown in Fig. 2-15. ALT ON lamp extinguishes after 10 seconds, as shown in Fig. 2-16.

Fig. 2-13. ALT HOLD ON/OFF Switch Display, ALT ON, UP, and DN Lamps Illuminated at Power-Up (System Thirty ALT)

Fig. 2-14. ALT HOLD ON/OFF Switch Display, UP Lamp Extinguished (System Thirty ALT)

Fig. 2-15. ALT HOLD ON/OFF Switch Display, DN Lamp Extinguished (System Thirty ALT)

Fig. 2-16. ALT HOLD ON/OFF Switch Display, ALT ON Lamp Extinguished (System Thirty ALT)

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2.2 Pre-Flight Test

2.2.1 System Twenty

Prior to takeoff and with engine running, perform the actions shown in Table 2-4. For each action, verify the corresponding response where applicable.

Table 2-4. Pre-Flight Test, System Twenty (continued on page 2-18)

ACTION	RESPONSE
1. Move A/C Control Wheel left and right, to sense its freedom of movement about roll axis.	------
2. Set L/R Turn Knob located on bezel under its index.	------
3. Engage stabilizer mode.	ST lamp alone is illuminated on AP display, as shown in Fig. 2-17.
4. Attempt movement of A/C Control Wheel left and right.	A/C Control Wheel's reduced freedom of movement indicates that Roll Servo is engaged. Roll Servo can be overridden. If not, disconnect autopilot and do not use.
5. Turn L/R Turn Knob to the left side of its index.	A/C Control Wheel turns to the left.
6. Turn L/R Turn Knob to the right side of its index.	A/C Control Wheel turns to the right.
7. Set L/R Turn Knob under its index.	A/C Control Wheel stops.
Note: *If A/C is equipped with a heading system (HSI or DG), then proceed to step 8.* *If A/C is not equipped with a heading system, then proceed to step 13 only if a VOR frequency can be selected. Otherwise, proceed to step 26.*	

Table 2-4. Pre-Flight Test, System Twenty (continued from page 2-17)

ACTION	RESPONSE
8. Set Heading Bug under Lubber Line.	------
9. Engage heading mode.	HD lamp alone is illuminated on AP display, as shown in Fig. 2-18.
10. Turn Heading Bug to the left side of Lubber Line.	A/C Control Wheel turns to the left.
11. Turn Heading Bug to the right side of Lubber Line.	A/C Control Wheel turns to the right.
12. Set Heading Bug under Lubber Line.	A/C Control Wheel stops.
Note: If it is not possible to select a local VOR frequency on Navigation Receiver, then proceed to step 26. Otherwise, proceed to step 13.	
13. Select local VOR frequency on Navigation Receiver.	------
Note: Proceed to either step 14 (HSI) or step 20 (DG).	
14. Turn Course Pointer until CDI needle is centered.	------
15. Engage low track mode.	LO TRK lamp alone is illuminated on AP display, as shown in Fig. 2-19.
16. Engage high track mode.	HI TRK lamp alone is illuminated on AP display, as shown in Fig. 2-20.
17. Turn Course Pointer left until CDI needle deflection is 2 dots right of center.	A/C Control Wheel turns to the right.

Fig. 2-17. AP Display, ST Mode Engaged (System Twenty)

Fig. 2-18. AP Display, HD Mode Engaged (System Twenty)

Table 2-4. Pre-Flight Test, System Twenty (continued from page 2-18)

ACTION	RESPONSE
18. Turn Course Pointer right until CDI needle deflection is 2 dots left of center.	A/C Control Wheel turns to the left.
19. Turn Course Pointer left until CDI needle is centered.	A/C Control Wheel stops.
Note: Proceed to step 28.	
20. Turn OBS until CDI needle is centered.	------
21. Engage low track mode.	LO TRK lamp alone is illuminated on AP display, as shown in Fig. 2-19.
22. Engage high track mode.	HI TRK lamp alone is illuminated on AP display, as shown in Fig. 2-20.
23. Turn OBS until CDI needle deflection is 2 dots right of center.	A/C Control Wheel turns to the right.
24. Turn OBS until CDI needle deflection is 2 dots left of center.	A/C Control Wheel turns to the left.
25. Turn OBS until CDI needle is centered.	A/C Control Wheel stops.
Note: Proceed to step 28.	
26. Engage low track mode.	LO TRK lamp alone is illuminated on AP display, as shown in Fig. 2-19.
27. Engage high track mode.	HI TRK lamp alone is illuminated on AP display, as shown in Fig. 2-20.

Fig. 2-19. AP Display, LO TRK Mode Engaged (System Twenty)

Fig. 2-20. AP Display, HI TRK Mode Engaged (System Twenty)

Table 2-4. Pre-Flight Test, System Twenty (continued from page 2-20)

ACTION	RESPONSE
28. Disconnect autopilot by any one of the following means: a. Press optional AP DISC Switch typically located on Control Wheel. b. Press/Hold optional MODE SEL Switch typically located on Control Wheel for 3 seconds. c. Press/Hold PUSH MODE Switch located on bezel for 3 seconds.	RDY lamp flashes and audible alert sounds a periodic tone, while all other lamps are extinguished. After 5 seconds, RDY lamp stops flashing but remains illuminated, and audible alert is squelched.
29. Move A/C Control Wheel left and right.	A/C Control Wheel's increased freedom of movement indicates that Roll Servo is disengaged.
Note: If a Yaw Damper is installed, then proceed to step 30. Otherwise, proceed to step 39.	
30. Actuate A/C Rudder Pedals alternately in succession, to sense their freedom of movement about yaw axis.	------
31. Set Yaw Damper Master Switch to ON position.	------
32. Turn Yaw Trim Knob until A/C Rudder Pedals stop.	------
33. Attempt actuation of A/C Rudder Pedals alternately in succession.	A/C Rudder Pedals' reduced freedom of movement indicates that Yaw Servo is engaged. Yaw Servo can be overridden. If not, set Yaw Damper Master Switch to OFF position, and do not use.

Table 2-4. Pre-Flight Test, System Twenty (continued from page 2-22)

ACTION	RESPONSE
34. Turn Yaw Trim Knob fully CCW.	Left A/C Rudder Pedal slowly moves forward.
35. Turn Yaw Trim Knob fully CW.	Right A/C Rudder Pedal slowly moves forward.
36. Turn Yaw Trim Knob CCW until A/C Rudder Pedals stop.	------
37. Set Yaw Damper Master Switch to OFF position.	------
38. Actuate A/C Rudder Pedals alternately in succession.	A/C Rudder Pedals' increased freedom of movement indicates that Yaw Servo is disengaged.
39. Trim A/C for takeoff.	------

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2.2.2 System Thirty

Prior to takeoff and with engine running, perform the actions shown in Table 2-5. For each action, verify the corresponding response where applicable.

Table 2-5. Pre-Flight Test, System Thirty (continued on page 2-26)

ACTION	RESPONSE
1. Move A/C Control Wheel left and right, to sense its freedom of movement about roll axis.	------
2. Set L/R Turn Knob located on bezel under its index.	------
3. Engage stabilizer mode.	ST lamp alone is illuminated on AP display, as shown in Fig. 2-21.
4. Attempt movement of A/C Control Wheel left and right.	A/C Control Wheel's reduced freedom of movement indicates that Roll Servo is engaged. Roll Servo can be overridden. If not, disconnect autopilot and do not use.
5. Turn L/R Turn Knob to the left side of its index.	A/C Control Wheel turns to the left.
6. Turn L/R Turn Knob to the right side of its index.	A/C Control Wheel turns to the right.
7. Set L/R Turn Knob under its index.	A/C Control Wheel stops.
Note: *If A/C is equipped with a heading system (HSI or DG), then proceed to step 8.* *If A/C is not equipped with a heading system, then proceed to step 13 only if a VOR frequency can be selected. Otherwise, proceed to step 26.*	

Table 2-5. Pre-Flight Test, System Thirty (continued from page 2-25)

ACTION	RESPONSE
8. Set Heading Bug under Lubber Line.	------
9. Engage heading mode.	HD lamp alone is illuminated on AP display, as shown in Fig. 2-22.
10. Turn Heading Bug to the left side of Lubber Line.	A/C Control Wheel turns to the left.
11. Turn Heading Bug to the right side of Lubber Line.	A/C Control Wheel turns to the right.
12. Set Heading Bug under Lubber Line.	A/C Control Wheel stops.
Note: If it is not possible to select a local VOR frequency on Navigation Receiver, then proceed to step 26. Otherwise, proceed to step 13.	
13. Select local VOR frequency on Navigation Receiver.	------
Note: Proceed to either step 14 (HSI) or step 20 (DG).	
14. Turn Course Pointer until CDI needle is centered.	------
15. Engage low track mode.	LO TRK lamp alone is illuminated on AP display, as shown in Fig. 2-23.
16. Engage high track mode.	HI TRK lamp alone is illuminated on AP display, as shown in Fig. 2-24.
17. Turn Course Pointer left until CDI needle deflection is 2 dots right of center.	A/C Control Wheel turns to the right.

Fig. 2-21. AP Display, ST Mode Engaged (System Thirty)

Fig. 2-22. AP Display, HD Mode Engaged (System Thirty)

Table 2-5. Pre-Flight Test, System Thirty (continued from page 2-26)

ACTION	RESPONSE
18. Turn Course Pointer right until CDI needle deflection is 2 dots left of center.	A/C Control Wheel turns to the left.
19. Turn Course Pointer left until CDI needle is centered.	A/C Control Wheel stops.
Note: Proceed to step 28.	
20. Turn OBS until CDI needle is centered.	------
21. Engage low track mode.	LO TRK lamp alone is illuminated on AP display, as shown in Fig. 2-23.
22. Engage high track mode.	HI TRK lamp alone is illuminated on AP display, as shown in Fig. 2-24.
23. Turn OBS until CDI needle deflection is 2 dots right of center.	A/C Control Wheel turns to the right.
24. Turn OBS until CDI needle deflection is 2 dots left of center.	A/C Control Wheel turns to the left.
25. Turn OBS until CDI needle is centered.	A/C Control Wheel stops.
Note: Proceed to step 28.	
26. Engage low track mode.	LO TRK lamp alone is illuminated on AP display, as shown in Fig. 2-23.
27. Engage high track mode.	HI TRK lamp alone is illuminated on AP display, as shown in Fig. 2-24.

Fig. 2-23. AP Display, LO TRK Mode Engaged (System Thirty)

Fig. 2-24. AP Display, HI TRK Mode Engaged (System Thirty)

Table 2-5. Pre-Flight Test, System Thirty (continued from page 2-28)

ACTION	RESPONSE
28. Move A/C Control Wheel forward and aft, to sense its freedom of movement about pitch axis.	-----
29. Engage altitude hold mode.	ALT lamp is illuminated on AP display, as shown in Fig. 2-25.
30. Attempt movement of A/C Control Wheel forward and aft.	A/C Control Wheel's reduced freedom of movement indicates that Pitch Servo is engaged. Pitch Servo can be overridden. If not, disconnect autopilot and do not use.
31. Move A/C Control Wheel as far forward as possible.	After 3 seconds, TRIM UP lamp becomes illuminated on AP display as shown in Fig. 2-26, and audible alert sounds a steady tone. After 7 seconds, TRIM UP lamp flashes and audible alert becomes periodic.
32. Move A/C Control Wheel aft until TRIM UP lamp is extinguished.	Audible alert is squelched.
33. Move A/C Control Wheel as far aft as possible.	After 3 seconds, TRIM DN lamp becomes illuminated on AP display as shown in Fig. 2-27, and audible alert sounds a steady tone. After 7 seconds, TRIM DN lamp flashes and audible alert becomes periodic.
34. Move A/C Control Wheel forward until TRIM DN lamp is extinguished.	Audible alert is squelched.

Fig. 2-25. AP Display, HI TRK and ALT HOLD Modes Engaged (System Thirty)

Fig. 2-26. AP Display, HI TRK and ALT HOLD Modes Engaged, TRIM UP Required (System Thirty)

Fig. 2-27. AP Display, HI TRK and ALT HOLD Modes Engaged, TRIM DN Required (System Thirty)

Table 2-5. Pre-Flight Test, System Thirty (continued from page 2-30)

ACTION	RESPONSE
35. Disconnect autopilot by any one of the following means: a. Press optional AP DISC Switch typically located on Control Wheel. b. Press/Hold optional MODE SEL Switch typically located on Control Wheel for 3 seconds. c. Press/Hold PUSH MODE Switch located on bezel for 3 seconds.	RDY lamp flashes and audible alert sounds a periodic tone, while all other lamps are extinguished. After 5 seconds, RDY lamp stops flashing but remains illuminated, and audible alert is squelched.
36. Move A/C Control Wheel left and right.	A/C Control Wheel's increased freedom of movement indicates that Roll Servo is disengaged.
37. Move A/C Control Wheel forward and aft.	A/C Control Wheel's increased freedom of movement indicates that Pitch Servo is disengaged.
Note: If a Yaw Damper is installed, then proceed to step 38. Otherwise, proceed to step 47.	
38. Actuate A/C Rudder Pedals alternately in succession, to sense their freedom of movement about yaw axis.	------
39. Set Yaw Damper Master Switch to ON position.	------
40. Turn Yaw Trim Knob until A/C Rudder Pedals stop.	------

Table 2-5. Pre-Flight Test, System Thirty (continued from page 2-33)

ACTION	RESPONSE
41. Attempt actuation of A/C Rudder Pedals alternately in succession.	A/C Rudder Pedals' reduced freedom of movement indicates that Yaw Servo is engaged. Yaw Servo can be overridden. If not, set Yaw Damper Master Switch to OFF position, and do not use.
42. Turn Yaw Trim Knob fully CCW.	Left A/C Rudder Pedal slowly moves forward.
43. Turn Yaw Trim Knob fully CW.	Right A/C Rudder Pedal slowly moves forward.
44. Turn Yaw Trim Knob CCW until A/C Rudder Pedals stop.	------
45. Set Yaw Damper Master Switch to OFF position.	------
46. Actuate A/C Rudder Pedals alternately in succession.	A/C Rudder Pedals' increased freedom of movement indicates that Yaw Servo is disengaged.
47. Trim A/C for takeoff.	------

2.2.3 System Thirty ALT

Prior to takeoff and with engine running, perform the actions shown in Table 2-6. For each action, verify the corresponding response where applicable.

Table 2-6. Pre-Flight Test, System Thirty ALT (continued on page 2-37)

ACTION	RESPONSE
1. Move A/C Control Wheel forward and aft, to sense its freedom of movement about pitch axis.	------
2. Engage altitude hold mode.	ALT ON lamp is illuminated on ALT HOLD ON/OFF Switch display, as shown in Fig. 2-28.
3. Attempt movement of A/C Control Wheel forward and aft.	A/C Control Wheel's reduced freedom of movement indicates that Pitch Servo is engaged. Pitch Servo can be overridden. If not, disconnect autopilot and do not use.
4. Move A/C Control Wheel as far forward as possible.	After 3 seconds, UP lamp becomes illuminated on ALT HOLD ON/OFF Switch display as shown in Fig. 2-29, and audible alert sounds a steady tone. After 7 seconds, UP lamp flashes and audible alert becomes periodic.
5. Move A/C Control Wheel aft until UP lamp is extinguished.	Audible alert is squelched.
6. Move A/C Control Wheel as far aft as possible.	After 3 seconds, DN lamp becomes illuminated on ALT HOLD ON/OFF Switch display as shown in Fig. 2-30, and audible alert sounds a steady tone. After 7 seconds, DN lamp flashes and audible alert becomes periodic.

Fig. 2-28. ALT HOLD ON/OFF Switch Display, ALT HOLD Mode Engaged (System Thirty ALT)

Fig. 2-29. ALT HOLD ON/OFF Switch Display, ALT HOLD Mode Engaged, TRIM UP Required (System Thirty ALT)

Fig. 2-30. ALT HOLD ON/OFF Switch Display, ALT HOLD Mode Engaged, TRIM DN Required (System Thirty ALT)

Table 2-6. Pre-Flight Test, System Thirty ALT (continued from page 2-35)

ACTION	RESPONSE
7. Move A/C Control Wheel forward until DN lamp is extinguished.	Audible alert is squelched.
8. Disengage altitude hold mode.	ALT ON lamp is extinguished on ALT HOLD ON/OFF Switch display.
9. Move A/C Control Wheel forward and aft.	A/C Control Wheel's increased freedom of movement indicates that Pitch Servo is disengaged.
Note: If a Yaw Damper is installed, then proceed to step 10. Otherwise, proceed to step 19.	
10. Actuate A/C Rudder Pedals alternately in succession, to sense their freedom of movement about yaw axis.	------
11. Set Yaw Damper Master Switch to ON position.	------
12. Turn Yaw Trim Knob until A/C Rudder Pedals stop.	------
13. Attempt actuation of A/C Rudder Pedals alternately in succession.	A/C Rudder Pedals' reduced freedom of movement indicates that Yaw Servo is engaged. Yaw Servo can be overridden. If not, set Yaw Damper Master Switch to OFF position, and do not use.
14. Turn Yaw Trim Knob fully CCW.	Left A/C Rudder Pedal slowly moves forward.
15. Turn Yaw Trim Knob fully CW.	Right A/C Rudder Pedal slowly moves forward.

Table 2-5. Pre-Flight Test, System Thirty ALT (continued from page 2-37)

ACTION	RESPONSE
16. Turn Yaw Trim Knob CCW until A/C Rudder Pedals stop.	------
17. Set Yaw Damper Master Switch to OFF position.	------
18. Actuate A/C Rudder Pedals alternately in succession.	A/C Rudder Pedals' increased freedom of movement indicates that Yaw Servo is disengaged.
19. Trim A/C for takeoff.	------

SECTION 3
IN-FLIGHT PROCEDURES

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3.1 Normal Operating Procedures

3.1.1 Stabilizer (ST) Mode, System Twenty / Thirty

Set the L/R Turn Knob under its index, and then engage the stabilizer mode. The ST lamp alone will be illuminated as shown in Fig. 3-1, to acknowledge that this mode is engaged. The autopilot will hold the aircraft at wings level.

Turning the L/R Turn Knob to the left or right of its index will cause the aircraft to turn either left or right, respectively. The L/R Turn Knob is active only when the stabilizer mode is engaged.

Fig. 3-1. AP Display, ST Mode Engaged

3.1.2 Heading (HD) Mode, System Twenty / Thirty

Set the Heading Bug to the desired heading on the compass card (HSI or DG), and then engage the heading mode. The HD lamp alone will be illuminated as shown in Fig. 3-2, to acknowledge that this mode is engaged. The autopilot will turn the aircraft onto the selected heading and hold it. A new heading can be subsequently selected by setting the Heading Bug to it.

Fig. 3-2. AP Display, HD Mode Engaged

3.1.3 Low Track (LO TRK) Mode, System Twenty / Thirty

Select the VOR frequency on the Navigation Receiver. Maneuver the aircraft to within ±1 CDI needle width and ±10° heading of the selected course. Engage the low track mode. The LO TRK lamp alone will be illuminated as shown in Fig. 3-3, to acknowledge that this mode is engaged. The autopilot will track the selected course with minimum authority, thereby ignoring short term CDI needle deflections (excursions) to inhibit aircraft scalloping during VOR station passage.

Fig. 3-3. AP Display, LO TRK Mode Engaged

3.1.4 High Track (HI TRK) Mode, System Twenty / Thirty

3.1.4.1 LOC Course Tracking

Select the LOC frequency on the Navigation Receiver. Maneuver the aircraft to within ±1 CDI needle width and ±10° heading of the selected course. Engage the high track mode. The HI TRK lamp alone will be illuminated as shown in Fig. 3-4, to acknowledge that this mode is engaged. The autopilot will track the selected course with maximum authority.

3.1.4.2 GPS Course Tracking

Program a predefined course into the GPS Navigation Receiver, comprised of course segments connected by waypoints. Maneuver the aircraft to within ±1 CDI needle width and ±10° heading of each successive course segment. Engage the high track mode. The HI TRK lamp alone will be illuminated as shown in Fig. 3-4, to acknowledge that this mode is engaged. The autopilot will track the selected course segment with maximum authority.

3.1.4.3 VOR Course Tracking

Select the VOR frequency on the Navigation Receiver. Maneuver the aircraft to within ±1 CDI needle width and ±10° heading of the selected course. Engage the high track mode. The HI TRK lamp alone will be illuminated as shown in Fig. 3-4, to acknowledge that this mode is engaged. The autopilot will track the selected course with maximum authority. As a result, however, the aircraft may exhibit scalloping during VOR station passage.

Fig. 3-4. AP Display, HI TRK Mode Engaged

3.1.5 Altitude Hold (ALT HOLD) Mode, System Thirty / Thirty ALT

3.1.5.1 System Thirty

The altitude hold mode can only be engaged if a roll mode (ST, HD, LO TRK, HI TRK) is already engaged. Maneuver the aircraft to the desired altitude. Engage the altitude hold mode. The ALT lamp will be illuminated as shown in Fig. 3-5, to acknowledge that this mode is engaged. The autopilot will hold the aircraft at its current (captured) absolute pressure altitude.

Fig. 3-5. AP Display, ST and ALT HOLD Modes Engaged (System Thirty)

3.1.5.2 System Thirty ALT

Maneuver the aircraft to the desired altitude. Engage the altitude hold mode. The ALT ON lamp will be illuminated as shown in Fig. 3-6, to acknowledge that this mode is engaged. The autopilot will hold the aircraft at its current (captured) absolute pressure altitude.

Fig. 3-6. ALT HOLD ON/OFF Switch Display, ALT HOLD Mode Engaged (System Thirty ALT)

3.1.6 Manual Elevator Trim Prompts, System Thirty / Thirty ALT

3.1.6.1 System Thirty

If the altitude hold mode is engaged, then the autopilot will provide a prompt whenever it is necessary to manually trim the aircraft about the pitch axis using the Elevator Trim Wheel.

Should the pitch servo loading exceed a preset threshold for a period of three seconds, either the TRIM UP lamp or TRIM DN lamp will become illuminated, as a prompt to trim the aircraft in the indicated direction. This is shown in Fig. 3-7. In addition, an audible alert will sound a steady tone. If no action is taken after four more seconds, then the lamp will flash and the audible alert will become periodic. Once the aircraft has been sufficiently trimmed, such that the pitch servo loading is below the preset threshold, the lamp will extinguish and the audible alert will be squelched.

3.1.6.2 System Thirty ALT

If the altitude hold mode is engaged, then the autopilot will provide a prompt whenever it is necessary to manually trim the aircraft about the pitch axis using the Elevator Trim Wheel.

Should the pitch servo loading exceed a preset threshold for a period of three seconds, either the UP lamp or DN lamp will become illuminated, as a prompt to trim the aircraft in the indicated direction. This is shown in Fig. 3-8. In addition, an audible alert will sound a steady tone. If no action is taken after four more seconds, then the lamp will flash and the audible alert will become periodic. Once the aircraft has been sufficiently trimmed, such that the pitch servo loading is below the preset threshold, the lamp will extinguish and the audible alert will be squelched.

a. TRIM UP Required

b. TRIM DN Required

Fig. 3-7. AP Display, Manual Trim Prompts (System Thirty)

a. TRIM UP Required

b. TRIM DN Required

Fig. 3-8. ALT HOLD ON/OFF Switch Display, Manual Trim Prompts (System Thirty ALT)

3.2 Approach Procedures

3.2.1 Straight-In LOC Approach

3.2.1.1 Heading System DG

Select the LOC frequency on the Navigation Receiver. Set the Heading Bug to the FRONT INBOUND LOC heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND LOC course. Engage the high track mode. The autopilot will track the FRONT INBOUND LOC course.

A summary pictorial of this procedure is shown in Fig. 3-9.

3.2.1.2 Heading System HSI

Select the LOC frequency on the Navigation Receiver. For reference only, set the Course Pointer to the FRONT INBOUND LOC course. Set the Heading Bug to the FRONT INBOUND LOC heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND LOC course. Engage the high track mode. The autopilot will track the FRONT INBOUND LOC course.

A summary pictorial of this procedure is shown in Fig. 3-10.

3.2.2 Straight-In VOR Approach

3.2.2.1 Heading System DG

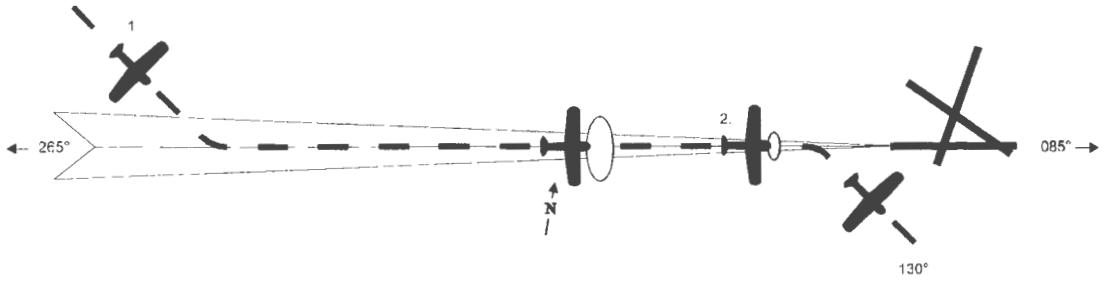
Select the VOR frequency on the Navigation Receiver. Set the OBS to the FRONT INBOUND VOR course. Set the Heading Bug to the FRONT INBOUND VOR heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND VOR course. Engage the high track mode. The autopilot will track the FRONT INBOUND VOR course.

A summary pictorial of this procedure is shown in Fig. 3-11.

3.2.2.2 Heading System HSI

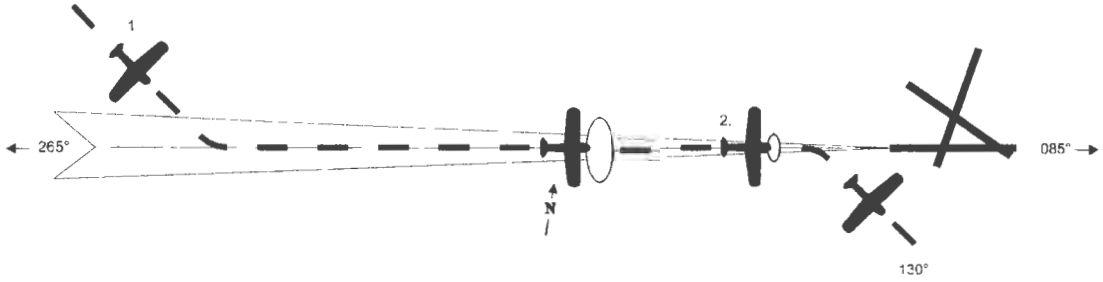
Select the VOR frequency on the Navigation Receiver. Set the Course Pointer to the FRONT INBOUND VOR course. Set the Heading Bug to the FRONT INBOUND VOR heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND VOR course. Engage the high track mode. The autopilot will track the FRONT INBOUND VOR course.

A summary pictorial of this procedure is shown in Fig. 3-12.



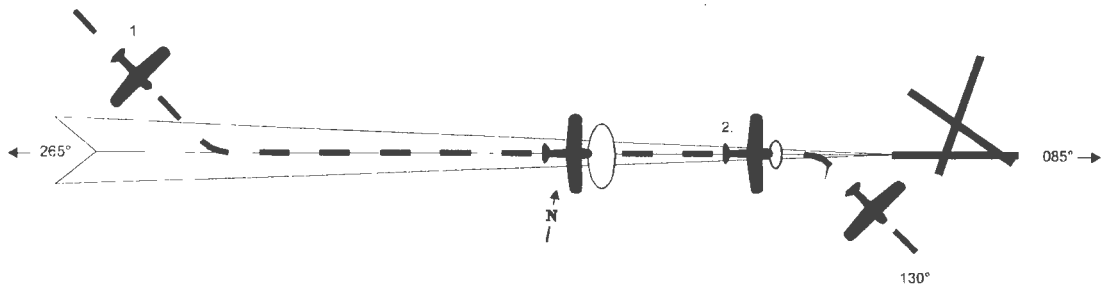
1. a. Select LOC frequency.
   b. Set Heading Bug to FRONT INBOUND LOC heading.
   c. Engage heading mode.
   d. Turn Heading Bug to establish aircraft on FRONT INBOUND LOC course.
   e. Engage high track mode.
   f. Track FRONT INBOUND LOC course.
2. a. At middle marker, if missed approach is declared, disconnect autopilot.
   b. Stabilize aircraft.
   c. Set Heading Bug to missed approach heading.
   d. Engage heading mode.

Fig. 3-9. Straight-In LOC Approach (DG)



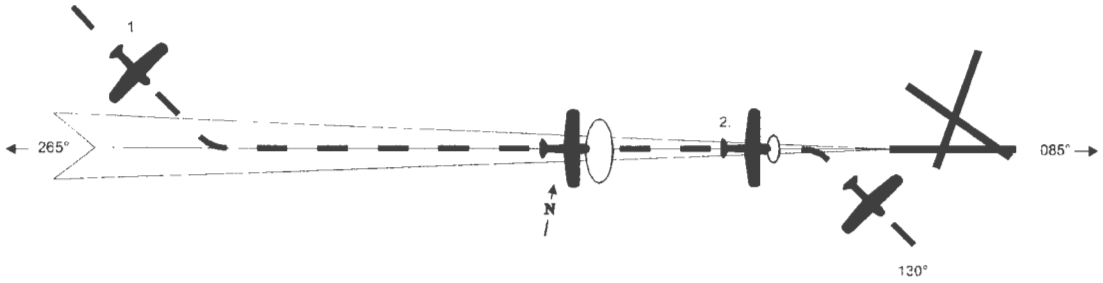
1. a. Select LOC frequency.
   b. Set Course Pointer to FRONT INBOUND LOC course (reference only).
   c. Set Heading Bug to FRONT INBOUND LOC heading.
   d. Engage heading mode.
   e. Turn Heading Bug to establish aircraft on FRONT INBOUND LOC course.
   f. Engage high track mode.
   g. Track FRONT INBOUND LOC course.
2. a. At middle marker, if missed approach is declared, disconnect autopilot.
   b. Stabilize aircraft.
   c. Set Heading Bug to missed approach heading.
   d. Engage heading mode.

Fig. 3-10. Straight-In LOC Approach (HSI)



1. a. Select VOR frequency.
   b. Set OBS to FRONT INBOUND VOR course.
   c. Set Heading Bug to FRONT INBOUND VOR heading.
   d. Engage heading mode.
   e. Turn Heading Bug to establish aircraft on FRONT INBOUND VOR course.
   f. Engage high track mode.
   g. Track FRONT INBOUND VOR course.
2. a. At middle marker, if missed approach is declared, disconnect autopilot.
   b. Stabilize aircraft.
   c. Set Heading Bug to missed approach heading.
   d. Engage heading mode.

Fig. 3-11. Straight-In VOR Approach (DG)



1. a. Select VOR frequency.
   b. Set Course Pointer to FRONT INBOUND VOR course.
   c. Set Heading Bug to FRONT INBOUND VOR heading.
   d. Engage heading mode.
   e. Turn Heading Bug to establish aircraft on FRONT INBOUND VOR course.
   f. Engage high track mode.
   g. Track FRONT INBOUND VOR course.
2. a. At middle marker, if missed approach is declared, disconnect autopilot.
   b. Stabilize aircraft.
   c. Set Heading Bug to missed approach heading.
   d. Engage heading mode.

Fig. 3-12. Straight-In VOR Approach (HSI)

3.2.3 LOC Approach with Procedure Turn

3.2.3.1 Heading System DG

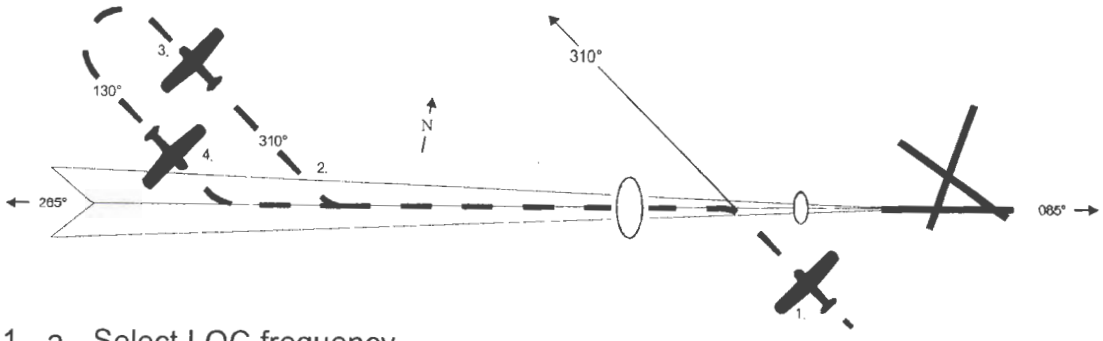
Select the LOC frequency on the Navigation Receiver. Set the Heading Bug to the FRONT OUTBOUND LOC heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT OUTBOUND LOC course. At the appropriate point thereafter, set the Heading Bug to the FRONT OUTBOUND PROCEDURE TURN heading. Hold this heading until the point at which it is time to turn the aircraft again. At that point, turn the Heading Bug in two successive 90° increments, to establish the aircraft on the FRONT INBOUND PROCEDURE TURN heading. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND LOC course. Engage the high track mode. The autopilot will track the FRONT INBOUND LOC course.

A summary pictorial of this procedure is shown in Fig. 3-13.

3.2.3.2 Heading System HSI

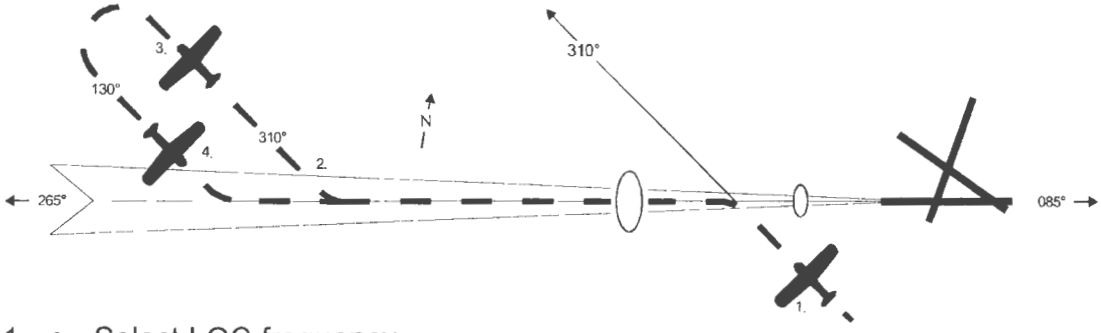
Select the LOC frequency on the Navigation Receiver. For reference only, set the Course Pointer to the FRONT INBOUND LOC course. Set the Heading Bug to the FRONT OUTBOUND LOC heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT OUTBOUND LOC course. At the appropriate point thereafter, set the Heading Bug to the FRONT OUTBOUND PROCEDURE TURN heading. Hold this heading until the point at which it is time to turn the aircraft again. At that point, turn the Heading Bug in two successive 90° increments, to establish the aircraft on the FRONT INBOUND PROCEDURE TURN heading. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND LOC course. Engage the high track mode. The autopilot will track the FRONT INBOUND LOC course.

A summary pictorial of this procedure is shown in Fig. 3-14.



1. a. Select LOC frequency.
   b. Set Heading Bug to FRONT OUTBOUND LOC heading.
   c. Engage heading mode.
   d. Turn Heading Bug to establish aircraft on FRONT OUTBOUND LOC course.
2. a. Set Heading Bug to FRONT OUTBOUND PROCEDURE TURN heading.
3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on FRONT INBOUND PROCEDURE TURN heading.
4. a. Turn Heading Bug to establish aircraft on FRONT INBOUND LOC course.
   b. Engage high track mode.
   c. Track FRONT INBOUND LOC course.
5. a. At middle marker, if missed approach is declared, disconnect autopilot.
   b. Stabilize aircraft.
   c. Set Heading Bug to missed approach heading.
   d. Engage heading mode.

Fig. 3-13. LOC Approach with Procedure Turn (DG)



1. a. Select LOC frequency.
   b. Set Course Pointer to FRONT INBOUND LOC course (reference only).
   c. Set Heading Bug to FRONT OUTBOUND LOC heading.
   d. Engage heading mode.
   e. Turn Heading Bug to establish aircraft on FRONT OUTBOUND LOC course.
2. a. Set Heading Bug to FRONT OUTBOUND PROCEDURE TURN heading.
3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on FRONT INBOUND PROCEDURE TURN heading.
4. a. Turn Heading Bug to establish aircraft on FRONT INBOUND LOC course.
   b. Engage high track mode.
   c. Track FRONT INBOUND LOC course.
5. a. At middle marker, if missed approach is declared, disconnect autopilot.
   b. Stabilize aircraft.
   c. Set Heading Bug to missed approach heading.
   d. Engage heading mode.

Fig. 3-14. LOC Approach with Procedure Turn (HSI)

3.2.4 VOR Approach with Procedure Turn

3.2.4.1 Heading System DG

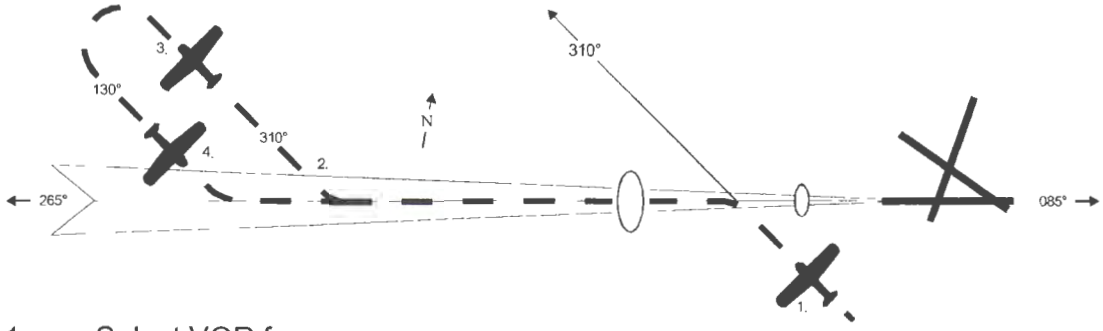
Select the VOR frequency on the Navigation Receiver. Set the OBS to the FRONT INBOUND VOR course. Set the Heading Bug to the FRONT OUTBOUND VOR heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT OUTBOUND VOR course. At the appropriate point thereafter, set the Heading Bug to the FRONT OUTBOUND PROCEDURE TURN heading. Hold this heading until the point at which it is time to turn the aircraft again. At that point, turn the Heading Bug in two successive 90° increments, to establish the aircraft on the FRONT INBOUND PROCEDURE TURN heading. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND VOR course. Engage the high track mode. The autopilot will track the FRONT INBOUND VOR course.

A summary pictorial of this procedure is shown in Fig. 3-15.

3.2.4.2 Heading System HSI

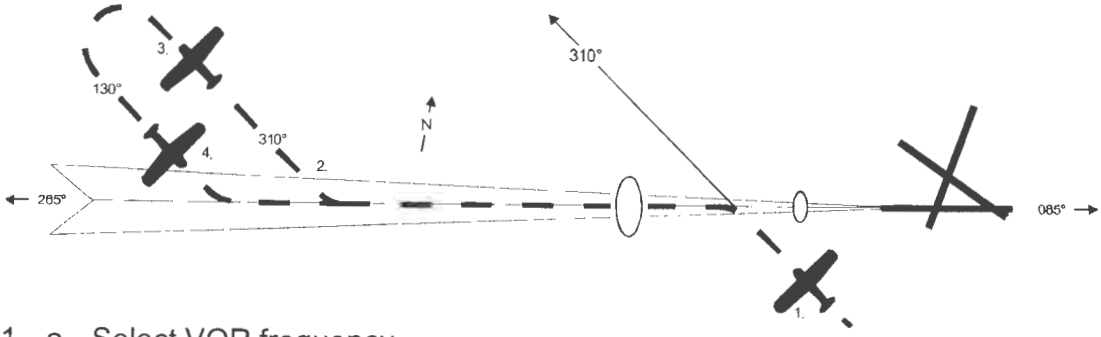
Select the VOR frequency on the Navigation Receiver. Set the Course Pointer to the FRONT INBOUND VOR course. Set the Heading Bug to the FRONT OUTBOUND VOR heading, and then engage the heading mode. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT OUTBOUND VOR course. At the appropriate point thereafter, set the Heading Bug to the FRONT OUTBOUND PROCEDURE TURN heading. Hold this heading until the point at which it is time to turn the aircraft again. At that point, turn the Heading Bug in two successive 90° increments, to establish the aircraft on the FRONT INBOUND PROCEDURE TURN heading. At the appropriate point, turn the Heading Bug to establish the aircraft on the FRONT INBOUND VOR course. Engage the high track mode. The autopilot will track the FRONT INBOUND VOR course.

A summary pictorial of this procedure is shown in Fig. 3-16.



1. a. Select VOR frequency.
   b. Set OBS to FRONT INBOUND VOR course.
   c. Set Heading Bug to FRONT OUTBOUND VOR heading.
   d. Engage heading mode.
   e. Turn Heading Bug to establish aircraft on FRONT OUTBOUND VOR course.
2. a. Set Heading Bug to FRONT OUTBOUND PROCEDURE TURN heading.
3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on FRONT INBOUND PROCEDURE TURN heading.
4. a. Turn Heading Bug to establish aircraft on FRONT INBOUND VOR course.
   b. Engage high track mode.
   c. Track FRONT INBOUND VOR course.
5. a. At middle marker, if missed approach is declared, disconnect autopilot.
   b. Stabilize aircraft.
   c. Set Heading Bug to missed approach heading.
   d. Engage heading mode.

Fig. 3-15. VOR Approach with Procedure Turn (DG)



1. a. Select VOR frequency.

   b. Set Course Pointer to FRONT INBOUND VOR course.

   c. Set Heading Bug to FRONT OUTBOUND VOR heading.

   d. Engage heading mode.

   e. Turn Heading Bug to establish aircraft on FRONT OUTBOUND VOR course.

2. a. Set Heading Bug to FRONT OUTBOUND PROCEDURE TURN heading.

3. a. Turn Heading Bug in two successive 90° increments, to establish aircraft on FRONT INBOUND PROCEDURE TURN heading.

4. a. Turn Heading Bug to establish aircraft on FRONT INBOUND VOR course.

   b. Engage high track mode.

   c. Track FRONT INBOUND VOR course.

5. a. At middle marker, if missed approach is declared, disconnect autopilot.

   b. Stabilize aircraft.

   c. Set Heading Bug to missed approach heading.

   d. Engage heading mode.

Fig. 3-16. VOR Approach with Procedure Turn (HSI)

3.3 Yaw Damper Operation

The optional Yaw Damper serves to dampen excessive adverse yaw. It operates in either the AUTO mode or ON mode, depending upon the position of the Yaw Damper Master Switch shown in Fig. 3-17.

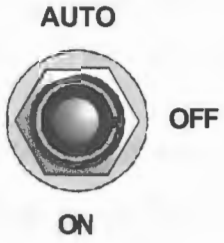


Fig. 3-17. Yaw Damper Master Switch

The Yaw Trim Knob, shown in Fig. 3-18, is used to center the slip/skid ball when the yaw servo is engaged.

Fig. 3-18. Yaw Trim Knob

3.3.1 AUTO Mode

With the Yaw Damper Master Switch in the AUTO position, the yaw servo will become automatically engaged whenever a roll mode (ST, HD, LO TRK, HI TRK) is engaged.

3.3.2 ON Mode

With the Yaw Damper Master Switch in the ON position, the yaw servo will be engaged at all times, entirely independent of autopilot operation.

3.3.3 Yaw Damper Trim

With the yaw servo engaged, rotate the Yaw Trim Knob to center the slip/skid ball.

3.4 Autopilot Disconnect

3.4.1 System Twenty / Thirty

The autopilot can be disconnected by any of the following means:

1. Press optional AP DISC Switch typically located on Control Wheel.
2. Press/Hold optional MODE SEL Switch typically located on Control Wheel for 3 seconds.
3. Press/Hold PUSH MODE Switch located on bezel for 3 seconds.
4. Set Autopilot Master Switch to OFF position.
5. Pull Autopilot Circuit Breaker.

3.4.2 System Thirty ALT

The autopilot can be disconnected by any of the following means:

1. Press optional ALT ENG/DSNG Switch typically located on Control Wheel.
2. Press ALT HOLD ON/OFF Switch located on instrument panel.
3. Set ALT HOLD Master Switch to OFF position.
4. Pull ALT HOLD Circuit Breaker.

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SECTION 4
OPERATING PARAMETERS

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4.1 Roll Axis Limits

Turn Rate

Piston A/C:

90% Standard Rate Turn

Turboprop A/C:

75% Standard Rate Turn

4.2 Pitch Axis Limits

Altitude

32,000 FT

Vertical Force Due to Acceleration

0.60 g

Modes

For the System Thirty, the pitch mode (ALT HOLD) can only be engaged after a roll mode (ST, HD, LO TRK, HI TRK) has been engaged.

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SECTION 5
GLOSSARY

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Term	Meaning
A/C	Aircraft
ALT	Altitude
AP	Autopilot
CDI	Course Deviation Indication
CW	Clockwise
CCW	Counter–Clockwise
DG	Directional Gyro
DISC	Disconnect
DN	Down
DSNG	Disengage
ENG	Engage
FAA	Federal Aviation Administration
FT	Feet
GPS	Global Positioning System
HD	Heading
HI TRK	High Track
HSI	Horizontal Situation Indicator
IFR	Instrument Flight Rules
LO TRK	Low Track
LOC	Localizer
MAP	Missed Approach Point
OBS	Omnibearing Selector
PN	Part Number
POH	Pilot's Operating Handbook
RDY	Ready
ST	Stabilizer
UP	Up
VMC	Visual Meteorological Conditions
VOR	Very High Frequency Omnidirectional Radio Range

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Notice:
Contact S-TEC Customer Support at 800-872-7832 for a Return Material Authorization (RMA) number prior to the return of any component for any reason.

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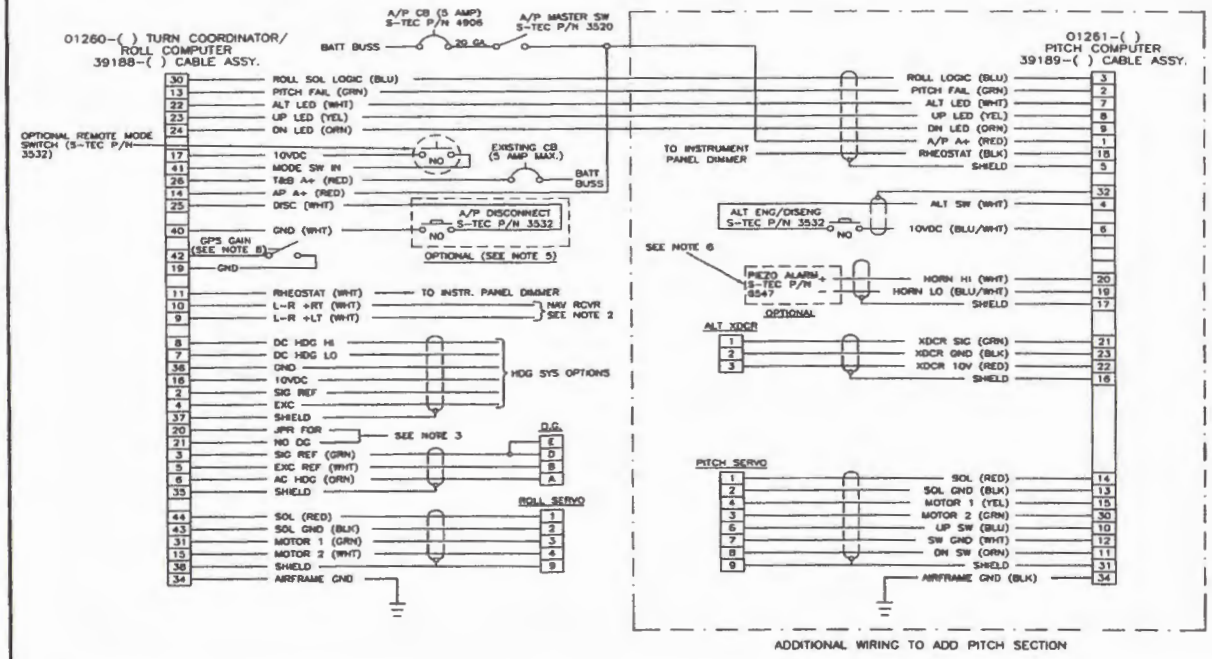
Mineral Wells, TX 76067–9236
Tel: 800–872–7832
Fax: 940–325–3904
www.s-tec.com
www.cobham.com
S–TEC PN 8777

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
–	RELEASED PER E.O. 6099	1-6-97	W.DAVIS
A	REV PER EO 6384	5-6-97	M.KEIRNAN
B	REV PER EO 6444	7-21-97	M.KEIRNAN
C	REV PER EO 6548	9-30-97	M.KEIRNAN
D	REV PER EO 6692	12-23-97	J.FROST
E	REV PER EO 6780	2-20-98	M.KEIRNAN
F	REV PER EO 7506	1-20-99	J.FROST
G	REV PER EO 7572	2-24-99	T. PIERSON



ADDITIONAL WIRING TO ADD PITCH SECTION

NOTES:

1. FIELD FABRICATED WIRING TO BE 22 GA. MINIMUM (UNLESS OTHERWISE NOTED) AND MUST MEET OR EXCEED THE REQUIREMENTS OF MIL-W-22759/16. ALL WIRING TO BE ROUTED & SECURED IN ACCORDANCE WITH AC43.13-1A, CHAPTER 11, SECTION 7.
2. REFER TO RADIO MANUFACTURER'S SERVICE AND/OR INSTALLATION INFORMATION FOR SPECIFIC INTERCONNECT INFORMATION.
3. REMOVE JUMPER ACROSS PINS 20 & 21 OF THE TURN COORDINATOR/ROLL COMPUTER CONNECTOR WHEN OPTIONAL DIRECTIONAL GYRO OR A HEADING SYSTEM IS BEING INSTALLED.
4. WHEN A HEADING SYSTEM IS INSTALLED, REFER TO HEADING SYSTEM INTERCONNECT DETAILS (DWG. NO. 10114) & HEADING SYSTEM MANUFACTURERS SERVICE AND/OR INSTALLATION INTERCONNECT INFORMATION. REFER TO DWG. NO. 0570 FOR MODIFICATION REQUIRED TO ROLL BOARD OF TURN COORDINATOR/ROLL COMPUTER.
5. THE A/P DISCONNECT IS AN OPTIONAL COMPONENT. IF THE A/P DISCONNECT IS NOT USED CAP OFF THE ENDS OF THE WIRES MARKED "A/P DISCONNECT" & TIE BACK INTO WIRING BUNDLE.
6. A REMOTELY MOUNTED AUDIBLE ALARM (PIEZO ALARM, S-TEC P/N 6547) IS REQUIRED TO PROVIDE AN AUDIBLE "ELEVATOR OUT OF TRIM" INDICATION WHEN THE PITCH COMPUTER IS LOCATED OUTSIDE THE CABIN AREA.
7. ATTACH 5279 SOCKETS TO WIRE (WHERE APPLICABLE) USING DMC M22520/2-01 CRIMPING TOOL & DMC M22520/2-06 INSERT.
8. PIN 42 TO GND ENABLES GPS TRACK GAIN SETTING. USE ONE SET OF CONTACTS ON THE EXTERNAL AP SELECT SWITCH FOR NAV/GPS. THIS CONNECTION IS REQUIRED WHEN INTERFACING TO GPS RECEIVER.

	BULLETIN 700
NEXT ASSY	USED ON
APPLICATIONS	

LIST OF MATERIALS

APPROVAL	DATE
DRAWN R.TUCKER	9-19-96
CHECKED J.MOORE	9-19-96
ENGINEER M.KEIRNAN	1-5-97
APPROVED E.CAMERON	1-6-97

TOLERANCES UNLESS OTHERWISE SPECIFIED
DECIMAL XXX: +/- .005
DECIMAL XX : +/- .010
FRACTIONS: +/- 1/64
ANGLES: +/- 0 ° 30'
REMOVE BURRS
BREAK SHARP EDGES .010

S-TEC Corporation
One S-TEC Way
Municipal Airport – Mineral Wells, Tx. 76067-9236

TITLE
SCHEMATIC, EXTERNAL WIRING INTERCONNECT-SYS. 20/30

SIZE	DRAWING NO.	REV
C	10113	G
SCALE N/A	DO NOT SCALE DRAWING	SHEET 1 of 1