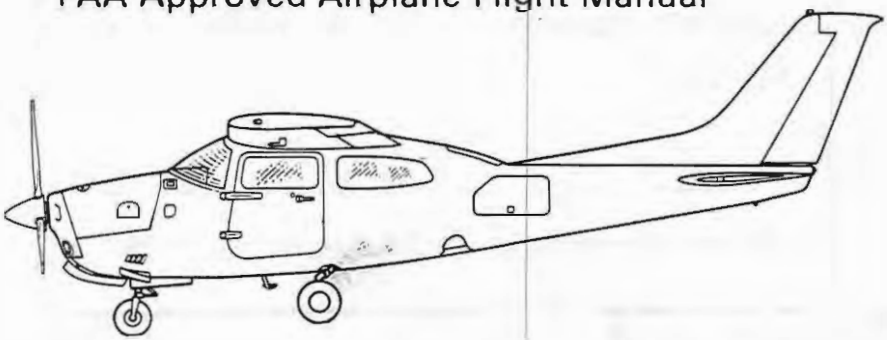
Cessna

Pilot's Operating Handbook

and

FAA Approved Airplane Flight Manual



Cessna Aircraft Company

THIS DOCUMENT MUST BE CARRIED IN THE AIRPLANE AT ALL TIMES.

1984 Model 210N

Serial No. 210 64837

Registration No. [illegible]

THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY CAR PART 3 AND CONSTITUTES THE FAA APPROVED AIRPLANE FLIGHT MANUAL.

Cessna Aircraft Company
Wichita, Kansas USA

Member of GAMA

Original Issue - 22 August 1983

THIS MANUAL WAS PROVIDED FOR THE AIRPLANE IDENTIFIED ON THE TITLE PAGE ON _____. SUBSEQUENT REVISIONS SUPPLIED BY CESSNA AIRCRAFT COMPANY MUST BE PROPERLY INSERTED.

Cessna Aircraft Company, Pawnee Aircraft Division

This manual is issued to replace one originally provided for the airplane identified on the cover page on 12-05-83.
All revisions, if any, have been incorporated as of 0305-01.

Subsequent revisions supplied by Cessna Aircraft Company must be properly inserted.

Cessna Aircraft Company

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

Our interest in your flying pleasure has not ceased with your purchase of a Cessna. Worldwide, the Cessna Dealer Organization backed by the Cessna Customer Services Department stands ready to serve you. The following services are offered by most Cessna Dealers:

- THE CESSNA WARRANTY, which provides coverage for parts and labor, is available at Cessna Dealers worldwide. Specific benefits and provisions of warranty, plus other important benefits for you, are contained in your Customer Care Program book, supplied with your airplane. Warranty service is available to you at authorized Cessna Dealers throughout the world upon presentation of your Customer Care Card which establishes your eligibility under the warranty.
- FACTORY-TRAINED PERSONNEL to provide you with courteous expert service.
- FACTORY-APPROVED SERVICE EQUIPMENT to provide you efficient and accurate workmanship.
- A STOCK OF GENUINE CESSNA SERVICE PARTS on hand when you need them.
- THE LATEST AUTHORITATIVE INFORMATION FOR SERVICING CESSNA AIRPLANES, since Cessna Dealers have all of the Service Manuals and Parts Catalogs, kept current by Customer Care Service Information Letters and Customer Care News Letters, published by Cessna Aircraft Company.

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

A current Worldwide Customer Care Directory accompanies your new airplane. The Directory is revised frequently, and a current copy can be obtained from your Cessna Dealer. Make your Directory one of your cross-country flight planning aids; a warm welcome awaits you at every Cessna Dealer.

PERFORMANCE - SPECIFICATIONS

*SPEED:		
Maximum at Sea Level		175 KNOTS
Cruise, 75% Power at 6500 Ft		168 KNOTS
CRUISE: Recommended lean mixture with fuel allowance for engine start, taxi, takeoff, climb and 45 minutes reserve.		
75% Power at 6500 Ft	Range	765 NM
522 Pounds Usable Fuel	Time	4.6 HRS
Maximum Range at 10,000 Ft	Range	1025 NM
522 Pounds Usable Fuel	Time	7.7 HRS
RATE OF CLIMB AT SEA LEVEL		950 FPM
SERVICE CEILING		17,300 FT
TAKEOFF PERFORMANCE:		
Ground Roll		1250 FT
Total Distance Over 50-Ft Obstacle		2030 FT
LANDING PERFORMANCE:		
Ground Roll		765 FT
Total Distance Over 50-Ft Obstacle		1500 FT
STALL SPEED (KCAS):		
Flaps Up, Power Off		65 KNOTS
Flaps Down, Power Off		56 KNOTS
MAXIMUM WEIGHT:		
Ramp		3812 LBS
Takeoff or Landing		3800 LBS
STANDARD EMPTY WEIGHT:		
Centurion		2173 LBS
Centurion II		2223 LBS
MAXIMUM USEFUL LOAD:		
Centurion		1639 LBS
Centurion II		1589 LBS
BAGGAGE ALLOWANCE: Maximum With 4 People		240 LBS
WING LOADING: Pounds/Sq Ft		21.7
POWER LOADING: Pounds/HP		12.7
FUEL CAPACITY: Total		90 GAL.
OIL CAPACITY		11 QTS
ENGINE: Teledyne Continental, Fuel Injection		IO-520-L
300 BHP at 2850 RPM (5-Minute Takeoff Rating)		
285 BHP at 2700 RPM (Maximum Continuous Rating)		
PROPELLER: 3-Bladed Constant Speed, Diameter		80 IN.

* Speeds are based on mid-cruise weight.

The above performance figures are based on the indicated weights, standard atmospheric conditions, level hard-surface dry runways, and no wind. They are calculated values derived from flight tests conducted by the Cessna Aircraft Company under carefully documented conditions and will vary with individual airplanes and numerous factors affecting flight performance.

COVERAGE

The Pilot's Operating Handbook in the airplane at the time of delivery from Cessna Aircraft Company contains information applicable to the 1984 Model 210N airplane designated by the serial number and registration number shown on the Title Page of this handbook. This information is based on data available at the time of publication.

REVISIONS

Changes and/or additions to this handbook will be covered by revisions published by Cessna Aircraft Company. These revisions are distributed to owners of U. S. Registered aircraft according to FAA records at the time of revision issuance.

Revisions should be examined immediately upon receipt and incorporated in this handbook.

NOTE

It is the responsibility of the owner to maintain this handbook in a current status when it is being used for operational purposes.

Owners should contact their Cessna Dealer whenever the revision status of their handbook is in question.

A revision bar will extend the full length of new or revised text and/or illustrations added on new or presently existing pages. This bar will be located adjacent to the applicable revised area on the outer margin of the page.

All revised pages will carry the revision number and date on the applicable page.

The following Log of Effective Pages provides the dates of issue for original and revised pages, and a listing of all pages in the handbook. Pages affected by the current revision are indicated by an asterisk (*) preceding the pages listed.

LOG OF EFFECTIVE PAGES

Dates of issue for original and revised pages are:
Original ..... 22 August 1983
Revision 1 ..... 24 February 1984
Revision 2 ..... 28 September 1984

Page	Date	Page	Date
Title	22 August 1983	4-1 thru 4-13	22 August 1983
Assignment Record	22 August 1983	4-14 Blank	22 August 1983
i thru ii	22 August 1983	4-15 thru 4-26	22 August 1983
*iii thru iv	28 September 1984	5-1	22 August 1983
v	22 August 1983	5-2 Blank	22 August 1983
vi Blank	22 August 1983	5-3 thru 5-11	22 August 1983
1-1 thru 1-8	22 August 1983	5-12 Blank	22 August 1983
2-1	22 August 1983	5-13 thru 5-31	22 August 1983
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NOTE

Refer to Section 9 Table of Contents for supplements applicable to optional systems.

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SECTION 1
GENERAL

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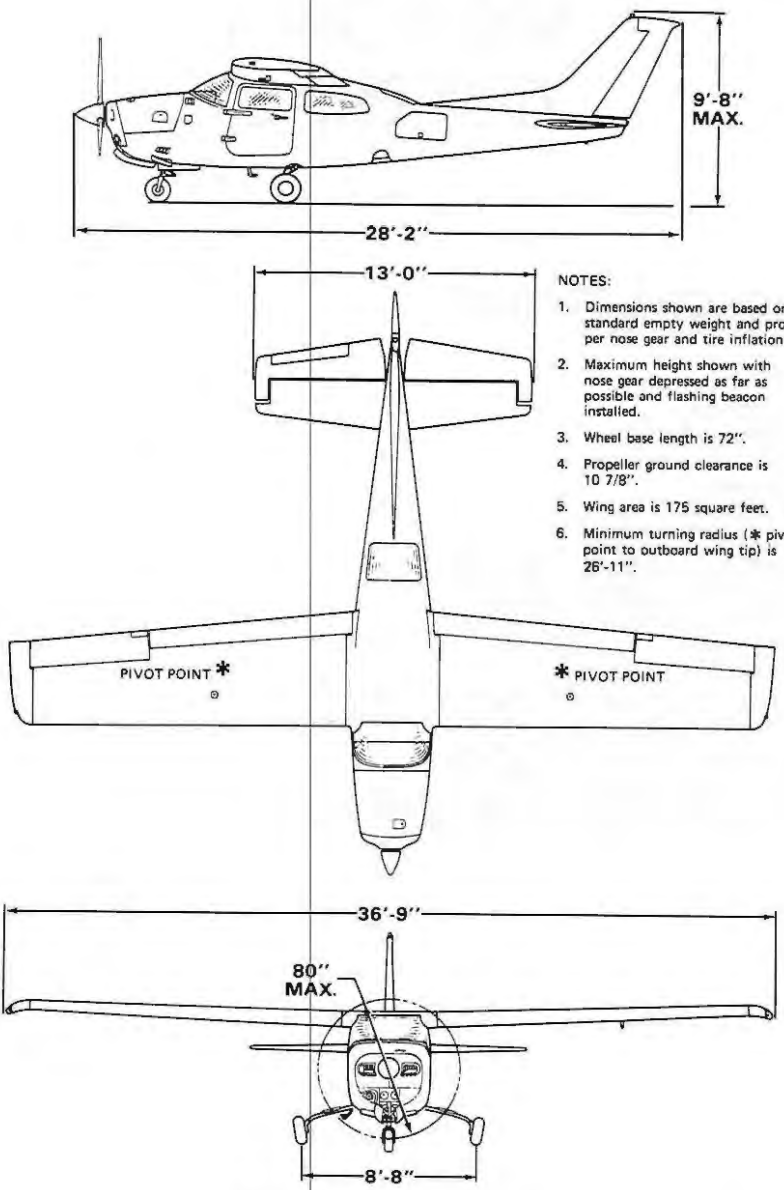

Figure 1-1. Three View

INTRODUCTION

This handbook contains 9 sections, and includes the material required to be furnished to the pilot by CAR Part 3. It also contains supplemental data supplied by Cessna Aircraft Company.

Section 1 provides basic data and information of general interest. It also contains definitions or explanations of symbols, abbreviations, and terminology commonly used.

DESCRIPTIVE DATA

ENGINE

Number of Engines: 1.
Engine Manufacturer: Teledyne Continental.
Engine Model Number: IO-520-L.
Engine Type: Normally-aspirated, direct-drive, air-cooled, horizontally-opposed, fuel-injected, six-cylinder engine with 520 cu. in. displacement.
Horsepower Rating and Engine Speed:
Maximum Power (5 minutes - takeoff): 300 rated BHP at 2850 RPM.
Maximum Continuous Power: 285 rated BHP at 2700 RPM.

PROPELLER

Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: D3A34C404/80VA-0.
Number of Blades: 3.
Propeller Diameter, Maximum: 80 inches.
Minimum: 78.5 inches.
Propeller Type: Constant speed and hydraulically actuated, with a low pitch setting of 11.0° and a high pitch setting of 27.0° (30 inch station).

FUEL

Approved Fuel Grades (and Colors):
100LL Grade Aviation Fuel (Blue).
100 (Formerly 100/130) Grade Aviation Fuel (Green).

NOTE

Isopropyl alcohol or ethylene glycol monomethyl ether may be added to the fuel supply. Additive concentrations shall not exceed 1% for isopropyl alcohol or .15% for ethylene glycol monomethyl ether. Refer to Section 8 for additional information.

Total Capacity: 90 gallons.
Total Capacity Each Tank: 45 gallons.
Total Usable: 87 gallons.

NOTE

Before refueling or when the airplane is parked on a slope, place the fuel selector handle in the LEFT ON or RIGHT ON position, whichever corresponds to the low wing. This action minimizes cross-feeding from the fuller tank and reduces fuel seepage from the wing tank vents.

OIL

Oil Specification:

The airplane was delivered from the factory with a corrosion-preventive aircraft engine oil. This oil should be drained after the first 25 hours of operation.

MIL-L-6082 Aviation Grade Straight Mineral Oil: Use to replenish supply during the first 25 hours.

Continental Motors Specification MHS-24 Aviation Grade Ashless Dispersant Oil: Oil conforming to Continental Motors Specification MHS-24, and all revisions or supplements thereto, **must be used** after first 25 hours. Refer to Continental Aircraft Engine Service Bulletin M82-8, and any superseding bulletins, revisions, or supplements thereto, for further recommendations.

Recommended Viscosity for Temperature Range:

All temperatures, use multi-viscosity oil or
Above 4°C (40°F), use SAE 50
Below 4°C (40°F), use SAE 30

NOTE

When operating temperatures overlap, use the lighter grade of oil. Multi-viscosity oil is recommended for improved starting in cold weather.

Oil Capacity:

Sump: 10 Quarts.
Total: 11 Quarts.

MAXIMUM CERTIFICATED WEIGHTS

Ramp: 3812 lbs.
Takeoff: 3800 lbs.
Landing: 3800 lbs.
Weight in Baggage Compartment:

Baggage - Forward of wheel well on folded down aft seat (Station 89 to

110): 120 lbs.
Baggage - On and aft of wheel well (Station 110 to 152): 200 lbs.

NOTE

The maximum allowable combined weight capacity for baggage forward, on and aft of the wheel well is 240 pounds.

STANDARD AIRPLANE WEIGHTS

Standard Empty Weight, Centurion: 2173 lbs.
Centurion II: 2223 lbs.
Maximum Useful Load, Centurion: 1639 lbs.
Centurion II: 1589 lbs.

CABIN AND ENTRY DIMENSIONS

Detailed dimensions of the cabin interior and entry door openings are illustrated in Section 6.

BAGGAGE SPACE AND ENTRY DIMENSIONS

Dimensions of the baggage area and baggage door opening are illustrated in detail in Section 6.

SPECIFIC LOADINGS

Wing Loading: 21.7 lbs./sq. ft.
Power Loading: 12.7 lbs./hp.

SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

GENERAL AIRSPEED TERMINOLOGY AND SYMBOLS

KCAS — **Knots Calibrated Airspeed** is indicated airspeed corrected for position and instrument error and expressed in knots. Knots calibrated airspeed is equal to KTAS in standard atmosphere at sea level.

KIAS — **Knots Indicated Airspeed** is the speed shown on the airspeed indicator and expressed in knots.

KTAS — **Knots True Airspeed** is the airspeed expressed in knots relative to undisturbed air which is KCAS corrected for altitude and temperature.

V_A	**Maneuvering Speed** is the maximum speed at which full or abrupt control movements may be used.
V_{FE}	**Maximum Flap Extended Speed** is the highest speed permissible with wing flaps in a prescribed extended position.
V_{LE}	**Maximum Landing Gear Extended Speed** is the maximum speed at which an airplane can be safely flown with the landing gear extended.
V_{LO}	**Maximum Landing Gear Operating Speed** is the maximum speed at which the landing gear can be safely extended or retracted.
V_{NO}	**Maximum Structural Cruising Speed** is the speed that should not be exceeded except in smooth air, then only with caution.
V_{NE}	**Never Exceed Speed** is the speed limit that may not be exceeded at any time.
V_S	**Stalling Speed or the minimum steady flight speed** at which the airplane is controllable.
V_{S_o}	**Stalling Speed or the minimum steady flight speed** at which the airplane is controllable in the landing configuration at the most forward center of gravity.
V_X	**Best Angle-of-Climb Speed** is the speed which results in the greatest gain of altitude in a given horizontal distance.
V_Y	**Best Rate-of-Climb Speed** is the speed which results in the greatest gain in altitude in a given time.

METEOROLOGICAL TERMINOLOGY

OAT	**Outside Air Temperature** is the free air static temperature. It is expressed in either degrees Celsius or degrees Fahrenheit.
Standard Temperature	**Standard Temperature** is 15°C at sea level pressure altitude and decreases by 2°C for each 1000 feet of altitude.
Pressure Altitude	**Pressure Altitude** is the altitude read from an altimeter when the altimeter's barometric scale has been set to 29.92 inches of mercury (1013 mb).

ENGINE POWER TERMINOLOGY

BHP	**Brake Horsepower** is the power developed by the engine. Percent power values in this handbook are based on the maximum continuous power rating.
RPM	**Revolutions Per Minute** is engine speed.
MP	**Manifold Pressure** is a pressure measured in the engine's induction system and is expressed in inches of mercury (Hg).

AIRPLANE PERFORMANCE AND FLIGHT PLANNING TERMINOLOGY

Demonstrated Crosswind Velocity	**Demonstrated Crosswind Velocity** is the velocity of the crosswind component for which adequate control of the airplane during takeoff and landing was actually demonstrated during certification tests. The value shown is not considered to be limiting.
Usable Fuel	**Usable Fuel** is the fuel available for flight planning.
Unusable Fuel	**Unusable Fuel** is the quantity of fuel that can not be safely used in flight.
PPH	**Pounds Per Hour** is the amount of fuel consumed per hour.
NMPG	**Nautical Miles Per Gallon** is the distance which can be expected per gallon of fuel consumed at a specific engine power setting and/or flight configuration.
g	g is acceleration due to gravity.

WEIGHT AND BALANCE TERMINOLOGY

Reference Datum	**Reference Datum** is an imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Station	**Station** is a location along the airplane fuselage given in terms of the distance from the reference datum.
Arm	**Arm** is the horizontal distance from the reference datum to the center of gravity (C.G.) of an item.

Moment	**Moment** is the product of the weight of an item multiplied by its arm. (Moment divided by the constant 1000 is used in this handbook to simplify balance calculations by reducing the number of digits.)
Center of Gravity (C.G.)	**Center of Gravity** is the point at which an airplane, or equipment, would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.
C.G. Arm	**Center of Gravity Arm** is the arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.
C.G. Limits	**Center of Gravity Limits** are the extreme center of gravity locations within which the airplane must be operated at a given weight.
Standard Empty Weight	**Standard Empty Weight** is the weight of a standard airplane, including unusable fuel, full operating fluids and full engine oil.
Basic Empty Weight	**Basic Empty Weight** is the standard empty weight plus the weight of optional equipment.
Useful Load	**Useful Load** is the difference between ramp weight and the basic empty weight.
Maximum Ramp Weight	**Maximum Ramp Weight** is the maximum weight approved for ground maneuver. (It includes the weight of start, taxi and runup fuel.)
Maximum Takeoff Weight	**Maximum Takeoff Weight** is the maximum weight approved for the start of the takeoff roll.
Maximum Landing Weight	**Maximum Landing Weight** is the maximum weight approved for the landing touchdown.
Tare	**Tare** is the weight of chocks, blocks, stands, etc. used when weighing an airplane, and is included in the scale readings. Tare is deducted from the scale reading to obtain the actual (net) airplane weight.

SECTION 2
LIMITATIONS

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INTRODUCTION

Section 2 includes operating limitations, instrument markings, and basic placards necessary for the safe operation of the airplane, its engine, standard systems and standard equipment. The limitations included in this section and in Section 9 have been approved by the Federal Aviation Administration. Observance of these operating limitations is required by Federal Aviation Regulations.

NOTE

Refer to Section 9 of this Pilot's Operating Handbook for amended operating limitations, operating procedures, performance data and other necessary information for airplanes equipped with specific options.

NOTE

The airspeeds listed in the Airspeed Limitations chart (figure 2-1) and the Airspeed Indicator Markings chart (figure 2-2) are based on Airspeed Calibration data shown in Section 5 with the normal static source. If the alternate static source is being used, ample margins should be observed to allow for the airspeed calibration variations between the normal and alternate static sources as shown in Section 5.

Your Cessna is certificated under FAA Type Certificate No. 3A21 as Cessna Model No. 210N.

AIRSPEED LIMITATIONS

Airspeed limitations and their operational significance are shown in figure 2-1.

	SPEED	KCAS	KIAS	REMARKS
V_{NE}	Never Exceed Speed	195	200	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	161	165	Do not exceed this speed except in smooth air, and then only with caution.
V_A	Maneuvering Speed: 3800 Pounds 3150 Pounds 2500 Pounds	 122 110 99	 125 113 101	Do not make full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed: To 10° Flaps 10° - 20° Flaps 20° - 30° Flaps	 159 128 114	 160 130 115	Do not exceed these speeds with the given flap settings.
V_{LO}	Maximum Landing Gear Operating Speed	161	165	Do not extend or retract landing gear above this speed.
V_{LE}	Maximum Landing Gear Extended Speed	195	200	Do not exceed this speed with landing gear extended.
	Maximum Window Open Speed	195	200	Do not exceed this speed with windows open.

Figure 2-1. Airspeed Limitations

AIRSPEED INDICATOR MARKINGS

Airspeed indicator markings and their color code significance are shown in figure 2-2.

MARKING	KIAS VALUE OR RANGE	SIGNIFICANCE
White Arc	57 - 115	Full Flap Operating Range. Lower limit is maximum weight V_{S_0} in landing configuration. Upper limit is maximum speed permissible with flaps extended.
Green Arc	69 - 165	Normal Operating Range. Lower limit is maximum weight V_S at most forward C.G. with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow Arc	165 - 200	Operations must be conducted with caution and only in smooth air.
Red Line	200	Maximum speed for all operations.

Figure 2-2. Airspeed Indicator Markings

POWER PLANT LIMITATIONS

Engine Manufacturer: Teledyne Continental.
Engine Model Number: IO-520-L.
Maximum Power, 5 Minutes - Takeoff: 300 BHP rating.
Continuous: 285 BHP rating.
Engine Operating Limits for Takeoff and Continuous Operations:
Maximum Engine Speed, 5 Minutes - Takeoff: 2850 RPM.
Continuous: 2700 RPM.
Maximum Cylinder Head Temperature: 460°F (238°C).
Maximum Oil Temperature: 240°F (116°C).
Oil Pressure, Minimum: 10 psi.
Maximum: 100 psi.
Fuel Pressure, Minimum: 3.5 psi.
Maximum: 19.5 psi (151 PPH).
Fuel Grade: See Fuel Limitations.
Oil Grade (Specifications):
MIL-L-6082 Aviation Grade Straight Mineral Oil or Ashless Dispersant Oil conforming to Continental Motors Specification MHS-24 and all revisions thereto.

Propeller Manufacturer: McCauley Accessory Division.
Propeller Model Number: D3A34C404/80VA-0.
Propeller Diameter, Maximum: 80 inches.
Minimum: 78.5 inches.
Propeller Blade Angle at 30 Inch Station, Low: 11.0°.
High: 27.0°.

POWER PLANT INSTRUMENT MARKINGS

Power plant instrument markings and their color code significance are shown in figure 2-3.

INSTRUMENT	RED LINE	GREEN ARC	YELLOW ARC	RED LINE
	MINIMUM LIMIT	NORMAL OPERATING	CAUTION RANGE	MAXIMUM LIMIT
Tachometer	- - -	2200 - 2550 RPM	2700 - 2850 RPM	2850 RPM
Manifold Pressure	- - -	15-25 in. Hg	- - -	- - -
Oil Temperature	- - -	100° - 240°F	- - -	240°F
Cylinder Head Temperature	- - -	200° - 460°F	- - -	460°F
Fuel Flow (Pressure)	(3.5 psi)	42 - 102 PPH	- - -	151 PPH (19.5 psi)
Oil Pressure	10 psi	30 - 60 psi	- - -	100 psi
Fuel Quantity	E (1.5 Gal Unusable Each Tank)	- - -	- - -	- - -
Suction	- - -	4.6 - 5.4 in. Hg	- - -	- - -

Figure 2-3. Power Plant Instrument Markings

WEIGHT LIMITS

Maximum Ramp Weight: 3812 lbs.
Maximum Takeoff Weight: 3800 lbs.
Maximum Landing Weight: 3800 lbs.
Maximum Weight in Baggage Compartment:
Baggage - Forward of wheel well on folded down aft seat (Station 89 to 110): 120 lbs.
Baggage - On and aft of wheel well (Station 110 to 152): 200 lbs.

NOTE

The maximum allowable combined weight capacity for baggage forward, on and aft of the wheel well is 240 pounds.

CENTER OF GRAVITY LIMITS

Center of Gravity Range with Landing Gear Extended:
Forward: 37.0 inches aft of datum at 3000 lbs. or less, with straight line variation to 42.5 inches aft of datum at 3800 lbs.
Aft: 53.0 inches aft of datum at all weights.
Reference Datum: Lower portion of front face of firewall.

MANEUVER LIMITS

This airplane is certificated in the normal category. The normal category is applicable to aircraft intended for non-aerobatic operations. These include any maneuvers incidental to normal flying, stalls (except whip stalls), lazy eights, chandelles, and turns in which the angle of bank is not more than 60°.

Aerobatic maneuvers, including spins, are not approved.

FLIGHT LOAD FACTOR LIMITS

Flight Load Factors:
*Flaps Up: +3.8g, -1.52g
*Flaps Down: +2.0g

*The design load factors are 150% of the above, and in all cases, the structure meets or exceeds design loads.

KINDS OF OPERATION LIMITS

The airplane is equipped for day VFR and may be equipped for night VFR and/or IFR operations. FAR Part 91 establishes the minimum required instrumentation and equipment for these operations. The reference to types of flight operations on the operating limitations placard reflects equipment installed at the time of Airworthiness Certificate issuance.

Flight into known icing conditions is prohibited.

FUEL LIMITATIONS

2 Standard Tanks: 45 U.S. gallons each.
Total Fuel: 90 U.S. gallons.
Usable Fuel (all flight conditions): 87 U.S. gallons.
Unusable Fuel: 3 U.S. gallons.

Take off and land with the fuel selector valve handle in BOTH ON position.

With 1/4 tank or less, prolonged uncoordinated flight is prohibited when operating on either left or right tank.

When switching from dry tank, turn auxiliary fuel pump on momentarily.

Use of left tank or right tank only is reserved for level flight.

Approved Fuel Grades (and Colors):
100LL Grade Aviation Fuel (Blue).
100 (Formerly 100/130) Grade Aviation Fuel (Green).

OTHER LIMITATIONS

FLAP LIMITATIONS

Approved Takeoff Range: 0° to 10°.
Approved Landing Range: 0° to 30°.

PLACARDS

The following information must be displayed in the form of composite or individual placards.

1. In full view of the pilot: (The "DAY-NIGHT-VFR-IFR" entry, shown on the example below, will vary as the airplane is equipped.)

> The markings and placards installed in this airplane contain operating limitations which must be complied with when operating this airplane in the Normal Category. Other operating limitations which must be complied with when operating this airplane in this category are contained in the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
>
> No acrobatic maneuvers, including spins, approved.
>
> Flight into known icing conditions prohibited.
>
> This airplane is certified for the following flight operations as of date of original airworthiness certificate:
>
> DAY—NIGHT—VFR—IFR

2. On control lock:

> CAUTION!
> CONTROL LOCK
> REMOVE BEFORE STARTING ENGINE

3. On fuel selector valve (at appropriate locations):

> ALL FLIGHT ATTITUDES
>
> BOTH ON — 87.0 GAL.
>
> FUEL SELECTOR
>
> LEFT ON 43.5 GAL. LEVEL FLT ONLY
>
> RIGHT ON 43.5 GAL. LEVEL FLT ONLY

4. Near fuel selector valve:

TAKEOFF AND LANDING ON BOTH WHEN SWITCHING FROM DRY TANK TURN AUX FUEL PUMP ON MOMENTARILY

5. Adjacent to fuel on-off valve control knob:

FUEL VALVE PUSH ON

6. Aft of fuel tank caps:

SERVICE THIS AIRPLANE WITH 100LL/100 MIN AVIATION GRADE GASOLINE TOTAL CAPACITY 45.0 GAL.

7. Forward of fuel tank caps:

CAPACITY 33.5 GALLONS TO BOTTOM OF FILLER NECK EXTENSION

8. On baggage compartment door:

MAX BAGGAGE 200 LBS TOTAL. REFER TO WEIGHT AND BALANCE DATA FOR BAGGAGE/CARGO LOADING.

9. On hand pump cover:

MANUAL GEAR EXTENSION

1. SELECT GEAR DOWN.
2. PULL HANDLE FWD.
3. PUMP VERTICALLY.

CAUTION:

DO NOT PUMP WITH GEAR UP SELECTED

10. Above manifold pressure/fuel flow indicator:

MIN. FUEL FLOWS AT FULL THROTTLE

	2700 RPM	2850 RPM
S.L.	138 LBS/HR	144 LBS/HR
4000 FT	126 LBS/HR	132 LBS/HR
8000 FT	114 LBS/HR	120 LBS/HR
12000 FT	102 LBS/HR	108 LBS/HR

11. On flap control indicator:

0°-10°	160 KIAS	(partial flap range with dark blue color code; also, mechanical detent at 10°.)
10°-20°	130 KIAS	(indices at these positions with light blue color code; also, mechanical detent at 20°.)
20°-FULL	115 KIAS	(white color code.)

12. On inside nose wheel doors:

WARNING

BEFORE WORKING IN WHEEL WELL AREA PULL HYDRAULIC PUMP CIRCUIT BREAKER OFF.

13. Near landing gear lever:

MAX SPEED IAS	
GEAR OPER	165 KTS
GEAR DOWN	200 KTS

14. A calibration card must be provided to indicate the accuracy of the magnetic compass in 30° increments.

15. On oil filler cap:

OIL
10 QTS

16. Near airspeed indicator:

MANEUVER SPEED
125 KIAS

17. Forward of each fuel tank filler cap in line with fwd arrow :

FUEL CAP FWD ▲ ARROW ALIGNMENT
CAP MUST NOT ROTATE DURING CLOSING

18. On battery cover:

CAUTION 24 VOLTS D.C.
This aircraft is equipped with alternator and a negative ground system.
OBSERVE PROPER POLARITY
Reverse polarity will damage electrical components.

19. Adjacent to fuel gages on pedestal cover:

WHEN PARKED, SELECT LEFT OR RIGHT (ON A SLOPE, SELECT LOW WING TANK)

SECTION 3
EMERGENCY PROCEDURES

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INTRODUCTION

Section 3 provides checklist and amplified procedures for coping with emergencies that may occur. Emergencies caused by airplane or engine malfunctions are extremely rare if proper preflight inspections and maintenance are practiced. Enroute weather emergencies can be minimized or eliminated by careful flight planning and good judgment when unexpected weather is encountered. However, should an emergency arise, the basic guidelines described in this section should be considered and applied as necessary to correct the problem. Emergency procedures associated with ELT and other optional systems can be found in Section 9.

AIRSPEEDS FOR EMERGENCY OPERATION

Engine Failure After Takeoff:	
Wing Flaps Up	85 KIAS
Wing Flaps Down	80 KIAS
Maneuvering Speed:	
3800 Lbs	125 KIAS
3150 Lbs	113 KIAS
2500 Lbs	101 KIAS
Maximum Glide:	
3800 Lbs	85 KIAS
3400 Lbs	80 KIAS
3000 Lbs	75 KIAS
Precautionary Landing With Engine Power	75 KIAS
Landing Without Engine Power:	
Wing Flaps Up	90 KIAS
Wing Flaps Down	80 KIAS

OPERATIONAL CHECKLISTS

Procedures in the Operational Checklists portion of this section shown in **bold-faced** type are immediate-action items which should be committed to memory.

ENGINE FAILURES

ENGINE FAILURE DURING TAKEOFF ROLL

1. **Throttle -- IDLE.**
2. **Brakes -- APPLY.**
3. Wing Flaps -- RETRACT.
4. Mixture -- IDLE CUT-OFF.
5. Ignition Switch -- OFF.
6. Master Switch -- OFF.

ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF

1. **Airspeed -- 85 KIAS.**
2. Mixture -- IDLE CUT-OFF.
3. Fuel On-Off Valve -- OFF (pull out).
4. Wing Flaps -- AS REQUIRED (30° recommended).
5. Ignition Switch -- OFF.
6. Master Switch -- OFF.

ENGINE FAILURE DURING FLIGHT (RESTART PROCEDURES)

1. **Airspeed -- 85 KIAS.**
2. **Fuel Selector Valve -- BOTH ON.**
3. **Auxiliary Fuel Pump -- ON.**
4. Throttle -- HALF OPEN.
5. Mixture -- LEAN from full rich until restart occurs.

NOTE

If propeller is windmilling, engine will restart automatically within a few seconds. If propeller has stopped, verify fuel flow indicator is in middle of the green arc range, then retard the throttle and turn auxiliary fuel pump off. Turn the ignition switch to START, advance throttle slowly from idle, and (at higher altitudes) lean the mixture from full rich.

6. Mixture -- ADJUST as required as power is restored.
7. Throttle -- ADJUST power as required (slowly at higher altitudes).
8. Auxiliary Fuel Pump -- OFF.

NOTE

If the fuel flow indication immediately drops to zero, signifying an engine-driven fuel pump failure, return the auxiliary fuel pump switch to ON.

9. Mixture -- ADJUST.
10. Fuel Selector Valve -- AS DESIRED after fuel flow is stabilized.

FORCED LANDINGS

EMERGENCY LANDING WITHOUT ENGINE POWER

1. Airspeed -- 90 KIAS (flaps UP).
   80 KIAS (flaps DOWN).
2. Mixture -- IDLE CUT-OFF.
3. Fuel On-Off Valve -- OFF (pull out).
4. Ignition Switch -- OFF.

5. Landing Gear -- DOWN (UP if terrain is rough or soft).
6. Wing Flaps -- AS REQUIRED (30° recommended).
7. Doors -- UNLATCH PRIOR TO TOUCHDOWN.
8. Master Switch -- OFF when landing is assured.
9. Touchdown -- SLIGHTLY TAIL LOW.
10. Brakes -- APPLY HEAVILY.

PRECAUTIONARY LANDING WITH ENGINE POWER

1. Airspeed -- 85 KIAS.
2. Wing Flaps -- 10°.
3. Selected Field -- FLY OVER, noting terrain and obstructions, then retract flaps upon reaching a safe altitude and airspeed.
4. Electrical Switches -- OFF.
5. Landing Gear -- DOWN (UP if terrain is rough or soft).
6. Wing Flaps -- 30° (on final approach).
7. Airspeed -- 75 KIAS.
8. Doors -- UNLATCH PRIOR TO TOUCHDOWN.
9. Avionics Power and Master Switches -- OFF when landing is assured.
10. Touchdown -- SLIGHTLY TAIL LOW.
11. Ignition Switch -- OFF.
12. Brakes -- APPLY HEAVILY.

DITCHING

1. Radio -- TRANSMIT MAYDAY on 121.5 MHz, giving location and intentions and SQUAWK 7700 if transponder is installed.
2. Heavy Objects (in baggage area) -- SECURE OR JETTISON.
3. Landing Gear -- UP.
4. Wing Flaps -- 30°.
5. Power -- ESTABLISH 300 FT/MIN DESCENT AT 75 KIAS.
6. Approach -- High Winds, Heavy Seas -- INTO THE WIND.
   Light Winds, Heavy Swells -- PARALLEL TO SWELLS.

NOTE

If no power is available, approach at 85 KIAS with flaps up or at 80 KIAS with 10° flaps.

7. Cabin Doors -- UNLATCH.
8. Touchdown -- LEVEL ATTITUDE AT 300 FT/MIN DESCENT.
9. Face -- CUSHION at touchdown with folded coat.
10. Airplane -- EVACUATE through cabin doors. If necessary, open window and flood cabin to equalize pressure so doors can be opened.
11. Life Vests and Raft -- INFLATE.

FIRES

DURING START ON GROUND

1. **Ignition Switch -- START** (continue cranking to obtain start).
2. **Auxiliary Fuel Pump -- OFF.**

If engine starts:

3. Power -- 1700 RPM for a few minutes.
4. Engine -- SHUTDOWN and inspect for damage.

If engine fails to start:

3. **Cranking -- CONTINUE** (ignition switch in START).
4. **Throttle -- FULL OPEN.**
5. **Mixture -- IDLE CUT-OFF.**
6. Fire Extinguisher -- OBTAIN (have ground attendants obtain if not installed).
7. Engine -- SECURE.
   a. Ignition Switch -- OFF.
   b. Master Switch -- OFF.
   c. Fuel On-Off Valve -- OFF (pull out).
8. Fire -- EXTINGUISH using fire extinguisher, wool blanket or dirt.

NOTE

If sufficient ground personnel are available (and fire is on ground and not too dangerous) move airplane away from the fire by pushing rearward on the leading edge of the horizontal tail.

9. Fire Damage -- INSPECT, repair damage or replace damaged components or wiring before conducting another flight.

ENGINE FIRE IN FLIGHT

1. **Mixture -- IDLE CUT-OFF.**
2. **Fuel On-Off Valve -- OFF (pull out).**
3. Master Switch -- OFF.
4. Cabin Heat and Air -- OFF (except overhead vents).
5. Airspeed -- 120 KIAS (If fire is not extinguished, increase glide speed to find an airspeed which will provide an incombustible mixture).
6. Forced Landing -- EXECUTE (as described in Emergency Landing Without Engine Power).

ELECTRICAL FIRE IN FLIGHT

1. **Master Switch -- OFF.**
2. **Vents/Cabin Air/Heat -- CLOSED.**
3. **Fire Extinguisher -- ACTIVATE** (if available).

WARNING

If an oxygen system is available, occupants should use oxygen masks until smoke and discharged dry powder clears. After discharging an extinguisher within a closed cabin, ventilate the cabin.

4. Avionics Power Switches -- OFF.
5. All Other Switches (except ignition switch) -- OFF.

If fire appears out and electrical power is necessary for continuance of flight:

6. Master Switch -- ON.
7. Circuit Breakers -- CHECK for faulty circuit; do not reset.
8. Radio Switches -- OFF.
9. Avionics Power Switch -- ON.
10. Radio and Electrical Switches -- ON one at a time, with delay after each until short circuit is localized.
11. Vents/Cabin Air/Heat -- OPEN when it is ascertained that fire is completely extinguished.

CABIN FIRE

1. **Master Switch -- OFF.**
2. **Vents/Cabin Air/Heat -- CLOSED** (to avoid drafts).
3. **Fire Extinguisher -- ACTIVATE** (if available).

WARNING

If an oxygen system is available, occupants should use oxygen masks until smoke and discharged dry powder clears. After discharging an extinguisher within a closed cabin, ventilate the cabin.

4. Land the airplane as soon as possible to inspect for damage.

WING FIRE

1. **Radar Altimeter (if installed) -- OFF.**
2. **Navigation Light Switch -- OFF.**
3. **Strobe Light Switch (if installed) -- OFF.**

4. **Pitot Heat Switch (if installed) -- OFF.**
5. **Stall Warning Heat Switch (if installed) -- OFF.**
6. **Radar (if installed) -- OFF.**

NOTE

Perform a sideslip to keep the flames away from the fuel tank and cabin, and land as soon as possible.

ICING

INADVERTENT ICING ENCOUNTER

1. **Turn pitot heat, stall warning heat, propeller anti-ice, and windshield anti-ice switches ON** (if installed).
2. **Turn back or change altitude** to obtain an outside air temperature that is less conducive to icing.
3. **Pull cabin heat and defrost controls full out** to obtain maximum windshield defroster effectiveness.
4. Increase engine speed to minimize ice build-up on propeller blades. If excessive vibration is noted, momentarily reduce engine speed to 2200 RPM with the propeller control, and then rapidly move the control full forward.

NOTE

Cycling the RPM flexes the propeller blades and high RPM increases centrifugal force, causing ice to shed more readily.

5. Watch for signs of induction air filter ice and regain manifold pressure by increasing the throttle setting.

NOTE

If ice accumulates on the intake filter (causing the alternate air valve to open), a decrease of 1 to 2 inches of full throttle manifold pressure will be experienced.

6. If icing conditions are unavoidable, plan a landing at the nearest airport. With an extremely rapid ice build-up, select a suitable "off airport" landing site.
7. With an ice accumulation of 1/4 inch or more on the wing leading edges, be prepared for a significantly higher power requirement, approach speed, stall speed, and landing roll.
8. Open the window and, if practical, scrape ice from a portion of the windshield for visibility in the landing approach.
9. Use a 10° to 20° landing flap setting for ice accumulations of 1 inch or less. With heavier ice accumulations, approach with flaps

retracted to ensure adequate elevator effectiveness in the approach and landing.

10. Approach at 85 to 95 KIAS with 20° flaps and 95 to 105 KIAS with 0° to 10° flaps, depending upon the amount of ice accumulation. If ice accumulation is unusually large, decelerate to the planned approach speed while in the approach configuration (landing gear and flaps down) at a high enough altitude which would permit recovery in the event that a stall buffet is encountered.
11. Land on the main wheels first, avoiding the slow and high type of flare-out.
12. Missed approaches should be avoided whenever possible because of severely reduced climb capability. However, if a go-around is mandatory, make the decision much earlier in the approach than normal. Apply maximum power and maintain 95 KIAS while retracting the flaps slowly in 10° increments. Retract the landing gear after immediate obstacles are cleared.

STATIC SOURCE BLOCKAGE (Erroneous Instrument Reading Suspected)

1. **Static Pressure Alternate Source Valve (if installed) -- PULL ON.**

NOTE

In an emergency on airplanes not equipped with an alternate static source, cabin pressure can be supplied to the static pressure instruments by breaking the glass in the face of the vertical speed indicator.

2. Airspeed -- Climb 3 knots slower and approach 2 knots faster than normal or consult appropriate table in Section 5.
3. Altitude -- Cruise 100 feet higher and approach 30 feet higher than normal.
4. 400B Autopilot or 400B IFCS (if installed) -- Disengage altitude hold mode.

LANDING GEAR MALFUNCTION PROCEDURES

LANDING GEAR FAILS TO RETRACT (Green Gear Locked And/Or Red Gear Unsafe Lights Remain On)

1. Master Switch -- ON.
2. Landing Gear Lever -- CHECK (lever full up).
3. Landing Gear and Gear Pump Circuit Breakers -- IN.
4. Landing Gear Lever -- RECYCLE.
5. Landing Gear Lights -- CHECK GREEN, RED OFF. If gear still fails to retract, proceed to repair station in accordance with Retrac-

tion Malfunctions paragraph in the amplified emergency procedures.

LANDING GEAR FAILS TO EXTEND (Green Gear Locked Light Fails To Illuminate And Red Gear Unsafe Light Remains On)

1. Master Switch -- ON.
2. Landing Gear Lever -- GEAR DOWN.
3. Landing Gear and Gear Pump Circuit Breakers -- IN.
4. Emergency Hand Pump -- EXTEND HANDLE, and PUMP (perpendicular to handle until resistance becomes heavy -- about 35 cycles).
5. Gear Locked Light -- ON.
6. Gear Unsafe Light -- OFF.
7. Pump Handle -- STOW.

GEAR UNSAFE LIGHT ILLUMINATES

(GEAR UP selected)

1. Gear Motor -- CHECK audibly for operation.
2. Main Gear --CHECK visually to see if they appear to be retracted.
3. Gear Pump Circuit Breaker -- PULL if gear appears to be retracted but gear motor continues to run and flight is to be continued to a maintenance facility.

(GEAR DOWN selected)

1. Gear Locked Light -- CHECK (If the gear locked light is ON but the gear motor continues to run, PULL the gear pump circuit breaker until just prior to landing; then RESET it. This will prevent overheating the gear motor. If the gear locked light is not illuminated, proceed to the Landing Without Positive Indication of Gear Locking checklist.)

GEAR UP LANDING

1. Landing Gear Lever -- GEAR UP.
2. Landing Gear and Gear Pump Circuit Breakers -- IN.
3. Runway -- SELECT longest hard surface or smooth sod runway available.
4. Wing Flaps -- 30° (on final approach).
5. Airspeed -- 75 KIAS.
6. Doors -- UNLATCH PRIOR TO TOUCHDOWN.
7. Avionics Power and Master Switches -- OFF when landing is assured.

8. Touchdown -- SLIGHTLY TAIL LOW.
9. Mixture -- IDLE CUT-OFF.
10. Ignition Switch -- OFF.
11. Fuel On-Off Valve -- OFF (pull out).
12. Airplane -- EVACUATE.

LANDING WITHOUT POSITIVE INDICATION OF GEAR LOCKING

1. Before Landing Check -- COMPLETE.
2. Approach -- NORMAL (full flap).
3. Landing Gear and Gear Pump Circuit Breakers -- IN.
4. Landing -- TAIL LOW as smoothly as possible.
5. Braking -- MINIMUM necessary.
6. Taxi -- SLOWLY.
7. Engine -- SHUTDOWN before inspecting gear.

LANDING WITH A DEFECTIVE NOSE GEAR (Or Flat Nose Tire)

1. Movable Load -- TRANSFER to baggage area.
2. Passenger -- MOVE to rear seat.
3. Before Landing Checklist -- COMPLETE.
4. Runway -- HARD SURFACE or SMOOTH SOD.

NOTE

If sod runway is rough or soft, plan a wheels-up landing.

5. Wing Flaps -- 30°.
6. Doors -- UNLATCH PRIOR TO TOUCHDOWN.
7. Avionics Power and Master Switches -- OFF when landing is assured.
8. Land -- SLIGHTLY TAIL LOW.
9. Mixture -- IDLE CUT-OFF.
10. Ignition Switch -- OFF.
11. Fuel On-Off Valve -- OFF (pull out).
12. Elevator Control -- HOLD NOSE OFF GROUND as long as possible.
13. Airplane -- EVACUATE as soon as it stops.

LANDING WITH A FLAT MAIN TIRE

1. Approach -- NORMAL (full flap).
2. Touchdown -- GOOD TIRE FIRST, hold airplane off flat tire as long as possible with aileron control.
3. Directional Control -- MAINTAIN using brake on good wheel as required.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

AMMETER SHOWS EXCESSIVE RATE OF CHARGE (Full Scale Deflection)

1. Alternator -- OFF.
2. Alternator Circuit Breaker -- PULL.
3. Nonessential Electrical Equipment -- OFF.
4. Flight -- TERMINATE as soon as practical.

LOW-VOLTAGE LIGHT ILLUMINATES DURING FLIGHT (Ammeter Indicates Discharge)

NOTE

Illumination of the low-voltage light may occur during low RPM conditions with an electrical load on the system such as during a low RPM taxi. Under these conditions, the light will go out at higher RPM. The master switch need not be recycled since an over-voltage condition has not occurred to de-activate the alternator system. Momentary illumination and/or ammeter needle deflection may also occur during startup of the landing gear system hydraulic pump motor.

1. Avionics Power Switches -- OFF.
2. Alternator Circuit Breaker -- CHECK IN.
3. Master Switch -- OFF (both sides).
4. Master Switch -- ON.
5. Low-Voltage Light -- CHECK OFF.
6. Avionics Power Switch -- ON.

If low-voltage light illuminates again:

7. Alternator -- OFF.
8. Nonessential Radio and Electrical Equipment -- OFF.
9. Flight -- TERMINATE as soon as practical.

AMPLIFIED PROCEDURES

The following Amplified Procedures elaborate upon information contained in the Operational Checklists portion of this section. These procedures also include information not readily adaptable to a checklist format, and material to which a pilot could not be expected to refer in resolution of a specific emergency.

ENGINE FAILURE

If an engine failure occurs during the takeoff run, the most important thing to do is stop the airplane on the remaining runway. Those extra items on the checklist will provide added safety after a failure of this type.

Prompt lowering of the nose to maintain airspeed and establish a glide attitude is the first response to an engine failure after takeoff. In most cases, the landing should be planned straight ahead with only small changes in direction to avoid obstructions. Altitude and airspeed are seldom sufficient to execute a 180° gliding turn necessary to return to the runway. The checklist procedures assume that adequate time exists to secure the fuel and ignition systems prior to touchdown.

After an engine failure in flight, the best glide speed as shown in figure

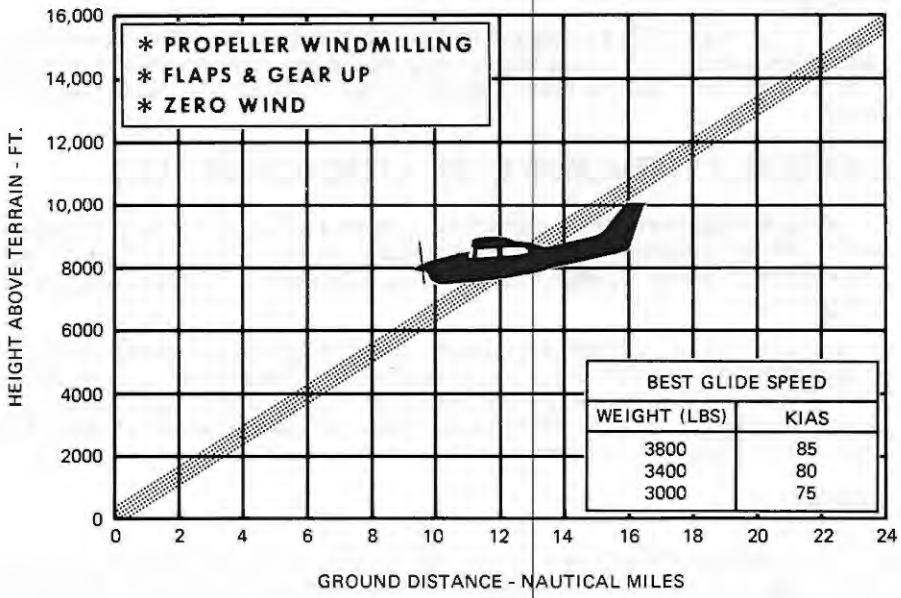


Figure 3-1. Maximum Glide

3-1 should be established as quickly as possible. While gliding toward a suitable landing area, an effort should be made to identify the cause of the failure. If time permits, an engine restart should be attempted as shown in the checklist. If the engine cannot be restarted, a forced landing without power must be completed.

FORCED LANDINGS

If all attempts to restart the engine fail and a forced landing is imminent, select a suitable field and prepare for the landing as discussed under the Emergency Landing Without Engine Power checklist.

Before attempting an "off airport" landing with engine power available, one should fly over the landing area at a safe but low altitude to inspect the terrain for obstructions and surface conditions, proceeding as discussed under the Precautionary Landing With Engine Power checklist.

Prepare for ditching by securing or jettisoning heavy objects located in the baggage area and collect folded coats for protection of occupants' face at touchdown. Transmit Mayday message on 121.5 MHz giving location and intentions and squawk 7700 if a transponder is installed. Avoid a landing flare because of difficulty in judging height over a water surface.

In a forced landing situation, do not turn off the avionics power and master switches until a landing is assured. Premature deactivation of the switches will disable the encoding altimeter and airplane electrical systems.

LANDING WITHOUT ELEVATOR CONTROL

Trim for horizontal flight (with an airspeed of approximately 80 KIAS and flaps set to 20°) by using throttle and trim tab controls. **Then do not change the trim tab setting** and control the glide angle by adjusting power exclusively.

At flareout, the nose-down moment resulting from power reduction is an adverse factor and the airplane may hit on the nose wheel. Consequently, at flareout, the trim tab should be set at full nose-up position and the power adjusted so that the airplane will rotate to the horizontal attitude for touchdown. Close the throttle at touchdown.

FIRES

Improper starting procedures such as excessive use of the auxiliary fuel pump during a cold weather start can cause a backfire which could ignite fuel that has accumulated in the intake duct. In this event, follow the prescribed checklist.

Although engine fires are extremely rare in flight, the steps of the appropriate checklist should be followed if one is encountered. After completion of this procedure, execute a forced landing. Do not attempt to restart the engine.

The initial indication of an electrical fire is usually the odor of burning insulation. The checklist for this problem should result in elimination of the fire.

EMERGENCY OPERATION IN CLOUDS (Vacuum System Failure)

In the event of a complete vacuum system failure during flight, the directional indicator and attitude indicator will be disabled, and the pilot will have to rely on the turn coordinator or the turn and bank indicator if he inadvertently flies into clouds. If an autopilot is installed, it too can be affected and should be turned off. Refer to Section 9, Supplements, for additional details concerning autopilot operation. The following instructions assume that only the electrically-powered turn coordinator or the turn and bank indicator is operative, and that the pilot is not completely proficient in instrument flying.

EXECUTING A 180° TURN IN CLOUDS

Upon inadvertently entering the clouds, an immediate plan should be made to turn back as follows:

1. Note the compass heading.
2. Note the time of the minute hand and observe the position of the sweep second hand on the clock (use timer mode with digital clock).
3. When the sweep second hand (or timer) indicates the nearest half-minute, initiate a standard rate left turn, holding the turn coordinator symbolic airplane wing opposite the lower left index mark for 60 seconds. Then roll back to level flight by leveling the miniature airplane.
4. Check accuracy of the turn by observing the compass heading which should be the reciprocal of the original heading.
5. If necessary, adjust heading primarily with skidding motions rather than rolling motions so that the compass will read more accurately.
6. Maintain altitude and airspeed by cautious application of elevator control. Avoid overcontrolling by keeping the hands off the control wheel as much as possible and steering only with rudder.

EMERGENCY DESCENT THROUGH CLOUDS

If conditions preclude reestablishment of VFR flight by a 180° turn, a

descent through a cloud deck to VFR conditions may be appropriate. If possible, obtain radio clearance for an emergency descent through clouds. To guard against a spiral dive, choose an easterly or westerly heading to minimize compass card swings due to changing bank angles. In addition, keep hands off the control wheel and steer a straight course with rudder control by monitoring the turn coordinator. Occasionally check the compass heading and make minor corrections to hold an approximate course. Before descending into the clouds, set up a stabilized let-down condition as follows:

1. Extend landing gear.
2. Reduce power to set up a 500 to 800 ft./min. rate of descent.
3. Adjust mixture for smooth operation.
4. Adjust the elevator and rudder trim control wheels for a stabilized descent at 105 KIAS.
5. Keep hands off the control wheel.
6. Monitor turn coordinator and make corrections by rudder alone.
7. Adjust rudder trim to relieve unbalanced rudder force.
8. Check trend of compass card movement and make cautious corrections with rudder to stop turn.
9. Upon breaking out of clouds, resume normal cruising flight.

RECOVERY FROM A SPIRAL DIVE

If a spiral is encountered, proceed as follows:

1. Close the throttle.
2. Stop the turn by using coordinated aileron and rudder control to align the symbolic airplane in the turn coordinator with the horizon reference line.
3. Cautiously apply control wheel back pressure to slowly reduce the airspeed to 105 KIAS.
4. Adjust the elevator trim control to maintain a 105 KIAS glide.
5. Keep hands off the control wheel, using rudder control to hold a straight heading. Adjust the rudder trim to relieve unbalanced rudder force.
6. Clear engine occasionally, but avoid using enough power to disturb the trimmed glide.
7. Upon breaking out of clouds, resume normal cruising flight.

INADVERTENT FLIGHT INTO ICING CONDITIONS

Flight into icing conditions is prohibited. An inadvertent encounter with these conditions can best be handled using the checklist procedures. The best procedure, of course, is to turn back or change altitude to escape icing conditions.

STATIC SOURCE BLOCKED

If erroneous readings of the static source instruments (airspeed, altimeter and vertical speed) are suspected, the static pressure alternate source valve should be pulled on, thereby supplying static pressure to these instruments from the cabin.

NOTE

In an emergency on airplanes not equipped with an alternate static source, cabin pressure can be supplied to the static pressure instruments by breaking the glass in the face of the vertical speed indicator.

Cabin pressures will be affected by open ventilators or windows and varying airspeeds, and this will affect the readings.

With windows closed, maximum airspeed and altimeter variation from normal occurs with the vents closed and reaches 2 knots and 40 feet respectively at maximum cruise (instruments read high). During approach, with vents closed, typical variations are 3 knots and 30 feet respectively (reads high). Opening the vents tends to reduce these variations to zero.

With windows open, variations up to 30 knots and 190 feet occur near stall (reads low) and up to 7 knots and 100 feet at maximum cruise (reads high). During approach, typical variations are 5 knots and 60 feet (reads low).

With the alternate static source on, fly the airplane at airspeeds and altitudes which compensate for the variations from normal indications. For more exact airspeed correction, refer to the Airspeed Calibration - Alternate Static Source table in Section 5, appropriate to the vent/window configuration.

If a 400B autopilot or IFCS system is installed and operating, the altitude hold function should be disengaged when the alternate static source is turned on.

SPINS

Intentional spins are prohibited in this airplane. Should an inadvertent spin occur, the following recovery technique may be used:

1. RETARD THROTTLE TO IDLE POSITION.
2. PLACE AILERONS IN NEUTRAL POSITION.
3. APPLY AND **HOLD** FULL RUDDER OPPOSITE TO THE DIRECTION OF ROTATION.

4. JUST **AFTER** THE RUDDER REACHES THE STOP, MOVE THE CONTROL WHEEL **BRISKLY** FORWARD FAR ENOUGH TO BREAK THE STALL. Full down elevator may be required at aft center of gravity loadings to assure optimum recoveries.
5. **HOLD** THESE CONTROL INPUTS UNTIL ROTATION STOPS. Premature relaxation of the control inputs may extend the recovery.
6. AS ROTATION STOPS, NEUTRALIZE RUDDER, AND MAKE A SMOOTH RECOVERY FROM THE RESULTING DIVE.

NOTE

If disorientation precludes a visual determination of the direction of rotation, the symbolic airplane in the turn coordinator or the needle of the turn and bank indicator may be referred to for this information.

ROUGH ENGINE OPERATION OR LOSS OF POWER

SPARK PLUG FOULING

A slight engine roughness in flight may be caused by one or more spark plugs becoming fouled by carbon or lead deposits. This may be verified by turning the ignition switch momentarily from BOTH to either L or R position. An obvious power loss in single ignition operation is evidence of spark plug or magneto trouble. Assuming that spark plugs are the more likely cause, lean the mixture to the recommended lean setting for cruising flight. If the problem does not clear up in several minutes, determine if a richer mixture setting will produce smoother operation. If not, proceed to the nearest airport for repairs using the BOTH position of the ignition switch unless extreme roughness dictates the use of a single ignition position.

MAGNETO MALFUNCTION

A sudden engine roughness or misfiring is usually evidence of magneto problems. Switching from BOTH to either L or R ignition switch position will identify which magneto is malfunctioning. Select different power settings and enrichen the mixture to determine if continued operation on BOTH magnetos is practicable. If not, switch to the good magneto and proceed to the nearest airport for repairs.

ENGINE-DRIVEN FUEL PUMP FAILURE

Failure of the engine-driven fuel pump will be evidenced by a sudden

reduction in the fuel flow indication immediately **prior to a loss of power**, while operating from a fuel tank containing adequate fuel.

In the event of an engine-driven fuel pump failure during takeoff, immediately hold the left half of the auxiliary fuel pump switch in the HI position until the airplane is well clear of obstacles. Upon reaching a safe altitude, and reducing the power to a cruise setting, release the HI side of the switch. The ON position will then provide sufficient fuel flow to maintain engine operation while maneuvering for a landing.

If an engine-driven fuel pump failure occurs during cruising flight, apply full rich mixture and hold the left half of the auxiliary fuel pump switch in the HI position to re-establish fuel flow. Then the normal ON position (the right half of the fuel pump switch) may be used to sustain level flight. If necessary, additional fuel flow is obtainable by holding the left half of the pump switch in the HI position.

LOW OIL PRESSURE

If low oil pressure is accompanied by normal oil temperature, there is a possibility the oil pressure gage or relief valve is malfunctioning. A leak in the line to the gage is not necessarily cause for an immediate precautionary landing because an orifice in this line will prevent a sudden loss of oil from the engine sump. However, a landing at the nearest airport would be advisable to inspect the source of trouble.

If a total loss of oil pressure is accompanied by a rise in oil temperature, there is good reason to suspect an engine failure is imminent. Reduce engine power immediately and select a suitable forced landing field. Use only the minimum power required to reach the desired touchdown spot.

LANDING GEAR MALFUNCTION PROCEDURES

In the event of possible landing gear retraction or extension malfunctions, there are several general checks that should be made prior to initiating the steps outlined in the following paragraphs.

In analyzing a landing gear malfunction, first check that the master switch is ON and the LDG GEAR and GEAR PUMP circuit breakers are in; reset if necessary. Also, check both landing gear position indicator lights for operation by "pressing-to-test" the light units and rotating them at the same time to check for open dimming shutters. A burned-out bulb can be replaced in flight by using the bulb from a post light or from the remaining gear position indicator light.

RETRACTION MALFUNCTIONS

Normal landing gear retraction time is approximately 8 seconds. If the landing gear fails to retract normally, attempt to recycle the landing gear. Place the landing gear lever in the GEAR DOWN position. When the GEAR LOCKED light illuminates, reposition the gear lever in the GEAR UP position for another retraction attempt. If the GEAR UNSAFE indicator light remains illuminated, the flight may be continued to an airport having maintenance facilities. If gear motor operation is audible after a period of one minute following gear up selection, pull the GEAR PUMP circuit breaker switch to prevent the electric motor from overheating. In this event, remember to re-engage the circuit breaker just prior to gear extension. Intermittent gear motor operation may also be detected audibly or by momentary fluctuations of the ammeter needle, and illumination of the GEAR UNSAFE light.

EXTENSION MALFUNCTIONS

Normal landing gear extension time is approximately 6 seconds. If the landing gear will not extend normally, perform the general checks of circuit breakers and master switch and repeat the normal extension procedures at a reduced airspeed of 100 KIAS. The landing gear lever must be in the down position with the detent engaged. If efforts to extend and lock the gear through the normal landing gear system fail, the gear can be manually extended (as long as hydraulic system fluid has not been completely lost) by use of the emergency hand pump. The hand pump is located between the front seats. A checklist is provided for step-by-step instructions for a manual gear extension.

It is possible to have both the GEAR LOCKED and GEAR UNSAFE indicator lights illuminated at the same time. This indicates that the gear is down and locked but because of a pressure switch malfunction or a malfunctioning hydraulic pump, the pump motor is still running. If this should occur, pull the gear pump circuit breaker to prevent the electric motor from overheating. In this event, remember to re-engage the circuit breaker just prior to landing.

GEAR UP LANDING

If the landing gear remains retracted or is only partially extended, and all efforts to fully extend it (including manual extension) have failed, plan a wheels up landing. In preparation for landing, reposition the landing gear lever to GEAR UP and push the LDG GEAR and GEAR PUMP circuit breakers in to allow the landing gear to swing into the gear wells at touchdown. Then proceed in accordance with the checklist.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

Malfunctions in the electrical power supply system can be detected by periodic monitoring of the ammeter and low-voltage warning light; however, the cause of these malfunctions is usually difficult to determine. A broken alternator drive belt or wiring is most likely the cause of alternator failures, although other factors could cause the problem. A defective alternator control unit can also cause malfunctions. Problems of this nature constitute an electrical emergency and should be dealt with immediately. Electrical power malfunctions usually fall into two categories: excessive rate of charge and insufficient rate of charge. The paragraphs below describe the recommended remedy for each situation.

EXCESSIVE RATE OF CHARGE

After engine starting and heavy electrical usage at low engine speeds (such as extended taxiing) the battery condition will be low enough to accept above normal charging during the initial part of a flight. However, after thirty minutes of cruising flight, the ammeter should be indicating less than two needle widths of charging current. If the charging rate were to remain above this value on a long flight, the battery would overheat and evaporate the electrolyte at an excessive rate.

Electronic components in the electrical system can be adversely affected by higher than normal voltage. The alternator control unit includes an over-voltage sensor which normally will automatically shut down the alternator if the charge voltage reaches approximately 31.5 volts. If the over-voltage sensor malfunctions, as evidenced by an excessive rate of charge shown on the ammeter, the alternator should be turned off, the alternator circuit breaker pulled, nonessential electrical equipment turned off and the flight terminated as soon as practical.

INSUFFICIENT RATE OF CHARGE

NOTE

Illumination of the low-voltage light and ammeter discharge indications may occur during low RPM conditions with an electrical load on the system, such as during a low RPM taxi. Under these conditions, the light will go out at higher RPM. The master switch need not be recycled since an over-voltage condition has not occurred to de-activate the alternator system. Momentary illumination and/or ammeter needle deflection may also occur during startup of the landing gear system hydraulic pump motor.

If the over-voltage sensor should shut down the alternator or if the alternator output is low, a discharge rate will be shown on the ammeter followed by illumination of the low-voltage warning light. Since this may be a "nuisance" trip-out, an attempt should be made to reactivate the alternator system. To do this, turn the avionics power switches off, check that the alternator circuit breaker is in, then turn both sides of the master switch off and then on again. If the problem no longer exists, normal alternator charging will resume and the low-voltage light will go off. The avionics power switch may then be turned back on. If the light illuminates again, a malfunction is confirmed. In this event, the flight should be terminated and/or the current drain on the battery minimized because the battery can supply the electrical system for only a limited period of time. Battery power must be conserved for later operation of the landing gear and wing flaps and, if the emergency occurs at night, for possible use of landing lights during landing. Details of the dual alternator installation are presented in Section 9, Supplements.

SECTION 4
NORMAL PROCEDURES

TABLE OF CONTENTS

4. Rudder Gust Lock -- REMOVE.
5. Tail Tie-Down -- DISCONNECT.
6. Control Surfaces -- CHECK freedom of movement and security.
7. Right Main Gear Wheel Well -- CHECK for condition and cleanliness.
8. Right Static Source Opening -- CHECK for stoppage.

(3) RIGHT WING Trailing Edge

1. Aileron -- CHECK for freedom of movement and security.
2. Aileron Gap Seal -- CHECK security and fit.
3. Fuel Tank Vent at Wing Tip Trailing Edge -- CHECK for stoppage.

(4) RIGHT WING

1. Wing Tie-Down -- DISCONNECT.
2. Fuel Quantity -- CHECK VISUALLY for desired level.
3. Fuel Filler Cap -- SECURE and vent unobstructed.
4. Radome (if weather radar is installed) -- CHECK for condition and security.
5. Fuel Tank Sump Quick-Drain Valve -- DRAIN at least a cupful of fuel (using sampler cup) to check for water, sediment, and proper fuel grade before first flight of day and after each refueling. If water is observed, take further samples until clear and then gently rock wings and lower tail to the ground to move any additional contaminants to the sampling points. Take repeated samples from all fuel drain points until all contamination has been removed.
6. Right Main Wheel -- CHECK tire for proper inflation and condition.
7. Retractable Cabin Step (if installed) -- CHECK for security and cleanliness and retraction well for cleanliness.

(5) NOSE

1. Vapor Return Line Quick-Drain Valve -- DRAIN at least a cupful of fuel (using sampler cup) to check for water, sediment, and proper fuel grade before first flight of day and after each refueling. If water is observed, take further samples until clear and then gently rock wings and lower tail to the ground to move any additional contaminants to the sampling points. Take repeated samples from all fuel drain points until all contamination has been removed.
2. Propeller and Spinner -- CHECK for nicks, security and oil leaks.
3. Air Inlets -- CHECK engine induction air (right), heater air (left), and oil cooler air (lower) for restrictions.
4. Landing and Taxi Lights -- CHECK for condition and cleanliness.
5. Nose Gear Doors -- CHECK for security.
6. Nose Wheel Tire, Strut and Wheel Well -- CHECK tire and strut for

proper inflation and wheel well for condition and cleanliness.

7. Nose Tie-Down -- DISCONNECT.
8. Engine Oil Filler Cap -- CHECK secure.
9. Engine Oil Dipstick -- CHECK oil level, then check dipstick SECURE. Do not operate with less than seven quarts. Fill to ten quarts for extended flight.
10. Fuel Strainer Quick-Drain Valve -- DRAIN at least a cupful of fuel (using sampler cup) to check for water, sediment, and proper fuel grade before first flight of day and after each refueling. Check strainer drain CLOSED. If water is observed, perform further draining at all drain points until clear and then gently rock wings and lower tail to the ground to move any additional contaminants to the sampling points. Take repeated samples from all fuel drain points until all contamination has been removed.
11. Fuel Reservoir Quick-Drain Valve -- DRAIN at least a cupful of fuel (using sampler cup) to check for water, sediment, and proper fuel grade before first flight of day and after each refueling. If water is observed, take further samples until clear and then gently rock wings and lower tail to the ground to move any additional contaminants to the sampling points. Take repeated samples from all fuel drain points until all contamination has been removed.

(6) LEFT WING

1. Left Main Wheel -- CHECK tire for proper inflation and condition.
2. Fuel Tank Sump Quick-Drain Valve -- DRAIN at least a cupful of fuel (using sampler cup) to check for water, sediment, and proper fuel grade before first flight of day and after each refueling. If water is observed, take further samples until clear and then gently rock wings and lower tail to the ground to move any additional contaminants to the sampling points. Take repeated samples from all fuel drain points until all contamination has been removed.
3. Fuel Quantity -- CHECK VISUALLY for desired level.
4. Fuel Filler Cap -- SECURE and vent unobstructed.

(7) LEFT WING Leading Edge

1. Pitot Tube Cover -- REMOVE and check opening for stoppage.
2. Stall Warning Vane -- CHECK for freedom of movement. While master switch is turned on, horn should sound when vane is pushed upward.
3. Wing Tie-Down -- DISCONNECT.

(8) LEFT WING Trailing Edge

1. Fuel Tank Vent at Wing Tip Trailing Edge -- CHECK for stoppage.
2. Aileron -- CHECK for freedom of movement and security.

3. Aileron Gap Seal -- CHECK security and fit.

BEFORE STARTING ENGINE

1. Preflight Inspection -- COMPLETE.
2. Passenger Briefing -- COMPLETE.
3. Seats, Seat Belts, Shoulder Harnesses -- ADJUST and LOCK.
4. Brakes -- TEST and SET.
5. Avionics Power Switches -- OFF.

CAUTION

The avionics power switches must be OFF during engine start to prevent possible damage to avionics.

6. Circuit Breakers -- CHECK IN.
7. Electrical Equipment -- OFF.
8. Landing Gear Lever -- GEAR DOWN.
9. Air Conditioner (if installed) -- OFF.
10. Radar (if installed) -- OFF.
11. Autopilot (if installed) -- OFF.
12. Cowl Flaps -- OPEN (move lever out of locking hole to reposition).
13. Manual Primer (if installed) -- IN and LOCKED.

STARTING ENGINE

1. Throttle -- CLOSED.
2. Propeller -- HIGH RPM.
3. Mixture -- RICH.
4. Propeller Area -- CLEAR.
5. Master Switch -- ON.
6. Auxiliary Fuel Pump -- ON.
7. Throttle -- ADVANCE to obtain 50-60 PPH, then RETURN to IDLE POSITION.
8. Auxiliary Fuel Pump -- OFF.
9. Ignition Switch -- START.
10. Throttle -- ADVANCE slowly.
11. Ignition Switch -- RELEASE when engine starts.

NOTE

The engine should start in two or three revolutions. If it does not continue running, start again at step 6 above. If the engine does not start, leave auxiliary fuel pump switch off, set mixture to idle cut-off, open throttle, and crank

until engine fires or for approximately 15 seconds. If still unsuccessful, start again using the normal starting procedure after allowing the starter motor to cool.

12. Throttle -- RESET to desired idle speed.
13. Oil Pressure -- CHECK.
14. Starter -- CHECK DISENGAGED (if starter were to remain engaged, ammeter would indicate full scale charge with engine running at 1000 RPM).
15. Avionics Power Switch -- ON.
16. Low-Voltage Warning Light -- OFF (approximately 800 RPM).
17. Alternator Off Lights (if installed) -- OFF.
18. Fuel Computer/Digital Clock (if installed) -- SET.
19. Navigation Lights and Flashing Beacon -- ON as required.
20. Radios -- ON.

BEFORE TAKEOFF

1. Parking Brake -- SET.
2. Seats, Seat Belts, Shoulder Harnesses -- CHECK SECURE.
3. Cabin Doors -- CLOSED and LOCKED.
4. Flight Controls -- FREE and CORRECT.
5. Flight Instruments -- CHECK and SET.
6. Auxiliary Fuel Pump -- OFF.
7. Mixture -- RICH (below 3000 feet).
8. Primer (if installed) -- CHECK LOCKED.
9. Fuel On-Off Valve -- RECHECK ON (full in).
10. Fuel Quantity -- CHECK.
11. Fuel Selector Valve -- RECHECK BOTH ON.
12. Elevator and Rudder Trim -- SET for takeoff.
13. Throttle -- 1700 RPM.
    a. Magnetos -- CHECK (RPM drop should not exceed 150 RPM on either magneto or 50 RPM differential between magnetos).
    b. Propeller -- CYCLE from high to low RPM; return to high RPM (full forward).
    c. Suction Gage -- CHECK in green arc and low-vacuum warning buttons retracted (if installed) or low-vacuum warning light off (if installed).
    d. Engine Instruments and Volt/Ammeter (if installed) -- CHECK.
14. Throttle -- 1000 RPM.
15. Throttle Friction Lock -- ADJUST.
16. Strobe Lights -- AS DESIRED.
17. Radios and Avionics -- SET.

18. Autopilot (if installed) (200A, 300A) -- OFF.
    (400B, IFCS) -- PREFLIGHT TEST (See Section 9), then OFF.
19. Wing Flaps -- SET for takeoff (see Takeoff checklists).
20. Cowl Flaps -- FULL OPEN.
21. Air Conditioner (if installed) -- OFF.
22. Brakes -- RELEASE.

TAKEOFF

NORMAL TAKEOFF

1. Wing Flaps -- 0°- 10° (10° preferred).
2. Power -- FULL THROTTLE and 2850 RPM.
3. Mixture -- RICH (lean for field elevation per fuel flow placard above 3000 feet).
4. Elevator Control -- LIFT NOSE WHEEL at 60 to 70 KIAS.

NOTE

When the nose wheel is lifted the gear motor may run 2-3 seconds (accompanied by momentary illumination of GEAR UNSAFE light) to restore hydraulic pressure.

5. Climb Speed -- 80-90 KIAS.
6. Brakes -- APPLY momentarily when airborne.
7. Landing Gear -- RETRACT in climb out.
8. Wing Flaps -- RETRACT.

SHORT FIELD TAKEOFF

1. Wing Flaps -- 10°.
2. Brakes -- APPLY.
3. Power -- FULL THROTTLE and 2850 RPM.
4. Mixture -- ADJUST for field elevation per fuel flow placard.
5. Brakes -- RELEASE.
6. Elevator Control -- SLIGHTLY TAIL-LOW.
7. Climb Speed -- 74 KIAS until all obstacles are cleared.
8. Landing Gear -- RETRACT after obstacles are cleared.
9. Wing Flaps -- RETRACT after reaching 80 KIAS.

NOTE

Do not reduce power until wing flaps and landing gear have been retracted.

ENROUTE CLIMB

NORMAL CLIMB

1. Airspeed -- 100-110 KIAS.
2. Power -- 25 INCHES Hg (OR FULL THROTTLE ABOVE 4000 FEET) and 2550 RPM.
3. Mixture -- LEAN to recommended fuel flow:
   108 PPH from S. L. to 4000 feet.
   102 PPH at 6000 feet.
   96 PPH at 8000 feet.
   90 PPH at 10,000 feet.
4. Cowl Flaps -- OPEN as required.

MAXIMUM PERFORMANCE CLIMB

1. Airspeed -- 98 KIAS at sea level to 92 KIAS at 10,000 feet.
2. Power -- FULL THROTTLE and 2700 RPM.
3. Mixture -- LEAN per fuel flow placard.
4. Cowl Flaps -- FULL OPEN.

CRUISE

1. Power -- 15-25 INCHES Hg, 2200-2550 RPM (no more than 75%).
2. Elevator and Rudder Trim -- ADJUST.
3. Mixture -- LEAN for cruise fuel flow using the EGT gage (if installed), a Cessna Power Computer, or the data in Section 5.
4. Cowl Flaps -- CLOSED (open if required).

DESCENT

1. Auxiliary Fuel Pump -- OFF.
2. Power -- AS DESIRED.
3. Mixture -- ADJUST for smooth operation (full rich for idle power).
4. Cowl Flaps -- CLOSED.

BEFORE LANDING

1. Seats, Seat Belts, Shoulder Harnesses -- SECURE.
2. Auxiliary Fuel Pump -- OFF.
3. Fuel Selector Valve -- BOTH ON.

4. Landing Gear -- EXTEND (below 165 KIAS).
5. Landing Gear -- CHECK (observe main gear down and green indicator light on).
6. Mixture -- RICH.
7. Propeller -- HIGH RPM.
8. Radar (if installed) -- OFF.
9. Autopilot (if installed) -- OFF.
10. Wing Flaps -- AS DESIRED (0° to 10° below 160 KIAS, 10° to 20° below 130 KIAS, and 20° to 30° below 115 KIAS).
11. Air Conditioner (if installed) -- OFF.

LANDING

NORMAL LANDING

1. Airspeed -- 85-95 KIAS (flaps UP).
2. Wing Flaps -- AS DESIRED (flaps down preferred).
3. Airspeed -- 70-80 KIAS (flaps DOWN).
4. Elevator Trim -- ADJUST.
5. Touchdown -- MAIN WHEELS FIRST.
6. Landing Roll -- LOWER NOSE WHEEL GENTLY.
7. Braking -- MINIMUM REQUIRED.

SHORT FIELD LANDING

1. Wing Flaps -- FULL DOWN.
2. Airspeed -- 75 KIAS.
3. Elevator Trim -- ADJUST.
4. Power -- REDUCE to idle after clearing obstacle.
5. Touchdown -- MAIN WHEELS FIRST.
6. Brakes -- APPLY HEAVILY.
7. Wing Flaps -- RETRACT.

BALKED LANDING

1. Power -- FULL THROTTLE and 2850 RPM.
2. Wing Flaps -- RETRACT to 20° (immediately).
3. Climb Speed -- 70 KIAS (until obstacles are cleared).
4. Mixture -- RICH (lean for field elevation per fuel flow placard above 3000 feet).
5. Wing Flaps -- RETRACT slowly (after reaching safe altitude and 75-80 KIAS).
6. Cowl Flaps -- OPEN.

AFTER LANDING

1. Wing Flaps -- RETRACT.
2. Cowl Flaps -- OPEN.

SECURING AIRPLANE

1. Parking Brake -- SET.
2. Avionics Power Switches, Electrical Equipment -- OFF.
3. Mixture -- IDLE CUT-OFF (pulled full out).
4. Ignition Switch -- OFF.
5. Master Switch -- OFF.
6. Control Lock -- INSTALL.
7. Fuel Selector Valve -- LEFT ON or RIGHT ON (Select low wing tank if parked on sloping surface to minimize cross-feeding and spillage).

AMPLIFIED PROCEDURES

PREFLIGHT INSPECTION

The Preflight Inspection, described in figure 4-1 and adjacent checklist, is recommended for the first flight of the day. Inspection procedures for subsequent flights are normally limited to brief checks of control surface hinges, fuel and oil quantity, security of fuel and oil filler caps and draining of the fuel system drains. If the airplane has been in extended storage, has had recent major maintenance, or has been operated from marginal airports, a more extensive exterior inspection is recommended.

After major maintenance has been performed, the flight and trim tab controls should be double-checked for free and correct movement and security. The security of all inspection plates on the airplane should be checked following periodic inspections. If the airplane has been waxed or polished, check the external static pressure source holes for stoppage.

If the airplane has been exposed to much ground handling in a crowded hangar, it should be checked for dents and scratches on wings, fuselage, and tail surfaces, as well as damage to navigation and anti-collision lights, and avionics antennas.

Outside storage for long periods may result in dust and dirt accumulation on the induction air filter, obstructions in airspeed system lines, and condensation in fuel tanks. If any water is detected in the fuel system, the quick-drain valves in the fuel tank sumps, vapor return line, fuel reservoir, and fuel strainer should all be thoroughly drained again. Then, the wings should be gently rocked and the tail lowered to the ground to move any further contaminants to the sampling points. Repeated samples should be taken from all drain points until all contamination has been removed. If, after repeated sampling, evidence of contamination still exists, the fuel tanks should be completely drained and the fuel system cleaned. Outside storage in windy or gusty areas, or tie-down adjacent to taxiing airplanes, calls for special attention to control surface stops, hinges, and brackets to detect the presence of wind damage.

If the airplane has been operated from muddy fields or in snow or slush, check the main and nose gear wheel wells for obstructions and cleanliness. Operation from a gravel or cinder field will require extra attention to propeller tips and abrasion on leading edges of the horizontal tail. Stone damage to the propeller can seriously reduce the fatigue life of the blades.

Airplanes that are operated from rough fields, especially at high altitudes, are subjected to abnormal landing gear abuse. Frequently check all components of the landing gear, shock strut, tires, and brakes. If the shock strut is insufficiently extended, undue landing and taxi loads will be subjected on the airplane structure.

To prevent loss of fuel in flight, make sure the fuel tank filler caps are tightly sealed after any fuel system check or servicing. Fuel system vents should also be inspected for obstructions, ice or water, especially after exposure to cold, wet weather.

The interior inspection will vary according to the planned flight and the optional equipment installed. For example, if the airplane is equipped with an oxygen system, check the condition and quantity of oxygen face masks and hose assemblies prior to high altitude flight. The oxygen supply system should be functionally checked to ensure that it is in working order and that an adequate supply of oxygen is available.

STARTING ENGINE

Proper fuel management and throttle adjustments are the determining factors in securing an easy start from your continuous-flow fuel-injection engine. The procedure outlined below should be followed closely as it is effective under nearly all operating conditions.

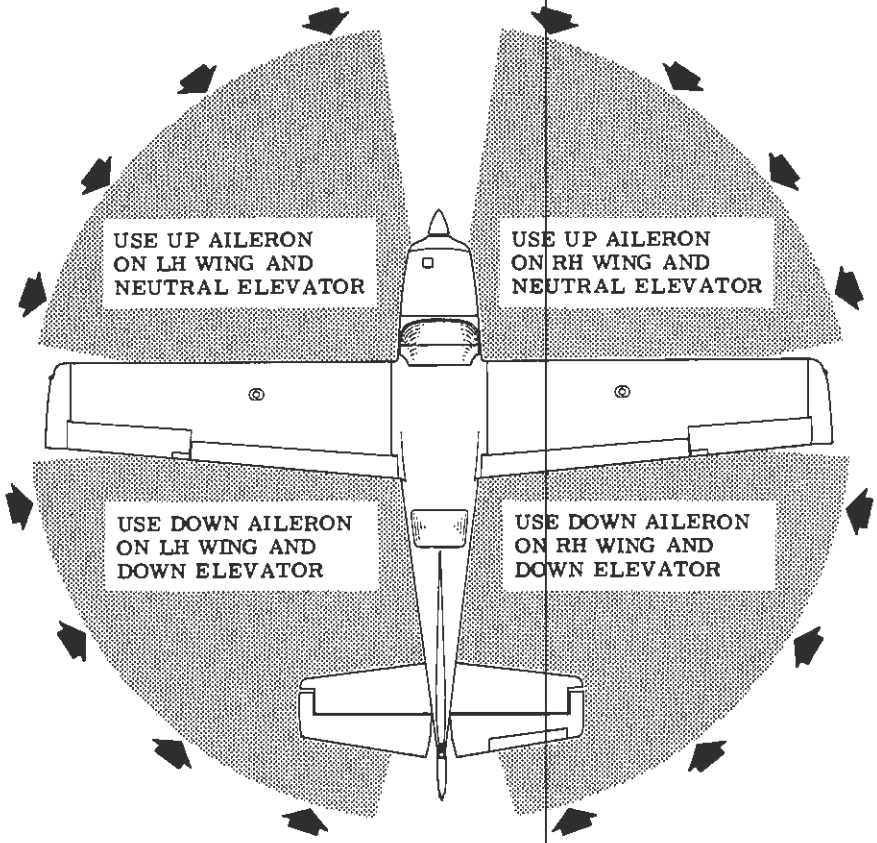
Conventional full rich mixture and high RPM propeller settings are used for starting; the throttle, however, should be fully closed initially. When ready to start, place the auxiliary fuel pump switch in the ON position and advance the throttle to obtain 50-60 PPH fuel flow. Then promptly return the throttle to idle and turn off the auxiliary fuel pump. Place the ignition switch in the START position. While cranking, slowly advance the throttle until the engine starts. Slow throttle advancement is essential since the engine will start readily when the correct fuel/air ratio is obtained. When the engine has started, reset the throttle to the desired idle speed.

When the engine is hot or outside air temperatures are high, the engine may die after running several seconds because the mixture became either too lean due to fuel vapor, or too rich due to excessive prime fuel. The following procedure will prevent over-priming and alleviate fuel vapor in the system:

1. Set the throttle 1/3 to 1/2 open.
2. When the ignition switch is in the BOTH position and you are ready to engage the starter, place the right half of the auxiliary fuel pump switch in the ON position until the indicated fuel flow comes up to 25 to 35 PPH; then turn the switch off.

NOTE

During a restart after a brief shutdown in extremely hot weather, the presence of fuel vapor may require the use of the auxiliary fuel pump switch in the ON position for up to 1 minute or more before the vapor is cleared sufficiently to



CODE

WIND DIRECTION

NOTE

Strong quartering tail winds require caution. Avoid sudden bursts of the throttle and sharp braking when the airplane is in this attitude. Use the steerable nose wheel and rudder to maintain direction.

Figure 4-2. Taxiing Diagram

obtain 25 to 35 PPH for starting. If the above procedure does not obtain sufficient fuel flow, fully depress and hold the left half of the switch in the HI position to obtain additional fuel pump capability.

3. Without hesitation, engage the starter and the engine should start in 3 to 5 revolutions. Adjust throttle for 1200 to 1400 RPM.
4. If there is fuel vapor in the lines, it will pass into the injector nozzles in 2 to 3 seconds and the engine will gradually slow down and stop. When engine speed starts to decrease, hold the left half of the auxiliary fuel pump switch in the HI position for approximately one second to clear out the vapor. Intermittent use of the HI position of the switch is necessary since prolonged use of the HI position after vapor is cleared will flood out the engine during a starting operation.
5. Let the engine run at 1200 to 1400 RPM until the vapor is eliminated and the engine idles normally.

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

After starting, if the oil pressure gage does not begin to show pressure within 30 seconds in normal temperatures and 60 seconds in very cold weather, shut off the engine and investigate. Lack of oil pressure can cause serious engine damage.

After the completion of normal engine starting procedures, it is a good practice to verify that the engine starter has disengaged. If the starter contactor were to stick closed, causing the starter to remain engaged, an excessively high charge indication (full scale at 1000 RPM) would be evident on the ammeter. In this event, immediately shut down the engine and take corrective action prior to flight.

TAXIING

Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller tips. Refer to figure 4-2 for additional taxiing instructions.

BEFORE TAKEOFF

WARM-UP

Since the engine is closely cowled for efficient in-flight cooling, precautions should be taken to avoid overheating on the ground. Full throttle checks on the ground are not recommended unless the pilot has good reason to suspect that the engine is not turning up properly.

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, note RPM and return the switch to the BOTH position. RPM drop should not exceed 150 RPM on either magneto or show greater than 50 RPM differential between magnetos. 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.

ALTERNATOR CHECK

Prior to flights where verification of proper alternator and alternator control unit operation is essential (such as night or instrument flights), a positive verification can be made by loading the electrical system momentarily (3 to 5 seconds) with the landing light during the engine runup (1700 RPM). The ammeter will remain within a needle width of the initial indication if the alternator and alternator control unit are operating properly.

TAKEOFF

POWER CHECK

It is important to check takeoff power early in the takeoff roll. Any sign of rough engine operation or sluggish engine acceleration is good cause for discontinuing the takeoff.

Full power runups over loose gravel are especially harmful to propeller tips. When takeoffs 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.

After full power is applied, adjust the throttle friction lock clockwise to prevent the throttle from creeping from a maximum power position. Similar friction lock adjustments should be made as required in other flight conditions to maintain a fixed throttle setting.

For maximum engine power, the mixture should be adjusted during the initial takeoff roll to the fuel flow corresponding to the field elevation.

(Refer to the fuel flow placard located adjacent to fuel flow indicator.) The power increase is significant above 3000 feet and this procedure should always be employed for field elevations greater than 5000 feet above sea level.

WING FLAP SETTINGS

Using 10° wing flaps reduces the ground roll and total distance over the obstacle by approximately 10 percent. Soft field takeoffs are performed with 10° flaps by lifting the nose wheel off the ground as soon as practical and leaving the ground in a slightly tail-low attitude. However, the airplane should be leveled off immediately to accelerate to a safe climb speed. Flap settings greater than 10° are not approved for takeoff.

SHORT FIELD TAKEOFF

If an obstruction dictates the use of a steep climb angle, after liftoff accelerate to and climb out at an obstacle clearance speed of 74 KIAS with 10° flaps and gear extended. This speed provides the best overall climb speed to clear obstacles when taking into account the turbulence often found near ground level. The takeoff performance data in Section 5 is based on this speed and configuration.

CROSSWIND TAKEOFF

Takeoffs into strong crosswinds normally are performed with the minimum flap setting necessary for the field length, to minimize the drift angle immediately after takeoff. With the ailerons partially deflected into the wind, the airplane is accelerated to a speed higher than normal, and 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.

LANDING GEAR RETRACTION

Landing gear retraction normally is started after reaching the point over the runway where a wheels-down, forced landing on that runway would become impractical. Since the landing gear swings downward approximately two feet as it starts the retraction cycle, damage can result by retracting it before obtaining at least that much ground clearance.

Before retracting the landing gear, the brakes should be applied momentarily to stop wheel rotation. Centrifugal force caused by the rapidly-spinning wheel expands the diameter of the tire. If there is an accumulation of mud or ice in the wheel wells, the rotating wheel may rub as it is retracted into the wheel well.

After the retraction cycle is complete, verify that the GEAR UNSAFE light is not illuminated.

ENROUTE CLIMB

A cruising climb at 25 inches of manifold pressure, 2550 RPM (approximately 75% power) and 100-110 KIAS is normally recommended. This type of climb provides an optimum combination of performance, visibility ahead, and passenger comfort (due to lower noise level).

Cruising climbs should be conducted at 108 PPH up to 4000 feet and at the fuel flow shown on the Normal Climb chart in Section 5 for higher altitudes.

If it is necessary to climb rapidly to clear mountains or reach favorable weather or winds at high altitudes, the best rate-of-climb speed should be used with maximum continuous power. This speed is 98 KIAS at sea level, decreasing to 92 KIAS at an altitude of 10,000 feet. The mixture should be leaned in accordance with the fuel flow placard located adjacent to the fuel flow indicator. Above 12,000 feet, the mixture may be leaned for power and smooth operation or set to 100° rich of peak EGT if an EGT indicator is installed.

If an obstruction dictates the use of a steep climb angle, climb with flaps retracted and maximum continuous power at 81 KIAS at sea level to 82 KIAS at 10,000 feet.

CRUISE

Normal cruising is performed between 55% and 75% power. The corresponding power settings and fuel consumption for various altitudes can be determined by using your Cessna Power Computer or the data in Section 5.

NOTE

Cruising should be done at 65% to 75% power until a total of 50 hours has accumulated or oil consumption has stabilized. This is to ensure proper seating of the rings and is applicable to new engines, and engines in service following cylinder replacement or top overhaul of one or more cylinders.

The Cruise Performance Table, figure 4-3, illustrates the advantage of higher altitude on both true airspeed and nautical miles per gallon. In addition, the beneficial effect of lower cruise power on nautical miles per gallon at a given altitude can be observed. This table should be used as a guide, along with the available winds aloft information, to determine the

	75% POWER		65% POWER		55% POWER	
ALTITUDE	KTAS	NMPG	KTAS	NMPG	KTAS	NMPG
3000 Feet	161	10.3	153	11.2	143	12.2
6500 Feet	167	10.7	158	11.6	147	12.6
10,000 Feet	- - -	- - -	163	12.0	151	12.9
Standard Conditions						Zero Wind

Figure 4-3. Cruise Performance Table

most favorable altitude and power setting for a given trip. The selection of cruise altitude on the basis of the most favorable wind conditions and the use of low power settings are significant factors that should be considered on every trip to reduce fuel consumption.

For reduced noise levels, it is desirable to select the lowest RPM in the green arc range for a given percent power that will provide smooth engine operation. The cowl flaps should be opened, if necessary, to maintain the cylinder head temperature at approximately two-thirds of the normal operating range (green arc).

For best fuel economy at 65% power or less, the engine should be operated at six pounds per hour leaner than shown in this handbook and on the power computer. This will result in approximately 6% greater range than shown in this handbook accompanied by approximately 4 knots decrease in speed.

The fuel injection system employed on this engine is considered to be non-icing. In the event that unusual conditions cause the intake air filter to become clogged or iced over, an alternate intake air valve opens automatically. Due to a one to two inch decrease in manifold pressure and a significant increase in intake air temperature when the filter is blocked, power at full throttle decreases approximately 10%.

LEANING WITH AN EGT INDICATOR

Exhaust gas temperature (EGT) as shown on the optional Cessna economy mixture indicator or the engine combustion analyzer (when set on position 7) may be used as an aid for mixture leaning in cruising flight at 75% power or less. To adjust the mixture, using either of these indicators, lean to establish the peak EGT as a reference point and then enrichen by a desired increment based on data in figure 4-4.

MIXTURE DESCRIPTION	EXHAUST GAS TEMPERATURE
RECOMMENDED LEAN (Pilot's Operating Handbook and Power Computer)	25°F Rich of Peak EGT
BEST ECONOMY (65% Power or Less)	Peak EGT

Figure 4-4. EGT Table

Continuous operation at peak EGT is authorized only at 65% power or less. This best economy mixture setting results in approximately 6% greater range than shown in this handbook accompanied by approximately 4 knots decrease in speed.

NOTE

Operation on the lean side of peak EGT is not approved.

When leaning the mixture, if a distinct peak is not obtained, use the corresponding maximum EGT as a reference point for enrichening the mixture to the desired cruise setting. Any change in altitude or power will require a recheck of the EGT indication.

Detailed information on use of the engine combustion analyzer is presented in Section 9, Supplements.

STALLS

The stall characteristics are conventional and aural warning is provided by a stall warning horn which sounds between 5 and 10 knots above the stall in all configurations. Altitude loss during a stall recovery may be as much as 300 feet from a wings-level stall and even greater from a turning stall.

Power-off stall speeds at maximum weight for both forward and aft C.G. are presented in Section 5.

BEFORE LANDING

In view of the relatively low drag of the extended landing gear and the high allowable gear-operating speed (165 KIAS), the landing gear should

be extended before entering the traffic pattern. This practice will allow more time to confirm that the landing gear is down and locked. As a further precaution, leave the landing gear extended in go-around procedures or traffic patterns for touch-and-go landing.

Landing gear extension can be detected by illumination of the GEAR LOCKED (green) indicator light, absence of a gear warning horn with the throttle retarded below approximately 12 inches of manifold pressure, and visual inspection of the main gear position. Should the gear indicator light fail to illuminate, the light should be checked for a burned-out bulb by pushing to test. A burned-out bulb can be replaced in flight with a post light bulb or the GEAR UNSAFE (red) indicator light.

LANDING

NORMAL LANDING

Normal landing approaches can be made with power on or power off with any flap setting desired. Use of flaps down is normally preferred to minimize touchdown speed and subsequent need for braking. For a given flap setting, surface winds and turbulence are usually the primary factors in determining the most comfortable approach speed.

Actual touchdown should be made with power off and on the main wheels first to reduce the landing speed and subsequent need for braking in the landing roll. The nose wheel is lowered to the runway after the speed diminished to avoid unnecessary nose gear load. This procedure is especially important in rough or short field landings.

SHORT FIELD LANDING

For short field landings, make a power approach at 75 KIAS with full flaps. After all approach obstacles are cleared, progressively reduce power. Maintain 75 KIAS approach speed by lowering the nose of the airplane. Touchdown should be made with the throttle closed, and on the main wheels first. Immediately after touchdown, lower the nose gear and apply heavy braking as required. For maximum brake effectiveness after all three wheels are on the ground, retract the flaps, hold full nose up elevator and apply maximum possible brake pressure without sliding the tires.

At light operating weights, during ground roll with full flaps, hold the control wheel full back to ensure maximum weight on the main wheels for braking. Under these conditions, full nose down elevator (control wheel full forward) will raise the main wheels off the ground.

CROSSWIND LANDING

When landing in a strong crosswind, use the minimum flap setting required for the field length. Although the crab or combination method of drift correction may be used, the wing-low method gives the best control. After touchdown, hold a straight course with the steerable nose wheel and occasional braking if necessary.

BALKED LANDING

In a balked landing (go-around) climb, the wing flap setting should be reduced to 20° immediately after full power is applied. If obstacles must be cleared during the go-around climb, leave the wing flaps at 20° and maintain a safe climb speed. Above 3000 feet altitude, the mixture should be leaned in accordance with the fuel flow placard to obtain maximum power. After all obstacles are cleared and a safe altitude and airspeed are obtained, the wing flaps may be retracted.

COLD WEATHER OPERATION

Special consideration should be given to the operation of the airplane fuel system during the winter season or prior to any flight in cold temperatures. Proper preflight draining of the fuel system is especially important and will eliminate any free water accumulation. The use of additives such as isopropyl alcohol or ethylene glycol monomethyl ether may also be desirable. Refer to Section 8 for information on the proper use of additives.

Cold weather often causes conditions which require special care during airplane operations. Even small accumulations of frost, ice, or snow must be removed, particularly from wing, tail and all control surfaces to assure satisfactory flight performance and handling. Also, control surfaces must be free of any internal accumulations of ice or snow.

If snow or slush covers the takeoff surface, allowance must be made for takeoff distances which will be increasingly extended as the snow or slush depth increases. The depth and consistency of this cover can, in fact, prevent takeoff in many instances.

The use of an external pre-heater and an external power source is recommended whenever possible to reduce wear and abuse to the engine and the electrical system. Pre-heat will thaw the oil trapped in the oil cooler, which probably will be congealed prior to starting in extremely cold temperatures. When using an external power source, the position of the master switch is important. Refer to Section 9, Supplements, for Ground Service Plug Receptacle operating details.

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

During let-down, observe engine temperatures closely and carry sufficient power to maintain them within the green arc operating range. A winterization kit is available to aid in maintaining warm engine operating temperatures.

NOISE CHARACTERISTICS

Increased emphasis on improving the quality of our environment requires renewed effort on the part of all pilots to minimize the effect of airplane noise on the public.

We, as pilots, can demonstrate our concern for environmental improvement, by application of the following suggested procedures, and thereby tend to build public support for aviation:

1. Pilots operating aircraft under VFR over outdoor assemblies of persons, recreational and park areas, and other noise-sensitive areas should make every effort to fly not less than 2000 feet above the surface, weather permitting, even though flight at a lower level may be consistent with the provisions of government regulations.
2. During departure from or approach to an airport, climb after takeoff and descent for landing should be made so as to avoid prolonged flight at low altitude near noise-sensitive areas.

NOTE

The above recommended procedures do not apply where they would conflict with Air Traffic Control clearances or instructions, or where, in the pilot's judgment, an altitude of less than 2000 feet is necessary for him to adequately exercise his duty to see and avoid other aircraft.

The certificated noise level for the Model 210N at 3800 pounds maximum weight is 79.6 dB(A). No determination has been made by the Federal Aviation Administration that the noise levels of this airplane are or should be acceptable or unacceptable for operation at, into, or out of, any airport.

SECTION 5
PERFORMANCE

TABLE OF CONTENTS

INTRODUCTION

Performance data charts on the following pages are presented so that you may know what to expect from the airplane under various conditions, and also, to facilitate the planning of flights in detail and with reasonable accuracy. The data in the charts has been computed from actual flight tests with the airplane and engine in good condition and using average piloting techniques.

It should be noted that the performance information presented in the range and endurance profile charts allows for 45 minutes reserve fuel at the specified cruise power. Fuel flow data for cruise is based on the recommended lean mixture setting. Some indeterminate variables such as mixture leaning technique, fuel metering characteristics, engine and propeller condition, and air turbulence may account for variations of 10% or more in range and endurance. Therefore, it is important to utilize all available information to estimate the fuel required for the particular flight.

USE OF PERFORMANCE CHARTS

Performance data is presented in tabular or graphical form to illustrate the effect of different variables. Sufficiently detailed information is provided in the tables so that conservative values can be selected and used to determine the particular performance figure with reasonable accuracy.

SAMPLE PROBLEM

The following sample flight problem utilizes information from the various charts to determine the predicted performance data for a typical flight. The following information is known:

AIRPLANE CONFIGURATION	
Takeoff weight	3750 Pounds
Usable fuel	522 Pounds
TAKEOFF CONDITIONS	
Field pressure altitude	1500 Feet
Temperature	28°C (16°C above standard)
Wind component along runway	12 Knot Headwind
Field length	3500 Feet
CRUISE CONDITIONS	
Total distance	685 Nautical Miles
Pressure altitude	7500 Feet
Temperature	16°C (16°C above standard)
Expected wind enroute	10 Knot Headwind
LANDING CONDITIONS	
Field pressure altitude	2000 Feet
Temperature	25°C
Field length	3000 Feet

TAKEOFF

The takeoff distance chart, figure 5-5, should be consulted, keeping in mind that the distances shown are based on the short field technique. Conservative distances can be established by reading the chart at the next higher value of weight, altitude and temperature. For example, in this particular sample problem, the takeoff distance information presented for a weight of 3800 pounds, pressure altitude of 2000 feet and a temperature of 30°C should be used and results in the following:

Ground roll	1675 Feet
Total distance to clear a 50-foot obstacle	2785 Feet

These distances are well within the available takeoff field length. However, a correction for the effect of wind may be made based on Note 3 of the takeoff chart. The correction for a 12 knot headwind is:

$$\frac{12 \text{ Knots}}{10 \text{ Knots}} \times 10\% = 12\% \text{ Decrease}$$

This results in the following distances, corrected for wind:

Ground roll, zero wind	1675
Decrease in ground roll (1675 feet × 12%)	201
Corrected ground roll	1474 Feet
Total distance to clear a 50-foot obstacle, zero wind	2785
Decrease in total distance (2785 feet × 12%)	334
Corrected total distance to clear a 50-foot obstacle	2451 Feet

CRUISE

The cruising altitude should be selected based on a consideration of trip length, winds aloft, and the airplane's performance. A cruising altitude and the expected wind enroute have been given for this sample problem. However, the power setting selection for cruise must be determined based on several considerations. These include the cruise performance characteristics presented in figure 5-8, the range profile charts presented in figure 5-9, and the endurance profile charts presented in figure 5-10.

The relationship between power and range is illustrated by the range profile charts. Considerable fuel savings and longer range result when lower power settings are used. For this sample problem, a cruise power of approximately 65% will be used.

The cruise performance chart for 8000 feet pressure altitude is entered using 20°C above standard temperature. These values most nearly correspond to the planned altitude and expected temperature conditions. The power setting chosen is 2550 RPM and 21 inches of manifold pressure which results in the following:

Power	65%
True airspeed	164 Knots
Cruise fuel flow	82 PPH

The power computer may be used to determine power and fuel consumption more accurately during the flight.

FUEL REQUIRED

The total fuel requirement for the flight may be estimated using the

performance information in figures 5-7 and 5-8. For this sample problem, figure 5-7 shows that a normal climb from 2000 feet to 8000 feet at a weight of 3800 pounds requires 18 pounds of fuel. The corresponding distance during the climb is 18 nautical miles. These values are for a standard temperature and are sufficiently accurate for most flight planning purposes. However, a further correction for the effect of temperature may be made as noted on the climb chart. The approximate effect of a non-standard temperature is to increase the time, fuel, and distance by 10% for each 10°C above standard temperature, due to the lower rate of climb. In this case, assuming a temperature 16°C above standard, the correction would be:

$$\frac{16°C}{10°C} \times 10\% = 16\% \text{ Increase}$$

With this factor included, the fuel estimate would be calculated as follows:

Fuel to climb, standard temperature	18
Increase due to non-standard temperature (18 × 16%)	3
Corrected fuel to climb	21 Pounds

Using a similar procedure for the distance during climb results in 21 nautical miles.

The resultant cruise distance is:

Total distance	685
Climb distance	-21
Cruise distance	664 Nautical Miles

With an expected 10 knot headwind, the ground speed for cruise is predicted to be:

164
-10
154 Knots

Therefore, the time required for the cruise portion of the trip is:

$$\frac{664 \text{ Nautical Miles}}{154 \text{ Knots}} = 4.3 \text{ Hours}$$

The fuel required for cruise is:

4.3 hours × 82 pounds/hour = 353 Pounds

A 45-minute reserve requires:

$$\frac{45}{60} \times 82 \text{ pounds/hour} = 62 \text{ Pounds}$$

The total estimated fuel required is as follows:

Engine start, taxi, and takeoff	12
Climb	21
Cruise	353
Reserve	62
Total fuel required	448 Pounds

Once the flight is underway, ground speed checks will provide a more accurate basis for estimating the time enroute and the corresponding fuel required to complete the trip with ample reserve.

LANDING

A procedure similar to takeoff should be used for estimating the landing distance at the destination airport. Figure 5-11 presents landing distance information for the short field technique. The distances corresponding to 2000 feet pressure altitude and a temperature of 30°C are as follows:

Ground roll	865 Feet
Total distance to clear a 50-foot obstacle	1650 Feet

A correction for the effect of wind may be made based on Note 2 of the landing chart using the same procedure as outlined for takeoff.

DEMONSTRATED OPERATING TEMPERATURE

Satisfactory engine cooling has been demonstrated for this airplane with an outside air temperature 23°C above standard. This is not to be considered as an operating limitation. Reference should be made to Section 2 for engine operating limitations.

AIRSPEED CALIBRATION

NORMAL STATIC SOURCE

CONDITIONS:
3800 Pounds
Power required for level flight or maximum power during descent.

FLAPS UP								
KIAS	60	80	100	120	140	160	180	200
KCAS	56	78	98	117	137	156	176	195
FLAPS 10°								
KIAS	60	70	80	90	100	120	140	160
KCAS	61	68	77	87	98	120	143	165
FLAPS 30°								
KIAS	50	60	70	80	90	100	110	115
KCAS	53	62	71	81	90	100	110	116

Figure 5-1. Airspeed Calibration (Sheet 1 of 2)

AIRSPEED CALIBRATION
ALTERNATE STATIC SOURCE

HEATER/VENTS AND WINDOWS CLOSED

FLAPS UP								
NORMAL KIAS	60	80	100	120	140	160	180	190
ALTERNATE KIAS	53	77	99	119	141	161	184	194
FLAPS 10°								
NORMAL KIAS	60	70	80	90	100	120	140	150
ALTERNATE KIAS	58	68	78	89	101	123	147	157
FLAPS 30°								
NORMAL KIAS	50	60	70	80	90	100	110	115
ALTERNATE KIAS	53	61	71	82	94	104	114	121

HEATER/VENTS OPEN AND WINDOWS CLOSED

FLAPS UP								
NORMAL KIAS	60	80	100	120	140	160	180	190
ALTERNATE KIAS	51	73	95	115	137	158	181	191
FLAPS 10°								
NORMAL KIAS	60	70	80	90	100	120	140	150
ALTERNATE KIAS	53	62	72	84	96	120	145	156
FLAPS 30°								
NORMAL KIAS	50	60	70	80	90	100	110	115
ALTERNATE KIAS	46	56	66	78	90	100	113	118

WINDOWS OPEN

FLAPS UP								
NORMAL KIAS	60	80	100	120	140	160	180	190
ALTERNATE KIAS	29	66	96	122	145	166	187	196
FLAPS 10°								
NORMAL KIAS	60	70	80	90	100	120	140	150
ALTERNATE KIAS	37	54	68	83	97	125	151	163
FLAPS 30°								
NORMAL KIAS	50	60	70	80	90	100	110	115
ALTERNATE KIAS	25	45	61	76	90	101	114	121

Figure 5-1. Airspeed Calibration (Sheet 2 of 2)

TEMPERATURE CONVERSION CHART

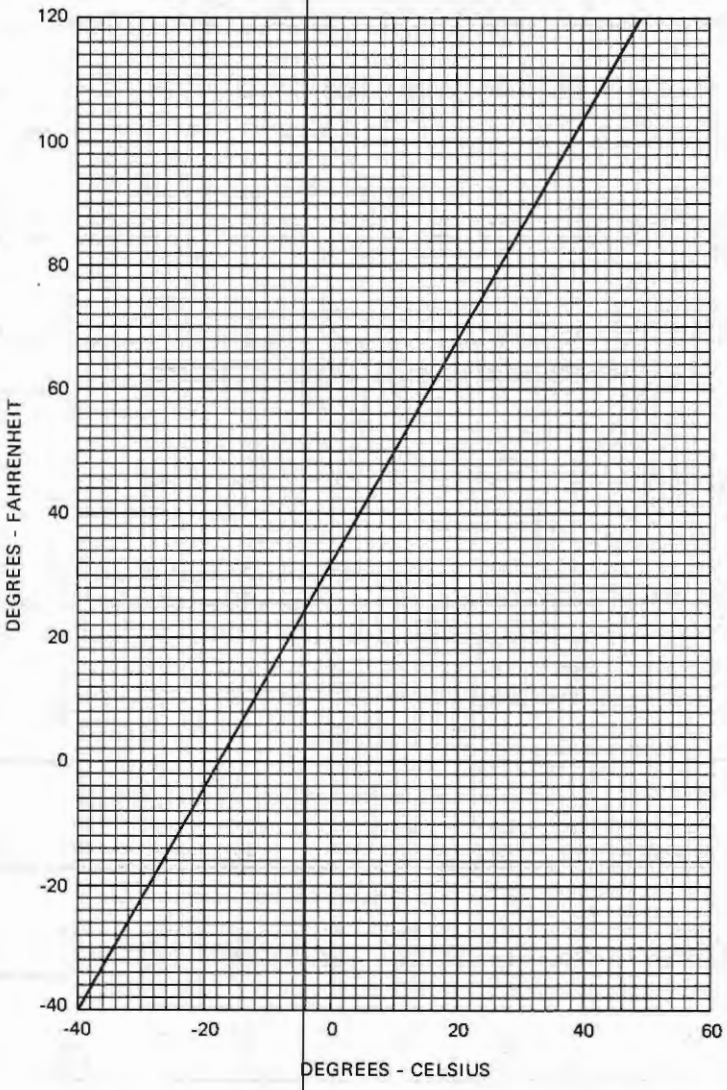


Figure 5-2. Temperature Conversion Chart

STALL SPEEDS

CONDITIONS:
Power Off
Gear Up or Down

NOTES:
1. Altitude loss during a stall recovery may be as much as 300 feet from a wings-level stall and even greater from a turning stall.
2. KIAS values are approximate.

MOST REARWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
3800	UP	65	65	70	70	77	77	92	92
	10°	64	64	69	69	76	76	91	91
	30°	52	56	56	60	62	67	74	79

MOST FORWARD CENTER OF GRAVITY

WEIGHT LBS	FLAP DEFLECTION	ANGLE OF BANK							
		0°		30°		45°		60°	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
3800	UP	69	69	74	74	82	82	98	98
	10°	69	68	74	73	82	81	98	96
	30°	57	61	62	66	69	73	82	86

Figure 5-3. Stall Speeds

WIND COMPONENTS

NOTE:
Maximum demonstrated crosswind velocity is 21 knots (not a limitation).

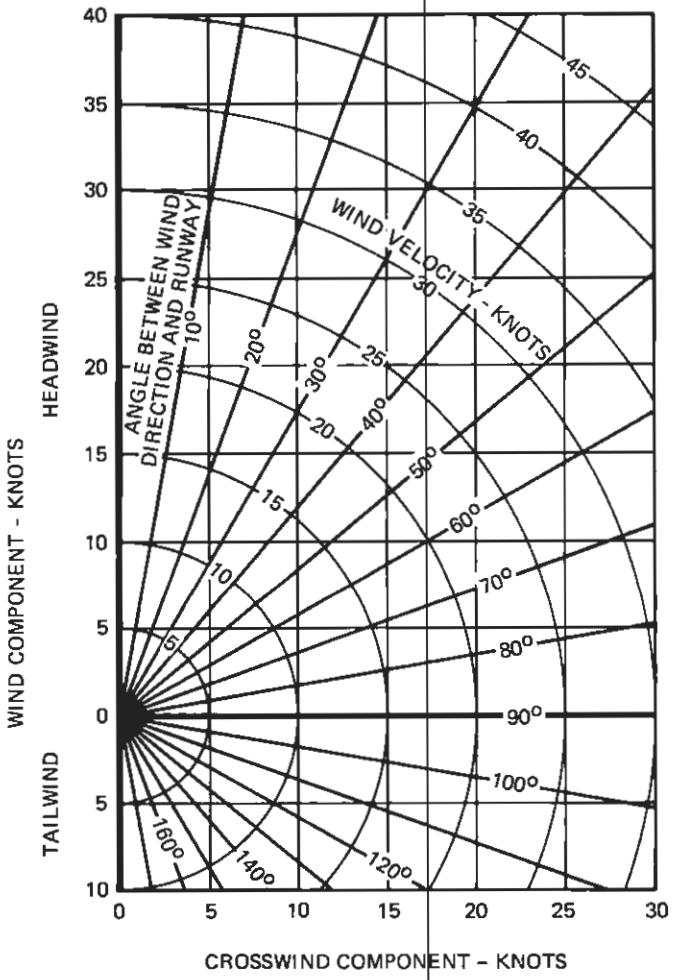


Figure 5-4. Wind Components

TAKEOFF DISTANCE
MAXIMUM WEIGHT 3800 LBS

SHORT FIELD

CONDITIONS:
Flaps 10°
2850 RPM, Full Throttle and Mixture Set at Placard Fuel Flow Prior to Brake Release
Cowl Flaps Open
Paved, Level, Dry Runway
Zero Wind

MIXTURE SETTING	
PRESS ALT	PPH
S.L.	144
2000	138
4000	132
6000	126
8000	120

NOTES:
1. Short field technique as specified in Section 4.
2. Where distance value has been deleted, climb performance after lift-off is less than 150 fpm. Rate of climb is based on landing gear extended and flaps 10° at takeoff speed.
3. Decrease distances 10% for each 10 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2.5 knots.
4. For operation on a dry, grass runway, increase distances by 15% of the "ground roll" figure.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS
3800	68	74	S.L.	1120	1820	1205	1960	1295	2105	1390	2265	1495	2440
			1000	1225	2005	1320	2155	1420	2320	1525	2505	1640	2705
			2000	1345	2210	1445	2380	1555	2570	1675	2785	1800	3020
			3000	1475	2450	1585	2645	1710	2865	1840	3110	1980	3390
			4000	1620	2725	1745	2955	1880	3210	2025	3505	2180	3840
			5000	1785	3055	1925	3325	2075	3630	2235	3990	2410	4415
			6000	1970	3455	2125	3780	2290	4160	2470	4615	2665	5185
			7000	2180	3950	2350	4365	2540	4860	2740	5485	- - -	- - -
			8000	2415	4595	2610	5155	- - -	- - -	- - -	- - -	- - -	- - -

Figure 5-5. Takeoff Distance (Sheet 1 of 2)

TAKEOFF DISTANCE
3500 LBS AND 3200 LBS

SHORT FIELD

REFER TO SHEET 1 FOR APPROPRIATE CONDITIONS AND NOTES.

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS
3500	65	71	S.L.	925	1495	990	1605	1065	1720	1145	1845	1225	1980
			1000	1010	1640	1085	1760	1165	1885	1250	2030	1340	2180
			2000	1105	1800	1185	1930	1275	2080	1370	2235	1470	2410
			3000	1210	1980	1300	2130	1400	2295	1505	2475	1615	2680
			4000	1325	2190	1425	2360	1535	2550	1650	2755	1775	2990
			5000	1460	2430	1570	2625	1690	2845	1820	3090	1960	3365
			6000	1605	2715	1730	2940	1865	3195	2005	3490	2160	3825
			7000	1770	3050	1910	3320	2060	3630	2220	3990	2395	4415
			8000	1960	3460	2115	3790	2280	4175	2460	4640	2655	5215
3200	62	68	S.L.	755	1220	810	1305	865	1395	930	1490	995	1595
			1000	820	1330	880	1425	945	1525	1015	1635	1090	1750
			2000	895	1455	965	1560	1035	1670	1110	1790	1190	1925
			3000	980	1595	1055	1710	1135	1835	1215	1970	1305	2120
			4000	1075	1755	1155	1880	1240	2025	1335	2180	1435	2350
			5000	1180	1935	1270	2080	1365	2240	1470	2415	1580	2610
			6000	1300	2140	1395	2305	1500	2490	1615	2695	1740	2920
			7000	1430	2380	1540	2575	1655	2785	1785	3025	1920	3295
			8000	1575	2665	1700	2885	1830	3140	1970	3425	2125	3755

Figure 5-5. Takeoff Distance (Sheet 2 of 2)

MAXIMUM RATE OF CLIMB

CONDITIONS:
Flaps Up
Gear Up
2700 RPM
Full Throttle
Mixture Set at Placard Fuel Flow
Cowl Flaps Open

MIXTURE SETTING	
PRESS ALT	PPH
S.L.	138
4000	126
8000	114
12,000	102
16,000	90

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB - FPM			
			-20°C	0°C	20°C	40°C
3800	S.L.	98	1115	1020	925	830
	2000	97	995	900	810	720
	4000	96	870	785	700	615
	6000	95	750	670	585	505
	8000	93	635	555	475	395
	10,000	92	520	440	365	- - -
	12,000	91	405	330	255	- - -
	14,000	89	290	220	- - -	- - -
	16,000	88	175	110	- - -	- - -
3500	S.L.	97	1255	1160	1060	960
	2000	96	1125	1035	940	845
	4000	94	1000	910	820	730
	6000	93	870	785	705	620
	8000	92	745	665	585	505
	10,000	90	625	550	470	- - -
	12,000	89	505	430	355	- - -
	14,000	88	385	315	- - -	- - -
	16,000	87	270	200	- - -	- - -
3200	S.L.	95	1415	1315	1215	1110
	2000	94	1275	1185	1085	990
	4000	92	1140	1050	960	865
	6000	91	1010	920	835	750
	8000	90	875	795	710	630
	10,000	89	745	670	590	- - -
	12,000	87	620	545	470	- - -
	14,000	86	495	425	- - -	- - -
	16,000	85	370	300	- - -	- - -

Figure 5-6. Maximum Rate of Climb

TIME, FUEL, AND DISTANCE TO CLIMB

MAXIMUM RATE OF CLIMB

CONDITIONS:
Flaps Up
Gear Up
2700 RPM
Full Throttle
Mixture Set at Placard Fuel Flow
Cowl Flaps Open
Standard Temperature

MIXTURE SETTING	
PRESS ALT	PPH
S.L.	138
4000	126
8000	114
12,000	102
16,000	90

NOTES:
1. Add 12 pounds of fuel for engine start, taxi and takeoff allowance.
2. Increase time, fuel and distance by 10% for each 10°C above standard temperature.
3. Distances shown are based on zero wind.

WEIGHT LBS	PRESS ALT FT	CLIMB SPEED KIAS	RATE OF CLIMB FPM	FROM SEA LEVEL		
				TIME MIN	FUEL USED POUNDS	DISTANCE NM
3800	S.L.	98	950	0	0	0
	2000	97	850	2	5	4
	4000	96	755	5	10	8
	6000	95	655	8	16	13
	8000	93	560	11	23	18
	10,000	92	460	15	30	25
	12,000	91	360	20	39	34
	14,000	89	265	27	50	46
	16,000	88	165	36	65	63
3500	S.L.	97	1085	0	0	0
	2000	96	980	2	4	3
	4000	94	880	4	9	7
	6000	93	775	7	14	11
	8000	92	670	9	19	15
	10,000	90	565	13	26	21
	12,000	89	465	17	32	28
	14,000	88	360	22	41	36
	16,000	87	260	28	51	48
3200	S.L.	95	1240	0	0	0
	2000	94	1130	2	4	3
	4000	92	1020	4	8	6
	6000	91	910	6	12	9
	8000	90	800	8	17	13
	10,000	89	690	11	22	17
	12,000	87	580	14	27	23
	14,000	86	470	18	34	29
	16,000	85	360	23	41	38

Figure 5-7. Time, Fuel, and Distance to Climb (Sheet 1 of 2)

TIME, FUEL, AND DISTANCE TO CLIMB

NORMAL CLIMB - 100 KIAS

CONDITIONS:
Flaps Up
Gear Up
2550 RPM
25 Inches Hg or Full Throttle
Cowl Flaps Open
Standard Temperature

MIXTURE SETTING	
PRESS ALT	PPH
S.L. to 4000	108
6000	102
8000	96
10,000	90

NOTES:
1. Add 12 pounds of fuel for engine start, taxi and takeoff allowance.
2. Increase time, fuel and distance by 10% for each 10°C above standard temperature.
3. Distances shown are based on zero wind.

WEIGHT LBS	PRESS ALT FT	RATE OF CLIMB FPM	FROM SEA LEVEL		
			TIME MIN	FUEL USED POUNDS	DISTANCE NM
3800	S.L.	670	0	0	0
	2000	670	3	5	5
	4000	660	6	11	10
	6000	560	9	17	16
	8000	455	13	23	23
	10,000	355	18	31	33
3500	S.L.	780	0	0	0
	2000	780	3	5	4
	4000	770	5	9	9
	6000	665	8	14	14
	8000	555	11	20	20
	10,000	445	15	26	28
3200	S.L.	910	0	0	0
	2000	910	2	4	4
	4000	900	4	8	7
	6000	785	7	12	12
	8000	665	10	17	17
	10,000	550	13	22	23

Figure 5-7. Time, Fuel, and Distance to Climb (Sheet 2 of 2)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 2000 FEET

CONDITIONS:
3800 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy at 65% power or less, operate at 6 PPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -9°C			STANDARD TEMPERATURE 11°C			20°C ABOVE STANDARD TEMP 31°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2550	25	- - -	- - -	- - -	78	162	98	76	164	95
	24	77	157	96	74	159	93	71	160	90
	23	72	154	91	70	156	88	67	157	85
	22	68	151	85	65	152	82	63	153	80
2500	25	78	159	98	76	160	95	73	162	92
	24	74	156	93	72	157	90	69	159	87
	23	70	152	88	68	154	85	65	155	82
	22	66	149	83	64	150	80	62	152	78
2400	25	73	155	92	71	156	89	68	158	86
	24	69	152	87	67	153	84	65	155	82
	23	66	149	83	63	150	80	61	151	77
	22	62	145	78	59	146	75	57	147	73
2300	25	69	151	86	66	153	84	64	154	81
	24	65	148	82	63	150	79	61	151	77
	23	61	145	77	59	146	75	57	147	73
	22	58	141	73	56	143	71	54	143	69
2200	25	64	147	80	61	148	77	59	149	75
	24	60	144	76	58	145	74	56	146	71
	23	57	141	72	55	142	70	53	142	68
	22	53	137	68	51	137	66	50	137	64
	21	50	133	64	48	133	62	46	132	60
	20	46	128	60	45	128	58	43	127	57

Figure 5-8. Cruise Performance (Sheet 1 of 8)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 4000 FEET

CONDITIONS:
3800 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy at 65% power or less, operate at 6 PPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -13°C			STANDARD TEMPERATURE 7°C			20°C ABOVE STANDARD TEMP 27°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2550	24	79	162	99	76	164	95	73	165	92
	23	74	159	93	72	160	90	69	162	87
	22	70	155	88	67	157	85	65	158	82
	21	66	152	83	63	153	80	61	154	77
2500	25	- - -	- - -	- - -	78	165	97	75	166	94
	24	76	160	96	74	162	92	71	163	89
	23	72	157	90	70	158	87	67	160	85
	22	68	153	85	65	155	82	63	156	80
2400	25	75	159	94	72	161	91	70	162	88
	24	71	156	89	69	158	86	66	159	83
	23	67	153	85	65	154	82	63	156	79
	22	63	150	80	61	151	77	59	152	75
2300	25	70	156	88	68	157	85	66	158	83
	24	67	152	84	64	154	81	62	155	79
	23	63	149	80	61	151	77	59	152	74
	22	59	146	75	57	147	73	55	147	71
2200	25	65	151	82	63	152	79	61	153	77
	24	62	148	78	59	149	75	57	150	73
	23	58	145	74	56	146	71	54	146	69
	22	55	141	70	53	142	68	51	142	66
	21	51	137	66	50	137	64	48	137	62
	20	48	132	62	46	132	60	45	131	59
	19	44	127	58	43	126	56	41	125	55

Figure 5-8. Cruise Performance (Sheet 2 of 8)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 6000 FEET

CONDITIONS:
3800 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy at 65% power or less, operate at 6 PPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -17°C			STANDARD TEMPERATURE 3°C			20°C ABOVE STANDARD TEMP 23°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2550	24	- - -	- - -	- - -	78	168	97	75	170	94
	23	76	163	96	74	165	92	71	166	89
	22	72	160	90	69	161	87	67	163	84
	21	68	156	85	65	158	82	63	159	80
2500	24	78	165	98	75	166	95	73	168	91
	23	74	161	93	71	163	90	69	165	87
	22	70	158	88	67	160	85	65	161	82
	21	66	154	83	63	156	80	61	157	77
2400	24	73	160	91	70	162	88	68	163	85
	23	69	157	87	67	159	84	64	160	81
	22	65	154	82	63	155	79	61	156	77
	21	61	150	77	59	151	75	57	152	73
2300	24	68	157	86	66	158	83	64	160	80
	23	65	154	82	62	155	79	60	156	76
	22	61	150	77	59	151	75	57	152	72
	21	57	146	73	55	147	71	53	147	68
2200	24	63	152	80	61	153	77	59	154	75
	23	60	149	76	58	150	73	56	150	71
	22	57	145	72	54	146	70	53	146	67
	21	53	141	68	51	141	66	49	141	64
	20	50	137	64	48	136	62	46	135	60
	19	46	131	60	44	130	58	43	129	57

Figure 5-8. Cruise Performance (Sheet 3 of 8)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 8000 FEET

CONDITIONS:
3800 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy at 65% power or less, operate at 6 PPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -21°C			STANDARD TEMPERATURE -1°C			20°C ABOVE STANDARD TEMP 19°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2550	22	74	165	93	71	166	90	69	168	87
	21	70	161	88	67	163	85	65	164	82
	20	66	157	82	63	158	80	61	159	77
	19	61	153	77	59	154	75	57	154	72
2500	22	72	163	90	69	164	87	67	166	84
	21	68	159	85	65	161	82	63	162	79
	20	63	155	80	61	156	77	59	157	75
	19	59	151	75	57	152	72	55	152	70
2400	22	67	159	84	65	160	81	62	161	79
	21	63	155	80	61	156	77	59	157	74
	20	59	151	75	57	152	73	55	152	70
	19	55	146	70	53	146	68	51	146	66
2300	22	63	155	79	61	156	77	59	156	74
	21	59	151	75	57	152	72	55	152	70
	20	55	147	71	53	147	68	52	146	66
	19	52	141	66	50	141	64	48	140	62
2200	22	58	150	74	56	150	71	54	150	69
	21	55	146	70	53	146	68	51	145	66
	20	51	141	66	49	141	64	48	140	62
	19	48	136	62	46	135	60	44	134	58
	18	44	130	58	43	128	56	41	127	55

Figure 5-8. Cruise Performance (Sheet 4 of 8)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 10,000 FEET

CONDITIONS:
3800 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy at 65% power or less, operate at 6 PPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -25°C			STANDARD TEMPERATURE -5°C			20°C ABOVE STANDARD TEMP 15°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2550	20	68	162	85	65	163	82	63	164	79
	19	63	158	80	61	159	77	59	159	74
	18	59	153	74	56	153	72	55	153	70
	17	54	147	69	52	147	67	50	146	65
2500	20	65	160	82	63	161	80	61	162	77
	19	61	156	77	59	156	75	57	156	72
	18	57	151	72	55	151	70	53	150	68
	17	52	145	67	50	144	65	49	143	63
2400	20	61	156	77	59	156	75	57	156	72
	19	57	151	73	55	151	70	53	151	68
	18	53	146	68	51	145	66	49	144	64
	17	49	139	63	47	138	61	45	137	59
2300	20	57	151	73	55	151	70	53	151	68
	19	53	146	68	51	146	66	50	145	64
	18	50	140	64	48	139	62	46	138	60
	17	46	134	60	44	132	58	42	131	56
2200	20	53	146	68	51	145	66	49	144	64
	19	49	140	64	48	139	62	46	138	60
	18	46	134	60	44	133	58	43	131	56

Figure 5-8. Cruise Performance (Sheet 5 of 8)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 12,000 FEET

CONDITIONS:
3800 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy, operate at 6 PPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -29°C			STANDARD TEMPERATURE -9°C			20°C ABOVE STANDARD TEMP 11°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2550	18	61	158	77	58	158	74	56	158	72
	17	56	152	71	54	152	69	52	151	67
	16	51	145	66	50	144	64	48	143	62
	15	47	137	61	45	136	59	43	134	57
2500	18	59	156	74	57	156	72	55	155	70
	17	54	150	69	52	149	67	50	148	65
	16	50	143	64	48	141	62	46	140	60
	15	45	134	59	43	133	57	42	131	55
2400	18	55	151	70	53	150	68	51	149	66
	17	51	144	65	49	143	63	47	142	61
	16	47	137	61	45	135	59	43	134	57
2300	18	51	145	66	49	144	64	48	143	62
	17	47	138	62	46	137	60	44	135	58
	16	43	131	57	42	129	55	40	127	54
2200	18	48	139	62	46	138	60	44	136	58
	17	44	132	58	42	130	56	41	128	54

Figure 5-8. Cruise Performance (Sheet 6 of 8)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 14,000 FEET

CONDITIONS:
3800 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy, operate at 6 PPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -33°C			STANDARD TEMPERATURE -13°C			20°C ABOVE STANDARD TEMP 7°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2550	17	58	158	74	56	157	71	54	156	69
	16	53	150	68	51	150	66	50	148	64
	15	49	142	63	47	141	61	45	139	59
2500	17	56	155	72	54	154	69	52	153	67
	16	52	148	66	50	147	64	48	145	62
	15	47	139	61	45	138	59	44	136	57
2400	17	53	149	68	51	148	65	49	147	63
	16	48	142	63	46	140	61	45	139	59
2300	17	49	143	64	47	142	61	46	140	59
	16	45	136	59	43	134	57	42	131	55
2200	17	46	137	60	44	135	58	42	133	56

Figure 5-8. Cruise Performance (Sheet 7 of 8)

CRUISE PERFORMANCE

PRESSURE ALTITUDE 16,000 FEET

CONDITIONS:
3800 Pounds
Recommended Lean Mixture
Cowl Flaps Closed

NOTE
For best fuel economy, operate at 6 PPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

		20°C BELOW STANDARD TEMP -37°C			STANDARD TEMPERATURE -17°C			20°C ABOVE STANDARD TEMP 3°C		
RPM	MP	% BHP	KTAS	PPH	% BHP	KTAS	PPH	% BHP	KTAS	PPH
2550	15	51	148	65	49	146	63	47	144	61
	14	46	138	59	44	136	57	42	133	56
2500	15	49	145	63	47	143	61	45	141	59
	14	44	135	58	42	132	56	41	129	54
2400	15	46	138	60	44	136	58	42	134	56
2300	15	43	132	56	41	129	54	39	126	53

Figure 5-8. Cruise Performance (Sheet 8 of 8)

RANGE PROFILE
45 MINUTES RESERVE
384 LBS. USABLE FUEL

CONDITIONS:
3800 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during a normal climb up to 10,000 feet and maximum climb above 10,000 feet.

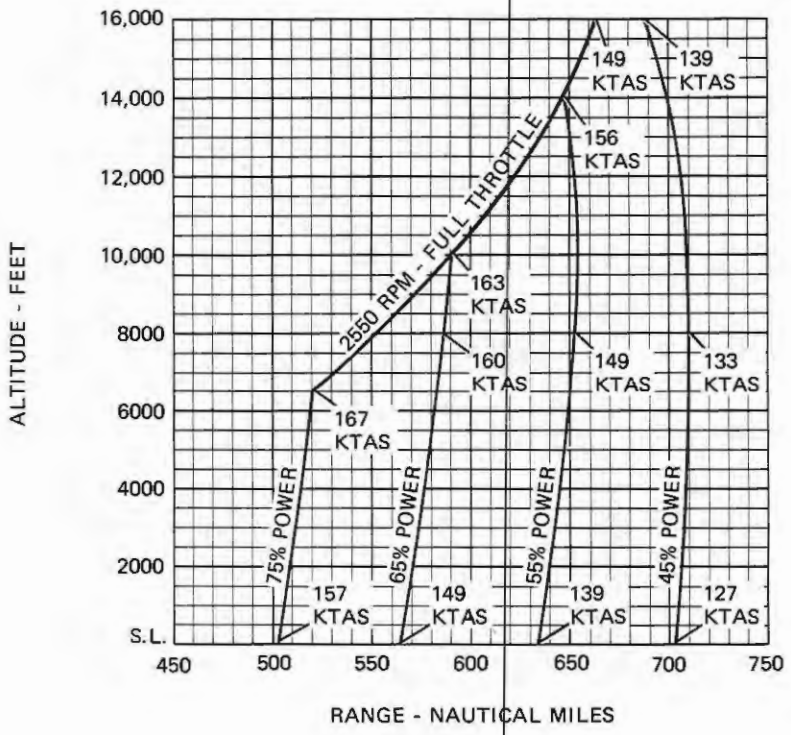


Figure 5-9. Range Profile (Sheet 1 of 2)

RANGE PROFILE
45 MINUTES RESERVE
522 LBS. USABLE FUEL

CONDITIONS:
3800 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature
Zero Wind

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the distance during a normal climb up to 10,000 feet and maximum climb above 10,000 feet.

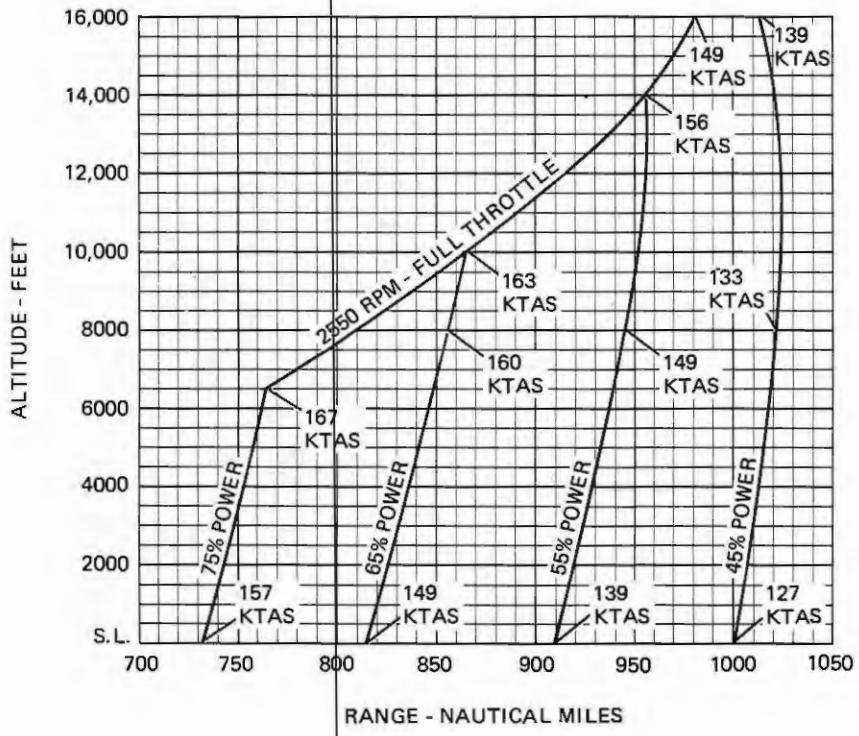


Figure 5-9. Range Profile (Sheet 2 of 2)

ENDURANCE PROFILE
45 MINUTES RESERVE
384 LBS. USABLE FUEL

CONDITIONS:
3800 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the time during a normal climb up to 10,000 feet and maximum climb above 10,000 feet.

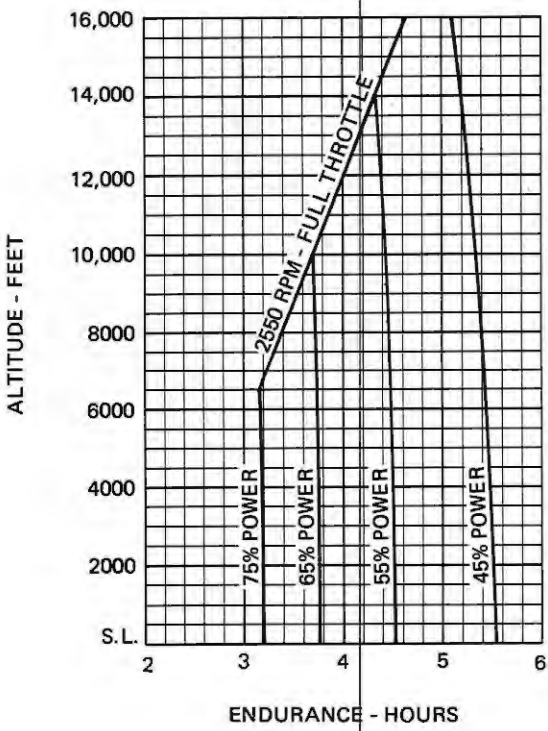


Figure 5-10. Endurance Profile (Sheet 1 of 2)

ENDURANCE PROFILE
45 MINUTES RESERVE
522 LBS. USABLE FUEL

CONDITIONS:
3800 Pounds
Recommended Lean Mixture for Cruise
Standard Temperature

NOTE:
This chart allows for the fuel used for engine start, taxi, takeoff and climb, and the time during a normal climb up to 10,000 feet and maximum climb above 10,000 feet.

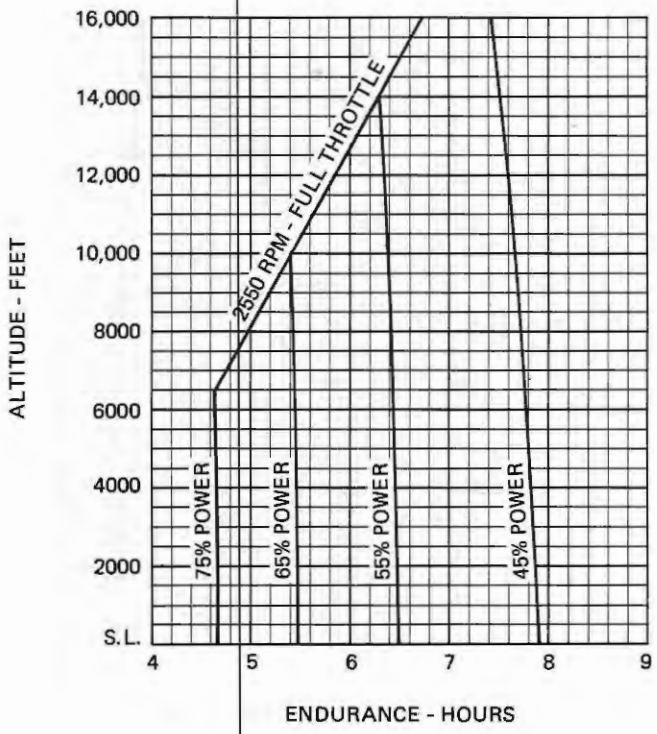


Figure 5-10. Endurance Profile (Sheet 2 of 2)

LANDING DISTANCE

SHORT FIELD

CONDITIONS:
Flaps 30°
Power Off
Maximum Braking
Paved, Level, Dry Runway
Zero Wind

NOTES:
1. Short field technique as specified in Section 4.
2. Decrease distances 10% for each 10 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2.5 knots.
3. For operation on a dry, grass runway, increase distances by 40% of the "ground roll" figure.
4. If a landing with flaps up is necessary, increase the approach speed by 13 KIAS and allow for 35% longer distances.

WEIGHT LBS	SPEED AT 50 FT KIAS	PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
			GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS	GRND ROLL FT	TOTAL FT TO CLEAR 50 FT OBS
3800	75	S.L.	725	1440	750	1480	780	1520	805	1560	830	1600
		1000	750	1480	780	1520	805	1560	835	1605	860	1645
		2000	780	1525	810	1565	835	1605	865	1650	895	1695
		3000	810	1565	840	1610	870	1660	900	1705	930	1750
		4000	840	1615	870	1660	900	1705	930	1750	965	1800
		5000	870	1660	905	1710	935	1755	965	1805	1000	1855
		6000	905	1710	940	1765	970	1810	1005	1860	1035	1910
		7000	940	1765	975	1815	1010	1870	1045	1920	1075	1970
		8000	975	1815	1010	1870	1050	1930	1085	1980	1120	2035

Figure 5-11. Landing Distance

SECTION 6
WEIGHT & BALANCE/ EQUIPMENT LIST

TABLE OF CONTENTS

INTRODUCTION

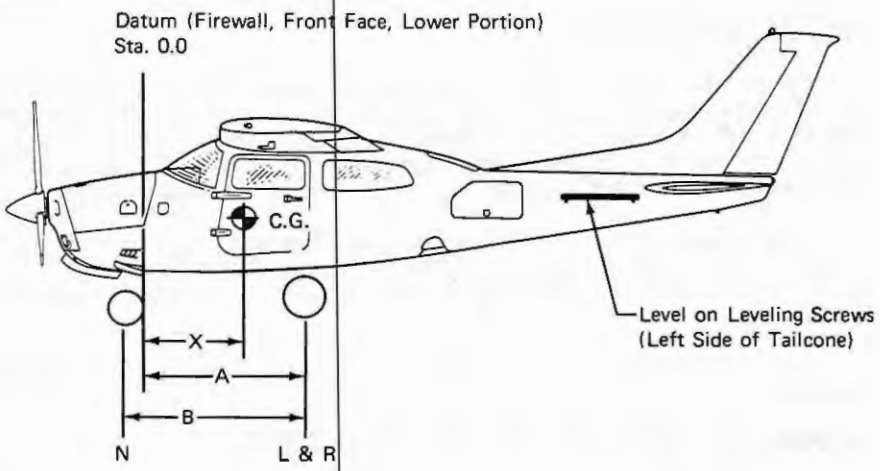
This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample forms are provided for reference. Procedures for calculating the weight and moment for various operations are also provided. A comprehensive list of all Cessna equipment available for this airplane is included at the back of this section.

It should be noted that specific information regarding the weight, arm, moment and installed equipment for this airplane as delivered from the factory can only be found in the plastic envelope carried in the back of this handbook.

It is the responsibility of the pilot to ensure that the airplane is loaded properly.

AIRPLANE WEIGHING PROCEDURES

1. Preparation:
   a. Inflate tires to recommended operating pressures.
   b. Remove fuel tank sump quick-drain fittings and use sampler cup at quick-drain valves in reservoir and vapor return line to drain all fuel.
   c. Service engine oil as required to obtain a normal full indication (10 quarts on dipstick).
   d. Move sliding seats to the most forward position.
   e. Raise flaps to the fully retracted position.
   f. Place all control surfaces in neutral position.
2. Leveling:
   a. Place scales under each wheel (minimum scale capacity, 1000 pounds).
   b. Deflate nose tire and/or lower or raise the nose strut to properly center the bubble in the level (see figure 6-1).
3. Weighing:
   a. With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.
4. Measuring:
   a. Obtain measurement A by measuring horizontally (along the airplane center line) from a line stretched between the main wheel centers to a plumb bob dropped from the firewall.
   b. Obtain measurement B by measuring horizontally and parallel to the airplane center line, from center of nose wheel axle, left side, to a plumb bob dropped from the line between the main wheel centers. Repeat on right side and average measurements.
5. Using weights from item 3 and measurements from item 4, the airplane weight and C.G. can be determined.
6. Basic Empty Weight may be determined by completing figure 6-1.



Scale Position	Scale Reading	Tare	Symbol	Net Weight
Left Wheel			L	
Right Wheel			R	
Nose Wheel			N	
Sum of Net Weights (As Weighed)			W	

$X = ARM = (A) - \frac{(N) \times (B)}{W}$; $X = (\quad) - \frac{(\quad) \times (\quad)}{(\quad)} = (\quad)$ IN.

Item	Weight (Lbs.)	X C.G. Arm (In.) =	Moment/1000 (Lbs.-In.)
Airplane Weight (From Item 5, page 6-3)			
Add: Unusable Fuel (3 Gal at 6 Lbs/Gal)	18	38.0	0.7
Equipment Changes			
Airplane Basic Empty Weight			

Figure 6-1. Sample Airplane Weighing

SAMPLE WEIGHT AND BALANCE RECORD

(Continuous History of Changes in Structure or Equipment Affecting Weight and Balance)

AIRPLANE MODEL			SERIAL NUMBER						PAGE NUMBER	
DATE	ITEM NO.		DESCRIPTION OF ARTICLE OR MODIFICATION	WEIGHT CHANGE						RUNNING BASIC EMPTY WEIGHT	
				ADDED (+)			REMOVED (-)				
	In	Out		Wt. (lb.)	Arm (In.)	Moment /1000	Wt. (lb.)	Arm (In.)	Moment /1000	Wt. (lb.)	Moment /1000
			As Delivered								

Figure 6-2. Sample Weight and Balance Record

WEIGHT AND BALANCE

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

Take the basic empty weight and moment from appropriate weight and balance records carried in your airplane, and enter them in the column titled YOUR AIRPLANE on the Sample Loading Problem.

NOTE

In addition to the basic empty weight and moment noted on these records, the C.G. arm (fuselage station) is also shown, but need not be used on the Sample Loading Problem. The moment which is shown must be divided by 1000 and this value used as the moment/1000 on the loading problem.

Use the Loading Graph to determine the moment/1000 for each additional item to be carried, then list these on the loading problem.

NOTE

Loading Graph information for the pilot, passengers and baggage is based on seats positioned for average occupants and baggage loaded in the center of the baggage areas as shown on the Loading Arrangements diagram. For loadings which may differ from these, the Sample Loading Problem lists fuselage stations for these items to indicate their forward and aft C.G. range limitation (seat travel or baggage area limitation). Additional moment calculations, based on the actual weight and C.G. arm (fuselage station) of the item being loaded, must be made if the position of the load is different from that shown on the Loading Graph.

Total the weights and moments/1000 and plot these values on the Center of Gravity Moment Envelope to determine whether the point falls within the envelope, and if the loading is acceptable.

BAGGAGE TIE-DOWN

A nylon baggage net having six tie-down straps is provided to secure baggage in the area aft of the wheel well and on the backs of the fifth and sixth seats when they are used for stowing baggage.

When using the baggage net to secure baggage stowed aft of the wheel well, only four of the net tie-down straps are usually used. They are fastened to the two tie-down rings located on the forward edge of the wheel well and two rings at the bottom edge of the rear cabin window. If the fifth and sixth seats are not occupied, the seat backs may be folded forward to create more baggage area. If this area is used, all six tie-down straps must be used. Tie the front straps of the net to the front legs of the fifth and sixth seats and the remaining four straps to the tie-down rings provided.

Weight and balance calculations for baggage forward of the wheel well and stowed on the backs of the fifth and sixth seats can be figured on the AFT PASSENGERS line of the Loading Graph. Note that the baggage load in this area is limited to 120 pounds. Separate lines are provided for computing weight and balance of baggage in the baggage areas on and aft of the wheel well. The baggage load on the wheel well is limited to 50 pounds. The baggage load aft of the wheel well is limited to 200 pounds. The maximum allowable combined weight capacity for baggage on and aft of the wheel well is 200 pounds. The maximum allowable combined weight capacity for baggage forward, on and aft of the wheel well is 240 pounds.

LOADING ARRANGEMENTS

* Pilot or passenger center of gravity on adjustable seats positioned for average occupant. Numbers in parentheses indicate forward and aft limits of occupant center of gravity range.

**Baggage area center of gravity.

NOTES:

1. The usable fuel C.G. arm is located at station 43.0.
2. The aft baggage wall (approximate station 152) can be used as a convenient interior reference point for determining the location of baggage area fuselage station.

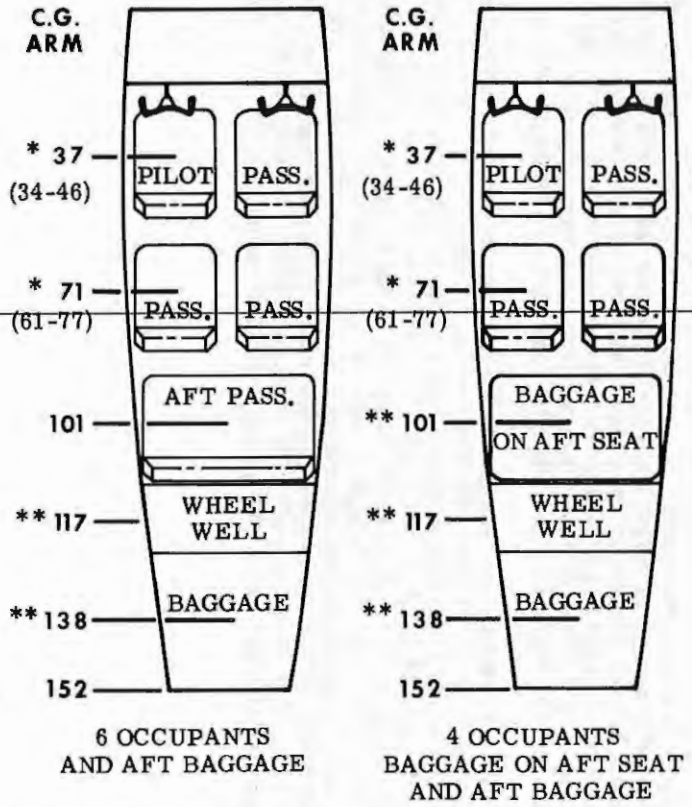
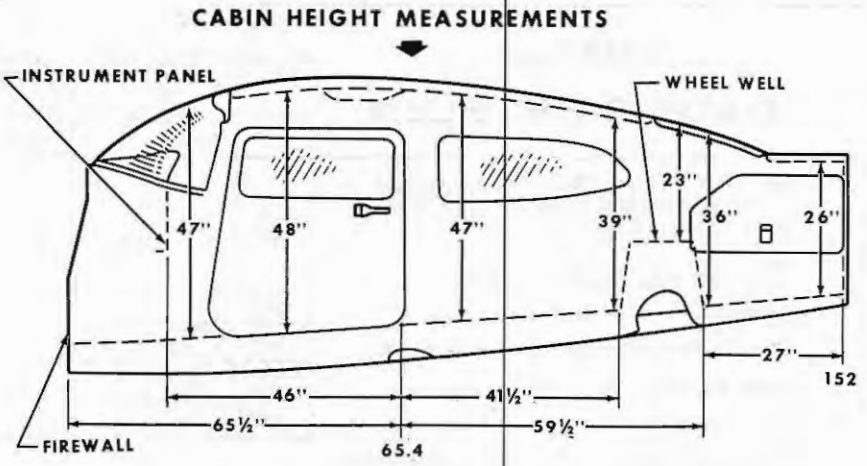


Figure 6-3. Loading Arrangements



DOOR OPENING DIMENSIONS

	WIDTH (TOP)	WIDTH (BOTTOM)	HEIGHT (FRONT)	HEIGHT (REAR)
CABIN DOOR	31"	36"	40"	38½"
BAGGAGE DOOR	19"	28½"	8½"	14¾"

WIDTH
• LWR WINDOW LINE
* CABIN FLOOR

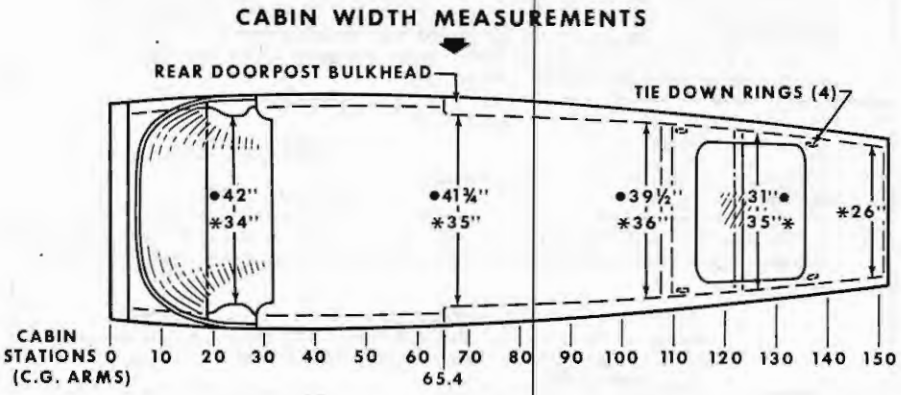


Figure 6-4. Internal Cabin Dimensions

SAMPLE LOADING PROBLEM		SAMPLE AIRPLANE		YOUR AIRPLANE	
		Weight (lbs.)	Moment (lb.-ins. /1000)	Weight (lbs.)	Moment (lb.-ins. /1000)
1.	Basic Empty Weight (Use the data pertaining to your airplane as it is presently equipped. Includes unusable fuel and full oil)	2276	92.4		
2.	Usable Fuel (At 6 Lbs./Gal.) Standard Tanks (87 Gal. Maximum)				
	Reduced Fuel (64 Gal.)	384	16.5		
3.	Pilot and Front Passenger (Station 34 to 46) .	340	12.6		
4.	Center Passengers (Station 61 to 77)	340	24.1		
5.	Aft Passengers	340	34.3		
6. *	Baggage - Forward of wheel well on folded down aft seat (Station 89 to 110) (120 lbs. max.) . .				
7. *	Baggage - On wheel well (Station 110 to 124) (50 lbs. max.)				
8. *	Baggage - Aft of wheel well (Station 124 to 152((200 lbs. max.)	132	18.2		
9.	RAMP WEIGHT AND MOMENT	3812	198.1		
10.	Fuel allowance for engine start, taxi and runup	-12	-.5		
11.	TAKEOFF WEIGHT AND MOMENT (Subtract step 10 from step 9)	3800	197.6		
12.	Locate this point (3800 at 197.6) on the Center of Gravity Moment Envelope. Since this loading falls within the shaded area of the moment envelope, proceed with steps 13, 14 and 15. If the computed loading point falls within the clear area of the moment envelope, no further steps are required and the loading is assumed satisfactory for takeoff and landing.				
13.	Estimated Fuel Burn-Off (Climb and Cruise) (38 gallons at 6 lbs./gal.)	-228	-9.8		
14.	Subtract step 13 from step 11 for estimated airplane landing weight	3572	187.8		
15.	Locate this point (3572 at 187.8) on the Center of Gravity Moment Envelope. Since this point falls within the overall envelope, the loading may be assumed acceptable for landing.				

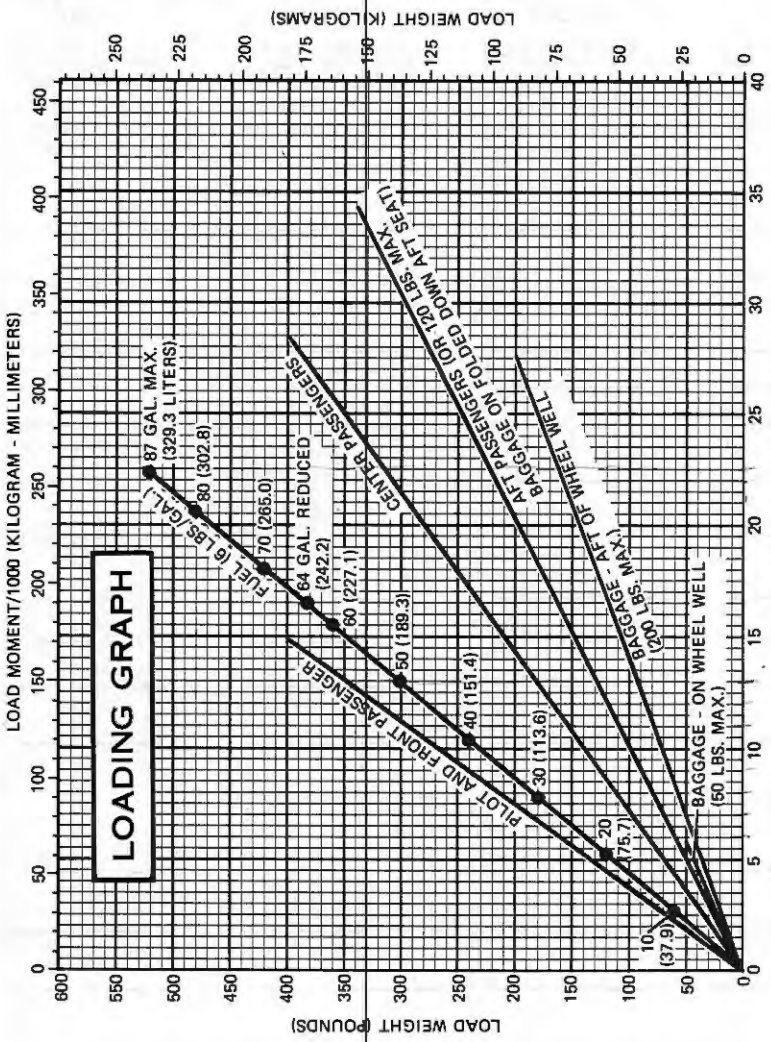
* The maximum allowable combined weight capacity for baggage on and aft of the wheel well is 200 lbs. The maximum allowable combined weight capacity for baggage forward, on and aft of the wheel well is 240 lbs.

Figure 6-5. Sample Loading Problem (Sheet 1 of 2)

YOUR AIRPLANE		YOUR AIRPLANE		YOUR AIRPLANE		YOUR AIRPLANE	
Weight (lbs.)	Moment (lb.-ins. /1000)	Weight (lbs.)	Moment (lb.-ins. /1000)	Weight (lbs.)	Moment (lb.-ins. /1000)	Weight (lbs.)	Moment (lb.-ins. /1000)

When several loading configurations are representative of your operations, it may be useful to fill out one or more of the above columns so that specific loadings are available at a glance.

Figure 6-5. Sample Loading Problem (Sheet 2 of 2)



NOTES: Lines representing adjustable seats show the pilot or passenger center of gravity on adjustable seats positioned for an average occupant. Refer to the Loading Arrangements diagram for forward and aft limits of occupant C.G. range.

Figure 6-6. Loading Graph

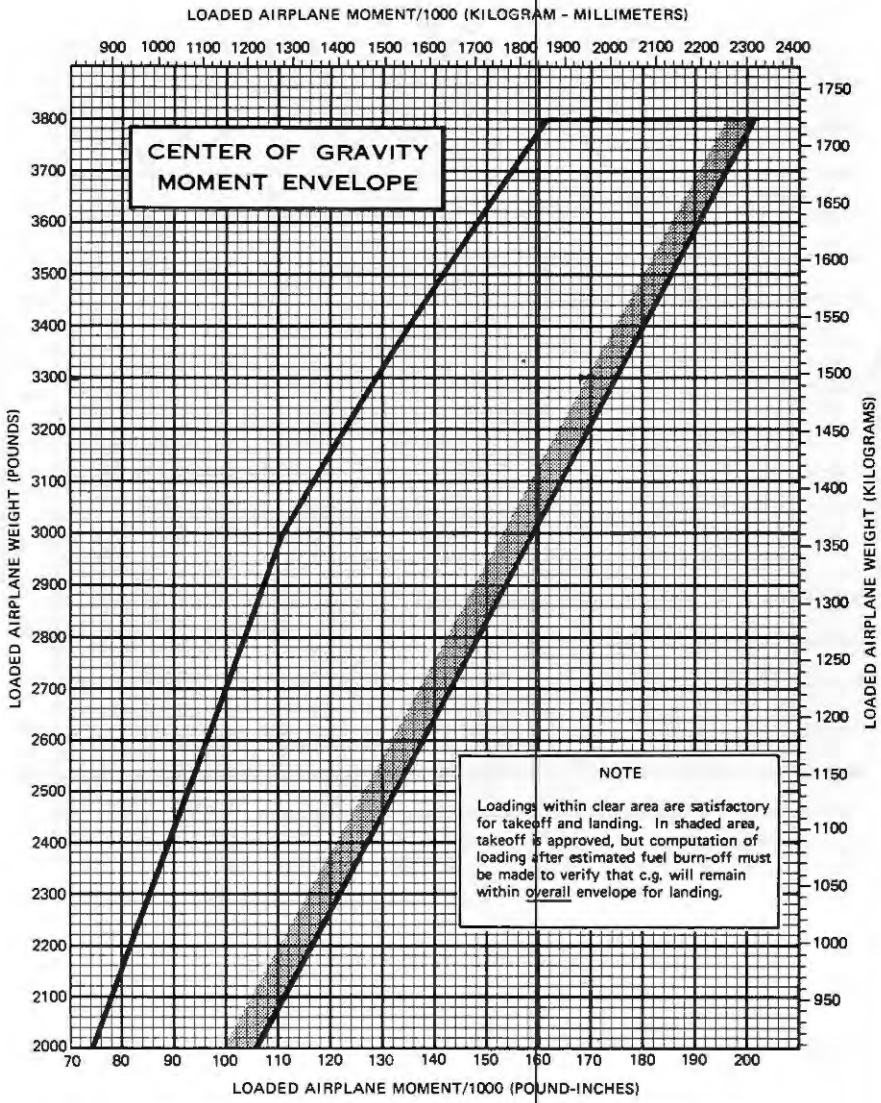


Figure 6-7. Center of Gravity Moment Envelope

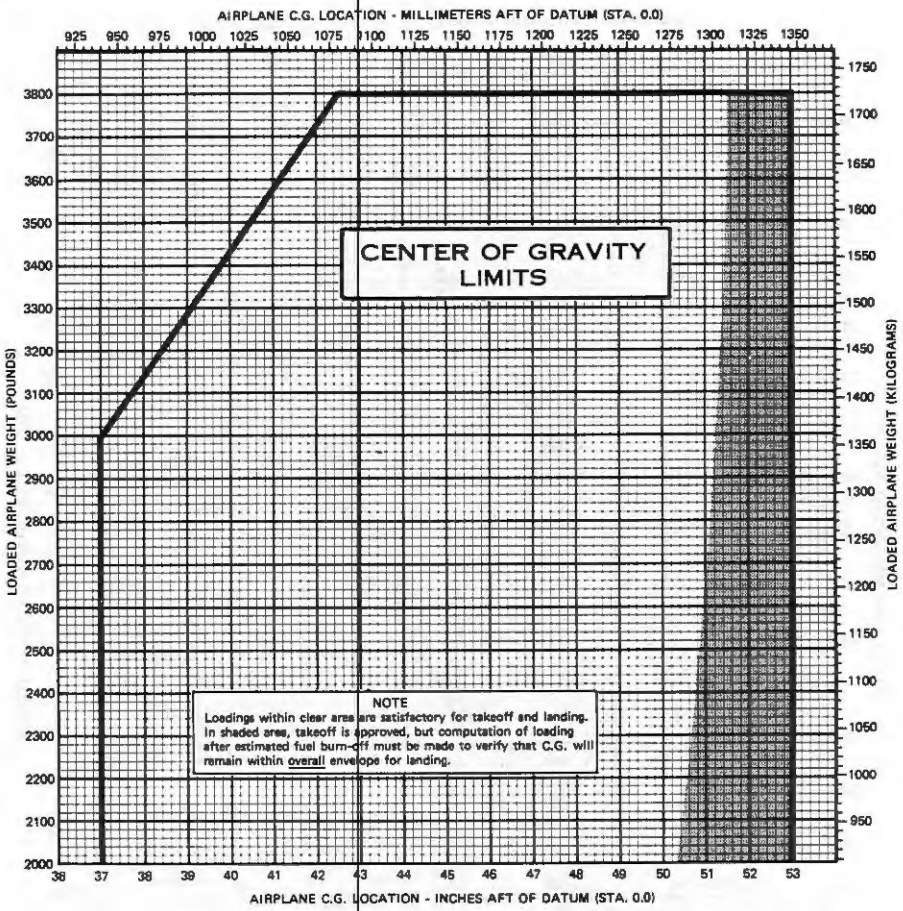


Figure 6-8. Center of Gravity Limits

EQUIPMENT LIST

The following equipment list is a comprehensive list of all Cessna equipment available for this airplane. A separate equipment list of items installed in your specific airplane is provided in your aircraft file. The following list and the specific list for your airplane have a similar order of listing.

This equipment list provides the following information:

An **item number** gives the identification number for the item. Each number is prefixed with a letter which identifies the **descriptive** grouping (example: A. Powerplant & Accessories) under which it is listed. Suffix letters identify the equipment as a required item, a standard item or an optional item. Suffix letters are as follows:

-R = required items of equipment for FAA certification
-S = standard equipment items
-O = optional equipment items replacing required or standard items
-A = optional equipment items which are in addition to required or standard items

A **reference drawing** column provides the drawing number for the item.

NOTE

If additional equipment is to be installed, it must be done in accordance with the reference drawing, accessory kit instructions, or a separate FAA approval.

Columns showing **weight (in pounds)** and **arm (in inches)** provide the weight and center of gravity location for the equipment.

NOTE

Unless otherwise indicated, true values (not net change values) for the weight and arm are shown. Positive arms are distances aft of the airplane datum; negative arms are distances forward of the datum.

NOTE

Asterisks (*) after the item weight and arm indicate complete assembly installations. Some major components of the assembly are listed on the lines immediately following. The summation of these major components does not necessarily equal the complete assembly installation.

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	A. POWERPLANT & ACCESSORIES			
A01-R	ENGINE, CONTINENTAL, IO-520-L SPEC 13	1250052	448.0*	-17.3*
	-TWO MAGNETOS WITH IMPULSE COUPLINGS	SLICK 6210	10.1	-12.5
	-OIL COOLER 8547333 OR	10599R	2.8	-18.5
	-TWELVE 18 MM X 3/4 20-3A SPARK PLUGS	SL 350	3.0	-19.5
	-STARTER, 24 VOLT PRESTOLITE	-.-	17.8	-5.0
	-OIL FILTER ELEMENT		1.1	-4.8
A05-R	FILTER, ENGINE AIR INDUCTION	1250846-1	1.2	-8.7
A09-R	ALTERNATOR, 28 VOLT, 60 AMP	C611503-0102	10.7	-4.7
A09-D-1	ALTERNATOR INSTL, 95 AMP (NET CHG)	1201192-3	5.3*	-5.0*
	-ALTERNATOR, 28V, 95A ADDED	C611505-0102	15.7	-4.4
	-ALTERNATOR, 28V, 60A DELETED	C611503-0102	-10.7	-4.7
	-MOUNTING ADAPTER & HARDWARE		0.3	-4.4
A09-D-2	SECOND ALTERNATOR INSTALLATION	2101054-2	19.6*	-34.0*
	-ALTERNATOR, 60 AMP	C611503-0103	10.7	-35.4
	-SHEAVE PLATE	D40205	4.1	-37.0
	-BELT	N7365	0.3	-37.0
	-BRACKETS & MISC. ITEMS		4.5	-27.7
A33-R	PROPELLER, 3 BLADE MCCAULEY MODEL NO. D3A34C404/80VA-0	C161007-0102	73.0	-44.0
A37-R	PROP GOVERNOR, MCCAULEY C290D4/T4	C161032-0102	3.0	-35.5
A41-R	SPINNER, PROPELLER	1250419-12	3.5	-44.5
A41-0	SPINNER, POLISHED	1250419	3.4	-44.5
A61-S	VACUUM SYSTEM, SINGLE PUMP	1201182-2	4.5*	2.2*
	-VACUUM PUMP OR	431003-0102	1.9	-5.9
	-VACUUM PUMP (ALTERNATE)	C431003-0302	2.1	-5.9
	-VACUUM RELIEF VALVE	C482001-0701	0.4	5.0
	-SUCTION GAGE	C668540-0101	0.3	18.5
	-GYRO AIR FILTER	1201075-1	0.3	11.5

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
A61-0-1	VACUUM SYSTEM WITH DUAL PUMP (NET CHANGE)	1201180-1	4.5*	4.0*
	-VACUUM PUMP AND	C431003-0102	1.9	-5.9
	-VACUUM PUMP	C431003-0302	2.1	-5.9
	-SUCTION GAGE	C668519-0104	0.3	18.5
	-VACUUM RELIEF VALVE	C482001-0701	0.4	5.0
	-GYRO AIR FILTER ASSEMBLY	1201075-1	0.3	11.5
A61-0-2	VACUUM SYSTEM DUAL PUMPS USED WITH DE-ICE SYSTEMS (NET CHANGE)	1201180-3	7.1*	-0.6*
	-VACUUM PUMPS (2)	C431004-0102	6.1	-4.4
	-SUCTION GAGE WITH DUAL INPUT	C668519-0102	0.4	18.5
A7D-A	ENGINE PRIMER SYSTEM, 2-POINT MANIFOLD	2101010-3	0.8	5.7
	B. LANDING GEAR & ACCESSORIES			
B01-R	WHEEL, BRAKE & TIRE ASSY. 6.00X6 MAIN (2)	1241670	40.2*	44.3*
	-WHEEL ASSY., CLEVELAND 40-142 (EACH)	C163001-0701	7.9	44.0
	-BRAKE ASSY., CLEVELAND 30-127C (LEFT)	C163030-0901	3.2	66.5
	-BRAKE ASSY., CLEVELAND 30-127C (RIGHT)	C153030-0902	3.2	66.5
	-TIRE, 8 PLY RATED (EACH)	C262003-0208	8.0	64.0
	-TUBE	C262023-0102	1.3	64.0
B04-R	WHEEL & TIRE ASSY., 5.00X5 NOSE	C163018B0103	9.8*	-7.4*
	-WHEEL ASSY., MCCAULEY	C163005-0201	3.8	-7.4
	-TIRE, 6 PLY RATED	C262003-0202	4.6	-7.4
	-TUBE	C262023-0101	1.4	-7.4
	C. ELECTRICAL SYSTEMS			
C01-R	BATTERY, 24 VOLT STANDARD DUTY	C614001-0105	22.8	3.0
C01-0	BATTERY, 24 VOLT, HEAVY DUTY	C614001-0106	24.8	3.0
C04-R	ALTERNATOR CONTROL UNIT WITH HIGH	C611005-0101	0.4	3.4

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	AND LOW VOLTAGE SENSING, 28 VOLT			
C07-A	GROUND SERVICE PLUG RECEPTACLE	1270621-1	2.0	-4.5
C10-A	ELEVATOR ELECTRIC TRIM INSTALLATION -DRIVE ACTUATOR ASSY. -ACTUATOR MOUNT (WT INCLUDED IN DRIVE ASSEMBLY)	1260542-1 44430-3235 44575-2201	4.4* 2.3 -.-	196.7* 221.0 -.-
C19-D	HEATING SYSTEM, STALL SENSOR & PITOT (NET CHANGE)	1201093-1	0.2	26.4
C22-A	LIGHTS INSTL., INSTRUMENT POST (SET OF 18)	2101009-6	0.5	19.5
C23-A	LIGHTS, INSTRUMENT PANEL ELECTROLUMINESCENCE LIGHTING	2101009-5	2.3	17.5
C25-A	LIGHT INSTALLATION, CONTROL WHEEL MAP (CHANGES 1260243-2 CONTROL WHEEL TO 1260243-11 & INSTALLED W/E89-C ONLY)	1260243-11	0.1	22.5
C31-A	COURTESY LIGHTS, WING UNDERSIDE (SET OF 2)	1221103-2	0.5	51.4
C40-A	DETECTORS, NAVIGATION LIGHT (SET OF 2)	1221201-1	NEGL	-.-
C43-A	LIGHT INSTALLATION, OMNIFLASH BEACON -BEACON LIGHT IN FIN TIP -FLASHER POWER SUPPLY	1201049-1 C621001-0102 C594502-0102	1.6* 0.4 0.7	226.0* 253.0 253.1
C46-A	LIGHT INSTL, WING TIP STROBE -FLASHERS POWER SUPPLY (2) -STROBE LIGHTS (SET OF 2) -WIRING, BRACKET & HARDWARE	1201129-1 C622008-0102 C622006-0107	3.3* 2.3 0.2 0.8	38.9* 39.9 38.7 36.0
C49-S	LIGHTS, COWL MOUNTED LANDING & TAXI -LIGHT BULBS (SET OF 2)	1213401 GE 4591	2.0* 1.0	-30.0* -34.5
C57-A	FLOODLIGHT INSTL., VERTICAL TAIL	1231069-1	1.7	226.0
C61-A	LIGHT INSTALLATION, ICE DETECTOR (WING)	1201100-1	0.6	9.6

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	D. INSTRUMENTS			
D01-R	INDICATOR, AIRSPEED	C661064-0218	0.7	18.0
D01-D	TRUE AIR SPEED INDICATOR, NET CHANGE	1201108-6	0.1	18.0
D04-A	INSTRUMENT AIR ALTERNATE STATIC SOURCE	1201099-1	0.3	16.5
D07-R	ALTIMETER, SENSITIVE, 20,000 FT.	C661071-0101	0.9	18.0
D07-D-1	ALTIMETER, SENSITIVE-FEET & MILLIBARS	C661071-0102	0.8	18.0
D07-D-2	ALTIMETER, SENSITIVE (35,000 FT, 20 FT MARKINGS)	C661025-0102	0.7	18.0
D10-A	ALTIMETER, 2ND INSTRUMENT	2101013-3	1.1	17.5
D16-A-1	ALTIMETER, ENCODING (REQUIRES RELOCATION OF REGULAR ALTIMETER) -ALTIMETER (IN. OF HG.)(20,000 FT)	2101013-1	3.2* 2.8	15.7* 16.0
D16-A-2	ALTIMETER, ENCODING (REQUIRES RELOCATION OF REGULAR ALTIMETER) (FEET & MILLIBARS) -ALTIMETER (35,000 FT)	2101013-2 52524-2	3.4* 2.8	16.0* 16.0
D16-A-3	ALTITUDE ENCODER, BLIND (INSTRUMENT PANEL MOUNTING NOT REQUIRED) -ENCODER	2101011-1 C744001-0101	1.6* 1.3	16.6* 15.5
D16-A-4	ALTITUDE ALERT INSTALLATION -ENCODING ALTIMETER -ALTITUDE ALERTER -CABLES & MISC ITEMS	3910216-5 2101013-10 43310-0000	4.3* 2.8 0.7 0.8	16.0* 16.0 17.5 14.7
D25-S	ELECTRIC CLOCK	C664508-0102	0.3	18.0
D25-D	ELECTRIC CLOCK, DIGITAL NET CHANGE -CLOCK/CHRONOMETER	0770776-1 C664511-0102	0.3* 0.6	18.0* 18.0
D28-R	COMPASS, MAGNETIC	C660501-0102	0.5	20.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
D38-R	GAGE, FUEL QUANTITY, (IN LOWER PEDESTAL)	-0-	0.5	20.0
D41-R	GAGE, CYLINDER HEAD & OIL TEMPERATURE	C669526-0101	0.5	18.2
D43-R	GAGE, AMMETER & OIL PRESSURE	C669527-0101	0.4	18.2
D49-A-1	INDICATOR INSTL., ECONOMY MIXTURE	1200677-3	0.7*	10.8*
	-EGT INDICATOR, ALCOR 202-7AY	C668501-0211	0.4	18.3
	-THERMOCOUPLE LEAD WIRE	C668501-0208	0.1	-0.3
	-THERMOCOUPLE PROBE, ALCOR 01-005-1A44	C668501-0204	0.1	-18.0
D49-A-2	ALCOR EGT IND. INSTL., ENGINE ANALYSER	1200567-5	2.0	-8.3
D52-0	FUEL COMPUTER/CLOCK INSTL., (NET CHG)	2101057-2	0.5	-2.8
D55-R	GAGE, MANIFOLD PRESSURE & FUEL FLOW	C662037-0201	1.0	17.5
D64-S	GYRO INSTL. NON AUTO-PILOT	2101001-1	4.8*	15.3*
	-HEADING INDICATOR	C661075-0101	2.4	15.2
	-ATTITUDE INDICATOR	C661076-0103	2.1	16.2
	-CONNECTING HOSES & MISC. HARDWARE		0.3	9.8
D64-0-1	GYRO INSTL., CESSNA NAV-C-MATIC 300A (NET CHANGE)	2101001-3	0.3*	15.3*
	-ATTITUDE INDICATOR	C661076-0103	2.1	16.2
	-HEADING INDICATOR	40760-0104	2.7	15.2
	-HOSES & MISC. HARDWARE		0.3	9.9
D64-0-2	GYRO INSTL., CESSNA 400B AUTO-PILOT (UNSLAVED HEADING INDICATOR)(NET CHANGE)	2101001-4	0.5*	15.3*
	-ATTITUDE INDICATOR	37570-0105	2.3	16.2
	-DIRECTIONAL INDICATOR (HEADING)	40760-0104	2.7	15.2
	-HOSES & MISC. HARDWARE		0.3	9.3
D64-0-3	GYRO INSTALLATION, CESSNA 400B IFCS (NET CHANGE)	2101001-6	3.6*	15.5*
	-ADI GYRO	44670-0000	3.1	16.2
	-HSI GYRO (SLAVED)	44690-0000	5.0	15.2
	-HOSES & MISC. HARDWARE		0.3	10.5
D64-0-4	GYRO INSTALLATION, CESSNA 400B AUTOPILOT	2101001-7	1.1*	15.3*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	WITH SLAVED HEADING IND. (NET CHANGE)			
	-ATTITUDE INDICATOR	37570-0105	2.3	16.2
	-HEADING INDICATOR (SLAVED)	44760-0000	3.3	15.2
	-HOSES & MISC. HARDWARE		0.2	7.5
D64-0-5	GYRO INSTALLATION, CESSNA NAV-O-MATIC WITH SLAVED HSI (NET CHANGE)	2101001-8	2.7*	15.3*
	-ATTITUDE INDICATOR (HG)	37570-0105	2.3	16.2
	-HORIZONTAL SITUATION IND. (SLAVED)	44690-0000	5.0	15.2
	-HOSES & MISC. HARDWARE		0.2	7.5
D64-0-6	GYRO INSTALLATION, CESSNA 300A N.O.M WITH UNSLAVED HSI (NET CHANGE)	2101001-9	2.1*	15.3*
	-ATTITUDE INDICATOR	C661076-0103	2.1	16.2
	-HORIZONTAL SITUATION IND. (UNSLAVED)	44690-2000	4.5	15.2
	-HOSES & MISC. HARDWARE		0.3	10.5
D64-0-7	GYRO INSTALLATION, 400B NAV-O-MATIC WITH UNSLAVED HSI (NET CHANGE)	2101001-10	2.3*	15.3*
	-ATTITUDE INDICATOR (HG)	37570-0105	2.3	16.2
	-UNSLAVED HSI GYRO	44690-2000	4.5	15.2
	-HOSES & MISC. HARDWARE		0.3	9.9
D67-A	HOURMETER INSTALLATION	2100010-1	0.5	9.8
~~D82-S~~	~~GAGE, OUTSIDE AIR TEMPERATURE~~	~~C668507-0101~~	~~0.1~~	~~26.5~~
D85-R	TACHOMETER, RECORDING	C668020-0207	0.6	17.5
D88-S-1	INDICATOR TURN COORDINATOR (10-30 VOLT)	C661003-0507	1.0	17.8
D88-S-2	INDICATOR TURN COORDINATOR (28 VOLT)	C661003-0506	1.8	17.8
D88-0-1	INDICATOR, TURN COORDINATOR (USED WITH AUTOPILOTS)	42320-0028	1.2	17.8
D88-0-2	INDICATOR, TURN AND BANK	S-1303-2	1.0	17.5
D91-S	INDICATOR, VERTICAL SPEED	C661080-0101	0.8	17.5
	E. CABIN ACCOMMODATIONS			

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
E01-A	ARM RESTS (2) 1ST ROW REMOVABLE INBOARD	1214121-1	1.5	37.0
E02-A	ARM RESTS (2) 2ND ROW REMOVABLE INBOARD	1214121-2	1.5	71.0
E05-R	SEAT, PILOT, INFINITE VERTICAL ADJUSTING	1214180-1	23.5	44.0
E05-O	SEAT, PILOT ARTICULATING VERTICAL ADJUST WITH LUMBAR SUPPORT	1214180-7	25.4	39.5
E07-S	SEAT, CO-PILOT FIXED HEIGHT, ARTICULATING	1214180-3	18.5	44.0
E07-O-1	SEAT, CO-PILOT FIXED HEIGHT, ARTICULATING W/LUMBAR SUPPORT	1214180-2	19.4	44.0
E07-O-2	SEAT, CO-PILOT VERTICAL ADJUST. AND ARTICULATING	1214180-5	24.3	39.5
E07-O-3	SEAT, CO-PILOT VERTICAL ADJUST. ARTICULATING W/LUMBAR SUPPORT	1214180-8	25.4	39.5
E09-S	SEATS, 2 PLACES, 2ND ROW INDIVIDUAL	1214179-1 & -2	37.5	73.0
E11-S	SEAT, 2 PLACES, 3RD ROW BENCH (WITH REMOVABLE CUSHION)	1214181-1	25.5	104.5
E15-R	SEAT BELT ASSY, PILOT	S2275-103	1.0	37.0
E15-S	SHOULDER HARNESS ASSY, PILOT	S2275-201	0.6	37.0
E19-A	INERTIA REEL INSTALLATION, 1ST ROW SEAT BELT & SHOULDER HARNESS NET CHG.	1201057-1	0.6	89.1
E23-S	BELT & SHOULDER HARNESS ASSY, CO-PILOT	S-2275-11	1.6	37.0
E27-S	BELT & SHOULDER HARNESS, 2ND ROW (2)	S-2275-5	3.2	71.0
E29-S	BELT & SHOULDER HARNESS, 3RD ROW (2)	S-2275-32	3.2	101.0
E34-O	UPHOLSTERY SIDEPANELS LEATHER COVERED (NET CHANGE)	1215150	2.0	65.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
E35-O	LEATHER SEAT COVERING, FULL COVER 6 PLACE		1.5	73.1
E36-A	FLOOR MATS, REMOVABLE (2)	0501120-1	3.8	20.0
E37-A	OPENABLE WINDOW, RH CABIN DOOR, NET CHANGE	0701065-5	2.3	47.0
E47-A-1	OXYGEN SYSTEM, 76 CU. FT. CAPACITY AFT CYLINDER INSTALLATION -OXYGEN CYLINDER W/REGULATOR, EMPTY -OXYGEN (76 CU. FT., 1800 PSI @ 0.0832 LBS/CU. FT.) -OXYGEN MASKS (1 PILOT & 5 PASSENGERS) -HOSES, MOUNT & HARDWARE	1201166-1 C166001-0701 C166005	37.0* 24.2 6.3 1.5 5.0	109.5* 116.0 116.0 67.2 82.7
E47-A-2	OXYGEN SYSTEM, 74 CU. FT. CAPACITY OVERHEAD CYLINDER INSTALLATION -OXYGEN CYLINDER (EMPTY) -OXYGEN CYLINDERS, ON-OFF VALVES, (EMPTY) (SET OF 2) -OXYGEN CYLINDER, ON-OFF VALVE (EMPTY) -OXYGEN MASKS--1 PILOT & 5 PASSENGERS -74 CU. FT. OXYGEN (1800 PSI @ 0.0832 LBS/CU. FT.) -HOSES, MOUNT & HARDWARE	1201166-2 C166001-0605 C166003-0102 C166003-0103 C166005	57.5* 9.6 22.5 8.2 1.5 6.2 9.5	56.3* 52.0 56.3 60.6 67.2 56.3 52.2
E49-A-1	BEVERAGE CUP HOLDER, RETRACTABLE, PILOT	1201124-1	0.1	17.0
E49-A-2	BEVERAGE CUP HOLDER, RETRACTABLE, CO-PILOT	1201124-2	0.1	17.0
E50-A	HEADREST, FRONT ROW (EACH)	1215073-1	0.9	48.0
E51-A	HEADREST, 2ND ROW (EACH)	1215073-1	0.9	82.0
E52-A	HEADREST, 3RD ROW (EACH)	1215073-1	0.9	112.0
E55-S	SUN VISORS (SET OF 2)	1414087-20, -21	1.0	33.0
E59-A	APPROACH PLATE HOLDER	0715083-1	0.1	22.0
E65-S	BAGGAGE TIE DOWN NET	1215171-1	0.7	138.0
E75-A	STRETCHER INSTALLATION, CUSTOM-AIR (BOXED)	0700164-8	-.-	-.-

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	(USE ACTUAL INSTALLED WEIGHT & ARM CHANGE) (DEALER OFFERED ONLY)			
E85-S	CONTROL INSTALLATION, RH SIDE WHEEL, PEDALS & TOE BRAKES	1260004-8	7.3	14.1
E88-A	AIR CONDITIONING SYSTEM INSTL. -COMPRESSOR & CLUTCH -CONDENSOR INSTALLATION -EVAPORATOR COILS (SET OF 2) -HOSES, BOXES & MISC. ITEMS	1201162-1 C413001-0113 2112107 2101043	83.4* 17.3 23.0 13.2 29.9	62.1* -32.7 173.5 49.9 -3.7
E89-D	CONTROL WHEEL, ALL PURPOSE (NET CHANGE) INCLUDED MIC. SWITCH, AUXILIARY MIC. JACK, (CHANGES CONTROL WHEEL FROM 1260243-2 TO 1260243-9)—LH OR RH WHEEL	1270747-1	0.3	21.7
E93-R	CABIN HEATING AND ENGINE EXHAUST SYSTEM	1250500	17.5	-11.0
	F. PLACARDS, WARNINGS & MANUALS			
F01-R	PLACARD, OPERATIONAL LIMITATIONS VFR, DAY	0505087-13	NEGL	18.0
F01-D-1	PLACARD, OPERATIONAL LIMITATIONS VFR, DAY-NIGHT	0505087-14	NEGL	18.0
F01-D-2	PLACARD, OPERATIONAL LIMITATIONS IFR, DAY-NIGHT	0505087-15	NEGL	18.0
F07-R	STALL & GEAR WARNING BLACKBOX (REQUIRES ITEM H61-R FOR AUDIBLE OPERATION)	1270733-2	0.5	41.0
F13-S	PILOT'S CHECK LIST (STOWED)	D6137	0.3	-.-
F16-R	PILOT'S OPERATING HANDBOOK AND FAA APPROVED FLIGHT MANUAL, STOWED (LOCATED AT BACK OF PILOT SEAT)	D1265-13PH	1.5	49.5

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	G. AUXILIARY EQUIPMENT			
G04-A	TOW HOOK (INSTALLED ARM SHOWN) (NOT FACTORY INSTALLED)	0712643-3	0.5	231.0
G07-A	HOISTING RINGS, AIRPLANE (NOT FACTORY INSTALLED)	1200190-6	1.0	38.5
G13-A	CORROSION PROOFING, INTERNAL	1260100	10.0	70.0
G16-A	STATIC DISCHARGERS INSTL. (SET OF 11)	121131-3	0.5	179.3
G19-A	STABILIZER ABRASION BOOTS	0500041-3	2.7	202.0
G22-S	TOW BAR, TELESCOPING HANDLE	1200008-8	2.0	138.0
G25-S	PAINT, OVERALL EXTERIOR -OVERALL BASE WHITE -COLORED STRIPE	1204047-3	13.2* 12.2 0.6	92.1* 91.5 103.7
G28-S	JACK PADS, STOWED (INSTALLED ARM SHOWN)	1200028-1	0.2	54.9
G31-S	CONTROL CABLES, CORROSION RESISTANT (INCLUDED 0510105 & 1260505) (NET CHG)	- -	NEGL	-.-
G55-A	FIRE EXTINGUISHER, HAND TYPE	1201177-1	5.5	35.0
G61-A	WRITING TABLE, MOUNTED ON BACK PILOT OR CO-PILOT SEAT	1715072-1	6.5	61.5
G67-A	EXTENSIONS, RUDDER PEDAL, REMOVABLE (SET OF 2, STOWABLE - INSTALLED ARM SHOWN, NOT FACTORY INSTALLED)	0501082-1	2.3	8.0
G76-A-1	DE-ICE SYST., WING & HORIZONTAL STABILIZER (INCLUDES DUAL PUMP VAC. SYST. NET CHANGE) -TIMER -FLOW VALVES (SET OF 3) -DE-ICE BOOTS, WINGS & STABILIZER (4)	1201197-6 3D2600-03 3D2357-01 25S505101	36.6* 0.4 1.7 12.6	52.1* 16.0 93.7 74.6

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
G76-A-2	DE-ICE SYSTEM, PARTIAL PLUMBING (FACTORY INSTALLED THE DIFFICULT PLUMBING ITEMS)	1201197-2	4.2	48.9
G79-A	ANTI-ICE SYSTEM, 3 BLADE PROPELLER	1201188	5.1*	-22.0*
	-TIMER	C165020-0101	0.9	9.0
	-SLIP RING	D40106	1.7	-37.0
	-BRUSH BLOCK ASSEMBLY	C40187	0.3	-36.2
	-WIRING & HARDWARE		2.2	-21.2
G82-A	WINDSHIELD ANTI-ICE SYSTEM	1201060-4	2.1*	9.2*
	-REMOVABLE HEATER PANEL (INSTALL ARM SHOWN)	1513460-6	1.9	9.0
G88-A	WINTERIZATION KIT INSTALLATION	1200762	0.8	-27.6
G96-A	CABIN STEP, RH SIDE, RETRACTABLE	1211500-2	3.5	42.0
	H. AVIONICS & AUTOPILOTS			
H01-A-1	CESSNA 300 ADF INSTALLATION W/BFO	3910159-10	8.1*	24.0*
	-RECEIVER R-546E	41240-1001	3.4	14.5
	-INDICATOR IN-346A	40980-1001	0.9	16.5
	-LOOP ANTENNA (L-346A)	41000-1000	1.4	39.8
	-SENSE ANTENNA INSTALLATION	3960115-2	0.3	127.3
	-MOUNT, WIRING & MISC. ITEMS	- -	1.9	15.4
H01-A-2	CESSNA 400 ADF INSTALLATION	3910160-8	8.0*	23.9*
	-RECEIVER, R-446A	43090-1028	3.3	14.5
	-INDICATOR, IN-346A	40980-1001	0.9	16.5
	-LOOP ANTENNA (L-346A)	41000-1000	1.4	39.8
	-SENSE ANTENNA INSTALLATION	3960115-2	0.3	127.3
	-MOUNT, WIRING & MISC. ITEMS	- -	1.8	15.2
H01-A-3	KING ADF, KR-87 INSTALLATION	3910231-1	7.0*	25.6*
	-KI-227 INDICATOR	066-3063-00	0.7	17.5
	-ADF RECEIVER & MOUNT, KR-87	066-1072-00	3.2	14.5
	-ANTENNA, KA-44 (COMBINATION)	071-1234-00	2.0	49.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
H02-A-1	CESSNA RMI INSTL. (RQS. ADF, SLAVED GYROS & SLAVING SYSTEM), (AUTO PILOT GYROS TO BE INSTALLED WITH ROOT STRAP TYPE SLAVING ACCESSORY UNIT)	3910204	8.4*	65.9*
	-RMI INDICATOR, IN-404A (DUAL NEEDLE)	46450-0404	2.1	17.0
	-REMOTE GONIOMETER (RMI IND. DRIVER)	41950-0001	1.3	15.5
	-DYNAVERTER	51500-0000	2.2	98.0
	-ADF INDICATOR DELETED	40980-1001	-0.9	16.5
	-WIRING & MISC. ITEMS		3.7	80.1
H02-A-2	KING RMI INSTALLATION, KI-229	3910234-2	5.9*	52.7*
	-RMI INDICATOR, KI-229	066-3038-00	2.8	17.0
	-DYNAVERTER (FLITETRONICS)	PC-50	2.2	99.0
H03-A	AM-FM STEREO & CASSETTE RECEIVER/PLAYER INSTALLATION WITH TWO HEADSETS	3910209-5	6.7*	29.8*
	-RECEIVER/TAPE PLAYER INSTL.	3930211-1	2.8	14.1
	-HEADSETS (2 LISTED, 4 MAY BE USED)	C596532-0101	2.2	37.0
	-ANTENNA, WIRING & MIS. HARDWARE		1.7	46.3
H04-A-1	CESSNA 400 DME WITH 300 CR 400 NAV/COM (FOR EXPORT AIRCRAFT)	3910167-8	14.6*	132.1*
	-CONTROL UNIT, C-476A	44020-1000	1.6	14.0
	-REMOTE TRANSCEIVER UNIT, RTA-476A	44000-0000	9.0	173.4
	-ANTENNA	42940-0000	0.2	173.0
	-REMOTE MOUNTING RACK	44088-0000	0.4	173.4
	-COOLING, WIRING & MISC. HARDWARE		3.4	71.1
H04-A-2	CESSNA 400 DME INSTL., TYPE 477A	3910228-6	12.5*	108.7*
	-CONTROL UNIT, C-477A	50930-0000	2.0	14.0
	-REMOTE TRANSCEIVER UNIT, RT-477A	50950-0000	5.0	173.4
	-ANTENNA	42940-0000	0.2	31.3
	-DME COVER ASSEMBLY	1212143-3	0.4	173.4
H04-A-3	KING DME, KN-63 INSTALLATION	3910233-1	4.7*	15.3*
	-KDI-572 INDICATOR	066-1069-00	0.8	18.0
	-TRANSCEIVER, KN-63 DME	066-1070-00	2.8	13.5
	-ANTENNA, KA-60		0.2	31.3
H05-A-1	CESSNA 400 R-NAV., 300 OR 400 NAV/COM (FOR EXPORT AIRCRAFT) WITH 300 SERIES INDICATORS EXCHANGE	3910168-5	4.6*	13.8*

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	-R-NAV COMPUTER, RN-478	44100-0000	3.8	14.2
	-INDICATOR, IN-442AR ADDED	43910-1000	1.0	17.0
	-INDICATOR, IN-380A DELETED	50570-1000	-1.4	16.5
	-WIRING & MISC. ITEMS		1.4	13.5
H05-A-1	CESSNA 400 R-NAV, TYPE RN-479A	3910168-5	4.0*	13.0*
	-R-NAV COMPUTER-INDICATOR	50960-0000	4.0	13.5
	-INDICATOR, IN-480AC DELETED	50570-1300	-1.8	16.0
	-INDICATOR, IN-482AC ADDED	50570-1310	+1.2	16.0
	-COOLING, WIRING & HARDWARE		0.9	19.1
H05-A-5	KING R-NAV, KNS-81 INSTALLATION (WITH GLIDESLOPE & NAV. RECEIVER SYSTEM)	3910238-1	7.7*	16.6*
	-VOR/ILS INDICATOR, KI-206	066-2034-05	1.3	15.4
	-R-NAV COMPUTER & RECEIVER, KNS-81	066-4010-00	5.0	13.0
H07-A-1	CESSNA 400 GLIDESLOPE, IN-381A ILS IND. EXCHANGE WITH VOR/LOC INDICATOR	3910157-9	4.1*	72.5*
	-GLIDESLOPE RECEIVER, R-443B	42100-0000	2.1	99.3
	-COUPLER ANTENNA (NET CHANGE)	S2473-1	NEGL	-.-
	-VOR/ILS INDICATOR, IN-381A ADDED	50570-2000	+1.4	16.5
	-VOR/LOC INDICATOR, IN-380A DELETED	50570-1000	-1.4	16.5
	-WIRING & MISC. HARDWARE		1.9	47.8
H07-A-2	CESSNA 400 GLIDESLOPE, IN-481AC ILS IND. EXCHANGE W/VOR-LOC IND. (1ST & 2ND UNIT)	3910157-16	3.7*	86.3*
	-GLIDESLOPE RECEIVER, R-443B	42100-0000	2.1	99.3
	-COUPLER ANTENNA (NET CHANGE)	S2473-1	NEGL	-.-
	-VOR/LOC INDICATOR, IN-480AC DELETED	50570-1300	-1.7	15.5
	-VOR/ILS INDICATOR, IN481AC ADDED	50570-2300	+1.8	15.5
	-WIRING & MISC. HARDWARE		1.9	47.8
H08-A	NAV IND. ARC/LOC EXCHANGE WITH VOR/LOC (USE WITH NAV/COM INSTALLATIONS)	3910196-1	+0.1	15.5
	-ARC/LOC INDICATOR, IN-380AC ADDED	50570-1200	1.6	15.5
	-VOR/LOC INDICATOR, IN-380A DELETED	50570-1000	-1.4	15.5
H11-A	SUNAIR SINGLE SIDE BAND INSTL., ASB-125	3910158-19	25.0*	107.5*
	-ANTENNA LOAD BOX	99816	4.9	157.2
	-TRANSCEIVER SSB	99681	5.3	13.5
	-POWER SUPPLY & SHOCK MOUNT	99391	7.5	161.0
	-HF ANTENNA INSTALLATION	3960117-1	0.3	180.2

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	-WIRING & MISC. HARDWARE	- -	7.0	83.4
H13-A	CESSNA 400 MARKER BEACON INSTALLATION	3910164	2.3*	93.2*
	-REMOTE RECEIVER, R-402B	51170-0000	0.7	12.5
	-ANTENNA INSTL., FLUSH MTD IN TAIL AREA	3960126-2	0.9	201.2
	-WIRING & MISC. ITEMS		0.7	35.0
H14-A-1	RADAR ALTIMETER INSTALLATION, BONZER	3910225-2	3.5*	28.9*
	-INDICATOR	104-0184-00	1.0	18.7
	-VOLTAGE CONVERTER	104-0184-00	0.5	14.6
	-ANTENNA	104-0183-00	1.0	46.7
	-WIRING & HARDWARE		1.0	28.5
H14-A-2	RADAR ALTIMETER INSTL., KING KRA-10A	3910235-1	5.9*	127.9*
	-KI-250 ALTITUDE INDICATOR	066-3054-01	0.9	17.0
	-KRA-10A RECEIVER/TRANSMITTER	066-1061-03	2.0	189.0
	-WARNING HORN INSTALLATION	3970163-1	0.2	10.0
	-VOLTAGE CONVERTER	104-0184-00	0.5	14.0
H15-A-1	WEATHER COLOR RADAR INSTL., BENDIX RDR-160	3910207-14	29.8*	33.3*
	-INDICATOR (VIEWING SCREEN), IN-2026A	4001294-2601	9.5	14.0
	-RADAR ANTENNA-TRANSCEIVER, ART-161	4001018-6105	9.3	34.9
	-WING POD & RADOME ASSEMBLY	2170300-1	6.1	51.8
	-CABLES & MISC. ITEMS		4.9	44.7
H15-A-2	WEATHER RADAR INSTL., BENDIX RDR-160 (B&W)	3910179-3	25.5*	36.7*
	-INDICATOR (VIEWING SCREEN) IN-152A	4000946-5201	5.1	14.0
	-RADAR ANTENNA-TRANSCEIVER, ART-161	4001018-6101	9.3	34.9
	-WING POD & RADOME ASSEMBLY	2170300-1	6.1	51.8
	-CABLES & MISC. ITEMS		5.0	43.4
H15-A-3	WEATHER RADAR INSTL., PRIMUS 100WX (B & W)	3910207-3	24.6*	36.9*
	-INDICATOR (VIEWING SCREEN)	MI585256-1	4.6	14.0
	-RADAR ANTENNA-TRANSCEIVER	MI585264	8.9	34.4
	-WING POD & RADOME ASSEMBLY	2170300-1	6.1	43.9
	-CABLES & MISC. ITEMS		3.0	30.1
H15-A-4	WEATHER RADAR, KING KWX-56 INSTALLATION	3910240-1	31.1*	35.0*
	-INDICATOR, KI-244	066-3065-00	8.6	15.0
	-ANTENNA/TRANSCEIVER ASSEMBLY, KA-126	071-1220-00	9.8	34.9
	-RADOME & WING SUPPORT POD ASSEMBLY		6.1	51.8

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
H16-A-1	CESSNA 300 TRANSPONDER INSTL., (LOW ALT.)	3910127-22	3.8*	14.8*
	-TRANSCEIVER, RT-359A	41420-0028	2.7	11.5
	-ANTENNA	42940-0000	0.2	60.5
	-WIRING, RADIO COOLING & MISC. HARDWARE		0.7	14.5
H16-A-2	CESSNA 400 TRANSPONDER INSTALLATION	3910128-16	3.9*	16.8*
	-TRANSCEIVER, RT-459A	41470-1028	2.8	11.5
	-ANTENNA	42940-0000	0.2	60.5
	-WIRING & MISC. ITEMS		0.9	17.4
H16-A-3	KING TRANSPONDER, KT-79	3910232-2	4.2*	16.5*
	-TRANSCEIVER,. KT-79	066-1053-00	3.4	13.5
	-ANTENNA, KT-60		0.2	60.5
H18-A	KING RADIO TELEPHONE INSTL. KT-96	3910236	7.4*	33.5*
	-KINGPHONE CONTROL, KT79	0641012-00	3.5	14.0
	-VOLTAGE CONVERTER, KA-39	071-1041-01	1.1	98.8
	-ANTENNA, KA-55	071-1063-00	0.1	4.5
	-HANDSET, KA-115	071-3002-1	1.1	40.0
H19-A	KING KY-196 VHF COM TRANSCEIVER	2910239-1	3.3*	14.1*
	-VHF COM TRANSCEIVER, KY-196	066-1019-00	3.2	14.0
H22-A-1	CESSNA 300 NAV/COM 720 CH COM INSTALLATION	3910183	7.7*	14.0*
	1ST & 2ND UNITS W/300 SERIES INDICATORS			
	REQUIRES H34-A TO BE OPERATIONAL, 1ST UNIT			
	H37-A TO BE OPERATIONAL, 2ND UNIT			
	-RECEIVER/TRANSCEIVER, RT-385A	46660-1000	5.5	13.5
	-VOR/LOC INDICATOR, IN-380A	50570-1000	1.4	15.5
	-MOUNT, WIRING & MISC. HARDWARE	- -	0.8	12.0
H22-A-2	CESSNA 400 NAV/COM 720 CH COM INSTALLATION	3910189	8.1*	14.0*
	(FOR EXPORT AIRCRAFT)			
	1ST & 2ND UNITS W/300 SERIES INDICATORS			
	REQUIRES H34-A TO BE OPERATIONAL, 1ST UNIT			
	H37-A TO BE OPERATIONAL, 2ND UNIT			
	-RECEIVER-TRANSCEIVER, RT-485A	47360-1000	5.5	13.5
	-VOR/LOC INDICATOR, IN-385A	46860-1000	1.6	16.5
	-MOUNT, WIRING & MISC. HARDWARE		0.8	12.0
H22-A-3	CESSNA 400 NAV/COM 720 CH COM INSTALLATION	3910189	7.8*	14.0*
	1ST & 2ND UNITS W/400 SERIES INDICATORS			

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	REQUIRES H34-A TO BE OPERATIONAL, 1ST UNIT H37-A TO BE OPERATIONAL, 2ND UNIT			
	-RECEIVER-TRANSCEIVER, RT-485B	49250-1000	5.5	13.8
	-VOR/LOC INDICATOR, IN-480AC	50570-1300	1.7	15.5
	-MOUNT, WIRING & MISC. HARDWARE		0.8	12.0
H22-A-4	CESSNA 400 NAV/COM W/RT-485B TRANSCEIVER	3910222-12	7.7*	14.0*
	REQUIRES--H34-A TO BE OPERATIONAL 1ST UNIT H37-A TO BE OPERATIONAL 2ND UNIT			
	-RECEIVER-TRANSCEIVER, RT-485B	49250-1000	5.5	13.5
	-VOR/LOC INDICATOR, IN-380A	50570-1000	1.4	15.5
H22-A-5	CESSNA 400 NAV/COM RT-485A INSTALLATION (USED WITH EXPORT AIRCRAFT 1ST & 2ND UNITS WITH 400 SERIES INDICATORS	3910189	8.1*	13.8*
	REQUIRES--H34-A TO OPERATE 1ST UNIT H37-A TO OPERATE 2ND UNIT			
	-RECEIVER-TRANSCEIVER, RT-485A	47360-1000	5.5	13.8
	-VOR/LOC INDICATOR, IN-480AC	50570-1300	1.9	15.5
	-MOUNT, WIRING & MISC., HARDWARE		0.8	12.0
H22-A-6	KING KX-165 VHF NAV/COM INSTALLATION WITH KMA-24 AUDIO PANEL & MARKER BEACON RECVR REQUIRES INSTALLATION OF SLAVED HSI	3910237-1	8.5*	14.0*
	~~-KING KMA-24 AUDIO PNL & MKR BCN RCVR~~	~~066-1055-03~~	~~1.7~~	~~15.6~~
	-KING KX-165 NAV/COM W/GLIDESLOPE RCVR	069-1025-05	5.7	14.0
H28-A	EMERGENCY LOCATOR TRANSMITTER	2101061	3.0*	159.0*
	-TRANSMITTER, D & M	C589512-0103	2.7	160.1
	-ANTENNA	C589512-0106	0.1	142.5
H31-A-1	CESSNA 200B NAV-O-MATIC INSTALLATION	3910162-6	8.2*	42.1*
	-CONTROLLER INSTALLATION (INCLUDES TURN COORDINATOR NET CHANGE	3910198-3	1.9	15.7
	-WING SERVO INSTALLATION	1200237-7	4.7	56.5
	-WIRING & MISC. HARDWARE	42710-0000	1.6	31.2
H31-A-2	NAV-O-MATIC 300A INSTL., AF-395B	3910162-16	8.6*	39.6*
	-CONTROLLER & MOUNT INSTL.	3930144-7	2.5	16.1
	-CONTROLLER/AMPLIFIER & MOUNT	42430-1028	1.9	15.0
	-D64-O-1 GYRO INSTL., NET CHANGE	1200237-7	0.3	56.6
	-D88-O-1 TURN COORDINATOR, NET CHANGE	42320-0028	+0.2	16.8

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	-WIRING & MISC. HARDWARE		1.5	25.8
H31-A-3	CESSNA 400B NAV-O-MATIC INSTALLATION WITH NON-SLAVED DIRECTIONAL INDICATOR	3910197-1	34.4*	92.9*
	-AILERON ROLL ACTUATOR, PA-495-1	4415-2101	4.0	56.5
	-ELEVATOR PITCH ACTUATOR, PA-495-2	45850-3912	4.0	168.8
	-CONTROLLER	37960-1128	1.6	17.5
	-COMPUTER/AMPLIFIER	42680-0007	5.8	96.9
	-ALTITUDE SENSOR	44400-0000	2.3	97.5
	-PITCH TRIM ACTUATOR	44430-3025	2.3	220.5
	-D64-O-2 GYRO INSTALLATION	2101001-4	0.5	15.3
	-ACCESSORY UNIT INSTALLATION	3930200-1	1.0	15.0
	-C01-O BATTERY CHANGE TO H.D. BATTERY	C614001-0106	2.0	3.0
	-FILTER, WIRING & MISC. ITEMS		11.4	83.9
H31-A-4	CESSNA 400B NAV-O-MATIC., SLAVED HEADING INDICATOR	3910197-9	39.5*	89.7*
	-H31-A-3 400B NAV-O-MATIC INSTALLATION	3910197-1	34.4	92.9
	-SLAVED ACCESSORY (W/C BOOT STRAPING)	3940229-1	0.6	154.3
	-FLUX DETECTOR INSTALLATION	3940200-2	0.7	45.1
	-D64-O-2 GYRO IN H31-A-3 DELETED	2101001-4	-0.5	15.3
	-D64-O-5 SLAVED GYRO SYSTEM ADDED	2101001-7	1.1	15.3
	-ALTITUDE SENSOR	44400-0000	2.2	97.3
	-SLAVING ACCESSORY UNIT	3930200-1	0.5	15.5
H31-A-5	CESSNA 400B NAV-O-MATIC WITH UNSLAVED HSI	3910197-9	40.0*	87.0*
	-H31-A-3 400B AUTOPILOT INSTALLATION	3910154-129	34.4	92.9
	-CONVERTER INSTALLATION	3940236-1	1.1	98.0
	-D64-O-2 GYRO IN H31-A-4 DELETED	2101001-4	-0.5	15.3
	-D64-O-8 UNSLAVED HSI ADDED	2101001-10	+2.3	15.3
	-CABLES, UNSLAVED HSI	3950139	1.6	55.5
	-VOR/ILS INDICATOR DELETED	50570-2000	-1.4	15.5
H31-A-6	CESSNA 400B AUTOPILOT WITH SLAVED HSI INDICATOR	3910197-17	43.7*	76.5*
	-H31-A-3 400B NAV-O-MATIC INSTALLATION	- -	34.4	92.9
	-CONVERTER INSTALLATION	3940236-1	1.1	98.0
	-SLAVING ACCESSORY	- -	0.6	154.3
	-FLUX DETECTOR INSTL.	3940200-2	0.7	45.1
	-D64-O-2 GYRO INSTL USED IN H31-A-3	2101001-4	-0.5	15.3
	-D64-O-5 SLAVED HSI GYRO ADDED	2101001-8	+2.7	15.3
	-CABLES FOR SLAVED HSI	3950139-25	2.2	72.7

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	-VOR/ILS INDICATOR DELETED	50570-2000	-1.4	15.5
H31-A-7	CESSNA 400B IFCS W/SLAVED HSI INSTALLATION	3910198-1	51.2*	79.3*
	CESSNA 400B IFCS W/ALTITUDE ALERT OPTION	3910198-3	55.5*	74.5*
	-CONTROLLER	41090-1028	1.3	17.0
	-MODE SELECTOR	42710-0000	2.6	15.5
	-PITCH ACTUATOR	45850-3912	4.2	154.7
	-ALTITUDE SENSOR	44400-0000	2.3	97.5
	-COMPUTER/AMPLIFIER	42680-0007	5.8	98.0
	-PITCH TRIM ACTUATOR	44430-3028	2.2	220.5
	-ROLL ACTUATOR	45850-2900	4.2	56.2
	-D64-0-4 GYRO ADDED NET CHANGE	2101001-6	2.6	15.5
	-HSI CONVERTER INSTALLATION	3940236-1	1.1	15.5
	-VOR/ILS INDICATOR DELETED	50570-1300	-1.7	15.5
	-FLUX DETECTOR INSTALLATION	3940200-2	0.7	45.1
	-C01-O HEAVY DUTY BATTERY EXCHANGED	C614001-0106	2.0	3.0
	-FILTER, WIRING & MISC. ITEMS		23.2	43.7
	-D16-A-4 ALTITUDE ALERT SYSTEM	3910216-6	4.3	16.0
H31-A-8	CESSNA 300A N.O.M. WITH UNSLAVED HSI	3910195-6	13.7*	42.1*
	-H31-A-2 300 N.O.M. INSTALLATION		8.6	39.6
	-H31-A-5 NON SLAVED HSI ITEMS		5.1	46.4
H33-A	INTERPHONE SYSTEM INSTALLATION	3910210-12	2.9*	32.8*
	-JACK FOR INTERPHONE, R.H. SIDE	3970150-5	0.1	18.2
	-H56-A HEADPHONE & MIKE (2) ARM SHOWN IS AS USED, STOWED ARM=14.0	C596531-0101	2.2	37.0
	-E89-O CONTROL WHEEL OPTION LH & RH	1271747	0.6	21.7
H34-A-1	BASIC AVIONICS KIT INSTALLATION REQUIRED WITH 1ST CESSNA NAV/COM INSTL.	3910186-11	6.2*	63.3*
	-RADIO COOLING INSTL.	3930254-9,-2	1.2	7.3
	-NOISE FILTER INSTALLATION	3940148-1	0.1	-6.2
	-VHF COM AND. CABLE INSTL., LH WING	3950129-47	0.6	40.0
	-VHF NAV ANT. CABLE INSTL.	3950129-10	0.9	131.3
	-VHF OMNI ANT. INSTALLATION	3960142-6	0.5	244.7
	-VHF COM ANTENNA INSTL., LH	3960113-1	0.5	51.5
	-MICROPHONE INSTL., HAND HELD	3970143-1	0.3	17.0
	-AUDIO CONTROL PANEL	3970152-1	1.2	15.9
	-HEADPHONE INSTALLATION	3970138-4	0.2	19.2
	-1ST N/C TRANSCEIVER KIT INSTL.	3930260-3	0.2	17.1
	-ANTENNA ADAPTER INSTALLATION	3960139-3	0.1	7.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	-BUS BAR INSTALLATION	3930178-10	0.1	22.0
	-FUSE HOLDER INSTALLATION	3940247-3	NEGL	-.-
	-G16-A ANTI-PRECIP STATIC WICKS	1201203-1	0.3	179.3
H34-A-2	BASIC AVIONICS KIT INSTALLATION, USED WITH KING AVIONICS PACKAGE (WITH JO1-A-2 ONLY)	3910186-23	8.3*	79.0*
	-STATIC DISCHARGER WICK INSTALLATION	1201203-1	0.3	179.3
	-BUS BAR INSTL., INCLUDES 2 SWITCHES	3930178-24	0.3	22.0
	-RADIO COOLING INSTALLATION	3930263-1	1.5	7.1
	-NOISE FILTER INSTALLATION	3940148-1	0.2	-6.2
	-FUSE HOLDER INSTALLATION	3940247-3	0.1	-0.5
	-GROUNDING BLOCK INSTALLATION	3940288-2	0.2	13.5
	-OMNI ANTENNA CABLE	3950129-0	0.9	131.3
	-VHF COM ANTENNA CABLES (2)	3950154-3	1.2	35.8
	-CABLE INSTL., G.S. & NAV.	3950154-30	0.1	8.0
	-ANTENNA COUPLER	3960111-29	0.2	94.0
	-ANTENNA VHF COM., LH & RH (2)	3960113	0.9	51.5
	-ANTENNA, MARKER BEACON	3960126-2	0.7	201.2
	-ANTENNA, OMNI	3960142-6	0.5	244.7
	-HEADPHONE INSTL. (STOWED ARM SHOWN)	3970138-4	0.2	19.2
	-MICROPHONE INSTALLATION	3970143-1	0.3	17.0
H37-A	ANTENNA & COUPLER KIT INSTALLATION REQUIRED W/2ND UNIT NAV/COM RADIO INSTL.	3910185-9	2.2*	40.5*
	-OMNI ANTENNA COUPLER INSTL.	3960111-14	0.2	94.0
	-VHF COM ANTENNA INSTALLATION	3960113-2	0.5	51.5
	-VHF COM ANTENNA CABLE INSTL.	3950129-46	0.6	40.0
	-2ND N/C TRANSCEIVER KIT	3930260-7	0.2	17.9
	-ADAPTER ANTENNA, DELETED	3960139-3	-0.2	7.0
	-RADIO COOLING	3930217-3	NEGL	-.-
H43-A-1	CESSNA 200A N.O.M. PARTIAL INSTALLATION (USED WITH EXPORT AIRCRAFT)	3910154-110	7.7	42.5
H43-A-2	CESSNA 300A N.O.M. PARTIAL INSTALLATION (USED WITH EXPORT AIRCRAFT)	3910154-120	8.4	40.2
H43-A-3	CESSNA 400A N.O.M. PARTIAL INSTALLATION (USED WITH EXPORT AIRCRAFT)	3910154-129	34.9	92.3
H46-A	ADF ANTI-PRECIP SENSE ANTENNA	3910154-71	0.7	127.0

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
H49-A	BALANCED LOOP ANTENNA INSTALLATION (EXCHANGED WITH OMNI ANT.) (WT. NET CHG.)	3910154-138	2.2*	246.4*
	-BALANCED LOOP ANTENNA	C598505-0101	2.3	245.4
	-OMNI ANT. KIT, DELETED	C598504-0101	-0.4	245.0
	-MISC. HARDWARE		0.3	252.2
H55-A	HEADSET MICROPHONE	C596533-0101	0.3	16.1
H56-A	PADDED HEADSET-MICROPHONE COMBINATION	C596531-0101	1.1	14.0
H61-R	GEAR WARNING & CABIN SPEAKER	C596510-0101	1.9	45.8
H64-A	AVIONICS PARTIAL OPTION 'A' (EXPORT ONLY)	3910206-19	4.0*	76.4*
	-BLOWER RADIO COOLING INSTL.	3930254-1	1.1	7.3
	-OMNI ANTENNA CABLE INSTL.	3950129-10	0.9	131.3
	-VHF COM ANT CABLE INSTL., LH	3950129-47	0.6	40.0
	-VHF OMNI ANTENNA INSTL.	3960142-6	0.5	244.7
	-VHF COM ANTENNA INSTL., LH	3960113-1	0.5	51.5
	-HEADPHONE INSTALLATION	3970138-4	0.2	19.2
	-MICROPHONE INSTALLATION	3970143-1	0.3	17.0
H67-A	AVIONICS PARTIAL OPTION 'B' INSTALLATION (EXPORT ONLY) INCLUDING	3910206-20	5.7*	68.5*
	-AVIONICS OPTION 'A' EQUIPMENT	3910206-19	4.0	76.4
	-ANT. & COUPLER FOR 2ND NAV RCVR	3960111-14	0.7	56.6
	-COM ANTENNA INSTALLATION, RH.	3960113-2	0.5	51.5
	-COM ANT. CABLE INSTL., RH	3950129-46	0.6	40.0
H70-A	REMOTE TRANSPONDER IDENT SWITCH (IN PILOT CONTROL WHEEL)	3910205-5	0.2	22.5
	J. SPECIAL OPTION PACKAGES			
J01-A-1	CENTURION II KIT WITH CESSNA AVIONIC EQUIPMENT INSTALLATION		48.1*	44.4*
	-C07-A GROUND SERVICE RECEPTACLE	1270621-1	2.0	-4.5
	-C19-G-2 HEATED PITOT & STALL SENSORS (WT. NET CHANGE)	1201093-1	0.2	26.3

ITEM NO	EQUIPMENT LIST DESCRIPTION	REF DRAWING	WT LBS	ARM INS
	-C22-A INSTRUMENT POST LIGHTS	2101009-6	0.5	19.5
	-C31-A COURTESY ENTRANCE LIGHTS	1221103-2	0.5	51.4
	-C40-A NAVIGATION LIGHT DETECTORS	1221201-1,-2	NEGL	-.-
	-C43-A OMNI FLASHING BEACON	1201049-1	1.6	226.0
	-D01-D TRUE AIR SPEED IND (NET CHNG)	1201108-11	0.1	18.0
	-E07-D-2 VERT. ADJUST RH SEAT (NET CHG)	1214180-5	5.8	25.1
	-G25-S EXTERIOR STYLING (NET CHANGE)	1204047	NEGL	-.-
	-H01-A-1 CESSNA 300 ADF, R-546A	2910156-10	8.1	24.0
	-H16-A CESSNA 400 TRANSPONDER, RT-459	3910128-16	3.9	16.8
	-H22-A-1 CESSNA 300 NAV/COM VOR/LOC	3910183-32	7.7	14.0
	-H28-A E.L.T. INSTALLATION		3.0	159.0
	-H31-A-1 CESSNA 200A AUTOPILOT	3910162-16	8.2	42.1
	-H34-A-1 CESSNA BASIC AVIONICS KIT	3910186-11	6.2	63.3
J01-A-2	CENTURION II WITH KING AVIONICS PKG.		99.6*	52.0*
	-C07-A GROUND SERVICE RECEPTACLE	1270621-1	2.0	-4.5
	-C19-C-2 HEATED PITOT & STALL SENSOR (WT. NET CHANGE)	1201093-1	0.2	26.3
	-C22-A INSTRUMENT POST LIGHTS	2101009-6	0.5	19.5
	-C31-A COURTESY ENTERANCE LIGHTS	1221103-2	0.5	51.4
	-C40-A NAVIGATION LIGHT DETECTORS	1221201-1,-2	NEGL	-.-
	-D07-D TRUE AIRSPEED IND. (NET CHG)	1201049-1	1.6	226.0
	-E07-D-2 VERT. ADJUST RH SEAT (NET CHG)	1214180-5	5.8	25.1
	-G25-S EXTERIOR STYLING (NET CHG)	1204047	NEGL	-.-
	-H01-A-3 KING KR-87 ADF	3910231-1	7.0	25.6
	-H04-A-3 KN-63 KING DME	3910233-1	4.7	15.3
	-H05-A-4 KNS-81 R-NAV W/GS & NAV RCVRS	3910238-1	7.7	16.6
	-H16-A-3 KT79 KING TRANSPONDER	3910232-3	4.2	16.5
	-H19-A KY196 VHF COM TRANSCEIVER	3910239-1	3.3	14.1
	-H22-A-6 KX-165 VHF NAV/COM	3910237-1	8.5	14.0
	-H34-A-2 BASIC AVIONICS FOR KING EQUIP.	3910186-23	8.3	79.0
	-H31-A-6 CESSNA 400B AUTOPILOT		45.1	74.6
J04-A	NAV-PAC INSTALLATION (AVAILABLE WITH CESSNA AVIONICS II KIT, J01-A-1, ONLY)		16.0*	45.8*
	-H07-A-3 400 GLIDESLOPE, 2ND UNIT	3910157-24	3.8	84.5
	-H13-A 400 MARKER BEACON	3910164	2.3	93.2
	-H22-A-1 300 NAV-COM, 2ND UNIT	3910163	7.7	14.0
	-H37-A ANTENNA & COUPLER KIT	3910185-9	2.2	40.5

SECTION 7
AIRPLANE & SYSTEMS DESCRIPTIONS

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INTRODUCTION

This section provides description and operation of the airplane and its systems. Some equipment described herein is optional and may not be installed in the airplane. Refer to Section 9, Supplements, for details of other optional systems and equipment.

AIRFRAME

The airplane is an all-metal, six-place, high-wing, single-engine airplane equipped with retractable tricycle landing gear and designed for general utility purposes.

The construction of the fuselage is a conventional formed sheet metal bulkhead and skin design referred to as semimonocoque. Incorporated into the fuselage structure are two large cabin door openings and a baggage door opening. Major items of structure include a forward carry-through spar and a forged aluminum main carry-through spar to which the wings are attached. The lower aft portion of the fuselage center section contains the forgings and structure for the retractable main landing gear.

The full cantilever wings have integral fuel tanks and are constructed of a forward spar, main spar, conventional formed sheet metal ribs and aluminum skin. The integral fuel tanks are formed by the forward spar, two sealing ribs, and an aft fuel tank spar forward of the main spar. The Frise type ailerons and single-slot type flaps are of conventional formed sheet metal ribs and smooth aluminum skin construction. The ailerons are equipped with ground adjustable trim tabs on the inboard end of the trailing edge, and balance weights in the leading edges.

The empennage (tail assembly) consists of a conventional vertical stabilizer, rudder, horizontal stabilizer, and elevator. The vertical stabilizer consists of a forward and aft spar, formed sheet metal ribs and reinforcements, four skin panels, formed leading edge skins, and a dorsal. The rudder is constructed of a forward and aft spar, formed sheet metal ribs and reinforcements, and a wrap-around skin panel. The top of the rudder incorporates a leading edge extension which contains a balance weight. The horizontal stabilizer is constructed of a forward and aft spar, ribs and stiffeners, center upper skin panel, and two left and two right wrap-around skin panels which also form the leading edges. The horizontal stabilizer also contains the elevator trim tab actuator. Construction of the elevator consists of a forward and aft spar, ribs, torque tube and bellcrank, left upper and lower skin panels, a formed one-piece left trailing edge, right upper and lower skin panels, and right inboard and outboard formed trailing edges. The elevator trim tab consists of a bracket assembly, hinge

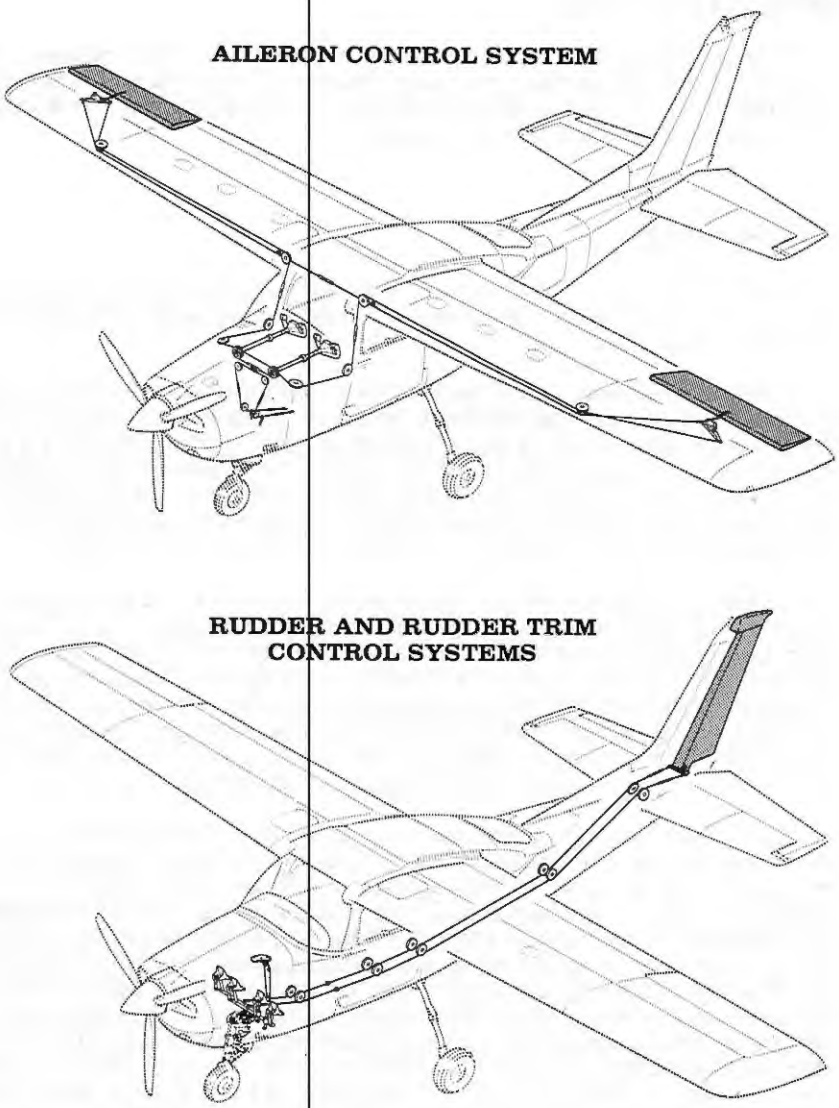


Figure 7-1. Flight Control and Trim Systems (Sheet 1 of 2)

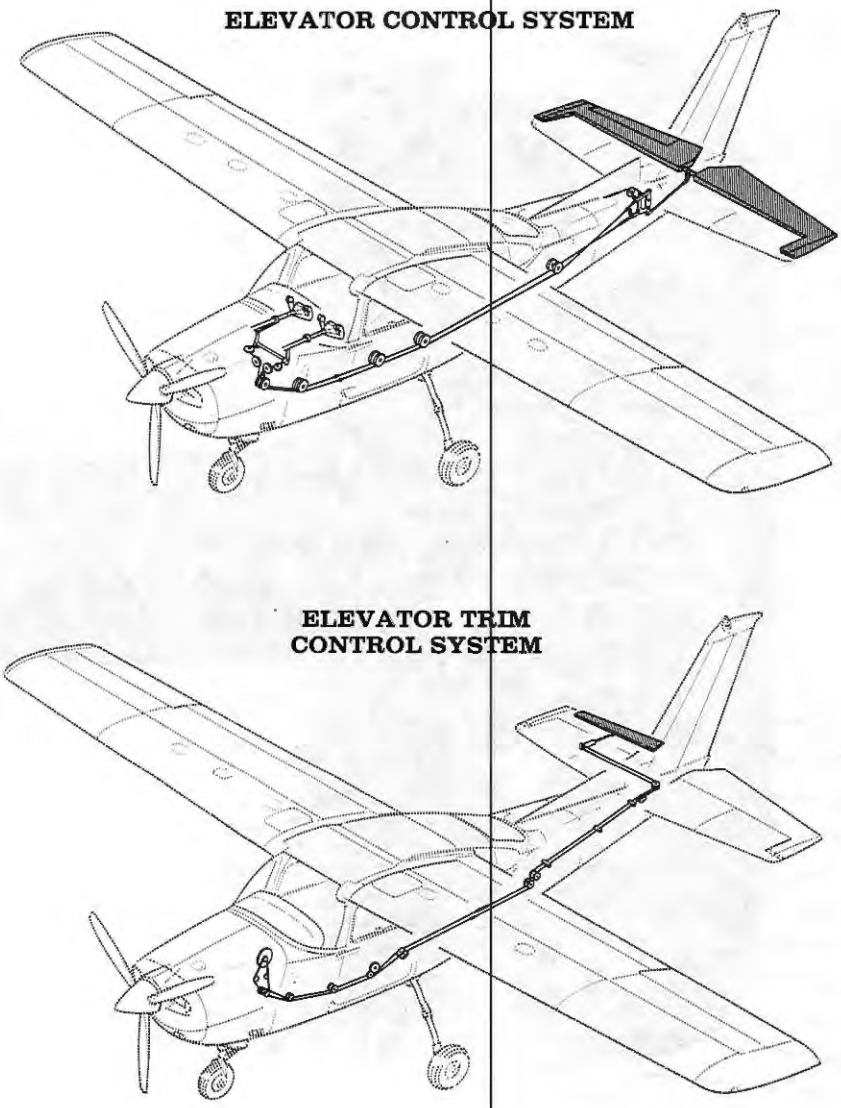


Figure 7-1. Flight Control and Trim Systems (Sheet 2 of 2)

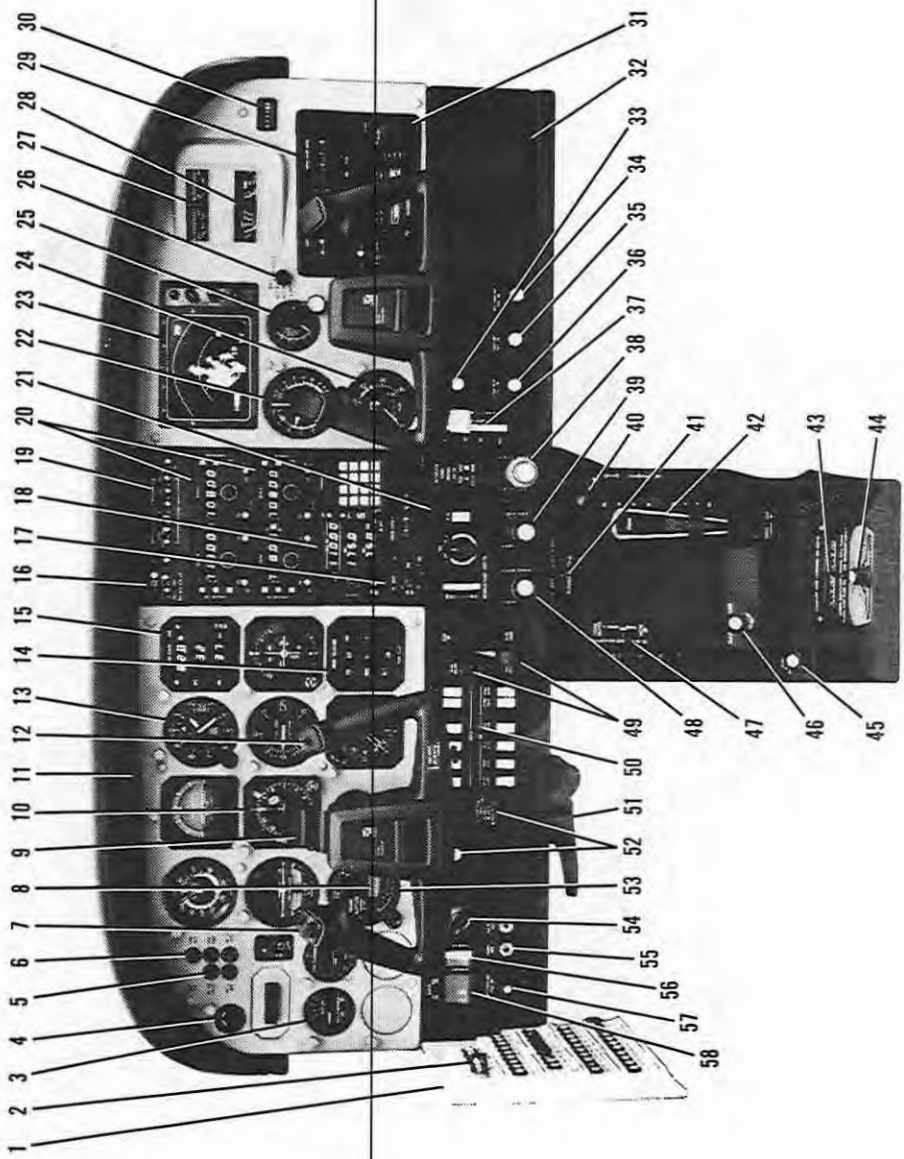


Figure 7-2. Instrument Panel (Sheet 1 of 2)

1. Sidewall Circuit Breaker Panel
2. Avionics Power Switches
3. Suction Gage
4. Propeller Anti-Ice Ammeter
5. Wing De-Ice Pressure Indicator and Alternator 1 Off Warning Lights
6. Low-Vacuum, Low-Voltage, and Alternator 2 Off Warning Lights
7. Electric Elevator Trim, IFCS Go-Around and Microphone Switches
8. Autopilot and Electric Elevator Trim Disengage Switches
9. Approach Plate Holder
10. Flight Instrument Group
11. Map Light and Switch
12. IFCS Pitch Synchronizer and Transponder Remote IDENT Switches
13. Barometric Altimeter
14. IFCS Mode Selector
15. DME
16. Marker Beacon Indicator Lights and Switches
17. Transponder
18. Area Navigation (RNAV) Radio
19. Audio Control Panel
20. NAV/COM Radios
21. Autopilot Control Unit
22. Manifold Pressure/Fuel Flow Indicator
23. Weather Radar
24. Tachometer
25. Engine Combustion Analyzer
26. Volt-Ammeter Selector Switch
27. Cylinder Head Temperature and Oil Temperature Gages
28. Oil Pressure Gage and Volt-Ammeter
29. ADF Radio
30. Flight Hour Recorder
31. AM/FM Cassette Stereo Entertainment Center
32. Map Compartment
33. Defrost Control
34. Auxiliary Cabin Air Control
35. Cabin Air Control
36. Cabin Heat Control
37. Wing Flap Switch Lever and Position Indicator
38. Mixture Control
39. Propeller Control
40. Cowl Flap Control Lever
41. Rudder Trim Control Wheel and Position Indicator
42. Microphone
43. Fuel Quantity Indicators
44. Fuel Selector Valve Handle
45. Fuel ON-OFF Valve Control
46. Manual Primer
47. Elevator Trim Control Wheel and Position Indicator
48. Throttle (With Friction Lock)
49. Landing Gear Lever and Position Indicator Lights
50. Electrical Switches
51. Parking Brake Handle
52. Instrument and Control Panel Lighting Controls
53. Radar Altimeter
54. Ignition Switch
55. Auxiliary Mike and Phone Jacks
56. Auxiliary Fuel Pump Switch
57. Static Pressure Alternate Source Valve
58. Battery and Alternator Switches

Figure 7-2. Instrument Panel (Sheet 2 of 2)

half, and a wrap-around skin panel. Both elevator tip leading edge extensions incorporate balance weights.

FLIGHT CONTROLS

The airplane's flight control system (see figure 7-1) consists of conventional aileron, elevator and rudder control surfaces. The control surfaces are manually operated through mechanical linkage using a control wheel for the ailerons and elevator, and rudder/brake pedals for the rudder. The elevator control system is equipped with a downspring, and an aileron-rudder interconnect is incorporated to provide improved stability in flight.

Extensions are available for the rudder/brake pedals. They consist of a rudder pedal face, two spacers and two spring clips. To install an extension, place the clip on the bottom of the extension under the bottom of rudder pedal and snap the top clip over the top of the rudder pedal. Check that the extension is firmly in place. To remove the extensions, reverse the above procedures.

TRIM SYSTEMS

Manually-operated rudder and elevator trim is provided (see figure 7-1). Rudder trimming is accomplished through a bungee connected to the rudder control system and a trim control wheel mounted on the control pedestal. Rudder trimming is accomplished by rotating the horizontally mounted trim control wheel either left or right to the desired trim position. Rotating the trim wheel to the right will trim nose-right; conversely, rotating it to the left will trim nose-left. Elevator trimming is accomplished through the elevator trim tab by utilizing the vertically mounted trim control wheel. Forward rotation of the trim wheel will trim nose-down; conversely, aft rotation will trim nose-up. The airplane may also be equipped with an electric elevator trim system. For details concerning this system, refer to Section 9, Supplements.

INSTRUMENT PANEL

The instrument panel (see figure 7-2) is designed around the basic "T" configuration. The gyros are located immediately in front of the pilot, and arranged vertically. The airspeed indicator and altimeter are located to the left and right of the gyros respectively. The remainder of the flight instruments are located around the basic "T". A series of indicator and warning lights is located on the upper left side of the instrument panel. Avionics

equipment is stacked approximately on the centerline of the panel, with the right side of the panel containing the manifold pressure/fuel flow indicator, tachometer, weather radar, AM/FM cassette stereo, map compartment, and space for additional instruments and avionics equipment. The engine instrument cluster and economy mixture indicator or engine combustion analyzer are also on the right side of the avionics stack near the top of the panel. A switch and control panel, at the lower edge of the instrument panel, contains most of the switches and controls necessary to operate the airplane. The left side of the panel contains the master switch, auxiliary fuel pump switch, ignition switch, light intensity controls, electrical switches, landing gear lever and indicator lights, and static pressure alternate source valve control knob. The center area contains the throttle, propeller control, and mixture control. The right side of the panel contains the wing flap switch lever and indicator, cabin heat control knob, cabin air control knob, defroster control knob, and auxiliary cabin air control knob. A pedestal, extending from the edge of the switch and control panel to the floorboard, contains the elevator and rudder trim control wheels, cowl flap control lever, engine manual primer, fuel on-off valve control, and microphone bracket. The fuel selector valve handle is located at the base of the pedestal with the fuel quantity indicators immediately forward of the handle. A parking brake handle is mounted under the switch and control panel in front of the pilot. All circuit breakers for general electrical equipment and avionics are mounted in a circuit breaker panel located on the left cabin sidewall adjacent to the pilot's seat.

For details concerning the instruments, switches, circuit breakers and controls on this panel and on the circuit breaker panel, refer in this section to the description of the systems to which these items are related.

GROUND CONTROL

Effective ground control while taxiing is accomplished through nose wheel steering by using the rudder pedals; left rudder pedal to steer left and right rudder pedal to steer right. When a rudder pedal is depressed, a spring-loaded steering bungee (which is connected to the nose gear and to the rudder bars) will turn the nose wheel through an arc of approximately 14.5° each side of center. By applying either left or right brake, the degree of turn may be increased up to 35° each side of center.

Moving the airplane by hand is most easily accomplished by attaching a tow bar to the nose gear strut. If a tow bar is not available, or pushing is required, use the main landing gear struts as push points. Do not use the vertical or horizontal tail surfaces to move the airplane. If the airplane is to be towed by vehicle, never turn the nose wheel more than 35° either side of center or structural damage to the nose gear could result.

The minimum turning radius of the airplane, using differential

braking and nose wheel steering during taxi, is approximately 26 feet 11 inches.

WING FLAP SYSTEM

The wing flaps are of the large span, single-slot type (see figure 7-3), and are extended or retracted by positioning the wing flap switch lever on the instrument panel to the desired flap deflection position. The switch lever is moved up or down in a slotted panel that provides mechanical stops at the 10° and 20° positions. For flap settings greater than 10°, move the switch lever to the right to clear the stop and position it as desired. A scale and pointer on the left side of the switch lever indicates flap travel in degrees. The wing flap system circuit is protected by a 10-ampere circuit breaker, labeled FLAP, on the left sidewall circuit breaker panel.

LANDING GEAR SYSTEM

The landing gear is a retractable, tricycle type with a steerable nose wheel and two main wheels. Shock absorption is provided by the tubular spring-steel main landing gear struts and the air/oil nose gear shock strut.

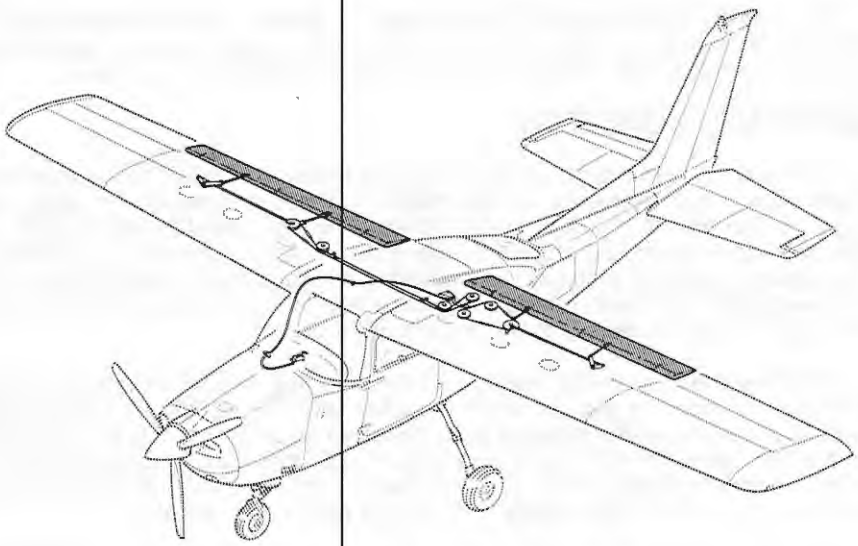


Figure 7-3. Wing Flap System

Each main wheel is equipped with a hydraulically actuated disc-type brake on the inboard side of the wheel.

Landing gear extension, retraction, and down lock operation is accomplished by hydraulic actuators powered by an electrically-driven hydraulic power pack (see figure 7-7). The power pack assembly is housed within the control pedestal. Hydraulic system fluid level may be checked by utilizing the dipstick/filler cap, on the power pack, behind a snap-out cover panel on the right side of the control pedestal. The system should be checked at 25-hour intervals. If the fluid level is at or below the ADD line on the dipstick, hydraulic fluid (MIL-H-5606) should be added.

Power pack operation is started and stopped by a pressure switch, and hydraulic pressure is directed by the landing gear lever. Two position indicator lights are provided to show landing gear position and power pack operation. The landing gear system is also equipped with a nose gear safety (squat) switch, an emergency extension hand pump, and a gear-up warning system. Nose gear wheel and strut door operation is accomplished mechanically.

LANDING GEAR LEVER

The landing gear lever is located on the switch and control panel to the right of the electrical switches. The lever has two positions, labeled GEAR UP and GEAR DOWN, which give a mechanical indication of the gear position selected. From either position, the lever must be pulled out to clear a detent before it can be repositioned; operation of the landing gear system will not begin until the lever has been repositioned. After the lever has been repositioned, it directs hydraulic pressure within the system to actuate the gear to the selected position.

LANDING GEAR POSITION INDICATOR LIGHTS

Two position indicator lights, adjacent to the landing gear lever, indicate that the gear is down and locked (green GEAR LOCKED light on) or that one or more gear is not fully up (red GEAR UNSAFE light on). In addition, the red light is a dual function light and will also illuminate anytime the gear pump motor is operating. Both of these lights are the press-to-test type, incorporating dimming shutters for night operation. The GEAR LOCKED (green) light has two test positions; with the light pushed in halfway (throttle retarded and master switch on) the gear warning system should be heard intermittently on the airplane speaker, and with the

light pushed fully in, it should illuminate. The GEAR UNSAFE (red) light has only one test position; with the light pushed fully in, it should illuminate. If an indicator light bulb should burn out, it can be replaced in flight with the bulb from the remaining gear indicator light or any postlight.

LANDING GEAR OPERATION

To retract or extend the landing gear, pull out on the gear lever and move it to the desired position. After the lever is positioned, the power pack comes on to create pressure in the system and actuate the landing gear to the selected position. During a normal cycle, the gear extends and locks or retracts fully, limit switches actuate, and the green light comes on (extend cycle) or the red light goes off (retract cycle), indicating completion of the cycle. The gear is held in the full up position by hydraulic pressure. Whenever fluid pressure in the system drops below 1000 PSI, the pressure switch will close and start power pack operation, and the red GEAR UNSAFE light will illuminate, except when the nose gear safety (squat) switch is open.

NOTE

It is possible to have both the red GEAR UNSAFE and the green GEAR LOCKED light on at the same time. Under normal circumstances this may occur only momentarily. However, any time both lights stay on or the red GEAR UNSAFE light does not go off, a malfunction has occurred. Refer to Section 3, Emergency Procedures, for appropriate action to be taken in this event.

The safety (squat) switch, actuated by the nose gear, electrically prevents inadvertent retraction whenever the nose gear strut is compressed by the weight of the airplane. When the nose gear is lifted off the runway during takeoff, the squat switch will close, which may cause the power pack to operate for 1 to 2 seconds (red GEAR UNSAFE light on) and return system pressure to 1500 PSI in the event pressure has dropped below 1000 PSI. A "pull-off" type circuit breaker, labeled GEAR PUMP, is also provided in the system as a maintenance safety feature. With the circuit breaker pulled out, landing gear operation by the gear pump motor is prevented. After maintenance is completed, and prior to flight, the circuit breaker should be pushed back in.

WARNING

Safety placards are installed in the nose wheel well to warn against any maintenance in this area with the circuit breaker pushed in.

EMERGENCY HAND PUMP

A hand-operated hydraulic pump, located between the two front seats, is provided for extension of the landing gear in the event of a hydraulic or electrical system failure. The landing gear cannot be retracted with the hand pump. To utilize the pump, extend the handle forward and pump vertically. For complete emergency procedures, refer to Section 3.

For practice manual gear extensions, pull out the GEAR PUMP circuit breaker before placing the landing gear lever in the GEAR DOWN position. After the practice manual extension is completed, push the circuit breaker in to restore normal gear operation.

LANDING GEAR WARNING SYSTEM

The airplane is equipped with a landing gear warning system designed to help prevent the pilot from inadvertently making a wheels-up landing. The system consists of a throttle actuated switch which is electrically connected to a dual warning unit. The warning unit is connected to the airplane speaker.

When the throttle is retarded below approximately 12 inches of manifold pressure (master switch on), the throttle linkage will actuate a switch which is electrically connected to the gear warning portion of a dual warning unit. If the landing gear is retracted (or not down and locked), an intermittent tone will be heard on the airplane speaker. The system may be checked for correct operation before flight by retarding the throttle to idle and depressing the green gear-down position indicator light half way in. With the indicator light depressed as described, an intermittent tone should be heard on the airplane speaker.

A "pull-off" type circuit breaker, labeled **STALL/GEAR HORN**, is provided to shut off the warning horn in the event it should stick in the on position.

CAUTION

This circuit breaker should be pushed in for landing.

RETRACTABLE CABIN ENTRY STEP

The airplane may be equipped with a retractable cabin entry step located on the right side of the fuselage below the cabin door. The step cycles directly with the landing gear, and is spring loaded to the extended position. A cable attached to the nose gear hydraulic actuator thru-bolt retracts the step as the nose gear is retracted.

BAGGAGE COMPARTMENT

The baggage compartment consists of the area from the back of the rear passenger seats to the aft cabin bulkhead. Access to the baggage compartment is gained through a lockable baggage door on the left side of the airplane, or from within the airplane cabin. A baggage net with six tie-down straps is provided for securing baggage and is attached by tying the straps to tie-down rings provided in the airplane. When loading the airplane, children should not be placed or permitted in the baggage compartment, and any material that might be hazardous to the airplane or occupants should not be placed anywhere in the airplane. For baggage area and door dimensions, refer to Section 6.

SEATS

The seating arrangement consists of four separate adjustable seats and a one-piece fixed seat. The pilot's seat is a six-way adjustable seat, and the front and center passengers seats are four-way adjustable. The front passenger's seat is also available in the six-way adjustable configuration. The two aft passengers utilize a one-piece fixed seat.

The six-way adjustable pilot's seat may be moved forward or aft, adjusted for height, and the seat back angle is infinitely adjustable. Position the seat by lifting the tubular handle, under the center of the seat bottom, and slide the seat into position; then release the handle and check that the seat is locked in place. Raise or lower the seat by rotating a large crank under the right corner of the seat. Seat back angle is adjustable by rotating a small crank under the left corner of the seat. The seat bottom angle will change as the seat back angle changes, providing proper support. The seat back will also fold full forward. If the front passenger's seat is six-way adjustable, it will function the same as the pilot's seat except the height adjusting and back reclining cranks will be opposite the respective adjustment cranks of the pilot's seat.

The four-way adjustable front and center passenger's seats may be moved forward and aft, and the seat back angle is infinitely adjustable. Position the seat by lifting up on the tubular handle under the center of the seat bottom of the front passenger's seat, or the handle under the inboard corner of the center passenger's seats, and slide the seat into position; then release the handle and check that the seat is locked in place. The seat back angle of either front or center passenger seats may be adjusted by rotating a crank under the outboard corner of the seat. The seat bottom angle will change as the seat back angle changes, providing proper support. The seat backs will also fold full forward.

The aft passengers' seats consist of a fixed position one-piece seat

bottom and a one-piece fold-down seat back. If the seats are not to be occupied, a camming action permits the seat back to fold down completely flat, providing more space for baggage. To fold down the seat back, grasp the top edge and rotate it downward.

Headrests are available for any of the seat configurations. To adjust the headrest, apply enough pressure to it to raise or lower it to the desired level. The headrest may be removed at any time by raising it until it disengages from the top of the seat back.

SEAT BELTS AND SHOULDER HARNESSES

All seat positions are equipped with seat belts and shoulder harnesses (see figure 7-4). Integrated seat belt/shoulder harnesses with inertia reels can be furnished for the pilot's and front passenger's seat positions, if desired.

SEAT BELTS

The seat belts used with the pilot, front passenger, and center passenger seats are attached to fittings on the floorboard. The buckle half is inboard of each seat and the link half is outboard of each seat. The belts for the aft seat are attached to the seat frame, with the link halves on the left and right sides of the seat bottom, and the buckles at the center of the seat bottom.

To use the seat belts for the front and center seats, position the seat as desired, and then lengthen the link half of the belt as needed by grasping the sides of the link and pulling against the belt. Insert and lock the belt link into the buckle. Tighten the belt to a snug fit. Seat belts for the aft seat are used in the same manner as the belts for the front and center seats. To release the seat belts, grasp the top of the buckle opposite the link and pull upward.

SHOULDER HARNESSES

Each front seat shoulder harness is attached to a rear doorpost above the window line and is stowed behind a stowage sheath above the cabin door. To stow the harness, fold it and place it behind the sheath. The shoulder harnesses for the remaining seats are attached above and aft of the side windows. Each harness is stowed behind a stowage sheath above the side windows.

To use the shoulder harness, fasten and adjust the seat belt first. Lengthen the harness as required by pulling on the connecting link on the end of the harness and the narrow release strap. Snap the connecting link firmly onto the retaining stud on the seat belt link half. Then adjust to length. A properly adjusted harness will permit the occupant to lean forward enough to sit completely erect, but prevent excessive forward movement and contact with objects during sudden deceleration. Also, the pilot will want the freedom to reach all controls easily.

Removing the shoulder harness is accomplished by pulling upward on the narrow release strap, and removing the harness connecting link from the stud on the seat belt link. In an emergency, the shoulder harness may be removed by releasing the seat belt first and allowing the harness, still attached to the link half of the seat belt, to drop to the side of the seat.

INTEGRATED SEAT BELT/SHOULDER HARNESSES WITH INERTIA REELS

Integrated seat belt/shoulder harnesses with inertia reels are available for the pilot and front seat passenger. The seat belt/shoulder harnesses extend from inertia reels located in the cabin top structure, through the overhead console marked PILOT and COPILOT, to attach points inboard of the two front seats. A separate seat belt half and buckle is located outboard of the seats. Inertia reels allow complete freedom of body movement. However, in the event of a sudden deceleration, they will lock automatically to protect the occupants.

To use the seat belt/shoulder harness, position the adjustable metal link on the harness just below shoulder level, pull the link and harness downward, and insert the link in the seat belt buckle. Adjust belt tension across the lap by pulling upward on the shoulder harness. Removal is accomplished by releasing the seat belt buckle, which will allow the inertia reel to pull the harness inboard of the seat.

ENTRANCE DOORS AND CABIN WINDOWS

Entry to, and exit from the airplane is accomplished through either of two entry doors, one on each side of the cabin at the front seat positions (refer to Section 6 for cabin and cabin door dimensions). The doors incorporate a recessed exterior door handle, a conventional interior door handle, a key-operated door lock (left door only), a door stop mechanism, and an openable window in the left door. An openable right door window is also available.

NOTE

The door latch design on this model requires that the

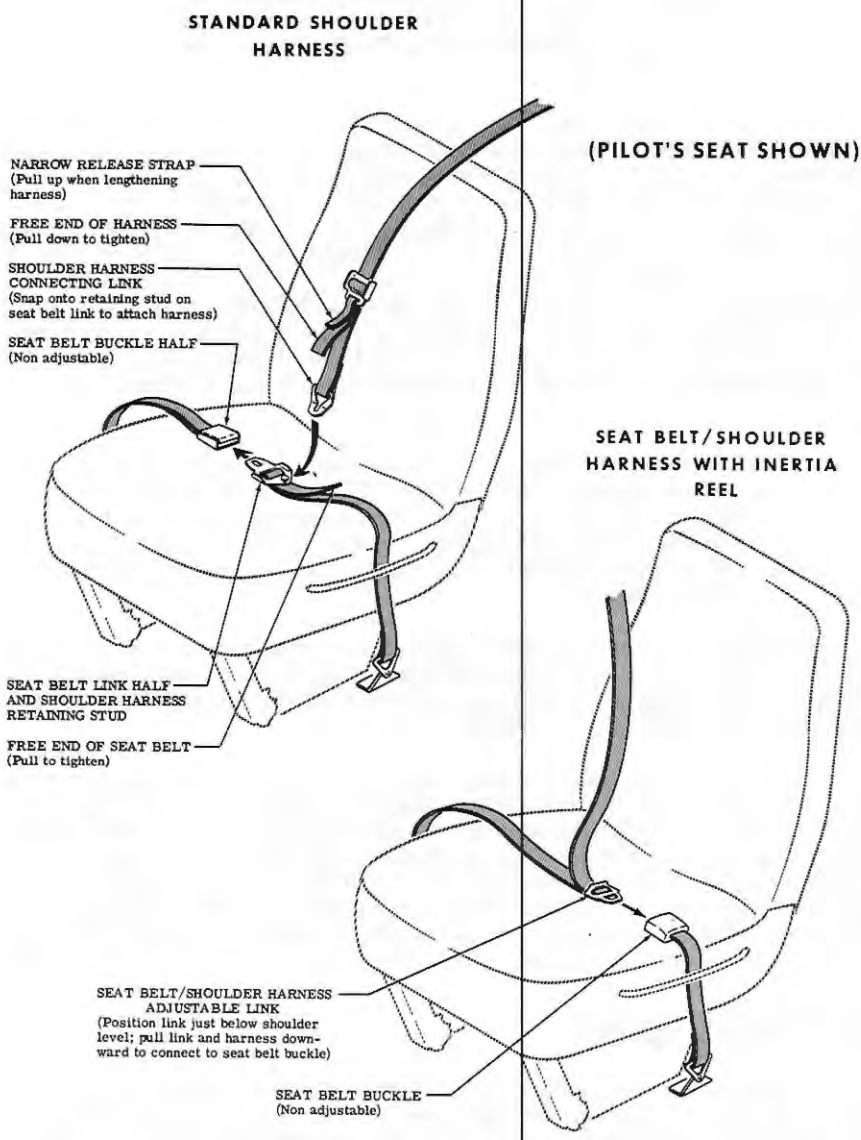


Figure 7-4. Seat Belts and Shoulder Harnesses

outside door handle on the pilot and front passenger doors be extended out whenever the doors are open. When closing the door do not attempt to push the door handle in until the door is fully shut.

To open the doors from outside the airplane, utilize the recessed door handle near the aft edge of each door. Grasp the forward end of the handle and pull outboard. To close or open the doors from inside the airplane, use the conventional door handle and arm rest. The inside door handle is a three-position handle having a placard at its base with the positions OPEN, CLOSE, and LOCK shown on it. The handle is spring-loaded to the CLOSE (up) position. When the door has been pulled shut and latched, lock it by rotating the door handle forward to the LOCK position (flush with the arm rest). When the handle is rotated to the LOCK position, an over-center action will hold it in that position. Both cabin doors should be locked prior to flight, and should not be opened intentionally during flight.

NOTE

Accidental opening of a cabin door in flight due to improper closing does not constitute a need to land the airplane. The best procedure is to set up the airplane in a trimmed condition at approximately 85 KIAS, momentarily shove the door outward slightly, and forcefully close and lock the door.

Exit from the airplane is accomplished by rotating the door handle full aft to the OPEN position and pushing the door open. To lock the airplane, lock the right cabin door with the inside handle, close the left cabin door, and using the ignition key, lock the door.

The left cabin door is equipped with an openable window which is held in the closed position by a detent-equipped latch on the lower edge of the window frame. To open the window, rotate the latch upward. The window is equipped with a spring-loaded retaining arm which will help rotate the window outward and hold it there. An openable window is also available for the right door, and functions in the same manner as the left window. If required, either window may be opened at any speed up to 200 KIAS. The aft side windows, and rear window are of the fixed type and cannot be opened.

CONTROL LOCKS

A control lock is provided to lock the aileron and elevator control surfaces to prevent damage to these systems by wind buffeting while the airplane is parked. The lock consists of a shaped steel rod and flag. The flag identifies the control lock and cautions about its removal before starting the engine. To install the control lock, align the hole in the right side

of the pilot's control wheel shaft with the hole in the right side of the shaft collar on the instrument panel and insert the rod into the aligned holes. Installation of the lock will secure the ailerons in a neutral position and the elevators in a slightly trailing edge down position. Proper installation of the lock will place the flag over the ignition switch. In areas where high or gusty winds occur, a control surface lock should be installed over the vertical stabilizer and rudder. The control lock and any other type of locking device should be removed prior to starting the engine.

ENGINE

The airplane is powered by a horizontally-opposed, six-cylinder, overhead-valve, air-cooled, fuel injection engine with a wet sump lubrication system. The engine is a Continental Model IO-520-L and is rated at 300 horsepower at 2850 RPM for five minutes and 285 horsepower at 2700 RPM continuous. Major accessories include a propeller governor on the front of the engine and dual magnetos, starter, vacuum pump, belt-driven alternator and full flow oil filter on the rear of the engine. Provisions are also made for a second belt-driven alternator and an air conditioner compressor on the front of the engine and a second vacuum pump on the rear of the engine.

ENGINE CONTROLS

Engine manifold pressure is controlled by a throttle located on the lower center portion of the instrument panel. The throttle operates in a conventional manner; in the full forward position, the throttle is open, and in the full aft position, it is closed. A friction lock, which is a round knurled disk, is located at the base of the throttle and is operated by rotating the lock clockwise to increase friction or counterclockwise to decrease it. The throttle linkage is designed to mechanically actuate a microswitch electrically connected to the landing gear warning system. The switch will cause a warning tone to sound anytime the throttle is retarded with the landing gear retracted, with less than approximately 12 inches of manifold pressure.

The mixture control, mounted above the right corner of the control pedestal, is a red knob with raised points around the circumference and is equipped with a lock button in the end of the knob. The rich position is full forward, and full aft is the idle cut-off position. For small adjustments, the control may be moved forward by rotating the knob clockwise, and aft by rotating the knob counterclockwise. For rapid or large adjustments, the knob may be moved forward or aft by depressing the lock button in the end of the control, and then positioning the control as desired.

ENGINE INSTRUMENTS

Engine operation is monitored by the following instruments: oil pressure gage, oil temperature gage, cylinder head temperature gage, tachometer, and manifold pressure/fuel flow indicator. An economy mixture (EGT) indicator, an engine combustion analyzer, and a fuel computer/digital clock are also available.

The oil pressure gage, located on the upper right side of the instrument panel, is operated by oil pressure. A direct pressure oil line from the engine delivers oil at engine operating pressure to the oil pressure gage. Gage markings indicate that minimum idling pressure is 10 PSI (red line), the normal operating range is 30 to 60 PSI (green arc), and maximum pressure is 100 PSI (red line).

Oil temperature is indicated by a gage adjacent to the oil pressure gage. The gage is operated by an electrical-resistance type temperature sensor which receives power from the airplane electrical system. Gage markings indicate the normal operating range (green arc) which is 100°F (38°C) to 240°F (116°C), and the maximum (red line) which is 240°F (116°C).

The cylinder head temperature gage, adjacent to the oil temperature gage, is operated by an electrical-resistance type temperature sensor on the engine and is powered by the airplane electrical system. Gage markings indicate the normal operating range (green arc) which is 200°F (93°C) to 460°F (238°C) and the maximum (red line) which is 460°F (238°C).

The engine-driven mechanical tachometer is located on the lower right side of the instrument panel. The instrument is calibrated in increments of 100 RPM and indicates both engine and propeller speed. An hour meter below the center of the tachometer dial records elapsed engine time in hours and tenths. Instrument markings include a normal operating range (green arc) of 2200 to 2550 RPM, a five minute maximum power range (yellow arc) of 2700 to 2850 RPM, and a maximum (red line) of 2850 RPM.

The manifold pressure gage is the left half of a dual-indicating instrument mounted above the tachometer. The gage is direct reading and indicates induction air manifold pressure in inches of mercury. It has a normal operating range (green arc) of 15 to 25 inches of mercury.

The fuel flow indicator is the right half of a dual-indicating instrument mounted above the tachometer. The indicator is a fuel pressure gage calibrated to indicate the approximate pounds per hour of fuel being metered to the engine. The normal operating range (green arc) is from 42 to 102 PPH, the minimum (red line) is 3.5 PSI, and the maximum (red line) is 151 PPH (19.5 PSI).

An economy mixture (EGT) indicator is available for the airplane and is located on the right side of the instrument panel. A thermocouple probe in the left exhaust collector assembly measures exhaust gas temperature and transmits it to the indicator. The indicator serves as a visual aid to the pilot in adjusting cruise mixture. Exhaust gas temperature varies with fuel-to-air ratio, power, and RPM. However, the difference between the peak EGT and the EGT at the cruise mixture setting is essentially constant and this provides a useful leaning aid. The indicator is equipped with a manually positioned reference pointer. An engine combustion analyzer system (seven probe EGT system) is also available. Details of this system are presented in Section 9, Supplements.

A fuel computer/digital clock is available for the airplane. This instrument provides the pilot with a series of fuel management and time keeping functions which are very useful during typical flight operations. Details of this system are presented in Section 9, Supplements.

NEW ENGINE BREAK-IN AND OPERATION

The engine underwent a run-in at the factory and is ready for the full range of use. It is, however, suggested that cruising be accomplished at 65% to 75% power until a total of 50 hours has accumulated or oil consumption has stabilized. This will ensure proper seating of the rings.

The airplane is delivered from the factory with corrosion-preventive oil in the engine. If, during the first 25 hours, oil must be added, use only aviation grade straight mineral oil conforming to Specification No. MIL-L-6082.

ENGINE LUBRICATION SYSTEM

The engine utilizes a full pressure, wet sump-type lubrication system with aviation grade oil used as the lubricant. Engine oil is also used for propeller and propeller governor operation. The capacity of the engine sump (located on the bottom of the engine) is 10 quarts (one additional quart is contained in the engine oil filter). Oil is drawn from the sump through a filter screen on the end of a pickup tube to the engine-driven oil pump. Oil from the pump passes through the full flow oil filter, a pressure relief valve at the rear of the right oil gallery, and a thermostatically controlled remotely located oil cooler. Oil from the cooler is then circulated to the left gallery and propeller governor. The engine parts are then lubricated by oil from the galleries. After lubricating the engine, the oil returns to the sump by gravity. The oil filter is equipped with a bypass valve which will cause lubricating oil to bypass the filter in the event the filter becomes plugged, or oil temperature is extremely cold.

An oil dipstick is located at the rear of the engine on the left side, and an oil filler tube is on top of the crankcase near the front of the engine. The dipstick and oil filler are accessible through doors on the engine cowling. The engine should not be operated on less than 7 quarts of oil. To minimize loss of oil through the breather, fill to 8 quarts for normal flights of less than three hours. For extended flight, fill to 10 quarts (dipstick indication only). For engine oil grade and specifications, refer to Section 8 of this handbook.

IGNITION-STARTER SYSTEM

Engine ignition is provided by two engine-driven magnetos and two spark plugs in each cylinder. The right magneto fires the lower left and upper right spark plugs, and the left magneto fires the lower right and upper left spark plugs. Normal operation is conducted with both magnetos due to the more complete burning of the fuel-air mixture with dual ignition.

Ignition and starter operation is controlled by a rotary type switch located on the left switch and control panel. The switch is labeled clockwise, OFF, R, L, BOTH, and START. The engine should be operated on both magnetos (BOTH position) except for magneto checks. The R and L positions are for checking purposes and emergency use only. When the switch is rotated to the spring-loaded START position, (with the master switch in the ON position), the starter contactor is energized and the starter will crank the engine. When the switch is released, it will automatically return to the BOTH position.

AIR INDUCTION SYSTEM

The engine air induction system receives ram air through an intake on the right front of the engine cowling. Aft of the engine cylinders is an air filter which removes dust and other foreign matter from the induction air. Airflow passing through the filter enters an airbox at the rear of the engine. The airbox has a spring-loaded alternate air door. If the air induction filter should become blocked, suction created by the engine will open the door and draw unfiltered air from inside the upper cowl area. An open alternate air door will result in an approximate 10% power loss at full throttle. After passing through the airbox, induction air enters a fuel/air control unit behind the engine, and is then ducted to the engine cylinders through intake manifold tubes.

EXHAUST SYSTEM

Exhaust gas from each cylinder passes through riser assemblies to a muffler on each side of the engine. The left muffler is constructed with a shroud around the outside which forms a heating chamber for cabin heater air.

FUEL INJECTION SYSTEM

The engine is equipped with a fuel injection system. The system is comprised of an engine-driven fuel pump, fuel/air control unit, fuel manifold, fuel flow indicator, and air-bleed type injector nozzles.

Fuel is delivered by the engine-driven fuel pump to the fuel/air control unit behind the engine. The fuel/air control unit correctly proportions the fuel flow to the induction air flow. After passing through the control unit, induction air is delivered to the cylinders through intake manifold tubes, and metered fuel is delivered to a fuel manifold. The fuel manifold, through spring tension on a diaphragm and valve, evenly distributes the fuel to an air-bleed type injector nozzle in the intake valve chamber of each cylinder. A pressure line is also attached to the fuel manifold, and is connected to a fuel flow indicator on the instrument panel.

COOLING SYSTEM

Ram air for engine cylinder cooling enters through two intake openings in the front of the engine cowling. The cooling air is directed around the cylinders and other areas of the engine by baffling, and is then exhausted through cowl flaps on the lower aft edge of the cowling. A separate inlet on the lower right front of the cowling provides cooling air for the remote oil cooler. The cowl flaps are mechanically operated from the cabin by means of a cowl flap lever on the right side of the control pedestal. The pedestal is labeled COWL FLAP, OPEN, CLOSED. During takeoff and high power operation, the cowl flap lever should be placed in the OPEN position for maximum cooling. This is accomplished by moving the lever to the right to clear a detent, then moving the lever up to the OPEN position. Anytime the lever is repositioned, it must first be moved to the right. While in cruise flight, cowl flaps should be adjusted to keep the cylinder head temperature at approximately two-thirds of the normal operating range (green arc). During extended let-downs, it may be necessary to completely close the cowl flaps by pushing the cowl flap lever down to the CLOSED position.

A winterization kit is available for the airplane. Details of this kit are presented in Section 9, Supplements.

PROPELLER

The airplane has an all-metal, three-bladed, constant-speed, governor-regulated propeller. A setting introduced into the governor with the propeller control establishes the propeller speed, and thus the engine speed to be maintained. The governor then controls flow of engine oil, boosted to high pressure by the governing pump, to or from a piston in the

propeller hub. Oil pressure acting on the piston twists the blades toward high pitch (low RPM). When oil pressure to the piston in the propeller hub is relieved, centrifugal force, assisted by an internal spring, twists the blades toward low pitch (high RPM).

A control knob on the lower center portion of the instrument panel is used to set the propeller and control engine RPM as desired for various flight conditions. The knob is labeled PROP PITCH PUSH INCR RPM. When the control knob is pushed in, blade pitch will decrease, giving a higher RPM. When the control knob is pulled out, the blade pitch increases, thereby decreasing RPM. The propeller control knob is equipped with a vernier feature which allows slow or fine RPM adjustments by rotating the knob clockwise to increase RPM, and counterclockwise to decrease it. To make rapid or large adjustments, depress the button on the end of the control knob and reposition the control as desired.

FUEL SYSTEM

The fuel system (see figure 7-5) consists of two vented integral fuel tanks (one in each wing), a fuel selector valve, a reservoir, an auxiliary fuel pump, an on-off valve, fuel strainer, engine-driven fuel pump, fuel/air control unit, fuel manifold, and fuel injection nozzles.

NOTE

Unusable fuel is at a minimum due to the design of the fuel system. However, when the fuel tanks are 1/4 full or less, prolonged uncoordinated flight such as slips or skids can uncover the fuel tank outlets, possibly causing fuel starvation and engine stoppage. Therefore, with low fuel reserves, do not allow the airplane to remain in uncoordinated flight for periods in excess of 30 seconds with the fuel selector on left or right tanks or one minute with the selector in the BOTH ON position.

Fuel flows by gravity from the two integral tanks (one in each wing) to a two-segment, three-position selector valve labeled LEFT ON, RIGHT ON, and BOTH ON.

NOTE

When the fuel selector valve handle is in the BOTH ON position in cruising flight, unequal fuel flow from each tank may occur if the wings are not maintained exactly level. Resulting wing heaviness can be alleviated gradually by turning the selector valve handle to the tank in the "heavy" wing.

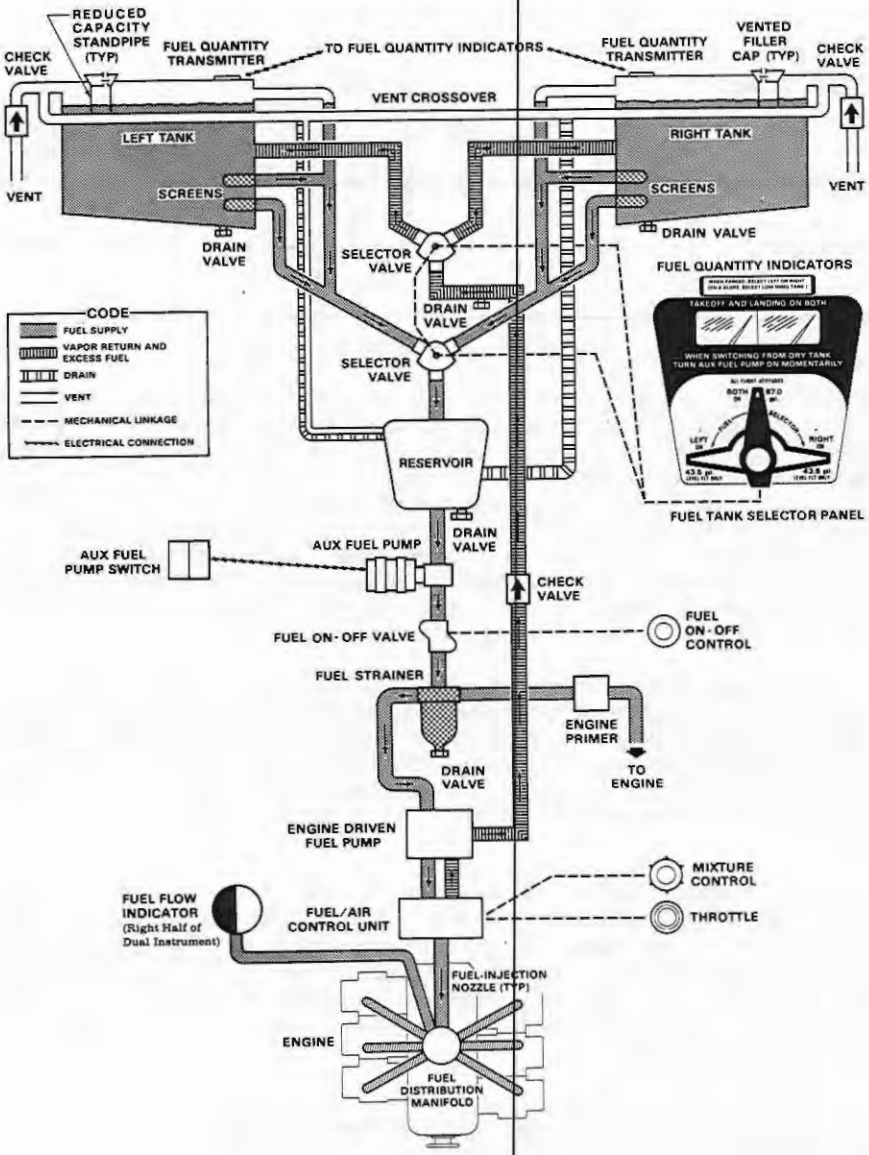


Figure 7-5. Fuel System

FUEL QUANTITY DATA (U.S. GALLONS)				
FUEL TANKS	FUEL LEVEL (QUANTITY EACH TANK)	TOTAL FUEL	TOTAL UNUSABLE	TOTAL USABLE ALL FLIGHT CONDITIONS
STANDARD	FULL (45)	90	3	87
	REDUCED (33.5)	67	3	64

Figure 7-6. Fuel Quantity Data

With the selector valve handle in one of the designated (detent) positions, fuel from either the left tank, right tank or both tanks flows through the selector valve, the reservoir, through a bypass in the auxiliary fuel pump (when it is not in operation), and through a fuel on-off valve to a strainer mounted on the firewall. The engine-driven fuel pump delivers fuel from the strainer to the fuel/air control unit where it is metered and directed to a manifold which distributes it to each cylinder. Vapor and excess fuel from the engine-driven fuel pump and the fuel/air control unit are returned by way of a separate segment of the selector valve to the wing fuel tank or tanks, as selected by the fuel selector handle position.

A two-position on-off valve is incorporated into the fuel system to be used for maintenance purposes or in the event of emergency conditions requiring fuel flow to be shut off. A push-pull control labeled FUEL VALVE PUSH ON and located on the lower left side of the pedestal, controls valve position. Under normal conditions the control is pushed fully in to the ON position. To shut off fuel flow, the control is pulled fully out.

Fuel system venting is essential to system operation. Complete blockage of the venting system will result in decreasing fuel flow and eventual engine stoppage. Venting is accomplished by vent lines, one from each fuel tank, which are equipped with check valves, and a tank interconnect vent line. The fuel filler caps are equipped with vacuum operated vents which open, allowing air into the tanks, should the fuel tank vent lines become blocked.

Fuel quantity is measured by two float-type fuel quantity transmitters (one in each tank) and indicated by two electrically-operated fuel quantity indicators on the lower portion of the pedestal adjacent to the fuel selector valve handle. The indicators are marked in pounds (top scale) and gallons (bottom scale) with a red line indicating an empty tank. When an indicator

shows an empty tank, approximately 1.5 gallon remains in the tank as unusable fuel. The indicators cannot be relied upon for accurate readings during skids, slips or unusual attitudes. Maximum indicator travel is reached with 40 to 41 gallons in the tank. Therefore, indications at the right end of the scale (40 gallons to F) should be verified by visual inspection of the tanks if a short field takeoff or a long range flight is planned. If both indicator pointers should rapidly move to a zero reading, check the cylinder head temperature and oil temperature gages for operation. If these gages are not indicating, an electrical malfunction has occurred.

The airplane may be serviced to a reduced capacity to permit heavier cabin loadings. This is accomplished by filling each tank to the bottom edge of the fuel filler neck, thus giving a reduced fuel load of 201 pounds in each tank (192 pounds usable in all flight conditions).

Before refueling or when the airplane is parked on a slope, place the fuel selector handle in the LEFT ON or RIGHT ON position, whichever corresponds to the low wing. This action minimizes crossfeeding from the fuller tank and reduces fuel seepage from the wing tank vents.

The auxiliary fuel pump switch is located on the left side of the instrument panel and is a yellow and red split-rocker type switch. The yellow right half of the switch is labeled START, and its upper ON position is used for normal starting, minor vapor purging and continued engine operation in the event of an engine-driven fuel pump failure. With the right half of the switch in the ON position, the pump operates at one of two flow rates that are dependent upon the setting of the throttle. With the throttle open to a cruise setting, the pump operates at a high enough capacity to supply sufficient fuel flow to maintain flight with an inoperative engine-driven fuel pump. When the throttle is moved toward the closed position (as during letdown, landing, and taxiing), the fuel pump flow rate is automatically reduced, preventing an excessively rich mixture during these periods of reduced engine speed.

NOTE

If the engine-driven fuel pump is functioning and the auxiliary fuel pump switch is placed in the ON position, an excessively rich fuel/air ratio is produced unless the mixture is leaned. Therefore, this switch should be turned off during takeoff and landing.

NOTE

If the auxiliary fuel pump switch is accidentally placed in the ON position with the master switch on and the engine stopped, the intake manifolds will be flooded.

The red left half of the switch is labeled EMERG, and its upper HI position is used in the event of an engine-driven fuel pump failure during takeoff or high power operation. The HI position may also be used for extreme vapor purging. Maximum fuel flow is produced when the left half of the switch is held in the spring-loaded HI position. In this position, an interlock within the switch automatically trips the right half of the switch to the ON position. When the spring-loaded left half of the switch is released, the right half will remain in the ON position until manually returned to the off position.

If it is desired to completely exhaust a fuel tank quantity in flight, the auxiliary fuel pump will be needed to assist in restarting the engine when fuel exhaustion occurs. Therefore, it is recommended that proper operation of the auxiliary fuel pump be verified prior to running a fuel tank dry by turning the auxiliary fuel pump ON momentarily and checking for a slight rise in fuel flow indication.

To ensure a prompt engine restart in flight after running a fuel tank dry, immediately switch to the tank containing fuel or to BOTH ON at the first indication of fuel pressure fluctuation and/or power loss. Then place the right half of the auxiliary fuel pump switch in the ON position momentarily (3 to 5 seconds) with the throttle at least 1/2 open. Excessive use of the ON position at high altitude and full rich mixture can cause flooding of the engine as indicated by a short (1 to 2 seconds) period of power followed by a loss of power. This can later be detected by a fuel flow indication accompanied by a lack of power. If flooding does occur, turn off the auxiliary fuel pump switch, and normal propeller windmilling should start the engine in 1 to 2 seconds.

If the propeller should stop (possible at very low airspeeds) before the tank containing fuel is selected, place the auxiliary fuel pump switch in the ON position and advance the throttle promptly until the fuel flow indicator registers approximately 1/2 way into the green arc for 1 to 2 seconds duration. Then retard the throttle, turn off the auxiliary fuel pump, and use the starter to turn the engine over until a start is obtained.

The fuel system is equipped with drain valves to provide a means for the examination of fuel in the system for contamination and grade. The system should be examined before the first flight of every day and after each refueling by using the sampler cup provided to drain fuel from the wing tank sump quick-drains, the fuel strainer quick-drain on the lower left side of the engine cowling, and the fuel reservoir and vapor return line quick-drains located approximately in line with the front edge of the cabin doors beneath the cabin. If any evidence of fuel contamination is found, it must be eliminated in accordance with the Preflight Inspection checklist and the discussion in Section 8 of this handbook. The fuel tanks should be filled after each flight to minimize condensation.

HYDRAULIC SYSTEM

Hydraulic power (see figure 7-7) is supplied by an electrically-driven hydraulic power pack located behind the control pedestal. The power pack's only function is to supply hydraulic power for operation of the retractable landing gear. This is accomplished by applying hydraulic pressure to actuator cylinders which extend or retract the gear and operate the gear down locks. The hydraulic system normally operates at 1000 PSI to 1500 PSI, and is protected by relief valves which prevent high pressure damage to the pump and other components in the system. The electrical portion of the power pack is protected by a 35-amp "pull-off" type circuit breaker on the circuit breaker panel.

The hydraulic power pack is turned on by a pressure switch on the power pack when the landing gear lever is placed in either the GEAR UP or GEAR DOWN position. When the lever is placed in the GEAR UP or GEAR DOWN position, it mechanically rotates a selector valve which applies hydraulic pressure in the direction selected. As soon as the landing gear reaches the selected position, a series of electrical switches will illuminate the green GEAR LOCKED light or turn off the red GEAR UNSAFE light to show gear position and completion of the cycle.

NOTE

In the event the hydraulic pump continues to run (longer than one minute) after completion of a cycle as evidenced by audible sound from the gear pump motor and the red GEAR UNSAFE light staying on, it is recommended that the circuit breaker, labeled GEAR PUMP, be pulled out to prevent possible damage due to overheating.

The hydraulic system includes an emergency hand pump to permit manual extension of the landing gear in the event of hydraulic power pack or electrical system failure. The hand pump is located on the cabin floor between the front seats.

During normal operations, the landing gear should require from 6 to 8 seconds to fully extend or retract. For malfunctions of the hydraulic and landing gear systems, refer to Section 3 of this handbook.

BRAKE SYSTEM

The airplane has a single-disc, hydraulically-actuated, metallic-type brake on each main landing gear wheel. Each brake is connected, by a hydraulic line, to a master cylinder attached to each of the pilot's rudder pedals. The brakes are operated by applying pressure to the top of either the left (pilot's) or right (copilot's) set of rudder pedals, which are interconnected. When the airplane is parked, both main wheel brakes may be set by

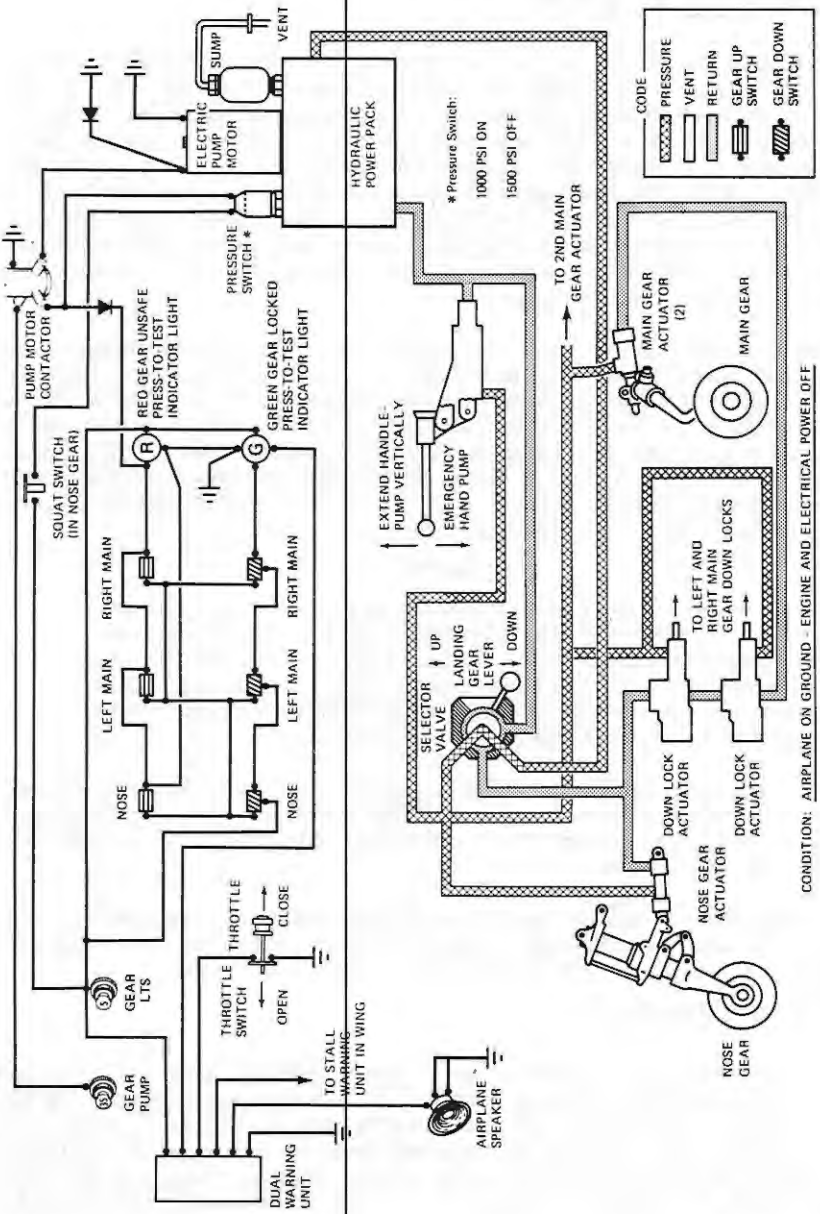


Figure 7-7. Hydraulic System

utilizing the parking brake which is operated by a handle under the left side of the instrument panel. To apply the parking brake, set the brakes with the rudder pedals, pull the handle aft, and rotate it 90° down.

For maximum brake life, keep the brake system properly maintained. The brakes on this airplane are the metallic type and were given a special brake burn-in before delivery. Also, unlike organic brakes, the day-to-day braking technique is different. When conditions permit, hard brake application is beneficial in that the resulting higher brake temperatures tend to maintain proper brake glazing and will prolong the expected brake life. Conversely, the habitual use of light and conservative brake application is detrimental to metallic brakes.

Some of the symptoms of impending brake failure are: gradual decrease in braking action after brake application, noisy or dragging brakes, soft or spongy pedals, and excessive travel and weak braking action. If any of these symptoms appear, the brake system is in need of immediate attention. If, during taxi or landing roll, braking action decreases, let up on the pedals and then re-apply the brakes with heavy pressure. If the brakes become spongy or pedal travel increases, pumping the pedals should build braking pressure. If one brake becomes weak or fails, use the other brake sparingly while using opposite rudder, as required, to offset the good brake.

ELECTRICAL SYSTEM

The airplane is equipped with a 28-volt, direct-current electrical system (see figure 7-8). The system uses a battery located on the forward side, upper left portion, of the firewall, as the source of electrical energy and a belt-driven, 60-amp alternator (or 95-amp, if installed) to maintain the battery's state of charge. Power is supplied to most general electrical and all avionics circuits through the primary bus bar and the avionics bus bar, which are interconnected by two avionics power switches. The primary bus is on anytime the master switch is turned on, and is not affected by starter or external power usage. Both bus bars are on anytime the master and either avionics power switch are turned on. The airplane may be equipped with a dual 60-amp alternator electrical system. Details of this system are presented in Section 9, Supplements.

CAUTION

Prior to turning the master switch on or off, starting the engine, or applying an external power source, the avionics power switches, labeled AVN PWR, should be turned off to prevent any harmful transient voltage from damaging the avionics equipment.

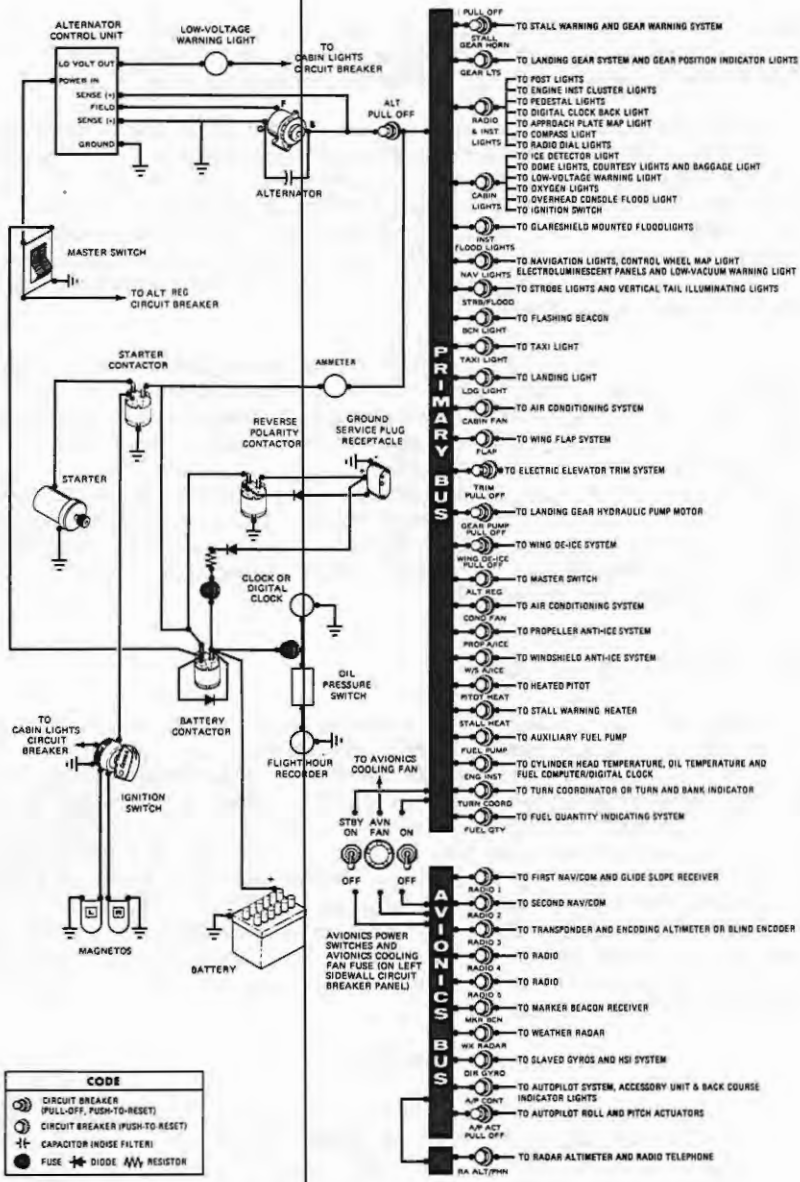


Figure 7-8. Electrical System

MASTER SWITCH

The master switch is a split-rocker type switch labeled MASTER, and is ON in the up position and off in the down position. The right half of the switch, labeled BAT, controls electrical power to the airplane through the primary bus bar. The left half, labeled ALT, controls the alternator.

Normally, both sides of the master switch should be used simultaneously; however, the BAT side of the switch could be turned on separately to check equipment while on the ground. To check or use avionics equipment or radios while on the ground, either of the avionics power switches must also be turned on. The ALT side of the switch, when placed in the off position, removes the alternator from the electrical system. With this switch in the off position, the entire electrical load is placed on the battery. Continued operation with the alternator switch in the off position will reduce battery power low enough to open the battery contactor, remove power from the alternator field, and prevent alternator restart.

AVIONICS POWER SWITCHES

Electrical power from the airplane primary bus to the avionics bus (see figure 7-8) is controlled by two toggle-type switches, labeled AVN PWR. The switches are located on the left sidewall circuit breaker panel and are ON in the up position and OFF in the down position. The forward switch serves as the primary power control to the avionics equipment while the other switch, labeled STBY, serves as a backup in the event the primary switch fails. The avionics power switches should be placed in the OFF position prior to turning the master switch on or off, starting the engine, or applying an external power source. The primary avionics power switch may be used in place of the individual avionics equipment switches.

Since the standby avionics power switch is not used in normal operation of the system, check it occasionally to verify its function by turning the AVN PWR (forward) switch OFF and the STBY (aft) switch ON. This action may help avoid a possible malfunction of this switch caused by its infrequent use.

AMMETER

The ammeter, located on the upper right side of the instrument panel, indicates the amount of current, in amperes, from the alternator to the battery or from the battery to the airplane electrical system. When the engine is operating and the master switch is turned 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 battery discharge rate.

ALTERNATOR CONTROL UNIT AND LOW-VOLTAGE WARNING LIGHT

The airplane is equipped with a combination alternator regulator high-low voltage control unit mounted on the cabin side of the firewall and red warning light, labeled LOW VOLTAGE, near the upper left corner of the instrument panel.

In the event an over-voltage condition occurs, the alternator control unit automatically removes alternator field current which shuts down the alternator. The battery will then supply system current as shown by a discharge rate on the ammeter. Under these conditions, depending on electrical system load, the low-voltage warning light will illuminate when system voltage drops below normal. The alternator control unit may be reset by turning the master switch off and back on again. If the warning light does not illuminate, normal alternator charging has resumed; however, if the light does illuminate again, a malfunction has occurred, and the flight should be terminated as soon as practicable.

NOTE

Illumination of the low-voltage light and ammeter discharge indications may occur during low RPM conditions with an electrical load on the system, such as during a low RPM taxi. Under these conditions, the light will go out at higher RPM. The master switch need not be recycled since an over-voltage condition has not occurred to de-activate the alternator system. Momentary illumination of the low-voltage warning light and/or ammeter needle deflection may also occur during startup of the landing gear system hydraulic pump motor.

The warning light may be tested by turning on the landing lights and momentarily turning off the ALT portion of the master switch while leaving the BAT portion turned on.

CIRCUIT BREAKERS AND FUSES

Most of the electrical circuits in the airplane are protected by "push-to-reset" type circuit breakers mounted on a single circuit breaker panel on the left cabin sidewall between the forward doorpost and the instrument panel. "Pull-off" type circuit breakers on this panel protect the alternator output, landing gear system hydraulic pump motor, wing and stabilizer de-ice system, electric elevator trim system, autopilot pitch and roll actuators, and the stall/landing gear warning circuits. All of the avionics circuits are protected by circuit breakers grouped together in the lower portion of the circuit breaker panel. Fuses protect the battery contactor closing circuit (when used with external power) and the clock, flight hour re-

corder and fuel computer/digital clock memory "keep alive" circuits. These fuses are located adjacent to the battery. Also, a fuse located on the left sidewall circuit breaker panel protects the avionics cooling fan circuit.

Spare fuses are required to be carried in the airplane at all times. To assist the pilot in meeting this requirement, a special spare fuse holder is located inside the cover of the Pilot's Operating Handbook. This holder contains an assortment of spare fuses to be used in the event an installed fuse requires replacement. If one of the fuses from the holder is used, a replacement spare should be obtained for the fuse holder.

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 or during lengthy maintenance work on the airplane electrical system. Details of the ground service plug receptacle are presented in Section 9, Supplements.

LIGHTING SYSTEMS

EXTERIOR LIGHTING

Conventional navigation lights are located on the wing tips and tail stinger, and dual landing lights are installed in the cowl nose cap. Additional lighting is available and includes a strobe light on each wing tip, a flashing beacon on top of the vertical stabilizer, two courtesy lights, one under each wing, just outboard of the cabin door, and vertical tail illumination lights, mounted on each horizontal stabilizer. Details of the strobe light system are presented in Section 9, Supplements. The courtesy lights are operated by a switch located on the left rear door post. All exterior lights, except the courtesy lights, are controlled by rocker-type switches on the left switch and control panel. The switches are ON in the up position and off in the down position.

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.

INTERIOR LIGHTING

Instrument and control panel lighting is provided by flood and integral lighting, with electroluminescent and post lighting also available. Rheostats and control knobs, located on the left switch and control panel, control the intensity of all lighting. The following paragraphs describe the various lighting systems and their controls.

Switches and controls on the lower part of the instrument panel and the marker beacon/audio control panel may be lighted by electroluminescent panels which do not require light bulbs for illumination. To utilize this lighting, turn on the NAV light switch and adjust light intensity with the small (inner) control knob of the concentric control knobs labeled EL PANEL, ENG-RADIO.

Instrument panel flood lighting consists of six red flood lights on the underside of the glare shield, up to eight red postlights for the bottom and left and right instruments, and two red flood lights in the forward part of the overhead console (one, if an air conditioning system is installed). All of these lights are utilized by adjusting light intensity with the large (outer) control knob of the concentric control knobs labeled POST, FLOOD.

The instrument panel may be equipped with white post lights which are mounted at the edge of each instrument or control and provide direct lighting. To operate the post lights, adjust light intensity with the small (inner) control knob of the concentric control knobs labeled POST, FLOOD. To combine post and red flood lighting, adjust flood light intensity with the large (outer) control knob.

The engine instrument cluster, radio equipment, magnetic compass, and digital clock have integral lighting and operate independently of post or flood lighting. The light intensity of instrument cluster, magnetic compass, radio equipment, and digital clock lighting is controlled by the large (outer) control knob of the concentric control knobs labeled EL PANEL, ENG-RADIO. If the airplane is equipped with avionics incorporating incandescent digital readouts, the ENG-RADIO (large outer) control knob controls the light intensity of the digital readouts. For daylight operation, the control knob should be rotated full counterclockwise to produce maximum light intensity for the digital readouts only. Clockwise rotation of the control knob will provide normal variable light intensity for nighttime operation.

If the airplane is equipped with a Cessna 400B Integrated Flight Control System, individual dimming of both the white and the green Mode Selector panel lamps is provided by the concentric control knobs labeled IFCS, WHITE, GREEN. A push-to-test feature is incorporated into the small (inner) knob to test for proper green mode selector lamp operation.

The control pedestal has integral lights and a white post light adjacent to the fuel on-off valve. If the airplane is equipped with oxygen or air conditioning, the overhead console is illuminated by post lights. Pedestal and console light intensity is controlled by the large (outer) control knob of the concentric control knobs labeled POST, FLOOD.

Map lighting is provided by overhead console map lights and a glare shield mounted map light. The airplane may also be equipped with a control wheel map light. The overhead console map lights (not installed if

an air conditioning system is installed) operate in conjunction with instrument panel flood lighting and consist of two openings just aft of the red instrument panel flood lights. The map light openings have sliding covers controlled by small round knobs which uncover the openings when moved toward each other. The covers should be kept closed unless the map lights are required. A map light and toggle switch, mounted in front of the pilot on the underside of the glare shield, is used for illuminating approach plates or other charts when using a control wheel mounted approach plate holder. The switch is labeled MAP LIGHT ON, OFF and light intensity is controlled by the POST, FLOOD control knob. A map light mounted on the bottom of the pilot's control wheel illuminates the lower portion of the cabin in front of the pilot, and is used for checking maps and other flight data during night operation. The light is utilized by turning on the NAV LIGHTS switch, and adjusting light intensity with the rheostat control knob on the bottom of the control wheel.

The airplane is equipped with a dome light aft of the overhead console, and a baggage compartment light above the baggage area. The lights are operated by a slide-type switch adjacent to the dome light.

The most probable cause of a light failure is a burned out bulb; however, in the event any of the lighting systems fail to illuminate when turned on, check the appropriate circuit breaker. If the circuit breaker has opened (white button popped out), and there is no obvious indication of a short circuit (smoke or odor), turn off the light switch of the affected lights, reset the breaker, and turn the switch on again. If the breaker opens again, do not reset it.

CABIN HEATING, VENTILATING AND DEFROSTING SYSTEM

The temperature and volume of airflow into the cabin can be regulated by manipulation of the push-pull CABIN HEAT and CABIN AIR control knobs (see figure 7-9). When partial cabin heat is desired, blending warm and cold air will result in improved ventilation and heat distribution throughout the cabin. Additional outside air for summer ventilation is provided through the heat and vent system by operation of the push-pull AUX CABIN AIR knob. All three control knobs are the double button type with locks to permit intermediate settings.

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. Flow from the outlet holes is adjusted by moving a knob left or right as indicated by a placard labeled CLOSE, OPEN, located adjacent to the knob. Rear cabin heat and air is supplied by two ducts from the manifold, one

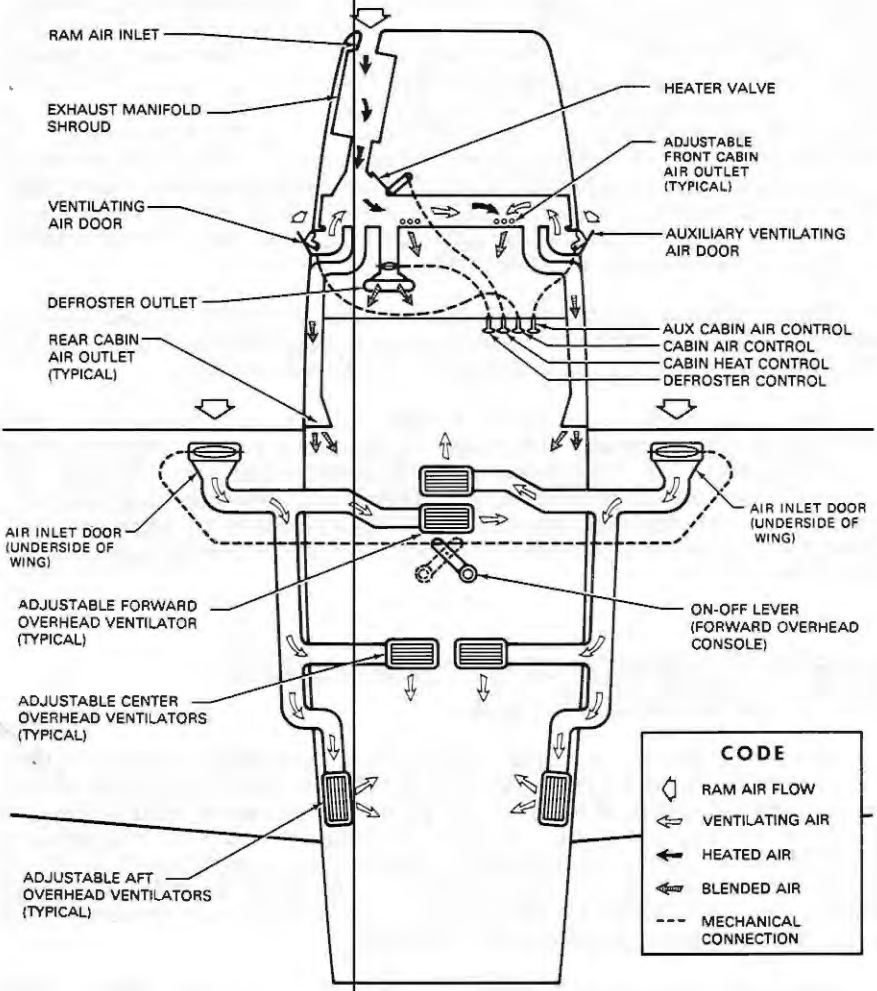


Figure 7-9. Cabin Heating, Ventilating, and Defrosting System

extending down each side of the cabin to an outlet at the front door post at floor level.

Windshield defrost air is supplied by a duct from the cabin manifold to an outlet on top of the glare shield; therefore, the temperature of the defrosting air is the same as heated cabin air. A push-pull type control knob, labeled DEFROST, regulates the volume of air to the windshield. Pulling out on the knob increases defroster airflow.

Additional cabin ventilating air is supplied by two adjustable ventilators mounted in the forward and aft overhead consoles and one ventilator in each console located above the rear side windows. Flow to the outlets is controlled by doors on the underside of each wing near the root, as selected by a single lever in the forward overhead console labeled OVERHEAD AIR VENTS. In the ON (right) position, the doors are open and ventilating airflow from the wing intakes is supplied to all the adjustable outlets. When the OFF (left) position is selected, the doors are closed and flow to the outlets is shut off. An air conditioning system may be installed in the airplane. Details of this system are presented in Section 9, Supplements.

PITOT-STATIC SYSTEM AND INSTRUMENTS

The pitot-static system supplies ram air pressure to the airspeed indicator and static pressure to the airspeed indicator, vertical speed indicator and altimeter. The system is composed of a pitot tube mounted on the lower surface of the left wing, two external static ports, one on each side of the fuselage below the rear corners of the aft side windows, and the associated plumbing necessary to connect the instruments to the sources.

The airplane may also be equipped with a pitot heat system. The system consists of a heating element in the pitot tube, a rocker-type switch labeled PITOT HEAT on the left side of the instrument panel, a 10-amp circuit breaker on the left sidewall circuit breaker panel, and associated wiring. When the pitot heat switch is turned on, the element in the pitot tube is heated electrically to maintain proper operation in possible icing conditions. Pitot heat should be used only as required.

A static pressure alternate source valve may be installed on the lower left side of the instrument panel, and can be used if the external static source is malfunctioning. This valve supplies static pressure from inside the cabin instead of the external static ports.

If erroneous instrument readings are suspected due to water or ice in the pressure lines going to the standard external static pressure source, the alternate static source valve should be pulled on. If a 400B autopilot or IFCS system is installed and operating, the attitude hold function should

be disengaged.

Pressures within the cabin will vary with open cabin ventilators and windows. Refer to Sections 3 and 5 for the effect of varying cabin pressures on airspeed and altimeter readings.

AIRSPEED INDICATOR

The airspeed indicator is calibrated in knots and miles per hour. Limitation and range markings (in KIAS) include the white arc (57 to 115 knots), green arc (69 to 165 knots), yellow arc (165 to 200 knots), and a red line (200 knots).

If a true airspeed indicator is installed, it is equipped with a rotatable ring which works in conjunction with the airspeed indicator dial in a manner similar to the operation of a flight computer. To operate the indicator, first rotate the ring until pressure altitude is aligned with outside air temperature in degrees Fahrenheit. Pressure altitude should not be confused with indicated altitude. To obtain pressure altitude, momentarily set the barometric scale on the altimeter to 29.92 and read pressure altitude on the altimeter. Be sure to return the altimeter barometric scale to the original barometric setting after pressure altitude has been obtained. Having set the ring to correct for altitude and temperature, read the true airspeed shown on the rotatable ring by the indicator pointer. For best accuracy, the indicated airspeed should be corrected to calibrated airspeed by referring to the Airspeed Calibration chart in Section 5. Knowing the calibrated airspeed, read true airspeed on the ring opposite the calibrated airspeed.

VERTICAL SPEED INDICATOR

The vertical speed indicator depicts airplane rate of climb or descent in feet per minute. The pointer is actuated by atmospheric pressure changes resulting from changes of altitude as supplied by the static source.

ALTIMETER

Airplane altitude is depicted by a barometric type altimeter. A knob near the lower left portion of the indicator provides adjustment of the instrument's barometric scale to the current altimeter setting.

VACUUM SYSTEMS AND INSTRUMENTS

Two engine-driven vacuum systems are available and provide the suction necessary to operate the attitude indicator and directional indicator. The standard system (see figure 7-10) consists of a single vacuum pump

on the engine, a vacuum relief valve and vacuum system air filter on the aft side of the firewall below the instrument panel, vacuum-operated instruments, and a suction gage and low-vacuum warning light on the left side of the instrument panel. The optional vacuum system (see figure 7-11) offers a dual-pump installation on the rear of the engine, two vacuum relief valves, a system air filter, a check valve manifold, vacuum-operated instruments, and a suction gage, equipped with dual warning indicators labeled L and R, on the left side of the instrument panel.

ATTITUDE INDICATOR

The attitude indicator gives a visual indication of flight attitude. Bank attitude is presented by a pointer at the top of the indicator relative to the bank scale which has index marks at 10°, 20°, 30°, 60°, and 90° either side of the center mark. Pitch and roll attitudes are presented by a miniature airplane superimposed over a symbolic horizon area divided into two sections by a white horizon bar. The upper "blue sky" area and the lower "ground" area have arbitrary pitch reference lines useful for pitch attitude control. A knob at the bottom of the instrument is provided for inflight adjustment of the miniature airplane to the horizon bar for a more accurate flight attitude indication.

DIRECTIONAL INDICATOR

The directional indicator displays airplane heading on a compass card in relation to a fixed simulated airplane image and index. The directional indicator will precess slightly over a period of time. Therefore, the compass card should be set in accordance with the magnetic compass just prior to takeoff, and occasionally re-adjusted on extended flights. A knob on the lower left edge of the instrument is used to adjust the compass card to correct for any precession.

SUCTION GAGE

A suction gage, located on the left side of the instrument panel, is calibrated in inches of mercury and indicates suction available for operation of the attitude and directional indicators. The desired suction range is 4.6 to 5.4 inches of mercury. A suction reading out of this range may indicate a system malfunction or improper adjustment, and in this case, the indicators should not be considered reliable.

LOW-VACUUM WARNING LIGHT/BUTTONS

If the airplane is equipped with a single-pump vacuum system, a red low-vacuum warning light is installed on the instrument panel adjacent to the low-voltage warning light to warn the pilot of a possible low-vacuum condition existing in the vacuum system. Illumination of the light warns

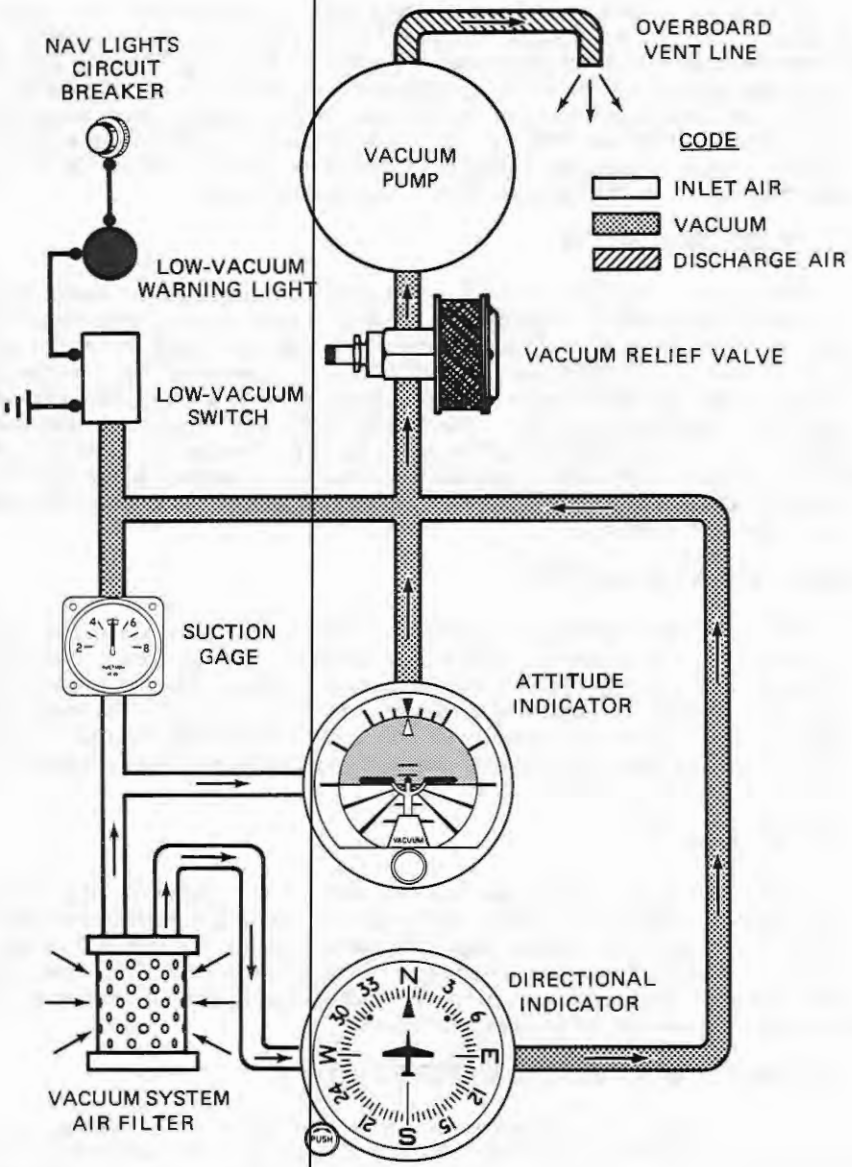


Figure 7-10. Single-Pump Vacuum System

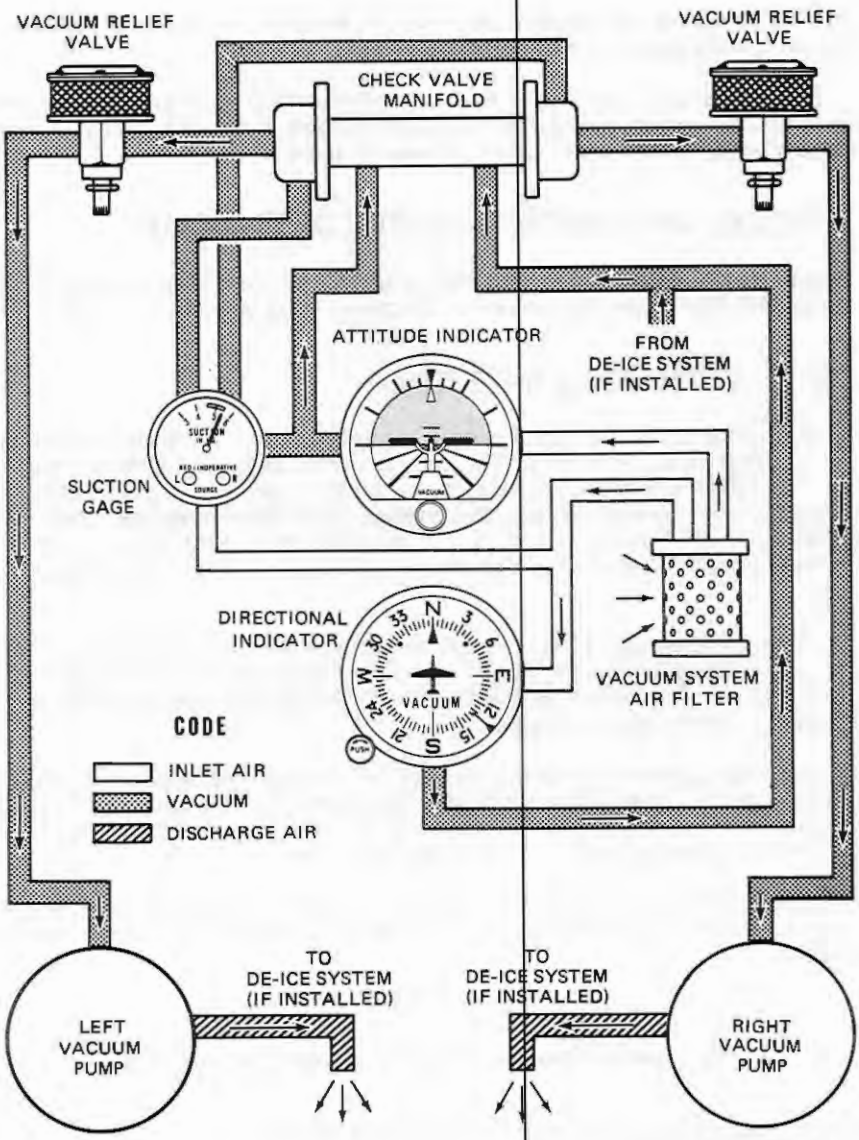


Figure 7-11. Dual-Pump Vacuum System

the pilot to check the suction gage and to be alert for possible erroneous vacuum-driven gyro instrument indications.

If the airplane is equipped with a dual-pump vacuum system, the suction gage incorporates two red warning buttons, marked L and R, which extend visibily in the event either or both sources fail.

OUTSIDE AIR TEMPERATURE (OAT) GAGE

An outside air temperature (OAT) gage is installed in the center of the windshield. The gage is calibrated in degrees Fahrenheit and Celsius.

STALL WARNING SYSTEM

The airplane is equipped with a vane-type stall warning unit in the leading edge of the left wing. The unit is electrically connected to a dual warning unit located above the right cabin door behind the headliner. The vane in the wing unit senses the change in airflow over the wing, and operates the dual warning unit, which produces a continuous tone over the airplane speaker between 5 and 10 knots above the stall in all configurations.

If the airplane has a heated stall warning system, the vane-type unit in the wing leading edge is equipped with a heating element. The heated part of the system is operated by the STALL HEAT switch, and is protected by the STALL HEAT circuit breaker.

The stall warning system should be checked during the preflight inspection by momentarily turning on the master switch and actuating the vane in the wing. The system is operational if a continuous tone is heard on the airplane speaker as the vane is pushed upward.

A "pull-off" type circuit breaker, labeled STALL/GEAR HORN, is provided to shut off the warning horn in the event it should stick in the on position.

CAUTION

This circuit breaker should be pushed in for landing.

AVIONICS SUPPORT EQUIPMENT

If the airplane is equipped with avionics, various avionics support equipment may also be installed. Equipment available includes an avio-

nics cooling fan, microphone-headset installations and control surface static dischargers. The following paragraphs discuss these items. Description and operation of radio equipment is covered in Section 9 of this handbook.

AVIONICS COOLING FAN

An avionics cooling fan system is provided whenever a factory-installed Nav/Com radio is installed. The system is designed to provide internal cooling air from a small electric fan to the avionics units and thereby eliminate the possibility of moisture contamination using an external cooling air source.

Power to the electric fan is supplied directly from the avionics bus through a fuse labeled AVN FAN, located on the left sidewall circuit breaker panel. Hence, power is supplied to the fan anytime the master switch and either avionics power switch are ON.

MICROPHONE-HEADSET INSTALLATIONS

Three types of microphone-headset installations are offered. The standard system provided with avionics equipment includes a hand-held microphone and separate headset. The keying switch for this microphone is on the microphone. Two optional microphone-headset installations are also available; these feature a single-unit microphone-headset combination which permits the pilot or front passenger to conduct radio communications without interrupting other control operations to handle a hand-held microphone. One microphone-headset combination is a lightweight type without a padded headset and the other version has a padded headset. The microphone-headset combinations utilize a remote keying switch located on the left grip of the pilot's control wheel and, if an optional intercom system is installed, a second switch on the right grip of the front passenger's control wheel. The microphone and headset jacks are located on the lower left and right sides of the instrument panel. Audio to all three headsets is controlled by the individual audio selector switches and adjusted for volume level by using the selected receiver volume controls.

NOTE

To ensure audibility and clarity when transmitting with the hand-held microphone, always hold it as closely as possible to the lips, then key the microphone and speak directly into it.

STATIC DISCHARGERS

If frequent IFR flights are planned, installation of wick-type static

dischargers is recommended to improve radio communications during flight through dust or various forms of precipitation (rain, snow or ice crystals). Under these conditions, the build-up and discharge of static electricity from the trailing edges of the wings, rudder, elevator, propeller tips, and radio antennas can result in loss of usable radio signals on all communications and navigation radio equipment. Usually the ADF is first to be affected and VHF communication equipment is the last to be affected.

Installation of static dischargers reduces interference from precipitation static, but it is possible to encounter severe precipitation static conditions which might cause the loss of radio signals, even with static dischargers installed. Whenever possible, avoid known severe precipitation areas to prevent loss of dependable radio signals. If avoidance is impractical, minimize airspeed and anticipate temporary loss of radio signals while in these areas.

Static dischargers lose their effectiveness with age, and therefore, should be checked periodically (at least at every annual inspection) by qualified avionics technicians, etc. If testing equipment is not available, it is recommended that the wicks be replaced every two years, especially if the airplane is operated frequently in IFR conditions. The discharger wicks are designed to unscrew from their mounting bases to facilitate replacement.

CABIN FEATURES

CABIN FIRE EXTINGUISHER

A portable Halon 1211 (Bromochlorodifluoromethane) fire extinguisher is available for installation on the pilot's seat where it would be accessible in case of fire. The extinguisher has an Underwriters Laboratories classification of 5B:C. If installed, the extinguisher should be checked prior to each flight to ensure that its bottle pressure, as indicated by the gage on the bottle, is within the green arc (approximately 125 psi) and the operating lever lock pin is securely in place.

To operate the fire extinguisher:

1. Loosen retaining clamp(s) and remove extinguisher from bracket.
2. Hold extinguisher upright, pull operating lever lock pin, and press lever while directing the discharge at the base of the fire at the near edge. Progress toward the back of the fire by moving the nozzle rapidly with a side-to-side sweeping motion.

CAUTION

Care must be taken not to direct the initial discharge directly at the burning surface at close range (less than five feet) because the high velocity stream may cause splashing and/or scattering of the burning material.

3. Anticipate approximately eight seconds of discharge duration.

WARNING

Ventilate the cabin promptly after successfully extinguishing the fire to reduce the gases produced by thermal decomposition.

Fire extinguishers should be recharged by a qualified fire extinguisher agency after each use. Such agencies are listed under "Fire Extinguisher" in the telephone directory. After recharging, secure the extinguisher to its mounting bracket; do not allow it to lie loose on shelves or seats.

SECTION 8
AIRPLANE HANDLING, SERVICE & MAINTENANCE

TABLE OF CONTENTS

INTRODUCTION

This section contains factory-recommended procedures for proper ground handling and routine care and servicing of your Cessna. It also identifies certain inspection and maintenance requirements which must be followed if your airplane is to retain that new-plane performance and dependability. It is wise to follow a planned schedule of lubrication and preventive 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.

IDENTIFICATION PLATE

All correspondence regarding your airplane should include the SERIAL NUMBER. The Serial Number, Model Number, Production Certificate Number (PC) and Type Certificate Number (TC) can be found on the Identification Plate, located on the lower part of the left forward doorpost. Located adjacent to the Identification Plate is a Finish and Trim Plate which contains a code describing the interior color scheme and exterior paint combination of the airplane. The code may be used in conjunction with an applicable Parts Catalog if finish and trim information is needed.

OWNER NOTIFICATION SYSTEM

As the owner of a Cessna, you will receive applicable Cessna Owner Advisories at no charge. These Owner Advisories will be mailed to owners of record. A subscription service for Service Information Letters is available directly from the Cessna Customer Services Department. Your Cessna Dealer will be glad to supply you with details concerning this subscription program, and stands ready, through his Service Department, to supply you with fast, efficient, low-cost service.

PUBLICATIONS

Various publications and flight operation aids are furnished in the airplane when delivered from the factory. These items are listed below.

- CUSTOMER CARE PROGRAM BOOK
- PILOT'S OPERATING HANDBOOK AND FAA APPROVED AIRPLANE FLIGHT MANUAL
- PILOT'S CHECKLISTS
- POWER COMPUTER
- WORLDWIDE CUSTOMER CARE DIRECTORY
- DO'S AND DON'TS ENGINE BOOKLET

The following additional publications, plus many other supplies that are applicable to your airplane, are available from your Cessna Dealer.

- INFORMATION MANUAL (Contains Pilot's Operating Handbook Information)
- SERVICE MANUALS AND PARTS CATALOGS FOR YOUR:
  AIRPLANE
  ENGINE AND ACCESSORIES
  AVIONICS AND AUTOPILOT

Your Cessna Dealer has a Customer Care Supplies Catalog covering all available items, many of which he keeps on hand. He will be happy to place an order for any item which is not in stock.

NOTE

A Pilot's Operating Handbook and FAA Approved Airplane Flight Manual which is lost or destroyed may be replaced by contacting your Cessna Dealer. An affidavit containing the owner's name, airplane serial number and registration number must be included in replacement requests since the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual is identified for specific airplanes only.

AIRPLANE FILE

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

A. To be displayed in the airplane at all times:
   1. Aircraft Airworthiness Certificate (FAA Form 8100-2).
   2. Aircraft Registration Certificate (FAA Form 8050-3).
   3. Aircraft Radio Station License, if transmitter installed (FCC Form 556).

B. To be carried in the airplane at all times:
   1. Pilot's Operating Handbook and FAA Approved Airplane Flight Manual.
   2. Weight and Balance, and associated papers (latest copy of the Repair and Alteration Form, FAA Form 337, if applicable).
   3. Equipment List.

C. To be made available upon request:
   1. Airplane Log Book.
   2. Engine Log Book.

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 airplanes not registered in the United States should check with their own aviation officials to determine their individual requirements.

Cessna recommends that these items, plus the Pilot's Checklists, Power Computer, Customer Care Program book and Customer Care Card, be carried in the airplane at all times.

AIRPLANE INSPECTION PERIODS

FAA REQUIRED INSPECTIONS

As required by Federal Aviation Regulations, all civil aircraft of U.S. registry must undergo a complete inspection (annual) each twelve calendar months. In addition to the required ANNUAL inspection, aircraft operated commercially (for hire) must have a complete inspection every 100 hours of operation.

The FAA may require other inspections by the issuance of airworthiness directives applicable to the airplane, engine, propeller and components. It is the responsibility of the owner/operator to ensure compliance with all applicable airworthiness directives and, when the inspections are repetitive, to take appropriate steps to prevent inadvertent noncompliance.

In lieu of the 100 HOUR and ANNUAL inspection requirements, an airplane may be inspected in accordance with a progressive inspection schedule, which allows the work load to be divided into smaller operations that can be accomplished in shorter time periods.

The CESSNA PROGRESSIVE CARE PROGRAM has been developed to provide a modern progressive inspection schedule that satisfies the complete airplane inspection requirements of both the 100 HOUR and ANNUAL inspections as applicable to Cessna airplanes. The program assists the owner in his responsibility to comply with all FAA inspection requirements, while ensuring timely replacement of life-limited parts and adherence to factory-recommended inspection intervals and maintenance procedures.

CESSNA PROGRESSIVE CARE

The Cessna Progressive Care Program has been designed to help you realize maximum utilization of your airplane at a minimum cost and downtime. Under this program, your airplane is inspected and maintained in four operations. The four operations are recycled each 200 hours and are recorded in a specially provided Aircraft Inspection Log as each operation is conducted.

The Cessna Aircraft Company recommends Progressive Care for airplanes that are being flown 200 hours or more per year, and the 100-hour inspection for all other airplanes. The procedures for the Progressive Care Program and the 100-hour inspection have been carefully worked out by the factory and are followed by the Cessna Dealer Organization. The complete familiarity of Cessna Dealers with Cessna equipment and factory-approved procedures provides the highest level of service possible at lower cost to Cessna owners.

Regardless of the inspection method selected by the owner, he should keep in mind that FAR Part 43 and FAR Part 91 establishes the requirement that properly certified agencies or personnel accomplish all required FAA inspections and most of the manufacturer recommended inspections.

CESSNA CUSTOMER CARE PROGRAM

Specific benefits and provisions of the CESSNA WARRANTY plus

other important benefits for you are contained in your CUSTOMER CARE PROGRAM book supplied with your airplane. You will want to thoroughly review your Customer Care Program book and keep it in your airplane at all times.

An initial inspection and either a Progressive Care Operation No. 1 or the first 100-hour inspection will be performed within the first 6 months of ownership at no charge to you. If you take delivery from your Dealer, the initial inspection will have been performed before delivery of the airplane to you. If you pick up your airplane at the factory, plan to take it to your Dealer within 30 days after you take delivery, so the initial inspection may be performed allowing the Dealer to make any minor adjustments which may be necessary.

You will also want to return to your Dealer either at 50 hours for your first Progressive Care Operation, or at 100 hours for your first 100-hour inspection depending on which program you choose to establish for your airplane. 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.

PILOT CONDUCTED PREVENTIVE MAINTENANCE

A certified pilot who owns or operates an airplane not used as an air carrier is authorized by FAR Part 43 to perform limited maintenance on his airplane. Refer to FAR Part 43 for a list of the specific maintenance operations which are allowed.

NOTE

Pilots operating airplanes of other than U.S. registry should refer to the regulations of the country of certification for information on preventive maintenance that may be performed by pilots.

A Service Manual should be obtained prior to performing any preventive maintenance to ensure that proper procedures are followed. Your Cessna Dealer should be contacted for further information or for required maintenance which must be accomplished by appropriately licensed personnel.

ALTERATIONS OR REPAIRS

It is essential that the FAA be contacted **prior to** any alterations on the airplane to ensure that airworthiness of the airplane is not violated. Alterations or repairs to the airplane must be accomplished by licensed personnel.

GROUND HANDLING

TOWING

The airplane is most easily and safely maneuvered by hand with the tow bar attached to the nose wheel (the tow bar is stored on the floor in the baggage area). When towing with a vehicle, do not exceed the nose gear turning angle of 35° either side of center, or damage to the gear will result.

CAUTION

Remove any installed rudder lock before towing.

If the airplane is towed or pushed over a rough surface during hangaring, watch that the normal cushioning action of the nose strut does not cause excessive vertical movement of the tail and the resulting contact with low hangar doors or structure. A flat nose tire or deflated strut will also increase tail height.

PARKING

When parking the airplane, head into the wind and set the parking brakes. Do not set the parking brakes during cold weather when accumulated moisture may freeze the brakes, or when the brakes are overheated. Close the cowl flaps, (except when engine is hot in hot weather), install the control wheel lock and chock the wheels. When the airplane is parked on a slope, place the fuel selector handle in the LEFT ON or RIGHT ON position, whichever corresponds to the low wing. This action minimizes cross-feeding from the fuller tank and reduces fuel seepage from the wing tank vents. In severe weather and high wind conditions, tie the airplane down as outlined in the following paragraph.

TIE-DOWN

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

1. Set the parking brake and install the control wheel lock.
2. Install a surface control lock over the fin and rudder.

3. Tie sufficiently strong ropes or chains (700 pounds tensile strength) to the wing and tail tie-down fittings and secure each rope or chain to a ramp tie-down.
4. Tie a rope (no chains or cables) to the nose gear torque link and secure to a ramp tie-down.
5. Install a pitot tube cover.

JACKING

When a requirement exists to jack the entire airplane off the ground, or when wing jack points are used in the jacking operation, refer to the Service Manual for specific procedures and equipment required.

A jack pad assembly is available to facilitate jacking individual main gear. When using the individual gear strut jack pad, flexibility of the gear strut will cause the main wheel to slide inboard as the wheel is raised, tilting the jack. The jack must then be lowered for a second jacking operation. **Do not** jack both main wheels simultaneously using the individual main gear jack pads.

If nose gear maintenance is required, the nose wheel may be raised off the ground by pressing down on a tailcone bulkhead, just forward of the horizontal stabilizer, and allowing the tail to rest on the tail tie-down ring.

NOTE

Do not apply pressure on the elevator or outboard horizontal stabilizer surfaces. When pushing on the tailcone, always apply pressure at a bulkhead to avoid buckling the skin.

To assist in raising and holding the nose wheel off the ground, weight down the tail by placing sand-bags, or suitable weights, on each side of the horizontal stabilizer, next to the fuselage. If ground anchors are available, the tail should be securely tied down.

NOTE

Ensure that the nose will be held off the ground under all conditions by means of suitable stands or supports under weight supporting bulkheads near the nose of the airplane.

LEVELING

Longitudinal leveling of the airplane is accomplished by placing a level on the leveling screws located on the left side of the tailcone. Deflate the nose tire and/or lower or raise the nose strut to properly center the bubble in the level. Corresponding points on either the upper or lower main door sills may be used to level the airplane laterally.

FLYABLE STORAGE

Airplanes placed in non-operational storage for a maximum of 30 days or those which receive only intermittent operational use for the first 25 hours are considered in flyable storage status. Every seventh day during these periods, the propeller should be rotated by hand through five revolutions. This action "limbers" the oil and prevents any accumulation of corrosion on engine cylinder walls.

WARNING

For maximum safety, check that the ignition switch is OFF, the throttle is closed, the mixture control is in the idle cut-off position, and the airplane is secured before rotating the propeller by hand. Do not stand within the arc of the propeller blades while turning the propeller.

After 30 days, the airplane should be flown for 30 minutes or a ground runup should be made just long enough to produce an oil temperature within the lower green arc range. Excessive ground runup should be avoided.

Engine runup also helps to eliminate excessive accumulations of water in the fuel system and other air spaces in the engine. Keep fuel tanks full to minimize condensation in the tanks. Keep the battery fully charged to prevent the electrolyte from freezing in cold weather. If the airplane is to be stored temporarily, or indefinitely, refer to the Service Manual for proper storage procedures.

SERVICING

In addition to the PREFLIGHT INSPECTION covered in Section 4, COMPLETE servicing, inspection, and test requirements for your airplane are detailed in the Service Manual. The Service Manual outlines all items which require attention at 50, 100, and 200 hour intervals plus those items which require servicing, inspection, and/or testing at special intervals.

Since Cessna Dealers conduct all service, inspection, and test procedures in accordance with applicable Service Manuals, it is recommended that you contact your Cessna Dealer concerning these requirements and begin scheduling your airplane for service at the recommended intervals.

Cessna Progressive Care ensures that these requirements are accomplished at the required intervals to comply with the 100-hour or ANNUAL inspection as previously covered.

Depending on various flight operations, your local Government Aviation Agency may require additional service, inspections, or tests. For

these regulatory requirements, owners should check with local aviation officials where the airplane is being operated.

For quick and ready reference, quantities, materials, and specifications for frequently used service items are as follows:

OIL

OIL SPECIFICATION --

The airplane was delivered from the factory with a corrosion-preventive aircraft engine oil. This oil should be drained after the first 25 hours of operation.

MIL-L-6082 Aviation Grade Straight Mineral Oil: Use to replenish supply during the first 25 hours.

Continental Motors Specification MHS-24 Aviation Grade Ashless Dispersant Oil: Oil conforming to Continental Motors Specification MHS-24, and all revisions or supplements thereto, **must be used** after first 25 hours. Refer to Continental Aircraft Engine Service Bulletin M82-8, and any superseding bulletins, revisions, or supplements thereto, for further recommendations.

RECOMMENDED VISCOSITY FOR TEMPERATURE RANGE --

All temperatures, use multi-viscosity oil or
Above 4°C (40°F), use SAE 50
Below 4°C (40°F), use SAE 30

NOTE

When operating temperatures overlap, use the lighter grade of oil. Multi-viscosity oil is recommended to improve starting in cold weather.

CAPACITY OF ENGINE SUMP -- 10 Quarts.

Do not operate on less than 7 quarts. To minimize loss of oil through breather, fill to 8 quart level for normal flights of less than 3 hours. For extended flight, fill to 10 quarts. These quantities refer to oil dipstick level readings. During oil and oil filter changes, one additional quart is required.

OIL AND OIL FILTER CHANGE --

After the first 25 hours of operation, drain engine oil sump and replace filter. Refill sump with ashless dispersant oil. Drain the engine oil sump and replace the filter each 100 hours thereafter. Change engine oil and replace the filter at least every 6 months even though less than the recommended hours have accumulated. Reduce intervals for

prolonged operation in dusty areas, cold climates, or when short flights and long idle periods result in sludging conditions.

NOTE

During the first 25-hour oil and filter change, a general inspection of the overall engine compartment is required. Items which are not normally checked during a preflight inspection should be given special attention. Hoses, metal lines and fittings should be inspected for signs of oil and fuel leaks, and checked for abrasions, chafing, security, proper routing and support, and evidence of deterioration. Inspect the intake and exhaust systems for cracks, evidence of leakage, and security of attachment. Engine controls and linkages should be checked for freedom of movement through their full range, security of attachment and evidence of wear. Inspect wiring for security, chafing, burning, defective insulation, loose or broken terminals, heat deterioration, and corroded terminals. Check the alternator belt(s) in accordance with Service Manual instructions, and retighten if necessary. A periodic check of these items during subsequent servicing operations is recommended.

FUEL

APPROVED FUEL GRADES (AND COLORS) --
100LL Grade Aviation Fuel (Blue).
100 (Formerly 100/130) Grade Aviation Fuel (Green).

NOTE

Isopropyl alcohol or ethylene glycol monomethyl ether may be added to the fuel supply in quantities not to exceed 1% or .15% by volume, respectively, of the total. Refer to Fuel Additives in later paragraphs for additional information.

CAPACITY EACH TANK -- 45 Gallons.
REDUCED CAPACITY EACH TANK (WHEN FILLED TO BOTTOM OF FUEL FILLER NECK EXTENSION) -- 33.5 Gallons.

NOTE

Service the fuel system after each flight, and keep fuel tanks full to minimize condensation in the tanks.

FUEL ADDITIVES --
Strict adherence to recommended preflight draining instructions as called for in Section 4 will eliminate any free water accumulations

from the tank sumps. While small amounts of water may still remain in solution in the gasoline, it will normally be consumed and go unnoticed in the operation of the engine.

One exception to this can be encountered when operating under the combined effect of: (1) use of certain fuels, with (2) high humidity conditions on the ground (3) followed by flight at high altitude and low temperature. Under these unusual conditions, small amounts of water in solution can precipitate from the fuel stream and freeze in sufficient quantities to induce partial icing of the engine fuel system.

While these conditions are quite rare and will not normally pose a problem to owners and operators, they do exist in certain areas of the world and consequently must be dealt with, when encountered.

Therefore, to alleviate the possibility of fuel icing occurring under these unusual conditions, it is permissible to add isopropyl alcohol or ethylene glycol monomethyl ether (EGME) compound to the fuel supply.

The introduction of alcohol or EGME compound into the fuel provides two distinct effects: (1) it absorbs the dissolved water from the gasoline and (2) alcohol has a freezing temperature depressant effect.

Alcohol, if used, is to be blended with the fuel in a concentration of 1% by volume. Concentrations greater than 1% are not recommended since they can be detrimental to fuel tank materials.

The manner in which the alcohol is added to the fuel is significant because alcohol is most effective when it is completely dissolved in the fuel. To ensure proper mixing, the following is recommended:

1. For best results, the alcohol should be added during the fueling operation by pouring the alcohol directly on the fuel stream issuing from the fueling nozzle.

2. An alternate method that may be used is to premix the complete alcohol dosage with some fuel in a separate clean container (approximately 2-3 gallon capacity) and then transferring this mixture to the tank prior to the fuel operation.

Any high quality isopropyl alcohol may be used, such as Anti-Icing Fluid (MIL-F-5566) or Isopropyl Alcohol (Federal Specification TT-I-735a). Figure 8-1 provides alcohol-fuel mixing ratio information.

Ethylene glycol monomethyl ether (EGME) compound, in compliance with MIL-I-27686 or Phillips PFA-55MB, if used, must be carefully mixed with the fuel in concentrations not to exceed .15% by volume. Figure 8-1 provides EGME-fuel mixing ratio information.

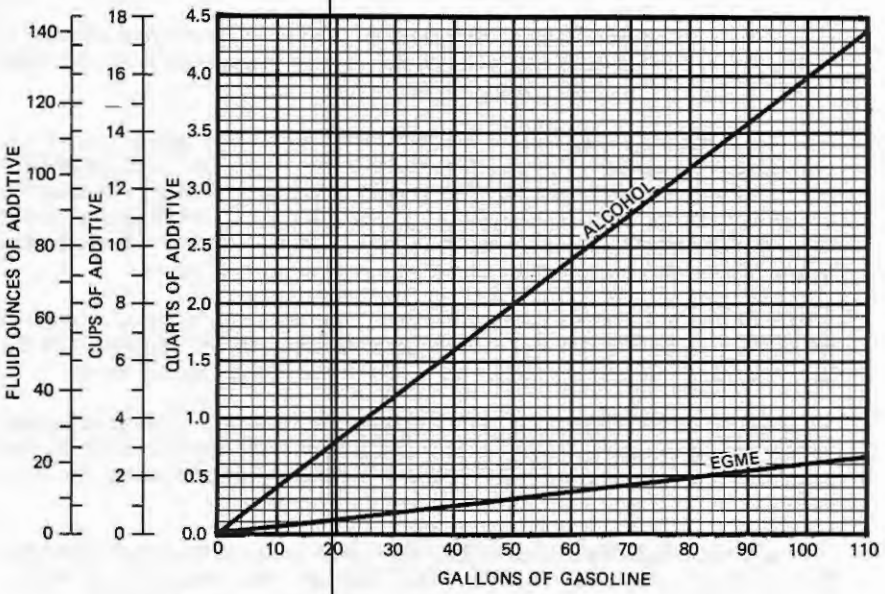


Figure 8-1. Additive Mixing Ratio

CAUTION

Mixing of the EGME compound with the fuel is extremely important because a concentration in excess of that recommended (.15% by volume maximum) will result in detrimental effects to the fuel tanks, such as deterioration of protective primer and sealants and damage to O-rings and seals in the fuel system and engine components. Use only blending equipment that is recommended by the manufacturer to obtain proper proportioning.

CAUTION

Do not allow the concentrated EGME compound to come in contact with the airplane finish as damage can result.

Prolonged storage of the airplane will result in a water buildup in the fuel which "leeches out" the additive. An indication of this is when an excessive amount of water accumulates in the fuel tank sumps. The

concentration can be checked using a differential refractometer. It is imperative that the technical manual for the differential refractometer be followed explicitly when checking the additive concentration.

FUEL CONTAMINATION --

Fuel contamination is usually the result of foreign material present in the fuel system, and may consist of water, rust, sand, dirt, microbes or bacterial growth. In addition, additives that are not compatible with fuel or fuel system components can cause the fuel to become contaminated.

Before the first flight of the day and after each refueling, use a clear sampler cup and drain at least a cupful of fuel from the quick-drain valves in the fuel tank sumps, fuel strainer, fuel reservoir, and vapor return line to determine if contaminants are present, and that the airplane has been fueled with the proper grade of fuel. If contamination is detected, drain all fuel drain points again and then gently rock the wings and lower the tail to the ground to move any additional contaminants to the sampling points. Take repeated samples from all fuel drain points until all contamination has been removed. If, after repeated sampling, evidence of contamination still exists, the fuel tanks should be completely drained and the fuel system cleaned. If the airplane has been serviced with the improper fuel grade, defuel completely and refuel with the correct grade. **Do not** fly the airplane with contaminated or unapproved fuel.

In addition, Owners/Operators who are not acquainted with a particular fixed base operator should be assured that the fuel supply has been checked for contamination and is properly filtered before allowing the airplane to be serviced. Also, fuel tanks should be kept full between flights, provided weight and balance considerations will permit, to reduce the possibility of water condensing on the walls of partially filled tanks.

To further reduce the possibility of contaminated fuel, routine maintenance of the fuel system should be performed in accordance with the airplane Service Manual. Only the proper fuel, as recommended in this handbook, should be used, and fuel additives should not be used unless approved by Cessna and the Federal Aviation Administration.

LANDING GEAR

NOSE WHEEL TIRE PRESSURE -- 50 PSI on 5.00-5, 6-Ply Rated Tire.
MAIN WHEEL TIRE PRESSURE -- 55 PSI on 6.00-6, 8-Ply Rated Tires.
NOSE GEAR SHOCK STRUT --

Keep filled with MIL-H-5606 hydraulic fluid per filling instructions placard, and with no load on the strut, inflate with air to 90 PSI. Do not

over-inflate.

HYDRAULIC FLUID RESERVOIR -- Check every 25 hours and service with MIL-H-5606 hydraulic fluid. At first 25 hours, first 50 hours, and each 100 hours thereafter, clean the filter on the right side of the reservoir.

BRAKES -- Service as required with MIL-H-5606 hydraulic fluid.

OXYGEN

AVIATOR'S BREATHING OXYGEN -- Spec. No. MIL-O-27210.

MAXIMUM PRESSURE (cylinder temperature stabilized after filling) -- 1800 PSI (overhead cylinders) or 1850 PSI (aft cylinder) at 21°C (70°F). Refer to Oxygen System Supplement (Section 9) for filling pressures.

CLEANING AND CARE

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, 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. Approximately 10 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 scratches should never be used. Remove stubborn oil and grease with a cloth moistened with Stoddard solvent.

To seal any minor surface chips or scratches and protect against corrosion, the airplane should be waxed regularly with a good automotive wax applied in accordance with the manufacturer's instructions. If the airplane is operated in a seacoast or other salt water environment, it must be washed and waxed more frequently to assure adequate protection. Special care should be taken to seal around rivet heads and skin laps, which are the areas most susceptible to corrosion. A heavier coating of wax on the leading edges of the wings and tail and on the cowl nose cap and propeller spinner will help reduce the abrasion encountered in these areas. Reapplication of wax will generally be necessary after cleaning with soap solutions or after chemical de-icing operations.

When the airplane is parked outside in cold climates and it is necessary to remove ice before flight, care should be taken to protect the painted surfaces during ice removal with chemical liquids. Isopropyl alcohol will satisfactorily remove ice accumulations without damaging the paint. However, keep the isopropyl alcohol away from the windshield and cabin windows since it will attack the plastic and may cause it to craze.

STABILIZER ABRASION BOOT CARE

If the airplane is equipped with stabilizer abrasion boots, keep them clean and free from oil and grease which can swell the rubber. Wash them with mild soap and water, using Form Tech AC cleaner or naphtha to remove stubborn grease. Do not scrub the boots, and be sure to wipe off all solvent before it dries. Boots with loosened edges or small tears should be repaired. Your Cessna Dealer has the proper material and know-how to do this correctly.

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 blade life. Small nicks on the propeller, particularly near the tips and on the leading edges, should be 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 Stoddard solvent.

DE-ICE/ANTI-ICE BOOT CARE

The optional wing and stabilizer de-ice and propeller anti-ice boots have a special electrically-conductive coating to bleed off static charges which cause radio interference and may perforate the boots. Fueling and other servicing operations should be done carefully to avoid damaging this conductive coating or tearing the boots.

To prolong the life of de-ice/anti-ice boots, they should be washed and serviced on a regular basis. Keep the boots clean and free from oil, grease and other solvents which cause rubber to swell and deteriorate. Outlined below are recommended cleaning and servicing procedures.

CAUTION

Use only the following instructions when cleaning boots. Disregard instructions which recommend petroleum base liquids (MEK, non-leaded gasoline, etc.) which can harm the boot material.

1. Clean boots with mild soap and water, then rinse thoroughly with clean water.

NOTE

Isopropyl alcohol can be used to remove grime which cannot be removed using soap. If isopropyl alcohol is used for cleaning, wash area with mild soap and water, then rinse thoroughly with clean water.

2. Allow the boots to dry, then apply a coating of Age Master No. 1 to the boots in accordance with application instructions on the container.

NOTE

Age Master No. 1 is beneficial for its ozone and weather resistance features.

3. After the boots have been treated with Age Master No. 1, apply a coating of ICEX to the boots in accordance with application instructions on the ICEX container.

NOTE

ICEX may be beneficial as an ice adhesion depressant. Both Age Master No. 1 and ICEX are distributed by the B.F.

Goodrich Company.

CAUTION

ICEX contains silicone, which lessens paint adhesion. Use care when applying ICEX, and protect adjacent surfaces from overspray, since overspray of ICEX will make touch-up painting almost impossible.

Age Master No. 1 and ICEX coatings last approximately 150 hours on the wing and stabilizer de-ice boots and 15 hours on propeller anti-ice boots.

Small tears and abrasions on de-ice boots can be repaired temporarily without removing the boots and the conductive coating can be renewed. Your Cessna Dealer has the proper materials and know-how to do this correctly.

LANDING GEAR CARE

Cessna Dealer's mechanics have been trained in the proper adjustment and rigging procedures on the airplane hydraulic system. To assure trouble-free operation, have your Cessna Dealer check the gear regularly and make any necessary adjustments. Only properly trained mechanics should attempt to repair or adjust the landing gear.

ENGINE CARE

The engine may be cleaned, using a suitable solvent, in accordance with instructions in the airplane Service Manual. Most efficient cleaning is done using a spray-type cleaner. Before spray cleaning, ensure that protection is afforded for components which might be adversely affected by the solvent. Refer to the Service Manual for proper lubrication of controls and components after engine cleaning.

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.

If your airplane is equipped with leather seating, cleaning of the seats is accomplished using a soft cloth or sponge dipped in mild soap suds. The soap suds, used sparingly, will remove traces of dirt and grease. The soap should be removed with a clean damp cloth.

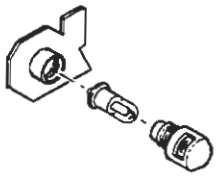
The plastic trim, headliner, instrument panel and control knobs need only be wiped off with a damp cloth. Oil and grease on the control wheel and control knobs can be removed with a cloth moistened with Stoddard solvent. Volatile solvents, such as mentioned in paragraphs on care of the windshield, must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

BULB REPLACEMENT DURING FLIGHT

Figure 8-2 provides instructions to aid the pilot in the replacement of defective light bulbs during flight without tools. It is suggested that spare bulbs be stored in the map compartment. However, if a spare bulb is not available, an identical bulb which is found to be available from other lights listed herein can be substituted for the defective bulb. For a listing of other bulb requirements and specific tools needed, refer to the Service Manual for this airplane.

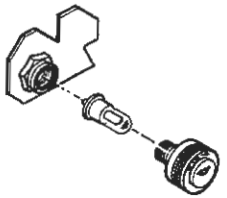
POST LIGHTS

Grasp lens cap and pull straight out from socket. Pull bulb from cap and replace with MS25237-327 bulb. Replace cap in socket and rotate cap to direct light in desired direction.



LANDING GEAR LIGHTS, DE-ICE PRESSURE LIGHT, LOW VOLTAGE LIGHT, LOW VACUUM LIGHT, ALTERNATOR OFF LIGHTS AND RADAR ALTIMETER LIGHT

Remove lens cap by turning counterclockwise until it separates from housing. Pull bulb from back side of lens cap and replace with MS25237-327 bulb. Replace lens cap by turning it clockwise until hand-tight. After replacing lens cap, check that dimming shutter is not closed. Replacement procedure is identical for all lights in this group, and any bulb may be used to replace the other, if a spare bulb is not available.



CONTROL WHEEL MAP LIGHT

Grasp rim of bulb, push straight up and turn counterclockwise as far as possible, then pull bulb straight down and out of socket. Replace with 24RB bulb. To install new bulb in socket, align pins on bulb with slots in socket, then push straight up and rotate bulb clockwise as far as possible.

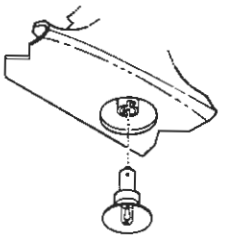


Figure 8-2. Bulb Replacement

SECTION 9
SUPPLEMENTS
(Optional Systems Description & Operating Procedures)

TABLE OF CONTENTS (Continued)

Original Issue - 22 August 1983
Revision 2 - 28 September 1984

INTRODUCTION

This section consists of a series of supplements, each covering a single optional system which may be installed in the airplane. Each supplement contains a brief description, and when applicable, operating limitations, emergency and normal procedures, and performance. As listed in the Table of Contents, the supplements are classified under the headings of General and Avionics, and have been provided with reference numbers. Also, the supplements are arranged alphabetically and numerically to make it easier to locate a particular supplement. Other routinely installed items of optional equipment, whose function and operational procedures do not require detailed instructions, are discussed in Section 7.

Limitations contained in the following supplements are FAA approved. Observance of these operating limitations is required by Federal Aviation Regulations.

SUPPLEMENT

ELECTRIC ELEVATOR TRIM SYSTEM

SECTION 1
GENERAL

The electric elevator trim system provides a simple method of relieving pitch control pressures without interrupting other control operations to adjust the manual elevator trim wheel. The system is controlled by a slide-type trim switch on the top of the left control wheel grip, a disengage switch located on the left side of the control wheel pad, and a "pull-off" type circuit breaker on the left sidewall circuit breaker panel. Pushing the trim switch to the forward position, labeled DN, moves the elevator trim tab in the "nose down" direction; conversely, pulling the switch aft to the UP position moves the tab in the "nose up" direction. When the switch is released, it automatically returns to the center off position, and elevator trim tab motion stops. The disengage switch, labeled ELEC TRIM DISENGAGE, disables the system when placed in the DISENGAGE position. The elevator trim circuit breaker, labeled TRIM PULL-OFF, is provided as a secondary control of all electrical power to the system and can be pulled to the off position in case of a system malfunction.

A servo unit (which includes a motor and chain-driven, solenoid-operated clutch) actuates the trim tab to the selected position. When the clutch is not energized (trim switch off) the electric portion of the trim system freewheels so that manual operation is not affected. The electric trim system can be overridden at any time by manually rotating the elevator trim wheel, thus overriding the servo that drives the trim tab.

SECTION 2
LIMITATIONS

The following limitation applies to the electric elevator trim system:

1. The maximum altitude loss during an electric elevator trim malfunction may be as much as 250 feet.

SECTION 3
EMERGENCY PROCEDURES

1. Elevator Trim Disengage Switch -- DISENGAGE.
2. Elevator Trim Circuit Breaker -- PULL-OFF for the remainder of the flight.
3. Manual Trim -- AS REQUIRED.

SECTION 4
NORMAL PROCEDURES

To operate the electric elevator trim system, proceed as follows:

1. Master Switch -- ON.
2. Elevator Trim Circuit Breaker -- PUSH-TO-RESET, if off.
3. Elevator Trim Disengage Switch -- ON.
4. Trim Switch -- ACTUATE as desired.
5. Elevator Trim Position Indicator -- CHECK.

NOTE

To check the operation of the disengage switch, actuate the elevator trim switch with the disengage switch in the DISENGAGE position. Observe that the manual trim wheel and indicator do not rotate when the elevator trim switch is activated.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when this trim system is installed.

SUPPLEMENT

ENGINE COMBUSTION ANALYZER

SECTION 1
GENERAL

An engine combustion analyzer system, useful as an aid for mixture leaning in cruising flight at 75% power or less, and detection of possible combustion problems, may be installed in the airplane. This system is similar to the economy mixture indicator (EGT) but employs additional components so that exhaust gas temperature (EGT) of the individual engine cylinders can be monitored.

The combustion analyzer system consists of an instrument panel-mounted indicator with selector switch (see figure 1), seven temperature sensing probes installed in the engine exhaust system, and wiring connecting the indicator to the probes. The system does not require airplane electrical power for proper operation.

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when the engine combustion analyzer system is installed.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the engine combustion analyzer system is installed.

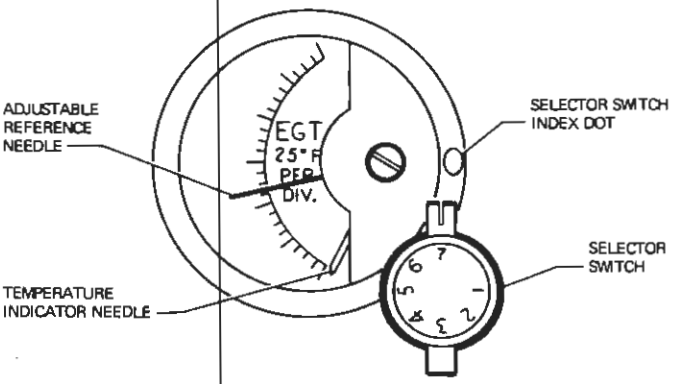


Figure 1. Engine Combustion Analyzer Indicator

SECTION 4
NORMAL PROCEDURES

The operation of the combustion analyzer system is similar to the economy mixture indicator (see Section 4 of the basic handbook) with the exception that the pilot can monitor individual cylinder exhaust gas temperatures by selecting the desired cylinder using the indicator selector switch (see figure 1). Aligning a number on the selector switch with the white index dot on the indicator face selects the corresponding engine cylinder for temperature sensing. For example, position 1 is engine cylinder number 1. Position 7 selects the left exhaust collector probe (which senses the composite temperature indication of cylinders 2, 4 and 6), and is, thus, used as a "single point" system like the economy mixture indicator. Normally, leaning of fuel-air mixtures is accomplished using position 7. Position 7 temperature is normally 100°F to 200°F higher than the other positions. All performance data shown in Section 5 of the basic handbook is based on use of the engine combustion analyzer selector switch set on the number 7 position.

For combustion problem detection procedures, refer to the combustion analyzer manufacturer's information provided in the airplane when this equipment is installed.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when the engine combustion analyzer system is installed.

SUPPLEMENT

GROUND SERVICE PLUG RECEPTACLE

SECTION 1
GENERAL

The ground service plug receptacle permits the use of an external power source for cold weather starting and during lengthy maintenance work on electrical and avionics equipment. The receptacle is located behind the engine oil dipstick access door on the left side of the upper cowling.

NOTE

If no avionics equipment is to be used or worked on, the avionics power switches should be turned off. If maintenance is required on the avionics equipment, it is advisable to utilize a battery cart external power source to prevent damage to the avionics equipment by transient voltage. Do not crank or start the engine with the avionics power switch turned on.

A special fused circuit is included with the ground service plug receptacle which will close the battery contactor when external power is applied with the master switch turned on. This circuit is intended as a servicing aid when battery power is too low to close the contactor, and should not be used to avoid performing proper maintenance procedures on a low battery.

NOTE

Use of the ground service plug receptacle for starting an airplane with a "dead" battery or charging a "dead" battery in the airplane is not recommended. The battery should be removed from the airplane and serviced in accordance with Service Manual procedures. Failure to observe this precaution could result in loss of electrical power during flight.

SECTION 2
LIMITATIONS

The following information must be presented in the form of a placard located on the inside of the engine oil dipstick access door:

CAUTION 24 VOLTS D.C.
This aircraft is equipped with alternator and a negative ground system.
OBSERVE PROPER POLARITY
Reverse polarity will damage electrical components.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when the ground service plug receptacle is installed.

SECTION 4
NORMAL PROCEDURES

Just before connecting an external power source (generator type or battery cart), the avionics power switches should be turned off, and the master switch turned on.

WARNING

When turning on the master switch, using an external power source, or pulling the propeller through by hand, treat the propeller as if the ignition switch were on. Do not stand, nor allow anyone else to stand, within the arc of the propeller since a loose or broken wire or a component malfunction could cause the propeller to rotate.

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 electrical system, thereby preventing any damage to electrical equipment.

The following check should be made after engine start and removal of the external power source, if there is any question as to the condition of the battery.

1. Master Switch -- OFF.
2. Taxi and Landing Light Switches -- ON.
3. Engine RPM -- REDUCE to idle.
4. Master Switch -- ON (with taxi and landing lights turned on).
5. Engine RPM -- INCREASE to approximately 1500 RPM.
6. Ammeter and Low-Voltage Warning Light -- CHECK.

NOTE

If the ammeter does not show a charge or the low-voltage warning light does not go out, the battery should be removed from the airplane and properly serviced prior to flight.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when the ground service plug receptacle is installed.

SUPPLEMENT
AUDIO CONTROL PANELS
SECTION 1
GENERAL

Two types of audio control panels (see figure 1) are available for this airplane, depending upon how many transmitters are included. The operational features of both audio control panels are similar and are discussed in the following paragraphs.

TRANSMITTER SELECTOR SWITCH

When the avionics package includes a maximum of two transmitters, a two-position toggle-type switch, labeled XMTR, is provided to switch the microphone to the transmitter the pilot desires to use. If the airplane avionics package includes a third transmitter, the transmitter selector switch is a three-position rotary-type switch, labeled XMTR SEL. To select a transmitter, place the transmitter selector switch in the position number corresponding to the desired transmitter.

The action of selecting a particular transmitter using the transmitter selector switch simultaneously selects the audio amplifier associated with that transmitter to provide speaker audio. For example, if the number one transmitter is selected, the audio amplifier in the number one NAV/COM is also selected and is used for ALL speaker audio. Headset audio is not affected by audio amplifier operation.

AUDIO SELECTOR SWITCHES

Both audio control panels (see figure 1) incorporate three-position toggle-type audio selector switches for individual control of the audio systems installed in the airplane. These switches allow receiver audio to be directed to the airplane speaker or to a headset, and heard singly or in combination with other receivers. To hear a particular receiver on the airplane speaker, place that receiver's audio selector switch in the up (SPEAKER) position. To listen to a receiver over a headset, place that receiver's audio selector switch in the down (PHONE) position. The center (OFF) position turns off all audio from the associated receiver.

NOTE

Volume level is adjusted using the individual receiver volume controls on each radio.

A special feature of the audio control panel used when one or two transmitters are installed is separate control of NAV and COM audio from the NAV/COM radios. With this installation, the audio selector switches labeled NAV, 1 and 2 select audio only from the navigation receivers of the NAV/COM radios. Communication receiver audio is selected by the switches labeled COM, AUTO and BOTH. Description and operation of these switches is described in figure 1.

When the audio control panel for three transmitters is installed, audio from both NAV and COM frequencies is combined, and is selected by the audio selector switches labeled NAV/COM, 1, 2 and 3.

COM AUTO AUDIO SELECTOR SWITCH

The audio control panel used with either one or two transmitters incorporates a three-position toggle switch, labeled COM AUTO, which is provided to automatically match the audio of the appropriate NAV/COM communications receiver to the radio selected by the transmitter selector switch.

COM BOTH AUDIO SELECTOR SWITCH

The audio control panel used with either one or two transmitters incorporates a three-position toggle switch, labeled COM BOTH, which is provided to allow both COM receivers to be monitored at the same time.

AUTO AUDIO SELECTOR SWITCH

The audio control panel used with three transmitters incorporates a three-position toggle switch, labeled AUTO, which is provided to automatically match the audio of the appropriate NAV/COM receiver to the selected transmitter.

ANNUNCIATOR LIGHTS BRIGHTNESS AND TEST SWITCH

The audio control panel used with either one or two transmitters incorporates a three-position toggle switch with NITE (up) and DAY (middle) positions to control the brightness level of the marker beacon indicator lights, and the BC, LOC, ARC and RN Nav indicator lights (when installed). In the TEST (down) position, all marker beacon annunciator lights will illuminate full bright to verify bulb operation.

NOTE

A potentiometer is installed inside the audio control panel to provide further minimum light dimming capabilities. Refer to the appropriate Avionics Service/Parts manual for adjustment procedures.

SIDETONE OPERATION

Cessna radios are equipped with sidetone capability (monitoring of the operator's own voice transmission). While adjusting speaker sidetone, be aware that if the sidetone volume level is set too high, audio feedback (squeal) may result when transmitting.

When the airplane has one or two transmitters, sidetone is provided in either the speaker or headset anytime the COM AUTO selector switch is utilized. Placing the COM AUTO selector switch in the OFF position will eliminate sidetone. Sidetone internal adjustments are available to the pilot through the front of the audio control panel (see figure 1).

When the airplane has three transmitters, sidetone will be heard on either the speaker or a headset as selected with the AUTO selector switch. Sidetone may be eliminated by placing the AUTO selector switch in the OFF position, and utilizing the individual audio selector switches. Adjustment of speaker and headset sidetone volume can only be accomplished by adjusting the sidetone potentiometers located inside the audio control panel.

NOTE

Sidetone is not available on HF Transceiver (Type ASB-125), when installed.

OPTIONAL INTERCOM SYSTEM

The optional intercom system is a pilot and copilot intercom phone system which is only offered with the one or two transmitter type audio control panel. The system incorporates its own audio amplifier with a volume control (labeled INT) and a "hot mike" feature. The intercom system is used with the headphones only.

The "hot mike" feature allows the pilot and copilot to communicate at anytime through their microphone/headsets without having to key the mike. However, they must key the mike button on their control wheel to transmit over the aircraft's transceiver. Sidetone is present on the intercom system when the COM AUTO switch is in the PHONE position.

NOTE

Some ambient noise attenuating type padded headset and boom mike combinations may not be compatible with this system.

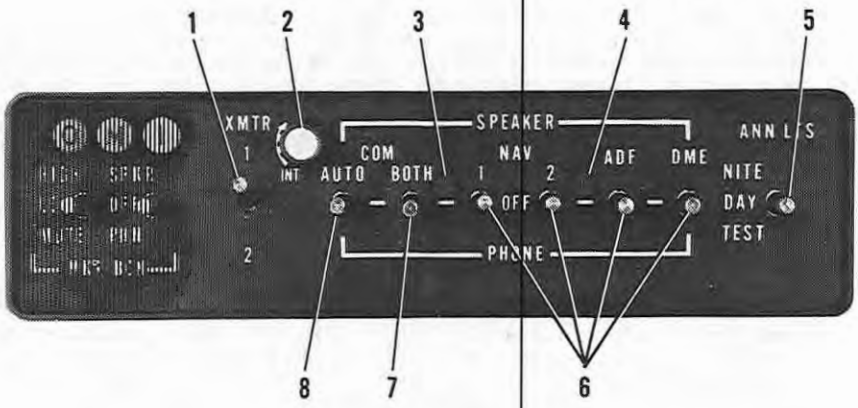
The intercom audio volume is controlled by the INT knob located on the front of the audio control panel. Clockwise rotation of the knob increases the volume of the intercom audio and counterclockwise rotation decreases it. The INT knob controls the audio volume for the intercom system only. Receiver audio volume is adjusted using the individual receiver volume controls. When the intercom system is not being used, the INT volume control should be turned full counterclockwise to eliminate any noise over the headphones.

NOTE

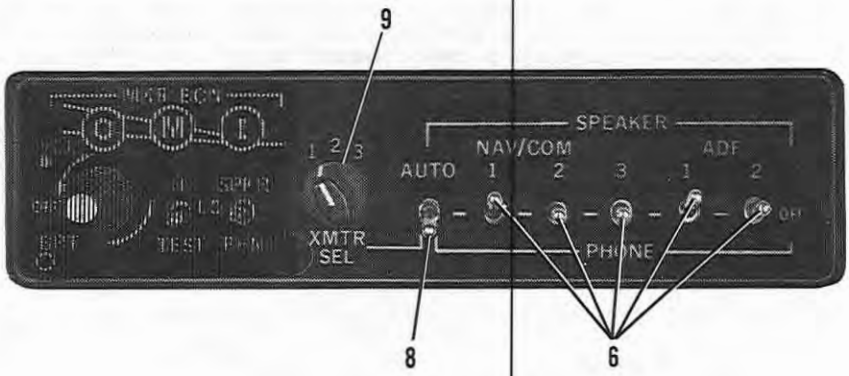
When the intercom volume is turned up and an auxiliary mike is plugged in, there will be a loud squeal over the speaker if the COM BOTH and COM AUTO switches are inadvertently placed in the opposite positions (one in the SPEAKER position and the other in the PHONE position). To eliminate this squeal turn the volume down or place both switches in the same position.

When the optional intercom system is not installed, a plug button will be installed in place of the INT volume control knob.

USED WITH ONE OR TWO TRANSMITTERS



USED WITH THREE TRANSMITTERS OR DUAL ADF'S



1. TRANSMITTER SELECTOR SWITCH (XMTR) - A two-position toggle switch used to activate the audio amplifier and switch the microphone to the desired transmitter. The number 1 (up position) and 2 (down position) corresponds to the first and second (from top to bottom) transmitters, respectively.

Figure 1. Audio Control Panel Operating Controls
(Sheet 1 of 2)

2. INTERCOM VOLUME CONTROL (INT) - Controls the intercom audio volume. Clockwise rotation of the knob increases the intercom audio volume and counterclockwise rotation decreases it.

3. HEADSET SIDETONE INTERNAL ADJUSTMENT ACCESS - To adjust headset sidetone, remove the plug button, place COM AUTO selector switch in the PHONE position, insert a small screwdriver into the adjustment potentiometer and rotate it clockwise to increase the sidetone volume or counterclockwise to decrease sidetone.

4. SPEAKER SIDETONE INTERNAL ADJUSTMENT ACCESS - To adjust speaker sidetone, remove the plug button, place COM AUTO selector switch in the SPEAKER position, insert a small screwdriver into the adjustment potentiometer and rotate it clockwise to increase the sidetone volume or counterclockwise to decrease sidetone. While adjusting sidetone, be aware that if the sidetone volume level is set too high, audio feedback (squeal) may result when transmitting.

5. ANNUNCIATOR LIGHTS BRIGHTNESS SELECTOR AND TEST SWITCH (ANN LTS-NITE/DAY/TEST) - Three-position toggle switch; in the up (NITE) position, annunciator lights (Mkr Bcn, BC, LOC, ARC and RN) will show at a reduced light level for typical night operations. In the NITE position, annunciator light (Mkr Bcn, BC, LOC, ARC and RN) level can be further adjusted down to a preset minimum using the RADIO LT dimming rheostat knob. In the center (DAY) position, annunciator lights (Mkr Bcn, BC, LOC, ARC, and RN) will show full bright. In the TEST position, the Mkr Bcn lights will show full bright to verify lamp operation.

6. AUDIO SELECTOR SWITCHES - Three-position selector switches used to select either SPEAKER or PHONE operation for audio outputs. Enables the operator to select any one or more, audio signals on either SPEAKER or PHONE at the same time or to silence audio when placed in the OFF position.

7. COM BOTH AUDIO SELECTOR SWITCH (COM BOTH) - A three-position toggle switch used to allow both COM receivers to be monitored at the same time. Placing the COM BOTH switch in the up (SPEAKER) position will enable the pilot to monitor both the number 1 and number 2 COM receivers over the SPEAKER at the same time. Placing the switch in the down (PHONE) position allows the pilot to monitor both the number 1 and number 2 COM receivers through the headset at the same time. Center (OFF) position, removes the non-selected COM receiver (or both COM receivers if COM AUTO switch is OFF) from the audio system.

8. COM AUTO AUDIO SELECTOR SWITCH (COM AUTO OR AUTO) - A three-position toggle switch provided to automatically match the audio of the appropriate NAV/COM communications receiver to the transmitter selected by the transmitter selector switch. In the up (SPEAKER) position, audio from the selected receiver will be heard on the airplane speaker. In the down (PHONE) position, audio from the selected receiver will be heard through the headset. Center (OFF) position, removes the automatic SPEAKER/PHONE selection feature and will also disable the sidetone feature.

9. TRANSMITTER SELECTOR SWITCH (XMTR SEL) - A three-position rotary switch used to activate the audio amplifier and switch the microphone to the desired transmitter. The numbers 1, 2 and 3 positions correspond to the first, second and third (from top to bottom) transmitters, respectively.

Figure 1. Audio Control Panel Operating Controls
(Sheet 2 of 2)

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when either of these audio control panels is installed.

SECTION 3
EMERGENCY PROCEDURES

In the event the audio amplifier in use fails, as evidenced by loss of all speaker audio, selecting an alternate transmitter will reestablish speaker audio using the alternate transmitter audio amplifier.

SECTION 4
NORMAL PROCEDURES

AUDIO CONTROL PANEL OPERATIONS:

1. Transmitter Selector (XMTR or XMTR SEL) Switch -- SELECT desired transmitter for transceiver operation.
2. COM AUTO or AUTO Selector Switch -- SELECT SPEAKER or PHONE position to automatically select SPEAKER or PHONE audio.

NOTE

If the NAV/COM audio selector switch corresponding to the selected transmitter is in the PHONE position with the AUTO selector switch in the SPEAKER position, all audio selector switches placed in the PHONE position will automatically be connected to both the airplane speaker and any headsets in use.

3. COM BOTH Selector Switch -- SELECT the same SPEAKER or PHONE position which was set on the COM AUTO selector switch to allow both COM receivers to be monitored at the same time.

NOTE

The combination of placing the COM AUTO switch in the SPEAKER position and the COM BOTH switch in the PHONE position (or vice versa) is not normally recommended as it will cause audio from both communications receivers (and any other navigation receiver with its audio selector switch in the PHONE position) to be heard on both the airplane speaker and the headset simultaneously.

4. Audio SPEAKER/PHONE Selector Switches -- SELECT desired SPEAKER, PHONE, or silent (OFF) audio position.
5. INT Control Knob -- ROTATE as desired to increase or decrease intercom audio volume.
6. ANN LTS Switch:
   a. TEST Position -- SELECT to verify operation of marker beacon annunciator lights (when installed).
   b. DAY Position -- SELECT for typical daytime lighting.
   c. NITE Position -- SELECT for typical night lighting.

NOTE

In the NITE position, further lighting adjustment for the Mkr Bcn, BC, LOC, ARC, and RN (when installed) annunciator lights can be obtained using the RADIO LT dimming rheostat knob.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when either of these audio control panels is installed.

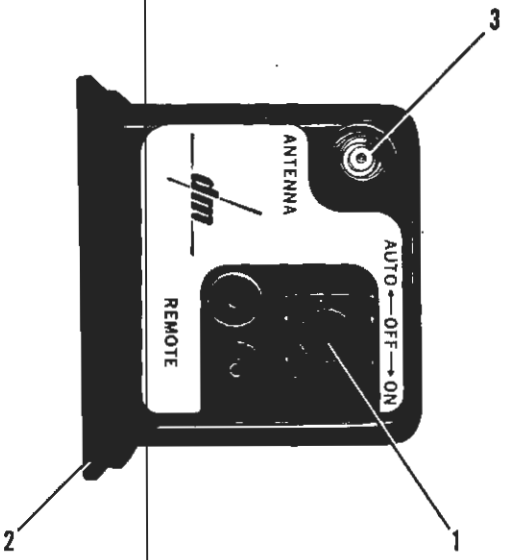
SUPPLEMENT

EMERGENCY LOCATOR TRANSMITTER (ELT)

SECTION 1
GENERAL

The ELT consists of a self-contained dual-frequency radio transmitter and battery power supply, and is activated by an impact of 5g or more as may be experienced in a crash landing. The ELT emits an omni-directional signal on the international distress frequencies of 121.5 and 243.0 MHz. General aviation and commercial aircraft, the FAA, and CAP monitor 121.5 MHz, and 243.0 MHz is monitored by the military. Following a crash landing, the ELT will provide line-of-sight transmission up to 100 miles at 10,000 feet. The ELT transmits on both distress frequencies simultaneously at 75 mw rated power output for 48 continuous hours in the temperature range of -4°F to +131°F (-20°C to +55°C).

The ELT is readily identified as a bright orange unit mounted behind the baggage compartment on the right-hand side of the tailcone. To gain access to the unit, remove the rear baggage compartment decorative wall panel, and untape and pull out the ELT access plug. The ELT is operated by a control panel at the forward facing end of the unit (see figure 1).



1. FUNCTION SELECTOR SWITCH (3-position toggle switch):

   AUTO - Activates transmitter only when "g" switch receives 5g or more impact.

   OFF - Deactivates transmitter. Used during shipping, storage and following rescue.

   ON - Activates transmitter instantly. Used for test purposes and if "g" switch is inoperative.

2. COVER - Removable for access to battery pack.

3. ANTENNA RECEPTACLE - Connects to antenna mounted on top of tailcone.

Figure 1. ELT Control Panel

SECTION 2
LIMITATIONS

The following information is presented in the form of a placard located on the rear baggage compartment decorative wall panel.

> EMERGENCY LOCATOR TRANSMITTER
> INSTALLED AFT OF THIS PARTITION.
> MUST BE SERVICED IN ACCORDANCE
> WITH FAR PART 91.52

In addition, the following information must be presented in the form of a placard located on the ELT access plug door in the baggage compartment wall (behind the decorative panel).

SECTION 3
EMERGENCY PROCEDURES

Immediately after a forced landing where emergency assistance is required, the ELT should be utilized as follows.

1. ENSURE ELT ACTIVATION --Turn a radio transceiver ON and select 121.5 MHz. If the ELT can be heard transmitting, it was activated by the "g" switch and is functioning properly. If no emergency tone is audible, gain access to the ELT and place the function selector switch in the ON position.

2. PRIOR TO SIGHTING RESCUE AIRCRAFT -- Conserve airplane battery. Do not activate radio transceiver.

3. AFTER SIGHTING RESCUE AIRCRAFT -- Place ELT function selector switch in the OFF position, preventing radio interference. Attempt contact with rescue aircraft with the radio transceiver set to a frequency of 121.5 MHz. If no contact is established, return the function selector switch to ON immediately.

4. FOLLOWING RESCUE -- Place ELT function selector switch in the OFF position, terminating emergency transmissions.

SECTION 4
NORMAL PROCEDURES

As long as the function selector switch remains in the AUTO position, the ELT automatically activates following an impact of 5g or more over a short period of time.

Following a lightning strike, or an exceptionally hard landing, the ELT may activate although no emergency exists. To check your ELT for inadvertent activation, select 121.5 MHz on your radio transceiver and listen for an emergency tone transmission. If the ELT can be heard transmitting, place the function selector switch in the OFF position and the tone should cease. Immediately place the function selector switch in the AUTO position to re-set the ELT for normal operation.

SECTION 5
PERFORMANCE

There is no change to the airplane performance data when this equipment is installed.

SUPPLEMENT

RADAR ALTIMETER

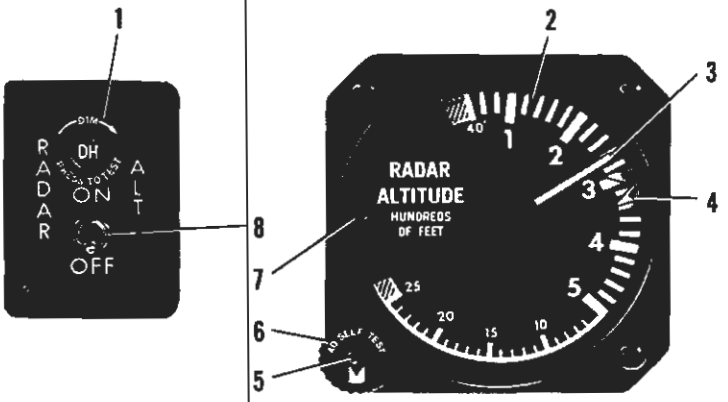
(Type Terra TRA2500)

SECTION 1
GENERAL

The Terra TRA2500 Radar Altimeter System is a short pulse radar altitude system designed for automatic continuous operation over wide variations of terrain, target reflectivity, weather and aircraft altitude. The Terra TRA2500 Radar Altimeter may be used inflight to monitor absolute altitude at any altitude from 60 ±20 feet up to a maximum of 2500 feet (depending upon terrain reflectivity and aircraft bank angle), or the pilot may select a warning absolute altitude with the DH SET control and be alerted automatically with aural and visual warnings whenever the aircraft descends below that absolute altitude. The Terra TRA2500 Radar Altimeter may also be used for displaying ground separation during night or instrument climbouts, as well as indicating ground clearances during approaches.

The Terra TRA2500 Radar Altimeter is turned on by a panel-mounted toggle switch (labeled RADAR ALT) prior to takeoff and may be left on for the duration of the flight. An initial warm-up period of approximately one minute is required before indicator accuracy can be assured. At altitude within the usable range of the indicator, proper system operation is indicated by the red OFF flag being out of view and an accurate indication of aircraft height above the nearest terrain. Once the aircraft has flown above the usable range of the indicator the pointer remains retracted behind the high altitude position mask. If an electrical failure occurs at anytime, the red OFF flag will appear and the pointer will stop and remain in that position. Momentary signal loss within the usable range of the indicator will cause the pointer to swing to the high altitude position mask temporarily.

The radar altimeter indicator provides an absolute altitude display from 40 to 2500 feet, an integral TEST button, and a decision height (DH) selector knob. Internal indicator lighting is controlled by the radio light dimming rheostat. Also included is a remote mounted DH warning light and power switch. The indicator and controls for the Terra TRA2500 Radar Altimeter are shown and described in figure 1.



1. DECISION HEIGHT (DH) WARNING LIGHT - A press-to-test light which illuminates amber to indicate aircraft has descended below the selected decision height. A warning horn will also sound momentarily. Light level may be dimmed by turning the outside ring clockwise.

2. ALTITUDE DISPLAY DIAL - From 40 to 500 feet, calibrated in numerical graduations which represent increments of 100 feet; from 500 to 2500, numerical graduations represent increments of 500 feet.

3. ALTITUDE DISPLAY POINTER - Indicates airplane altitude from 60 ±20 feet up to a maximum of 2500 feet (depending upon terrain reflectivity). If the aircraft is out of the system's range, the pointer will remain retracted behind the high altitude position mask. When descending through 60 ±20 feet, the pointer will pause momentarily, then start back around toward the high altitude position, indicating that useful information is no longer provided. If the system is turned off or becomes inoperative, the pointer will stop and remain in that position.

4. DECISION HEIGHT BUG - Indicates selected warning altitude.

5. SELF-TEST BUTTON - Momentarily press the TEST button; the pointer will swing to the red dot on the face of the dial (located below the 40 feet numeral). If the aircraft absolute altitude is higher than the preselected DH, the DH warning light will illuminate, and the warning horn will sound.

6. DECISION HEIGHT SET CONTROL KNOB - Used to select a warning absolute altitude. The pilot will be alerted automatically with a visual and audio alert whenever the aircraft descends below the selected altitude.

7. OFF FLAG - Red OFF flag indicates power is turned off or system is inoperative.

8. RADAR ALTIMETER (RADAR ALT ON/OFF) POWER SWITCH - Applies power to radar altimeter when an avionics power switch is ON.

Figure 1. Radar Altimeter (Type Terra TRA2500)

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when this avionic equipment is installed.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when this avionic equipment is installed.

SECTION 4
NORMAL PROCEDURES

TEST FUNCTION:

Preflight Test:

1. Avionics Power Switch -- ON.
2. RADAR ALT Switch -- ON. Allow approximately one minute for warm up. Verify OFF flag is out of view. Pointer will travel to the high altitude position.

NOTE

Inside a hangar or near large reflective objects, an erroneous reading may appear.

3. Decision Height Set Knob -- SELECT desired warning altitude.
4. TEST Switch -- PRESS MOMENTARILY. The pointer will swing to the red dot on the dial below the 40 ft. numeral. DH warning light will illuminate and warning horn will sound as the pointer descends through the DH setting. After a 10 second pause, and if no reflective objects are nearby, the pointer will travel back to the high altitude position mask and the DH warning light will extinguish.

ALTIMETER OPERATION:

1. Avionics Power Switch -- ON.
2. RADAR ALT Switch -- ON. Allow approximately one minute for warm-up. Verify OFF flag is out of view.
3. Decision Height Set Knob -- SELECT desired warning altitude.

CAUTION

The radar altimeter must not be used to identify the MDA (Minimum Descent Altitude) or DH (Decision Height) while making an instrument approach.

OPERATIONAL NOTES:

1. After takeoff, system lag makes radar altimeter indications unreliable until after approximately the first 30 seconds after climbing above 80 feet altitude.
2. Depending upon terrain reflectivity, initial and/or reliable indications during descents through the 2500 foot level may not occur until the aircraft has reached absolute altitudes as low as 1500 feet.
3. Accuracy in level flight or in descents at rates up to 1000 FPM is within 7% or 80 feet, whichever is greater.
4. The pointer will disappear from view below 2500 feet if the ground return signal is lost. The pointer may also disappear from view momentarily when the aircraft is in a bank in excess of 20° (above 500 feet) or 30° (below 500 feet).
5. Erroneous or spurious indications may occasionally occur at altitudes above 2500 feet even though the OFF flag may not be showing.
6. The press-to-test function should not be actuated on approach since it may require up to 35 seconds to complete and reliable altitude indications are again available.
7. Once the indicator has reached 60 ±20 feet during landing approach, further indications in this range are unreliable, since the indicator may dwell briefly in this range even as the aircraft descends further.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when this avionic equipment is installed.

SUPPLEMENT

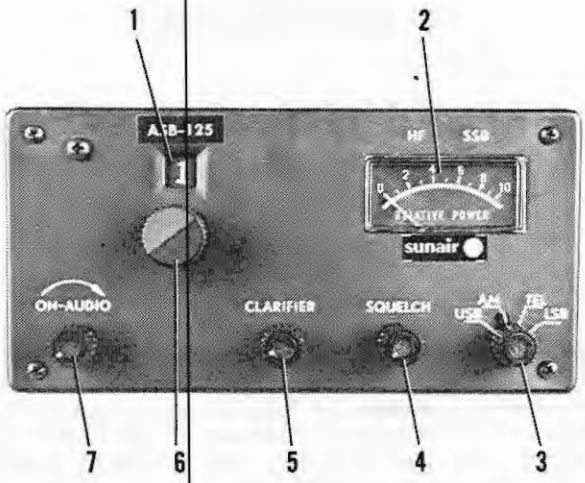
SSB HF TRANSCEIVER
(TYPE ASB-125)

SECTION 1
GENERAL

The ASB-125 HF transceiver is an airborne, 10-channel, single sideband (SSB) radio with a compatible amplitude modulated (AM) transmitting-receiving system for long range voice communications in the 2 to 18 MHz frequency range. The system consists of a panel mounted receiver/exciter, a remote mounted power amplifier/power supply, an antenna coupler and an externally mounted, fixed wire, medium/high frequency antenna.

A channel selector knob determines the operating frequency of the transceiver which has predetermined crystals installed to provide the desired operating frequencies. A mode selector control is provided to supply the type of emission required for the channel, either sideband, AM or telephone for public correspondence. An audio knob, clarifier knob and squelch knob are provided to assist in audio operation during receive. In addition to the aforementioned controls, which are all located on the receiver/exciter, a meter is incorporated to provide relative radiated poower of antenna loading readouts.

The system utilizes the airplane microphone, headphone and speaker. Operation and description of the audio control panels used in conjunction with this radio are shown and described in another supplement in this section.



1. CHANNEL WINDOW - Displays selected channel.

2. RELATIVE POWER METER - Indicates relative radiated power of the power amplifier/antenna system.

3. MODE SELECTOR CONTROL - Selects one of the desired operating modes:
   - USB - Selects upper sideband operation for long range voice communications.
   - AM - Selects compatible AM operation and full AM reception.
   - TEL - Selects upper sideband with reduced carrier, used for public correspondence telephone and ship-to-shore.
   - LSB - (Optional) Selects lower sideband operation (not legal in U.S., Canada and most other countries).

4. SQUELCH CONTROL - Used to adjust signal threshold necessary to activate receiver audio. Clockwise rotation increases background noise (decreases squelch action); counterclockwise rotation decreases background noise.

5. CLARIFIER CONTROL - Used to "clarify" single sideband speech during receive while in USB mode only.

6. CHANNEL SELECTOR CONTROL - Selects desired channel. Also selects AM mode if channel frequency is 2003 kHz, 2182 kHz or 2638 kHz.

7. ON - AUDIO CONTROL - Turns set ON and controls receiver audio gain.

Figure 1. SSB HF Transceiver Operating Controls

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when this avionic equipment is installed.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when this avionic equipment is installed.

SECTION 4
NORMAL PROCEDURES

COMMUNICATIONS TRANSCEIVER OPERATION:

NOTE

The pilot should be aware of the two following radio operational restrictions:

a. For sideband operation in the United States, Canada and various other countries, only the upper sideband may be used. Use of lower sideband is prohibited.
b. Only AM transmissions are permitted on frequencies 2003 kHz, 2182 kHz and 2638 kHz. The selection of these channels will automatically select the AM mode of transmission.

1. XMTR SEL Switch (on audio control panel) -- SELECT transceiver.
2. SPEAKER/PHONE Selector Switches (on audio control panel) -- SELECT desired mode.
3. ON-AUDIO Control -- ON (allow equipment to warm up for 5 minutes for sideband or one minute for AM operation and adjust audio to comfortable listening level).
4. Channel Selector Control -- SELECT desired frequency.
5. Mode Selector Control -- SELECT operating mode.

6. SQUELCH Control -- ADJUST clockwise for normal background noise output, then slowly adjust counterclockwise until the receiver is silent.
7. CLARIFIER Control -- ADJUST when upper single sideband RF signal is being received for maximum clarity.
8. Mike Button:
   a. To Transmit -- DEPRESS and SPEAK into microphone.

NOTE

Sidetone and interphone intercom are not available on this radio.

   b. To Receive -- RELEASE mike button.

NOTE

Voice communications are not available in the LSB mode.

NOTE

Lower sideband (LSB) mode is not legal in the U.S., Canada, and most other countries.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when this avionic equipment is installed. However, the installation of an externally mounted antenna or several related external antennas, will result in a minor reduction in cruise performance.

SUPPLEMENT

CESSNA 300 NAV/COM
(720-Channel - Type RT-385A)

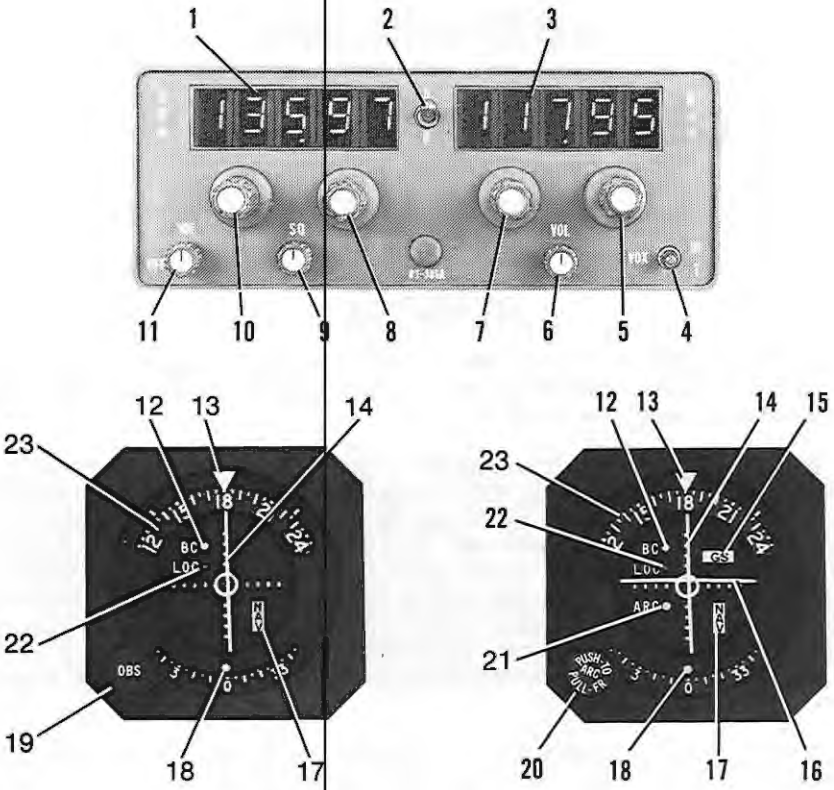
SECTION 1
GENERAL

The Cessna 300 Nav/Com (Type RT-385A), shown in Figure 1, consists of a panel-mounted receiver-transmitter and a single or dual-pointer remote course deviation indicator.

The set includes a 720-channel VHF communications receiver-transmitter and a 200-channel VHF navigation receiver, both of which may be operated simultaneously. The communications receiver-transmitter receives and transmits signals between 118.000 and 135.975 MHz in 25-kHz steps. The navigation receiver receives omni and localizer signals between 108.00 and 117.95 MHz in 50-kHz steps. The circuits required to interpret the omni and localizer signals are located in the course deviation indicator. Both the communications and navigation operating frequencies are digitally displayed by incandescent readouts on the front panel of the Nav/Com.

A DME receiver-transmitter or a glide slope receiver, or both, may be interconnected with the Nav/Com set for automatic selection of the associated DME or glide slope frequency. When a VOR frequency is selected on the Nav/Com, associated VORTAC or VOR-DME station frequency will also be selected automatically; likewise, if a localizer frequency is selected, the associated glide slope will be selected automatically.

The course deviation indicator includes either a rectilinear single-pointer and related NAV flag for VOR/LOC indication only, or rectilinear dual pointers and related NAV and GS flags for both VOR/LOC and glide slope indications. Both types of course deviation indicators incorporate an amber back-course lamp (BC) which lights when optional back course (reversed sense) operation is selected and a green localizer lamp (LOC) which illuminates when a localizer frequency is selected on the associated Navigation Receiver. Both types may be provided with Automatic Radial Centering which, depending on how it is selected, will automatically indicate the bearing TO or FROM the VOR station. The ARC feature includes an amber annunciator light that illuminates when ARC is in use.



1. COMMUNICATION OPERATING FREQUENCY READOUT (Third-decimal-place is shown by the position of the "5-0" switch).

2. 5-0 SWITCH - Part of Com Receiver-Transmitter Fractional MHz Frequency Selector. In "5" position, enables Com frequency readout to display and Com Fractional MHz Selector to select frequency in .05-MHz steps between .025 and .975 MHz. In "0" position, enables COM frequency readout to display and Com Fractional MHz Selector to select frequency in .05-MHz steps between .000 and .950 MHz.

NOTE

The "5" or "0" may be read as the third decimal digit, which is not displayed in the Com fractional frequency display.

Figure 1. Cessna 300 Nav/Com (Type RT-385A), Operating Controls and Indicators (Sheet 1 of 3)

3. NAVIGATION OPERATING FREQUENCY READOUT.

4. ID-VOX-T SWITCH - With VOR or LOC station selected, in ID position, station identifier signal is audible; in VOX (Voice) position, identifier signal is suppressed; in T (Momentary On) position, the VOR navigational self-test function is selected.

5. NAVIGATION RECEIVER FRACTIONAL MEGAHERTZ SELECTOR - Selects Nav frequency in .05-MHz steps between .00 and .95 MHz; simultaneously selects paired glide slope frequency and DME channel.

6. NAV VOL CONTROL - Adjusts volume of navigation receiver audio.

7. NAVIGATION RECEIVER MEGAHERTZ SELECTOR - Selects NAV frequency in 1-MHz steps between 108 and 117 MHz; simultaneously selects paired glide slope frequency and DME channel.

8. COMMUNICATION RECEIVER-TRANSMITTER FRACTIONAL MEGAHERTZ SELECTOR - Depending on position of 5-0 switch, selects COM frequency in .05-MHz steps between .000 and .975 MHz. The 5-0 switch identifies the last digit as either 5 or 0.

9. SQUELCH CONTROL - Used to adjust signal threshold necessary to activate COM receiver audio. Clockwise rotation increases background noise (decreases squelch action); counterclockwise rotation decreases background noise.

10. COMMUNICATION RECEIVER-TRANSMITTER MEGAHERTZ SELECTOR - Selects COM frequency in 1-MHz steps between 118 and 135 MHz.

11. COM OFF-VOL CONTROL - Combination on/off switch and volume control; turns on NAV/COM set and controls volume of communications receiver audio.

12. BC LAMP - Amber light illuminates when an autopilot's back-course (reverse sense) function is engaged; indicates course deviation pointer is reversed on selected receiver when tuned to a localizer frequency. Light dimming is only available when installed with an audio control panel incorporating the annunciator lights DAY/NITE selector switch.

13. COURSE INDEX - Indicates selected VOR course.

14. COURSE DEVIATION POINTER - The rectilinear vertical pointer is used in conjunction with its associated scale of horizontal dots to indicate aircraft displacement from selected omni, or localizer beam centerline. A course deviation displacement of the vertical pointer to the outer dot (either left or right) represents full scale (VOR = ± 10° or LOC = ± 2 1/2° nominal) deviation from beam centerline. Localizer may be ± 1 1/2° to ± 3°full scale left or right depending on runway length. When power is removed or the received signal applied to the indicator is not usable, the vertical pointer is stored out of view to the right of the indicator.

15. GLIDE SLOPE "GS" FLAG - When visible, red GS flag indicates unreliable glide slope signal or improperly operating equipment. Flag disappears when a reliable glide slope signal is being received.

Figure 1. Cessna 300 Nav/Com (Type RT-385A), Operating Controls and Indicators (Sheet 2 of 3)

16. GLIDE SLOPE DEVIATION POINTER - The rectilinear horizontal pointer is used in conjunction with its associated scale of vertical dots to indicate aircraft displacement from glide slope beam centerline. A course deviation displacement of the horizontal pointer to the outer vertical dot (either above or below) represents full scale (0.7°) deviation above or below glide slope beam centerline. When power is removed or the received signal applied to the indicator is not usable, the horizontal pointer is stored out of view to the top of the indicator.

17. NAV/TO-FROM INDICATOR - Operates only with a VOR or localizer signal. Red NAV position (Flag) indicates unusable signal. With usable VOR signal, indicates whether selected course is TO or FROM station. With usable localizer signal, shows TO.

18. RECIPROCAL COURSE INDEX - Indicates reciprocal of selected VOR course.

19. OMNI BEARING SELECTOR (OBS) - Rotates OBS course card to select desired course.

20. AUTOMATIC RADIAL CENTERING (ARC-PUSH-TO/PULL-FR) SELECTOR - In center detent, functions as conventional OBS. Pushed to inner (Momentary On) position, turns OBS course card to center course deviation pointer with a TO flag, then returns to conventional OBS selection. Pulled to outer detent, continuously drives OBS course card to indicate bearing from VOR station, keeping course deviation pointer centered, with a FROM flag. ARC function will not operate on localizer frequencies.

21. AUTOMATIC RADIAL CENTERING (ARC) LAMP - Amber light illuminates when Automatic Radial Centering is in use.Light dimming is only available when installed with an audio control panel incorporating the annunciator lights DAY/NITE selector switch.

22. LOCALIZER (LOC) LAMP - Green light illuminates when a localizer frequency is selected on the associated Navigation Receiver. Light dimming is only available when installed with an audio control panel incorporating the annunciator light DAY/NITE selector switch.

23. OBS COURSE CARD - Indicates selected VOR course under course index.

Figure 1. Cessna 300 Nav/Com (Type RT-385A), Operating Controls and Indicators (Sheet 3 of 3)

The Cessna 300 Nav/Com incorporates a variable threshold automatic squelch. With this squelch system, you set the threshold level for automatic operation - the further clockwise the lower the threshold - or the more sensitive the set. When the signal is above this level, it is heard even if the noise is very close to the signal. Below this level, the squelch is fully automatic so when the background noise is very low, very weak signals (that are above the noise) are let through. For normal operation of the squelch circuit, just turn the squelch clockwise until noise is heard - then back off slightly until it is quiet, and you will have automatic squelch with the lowest practical threshold. This adjustment should be rechecked periodically during each flight to assure optimum reception.

All controls for the Nav/Com, except the standard omni bearing selector (OBS) knob or the optional automatic radial centering (ARC) knob located on the course deviation indicator, are mounted on the front panel of the receiver-transmitter. Operation and description of the audio control panels used in conjunction with this radio are shown and described in another supplement in this section.

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when this avionic equipment is installed.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when this avionic equipment is installed. However, if the frequency readouts fail, the radio will remain operational on the last frequency selected. The frequency control should not be moved due to the difficulty of obtaining a known frequency under this condition.

SECTION 4
NORMAL PROCEDURES

COMMUNICATION RECEIVER-TRANSMITTER OPERATION:

1. COM OFF/VOL Control -- TURN ON; adjust to desired audio level.
2. XMTR SEL Switch (on audio control panel) -- SET to desired Nav/Com Radio.
3. SPEAKER/PHONE Selector Switches (on audio control panel) -- SET to desired mode.
4. COM Frequency Selector Knobs -- SELECT desired operating frequency.
5. 5-0 Fractional MHz Selector Switch -- SELECT desired operating frequency (does not affect navigation frequencies).
6. SQ Control -- ROTATE counterclockwise to just eliminate background noise.
7. Mike Button:
   a. To Transmit -- DEPRESS and SPEAK into microphone.

NOTE

Sidetone may be selected by placing the AUTO selector switch (on audio control panel) in either the SPEAKER or PHONE position. Sidetone may be eliminated by placing the AUTO selector switch in the OFF position. Adjustment of sidetone on audio control panels supplied with three transmitters cannot be accomplished externally. However, audio control panels supplied with one or two transmitters have sidetone adjustment pots that are accessible through the front of the audio control panel with a small screwdriver.

   b. To Receive -- RELEASE mike button.

NAVIGATION OPERATION:

NOTE

The pilot should be aware that on Cessna airplanes equipped with the vertical fin mounted combination glide slope and omni antenna, pilots should avoid use of 2700 ± 100 RPM on airplanes equipped with a two-bladed propeller or 1800 ± 100 RPM on airplanes equipped with a three-bladed propeller during ILS approaches to avoid any possibility of oscillations of the glide slope deviation pointer caused by propeller interference.

1. COM OFF/VOL Control -- TURN ON.
2. SPEAKER/PHONE Selector Switches (on audio control panel) -- SET to desired mode.
3. NAV Frequency Selector Knobs -- SELECT desired operating frequency.

NOTE

If a localizer frequency was selected, the LOC lamp will illuminate green.

4. NAV VOL -- ADJUST to desired audio level.
5. ID-VOX-T Switch:
   a. To Identify Station -- SET to ID to hear navigation station identifier signal.
   b. To Filter Out Station Identifier Signal -- SET to VOX to include filter in audio circuit.
6. Course Deviation Indicator -- CHECK that it reads TO or FROM with the usable VOR navigation signal and that the vertical pointer is indicating the bearing to the VOR station.
7. ARC PUSH-TO/PULL-FROM Knob (If Applicable):
   a. To Use As Conventional OBS -- PLACE in center detent and select desired course.
   b. To Obtain Bearing TO VOR Station -- PUSH (ARC/PUSH-TO) knob to inner (momentary on) position.

NOTE

ARC lamp will illuminate amber while the OBS course card is moving to center with the course deviation pointer. After alignment has been achieved to reflect bearing to VOR, automatic radial centering will automatically shut down, causing the ARC lamp to go out.

   c. To Obtain Continuous Bearing FROM VOR Station -- PULL (ARC/PULL-FR) knob to outer detent.

NOTE

ARC lamp will illuminate amber, OBS course card will turn to center the course deviation pointer with a FROM flag to indicate bearing from VOR station.

8. OBS Knob (If Applicable) -- SELECT desired course.

VOR SELF-TEST OPERATION:

1. COM OFF/VOL Control -- TURN ON.
2. NAV Frequency Selector Switches -- SELECT usable VOR station signal.
3. OBS Knob -- SET for 0° course at course index; course deviation pointer centers or deflects left or right, depending on bearing of signal; NAV/TO-FROM indicator shows TO or FROM.
4. ID/VOX/T Switch -- PRESS to T and HOLD at T; course deviation pointer centers and NAV/TO-FROM indicator shows FROM.
5. OBS Knob -- TURN to displace course approximately 10° to either side of 0° (while holding ID/VOX/T to T). Course deviation pointer deflects full scale in direction corresponding to course displacement. NAV/TO-FROM indicator shows FROM.

NOTE

When the 300 NAV/COM is coupled to the ANS-351C RNAV system the TEST operation is non-functional. Refer to the "Ground Check Procedures" in the Area Navigation System (Type ANS-351C) Supplement in this section to verify VOR operation of the CDI.

6. ID/VOX/T Switch -- RELEASE for normal operation.

NOTE

This test does not fulfill the requirements of FAR 91.25.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when this avionic equipment is installed. However, the installation of an externally mounted antenna or several related external antennas, will result in a minor reduction in cruise performance.

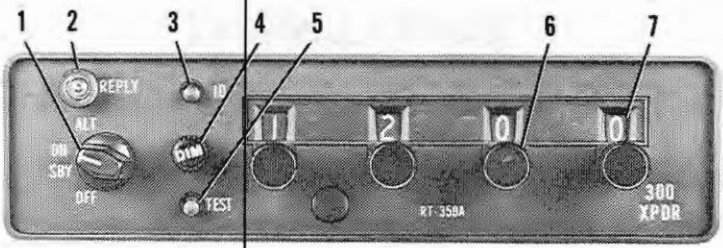
SUPPLEMENT
CESSNA 300 TRANSPONDER
(Type RT-359A)
AND
OPTIONAL ALTITUDE ENCODER (BLIND)

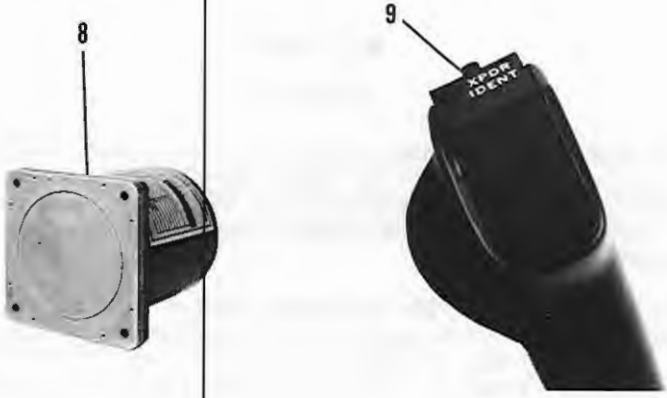
SECTION 1
GENERAL

The Cessna 300 Transponder (Type RT-359A), shown in Figure 1, is the airborne component of an Air Traffic Control Radar Beacon System (ATCRBS). The transponder enables the ATC ground controller to "see" and identify the aircraft, while in flight, on the control center's radarscope more readily.

The Cessna 300 Transponder system consists of a panel-mounted unit, an externally-mounted antenna and an optional control wheel-mounted XPDR IDENT switch. The transponder receives interrogating pulse signals on 1030 MHz and transmits pulse-train reply signals on 1090 MHz. The transponder is capable of replying to Mode A (aircraft identification) and also to Mode C (altitude reporting) when coupled to an optional altitude encoder system. The transponder is capable of replying on both modes of interrogation on a selective reply basis on any of 4096 information code selections. The optional altitude encoder system (not part of a standard 300 Transponder system) required for Mode C (altitude reporting) operation consists of a completely independent remote-mounted digitizer that is connected to the static system and supplies encoded altitude information to the transponder. When the altitude encoder system is coupled to the 300 Transponder system, altitude reporting capabilities are available in 100-foot increments between -1000 and +20,000 feet.

All Cessna 300 Transponder operating controls, with the exception of the optional XPDR IDENT switch, are located on the front panel of the unit. The remote XPDR IDENT switch is located on the right hand grip of the pilot's control wheel. Functions of the operating controls are described in Figure 1.





1. FUNCTION SELECTOR SWITCH - Controls application of power and selects transponder operating mode as follows:

   OFF - Turns set off.
   SBY - Turns set on for equipment warm-up or standby power.
   ON - Turns set on and enables transponder to transmit Mode A (aircraft identification) reply pulses.
   ALT - Turns set on and enables transponder to transmit either Mode A (aircraft identification) reply pulses or Mode C (altitude reporting) pulses selected automatically by the interrogating signal.

Figure 1. Cessna 300 Transponder and Altitude Encoder (Blind) (Sheet 1 of 2)

2. REPLY LAMP - Lamp flashes to indicate transmission of reply pulses; glows steadily to indicate transmission of IDENT pulse or satisfactory self-test operation. (Reply lamp will also glow steadily during initial warm-up period.)

3. IDENT (ID) SWITCH - When depressed, selects special pulse identifier to be transmitted with transponder reply to effect immediate identification of aircraft on ground controller's display. (Reply lamp will glow steadily during duration of IDENT pulse transmission.)

4. DIMMER (DIM) CONTROL - Allows pilot to control brilliance of reply lamp.

5. SELF-TEST (TST) SWITCH - When depressed, causes transponder to generate a self-interrogating signal to provide a check of transponder operation. (Reply lamp will glow steadily to verify self-test operation.)

6. REPLY-CODE SELECTOR KNOBS (4) - Select assigned Mode A reply code.

7. REPLY-CODE INDICATORS (4) - Display selected Mode A reply code.

8. REMOTE-MOUNTED DIGITIZER - Provides an altitude reporting code range of -1000 feet up to the airplane's maximum service ceiling.

9. REMOTE ID SWITCH (XPDR IDENT) - Same as panel-mounted ID switch described in Item 3.

Figure 1. Cessna 300 Transponder and Altitude Encoder (Blind)
(Sheet 2 of 2)

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when this avionic equipment is installed. However, the following information must be displayed in the form of a placard located near the altimeter.

ALTITUDE ENCODER EQUIPPED

SECTION 3
EMERGENCY PROCEDURES

TO TRANSMIT AN EMERGENCY SIGNAL:

1. Function Selector Switch -- ON.
2. Reply-Code Selector Knobs -- SELECT 7700 operating code.

TO TRANSMIT A SIGNAL REPRESENTING LOSS OF ALL COMMUNICATIONS (WHEN IN A CONTROLLED ENVIRONMENT):

1. Function Selector Switch -- ON.
2. Reply-Code Selector Knobs -- SELECT 7700 operating code for 1 minute; then SELECT 7600 operating code for 15 minutes and then REPEAT this procedure at same intervals for remainder of flight.

SECTION 4
NORMAL PROCEDURES

BEFORE TAKEOFF:

1. Function Selector Switch -- SBY.

TO TRANSMIT MODE A (AIRCRAFT IDENTIFICATION) CODES IN FLIGHT:

1. Reply-Code Selector Knobs -- SELECT assigned code.

2. Function Selector Switch -- ON.
3. DIM Control -- ADJUST light brilliance of reply lamp.

NOTE

During normal operation with function selector switch in ON position, reply lamp flashes indicating transponder replies to interrogations.

4. ID or XPDR IDENT Button -- DEPRESS momentarily when instructed by ground controller to "squawk IDENT" (reply lamp will glow steadily, indicating IDENT operation).

TO TRANSMIT MODE C (ALTITUDE REPORTING) CODES IN FLIGHT:

1. Reply-Code Selector Knobs -- SELECT assigned code.
2. Function Selector Switch -- ALT.

NOTE

When directed by ground controller to "stop altitude squawk", turn Function Selector Switch to ON for Mode A operation only.

NOTE

Pressure altitude is transmitted by the transponder for altitude squawk and conversion to indicated altitude is done in ATC computers. Altitude squawked will only agree with indicated altitude when the local altimeter setting in use by the ground controller is set in the aircraft altimeter.

3. DIM Control -- ADJUST light brilliance of reply lamp.

TO SELF-TEST TRANSPONDER OPERATION:

1. Function Selector Switch -- SBY and wait 30 seconds for equipment to warm-up.
2. Function Selector Switch -- ON or ALT.
3. TST Button -- DEPRESS (reply lamp should light brightly regardless of DIM control setting).
4. TST Button -- RELEASE for normal operation.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when this avionic equipment is installed. However, the installation of an externally mounted antenna or several related external antennas, will result in a minor reduction in cruise performance.

SUPPLEMENT

CESSNA 300 TRANSPONDER

(Type RT-359A)

AND

OPTIONAL ENCODING ALTIMETER

(Type EA-401A)

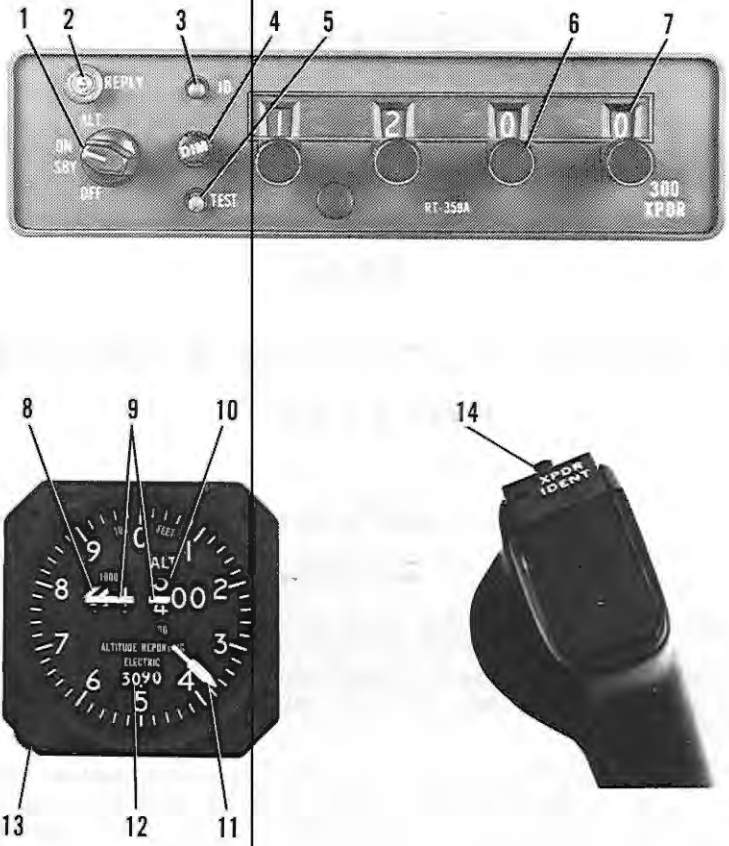
SECTION 1

GENERAL

The Cessna 300 Transponder (Type RT-359A), shown in Figure 1, is the airborne component of an Air Traffic Control Radar Beacon System (ATCRBS). The transponder enables the ATC ground controller to "see" and identify the aircraft, while in flight, on the control center's radarscope more readily.

The Cessna 300 Transponder system consists of a panel-mounted unit, an externally-mounted antenna and an optional control wheel-mounted XPDR IDENT switch. The transponder receives interrogating pulse signals on 1030 MHz and transmits pulse-train reply signals on 1090 MHz. It is capable of replying to Mode A (aircraft identification) and also to Mode C (altitude reporting) interrogations on a selective reply basis on any of 4096 information code selections. When an optional panel-mounted EA-401A Encoding Altimeter (not part of a standard 300 Transponder system) is included in the avionic configuration, the transponder can provide altitude reporting in the 100-foot increments between -1000 and +35,000 feet.

All Cessna 300 Transponder operating controls, with the exception of the optional altitude encoder's altimeter setting knob and the optional remote XPDR IDENT switch, are located on the front panel of the unit. The altimeter setting knob is located on the encoding altimeter and the remote XPDR IDENT switch is located on the right hand grip of the pilot's control wheel. Functions of the operating controls are described in Figure 1.



1. FUNCTION SELECTOR SWITCH - Controls application of power and selects transponder operating mode as follows:

   OFF - Turns set off.
   SBY - Turns set on for equipment warm-up or stand-by power.
   ON - Turns set on and enables transponder to transmit Mode A (aircraft identification) reply pulses.
   ALT - Turns set on and enables transponder to transmit either Mode A (aircraft identification) reply pulses or Mode C (altitude reporting) pulses selected automatically by the interrogating signal.

Figure 1. Cessna 300 Transponder and Encoding Altimeter (Sheet 1 of 2)

2. REPLY LAMP - Lamp flashes to indicate transmission of reply pulses; glows steadily to indicate transmission of IDENT pulse or satisfactory self-test operation. (Reply lamp will also glow steadily during initial warm-up period.)

3. IDENT (ID) SWITCH - When depressed, selects special pulse identifier to be transmitted with transponder reply to effect immediate identification of aircraft on ground controller's display. (Reply lamp will glow steadily during duration of IDENT pulse transmission.)

4. DIMMER (DIM) CONTROL - Allows pilot to control brilliance of reply lamp.

5. SELF-TEST (TST) SWITCH - When depressed, causes transponder to generate a self-interrogating signal to provide a check of transponder operation. (Reply lamp will glow steadily to verify self-test operation.)

6. REPLY-CODE SELECTOR KNOBS (4) - Select assigned Mode A reply code.

7. REPLY-CODE INDICATORS (4) - Display selected Mode A reply code.

8. 1000-FOOT DRUM TYPE INDICATOR - Provides digital altitude readout in 1000-foot increments between -1000 feet and +35,000 feet. When altitude is below 10,000 feet, a diagonally striped flag appears in the 10,000 foot window.

9. OFF INDICATOR WARNING FLAG - Flag appears across altitude readout when power is removed from the altimeter to indicate that readout is not reliable.

10. 100-FOOT DRUM TYPE INDICATOR - Provides digital altitude readout in 100-foot increments between 0 and 1000 feet.

11. 20-FOOT INDICATOR NEEDLE - Indicates altitude in 20-foot increments between 0 feet and 1000 feet.

12. ALTIMETER SETTING SCALE - DRUM TYPE - Indicates selected altimeter setting in the range of 27.9 to 31.0 inches of mercury on the standard altimeter or 950 to 1050 millibars on the optional altimeter.

13. ALTIMETER SETTING KNOB - Dials in desired altimeter setting in the range of 27.9 to 31.0 inches of mercury on the standard altimeter or 950 to 1050 millibars on the optional altimeter.

14. REMOTE ID SWITCH (XPDR IDENT) - Same as panel-mounted ID switch described in Item 3.

Figure 1. Cessna 300 Transponder and Encoding Altimeter (Sheet 2 of 2)

SECTION 2
LIMITATIONS

There is no change to the airplane performance when this avionic equipment is installed. However, the encoding altimeter used in this installation does have a limitation that requires a standard barometric altimeter to be installed as a back-up altimeter.

SECTION 3
EMERGENCY PROCEDURES

TO TRANSMIT AN EMERGENCY SIGNAL:

1. Function Selector Switch -- ON.
2. Reply-Code Selector Knobs -- SELECT 7700 operating code.

TO TRANSMIT A SIGNAL REPRESENTING LOSS OF ALL COMMUNICATIONS (WHEN IN A CONTROLLED ENVIRONMENT):

1. Function Selector Switch -- ON.
2. Reply-Code Selector Knobs -- SELECT 7700 operating code for 1 minute; then SELECT 7600 operating code for 15 minutes and then REPEAT this procedure at same intervals for remainder of flight.

SECTION 4
NORMAL PROCEDURES

BEFORE TAKEOFF:

1. Function Selector Switch -- SBY.

TO TRANSMIT MODE A (AIRCRAFT IDENTIFICATION) CODES IN FLIGHT:

1. Reply-Code Selector Knobs -- SELECT assigned code.

2. Function Selector Switch -- ON.
3. DIM Control -- ADJUST light brilliance of reply lamp.

NOTE

During normal operation with function selector switch in ON position, reply lamp flashes indicating transponder replies to interrogations.

4. ID or XPDR IDENT Button -- DEPRESS momentarily when instructed by ground controller to "squawk IDENT" (reply lamp will glow steadily, indicating IDENT operation).

TO TRANSMIT MODE C (ALTITUDE REPORTING) CODES IN FLIGHT:

1. Off Indicator Warning Flag -- VERIFY that flag is out of view on encoding altimeter.
2. Altitude Encoder Altimeter Setting Knob -- SET IN assigned local altimeter setting.
3. Reply-Code Selector Knobs -- SELECT assigned code.
4. Function Selector Switch -- ALT.

NOTE

When directed by ground controller to "stop altitude squawk", turn Function Selector Switch to ON for Mode A operation only.

NOTE

Pressure altitude is transmitted by the transponder for altitude squawk and conversion to indicated altitude is done in ATC computers. Altitude squawked will only agree with indicated altitude when the local altimeter setting in use by the ground controller is set in the encoding altimeter.

5. DIM Control -- ADJUST light brilliance of reply lamp.

TO SELF-TEST TRANSPONDER OPERATION:

1. Function Selector Switch -- SBY and wait 30 seconds for equipment to warm-up.
2. Function Selector Switch -- ON or ALT.
3. TST Button -- DEPRESS and HOLD (reply lamp should light with full brilliance regardless of DIM control setting).
4. TST Button -- RELEASE for normal operation.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when this avionic equipment is installed. However, the installation of an externally mounted antenna or several related external antennas, will result in a minor reduction in cruise performance.

SUPPLEMENT

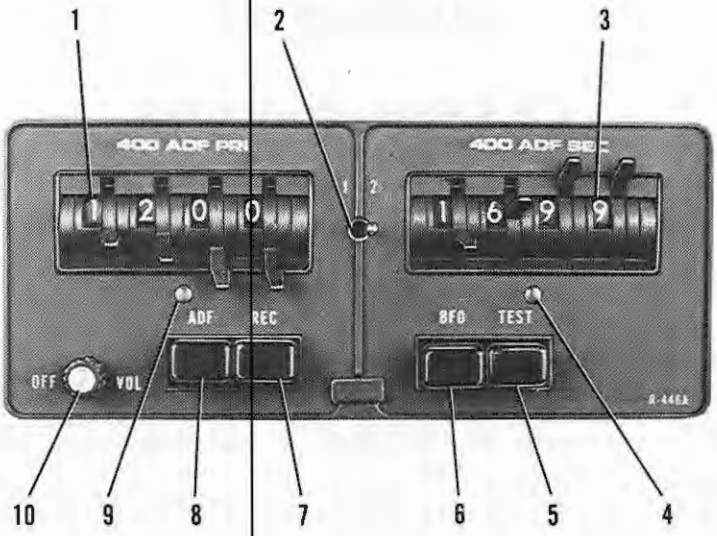
CESSNA 400 ADF
(Type R-446A)

SECTION 1
GENERAL

The Cessna 400 ADF is an automatic direction finder set which provides continuous, visual bearing indications of the direction from which an RF signal is being received. It can be used for plotting position, for homing, and for aural reception of AM signals between 200 kHz and 1699 kHz. In addition, a crystal-controlled, beat frequency oscillator (BFO) permits coded identifier of stations transmitting keyed CW signals (Morse Code) to be heard. CW signals are unmodulated and no audio will be heard without use of BFO. This type of signal is not used in United States air navigation. It is used in some foreign countries and marine beacons.

The basic units of the Cessna 400 ADF are a R-446A Receiver with dual frequency selectors, a goniometer-indicator (IN-346A), a sense antenna and a loop antenna. The receiver and goniometer-indicator are panel-mounted units. The sense and loop antennas are mounted on the external airplane surfaces. The goniometer-indicator presents station bearing in degrees of azimuth. An automatic pointer-stow feature alerts the operator to non-ADF operation by slewing the pointer to the 3:00 o'clock position when the REC mode is selected. Operating controls and displays for the Cessna 400 ADF are shown and described in Figure 1. The audio control panels used in conjunction with this radio for speaker-phone selection are shown and described in another supplement in this section.

The operating frequency is selected by a four-section Minilever switch which displays a digital readout of the frequency selected and supplies a binary code to control the logic circuits within the set. A secondary (standby) operating frequency is selected by another four-section Minilever switch. Frequency control of the ADF is switched to the primary or the secondary operating frequency by a toggle switch. The operating modes (ADF and REC) are selected by individual pushbutton switches. Additional pushbutton switches are used to select the BFO and to test signal reliability during ADF operation.



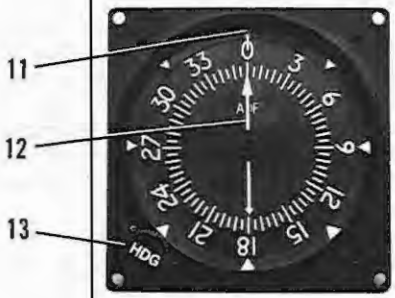


Figure 1. Cessna 400 ADF Operating Controls and Indicator (Sheet 1 of 2)

1. PRI (PRIMARY FREQUENCY SELECTOR) - Selects and displays "primary" frequency.

2. 1-2 - The "1" position activates "primary" (PRI) frequency. The "2" position activates "secondary" (SEC) frequency.

3. SEC (SECONDARY FREQUENCY SELECTOR) - Selects and displays "secondary" frequency.

4. SECONDARY RESELECT LAMP - Lamp will flash only when "secondary" (SEC) frequency selection is outside of operating range of the receiver and 1-2 switch is in the "2" position.

5. TEST - Momentary-on switch used only with ADF function to test bearing reliability. When held depressed, slews indicator pointer; when released, if bearing is realiable, pointer returns to original position.

6. BFO - Pushed in: Activates beat frequency oscillator tone to permit coded identifier of stations transmitting keyed CW signals (Morse Code) to be heard.

7. REC - Pushed in: Selects receive mode. ADF function is disabled. Audio quality is improved and noise reduced.

NOTE

In this position an automatic pointer stow feature will alert the pilot to non-ADF operation by positioning and retaining the pointer at the 3:00 o'clock position when the 400 ADF is in the REC function.

8. ADF - Pushed in: Selects ADF mode (set operates as automatic direction finder using loop and sense antennas).

9. PRIMARY RESELECT LAMP - Lamp will flash only when "primary" (PRI) frequency selection is outside of operating range of the receiver and 1-2 switch is in the "1" position.

10. OFF-VOL - Turns set on or off and adjusts receiver volume.

11. INDEX - Fixed reference line for HDG adjustment.

12. POINTER - When HDG control is adjusted, indicates either relative, magnetic, or true bearings of a radio station.

13. HDG - Rotates dial to facilitate relative, magnetic, or true bearing information.

Figure 1. Cessna 400 ADF Operating Controls and Indicator
(Sheet 2 of 2)

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when this avionic equipment is installed.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when this avionic equipment is installed.

SECTION 4
NORMAL PROCEDURES

TO OPERATE AS A COMMUNICATIONS RECEIVER ONLY:

1. OFF/VOL Control -- ON.
2. PRI Frequency Selectors -- SELECT desired operating frequency.
3. SEC Frequency Selectors -- SELECT desired operating frequency.
4. 1-2 Selector Switch -- 1 position.

NOTE

1-2 selector switch can be placed in the 2 position for operation on secondary frequency. The re-select lamp will flash only when frequency selection is outside of operating range of the receiver.

5. ADF SPEAKER/PHONE Selector Switch (on audio control panel) -- SELECT speaker or phone position.
6. REC Pushbutton -- PUSH in.

NOTE

ADF indicator pointer will stow at a 90-degree position to alert the pilot to non-ADF operation.

7. VOL Control -- ADJUST to desired listening level.

TO OPERATE AS AN AUTOMATIC DIRECTION FINDER:

1. OFF/VOL Control -- ON.
2. PRI Frequency Selectors -- SELECT desired operating frequency.
3. SEC Frequency Selectors -- SELECT desired operating frequency.
4. 1-2 Selector Switch -- 1 position.

NOTE

1-2 selector switch can be placed in the 2 position for operation on secondary frequency. The re-select lamp will flash only when frequency selection is outside of operating range of the receiver.

5. ADF SPEAKER/PHONE Selector Switch (on audio control panel) -- SELECT speaker or phone position as desired.
6. ADF Pushbutton -- PUSH in and note relative bearing on ADF indicator.
7. HDG Control -- SET ADF indicator dial so that index indicates 0°, magnetic, or true heading of airplane. Pointer then indicates relative, magnetic, or true bearing to station.
8. VOL Control -- ADJUST as required to identify station.

NOTE

When switching stations, place function pushbutton in the REC position. Then, after station has been selected, place function pushbutton in the ADF position to resume automatic direction finder operation. (This practice prevents the bearing indicator from swinging back and forth as frequency dial is rotated.)

TO TEST RELIABILITY OF AUTOMATIC DIRECTION FINDER:

1. ADF Pushbutton -- PUSH in and note relative bearing on indicator.
2. TEST Pushbutton -- PUSH in and hold TEST button until indicator pointer slews off indicated bearing at least 10 to 20 degrees.
3. TEST Pushbutton -- RELEASE and OBSERVE that indicator pointer returns to the same relative bearing as in step (1).

TO OPERATE BFO:

1. OFF/VOL Control -- ON.
2. ADF SPEAKER/PHONE Selector Switch (on audio control panel) -- SELECT speaker or phone position as desired.
3. BFO Pushbutton -- PUSH in if required.
4. 1-2 Selector Switch -- SELECT 1 position to activate PRI frequency

or 2 to activate SEC frequency that is transmitting keyed CW signals (Morse Code).

5. VOL Control -- ADJUST to desired listening level.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when this avionic equipment is installed. However, the installation of an externally mounted antenna or several related external antennas, will result in a minor reduction in cruise performance.

SUPPLEMENT

CESSNA 400 GLIDE SLOPE

(Type R-443B)

SECTION 1
GENERAL

The Cessna 400 Glide Slope is an airborne navigation receiver which receives and interprets glide slope signals from a ground-based Instrument Landing System (ILS). It is used with the localizer function of a VHF navigation system when making instrument approaches to an airport. The glide slope provides vertical path guidance while the localizer provides horizontal track guidance.

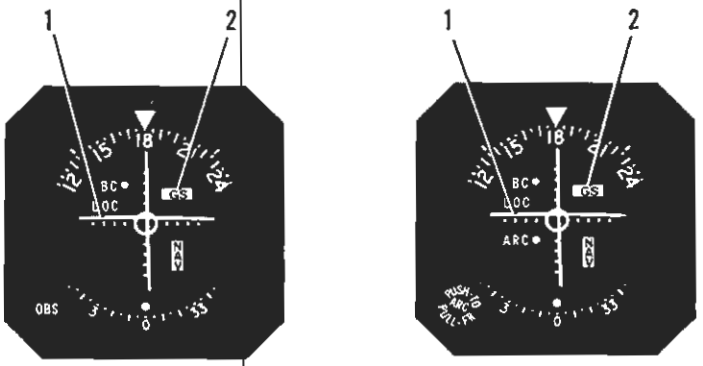
The Cessna 400 Glide Slope system consists of a remote-mounted receiver coupled to an existing navigation system, a panel-mounted indicator and an externally mounted antenna. The glide slope receiver is designed to receive ILS glide slope signals on any of 40 channels. The channels are spaced 150 kHz apart and cover a frequency range of 329.15 MHz through 335.0 MHz. When a localizer frequency is selected on the NAV receiver, the associated glide slope frequency is selected automatically.

Operation of the Cessna 400 Glide Slope system is controlled by the associated navigation system. The functions and indications of typical 300 and 400 series glide slope indicators are pictured and described in Figure 1. The glide slope indicators shown in Figure 1 depict typical indications for Cessna-crafted glide slope indicators. However, refer to the HSI write-up if it is listed in this section as an optional glide slope indicator.

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when this avionic equipment is installed.

TYPICAL 300 & 400 SERIES GLIDE SLOPE INDICATORS



1. GLIDE SLOPE DEVIATION POINTER - The rectilinear horizontal pointer is used in conjunction with its associated scale of vertical dots to indicate aircraft displacement from glide slope beam centerline. A course deviation displacement of the horizontal pointer to the outer vertical dot (either above or below) represents full scale (0.7°) deviation above or below glide slope beam centerline. When power is removed or the received signal applied to the indicator is not usable, the horizontal pointer is stored out of view to the top of the indicator.

2. GLIDE SLOPE "GS" FLAG - When visible, indicates unreliable glide slope signal or improperly operating equipment. The flag disappears when a reliable glide slope signal is being received.

CAUTION

Spurious glide slope signals may exist in the area of the localizer back course approach which can cause the glide slope "GS" flag to disappear and present unreliable glide slope information. Disregard all glide slope signal indications when making a localizer back course approach unless a glide slope (ILS BC) is specified on the approach and landing chart.

Figure 1. Typical 300 and 400 Series VOR/LOC/ILS Indicators

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when this avionic equipment is installed.

SECTION 4
NORMAL PROCEDURES

TO RECEIVE GLIDE SLOPE SIGNALS:

NOTE

The pilot should be aware that on Cessna airplanes equipped with the vertical fin mounted glide slope antenna, pilots should avoid use of 2700 ±100 RPM on airplanes equipped with a two-bladed propeller or 1800 ±100 RPM on airplanes equipped with a three-bladed propeller during ILS approaches to avoid any possibility of oscillations of the glide slope deviation pointer caused by propeller interference.

1. NAV Frequency Select Knobs -- SELECT desired localizer frequency (glide slope frequency is automatically selected).
2. NAV/COM VOX-ID-T Switch -- SELECT ID position to disconnect filter from audio circuit.
3. NAV VOL Control -- ADJUST to desired listening level to confirm proper localizer station.

CAUTION

When glide slope "GS" flag is visible, glide slope indications are unusable.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when this avionic equipment is installed.

SUPPLEMENT

CESSNA 400 MARKER BEACON
(Type R-402)

SECTION 1
GENERAL

The system consists of a remote mounted 75 MHz marker beacon receiver, an antenna which is either flush mounted or externally mounted on the under side of the aircraft and operating controls and annunciator lights which are mounted on the front of the audio control panel.

Operating controls for the marker beacon system are supplied on the front of the two types of audio control panels used in this Cessna aircraft. The operating controls for the marker beacon are different on the two audio control panels. One type of audio control panel is supplied with one or two transmitters and the other is supplied with three transmitters.

The marker beacon operating controls and annunciator lights used on the audio control panel supplied with two or less transmitters are shown and described in Figure 1. The operating controls consist of three, three-position toggle switches. One switch is labeled "HIGH/LO/MUTE" and provides the pilot with HIGH-LO sensitivity selection and marker beacon audio muting, for approximately 30 seconds, to enable voice communication to be heard without interference of marker beacon signals. The marker beacon audible tone is automatically restored at the end of the 30 second muting period to continue marker audio for passage over the next marker. Another switch is labeled "SPKR/OFF/PHN" and is used to turn the set on and select the desired speaker or phone position for marker beacon signals. The third toggle switch labeled, "ANN LT", is provided to enable the pilot to select the desired DAY or NITE lighting position for annunciator lights, and also a "TEST" position to verify operation of marker beacon annunciator lights.

The marker beacon operating controls and annunciator lights used on the audio control panel supplied with three transmitters are shown and described in Figure 2. The operating controls consist of two, three-position toggle switches, and two concentric control knobs. One switch is labeled "SPKR/PHN" and is used to select the desired speaker or phone position for marker beacon signals. The other switch is labeled "HI/LO/TEST" and

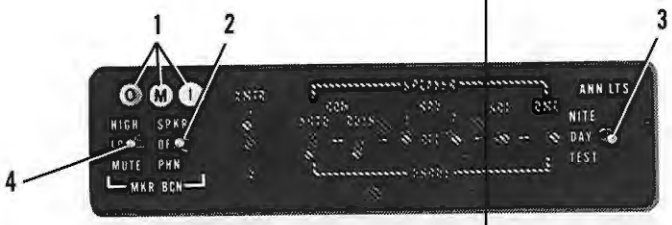
provides the pilot with HI-LO sensitivity selection and a TEST position to verify operation of all annunciator lights. The small, inner control knob labeled OFF/VOL, turns the set on or off and adjusts the audio listening level. The large, outer control knob labeled BRT, provides light dimming for the marker beacon lights.

When the Cessna 400 Marker Beacon controls are incorporated in an audio control panel incorporated with two or less transmitters a marker Beacon audio level adjustment potentiometer and an annunciator lights minimum dimming potentiometer are mounted on the audio control panel circuit board. Potentiometer adjustments cannot be accomplished externally. However, if readjustments are desired, adjustments can be made in accordance with instructions found in the Avionics Installations Service/Parts Manual for this aircraft.

MARKER FACILITIES

MARKER	IDENTIFYING TONE	LIGHT*
Inner & Fan	Continuous 6 dots/sec (3000 Hz)	White
Back Course	72-95 two dot combinations per minute (3000 Hz)	White
Middle	Alternate dots and dashes (1300 Hz)	Amber
Outer	2 dashes/sec (400 Hz)	Blue

* When the identifying tone is keyed, the respective indicating light will blink accordingly.



AUDIO CONTROL PANEL FOR USE WITH ONE OR TWO TRANSMITTERS

1. MARKER BEACON ANNUNCIATOR LIGHTS:

   OUTER - Light illuminates blue to indicate passage of outer marker beacon.
   MIDDLE - Light illuminates amber to indicate passage of middle marker beacon.
   INNER - Light illuminates white to indicate passage of inner, fan, or back course marker beacons.

2. SPEAKER/OFF/PHONE SELECTOR SWITCH:

   SPEAKER POSITION - Turns set on and selects speaker for aural reception.
   OFF POSITION - Turns set off.
   PHONE POSITION - Turns set on and selects phone for aural reception.

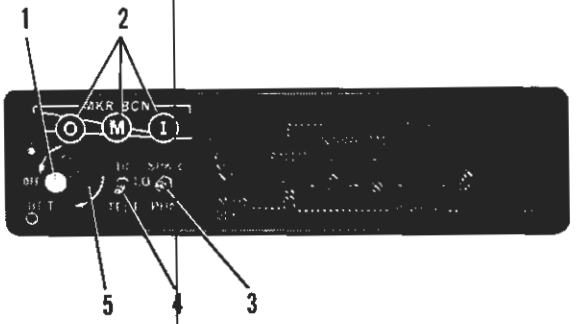
3. ANNUNCIATOR LIGHTS SWITCH:

   NITE POSITION - Places the annunciator lights in a dim lighting mode for night flying operations. Light intensity of the NITE position is controlled by the RADIO LT dimming rheostat.
   DAY POSITION - Places the annunciator lights in the full bright position for daylight flying operations.
   TEST POSITION - Illuminates all marker beacon annunciator lights in the full bright position to verify operation of marker beacon lights.

4. HIGH/LO/MUTE SELECTOR SWITCH:

   HIGH POSITION - Receiver sensitivity is positioned for airway flying.
   LO POSITION - Receiver sensitivity is positioned for ILS approaches.
   MUTE POSITION - The marker beacon audio signals are temporarily blanked out (for approximately 30 seconds) and then automatically restored, over the speaker or headset in order to provide voice communications without interference of marker beacon signals.

Figure 1. Cessna 400 Marker Beacon Operating Controls and Indicator Lights Supplied with Two or Less Transmitters



AUDIO CONTROL PANEL FOR USE WITH THREE TRANSMITTERS

1. OFF/VOLUME CONTROL:

   OFF/VOL - Turns the set on or off and adjusts the audio listening level. Clockwise rotation of the smaller knob turns the set on and increases the audio level.

2. MARKER BEACON ANNUNCIATOR LIGHTS:

   OUTER - Light illuminates blue to indicate passage of outer marker beacon.
   MIDDLE - Light illuminates amber to indicate passage of middle marker beacon.
   INNER - Light illuminates white to indicate passage of inner, fan, or back course marker beacons.

3. SPEAKER/PHONE SELECTOR SWITCH:

   SPEAKER POSITION - Selects speaker for aural reception.
   PHONE POSITION - Selects beadphone for aural reception.

4. HI/LO/TEST SELECTOR SWITCH:

   HI POSITION - Receiver sensitivity is positioned for airway flying.
   LO POSITION - Receiver sensitivity is positioned for ILS approaches.
   TEST POSITION - Illuminates marker beacon annunciator lights in the full bright position to verify operation of marker beacon lights.

5. LIGHT DIMMING CONTROL:

   BRT - Provides light dimming for the annunciator lights. Clockwise rotation of the larger knob increases light intensity.

Figure 2. Cessna 400 Marker Beacon Operating Controls and Indicator Lights Supplied With Three Transmitters.

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when this avionic equipment is installed.

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when this avionic equipment is installed.

SECTION 4
NORMAL PROCEDURES

MARKER BEACON OPERATING PROCEDURES FOR USE WITH AUDIO CONTROL PANELS PROVIDED WITH ONE OR TWO TRANSMITTERS (REF. FIG. 1)

1. SPKR/OFF/PHN Selector Switch -- SELECT desired speaker or phone audio. Either selected position will turn set on.
2. NITE/DAY/TEST Selector Switch -- PRESS to TEST position and verify that all marker beacon annunciator lights illuminate full bright to indicate lights are operational.
3. NITE/DAY/TEST Selector Switch -- SELECT desired position for NITE or DAY lighting.
4. HIGH/LO/MUTE Selector Switch -- SELECT HI position for airway flying or LO position for ILS approaches.

NOTE

Press MUTE switch to provide an approximate 30 seconds temporary blanking out of Marker Beacon audio tone. The marker beacon audio tone identifier is automatically restored at the end of the muting period.

NOTE

Due to the short distance typical between the middle marker and inner marker, audio identification of an inner marker may not be possible if muting is activated over the middle marker.

MARKER BEACON OPERATING PROCEDURES FOR USE WITH AUDIO CONTROL PANELS PROVIDED WITH THREE TRANSMITTERS. (REF. FIG. 2)

1. OFF/VOL Control -- TURN to VOL position and adjust to desired listening level. Clockwise rotation increases audio level.
2. HI/LO Sen Switch -- SELECT HI position for airway flying or LO position for ILS approaches.
3. SPKR/PHN Switch -- SELECT speaker or phone audio.
4. BRT Control -- SELECT BRT (full clockwise). ADJUST as desired when illuminated over marker beacon.
5. TEST Switch -- PRESS to TEST position and verify that all marker beacon annunciator lights will illuminate full bright to indicate lights are operational.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when this avionic equipment is installed. However, the installation of an externally mounted antenna or several related external antennas, will result in a minor reduction in cruise performance.

SUPPLEMENT
CESSNA 400 NAV/COM
(720-Channel - Type RT-485B)
SECTION 1
GENERAL

The Cessna 400 Nav/Com (Type RT-485B), shown in Figure 1, consists of a panel-mounted receiver-transmitter and a single or dual-pointer remote 300 or 400 Series course deviation indicator.

The set includes a 720-channel VHF communications receiver-transmitter and a 200-channel VHF navigation receiver, both of which may be operated simultaneously. The communications receiver-transmitter receives and transmits on frequencies between 118.000 and 135.975 MHz in 25-kHz steps. The navigation receiver receives omni and localizer signals between 108.00 and 117.95 MHz in 50 kHz steps. The circuits required to interpret the omni and localizer signals are located in the course deviation indicator. Microprocessor frequency management provides storage for 3 preset NAV and 3 preset COM frequencies in MEMORY. A "keep-alive" voltage prevents loss of the preset frequencies when the Nav/Com is turned off. Both the communications and navigation operating frequencies are digitally displayed by LED readouts on the front panel of the Nav/Com.

A DME receiver-transmitter or a glide slope receiver, or both, may be interconnected with the Nav/Com set for automatic selection of the associated DME or glide slope frequency. When a VOR frequency is selected on the Nav/Com, the associated VORTAC or VOR-DME station frequency will also be selected automatically; likewise, if a localizer frequency is selected, the associated glide slope frequency will be selected automatically.

The 400 Nav/Com is installed with either 300 or 400 Series course deviation indicators. The 400 Series Nav/Com indicators incorporate Automatic Radial Centering and a Course Datum synchro as standard features. The 300 Series course deviation indicators do not incorporate a Course Datum synchro but are offered with, or without, Automatic Radial Centering.

NOTE

The Course Datum synchro incorporated in 400 Series

course deviation indicators is only operational when coupled to a slaved directional gyro system which is coupled to a 400B Autopilot or Integrated Flight Control System (IFCS).

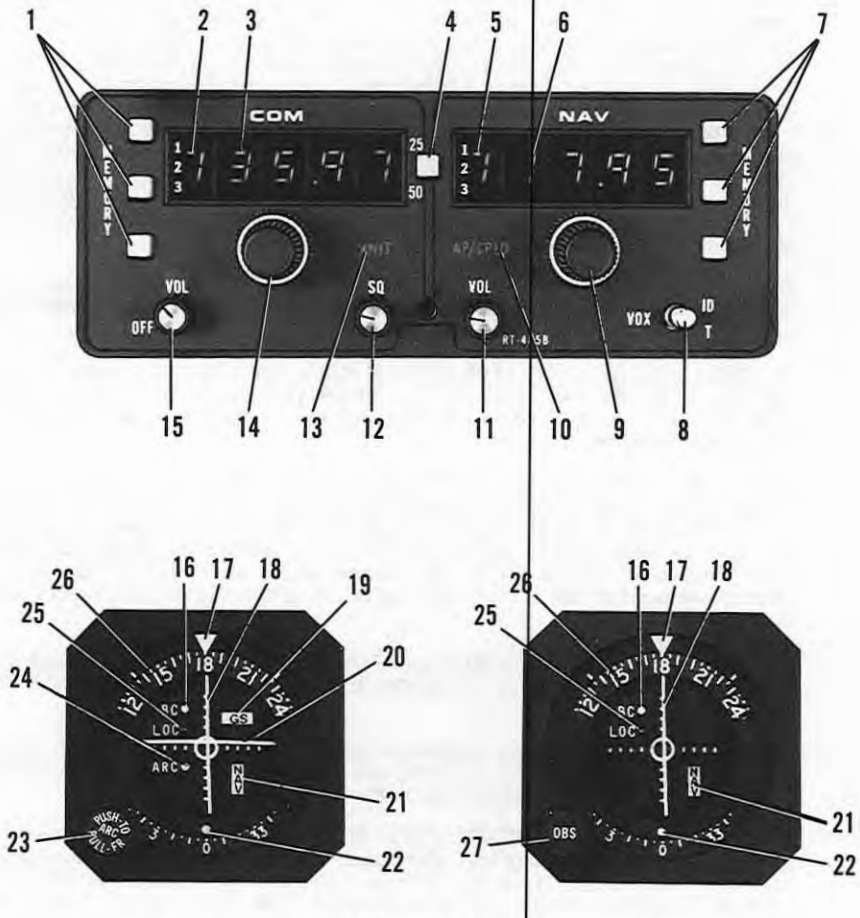
Both the 300 and 400 Series course deviation indicators include either a rectilinear single-pointer and related NAV flag for VOR/LOC indication only, or dual rectilinear pointers and related NAV and GS flags for both VOR/LOC and glide slope indications. Both types of indicators incorporate an amber back-course lamp (BC) which lights when back course (reversed sense) operation is selected and a green localizer lamp (LOC) which illuminates when a localizer frequency is selected on the associated Navigation Receiver. Both types may be provided with Automatic Radial Centering which, depending on how it is selected, will automatically indicate the bearing TO or FROM the VOR station. The ARC feature includes an amber annunciator light that illuminates when ARC is in use.

The Cessna 400 Nav/Com incorporates a variable threshold automatic squelch. With this squelch system, you set the threshold level for automatic operation - the further clockwise the lower the threshold - or the more sensitive the set. When the signal is above this level, it is heard even if the noise is very close to the signal. Below this level, the squelch is fully automatic so when the background noise is very low, very weak signals (that are above the noise) are let through. For normal operation of the squelch circuit, just turn the squelch clockwise until noise is heard - then back off slightly until it is quiet, and you will have automatic squelch with the lowest practical threshold. This adjustment should be rechecked periodically during each flight to assure optimum reception.

All controls for the Nav/Com, except the omni bearing selector (OBS) knob or automatic radial centering (ARC) knob, which is located on the course deviation indicator, are mounted on the front panel of the receiver-transmitter. The audio control panels used in conjunction with this radio are shown and described in another supplement in this section.

SECTION 2
LIMITATIONS

There is no change to the airplane limitations when this avionic equipment is installed.



TYPICAL 300 AND 400 SERIES INDICATORS

Figure 1. Cessna 400 Nav/Com (Type RT-485B), Operating Controls and Indicators (Sheet 1 of 4)

1. COM MEMORY 1, 2 & 3 PUSHBUTTONS - When a COM MEMORY pushbutton is pressed, the preset frequency will appear in the COM frequency window for use as the operating frequency. Three preset frequencies may be stored in MEMORY and selected as desired, by merely pressing the appropriate COM MEMORY pushbutton to recall the desired operating frequency. If electrical power to the set's "keep-alive"circuit has not been interrupted, upon turn-on, the set will automatically recall the last COM MEMORY frequency selected by a MEMORY pushbutton. If electrical power is removed from the set's "keep-alive" circuit (such as radio removal or battery replacement) upon turn-on, all COM MEMORY circuits will display the lowest operating frequency (118.000 MHz) and will have to be reset. COM 1 MEMORY will automatically be selected. Pushbutton light dimming is controlled by the RADIO light dimming rheostat knob.

2. COM MEMORY BARS 1, 2, 3 - When a COM MEMORY pushbutton is pressed, the corresponding memory bar is illuminated to indicate which COM MEMORY is in use.

3. COMMUNICATION OPERATING FREQUENCY READOUT - Steady display indicates COM frequency in use. Blinking display indicates a frequency selected prior to memory storing and not the frequency in use. Third decimal place (either 0 or 5) is not shown on display.

4. 25/50 PUSHBUTTON - Selects last illuminated decimal place on COM frequency in use. If last decimal place is 2 or 7, pressing 25/50 pushbutton changes number to 5 or 0, respectively. If last decimal place is 5 or 0, pressing 25/50 pushbutton changes number to 7 or 2, respectively. When the last illuminated digit on the set is 2 or 7, the third digit on the set (not shown) will always be 5. When the last illuminated digit on the set is 0 or 5, the third digit on the set (not shown) will always be 0.

5. NAV MEMORY BARS 1, 2, 3 - When a NAV MEMORY pushbutton is pressed, the corresponding memory bar is illuminated to indicate which NAV MEMORY is in use.

6. NAVIGATION OPERATING FREQUENCY READOUT - Steady display indicates NAV frequency in use. Blinking display indicates a frequency selected prior to memory storing and not the frequency in use.

7. NAV MEMORY 1, 2 & 3 PUSHBUTTONS - When a NAV MEMORY pushbutton is pressed, the preset frequency will appear in the NAV frequency window for use as the operating frequency. Three preset frequencies may be stored in MEMORY and selected as desired, by merely pressing the appropriate NAV MEMORY pushbutton to recall the desired operating frequency. If electrical power to the set's "keep-alive" circuit has not been interrupted, upon turn-on, the set will automatically recall the last NAV MEMORY frequency selected by a MEMORY pushbutton. If electrical power is removed from the set's "keep-alive" circuit (such as radio removal or battery replacement) upon turn-on, all NAV MEMORY circuits will display the lowest operating frequency (108.00 MHz) and will have to be reset. NAV 1 MEMORY will automatically be selected. Pushbutton light dimming is controlled by the RADIO light dimming rheostat knob.

Figure 1. Cessna 400 Nav/Com (Type RT-485B), Operating Controls and Indicators (Sheet 2 of 4)

8. ID-VOX-T SWITCH - In the ID position, both voice transmission and station identifier signal are heard over the selected navigation frequency; in the VOX (Voice) position, the identifier signal is suppressed and only the voice transmission is heard; in the T (TEST, Momentary ON) position, a test signal is sent to the CDI causing a 0° FROM bearing indication, the XMIT and AP/CPLD annunciators are illuminated, and the COM and NAV frequency displays show 188.88 with all memory bars illuminated.

9. NAVIGATION RECEIVER FREQUENCY SELECTORS - Outer knob changes NAV frequency in 1-MHz steps between 108 and 117 MHz; inner knob changes NAV frequency in .05-MHz steps between .00 and .95 MHz; simultaneously selects paired glide slope frequency and DME channel.

10. AUTOPILOT COUPLED ANNUNCIATOR (AP/CPLD) - Illuminates amber when a 400B or 400B IFCS autopilot is coupled to NAV VOR/LOC converter output (non-operational with 200A and 300A autopilots).

11. NAV VOLUME CONTROL (VOL) - Adjusts volume of navigation receiver audio.

12. SQUELCH CONTROL - Used to adjust signal threehold necessary to activate COM receiver audio. Clockwise rotation increases background noise (decreases squelch action); counterclockwise rotation decreases background noise.

13. TRANSMIT ANNUNCIATOR (XMIT) - Illuminates green when transmitter output is normal while mike is keyed.

14. COMMUNICATION RECEIVER FREQUENCY SELECTORS - Outer knob changes COM frequency in 1-MHz steps between 118 and 135 MHz; inner knob changes COM frequency in .05 MHz steps between .025 and .975 MHz or between .000 and .950 MHz depending on selection of 25/50 button.

15. COM OFF-VOLUME CONTROL (OFF-VOL) - Combination ON/OFF switch and volume control; turns on Nav/Com set and controls volume of COM receiver audio.

16. BACK-COURSE LAMP (BC) - Amber light illuminates when an autopilot with reverse sense feature is installed and the reverse sense switch or autopilot's back-course function is engaged and receiver is tuned to a localizer frequency; indicates course deviation pointer is reversed. BC light dimming is only available when installed with an audio control panel incorporating the annunciator lights DAY/NITE selector switch.

17. COURSE INDEX - Indicates selected VOR COURSE.

18. COURSE DEVIATION POINTER - The rectilinear vertical pointer is used in conjunction with its associated scale of horizontal dots to indicate aircraft displacement from selected omni course, or localizer beam centerline. A course deviation displacement of the vertical pointer to the outer dot (either left or right) represents full scale (VOR = ±10° or LOC = ±2 1/2° nominal) deviation from beam centerline. Localizer may be ±1 1/2° to ±3° full scale left or right depending on runway length. When power is removed or the received signal applied to the indicator is not usable, the vertical pointer is stored out of view to the right of the indicator.

Figure 1. Cessna 400 Nav/Com (Type RT-485B), Operating Controls and Indicators (Sheet 3 of 4)

19. GLIDE SLOPE "GS" FLAG - When visible, red GS flag indicates unreliable glide slope signal or improperly operating equipment. Flag disappears when a reliable glide slope signal is being received.

20. GLIDE SLOPE DEVIATION POINTER - The rectilinear horizontal pointer is used in conjunction with its associated scale of vertical dots to indicate aircraft displacement from glide slope beam centerline. A course deviation displacement of the horizontal pointer to the outer vertical dot (either above or below) represents full scale (0.7°) deviation respectively, below or above glide slope beam centerline. When power is removed or the received signal applied to the indicator is not usable, the horizontal pointer is stored out of view to the top of the indicator.

21. NAV/TO-FROM INDICATOR - Operates only with a VOR or localizer signal. Red NAV position (Flag) indicates unusable signal. With usable VOR signal, indicates whether selected VOR course is TO or FROM station. With usable localizer signal, TO flag is in view.

22. RECIPROCAL COURSE INDEX - Indicates reciprocal of selected VOR course.

23. AUTOMATIC RADIAL CENTERING (ARC) PUSH-TO/PULL-FR SELECTOR - In center detent, functions as conventional OBS. Pushed to inner (Momentary On) position, rotates OBS course card to center course deviation pointer with a TO flag, then returns to conventional OBS operation. Pulled to outer detent, continuously drives OBS course card to indicate bearing from VOR station, keeping course deviation pointer centered, with a FROM flag. ARC function will not operate on localizer frequencies.

NOTE

Engaging either Automatic Radial Centering (ARC) functions will alter the airplane's course anytime the autopilot is engaged and coupled to any frequency other than a localizer frequency.

24. AUTOMATIC RADIAL CENTERING (ARC) LAMP - Amber light illuminates when Automatic Radial Centering is in use. ARC light dimming is only available when installed with an audio control panel incorporating the annunciator lights, DAY/NITE selector switch.

25. LOCALIZER (LOC) LAMP - Green light illuminates when a localizer frequency is selected on the associated Navigation Receiver. Light dimming is only available when installed with an audio control panel incorporating the annunciator lights DAY/NITE selector switch.

26. OBS COURSE CARD - Indicates selected VOR course under course index.

27. OMNI BEARING SELECTOR (OBS) - Rotates OBS course card to select desired VOR radial.

Figure 1. Cessna 400 Nav/Com (Type RT-485B), Operating Controls and Indicators (Sheet 4 of 4)

SECTION 3
EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when this avionic equipment is installed. However, if the frequency readouts fail, the frequency controls should not be moved due to the difficulty of obtaining a known frequency under this condition. The radio will remain operational on the last frequency selected, and the preset frequencies in MEMORY may be selected by pressing the appropriate MEMORY pushbutton.

SECTION 4
NORMAL PROCEDURES

SELECTING A NEW NAV/COM ACTIVE FREQUENCY:

1. COM OFF/VOL CONTROL -- TURN ON; adjust to desired audio level.
2. FREQUENCY SELECTORS -- MANUALLY ROTATE corresponding NAV or COM frequency selectors (press 25/50 pushbutton as required to select the desired third fractional COM digit) until the desired frequency is shown in the frequency readout window. The display blinks for approximately 8 seconds, indicating that the selected frequency is ready for storage in memory.
3. MEMORY 1, 2, 3 Pushbuttons -- PRESS the active frequency memory button as indicated by the illuminated memory bar. The display immediately stops blinking, indicating that the new frequency is stored in the active memory, and displays the new active frequency. The original active frequency is replaced.

NOTE

If a memory button is not pressed, the display stops blinking after approximately 8 seconds and returns to the original active frequency.

PRESELECTING AND STORING NAV/COM FREQUENCIES IN MEMORY:

1. COM OFF/VOL CONTROL -- TURN ON; adjust to desired audio level.
2. FREQUENCY SELECTORS -- MANUALLY ROTATE corresponding NAV or COM frequency selectors (press 25/50 pushbutton as required to select the desired third fractional COM digit) until the desired frequency is shown in the frequency readout window. The display blinks for approximately 8 seconds, indicating that the selected frequency is ready for storage in memory.
3. MEMORY 1, 2, 3 Pushbuttons -- PRESS the memory pushbutton of one of the NAV or COM memories not in use. The display immediately stops blinking, and displays the new frequency for 1 second to indicate that it is now stored in the selected memory. The display then reverts to indicating the active frequency.
4. MEMORY 1, 2, 3 Pushbuttons -- REPEAT STEPS 2 and 3 to store another frequency in the second NAV or COM memory not in use.

NOTE

This presetting sequence does not affect communication and/or navigation operation on the original active frequency.

RECALLING A STORED FREQUENCY:

1. MEMORY 1, 2, 3 Pushbuttons -- SELECT and PRESS the desired NAV or COM memory button, and observe the following:
   a. Frequency in selected memory becomes the active frequency.
   b. Frequency readout window indicates new active frequency.
   c. Corresponding memory bar indicates selected memory.

COMMUNICATION RECEIVER-TRANSMITTER OPERATION:

1. COM OFF/VOL Control -- TURN ON.
2. XMTR SEL Switch (on audio control panel) -- SET to desired 400 Nav/Com.
3. SPEAKER/PHONE Selector Switches (on audio control panel) -- SET to desired mode.
4. COM Frequency Selection -- SELECT desired operating frequency by either pressing a COM MEMORY 1, 2 or 3 pushbutton to recall a preset frequency, or by manually selecting the desired operating frequency using the COM frequency selectors and 25/50 pushbutton.
5. VOL Control -- ADJUST to desired audio level.

6. SQ Control -- ROTATE counterclockwise to just eliminate background noise.
7. Mike Button:
   a. To Transmit -- DEPRESS and SPEAK into microphone.

NOTE

Sidetone may be selected by placing the AUTO selector switch (on audio control panel) in either the SPEAKER or PHONE position, or may be eliminated by placing the AUTO selector switch in the OFF position. Adjustment of sidetone on audio control panels supplied with three transmitters cannot be accomplished externally. However, audio control panels supplied with one or two transmitters have sidetone adjustment pots that are accessible through the front of the audio control panel with a small, nonconductive screwdriver.

   b. XMIT Annunciator Light -- CHECK ON (green light illuminated).
   c. To Receive -- RELEASE mike button.

NAVIGATION OPERATION:

NOTICE

When a 400 Area Navigation System (Type RN-479A) is installed with dual 400 Nav/Coms, the 400 RNAV set must be turned ON to activate the 400 Nav/Com's Number Two Nav Indicator.

NOTE

The pilot should be aware that on Cessna airplanes equipped with the vertical fin mounted combination glide slope and omni antenna, pilots should avoid use of 1800 ±100 RPM on airplanes equipped with a three-bladed propeller during ILS approaches to avoid any possibility of oscillations of the glide slope deviation pointer caused by propeller interference.

1. COM OFF/VOL Control -- TURN ON; adjust to desired audio level.
2. SPEAKER/PHONE Selector Switches (on audio control panel) -- SET to desired mode.
3. NAV Frequency Selection -- SELECT desired operating frequency by either pressing a NAV MEMORY 1, 2 or 3 pushbutton to recall a preset frequency, or by using NAV frequency selectors.

NOTE

If a localizer frequency was selected, the LOC lamp will illuminate green.

4. NAV VOL Control -- ADJUST to desired audio level.

5. ID-VOX-T Switch:
   a. To Identify Station -- SET to ID to hear navigation station identifier signal.
   b. To Filter Out Station Identifier Signal -- SET to VOX to include filter in audio circuit.
6. ARC PUSH-TO/PULL-FROM Knob (If Applicable):
   a. To Use As Conventional OBS -- PLACE in center detent and select desired course.
   b. To Obtain Bearing TO VOR Station -- PUSH (ARC/PUSH-TO) knob to inner (Momentary On) position.

NOTE

ARC lamp will illuminate amber while the OBS course card is moving to center the course deviation pointer. After alignment has been achieved to reflect bearing TO VOR, automatic radial centering will automatically shut down, causing the ARC lamp to go out and the ARC knob to return to the center detent position and function as a normal OBS.

   c. To obtain Continuous Bearing FROM VOR Station -- PULL (ARC/PULL-FR) knob to outer detent.

NOTE

ARC lamp will illuminate amber, OBS course card will turn to center the course deviation pointer with a FROM flag to indicate bearing from VOR station. This system will continually drive to present the VOR radial the aircraft is on until manually returned to the center detent by the pilot.

7. AP/CPLD Annunciator Light -- CHECK ON (light is only operational if a 400B Autopilot or 400B IFCS is engaged), amber light illuminated.

VOR SELF-TEST OPERATION:

1. COM OFF/VOL Control -- TURN ON.
2. NAV Frequency Selector Switches -- SELECT usable VOR station signal.
3. OBS Knob -- SET for 0° course at course index; course deviation pointer centers or deflects left or right, depending on bearing of signal; NAV/TO-FROM indicator shows TO or FROM.
4. ID/VOX/T Switch -- PRESS to T and HOLD at T; course deviation pointer centers, NAV/TO-FROM indicator shows FROM, AP/CPLD and XMIT annunciators are illuminated and the COM and NAV displays show 188.88 with all memory bars illuminated.

5. OBS Knob -- TURN to displace course approximately 10° to either side of 0° (while holding ID/VOX/T to T). Course deviation pointer deflects full scale in direction corresponding to course displacement.
6. OBS Knob -- SET for 180° course at course index, course deviation pointer centers or deflects left or right, depending on bearing of signal. NAV/TO-FROM indicator shows FROM or TO.
7. ID/VOX/T Switch -- PRESS to T and HOLD at T; course deviation pointer centers, NAV/TO-FROM indicator shows TO, AP/CPLD and XMIT annunciators are illuminated and the COM and NAV displays show 188.88 with all memory bars illuminated.
8. OBS Knob -- TURN to displace course approximately 10° to either side of 180° (while holding ID/VOX/T to T). Course deviation pointer deflects full scale in direction corresponding to course displacement.
9. ID/VOX/T Switch -- RELEASE for normal operation.

NOTE

This test does not fulfill the requirements of FAR 91.25.

SECTION 5
PERFORMANCE

There is no change to the airplane performance when this avionic equipment is installed. However, the installation of an externally mounted antenna or several related external antennas, will result in a minor reduction in cruise performance.