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1967

Cessna®

SALES AND SERVICE

MODEL 172 AND SKYHAWK

OWNER'S MANUAL

WORLD'S LARGEST PRODUCER OF GENERAL AVIATION AIRCRAFT SINCE 1956

PERFORMANCE - SPECIFICATIONS

	MODEL 172	SKYHAWK
GROSS WEIGHT	2300 lbs	2300 lbs
SPEED:		
Top Speed at Sea Level	138 mph	139 mph
Cruise, 75% Power at 7000 ft	130 mph	131 mph
RANGE:		
Cruise, 75% Power at 7000 ft	550 miles	555 miles
36 Gal., No Reserve	4.2 hours	4.2 hours
	130 mph	131 mph
Optimum Range at 10,000 ft	670 miles	670 miles
36 Gal., No Reserve	6.6 hours	6.6 hours
	102 mph	102 mph
RATE OF CLIMB AT SEA LEVEL	645 fpm	645 fpm
SERVICE CEILING	13,100 ft	13,100 ft
TAKE-OFF:		
Ground Run	865 ft	865 ft
Total Distance Over 50-Foot Obstacle	1525 ft	1525 ft
LANDING:		
Landing Roll	520 ft	520 ft
Total Distance Over 50-Foot Obstacle	1250 ft	1250 ft
EMPTY WEIGHT: (Approximate)	1275 lbs	1340 lbs
BAGGAGE	120 lbs	120 lbs
WING LOADING: Pounds/Sq Foot	13.2	13.2
POWER LOADING: Pounds/HP	15.9	15.9
FUEL CAPACITY: Total	39 gal.	39 gal.
OIL CAPACITY: Total	8 qts	8 qts
PROPELLER: Fixed Pitch (Diameter)	76 inches	76 inches
ENGINE:		
Continental Engine	O-300-C*	O-300-D
145 rated HP at 2700 RPM		

*The Model F172, which is manufactured by Reims Aviation S.A., Reims (Marne) France, is identical to the 172 except that it is powered by an O-300-D engine, manufactured under license by Rolls Royce, Crewe, England. All 172 information in this manual pertains to the F172 as well.

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. It is our desire that 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 Model 172/Skyhawk. 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 by most Cessna Dealers:

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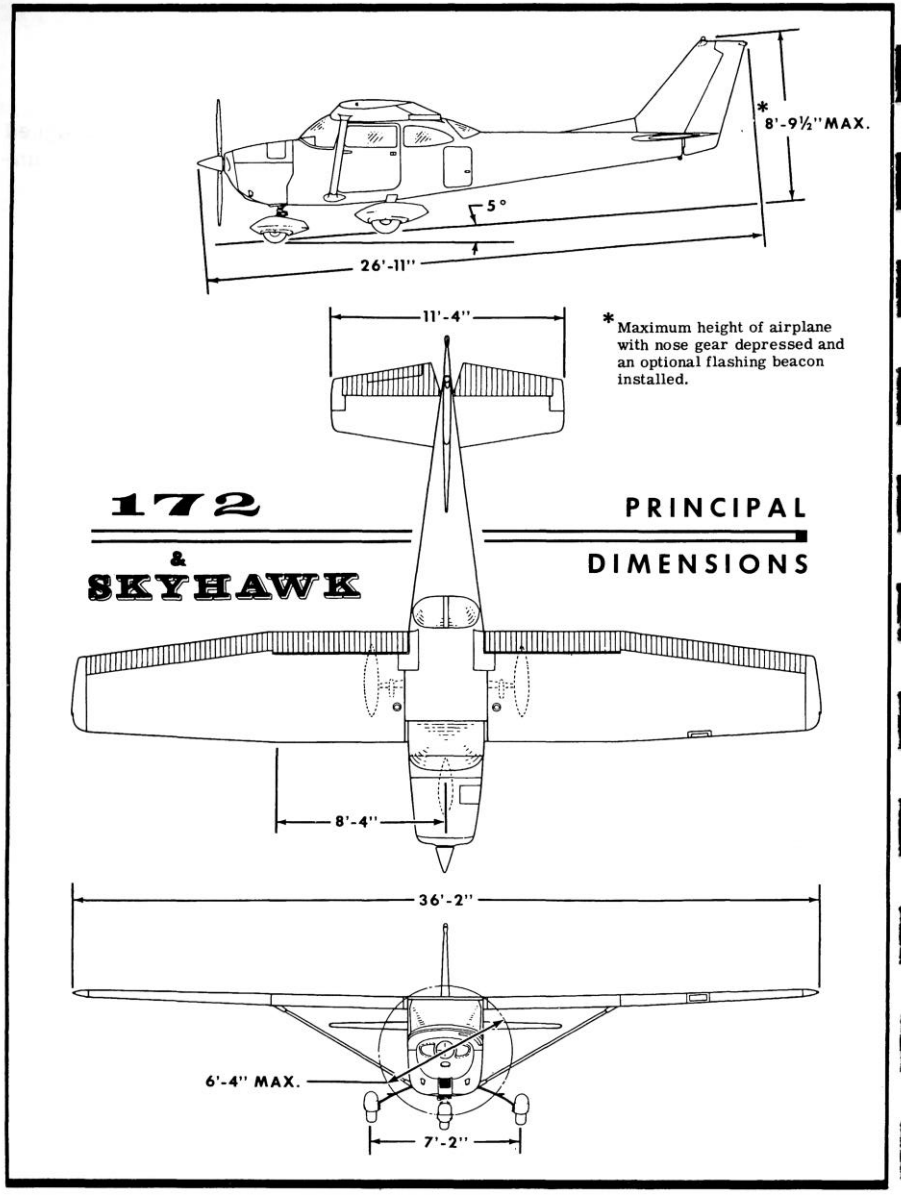
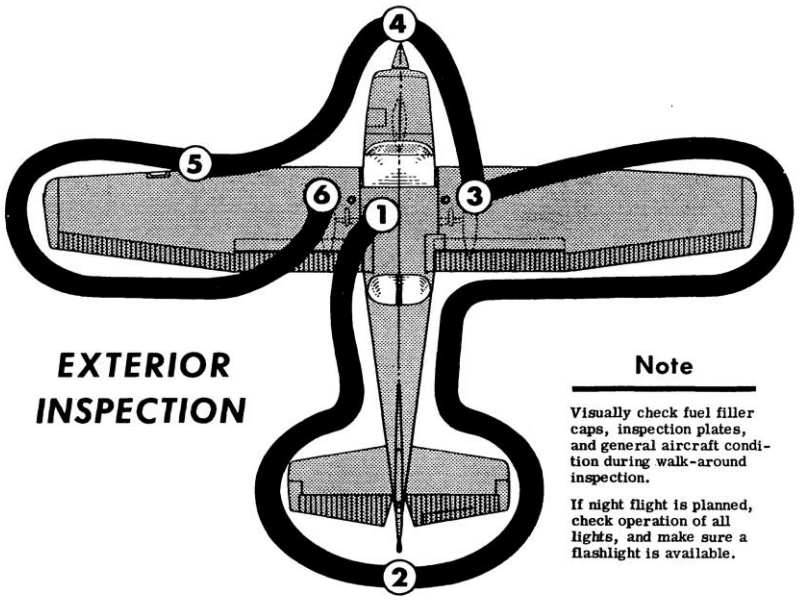


TABLE OF CONTENTS

This manual describes the operation and performance of both the Cessna Model 172 and the Cessna Skyhawk. Equipment described as "Optional" denotes that the subject equipment is optional on the Model 172. Much of this equipment is standard on the Skyhawk model.



EXTERIOR INSPECTION

Note

Visually check fuel filler caps, inspection plates, and general aircraft condition during walk-around inspection.

If night flight is planned, check operation of all lights, and make sure a flashlight is available.

(1)
a. Turn on master switch and check fuel quantity indicators, then turn master switch off.
b. Check ignition switch "OFF".
c. Check fuel selector valve handle "BOTH ON."
d. On first flight of day and after each fueling, pull out strainer drain knob for about four seconds, to clear fuel strainer of possible water and sediment.
e. Remove control wheel lock.
f. Check baggage door for security.

(2)
a. Remove rudder gust lock, if installed.
b. Disconnect tail tie-down.

(3)
a. Check main wheel tire for proper inflation.
b. Inspect airspeed static source hole on side of fuselage for stoppage (left side only).
c. Disconnect wing tie-down.

(4)
a. Check oil level. Do not operate with less than six quarts. Fill for extended flight.
b. Check propeller and spinner for nicks and security.
c. Check nose wheel strut and tire for proper inflation.
d. Disconnect tie-down rope.
e. Make visual check to insure that fuel strainer drain valve is closed after draining operation.

(5)
a. Remove pitot tube cover, if installed, and check pitot tube opening for stoppage.
b. Check fuel tank vent opening for stoppage.
c. Check stall warning vent opening for stoppage.

(6) Same as (3).

Figure 1-1.

Section I

OPERATING CHECK LIST

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 in Section II.

Section I 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 should know 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 I and II are indicated airspeeds. Corresponding calibrated airspeed may be obtained from the Airspeed Correction Table in Section V.

BEFORE ENTERING THE AIRPLANE.

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

BEFORE STARTING THE ENGINE.

(1) Seats and Seat Belts -- Adjust and lock.
(2) Brakes -- Test and set.
(3) Radios and Flashing Beacon -- "OFF."
(4) Fuel Selector -- "BOTH ON."

STARTING THE ENGINE.

(1) Master Switch -- "ON".
(2) Carburetor Heat -- Cold.
(3) Mixture -- Rich.
(4) Primer -- 2-5 strokes (depending on temperature).
(5) Throttle -- Open 1/8".
(6) Propeller Area -- Clear.
(7) Ignition Switch -- "BOTH".
(8) Starter -- Engage.

BEFORE TAKE-OFF.

(1) Flight Controls -- Check.
(2) Trim Tab -- "TAKE-OFF" setting.
(3) Cabin Doors -- Latched and locked.
(4) Throttle Setting -- 1700 RPM.
(5) Engine Instruments -- Check.
(6) Carburetor Heat -- Check operation.
(7) Magnetos -- Check (75 RPM maximum differential between magnetos).
(8) Flight Instruments and Radios -- Set.
(9) Suction Gage -- Check (4.6 to 5.4 inches of mercury).

TAKE-OFF.

NORMAL TAKE-OFF.

(1) Wing Flaps -- 0°
(2) Carburetor Heat -- Cold.
(3) Power -- Full throttle (applied smoothly).
(4) Elevator Control -- Lift nosewheel at 60 MPH.
(5) Climb Speed -- 85 MPH.

MAXIMUM PERFORMANCE TAKE-OFF.

(1) Wing Flaps -- 0°
(2) Carburetor Heat -- Cold.
(3) Brakes -- Apply.
(4) Power -- Full throttle.

(5) Brakes -- Release.
(6) Elevator Control -- Slightly tail low.
(7) Climb Speed -- 66 MPH (with obstacles ahead).

CLIMB.

NORMAL CLIMB.

(1) Airspeed -- 80 to 90 MPH.
(2) Power -- Full throttle.
(3) Mixture -- Full rich (unless engine is rough).

MAXIMUM PERFORMANCE CLIMB.

(1) Airspeed -- 80 MPH at sea level to 77 MPH at 10, 000 feet.
(2) Power -- Full throttle.
(3) Mixture -- Full rich (unless engine is rough).

CRUISING.

(1) Power -- 2200 to 2700 RPM.
(2) Trim Tab -- Adjust.
(3) Mixture -- Lean.

LET-DOWN.

(1) Mixture -- Rich.
(2) Power -- As desired.
(3) Carburetor Heat -- As required to prevent carburetor icing.

BEFORE LANDING.

(1) Mixture -- Rich.
(2) Fuel Selector -- "BOTH ON."
(3) Carburetor Heat -- Apply full heat before closing throttle.
(4) Airspeed -- 70 to 80 MPH (flaps up).

(5) Wing Flaps -- As desired.
(6) Airspeed -- 65 to 75 MPH (flaps down).

NORMAL LANDING.

(1) Touchdown -- Main wheels first.
(2) Landing Roll -- Lower nosewheel gently.
(3) Braking -- Minimum required.

AFTER LANDING.

(1) Wing Flaps -- Up.
(2) Carburetor Heat -- Cold.

SECURE AIRCRAFT.

(1) Mixture -- Full lean.
(2) All Switches -- Off.
(3) Brakes -- Set.
(4) Control Lock -- Installed.

MODIFIED FUEL MANAGEMENT PROCEDURES

With a combination of highly volatile fuel, high fuel temperature, high operating altitude, and low fuel flow rate in the tank outlet lines, there is a remote possibility of accumulating fuel vapor and encountering power irregularities on some airplanes. To minimize this possibility, the following operating procedures are recommended:

(1) Take-off and climb to cruise altitude on "both" tanks. (This is consistent with current recommendations.)
(2) When reaching cruise altitude above 5000 feet MSL, promptly switch the fuel selector valve from "both" tanks to either the "right" or "left" tank.
(3) During cruise, use "left" and "right" tank as required.
(4) Select "both" tanks for landing as currently recommended.

POWER RECOVERY TECHNIQUES

In the remote event that vapor is present in sufficient amounts to cause a power irregularity, the following power recovery techniques should be followed:

OPERATION ON A SINGLE TANK

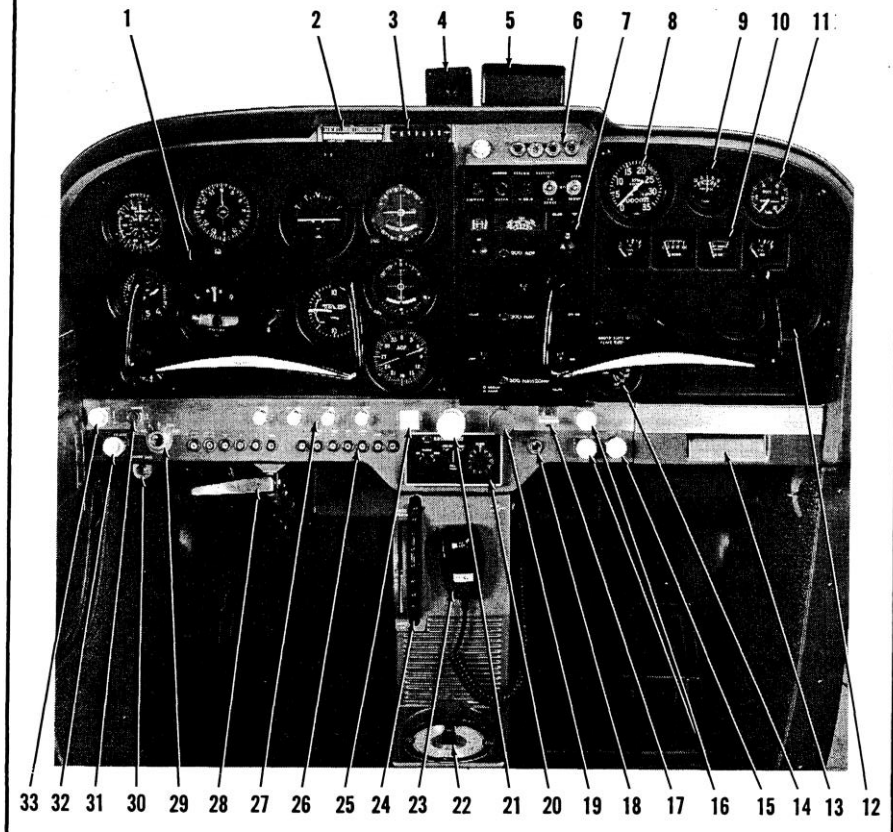
Should power irregularities occur when operating on a single tank, power can be restored immediately by switching to the opposite tank. In addition, the vapor accumulation in the tank on which the power irregularity occurred will rapidly dissipate itself such that that tank will also be available for normal operation after it has been unused for approximately one (1) minute.

OPERATION ON BOTH TANKS

Should power irregularities occur with the fuel selector on both tanks, the following steps are to be taken to restore power:

(1) Switch to a single tank for a period of 60 seconds.
(2) Then switch to the opposite tank and power will be restored.

INSTRUMENT PANEL



1. Flight Instrument Group
2. Compass Correction Card
3. Aircraft Registration Number
4. Magnetic Compass
5. Rear View Mirror (Opt.)
6. Radio Selector Switches (Opt.)
7. Radios (Opt.)
8. Tachometer
9. Ammeter
10. Fuel and Oil Gages
11. Suction Gage (Opt.)
12. Optional Instrument Space (Typical)
13. Map Compartment
14. Wing Flap Position Indicator
15. Cigar Lighter
16. Cabin Air and Heat Controls
17. Wing Flap Switch
18. Autopilot - Omni Switch (Opt.)
19. Mixture Control Knob
20. Autopilot Control Unit (Opt.)
21. Throttle
22. Fuel Selector Valve
23. Microphone
24. Elevator Trim Control Wheel
25. Carburetor Air Heat Control
26. Circuit Breakers
27. Electrical Switches
28. Parking Brake Handle
29. Ignition/Starter Switch
30. Phone Jack
31. Master Switch
32. Primer
33. Fuel Strainer Drain Knob

Figure 2-1.

Section II

DESCRIPTION AND OPERATING DETAILS

The following paragraphs describe the systems and equipment whose function and operation is not obvious when sitting in the airplane. This section also covers in somewhat greater detail some of the items listed in Check List form in Section I that require further explanation.

FUEL SYSTEM.

Fuel is supplied to the engine from two aluminum tanks, one in each wing. From these tanks, fuel flows by gravity through a selector valve and a strainer to the carburetor.

Refer to figure 2-2 for fuel quantity data. For fuel system servicing information, refer to Lubrication and Servicing Procedures in Section IV.

FUEL QUANTITY DATA (U.S. GALLONS)

TANKS	NO.	USABLE FUEL ALL FLIGHT CONDITIONS	ADDITIONAL USABLE FUEL (LEVEL FLIGHT)	UNUSABLE FUEL (LEVEL FLIGHT)	TOTAL FUEL VOLUME EACH
LEFT WING	1	18.0 gal.	1.0 gal.	0.5 gal.	19.5 gal.
RIGHT WING	1	18.0 gal.	1.0 gal.	0.5 gal.	19.5 gal.

Figure 2-2.

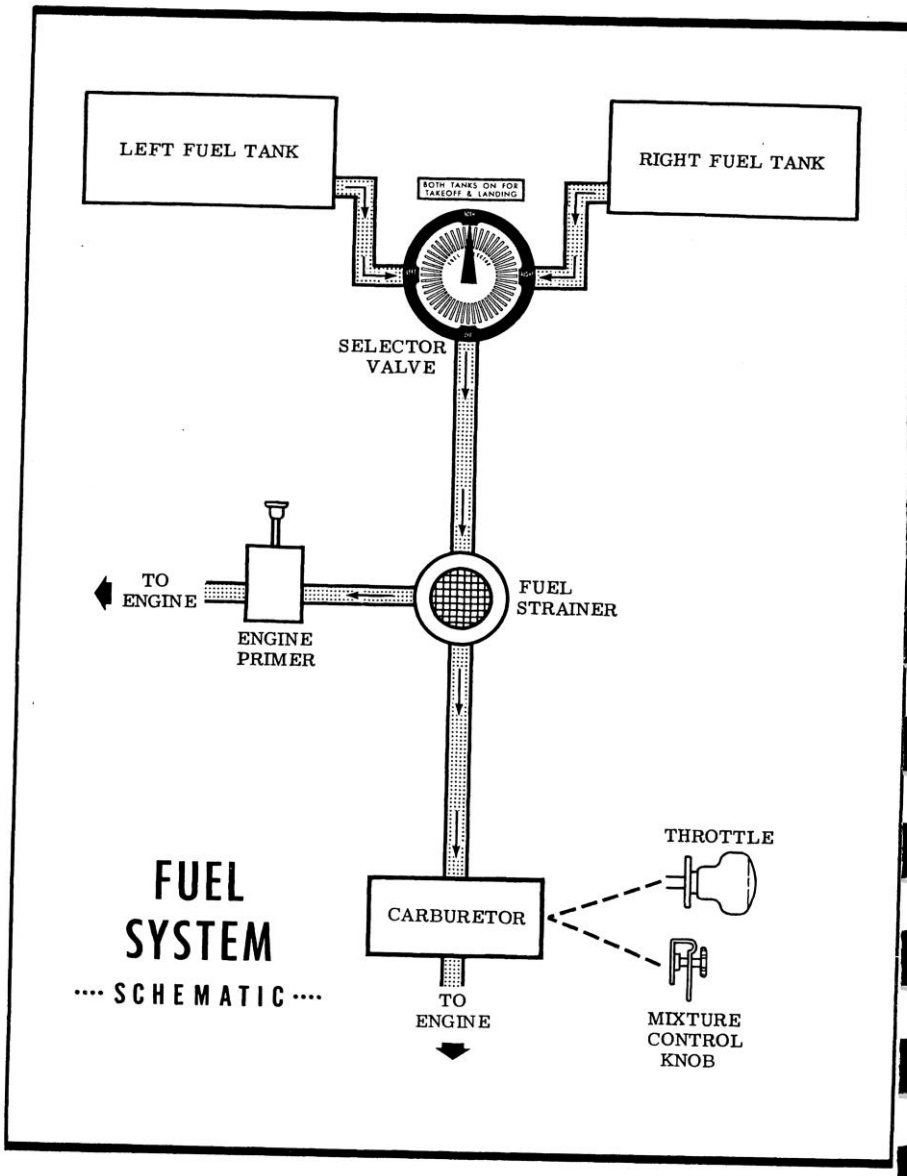


Figure 2-3.

FUEL STRAINER DRAIN KNOB.

Refer to fuel strainer servicing procedures, Section IV.

ELECTRICAL SYSTEM.

Electrical energy is supplied by a 14-volt, direct-current system powered by an engine-driven alternator (see figure 2-4). The 12-volt battery is located on the left-hand forward portion of the firewall. On the standard Model 172, power is supplied to all electrical and electronic system circuits from a single bus bar. On Skyhawk models, electrical power is supplied through a split bus bar, one side containing electronic system circuits and the other side having general electrical system circuits. In the split bus system, both sides of the bus are on at all times except when either an external power source is connected or the starter switch is turned on; then a power contactor is automatically activated to open the circuit to the electronic bus. Isolating the electronic circuits in this manner prevents harmful transient voltages from damaging the semiconductors in the electronic equipment. Figure 2-4 illustrates the bus bar arrangement for Skyhawk models; wiring in the standard Model 172 is identical except for the split bus system.

AMMETER.

The ammeter indicates the flow of current, in amperes, from the alternator to the battery or from the battery to the aircraft electrical system. When the engine is operating and the master switch is "ON," the ammeter indicates the charging rate applied to the battery. In the event the alternator is not functioning or the electrical load exceeds the output of the alternator, the ammeter indicates the discharge rate of the battery.

CIRCUIT BREAKERS AND FUSES.

The majority of electrical circuits in the airplane are protected by "push-to-reset" circuit breakers mounted on the instrument panel. Exceptions to this are the clock circuit and battery contactor closing (external power) circuit which have fuses mounted adjacent to the battery. Also, the cigar lighter is protected by a manually reset type circuit breaker mounted directly on the back of the lighter behind the instrument panel.

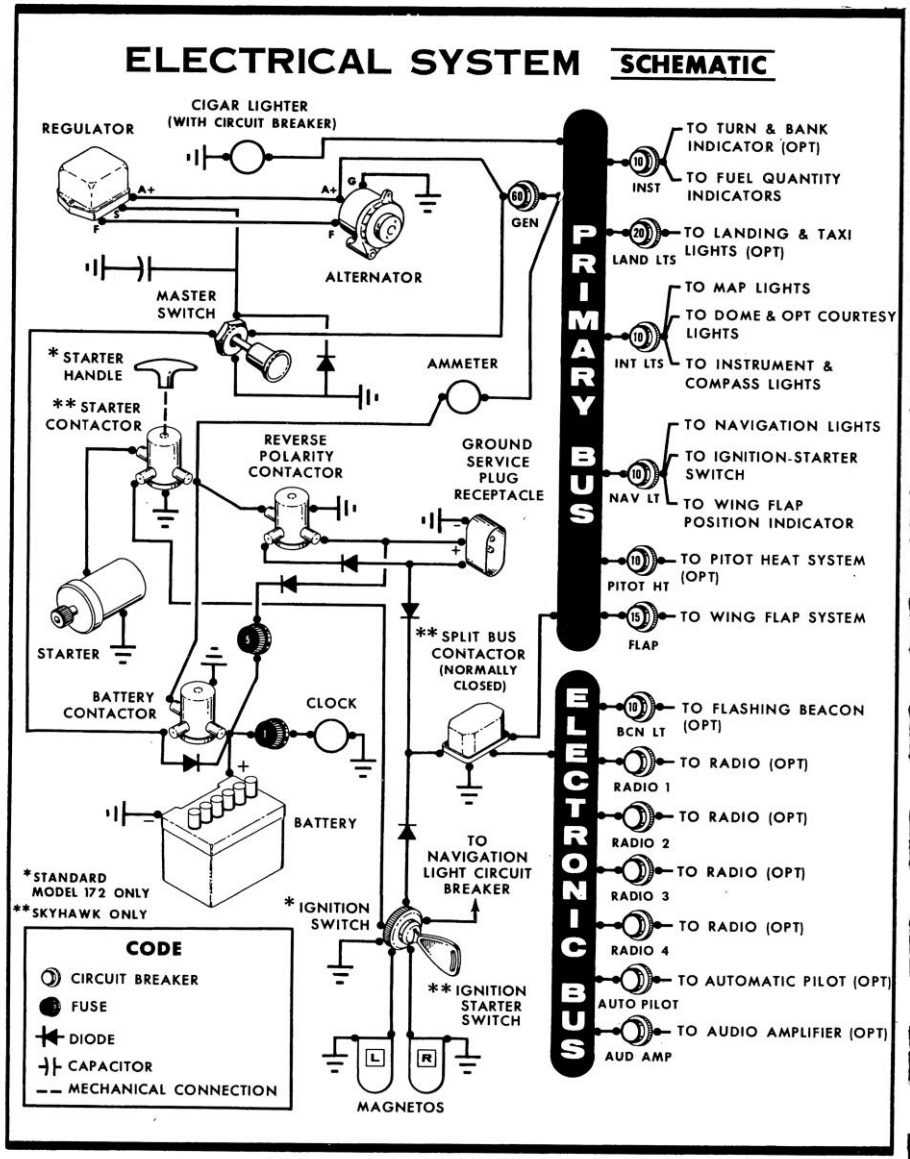


Figure 2-4.

LANDING LIGHTS (OPT).

A three-position, push-pull switch controls the optional landing lights. To turn one lamp on for taxiing, pull the switch out to the first stop. To turn both lamps on for landing, pull the switch out to the second stop.

FLASHING BEACON (OPT).

The flashing beacon should not be used when flying through clouds or overcast; the flashing light reflected from water droplets or particles in the atmosphere, particularly at night, can produce vertigo and loss of orientation.

CABIN HEATING AND VENTILATION SYSTEM.

For cabin ventilation, pull the "CABIN AIR" knob out. To raise the air temperature, pull the "CABIN HT" knob out approximately 1/4" to 1/2" for a small amount of cabin heat. Additional heat is available by pulling the knob out farther; maximum heat is available with the "CABIN HT" knob pulled full out and the "CABIN AIR" knob pushed full in. When no heat is desired inthe cabin, the "CABIN HT" knob is pushed full in.

Front cabin heat and ventilating air is supplied by outlet holes spaced across a cabin manifold just forward of the pilot's and copilot's feet. Rear cabin heat and air is supplied by two ducts from the manifold, one extending down each side of the cabin. Windshield defrost air is also supplied by a duct leading from the cabin manifold.

Separate adjustable ventilators supply additional air; one near each upper corner of the windshield supplies air for the pilot and copilot, and two optional ventilators in the rear cabin ceiling supply air to the rear seat passengers.

STARTING ENGINE.

Ordinarily the engine starts easily with one or two strokes of the primer in warm temperatures to six strokes in cold weather, with the throttle open approximately 1/8 inch. In extremely cold temperatures, it may be necessary to continue priming while cranking.

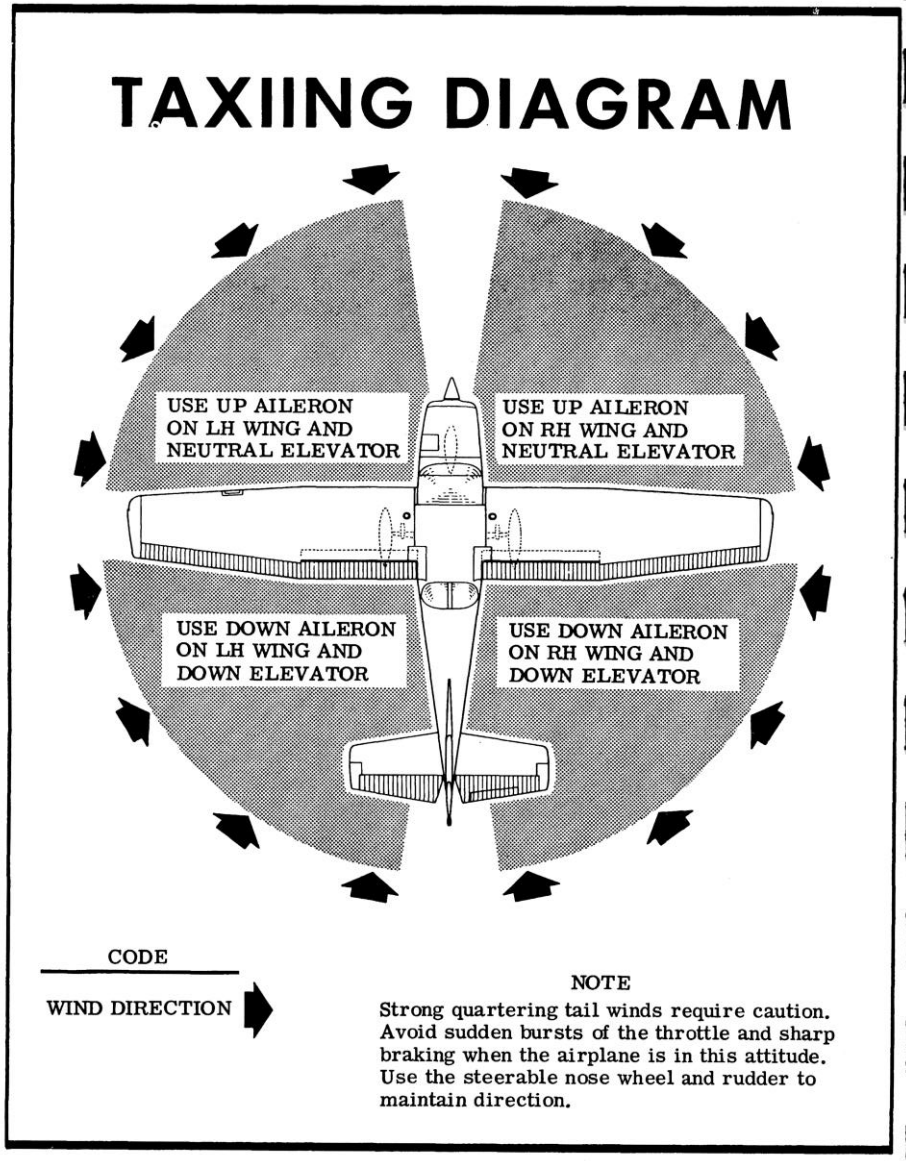


Figure 2-5.

Weak intermittent explosions followed by puffs of black smoke from the exhaust stack indicates overpriming or flooding. Excess fuel can be cleared from the combustion chambers by the following procedure: Set the mixture control full lean and the throttle full open; then crank the engine through several revolutions with the starter. Repeat the starting procedure without any additional priming.

If the engine is underprimed (most likely in cold weather with a cold engine) it will not fire at all, and additional priming will be necessary. As soon as the cylinders begin to fire, open the throttle slightly tc keep it running.

After starting, if the oil gage does not begin to show pressure within 30 seconds in the summertime and about twice that long in very cold weather, stop engine and investigate. Lack of oil pressure can cause serious engine damage. After starting, avoid the use of carburetor heat unless icing conditions prevail.

TAXIING.

When taxiing, it is important that speed and use of brakes be held to a minimum and that all controls be utilized (see taxiing diagram, figure 2-5) to maintain directional control and balance.

Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller tips.

BEFORE TAKE-OFF.

WARM-UP.

Since the engine is closely cowled for efficient in-flight engine cooling, precautions should be taken to avoid overheating during prolonged engine operation on the ground.

MAGNETO CHECK.

The magneto check should be made at 1700 RPM as follows: Move ignition switch first to "R" position, and note RPM. Next move switch back to "BOTH" to clear the other set of plugs. Then move switch to

the "L" position and note RPM. The difference between the two magnetos operated individually should not be more than 75 RPM. If there is a doubt concerning operation of the ignition system, RPM checks at higher engine speeds will usually confirm whether a deficiency exists.

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 is set in advance of the setting specified.

TAKE-OFF.

POWER CHECK.

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. If this occurs, you are justified in making a thorough full-throttle, static runup before another take-off is attempted. The engine should run smoothly and turn approximately 2230-2330 RPM with carburetor heat off.

For improved take-off and climb performance, an optional McCauley 1C172/EM 7651 climb propeller is available. This propeller has a full-throttle static RPM range of 2320-2420 RPM.

Full-throttle runups 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. When unavoidable small dents appear in the propeller blades, they should be immediately corrected as described in Section IV under propeller care.

Prior to take-off from fields above 5000 feet elevation, the mixture should be leaned to give maximum RPM in a full-throttle, static runup.

WING FLAP SETTINGS.

Normal and obstacle clearance take-offs are performed with wing flaps up. The use of 10° flaps will shorten the ground run approximately 10%, but this advantage is lost in the climb to a 50-foot obstacle. Therefore, the use of 10° flaps is reserved for minimum ground runs or for take-off from soft or rough fields with no obstacles ahead.

If 10° of flaps are used in ground runs, it is preferable to leave them extended rather than retract them in the climb to the obstacle. The exception to this rule would be in a high altitude take-off in hot weather where climb would be marginal with flaps 10°.

Flap settings of 30° to 40° are not recommended at any time for take-off.

PERFORMANCE CHARTS.

Consult the take-off chart in Section V for take-off distances under various gross weight, altitude, and headwind conditions.

CROSSWIND TAKE-OFFS.

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.

CLIMB.

CLIMB DATA.

For detailed data, refer to the Maximum Rate-Of-Climb Data chart in Section V.

NOTE

If your aircraft is equipped with a 7651 climb propeller, slight improvement in climb performance may be expected over that shown in Section V.

CLIMB SPEEDS.

Normal climbs are performed at 80 to 90 MPH with flaps up and full throttle for best engine cooling. The mixture should be full rich unless the engine is rough due to too rich a mixture. The maximum rate-of-climb speeds range from 80 MPH at sea level to 77 MPH at 10,000 feet. If an obstacle dictates the use of a steep climb angle, the best angle-of-climb speed should be used with flaps up and full throttle. These speeds vary from 66 MPH at sea level to 71 MPH at 10,000 feet.

NOTE

Steep climbs at these low speeds should be of short duration to improve engine cooling.

GO-AROUND CLIMB.

In a balked landing (go-around) climb, the wing flap setting should be reduced to 20° immediately after full power is applied. Upon reaching a safe airspeed, flaps should be slowly retracted to the full up position.

CRUISE.

Normal cruising is done between 65% and 75% power. The power settings required to obtain these powers at various altitudes and outside air temperatures can be determined by using your Cessna Power Computer or the OPERATIONAL DATA, Section V.

NOTE

The Cruise and Range Performance chart on page 5-4 outlines complete cruise figures for the Model 172 equipped with a standard propeller. The table on page 5-5 shows the RPM and speed differentials for a given % BHP to be considered when figuring cruise performance if your airplane is equipped with a 7651 climb propeller.

Cruising can be done most efficiently at high altitudes because of lower air density and therefore lower airplane drag. This is illustrated in the following table which shows performance at 75% power at various altitudes.

OPTIMUM CRUISE PERFORMANCE

ALTITUDE	RPM	TRUE AIRSPEED	RANGE
Sea Level	2450	123	520
5000 ft.	2560	128	540
7000 ft.	Full Throttle	130	550

All figures are based on lean mixture, 36 gallons of fuel (no reserve), zero wind, standard atmospheric conditions, and 2300 pounds gross weight.

Carburetor ice, as evidenced by an unexplained drop in RPM, can be removed by application of full carburetor heat. Upon regaining the original RPM (with heat off), use the minimum amount of heat (by trial and error) to prevent ice from forming. Since heated air causes a richer mixture, readjust the mixture setting when carburetor heat is used continuously in cruising flight.

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 5-2 as calibrated airspeeds since indicated airspeeds are unreliable near the stall.

LANDING.

Normal landings are made power-off with any flap setting. Slips are prohibited in full flap approaches because of a downward pitch encountered under certain combinations of airspeed and sideslip angle.

SHORT FIELD LANDINGS.

For a short field landing, make a power-off approach at approximately 69 MPH with flaps 40°, and land on the main wheels first. Immediately after touchdown, lower the nose gear to the ground and apply heavy braking as required. Raising the flaps after landing will provide more efficient braking.

CROSSWIND LANDINGS.

When landing in a strong crosswind, use the minimum flap setting required for the field length. Use a wing-low, crab, or a combination metho of drift correction and land in a nearly level attitude. Hold a straight

course with the steerable nosewheel and occasional braking if necessary.

The maximum allowable crosswind velocity is dependent upon pilot capability rather than airplane limitations. With average pilot technique, direct crosswinds of 15 MPH can be handled with safety.

COLD WEATHER OPERATION.

STARTING.

Prior to starting on a cold morning, it is advisable to pull the propeller through several times by hand to "break loose" or "limber" the oil, thus conserving battery energy. In extremely cold (0°F and lower) weather, the use of an external preheater (for both the engine and battery) and an external power source is recommended whenever possible to reduce wear and abuse to the engine and the electrical system. When using an external power source, the position of the master switch is important. Refer to Section VI, paragraph GROUND SERVICE PLUG RECEPTACLE, for operating details.

Cold weather starting procedures are as follows:

With Preheat:

(1) Clear propeller.
(2) Pull master switch "ON."
(3) With ignition switch "OFF" and throttle closed, prime the engine four to eight strokes as the propeller is being turned over by hand.

NOTE

Use heavy strokes of primer for best atomization of fuel. After priming, push primer all the way in and turn to locked position to avoid possibility of engine drawing fuel through the primer.

(4) Turn ignition switch to "BOTH."
(5) Open throttle 1/4" and engage starter.

Without Preheat:

(1) Prime the engine six to ten strokes while the propeller is being turned by hand with throttle closed. Leave primer charged and ready for stroke.
(2) Clear propeller.
(3) Pull master switch "ON."
(4) Turn ignition switch to "BOTH."
(5) Pump throttle rapidly to full open twice. Return to 1/4" open position.
(6) Engage starter and continue to prime engine until it is running smoothly, or alternately, pump throttle rapidly over first 1/4 of total travel.
(7) Pull carburetor heat knob full on after engine has started. Leave on until engine is running smoothly.
(8) Lock primer.

NOTE

If the engine does not start during the first few attempts, or if engine firing diminishes in strength, it is probable that the spark plugs have been frosted over. Preheat must be used before another start is attempted.

IMPORTANT

Pumping the throttle may cause raw fuel to accumulate in the intake air duct, creating a fire hazard in the event of a backfire. If this occurs, maintain a cranking action to suck flames into the engine. An outside attendant with a fire extinguisher is advised for cold starts without preheat.

During cold weather operations, no indication will be apparent on the oil temperature gage prior to take-off if outside air temperatures are very cold. After a suitable warm-up period (2 to 5 minutes at 1000 RPM), accelerate the engine several times to higher engine RPM. If the engine accelerates smoothly and the oil pressure remains normal and steady, the airplane is ready for take-off.

FLIGHT OPERATIONS.

Take-off is made normally with carburetor heat off. Avoid excessive leaning in cruise.

Carburetor heat may be used to overcome any occasional engine roughness.

When operating in sub-zero temperature, avoid using partial carburetor heat. Partial heat may increase the carburetor air temperature to the 32° to 70°F range, where icing is critical under certain atmospheric conditions.

Refer to Section VI for cold weather equipment.

HOT WEATHER OPERATION.

The general warm temperature starting information on page 2-5 is appropriate. Avoid prolonged engine operation on the ground.

Section III

OPERATING LIMITATIONS

OPERATIONS AUTHORIZED.

Your Cessna exceeds the requirements for airworthiness as set forth by the United States Government, and is certificated under FAA Type Certificate No. 3A12 as Cessna Model No. 172H.

With standard equipment, the airplane is approved for day and night operations 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.

This airplane is certificated in both the normal and utility category. The normal category is applicable to airplanes intended for non-aerobatic operations. These include any maneuvers incidental to normal flying, stalls (except whip stalls) and turns in which the angle of bank is not more than 60°. In connection with the foregoing, the following gross weight and flight load factors apply:

Gross Weight	2300 lbs	
Flight Load Factor *Flaps Up	+3.8	-1.52
Flight Load Factor *Flaps Down	+3.5	

*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.

MANEUVERS - UTILITY CATEGORY.

This airplane is not designed for purely aerobatic flight. However, in the acquisition of various certificates such as commercial pilot, instrument pilot and flight instructor, certain maneuvers are required by the FAA. All of these maneuvers are permitted in this airplane when operated in the utility category. In connection with the utility category, the following gross weight and flight load factors apply, with recommended entry speeds for maneuvers as shown:

Gross Weight	2000 lbs
Flight Maneuvering Load Factor, Flaps Up	+4.4 -1.76
Flight Maneuvering Load Factor, Flaps Down	+3.5

No aerobatic maneuvers are approved except those listed below:

MANEUVER	RECOMMENDED ENTRY SPEED
Chandelles	122 mph (106 knots)
Lazy Eights	122 mph (106 knots)
Steep Turns	122 mph (106 knots)
Spins	Slow Deceleration
Stalls (Except Whip Stalls)	Slow Deceleration

The baggage compartment and rear seat must not be occupied.

Aerobatics that may impose high inverted loads should not be attempted. The important thing to bear in mind in flight maneuvers is that the airplane is clean in aerodynamic design and will build up speed quickly with the nose down. Proper speed control is an essential requirement for execution of any maneuver, and care should always be exercised to avoid excessive speed which in turn can impose excessive loads. In the execution of all maneuvers, avoid abrupt use of controls.

AIRSPEED LIMITATIONS.

The following are the certificated calibrated airspeed limits for your Cessna:

Maximum (Glide or dive, smooth air)	174 MPH (red line)
Caution Range	140-174 MPH (yellow arc)
Normal Range	59-140 MPH (green arc)
Flap Operating Range	52-100 MPH (white arc)
Maneuvering Speed*	122 MPH

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

ENGINE OPERATION LIMITATIONS.

Power and Speed:	145 BHP at 2700 RPM

ENGINE INSTRUMENT MARKINGS.

OIL TEMPERATURE GAGE.

Normal Operating Range	Green Arc
Maximum Allowable	240°F (red line)

OIL PRESSURE GAGE.

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

FUEL QUANTITY INDICATORS.

Empty (1.50 gallons unusable each tank)	E (red line)

TACHOMETER.

Normal Operating Range:	
At sea level	2200-2500 (inner green arc)
At 5000 feet	2200-2600 (middle green arc)
At 10,000 feet	2200-2700 (outer green arc)
Maximum Allowable	2700 (red line)

WEIGHT AND BALANCE.

The following information will enable you to operate your Cessna within the prescribed weight and center of gravity limitations. To figure the weight and balance for your particular airplane, use the Sample Problem, Loading Graph, and Center of Gravity Moment Envelope as follows:

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 the proper columns. Using the Loading Graph, determine the moment/1000 of each item to be carried. Total the weights and moments/1000 and use the Center of Gravity Moment Envelope to determine whether the point falls within the envelope, and if the loading is acceptable.

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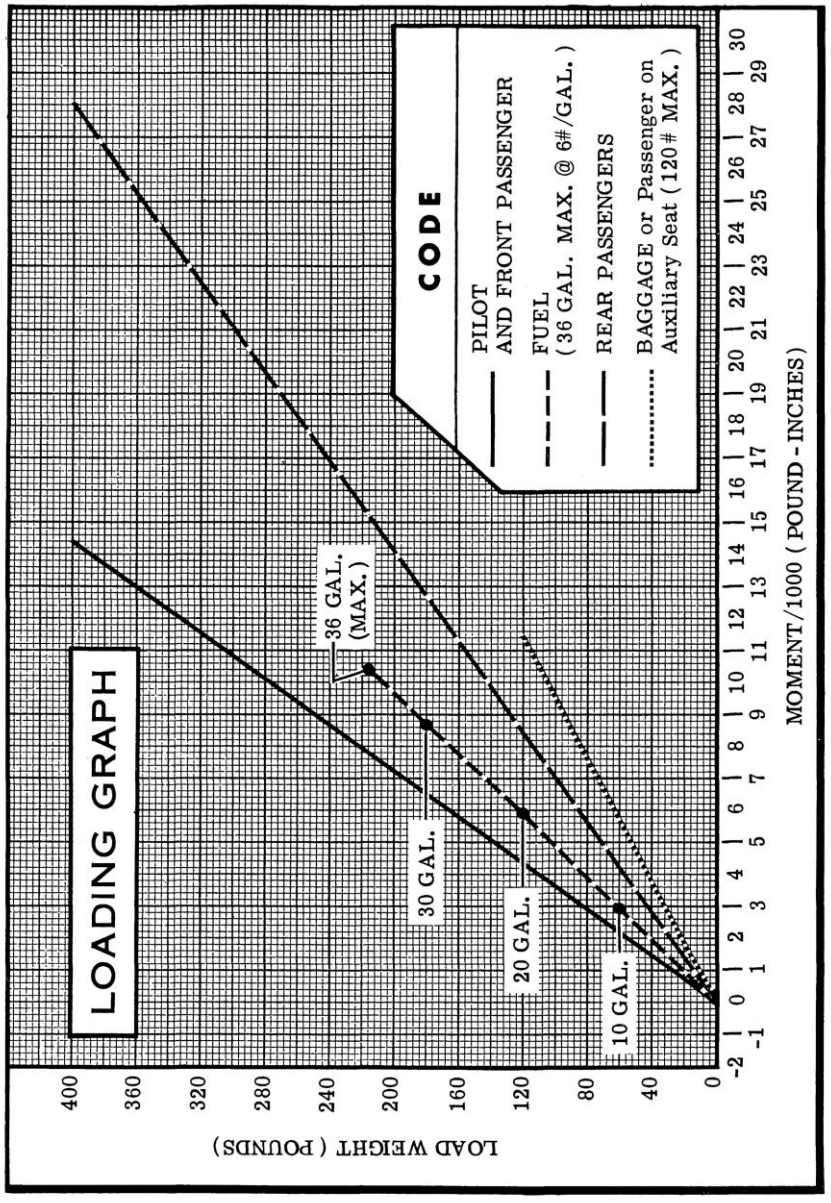
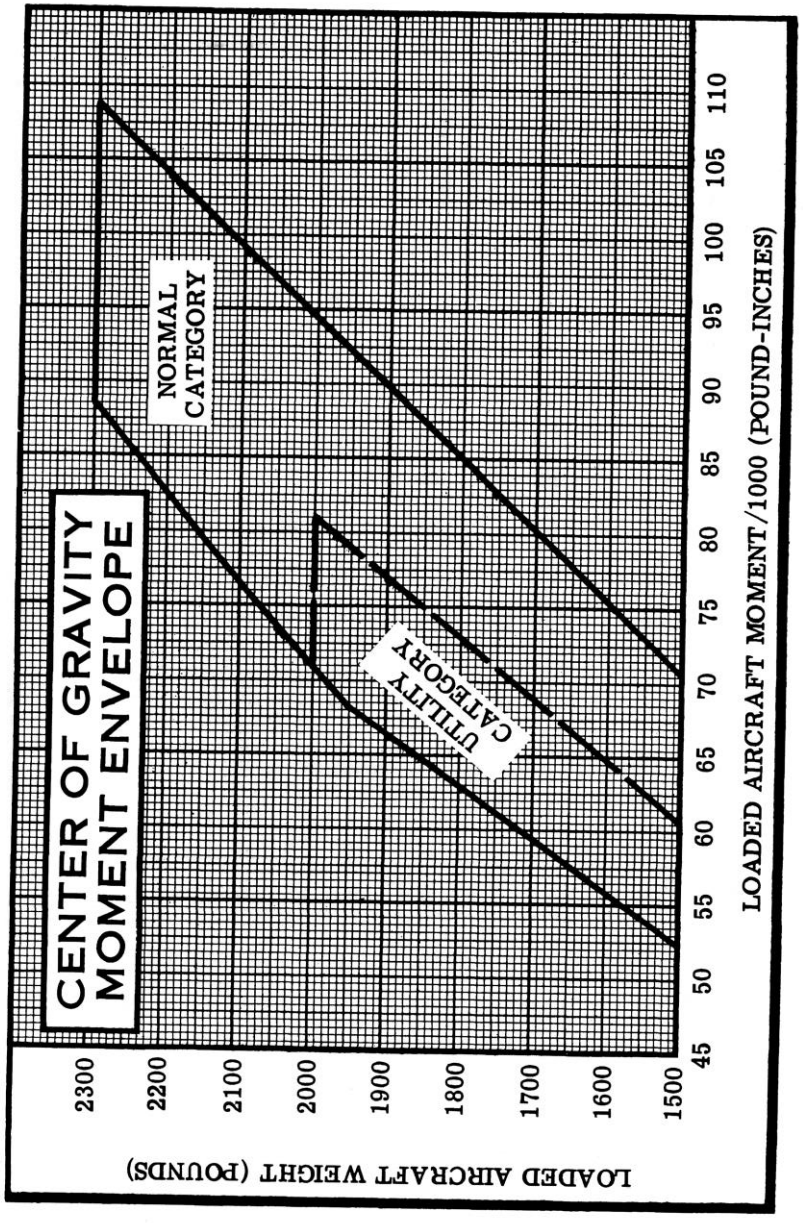
SAMPLE LOADING PROBLEM

	Sample Airplane		Your Airplane	
	Weight (lbs)	Moment (lb - ins. /1000)	Weight ⋮	Moment ⋮
1. Licensed Empty Weight (Sample Airplane) ...	1324	48.2	1501	60,304
2. Oil - 8 Qts.*	15	-0.3	15	-0.3
3. Pilot & Front Passenger	340	12.2		
4. Fuel- (36 Gal at 6#/Gal)	216	10.4		
5. Rear Passengers	340	23.8		
6. Baggage (or Passenger on Auxiliary Seat)	65	6.2		
7. Total Aircraft Weight (Loaded)	2300	100.5		

8. Locate this point (2300 at 100.5) 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.





Section IV

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 by hand with the tow-bar attached to the nosewheel.

NOTE

When using the tow-bar, never exceed the turning angle of 30°, either side of center, or damage to the gear will result.

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) Set the parking brake and install the control wheel lock.
(2) Tie sufficiently strong ropes or chains (700 pounds tensile strength) to wing, tail, and nose tie-down fittings and secure each rope to a ramp tie-down.
(3) Install a surface control lock over the fin and rudder.
(4) Install a pitot tube cover.

WINDSHIELD - WINDOWS.

The plastic windshield and windows should be cleaned with an aircraft windshield cleaner. Apply the cleaner sparingly with soft cloths, and rub with moderate pressure until all dirt, oil scum and bug stains are removed. Allow the cleaner to dry, then wipe it off with soft flannel cloths.

If a windshield cleaner is not available, the plastic can be cleaned with soft cloths moistened with Stoddard solvent to remove oil and grease.

NOTE

Never use gasoline, benzine, alcohol, acetone, carbon tetrachloride, fire extinguisher or anti-ice fluid, lacquer thinner or glass cleaner to clean the plastic. These materials will attack the plastic and may cause it to craze.

Follow by carefully washing with a mild detergent and plenty of water. Rinse thoroughly, then dry with a clean moist chamois. Do not rub the plastic with a dry cloth since this builds up an electrostatic charge which attracts dust. Waxing with a good commercial wax will finish the cleaning job. A thin, even coat of wax, polished out by hand with clean soft flannel cloths, will fill in minor scratches and help prevent further scratching.

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

PAINTED SURFACES.

The painted exterior surfaces of your new Cessna have a durable, long lasting finish and, under normal conditions, require no polishing or buffing. Approximately 15 days are required for the paint to cure completely; in most cases, the curing period will have been completed prior to delivery of the airplane. In the event that polishing or buffing is required within the curing period, it is recommended that the work be done by someone experienced in handling uncured paint. Any Cessna Dealer can accomplish this work.

Generally, the painted surfaces can be kept bright by washing with water and mild soap, followed by a rinse with water and drying with cloths or a chamois. Harsh or abrasive soaps or detergents which cause corrosion or make scratches should never be used. Remove stubborn oil and grease with a cloth moistened with Stoddard solvent.

Waxing is unnecessary to keep the painted surfaces bright. However, if desired, the airplane 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 engine nose cap and propeller spinner will help reduce the abrasion encountered in these areas.

ALUMINUM SURFACES.

The clad aluminum surfaces of your Cessna may be washed with clear water to remove dirt; oil and grease may be removed with gasoline, naptha, carbon tetrachloride or other non-alkaline solvents. Dulled aluminum surfaces may be cleaned effectively with an aircraft aluminum polish.

After cleaning, and periodically thereafter, waxing with a good automotive wax will preserve the bright appearance and retard corrosion. Regular waxing is especially recommended for airplanes operated in salt water areas as a protection against corrosion.

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.

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 on 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 180 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 purchased the airplane accomplish this work.

Federal Aviation 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.

AIRCRAFT FILE.

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

A. To be displayed in the aircraft at all times:

(1) Aircraft Airworthiness Certificate (Form FAA-1362B).
(2) Aircraft Registration Certificate (Form FAA-500A).
(3) Aircraft Radio Station License (Form FCC-404, if transmitter installed).

B. To be carried in the aircraft at all times:

(1) Weight and Balance, and associated papers (latest copy of the Repair and Alteration Form, Form FAA-337, if applicable).
(2) Aircraft Equipment List.

C. To be made available upon request:

(1) Aircraft Log Book.
(2) Engine Log Book.

NOTE

Cessna recommends that these items, plus the Owner's Manual and the "Cessna Flight Guide" (Flight Computer), be carried in the aircraft at all times.

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

LUBRICATION AND SERVICING PROCEDURES

Specific servicing information is provided here for items requiring daily attention. A Servicing Intervals Check List is included to inform the pilot when to have other items checked and serviced.

DAILY

FUEL TANK FILLERS:

Service after each flight with 80/87 minimum grade fuel. The capacity of each wing tank is 19.5 gallons.

FUEL STRAINER:

On the first flight of the day and after each refueling, pull out fuel strainer drain knob for about four seconds, to clear fuel strainer of possible water and sediment. Release drain knob, then check that strainer drain is closed after draining.

OIL FILLER:

When preflight check shows low oil level, service with aviation grade engine oil; SAE 50 above 40°F and SAE 10W30 or SAE 30 below 40°F. (Multi-viscosity oil with a range of SAE 10W30 is recommended for improved starting in cold weather.) Detergent or dispersant oil, conforming to Continental Motors Specification MHS-24, must be used. The aircraft is delivered from the factory with detergent oil. Your Cessna Dealer can supply approved brands of detergent oil.

OIL DIPSTICK:

Check oil level before each flight. Do not operate on less than 6 quarts. To minimize loss of oil through breather, fill to 7 quart level for normal flights of less than 3 hours. For extended flight, fill to 8 quarts. If optional oil filter is installed, one additional quart is required when the filter element is changed.

SERVICING INTERVALS CHECK LIST

EACH 50 HOURS

BATTERY -- Check and service. Check oftener (at least every 30 days) if operating in hot weather.

ENGINE OIL AND OIL FILTER -- Change engine oil and replace filter element. If optional oil filter is not installed, change oil and clean screen every 25 hours. Change engine oil at least every four months even though less than 50 hours have been accumulated. Reduce periods for prolonged operation in dusty areas, cold climates, or when short flights and long idle periods result in sludging conditions.

CARBURETOR AIR FILTER -- Clean or replace. Under extremely dusty conditions, daily maintenance of the filter is recommended.

NOSE GEAR TORQUE LINKS -- Lubricate.

EACH 100 HOURS

BRAKE MASTER CYLINDERS -- Check and fill.

SHIMMY DAMPENER -- Check and fill.

FUEL STRAINER -- Disassemble and clean.

FUEL TANK SUMP DRAINS -- Drain water and sediment.

FUEL LINE DRAIN PLUG -- Drain water and sediment.

VACUUM SYSTEM OIL SEPARATOR (OPT) -- Clean.

SUCTION RELIEF VALVE INLET SCREEN (OPT) -- Clean.

EACH 500 HOURS

VACUUM SYSTEM AIR FILTER (OPT) -- Replace filter element. Replace sooner if suction gage reading drops to 4.6 in. Hg.

WHEEL BEARINGS -- Lubricate at first 100 hours and at 500 hours thereafter. Reduce lubrication interval to 100 hours when operating in dusty or seacoast areas, during periods of extensive taxiing, or when numerous take-offs and landings are made.

AS REQUIRED

NOSE GEAR SHOCK STRUT -- Keep filled with fluid and inflated to 45 psi.

OWNER 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 aircraft 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.

PUBLICATIONS

Included in your aircraft file are various manuals which describe the operation of the equipment in your aircraft. These manuals, plus many other supplies that are applicable to your aircraft, are available from your Cessna Dealer, and, for your convenience, are listed below.

- OWNER'S MANUALS FOR YOUR
  - AIRCRAFT
  - ELECTRONICS - 300 SERIES
  - AUTOPILOT - NAV-O-MATIC 300 AND 400
- SERVICE MANUALS AND PARTS CATALOGS FOR YOUR
  - AIRCRAFT
  - ENGINE AND ACCESSORIES
  - ELECTRONICS - 300 SERIES
  - AUTOPILOT - NAV-O-MATIC 300 AND 400
- COMPUTERS
- SALES AND SERVICE DEALER DIRECTORY
- DO'S AND DON'TS ENGINE BOOKLET

Your Cessna Dealer has a current catalog of all Customer Services Supplies that are available, many of which he keeps on hand. Supplies which are not in stock, he will be happy to order for you.

Section V

OPERATIONAL DATA

The operational data shown on the following pages are compiled from actual tests with airplane and engine in good condition and using average piloting technique and best power mixture. You will find this data a valuable aid when planning your flights.

A power setting selected from the range charts usually will be more efficient than a random setting, since it will permit you to estimate your fuel consumption more accurately. You will find that using the charts and your Power Computer will pay dividends in overall efficiency.

Range and endurance figures shown in the chart on page 5-4 are based on flight test using a McCauley 1C172/EM 7653 propeller (standard). Information to be considered when the aircraft is equipped with a McCauley 1C172/EM 7651 climb propeller may be found on page 5-5. Other conditions of the tests are shown in the chart headings. Allowances for fuel reserve, headwinds, take-offs, and climb, and variations in mixture leaning technique should be made and are in addition to those shown on the charts. Other indeterminate variables such as carburetor metering-characteristics, engine and propeller conditions, and turbulence of atmosphere may account for variations of 10% or more in maximum range.

Remember that the charts contained herein are based on standard day conditions. For more precise power, fuel consumption, and endurance information, consult the Cessna Flight Guide (Power Computer) supplied with your aircraft. With the Flight Guide, you can easily take into account temperature variations from standard at any flight altitude.

AIRSPEED CORRECTION TABLE

	IAS	40	50	60	70	80	90	100	110	120	130	140
FLAPS UP	CAS	48	55	63	71	80	89	98	108	117	128	138
FLAPS DOWN	CAS	48	56	64	72	81	90	99	•	•	•	•

Figure 5-1.

POWER OFF STALLING SPEEDS MPH - CAS

CONDITION		ANGLE OF BANK 0°	20°	40°	60°
2300 LBS. GROSS WEIGHT	FLAPS UP	57	59	65	81
	FLAPS 10°	52	54	59	74
	FLAPS 40°	49	51	56	69

Figure 5-2.

TAKE-OFF DATA

TAKE-OFF DISTANCE FROM HARD SURFACE RUNWAY, FLAPS UP

GROSS WEIGHT LBS.	IAS AT 50 FT. MPH	HEAD WIND KNOTS	@ S.L. & 59° F GROUND RUN	@ S.L. & 59° F TOTAL TO CLEAR 50' OBS.	@ 2500 ft. & 50° F GROUND RUN	@ 2500 ft. & 50° F TOTAL TO CLEAR 50' OBS.	@ 5000 ft. & 41° F GROUND RUN	@ 5000 ft. & 41° F TOTAL TO CLEAR 50' OBS.	@ 7500 ft. & 32° F GROUND RUN	@ 7500 ft. & 32° F TOTAL TO CLEAR 50' OBS.
2300	70	0	865	1525	1040	1910	1255	2480	1565	3855
		10	615	1170	750	1485	920	1955	1160	3110
		20	405	850	505	1100	630	1480	810	2425
2000	65	0	630	1095	755	1325	905	1625	1120	2155
		10	435	820	530	1005	645	1250	810	1685
		20	275	580	340	720	425	910	595	1255
1700	60	0	435	780	520	920	625	1095	765	1370
		10	290	570	355	680	430	820	535	1040
		20	175	385	215	470	270	575	345	745

NOTES: 1. Increase distance 10% for each 25°F above standard temperature for particular altitude.
2. For operation on a dry, grass runway, increase distances (both "ground run" and "total to clear 50 ft. obstacle") by 7% of the "total to clear 50 ft. obstacle" figure.

MAXIMUM RATE-OF-CLIMB DATA

GROSS WEIGHT LBS.	@ S.L. & 59° F IAS MPH	@ S.L. & 59° F RATE OF CLIMB FT/MIN.	@ S.L. & 59° F GALS OF FUEL USED	@ 5000 ft. & 41°F IAS MPH	@ 5000 ft. & 41°F RATE OF CLIMB FT/MIN.	@ 5000 ft. & 41°F FROM S.L. FUEL USED	@ 10,000 ft. & 23° F IAS MPH	@ 10,000 ft. & 23° F RATE OF CLIMB FT/MIN.	@ 10,000 ft. & 23° F FROM S.L. FUEL USED	@ 15,000 ft. & 5° F IAS MPH	@ 15,000 ft. & 5° F RATE OF CLIMB FT/MIN.	@ 15,000 ft. & 5° F FROM S.L. FUEL USED
2300	80	645	1.0	78	435	2.6	77	230	4.8	76	22	11.5
2000	77	840	1.0	76	610	2.2	74	380	3.6	73	155	6.3
1700	75	1085	1.0	73	825	1.9	71	570	2.9	70	315	4.4

NOTES: 1. Flaps up, full throttle and mixture leaned for smooth operation above 5000 ft.
2. Fuel used includes warm-up and take-off allowance.
3. For hot weather, decrease rate of climb 20 ft./min. for each 10°F above standard day temperature for particular altitude.

Figure 5-3.

CRUISE & RANGE PERFORMANCE

172 SKYHAWK

Gross Weight- 2300 Lbs. ✱
Standard Conditions ✱
Zero Wind ✱ Lean Mixture ✱
36 Gal. of Fuel (No Reserve)

NOTE: Maximum cruise is normally limited to 75% power. For standard 172 performance, subtract 1 MPH from the higher cruise speeds shown.

ALT.	RPM	% BHP	TAS MPH	GAL. / HOUR	ENDR. HOURS	RANGE MILES
2500	2700	93	138	10.5	3.4	470
	2600	84	131	9.5	3.8	495
	2500	75	125	8.5	4.2	530
	2400	67	119	7.6	4.7	560
	2300	59	113	6.8	5.3	595
	2200	52	106	6.2	5.8	615
	2100	46	100	5.7	6.4	635
5000	2700	87	136	9.8	3.7	500
	2600	78	130	8.8	4.1	525
	2550	74	127	8.4	4.3	550
	2500	70	124	7.9	4.5	560
	2400	62	118	7.1	5.1	600
	2300	55	111	6.4	5.6	625
	2200	49	105	5.9	6.1	640
	2100	44	98	5.5	6.4	640
7500	2650	77	132	8.7	4.2	550
	2600	73	129	8.2	4.3	560
	2500	65	123	7.4	4.9	600
	2400	58	116	6.7	5.3	620
	2300	52	110	6.1	5.9	650
	2200	47	103	5.7	6.4	655
	2100	42	97	5.3	6.7	655
10,000	2600	68	128	7.7	4.7	605
	2500	61	121	7.0	5.2	625
	2400	55	115	6.4	5.6	645
	2300	49	108	5.9	6.1	655
	2200	45	102	5.5	6.6	670
	2100	41	96	5.2	6.8	655
12,500	2600	63	126	7.2	5.0	630
	2500	57	120	6.6	5.4	650
	2400	52	113	6.1	5.9	670
	2300	47	107	5.7	6.3	670
	2200	43	101	5.4	6.6	670

The performance figures above apply to aircraft equipped with a standard McCauley 1C172/EM7653 propeller. Refer to figure 5-5 for information concerning aircraft with an optional McCauley 1C172/EM7651 climb propeller.

Figure 5-4.

CRUISE AND RANGE PERFORMANCE

With McCauley 1C172/EM 7651 Propeller

To obtain same % BHP as shown in adjoining figure and on Cessna Power Computer, increase RPM as follows:

For % BHP	Increase RPM
75	+20 RPM
70	+10 RPM
65 (and lower)	0 RPM

The faster turning climb propeller gives a slight loss in cruise speed at a given % BHP as shown below:

At % BHP	Speed Loss Differential
70 - 75	0 MPH
65 - 70	-1.0 MPH
60 - 65	-1.5 MPH
55 - 60	-2.0 MPH
50 - 55	-3.0 MPH

NOTE: When your aircraft is equipped with a McCauley 1C172/EM 7651 climb propeller, the above factors should be used in conjunction with the Cruise and Range Performance on the adjoining page.

Figure 5-5.

LANDING DATA

LANDING DISTANCE ON HARD SURFACE RUNWAY
NO WIND – 40° FLAPS – POWER OFF

GROSS WEIGHT LBS.	APPROACH IAS MPH	@ S.L. & 59° F		@ 2500 ft. & 50° F		@ 5000 ft. & 41° F		@ 7500 ft. & 32° F	
		GROUND ROLL	TOTAL TO CLEAR 50' OBS.	GROUND ROLL	TOTAL TO CLEAR 50' OBS.	GROUND ROLL	TOTAL TO CLEAR 50' OBS.	GROUND ROLL	TOTAL TO CLEAR 50' OBS.
2300	69	520	1250	560	1310	605	1385	650	1455

NOTES: 1. Reduce landing distance 10% for each 5 knot headwind.
2. For operation on a dry, grass runway, increase distances (both "ground roll" and "total to clear 50 ft. obstacle") by 20% of the "total to clear 50 ft. obstacle" figure.

Figure 5-6.

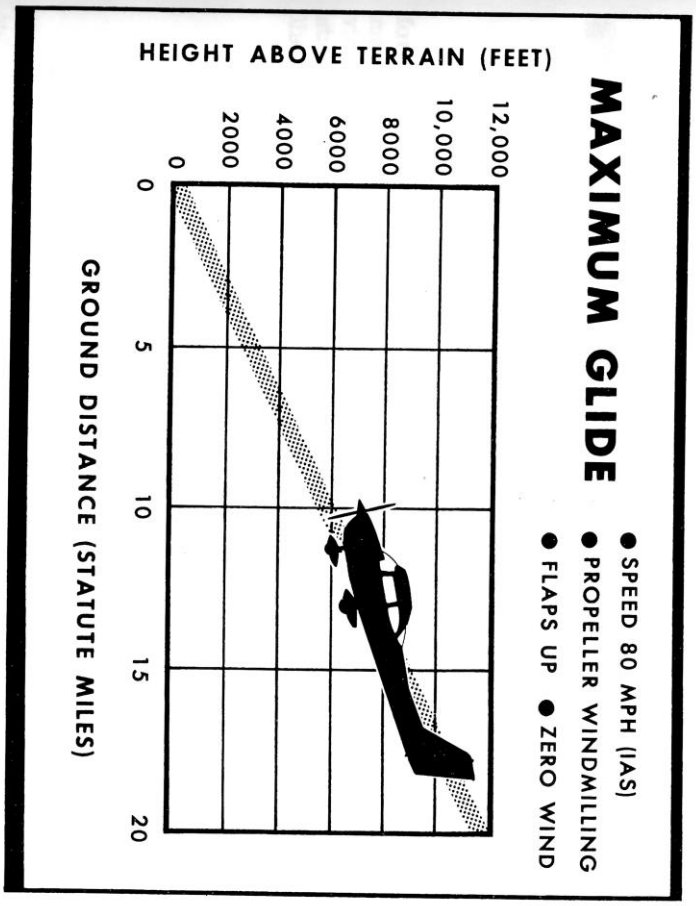


Figure 5-7.

Section VI

OPTIONAL SYSTEMS

This section contains a description, operating procedures, and performance data (when applicable) for some of the optional equipment which may be installed in your Cessna. Owner's Manual Supplements are provided to cover operation of other optional equipment systems when installed in your airplane. Contact your Cessna Dealer for a complete list of available optional equipment.

AUXILIARY FUEL TANK SYSTEM

An optional auxiliary fuel tank system (figure 6-1) is available to increase the airplane operating range. System components include an 18 gallon fuel tank (17.55 gallons usable) installed on the baggage compartment floor, an electric fuel transfer pump behind the tank, an electrically-operated fuel quantity indicator and fuel transfer pump switch on the instrument panel, a fuel tank filler provision on the right side of the fuselage, a fuel tank sump drain valve at the front of the tank on the bottom of the fuselage, and the necessary plumbing.

The auxiliary fuel system is connected to the right main fuel tank plumbing above the right cabin door.

AUXILIARY FUEL SYSTEM OPERATION.

To operate the auxiliary fuel system, proceed as follows:

PRE-FLIGHT CHECK:

(1) Turn on master switch and check fuel quantity indicator for reading.

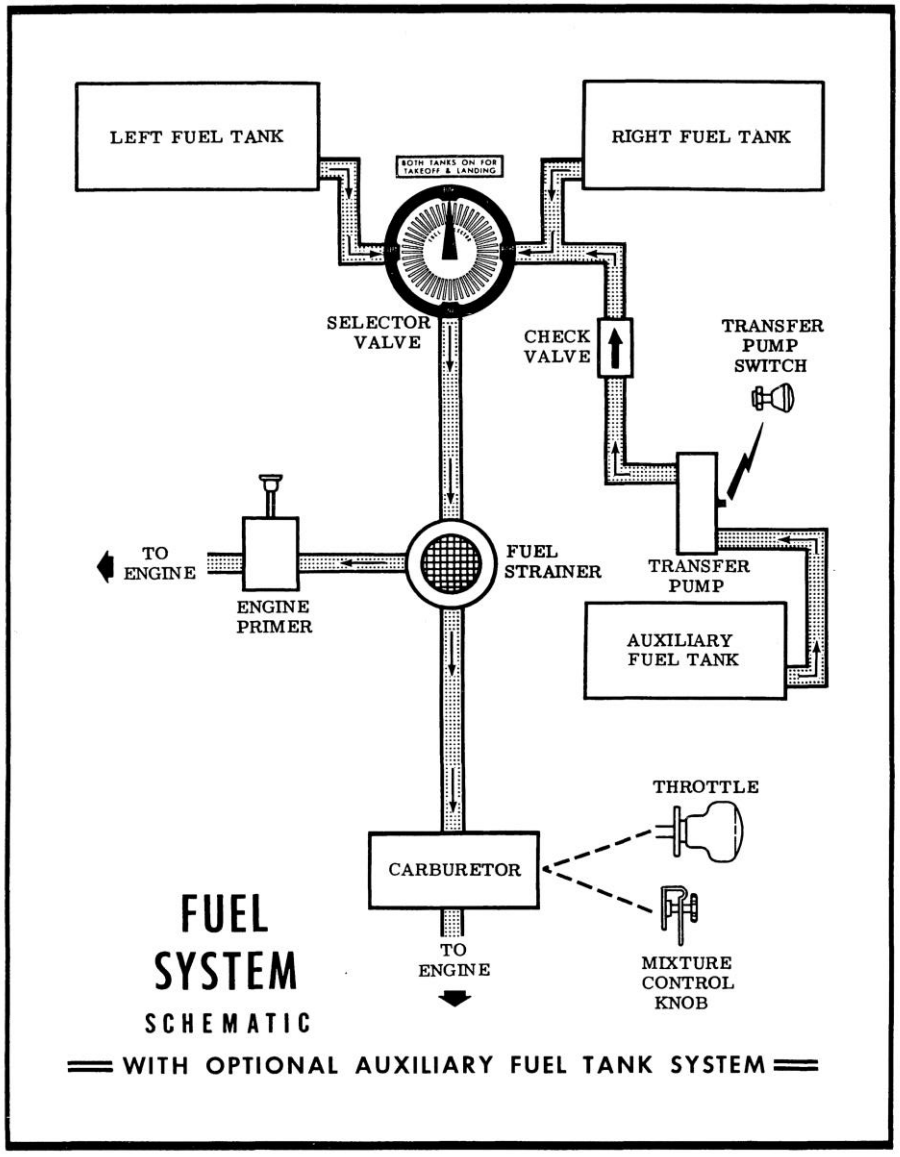


Figure 6-1.

(2) Momentarily pull on transfer pump switch and listen for pump operation. Turn off master switch.
(3) Check quantity of fuel in tank for agreement with fuel quantity indicator. Fill tank for anticipated requirements.
(4) Drain small amount of fuel from fuel tank drain valve to check for possible water and sediment.

DURING FLIGHT:

(1) Take-off, climb and land with fuel selector valve handle set on "BOTH" for maximum safety.
(2) After leveling off at cruise altitude, switch to "RIGHT" and operate from this tank until the fuel supply is exhausted.
(3) Switch to "LEFT" for operation, then pull on transfer pump switch and refill right main fuel tank from auxiliary tank. Push transfer pump switch off when fuel transfer is completed.

NOTE

Transfer of total fuel from the auxiliary tank will take from 45 minutes to 1 hour.

(4) Return fuel selector valve handle to "BOTH" position after refilling right tank, or if desired switch again to right main tank.

IMPORTANT

Do not operate the transfer pump with the fuel selector turned to either "BOTH" or "RIGHT" positions. Total or partial engine stoppage will result from air being pumped into fuel lines after fuel transfer has been completed. If the pump should accidentally be turned on with the fuel selector in either of these positions, and engine stoppage occurs, the engine will restart in from 3 to 5 seconds after turning off the transfer pump as the air in the fuel line will be evacuated rapidly.

COLD WEATHER EQUIPMENT

WINTERIZATION KIT.

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.

GROUND SERVICE PLUG RECEPTACLE.

A ground service plug receptacle may be installed to permit the use of an external power source for cold weather starting and during lengthy maintenance work on the electrical system.

NOTE

On the standard Model 172, both electrical and electronic system checks may be made using an external power source for electrical power. On the Skyhawk, electrical power for the airplane electrical circuits is provided through a split bus bar having all electronic circuits on one side of the bus and other electrical circuits on the other side of the bus. When an external power source is connected, a contactor automatically opens the circuit to the electronic portion of the split bus bar as a protection against damage to the semi-conductors in the electronic equipment by transient voltages from the power source. Therefore, the external power source can not be used as a source of power when checking electronic components.

Before connecting a generator type external power source, the master switch should be turned on. This is especially important on the Model 172 since it will enable the battery to absorb transient voltages which otherwise might damage the semi-conductors in the electronic equipment. The Skyhawk utilizes the split bus system to prevent damage to electronic equipment by transient voltages. When using a battery type external power source, the master switch should be turned off to prevent an unnecessary power drain from the power source batteries to the airplane's battery. After starting, and before disconnecting external power, the master switch should be turned "ON" to allow the airplane battery to be charged by the alternator.

The ground service plug receptacle circuit incorporates a polarity reversal protection. Power from the external power source will flow only if the ground service plug is correctly connected to the airplane. If the plug is accidentally connected backwards, no power will flow to the airplane's electrical system, thereby preventing any damage to electrical equipment.

The battery and external power circuits have been designed to completely eliminate the need to "jumper" across the battery contactor to close it for charging a completely "dead" battery. A special fused circuit in the external power system supplies the needed "jumper" across the contacts so that with a "dead" battery and an external power source applied, turning the master switch "ON" will close the battery contactor. When the airplane battery is nearly "dead", and an external power source has been used to start the engine, make sure the master switch is "ON" before disconnecting the external power source. This will close the battery contactor so that the battery will supply field current to the alternator, and at the same time, will be charged by the alternator.

STATIC PRESSURE ALTERNATE SOURCE VALVE.

A static pressure alternate source valve may be installed in the static system for use when the external static source is malfunctioning. This valve also permits draining condensate from the static lines.

If erroneous instrument readings are suspected due to water or ice in the static pressure lines, the static pressure alternate source valve should be opened, thereby supplying static pressure from the cabin. Cabin pressures will vary, however, with open cabin ventilators or windows. The most adverse combinations will result in airspeed and altimeter variations of no more than 2 MPH and 15 feet, respectively.

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 (figure 6-2) is labeled "TRANS," and has two positions. When two transmitters are installed, it is necessary to switch the microphone to the radio unit the pilot desires to use for transmission. This is accomplished by placing the transmitter selector switch in the position corresponding to the radio unit which is to be used.

SPEAKER-PHONE SWITCHES.

The speaker-phone switches (figure 6-2) 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.

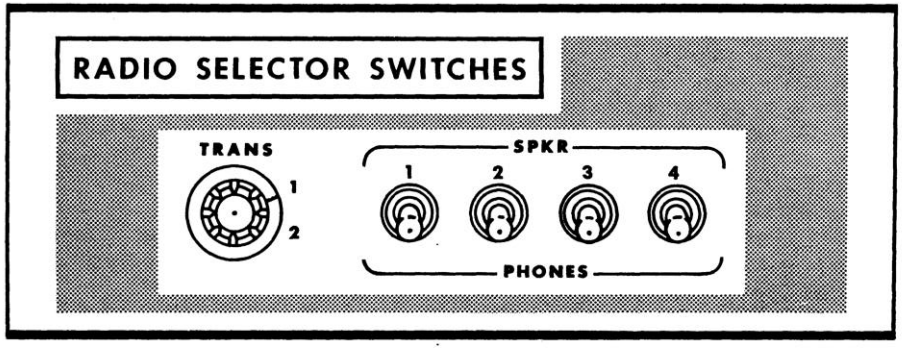


Figure 6-2.

AUTOPILOT-OMNI SWITCH.

When a Nav-O-Matic autopilot is installed with two compatible omni receivers, an autopilot-omni switch is utilized. This switch selects the omni receiver to be used for the omni course sensing function of the autopilot. The switch is mounted just to the right of the autopilot control unit at the bottom of the instrument panel. The switch positions, labeled "OMNI 1" and "OMNI 2", correspond to the omni receivers in the radio panel stack.

TRUE AIRSPEED INDICATOR

A true airspeed indicator is available to replace the standard airspeed indicator in your airplane. The true airspeed indicator has a calibrated rotatable ring which works in conjunction with the airspeed indicator dial in a manner similar to the operation of a flight computer.

TO OBTAIN TRUE AIRSPEED, rotate ring until pressure altitude is aligned with outside air temperature in degrees Fahrenheit. Then read true airspeed on rotatable ring opposite airspeed needle.

NOTE

Pressure altitude should not be confused with indicated altitude. To obtain pressure altitude, set barometric scale on altimeter to "29.92" and read pressure altitude on altimeter. Be sure to return altimeter barometric scale to original barometric setting after pressure altitude has been obtained.

ALPHABETICAL INDEX

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WARRANTY

The Cessna Aircraft Company (Cessna) warrants each new aircraft manufactured by it, including factory installed equipment and accessories, and warrants all new aircraft equipment and accessories bearing the name "Cessna", to be free from defects in material and workmanship under normal use and service. Cessna's obligation under this warranty is limited to supplying a part or parts to replace any part or parts which, within six (6) months after delivery of such aircraft or such aircraft equipment or accessories to the original retail purchaser or first user, shall be returned transportation charges prepaid to Cessna at Wichita, Kansas, or such other place as Cessna may designate and which upon examination shall disclose to Cessna's satisfaction to have been thus defective.

The provisions of this warranty shall not apply to any aircraft, equipment or accessories which have been subject to misuse, negligence or accident, or which shall have been repaired or altered outside of Cessna's factory in any way so as in the judgment of Cessna to affect adversely its performance, stability or reliability. **This warranty is expressly in lieu of any other warranties, expressed or implied, including any implied warranty of merchantability or fitness for a particular purpose, and of any other obligation or liability on the part of Cessna of any nature whatsoever and Cessna neither assumes nor authorizes anyone to assume for it any other obligation or liability in connection with such aircraft, equipment and accessories.**

SERVICING REQUIREMENTS

FUEL:

AVIATION GRADE -- 80/87 MINIMUM GRADE
CAPACITY EACH TANK -- 19.5 GALLONS

ENGINE OIL:

AVIATION GRADE -- SAE 50 ABOVE 40°F.
SAE 10W30 OR SAE 30 BELOW 40°F.
(MULTI-VISCOSITY OIL WITH A RANGE OF SAE 10W30 IS RECOMMENDED FOR IMPROVED STARTING IN COLD WEATHER. DETERGENT OR DISPERSANT OIL, CONFORMING TO CONTINENTAL MOTORS SPECIFICATION MHS-24, MUST BE USED. THE AIRCRAFT IS DELIVERED FROM THE FACTORY WITH DETERGENT OIL.)
CAPACITY OF ENGINE SUMP -- 8 QUARTS.
(DO NOT OPERATE ON LESS THAN 6 QUARTS. TO MINIMIZE LOSS OF OIL THROUGH BREATHER, FILL TO 7 QUART LEVEL FOR NORMAL FLIGHTS OF LESS THAN 3 HOURS. FOR EXTENDED FLIGHT, FILL TO 8 QUARTS. IF OPTIONAL OIL FILTER IS INSTALLED, ONE ADDITIONAL QUART IS REQUIRED WHEN THE FILTER ELEMENT IS CHANGED.)

HYDRAULIC FLUID:

MIL-H-5606 HYDRAULIC FLUID

TIRE PRESSURES:

NOSE WHEEL ----------26 PSI ON 5.00X5 TIRE
26 PSI ON 6.00X6 TIRE
MAIN WHEELS ----------24 PSI ON 6.00X6 TIRES

NOSE GEAR SHOCK STRUT.

KEEP FILLED WITH FLUID AND INFLATED TO 45 PSI.

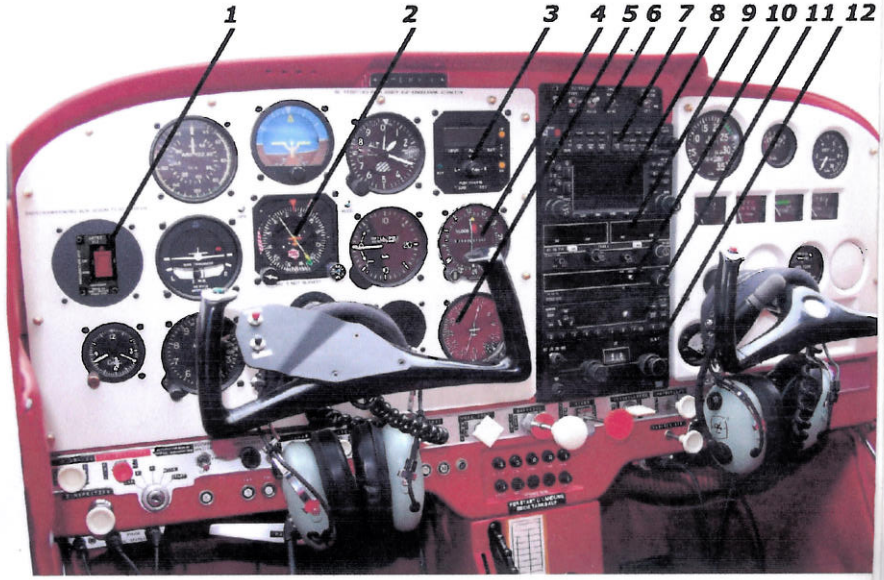
Cessna
SALES AND SERVICE

"TAKE YOUR CESSNA HOME
FOR SERVICE AT THE SIGN
OF THE CESSNA SHIELD".

CESSNA AIRCRAFT COMPANY

WICHITA, KANSAS

D638-13



OPTIONAL INSTRUMENTS

1 *ELT*
2 *HSI / NAV1*
3 *Autopilot unit*
4 *VOR indicator / NAV 2*
5 *NDB indicator*
6 *Autopilot / avionics switch*
7 *Audio panel / marker*
8 *COM 1 / NAV 1 / GPS*
9 *COM 2 / NAV 2*
10 *DME*
11 *Transponder*
12 *NDB*

Installation Center	
Repair Station #	EASA DE.145.0010
Name:	Avionik Straubing GmbH
Address:	Flugplatz Wallmühle
	D-94348 Atting
	Germany
DOA Center	
DOA #	EASA.21J.046
Name:	Avionik Straubing GmbH
Address:	Flugplatz Wallmühle
	D-94348 Atting
	Germany

Operating Manual

Installation of

GARMIN GMA 340 Audio Panel, Marker

In accordance with Avionik Straubing Engineering Order LBA2007-003-00 and GARMIN Installation Manual P/N 190-00149-00 Rev. E

AIRCRAFT MAKE: **CESSNA**

AIRCRAFT MODEL: **F 172 H**

AIRCRAFT SERIAL NO.: **F172-0528**

Avionik Straubing GmbH
EASA.21J.046

Gunter Hemmel
Leiter Musterprüfleitstelle

LOG OF REVISIONS		
Revision Number	Revision Date	Description
A	20.01.07	Initial Release

Aircraft Make: CESSNA
Aircraft Model: F 172 H
Aircraft Serial Number: F172-0528

GARMIN GMA 340 Audio Panel , Marker

Table of Contents

SECTION I
GENERAL

The GARMIN GMA 340 is a panel mounted TSO'd audio panel that provides control of the aircraft audio system. The GMA 340 provides flexibility in switching up to three microphone and audio transceiver communication inputs plus NAV 1, NAV 2, ADF, DME and marker audio. The GMA 340 includes a voice activated (VOX) intercom system and a three lamp marker beacon receiver and display. Two stereo entertainment inputs are also provided. The VOX intercom uses rotary knobs for volume and squelch adjustment while selection of all other functions is accomplished with the use of pushbuttons. Marker HI and LO and button annunciation is accomplished with LED devices. Front panel backlighting of button function, squelch and volume control knobs is provided by LED's controlled by the aircraft lighting bus..

SECTION II
LIMITATIONS

No Limitations

SECTION III
EMERGENCY PROCEDURES

A failsafe circuit connects the pilot's headset and microphone directly to COM 1 in case the power is interrupted or the unit is turned off.

SECTION IV
NORMAL PROCEDURES

1. DETAILED OPERATING PROCEDURES

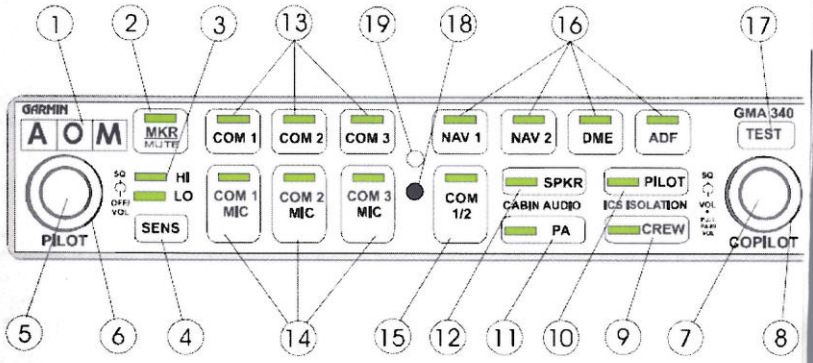


Figure 1-1. GMA 340 Front Panel

1.1 Front Panel Controls

1. Marker Beacon Lamps
2. Marker Beacon Receiver Audio Select/Mute Button
3. Marker Beacon Receiver Sensitivity Indicator LED's
4. Marker Beacon Receiver Sensitivity Selection Button
5. Unit On/Off, Pilot Intercom System (ICS) Volume
6. Pilot ICS Voice Activated (VOX) Intercom Squelch Level
7. Copilot and Passenger ICS Volume Control (Pull out for Passenger Volume)
8. Copilot and Passenger VOX Intercom Squelch Level
9. Crew Isolation Intercom Mode Button
10. Pilot Isolation Intercom Mode Button
11. Passenger Address (PA) Function Button
12. Speaker Function Button
13. Transceiver Audio Selector Buttons (COM 1, COM 2, COM 3)
14. Transmitter (Audio/Mic) Selection Buttons
15. Split COM Button
16. Aircraft Radio Audio Selection Buttons (NAV1, NAV2, DME, ADF)
17. Annunciator Test Button
18. Locking Screw Access
19. Photocell – Automatic Annunciator Dimming

1.2 On, Off, and Failsafe Operation

The GMA 340 is powered off when the left small knob (figure 3-1, item 5) is rotated fully CCW into the detent. To turn the unit on rotate the knob clockwise past the click. The knob then functions as the pilot's ICS volume control.

A failsafe circuit connects the pilot's headset and microphone directly to COM 1 in case the power is interrupted or the unit is turned off.

1.3 Lighting

The intensity of the LED Button annunciators and marker beacon lamps are controlled automatically by a built-in photocell (19) on the front panel. Nomenclature backlighting is controlled by the aircraft dimmer bus.

1.4 Transceivers

NOTE

Audio level is controlled by the selected com radio volume control.

Selection of either COM 1, COM 2, or COM 3 (13) for both MIC and audio source is accomplished by pressing either COM 1 MIC, COM 2 MIC, or COM 3 MIC (14). The active com audio is always heard on the headphones. Each audio source can be selected independently by pressing COM 1, COM 2, or COM 3 (13).

When selected in this way, they remain active as audio sources independently of which transceiver has been selected as the active microphone source.

When a microphone is keyed, the active transceiver's MIC button LED blinks approximately once per second to indicate the transmitter is active.

When no aircraft radio activity is detected by the GMA 340, the amount of ambient background noise from the radios is further reduced by the **MASQ**TM circuit. This processing is also applied to the Nav radios (described in 3.1.7).

1.5 Split Com

Pressing the COM 1/2 button (15) activates the split com function. While this mode is active, COM 2 is dedicated solely to the copilot as a MIC/audio source while COM 1 is dedicated to the pilot as a MIC/audio source. The pilot can still listen to COM 3, NAV 1, NAV 2, DME, ADF, and MKR. The pilot and copilot can simultaneously transmit in this mode, the pilot transmitting over COM 1 and the copilot transmitting over COM 2. The SPLIT COM mode is cancelled by pressing the COM 1/2 button a second time. While in the split com mode the copilot may make PA announcements while the pilot continues using COM 1 independently. When the PA button is pressed after the split com mode is activated, the copilot's mic is output over the cabin speaker when keyed. A second press of the PA button returns the copilot to normal split com operation.

NOTE

If the com radios in the installation utilize a "transmit interlock" system, the split com function may require that this feature is enabled. Refer to the radio's installation manual for guidance. GARMIN makes no expressed or implied guarantees regarding the suitability of the split com feature in a given installation.

1.6 Aircraft Radios & Navigation

NOTE

Audio level is controlled by the selected NAV radio volume control.

Pressing NAV 1, NAV 2, DME, ADF (16), or MKR (2) (see MKR beacon operation) selects that audio source. A second button press deselects the audio source. In addition, the GMA 340 provides inputs for an unswitched aircraft radio (TEL RINGER) and an unmuted, unswitched aircraft radio (ALT WRN).

1.7 Speaker Output

Pressing the SPKR button (12) selects Aircraft radios over the cabin speaker. The speaker output is muted when a COM microphone is keyed. Speaker level is adjustable through an access hole in the top of the unit (see figure 2-3).

1.8 PA Function

The PA mode is activated by pressing the PA button (11). Then, when either the pilot's or copilot's microphone is keyed, the corresponding mic audio is heard over the cabin speaker. If the SPKR button (12) is also active, then any selected speaker audio is muted while the microphone is keyed. The SPKR button does not have to be previously active in order to use the PA function. Pilot and copilot PA microphone speaker levels are adjustable through an access hole in the top of the unit (see figure 2-3).

1.9 Auxiliary Entertainment Inputs

The GMA 340 provides two stereo entertainment inputs: MUSIC 1 and MUSIC 2. MUSIC 1 is soft-muted during all aircraft radio activity and normally during ICS activity. MUSIC 2 is a non-muted input. These inputs are compatible with popular portable entertainment devices such as cassette tape or CD players. The headphone outputs of these devices are used and plugged into MUSIC 1 or MUSIC 2. Two 3.5 mm stereo phone jacks should be installed in a convenient location for this purpose. MUSIC 1 and MUSIC 2 have characteristics that are affected by the active intercom mode (see paragraph 3.1.11).

1.10 Intercom System (ICS)

Intercom volume and squelch (VOX) are adjusted using the following front panel knobs.

LEFT SMALL KNOB Unit on/off power control and Pilot ICS volume (5). Full CCW DETENT position is OFF.

LEFT LARGE KNOB Pilot ICS mic VOX squelch level (6). CW rotation increases the amount of mic audio (VOX level) required to break squelch. Full CCW is the "hot mic" position.

RIGHT SMALL KNOB IN position: Copilot ICS volume. OUT position: Passenger ICS volume (7).

RIGHT LARGE KNOB Copilot and passenger mic VOX squelch level (8). CW rotation increases the amount of mic audio (VOX level) required to break squelch. Fully CCW is the "hot mic" position.

Each microphone input (six total) has a dedicated VOX circuit to ensure that only the active microphone(s) is/are heard when squelch is broken. This represents a vast improvement over single-gate systems and reduces the amount of background noise in the headphones during cockpit communications. After the operator has stopped talking, the intercom channel remains momentarily open to avoid closure between words or normal pauses. The GMA 340 provides three intercom modes: PILOT, CREW and ALL. The mode selection is accomplished using the PILOT (10) and CREW (9) buttons.

Pressing a button activates the corresponding ICS mode. Pressing again deactivates the mode. The operator can switch directly from PILOT to CREW or from CREW to PILOT by pressing the other mode button. ALL mode is active when neither PILOT or CREW mode is selected. These modes allow different degrees of interaction between the crew and passengers:

- **PILOT mode** isolates the pilot from everyone else and dedicates the aircraft radios to the pilot exclusively. The copilot and passengers share communication between themselves but cannot communicate with the pilot or hear the aircraft radios.
- **CREW mode** places the pilot and copilot on a common ICS communication channel. The passengers are on their own intercom channel and can communicate with each other, but cannot communicate with the crew or hear the aircraft radios.
- **ALL** mode allows full intercom communication between everyone plugged in to the GMA 340. Aircraft radios are heard by all.
- **MUSIC 1 and MUSIC 2** stereo entertainment inputs are affected by the intercom mode selected.

The following table summarizes the ICS operation for the different modes supported by the GMA 340.

MODE	PILOT HEARS	COPILOT HEARS	PASSENGER HEARS	MUSIC 1 MUTING TRIGGERED BY
PILOT (LED LIT)	Selected Radios. Pilot	Copilot Passengers. MUSIC 1.	Passengers Copilot MUSIC 1.	Copilot or passenger ICS activity.
CREW (LED LIT)	Selected Radios. Pilot. Copilot MUSIC 1	Selected Radios. Copilot. Pilot. MUSIC 1.	Passengers. MUSIC 2.	Aircraft radio activity. MKR activity. Pilot or Copilot ICS activity.
ALL (LED's OFF)	Selected Radios. Pilot. Copilot Passengers. MUSIC 1.	Selected Radios. Pilot. Copilot. Passengers. MUSIC 1.	Selected Radios. Pilot. Copilot Passengers. MUSIC 1.	Aircraft radio activity. MKR activity. ICS activity.

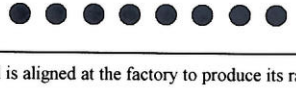
MUSIC 1 is normally muted during ICS activity. However an installation option is available to disable ICS MUTE. Then muting of MUSIC 1 will not occur due to ICS activity.

1.11 Mono/Stereo Headset

If monaural headsets are plugged into stereo jacks that do not have a switch installed the unit will not be damaged. One of the headset channel outputs will be shorted to ground under these conditions. The person plugging in the mono headset will hear only one channel from the GMA 340, but in both ears. However, anyone else plugging in a stereo headset at a different passenger position will have audio in one ear only unless his or her headset has a stereo/mono switch. Note that a stereo/mono switch on the headset does not prevent the mono headset from shorting one of the channels to ground. That headset only routes it's tip audio to both ears.

1.12 Marker Beacon Receiver

The marker beacon is used as part of an ILS approach, and in certain instances, to identify an airway. In addition to the normal marker beacon functions, the GMA 340 provides an audio muting function. The lamps illuminate, and an associated keyed-tone is heard (when MKR audio is selected), when the aircraft passes over a 75 MHz marker beacon transmitter. The lamp and audio keying for ILS approach operation are summarized below.

Audio Frequency	Audio Keying	Lamp Actuated
400 Hz		Blue (Outer)
1300 Hz		Amber (Middle)
3000 Hz		White (Airway/Inner)

The marker beacon audio level is aligned at the factory to produce its rated audio output.

The GMA 340's marker beacon receiver controls are located on the left side of the front panel [(1) through (4)]. The SENS button (4) selects either high or low sensitivity as indicated by the HI or LO LED being lit. Low sensitivity is used on ILS approaches while high sensitivity allows operation over airway markers or to get an earlier indication of nearing the outer marker during an approach.

The marker audio is selected initially by pressing the MKR/mute button (2). If no marker beacon signal is received, then pressing again will deselect the marker audio. This operation is similar to selecting any other audio source on the GMA 340. However, if the second button press occurs while a marker beacon signal is received, then the marker audio is muted but not deselected. The button's LED will remain lit to indicate that the source is still selected.

The GMA 340's **SmartMute**TM function then monitors the marker signal and automatically unmutes the audio when the current marker signal is no longer being received.

In all cases, the marker beacon lamps operate independently of any audio selection and cannot be turned off. The GMA 340 can drive external marker lamps if required.

SECTION V
PERFORMANCE

No change.

SECTION VI
WEIGHT AND BALANCE

See current weight and balance data.

SECTION VII
AIRPLANE & SYSTEM DESCRIPTIONS

See GMA 340 Pilot's Guide, P/N 190-00149-10 for a complete description of the GMA340 system.

LBA APPROVED FLIGHT MANUAL SUPPLEMENT
GARMIN GNS 430 VHF COMMUNICATIONS TRANSCEIVER / VOR/ILS RECEIVER / GPS RECEIVER

AIRCRAFT MAKE: CESSNA

AIRCRAFT MODEL: F 172 H

AIRCRAFT SERIAL NO.: F172-0528

This document must be carried in the aircraft at all times. It describes the operating procedures for the GARMIN GNS 430 navigation system when it has been installed in accordance with GARMIN Installation Manual 190-00140-02 Rev. F (Rev. A or later) and LBA EMZ RC/SA 1122 issue 1.

For aircraft with an FAA/LBA Approved Airplane Flight Manual, this document serves as the LBA Approved Flight Manual Supplement for the GARMIN GNS 430. For aircraft that do not have an approved flight manual, this document serves as the LBA Approved Supplemental Flight Manual for the GARMIN GNS 430.

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

LBA APPROVED

01 April 99

_____ Date: _____

Table of Contents

Aircraft Make: CESSNA _____ GARMIN GNS 430 VHF Communications
Aircraft Model: F 172 H _____ Transceiver / VOR/ILS Receiver / GPS Receiver
Aircraft Serial Number: F172-0528 _____

SECTION I
GENERAL

1. The GNS 430 System is a fully integrated, panel mounted instrument, which contains a VHF Communications Transceiver, a VOR/ILS receiver, and a Global Positioning System (GPS) Navigation computer. The system consists of a GPS antenna, GPS Receiver, VHF VOR/LOC/GS antenna, VOR/ILS receiver, VHF COMM antenna and a VHF Communications Transceiver. The primary function of the VHF Communication portion of the equipment is to facilitate communication with Air Traffic Control. The primary function of the VOR/ILS Receiver portion of the equipment is to receive and demodulate VOR, Localizer, and Glide Slope signals. The primary function of the GPS portion of the system is to acquire signals from the GPS system satellites, recover orbital data, make range and Doppler measurements, and process this information in real-time to obtain the user's position, velocity, and time.

2. Provided the GARMIN GNS 430's GPS receiver is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications for:

   - VFR/IFR enroute, terminal, and non-precision instrument approach (GPS, Loran-C, VOR, VOR-DME, TACAN, NDB, NDB-DME, RNAV) in accordance with AC 20-138.
   - One of the approved sensors, for a single or dual GNS 430 installation, for North Atlantic Minimum Navigation Performance Specification (MNPS) Airspace in accordance with AC 91-49 and AC 120-33.
   - The system meets RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138, and JAA GAI-20 ACJ 20X4, provided it is receiving useable navigation information from GPS receiver.
   - The equipment as installed has been found to comply with requirements for GPS primary means of navigation in oceanic and remote airspace, when used in conjunction with the 400 Series Trainer Program incorporating the FDE Prediction Program. This does not constitute an operational approval.

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

SECTION II
LIMITATIONS

1. The GARMIN GNS 430 Pilot's Guide, P/N 190-00140-00, Rev. A, dated October, 1998, or later appropriate revision, must be immediately available to the flight crew whenever navigation is predicated on the use of the system. In addition to the Pilot's Guide, the appropriate Pilot's Guide Addendum (if the information is not already incorporated into the Pilot's Guide) also must be immediately available to the flight crew if lightning detection or traffic advisory equipment is interfaced to the system or if primary means oceanic/remote navigation is conducted.

2. The GNS 430 must utilize the following or later FAA approved software versions:

Function	Sub-System Version				
	Main	GPS	COM	VOR/LOC	G/S
Initial Approval	2.00	2.00	2.00	1.25	2.00
Traffic/Weather Interface	2.08	2.00	2.00	1.25	2.00
Primary Oceanic/Remote	3.00	3.00	2.00	1.25	2.00
TIS Interface	4.00	2.00	2.00	1.25	2.00

The Main software version is displayed on the GNS 430 self test page immediately after turn-on for 5 seconds. The remaining system software versions can be verified on the AUX group sub-page 2, "SOFTWARE/DATABASE VER".

3. IFR enroute and terminal navigation predicated upon the GNS 430's GPS Receiver is prohibited unless the pilot verifies the currency of the data base or verifies each selected waypoint for accuracy by reference to current approved data.

4. Instrument approach navigation predicated upon the GNS 430's GPS Receiver must be accomplished in accordance with approved instrument approach procedures that are retrieved from the GPS equipment data base. The GPS equipment database must incorporate the current update cycle.

   (a) Instrument approaches utilizing the GPS receiver must be conducted in the approach mode and Receiver Autonomous Integrity Monitoring (RAIM) must be available at the Final Approach Fix.

   (b) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay with the GNS 430's GPS receiver is not authorized.

   (c) Use of the GNS 430 VOR/ILS receiver to fly approaches not approved for GPS require VOR/ILS navigation data to be present on the external indicator.

   (d) When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS or Loran-C navigation, the aircraft must have the operational equipment capable of using that navigation aid, and the required navigation aid must be operational.

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

Aircraft Make: CESSNA
Aircraft Model: F 172 H
Aircraft Serial Number: F172-0528

GARMIN GNS 430 VHF Communications
Transceiver / VOR/ILS Receiver / GPS Receiver

5. If not previously defined, the following default settings must be made in the "SETUP 1" menu of the GNS 430 prior to operation (refer to Pilot's Guide for procedure if necessary):

   (a) **dis, spd** ..... $^{n}_{m}$ k_t (sets navigation units to "nautical miles" and "knots")
   (b) **alt, vs** ..... f_t fpm (sets altitude units to "feet" and "feet per minute")
   (c) **map datum** .. WGS 84 (sets map datum to WGS-84, see note below)
   (d) **posn** ..... deg-min (sets navigation grid units to decimal minutes)

   NOTE: In some areas outside the United States, datums other than WGS-84 or NAD-83 may be used. If the GNS 430 is authorized for use by the appropriate Airworthiness authority, the required geodetic datum must be set in the GNS 430 prior to its use for navigation.

SECTION III
EMERGENCY PROCEDURES

ABNORMAL PROCEDURES

1. If GARMIN GNS 430 navigation information is not available or invalid, utilize remaining operational navigation equipment as required.

2. If "RAIM POSITION WARNING" message is displayed the system will flag and no longer provide GPS based navigational guidance. The crew should revert to the GNS 430 VOR/ILS receiver or an alternate means of navigation other than the GNS 430's GPS Receiver.

3. If "RAIM IS NOT AVAILABLE" message is displayed in the enroute, terminal, or initial approach phase of flight, continue to navigate using the GPS equipment or revert to an alternate means of navigation other than the GNS 430's GPS receiver appropriate to the route and phase of flight. When continuing to use GPS navigation, position must be verified every 15 minutes using the GNS 430's VOR/ILS receiver or another IFR-approved navigation system.

4. If "RAIM IS NOT AVAILABLE" message is displayed while on the final approach segment, GPS based navigation will continue for up to 5 minutes with approach CDI sensitivity (0.3 nautical mile). After 5 minutes the system will flag and no longer provide course guidance with approach sensitivity. Missed approach course guidance may still be available with 1 nautical mile CDI sensitivity by executing the missed approach.

5. In an in-flight emergency, depressing and holding the Comm transfer button for 2 seconds will select the emergency frequency of 121.500 Mhz into the "Active" frequency window.

SECTION IV
NORMAL PROCEDURES

1. DETAILED OPERATING PROCEDURES

Normal operating procedures are described in the GARMIN GNS 430 Pilot's Guide, P/N 190-00140-00, Rev. A, dated October 1998, or later appropriate revision. Normal operating procedures for the Traffic Information Service (TIS) interface and the Weather Data Link interface are described in the 400/500 Series Garmin Display Interfaces Pilot's Guide Addendum, P/N 190-00140-13, Rev B, or later appropriate revision.

2. PILOT'S DISPLAY

The GNS 430 System data will appear on the Pilot's HSI. The source of data is either GPS or VLOC as annunciated on the display above the CDI key.

NOTE: It is the pilot's responsibility to assure that published or assigned procedures are correctly complied with. Course guidance is not provided for all possible ARINC 424 leg types. See the GNS 430 Pilot's Guide for detailed operating procedures regarding navigation capabilities for specific ARINC 424 leg types.

3. AUTOPILOT / FLIGHT DIRECTOR OPERATION

Coupling of the GNS 430 System steering information to the autopilot/flight director can be accomplished by engaging the autopilot/flight director in the NAV or APR mode.

When the autopilot/flight director system is using course information supplied by the GNS 430 System and the course pointer is not automatically driven to the desired track, the course pointer on the HSI must be manually set to the desired track (DTK) indicated by the GNS 430. For detailed autopilot/flight director operational instructions, refer to the FAA/LBA Approved Flight Manual Supplement for the autopilot/flight director.

4. CROSSFILL OPERATIONS

For dual GNC 400 Product Series installations, crossfill capabilities exist between the number one and number two GNC 400 Systems. Refer to the GARMIN GNS 430 Pilot's Guide for detailed crossfill operating instructions.

Aircraft Make: CESSNA
Aircraft Model: F 172 H
Aircraft Serial Number: F172-0528
GARMIN GNS 430 VHF Communications Transceiver / VOR/ILS Receiver / GPS Receiver

5. AUTOMATIC LOCALIZER COURSE CAPTURE

By default, the GNS 430 automatic localizer course capture feature is enabled. This feature provides a method for system navigation data present on the external indicators to be switched automatically from GPS guidance to localizer / glide slope guidance as the aircraft approaches the localizer course inbound to the final approach fix. If an offset from the final approach course is being flown, it is possible that the automatic switch from GPS course guidance to localizer / glide slope course guidance will not occur. It is the pilot's responsibility to ensure correct system navigation data is present on the external indicator before continuing a localizer based approach beyond the final approach fix. Refer to the GNS 430 Pilot's Guide for detailed operating instructions.

6. DISPLAY OF LIGHTNING STRIKE DATA

For installations that interface the BFGoodrich WX-500 Stormscope and the GNS 430, lightning strike data detected by the WX-500 will appear on the GNS 430. For detailed operating instructions regarding the interface of the GNS 430 with the WX-500, refer to the WX-500 Pilot's Guide and the GNS 400/500 Series Display Interfaces Pilot's Guide Addendum, P/N 190-00140-10, Rev D, or later appropriate revision for the WX-500 Stormscope interface.

7. DISPLAY OF TRAFFIC ADVISORY DATA

For installations that interface a Traffic Advisory System (TAS) and the GNS 430, traffic data detected by the TAS will appear on the GNS 430. For detailed operating instructions regarding the interface of the GNS 430 with the TAS, refer to the FAA Approved Flight Manual Supplement for the TAS, the Pilot's Guide for the TAS and the GNS 430 Pilot's Guide Addendum for the Traffic Advisory System interface.

8. DISPLAY OF TRAFFIC INFORMATION SERVICE DATA

TIS surveillance data uplinked by Air Traffic Control (ATC) radar5 through the GTX 330 Mode S Transponder will appear on the moving map and trffic display pages of the GNS 430. For detailed operating instructions regarding the interface of the GNS 430 with the GTX 330, refer to the 400/500 Series Garmin Display Interfaces Pilot's Guide Addendum, P/N 190-00140-13, Rev B, or later appropriate revision for the TIS System interface.

SECTION V
PERFORMANCE

No change.

SECTION VI
WEIGHT AND BALANCE

See current weight and balance data.

SECTION VII
AIRPLANE & SYSTEM DESCRIPTIONS

See GNS 430 Pilot's Guide for a complete description of the GNS 430 system.

See 400/500 Series Garmin Display Interfaces Pilot's Guide Addendum, P/N 190-00140-13, Rev B, or later appropriate revision for information pertaining to the Traffic Information Service (TIS) System interface and the Weather Data Link interface.

See GNS 400/500 Series Display Interfaces Pilot's Guide Addendum, P/N 190-00140-10, Rev D, or later appropriate revision for information pertaining to the lightning strike data.

ENGINEERING DEPARTMENT

GARMIN GTX 330 Mode S Transponder

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Germany

Operating Manual

Installation of

GARMIN GTX 330 MODE S TRANSPONDER

In accordance with Avionik Straubing Engineering Order LBA2006-009-00 and GARMIN Installation Manual P/N 190-00207-02 Rev. E

AIRCRAFT MAKE: **CESSNA**

AIRCRAFT MODEL: **F 172 H**

AIRCRAFT SERIAL NO.: **F172-0528**

Avionik Straubing GmbH
EASA.21J.046

_____
Gunter Hemmel
Leiter Musterprüfleitstelle

LOG OF REVISIONS		
Revision Number	Revision Date	Description
A	20.01.06	Initial Release

Aircraft Make: CESSNA
Aircraft Model: F 172 H
Aircraft Serial Number: F172-0528

GARMIN GTX 330 Mode S Transponder

Table of Contents

SECTION I
GENERAL

1. The Garmin GTX 330 panel mounted Mode S Transponder is a radio transmitter and 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. The GTX 330 is equipped with IDENT capability that activates the Special Position Identification (SPI) pulse for 18 seconds. Mode S transmit/receive capability also requires 1090 MHz transmitting and 1030 MHz receiving for Mode S functions.

2. In addition to displaying the code, reply symbol and mode of operation, the GTX 330 screen will display pressure altitude and timer functions. The unit also features an altitude monitor, Traffic Information Service (TIS) traffic advisories and flight timers. A voice audio output announces altitude deviation, TIS traffic advisory and count down timer expiration.

SECTION II
LIMITATIONS

1. Display of TIS traffic information is advisory only and does not relieve the pilot responsibility to "see and avoid" other aircraft. Aircraft maneuvers shall not be predicated on the TIS displayed information.

2. Display of TIS traffic information does not constitute a TCAS I or TCAS II collision avoidance system as required 14 CFR Part 121 or part 135.

3. Title 14 of the Code of Federal Regulations (14 CFR) state that "When an Air Traffic Control (ATC) clearance has been obtained, no pilot-in-command (PIC) may deviate from that clearance, except in an emergency, unless he obtains an amended clearance." Traffic information provided by the TIS up-link does not relieve the PIC of this responsibility.

4. The 400/500 Series Garmin Display Interfaces (Pilot's Guide Addendum) P/N 190-00140-13 Rev. A or later revision must be accessible to the flight crew during flight.

5. 400/500 Series Main software 4.00 or later FAA approved software is required to operate the TIS interface and provide TIS functionality.

Note: Items 1-5 are only applicable if TIS (Traffic Information Service) is available.

SECTION III
EMERGENCY PROCEDURES

No change.

Aircraft Make: CESSNA
Aircraft Model: F 172 H
Aircraft Serial Number: F172-0528

GARMIN GTX 330 Mode S Transponder

SECTION IV
NORMAL PROCEDURES

1. DETAILED TRANSPONDER OPERATING PROCEDURES

NOTE

The coverage you can expect from the GTX 330 is limited to line of sight. Low altitude or antenna shielding by the aircraft itself may result in reduced range. Range can be improved by climbing to a higher altitude. It may be possible to minimize antenna shielding by locating the antenna where dead spots are only noticed during abnormal flight attitudes.

Figure 5-1. GTX 330 Front Panel

NOTE

The GTX 330 should be turned off before starting aircraft engine(s).

1.1 Function Selector Switches

The function selection switches are:

□ **OFF** | Powers off the GTX 330. Pressing the STBY, ON or ALT key powers on the transponder displaying the last active identification code.

□ **STBY** | Selects the standby mode. When in standby mode, the transponder does not reply to any interrogations.

□ **ON** | Selects Mode A and Mode S. In this mode, the transponder replies to Mode A, Mode C and Mode S interrogations, as indicated by the Reply Symbol ("®"), but the replies do not include altitude information.

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

NOTE

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

□ **IDENT** | Pressing the IDENT key activates the Special Position Identification (SPI) Pulse for 18 seconds, identifying the transponder return from others on an air traffic controller's screen.
During the IDENT period the word 'IDENT' appears in the upper left corner of the display.

□ **VFR** | Sets the transponder code to the pre-programmed VFR code selected in Configuration Mode (Set to 1200 at the factory). Pressing the VFR key again restores the previous identification code.

□ **FUNC** | Changes the page shown on the right side of the display. Display data includes Pressure Altitude, Flight Time, Altitude Monitor, Count Up and Count Down timers. In the Configuration Mode, steps through the function pages.

□ **START**/| Starts and stops the Altitude Monitor, Count Up, Count Down and Flight timers. In **STOP** configuration mode, steps through functions in reverse.

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

□ **CLR** | Resets the Count Up, Count Down and Flight timers. Cancels the previous keypress during code selection and Count Down entry. Used in Configuration Mode.

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

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

1.2 Code Selection

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

NOTE

The selected identification code should be entered carefully, either one assigned by air traffic control for IFR flight or an applicable VFR transponder code.

Aircraft Make: CESSNA
Aircraft Model: F 172 H
Aircraft Serial Number: F172-0528

GARMIN GTX 330 Mode S Transponder

□ **Important Codes:**

1200 | VFR code for any altitude in the US (Refer to ICAO standards elsewhere)
2000 | VFR code commonly used in Europe (Refer to ICAO standards)
7000 | VFR code commonly used in Europe (Refer to ICAO standards)
7500 | Hijack code (Aircraft is subject to unlawful interference)
7600 | Loss of communications
7700 | Emergency

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

1.3 Function Display

PRESSURE ALT Displays the altitude data supplied to the GTX 330 in feet, hundreds of feet (i.e., flight level), or meters, depending on configuration.

FLIGHT TIME Displays the Flight Time, controlled by the START/STOP key or by one of four airborne sources (squat switch, GPS ground speed recognition, airdata airspeed recognition or altitude increase) as configured during installation. The timer begins when the GTX 330 determines that the aircraft is airborne.

ALTITUDE MONITOR Controlled by START/STOP key. Activates a voice alarm and warning annunciator when altitude limit is exceeded.

OAT/DALT Displayed when the GTX 330 is configured with temperature input. Displays Outside Air Temperature and Density Altitude.

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

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

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

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

2. DISPLAY OF TRAFFIC INFORMATION SERVICE (TIS) DATA

TIS surveillance data uplinked by Air Traffic Control (ATC) radar through the GTX 330 Mode S Transponder will appear on the interfaced display device (Garmin 400 or 500 series products). For detailed operating instructions and information regarding the TIS interface, refer to the 400/500 Series Garmin Display Interfaces (Pilot's Guide Addendum) P/N 190-00140-13 Rev. A or later appropriate revision.

Aircraft Make: CESSNA
Aircraft Model: F 172 H
Aircraft Serial Number: F172-0528

GARMIN GTX 330 Mode S Transponder

SECTION V
PERFORMANCE

No change.

SECTION VI
WEIGHT AND BALANCE

See current weight and balance data.

SECTION VII
AIRPLANE & SYSTEM DESCRIPTIONS

See the 400/500 Series Garmin Display Interfaces (Pilot's Guide Addendum), P/N 190-00140-13 and GTX 330 Pilot's Guide, P/N 190-00207-00 for a complete description of the GTX 330 system.

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RT. 4, BLDG. 946
WOLTERS INDUSTRIAL COMPLEX
MINERAL WELLS, TEXAS 76067

FAA APPROVED
SUPPLEMENTAL FLIGHT MANUAL
FOR

REIMS-CESSNA MODELS F172F, F172G, F172H, F172K AND F172L

WITH
S-TEC SYSTEM 50 TWO AXIS
AUTOMATIC FLIGHT GUIDANCE SYSTEM
(14 VOLT SYSTEM)

REG. NO. D-EMMH
SER. NO. F172-0528

The information in this manual is FAA Approved material which along with other approved documents is applicable to the operation of the airplane when modified by the installation of the S-TEC System 50 Autopilot Model ST-182-50 installed in accordance with STC SA7196SW-D.

SECTION I

GENERAL

This manual is to acquaint the pilot with the features and functions of the System 50 Two Axis Autopilot and to provide operating instructions for the system when installed in the above aircraft model(s). The aircraft must be operated within the limitations herein provided when the autopilot is in use

SECTION II

OPERATING LIMITATIONS

1. Autopilot operation prohibited above 145 MPH CAS.
2. Autopilot must be OFF during take-off and landing.
3. Use of flaps prohibited during altitude hold mode operation.

FAA/DAS APPROVED
P/N: 89822
DATE: 4-28-89

SECTION III

EMERGENCY OPERATING PROCEDURES

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

1. Autopilot may be disconnected by:
   a. Depressing the "AP Disconnect" Switch on the left horn of the pilot's control wheel (if installed).
   b. Depressing the "ON-OFF" Switch on the autopilot programmer unit.
   c. Moving autopilot master switch to "OFF" position.
   d. Pulling the autopilot circuit breaker.
2. Altitude loss during a malfunction and recovery.
   a. The following altitude losses and bank angles were recorded after a malfunction with a 3 second recovery delay:

Configuration	Bank Angle/Altitude Loss
Climb	60°/ -20'
Cruise	55°/-150'
Descent	50°/-250'

   b. The following altitude losses and bank angles were recorded after a malfunction with a 1 second recovery delay:

Configuration	Bank Angle/Altitude Loss
Maneuvering	20°/ -60'
Approach (coupled or uncoupled)	25°/ -40'

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

SECTION IV

NORMAL OPERATING PROCEDURES

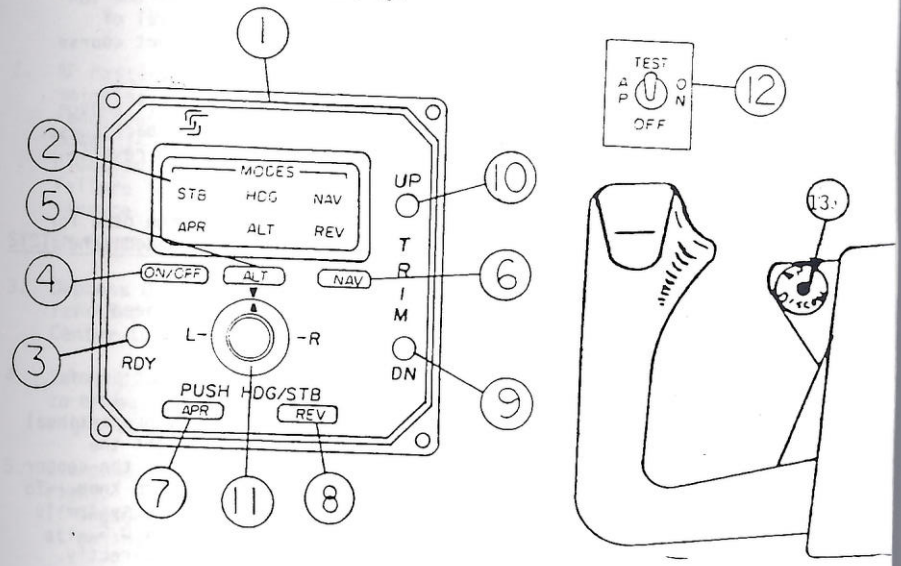
4-1 SYSTEM DESCRIPTION

The System 50 is a pure rate autopilot which uses an inclined rate gyro in the Turn Coordinator instrument as the primary roll and turn rate sensor and an accelerometer and an absolute pressure transducer as pitch rate sensors. The turn coordinator includes an autopilot pick-off, a gyro RPM detector and an instrument power monitor. Low electrical power will cause the instrument "flag" to appear while low RPM will cause the autopilot to disconnect. The autopilot includes an automatic pre-flight test feature that allows a visual check of all the annunciator lamps and checks critical elements of the accelerometer system. The test feature will not enable autopilot function unless the automatic test sequence is satisfactorly completed.

When the pre-flight test is satisfactorily completed and when the rate gyro RPM is correct, the green "RDY" light will illuminate indicating the autopilot is ready for the functional check and operation. The autopilot cannot be engaged unless the "RDY" light is illuminated. When the system is equipped with the optional 3" Air Driven Directional Gyro (D.G.) or a compass system, directional information is provided to the autopilot by a heading bug in the instrument.

Pitch axis control is provided for the altitude hold function by use of the accelerometer and the pressure transducer. When the altitude hold mode is engaged an elevator trim sensor in the pitch servo will detect the elevator trim condition. When elevator trim is necessary to re-establish a trimmed condition, trim indicator lights on the programmer unit will illuminate to indicate the direction to trim to restore a trimmed condition.

The indicator and annunciator lamp brilliance is controlled through the aircraft instrument light rheostat, except for the "trim" indicators which always illuminate at full intensity.



1. Mode Programmer and Annunciator Unit - Provides mode switches and annunciation for the system.
2. Mode Annunciation Window - Displays mode in use.

3. Ready Light (RDY) - Green RDY lamp illuminates when autopilot is ready for engagement.

4. ON-OFF Stabilizer Mode Switch - Momentary actuation engages roll system in stabilizer (STB) Mode and allows use of the turn knob (Item 11) to command turn rate desired. When the system is operating a momentary actuation will disengage the system and cancel all annunciations.

5. Altitude Mode Switch (ALT) - Momentary actuation will engage altitude hold mode or disengage altitude mode if previously engaged. This function is also available by use of an optional control wheel mounted altitude engage/disengage switch, for added convenience.

6. Navigation Mode Switch (NAV) - Momentary activation will engage the VOR Tracking Mode. This mode provides low system gain for comfortable cross country tracking.

7. Approach Mode Switch (APR) - Momentary actuation will engage the VOR or Localizer Tracking Mode. This mode provides a higher level of system gain for more active tracking of VOR or Localizer front course signals.

8. Reverse Approach Mode Switch (REV) - Momentary activation will engage the reverse tracking mode for use when tracking a localizer backcourse. This mode provides the same system gain as the APR Mode with reverse needle sensing.

9. Down TRIM Light (DN) - This light illuminates to indicate the need for nose down trim. When both the UP and DN lights are not lighted, the aircraft is in trim longitudinally.

10. UP Trim Light (UP) - This light illuminates to indicate the need for nose UP trim.

11. Turn Knob and Heading Switch - The turn knob allows the selection of turn rates up to standard rate(3^{o}/sec.) either right or left. Turning the knob to the right or left will cause a turn that is proportional to the displacement of the knob from center. For level flight the electronics provide a small dead zone of approximately 10^{o} at the center indice. To actuate heading mode, momentarily depress the turn knob. To return to STB Mode from HDG, depress the turn knob. When the system is operating in any radio mode and the system is equipped with a D.G., depressing the turn knob will return the system to HDG Mode directly.

12. Autopilot Master ON-OFF Test Switch - Refer to Pre-Flight Procedures for operating details.

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13. Optional remote AP disconnect switch and/or remote altitude hold engage-disengage switch.

4-2 PRE-FLIGHT PROCEDURES

NOTE: During system functional checks the system must be provided adequate DC voltage (12 or 24 VDC minimum as appropriate)

MANDATORY PRE-FLIGHT TEST

1. AP Master Switch - Move to TEST position.

   a. Observe all lights and annunciators illuminate.
   b. Observe the following light sequence of the trim indicators: (Sequence requires 9 seconds)

      1. Initially both trim UP & DN lights are illuminated.
      2. Up light extinguishes momentarily and relights.
      3. DN light then extinguishes and will remain off.

2. AP Master Switch - Move to ON position, observe ready (RDY) light illuminates. Autopilot can be engaged and disengaged repeatedly without repeating the test sequence until electrical power is removed. Once power is interrupted the test must be reconducted to get a ready indication. If the ready light does not illuminate after the test a failure to pass the test is indicated and the system will require service. NOTE: ALTITUDE MODE CANNOT BE ENGAGED UNLESS POWER IS ON FOR MORE THAN 15 SECONDS.

SYSTEM FUNCTIONAL TEST

3. Depress ON-OFF Switch - STB Annunciator illuminates. Rotate turn knob left and right, observe control wheel moves in corresponding direction. Center turn knob.

4. Set D.G. and place bug under lubber line (if installed) push turn knob to engage HDG mode. Observe HDG annunciator. Move HDG bug left and right observe proper control wheel motion.

5. Overpower Test - Grasp control wheel and overpower roll servo left and right. Overpower action should be smooth with no noise or jerky feel. If unusual sounds or excessive play is detected, have the servo installation inspected prior to flight.

6. Radio Check - A. Turn on NAV Radio, with valid NAV signal, engage NAV Mode and move VOR OBS so that VOR needle moves left and right - control wheel should follow the direction of needle movement.

B. Select REV Mode - the control wheel should rotate in opposite direction of the NAV needle.

C. Select APR Mode - the control wheel should again follow radio needle movement and with more authority than produced by NAV Mode.

7. Move control wheel to level flight position - Engage ALT Mode. Move control wheel fore and aft to overpower pitch servo clutch. Overpower action should be smooth with no noise or jerky feel. If unusual sounds or excessive play is detected, have the servo installation inspected prior to flight.

8. Trim Check - Manually apply back pressure to control wheel for 2-3 seconds - observe the DN trim light illuminates. Apply forward pressure to the control wheel for 2-3 seconds, observe the UP trim light illuminates. Move the control wheel to center - observe both UP/DN lights extinguish.

9. Hold control wheel and depress ON-OFF Switch - note that roll and pitch servo release. Move control wheel to confirm roll and pitch motions are free, with no control restriction or binding. If the optional disconnect switch is installed it may be used to effect the disconnect for this check.

4-3 IN-FLIGHT PROCEDURES

NOTE: The required pre-flight test can be conducted in the air if necessary. It should be noted, however, that when the UP/DN lights are flashing the pitch servo will momentarily engage and disengage. This alternate engage-disengage sequence is part of the test function. Because of the engage-disengage sequence the test should not be conducted while maneuvering.

1. Check - RDY light on.

2. Trim aircraft for existing flight condition. Maintain Yaw Trim during all Autopilot operations.

3. Center turn-knob - depress ON-OFF Switch.

4. Set turn knob to level or turning flight, as desired.

5. Set HDG bug to desired heading (if installed) and depress turn knob to engage heading mode, select headings as desired.

6. At desired altitude, depress ALT Mode Switch. Trim aircraft as necessary to establish cruise condition - disengage ALT Mode to climb or descend.

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VOR TRACKING AND VOR-LOC APPROACH

1. Tune NAV receiver and select radial.

2. Maneuver aircraft to selected radial (or localizer) within ± 1 needle width and within 10^{o} of the course heading.

3. Engage NAV Mode for VOR tracking.

4. Engage APR Mode for VOR or LOC approach.

To track the localizer front course outbound to the procedure turn area, maneuver to the localizer center and, when on the outbound heading, select REV Mode. To track the localizer back course inbound, maneuver to the localizer back course center and, when on the inbound heading, select REV Mode.

Approach Mode may be used to track VOR radials cross country, if desired. Use of APR Mode for cross country tracking may result in some course scalloping if the VOR signal is weak or otherwise "noisey". In areas of poor signal quality NAV Mode may provide more accurate tracking even with reduced gain.

SECTION V

OPERATIONAL DATA

Text of this Section not affected by installation of this equipment.

SECTION VI

REQUIRED OPERATING EQUIPMENT

Text of this Section not affected by installation of this equipment.

SECTION VII

WEIGHT AND BALANCE

Text of this Section not affected by installation of this equipment.

FAA APPROVED _____
Walter F. Davis

S-TEC CORPORATION
DAS 5 SW
P/N: 89822
DATE: 4-28-89

ENGINEERING DEPARTMENT

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Germany

Operating Manual

Installation of

ARTEX ME-406 ELT

In accordance with Avionik Straubing Engineering Order LBA2008-008-00 and Artex Installation Manual P/N 570-1600 Rev. F

AIRCRAFT MAKE: **CESSNA**

AIRCRAFT MODEL: **F 172 H**

AICRAFT SERIAL NO.: **F172-0528**

Avionik Straubing GmbH
EASA.21J046

Gunter Hemmel
Leiter Musterprufleitstelle

LOG OF REVISIONS		
Revision Number	Revision Date	Description
A	15.5.08	Initial Release

Table of Contents

SECTION I
GENERAL

The Artex ME 406 series transmits on 2 emergency frequencies (121,5 and 406,025 MHz.) The ELT automatically activates during a cash and transmits the standard swept tone on 121,5MHz. It also transmits a 406,025MHz encoded digital message to the COSPAS/SARSAT satellite systém, which allows for rapid identification and reduces search and rescue response time. ME 406 series has been tested to meet the rigorous requirements of TSO C126 including 500 G shock, 1000 poud crush as well as flame and vibration tests.

SECTION II
LIMITATIONS

No change.

SECTION III
EMERGENCY PROCEDURES

In a crash, an acceleration activated crash sensor (G-switch) turns the ELT "ON" automatically when the ELT experiences a change in velocity (or deceleration) of 4,5 fps +/- 0,5 fps. Activation is also accomplished by means of the cockpit mounted remote switch or the panel (local) switch on the ELT.
After emergency landing, if the rescue assistance is required, should be the ELT used as follows:

1. Check the ELT functionality:
   - Set the remote switch to "ON" position (the red LED starts blinking)
   - If the communication radio is working and i´ts usable, tune the frequency 121,5 MHz. If you can hear the ELT, it works correctly.
2. During waiting on the rescue airplane:
   - Save the airborne battery. Don´t turn on the radio communication.
3. Contact the rescue plane
   - Set the remote switch to "ARM" position. Try to contact the rescue plane using the communication radio tuned on the frequency 121,5 MHz. If the contacting is not successful, set the remote switch back to "ON" position.
4. After finishing the rescue
   - Set the remote switch to "ARM" position.

Aircraft Make: CESSNA
Aircraft Model: F 172 H
Aircraft Serial Number: F172-0528

ARTEX ME-406 ELT

NOTE

The ELT can be activated automatically during hard landing or advanced turbulence. To deactivate the ELT set either switch to the "ON" position, then back to "ARM"

SECTION IV
NORMAL PROCEDURES

No change

SECTION V
PERFORMANCE

No change

SECTION VI
WEIGHT AND BALACE

See current weight and balance data

SECTION VII
AIRPLANE & SYSTÉM DESCRIPTIONS

Switch Operation:

In a crash, an acceleration activated crash sensor G switch turns the ELT "ON" automatically when the ELT experiences a change in velocity or deceleration of 4,5 fps +/- 0,5 fps. Activation is also accomplished by means of the cockpit mounted remote switch or the panel switch on the ELT. To deactivate the ELT set either switch to the "ON" position, then back to "ARM". The ELT does not have an "OFF" position. Instead, a jumper between two pins on the front D-sub connector must be in place for the G-switch to activate the unit. The jumper is installed on the mating half of the connector so that when the connector is installed, the beacon is armed. This allows the beacon to be handled or shipped without "nuisance" activation front connector removed.

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NOTE

The ELT can still be manually activated using the local switch on the front of the ELT. Care should be taken when transporting or shipping the ELT not to move the switch or allow packing materiál to become lodged such as to toggle the switch.

Self Test mode:

Upon turn-off, the ELT automatically enters a self-test mode that transmits a 406 MHz test coded pulse that monitors certain systém functions before returning to the "ARM"ed mode.The 406 MHz test pulse is ignored by any satellite that receives the signal, but the ELT uses this output to check output power and correct frequency. If the ELT is left activated for approximately 50 seconds or greater, a distress signal is generated that is accepted by one or more SAR satellites. Therefore, when the self-test mode is required, the ELT must be activated, then, returned to "ARM" within about 45 seconds otherwise a "live" distress message will be transmitted.

1. Flash - Indicated that the system is operational and that no error conditions were found.

3. Flashes - Bad load detect. Detects open or short condition on the antenna output or cable.

4. Flashes- Low power detected.

5. Flashes - Indicated that the ELT has not been programmed.

6. Flashes - Indicates that G-switch loop between pins 5 and 12 at the D-sub connector is not installed.

7. Flashes - Indicates that the ELT battery has too much accumulated operation time > 1 hr.

ÚŘAD PRO CIVILNÍ LETECTVÍ
CIVIL AVIATION AUTHORITY

ČESKÁ REPUBLIKA — CZECH REPUBLIC

PAGE OF ACCEPTANCE

CIVIL AVIATION AUTHORITY OF THE CZECH REPUBLIC ACCEPTS THIS AIRCRAFT FLIGHT MANUAL DOC.No APPROVED ORIGINALLY BY SGAC (France)

FOR THE AIRCRAFT TYPE : F 172 H
WITH THESE LIMITATIONS : No additional limitations to this Aircraft Flight Manual

NATIONALITY OR COMMON MARK AND REGISTRATION MARK

OK-OKB

AIRPLANE SERIAL NUMBER : 0528

THIS MANUAL MUST BE MAINTAINED IN ACCORDANCE WITH REVISION SERVICE OF THE MANUFACTURER

ÚŘAD PRO CIVILNÍ LETECTVÍ 57

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