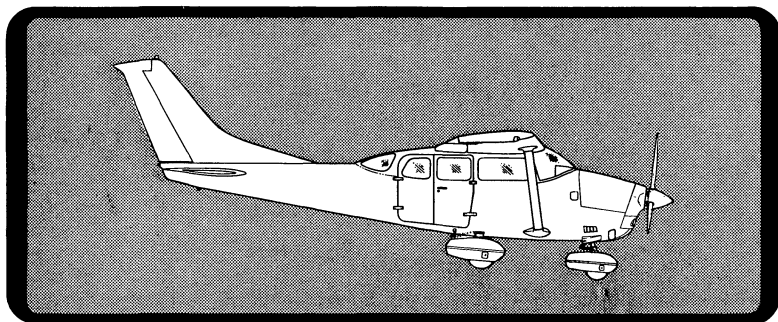


# PILOT'S OPERATING HANDBOOK



## TURBO STATIONAIR 6

1978 MODEL TU206G

Serial No. \_\_\_\_\_

Registration No. \_\_\_\_\_

THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED  
TO BE FURNISHED TO THE PILOT BY CAR PART 3

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CESSNA AIRCRAFT COMPANY  
WICHITA, KANSAS, USA

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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.

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PERFORMANCE - SPECIFICATIONS

|                                                                                                                                  |       |            |
|----------------------------------------------------------------------------------------------------------------------------------|-------|------------|
| SPEED:                                                                                                                           |       |            |
| Maximum at 17,000 Ft                                                                                                             |       | 174 KNOTS  |
| Cruise, 80% Power at 20,000 Ft                                                                                                   |       | 167 KNOTS  |
| Cruise, 80% Power at 10,000 Ft                                                                                                   |       | 152 KNOTS  |
| CRUISE: Recommended lean mixture with fuel allowance for engine start, taxi, takeoff, climb and 45 minutes reserve at 45% power. |       |            |
| 80% Power at 20,000 Ft                                                                                                           | Range | 415 NM     |
| 59 Gallons Usable Fuel                                                                                                           | Time  | 2.7 HRS    |
| 80% Power at 10,000 Ft                                                                                                           | Range | 405 NM     |
| 59 Gallons Usable Fuel                                                                                                           | Time  | 2.8 HRS    |
| 80% Power at 20,000 Ft                                                                                                           | Range | 575 NM     |
| 76 Gallons Usable Fuel                                                                                                           | Time  | 3.7 HRS    |
| 80% Power at 10,000 Ft                                                                                                           | Range | 550 NM     |
| 76 Gallons Usable Fuel                                                                                                           | Time  | 3.7 HRS    |
| Maximum Range at 20,000 Ft                                                                                                       | Range | 465 NM     |
| 59 Gallons Usable Fuel                                                                                                           | Time  | 3.8 HRS    |
| Maximum Range at 10,000 Ft                                                                                                       | Range | 490 NM     |
| 59 Gallons Usable Fuel                                                                                                           | Time  | 4.5 HRS    |
| Maximum Range at 20,000 Ft                                                                                                       | Range | 655 NM     |
| 76 Gallons Usable Fuel                                                                                                           | Time  | 5.3 HRS    |
| Maximum Range at 10,000 Ft                                                                                                       | Range | 675 NM     |
| 76 Gallons Usable Fuel                                                                                                           | Time  | 6.1 HRS    |
| RATE OF CLIMB AT SEA LEVEL                                                                                                       |       | 1010 FPM   |
| SERVICE CEILING                                                                                                                  |       | 27,000 FT  |
| TAKEOFF PERFORMANCE:                                                                                                             |       |            |
| Ground Roll                                                                                                                      |       | 835 FT     |
| Total Distance Over 50-Ft Obstacle                                                                                               |       | 1640 FT    |
| LANDING PERFORMANCE:                                                                                                             |       |            |
| Ground Roll                                                                                                                      |       | 735 FT     |
| Total Distance Over 50-Ft Obstacle                                                                                               |       | 1395 FT    |
| STALL SPEED (CAS):                                                                                                               |       |            |
| Flaps Up, Power Off                                                                                                              |       | 62 KNOTS   |
| Flaps Down, Power Off                                                                                                            |       | 54 KNOTS   |
| MAXIMUM WEIGHT:                                                                                                                  |       |            |
| Ramp                                                                                                                             |       | 3616 LBS   |
| Takeoff or Landing                                                                                                               |       | 3600 LBS   |
| STANDARD EMPTY WEIGHT:                                                                                                           |       |            |
| Turbo Stationair 6 (6 Seats)                                                                                                     |       | 1988 LBS   |
| Turbo Stationair 6 II (6 Seats)                                                                                                  |       | 2057 LBS   |
| Utility Option (1 Seat)                                                                                                          |       | 1886 LBS   |
| II Utility Option (1 Seat)                                                                                                       |       | 1955 LBS   |
| MAXIMUM USEFUL LOAD:                                                                                                             |       |            |
| Turbo Stationair 6 (6 Seats)                                                                                                     |       | 1628 LBS   |
| Turbo Stationair 6 II (6 Seats)                                                                                                  |       | 1559 LBS   |
| Utility Option (1 Seat)                                                                                                          |       | 1730 LBS   |
| II Utility Option (1 Seat)                                                                                                       |       | 1661 LBS   |
| BAGGAGE ALLOWANCE                                                                                                                |       | 180 LBS    |
| WING LOADING: Pounds/Sq Ft                                                                                                       |       | 20.7       |
| POWER LOADING: Pounds/HP                                                                                                         |       | 11.6       |
| FUEL CAPACITY: Total                                                                                                             |       |            |
| Standard Tanks                                                                                                                   |       | 61 GAL.    |
| Long Range Tanks                                                                                                                 |       | 80 GAL.    |
| OIL CAPACITY                                                                                                                     |       |            |
|                                                                                                                                  |       | 13 QTS     |
| ENGINE: Teledyne Continental, Turbocharged Fuel Injection                                                                        |       |            |
| 310 BHP at 2700 RPM (5-Minute Takeoff Rating)                                                                                    |       | TSIO-520-M |
| 285 BHP at 2600 RPM (Maximum Continuous Rating)                                                                                  |       |            |
| PROPELLER: 3-Bladed Constant Speed, Diameter                                                                                     |       |            |
|                                                                                                                                  |       | 80 IN.     |



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# SECTION 1

# GENERAL

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SECTION 1  
GENERAL

CESSNA  
MODEL TU206G

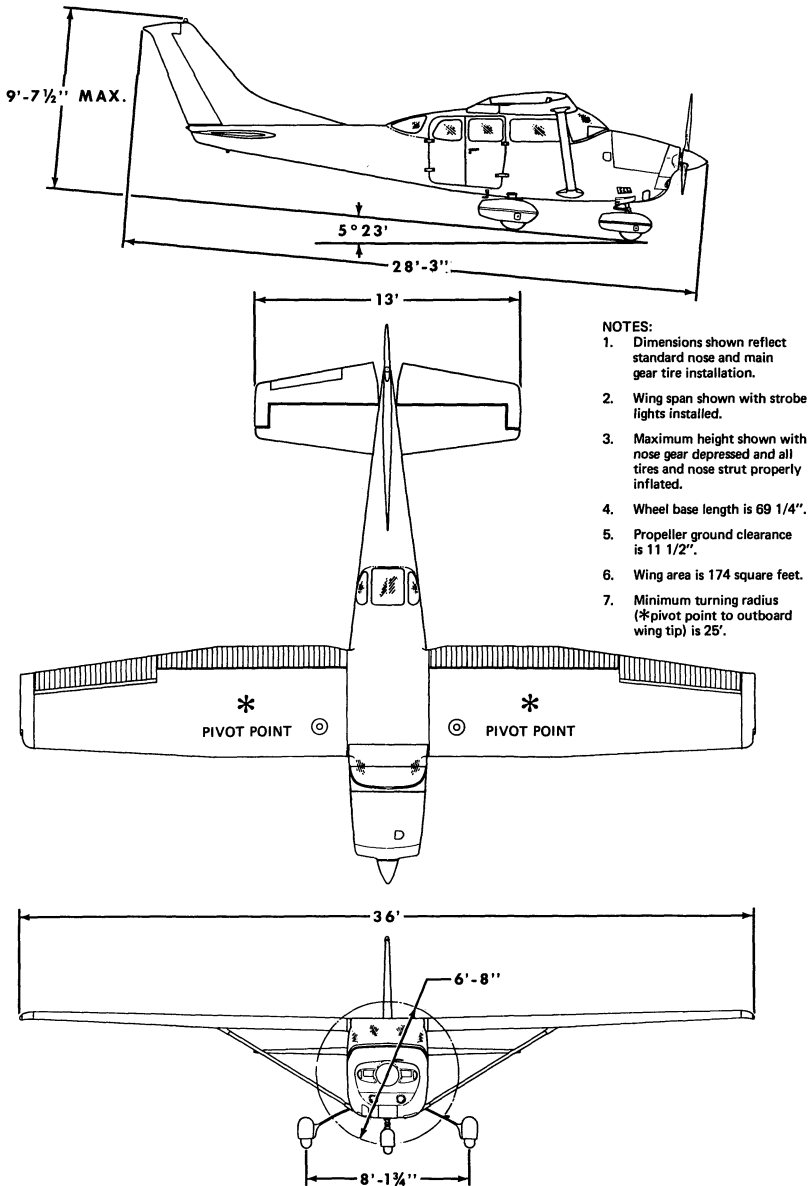


Figure 1-1. Three View

## 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: TSIO-520-M.

Engine Type: Turbocharged, 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): 310 rated BHP at 36.5 inches Hg and 2700 RPM.

Maximum Continuous Power: 285 rated BHP at 35 inches Hg and 2600 RPM.

### PROPELLER

Propeller Manufacturer: McCauley Accessory Division.

Propeller Model Number: D3A34C402/90DFA-10.

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 12.4° and a high pitch setting of 28.5° (30 inch station).

### FUEL

Approved Fuel Grades (and Colors):

100LL Grade Aviation Fuel (Blue).

100 (Formerly 100/130) Grade Aviation Fuel (Green).

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Fuel Capacity:

Standard Tanks:

Total Capacity: 61 gallons.

Total Capacity Each Tank: 30.5 gallons.

Total Usable: 59 gallons.

Long Range Tanks:

Total Capacity: 80 gallons.

Total Capacity Each Tank: 40 gallons.

Total Usable: 76 gallons.

OIL

Oil Grade (Specification):

MIL-L-6082 Aviation Grade Straight Mineral Oil: Use to replenish supply during first 25 hours and at the first 25-hour oil change. Continue to use until a total of 50 hours has accumulated or oil consumption has stabilized.

NOTE

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.

Continental Motors Specification MHS-24A, Ashless Dispersant Oil: This oil **must be used** after first 50 hours or oil consumption has stabilized.

Recommended Viscosity for Temperature Range:

SAE 50 above 4°C (40°F).

SAE 10W30 or SAE 30 below 4°C (40°F).

NOTE

Multi-viscosity oil with a range of SAE 10W30 is recommended for improved starting and turbocharger controller operation in cold weather.

Oil Capacity:

Sump: 12 Quarts.

Total: 13 Quarts.

MAXIMUM CERTIFICATED WEIGHTS

Takeoff: 3600 lbs.

Landing: 3600 lbs.

Weight in Baggage Compartment - Station 109 to 145: 180 lbs maximum.

## NOTE

Refer to Section 6 of this handbook for loading arrangements with one or more seats removed for cargo accommodation.

## STANDARD AIRPLANE WEIGHTS

Standard Empty Weight, Turbo Stationair 6 (6 Seats): 1988 lbs.  
Turbo Stationair 6 II (6 Seats): 2057 lbs.  
Utility Option (1 Seat): 1886 lbs.  
II Utility Option (1 Seat): 1955 lbs.  
Maximum Useful Load, Turbo Stationair 6 (6 Seats): 1628 lbs.  
Turbo Stationair 6 II (6 Seats): 1559 lbs.  
Utility Option (1 Seat): 1730 lbs.  
II Utility Option (1 Seat): 1661 lbs.

## CABIN AND ENTRY DIMENSIONS

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

## BAGGAGE SPACE AND CARGO DOOR ENTRY DIMENSIONS

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

## SPECIFIC LOADINGS

Wing Loading: 20.7 lbs./sq. ft.  
Power Loading: 11.6 lbs./hp.

## SYMBOLS, ABBREVIATIONS AND TERMINOLOGY

### GENERAL AIRSPEED TERMINOLOGY AND SYMBOLS

|      |                                                                                                                                                                                                            |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| KCAS | <b>Knots Calibrated Airspeed</b> 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 | <b>Knots Indicated Airspeed</b> is the speed shown on the airspeed indicator and expressed in knots.                                                                                                       |

## SECTION 1 GENERAL

CESSNA  
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|           |                                                                                                                                                                    |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| KTAS      | <b>Knots True Airspeed</b> is the airspeed expressed in knots relative to undisturbed air which is KCAS corrected for altitude and temperature.                    |
| $V_A$     | <b>Maneuvering Speed</b> is the maximum speed at which you may use abrupt control travel.                                                                          |
| $V_{FE}$  | <b>Maximum Flap Extended Speed</b> is the highest speed permissible with wing flaps in a prescribed extended position.                                             |
| $V_{NO}$  | <b>Maximum Structural Cruising Speed</b> is the speed that should not be exceeded except in smooth air, then only with caution.                                    |
| $V_{NE}$  | <b>Never Exceed Speed</b> is the speed limit that may not be exceeded at any time.                                                                                 |
| $V_S$     | <b>Stalling Speed or the minimum steady flight speed</b> at which the airplane is controllable.                                                                    |
| $V_{S_0}$ | <b>Stalling Speed or the minimum steady flight speed</b> at which the airplane is controllable in the landing configuration at the most forward center of gravity. |
| $V_X$     | <b>Best Angle-of-Climb Speed</b> is the speed which results in the greatest gain of altitude in a given horizontal distance.                                       |
| $V_Y$     | <b>Best Rate-of-Climb Speed</b> is the speed which results in the greatest gain in altitude in a given time.                                                       |

## METEOROLOGICAL TERMINOLOGY

|                      |                                                                                                                                                           |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| OAT                  | <b>Outside Air Temperature</b> is the free air static temperature. It is expressed in either degrees Celsius (formerly Centigrade) or degrees Fahrenheit. |
| Standard Temperature | <b>Standard Temperature</b> is 15°C at sea level pressure altitude and decreases by 2°C for each 1000 feet of altitude.                                   |
| Pressure Altitude    | <b>Pressure Altitude</b> 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 | <b>Brake Horsepower</b> is the power developed by the engine. Percent power values in this handbook are based on the maximum continuous power rating. |
| RPM | <b>Revolutions Per Minute</b> is engine speed.                                                                                                        |
| MP  | <b>Manifold Pressure</b> 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 | <b>Demonstrated Crosswind Velocity</b> 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                     | <b>Usable Fuel</b> is the fuel available for flight planning.                                                                                                                                                                                                   |
| Unusable Fuel                   | <b>Unusable Fuel</b> is the quantity of fuel that can not be safely used in flight.                                                                                                                                                                             |
| GPH                             | <b>Gallons Per Hour</b> is the amount of fuel (in gallons) consumed per hour.                                                                                                                                                                                   |
| NMPG                            | <b>Nautical Miles Per Gallon</b> is the distance (in nautical miles) which can be expected per gallon of fuel consumed at a specific engine power setting and/or flight configuration.                                                                          |
| g                               | <b>g</b> is acceleration due to gravity.                                                                                                                                                                                                                        |

## WEIGHT AND BALANCE TERMINOLOGY

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

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|                          |                                                                                                                                                                                                                        |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Moment                   | <b>Moment</b> 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.) | <b>Center of Gravity</b> 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                 | <b>Center of Gravity Arm</b> is the arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.                                                                                 |
| C.G. Limits              | <b>Center of Gravity Limits</b> are the extreme center of gravity locations within which the airplane must be operated at a given weight.                                                                              |
| Standard Empty Weight    | <b>Standard Empty Weight</b> is the weight of a standard airplane, including unusable fuel, full operating fluids and full engine oil.                                                                                 |
| Basic Empty Weight       | <b>Basic Empty Weight</b> is the standard empty weight plus the weight of optional equipment.                                                                                                                          |
| Useful Load              | <b>Useful Load</b> is the difference between ramp weight and the basic empty weight.                                                                                                                                   |
| Maximum Ramp Weight      | <b>Maximum Ramp Weight</b> is the maximum weight approved for ground maneuver. (It includes the weight of start, taxi and runup fuel.)                                                                                 |
| Gross (Loaded) Weight    | <b>Gross (Loaded) Weight</b> is the loaded weight of the airplane.                                                                                                                                                     |
| Maximum Takeoff Weight   | <b>Maximum Takeoff Weight</b> is the maximum weight approved for the start of the takeoff run.                                                                                                                         |
| Maximum Landing Weight   | <b>Maximum Landing Weight</b> is the maximum weight approved for the landing touchdown.                                                                                                                                |
| Tare                     | <b>Tare</b> 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 have been approved by the Federal Aviation Administration. When applicable, limitations associated with optional systems or equipment are included in Section 9.

### 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. A4CE as Cessna Model No. TU206G.

AIRSPPEED LIMITATIONS

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

|                 | SPEED                                                                                               | KCAS             | KIAS             | REMARKS                                                                    |
|-----------------|-----------------------------------------------------------------------------------------------------|------------------|------------------|----------------------------------------------------------------------------|
| V <sub>NE</sub> | Never Exceed Speed                                                                                  | 182              | 183              | Do not exceed this speed in any operation.                                 |
| V <sub>NO</sub> | Maximum Structural Cruising Speed                                                                   | 148              | 149              | Do not exceed this speed except in smooth air, and then only with caution. |
| V <sub>A</sub>  | Maneuvering Speed:<br>3600 Pounds<br>2950 Pounds<br>2300 Pounds                                     | 120<br>109<br>97 | 120<br>108<br>96 | Do not make full or abrupt control movements above this speed.             |
| V <sub>FE</sub> | Maximum Flap Extended Speed:<br>To 10 <sup>0</sup> Flaps<br>10 <sup>0</sup> - 40 <sup>0</sup> Flaps | 139<br>102       | 140<br>100       | Do not exceed these speeds with the given flap settings.                   |
|                 | Maximum Window Open Speed                                                                           | 182              | 183              | Do not exceed this speed with windows open.                                |

Figure 2-1. Airspeed Limitations

AIRSPPEED INDICATOR MARKINGS

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

| MARKING    | KIAS VALUE<br>OR RANGE | SIGNIFICANCE                                                                                                                                              |
|------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| White Arc  | 46 - 100               | Full Flap Operating Range. Lower limit is maximum weight $V_{SO}$ in landing configuration. Upper limit is maximum speed permissible with flaps extended. |
| Green Arc  | 55 - 149               | 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 | 149 - 183              | Operations must be conducted with caution and only in smooth air.                                                                                         |
| Red Line   | 183                    | Maximum speed for all operations.                                                                                                                         |

Figure 2-2. Airspeed Indicator Markings

## POWER PLANT LIMITATIONS

Engine Manufacturer: Teledyne Continental.

Engine Model Number: TSIO-520-M.

Engine Operating Limits for Takeoff and Continuous Operations:

Maximum Power, 5 Minutes - Takeoff: 310 BHP.

Continuous: 285 BHP

Maximum Engine Speed, 5 Minutes - Takeoff: 2700 RPM.

Continuous: 2600 RPM.

Maximum Manifold Pressure, 5 Minutes - Takeoff: 36.5 inches Hg.

Continuous: 35 inches Hg.

Maximum Cylinder Head Temperature: 238°C (460°F).

Maximum Oil Temperature: 116°C (240°F).

Oil Pressure, Minimum: 10 psi.

Maximum: 100 psi.

Fuel Pressure, Minimum: 3.0 psi.

Maximum: 19.5 psi (31.0 gal/hr).

Propeller Manufacturer: McCauley Accessory Division.

Propeller Model Number: D3A34C402/90DFA-10.

Propeller Diameter, Maximum: 80 inches.

Minimum: 78.5 inches.

Propeller Blade Angle at 30 Inch Station, Low: 12.4°.

High: 28.5°.

Propeller Operating Limits: Avoid continuous operation between 1850 and 2150 RPM above 24 inches manifold pressure.

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       | WHITE ARC          | RED LINE               |
|---------------------------|---------------|---------------------------------------|------------------|--------------------|------------------------|
|                           | MINIMUM LIMIT | NORMAL OPERATING                      | CAUTION RANGE    | NORMAL CLIMB RANGE | MAXIMUM LIMIT          |
| Tachometer                | - - -         | 2200 - 2500 RPM                       | 2600 - 2700 RPM  | - - -              | 2700 RPM               |
| Manifold Pressure         | - - -         | 15 - 30 in. Hg                        | 35 - 36.5 in. Hg | - - -              | 36.5 in. Hg            |
| Oil Temperature           | - - -         | 100 <sup>o</sup> - 240 <sup>o</sup> F | - - -            | - - -              | 240 <sup>o</sup> F     |
| Cylinder Head Temperature | - - -         | 200 <sup>o</sup> - 460 <sup>o</sup> F | - - -            | - - -              | 460 <sup>o</sup> F     |
| Fuel Flow (Pressure)      | (3.0 psi)     | 6.0 - 20.0 gal/hr                     | - - -            | 20.0 - 27.0 gal/hr | 31.0 gal/hr (19.5 psi) |
| Oil Pressure              | 10 psi        | 30 - 60 psi                           | - - -            | - - -              | 100 psi                |

Figure 2-3. Power Plant Instrument Markings

WEIGHT LIMITS

Maximum Takeoff Weight: 3600 lbs.  
Maximum Landing Weight: 3600 lbs.  
Maximum Weight in Baggage Compartment .- Station 109 to 145: 180 lbs.

NOTE

Refer to Section 6 of this handbook for loading arrangements with one or more seats removed for cargo accommodation.



## CENTER OF GRAVITY LIMITS

Center of Gravity Range:

Forward: 33.0 inches aft of datum at 2500 lbs. or less, with straight line variation to 42.5 inches aft of datum at 3600 lbs.

Aft: 49.7 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: 30.5 U.S. gallons each.  
Total Fuel: 61 U.S. gallons.  
Usable Fuel (all flight conditions): 59 U.S. gallons.  
Unusable Fuel: 2.0 U.S. gallons.
- 2 Long Range Tanks: 40 U.S. gallons each.  
Total Fuel: 80 U.S. gallons.  
Usable Fuel (all flight conditions): 76 U.S. gallons.  
Unusable Fuel: 4.0 U.S. gallons.

NOTE

Use fuller tank for takeoff and landing.

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

PLACARDS

The following information is 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.)

This airplane must be operated as a normal category airplane in compliance with the operating limitations stated in the form of placards, markings, and manuals.

| MAXIMUMS                |                                         |            |
|-------------------------|-----------------------------------------|------------|
|                         | U206/TU206                              | U206       |
|                         | Landplane                               | Floatplane |
| MANEUVERING SPEED (IAS) | 120 knots                               | 120 knots  |
| GROSS WEIGHT            | 3600 lbs.                               | 3500 lbs.  |
| FLIGHT LOAD FACTOR      | Flaps Up +3.8, -1.52<br>Flaps Down +2.0 |            |

No acrobatic maneuvers, including spins, approved. Altitude loss in a stall recovery - 240 ft. 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:

CONTROL LOCK - REMOVE BEFORE STARTING ENGINE.

3. On fuel selector plate, at appropriate locations (standard tanks):

OFF.  
LEFT ON -- 29.5 GAL.  
RIGHT ON -- 29.5 GAL.  
TAKEOFF AND LAND ON FULLER TANK.

On fuel selector plate, at appropriate locations (long range tanks):

OFF.  
LEFT ON -- 38.0 GAL.  
RIGHT ON -- 38.0 GAL.  
TAKEOFF AND LAND ON FULLER TANK.

4. Above fuel selector plate:

WHEN SWITCHING FROM DRY TANK TURN AUX FUEL PUMP  
"ON" MOMENTARILY.

5. Forward of fuel tank filler cap (standard tanks):

SERVICE THIS AIRPLANE WITH 100LL/100 MIN. AVIATION  
GRADE GASOLINE - CAPACITY 30.5 GAL.

Forward of fuel tank filler cap (long range tanks):

SERVICE THIS AIRPLANE WITH 100LL/100 MIN. AVIATION  
GRADE GASOLINE - CAPACITY 40.0 GAL.

6. Near manifold pressure /fuel flow indicator:

MAX. POWER SETTINGS  
—— AND FUEL FLOW ——  
TAKEOFF (5 MIN. ONLY): 2700 RPM,  
36.5 IN. MP., 31 GPH  
MAX. CONTINUOUS POWER: 2600 RPM,  
35.0 IN. MP., 27 GPH

| ALT. FT.      | MP<br>IN. HG. | FUEL FLOW<br>GPH |
|---------------|---------------|------------------|
| S.L. - 17,000 | 35            | 27               |
| 18,000        | 34            | 26               |
| 20,000        | 32            | 24               |
| 22,000        | 30            | 22               |
| 24,000        | 28            | 20               |
| 26,000        | 26            | 18               |
| 28,000        | 24            | 17               |
| 30,000        | 22            | 16               |

NORMAL CLIMB: 2500 RPM, 30.0 IN. MP., 20 GPH

AVOID CONTINUOUS OPERATION BETWEEN 1850 AND 2150 RPM  
ABOVE 24 IN. MP.

7. On the flap control indicator:

|             |                                                                                                          |
|-------------|----------------------------------------------------------------------------------------------------------|
| UP to 10°   | (Partial flap range with blue color code and 140 knot callout; also, mechanical detent at 10°.)          |
| 10° to FULL | (Indices at these positions with white color code and 100 knot callout; also, mechanical detent at 20°.) |

8. On aft cargo door:

BAGGAGE NET 180 LBS. MAX. CAPACITY. REFER TO WEIGHT  
AND BALANCE DATA FOR BAGGAGE AND CARGO LOAD-  
ING.

9. On forward cargo door:

EMERGENCY EXIT OPERATION

1. OPEN FWD CARGO DOOR AS FAR AS POSSIBLE.
2. ROTATE RED LEVER IN REAR CARGO DOOR FWD.
3. FORCE REAR CARGO DOOR FULL OPEN.



# 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 . . . . .   | 80 KIAS |
| Wing Flaps Down . . . . . | 70 KIAS |

### Maneuvering Speed:

|                    |          |
|--------------------|----------|
| 3600 Lbs . . . . . | 120 KIAS |
| 2950 Lbs . . . . . | 108 KIAS |
| 2300 Lbs . . . . . | 96 KIAS  |

### Maximum Glide:

|                    |         |
|--------------------|---------|
| 3600 Lbs . . . . . | 75 KIAS |
| 3200 Lbs . . . . . | 70 KIAS |
| 2800 Lbs . . . . . | 65 KIAS |

|                                                   |         |
|---------------------------------------------------|---------|
| Precautionary Landing With Engine Power . . . . . | 70 KIAS |
|---------------------------------------------------|---------|

### Landing Without Engine Power:

|                           |         |
|---------------------------|---------|
| Wing Flaps Up . . . . .   | 80 KIAS |
| Wing Flaps Down . . . . . | 70 KIAS |

## OPERATIONAL CHECKLISTS

## ENGINE FAILURES

### ENGINE FAILURE DURING TAKEOFF RUN

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 -- 80 KIAS.
2. Mixture -- IDLE CUT-OFF.
3. Fuel Selector Valve -- OFF.
4. Ignition Switch -- OFF.
5. Wing Flaps -- AS REQUIRED (40° recommended).
6. Master Switch -- OFF.

## **ENGINE FAILURE DURING FLIGHT**

1. Airspeed -- 75 KIAS.
2. Fuel Selector Valve and Quantity -- CHECK.
3. Mixture -- RICH.
4. Auxiliary Fuel Pump -- ON for 3-5 seconds with throttle 1/2 open; then OFF.
5. Ignition Switch -- BOTH (or START if propeller is stopped).
6. Throttle -- ADVANCE slowly.

## **FORCED LANDINGS**

### **EMERGENCY LANDING WITHOUT ENGINE POWER**

1. Airspeed -- 80 KIAS (flaps UP).  
70 KIAS (flaps DOWN).
2. Mixture -- IDLE CUT-OFF.
3. Fuel Selector Valve -- OFF.
4. Ignition Switch -- OFF.
5. Wing Flaps -- AS REQUIRED (40° recommended).
6. Master Switch -- OFF.
7. Doors -- UNLATCH PRIOR TO TOUCHDOWN.
8. Touchdown -- SLIGHTLY TAIL LOW.
9. Brakes -- APPLY HEAVILY.

### **PRECAUTIONARY LANDING WITH ENGINE POWER**

1. Airspeed -- 80 KIAS.
2. Wing Flaps -- 20°.
3. Selected Field -- FLY OVER, noting terrain and obstructions, then retract flaps upon reaching a safe altitude and airspeed.
4. Electrical Switches -- OFF.
5. Wing Flaps -- 40° (on final approach).
6. Airspeed -- 70 KIAS.
7. Avionics Power and Master Switches -- OFF.

8. Doors -- UNLATCH PRIOR TO TOUCHDOWN.
9. Touchdown -- SLIGHTLY TAIL LOW.
10. Ignition Switch -- OFF.
11. Brakes -- APPLY HEAVILY.

## DITCHING

1. Radio -- TRANSMIT MAYDAY on 121.5 MHz, giving location and intentions.
2. Heavy Objects (in baggage area) -- SECURE OR JETTISON.
3. Wing Flaps -- 40°.
4. Approach -- High Winds, Heavy Seas -- INTO THE WIND.  
Light Winds, Heavy Swells -- PARALLEL TO SWELLS.
5. Power -- ESTABLISH 300 FT/MIN DESCENT AT 65 KIAS.
6. Cabin Doors -- UNLATCH.
7. Touchdown -- LEVEL ATTITUDE AT 300 FT/MIN DESCENT.
8. Face -- CUSHION at touchdown with folded coat.
9. Airplane -- EVACUATE through cabin doors. If necessary, open window and flood cabin to equalize pressure so doors can be opened.
10. 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. Ignition Switch -- START (continue cranking).
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 Selector Valve -- OFF.

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 Selector Valve -- OFF.
3. Master Switch -- OFF.
4. Cabin Heat and Air -- OFF (except overhead vents).
5. Airspeed -- 105 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. Avionics Power Switch -- OFF.
3. All Other Switches (except ignition switch) -- OFF.
4. Vents/Cabin Air/Heat -- CLOSED.
5. 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.

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/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. Navigation Light Switch -- OFF.
2. Pitot Heat Switch (if installed) -- OFF.
3. Strobe Light Switch (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 switch 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 control full out and rotate defrost knob clockwise 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 door to open), a decrease of up to 10 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° - 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 90-100 KIAS with 20° flaps and 105-115 KIAS with 0° - 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 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.

**STATIC SOURCE BLOCKAGE**  
**(Erroneous Instrument Reading Suspected)**

1. Vents and Windows -- CLOSED.
2. Alternate Static Source Valve -- PULL ON.
3. Airspeed -- Consult calibration table in Section 5.

## **LANDING WITH A FLAT MAIN TIRE**

1. Wing Flaps -- AS DESIRED (0° - 10° below 140 KIAS, 10° - 40° below 99 KIAS).
2. Make a normal approach.
3. Touchdown -- GOOD TIRE FIRST, hold airplane off flat tire as long as possible with aileron control.

## **ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS**

### **OVER-VOLTAGE LIGHT ILLUMINATES**

1. Avionics Power Switch -- OFF.
2. Master Switch -- OFF (both sides).
3. Master Switch -- ON.
4. Over-Voltage Light -- OFF.
5. Avionics Power Switch -- ON.

If over-voltage light illuminates again:

6. Flight -- TERMINATE as soon as practical.

### **AMMETER SHOWS DISCHARGE**

1. Alternator -- OFF.
2. Nonessential Radio/Electrical Equipment -- OFF.
3. Flight -- TERMINATE as soon as practical.





## AMPLIFIED PROCEDURES

### 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 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.

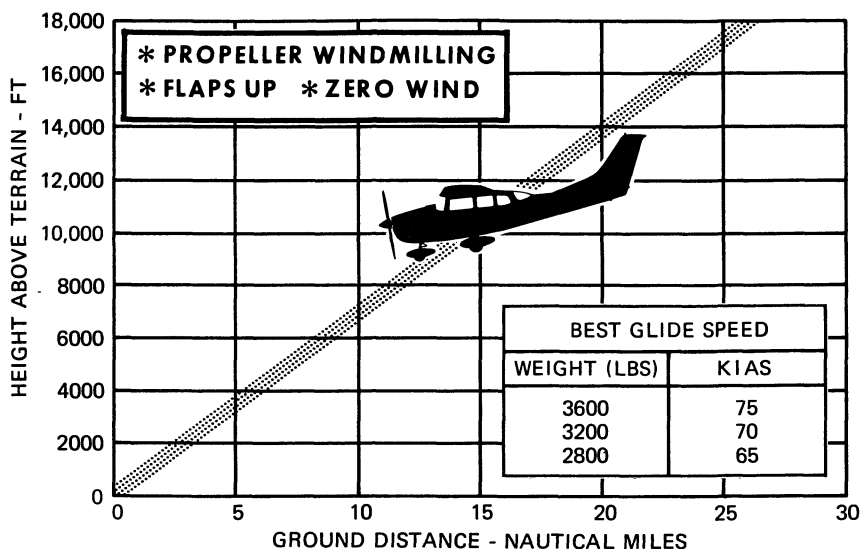


Figure 3-1. Maximum Glide

## 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. Avoid a landing flare because of difficulty in judging height over a water surface.

## LANDING WITHOUT ELEVATOR CONTROL

Trim for horizontal flight (with an airspeed of approximately 90 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 involving the excessive use of auxiliary fuel pump operation can cause engine flooding and subsequent collection of fuel on the parking ramp as the excess fuel drains overboard from the intake manifolds. This is sometimes experienced in difficult starts in cold weather where engine pre-heat service is not available. If this occurs, the airplane should be pushed away from the fuel puddle before another engine start is attempted. Otherwise, there is a possibility of raw fuel accumulations in the exhaust system igniting during an engine start, causing a long flame from the tailpipe, and possibly igniting the collected fuel on the pavement. If a fire occurs, proceed according to the 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 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. 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.
3. When the sweep second hand 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 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. Reduce power to set up a 500 to 800 ft./min. rate of descent.
2. Apply full rich mixture.
3. Adjust the elevator and rudder trim control wheels for a stabilized descent at 95 KIAS.
4. Keep hands off control wheel.
5. Monitor turn coordinator and make corrections by rudder alone.
6. Adjust rudder trim to relieve unbalanced rudder force, if present.
7. Check trend of compass card movement and make cautious corrections with rudder to stop turn.
8. 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 95 KIAS.
4. Adjust the elevator trim control to maintain a 95 KIAS glide.
5. Keep hands off the control wheel, using rudder control to hold a straight heading. Use rudder trim to relieve unbalanced rudder force, if present.
6. Clear engine occasionally, but avoid using enough power to disturb the trimmed glide.
7. Upon breaking out of clouds, resume normal cruising flight.

## **FLIGHT IN 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 rate-of-climb) are suspected, the alternate static source valve should be pulled on, thereby supplying static pressure to these instruments from the cabin.

With the alternate static source on, adjust indicated airspeed slightly during climb or approach according to the alternate static source airspeed calibration table in Section 5.

## SPINS

Intentional spins are prohibited in this airplane. Should an inadvertent spin occur, the following recovery procedure should 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 **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 all obstacles. Upon reaching a safe altitude, reduce the power settings to give cruise power. Then release the HI side of the switch, allowing the right side of the switch to remain in the ON position for level flight.

This ON position provides a reduced fuel flow which results in lean mixtures at two portions of the manifold pressure range. For example, at 2500 RPM excessively lean mixtures with resulting roughness and/or power drop off are experienced at approximately 22 inches (just before the throttle switch activates) and again at 28 or more inches of manifold pressure.

To avoid these areas of rough engine operation, select 2200 RPM and sufficient manifold pressure within the green arc range for the flight condition at hand. If more power is required, use progressively more RPM and select a manifold pressure where smooth engine operation and normal airspeed can be obtained.

The landing approach should be planned so that approximately 15 inches of manifold pressure can be used. If the throttle is brought back to

idle position, the mixture becomes very rich. This could cause a sluggish power response if the throttle had to be advanced rapidly for dragging into the airport.

## **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.

## **ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS**

Malfunctions in the electrical power supply system can be detected by periodic monitoring of the ammeter and over-voltage warning light; however, the cause of these malfunctions is usually difficult to determine. A broken alternator drive belt or wiring is the most likely cause of alternator failures, although other factors could cause the problem. A damaged or improperly adjusted voltage regulator 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 could be adversely affected by higher than normal voltage if a faulty voltage regulator setting is causing the overcharging. To preclude these possibilities, an over-voltage sensor will automatically

shut down the alternator and the over-voltage warning light will illuminate if the charge voltage reaches approximately 31.5 volts. Assuming that the malfunction was only momentary, an attempt should be made to reactivate the alternator system. To do this, turn the avionics power switch off, 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 warning light will go off. The avionics power switch should then be turned 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. If the emergency occurs at night, power must be conserved for later use of the landing light and flaps during landing.

### **INSUFFICIENT RATE OF CHARGE**

If the ammeter indicates a continuous discharge rate in flight, the alternator is not supplying power to the system and should be shut down since the alternator field circuit may be placing an unnecessary load on the system. All nonessential equipment should be turned off and the flight terminated as soon as practical.

### **CARGO DOOR EMERGENCY EXIT**

If it is necessary to use the cargo doors as an emergency exit and the wing flaps are not extended, open the forward door and exit. If the wing flaps are extended, open the doors in accordance with the instructions shown on the placard which is mounted on the forward cargo door. For convenience, these placarded instructions may also be found in Section 2.



# SECTION 4

# NORMAL PROCEDURES

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## INTRODUCTION

Section 4 provides checklist and amplified procedures for the conduct of normal operation. Normal procedures associated with optional systems can be found in Section 9.

## SPEEDS FOR NORMAL OPERATION

Unless otherwise noted, the following speeds are based on a maximum weight of 3600 pounds and may be used for any lesser weight. However, to achieve the performance specified in Section 5 for takeoff distance and climb performance, the speed appropriate to the particular weight must be used.

### Takeoff:

|                                                  |            |
|--------------------------------------------------|------------|
| Normal Climb Out                                 | 70-80 KIAS |
| Short Field Takeoff, Flaps 20°, Speed at 50 Feet | 68 KIAS    |

### Enroute Climb, Flaps Up:

|                                              |             |
|----------------------------------------------|-------------|
| Normal                                       | 95-105 KIAS |
| Best Rate of Climb, Sea Level to 17,000 Feet | 88 KIAS     |
| Best Angle of Climb, Sea Level               | 55 KIAS     |

### Landing Approach:

|                                 |            |
|---------------------------------|------------|
| Normal Approach, Flaps Up       | 75-85 KIAS |
| Normal Approach, Flaps 40°      | 65-75 KIAS |
| Short Field Approach, Flaps 40° | 64 KIAS    |

### Balked Landing:

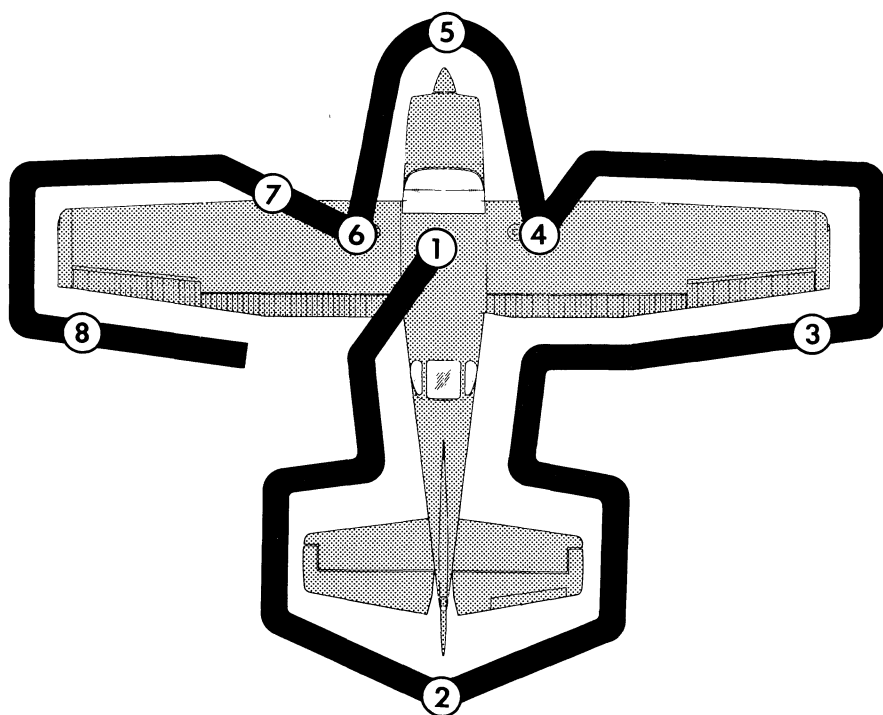
|                          |         |
|--------------------------|---------|
| Maximum Power, Flaps 20° | 80 KIAS |
|--------------------------|---------|

### Maximum Recommended Turbulent Air Penetration Speed:

|          |          |
|----------|----------|
| 3600 Lbs | 120 KIAS |
| 2950 Lbs | 108 KIAS |
| 2300 Lbs | 96 KIAS  |

### Maximum Demonstrated Crosswind Velocity:

|                    |          |
|--------------------|----------|
| Takeoff or Landing | 20 KNOTS |
|--------------------|----------|



NOTE

Visually check airplane for general condition during walk-around inspection. In cold weather, remove even small accumulations of frost, ice or snow from wing, tail and control surfaces. Also, make sure that control surfaces contain no internal accumulations of ice or debris. Prior to flight, check that pitot heater (if installed) is warm to touch within 30 seconds with battery and pitot heat switches on. If a night flight is planned, check operation of all lights, and make sure a flashlight is available.

Figure 4-1. Preflight Inspection

## CHECKLIST PROCEDURES

### PREFLIGHT INSPECTION

#### ① CABIN

1. Control Wheel Lock -- REMOVE.
2. Ignition Switch -- OFF.
3. Avionics Power Switch -- OFF.
4. Master Switch -- ON.
5. Fuel Quantity Indicators -- CHECK QUANTITY.
6. Master Switch -- OFF.
7. Fuel Selector Valve -- FULLER TANK.
8. Oxygen Supply Pressure (if installed) -- CHECK.
9. Oxygen Masks (if installed) -- CHECK.

#### ② EMPENNAGE

1. Rudder Gust Lock -- REMOVE.
2. Tail Tie-Down -- DISCONNECT.
3. Control Surfaces -- CHECK freedom of movement and security.
4. Check cargo doors securely latched and locked (right side only). If cargo load will not permit access to the front cargo door inside handle, lock the door from the outside by means of the T-handle stored in the map compartment.

#### NOTE

The cargo doors must be fully closed and latched before operating the electric wing flaps. A switch in the upper door sill of the front cargo door interrupts the wing flap electrical circuit when the front door is opened or removed, thus preventing the flaps being lowered with possible damage to the cargo door or wing flaps when the cargo door is open. If operating with the cargo doors removed and the optional spoiler kit installed, check that the wing flap interrupt switch cover plate is installed so that the wing flaps can be lowered in flight.

#### ③ RIGHT WING Trailing Edge

1. Aileron -- CHECK freedom of movement and security.

#### ④ RIGHT WING

1. Wing Tie-Down -- DISCONNECT.
2. Fuel Tank Vent -- CHECK for stoppage.

3. Main Wheel Tire -- CHECK for proper inflation.
4. Before first flight of the day and after each refueling, use sampler cup and drain small quantity of fuel from fuel tank sump quick-drain valve to check for water, sediment, and proper fuel grade.
5. Fuel Quantity -- CHECK VISUALLY for desired level.
6. Fuel Filler Cap -- SECURE and vent unobstructed.

## **⑤ NOSE**

1. Static Source Opening (both sides of fuselage) -- CHECK for stoppage.
2. Propeller and Spinner -- CHECK for nicks, security and oil leaks.
3. Air Inlets -- CHECK, engine induction air (left) and heater air (right) for restrictions.
4. Landing and Taxi Lights -- CHECK for condition and cleanliness.
5. Nose Wheel Strut and Tire -- CHECK for proper inflation.
6. Nose Tie-Down -- DISCONNECT.
7. Engine Oil Level -- CHECK, do not operate with less than nine quarts. Fill to twelve quarts for extended flight.
8. Before first flight of the day and after each refueling, pull out strainer drain knob for about four seconds to clear fuel strainer of possible water and sediment. Check strainer drain closed. If water is observed, the fuel system may contain additional water, and further draining of the system at the strainer, fuel tank sumps and reservoirs will be necessary.

## **⑥ LEFT WING**

1. Main Wheel Tire -- CHECK for proper inflation.
2. Before first flight of the day and after each refueling, use sampler cup and drain small quantity of fuel from fuel tank sump quick-drain valve to check for water, sediment and proper fuel grade.
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 momentarily turned on (horn should sound when vane is pushed upward).
3. Wing Tie-Down -- DISCONNECT..
4. Fuel Tank Vent -- CHECK for stoppage.

## **⑧ LEFT WING Trailing Edge**

1. Aileron -- CHECK freedom of movement and security.

## BEFORE STARTING ENGINE

1. Preflight Inspection -- COMPLETE.
2. Seats, Belts, Shoulder Harnesses -- ADJUST and LOCK.
3. Brakes -- TEST and SET.
4. Cowl Flaps -- OPEN (move lever out of locking hole to reposition).
5. Avionics Power Switch, Electrical Equipment and Autopilot (if installed) -- OFF.

### CAUTION

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

6. Master Switch -- ON.
7. Circuit Breakers -- CHECK IN.
8. Fuel Selector Valve -- FULLER TANK.

## STARTING ENGINE

1. Mixture -- RICH.
2. Propeller -- HIGH RPM.
3. Throttle -- CLOSED.
4. Auxiliary Fuel Pump -- ON.
5. Throttle -- ADVANCE to obtain 8-10 gal/hr fuel flow, then return to CLOSED position.
6. Auxiliary Fuel Pump -- OFF as throttle is retarded.
7. Propeller Area -- CLEAR.
8. Ignition Switch -- START.
9. Throttle -- ADVANCE slowly.
10. 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 3 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.

11. Throttle -- IDLE.
12. Oil Pressure -- CHECK.

## **BEFORE TAKEOFF**

1. Parking Brake -- SET.
2. Cabin Doors and Window -- CLOSED and LOCKED.
3. Cowl Flaps -- OPEN.
4. Flight Controls -- FREE and CORRECT.
5. Flight Instruments -- CHECK.
6. Fuel Selector Valve -- FULLER TANK.
7. Mixture -- RICH.
8. Elevator and Rudder Trim -- TAKEOFF setting.
9. 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. Engine Instruments and Ammeter -- CHECK.
  - d. Suction Gage -- CHECK (4.6 to 5.4 In. Hg.).
10. Avionics Power Switch -- ON.
11. Radios -- SET.
12. Autopilot (if installed) -- OFF.
13. Flashing Beacon, Navigation Lights and/or Strobe Lights -- ON as required.
14. Throttle Friction Lock -- ADJUST.
15. Parking Brake -- RELEASE.

## **TAKEOFF**

### **NORMAL TAKEOFF**

1. Wing Flaps -- 0°- 20°.
2. Power -- 36.5 INCHES HG and 2700 RPM.
3. Mixture -- ADJUST to 31 gal/hr fuel flow.
4. Elevator Control -- LIFT NOSE WHEEL at 50 KIAS.
5. Climb Speed -- 70-80 KIAS.
6. Wing Flaps -- RETRACT after obstacles are cleared.

### **SHORT FIELD TAKEOFF**

1. Wing Flaps -- 20°.
2. Brakes -- APPLY.
3. Power -- 36.5 INCHES HG and 2700 RPM.
4. Mixture -- ADJUST to 31 gal/hr fuel flow.
5. Brakes -- RELEASE.
6. Elevator Control -- SLIGHTLY TAIL-LOW ATTITUDE.
7. Climb Speed -- 68 KIAS until all obstacles are cleared.



8. Wing Flaps -- RETRACT after obstacles are cleared and 85 KIAS is reached.

**NOTE**

Do not reduce power until wing flaps have been retracted.

## **ENROUTE CLIMB**

### **NORMAL CLIMB**

1. Airspeed -- 95-105 KIAS.
2. Power -- 30 INCHES Hg and 2500 RPM.
3. Mixture -- LEAN to 20 gal/hr.

**NOTE**

On hot days, it may be necessary to utilize the auxiliary fuel pump to maintain 20 gal/hr fuel flow.

4. Cowl Flaps -- OPEN as required.

**NOTE**

On hot days, turn on auxiliary fuel pump momentarily if switching tanks in climb.

### **MAXIMUM PERFORMANCE CLIMB**

1. Airspeed -- 88 KIAS.
2. Power -- 35 INCHES Hg and 2600 RPM.
3. Mixture -- ADJUST to 27 gal /hr fuel flow.

**NOTE**

See power and fuel flow placard for maximum continuous power manifold pressure and fuel flow above 17,000 feet. Refer to Section 5 for airspeed above 17,000 feet.

**NOTE**

On hot days at higher altitudes, be alert for fuel vapor indications. If fuel flow fluctuations are observed or if desired fuel flows cannot be maintained, turn the auxiliary fuel pump ON and reset the mixture as required.

4. Cowl Flaps -- FULL OPEN.

**NOTE**

On hot days, turn on auxiliary fuel pump momentarily if switching tanks in climb.

## **CRUISE**

1. Power -- 15-30 INCHES Hg, 2200-2500 RPM.
2. Mixture -- LEAN for cruise fuel flow as determined from your Cessna Power Computer, or in accordance with the Cruise data in Section 5.

**NOTE**

In hot weather at high altitudes, be alert for fuel vapor indications. If fuel flow fluctuations are observed, place the auxiliary fuel pump switch in the ON position and reset the mixture control as desired. The auxiliary fuel pump should be turned off when fuel flows will remain steady.

3. Elevator and Rudder Trim -- ADJUST.
4. Cowl Flaps -- AS REQUIRED.

## **DESCENT**

1. Power -- AS DESIRED.
2. Auxiliary Fuel Pump -- OFF.
3. Mixture -- LEAN for smoothness in power descents. Use full rich mixture for idle power.
4. Cowl Flaps -- CLOSED.

## **BEFORE LANDING**

1. Fuel Selector Valve -- FULLER TANK.
2. Auxiliary Fuel Pump -- OFF.
3. Mixture -- RICH.
4. Propeller -- HIGH RPM.
5. Autopilot (if installed) -- OFF.

## LANDING

### NORMAL LANDING

1. Airspeed -- 75-85 KIAS (flaps UP).
2. Wing Flaps -- AS DESIRED (0°- 10° below 140 KIAS, 10°- 40° below 100 KIAS).
3. Airspeed -- 65-75 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. Airspeed -- 75-85 KIAS (flaps UP).
2. Wing Flaps -- 40° (below 100 KIAS).
3. Airspeed -- MAINTAIN 64 KIAS.
4. Elevator Trim -- ADJUST.
5. Power -- REDUCE TO IDLE as obstacle is cleared.
6. Touchdown -- MAIN WHEELS FIRST.
7. Brakes -- APPLY HEAVILY.
8. Wing Flaps -- RETRACT for maximum brake effectiveness.

### BALKED LANDING

1. Power -- 36.5 INCHES Hg and 2700 RPM.
2. Wing Flaps -- RETRACT to 20°.
3. Airspeed -- 80 KIAS.
4. Wing Flaps -- RETRACT slowly.
5. Cowl Flaps -- OPEN.

## AFTER LANDING

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

## SECURING AIRPLANE

1. Parking Brake -- SET.
2. Avionics Power Switch, Electrical Equipment -- OFF.
3. Mixture -- IDLE CUT-OFF (pull full out).
4. Ignition Switch -- OFF.
5. Master Switch -- OFF.
6. Control Lock -- INSTALL.



## AMPLIFIED PROCEDURES

### STARTING ENGINE

Proper fuel management and throttle adjustments are the determining factors in securing an easy start from your turbocharged continuous-flow fuel-injection engine. The procedure outlined in this section 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 8-10 gal/hr fuel flow. Then close the throttle 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 on BOTH and you are ready to engage the starter, place the right half of the auxiliary fuel pump switch ON until the indicated fuel flow comes up to 4 to 6 gal/hr; 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 auxiliary fuel pump to operate in the ON position for up to 1 minute or more before the vapor is cleared sufficiently to obtain 4 to 6 gal/hr 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 HI boost 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.

## **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.

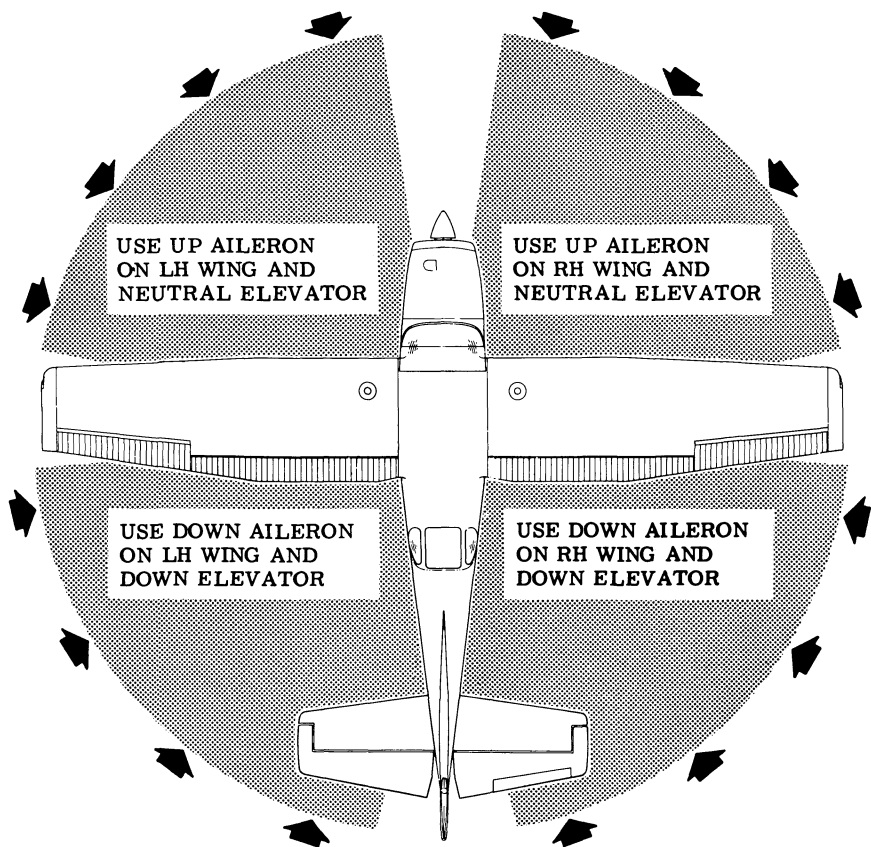
## **BEFORE TAKEOFF**

### **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.



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

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 voltage regulator 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 its original position if the alternator and voltage regulator are operating properly.

## **TAKEOFF**

### **POWER CHECK**

It is important to check takeoff power early in the takeoff run. 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.

On the first flight of the day when the throttle is advanced for takeoff, manifold pressure will normally exceed 36.5 inches Hg and fuel flows will exceed 31 gal/hr if the throttle is opened fully. On any takeoff, the manifold pressure should be monitored and the throttle set to provide 36.5 inches Hg; then, for maximum engine power, the mixture should be adjusted during the initial takeoff roll to 31 gal/hr fuel flow.

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.

## **WING FLAP SETTINGS**

Using 20° wing flaps reduces the ground run and total distance over the obstacle by approximately 10 percent. Soft field takeoffs are performed with 20° 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.



If 20° wing flaps are used for takeoff, they should be left down until all obstacles are cleared. To clear an obstacle with 20° flaps, a 68 KIAS climb speed should be used. If no obstructions are ahead, a best rate-of-climb speed of 88 KIAS would be most efficient. Flap deflections greater than 20° are not approved for takeoff.

## 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 deflected partially into the wind, the airplane is accelerated to a speed slightly 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.

## ENROUTE CLIMB

Power settings for climb must be limited to 35 inches of manifold pressure and 2600 RPM up to 17,000 feet with decreasing manifold pressure above 17,000 feet as noted on the maximum power placard.

A cruising climb at 30 inches of manifold pressure, 2500 RPM, 20 gal/hr fuel flow, and 95 to 105 KIAS is recommended to provide an optimum combination of performance, visibility ahead, engine cooling, economy and passenger comfort (due to lower noise level).

### NOTE

During warm weather, if there is an indication of vapor in the fuel system (fluctuating fuel flow), or if the desired fuel flow cannot be maintained with the mixture control in the full rich position, turn on the auxiliary fuel pump and reset the mixture as required until cruising altitude has been obtained and the system is purged (usually 5 to 15 minutes after establishing cruising flight). The auxiliary fuel pump should be turned off when the fuel flow will remain steady.

If it is necessary to climb rapidly to clear mountains or reach favorable winds at high altitudes, the best rate-of-climb speed should be used with maximum continuous power. This speed is 88 KIAS from sea level to 17,000 feet, decreasing to 86 KIAS at 24,000 feet.

If an obstruction dictates the use of a steep climb angle, climb with

flaps retracted and maximum continuous power at 55 KIAS at sea level to 61 KIAS at 10,000 feet.

CRUISE

Normal cruising is performed between 60% and 80% of the maximum continous power rating. The power settings and corresponding 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 70% to 80% 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 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.

| ALTITUDE            | 80% POWER |      | 70% POWER |      | 60% POWER |      |
|---------------------|-----------|------|-----------|------|-----------|------|
|                     | KTAS      | NMPG | KTAS      | NMPG | KTAS      | NMPG |
| 5000 Feet           | 145       | 8.3  | 137       | 9.0  | 128       | 9.7  |
| 10,000 Feet         | 152       | 8.7  | 144       | 9.4  | 133       | 10.1 |
| 15,000 Feet         | 159       | 9.1  | 150       | 9.8  | 138       | 10.4 |
| 20,000 Feet         | 167       | 9.5  | 156       | 10.2 | 142       | 10.8 |
| Standard Conditions |           |      |           |      | Zero Wind |      |

Figure 4-3. Cruise Performance Table

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 70% power or less, the engine may be operated at one gallon per hour leaner than shown in this handbook and on the power computer. This will result in approximately 5% greater range than shown in this handbook accompanied by approximately a 4 knot 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 door opens automatically for the most efficient use of either normal or alternate air, depending on the amount of filter blockage. Due to the lower intake pressure available through the alternate air door or a partially blocked filter, manifold pressure can decrease up to 10 in. Hg from a cruise power setting. This manifold pressure should be recovered by increased throttle setting or higher RPM as necessary to maintain the desired power. Maximum continuous allowable manifold pressure (35 in. Hg) is available up to 14,000 feet under hot day conditions using the alternate air source with a fully blocked filter.

**LEANING WITH A CESSNA ECONOMY MIXTURE INDICATOR (EGT)**

Exhaust gas temperature (EGT) as shown on the optional Cessna Economy Mixture Indicator may be used as an aid for mixture leaning in cruising flight at 80% power or less. To adjust the mixture, using this indicator, lean to establish the peak EGT as a reference point and then enrichen the mixture by a desired increment based on data in figure 4-4.

| MIXTURE DESCRIPTION                                                 | EXHAUST GAS TEMPERATURE |
|---------------------------------------------------------------------|-------------------------|
| RECOMMENDED LEAN<br>(Pilot's Operating Handbook and Power Computer) | 50°F Rich of Peak EGT   |
| BEST ECONOMY<br>(70% Power or Less)                                 | Peak EGT                |

Figure 4-4. EGT Table

Continuous operation at peak EGT is authorized only at 70% power or less. This best economy mixture setting results in approximately 5% greater range than shown in this handbook accompanied by approximately a 4 knot 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.

## 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.

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

## DESCENT

Descent should be initiated far enough in advance of estimated landing to allow a gradual rate of descent at cruising speed. Just prior to beginning the descent, check that the auxiliary fuel pump has been turned off. Descent should be at approximately 500 FPM for passenger comfort, using enough power to keep the engine warm. The optimum engine RPM in a let-down is usually the lowest RPM in the green arc range that will allow cylinder head temperature to remain in the recommended operating range.

The airplane is equipped with a specially marked altimeter to attract the pilot's attention and prevent misreading the altimeter. A striped warning segment on the face of the altimeter is exposed at all altitudes below 10,000 feet to indicate low altitude.

## LANDINGS

Landings should be made on the main wheels first to reduce the

landing speed and subsequent need for braking in the landing roll. The nose wheel is lowered to the runway after the speed has diminished to avoid unnecessary nose gear load. This procedure is especially important in rough field landings.

## **SHORT FIELD LANDING**

For short field landings, make a power approach at 64 KIAS with full flaps. After all approach obstacles are cleared, progressively reduce power. Maintain 64 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 bailed landing (go-around) climb, the wing flap setting should be reduced to 20° immediately after full power is applied. After all obstacles are cleared and a safe altitude and airspeed are obtained, the wing flaps should be retracted.

## **COLD WEATHER OPERATION**

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 and turbine waste gate controller, 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 7, paragraph Ground Service Plug Receptacle, for 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.

**NOTE**

The waste gate controller will not respond quickly to variations in manifold pressure when oil temperature is near the lower limit of the green arc. Therefore, under these conditions, throttle motion should be made slowly and care should be exercised to prevent exceeding the 36.5 inches Hg manifold pressure limit. In addition, the fuel flow indications may exceed 31 gal/hr on takeoff if the mixture isn't leaned to compensate.

The Turbo-System engine installation has been designed such that a winterization kit is not required. With the cowl flaps fully closed, engine temperature will be normal (in the green arc range) in outside air temperature as low as 20° to 30°C below standard. When colder surface temperatures are encountered, the normal air temperature inversion will result in warmer temperatures at cruise altitudes above 5000 feet.

If low altitude cruise in very cold temperature results in engine temperature below the green arc, increasing cruise altitude or cruise power will increase engine temperature into the green arc. Cylinder head temperatures will increase approximately 50°F as cruise altitudes increase from 5000 feet to 24,000 feet.

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

## **HOT WEATHER OPERATION**

The general warm temperature starting information in this section is appropriate. Avoid prolonged engine operation on the ground.

## **FLIGHT WITH CARGO DOORS REMOVED**

When operating with the cargo doors removed, an optional spoiler kit must be installed to minimize strong air flow buffeting within the cabin. In

addition, all loose equipment, including head rests, rear window sun shade, removable arm rests, safety belts, etc., should be removed or secured. Fifth and sixth seat passengers will receive a strong air blast, and face protection in the form of goggles or helmet is recommended.

The electric wing flap circuit is interrupted by a push-button switch (mounted on the upper sill of the cargo door opening) when the front cargo door is open or removed. Therefore, to have the use of wing flaps when the cargo doors are removed, it is necessary to install a switch depressor plate over the door switch button. Two screws secure the plate in position, depressing the switch button. Without this plate, the wing flaps could not be used unless a rear passenger was available to manually depress the door switch button during flap operation.

With the cargo doors removed, flight characteristics are essentially unchanged, except that a slightly different directional trim setting may be needed. With cargo doors removed, do not exceed 130 KIAS.

## NOISE ABATEMENT

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.

**SECTION 4**  
**NORMAL PROCEDURES**

**CESSNA**  
**MODEL TU206G**

The certificated noise level for the Model TU206G at 3600 pounds maximum weight is 75.4 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

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## 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 based on 45% 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 | 3550 Pounds |
| Usable fuel    | 76 Gallons  |

TAKEOFF CONDITIONS

|                             |                            |
|-----------------------------|----------------------------|
| Field pressure altitude     | 3500 Feet                  |
| Temperature                 | 24°C (16°C above standard) |
| Wind component along runway | 12 Knot Headwind           |
| Field length                | 4000 Feet                  |

CRUISE CONDITIONS

|                       |                    |
|-----------------------|--------------------|
| Total distance        | 530 Nautical Miles |
| Pressure altitude     | 11,500 Feet        |
| Temperature           | 8°C                |
| Expected wind enroute | 10 Knot Headwind   |

LANDING CONDITIONS

|                         |           |
|-------------------------|-----------|
| Field pressure altitude | 3000 Feet |
| Temperature             | 25°C      |
| Field length            | 3000 Feet |

TAKEOFF

The takeoff distance chart, figure 5-4, 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 3600 pounds, pressure altitude of 4000 feet and a temperature of 30°C should be used and results in the following:

|                                            |           |
|--------------------------------------------|-----------|
| Ground roll                                | 1225 Feet |
| Total distance to clear a 50-foot obstacle | 2390 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 2 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                                   | 1225       |
| Decrease in ground roll<br>(1225 feet × 12%)             | <u>147</u> |
| Corrected ground roll                                    | 1078 Feet  |
| Total distance to clear a<br>50-foot obstacle, zero wind | 2390       |
| Decrease in total distance<br>(2390 feet × 12%)          | <u>287</u> |
| Corrected total distance<br>to clear a 50-foot obstacle  | 2103 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 5-7, the range profile chart presented in figure 5-8, and the endurance profile chart presented in figure 5-9.

The relationship between power and range is illustrated by the range profile chart. Considerable fuel savings and longer range result when lower power settings are used.

The range profile chart indicates that use of 70% power at 11,500 feet yields a predicted range of 596 nautical miles with no wind. The endurance profile chart shows a corresponding 4.2 hours. Using this information, the estimated distance can be determined for the expected 10 knot headwind at 11,500 feet as follows:

|                                                                 |                    |
|-----------------------------------------------------------------|--------------------|
| Range, zero wind                                                | 596                |
| Decrease in range due to wind<br>(4.2 hours × 10 knot headwind) | <u>42</u>          |
| Corrected range                                                 | 554 Nautical Miles |

This indicates that the trip can be made without a fuel stop using approximately 70% power.

The cruise performance chart for 12,000 feet pressure altitude is entered using 20°C above standard temperature. These values most nearly correspond to the planned altitude and expected temperature conditions.

**SECTION 5**  
**PERFORMANCE**

**CESSNA**  
**MODEL TU206G**

The power setting chosen is 2300 RPM and 30 inches of manifold pressure which results in the following:

|                  |           |
|------------------|-----------|
| Power            | 70%       |
| True airspeed    | 148 Knots |
| Cruise fuel flow | 15.2 GPH  |

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 5-6 and 5-7. For this sample problem, the time, fuel, and distance to climb may be determined from figure 5-6 for a normal climb using the data for 3600 pounds. The difference between the values shown in the table for 4000 feet and 12,000 feet results in the following:

|          |                   |
|----------|-------------------|
| Time     | 15 Minutes        |
| Fuel     | 4.8 Gallons       |
| Distance | 26 Nautical Miles |

The above 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 8°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:

$$\frac{16^{\circ}\text{C}}{8^{\circ}\text{C}} \times 10\% = 20\% \text{ Increase}$$

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

|                                                         |             |
|---------------------------------------------------------|-------------|
| Fuel to climb, standard temperature                     | 4.8         |
| Increase due to non-standard temperature<br>(4.8 × 20%) | 1.0         |
| Corrected fuel to climb                                 | 5.8 Gallons |

Using a similar procedure for the time and distance during a climb, the following results are obtained:

|                   |                   |
|-------------------|-------------------|
| Time to climb     | 18 Minutes        |
| Distance to climb | 31 Nautical Miles |

The distances shown on the climb chart are for zero wind. A correction for the effect of wind may be made as follows:

|                                                                |                   |
|----------------------------------------------------------------|-------------------|
| Distance with no wind                                          | 31                |
| Decrease in distance due to wind<br>(18/60 × 10 knot headwind) | <u>3</u>          |
| Corrected Distance to Climb                                    | 28 Nautical Miles |

The resultant cruise distance is:

|                 |                    |
|-----------------|--------------------|
| Total distance  | 530                |
| Climb distance  | <u>-28</u>         |
| Cruise distance | 502 Nautical Miles |

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

|            |
|------------|
| 148        |
| <u>-10</u> |
| 138 Knots  |

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

$$\frac{502 \text{ Nautical Miles}}{138 \text{ Knots}} = 3.6 \text{ Hours}$$

The fuel required for cruise is:

$$3.6 \text{ hours} \times 15.2 \text{ gallons/hour} = 54.7 \text{ Gallons}$$

The total estimated fuel required is as follows:

|                                 |              |
|---------------------------------|--------------|
| Engine start, taxi, and takeoff | 2.6          |
| Climb                           | 5.8          |
| Cruise                          | <u>54.7</u>  |
| Total fuel required             | 63.1 Gallons |

This will leave a fuel reserve of:

|              |
|--------------|
| 76.0         |
| <u>-63.1</u> |
| 12.9 Gallons |

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 5-10 presents landing distance information for the short field technique. The distances corresponding to 3000 feet pressure altitude and a temperature of 30°C are as follows:

|                                            |           |
|--------------------------------------------|-----------|
| Ground roll                                | 865 Feet  |
| Total distance to clear a 50-foot obstacle | 1580 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.



AIRSPEED CALIBRATION

NORMAL STATIC SOURCE

|           |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|-----------|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| FLAPS UP  |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
| KIAS      | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 |     |
| KCAS      | 70 | 76 | 83 | 92 | 101 | 111 | 120 | 130 | 139 | 149 | 159 | 169 | 179 |     |
| FLAPS 20° |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
| KIAS      | 50 | 60 | 70 | 80 | 90  | 100 | --- | --- | --- | --- | --- | --- | --- | --- |
| KCAS      | 60 | 66 | 73 | 81 | 91  | 101 | --- | --- | --- | --- | --- | --- | --- | --- |
| FLAPS 40° |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
| KIAS      | 50 | 60 | 70 | 80 | 90  | 100 | --- | --- | --- | --- | --- | --- | --- | --- |
| KCAS      | 59 | 65 | 73 | 82 | 91  | 102 | --- | --- | --- | --- | --- | --- | --- | --- |

ALTERNATE STATIC SOURCE  
VENTS AND WINDOWS CLOSED

|                |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
|----------------|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| FLAPS UP       |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
| NORMAL KIAS    | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 |     |
| ALTERNATE KIAS | 61 | 71 | 82 | 92 | 102 | 112 | 123 | 133 | 143 | 153 | 164 | 174 | 184 |     |
| FLAPS 20°      |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
| NORMAL KIAS    | 50 | 60 | 70 | 80 | 90  | 100 | --- | --- | --- | --- | --- | --- | --- | --- |
| ALTERNATE KIAS | 53 | 63 | 73 | 84 | 94  | 104 | --- | --- | --- | --- | --- | --- | --- | --- |
| FLAPS 40°      |    |    |    |    |     |     |     |     |     |     |     |     |     |     |
| NORMAL KIAS    | 50 | 60 | 70 | 80 | 90  | 100 | --- | --- | --- | --- | --- | --- | --- | --- |
| ALTERNATE KIAS | 50 | 61 | 71 | 81 | 91  | 101 | --- | --- | --- | --- | --- | --- | --- | --- |

Figure 5-1. Airspeed Calibration

TEMPERATURE CONVERSION CHART

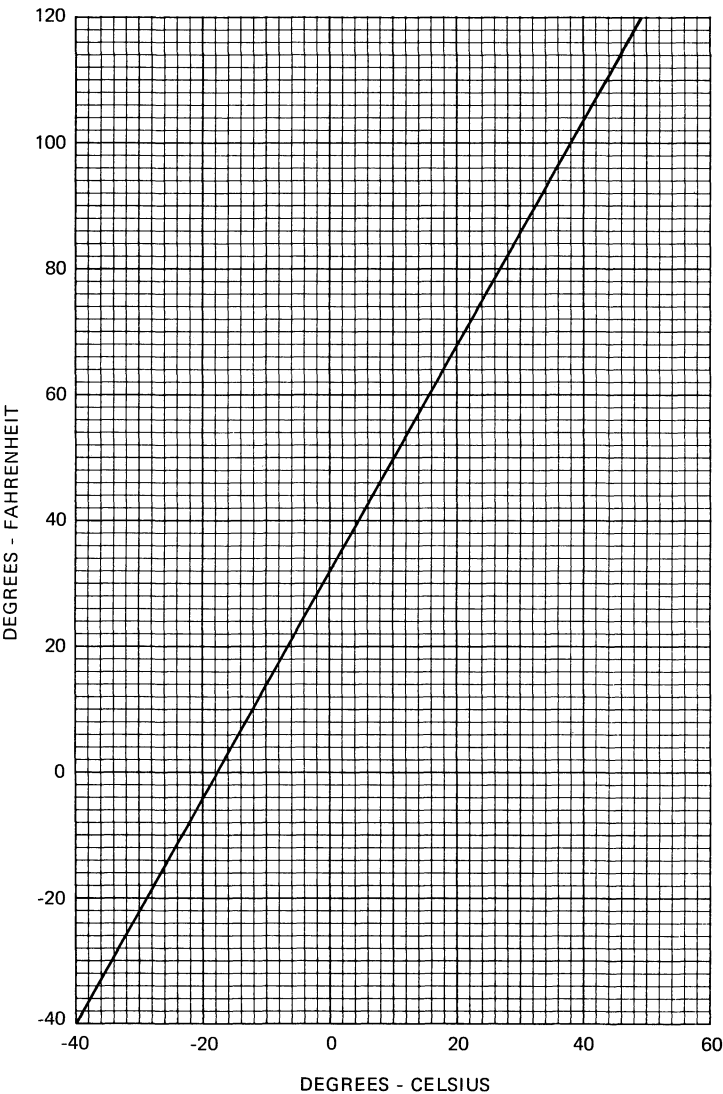


Figure 5-2. Temperature Conversion Chart

STALL SPEEDS

CONDITIONS:  
Power Off

- NOTES:
- 1. Maximum altitude loss during a stall recovery may be as much as 240 feet.
  - 2. KIAS values are approximate.

MOST REARWARD CENTER OF GRAVITY

| WEIGHT<br>LBS | FLAP<br>DEFLECTION | ANGLE OF BANK |      |      |      |      |      |      |      |
|---------------|--------------------|---------------|------|------|------|------|------|------|------|
|               |                    | 0°            |      | 30°  |      | 45°  |      | 60°  |      |
|               |                    | KIAS          | KCAS | KIAS | KCAS | KIAS | KCAS | KIAS | KCAS |
| 3600          | UP                 | 45            | 62   | 48   | 67   | 54   | 74   | 64   | 88   |
|               | 20°                | 43            | 57   | 46   | 61   | 51   | 68   | 61   | 81   |
|               | 40°                | 38            | 54   | 41   | 58   | 46   | 64   | 55   | 76   |

MOST FORWARD CENTER OF GRAVITY

| WEIGHT<br>LBS | FLAP<br>DEFLECTION | ANGLE OF BANK |      |      |      |      |      |      |      |
|---------------|--------------------|---------------|------|------|------|------|------|------|------|
|               |                    | 0°            |      | 30°  |      | 45°  |      | 60°  |      |
|               |                    | KIAS          | KCAS | KIAS | KCAS | KIAS | KCAS | KIAS | KCAS |
| 3600          | UP                 | 55            | 67   | 59   | 72   | 65   | 80   | 78   | 95   |
|               | 20°                | 50            | 60   | 54   | 65   | 59   | 71   | 71   | 85   |
|               | 40°                | 46            | 57   | 49   | 61   | 55   | 68   | 65   | 81   |

Figure 5-3. Stall Speeds

TAKEOFF DISTANCE  
MAXIMUM WEIGHT 3600 LBS

SHORT FIELD

CONDITIONS:

- Flaps 20°
- 2700 RPM, 36.5 inches Hg and Mixture Set at 31 GPH
- Prior to Brake Release
- Cowl Flaps Open
- Paved, Level, Dry Runway
- Zero Wind

NOTES:

- Short field technique as specified in Section 4.
- 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.
- For operation on a dry, grass runway, increase distances by 15% of the “ground roll” figure.

| WEIGHT<br>LBS | TAKEOFF<br>SPEED<br>KIAS |             | PRESS<br>ALT<br>FT | 0°C          |                                | 10°C         |                                | 20°C         |                                | 30°C         |                                | 40°C         |                                |
|---------------|--------------------------|-------------|--------------------|--------------|--------------------------------|--------------|--------------------------------|--------------|--------------------------------|--------------|--------------------------------|--------------|--------------------------------|
|               | LIFT<br>OFF              | AT<br>50 FT |                    | GRND<br>ROLL | TOTAL<br>TO CLEAR<br>50 FT OBS | GRND<br>ROLL | TOTAL<br>TO CLEAR<br>50 FT OBS | GRND<br>ROLL | TOTAL<br>TO CLEAR<br>50 FT OBS | GRND<br>ROLL | TOTAL<br>TO CLEAR<br>50 FT OBS | GRND<br>ROLL | TOTAL<br>TO CLEAR<br>50 FT OBS |
| 3600          | 55                       | 68          | S.L.               | 735          | 1440                           | 800          | 1570                           | 870          | 1715                           | 950          | 1875                           | 1035         | 2060                           |
|               |                          |             | 1000               | 780          | 1520                           | 850          | 1660                           | 930          | 1815                           | 1010         | 1990                           | 1105         | 2190                           |
|               |                          |             | 2000               | 830          | 1610                           | 905          | 1760                           | 990          | 1925                           | 1075         | 2115                           | 1175         | 2325                           |
|               |                          |             | 3000               | 885          | 1705                           | 965          | 1865                           | 1055         | 2045                           | 1150         | 2245                           | 1255         | 2475                           |
|               |                          |             | 4000               | 945          | 1810                           | 1030         | 1980                           | 1125         | 2175                           | 1225         | 2390                           | 1340         | 2640                           |
|               |                          |             | 5000               | 1005         | 1920                           | 1100         | 2105                           | 1200         | 2310                           | 1310         | 2545                           | 1430         | 2815                           |
|               |                          |             | 6000               | 1075         | 2040                           | 1170         | 2235                           | 1280         | 2460                           | 1400         | 2715                           | 1530         | 3005                           |
|               |                          |             | 7000               | 1145         | 2170                           | 1250         | 2380                           | 1370         | 2620                           | 1495         | 2895                           | 1635         | 3210                           |
|               |                          |             | 8000               | 1225         | 2305                           | 1340         | 2535                           | 1465         | 2795                           | 1600         | 3095                           | 1755         | 3440                           |

Figure 5-4. Takeoff Distance (Sheet 1 of 2)

# TAKEOFF DISTANCE

## 3300 LBS AND 3000 LBS

### SHORT FIELD

REFER TO SHEET 1 FOR APPROPRIATE CONDITIONS AND NOTES.

| WEIGHT<br>LBS | TAKEOFF<br>SPEED<br>KIAS |             | PRESS<br>ALT<br>FT | 0°C          |                                | 10°C         |                                | 20°C         |                                | 30°C         |                                | 40°C         |                                |
|---------------|--------------------------|-------------|--------------------|--------------|--------------------------------|--------------|--------------------------------|--------------|--------------------------------|--------------|--------------------------------|--------------|--------------------------------|
|               | LIFT<br>OFF              | AT<br>50 FT |                    | GRND<br>ROLL | TOTAL<br>TO CLEAR<br>50 FT OBS | GRND<br>ROLL | TOTAL<br>TO CLEAR<br>50 FT OBS | GRND<br>ROLL | TOTAL<br>TO CLEAR<br>50 FT OBS | GRND<br>ROLL | TOTAL<br>TO CLEAR<br>50 FT OBS | GRND<br>ROLL | TOTAL<br>TO CLEAR<br>50 FT OBS |
| 3300          | 53                       | 65          | S.L.               | 600          | 1180                           | 655          | 1280                           | 710          | 1395                           | 775          | 1520                           | 840          | 1665                           |
|               |                          |             | 1000               | 640          | 1245                           | 695          | 1355                           | 755          | 1475                           | 825          | 1610                           | 895          | 1765                           |
|               |                          |             | 2000               | 680          | 1315                           | 740          | 1435                           | 805          | 1565                           | 875          | 1710                           | 955          | 1870                           |
|               |                          |             | 3000               | 725          | 1390                           | 790          | 1515                           | 860          | 1655                           | 935          | 1810                           | 1020         | 1990                           |
|               |                          |             | 4000               | 770          | 1475                           | 840          | 1610                           | 915          | 1755                           | 995          | 1925                           | 1085         | 2115                           |
|               |                          |             | 5000               | 820          | 1560                           | 895          | 1705                           | 975          | 1865                           | 1065         | 2045                           | 1160         | 2250                           |
|               |                          |             | 6000               | 875          | 1655                           | 955          | 1810                           | 1040         | 1980                           | 1135         | 2175                           | 1240         | 2395                           |
|               |                          |             | 7000               | 935          | 1760                           | 1020         | 1925                           | 1115         | 2110                           | 1215         | 2315                           | 1325         | 2555                           |
|               |                          |             | 8000               | 1000         | 1870                           | 1090         | 2045                           | 1190         | 2245                           | 1300         | 2470                           | 1420         | 2725                           |
|               |                          |             | S.L.               | 485          | 955                            | 525          | 1035                           | 570          | 1125                           | 620          | 1220                           | 675          | 1330                           |
| 3000          | 50                       | 62          | 1000               | 515          | 1005                           | 560          | 1090                           | 605          | 1185                           | 660          | 1290                           | 720          | 1410                           |
|               |                          |             | 2000               | 545          | 1060                           | 595          | 1155                           | 645          | 1255                           | 705          | 1365                           | 765          | 1490                           |
|               |                          |             | 3000               | 580          | 1125                           | 635          | 1220                           | 690          | 1330                           | 750          | 1450                           | 815          | 1580                           |
|               |                          |             | 4000               | 620          | 1185                           | 675          | 1290                           | 735          | 1405                           | 800          | 1535                           | 870          | 1680                           |
|               |                          |             | 5000               | 660          | 1255                           | 720          | 1370                           | 780          | 1490                           | 850          | 1630                           | 930          | 1785                           |
|               |                          |             | 6000               | 705          | 1330                           | 765          | 1450                           | 835          | 1585                           | 910          | 1730                           | 990          | 1895                           |
|               |                          |             | 7000               | 750          | 1410                           | 820          | 1540                           | 890          | 1680                           | 970          | 1840                           | 1060         | 2020                           |
|               |                          |             | 8000               | 800          | 1500                           | 875          | 1635                           | 950          | 1785                           | 1040         | 1955                           | 1135         | 2150                           |

Figure 5-4. Takeoff Distance (Sheet 2 of 2)

RATE OF CLIMB

MAXIMUM

CONDITIONS:  
Flaps Up  
2600 RPM  
Cowl Flaps Open

| PRESS ALT      | MP | GPH |
|----------------|----|-----|
| S.L. to 17,000 | 35 | 27  |
| 18,000         | 34 | 26  |
| 20,000         | 32 | 24  |
| 22,000         | 30 | 22  |
| 24,000         | 28 | 20  |

| WEIGHT<br>LBS | PRESS<br>ALT<br>FT | CLIMB<br>SPEED<br>KIAS | RATE OF CLIMB - FPM |      |      |      |
|---------------|--------------------|------------------------|---------------------|------|------|------|
|               |                    |                        | -20°C               | 0°C  | 20°C | 40°C |
| 3600          | S.L.               | 88                     | 1260                | 1120 | 975  | 820  |
|               | 4000               | 88                     | 1165                | 1015 | 865  | 715  |
|               | 8000               | 88                     | 1055                | 905  | 755  | 600  |
|               | 12,000             | 88                     | 940                 | 790  | 645  | ---  |
|               | 16,000             | 88                     | 805                 | 665  | 530  | ---  |
|               | 20,000             | 87                     | 535                 | 405  | ---  | ---  |
|               | 24,000             | 86                     | 220                 | 90   | ---  | ---  |
| 3300          | S.L.               | 86                     | 1430                | 1280 | 1130 | 975  |
|               | 4000               | 86                     | 1330                | 1175 | 1020 | 860  |
|               | 8000               | 86                     | 1220                | 1065 | 905  | 745  |
|               | 12,000             | 86                     | 1100                | 950  | 795  | ---  |
|               | 16,000             | 86                     | 965                 | 820  | 680  | ---  |
|               | 20,000             | 85                     | 680                 | 545  | ---  | ---  |
|               | 24,000             | 84                     | 345                 | 215  | ---  | ---  |
| 3000          | S.L.               | 84                     | 1635                | 1475 | 1315 | 1150 |
|               | 4000               | 84                     | 1515                | 1355 | 1190 | 1020 |
|               | 8000               | 84                     | 1410                | 1245 | 1080 | 910  |
|               | 12,000             | 84                     | 1290                | 1130 | 965  | ---  |
|               | 16,000             | 84                     | 1145                | 995  | 840  | ---  |
|               | 20,000             | 84                     | 840                 | 705  | ---  | ---  |
|               | 24,000             | 83                     | 490                 | 355  | ---  | ---  |

Figure 5-5. Rate of Climb

TIME, FUEL, AND DISTANCE TO CLIMB

MAXIMUM RATE OF CLIMB

CONDITIONS:  
Flaps Up  
2600 RPM  
Cowl Flaps Open  
Standard Temperature

| PRESS ALT      | MP | GPH |
|----------------|----|-----|
| S.L. to 17,000 | 35 | 27  |
| 18,000         | 34 | 26  |
| 20,000         | 32 | 24  |
| 22,000         | 30 | 22  |
| 24,000         | 28 | 20  |

- NOTES:
1. Add 2.6 gallons 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<br>LBS | PRESS<br>ALT<br>FT | CLIMB<br>SPEED<br>KIAS | RATE OF<br>CLIMB<br>FPM | FROM SEA LEVEL |                      |                |
|---------------|--------------------|------------------------|-------------------------|----------------|----------------------|----------------|
|               |                    |                        |                         | TIME<br>MIN    | FUEL USED<br>GALLONS | DISTANCE<br>NM |
| 3600          | S.L.               | 88                     | 1010                    | 0              | 0                    | 0              |
|               | 4000               | 88                     | 960                     | 4              | 1.8                  | 6              |
|               | 8000               | 88                     | 910                     | 8              | 3.8                  | 13             |
|               | 12,000             | 88                     | 860                     | 13             | 5.8                  | 21             |
|               | 16,000             | 88                     | 785                     | 18             | 8.0                  | 30             |
|               | 20,000             | 87                     | 565                     | 24             | 10.5                 | 42             |
|               | 24,000             | 86                     | 300                     | 33             | 14.1                 | 63             |
| 3300          | S.L.               | 86                     | 1170                    | 0              | 0                    | 0              |
|               | 4000               | 86                     | 1120                    | 4              | 1.6                  | 5              |
|               | 8000               | 86                     | 1070                    | 7              | 3.2                  | 11             |
|               | 12,000             | 86                     | 1005                    | 11             | 5.0                  | 18             |
|               | 16,000             | 86                     | 945                     | 15             | 6.8                  | 25             |
|               | 20,000             | 85                     | 710                     | 20             | 8.9                  | 35             |
|               | 24,000             | 84                     | 430                     | 27             | 11.5                 | 50             |
| 3000          | S.L.               | 84                     | 1355                    | 0              | 0                    | 0              |
|               | 4000               | 84                     | 1305                    | 3              | 1.4                  | 4              |
|               | 8000               | 84                     | 1255                    | 6              | 2.8                  | 9              |
|               | 12,000             | 84                     | 1200                    | 9              | 4.2                  | 15             |
|               | 16,000             | 84                     | 1120                    | 13             | 5.8                  | 21             |
|               | 20,000             | 84                     | 875                     | 17             | 7.5                  | 29             |
|               | 24,000             | 83                     | 570                     | 23             | 9.6                  | 40             |

Figure 5-6. Time, Fuel, and Distance to Climb (Sheet 1 of 2)

TIME, FUEL, AND DISTANCE TO CLIMB

NORMAL CLIMB - 95 KIAS

CONDITIONS:  
Flaps Up  
2500 RPM  
30 Inches Hg  
20 GPH Fuel Flow  
Cowl Flaps Open  
Standard Temperature

- NOTES:
- 1. Add 2.6 gallons of fuel for engine start, taxi and takeoff allowance.
  - 2. Increase time, fuel and distance by 10% for each 8°C above standard temperature.
  - 3. Distances shown are based on zero wind.

| WEIGHT<br>LBS | PRESS<br>ALT<br>FT | RATE OF<br>CLIMB<br>FPM | FROM SEA LEVEL |                      |                |
|---------------|--------------------|-------------------------|----------------|----------------------|----------------|
|               |                    |                         | TIME<br>MIN    | FUEL USED<br>GALLONS | DISTANCE<br>NM |
| 3600          | S.L.               | 650                     | 0              | 0                    | 0              |
|               | 4000               | 610                     | 6              | 2.1                  | 11             |
|               | 8000               | 560                     | 13             | 4.4                  | 23             |
|               | 12,000             | 515                     | 21             | 6.9                  | 37             |
|               | 16,000             | 460                     | 29             | 9.6                  | 53             |
|               | 20,000             | 400                     | 38             | 12.8                 | 73             |
| 3300          | S.L.               | 770                     | 0              | 0                    | 0              |
|               | 4000               | 730                     | 5              | 1.8                  | 9              |
|               | 8000               | 685                     | 11             | 3.7                  | 19             |
|               | 12,000             | 635                     | 17             | 5.7                  | 30             |
|               | 16,000             | 585                     | 24             | 7.9                  | 43             |
|               | 20,000             | 520                     | 31             | 10.3                 | 59             |
| 3000          | S.L.               | 910                     | 0              | 0                    | 0              |
|               | 4000               | 870                     | 4              | 1.5                  | 7              |
|               | 8000               | 825                     | 9              | 3.1                  | 16             |
|               | 12,000             | 775                     | 14             | 4.8                  | 25             |
|               | 16,000             | 725                     | 20             | 6.5                  | 36             |
|               | 20,000             | 660                     | 25             | 8.5                  | 48             |

Figure 5-6. Time, Fuel, and Distance to Climb (Sheet 2 of 2)



**CRUISE PERFORMANCE**  
**PRESSURE ALTITUDE 2000 FEET**

CONDITIONS:  
3600 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

**NOTE**  
For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

|      |    | 20°C BELOW<br>STANDARD TEMP<br>-9°C |      |      | STANDARD<br>TEMPERATURE<br>11°C |      |      | 20°C ABOVE<br>STANDARD TEMP<br>31°C |      |      |
|------|----|-------------------------------------|------|------|---------------------------------|------|------|-------------------------------------|------|------|
| RPM  | MP | %<br>BHP                            | KTAS | GPH  | %<br>BHP                        | KTAS | GPH  | %<br>BHP                            | KTAS | GPH  |
| 2500 | 30 | ---                                 | ---  | ---  | 80                              | 142  | 17.5 | 75                                  | 141  | 16.5 |
|      | 28 | 78                                  | 137  | 17.0 | 74                              | 137  | 16.1 | 69                                  | 136  | 15.1 |
|      | 26 | 71                                  | 132  | 15.6 | 67                              | 132  | 14.7 | 63                                  | 130  | 13.8 |
|      | 24 | 64                                  | 126  | 14.1 | 60                              | 126  | 13.3 | 57                                  | 124  | 12.6 |
|      | 22 | 57                                  | 119  | 12.5 | 53                              | 118  | 11.9 | 50                                  | 116  | 11.3 |
| 2400 | 30 | 80                                  | 138  | 17.5 | 76                              | 138  | 16.5 | 71                                  | 137  | 15.5 |
|      | 28 | 74                                  | 134  | 16.1 | 69                              | 133  | 15.2 | 65                                  | 132  | 14.3 |
|      | 26 | 67                                  | 129  | 14.6 | 63                              | 128  | 13.8 | 59                                  | 126  | 13.1 |
|      | 24 | 60                                  | 123  | 13.3 | 57                              | 122  | 12.6 | 53                                  | 120  | 11.9 |
|      | 22 | 54                                  | 117  | 12.0 | 51                              | 115  | 11.4 | 48                                  | 112  | 10.8 |
| 2300 | 30 | 76                                  | 135  | 16.6 | 71                              | 135  | 15.6 | 67                                  | 134  | 14.7 |
|      | 28 | 70                                  | 131  | 15.4 | 66                              | 131  | 14.5 | 62                                  | 130  | 13.7 |
|      | 26 | 64                                  | 126  | 14.1 | 61                              | 126  | 13.3 | 57                                  | 124  | 12.6 |
|      | 24 | 58                                  | 121  | 12.8 | 55                              | 120  | 12.2 | 51                                  | 117  | 11.5 |
|      | 22 | 52                                  | 114  | 11.6 | 49                              | 112  | 11.0 | 46                                  | 109  | 10.4 |
| 2200 | 30 | 72                                  | 133  | 15.8 | 68                              | 132  | 14.9 | 64                                  | 131  | 14.0 |
|      | 28 | 66                                  | 128  | 14.5 | 62                              | 127  | 13.7 | 59                                  | 126  | 12.9 |
|      | 26 | 60                                  | 123  | 13.2 | 57                              | 122  | 12.6 | 53                                  | 120  | 11.9 |
|      | 24 | 54                                  | 117  | 12.1 | 51                              | 115  | 11.5 | 48                                  | 113  | 10.9 |
|      | 22 | 48                                  | 110  | 10.9 | 46                              | 108  | 10.4 | 43                                  | 104  | 9.9  |

Figure 5-7. Cruise Performance (Sheet 1 of 12)

**CRUISE PERFORMANCE**  
**PRESSURE ALTITUDE 4000 FEET**

CONDITIONS:  
3600 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

**NOTE**  
For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

|      |    | 20°C BELOW<br>STANDARD TEMP<br>-13°C |      |      | STANDARD<br>TEMPERATURE<br>7°C |      |      | 20°C ABOVE<br>STANDARD TEMP<br>27°C |      |      |
|------|----|--------------------------------------|------|------|--------------------------------|------|------|-------------------------------------|------|------|
| RPM  | MP | %<br>BHP                             | KTAS | GPH  | %<br>BHP                       | KTAS | GPH  | %<br>BHP                            | KTAS | GPH  |
| 2500 | 30 | ---                                  | ---  | ---  | 81                             | 145  | 17.7 | 76                                  | 144  | 16.6 |
|      | 28 | 79                                   | 140  | 17.2 | 74                             | 140  | 16.2 | 70                                  | 139  | 15.2 |
|      | 26 | 72                                   | 135  | 15.8 | 68                             | 135  | 14.9 | 64                                  | 133  | 14.0 |
|      | 24 | 65                                   | 130  | 14.3 | 62                             | 129  | 13.6 | 58                                  | 128  | 12.8 |
|      | 22 | 58                                   | 123  | 12.8 | 55                             | 122  | 12.2 | 51                                  | 119  | 11.5 |
| 2400 | 30 | 80                                   | 141  | 17.5 | 76                             | 141  | 16.5 | 71                                  | 140  | 15.5 |
|      | 28 | 74                                   | 137  | 16.2 | 70                             | 136  | 15.3 | 66                                  | 135  | 14.4 |
|      | 26 | 68                                   | 132  | 14.8 | 64                             | 131  | 14.0 | 60                                  | 129  | 13.2 |
|      | 24 | 61                                   | 126  | 13.5 | 58                             | 125  | 12.8 | 54                                  | 123  | 12.1 |
|      | 22 | 55                                   | 120  | 12.2 | 52                             | 118  | 11.6 | 49                                  | 115  | 11.0 |
| 2300 | 30 | 77                                   | 138  | 16.7 | 72                             | 138  | 15.8 | 68                                  | 137  | 14.8 |
|      | 28 | 71                                   | 134  | 15.5 | 67                             | 134  | 14.7 | 63                                  | 132  | 13.8 |
|      | 26 | 65                                   | 129  | 14.2 | 61                             | 128  | 13.5 | 58                                  | 127  | 12.7 |
|      | 24 | 59                                   | 123  | 13.0 | 55                             | 123  | 12.3 | 52                                  | 120  | 11.7 |
|      | 22 | 52                                   | 117  | 11.7 | 49                             | 115  | 11.1 | 46                                  | 111  | 10.6 |
| 2200 | 30 | 73                                   | 135  | 15.8 | 68                             | 135  | 15.0 | 64                                  | 134  | 14.1 |
|      | 28 | 67                                   | 131  | 14.6 | 63                             | 130  | 13.8 | 59                                  | 129  | 13.0 |
|      | 26 | 61                                   | 126  | 13.4 | 57                             | 125  | 12.7 | 54                                  | 122  | 12.0 |
|      | 24 | 55                                   | 120  | 12.2 | 52                             | 118  | 11.6 | 49                                  | 115  | 11.0 |
|      | 22 | 49                                   | 112  | 11.1 | 46                             | 110  | 10.5 | 44                                  | 106  | 10.0 |

Figure 5-7. Cruise Performance (Sheet 2 of 12)

## CRUISE PERFORMANCE

### PRESSURE ALTITUDE 6000 FEET

**CONDITIONS:**

3600 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

**NOTE**

For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

|      |    | 20°C BELOW<br>STANDARD TEMP<br>-17°C |      |      | STANDARD<br>TEMPERATURE<br>3°C |      |      | 20°C ABOVE<br>STANDARD TEMP<br>23°C |      |      |
|------|----|--------------------------------------|------|------|--------------------------------|------|------|-------------------------------------|------|------|
| RPM  | MP | %<br>BHP                             | KTAS | GPH  | %<br>BHP                       | KTAS | GPH  | %<br>BHP                            | KTAS | GPH  |
| 2500 | 30 | ---                                  | ---  | ---  | 81                             | 148  | 17.8 | 76                                  | 147  | 16.7 |
|      | 28 | 79                                   | 143  | 17.4 | 75                             | 143  | 16.4 | 70                                  | 142  | 15.4 |
|      | 26 | 73                                   | 139  | 16.0 | 69                             | 138  | 15.1 | 65                                  | 136  | 14.2 |
|      | 24 | 67                                   | 133  | 14.6 | 63                             | 132  | 13.8 | 59                                  | 131  | 13.0 |
|      | 22 | 59                                   | 126  | 13.1 | 56                             | 125  | 12.4 | 53                                  | 122  | 11.8 |
| 2400 | 30 | 81                                   | 144  | 17.6 | 76                             | 144  | 16.6 | 72                                  | 143  | 15.6 |
|      | 28 | 75                                   | 140  | 16.4 | 71                             | 139  | 15.4 | 66                                  | 138  | 14.5 |
|      | 26 | 69                                   | 135  | 15.0 | 65                             | 134  | 14.2 | 61                                  | 132  | 13.4 |
|      | 24 | 62                                   | 129  | 13.7 | 59                             | 128  | 13.0 | 55                                  | 126  | 12.3 |
|      | 22 | 56                                   | 123  | 12.4 | 53                             | 121  | 11.8 | 50                                  | 118  | 11.2 |
| 2300 | 30 | 77                                   | 142  | 16.9 | 73                             | 141  | 15.9 | 69                                  | 140  | 15.0 |
|      | 28 | 72                                   | 137  | 15.7 | 68                             | 137  | 14.8 | 64                                  | 135  | 14.0 |
|      | 26 | 66                                   | 132  | 14.4 | 62                             | 131  | 13.7 | 58                                  | 130  | 12.9 |
|      | 24 | 60                                   | 126  | 13.2 | 56                             | 125  | 12.5 | 53                                  | 122  | 11.8 |
|      | 22 | 53                                   | 120  | 11.9 | 50                             | 117  | 11.3 | 47                                  | 114  | 10.7 |
| 2200 | 30 | 73                                   | 138  | 16.0 | 69                             | 138  | 15.1 | 65                                  | 136  | 14.2 |
|      | 28 | 68                                   | 134  | 14.8 | 64                             | 133  | 14.0 | 60                                  | 132  | 13.2 |
|      | 26 | 62                                   | 128  | 13.6 | 58                             | 128  | 12.9 | 55                                  | 125  | 12.2 |
|      | 24 | 56                                   | 123  | 12.4 | 53                             | 121  | 11.8 | 50                                  | 117  | 11.2 |
|      | 22 | 50                                   | 115  | 11.3 | 47                             | 112  | 10.7 | 44                                  | 109  | 10.2 |

Figure 5-7. Cruise Performance (Sheet 3 of 12)

CRUISE PERFORMANCE  
PRESSURE ALTITUDE 8000 FEET

CONDITIONS:  
3600 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

NOTE  
For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

|      |    | 20°C BELOW<br>STANDARD TEMP<br>-21°C |       |       | STANDARD<br>TEMPERATURE<br>-1°C |      |      | 20°C ABOVE<br>STANDARD TEMP<br>19°C |      |      |
|------|----|--------------------------------------|-------|-------|---------------------------------|------|------|-------------------------------------|------|------|
| RPM  | MP | %<br>BHP                             | KTAS  | GPH   | %<br>BHP                        | KTAS | GPH  | %<br>BHP                            | KTAS | GPH  |
| 2500 | 30 | - - -                                | - - - | - - - | 81                              | 151  | 17.8 | 76                                  | 150  | 16.7 |
|      | 28 | 80                                   | 146   | 17.4  | 75                              | 146  | 16.4 | 71                                  | 144  | 15.4 |
|      | 26 | 74                                   | 141   | 16.2  | 70                              | 141  | 15.2 | 65                                  | 139  | 14.4 |
|      | 24 | 68                                   | 136   | 14.8  | 64                              | 135  | 14.0 | 60                                  | 133  | 13.2 |
|      | 22 | 60                                   | 129   | 13.3  | 57                              | 128  | 12.6 | 53                                  | 125  | 11.9 |
| 2400 | 30 | 81                                   | 147   | 17.7  | 76                              | 146  | 16.7 | 72                                  | 145  | 15.7 |
|      | 28 | 75                                   | 142   | 16.4  | 71                              | 142  | 15.5 | 67                                  | 140  | 14.6 |
|      | 26 | 69                                   | 137   | 15.1  | 65                              | 136  | 14.3 | 61                                  | 135  | 13.5 |
|      | 24 | 63                                   | 132   | 13.9  | 60                              | 131  | 13.1 | 56                                  | 128  | 12.4 |
|      | 22 | 57                                   | 126   | 12.6  | 54                              | 123  | 12.0 | 51                                  | 120  | 11.4 |
| 2300 | 30 | 78                                   | 144   | 17.0  | 73                              | 144  | 16.0 | 69                                  | 143  | 15.1 |
|      | 28 | 72                                   | 140   | 15.8  | 68                              | 139  | 14.9 | 64                                  | 138  | 14.0 |
|      | 26 | 67                                   | 135   | 14.6  | 63                              | 134  | 13.8 | 59                                  | 132  | 13.0 |
|      | 24 | 60                                   | 129   | 13.3  | 57                              | 128  | 12.6 | 54                                  | 125  | 12.0 |
|      | 22 | 54                                   | 122   | 12.1  | 51                              | 120  | 11.5 | 48                                  | 116  | 10.9 |
| 2200 | 30 | 73                                   | 141   | 16.1  | 69                              | 140  | 15.1 | 65                                  | 139  | 14.3 |
|      | 28 | 68                                   | 136   | 14.9  | 64                              | 135  | 14.1 | 60                                  | 134  | 13.3 |
|      | 26 | 63                                   | 131   | 13.7  | 59                              | 130  | 13.0 | 55                                  | 127  | 12.3 |
|      | 24 | 57                                   | 125   | 12.6  | 54                              | 123  | 11.9 | 50                                  | 120  | 11.3 |
|      | 22 | 51                                   | 118   | 11.4  | 48                              | 115  | 10.9 | 45                                  | 111  | 10.3 |

Figure 5-7. Cruise Performance (Sheet 4 of 12)

**CRUISE PERFORMANCE**  
**PRESSURE ALTITUDE 10,000 FEET**

CONDITIONS:  
3600 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

**NOTE**  
For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

|      |    | 20°C BELOW<br>STANDARD TEMP<br>-25°C |       |       | STANDARD<br>TEMPERATURE<br>-5°C |      |      | 20°C ABOVE<br>STANDARD TEMP<br>15°C |      |      |
|------|----|--------------------------------------|-------|-------|---------------------------------|------|------|-------------------------------------|------|------|
| RPM  | MP | %<br>BHP                             | KTAS  | GPH   | %<br>BHP                        | KTAS | GPH  | %<br>BHP                            | KTAS | GPH  |
| 2500 | 30 | - - -                                | - - - | - - - | 81                              | 153  | 17.8 | 76                                  | 152  | 16.7 |
|      | 28 | 80                                   | 149   | 17.5  | 76                              | 148  | 16.5 | 71                                  | 147  | 15.5 |
|      | 26 | 75                                   | 145   | 16.3  | 71                              | 144  | 15.4 | 66                                  | 142  | 14.5 |
|      | 24 | 69                                   | 139   | 15.0  | 65                              | 138  | 14.2 | 61                                  | 136  | 13.4 |
|      | 22 | 62                                   | 132   | 13.5  | 58                              | 131  | 12.8 | 55                                  | 128  | 12.1 |
| 2400 | 30 | 81                                   | 150   | 17.8  | 77                              | 149  | 16.8 | 72                                  | 148  | 15.7 |
|      | 28 | 76                                   | 145   | 16.6  | 71                              | 145  | 15.6 | 67                                  | 143  | 14.7 |
|      | 26 | 70                                   | 140   | 15.3  | 66                              | 139  | 14.5 | 62                                  | 138  | 13.6 |
|      | 24 | 64                                   | 135   | 14.1  | 60                              | 134  | 13.3 | 57                                  | 131  | 12.6 |
|      | 22 | 58                                   | 129   | 12.9  | 55                              | 126  | 12.2 | 51                                  | 123  | 11.5 |
| 2300 | 30 | 78                                   | 148   | 17.1  | 74                              | 147  | 16.2 | 69                                  | 146  | 15.2 |
|      | 28 | 73                                   | 143   | 16.0  | 69                              | 142  | 15.1 | 65                                  | 141  | 14.2 |
|      | 26 | 67                                   | 138   | 14.7  | 64                              | 137  | 13.9 | 60                                  | 135  | 13.1 |
|      | 24 | 61                                   | 132   | 13.5  | 58                              | 131  | 12.8 | 54                                  | 127  | 12.1 |
|      | 22 | 55                                   | 125   | 12.2  | 52                              | 122  | 11.6 | 49                                  | 118  | 11.0 |
| 2200 | 30 | 74                                   | 144   | 16.2  | 70                              | 143  | 15.3 | 66                                  | 142  | 14.4 |
|      | 28 | 69                                   | 139   | 15.1  | 65                              | 138  | 14.2 | 61                                  | 137  | 13.4 |
|      | 26 | 63                                   | 134   | 13.9  | 60                              | 133  | 13.2 | 56                                  | 130  | 12.5 |
|      | 24 | 58                                   | 128   | 12.8  | 54                              | 126  | 12.1 | 51                                  | 123  | 11.5 |
|      | 22 | 52                                   | 120   | 11.6  | 49                              | 117  | 11.0 | 46                                  | 113  | 10.4 |

Figure 5-7. Cruise Performance (Sheet 5 of 12)

**CRUISE PERFORMANCE**  
**PRESSURE ALTITUDE 12,000 FEET**

CONDITIONS:  
3600 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

**NOTE**  
For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

|      |    | 20°C BELOW<br>STANDARD TEMP<br>-29°C |       |       | STANDARD<br>TEMPERATURE<br>-9°C |      |      | 20°C ABOVE<br>STANDARD TEMP<br>11°C |      |      |
|------|----|--------------------------------------|-------|-------|---------------------------------|------|------|-------------------------------------|------|------|
| RPM  | MP | %<br>BHP                             | KTAS  | GPH   | %<br>BHP                        | KTAS | GPH  | %<br>BHP                            | KTAS | GPH  |
| 2500 | 30 | - - -                                | - - - | - - - | 81                              | 156  | 17.8 | 76                                  | 155  | 16.7 |
|      | 28 | 80                                   | 152   | 17.5  | 76                              | 151  | 16.5 | 71                                  | 150  | 15.5 |
|      | 26 | 75                                   | 147   | 16.4  | 71                              | 147  | 15.4 | 66                                  | 145  | 14.5 |
|      | 24 | 69                                   | 142   | 15.1  | 65                              | 141  | 14.2 | 61                                  | 139  | 13.4 |
|      | 22 | 62                                   | 135   | 13.7  | 59                              | 133  | 12.9 | 55                                  | 130  | 12.2 |
| 2400 | 30 | 81                                   | 153   | 17.8  | 77                              | 152  | 16.8 | 72                                  | 151  | 15.7 |
|      | 28 | 76                                   | 148   | 16.6  | 71                              | 147  | 15.6 | 67                                  | 146  | 14.7 |
|      | 26 | 70                                   | 143   | 15.4  | 66                              | 142  | 14.5 | 62                                  | 140  | 13.7 |
|      | 24 | 65                                   | 137   | 14.2  | 61                              | 136  | 13.4 | 57                                  | 133  | 12.7 |
|      | 22 | 59                                   | 131   | 13.0  | 55                              | 129  | 12.3 | 52                                  | 125  | 11.7 |
| 2300 | 30 | 79                                   | 150   | 17.2  | 74                              | 150  | 16.2 | 70                                  | 148  | 15.2 |
|      | 28 | 73                                   | 146   | 16.0  | 69                              | 145  | 15.1 | 65                                  | 144  | 14.2 |
|      | 26 | 68                                   | 141   | 14.8  | 64                              | 140  | 14.0 | 60                                  | 137  | 13.2 |
|      | 24 | 62                                   | 135   | 13.6  | 58                              | 133  | 12.9 | 55                                  | 130  | 12.2 |
|      | 22 | 56                                   | 127   | 12.4  | 53                              | 125  | 11.8 | 49                                  | 120  | 11.1 |
| 2200 | 28 | 69                                   | 142   | 15.2  | 65                              | 141  | 14.3 | 61                                  | 139  | 13.5 |
|      | 26 | 64                                   | 137   | 14.0  | 60                              | 136  | 13.3 | 57                                  | 132  | 12.6 |
|      | 24 | 58                                   | 131   | 12.9  | 55                              | 128  | 12.2 | 52                                  | 125  | 11.6 |
|      | 22 | 52                                   | 123   | 11.7  | 49                              | 119  | 11.1 | 46                                  | 114  | 10.6 |
|      | 20 | 46                                   | 113   | 10.6  | 44                              | 108  | 10.1 | 41                                  | 101  | 9.5  |

Figure 5-7. Cruise Performance (Sheet 6 of 12)

**CRUISE PERFORMANCE**  
**PRESSURE ALTITUDE 14,000 FEET**

CONDITIONS:  
3600 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

**NOTE**  
For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

|      |    | 20°C BELOW<br>STANDARD TEMP<br>-33°C |      |      | STANDARD<br>TEMPERATURE<br>-13°C |      |      | 20°C ABOVE<br>STANDARD TEMP<br>7°C |      |      |
|------|----|--------------------------------------|------|------|----------------------------------|------|------|------------------------------------|------|------|
| RPM  | MP | %<br>BHP                             | KTAS | GPH  | %<br>BHP                         | KTAS | GPH  | %<br>BHP                           | KTAS | GPH  |
| 2500 | 30 | ---                                  | ---  | ---  | 81                               | 159  | 17.8 | 76                                 | 158  | 16.7 |
|      | 28 | 80                                   | 155  | 17.6 | 76                               | 154  | 16.6 | 71                                 | 152  | 15.6 |
|      | 26 | 75                                   | 150  | 16.5 | 71                               | 149  | 15.5 | 67                                 | 148  | 14.6 |
|      | 24 | 70                                   | 145  | 15.2 | 66                               | 144  | 14.4 | 62                                 | 141  | 13.5 |
|      | 22 | 63                                   | 138  | 13.8 | 59                               | 136  | 13.1 | 56                                 | 132  | 12.4 |
| 2400 | 30 | 82                                   | 156  | 17.8 | 77                               | 155  | 16.8 | 72                                 | 153  | 15.8 |
|      | 28 | 76                                   | 151  | 16.6 | 72                               | 150  | 15.7 | 67                                 | 149  | 14.8 |
|      | 26 | 71                                   | 146  | 15.5 | 67                               | 145  | 14.6 | 63                                 | 143  | 13.8 |
|      | 24 | 65                                   | 141  | 14.3 | 61                               | 139  | 13.5 | 58                                 | 136  | 12.8 |
|      | 22 | 60                                   | 134  | 13.1 | 56                               | 131  | 12.5 | 53                                 | 128  | 11.8 |
| 2300 | 30 | 79                                   | 153  | 17.3 | 74                               | 153  | 16.3 | 70                                 | 151  | 15.3 |
|      | 28 | 74                                   | 149  | 16.2 | 70                               | 148  | 15.3 | 66                                 | 146  | 14.4 |
|      | 26 | 68                                   | 144  | 15.0 | 65                               | 143  | 14.1 | 61                                 | 140  | 13.3 |
|      | 24 | 63                                   | 138  | 13.8 | 59                               | 136  | 13.0 | 55                                 | 132  | 12.3 |
|      | 22 | 57                                   | 130  | 12.6 | 53                               | 127  | 11.9 | 50                                 | 123  | 11.3 |
| 2200 | 28 | 70                                   | 145  | 15.3 | 66                               | 144  | 14.4 | 62                                 | 142  | 13.6 |
|      | 26 | 65                                   | 140  | 14.2 | 61                               | 138  | 13.4 | 57                                 | 135  | 12.7 |
|      | 24 | 59                                   | 134  | 13.1 | 56                               | 131  | 12.4 | 52                                 | 127  | 11.7 |
|      | 22 | 53                                   | 125  | 11.9 | 50                               | 122  | 11.3 | 47                                 | 116  | 10.7 |
|      | 20 | 47                                   | 115  | 10.7 | 45                               | 110  | 10.2 | 42                                 | 103  | 9.7  |

Figure 5-7. Cruise Performance (Sheet 7 of 12)

**CRUISE PERFORMANCE**  
**PRESSURE ALTITUDE 16,000 FEET**

CONDITIONS:  
3600 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

**NOTE**  
For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

|      |    | 20°C BELOW<br>STANDARD TEMP<br>-37°C |      |      | STANDARD<br>TEMPERATURE<br>-17°C |      |      | 20°C ABOVE<br>STANDARD TEMP<br>3°C |      |      |
|------|----|--------------------------------------|------|------|----------------------------------|------|------|------------------------------------|------|------|
| RPM  | MP | %<br>BHP                             | KTAS | GPH  | %<br>BHP                         | KTAS | GPH  | %<br>BHP                           | KTAS | GPH  |
| 2500 | 30 | ---                                  | ---  | ---  | 81                               | 162  | 17.7 | 76                                 | 160  | 16.6 |
|      | 28 | 80                                   | 157  | 17.5 | 76                               | 157  | 16.5 | 71                                 | 155  | 15.5 |
|      | 26 | 75                                   | 153  | 16.5 | 71                               | 152  | 15.5 | 67                                 | 150  | 14.6 |
|      | 24 | 70                                   | 147  | 15.2 | 66                               | 146  | 14.4 | 62                                 | 143  | 13.5 |
|      | 22 | 63                                   | 141  | 13.9 | 60                               | 138  | 13.1 | 56                                 | 134  | 12.4 |
| 2400 | 30 | 81                                   | 158  | 17.8 | 77                               | 158  | 16.8 | 72                                 | 156  | 15.7 |
|      | 28 | 76                                   | 154  | 16.6 | 72                               | 153  | 15.7 | 67                                 | 151  | 14.7 |
|      | 26 | 71                                   | 149  | 15.5 | 67                               | 148  | 14.6 | 63                                 | 145  | 13.8 |
|      | 24 | 66                                   | 143  | 14.4 | 62                               | 141  | 13.6 | 58                                 | 138  | 12.8 |
|      | 22 | 60                                   | 137  | 13.2 | 57                               | 134  | 12.6 | 53                                 | 129  | 11.9 |
| 2300 | 30 | 79                                   | 156  | 17.2 | 74                               | 155  | 16.2 | 70                                 | 154  | 15.2 |
|      | 28 | 74                                   | 152  | 16.2 | 70                               | 151  | 15.3 | 66                                 | 149  | 14.4 |
|      | 26 | 69                                   | 146  | 15.0 | 65                               | 145  | 14.2 | 61                                 | 142  | 13.4 |
|      | 24 | 63                                   | 141  | 13.9 | 59                               | 138  | 13.1 | 56                                 | 134  | 12.4 |
|      | 22 | 57                                   | 133  | 12.7 | 54                               | 130  | 12.0 | 51                                 | 125  | 11.4 |
| 2200 | 28 | 70                                   | 148  | 15.4 | 66                               | 147  | 14.5 | 62                                 | 144  | 13.7 |
|      | 26 | 65                                   | 143  | 14.3 | 62                               | 141  | 13.5 | 58                                 | 137  | 12.8 |
|      | 24 | 60                                   | 136  | 13.2 | 56                               | 133  | 12.5 | 53                                 | 129  | 11.8 |
|      | 22 | 54                                   | 128  | 12.0 | 51                               | 124  | 11.4 | 48                                 | 118  | 10.8 |
|      | 20 | 48                                   | 117  | 10.8 | 45                               | 112  | 10.3 | 42                                 | 104  | 9.8  |

Figure 5-7. Cruise Performance (Sheet 8 of 12)



## CRUISE PERFORMANCE

### PRESSURE ALTITUDE 18,000 FEET

CONDITIONS:  
3600 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

**NOTE**

For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

|      |    | 20°C BELOW<br>STANDARD TEMP<br>-41°C |      |      | STANDARD<br>TEMPERATURE<br>-21°C |      |      | 20°C ABOVE<br>STANDARD TEMP<br>-1°C |      |      |
|------|----|--------------------------------------|------|------|----------------------------------|------|------|-------------------------------------|------|------|
| RPM  | MP | %<br>BHP                             | KTAS | GPH  | %<br>BHP                         | KTAS | GPH  | %<br>BHP                            | KTAS | GPH  |
| 2500 | 30 | ---                                  | ---  | ---  | 81                               | 165  | 17.7 | 76                                  | 163  | 16.6 |
|      | 28 | 80                                   | 160  | 17.5 | 76                               | 159  | 16.5 | 71                                  | 158  | 15.5 |
|      | 26 | 75                                   | 156  | 16.5 | 71                               | 155  | 15.5 | 67                                  | 152  | 14.6 |
|      | 24 | 70                                   | 150  | 15.2 | 66                               | 149  | 14.4 | 62                                  | 145  | 13.6 |
|      | 22 | 63                                   | 143  | 13.9 | 60                               | 140  | 13.2 | 56                                  | 136  | 12.5 |
| 2400 | 30 | 81                                   | 161  | 17.8 | 77                               | 160  | 16.8 | 72                                  | 159  | 15.7 |
|      | 28 | 76                                   | 157  | 16.6 | 72                               | 156  | 15.7 | 67                                  | 153  | 14.7 |
|      | 26 | 71                                   | 151  | 15.5 | 67                               | 150  | 14.7 | 63                                  | 147  | 13.8 |
|      | 24 | 66                                   | 146  | 14.4 | 62                               | 143  | 13.6 | 58                                  | 140  | 12.9 |
|      | 22 | 61                                   | 139  | 13.4 | 57                               | 136  | 12.7 | 54                                  | 131  | 12.0 |
| 2300 | 30 | 79                                   | 159  | 17.2 | 74                               | 158  | 16.2 | 70                                  | 156  | 15.2 |
|      | 28 | 74                                   | 154  | 16.2 | 70                               | 154  | 15.2 | 65                                  | 150  | 14.3 |
|      | 26 | 69                                   | 149  | 15.1 | 65                               | 148  | 14.3 | 61                                  | 144  | 13.4 |
|      | 24 | 64                                   | 143  | 14.0 | 60                               | 141  | 13.2 | 56                                  | 136  | 12.5 |
|      | 22 | 58                                   | 136  | 12.8 | 55                               | 132  | 12.2 | 51                                  | 127  | 11.5 |
| 2200 | 26 | 66                                   | 146  | 14.5 | 62                               | 144  | 13.7 | 58                                  | 140  | 12.9 |
|      | 24 | 61                                   | 139  | 13.3 | 57                               | 136  | 12.6 | 54                                  | 131  | 12.0 |
|      | 22 | 55                                   | 130  | 12.2 | 51                               | 126  | 11.5 | 48                                  | 120  | 10.9 |
|      | 20 | 49                                   | 120  | 11.0 | 46                               | 114  | 10.4 | 43                                  | 105  | 9.9  |

Figure 5-7. Cruise Performance (Sheet 9 of 12)

**CRUISE PERFORMANCE**  
**PRESSURE ALTITUDE 20,000 FEET**

CONDITIONS:  
3600 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

NOTE  
For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

|      |    | 20°C BELOW<br>STANDARD TEMP<br>-45°C |       |       | STANDARD<br>TEMPERATURE<br>-25°C |      |      | 20°C ABOVE<br>STANDARD TEMP<br>-5°C |      |      |
|------|----|--------------------------------------|-------|-------|----------------------------------|------|------|-------------------------------------|------|------|
| RPM  | MP | %<br>BHP                             | KTAS  | GPH   | %<br>BHP                         | KTAS | GPH  | %<br>BHP                            | KTAS | GPH  |
| 2500 | 30 | - - -                                | - - - | - - - | 80                               | 167  | 17.6 | 76                                  | 166  | 16.5 |
|      | 28 | 80                                   | 163   | 17.5  | 75                               | 162  | 16.5 | 71                                  | 160  | 15.4 |
|      | 26 | 75                                   | 158   | 16.4  | 71                               | 157  | 15.5 | 66                                  | 154  | 14.5 |
|      | 24 | 70                                   | 153   | 15.2  | 66                               | 150  | 14.4 | 62                                  | 147  | 13.5 |
|      | 22 | 64                                   | 145   | 13.9  | 60                               | 142  | 13.2 | 56                                  | 137  | 12.5 |
| 2400 | 30 | 81                                   | 164   | 17.7  | 76                               | 163  | 16.7 | 72                                  | 161  | 15.7 |
|      | 28 | 76                                   | 159   | 16.6  | 72                               | 158  | 15.6 | 67                                  | 155  | 14.7 |
|      | 26 | 71                                   | 154   | 15.5  | 67                               | 152  | 14.6 | 63                                  | 148  | 13.8 |
|      | 24 | 66                                   | 148   | 14.5  | 62                               | 145  | 13.7 | 58                                  | 141  | 12.9 |
|      | 22 | 61                                   | 141   | 13.4  | 57                               | 138  | 12.7 | 54                                  | 133  | 12.0 |
| 2300 | 28 | 74                                   | 157   | 16.1  | 69                               | 155  | 15.2 | 65                                  | 152  | 14.3 |
|      | 26 | 69                                   | 152   | 15.1  | 65                               | 150  | 14.3 | 61                                  | 146  | 13.5 |
|      | 24 | 64                                   | 146   | 14.1  | 60                               | 143  | 13.3 | 57                                  | 138  | 12.6 |
|      | 22 | 59                                   | 138   | 13.0  | 55                               | 134  | 12.3 | 52                                  | 128  | 11.6 |
| 2200 | 24 | 61                                   | 142   | 13.5  | 58                               | 139  | 12.7 | 54                                  | 133  | 12.1 |
|      | 22 | 55                                   | 133   | 12.3  | 52                               | 128  | 11.6 | 49                                  | 121  | 11.0 |
|      | 20 | 49                                   | 121   | 11.1  | 46                               | 115  | 10.5 | 44                                  | 105  | 10.0 |

Figure 5-7. Cruise Performance (Sheet 10 of 12)

**CRUISE PERFORMANCE**  
**PRESSURE ALTITUDE 22,000 FEET**

CONDITIONS:  
3600 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

**NOTE**  
For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

|      |    | 20°C BELOW<br>STANDARD TEMP<br>-49°C |      |      | STANDARD<br>TEMPERATURE<br>-29°C |      |      | 20°C ABOVE<br>STANDARD TEMP<br>-9°C |      |      |
|------|----|--------------------------------------|------|------|----------------------------------|------|------|-------------------------------------|------|------|
| RPM  | MP | %<br>BHP                             | KTAS | GPH  | %<br>BHP                         | KTAS | GPH  | %<br>BHP                            | KTAS | GPH  |
| 2500 | 30 | ---                                  | ---  | ---  | 80                               | 169  | 17.4 | 75                                  | 167  | 16.3 |
|      | 28 | 80                                   | 165  | 17.4 | 75                               | 165  | 16.4 | 70                                  | 161  | 15.4 |
|      | 26 | 75                                   | 160  | 16.3 | 70                               | 159  | 15.4 | 66                                  | 155  | 14.4 |
|      | 24 | 69                                   | 155  | 15.1 | 65                               | 152  | 14.3 | 61                                  | 147  | 13.4 |
|      | 22 | 63                                   | 146  | 13.8 | 59                               | 143  | 13.1 | 56                                  | 137  | 12.4 |
| 2400 | 30 | 80                                   | 166  | 17.5 | 75                               | 165  | 16.5 | 71                                  | 162  | 15.4 |
|      | 28 | 76                                   | 161  | 16.5 | 71                               | 160  | 15.6 | 67                                  | 157  | 14.7 |
|      | 26 | 71                                   | 156  | 15.4 | 67                               | 154  | 14.6 | 62                                  | 150  | 13.7 |
|      | 24 | 66                                   | 150  | 14.4 | 62                               | 147  | 13.6 | 58                                  | 142  | 12.8 |
|      | 22 | 61                                   | 143  | 13.3 | 57                               | 139  | 12.6 | 54                                  | 133  | 12.0 |
| 2300 | 26 | 69                                   | 155  | 15.1 | 65                               | 152  | 14.3 | 61                                  | 148  | 13.5 |
|      | 24 | 65                                   | 148  | 14.2 | 61                               | 145  | 13.4 | 57                                  | 140  | 12.6 |
|      | 22 | 59                                   | 141  | 13.1 | 56                               | 137  | 12.4 | 53                                  | 130  | 11.8 |
|      | 20 | 54                                   | 132  | 12.1 | 51                               | 127  | 11.5 | 48                                  | 119  | 10.9 |
| 2200 | 24 | 61                                   | 144  | 13.5 | 58                               | 140  | 12.8 | 54                                  | 134  | 12.1 |
|      | 22 | 56                                   | 135  | 12.4 | 52                               | 129  | 11.7 | 49                                  | 121  | 11.1 |
|      | 20 | 50                                   | 123  | 11.2 | 47                               | 116  | 10.7 | 44                                  | 106  | 10.1 |

Figure 5-7. Cruise Performance (Sheet 11 of 12)

**CRUISE PERFORMANCE**  
**PRESSURE ALTITUDE 24,000 FEET**

CONDITIONS:  
3600 Pounds  
Recommended Lean Mixture  
Cowl Flaps Closed

**NOTE**  
For best fuel economy at 70% power or less, operate at 1 GPH leaner than shown in this chart or at peak EGT if an EGT indicator is installed.

|      |    | 20°C BELOW<br>STANDARD TEMP<br>-53°C |      |      | STANDARD<br>TEMPERATURE<br>-33°C |      |      | 20°C ABOVE<br>STANDARD TEMP<br>-13°C |      |      |
|------|----|--------------------------------------|------|------|----------------------------------|------|------|--------------------------------------|------|------|
| RPM  | MP | %<br>BHP                             | KTAS | GPH  | %<br>BHP                         | KTAS | GPH  | %<br>BHP                             | KTAS | GPH  |
| 2500 | 28 | 79                                   | 168  | 17.3 | 74                               | 167  | 16.3 | 70                                   | 163  | 15.3 |
|      | 26 | 74                                   | 163  | 16.1 | 70                               | 160  | 15.2 | 65                                   | 156  | 14.3 |
|      | 24 | 68                                   | 156  | 15.0 | 64                               | 152  | 14.1 | 60                                   | 147  | 13.3 |
|      | 22 | 62                                   | 147  | 13.7 | 59                               | 143  | 13.0 | 55                                   | 137  | 12.3 |
| 2400 | 28 | 75                                   | 164  | 16.4 | 71                               | 162  | 15.5 | 66                                   | 158  | 14.5 |
|      | 26 | 70                                   | 158  | 15.3 | 66                               | 155  | 14.4 | 62                                   | 150  | 13.6 |
|      | 24 | 65                                   | 151  | 14.2 | 61                               | 147  | 13.5 | 57                                   | 141  | 12.7 |
|      | 22 | 60                                   | 144  | 13.2 | 57                               | 139  | 12.5 | 53                                   | 132  | 11.9 |
| 2300 | 26 | 69                                   | 157  | 15.1 | 65                               | 154  | 14.3 | 61                                   | 149  | 13.5 |
|      | 24 | 65                                   | 151  | 14.2 | 61                               | 147  | 13.4 | 57                                   | 141  | 12.7 |
|      | 22 | 60                                   | 144  | 13.2 | 57                               | 139  | 12.5 | 53                                   | 132  | 11.9 |
|      | 20 | 55                                   | 135  | 12.3 | 52                               | 129  | 11.7 | 49                                   | 120  | 11.0 |
| 2200 | 22 | 56                                   | 136  | 12.3 | 52                               | 130  | 11.7 | 49                                   | 121  | 11.1 |
|      | 20 | 50                                   | 124  | 11.3 | 47                               | 116  | 10.7 | 44                                   | 105  | 10.1 |

Figure 5-7. Cruise Performance (Sheet 12 of 12)

**RANGE PROFILE**  
**45 MINUTES RESERVE**  
**59 GALLONS USABLE FUEL**

CONDITIONS:  
3600 Pounds  
Recommended Lean Mixture for Cruise  
Standard Temperature  
Zero Wind

- NOTES:
- 1. This chart allows for the fuel used for engine start, taxi, takeoff and climb and the distance during climb (as shown in Figure 5-6) for a normal climb up to 20,000 feet and maximum rate of climb above 20,000 feet
  - 2. Reserve fuel is based on 45 minutes at 45% BHP and is 7.7 gallons.

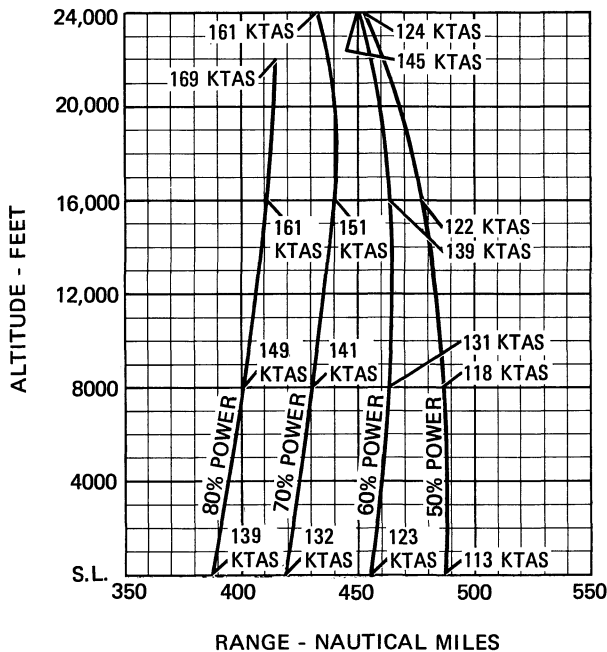


Figure 5-8. Range Profile (Sheet 1 of 2)

**RANGE PROFILE**  
**45 MINUTES RESERVE**  
**76 GALLONS USABLE FUEL**

CONDITIONS:  
3600 Pounds  
Recommended Lean Mixture for Cruise  
Standard Temperature  
Zero Wind

- NOTES:
- 1. This chart allows for the fuel used for engine start, taxi, takeoff and climb and the distance during climb (as shown in Figure 5-6) for a normal climb up to 20,000 feet and maximum rate of climb above 20,000 feet.
  - 2. Reserve fuel is based on 45 minutes at 45% BHP and is 7.7 gallons.

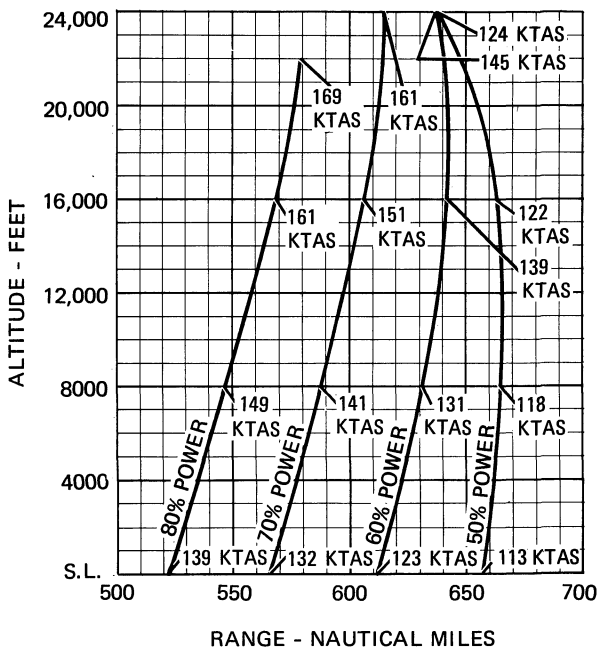


Figure 5-8. Range Profile (Sheet 2 of 2)

## ENDURANCE PROFILE

### 45 MINUTES RESERVE 59 GALLONS USABLE FUEL

**CONDITIONS:**

3600 Pounds

Recommended Lean Mixture for Cruise

Standard Temperature

**NOTES:**

1. This chart allows for the fuel used for engine start, taxi, takeoff and climb and the time during climb (as shown in Figure 5-6) for a normal climb up to 20,000 feet and maximum rate of climb above 20,000 feet.
2. Reserve fuel is based on 45 minutes at 45% BHP and is 7.7 gallons.

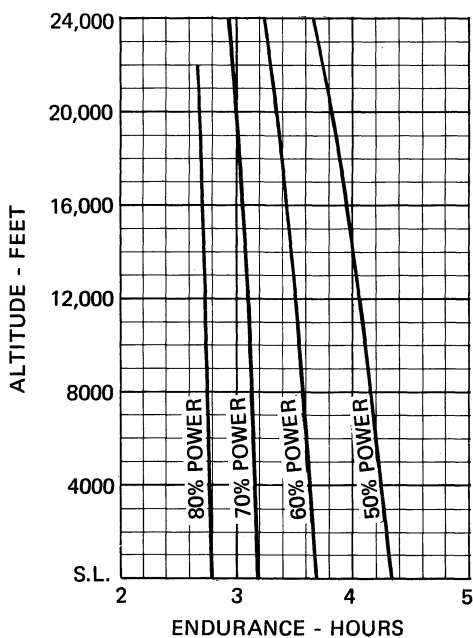


Figure 5-9. Endurance Profile (Sheet 1 of 2)

**ENDURANCE PROFILE**  
**45 MINUTES RESERVE**  
**76 GALLONS USABLE FUEL**

CONDITIONS:  
3600 Pounds  
Recommended Lean Mixture for Cruise  
Standard Temperature

- NOTES:
- 1. This chart allows for the fuel used for engine start, taxi, takeoff and climb and the time during climb (as shown in Figure 5-6) for a normal climb up to 20,000 feet and maximum rate of climb above 20,000 feet.
  - 2. Reserve fuel is based on 45 minutes at 45% BHP and is 7.7 gallons.

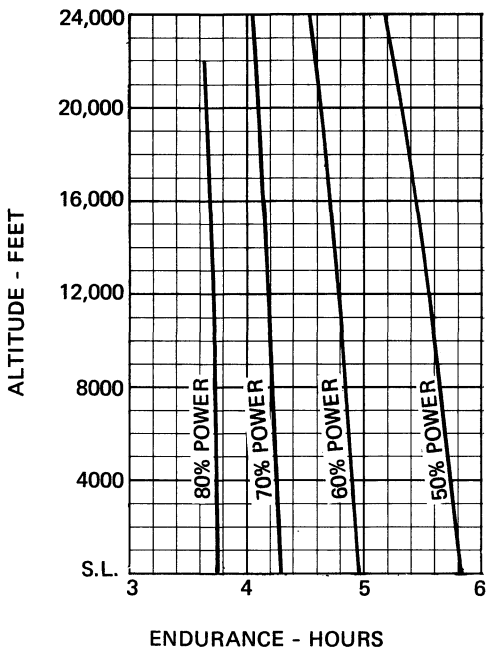


Figure 5-9. Endurance Profile (Sheet 2 of 2)



LANDING DISTANCE

SHORT FIELD

CONDITIONS:  
Flaps 40°  
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.

| WEIGHT<br>LBS | SPEED<br>AT<br>50 FT<br>KIAS | PRESS<br>ALT<br>FT | 0°C          |                                | 10°C         |                                | 20°C         |                                | 30°C         |                                | 40°C         |                                |
|---------------|------------------------------|--------------------|--------------|--------------------------------|--------------|--------------------------------|--------------|--------------------------------|--------------|--------------------------------|--------------|--------------------------------|
|               |                              |                    | GRND<br>ROLL | TOTAL<br>TO CLEAR<br>50 FT OBS | GRND<br>ROLL | TOTAL<br>TO CLEAR<br>50 FT OBS | GRND<br>ROLL | TOTAL<br>TO CLEAR<br>50 FT OBS | GRND<br>ROLL | TOTAL<br>TO CLEAR<br>50 FT OBS | GRND<br>ROLL | TOTAL<br>TO CLEAR<br>50 FT OBS |
| 3600          | 64                           | S.L.               | 695          | 1340                           | 720          | 1375                           | 750          | 1415                           | 775          | 1450                           | 800          | 1490                           |
|               |                              | 1000               | 720          | 1375                           | 750          | 1415                           | 775          | 1450                           | 800          | 1490                           | 830          | 1530                           |
|               |                              | 2000               | 750          | 1415                           | 775          | 1455                           | 805          | 1495                           | 830          | 1530                           | 860          | 1575                           |
|               |                              | 3000               | 775          | 1455                           | 805          | 1495                           | 835          | 1540                           | 865          | 1580                           | 890          | 1615                           |
|               |                              | 4000               | 805          | 1495                           | 835          | 1540                           | 865          | 1580                           | 895          | 1625                           | 925          | 1665                           |
|               |                              | 5000               | 835          | 1540                           | 870          | 1585                           | 900          | 1630                           | 930          | 1675                           | 960          | 1715                           |
|               |                              | 6000               | 870          | 1590                           | 900          | 1630                           | 935          | 1680                           | 965          | 1725                           | 995          | 1770                           |
|               |                              | 7000               | 905          | 1635                           | 935          | 1680                           | 970          | 1730                           | 1000         | 1775                           | 1035         | 1825                           |
|               | 8000                         | 940                | 1690         | 970                            | 1730         | 1005                           | 1780         | 1040                           | 1830         | 1075                           | 1880         |                                |

Figure 5-10. Landing Distance



# SECTION 6

## WEIGHT & BALANCE/ EQUIPMENT LIST

### TABLE OF CONTENTS

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| Introduction . . . . .                 | 6-3  |
| Airplane Weighing Procedures . . . . . | 6-3  |
| Weight And Balance . . . . .           | 6-6  |
| Equipment List . . . . .               | 6-17 |



## INTRODUCTION

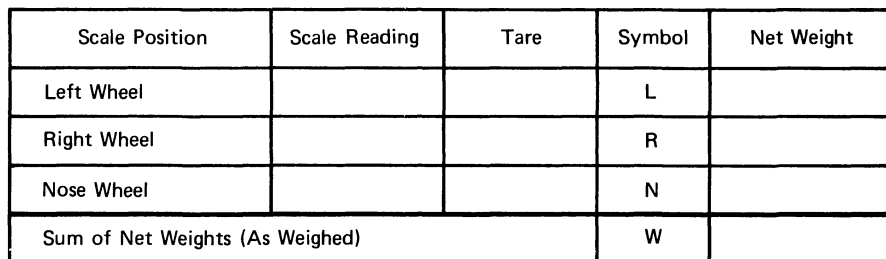
This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample forms are provided for reference. Procedures for calculating the weight and moment for various operations are also provided. A comprehensive list of all Cessna equipment available for this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

It should be noted that specific information regarding the weight, arm, moment and installed equipment list for this airplane can only be found in the appropriate weight and balance records carried in the airplane.

## AIRPLANE WEIGHING PROCEDURES

1. Preparation:
  - a. Inflate tires to recommended operating pressures.
  - b. Remove the fuel tank sump quick-drain fittings and reservoir tank quick-drain fittings to drain all fuel.
  - c. Remove oil sump drain plug to drain all oil.
  - 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 the 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.

**CESSNA  
MODEL TU206G**



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

| Item                                                  | Moment/1000<br>Weight (Lbs.) X C.G. Arm (In.) = (Lbs.-In.) |       |       |
|-------------------------------------------------------|------------------------------------------------------------|-------|-------|
| Airplane Weight (From Item 5, page 6-3)               |                                                            |       |       |
| Add:<br>Oil (13 Qts at 7.5 Lbs/Gal)                   | 24.4                                                       | -19.4 | -.473 |
| Add Unusable Fuel:<br>Std. Tanks (2 Gal at 6 Lbs/Gal) |                                                            | 46.0  |       |
| L.R. Tanks (4 Gal at 6 Lbs/Gal)                       |                                                            | 46.0  |       |
| Equipment Changes                                     |                                                            |       |       |
| Airplane Basic Empty Weight                           |                                                            |       |       |

### Figure 6-1. Sample Airplane Weighing



## 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 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 or cargo is based on seats positioned for average occupants and baggage or cargo loaded in the center of these 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/cargo 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.

When a cargo pack is installed, it is necessary to determine the C.G. arm and calculate the moment/1000 of items carried in the pack. The arm for any location in the pack can be determined from the diagram on figure 6-5. Multiply the weight of the item by the C.G. arm, then divide by 1000 to get the moment/1000. The maximum loading capacity of the pack is 300 pounds.

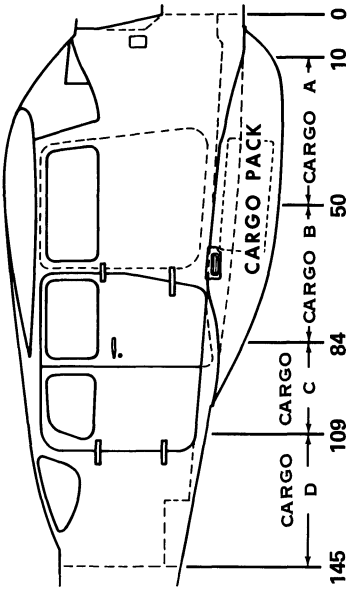


NOTE

Each loading should be figured in accordance with the above paragraphs. When the loading is light (such as pilot and copilot, and no oxygen system, rear seats or cargo), be sure to check the forward balance limits. When loading is heavy (near gross weight), be sure to check the aft balance limits.

To avoid time consuming delays in cargo and/or passenger shifting, plan your load so that the heaviest cargo and/or passengers are in the forward part of the airplane or cargo pack, and the lightest in the rear. Always plan to have any vacant space at the rear of the airplane or pack. For example, do not have passengers occupy the aft seat unless the front and center seats are to be occupied.

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.



# 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.

\*\* Arms measured to the center of the areas shown.

NOTE: The aft baggage wall (approximate station 145) can be used as a convenient interior reference point for determining the location of baggage area fuselage stations.

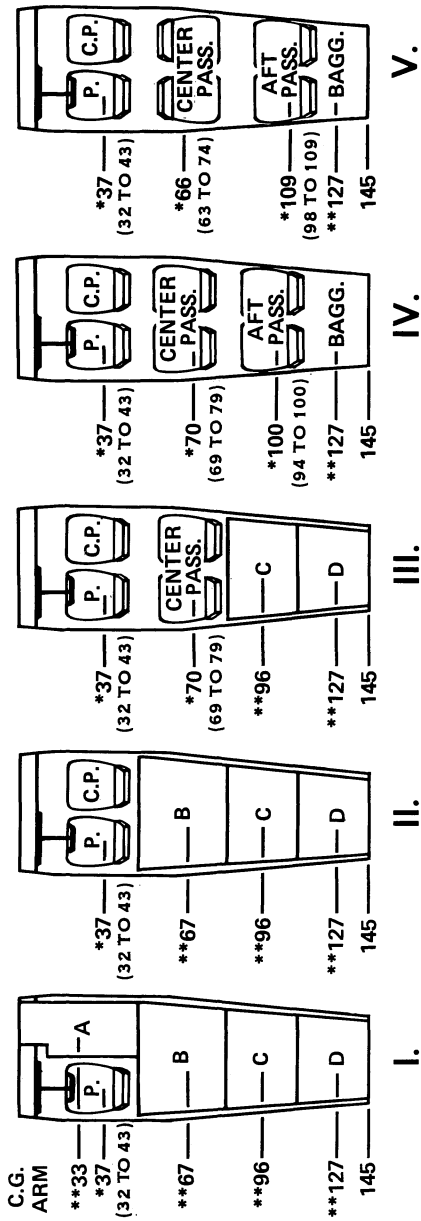


Figure 6-3. Loading Arrangements

Since your Cessna is capable of carrying large amounts of cargo, it will be necessary to properly secure this load before flight. A tie-down kit is available from any Cessna Dealer for airplanes with normal seating and airplanes with club seating. Provided in each kit are 12 tie-down blocks that fasten to the seat rails and three “D” rings on the floor at fuselage station 124. On airplanes equipped with club seating, eight of the tie-down blocks are designed for use on the larger seat rails used with the aft facing seats. Care must be taken to ensure that the proper sized tie-down blocks are used. If more tie-down points are needed, the seat belt attaching points, as well as shoulder harness attaching points, may be used. Rope, strap, or cable used for tie-down should be rated at a minimum of ten times the load weight capacity of the tie-down fittings used.

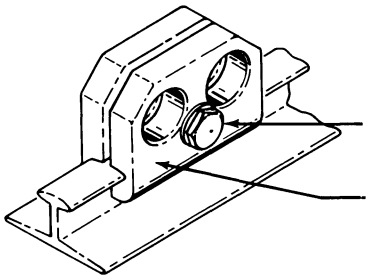
The following table shows the maximum allowable cargo weight for each type of attachment:

| ITEM                    | LOCATION                                    | *MAXIMUM LOAD (LBS.) |
|-------------------------|---------------------------------------------|----------------------|
| Seat Rail Tie-Down Assy | On Seat Rail Section Without Lock Pin Holes | 200                  |
| Seat Rail Tie-Down Assy | On Seat Rail Section With Lock Pin Holes    | 100                  |
| “D” Rings               | Floor only                                  | 60                   |
| Seat Belt Attachment    | Floor or Side-Wall                          | 200                  |
| Shoulder Strap          | Cabin Top                                   | 175                  |

\*Rated load per attachment (Cargo Item Wt. ÷ No. Tie-Downs). A sufficient number of attachments to restrain the cargo from shifting should be used in addition to load requirements

FOR EXAMPLE:

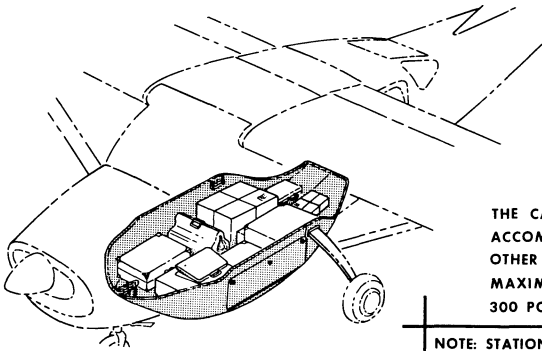
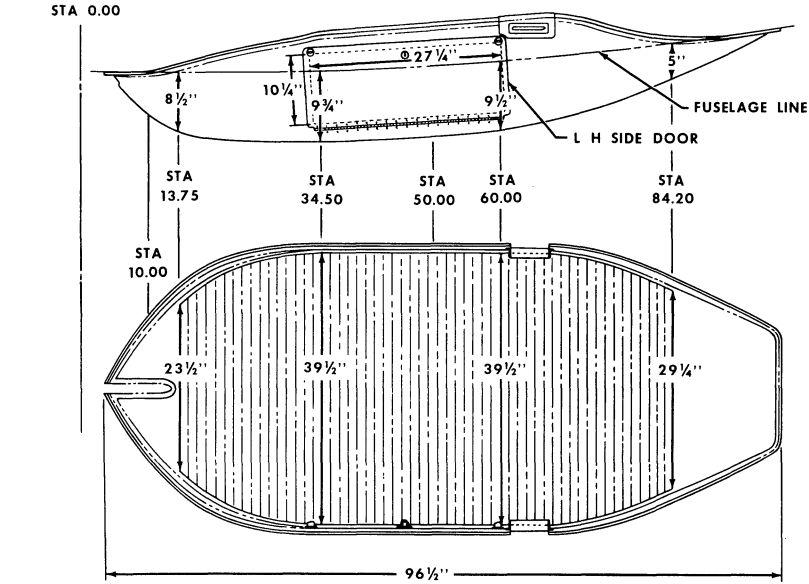
A 400# load would require a minimum of four (4) tie-downs rated at 100# each.



MUST BE TIGHTENED TO A MINIMUM OF 50 INCH POUNDS.

SEAT RAIL TIE-DOWN ASSEMBLY (TWO SIZES REQUIRED FOR CLUB SEATING)

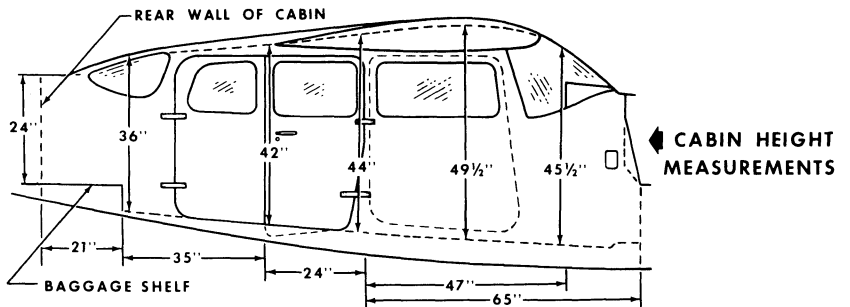
Figure 6-4. Cargo Loading



THE CARGO PACK WAS DESIGNED TO ACCOMMODATE THREE "TWO-SUITERS", PLUS OTHER SMALL MISCELLANEOUS ARTICLES. MAXIMUM LOADING FOR CARGO PACK IS 300 POUNDS.

NOTE: STATION LOCATION AND C.G. ARM ARE IDENTICAL

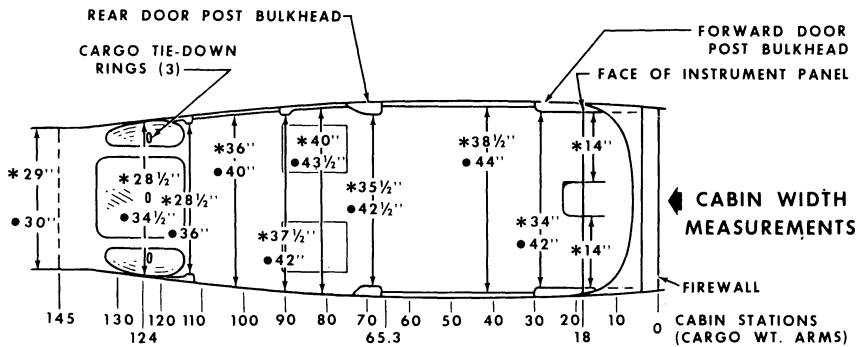
Figure 6-5. Cargo Pack



—— WIDTH ——  
\* CABIN FLOOR  
● LWR. WINDOW LINE

DOOR OPENING DIMENSIONS

|             | WIDTH<br>(TOP) | WIDTH<br>(BOTTOM) | HEIGHT<br>(FRONT) | HEIGHT<br>(REAR) |
|-------------|----------------|-------------------|-------------------|------------------|
| CABIN DOOR  | 32 1/2"        | 37"               | 41"               | 39"              |
| CARGO DOORS | 43"            | 40"               | 39 1/4"           | 37 1/2"          |



NOTES:

1. Use the forward face of the rear door post as a reference point to locate C. G. arms. For example, a box with its center of weight located 13 inches aft of the rear door post would have a C. G. arm of  $(65, 3 + 13, 0 = 78, 3)$  78.3 inches.
2. Maximum allowable floor loading: 200 pounds/square foot. However, when items with small or sharp support areas are carried, the installation of a 1/4" plywood floor is highly recommended to protect the aircraft structure.

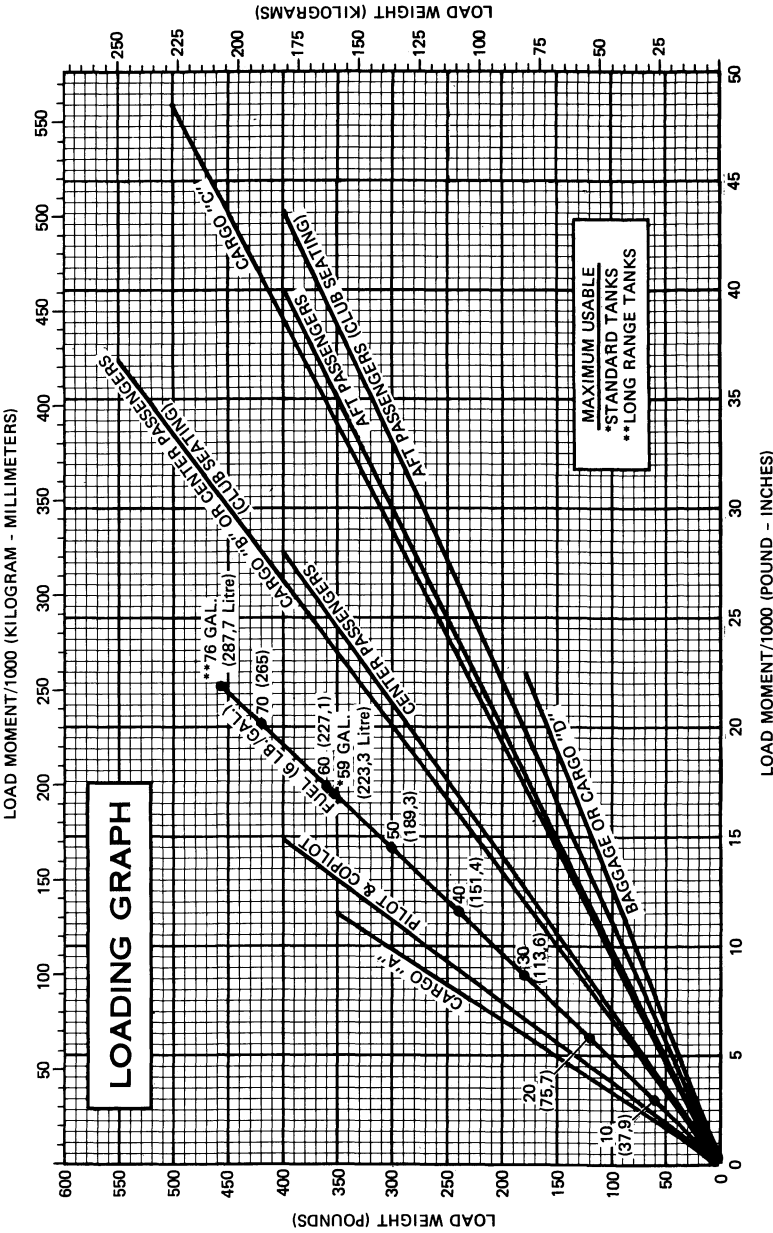
Figure 6-6. Internal Cabin Dimensions

SECTION 6  
WEIGHT & BALANCE/  
EQUIPMENT LIST

CESSNA  
MODEL TU206G

| SAMPLE<br>LOADING PROBLEM                                                                                                                                                                                                                                                                                                                                                     | SAMPLE<br>AIRPLANE |                               | YOUR<br>AIRPLANE |                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------------------|------------------|-------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                               | Weight<br>(lbs.)   | Moment<br>(lb.-ins.<br>/1000) | Weight<br>(lbs.) | Moment<br>(lb.-ins.<br>/1000) |
| 1. Basic Empty Weight (Use the data pertaining to your airplane as it is presently equipped. Includes unusable fuel and full oil) . . . . .                                                                                                                                                                                                                                   | 2122               | 75.9                          |                  |                               |
| 2. Usable Fuel (At 6 Lbs./Gal.)                                                                                                                                                                                                                                                                                                                                               |                    |                               |                  |                               |
| Standard Tanks (59 Gal. Max.) . . . . .                                                                                                                                                                                                                                                                                                                                       | 354                | 17.0                          |                  |                               |
| Long Range Tanks (76 Gal. Max.) . . . . .                                                                                                                                                                                                                                                                                                                                     |                    |                               |                  |                               |
| 3. Pilot and Copilot (Sta. 32 to 43) . . . . .                                                                                                                                                                                                                                                                                                                                | 340                | 12.6                          |                  |                               |
| 4. Center Passengers                                                                                                                                                                                                                                                                                                                                                          |                    |                               |                  |                               |
| Standard Seating (Sta. 69 to 79) . . . . .                                                                                                                                                                                                                                                                                                                                    | 340                | 23.8                          |                  |                               |
| Club Seating (Sta. 63 to 74) . . . . .                                                                                                                                                                                                                                                                                                                                        |                    |                               |                  |                               |
| Aft Passengers                                                                                                                                                                                                                                                                                                                                                                |                    |                               |                  |                               |
| Standard Seating (Sta. 94 to 100) . . . . .                                                                                                                                                                                                                                                                                                                                   | 340                | 34.0                          |                  |                               |
| Club Seating (Sta. 98 to 109) . . . . .                                                                                                                                                                                                                                                                                                                                       |                    |                               |                  |                               |
| Baggage IV or V (Sta. 109 to 145, 180 Lbs. Max.)                                                                                                                                                                                                                                                                                                                              | 120                | 15.2                          |                  |                               |
| 5. *Cargo "A" (Sta. 10 to 50) . . . . .                                                                                                                                                                                                                                                                                                                                       |                    |                               |                  |                               |
| *Cargo "B" (Sta. 50 to 84) . . . . .                                                                                                                                                                                                                                                                                                                                          |                    |                               |                  |                               |
| *Cargo "C" (Sta. 84 to 109) . . . . .                                                                                                                                                                                                                                                                                                                                         |                    |                               |                  |                               |
| *Cargo "D" (Sta. 109 to 145) . . . . .                                                                                                                                                                                                                                                                                                                                        |                    |                               |                  |                               |
| 6. Cargo Pack (Sta. 10 to 84; 300 Lbs. Max.) . . .                                                                                                                                                                                                                                                                                                                            |                    |                               |                  |                               |
| 7. RAMP WEIGHT AND MOMENT                                                                                                                                                                                                                                                                                                                                                     | 3616               | 178.5                         |                  |                               |
| 8. Fuel Allowance for engine start, taxi, and runup                                                                                                                                                                                                                                                                                                                           | -16                | -.8                           |                  |                               |
| 9. TAKEOFF WEIGHT AND MOMENT<br>(Subtract Step 8 from Step 7)                                                                                                                                                                                                                                                                                                                 | 3600               | 177.7                         |                  |                               |
| 10. Locate this point (3600 at 177.7) on the Center of Gravity Moment Envelope, and since this point falls within the envelope, the loading is acceptable.<br><br>*Maximum allowable cargo loads will be determined by the type and number of tie-downs used, as well as by the airplane weight and C.G. limitations. Floor loading must not exceed 200 lbs. per square foot. |                    |                               |                  |                               |

Figure 6-7. Sample Loading Problem



NOTE: 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 6-8. Loading Graph

SECTION 6  
WEIGHT & BALANCE/  
EQUIPMENT LIST

CESSNA  
MODEL TU206G

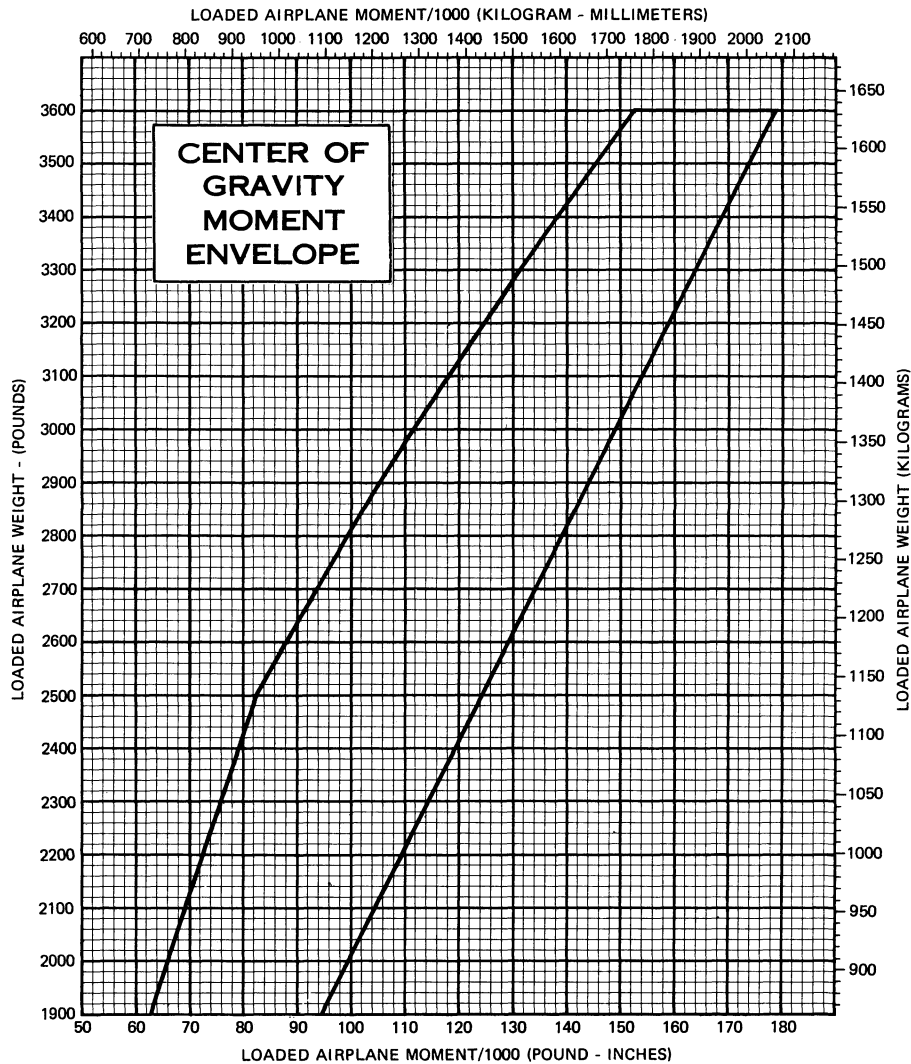


Figure 6-9. Center of Gravity Moment Envelope



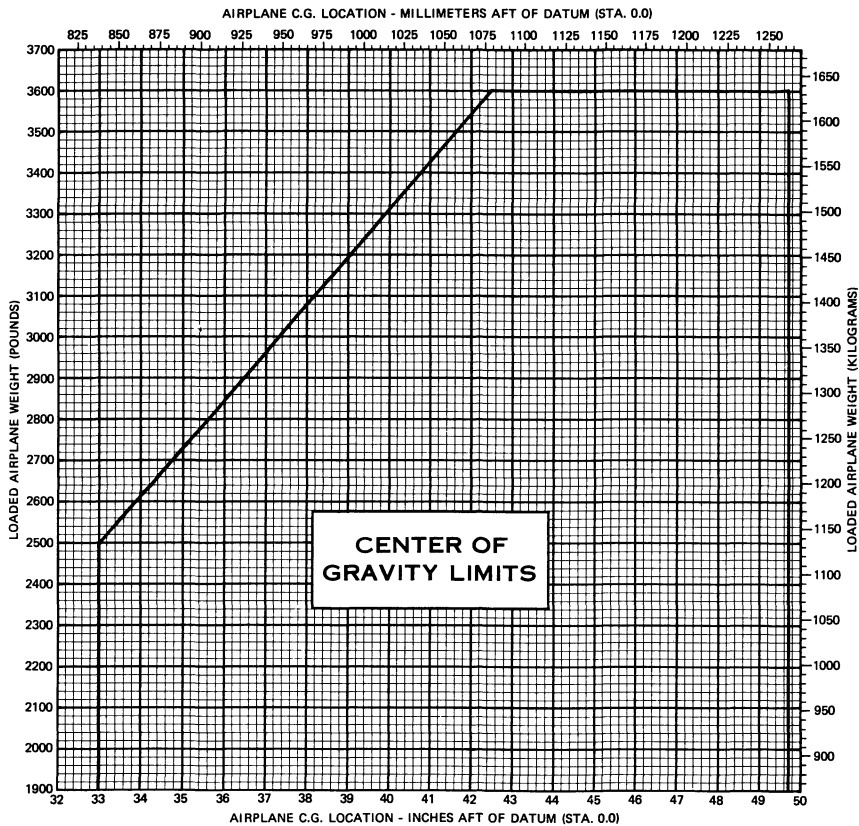


Figure 6-10. Center of Gravity Limits



## 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.

SECTION 6  
WEIGHT & BALANCE/  
EQUIPMENT LIST

CESSNA  
MODEL TU208G

| ITEM NO | EQUIPMENT LIST DESCRIPTION                                                                                                                                                                                        | REF DRAWING                                                                                                                                                                    | WT LBS                                                                   | ARM INS                                                                        |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------|
|         | A. POWERPLANT & ACCESSORIES                                                                                                                                                                                       |                                                                                                                                                                                |                                                                          |                                                                                |
| A01-R   | ENGINE, CONTINENTAL TS1C-520-M, SPEC 2<br>(INCLUDES MAGNETOS, NON-CONGEALING<br>MODINE OIL COOLER INSUL, AND STARTER)                                                                                             | 1250800                                                                                                                                                                        | 456.0*                                                                   | -18.0*                                                                         |
| A05-R   | FILTER, INDUCTION AIR, 60 AMP                                                                                                                                                                                     | 1250846                                                                                                                                                                        |                                                                          | -4.0                                                                           |
| A09-R   | ALTERNATOR, 28 VOLT, ENGINE OIL                                                                                                                                                                                   | C611503                                                                                                                                                                        | 10.8                                                                     | -6.0                                                                           |
| A21-R   | FILTER, FUEL FLOW ENGINE                                                                                                                                                                                          | 0750606                                                                                                                                                                        | 4.5                                                                      | -5.0                                                                           |
| A33-R   | PROPELLER ASSY, 3-BLADE 80-INCH LANDPLANE<br>MCCAULEY HUB (MCCAULEY C290D472)                                                                                                                                     | C161007                                                                                                                                                                        | 73.0*                                                                    | -43.7*                                                                         |
| A37-R-1 | GOVERNOR, PROPELLER (WOODWARD 6210452)                                                                                                                                                                            | C161032                                                                                                                                                                        | 71.0*                                                                    | -32.5                                                                          |
| A37-R-2 | GOVERNOR, PROPELLER (WOODWARD 6210452)                                                                                                                                                                            | C161040                                                                                                                                                                        | 3.0                                                                      | -32.5                                                                          |
| A41-R   | SPINNER, 3-BLADED PROPELLER                                                                                                                                                                                       | C295001                                                                                                                                                                        | 3.5                                                                      | -47.1                                                                          |
| A45-R   | TURBOCHARGER TURBINE ASSY                                                                                                                                                                                         | C165006                                                                                                                                                                        | 23.0                                                                     | -13.0                                                                          |
| A49-R   | TURBOCHARGER WASTE GATE VALVE ASSY                                                                                                                                                                                | C165004                                                                                                                                                                        | 2.5                                                                      | -16.5                                                                          |
| A53-R   | TURBOCHARGER CONTROLLER                                                                                                                                                                                           | C482002                                                                                                                                                                        | 2.5                                                                      | -7.0                                                                           |
| A57-R   | TURBOCHARGER OVERBOOST RELIEF VALVE                                                                                                                                                                               | C482002                                                                                                                                                                        | 1.5                                                                      | 0.0                                                                            |
| A61-A   | VACUUM SYSTEM, ENGINE DRIVEN<br>VACUUM PUMP                                                                                                                                                                       | 1201055                                                                                                                                                                        | 4.0*                                                                     | -3.0                                                                           |
|         | RELIEF VALVE                                                                                                                                                                                                      | C431003                                                                                                                                                                        | 2.8                                                                      | -2.1                                                                           |
|         | MISC. HOSES, CLAMPS ETC.                                                                                                                                                                                          | C482001                                                                                                                                                                        | 0.6                                                                      | -3.3                                                                           |
| A70-A   | PRIMER, 2-POINT MANIFOLD TYPE                                                                                                                                                                                     | 1216612                                                                                                                                                                        | 1.0                                                                      | -8.5                                                                           |
| A73-A   | OIL INJECTION VALVE (NET CHANGE)                                                                                                                                                                                  | 1256011                                                                                                                                                                        | 0.5                                                                      | -                                                                              |
| A88-R   | AIR INDUCTION SYSTEM                                                                                                                                                                                              | 1250830                                                                                                                                                                        |                                                                          |                                                                                |
|         | B. LANDING GEAR & ACCESSORIES                                                                                                                                                                                     |                                                                                                                                                                                |                                                                          |                                                                                |
| B01-R-1 | WHEEL, BRAKE & TIRE ASSY 6.00-6 MAIN (2)<br>WHEEL ASSY, CLEVELAND 40-758 (EACH)<br>BRAKE ASSY, CLEVELAND 30-52 (LEFT)<br>BRAKE ASSY, CLEVELAND 30-52 (RIGHT)<br>TIRE, 6 PLY RATED BLACKWALL (EACH)<br>TUBE (EACH) | 1241118-1 & 2<br>C163001-0301<br>C163030-0303<br>C163030-0304<br>C262003-0204<br>C262023-0102<br>1241118-1 & 2<br>C163001-0102<br>C163032-0205<br>C163032-0206<br>C262003-0204 | 39.2*<br>6.2*<br>2.8<br>8.7<br>9.9<br>41.8*<br>17.2<br>3.1<br>3.1<br>8.5 | 59.0*<br>59.0<br>59.0<br>59.0<br>59.0<br>59.0*<br>59.0<br>59.0<br>59.0<br>59.0 |
| B01-R-2 | WHEEL, BRAKE & TIRE ASSY 6.00-6 MAIN (2)<br>WHEEL ASSY, MCCAULEY (LEFT)<br>BRAKE ASSY, MCCAULEY (LEFT)<br>BRAKE ASSY, MCCAULEY (RIGHT)<br>TIRE, 6 PLY RATED BLACKWALL (EACH)                                      |                                                                                                                                                                                |                                                                          |                                                                                |

**6-19**

SECTION 6  
WEIGHT & BALANCE/  
EQUIPMENT LIST

CESSNA  
MODEL TU206G

| ITEM NO                      | EQUIPMENT LIST DESCRIPTION                                      | REF DRAWING  | WT LBS | ARM INS |
|------------------------------|-----------------------------------------------------------------|--------------|--------|---------|
| <b>C. ELECTRICAL SYSTEMS</b> |                                                                 |              |        |         |
| C01-R-1                      | BATTERY, 24 VOLT, 14 AMP HR                                     | 0870060-1    | 27.5   | 3.0     |
| C01-R-2                      | BATTERY, 24 VOLT, 14 AMP HR                                     | C614001-0101 | 22.0   | 3.0     |
| C01-O                        | BATTERY, 24 VOLT, 17 AMP HR                                     | C614001-0102 | 27.0   | 3.0     |
| C04-R                        | REGULATOR, 28 VOLT ALTERNATOR                                   | C611002-0105 | 0.5    | 3.0     |
| C07-A                        | GROUND SERVICE PLUG RECEPTACLE                                  | 1270652-4    | 2.0    | -4.5    |
| C10-A                        | ELEVATOR TRIM, ELECTRIC                                         | 1260537      | 5.1*   | 194.6*  |
|                              | ACTUATOR ASSY                                                   | 1260153      | 3.3    | 215.0   |
| C19-O                        | HEATING SYSTEM, STALL SENSOR & PITOT NET CHANGE                 | 1200816-1    | 0.2    | 22.1    |
| C22-A                        | LIGHT INSTL, INSTRUMENT POST (SET OF 20)                        | 1213384      | 0.5    | 18.5    |
| C23-A                        | LIGHT INSTL, CONROL WHEEL MAP                                   | 0760020      | 0.1    | 22.5    |
| C31-A                        | LIGHT INSTL, UNDERWING COURTESY (SET OF 2)                      | 1201054-1    | 0.5    | 61.9    |
| C40-A                        | DETECTOR ST, NAVIGATION LIGHT (SET OF 2)                        | 0701013-1    | NEGL   | -       |
| C43-R                        | LIGHT INSTL, OMNIFLASH BEACON                                   | 1270678      | 2.1*   | 220.8*  |
|                              | BEACON LIGHT (IN FIN TIP)                                       | C621001-0102 | 0.7    | 256.6   |
| C46-A                        | LIGHT INSTALLATION, WING TIP STROBE                             | C594502-0101 | 0.7    | 259.4   |
|                              | FLASHER POWER SUPPLY (EACH WING TIP)                            | 1201120      | 2.9*   | 43.7*   |
| C49-S                        | STROBE LIGHTS IN WING TIPS (SET OF 2)                           | C622008-0102 | 2.3    | 40.5    |
|                              | LIGHTS, COWL MOUNTED LANDING & TAXI                             | C622006-0101 | 0.3    | 44.7    |
|                              |                                                                 | 1270676      | 2.0    | -28.5   |
| <b>D. INSTRUMENTS</b>        |                                                                 |              |        |         |
| D01-R                        | INDICATOR, AIR SPEED                                            | C661064-0214 | 1.0    | 17.0    |
| D01-D                        | INDICATOR, TRUE AIR SPEED                                       | 1201108-10   | 1.0    | 17.0    |
| D04-S                        | STATIC AIR, ALTERNATE SOURCE                                    | 1201121-1    | 0.3    | 15.4    |
| D07-R                        | ALTIMETER, SENSITIVE (50 FT MARKINGS)                           | C661071-0201 | 1.0    | 16.5    |
| D07-O-1                      | ALTIMETER, SENSITIVE (FEET & MILLIBARS)                         | C661071-0102 | 1.0    | 16.5    |
| D07-O-2                      | ALTIMETER, SENSITIVE (50 FT MARKINGS)                           | C661071-0202 | 1.0    | 16.5    |
| D07-O-3                      | ALTIMETER, SENSITIVE (FEET & MILLIBARS)                         | C661071-0102 | 1.0    | 16.5    |
|                              | ALTIMETER, SENSITIVE (50 FT MARKINGS)                           | C661025-0102 | 1.0    | 16.5    |
| D10-A                        | ALTIMETER, SENSITIVE (20 FT MARKINGS)                           |              | 1.0    | 16.5    |
| D10-A                        | ALTIMETER, SENSITIVE (2ND INSTL. - MAKES DUAL ALTIMETER INSTL.) | 1213681      | 0.8    | 17.8    |
| D16-A-1                      | ALTIMETER, ENCODING (USED WITH ALTITUDE                         | 1213732      | 2.8    | 15.1    |

| ITEM NO | EQUIPMENT LIST DESCRIPTION                                                                                                                                               | REF DRAWING  | WT LBS | ARM INS |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------|---------|
| D16-A-2 | REPORTING TRANSPONDER)(REQUIRES ITEM C10-A SENSITIVE ALTIME TER)(WEIGHT NOT INCLUDED)<br>ALTITUDE ENCODER (BLIND)(DOES NOT REQUIRE INSTRUMENT PANEL MOUNTING)<br>ENCODER | 1201078      | 1.6*   | 15.5*   |
| D25-S   | CLOCK/ELECTRIC                                                                                                                                                           | C744001-0101 | 1.3    | 15.8    |
| D28-R   | COMPASS, MAGNETIC INSTALLATION                                                                                                                                           | C664508-0101 | 0.5    | 17.5    |
| D34-R   | INSTRUMENT CLUSTER - ENGINE                                                                                                                                              | 1213E79-1    | 0.6    | 21.5    |
| D49-A   | INDICATOR INSTALLATION, ECONOMY MIXTURE<br>EGT INDICATOR, ALCOR 202-2AY                                                                                                  | C669502-0202 | 1.5*   | 17.0    |
|         | TEMPERATURE COUPLE LEAD WIRE                                                                                                                                             | 1200677      | 0.7*   | 0.9*    |
|         | TEMPERATURE COUPLE PROBE, ALCOR 01-005-1A44                                                                                                                              | C668501-0211 | 0.4    | 17.3    |
| D55-R   | GAUGE, MANIFOLD PRESSURE & FUEL FLOW                                                                                                                                     | C668501-0206 | 0.1    | -18.0   |
| D64-A-1 | GYRO, INSTALLATION FOR NCN-SLAVED HSI<br>(REQUIRES ITEM A61-A VACUUM SYSTEM)<br>DIRECTIOAL INDICATOR<br>ATTITUDE INDICATOR                                               | C662037-0107 | 1.0    | 16.5    |
|         | ATTITUDE INDICATOR                                                                                                                                                       | 1201069-2    | 6.9*   | 13.6*   |
|         | CONNECTING HOSES & MISC. ITEMS                                                                                                                                           | C661075      | 2.2    | 15.5    |
| D64-A-2 | GYRO, INSTALLATION FOR 3COA NAV-O-MATIC<br>(REQUIRES ITEM A61-A VACUUM SYSTEM)<br>DIRECTIOAL INDICATOR<br>ATTITUDE INDICATOR                                             | C661076      | 2.1    | 15.1    |
|         | ATTITUDE INDICATOR                                                                                                                                                       | 1201075      | 0.2    | 11.5    |
|         | CONNECTING HOSES & MISC. ITEMS                                                                                                                                           | 1201069      | 2.4    | 10.7    |
| D64-A-3 | GYRO, INSTALLATION FOR 4CO NAV-O-MATIC<br>(REQUIRES ITEM A61-A VACUUM SYSTEM)<br>DIRECTIOAL INDICATOR<br>ATTITUDE INDICATOR                                              | 40760        | 6.9*   | 13.6*   |
|         | ATTITUDE INDICATOR                                                                                                                                                       | C661076      | 3.1    | 14.0    |
|         | CONNECTING HOSES & MISC. ITEMS                                                                                                                                           | 1201075      | 0.2    | 15.1    |
| D64-A-4 | GYRO, INSTALLATION FOR NCN-SLAVED HSI<br>(USED WITH ITEM H09-A)<br>HORIZON INDICATOR<br>HOSES, CLAMPS & MISC HARDWARE                                                    | 1201069      | 7.3*   | 13.7*   |
|         | HOSES, CLAMPS & MISC HARDWARE                                                                                                                                            | 40760        | 3.1    | 14.0    |
|         | GAUGE, OUTSIDE AIR TEMP. (C668507-0101)                                                                                                                                  | 37570        | 2.3    | 15.7    |
| D67-A   | TACHOMETER, RECORDING                                                                                                                                                    | 1201075      | 0.2    | 11.5    |
| D85-R   | INDICATOR, TURN COORDINATOR                                                                                                                                              | -            | 1.9    | 11.0    |
| D88-S   | INDICATOR, TURN COORDINATOR (FOR USE WITH 20CA & 30CA NAV-O-MATICS)                                                                                                      | -            | 4.0*   | 13.5*   |
| D88-O   |                                                                                                                                                                          | C661076      | 2.1    | 15.3    |
|         |                                                                                                                                                                          | 44690-2000   | 1.9    | 11.6    |
|         |                                                                                                                                                                          | 1200747      | 0.4    | 9.0     |
|         |                                                                                                                                                                          | 0701010      | 0.1    | 26.5    |
|         |                                                                                                                                                                          | C668020-0108 | 0.1    | 16.5    |
|         |                                                                                                                                                                          | C661003-0505 | 1.0    | 16.8    |
|         |                                                                                                                                                                          | 42320-0028   | 1.9    | 14.2    |

SECTION 6  
WEIGHT & BALANCE/  
EQUIPMENT LIST

CESSNA  
MODEL TU206G

| ITEM NO | EQUIPMENT LIST DESCRIPTION                                                                 | REF DRAWING  | WT LBS | ARM INS |
|---------|--------------------------------------------------------------------------------------------|--------------|--------|---------|
| D91-S   | INDICATOR, RATE OF CLIMB                                                                   | C661080-0101 | 1.0    | 16.5    |
| E01-A   | E. CABIN ACCOMMODATIONS                                                                    |              |        |         |
| E02-A   | ARM REST, FRONT SEAT INBOARD (SET OF 2)                                                    | 1214121      | 1.5    | 37.0    |
| E05-O-1 | ARM REST, 2ND ROW SEAT INBOARD (SET OF 2)                                                  | 1214121      | 1.5    | 74.0    |
| E05-O-2 | SEAT, PILOT - INFINITE ADJUST                                                              | 0714019      | 13.7   | 44.5    |
| E05-O-3 | SEAT, PILOT - UTILILINE                                                                    | 0714020      | 13.0   | 40.5    |
| E07-S   | SEAT, CO-PILOT - INFINITE ADJUST                                                           | 0714024      | 13.0   | 44.5    |
| E07-O-1 | SEAT, CO-PILOT - UTILILINE                                                                 | 0714025      | 13.7   | 40.8    |
| E07-O-2 | SEAT, CO-PILOT - INFINITE ADJUST                                                           | 0714019      | 13.0   | 44.5    |
| E07-O-3 | SEAT, CO-PILOT - UTILILINE                                                                 | 0714024      | 13.0   | 40.8    |
| E09-S   | SEATS, SECOND ROW - UTILILINE, INFINITE ADJ.                                               | 0714025      | 13.0   | 44.5    |
| E09-O-1 | SEATS, SECOND ROW - SET OF 2                                                               | 1214107      | 25.2   | 78.0    |
| E09-O-2 | SEATS, SECOND ROW - REAR FACING (SET OF 2)                                                 | 214008       | 25.8   | 72.0    |
| E11-S   | SEATS, INCLUDES SEAT BELT (SET OF 2)                                                       |              | 16.2   | 63.0    |
| E11-O   | SEATS, THIRD ROW (SET OF 2)                                                                |              | 34.8   |         |
| E15-O   | SEATS, THIRD ROW - UTILILINE (SET OF 2)                                                    | 1214108      | 21.7   | 105.2   |
| E15-S   | SAFETY BELT, PILOT                                                                         | 1214016      | 13.0   | 107.3   |
| E15-O-1 | SAFETY BELT, PILOT - UTILILINE (SET OF 2)                                                  | S-2275-103   | 1.0    | 37.0    |
| E19-O   | SAFETY BELT & SHOULDER HARNESS, PILOT<br>(USED WITH UTILITY OPTION SINGLE SEAT)            | S-2275-201   | 0.6    | 37.0    |
| E23-S   | SAFETY BELT & SHOULDER HARNESS, INERTIA                                                    | 1201136      | 2.1    | 102.4   |
| E27-S   | SAFETY BELT & SHOULDER HARNESS, CO-PILOT                                                   |              |        |         |
| E27-O   | SAFETY BELT & SHOULDER HARNESS, CO-PILOT<br>(SET OF 2)                                     | S-2275-3     | 3.8    | 89.1    |
| E29-S   | SAFETY BELT & SHOULDER HARNESS, CHANGE                                                     | S-1746       | 1.6    | 37.0    |
| E29-O   | SAFETY BELT & SHOULDER HARNESS, CHANGE<br>(SET OF 2)                                       | S-2275       | 2.0    | 74.0    |
| E34-A   | UTILITY UPHOLSTERY (NET CHANGE)<br>(FOR USE WITH JC7-A-1, JC7-A-2,<br>JC7-A-3, OR JC7-A-4) | S-1746       | 1.2    | 74.0    |
| E35-A   | LEATHER SEATING INSTALLATION (NET CHANGE)<br>(ADDS WEIGHT OF 0.5 LB. PER SEAT)             | S-2275       | 2.0    | 95.5    |
| E37-O   | WINDOW, OPENABLE RH                                                                        | 1215086      | 1.2    | 95.0    |
|         |                                                                                            |              | -15.4  | 74.6    |
|         |                                                                                            | CES-1158     | 3.0    | 73.3    |
|         |                                                                                            | 1211861      | 2.3    | 82.3    |



| ITEM NO            | EQUIPMENT LIST DESCRIPTION                                                                          | REF DRAWING                | WT LBS      | ARM INS      |
|--------------------|-----------------------------------------------------------------------------------------------------|----------------------------|-------------|--------------|
| E41-S<br>E41-A-1   | DOORS, FORWARD AND AFT CARGO<br>SPOILER, (INSTALLED AND AFT CARGO<br>REMOVAL OF E41-S, CARGO DOORS) | 1211670 1211673<br>1200197 | 22.2<br>1.0 | 90.4<br>67.3 |
| E41-A-2            | SKYDIVING KIT, (INCLUDES E41-A-1 INSTL)                                                             | 1201008                    | 2.1         | 69.7         |
| E45-A              | CURTAIN SYSTEM, PARTIAL INSTL                                                                       | 1200714                    | 1.5         | 106.5        |
| E47-S              | OXYGEN SYSTEM, 76 CU.FT. CAPACITY, 6 PORT<br>EMPTY CYLINDER & C166002-0401 REGULATOR                | 1200416-36                 | 2.5         | 66.0         |
| E47-A              | OXYGEN MASKS (1 PILOT, 5 PASSENGERS)<br>76 CU.FT. (1850 PSI) OXYGEN                                 | C166001-0701<br>C166005    | 39.8*       | 159.5*       |
|                    |                                                                                                     |                            | 29.5        | 169.9        |
|                    |                                                                                                     |                            | 1.5         | 67.9         |
|                    |                                                                                                     |                            | 6.3         | 169.9        |
| E49-A-1<br>E49-A-2 | CUP HOLDER, RETRACTABLE (PILOT)<br>CUP HOLDER, RETRACTABLE (SET OF 2)                               | 1201124-1<br>1201124-1 & 2 | 0.1<br>0.2  | 15.0<br>15.0 |
| E50-A              | HEADRESTS, FRONT SEAT (SET OF 2)                                                                    | 1215073                    | 2.0         | 47.0         |
| E51-A              | HEADRESTS, CENTER SEAT (SET OF 2)                                                                   | 1215073                    | 2.0         | 74.0         |
| E52-A              | HEADRESTS, REAR SEAT (SET OF 2)                                                                     | 1215073                    | 2.0         | 95.5         |
| E53-A              | MIRROR                                                                                              | 12007041                   | 0.3         | 18.0         |
| E55-S              | SUN VISORS (SET OF 2)                                                                               | 0709122                    | 1.0         | 33.0         |
| E59-A              | HOLDER, APPROACH PLATE                                                                              | 0715046-1                  | 0.1         | 22.0         |
| E65-S              | NET, BAGGAGE RETAINING                                                                              | 1215036                    | 0.5         | 127.0        |
| E71-A              | CARGO TIE DOWN PROVISIONS                                                                           | 1201123                    | 2.5         | 91.2         |
| E77-A              | MORTUARY KIT                                                                                        | 1210059-1                  | 84.9        | 171.2        |
| E79-A              | AMBULANCE KIT (WITH OXYGEN BOTTLE)                                                                  | 1210080                    | 68.0        | 76.0         |
| E85-A              | CONTROL S, DUAL (WHEEL, PEDALS, TOE BRAKES)                                                         | 1260004-10                 | 8.1         | 13.7         |
| E89-S              | CONTROL WHEEL - ALL PURPOSE (NET CHANGER)                                                           | 1260243                    | 0.0         | -            |
| E93-R              | CABIN HEATING (INCLUDES ENGINE EXHAUST SYS)                                                         | 1250860                    | 26.0        | -20.5        |
| F01-R              | F. PLACARDS & WARNING                                                                               |                            |             |              |
| F01-O-1            | PLACARD - OPERATIONAL, VFR (DAY-NIGHT)<br>(STD. STATIONAIR)                                         | 1205109-19                 | NEGL        | -            |
| F01-O-2            | PLACARD - OPERATIONAL, IFR (DAY-NIGHT)<br>(STD. STATIONAIR)                                         | 1205109-19                 | NEGL        | -            |
| F01-O-3            | PLACARD - OPERATIONAL, VFR (DAY-NIGHT)<br>(UTILITY STATIONAIR)                                      | 1205109-17                 | NEGL        | -            |
| F04-R              | PLACARD - OPERATIONAL, IFR (DAY-NIGHT)<br>(UTILITY STATIONAIR)<br>INDICATOR, STALL WARNING, ALDIBLE | 1205109-18<br>1220090      | NEGL<br>1.0 | -<br>14.0    |

SECTION 6  
WEIGHT & BALANCE/  
EQUIPMENT LIST

CESSNA  
MODEL TU206G

| ITEM NO | EQUIPMENT LIST DESCRIPTION                                                                                                                                                    | REF DRAWING                           | WT LBS             | ARM INS               |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------------------|-----------------------|
|         | <b>G. AUXILIARY EQUIPMENT</b>                                                                                                                                                 |                                       |                    |                       |
| G07-A   | RINGS, AIRPLANE HOISTING (NOT FACTORY INSTALLED)                                                                                                                              | 1201142-1                             | 0.8                | 74.4                  |
| G13-A   | CORROSION PROOFING, INTERNAL                                                                                                                                                  | 1260100-4                             | 18.0               | 63.5                  |
| G16-A   | DISCHARGER, STATIC (SET OF 10)                                                                                                                                                | 1201140-1                             | 0.3                | 153.6                 |
| G19-A   | STABILIZER, ABRASION BOOTS                                                                                                                                                    | 0500041-2                             | 1.5                | 206.0                 |
| G22-S   | TOW BAR, AIRPLANE (STOWED)                                                                                                                                                    | 0501019                               | 1.6                | 127.0                 |
| G22-O   | TOW BAR, AIRPLANE (TELESCOPING HANDLE)                                                                                                                                        |                                       | 2.0                | 127.0                 |
| G25-S   | PAINT, OVERALL EXTERIOR (MODIFIED POLY-URETHANE)                                                                                                                              | 1204030                               | 13.4*              | 93.3*                 |
|         | OVERALL WHITE BASE                                                                                                                                                            |                                       |                    |                       |
|         | WASH PRIME COATING                                                                                                                                                            |                                       |                    |                       |
|         | COLOR STRIPE                                                                                                                                                                  |                                       |                    |                       |
| G25-O   | PAINT, OVERALL EXTERIOR (MODIFIED POLY-URETHANE) USED WITH INTERNAL CORROSION PROOFING, ITEM G-13A                                                                            |                                       | 12.5               | 94.3                  |
| G31-O   | CABLES, CORROSION RESISTANT (NET CHANGE)                                                                                                                                      | 1260100-4                             | 0.0                | 94.3                  |
| G55-A-1 | FIRE EXTINGUISHER, STD PILOT SEAT                                                                                                                                             | 0701014-1                             | 3.0                | 61.2                  |
| G55-A-2 | FIRE EXTINGUISHER, VTL ADJUST PILOT SEAT                                                                                                                                      | 0701014-2                             | 3.0                | 93.3                  |
| G67-A   | RUDDER PEDAL EXTENSIONS, RELEASABLE - SET OF 2 (STOWABLE IN INSTALLED ARM SHOWN)                                                                                              | 0701048                               | 2.3                | -                     |
| G79-A   | PROPELLER DEICE SYSTEMS                                                                                                                                                       | 1201072-2                             | 4.4                | 35.0                  |
| G84-A   | PHOTOGRAPHIC PROVISIONS                                                                                                                                                       | 1201107                               | 9.5                | 29.0                  |
| G92-O   | FUEL SYSTEM, LONG RANGE WINGS (NET CHANGE)                                                                                                                                    | 1220800-5 & -6                        | 7.0                | 8.0                   |
| G94-A   | (80 GALLON CAPACITY)<br>CARGO PACK, EXTERNAL BELLY MOUNTED                                                                                                                    | 1200641                               | 32.0               | -25.1                 |
|         |                                                                                                                                                                               |                                       |                    | 77.0                  |
|         |                                                                                                                                                                               |                                       |                    | 46.5                  |
|         |                                                                                                                                                                               |                                       |                    | 51.0                  |
|         | <b>H. AVIONICS &amp; AUTOPILOTS</b>                                                                                                                                           |                                       |                    |                       |
| H01-A-1 | CESSNA 300 ADF W/BFG, NC CARGO POD RECEIVER WITH BFO (R-546E)<br>CONIGMETER INDICATOR (IN-346A)<br>ADF LOOP ANTENNA & ASSOC. WIRING                                           | 3910159-6<br>41240-0101<br>40980-1001 | 7.3*<br>2.3<br>0.9 | 23.4*<br>13.0<br>16.0 |
| H01-A-2 | ADF SENSE ANTENNA<br>CESSNA 300 ADF W/BFG & CARGO POD INSTALLED (SAME AS H01-A-1 ABOVE EXCEPT THE LOOP ANTENNA IS MOVED FROM STA. 39.8 TO STA. 144.5 AND NEW LOCP CABLE USED) | 3910159-6                             | 2.1<br>0.3<br>8.3* | 32.7<br>96.2<br>50.3* |

| ITEM NO | EQUIPMENT LIST DESCRIPTION                                                                                                                                                                                                                                                                                      | REF DRAWING                                               | WT LBS                                   | ARM INS                                                             |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------------------------------|---------------------------------------------------------------------|
| H01-A-3 | CESSNA 400 ADF W/BFO, NO CARGO POD RECEIVER, 24 VOLT (R-446A)<br>GONIOMETER INDICATOR (IN-346A)<br>ADF LOOP ANTENNA & ASSOC WIRING (FWD)                                                                                                                                                                        | 3910160-6<br>43090-1124<br>40980-1001                     | 8.4*<br>3.4<br>0.9<br>2.1<br>0.3<br>9.4* | 21.4*<br>11.5<br>116.0<br>32.7<br>96.2<br>45.3*                     |
| H01-A-4 | CESSNA 400 ADF W/BFO & CARGO POD INSTALLED (SAME AS H01-A-3 ABOVE EXCEPT THE LOOP ANTENNA IS MOVED FROM STA-39.8 TO STA-144.5 AND NEW LOOP CABLE USED)                                                                                                                                                          | 3910160-3, -6                                             |                                          |                                                                     |
| H04-A-1 | NARCO DME 150<br>TRANSMITTER<br>MOUNTING BOX                                                                                                                                                                                                                                                                    | 3910166-7<br>3312-400                                     | 6.1*<br>4.9<br>0.6<br>0.2<br>16.9*       | 16.7*<br>11.0<br>115.5<br>117.4*<br>14.0<br>159.3<br>133.3<br>159.3 |
| H04-A-2 | CESSNA 400 DME<br>CONTROL UNIT (RT-476)<br>REMOTE RECEIVER/TRANSMITTER (RTA-476A)<br>ANTENNA                                                                                                                                                                                                                    | UDA-3<br>3910167<br>44020-1100<br>44000<br>42940          | 1.6<br>8.5<br>0.2<br>0.6                 |                                                                     |
| H05-A   | REMOTE UNIT MOUNTING RACK<br>WITH VOR/LOC SYSTEM<br>AREA NAV COMPUTER (RN-478A)<br>VOR/LOC INDICATOR (IN-442AR) (NET CHG)<br>(INDICATOR'S EXCHANGE FOR 300 OR 400 STANDARD; INDICATORS RESPECTIVELY)<br>(R-NAV SYSTEM HAS BUILT-IN INDICATOR CONVERTER)                                                         | 44100-1100<br>43910-1000                                  | 3.0*<br>3.8<br>-0.9                      | 12.1*<br>12.0<br>12.1                                               |
| H07-A-1 | CESSNA 400 GLIDESLOPE (INCLUDES VOR/ILS INDICATOR--NET CHANGE FOR VOR/LOC)<br>RECEIVER (R-443B)<br>ANTENNA LOCATED ON UPPER WINDSHIELD)<br>VOR/ILS INDICATOR (IN-386A)<br>NET CHANGE, ACTUAL WT IS 2.3 LBS)<br>CESSNA 400 GLIDESLOPE WITH 300 ILS INDICATOR AUTOCOURSE, IN-386AC INDICATOR EXCHANGE FOR IN-386A | 3910157<br>42100-0000<br>1200098<br>46860-2000<br>3910157 | 4.1*<br>2.1<br>0.2<br>0.1<br>NIL         | -5.4*<br>-15.6<br>29.5<br>15.5<br>-                                 |
| H07-A-2 | CESSNA HSI, NON SLAVED<br>(NET CHANGE WITH VOR INDICATOR)                                                                                                                                                                                                                                                       | 44690-2000                                                | 4.9*                                     | -0.9*                                                               |
| H09-A   | PSI-VOR CONVERTER<br>OMNI INDICATOR; 300 OR 400 DELETED WIRING & MISC ITEMS                                                                                                                                                                                                                                     |                                                           | 4.5<br>-1.7<br>-2.2<br>0.9<br>22.2*      | 14.0<br>-15.0<br>-15.5<br>-8.8<br>109.1*                            |
| H11-A-1 | PANTRONICS HF TRANSMITTER                                                                                                                                                                                                                                                                                       | 3910156-21                                                |                                          |                                                                     |

**SECTION 6  
WEIGHT & BALANCE/  
EQUIPMENT LIST**

**CESSNA  
MODEL TU206G**

| ITEM NO | EQUIPMENT LIST DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | REF DRAWING                                                                                                                                                                                                                                                                                                                                                                                                                            | WT LBS                                                                                                                                                                                                                                                                            | ARM INS                                                                                                                                                                                                                                                                                                                     |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| H11-A-2 | TRANSCIVER (PT10-A)<br>REMOTE POWER SUPPLY (PT10-PS-28)<br>ANTENNA LOAD BOX (OX10-RL-28)<br>ANTENNA INSTL, 351 INCHES LONG<br>SUNAIR 358 HE TRANSCEIVER (RE-1000)<br>TRANSCIVER, 358 ASB-125 (RE-1000)<br>REMOTE POWER AMPLIFIER (PA-1010A)<br>ANTENNA COUPLER (LOAD BOX) (CU-110)<br>ANTENNA INSTL, 351 INCHES LONG<br>CESSNA 400 MARKER BEACON<br>RECEIVER (R-402A)<br>ANTENNA INSTL (FLUSH MTD IN TAILCONE)<br>TRANSCIVER (RT-459A)<br>TRANSCIVER (RT-459A)<br>ANTENNA<br>CESSNA 300 NAV COM 720 CH COM 1ST UNIT<br>RECEIVER-TRANSCIVER (RT-385A)<br>VOR/LOC INDICATOR (IN-385A)<br>BASIC AVIONICS KIT<br>MOUNT, WIRING & MISC HARDWARE<br>CESSNA 300 NAV/COM 720 CH COM WITH<br>IN-385A (AUTOMATIC RADIAL CENTERING<br>INDICATOR) EXCHANGE FOR IN-385A, NET<br>CHANGE<br>CESSNA 300 NAV/COM 720 CH COM 2ND UNIT<br>RECEIVER-TRANSCIVER (RT-385A)<br>VOR/LOC INDICATOR (IN-385A)<br>H37-A ANTENNA & COUPLER KIT<br>MOUNT, WIRING & MISC HARDWARE<br>EMERGENCY LOCATOR TRANSMITTER<br>TRANSMITTER ID & M DMELT-6)<br>ANTENNA<br>CABLE & HDWR<br>EMERGENCY LOCATOR TRANSMITTER<br>(FOR USE IN CANADA)<br>TRANSMITTER ID & M DMELT-6C)<br>ANTENNA<br>CABLE & HDWR<br>NAV-O-MATIC 20CA AUTOPILOT<br>COMPUTER-CONTROL<br>TURN-COORDINATOR (NET CHANGE)<br>WING SERVO | C582103-0102<br>C582103-0301<br>C589502-0201<br>3910158-13, -29<br>99681<br>99683<br>99686<br>3910164-8<br>42410-5128<br>3960126-2<br>3910128-18<br>41470-1128<br>42940-0000<br>3910183-24<br>46660-0000<br>46860-1000<br>3910186<br>-<br>3910183<br>3910183-25<br>46660-0000<br>46860-1000<br>0470419<br>C589511-0101<br>C589511-0109<br>0470419<br>C589511-0102<br>C589511-0109<br>3910162<br>43610-1700<br>42320-0028<br>42730-4008 | 3-8<br>8-6<br>4-2<br>0-3<br>25-0*<br>5-3<br>8-5<br>5-2<br>0-3<br>2-5*<br>0-9<br>0-9<br>3-7<br>2-7<br>0-9*<br>16-4*<br>5-4<br>2-2<br>8-1<br>1-2<br>NIL<br>9-8*<br>5-4<br>2-2<br>1-0<br>1-2<br>1-8*<br>1-6<br>0-1<br>0-1<br>1-8*<br>1-6<br>0-1<br>0-1<br>10-2*<br>1-1<br>1-1<br>9-8 | 11-7<br>158-0<br>147-0<br>1152-8*<br>1116-8*<br>159-0<br>159-0<br>152-5*<br>197-5*<br>211-0<br>201-7*<br>24-7*<br>11-5<br>13-2*<br>33-1*<br>12-5<br>15-7<br>11-8<br>-<br>15-8*<br>12-5<br>15-5<br>38-9<br>11-8<br>157-6*<br>158-0<br>154-7<br>153-7<br>157-6*<br>158-0<br>154-7<br>153-5*<br>142-5*<br>15-0<br>18-0<br>69-6 |

| ITEM NO | EQUIPMENT LIST DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | REF DRAWING                                                                                              | WT LBS                                                                          | ARM INS                                                                                      |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| H31-A-2 | RELAY INSTL.<br>NAV-O-MATIC 300A AUTOPILOT<br>CONTROLLER-COMPUTER<br>TURN COORDINATOR (NET CHANGE)<br>WING SERVO<br>RELAY INSTALLATION<br>GYRO INSTL.<br>VACUUM SYSTEM INSTL.<br>NAV-O-MATIC 300A AUTOPILOT FOR USE ON STATIONAIR II<br>SAME AS H31-A-2 EXCEPT AS FOLLOWS--<br>VACUUM SYSTEM NOT INCLUDED<br>(STANDARD ON STATIONAIR II)<br>GYRO INSTL. EXCHANGED (NET CHANGE)<br>WHICH IS STANDARD ON STATIONAIR II,<br>(ITEM D64-A-2 EXCHANGED FOR D64-A-1,<br>NAV-O-MATIC 400 AUTOPILOT<br>CONTROLLER 24V<br>COMPUTER AMPLIFIER 24V<br>AIRERON ROLL ACTUATOR 28V<br>ELEVATOR PITCH ACTUATOR 28V<br>GYRO INSTL.<br>VACUUM SYSTEM INSTL.<br>MISC. PARTS<br>WING WIRING & PARTS<br>NAV-O-MATIC 400 AUTOPILOT FOR USE ON STATIONAIR II<br>NAV-O-MATIC 400 AUTOPILOT 24V | 3970129<br>3910163<br>42660-1200<br>42320-0028<br>42730-4008<br>3970129<br>1201069<br>1201055<br>3910163 | 0.4<br>23.4*<br>1.6<br>0.6<br>3.8<br>0.4<br>6.9<br>4.0<br>11.9*                 | 6.0<br>23.3*<br>15.0<br>8.6<br>69.6<br>16.0<br>13.6<br>38.5*                                 |
| H31-A-3 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                          |                                                                                 |                                                                                              |
| H31-A-4 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1201069                                                                                                  | 0.0                                                                             | - -                                                                                          |
| H31-A-5 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1270651<br>1270651                                                                                       | 32.2*<br>1.3<br>5.5<br>3.3<br>3.3<br>7.5<br>4.0<br>1.6<br>5.1<br>20.7*<br>20.7* | 70.6*<br>17.4<br>159.3<br>53.7<br>154.5<br>13.7<br>-3.0<br>47.8<br>100.9<br>105.6*<br>105.6* |
| H31-A-6 | SAME AS ITEM H31-A-4 EXCEPT AS FOLLOWS<br>VACUUM SYSTEM NOT INCLUDED<br>(STANDARD ON STATIONAIR II)<br>GYRO INSTL. EXCHANGED (NET CHANGE)<br>WHICH IS STANDARD ON STATIONAIR II,<br>(ITEM D64-A-3 EXCHANGED FOR D64-A-1,<br>NAV-O-MATIC 300A WITH HSI NON-SLAVED<br>CONTROLLER-AMPLIFIER (NET CHANGE)<br>TURN COORDINATOR<br>WING SERVO<br>RELAY INSTALLATION<br>D64-A-4 GYRO INSTALLATION<br>A61-A VACUUM SYSTEM                                                                                                                                                                                                                                                                                                                                                      | 1201069<br>42660-1200<br>42320-0028<br>42730-4008<br>3970129-4<br>1201055                                | 0.6<br>24.8*<br>1.6<br>0.6<br>3.8<br>0.4<br>4.0<br>4.0                          | 14.9<br>20.0*<br>15.0<br>8.6<br>69.6<br>6.0<br>13.5<br>-13.0                                 |

SECTION 6  
WEIGHT & BALANCE/  
EQUIPMENT LIST

CESSNA  
MODEL TU206G

| ITEM NO                          | EQUIPMENT LIST DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | REF DRAWING                                                                                                                                                                                                                                        | WT LBS                                                                                      | ARM INS                                                                                         |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| H34-A                            | HQS-A FSI INSTALLATION<br>MISC ITEMS & HARDWARE<br>BASIC AVIONICS KIT (REQUIRED WITH 1ST<br>UNIT NAV/COM RADIO) CONSISTS OF--<br>CABIN SPEAKER INSTALLATION<br>RADIO COOLING<br>NOISE FILTER AUDIO (ON ALTERNATOR)<br>VHF COM ANTENNA CABLE<br>VHF OMNI ANTENNA<br>VHF OMNI ANTENNA (SPIKE ON CABIN TOP)<br>MICROPHONE, HAND HELD<br>HEADPHONE SET INSTALLATION & WIRING<br>RADIO-AUDIO SWITCH PANEL & WIRING<br>COM ANTENNA INSL & OMNI COUPLER KIT<br>(REQUIRED WITH 2ND UNIT INSTALLATION)<br>VHF COM CABLE ASSY<br>OMNI ANTENNA COUPLER ASSY<br>VHF COM ANTENNA (LEFT HAND)<br>ADF ANTI PRECIP SENSE ANTENNA<br>FLUSH MOUNTED COM ANTENNA<br>MIKE-HEADSET COMBINATION<br>PADDED HEADPHONE-BOOM MIKE COMBINATION | 3910136-9<br>1270675-734<br>3930152-8<br>3950138-1<br>3950127-10<br>3960102-6<br>3960113-2<br>3970109-1<br>3970119-1<br>3970131-1<br>3910185-7<br>3950127-7<br>3960111-1<br>3960113-1<br>3910154-66<br>3910154-67, -68<br>3970119-2<br>C59653-0101 | 4.9<br>5.5<br>8.1*                                                                          | -0.9<br>29.5<br>55.7*                                                                           |
| H37-A                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1270675-734<br>3930152-8<br>3950138-1<br>3950127-10<br>3960102-6<br>3960113-2<br>3970109-1<br>3970119-1<br>3970131-1<br>3910185-7                                                                                                                  | 2.0<br>1.1<br>1.1<br>0.4<br>1.0<br>0.6<br>0.5<br>0.3<br>0.2<br>1.1*                         | 45.0<br>12.4<br>12.0<br>27.8<br>125.2<br>250.6<br>63.4<br>17.5<br>19.5<br>12.5<br>39.8*         |
| H46-A<br>H52-A<br>H55-A<br>H56-A |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 3950127-7<br>3960111-1<br>3960113-1<br>3910154-66<br>3910154-67, -68<br>3970119-2<br>C59653-0101                                                                                                                                                   | 0.4<br>0.2<br>0.5<br>0.8<br>1.4<br>0.3<br>1.1                                               | 27.8<br>5.0<br>63.4<br>156.3<br>184.6<br>12.0<br>19.1                                           |
| J01-A                            | J. SPECIAL OPTION PACKAGES<br><br>STATIONAIR II EQUIPMENT<br>CONSISTS OF THE FOLLOWING ITEMS<br>AG1-A VACUUM SYSTEM, ENGINE DRIVEN<br>AG7-A GROUND SVC PLUG RECEPTACLE<br>C07-A HEATING, STALL WARNING & PITOT<br>C19-O UNDERWING, COURTESY LIGHTS (2)<br>C31-A NAVIGATION LIGHT DETECTORS (2)<br>C40-A TRUE AIRSPEED IND. (NET CHANGE)<br>D01-O 1 GYRO INSTALLATION<br>D64-A-1 DUAL CONTROLS<br>E05-A LONG RANGE FUEL TANKS (NET CHG)<br>G92-O 300 ADF<br>H01-A-1 300 TRANSPONDER<br>H16-A-1 300 NAV/COM, 1ST UNIT<br>H22-A-1 300 NAV/COM, 1ST UNIT                                                                                                                                                                | 1200300-25<br>1201055-1<br>1270652-4<br>1200816-1<br>1201054-1<br>0701013-1<br>1201089-5<br>1201089-1<br>1260004-7<br>1220800-5<br>3910159-6<br>3910128-18<br>3910183                                                                              | 69.1*<br>4.0<br>2.0<br>0.2<br>0.5<br>NEGL<br>0.0<br>6.9<br>8.1<br>7.0<br>7.3<br>3.9<br>16.9 | 30.3*<br>-3.0<br>-4.0<br>22.1<br>61.9<br>-<br>-<br>13.6<br>13.7<br>46.5<br>23.4<br>24.7<br>33.1 |

| ITEM NO | EQUIPMENT LIST DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | REF DRAWING                                                                                                              | WT LBS                                                                                      | ARM INS                                                                                                                                                                                                  |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| J04-A   | H28-A-1 EMERGENCY LOCATOR TRANSMITTER<br>H31-A-1 20CA NAV-O-MATIC<br>NAV-PAC INSTALLATION<br>H25-A-1 NAV/COM, 2ND UNIT<br>H07-A-1 40C GLIDESLOPE<br>H13-A 40C MARKER BEACON<br>UTILITY OPTION WITH ONE SEAT (NET CHANGE)<br>CONSISTS OF THE FOLLOWING ITEMS<br>EC5-A-2 PILOT SEAT - UTILITY<br>EC34-A UTILITY UPHOLSTERY (NET CHANGE)<br>F01-C-2 OPERATIONAL PLACARD, VFR<br>F01-D-3 OPERATIONAL PLACARD, IFR<br>F01-D-3 (PLACARD AS APPLICABLE)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0470419<br>3910162-12<br>3910183<br>3910157<br>3910164<br>1200300                                                        | 1.8<br>10.2*<br>16.4*<br>9.8<br>4.1<br>2.5<br>102.2*                                        | 157.6<br>42.5<br>23.0*<br>15.8<br>-5.4<br>71.1*                                                                                                                                                          |
| J07-A-1 | DELETES THE FOLLOWING STANDARD ITEMS<br>BIC-S WHEEL FAIRING INSTL.<br>BIC-S PILOT SEAT<br>BIC-S CO-PILOT SEAT<br>E09-S SECOND ROW SEATS (2)<br>E11-S THIRD ROW SEATS (2)<br>E27-S CO-PILOT SEAT BELT & HARNESS<br>E29-S SECOND ROW SEAT BELTS (2)<br>F01-R THIRD ROW SEAT BELTS (2)<br>F01-R OPERATIONAL PLACARD, VFR<br>F01-D-1 OPERATIONAL PLACARD, IFR<br>F01-D-1 (PLACARD AS APPLICABLE)<br>UTILITY OPTION WITH TWO SEATS (NET CHANGE)<br>CONSISTS OF THE FOLLOWING ITEMS<br>JC7-A-1 UTILITY OPTION WITH ONE SEAT<br>E07-C-2 CO-PILOT SEAT - UTILITY HARNESS<br>E23-S CO-PILOT SEAT BELT & HARNESS<br>UTILITY OPTION WITH FOUR SEATS (NET CHANGE)<br>CONSISTS OF THE FOLLOWING ITEMS<br>JC7-A-2 UTILITY OPTION WITH TWO SEATS<br>EC9-A-2 SECOND ROW SEAT BELTS (2)<br>E27-S SECOND ROW SEAT BELTS (NET CHANGE)<br>CONSISTS OF THE FOLLOWING ITEMS<br>JC7-A-3 UTILITY OPTION WITH FOUR SEATS<br>E11-C THIRD ROW SEAT BELTS (2)<br>E29-S THIRD ROW SEAT BELTS (2)<br>CLUB SEATING ARRANGEMENT | 0714024<br>S-2275-3<br>1200300<br>1214008<br>S-1746<br>1200300<br>1214016<br>S-1746                                      | 13.0<br>16.2<br>2.0<br>-54.4*<br>-69.4<br>13.0<br>10.8*                                     | 44.5<br>74.6<br>- -<br>40.6<br>44.5<br>44.5<br>78.0<br>105.2<br>37.0<br>74.0<br>95.5<br>- -<br>75.7*<br>71.1<br>44.5<br>37.0<br>76.6*<br>75.7<br>72.0<br>74.0<br>69.3*<br>76.6<br>104.3<br>95.5<br>31.0* |
| J07-A-2 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1241116<br>0714019<br>0714019<br>1214107<br>1214108<br>S-2275-3<br>S-1746<br>S-1746<br>1205109-4<br>1205109-2<br>1200300 | -19.3<br>-13.7<br>-13.7<br>-25.8<br>-21.7<br>-1.6<br>-2.0<br>-2.0<br>NEGL<br>NEGL<br>-87.6* | 40.6<br>44.5<br>44.5<br>78.0<br>105.2<br>37.0<br>74.0<br>95.5<br>- -<br>75.7*<br>71.1<br>44.5<br>37.0<br>76.6*                                                                                           |
| J07-A-3 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0714024<br>S-2275-3<br>1200300                                                                                           | 102.2<br>13.0<br>1.6<br>-69.4*                                                              | 71.1<br>44.5<br>37.0<br>76.6*                                                                                                                                                                            |
| J07-A-4 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1214008<br>S-1746<br>1200300                                                                                             | -87.6<br>16.2<br>2.0<br>-54.4*                                                              | 75.7<br>72.0<br>74.0<br>69.3*                                                                                                                                                                            |
| J43-A   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1214016<br>S-1746                                                                                                        | -69.4<br>13.0<br>2.0<br>10.8*                                                               | 76.6<br>104.3<br>95.5<br>31.0*                                                                                                                                                                           |

SECTION 6  
WEIGHT & BALANCE/  
EQUIPMENT LIST

CESSNA  
MODEL TU206G

| ITEM NO | EQUIPMENT LIST DESCRIPTION                                                                                                                                                     | REF DRAWING | WT LBS                       | ARM INS                      |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------------------------|------------------------------|
|         | DELETE STANDARD SECOND SEATS (E09-S)<br>SECOND ROW SEAT BELTS (E27-S)<br>ADDED--CLUB SEATS, SECOND ROW (E09-C-2)<br>INCLUDES SEAT BELTS<br>SEAT RAIL CHANGE FOR E09-C-2 SEATS) |             | -25.8<br>-2.0<br>34.8<br>3.0 | 78.0<br>74.0<br>63.0<br>80.0 |



# 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

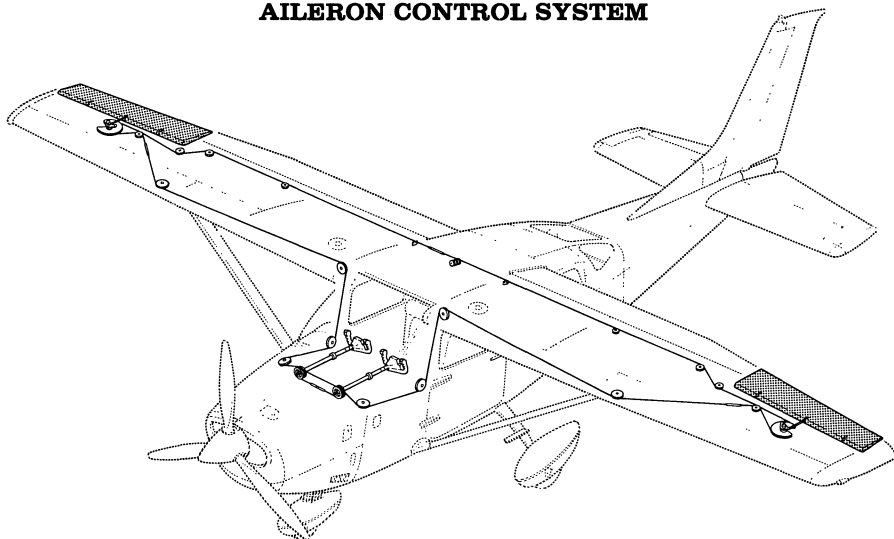
The airplane is an all-metal, six-place, high-wing, single-engine airplane equipped with tricycle landing gear, and designed for general utility purposes.

The construction of the fuselage is a conventional formed sheet metal bulkhead, stringer, and skin design referred to as semimonocoque. Major items of structure are the front and rear carry-through spars to which the wings are attached, a bulkhead and forgings for main landing gear attachment under the floorboard aft of the pilot and front passenger seats, and a bulkhead just aft of the instrument panel with attaching plates at its base for the strut-to-fuselage attachment of the wing struts. Structural engine mounts are also incorporated on this airplane.

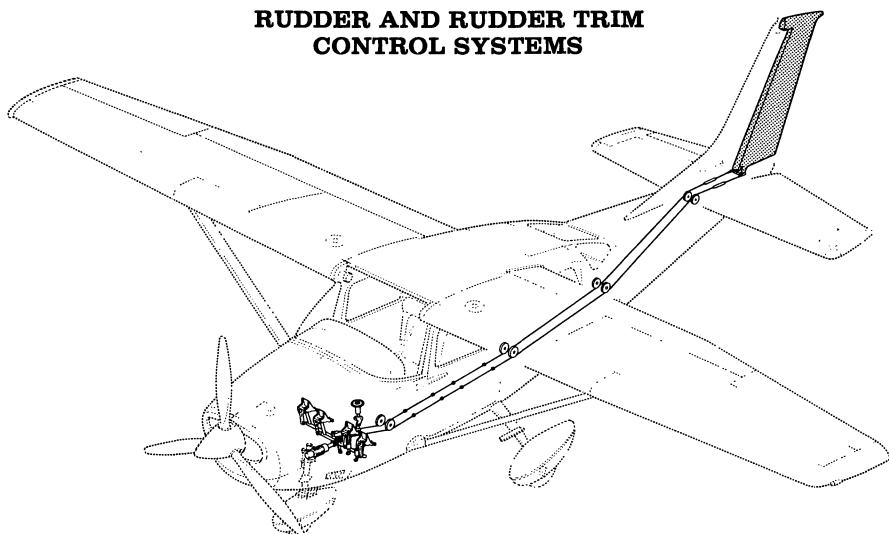
The externally braced wings, containing the fuel tanks, are constructed of a front and rear spar with formed steel metal ribs, doublers, and stringers. The entire structure is covered with aluminum skin. The front spars are equipped with wing-to-fuselage and wing-to-strut attach fittings. The aft spars are equipped with wing-to-fuselage attach fittings, and are partial span spars. Frise-type ailerons and single-slot type flaps are attached to the trailing edge of the wings. The ailerons are constructed of a forward and aft spar, formed sheet metal ribs, "V" type corrugated aluminum skin joined together at the trailing edge, and a formed leading edge containing a balance weight. The flaps are constructed basically the same as the ailerons, with the exception of the balance weights and aft spars, and the addition of a trailing edge stiffener.

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

**AILERON CONTROL SYSTEM**

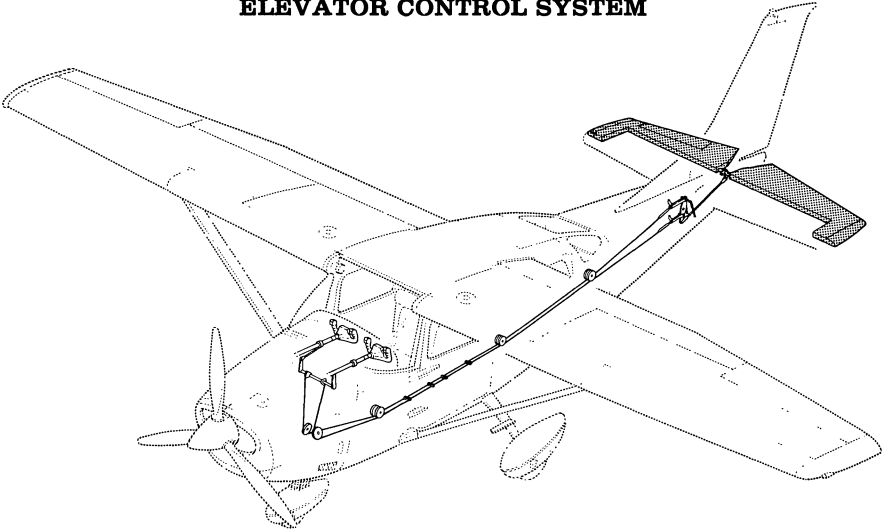


**RUDDER AND RUDDER TRIM  
CONTROL SYSTEMS**



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

**ELEVATOR CONTROL SYSTEM**



**ELEVATOR TRIM CONTROL SYSTEM**

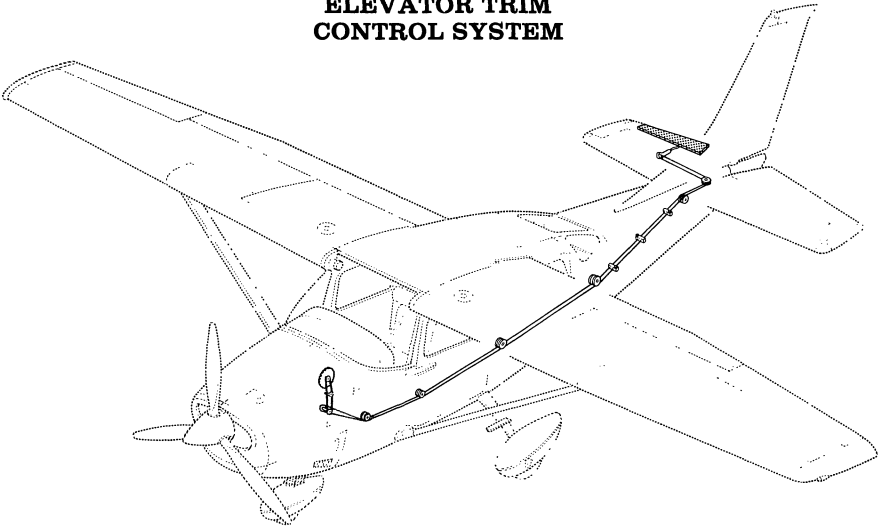


Figure 7-1. Flight Control and Trim Systems (Sheet 2 of 2)

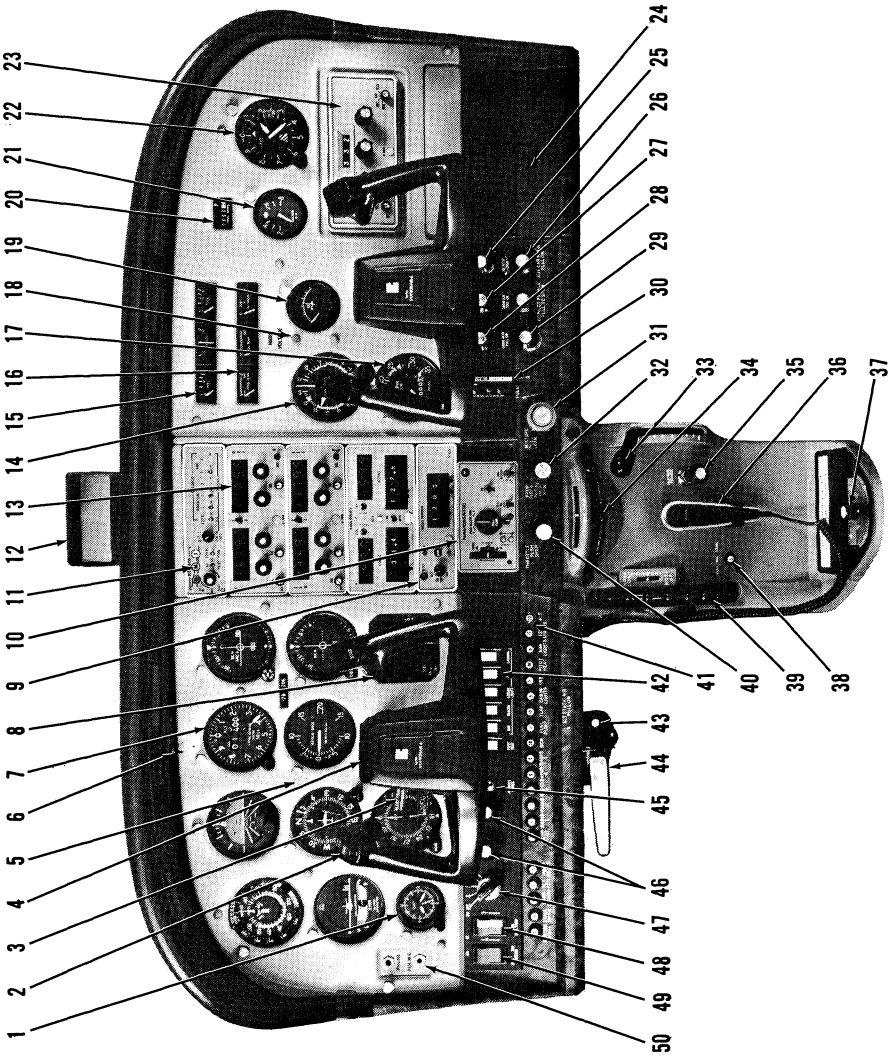


Figure 7-2. Instrument Panel (Sheet 1 of 2)

|     |                                                                    |     |                                         |
|-----|--------------------------------------------------------------------|-----|-----------------------------------------|
| 1.  | Clock                                                              | 26. | Auxiliary Cabin Air Control Knob        |
| 2.  | Electric Elevator Trim Switch                                      | 27. | Cabin Air Control Knob                  |
| 3.  | Electric Elevator Trim Disengage Switch                            | 28. | Cabin Heat Control Knob                 |
| 4.  | Approach Plate Holder                                              | 29. | Cigar Lighter                           |
| 5.  | Flight Instrument Group                                            | 30. | Wing Flap Switch and Position Indicator |
| 6.  | Map Light Switch and Light                                         | 31. | Mixture Control Knob                    |
| 7.  | Encoding Altimeter                                                 | 32. | Propeller Control Knob                  |
| 8.  | DME                                                                | 33. | Cowl Flap Control Lever                 |
| 9.  | Transponder                                                        | 34. | Rudder Trim Control Wheel               |
| 10. | Autopilot Control Unit                                             | 35. | Primer                                  |
| 11. | Marker Beacon and Audio Control Panels                             | 36. | Microphone                              |
| 12. | Rear View Mirror                                                   | 37. | Fuel Selector Valve Handle              |
| 13. | Radios                                                             | 38. | Electric Elevator Trim Circuit Breaker  |
| 14. | Manifold Pressure/Fuel Flow Indicator                              | 39. | Elevator Trim Control Wheel             |
| 15. | Fuel Quantity Indicators and Ammeter                               | 40. | Throttle (With Friction Lock)           |
| 16. | Cylinder Head Temperature, Oil Temperature, and Oil Pressure Gages | 41. | Circuit Breakers                        |
| 17. | Tachometer                                                         | 42. | Electrical Switches                     |
| 18. | Over-Voltage Warning Light                                         | 43. | Static Pressure Alternate Source Valve  |
| 19. | Economy Mixture Indicator                                          | 44. | Parking Brake Handle                    |
| 20. | Flight Hour Recorder                                               | 45. | Avionics Power Switch                   |
| 21. | Suction Gage                                                       | 46. | Instrument and Radio Dial               |
| 22. | Secondary Altimeter                                                | 47. | Light Rheostat Control Knobs            |
| 23. | ADF Radio                                                          | 48. | Ignition Switch                         |
| 24. | Map Compartment                                                    | 49. | Auxiliary Fuel Pump Switch              |
| 25. | Defrost Control Knob                                               | 50. | Master Switch                           |
|     |                                                                    |     | Phone and Auxiliary Mike Jacks          |

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

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 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, rudder, and elevator 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 downsprings which 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 the 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". Avionics equipment is stacked approximately on the center line of the panel, with the right side of the panel containing the wing flap switch and indicator, manifold pressure/fuel flow indicator, tachometer, map compartment, and space for additional instruments and avionics equipment. The engine instrument cluster, fuel quantity indicators, and suction gage are 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, controls, and circuit breakers necessary to operate the airplane. The left side of the panel contains the master switch, auxiliary fuel pump switch, ignition switch, light intensity controls, avionics power switch, electrical switches, and circuit breakers for installed equipment. The center area contains the throttle, propeller control, and mixture control. The right side of the panel contains the cabin heat, cabin air, defroster, and auxiliary cabin air control knobs and the cigar lighter. 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 primer and microphone bracket. The fuel selector valve handle is located at the base of the pedestal. A parking brake handle is mounted under the switch and control panel, in front of the pilot. An alternate static source valve control knob is also installed beneath the switch and control panel.

For details concerning the instruments, switches, circuit breakers, and controls on this 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 15° 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 wing 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.

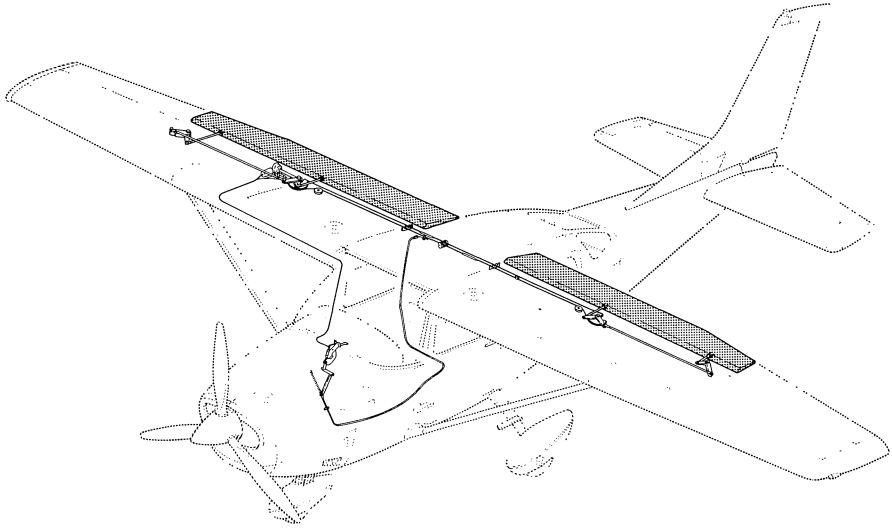


Figure 7-3. Wing Flap System

The minimum turning radius of the airplane, using differential braking and nose wheel steering during taxi, is approximately 25 feet.

## 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 15-ampere circuit breaker, labeled FLAP, on the left side of the instrument panel.

## LANDING GEAR SYSTEM

The landing gear is of the tricycle type with a steerable nose wheel and two main wheels. The landing gear may be equipped with wheel fairings.

Shock absorption is provided by the flat leaf spring-steel main landing gear struts and the air/oil nose gear shock strut. Each main gear wheel is equipped with a hydraulically actuated disc-type brake on the inboard side of each wheel. When wheel fairings are installed, an aerodynamic fairing covers each brake.

## 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 the cargo doors on the right 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 utilizing the airplane as a cargo carrier, refer to Section 6 for complete cargo loading details. 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/cargo area and door dimensions, refer to Section 6.

## SEATS

The airplane may be equipped with either the conventional or club style six seat arrangement. Conventional seating consists of six separate four-way adjustable seats, and the club style seating utilizes four forward facing four-way adjustable seats and two aft facing two-way adjustable seats. The pilot's and front passenger's seats are also available in a six-way adjustable configuration.

The club style seating arrangement requires two aft facing two-way adjustable seats in the center passenger seat positions. The seats may be moved forward or aft, and the seat backs are non-adjustable. Position the seat by lifting up on the lever on the rear inboard corner of each seat and slide the seat into position; then release the handle and check that the seat is locked in place.

The four-way seats, used with the conventional and club style seating arrangements, may be moved forward and aft, and the seat back angle changed. Position the seat by lifting up on the tubular handle under the center of the seat bottom of the pilot and front passenger's seats, the handle under the left front corner of the center passenger's seats, or the lever on the front outboard corner of the rear 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 may be adjusted by lifting the lever under the left front corner of the pilot and front passenger's seats, the aft inboard corner of the center passenger's seats or the front inboard corner of the rear passenger's seats. The seat backs will also fold full forward.

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.

Headrests are available for the four-way and six-way seat configurations only. 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 HARNESSSES**

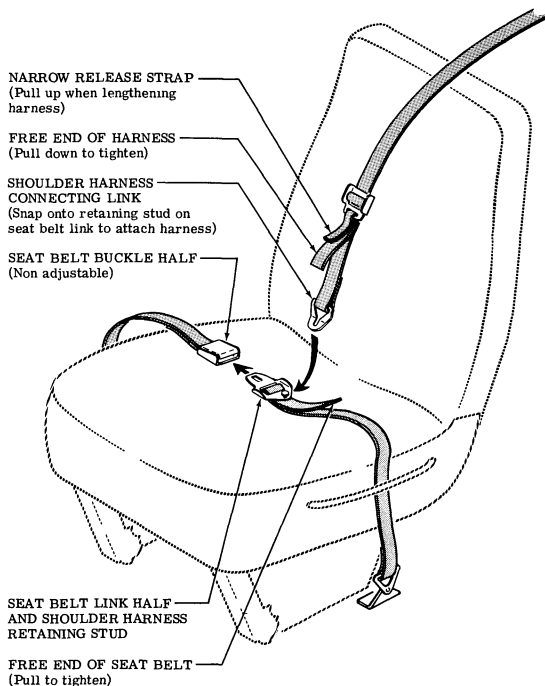
All seat positions are equipped with seat belts (see figure 7-4). The pilot's and front passenger's seats are also equipped with separate shoulder harnesses; separate shoulder harnesses are available for the remaining seat positions. However, if club seating is installed, no shoulder harness is available for the aft facing seats. 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 for all seat positions are attached to fittings on the floorboard. If club seating is installed, the seat belts for the aft facing seats are attached to the seat frame. The buckle half is inboard of each seat and the link half is outboard of each seat.

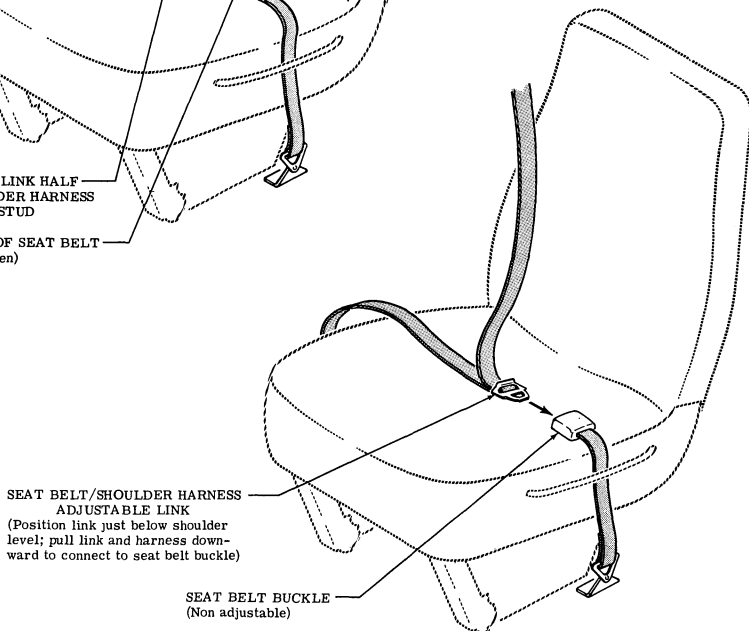
To use the seat belts, position the seat as desired, and then lengthen the link half of the belt as needed by grasping the sides of the link and pulling against the belt. Insert and lock the belt link into the buckle. Tighten the

**STANDARD SHOULDER  
HARNESS**



**(PILOT'S SEAT SHOWN)**

**SEAT BELT/SHOULDER  
HARNESS WITH INERTIA  
REEL**



**Figure 7-4. Seat Belts and Shoulder Harnesses**

belt to a snug fit. 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 above the aft edge of the front side window and is stowed behind a stowage sheath mounted above the side window. To stow the harness, fold it and place it behind the sheath. If the center and rear seats are equipped with shoulder harnesses, the center seat harnesses are attached above the window line aft of the seats and the rear seat harnesses are attached below the rear window. Center seat harnesses are stowed behind wire retaining clips above the window line, and rear seat harnesses are stowed behind clips located aft of the rear seats below the window line.

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 slots in 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 an entry door on the left side of the cabin at the pilot's seat position and through double cargo doors on the right side of the cabin at the center and rear seat passenger's positions (refer to Section 6 for cabin and cabin door dimensions). The left entry door incorporates a recessed exterior door handle, a conventional interior door handle, a key-operated door lock, a door stop mechanism, and an openable window. The forward cargo door is equipped with a recessed exterior door handle, conventional interior door handle, a key-operated door lock, a receptacle on the outside door skin for operation of the inside door handle-operated lock, and a door stop mechanism. The aft door utilizes a locking pawl on the top and bottom of the door near the forward edge, a red handle on the forward edge of the door, and a door stop mechanism.

To open the left entry door from outside the airplane, utilize the recessed door handle near the aft edge of the door. Depress the forward end of the handle to rotate it out of its recess, and then pull outboard. To open or close the door 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. The door should be locked prior to flight, and should not be opened intentionally during flight.

### NOTE

Accidental opening of the 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 90 knots, momentarily shove the door outward slightly, and forcefully close and lock the door. If the forward cargo door should come unlatched and open slightly in flight, it is suggested that a landing be made at a suitable airport to close and latch the door, unless a passenger is available to close it. It cannot be reached by the pilot. It should be remembered that the

wing flaps will not operate with the cargo door open, even very slightly, and the landing should be planned accordingly.

The double cargo doors are opened from outside the airplane by utilizing the recessed door handle near the aft edge of the forward door. Depress the forward end of the handle to rotate it out of its recess, and then pull outboard. After the forward door is opened, the aft door may be opened by grasping the red handle on the forward edge of the door and pulling downward to release the locking pawls. To close the cargo doors from inside the airplane, close the aft door first, with enough force to latch both locking pawls, and then close the forward door. When the forward door is closed and latched, rotate the door handle, labeled OPEN, CLOSE, and LOCK, to the locked (up) position. Both doors must be securely closed and the forward door locked prior to flight, and they must not be opened intentionally during flight.

#### NOTE

A flap interrupt switch, on the upper sill of the forward cargo door opening, will stop flap operation regardless of flap position any time the forward cargo door is unlatched. The switch is intended to prevent lowering the flaps into the cargo door when it is open.

Flight operations with the cargo doors removed are not approved, unless a depressor plate is installed over the wing flap interrupt switch and a spoiler is installed on the forward edge of the cargo door opening. With the cargo doors removed and the above items installed, flight is restricted to 130 knots.

If the airplane is loaded with cargo which prevents the pilot from locking or unlocking the forward cargo door from inside, the door will have to be locked or unlocked from the outside with a T-handle "key" stowed in the map compartment. This is accomplished by inserting the hex-shaped end of the T-handle into a receptacle in the door skin opposite the inside door handle, and then rotating the T-handle to position the inside door handle in the locked (up) position. The T-handle must be used to lock the forward cargo door prior to flight unless the inside door handle can be utilized. The key-operated lock may not be used in lieu of the T-handle for flight operations.

The left entry 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 utilizes 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 front passenger's seat position, and functions in the same manner as the window in the entry door. If required, either window may be opened at any speed up to 183 KIAS. All other cabin windows are of the fixed type and cannot be opened.

## CONTROL LOCKS

A control lock is provided to lock the ailerons and elevator control surfaces in a neutral position and prevent damage to these systems by wind buffeting while the airplane is parked. The lock consists of a shaped steel rod with a red metal flag attached to it. The flag is labeled CONTROL LOCK, REMOVE BEFORE STARTING ENGINE. To install the control lock, align the hole on 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. Proper installation of the lock will place the red 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, turbocharged, air-cooled, fuel injection engine with a wet sump oil system. The engine is a Continental Model TSIO-520-M and is rated at 310 horsepower at 2700 RPM and 36.5 inches of manifold pressure for five minutes, and at 285 horsepower at 2600 RPM and 35 inches of manifold pressure continuous. Major accessories include a propeller governor on the front of the engine and dual magnetos, starter, belt-driven alternator, and full flow oil filter on the rear of the engine. Other major accessories include a turbocharger, connected to the induction air and exhaust systems, and associated components. Provisions are also made for a vacuum pump.

## 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 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 is also available.

The oil pressure gage, located on the 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. Oil temperature limitations are the normal operating range (green arc) which is 38°C (100°F) to 116°C (240°F), and the maximum (red line) which is 116°C (240°F).

The cylinder head temperature gage, under the left fuel quantity indicator, is operated by an electrical-resistance type temperature sensor on the engine which receives power from the airplane electrical system. Temperature limitations are the normal operating range (green arc) which is 93°C (200°F) to 238°C (460°F) and the maximum (red line) which is 238°C (460°F).

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 2500 RPM, a five minute maximum power range (yellow arc) of 2600 to 2700 RPM, and a maximum (red line) of 2700 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 30 inches Hg, a five minute

maximum power range (yellow arc) of 35 to 36.5 inches Hg, and a maximum (red line) of 36.5 inches Hg.

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 gallons per hour of fuel being metered to the engine. The normal cruise range (green arc) is from 6 to 20 gallons per hour, the normal climb range (white arc) is from 20 to 27 gallons per hour, the minimum (red line) is 3.0 PSI, and the maximum (red line) is 31 gallons per hour (19.5 PSI).

An economy mixture (EGT) indicator is available for the airplane and is located on the extreme right side of the instrument panel. A thermocouple probe in the right exhaust collector 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 peak EGT reference pointer.

## 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 70% to 80% 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 OIL SYSTEM

Oil for engine lubrication, propeller governor operation, and turbocharger system control is supplied from a sump on the bottom of the engine. The capacity of the engine sump is 12 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 to the turbocharger system controls, a pressure relief valve at the rear of the right oil gallery, and a thermostatically controlled oil cooler. Oil from the cooler is then circulated to the left gallery and propeller governor. The engine parts and turbocharger are then lubricated by oil from the galleries. After lubricating the engine, the oil returns to the sump by gravity, and oil from the turbocharger is returned to the sump by a scavenger pump. The oil filter

adapter is equipped with a by-pass valve which will cause lubricating oil to by-pass the filter in the event the filter becomes plugged, or the 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 9 quarts of oil. To minimize loss of oil through the breather, fill to 10 quarts for normal flights of less than three hours. For extended flight, fill to 12 quarts (dipstick indication only). For engine oil grade and specifications, refer to Section 8 of this handbook.

An oil quick-drain valve is available to replace the drain plug on the bottom of the oil sump, and provides quicker, cleaner draining of the engine oil. To drain the oil with this valve, slip a hose over the end of the valve and push upward on the end of the valve until it snaps into the open position. Spring clips will hold the valve open. After draining, use a suitable tool to snap the valve into the extended (closed) position and remove the drain hose.

## **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 a duct in the right intake in the front of the engine cowling. The duct extends down the right side of the engine to an air filter which removes dust and other foreign matter from the induction air. On the aft side of the filter is a duct assembly which contains an alternate air door. If the induction air filter becomes blocked, suction created by the engine will open the door and draw

unfiltered air from inside the cowl. An open alternate air door will result in a decrease of up to 10 inches of manifold pressure from a cruise power setting. Maximum continuous manifold pressure (35 inches) can be maintained with throttle and/or RPM adjustment up to 14,000 feet under hot day conditions with the alternate air door open. A flexible duct, connected to the duct assembly, directs induction air from the air filter to the compressor section of the turbocharger. At this point, induction air is compressed. The pressurized air is then ducted through a fuel/air control unit and induction manifold to the cylinders.

## **EXHAUST SYSTEM**

Exhaust gas from each cylinder passes through riser assemblies into an exhaust manifold which discharges the gas into the turbine section of the turbocharger. After the exhaust gas has passed through the turbine, it is vented overboard through a tailpipe. A waste gate is incorporated into the exhaust manifold, and controls the amount of exhaust gas to the turbine by venting excess gas to the tailpipe through a bypass. A shroud, attached to the left side of the exhaust manifold, forms a heating chamber for cabin heater and windshield defrost 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 cooling enters through two intake openings in the front of the engine cowl. 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 cowl. 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

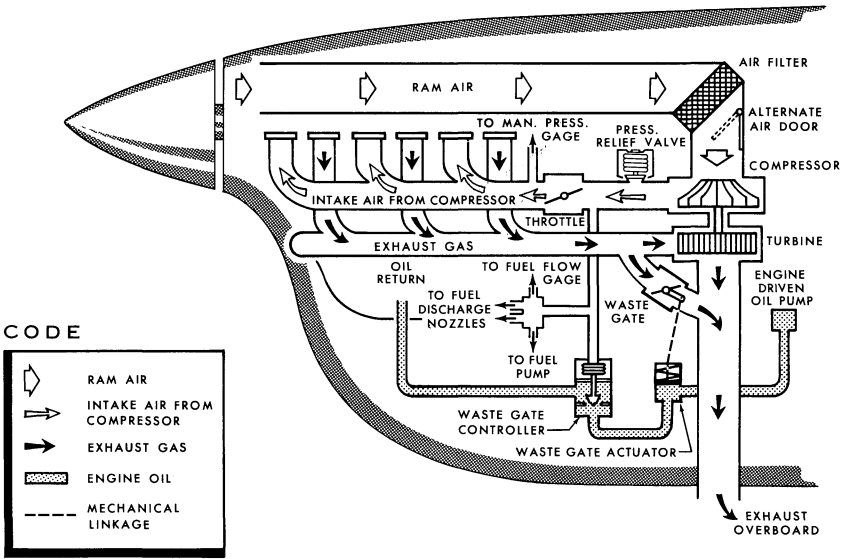


Figure 7-5. Turbocharger System

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.

## TURBOCHARGING SYSTEM

Because the engine is turbocharged, some of its characteristics are different from a normally aspirated engine. The following information describes the system and points out some of the items that are affected by turbocharging. Section 4 contains the normal operating procedures for the turbocharged engine.

The following steps, when combined with the turbocharger system schematic (figure 7-5), provide a better understanding of how the turbocharger system works. The steps follow the induction air as it enters and passes through the engine until it is expelled as exhaust gases.

1. Engine induction air is taken in through an opening in the nose cap, ducted through a filter and into the compressor where it is compressed.
2. The pressurized induction air then passes through the throttle body and induction manifold into the cylinders.
3. The air and fuel are burned and exhausted to the supercharger turbine.
4. The exhaust gases drive the turbine which, in turn, drives the compressor, thus completing the cycle.

The turbine has the capability of producing manifold pressures in excess of the five minute takeoff maximum of 36.5 inches Hg. In order not to exceed 36.5 inches of manifold pressure, a waste gate is used so that some of the exhaust will bypass the turbine and be vented into the tailpipe.

It can be seen from studying Steps 1 through 4 that anything that affects the flow of induction air into the compressor or the flow of exhaust gases into the turbine will increase or decrease the speed of the turbocharger. This resultant change in flow will have no effect on the engine if the waste gate is still open because the waste gate position is changed to hold compressor discharge pressure constant. A waste gate controller automatically maintains maximum allowable compressor discharge pressure any time the turbine and compressor are capable of producing that pressure.

At high altitude, part throttle, or low RPM, the exhaust flow is not capable of turning the turbine and compressor fast enough to maintain maximum compressor discharge pressure, and the waste gate will close to force all of the exhaust flow through the turbine.

When the waste gate is fully closed, any change in turbocharger speed will mean a change in engine operation. Thus, any increase or decrease in turbine speed will cause an increase or decrease in manifold pressure and fuel flow. If turbine speed increases, the manifold pressure increases; if the turbine speed decreases, the manifold pressure decreases. Since the compression ratio approaches 3 to 1 at high altitude, any change in exhaust flow to the turbine or ram induction air pressure will be magnified proportionally by the compression ratio and the change in flow through the exhaust system.

#### MANIFOLD PRESSURE VARIATION WITH ENGINE RPM

When the waste gate is open, the turbocharged engine will react the same as a normally aspirated engine when the engine RPM is varied. That

is, when the RPM is increased, the manifold pressure will decrease slightly. When the engine RPM is decreased, the manifold pressure will increase slightly.

However, when the waste gate is closed, manifold pressure variation with engine RPM is just the opposite of the normally aspirated engine. An increase in engine RPM will result in an increase in manifold pressure, and a decrease in engine RPM will result in a decrease in manifold pressure.

#### MANIFOLD PRESSURE VARIATION WITH ALTITUDE

At full throttle, the turbocharger has the capability of maintaining the maximum continuous manifold pressure of 35 inches Hg to well above 17,000 feet depending on engine and atmospheric conditions. However, engine operating limitations establish the maximum manifold pressure that may be used. Manifold pressure should be reduced above 17,000 feet, as noted on the operating placard in the airplane (subtract 1 inch Hg from 35 inches for each 1000 feet above 17,000 feet).

At part throttle, the turbocharger is capable of maintaining cruise climb power of 2500 RPM and 30 in. Hg from sea level to 21,000 feet in standard temperatures, and from sea level to 12,000 feet under hot day conditions without changing the throttle position, once the power setting is established after takeoff. Under hot day conditions, this climb power setting is maintained above 12,000 feet by advancing the throttle as necessary to maintain 30 inches of manifold pressure in the same manner as a normally aspirated engine during climb.

#### MANIFOLD PRESSURE VARIATION WITH AIRSPEED

When the waste gate is closed, manifold pressure will vary with variations in airspeed. This is because the compressor side of the turbocharger operates at pressure ratios of up to 3 to 1 and any change in pressure at the compressor inlet is magnified at the compressor outlet with a resulting effect on the exhaust flow and turbine side of the turbocharger.

#### FUEL FLOW VARIATIONS WITH CHANGES IN MANIFOLD PRESSURE

The engine-driven fuel pump output is regulated by engine speed and compressor discharge pressure. Engine fuel flow is regulated by fuel pump output and the metering effects of the throttle and mixture control. When the waste gate is open, fuel flow will vary directly with manifold pressure, engine speed, mixture, or throttle control position. In this case, manifold pressure is controlled by throttle position and the waste gate



controller, while fuel flow varies with throttle movement and manifold pressure.

When the waste gate is closed and manifold pressure changes are due to turbocharger output, as discussed previously, fuel flow will follow manifold pressure even though the throttle position is unchanged. This means that fuel flow adjustments required of the pilot are minimized to (1) small initial adjustments on takeoff or climb-out for the proper rich climb setting, (2) lean-out in cruise, and (3) return to full rich position for approach and landing.

#### MANIFOLD PRESSURE VARIATION WITH INCREASING OR DECREASING FUEL FLOW

When the waste gate is open, movement of the mixture control has little or no effect on the manifold pressure of the turbocharged engine.

When the waste gate is closed, any change in fuel flow to the engine will have a corresponding change in manifold pressure. That is, increasing the fuel flow will increase the manifold pressure and decreasing the fuel flow will decrease the manifold pressure. This is because an increased fuel flow to the engine increases the mass flow of the exhaust. This turns the turbocharger faster, increasing the induction air flow and raising the manifold pressure.

#### MOMENTARY OVERSHOOT OF MANIFOLD PRESSURE

Under some circumstances (such as rapid throttle movement, especially with cold oil), it is possible that the engine can be overboosted slightly above the maximum five minute takeoff manifold pressure of 36.5 inches. This would most likely be experienced during the takeoff roll or during a change to full throttle operation in flight. The induction air pressure relief valve will normally limit the overboost to 2 to 3 inches.

A slight overboost of 2 to 3 inches of manifold pressure is not considered detrimental to the engine as long as it is momentary. No corrective action is required when momentary overboost corrects itself and is followed by normal engine operation. However, if overboosting of this nature persists when oil temperature is normal or if the amount of overboost tends to exceed 3 inches or more, the throttle should be retarded to eliminate the overboost and the controller system, including the waste gate and relief valve, should be checked for necessary adjustment or replacement of components.

#### ALTITUDE OPERATION

Because a turbocharged airplane will climb faster and higher than a

normally aspirated airplane, fuel vaporization may be encountered. When fuel flow variations of  $\pm 1$  gal/hr or more are observed (as a "nervous" fuel flow needle), or if a full rich mixture setting doesn't provide the desired fuel flow, placing the auxiliary fuel pump switch in the ON position will control vapor. However, it will also increase fuel flow, making it necessary to adjust the mixture control for the desired fuel flow. The auxiliary fuel pump should be left on for the remainder of the climb. It can be turned off whenever fuel flow will remain steady with it off, and the mixture must be adjusted accordingly. The auxiliary fuel pump should be turned off and the mixture reset prior to descent.

### **HIGH ALTITUDE ENGINE ACCELERATION**

The engine will accelerate normally from idle to full throttle with full rich mixture at any altitude below 20,000 feet. At higher altitudes, it is usually necessary to lean the mixture to get smooth engine acceleration from idle to maximum power. At altitudes above 25,000 feet, and with temperatures above standard, it takes one to two minutes for the turbine to accelerate from idle to maximum RPM although adequate power is available in 20 to 30 seconds.

## **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 airplane may be equipped with either a standard fuel system or

| FUEL QUANTITY DATA (U. S. GALLONS) |                                                  |                           |                         |
|------------------------------------|--------------------------------------------------|---------------------------|-------------------------|
| TANKS                              | TOTAL<br>USABLE FUEL<br>ALL FLIGHT<br>CONDITIONS | TOTAL<br>UNUSABLE<br>FUEL | TOTAL<br>FUEL<br>VOLUME |
| STANDARD<br>(30.5 Gal. Each)       | 59                                               | 2                         | 61                      |
| LONG RANGE<br>(40 Gal. Each)       | 76                                               | 4                         | 80                      |

Figure 7-6. Fuel Quantity Data

long range system (see figure 7-7). Both systems consist of two vented fuel tanks (one in each wing), two fuel reservoir tanks, a fuel selector valve, auxiliary fuel pump, 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, with 1/4 tank or less, prolonged uncoordinated flight such as slips or skids can uncover the fuel tank outlets, 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 one minute.

Fuel flows by gravity from the two wing tanks to two reservoir tanks, and from the reservoir tanks to a three-position selector valve labeled LEFT ON, RIGHT ON, and OFF. With the selector valve in the LEFT ON or RIGHT ON position, fuel from either the left or right tank flows through a bypass in the auxiliary fuel pump (when it is not in operation), and through a strainer to an engine-driven fuel pump. The engine-driven fuel pump delivers the fuel to the fuel/air control unit where it is metered and directed to a manifold which distributes it to each cylinder.

NOTE

Fuel cannot be used from both fuel tanks simultaneously.

Vapor and excess fuel from the engine-driven fuel pump and fuel/air control unit are returned by way of the selector valve to the reservoir tank of the wing fuel tank system being used.

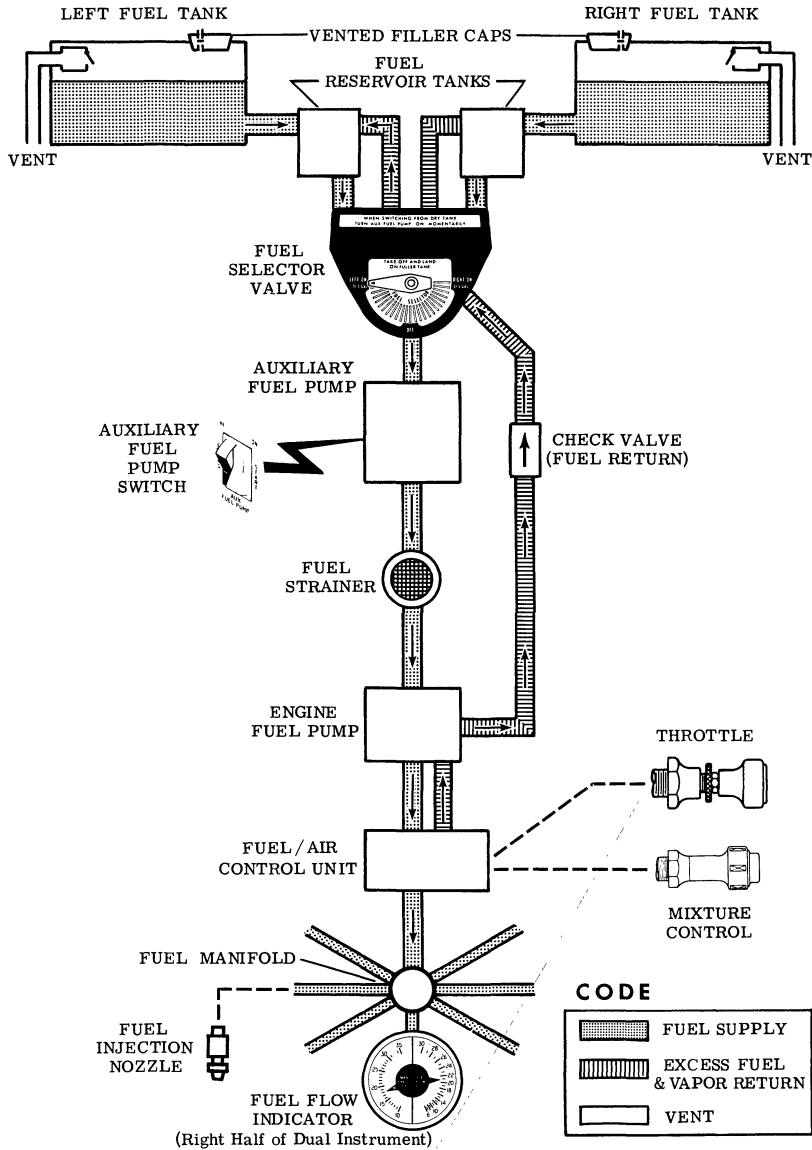


Figure 7-7. Fuel System (Standard and Long Range)

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 check valve equipped vent lines, one from each fuel tank, which protrude from the bottom surface of each wing at the wing strut attach point. 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 right side of the instrument panel. An empty tank is indicated by a red line and the letter E. When an indicator shows an empty tank, approximately 1 gallon remains in a standard tank, or 2 gallons remain in a long range tank as unusable fuel. The indicators cannot be relied upon for accurate readings during skids, slips, or unusual attitudes. 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 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.

#### 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.

Under hot day-high altitude conditions, or conditions during a climb that are conducive to fuel vapor formation, it may be necessary to utilize the auxiliary fuel pump to attain or stabilize the fuel flow required for the type of climb being performed. In this case turn the auxiliary fuel pump on, and adjust the mixture to the desired fuel flow. If fluctuating fuel flow (greater than 1 gal/hr) is observed during climb or cruise at high altitudes on hot days, place the auxiliary fuel pump switch in the ON position to clear the fuel system of vapor. The auxiliary fuel pump may be operated continuously in cruise, if necessary, but should be turned off prior to descent. Each time the auxiliary fuel pump switch is turned on or off, the mixture should be readjusted.

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 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 sumps, and by utilizing the fuel strainer drain under an access panel on the left side of the engine cowling. Quick-drain valves are also provided for the fuel reservoir tanks. The valves are located under plug buttons in the belly skin of the airplane, and are used to facilitate purging of the fuel system in the event water is discovered during the preflight fuel system inspection. The fuel tanks should be filled after each flight to prevent condensation.

## **BRAKE SYSTEM**

The airplane has a single-disc, hydraulically-actuated 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 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, and minimize brake usage during taxi operations and landings.

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**

Electrical energy (see figure 7-8) is supplied by a 28-volt, direct-current system powered by an engine-driven, 60-amp alternator. A 24-volt, 14-amp hour battery (or 17-amp hour battery, if installed) is located on the upper left forward portion of the firewall. Power is supplied to most general electrical and all avionics circuits through the primary bus bar

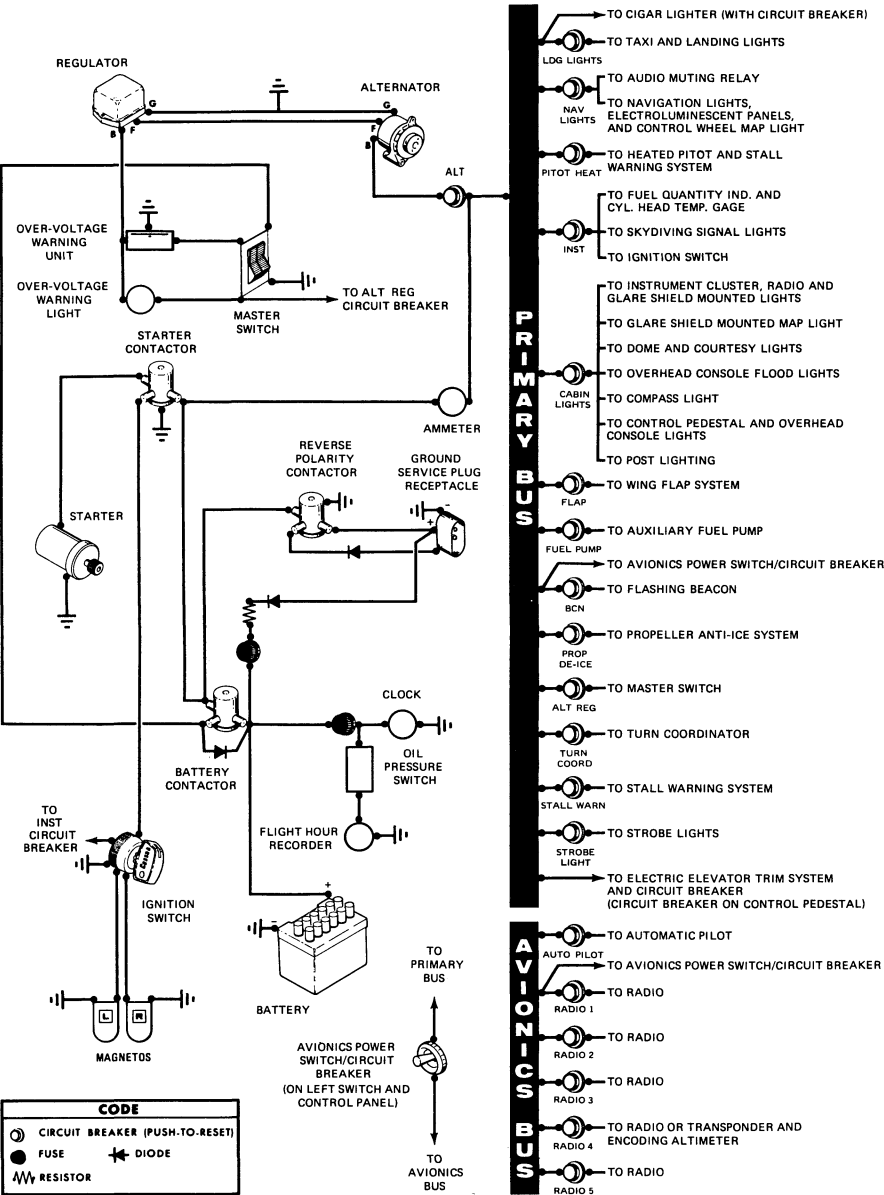


Figure 7-8. Electrical System



and the avionics bus bar, which are interconnected by an avionics power switch. 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 avionics power switches are turned on.

### **CAUTION**

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

## **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 all electrical power to the airplane. 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, the avionics power switch 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 SWITCH**

Electrical power from the airplane primary bus to the avionics bus (see figure 7-8) is controlled by a toggle-type circuit breaker-switch labeled AVIONICS POWER. The switch is located on the left side of the switch and control panel and is on in the up position and off in the down position. With the switch in the off position, no electrical power will be applied to the avionics equipment, regardless of the position of the master switch or the individual equipment switches. The avionics power switch also functions as a circuit breaker. If an electrical malfunction should occur and cause the circuit breaker to open, electrical power to the avionics equipment will be interrupted and the switch toggle will automatically move to the off position. If this occurs, allow the circuit breaker approximately two minutes to cool before placing the toggle in the on position again. If the circuit breaker opens again, do not reset it. The avionics power switch 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,

and may be utilized in place of the individual avionics equipment switches.

## **AMMETER**

The ammeter indicates the flow 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.

## **OVER-VOLTAGE SENSOR AND WARNING LIGHT**

The airplane is equipped with an automatic over-voltage protection system consisting of an over-voltage sensor behind the instrument panel and a red warning light, labeled HIGH VOLTAGE, below the oil temperature gage.

In the event an over-voltage condition occurs, the over-voltage sensor automatically removes alternator field current and shuts down the alternator. The red warning light will then turn on, indicating to the pilot that the alternator is not operating and the battery is supplying all electrical power.

The over-voltage sensor may be reset by turning off the avionics power switch and then 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 illuminates again, a malfunction has occurred, and the flight should be terminated as soon as practical. In either case, the avionics power switch may be turned on again if required.

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

## **CIRCUIT BREAKERS AND FUSES**

Most of the electrical circuits in the airplane are protected by "push-to-reset" circuit breakers mounted on the lower left side of the instrument panel. A circuit breaker on the control pedestal protects the electric elevator trim system. In addition to the individual circuit breakers, a toggle-type circuit breaker-switch, labeled AVIONICS POWER, on the left switch and control panel also protects the avionics systems. The cigar lighter is protected by a manually-reset type circuit breaker on the back of the lighter and a fuse behind the instrument panel. Protection for the control wheel map light is provided by the NAV LIGHT circuit breaker and a fuse behind the instrument panel. Electrical circuits which are not

protected by circuit breakers are the battery contactor closing (external power) circuit, clock circuit, and flight hour recorder circuit which are protected by fuses mounted adjacent to the battery.

## **GROUND SERVICE PLUG RECEPTACLE**

A ground service plug receptacle may be installed to permit the use of an external power source (generator type or battery cart) for cold weather starting and during lengthy maintenance work on the airplane electrical system. The receptacle is located under a cover plate, on the lower left side of the cowl.

### **NOTE**

If no avionics equipment is to be used or worked on, the avionics power switch 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.

Just before connecting an external power source (generator type or battery cart), the avionics power switch should be turned off, and the master switch turned on.

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 battery and external power circuits have been designed to completely eliminate the need to “jumper” across the battery contactor to close it for charging a completely “dead” battery. A special fused circuit in the external power system supplies the needed “jumper” across the contacts so that with a “dead” battery and an external power source applied, turning on the master switch will close the battery contactor.

## **LIGHTING SYSTEMS**

### **EXTERIOR LIGHTING**

Conventional navigation lights are located on the wing tips and tail stinger, dual landing lights are installed in the cowl nose cap, and a flashing beacon is mounted on top of the vertical stabilizer. Additional lighting is available and includes a strobe light on each wing tip and two

courtesy lights, one under each wing, just outboard of the cabin. 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.

The high intensity strobe lights will enhance anti-collision protection. However, the lights should be turned off when taxiing in the vicinity of other airplanes, or during night flight through clouds, fog or haze.

## **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 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 four red flood lights on the underside of the anti-glare shield, and two red flood lights in the forward part of the overhead console. The lights are utilized by adjusting light intensity with the large (outer) control knob of the concentric control knobs labeled POST, FLOOD. Flood lighting may be used in combination with post lighting by adjusting post light intensity with the small (inner) control knob.

The instrument panel may be equipped with 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 flood lighting, adjust flood light intensity with the large (outer) control knob.

The engine instrument cluster, radio equipment, and magnetic compass have integral lighting and operate independently of post or flood

lighting. The light intensity of instrument cluster, magnetic compass, and radio equipment 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.

The control pedestal and the overhead console are illuminated by post lights. Pedestal and console light intensity is controlled by the large (outer) control knob of the concentric control knobs labeled EL PANEL, ENG-RADIO.

Map lighting is provided by overhead console map lights, an anti-glare shield mounted map light, and a control wheel map light. The overhead console map lights 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 anti-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 FLOOD (large outer) 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, which is 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.

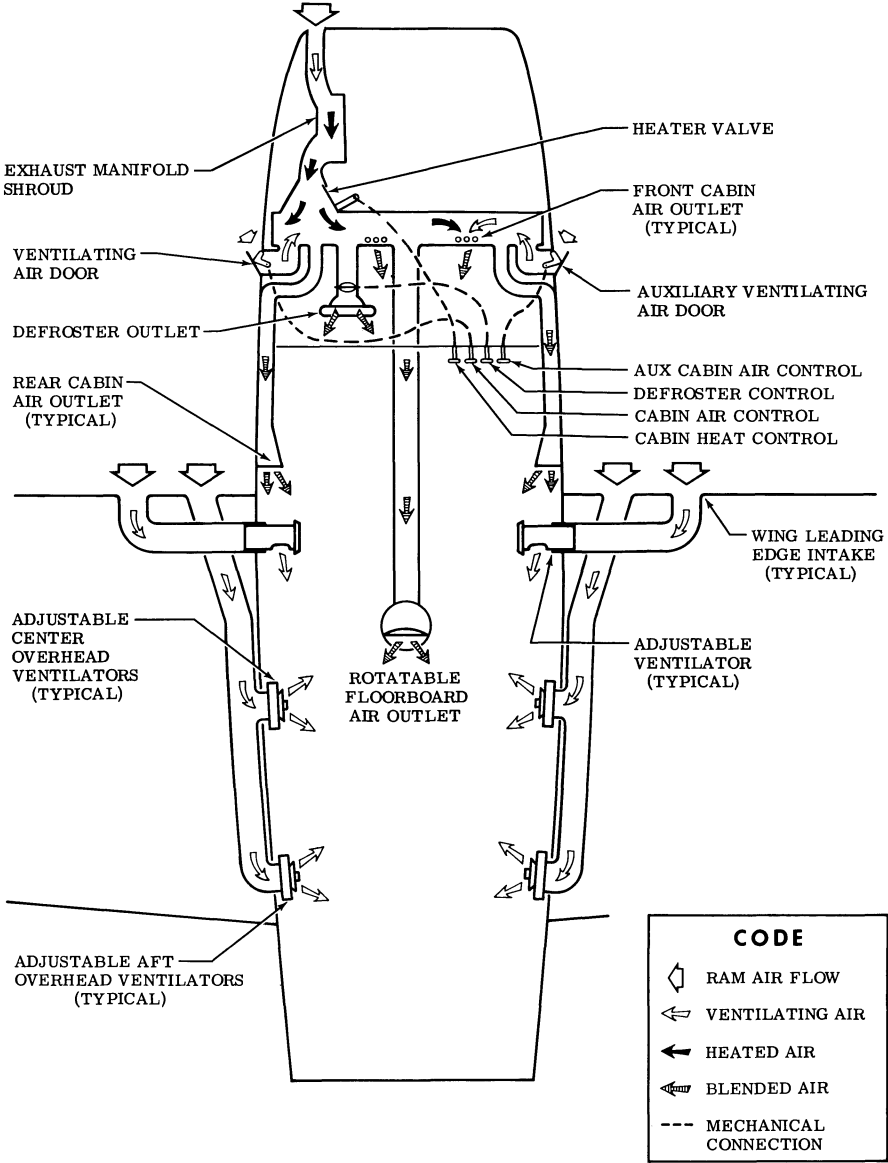


Figure 7-9. Cabin Heating, Ventilating, and Defrosting System

## **CABIN HEATING, VENTILATING AND DEFROSTING SYSTEM**

The temperature and volume of airflow into the cabin can be regulated to any degree desired 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. Rear cabin heat and air is supplied by three ducts from the manifold, one extending down each side of the cabin to an outlet at the front door post area at floor level and one extending under the center of the cabin floor to an outlet in the floor behind the pilot and copilot seats. The cabin floor outlet is flush mounted, with a removable airflow diverter.

Windshield defrost air is supplied by a duct from the cabin manifold to an outlet on top of the antiglare shield; therefore, the temperature of the defrosting air is the same as heated cabin air. A rotary type control knob labeled DEFROST regulates the volume of air to the windshield. Clockwise rotation of the knob increases defroster air flow.

Additional cabin ventilation can be obtained from separate adjustable ventilators, one near each upper corner of the windshield for the pilot and copilot, and four adjustable ventilators in the cabin ceiling adjacent to the center and rear seat passengers.

## **OXYGEN SYSTEM**

The airplane is equipped with a partial oxygen system which consists of the outlets, pressure gage, associated plumbing and an on-off control. If the airplane is equipped with a complete oxygen system, refer to Section 9, Supplements, for complete details and operating instructions.

## **PITOT-STATIC SYSTEM AND INSTRUMENTS**

The pitot-static system supplies ram air pressure to the airspeed indicator and static pressure to the airspeed indicator, rate-of-climb 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 lower forward portion of the fuselage, 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 lower left side of the instrument panel, a 10-amp circuit breaker on the lower left side of the instrument 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, installed to the right of the parking brake, 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 external static pressure source, the alternate static source valve should be pulled on.

## AIRSPED INDICATOR

The airspeed indicator is calibrated in knots and miles per hour. Limitation and range markings include the white arc (46 to 100 knots), green arc (55 to 149 knots), yellow arc (149 to 183 knots), and a red line (183 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.

## RATE-OF-CLIMB INDICATOR

The rate-of-climb 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.



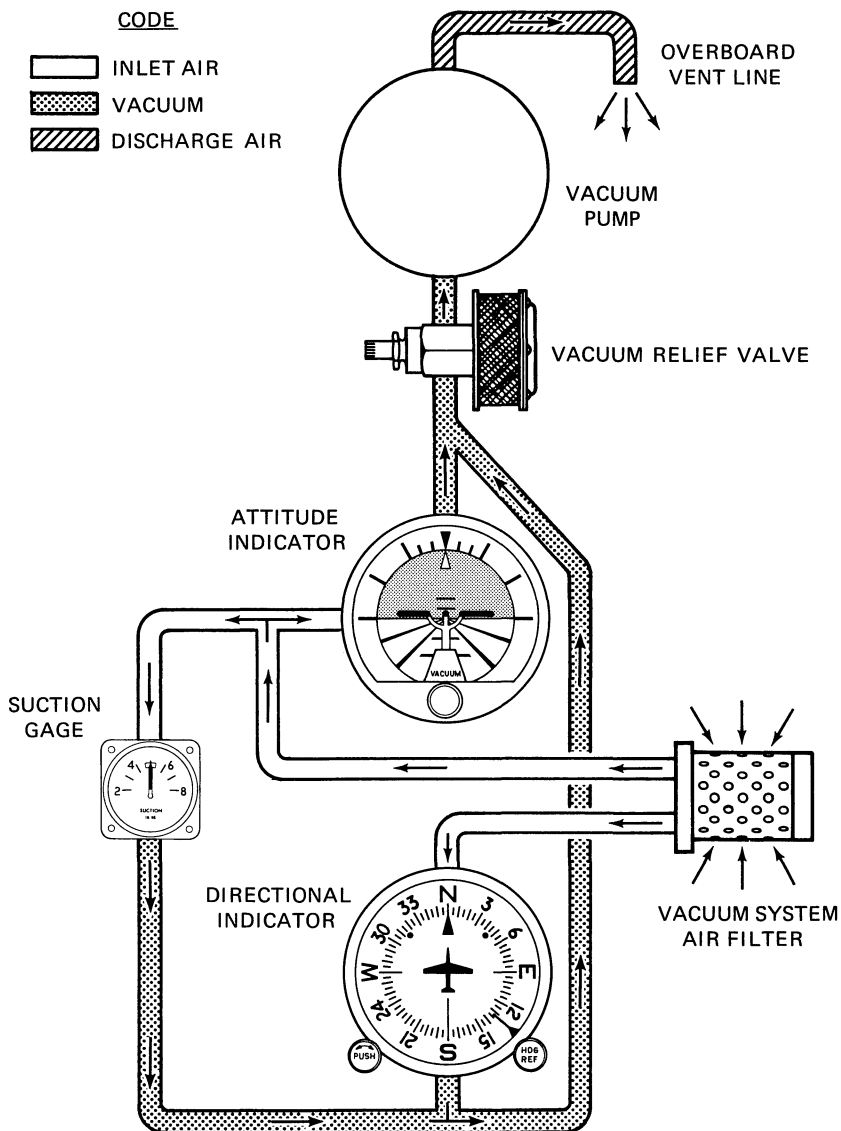


Figure 7-10. Vacuum System

## **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 SYSTEM AND INSTRUMENTS**

An engine-driven vacuum system (see figure 7-10) is available and provides the suction necessary to operate the attitude indicator and directional indicator. The system consists of a 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 on the left side of the instrument panel, and a suction gage on the right side of the panel.

## **ATTITUDE INDICATOR**

An attitude indicator is available and 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 in relation to the horizon bar. A knob at the bottom of the instrument is provided for in-flight adjustment of the miniature airplane to the horizon bar for a more accurate flight attitude indication.

## **DIRECTIONAL INDICATOR**

A directional indicator is available and 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 is located on the right side of the instrument panel when the airplane is equipped with a vacuum system. Suction available for operation of the attitude indicator and directional indicator is shown by this gage, which is calibrated in inches of mercury. The desired suction range is 4.6 to 5.4 inches of mercury. A suction reading below this range may indicate a system malfunction or improper adjustment, and in this case, the indicators should not be considered reliable.

## **STALL WARNING SYSTEM**

The airplane is equipped with a vane-type stall warning unit, in the leading edge of the left wing, which is electrically connected to a stall warning horn behind the map compartment. A 5-amp circuit breaker protects the stall warning system. The vane in the wing senses the change in airflow over the wing, and operates the warning horn at airspeeds between 5 and 10 knots above the stall in all configurations.

If the airplane has a heated stall warning system, the vane and sensor unit in the wing leading edge is equipped with a heating element. The heated part of the system is operated by the PITOT HEAT switch, and is protected by the PITOT 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 the warning horn sounds as the vane is pushed upward.

## **AVIONICS SUPPORT EQUIPMENT**

The airplane may, at the owner's discretion, be equipped with various types of avionics support equipment such as an audio control panel, microphone-headsets, and static dischargers. The following paragraphs discuss these items.

## **AUDIO CONTROL PANEL**

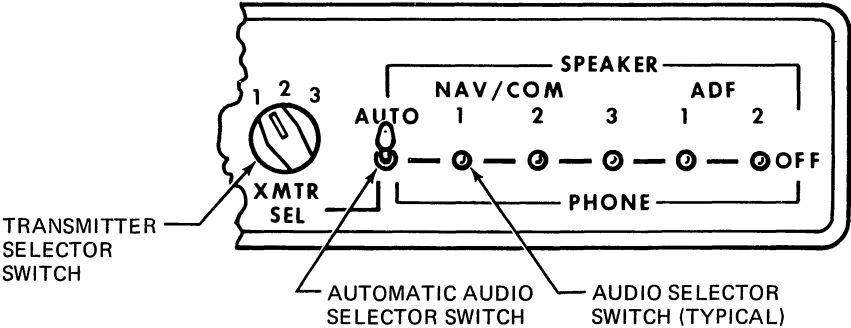
Operation of radio equipment is covered in Section 9 of this handbook. When one or more radios are installed, a transmitter/audio switching system is provided (see figure 7-11). The operation of this switching system is described in the following paragraphs.

### **TRANSMITTER SELECTOR SWITCH**

A rotary type transmitter selector switch, labeled XMTR SEL, is provided to connect the microphone to the transmitter the pilot desires to use. To select a transmitter, rotate the switch to the number corresponding to that transmitter. The numbers 1, 2 and 3 above the switch correspond to the top, second and third transceivers in the avionics stack.

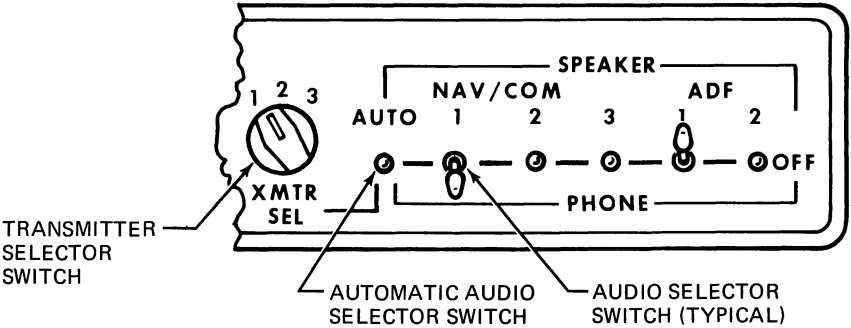
The audio amplifier in the NAV/COM radio is required for speaker and transmitter operation. The amplifier is automatically selected, along with

**AUTOMATIC AUDIO SELECTION**



As illustrated, the number 1 transmitter is selected, the AUTO selector switch is in the SPEAKER position, and the NAV/COM 1, 2 and 3 and ADF 1 and 2 audio selector switches are in the OFF position. With the switches set as shown, the pilot will transmit on the number 1 transmitter and hear the number 1 NAV/COM receiver through the airplane speaker.

**INDIVIDUAL AUDIO SELECTION**



As illustrated, the number 1 transmitter is selected, the AUTO selector switch is in the OFF position, the number 1 NAV/COM receiver is in the PHONE position, and the number 1 ADF is in the SPEAKER position. With the switches set as shown, the pilot will transmit on the number 1 transmitter and hear the number 1 NAV/COM receiver on a headset; while the passengers are listening to the ADF audio through the airplane speaker. If another audio selector switch is placed in either the PHONE or SPEAKER position, it will be heard simultaneously with either the number 1 NAV/COM or number 1 ADF respectively.

**Figure 7-11. Audio Control Panel**

the transmitter, by the transmitter selector switch. As an example, if the number 1 transmitter is selected, the audio amplifier in the associated NAV/COM receiver is also selected, and functions as the amplifier for ALL speaker audio. In the event the audio amplifier in use fails, as evidenced by loss of all speaker audio and transmitting capability of the selected transmitter, select another transmitter. This should re-establish speaker audio and transmitter operation. Since headset audio is not affected by audio amplifier operation, the pilot should be aware that, while utilizing a headset, the only indication of audio amplifier failure is loss of the selected transmitter. This can be verified by switching to the speaker function.

## **AUTOMATIC AUDIO SELECTOR SWITCH**

A toggle switch, labeled AUTO, can be used to automatically match the appropriate NAV/COM receiver audio to the transmitter being selected. To utilize this automatic feature, leave all NAV/COM receiver switches in the OFF (center) position, and place the AUTO selector switch in either the SPEAKER or PHONE position, as desired. Once the AUTO selector switch is positioned, the pilot may then select any transmitter and its associated NAV/COM receiver audio simultaneously with the transmitter selector switch. If automatic audio selection is not desired, the AUTO selector switch should be placed in the OFF (center) position.

### **NOTE**

Cessna radios are equipped with sidetone capability (monitoring of the operator's own voice transmission). Sidetone will be heard on either the airplane 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 radio selector switches.

## **AUDIO SELECTOR SWITCHES**

The audio selector switches, labeled NAV/COM 1, 2 and 3 and ADF 1 and 2, allow the pilot to initially pre-tune all NAV/COM and ADF receivers, and then individually select and listen to any receiver or combination of receivers. To listen to a specific receiver, first check that the AUTO selector switch is in the OFF (center) position, then place the audio selector switch corresponding to that receiver in either the SPEAKER (up) or PHONE (down) position. To turn off the audio of the selected receiver, place that switch in the OFF (center) position. If desired, the audio selector switches can be positioned to permit the pilot to listen to one receiver on a headset while the passengers listen to another receiver on the airplane speaker.

The ADF 1 and 2 switches may be used anytime ADF audio is desired. If the pilot wants only ADF audio, for station identification or other reasons, the AUTO selector switch (if in use) and all other audio selector switches should be in the OFF position. If simultaneous ADF and NAV/COM audio is acceptable to the pilot, no change in the existing switch positions is required. Place the ADF 1 or 2 switch in either the SPEAKER or PHONE position and adjust radio volume as desired.

#### **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.

## **MICROPHONE-HEADSET**

The microphone-headset combination consists of the microphone and headset combined in a single unit and a microphone keying switch located on the left side of the pilot's control wheel. The microphone-headset permits the pilot to conduct radio communications without interrupting other control operations to handle a hand-held microphone. Also, passengers need not listen to all communications. The microphone and headset jacks are located on the extreme left side of the instrument panel.

## **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.

# SECTION 8

## AIRPLANE HANDLING, SERVICE & MAINTENANCE

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## 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 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 FOLLOW-UP SYSTEM

Your Cessna Dealer has an Owner Follow-Up System to notify you when he receives information that applies to your Cessna. In addition, if you wish, you may choose to receive similar notification, in the form of Service Letters, directly from the Cessna Customer Services Department. A subscription form is supplied in your Customer Care Program book for your use, should you choose to request this service. Your Cessna Dealer will be glad to supply you with details concerning these follow-up programs, and stands ready, through his Service Department, to supply you with fast, efficient, low-cost service.

## PUBLICATIONS

Various publications and flight operation aids are furnished in the

**SECTION 8  
HANDLING, SERVICE  
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**CESSNA  
MODEL TU206G**

airplane when delivered from the factory. These items are listed below.

- **CUSTOMER CARE PROGRAM BOOK**
- **PILOT'S OPERATING HANDBOOK/SUPPLEMENTS FOR YOUR  
AIRPLANE  
AVIONICS AND AUTOPILOT**
- **PILOT'S CHECKLISTS**
- **POWER COMPUTER**
- **SALES AND SERVICE DEALER 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.

- **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.

## **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. Weight and Balance, and associated papers (latest copy of the Repair and Alteration Form, FAA Form 337, if applicable).
  - 2. 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 Operating Handbook, 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 at 50-hour intervals during a 200-hour period. The 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.

Coupons attached to the Program book entitle you to an initial inspection and either a Progressive Care Operation No. 1 or the first 100-hour inspection 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 reasonably soon 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. 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. 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 accumu-

lated moisture may freeze the brakes, or when the brakes are overheated. Close the cowl flaps, install the control wheel lock and chock the wheels. 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 one or both main gear, the entire airplane should be jacked by using the wing jack points. Refer to the Service Manual for specific procedures and equipment required.

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 the front seat rails 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

**SECTION 8  
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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:

**ENGINE OIL**

**GRADE -- Aviation Grade SAE 50 Above 4°C (40°F).**

**Aviation Grade SAE 10W30 or SAE 30 Below 4°C (40°F).**

Multi-viscosity oil with a range of SAE 10W30 is recommended for improved starting and turbocharger controller operation in cold weather. Ashless dispersant oil, conforming to Continental Motors Specification MHS-24A, **must be used.**

**NOTE**

Your Cessna was delivered from the factory with a corrosion preventive aircraft engine oil. If oil must be added during the first 25 hours, use only aviation grade straight mineral oil conforming to Specification No. MIL-L-6082.

**CAPACITY OF ENGINE SUMP -- 12 Quarts.**

Do not operate on less than 9 quarts. To minimize loss of oil through breather, fill to 10 quart level for normal flights of less than 3 hours. For extended flight, fill to 12 quarts. These quantities refer to oil dipstick level readings. During oil and oil filter changes, one additional quart is required when the filter is changed.

**OIL AND OIL FILTER CHANGE --**

After the first 25 hours of operation, drain engine oil sump and replace the filter. Refill sump with straight mineral oil and use until a total of 50 hours has accumulated or oil consumption has stabilized; then change to dispersant oil. Drain the engine oil sump and replace the



filter each 50 hours thereafter. The oil change interval may be extended to 100-hour intervals, providing the oil filter is changed at 50-hour intervals. Change engine oil 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.

## FUEL

### APPROVED FUEL GRADES (AND COLORS) --

100LL Grade Aviation Fuel (Blue).

100 (Formerly 100/130) Grade Aviation Fuel (Green).

CAPACITY EACH STANDARD TANK -- 30.5 Gallons.

CAPACITY EACH LONG RANGE TANK -- 40 Gallons.

## LANDING GEAR

NOSE WHEEL TIRE PRESSURE -- 49 PSI on 5.00-5, 6-Ply Rated Tire.  
29 PSI on 6.00-6, 4-Ply Rated Tire.

MAIN WHEEL TIRE PRESSURE -- 42 PSI on 6.00-6, 6-Ply Rated Tires.  
35 PSI on 8.00-6, 6-Ply Rated Tires.

NOSE GEAR SHOCK STRUT --

Keep filled with MIL-H-5606 hydraulic fluid and inflated with air to 80 PSI. Do not over-inflate.

## OXYGEN

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

MAXIMUM PRESSURE (cylinder temperature stabilized after filling) --  
1850 PSI at 21°C (70°F).

Refer to Oxygen 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, carbon tetrachloride, fire extinguisher or anti-ice fluid, lacquer thinner or glass cleaner to clean the plastic. These materials will attack the plastic and may cause it to craze.

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

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

## PAINTED SURFACES

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

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

Waxing is unnecessary to keep the painted surfaces bright. However, if desired, the airplane may be waxed with a good automotive wax. A heavier coating of wax on the leading edges of the wings and tail and on the engine nose cap and propeller spinner will help reduce the abrasion encountered in these areas.

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. A 50-50 solution of isopropyl alcohol and water will satisfactorily remove ice accumulations without damaging the paint. A solution with more than 50% alcohol is harmful and should be avoided. While applying the de-icing solution, keep

it away from the windshield and cabin windows since the alcohol will attack the plastic and may cause it to craze.

## PROPELLER CARE

Preflight inspection of propeller blades for nicks, and wiping them occasionally with an oily cloth to clean off grass and bug stains will assure long, trouble-free service. 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 carbon tetrachloride or Stoddard solvent.

## ENGINE CARE

The engine may be cleaned with Stoddard solvent, or equivalent, then dried thoroughly.

### CAUTION

Particular care should be given to electrical equipment before cleaning. Cleaning fluids should not be allowed to enter magnetos, starter, alternator and the like. Protect these components before saturating the engine with solvents. All other openings should also be covered before cleaning the engine assembly. Caustic cleaning solutions should be used cautiously and should always be properly neutralized after their use.

## 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.

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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.

On airplanes equipped with a cargo interior, materials used on the cabin floor and sidewalls are not easily soiled or stained. Dust and loose dirt should be picked up with a vacuum cleaner. Stubborn dirt can be wiped off with a cloth moistened in clean water. Mild soap suds, used sparingly, will remove grease. The soap should be removed with a clean damp cloth.

# SECTION 9

## SUPPLEMENTS

### (Optional Systems Description & Operating Procedures)

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##### Introduction

##### Supplements:

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| Oxygen System . . . . .                                                                           | (6 pages)  |
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| Cessna 400 Glide Slope (Type R-443B) . . . . .                                                    | (4 pages)  |
| Cessna Horizontal Situation Indicator (Type IG-832C) . . . . .                                    | (6 pages)  |
| Cessna 200A Navomatic Autopilot (Type AF-295B) . . . . .                                          | (6 pages)  |
| Cessna 300A Navomatic Autopilot (Type AF-395A) . . . . .                                          | (6 pages)  |
| Cessna 400 Navomatic Autopilot (Type AF-420A) . . . . .                                           | (8 pages)  |

## **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. Other routinely installed items of optional equipment, whose function and operational procedures do not require detailed instructions, are discussed in Section 7.

# **SUPPLEMENT**

## **EMERGENCY LOCATOR TRANSMITTER (ELT)**

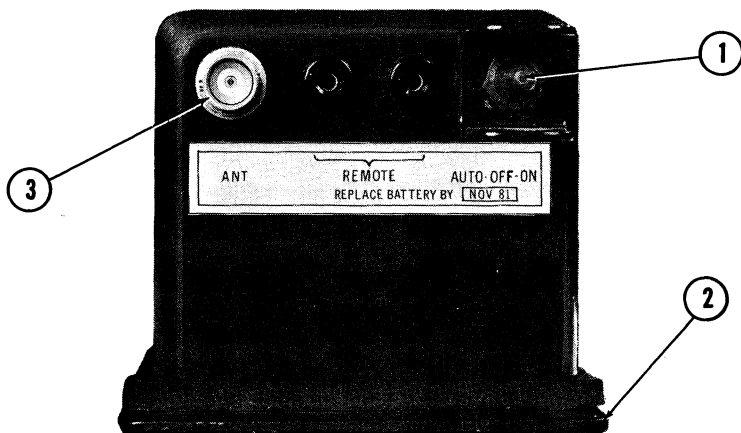
### **SECTION 1 GENERAL**

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. (Some ELT units in export aircraft transmit only on 121.5 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 supplied in domestic aircraft transmits on both distress frequencies simultaneously at 75 mw rated power output for 48 continuous hours in the temperature range of -40°F to +131°F (-40°C to +55°C). The ELT unit in export aircraft transmits on 121.5 MHz at 25 mw rated power output for 100 continuous hours in the temperature range of -40°F to +131°F (-40°C to +55°C).

The ELT is readily identified as a bright orange unit mounted behind the baggage compartment wall in the tailcone. To gain access to the unit, remove the baggage compartment wall. The ELT is operated by a control panel at the forward facing end of the unit (see figure 1.)

### **SECTION 2 LIMITATIONS**

There is no change to the airplane limitations when this equipment is installed.



1. FUNCTION SELECTOR SWITCH (3-position toggle switch):

ON - Activates transmitter instantly. Used for test purposes and if "g" switch is inoperative.

OFF - Deactivates transmitter. Used during shipping, storage and following rescue.

AUTO - Activates transmitter only when "g" switch receives 5g or more impact.

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 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 for 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**

## **ELECTRIC ELEVATOR TRIM SYSTEM (MODEL TU206)**

### **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 and a disengage switch located on the left side of the control wheel pad. 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, removes all electrical power from the system when placed in the DISENGAGE position.

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**

There is no change to the airplane limitations when this trim system is installed. However, the following information is presented on a placard at the top of the instrument panel:

|                                                                                    |
|------------------------------------------------------------------------------------|
| <p><b>Maximum Altitude Loss During<br/>Electric Trim Malfunction - 200 Ft.</b></p> |
|------------------------------------------------------------------------------------|

## **SECTION 3 EMERGENCY PROCEDURES**

1. Elevator Trim Disengage Switch -- DISENGAGE.

### **NOTE**

For maximum altitude loss during an electric trim malfunction, refer to placarding on the instrument panel.

2. 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 Disengage Switch -- ON.
3. Trim Switch -- ACTUATE as desired.
4. 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**

## **OXYGEN SYSTEM (MODEL TU206)**

### **SECTION 1 GENERAL**

A six-place oxygen system provides the supplementary oxygen necessary for continuous flight at high altitude. In this system, an oxygen cylinder, located in the fuselage tailcone, supplies the oxygen. Cylinder pressure is reduced to an operating pressure of 70 PSI by a pressure regulator attached to the cylinder. A shutoff valve is included as part of the regulator assembly. An oxygen cylinder filler valve is located on the left side of the fuselage tailcone (under a cover plate). Cylinder pressure is indicated by a pressure gage located in the overhead oxygen console above the pilot's and front passenger's seats.

Six oxygen outlets are provided; two in the overhead oxygen console and four in the cabin ceiling just above the side windows (one at each of the rear seating positions). One permanent, microphone-equipped mask is provided for the pilot, and five disposable type masks are provided for the passengers. All masks are the partial-rebreathing type, equipped with vinyl plastic hoses and flow indicators.

#### **NOTE**

The hose provided for the pilot is of a higher flow rate than those for the passengers; it is color-coded with a red band adjacent to the plug-in fitting. The passenger hoses are color-coded with an orange band. If the airplane owner prefers, he may provide higher flow hoses for all passengers. In any case, it is recommended that the pilot use the larger capacity hose. The pilot's mask is equipped with a microphone to facilitate use of the radio while using oxygen. An adapter cord is furnished with the microphone-equipped mask to mate the mask microphone lead to the auxiliary microphone jack located on the left side of the instrument panel. To connect the oxygen mask

microphone, connect the mask lead to the adapter cord and plug the cord into the auxiliary microphone jack. (If an optional microphone-headset combination has been in use, the microphone lead from this equipment is already plugged into the auxiliary microphone jack. It will be necessary to disconnect this lead from the auxiliary microphone jack so that the adapter cord from the oxygen mask microphone can be plugged into the jack.) A switch is incorporated on the left hand control wheel to operate the microphone.

A remote shutoff valve control, located adjacent to the pilot's oxygen outlet in the overhead oxygen console, is used to shut off the supply of oxygen to the system when not in use. The control is mechanically connected to the shutoff valve at the cylinder. With the exception of the shutoff function, the system is completely automatic and requires no manual regulation for change of altitude.

The oxygen cylinder, when fully charged, contains approximately 76 cubic feet of aviator's breathing oxygen (Spec. No. MIL-O-27210), under a pressure of 1850 PSI at 21°C (70°F). Filling pressures will vary, however, due to ambient temperature in the filling area, and the temperature rise resulting from compression of the oxygen. Because of this, merely filling to 1850 PSI will not result in a properly filled cylinder. Fill to pressures indicated on the table below for ambient temperature.

**WARNING**

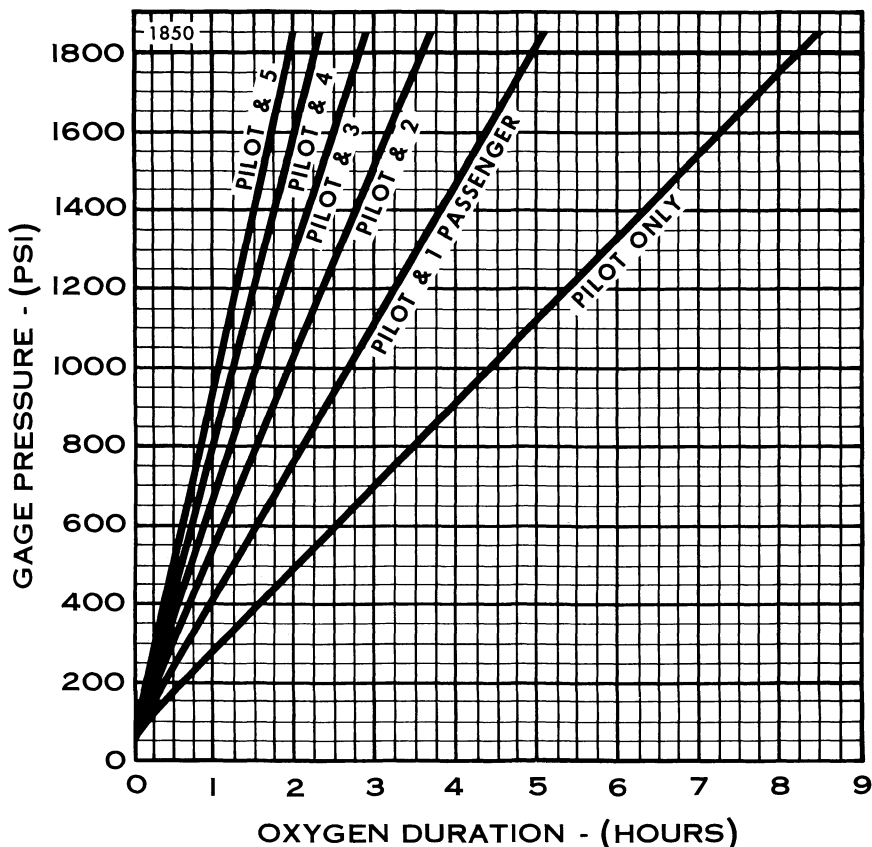
Oil, grease or other lubricants in contact with oxygen create a serious fire hazard, and such contact must be avoided when handling oxygen equipment.

| AMBIENT<br>TEMPERATURE<br>°F | FILLING<br>PRESSURE<br>PSIG | AMBIENT<br>TEMPERATURE<br>°F | FILLING<br>PRESSURE<br>PSIG |
|------------------------------|-----------------------------|------------------------------|-----------------------------|
| 0                            | 1650                        | 50                           | 1875                        |
| 10                           | 1700                        | 60                           | 1925                        |
| 20                           | 1750                        | 70                           | 1975                        |
| 30                           | 1775                        | 80                           | 2025                        |
| 40                           | 1825                        | 90                           | 2050                        |

Figure 1. Oxygen Filling Pressures

## OXYGEN DURATION CHART

(76 CUBIC FEET CAPACITY)



NOTE: This chart is based on a pilot with a red color-coded oxygen line fitting and passengers with orange color-coded line fittings.

Figure 2. Oxygen Duration Chart

For FAA requirements concerning supplemental oxygen, refer to FAR 91.32. Supplemental oxygen should be used by all occupants when cruising above 10,000 feet. As described in the Cessna booklet "Man At Altitude," it is often advisable to use oxygen at altitudes lower than 10,000 feet under conditions of night flying, fatigue, or periods of physiological or emotional disturbances. Also, the habitual and excessive use of tobacco or alcohol will usually necessitate the use of oxygen at less than 10,000 feet.

The Oxygen Duration Chart (figure 2) should be used in determining the usable duration (in hours) of the oxygen supply in your airplane. The following procedure outlines the method of finding the duration from the chart.

1. Note the available oxygen pressure shown on the pressure gage.
2. Locate this pressure on the scale on the left side of the chart, then go across the chart horizontally to the right until you intersect the line representing the number of persons making the flight. After intersecting the line, drop down vertically to the bottom of the chart and read the duration in hours given on the scale.
3. As an example of the above procedure, 1800 PSI of pressure will safely sustain the pilot only for 8 hours and 15 minutes. The same pressure will sustain the pilot and three passengers for approximately 2 hours and 50 minutes.

#### NOTE

The Oxygen Duration Chart is based on a standard configuration oxygen system having one red color-coded hose assembly for the pilot and orange color-coded hoses for the passengers. If red color-coded hoses are provided for pilot and passengers, it will be necessary to compute new oxygen duration figures due to the greater consumption of oxygen with these hoses. This is accomplished by computing the total duration available to the pilot only (from PILOT ONLY line on chart), then dividing this duration by the number of persons (pilot and passengers) using oxygen.

## SECTION 2 LIMITATIONS

There is no change to the airplane limitations when oxygen equipment is installed.

## SECTION 3 EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when oxygen equipment is installed.



## SECTION 4

### NORMAL PROCEDURES

Prior to flight, check to be sure that there is an adequate oxygen supply for the trip, by noting the oxygen pressure gage reading, and referring to the Oxygen Duration Chart (figure 2). Also, check that the face masks and hoses are accessible and in good condition.

#### WARNING

For safety reasons, no smoking should be allowed in the airplane while oxygen is being used.

When ready to use the oxygen system, proceed as follows:

1. Mask and Hose -- SELECT. Adjust mask to face and adjust metallic nose strap for snug mask fit.
2. Delivery Hose -- PLUG INTO OUTLET nearest to the seat you are occupying.

#### NOTE

When the oxygen system is turned on, oxygen will flow continuously at the proper rate of flow for any altitude without any manual adjustments.

3. Oxygen Supply Control Knob -- ON.
4. Face Mask Hose Flow Indicator -- CHECK. Oxygen is flowing if the indicator is being forced toward the mask.
5. Delivery Hose -- UNPLUG from outlet when discontinuing use of oxygen. This automatically stops the flow of oxygen.
6. Oxygen Supply Control Knob -- OFF when oxygen is no longer required.

## SECTION 5

### PERFORMANCE

There is no change to the airplane performance when oxygen equipment is installed.



## **SUPPLEMENT**

# **PROPELLER ANTI-ICE SYSTEM (MODEL TU206)**

## **SECTION 1 GENERAL**

The propeller anti-ice system provides a measure of protection if unexpected icing conditions are encountered. The system is operated by a toggle switch located on the left switch and control panel. When the switch is placed in the ON position, current flows to an anti-ice timer which supplies electric power in cycles every 20 seconds to elements in the anti-icing boots located on the propeller blades. Operation of the anti-ice system can be checked by monitoring a propeller anti-ice ammeter near the upper right corner of the instrument panel. The system is protected by a 20-amp circuit breaker, labeled PROP DE-ICE, located on the left switch and control panel.

## **SECTION 2 LIMITATIONS**

There is no change to the airplane limitations when the propeller anti-ice system is installed; intentional flight into known icing conditions is prohibited, regardless of installed ice protection equipment.

## **SECTION 3 EMERGENCY PROCEDURES**

There is no change to the airplane emergency procedures when the propeller anti-ice system is installed.

## SECTION 4

### NORMAL PROCEDURES

Flight into known or forecast icing conditions is prohibited. If unexpected icing conditions are encountered, the following procedure is recommended:

1. Master Switch -- ON.
2. Propeller Anti-Ice Switch -- ON.
3. Propeller Anti-Ice Ammeter -- CHECK in green arc range (14 to 18 amps).

#### NOTE

To check the heating elements and anti-ice timer for one complete cycle, the system must be left on for approximately 1 minute. Ammeter readings must remain in the green arc except during momentary change.

#### NOTE

While using the anti-ice system, monitor the airplane ammeter to ensure that the electrical system does not become overloaded. If the total electrical load is high, resulting in a discharge indication, limit the use of other electrical equipment so that the airplane ammeter maintains a slight charge.

#### CAUTION

If the ammeter indicates unusually high or low amperage during the 20-second cycle of operation, a malfunction has occurred and it is imperative that the system be turned off. Uneven anti-icing may result, causing propeller unbalance and engine roughness.

4. Propeller Anti-Ice Switch -- OFF when anti-icing is no longer required.

## SECTION 5

### PERFORMANCE

There is no change to the airplane performance when the propeller anti-ice system is installed.

# **SUPPLEMENT**

## **CARGO PACK (MODEL TU206)**

### **SECTION 1 GENERAL**

The cargo pack provides additional cargo and baggage space. The basic shell of the cargo pack, including the loading door, is fabricated from fiberglass. Corrugated aluminum forms the inner floor of the pack. A loading door is located on the left side of the pack, and is hinged at the bottom. It is secured in the closed position by two quick-release fasteners, and has a key-operated lock.

The volume of the cargo pack is 16 cubic feet. Dimensions of the pack and its loading door opening are contained in Section 6 of this handbook. The pack is designed to accommodate three "two-suiters", plus other small miscellaneous articles.

The pack is attached to the bottom of the fuselage with screws and, after the initial installation, can readily be removed or installed. Complete instructions for installation of the cargo pack, and required modifications to the nose gear access panels, fuel pump vent line and cowl flaps are contained in the Accessory Kit and Service Manual.

### **SECTION 2 LIMITATIONS**

The following limitations are presented in the form of individual placards, located on the inside of the cargo pack door:

Refer to weight & balance data for baggage/cargo loading. Never exceed 300 lbs. cargo weight.

The ADF bearing accuracy may be adversely affected by the type and/or arrangement of the cargo pack contents.

## **SECTION 3 EMERGENCY PROCEDURES**

There is no change to the airplane emergency procedures when the cargo pack is installed.

## **SECTION 4 NORMAL PROCEDURES**

In order to provide adequate engine cooling on hot days (100°F at sea level, or hotter), the maximum rate of climb speed schedule should be as follows:

|                     |         |
|---------------------|---------|
| S.L. to 17,000 Feet | 95 KIAS |
| 20,000 Feet         | 93 KIAS |
| 22,000 Feet         | 92 KIAS |

In addition, consideration should be given to loading of the cargo pack and the necessary weight and balance computations outlined in Section 6 of this handbook. All other normal procedures specified in the basic handbook are applicable when the cargo pack is installed.

## **SECTION 5 PERFORMANCE**

The climb performance of the airplane equipped with a cargo pack is approximately 110 fpm less than shown in the climb performance charts in Section 5. The cruise speeds are approximately 5 KTAS lower than shown in the cruise charts in Section 5.

# **SUPPLEMENT**

## **SKYDIVING KIT (MODEL TU206)**

### **SECTION 1 GENERAL**

The skydiving kit is designed to improve passenger comfort and facilitate diver-to-pilot communications during skydiving operations. The kit consists of a spoiler, skydiver steering switch, and a steering signal light console. The spoiler is installed on the door hinges of the removed front cargo door to minimize the strong air flow buffeting within the cabin when the cargo doors are removed. The rocker-type steering switch is mounted inside the cabin on the upper sill of the cargo door opening and is used by the skydiver to signal the pilot of his desired flight path over the drop zone. A steering signal light console, with red and green lights controlled by operation of the steering switch, is mounted on top of the instrument panel. Illumination of the red light indicates to the pilot that the diver desires that the airplane be steered left; conversely, a green light shows that the pilot is to steer right.

### **SECTION 2 LIMITATIONS**

Removal of the cargo doors requires that a spoiler be installed. With the doors removed and the spoiler installed, the following placard must be displayed on the instrument panel:

|                                                        |
|--------------------------------------------------------|
| With cargo doors removed<br>do not exceed 130 KTS IAS. |
|--------------------------------------------------------|

## **SECTION 3 EMERGENCY PROCEDURES**

There is no change to the airplane emergency procedures when the skydiving kit is installed.

## **SECTION 4 NORMAL PROCEDURES**

For skydiving operations, removal of both cargo doors is suggested, since exit through a single door would be difficult with the spoiler obstructing part of the door opening. Installation of the spoiler substantially reduces air flow buffeting in the cabin; however, all loose equipment, including head rests, rear window sun shade, removable arm rests, safety belts, etc., should be removed or secured. Fifth and sixth seat passengers will receive a strong air blast, and face protection in the form of goggles and helmet is recommended.

Removal of the cargo doors also necessitates the installation of a depressor plate over the wing flap circuit interrupt switch to permit flap operation with doors removed. (Under normal operations with the cargo doors installed, the switch prevents flap operation whenever the front cargo door is open to prevent accidental damage to the door or wing flap if the flaps are lowered.)

With the cargo doors removed, flight characteristics are essentially unchanged, except that slightly different directional trim may be needed.

Seating accommodations for as many as five skydivers are more easily provided by removing the right center seat and the copilot seat, and allowing these divers to sit on the floor back-to-back. An extra long seat belt (attached to the copilot seat belt anchor points) is needed to restrain the rearward facing diver having a back-pack parachute.

## **SECTION 5 PERFORMANCE**

Airplane performance information provided in this handbook does not apply when the airplane is flown with the cargo doors removed since significant performance decrements result. For example, maximum rate of climb is reduced by approximately 100 fpm and cruise speed is reduced by approximately 10 knots.



## **SUPPLEMENT**

### **CESSNA 300 NAV/COM (720-Channel - Type RT-385A)**

#### **SECTION 1 GENERAL**

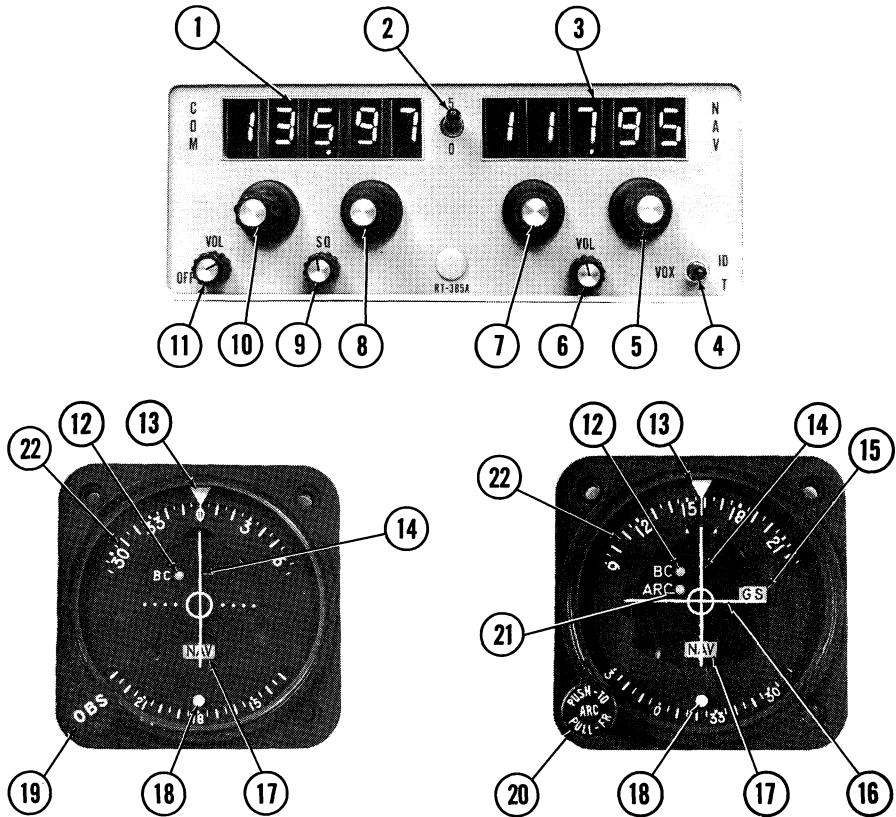
The Cessna 300 Nav/Com (Type RT-385A), shown in figure 1, consists of a panel-mounted receiver-transmitter and a single or dual-pointer remote course deviation indicator.

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, 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 course deviation indicator includes either a single-pointer and related NAV flag for VOR/LOC indication only, or dual pointers and related NAV and GS flags for both VOR/LOC and glide slope indications. Both types of course deviation indicators incorporate a back-course lamp (BC) which lights when optional back course (reversed sense) operation is selected. 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.

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



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 the autopilot or reverse sense option is installed and the reverse sense switch or autopilot's back-course function is engaged; indicates course deviation pointer is reversed on selected receiver when tuned to a localizer frequency.
13. COURSE INDEX - Indicates selected VOR course.
14. COURSE DEVIATION POINTER - Indicates course deviation from selected omni course or localizer centerline.
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.
16. GLIDE SLOPE DEVIATION POINTER - Indicates deviation from ILS glide slope.
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.

Figure 1. Cessna 300 Nav/Com (Type RT-385A), Operating Controls and Indicators (Sheet 3 of 3)

18. RECIPROCAL COURSE INDEX - Indicates reciprocal of selected VOR course.
19. OMNI BEARING SELECTOR (OBS) - Rotates 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.
22. COURSE CARD - Indicates selected VOR course under course index.

Figure 1. Cessna 300 Nav/Com (Type RT-385A), Operating Controls and Indicators (Sheet 2 of 3)

the receiver-transmitter. In addition, when two or more radios are installed, aircraft mounted transmitter selector and speaker/phone switches are provided.

## **SECTION 2 LIMITATIONS**

There is no change to the airplane limitations when this avionic equipment is installed. However, the pilot should be aware that on many Cessna airplanes equipped with the windshield mounted glide slope antenna, pilots should avoid use of  $2700 \pm 100$  RPM (or  $1800 \pm 100$  RPM with a three bladed propeller) during ILS approaches to avoid oscillations of the glide slope deviation pointer caused by propeller interference.

## **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 controls 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 -- SET to desired 300 Nav/Com (on audio control panel).
3. SPEAKER/PHONE (or AUTO) Switch -- SET to desired mode (on audio control panel).
4. 5-0 Fractional MHz Selector Switch -- SELECT desired operating frequency (does not affect navigation frequencies).
5. COM Frequency Selector Switches -- SELECT desired operating frequency.
6. SQ Control -- ROTATE counterclockwise to decrease background noise as required.

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. Adjustment of sidetone may be accomplished by adjusting the sidetone pot located inside the audio control panel.

- b. To Receive -- RELEASE mike button.

NAVIGATION OPERATION:

1. COM OFF/VOL Control -- TURN ON.
2. SPEAKER/PHONE (or AUTO) Switch -- SET to desired mode (on audio control panel).
3. NAV Frequency Selector Knobs -- SELECT desired operating frequency.
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. 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 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.

7. 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.
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 NAV/COM (Type RT-385A)**

### **WITH**

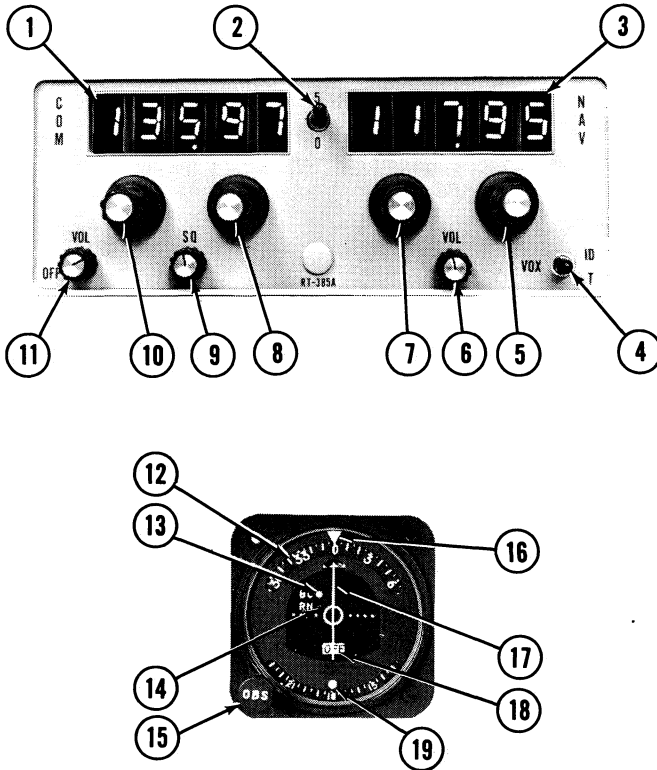
## **CESSNA 400 AREA NAVIGATION SYSTEM (Type RN-478A)**

### **SECTION 1 GENERAL**

The Cessna 300 Nav/Com (Type RT-385A) Set with Cessna 400 Area Navigation (RNAV-Type RN-478A) consists of a RT-385A Nav/Com, a R-476A DME system, a RN-478A Area Navigation Computer and a IN-442AR Course Deviation Indicator. The RN-478A includes circuits which combine the VOR navigation information with distance information from the R-476A DME system to provide data for area navigation. Operating information for the communication set and for VOR/localizer navigation is presented in this supplement. Operating information for area navigation and for DME is presented in separate supplements.

The RT-385A Receiver-Transmitter includes a 720-channel VHF communication receiver-transmitter which receives and transmits signals between 118.000 MHz and 135.975 MHz in 25-kHz steps. It also includes a 200-channel VHF navigation receiver which receives VOR and localizer signals between 108.00 MHz and 117.95 MHz in 50-kHz steps. The communication receiver-transmitter and the navigation receiver can be operated simultaneously.

The VOR or localizer signal from the navigation receiver is applied to the converter circuits in the RN-478A Area Navigation Computer. The



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 Set, 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 center VOX (Voice) position, identifier signal is suppressed; in T (Momentary On) position, the VOR navigational self-test function is selected.
5. NAVIGATIONAL RECEIVER FRACTIONAL MEGAHERTZ FREQUENCY SELECTOR - Selects NAV frequency in .05 MHz steps between .00 and .95 MHz; simultaneously selects paired glide slope frequency and DME channel.
6. NAV VOLUME CONTROL (VOL) - Adjusts volume of navigation receiver audio. Clockwise rotation increases audio level.
7. NAVIGATION RECEIVER MEGAHERTZ FREQUENCY 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 MHz FREQUENCY SELECTOR - Depending on position of the 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 MHz FREQUENCY 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 RNAV Computer circuits; controls volume of communication receiver audio.
12. COURSE CARD - Indicates selected VOR course under course index.
13. BACK COURSE LAMP (BC) - Amber light illuminates when an autopilot with reverse sense feature is installed and the reverse sense switch or the autopilot's back-course function is engaged and receiver is tuned to a localizer frequency; indicates course deviation pointer is reversed.
14. AREA NAV LAMP (RN) - When green light is illuminated, indicates that RNAV operation is selected.
15. OMNI BEARING SELECTOR (OBS) - Rotates course card (12) to select desired bearing to or from a VOR station or to a selected RNAV waypoint.
16. COURSE INDEX - Indicates selected VOR or RNAV course (bearing).
17. COURSE DEVIATION POINTER - Indicates deviation from selected VOR or RNAV course or localizer centerline.

Figure 1. Cessna 300 Nav/Com Set, Operating Controls and Indicators  
(Sheet 2 of 3)

18. OFF/TO-FROM INDICATOR - Operates only with VOR or localizer signal. OFF position (flag) indicates unusable signal. With usable VOR signal, when OFF position disappears, indicates whether selected course is TO or FROM station or waypoint. With usable localizer signal, shows TO.
19. RECIPROCAL COURSE INDEX - Indicates reciprocal of selected VOR or RNAV course.

Figure 1. Cessna 300 Nav/Com Set, Operating Controls and Indicators  
(Sheet 3 of 3)

converter processes the received navigation signal to provide omni bearing or localizer information for display by the course indicator.

### **CAUTION**

If the RNAV set is removed from the airplane or becomes inoperative, the associated VHF navigation indicator will be inoperative.

The course indicator includes a Course Deviation Indicator (CDI), an Omni Bearing Selector (OBS) and OFF/TO-FROM Indicator Flags. It also includes an RNAV lamp (RN) which lights when area navigation operation is selected, and a back-course lamp (BC) which lights when back-course operation is selected. The IN-442AR is offered as the standard Course Deviation Indicator.

All operating controls and indicators for the Cessna 300 Nav/Com are included on the front panel of the RT-385A Receiver-Transmitter and the associated Course Deviation Indicator. These controls and indicators are shown and described in Figure 1. Operating controls for the RN-478A Area Navigation Computer, which are used for area navigation, and operating controls for the associated Type R-476A DME are shown in the appropriate supplements in this manual.

## **SECTION 2 LIMITATIONS**

There is no change to the airplane limitations when this avionic equipment is installed. However, the pilot should be aware that on many Cessna airplanes equipped with the windshield mounted glide slope antenna, pilots should avoid use of  $2700 \pm 100$  RPM on airplanes equipped with a two-bladed propeller or  $1800 \pm 100$  RPM on airplanes equipped with a three-bladed propeller during ILS approaches to avoid oscillations of the glide slope deviation pointer caused by propeller interference.

## **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 controls should not be moved due to the difficulty of obtaining a known frequency under this condition.

## SECTION 4

### NORMAL PROCEDURES

#### COMMUNICATIONS TRANSCEIVER OPERATION:

1. COM OFF/VOL Control -- TURN ON; adjust to desired audio level.
2. XMTR SEL Switch -- SET to desired 300 NAV/COM (on audio control panel).
3. SPEAKER PHONE (or AUTO) Switch -- SET to desired mode (on audio control panel).
4. 5-0 Fractional MHz Selector Switch -- SELECT desired operating frequency (does not affect navigation frequencies).
5. COM Frequency Selector Knobs -- SELECT desired operating frequency.
6. SQ Control -- ROTATE counterclockwise to decrease background noise as required.
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. Adjustment of sidetone may be accomplished by adjusting the sidetone pot located inside the audio control panel.

- b. To Receive -- RELEASE mike button.

#### NAVIGATION RECEIVER OPERATION:

1. COM OFF/VOL Control -- TURN ON.
2. SPEAKER/PHONE (or AUTO) Switch -- SET to desired mode (on audio control panel).
3. NAV Frequency Selector Knobs -- SELECT desired operating frequency.
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 (Morse Code) signal.
  - b. To Filter Out Station Identifier Signal -- SET to VOX (center) position to include filter in audio circuit.
6. OBS Knob -- SELECT desired course.

#### TO SELF TEST VOR NAVIGATION CIRCUITS:

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 index; CDI pointer centers or deflects left or right, depending on bearing of signal; OFF/TO-FROM indicator shows TO or FROM.
4. ID-VOX-T Switch -- PRESS to T and HOLD at T; CDI pointer should center and OFF/TO-FROM indicator should show FROM.
5. OBS Knob -- TURN to displace course approximately 10° to either side of 0° (while holding ID-VOX-T switch at T); CDI pointer should deflect full scale in direction corresponding to course displacement. OFF/TO-FROM indicator should still show FROM.

**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 avionics 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 ADF**

### **(Type R-546E)**

## **SECTION 1**

### **GENERAL**

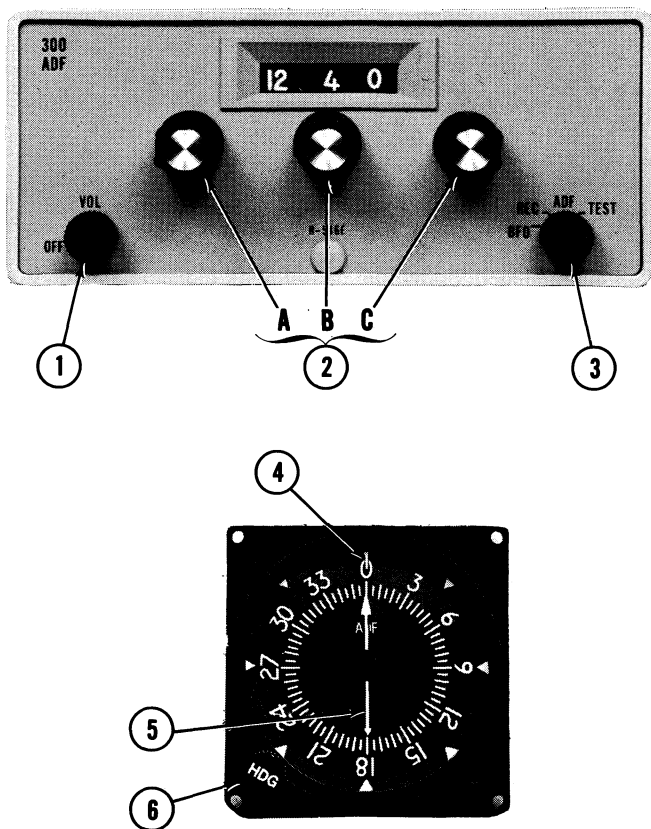
The Cessna 300 ADF is a panel-mounted, digitally tuned automatic direction finder. It is designed to provide continuous 1 kHz digital tuning in the frequency range of 200 kHz to 1,699 kHz and eliminates the need for mechanical band switching. The system is comprised of a receiver, loop antenna, bearing indicator and a sense antenna. In addition, when two or more radios are installed, speaker-phone selector switches are provided. Each control function is described in Figure 1.

The Cessna 300 ADF can be used for position plotting and homing procedures, and for aural reception of amplitude-modulated (AM) signals.

With the function selector knob at ADF, the Cessna 300 ADF provides a visual indication, on the bearing indicator, of the bearing to the transmitting station relative to the nose of the airplane. This is done by combining signals from the sense antenna with signals from the loop antenna.

With the function selector knob at REC, the Cessna 300 ADF uses only the sense antenna and operates as a conventional low-frequency receiver.

The Cessna 300 ADF is designed to receive transmission from the following radio facilities: commercial broadcast stations, low-frequency range stations, FAA radio beacons, and ILS compass locators.



1. **OFF/VOL CONTROL** - Controls primary power and audio output level. Clockwise rotation from OFF position applies primary power to receiver; further clockwise rotation increases audio level.
2. **FREQUENCY SELECTORS** - Knob (A) selects 100-kHz increments of receiver frequency, knob (B) selects 10-kHz increments, and knob (C) selects 1-kHz increments.

Figure 1. Cessna 300 ADF Operating Controls and Indicators (Sheet 1 of 2)

3. FUNCTION SWITCH:

BFO: Selects operation as communication receiver using only sense antenna and activates 1000-Hz tone beat frequency oscillator to permit coded identifier of stations transmitting keyed CW signals (Morse Code) to be heard.

REC: Selects operation as standard communication receiver using only sense antenna.

ADF: Set operates as automatic direction finder using loop and sense antennas.

TEST: Momentary-on position used during ADF operation to test bearing reliability. When held in TEST position, slews indicator pointer clockwise; when released, if bearing is reliable, pointer returns to original bearing position.

4. INDEX (ROTATABLE CARD) - Indicates relative, magnetic, or true heading of aircraft, as selected by HDG control.
5. POINTER - Indicates station bearing in degrees of azimuth, relative to the nose of the aircraft. When heading control is adjusted, indicates relative, magnetic, or true bearing of radio signal.
6. HEADING CONTROL (HDG) - Rotates card to set in relative, magnetic, or true bearing information.

Figure 1. Cessna 300 ADF Operating Controls and Indicators (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) Function Selector Knob -- REC.
- (3) Frequency Selector Knobs -- SELECT operating frequency.
- (4) ADF SPEAKER/PHONE Switch -- SELECT speaker or phone position as desired.
- (5) VOL Control -- ADJUST to desired listening level.

**TO OPERATE AS AN AUTOMATIC DIRECTION FINDER:**

- (1) OFF/VOL Control -- ON.
- (2) Frequency Selector Knobs -- SELECT operating frequency.
- (3) ADF SPEAKER/PHONE Switch -- SELECT speaker or phone position.
- (4) Function Selector Knob -- ADF position and note relative bearing on indicator.
- (5) VOL Control -- ADJUST to desired listening level.

**TO TEST RELIABILITY OF AUTOMATIC DIRECTION FINDER:**

- (1) Function Selector Knob -- ADF position and note relative bearing on indicator.
- (2) Function Selector Knob -- TEST position and observe that pointer moves away from relative bearing at least 10 to 20 degrees.
- (3) Function Selector Knob -- ADF position and observe that pointer returns to same relative bearing as in step (1).

**TO OPERATE BFO:**

- (1) OFF/VOL Control -- ON.
- (2) Function Selector Knob -- BFO.
- (3) Frequency Selector Knobs -- SELECT operating frequency.
- (4) ADF SPEAKER/PHONE Switch -- SELECT speaker or phone position.
- (5) VOL Control -- ADJUST to desired listening level.

**NOTE**

A 1000-Hz tone is heard in the audio output when a CW signal (Morse Code) is tuned in properly.

## **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**

## **DME (TYPE 190)**

### **SECTION 1 GENERAL**

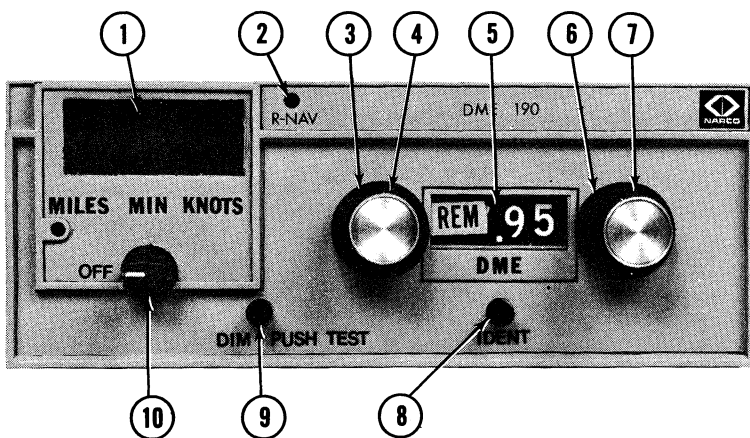
The DME 190 (Distance Measuring Equipment) system consists of a panel mounted 200 channel UHF transmitter-receiver and an externally mounted antenna. The transceiver has a single selector knob that changes the DME's mode of operation to provide the pilot with: distance-to-station, time-to-station, or ground speed readouts. The DME is designed to operate in altitudes up to a maximum of 50,000 feet at ground speeds up to 250 knots and has a maximum slant range of 199.9 nautical miles.

The DME can be channeled independently or by a remote NAV set. When coupled with a remote NAV set, the MHz digits will be covered over by a remote (REM) flag and the DME will utilize the frequency set by the NAV set's channeling knobs. When the DME is not coupled with a remote NAV set, the DME will reflect the channel selected on the DME unit. The transmitter operates in the frequency range of 1041 to 1150 MHz and is paired with 108 to 117.95 MHz to provide automatic DME channeling. The receiver operates in the frequency range of 978 to 1213 MHz and is paired with 108 to 117.95 MHz to provide automatic DME channeling.

All operating controls for the DME are mounted on the front panel of the DME and are described in Figure 1.

### **SECTION 2 LIMITATIONS**

There is no change to the airplane limitations when this avionics equipment is installed.



1. **READOUT WINDOW** - Displays function readout in nautical miles (distance-to-station), minutes (time-to-station) or knots (ground speed).
2. **R-NAV INDICATOR LAMP** - The green R-NAV indicator lamp is provided to indicate the DME is coupled to an R-NAV system. Since this DME is not factory installed with an R-NAV system on Cessna airplanes, the R-NAV indicator lamp should never be illuminated. However, if an R-NAV system is coupled to the DME, and when in R-NAV mode, the R-NAV lamp will light which indicates that the distance readout is the "way point" instead of the DME station. The DME can only give distance (MILES) in R-Nav mode.
3. **REMOTE CHANNELING SELECTOR** - This knob is held stationary by a stop when not coupled to a remote NAV receiver. When coupled to a remote NAV receiver, a stop in the selector is removed and the selector becomes a two position selector. In the first position, the DME will utilize the frequency set by the DME channeling knobs. In the second position, the MHz digits will utilize the frequency set by the NAV unit's channeling knobs.
4. **WHOLE MEGAHERTZ SELECTOR KNOB** - Selects operating frequency in 1-MHz steps between 108 and 117 MHz.
5. **FREQUENCY INDICATOR** - Shows operating frequency selected on the DME or displays remote (REM) flag to indicate DME is operating on a frequency selected by a remote NAV receiver.
6. **FRACTIONAL MEGAHERTZ SELECTOR KNOB** - Selects operating frequency in 50 kHz steps. This knob has two positions, one for the 0 and one for the 5.
7. **FRACTIONAL MEGAHERTZ SELECTOR KNOB** - Selects operating frequency in tenths of a Megahertz (0-9).

Figure 1. DME 190 Operating Controls (Sheet 1 of 2)



8. IDENT KNOB - Rotation of this control increases or decreases the volume of the received station's Ident signal. An erratic display, accompanied by the presence of two Ident signals, can result if the airplane is flying in an area where two stations using the same frequency are transmitting.
9. DIM/PUSH TEST KNOB -
  - DIM: Controls the brilliance of the readout lamp's segments. Rotate the control as desired for proper lamp illumination in the function window (The frequency window is dimmed by the aircraft's radio light dimming control).
  - PUSH TEST: This control is used to test the illumination of the readout lamps, with or without being tuned to a station. Press the control, a readout of 188.8 should be seen with the mode selector switch in the MIN or KNOTS position. The decimal point along with 188.8 will light in the MILES mode. When the control is released, and had the DME been channeled to a nearby station, the distance to that station will appear. If the station channeled was not in range, a "bar" readout will be seen (--- or -- -).
10. MODE SELECTOR SWITCH -
  - OFF: Turns the DME OFF.
  - MILES: Allows a digital readout to appear in the window which represents slant range (in nautical miles) to or from the channeled station.
  - MIN: Allows a digital readout (in minutes) to appear in the window that it will take the airplane to travel the distance to the channeled station. This time is only accurate when flying directly TO the station and after the ground speed has stabilized.
  - KNOTS: Allows a digital readout (in knots) to appear in the window that is ground speed and is valid only after the stabilization time (approximately 2 minutes) has elapsed when flying directly TO or FROM the channeled station.

Figure 1. DME 190 Operating Controls (Sheet 2 of 2)

## **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:**

1. Mode Selector Switch -- SELECT desired DME function.
2. Frequency Selector Knobs -- SELECT desired frequency and allow equipment to warm-up at least 2 minutes.

#### **NOTE**

If frequency is set on remote NAV receiver, place remote channeling selector in the REM position.

3. PUSH TEST Control -- PUSH and observe reading of 188.8 in function window.
4. DIM Control -- ADJUST.
5. IDENT CONTROL -- ADJUST audio output in speaker.
6. Mode Selector Functions:
  - MILES Position -- Distance-to-Station is slant range in nautical miles.
  - MIN Position -- Time-to-Station when flying directly to station.
  - KNOTS Position -- Ground Speed in knots when flying directly to or from station.

#### **CAUTION**

After the DME 190 has been turned OFF, do not turn it on again for 5 seconds to allow the protective circuits to reset.

## **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**

## **HF TRANSCEIVER**

### **(TYPE PT10-A)**

#### **SECTION 1**

#### **GENERAL**

The PT10-A HF Transceiver, shown in Figure 1, is a 10-channel AM transmitter-receiver which operates in the frequency range of 2.0 to 18.0 Megahertz. The transceiver is automatically tuned to the operating frequency by a Channel Selector. The operating controls for the unit are mounted on the front panel of the transceiver. The system consists of a transceiver, antenna load box, fixed wire antenna and associated wiring.

The Channel Selector Knob determines the operating frequency of the transmitter and receiver. The frequencies of operation are shown on the frequency chart adjacent to the channel selector.

The VOLUME control incorporates the power switch for the transceiver. Clockwise rotation of the volume control turns the set on and increases the volume of audio.

The meter on the face of the transceiver indicates transmitter output.

The system utilizes the airplane microphone, headphone and speaker. When two or more radios are installed, a transmitter selector switch and a speaker-phone switch are provided.

#### **SECTION 2**

#### **LIMITATIONS**

There is no change to the airplane limitations when this avionics equipment is installed.

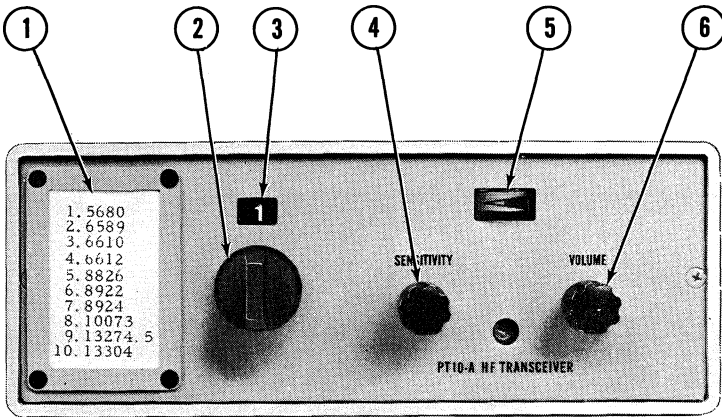


Figure 1. HF Transceiver (Type PT10-A)

## 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:

1. XMTR SEL Switch -- SELECT transceiver (on audio control panel).
2. SPEAKER/PHONE (or AUTO) Switch -- SELECT desired mode (on audio control panel).
3. VOLUME Control -- ON (allow equipment to warm up and adjust audio to comfortable listening level).
4. Frequency Chart -- SELECT desired operating frequency.
5. Channel Selector -- DIAL in frequency selected in step 4.
6. SENSITIVITY Control -- ROTATE clockwise to maximum position.

#### NOTE

If receiver becomes overloaded by very strong signals, back off SENSITIVITY control until background noise is barely audible.

#### NOTE

The antenna tuning meter indicates the energy flowing from the airplane's transmitter into the antenna. The optimum power transfer is indicated by the maximum meter reading.

7. Mike Button:
  - a. To Transmit -- DEPRESS and SPEAK into microphone.

#### NOTE

Sidetone may be selected by placing the AUTO selector switch in either the SPEAKER or PHONE positions.

- b. To Receive -- RELEASE mike button.

## **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**

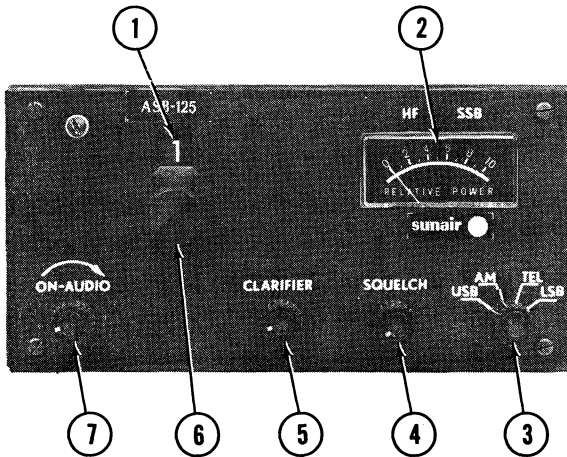
## **SSB HF TRANSCEIVER (TYPE ASB-125)**

### **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 antenna loading readouts.

The system utilizes the airplane microphone, headphone and speaker. When two or more radios are installed, a transmitter selector switch and a speaker-phone switch are provided.



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. However, the pilot should be aware of the two following radio limitations:

1. 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.
2. 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.

## **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:**

1. XMTR SEL Switch -- SELECT transceiver (on audio control panel).
2. SPEAKER/PHONE (or AUTO) Switch -- SELECT desired mode (on audio control panel).
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 the audio gain counterclockwise for normal noise output, then slowly adjust clockwise 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 may be selected by placing the AUTO selector switch in either the SPEAKER or PHONE positions.

- 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 400 NAV/COM (720-Channel - Type RT-485A)**

## **SECTION 1 GENERAL**

The Cessna 400 Nav/Com (Type RT-485A), 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 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. 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 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, 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 may be installed with either 300 or 400 Series course deviation indicators. The 400 Series Nav/Com indicators incorporate Automatic Radial Centering and Course Datum as standard features. The 300 Series course deviation indicators do not incorporate Course Datum but are offered with, or without, Automatic Radial Centering.

Both the 300 and 400 Series course deviation indicators include either a single-pointer and related NAV flag for VOR/LOC indication only, or dual

pointers and related NAV and GS flags for both VOR/LOC and glide slope indications. Both types of indicators incorporate a back-course lamp (BC) which lights when back course (reversed sense) operation is selected. Indicators with Automatic Radial Centering will, when selected, automatically indicate the bearing TO or FROM the VOR station.

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. In addition, when two or more radios are installed, aircraft mounted transmitter selector and speaker/phone switches are provided.

## **SECTION 2**

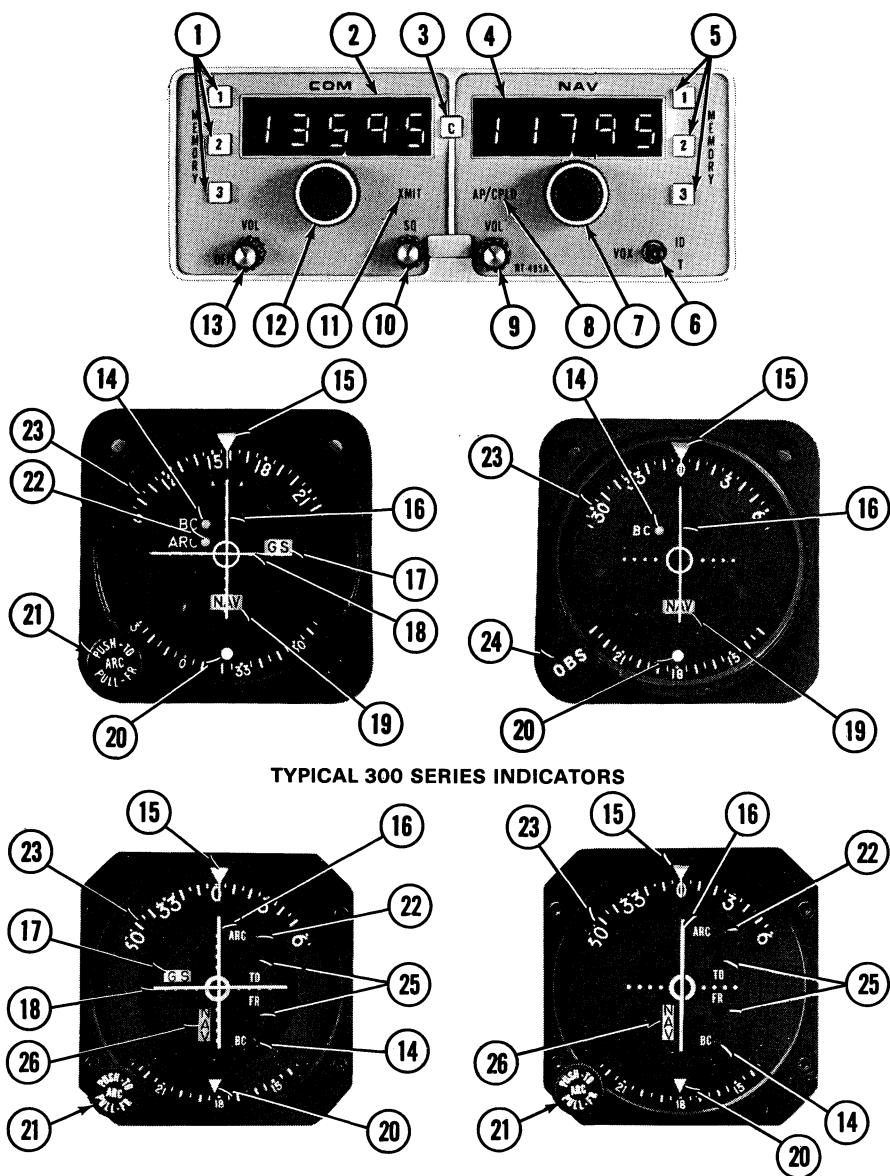
### **LIMITATIONS**

There is no change to the airplane limitations when this avionic equipment is installed. However, the pilot should be aware that on many Cessna airplanes equipped with the windshield mounted glide slope antenna, pilots should avoid use of  $2700 \pm 100$  RPM on airplanes equipped with a two-bladed propeller or  $1800 \pm 100$  RPM on airplanes equipped with a three-bladed propeller during ILS approaches to avoid oscillations of the glide slope deviation pointer caused by propeller interference.

## **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.



**Figure 1. Cessna 400 Nav/Com (Type RT-485A), Operating Controls and Indicators (Sheet 1 of 4)**

1. **COM MEMORY 1, 2 & 3 PUSHBUTTONS** - When a COM MEMORY pushbutton is pressed, the preset selected frequency will appear in the COM frequency window for use as the selected operating frequency. Each pushbutton will illuminate white when pressed and the light will go out on the previously selected pushbutton. 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 the MEMORY pushbutton. If electrical power is removed from the set's "keep-alive" circuit (such as radio removal or battery replacement) for more than 15 seconds, upon turn-on, the COM MEMORY circuits will have to be reset and COM 1 MEMORY will automatically be selected with the lowest operating frequency (118.000 MHz) selected.
2. **COMMUNICATION OPERATING FREQUENCY READOUT** - Indicates COM frequency in use. Third decimal place not shown.
3. **CYCLE BUTTON (C)** - Selects last illuminated decimal place on COM frequency in use. If last decimal place is 2 or 7, pressing C pushbutton changes number to 5 or 0, respectively. If last decimal place is 5 or 0, pressing C 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. Also provides test function by holding C pushbutton pressed for more than 1.7 seconds. This lights each COM and NAV MEMORY pushbutton in turn, and displays the corresponding preset frequency in MEMORY.
4. **NAVIGATION OPERATING FREQUENCY READOUT** - Indicates NAV frequency in use.
5. **NAV MEMORY 1, 2 & 3 PUSHBUTTONS** - When a NAV MEMORY pushbutton is pressed, the preset selected frequency will appear in the NAV frequency window for use as the selected operating frequency. Each pushbutton will illuminate white when pressed and the light will go out on the previously selected pushbutton. 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 the MEMORY pushbutton. If electrical power is removed from the set's "keep-alive" circuit (such as radio removal or battery replacement) for more than 15 seconds, upon turn-on, the NAV MEMORY circuits will have to be reset and NAV 1 MEMORY will automatically be selected with the lowest operating frequency (108.000 MHz) selected.
6. **ID-VOX-T SWITCH** - In ID position, station identifier signal is audible; in VOX (Voice) position, identifier signal is suppressed; in T (Momentary On) position, the self-test function is selected, and the AP/CPLD annunciator illuminates amber and the XMIT annunciator illuminates green.
7. **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.

Figure 1. Cessna 400 Nav/Com (Type RT-485A), Operating Controls and Indicators (Sheet 2 of 4)

8. 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, 300A, 400, 400A and 400A IFCS autopilots).
9. NAV VOLUME CONTROL (VOL) - Adjusts volume of navigation receiver audio.
10. 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.
11. TRANSMIT ANNUNCIATOR (XMIT) - Illuminates green when transmitter output is normal while mike is keyed.
12. 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 C button.
13. 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.
14. 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.
15. COURSE INDEX - Indicates selected VOR COURSE.
16. COURSE DEVIATION POINTER - Indicates course deviation from selected omni course or localizer centerline.
17. 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.
18. GLIDE SLOPE DEVIATION POINTER - Indicates deviation from ILS glide slope.
19. 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, shows TO.
20. RECIPROCAL COURSE INDEX - Indicates reciprocal of selected VOR course.
21. 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 selection. Pulled to outer detent, continuously drives OBS course card to indicate bearing from VOR station, keeping

Figure 1. Cessna 400 Nav/Com (Type RT-485A), Operating Controls and Indicators (Sheet 3 of 4)

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.

22. AUTOMATIC RADIAL CENTERING (ARC) LAMP - Amber light illuminates when Automatic Radial Centering is in use.
23. COURSE CARD - Indicates selected VOR course under course index.
24. OMNI BEARING SELECTOR (OBS) - Rotates course card to select desired course.
25. TO/FROM INDICATOR (TO/FR) - Operates only with a usable VOR or localizer signal. When white flag is in view, indicates whether selected course is TO or FROM station. With usable localizer signal, shows TO.
26. NAV INDICATOR FLAG - When in view, red NAV position (Flag) indicates the selected VOR or localizer signal is unusable.

Figure 1. Cessna 400 Nav/Com (Type RT-485A), Operating Controls and Indicators (Sheet 4 of 4)



## SECTION 4

### NORMAL PROCEDURES

#### PRESETTING NAV/COM FREQUENCIES IN MEMORY:

1. COM OFF/VOL CONTROL -- TURN ON; adjust to desired audio level.
2. MEMORY 1 Pushbutton -- PRESS desired NAV or COM pushbutton 1 momentarily to alert the memory bank of a forthcoming frequency to be stored.
3. FREQUENCY SELECTORS -- MANUALLY ROTATE corresponding NAV or COM frequency selectors (press C pushbutton as required to select the desired third fractional COM digit) until the desired frequency is shown in the operating frequency readout window. The frequency displayed will be automatically transferred into MEMORY 1.

#### NOTE

Do not press the C pushbutton more than about 2 seconds while selecting fractional frequencies or you will activate the MEMORY test function.

4. MEMORY 2 and 3 Pushbuttons -- REPEAT STEPS 2 and 3 using next desired NAV or COM MEMORY to be stored. Up to 3 NAV and 3 COM frequencies may be stored for automatic recall frequency selection.

#### NOTE

The operating frequency set in the selected MEMORY position will automatically be changed in the MEMORY bank any time the operating frequency is manually changed.

#### COMMUNICATION RECEIVER-TRANSMITTER OPERATION:

1. COM OFF/VOL Control -- TURN ON.
2. XMTR SEL Switch -- SET to desired 400 Nav/Com (on audio control panel).
3. SPEAKER/PHONE (or AUTO) Switch -- SET to desired mode (on audio control panel).
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 C pushbutton.

5. VOL Control -- ADJUST to desired audio level.
6. SQ Control -- ROTATE counterclockwise to decrease background noise as required.
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. Adjustment of sidetone may be accomplished by adjusting the sidetone pot located inside the audio control panel.

- b. XMIT Annunciator Light -- CHECK ON (green light illuminated).
- c. To Receive -- RELEASE mike button.

NAVIGATION OPERATION:

1. COM OFF/VOL Control -- TURN ON; adjust to desired audio level.
2. SPEAKER/PHONE (or AUTO) Switch -- SET to desired mode (on audio control panel).
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.
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 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 -- CHECK ON (if 400B Autopilot or 400B IFCS is engaged), amber light illuminated.

NOTE

The AP/CPLD annunciator light is only operational with a 400B Autopilot or 400B IFCS installation.

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 and AP/CPLD and XMIT annunciators light.
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.
6. ID/VOX/T Switch -- RELEASE for normal operation.

NOTE

This test does not fulfill the requirements of FAR 91.25.

MEMORY TEST OPERATION:

1. C Pushbutton -- PUSH for about 2 seconds. Each COM and NAV

**MEMORY** pushbutton (1, 2 & 3) will illuminate white, in turn, with the corresponding preset frequency displayed.

**NOTE**

If the "keep-alive" circuit has not been interrupted, the **MEMORY** test will always start with the last **COM** **MEMORY** selected and cycle through the remaining **COM** and **NAV** preset frequencies. The **MEMORY** test will always stop on the last selected **COM** and **NAV** preset frequencies.

## **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 (Type RT-485A)**

### **WITH**

### **CESSNA 400 AREA NAVIGATION SYSTEM (Type RN-478A)**

### **SECTION 1 GENERAL**

The Cessna 400 Nav/Com (Type RT-485A) Set with Cessna 400 Area Navigation (RNAV-Type RN-478A) consists of a RT-485A Nav/Com, a R-476A DME system, a RN-478A Area Navigation Computer and a Course Deviation Indicator with, or without, the optional Automatic Radial Centering (ARC) feature. The RN-478A includes circuits which combine the VOR navigation information with distance information from the R-476A DME system to provide data for area navigation. Operating information for the communication set and for VOR/localizer navigation is presented in this supplement. Operating information for area navigation and for DME is presented in separate supplements. 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 Switch, Avionics Power Switch, or Master Switch is turned OFF.

The RT-485A Receiver-Transmitter includes a 720-channel VHF communication receiver-transmitter which receives and transmits signals between 118.000 MHz and 135.975 MHz in 25-kHz steps. It also includes a 200-channel VHF navigation receiver which receives VOR and localizer signals between 108.00 MHz and 117.95 MHz in 50-kHz steps. The communication receiver-transmitter and the navigation receiver can be operated simultaneously.

The VOR or localizer signal from the navigation receiver is applied to

the converter circuits in the RN-478A Area Navigation Computer. The converter processes the received navigation signal to provide omni bearing or localizer information for display by the course indicator.

### **CAUTION**

If the RNAV set is removed from the airplane or becomes inoperative, the associated VHF navigation indicator will be inoperative.

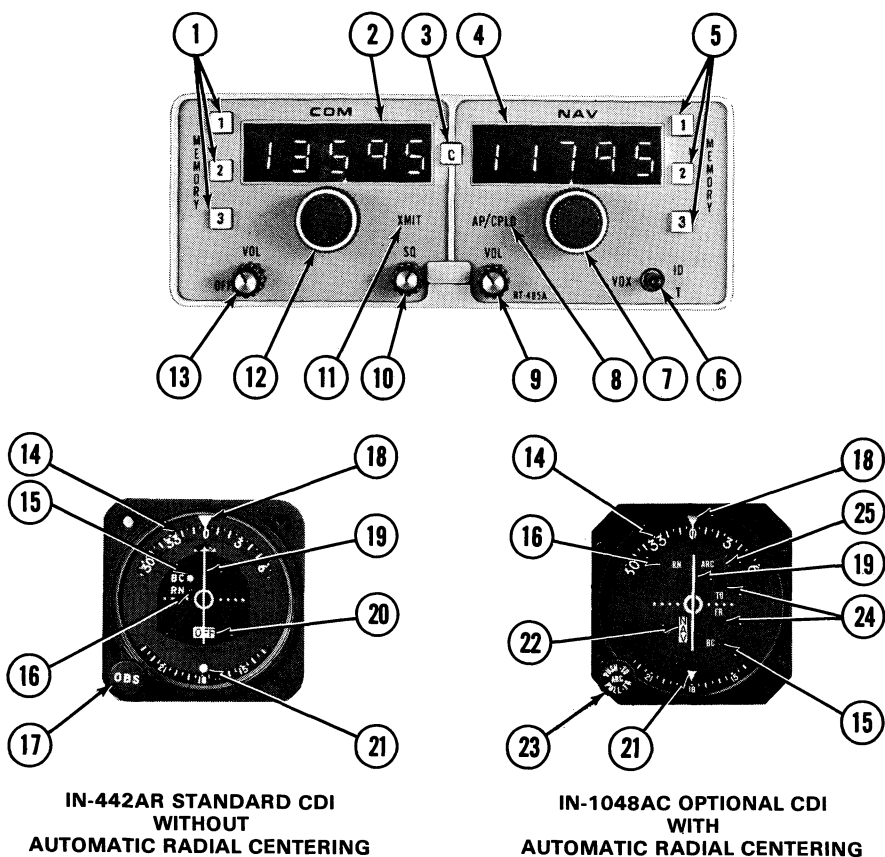
The course indicator includes a Course Deviation Indicator (CDI), an Omni Bearing Selector (OBS) or Automatic Radial Centering (ARC) knob, and OFF (or NAV)/To-From Indicator Flags. It also includes an RNAV lamp (RN) which lights when area navigation operation is selected, and a back-course lamp (BC) which lights when back-course operation is selected. The IN-442AR is offered as the standard Course Deviation Indicator and an optional IN-1048AC Course Deviation Indicator is also offered when Automatic Radial Centering (ARC) is desired. When the optional IN-1048AC Course Deviation Indicator is installed, an Automatic Radial Centering lamp (ARC) is incorporated in the CDI to alert the pilot that the Automatic Radial Centering feature has been selected.

All operating controls and indicators for the Cessna 400 Nav/Com are included on the front panel of the RT-485A Receiver-Transmitter and the associated Course Deviation Indicator. These controls and indicators are shown and described in Figure 1. Operating controls for the RN-478A Area Navigation Computer, which are used for area navigation, and operating controls for the associated Type R-476A DME are shown in the appropriate supplements in this manual.

## **SECTION 2**

### **LIMITATIONS**

There is no change to the airplane limitations when this avionic equipment is installed. However, the pilot should be aware that on many Cessna airplanes equipped with the windshield mounted glide slope antenna, pilots should avoid use of  $2700 \pm 100$  RPM on airplanes equipped with a two-bladed propeller or  $1800 \pm 100$  RPM on airplanes equipped with a three-bladed propeller during ILS approaches to avoid oscillations of the glide slope deviation pointer caused by propeller interference.



1. **COMM MEMORY 1, 2 & 3 PUSHBUTTONS** - When a COM MEMORY pushbutton is pressed, the preset selected frequency will appear in the COM frequency window for use as the selected operating frequency. Each pushbutton will illuminate white when pressed and the light will go out on the previously selected pushbutton. 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 the MEMORY pushbutton. If electrical power is removed from the set's "keep-alive" circuit (such as radio removal or battery replacement) for more than 15 seconds, upon turn-on, the COM MEMORY circuits will have to be reset and COM 1 MEMORY will automatically be selected with the lowest operating frequency (118.000 MHz) selected.

Figure 1. Cessna 400 Nav/Com Set, Operating Controls and Indicators  
(Sheet 1 of 4)

2. **COMMUNICATION OPERATING FREQUENCY READOUT** - Indicates COM frequency in use. Third decimal place not shown.
3. **CYCLE BUTTON (C)** - Selects last illuminated decimal place on COM frequency in use. If last decimal place is 2 or 7, pressing C pushbutton changes number to 5 or 0, respectively. If last decimal place is 5 or 0, pressing C 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. Also provides test function by holding C pushbutton pressed for more than 1.7 seconds. This lights each COM and NAV MEMORY pushbutton in turn, and displays the corresponding preset frequency in MEMORY.
4. **NAVIGATION OPERATING FREQUENCY READOUT** - Indicates NAV frequency in use.
5. **NAV MEMORY 1, 2 & 3 PUSHBUTTONS** - When a NAV MEMORY pushbutton is pressed, the preset selected frequency will appear in the NAV frequency window for use as the selected operating frequency. Each pushbutton will illuminate white when pressed and the light will go out on the previously selected pushbutton. 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 the MEMORY pushbutton. If electrical power is removed from the set's "keep-alive" circuit (such as radio removal or battery replacement) for more than 15 seconds, upon turn-on, the NAV MEMORY circuits will have to be reset and NAV 1 MEMORY will automatically be selected with the lowest operating frequency (108.000 MHz) selected.
6. **ID-VOX-T SWITCH** - In ID position, station identifier signal is audible; in VOX (Voice) position, identifier signal is suppressed; in T (Momentary On) position, the self-test function is selected, and the AP/CPLD annunciator illuminates amber and the XMIT annunciator illuminates green.
7. **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.
8. **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, 300A, 400A and 400A IFCS autopilots).
9. **NAV VOLUME CONTROL (VOL)** - Adjusts volume of navigation receiver audio.
10. **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
11. **TRANSMIT ANNUNCIATOR (XMIT)** - Illuminates green when transmitter output is normal while mike is keyed.

**Figure 1. Cessna 400 Nav/Com Set, Operating Controls and Indicators  
(Sheet 2 of 4)**



12. **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 setting of C button.
13. **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.
14. **COURSE CARD** - Indicates selected VOR course under course index.
15. **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.
16. **AREA NAV LAMP (RN)** - When green light is illuminated, indicates that RNAV operation is selected.
17. **OMNI BEARING SELECTOR (OBS)** - Rotates course card (12) to select desired bearing to or from a VOR station or to a selected RNAV waypoint.
18. **COURSE INDEX** - Indicates selected VOR or RNAV course (bearing).
19. **COURSE DEVIATION POINTER** - Indicates course deviation from selected VOR or RNAV course or localizer centerline.
20. **OFF/TO-FROM INDICATOR** - Operates only with VOR or localizer signal. OFF position (flag) indicates unusable signal. With usable VOR signal, when OFF position disappears, indicates whether selected course is TO or FROM station or waypoint. With usable localizer signal, shows TO.
21. **RECIPROCAL COURSE INDEX** - Indicates reciprocal of selected VOR or RNAV course.
22. **NAV INDICATOR FLAG** - When in view, red NAV position (Flag) indicates the selected VOR or localizer signal is unusable.
23. **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 (14) to center course deviation pointer (19) with a TO flag (20 or 24), then returns to conventional OBS selection. Pulled to outer detent, continuously drives OBS course card (14) to indicate bearing from VOR station, keeping course deviation pointer (19) centered, with a FROM flag (20 or 24). 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.

**Figure 1. Cessna 400 Nav/Com Set, Operating Controls and Indicators  
(Sheet 3 of 4)**

24. **INDICATOR (TO/FR)** - Operates only with a usable VOR or localizer signal. When white flag is in view, indicates whether selected course is TO or FROM station. With usable localizer signal, shows TO.
25. **AUTOMATIC RADIAL CENTERING (ARC) LAMP** - Amber light illuminates when Automatic Radial Centering is in use.

**Figure 1. Cessna 400 Nav/Com Set, 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

#### PRESETTING NAV/COM FREQUENCIES IN MEMORY:

1. COM OFF/VOL CONTROL -- TURN ON; adjust to desired audio level.
2. MEMORY 1 Pushbutton -- PRESS desired NAV or COM pushbutton 1 momentarily to alert the memory bank of a forthcoming frequency to be stored.
3. FREQUENCY SELECTORS -- MANUALLY ROTATE corresponding NAV or COM frequency selectors (press C pushbutton as required to select the desired third fractional COM digit) until the desired frequency is shown in the operating frequency readout window. The frequency displayed will be automatically transferred into MEMORY 1.

#### NOTE

Do not press the C pushbutton more than about 2 seconds while selecting fractional frequencies or you will activate the MEMORY test function.

4. MEMORY 2 and 3 Pushbutton -- REPEAT STEPS 2 and 3 using next desired NAV or COM MEMORY to be stored. Up to 3 NAV and 3 COM frequencies may be stored for automatic recall frequency selection.

#### NOTE

The operating frequency set in the selected MEMORY position will automatically be changed in the memory bank anytime the operating frequency is manually changed.

## COMMUNICATION RECEIVER-TRANSMITTER OPERATION:

1. COM OFF/VOL Control -- TURN ON.
2. XMTR SEL Switch -- SET to desired 400 Nav/Com (on audio control panel).
3. SPEAKER/PHONE (or AUTO) Switch -- SET to desired mode (on audio control panel).
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 C pushbutton.
5. VOL Control -- ADJUST to desired audio level.
6. SQ Control -- ROTATE counterclockwise to decrease background noise as required.
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. Adjustment of sidetone may be accomplished by adjusting the sidetone pot located inside the audio control panel.

- b. XMIT Annunciator Light -- CHECK ON (green light illuminated).
- c. To Receive -- RELEASE mike button.

## NAVIGATION OPERATION:

1. COM OFF/VOL Control -- TURN ON; adjust to desired audio level.
2. SPEAKER/PHONE (or AUTO) Switch -- SET to desired mode (on audio control panel).
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.
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 knob to inner (Momentary On) position.

NOTE

ARC lamp will illuminate amber while the 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 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 -- CHECK ON (if 400B or 400B IFCS autopilot is engaged), amber light illuminated.

NOTE

The AP/CPLD annunciator light is only operational with a 400B or 400B IFCS autopilot installation.

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 and AP/CPLD and XMIT annunciators light.
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.

6. ID/VOX/T Switch -- RELEASE for normal operation.

**NOTE**

This test does not fulfill the requirements of FAR 91.25.

**MEMORY TEST OPERATION:**

1. C Pushbutton -- PUSH for about 2 seconds. Each COM and NAV MEMORY pushbutton (1, 2 & 3) will illuminate white, in turn, with the corresponding preset frequency displayed.

**NOTE**

If the "keep-alive" circuit has not been interrupted, the MEMORY test will always start with the last COM MEMORY selected and cycle through the remaining COM and NAV preset frequencies. The MEMORY test will always stop on the last selected COM and NAV preset frequencies.

## **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 AREA NAVIGATION SYSTEM**

**(Type RN-478A)**

### **SECTION 1**

#### **GENERAL**

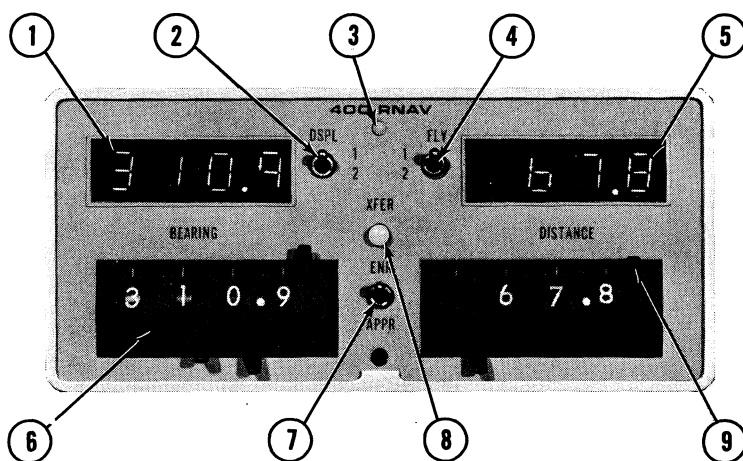
The Cessna 400 Area Navigation System (Type RN-478A) consists of an RN-478A Area NAV Computer (RNAV), a compatible VHF navigation receiver and course deviation indicator, and the Type R-476A distance measuring equipment (DME). The RNAV includes converter circuits which operate with the VHF navigation receiver and produce positional information for display by the course deviation indicator. It also includes computer circuits which combine the bearing information from the navigation set with the distance information from the R-476A DME to establish navigation data for selected waypoints. During RNAV operation, a course scalloping suppressor circuit suppresses the spurious navigation signal phases to provide stable waypoint information which enhances autopilot operation. The 400 RNAV is coupled to the number 2 Nav/Com and includes storage for 3 waypoints.

Ground speed/time-to-station information to the selected VOR (not the waypoint) is available on this system. This capability, along with the course scalloping suppression (radial straightening), may be used to an advantage while tracking inbound or outbound from the VOR station by programming a waypoint directly over the associated VOR (000.0°/000.0 nautical miles) and using RNAV for course smoothing while enroute.

#### **CAUTION**

If RNAV set is removed from the airplane or becomes inoperative, the associated VHF navigation indicator will be inoperative.

All operating controls and displays which are part of the RN-478A are shown and described in Figure 1. Other controls required for operation of the Cessna 400 Area Navigation System are included on the VHF navigation receiver and on the R-476A DME control; these controls are shown and described in the respective supplements included for this equipment.



1. BEARING DISPLAY READOUT - Depending on position of DSPL Switch, displays bearing programmed for waypoint 1 or waypoint 2.
2. DISPLAY 1-2 SWITCH (DSPL) - Determines information shown on DISTANCE and BEARING displays: In position 1, distance and bearing programmed for waypoint 1 are displayed; in position 2, distance and bearing programmed for waypoint 2 are displayed.
3. FLY/DISPLAY LAMP - Flashes amber when FLY Switch and DSPL Switch are not set to same number; indicates that waypoint information being displayed is not waypoint information being flown.
4. FLY SWITCH - Determines waypoint being used for navigation. In position 1, waypoint 1 is in use; in position 2, waypoint 2 is in use.
5. DISTANCE DISPLAY READOUT - Depending on position of DSPL Switch, displays distance programmed for waypoint 1 or waypoint 2.
6. BEARING MINILEVER SWITCHES (4) - Select bearing of desired waypoint from VOR/DME station. May be used to store bearing of 3rd waypoint.
7. ENROUTE/APPROACH SWITCH (ENR/APPR) - Controls width of navigation corridor. ENR position provides standard ( $\pm 5$  NM) enroute sensitivity; APPR position provides standard ( $\pm 1\text{-}1/4$  NM) approach course sensitivity.

#### NOTE

Due to unreliable signals, do not operate in the APPR position when computed distance to waypoint exceeds 51 nautical miles.

8. TRANSFER PUSHBUTTON SWITCH (XFER) - Transfers waypoint distance and bearing from minilevers into either waypoint 1 or 2 as selected by DSPL switch position.
9. DISTANCE MINILEVER SWITCHES (4) - Select distance of desired waypoint from VOR/DME station. May be used to store distance of 3rd waypoint.

Figure 1. Cessna 400 Area Nav (Type RN-478A) Computer, Operating Controls and Indicators



## **SECTION 2**

### **LIMITATIONS**

There is no change to the airplane limitations when this avionic equipment is installed. However, the following RNAV IFR approach limitation should be adhered to during airplane operation.

#### **OPERATING LIMITATION:**

1. IFR Approaches -- Follow approved published RNAV instrument procedures.

## **SECTION 3**

### **EMERGENCY PROCEDURES**

There is no change to the airplane emergency procedures when this avionic equipment is installed.

## **SECTION 4**

### **NORMAL PROCEDURES**

#### **VOR/LOC OPERATION**

#### **VOR NAVIGATION CIRCUITS VERIFICATION TESTS:**

1. See appropriate Nav/Com supplement.

#### **VOR/LOC NAVIGATION:**

As a convenience to the pilot, a separate supplement (Avionic Operation Guide) is supplied to explain the various procedures for using the VHF Navigation Set for VOR and localizer navigation. Refer to the Avionic Operations Guide for flight procedures.

#### **AREA NAVIGATION OPERATION**

#### **NOTE**

Proper RNAV operation requires valid VOR and DME inputs to the RNAV system. In certain areas, the ground station antenna patterns and transmitter power may be inadequate to provide valid signals to the RNAV. For this

reason, intermittent RNAV signal loss may be experienced enroute. Prolonged loss of RNAV signal shall require the pilot to revert to other navigational procedures.

#### WAYPOINT PROGRAMMING:

1. Using a VFR sectional, enroute instrument chart, instrument approach plate, or enroute RNAV chart -- DETERMINE distance and bearing for desired waypoint(s) from appropriate VOR/DME stations.
2. VHF Navigation Receiver -- ON.
3. DME TEST/ON-OFF Switch -- ON.
4. DME Mode Selector Switch -- RNAV.
5. RNAV DSPL Switch -- 1.

#### NOTE

When DSPL and FLY switches are not set to the same waypoint number, the display/fly light slowly blinks on and off as a reminder to the pilot that values displayed are not those being used for navigation. This does not affect operation of the unit.

6. BEARING Minilever Switches -- SET to first waypoint bearing.
7. DISTANCE Minilever Switches -- SET to first waypoint distance.
8. XFER Pushbutton Switch -- PUSH in.
  - a. First waypoint bearing and distance are placed in memory as waypoint 1.
  - b. BEARING Display Readout -- DISPLAYS readout of first waypoint bearing.
  - c. DISTANCE Display Readout -- DISPLAYS readout of first waypoint distance.
9. RNAV DSPL Switch -- SET to 2.
10. BEARING Minilever Switches -- SET to second waypoint bearing.
11. DISTANCE Minilever Switches -- SET to second waypoint distance.
12. XFER Pushbutton Switch -- PUSH in.
  - a. Second Waypoint Readout -- BEARING and DISTANCE are placed in memory as waypoint 2.
  - b. BEARING Display Readout -- DISPLAYS readout of second waypoint bearing.
  - c. DISTANCE Display Readout -- DISPLAYS readout of second waypoint distance.
13. BEARING Minilever Switches -- SET to standby waypoint bearing.

14. **DISTANCE Minilever Switches -- SET to standby waypoint distance.**

**NOTE**

As first waypoint is reached, it can be replaced with the third "standby" waypoint (already set) before placing the RNAV "DSPL" switch to 2. Then a fourth waypoint, if necessary, can be set with the minilever selectors.

**DISPLAY RELIABILITY TESTS:**

**NOTE**

This test must be conducted following the "Waypoint Programming" procedures with the VHF Navigation Receiver and DME TEST/ON-OFF switches still in the ON position.

1. VHF Navigation Receiver Frequency Selector Switches -- SET to VOR frequency.
2. RNAV DSPL and FLY Switches -- DSPL set to 1, FLY set to 2.
  - a. Readout -- DISPLAYS first waypoint bearing and distance that was selected in Waypoint Programming.
  - b. Fly/Display Lamp (On RNAV Control Head) -- FLASHES.
3. RNAV DSPL and FLY Switches -- DSPL set to 2, FLY set to 1.
  - a. Readout -- DISPLAYS second waypoint bearing and distance.
  - b. Fly/Display Lamp (On RNAV Control Head) -- FLASHES.
4. RNAV DSPL and FLY Switches -- BOTH SET to same number.
  - a. Readout -- DISPLAYS waypoint bearing and distance as selected by DSPL switch.
  - b. Fly/Display Lamp (On RNAV Control Head) -- NOT LIGHTED.
5. DME Mode Selector Switch -- SET to RNAV.
  - a. Both RN and NM Annunciators on DME -- LIGHTED.
  - b. RN Lamp on Course Deviation Indicator -- LIGHTS.
6. VHF Navigation Receiver Frequency Selector Switches -- SET to LOC frequency.
  - a. Both RN and NM Annunciators -- LIGHTED.
  - b. RN Lamp on Course Deviation Indicator -- LIGHTED.
  - c. Course Deviation Indicator OFF(or NAV)/TO-FROM Indicator -- OFF (or NAV) flag in view.
7. DME Mode Selector Switch -- SET to NAV 1, NAV 2, or HOLD.
  - a. NM Annunciator on DME -- LIGHTED.
  - b. RN Annunciator on DME -- NOT LIGHTED.
  - c. RN Lamp on Course Deviation Indicator -- NOT LIGHTED.
  - d. Course Indicator OFF(or NAV)/TO-FROM Indicator -- Shows TO if a usable signal is received.

8. DME Mode Selector Switch -- RNAV.
9. DME TEST/ON-OFF Switch -- HOLD to TEST.
  - a. DME RN/NM Distance Display -- READOUT is 888.8.
  - b. DME KTS/MIN Ground Speed/Time-to-Station Display -- READOUT is 888.
  - c. RNAV BEARING Display -- READOUT is 888.8.
  - d. RNAV DISTANCE Display -- READOUT is 188.8.

#### AREA NAVIGATION CIRCUITS SELF-TEST:

1. VHF Navigation Receiver -- ON.
2. VHF Navigation Receiver Frequency Selector Switches -- SET to a usable VOR/DME frequency.
3. DME TEST/ON-OFF Switch -- ON.
4. DME Mode Selector Switch -- RNAV.
  - a. RN Lamp on Course Deviation Indicator -- LIGHTED.
5. RNAV Computer -- PROGRAMMED to waypoint.
6. DSPL and FLY Switches -- SET both to waypoint to be tested.
  - a. BEARING Display -- READOUT is waypoint bearing.
  - b. DISTANCE Display -- READOUT is waypoint distance.
  - c. Course Indicator -- RN LAMP lights.
7. Course Indicator OBS (or ARC) -- SET to waypoint bearing.
8. VHF Navigation Receiver ID/VOX/T Switch -- HOLD in T position.
  - a. Course Deviation Pointer -- CENTERS.
  - b. Course Deviation Indicator OFF(or NAV)/TO-FROM Flag -- Shows TO.
  - c. DME Distance Display -- READOUT is the same as the RNAV DISTANCE readout.

#### NOTE

After releasing the navigation receiver test (T) switch, the return to accurate computed bearing and distance data can take up to 60 seconds depending upon airplane position and waypoint.

## SECTION 5

### PERFORMANCE

There is no change to the airplane performance when this avionics 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.

The basic units of the Cessna 400 ADF are an R-446A Receiver with dual frequency selectors, a goniometer-indicator (IN-346A), and sense and loop antennas. The receiver and goniometer-indicator are panel-mounted units. The sense and loop antennas are mounted on the external airplane surfaces. Operating controls for the Cessna 400 ADF are mounted on the receiver front panel. 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.

The frequency range of the Cessna 400 ADF is electronically divided into three bands: 200-399 kHz, 400-799 kHz, and 800-1699 kHz. Frequency spacing within each band is in 1-kHz increments. The operating frequency and band are 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. Operating controls for the Cessna 400 ADF are shown and described in Figure 1.

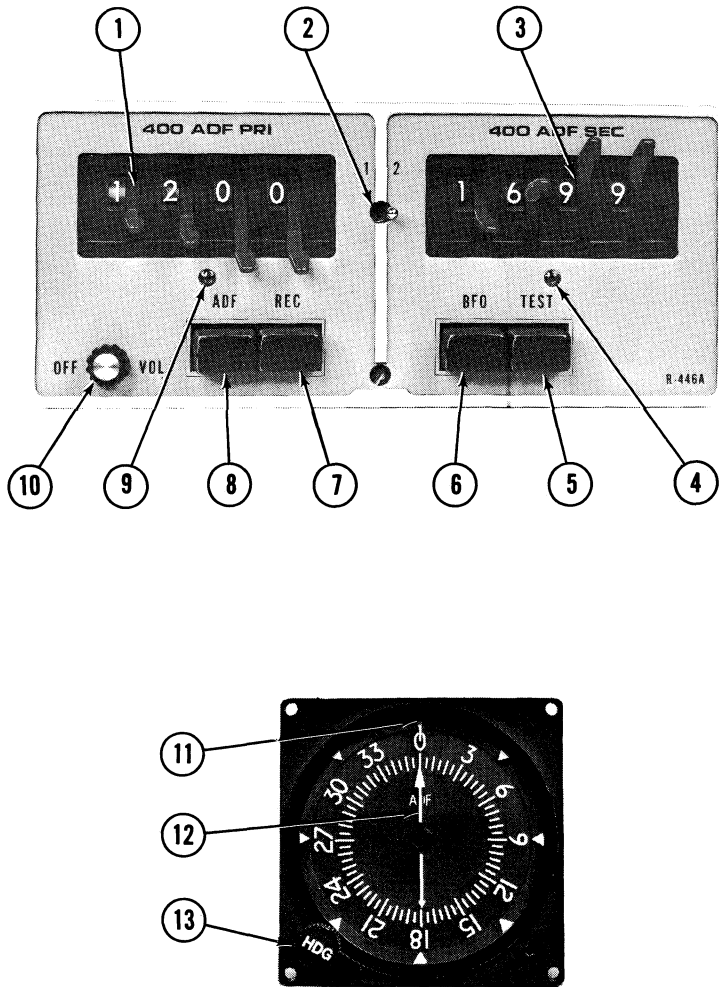


Figure 1. Cessna 400 ADF Operating Controls and Indicator  
(Sheet 1 of 2)

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 reliable, 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 (set operates as a standard communications receiver using sense antenna only).

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 dial rotation 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. REC Pushbutton -- PUSH in.

#### **NOTE**

ADF indicator pointer will stow at a 90-degree position to alert the pilot to non-ADF operation.

3. PRI Frequency Selectors -- SELECT desired operating frequency.
4. SEC Frequency Selectors -- SELECT desired operating frequency.
5. 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.

6. ADF SPEAKER/PHONE Switch -- SELECT speaker or phone position.
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 Switch -- SELECT speaker or phone position as desired.
6. ADF Pushbutton -- PUSH in and note relative bearing on ADF indicator.
7. HDG Control -- SET goniometer-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 to desired listening level.

**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 unit 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 Switch -- SELECT speaker or phone position.
3. BFO Pushbutton -- PUSH in.
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.

**NOTE**

A 1000-Hz tone is heard in the audio output when CW signal (Morse Code) is tuned in properly.

## **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 DME**

### **(TYPE R-476A)**

#### **SECTION 1**

#### **GENERAL**

The Cessna 400 DME (Type R-476A) is the airborne "interrogator" portion of a navigation system which supplies continuous, accurate, slant range distance information from a fixed ground station to an aircraft in flight.

Except for selection of the operating channel, which is selected by the VHF navigation receiver frequency selector switches, the Cessna 400 DME is capable of independent operation. The equipment consists of a panel-mounted C-476A Control Unit which contains all of the operating controls and displays, and a remotely mounted RTA-476A Receiver-Transmitter. The RTA-476A transmits interrogating pulse pairs on 200 channels between 1041 MHz and 1150 MHz; it receives associated ground-to-air replies between 978 MHz and 1213 MHz. The C-476A Control Unit digitally displays distances up to 200 nautical miles and either ground speed or time-to-station information, as selected. All operating controls and displays for the DME are shown in Figure 1, and the functions of each are described.

#### **SECTION 2**

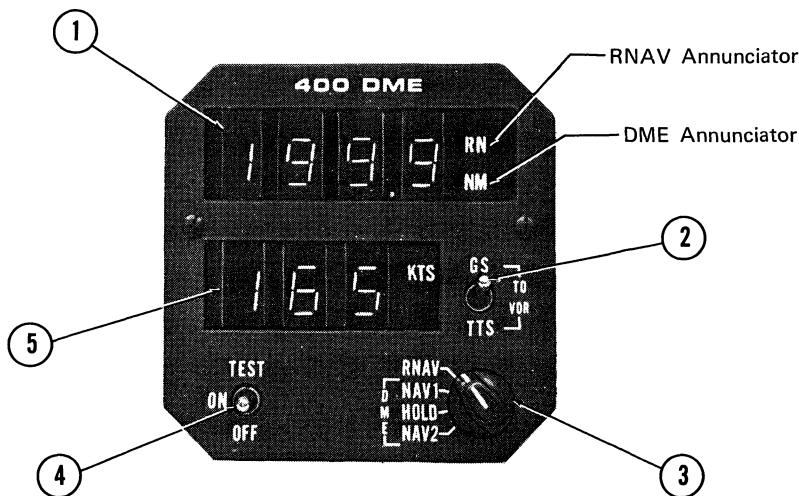
#### **LIMITATIONS**

There is no change to the airplane emergency procedures 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.



1. **DISTANCE DISPLAY** - In NAV 1, NAV 2, or HOLD mode, displays distance to selected VOR/DME station in nautical miles; only NM (Nautical Miles) annunciator lights. In RNAV mode, displays distance to selected waypoint in nautical miles; both RN (RNAV) and NM annunciators light.
2. **GS/TTS SELECTOR SWITCH** - In NAV 1, NAV 2, or HOLD mode, selects display of ground speed (GS) or time-to-station (TTS). In RNAV mode, display shows ground speed component to or from the VOR (not to waypoint) or the time to the VOR station at that indicated ground speed.
3. **DME MODE SELECTOR SWITCH** - Selects DME operating mode as follows:
  - RNAV:** Selects area navigation operation; selects display of nautical miles (distance) to selected RNAV waypoint.
  - NAV 1:** Selects DME operation with No. 1 VHF navigation set; enables channel selection by NAV 1 frequency selector switches.
  - HOLD:** Selects DME memory circuit; DME remains channeled to station to which it was channeled when HOLD was selected; display of distance continues to be nautical miles to that station. Both the NAV 1 and the NAV 2 sets may be set to new operation frequencies.

### **CAUTION**

In the HOLD mode, there is no annunciation of the VOR/DME station frequency.

NAV 2: Selects DME operation with No. 2 VHF navigation set; enables channel selection by NAV 2 frequency selector switches.

Figure 1. Cessna 400 DME (Type R-476A) (Sheet 1 of 2)

4. **TEST/ON-OFF SWITCH** - Controls application of power to DME circuits (turns equipment on or off); selects display lamp test for DME and RNAV displays.
5. **GROUND SPEED/TIME DISPLAY** - Displays ground speed in knots or time-to-station in minutes, as follows:
  - a. With GS/TTS Switch set to GS, displays ground speed component to or from station in knots (aircraft must be flying directly to or from the VOR/DME station for true ground speed indication).
  - b. With GS/TTS Switch set to TTS, displays time to VOR/DME station in minutes at the ground speed component indicated.
  - c. With GS/TTS in RNAV mode will display ground speed component or time-to-station at that speed to the selected VOR (not the waypoint).

Figure 1. Cessna 400 DME (Type R-476A) (Sheet 2 of 2)

## **SECTION 4**

### **NORMAL PROCEDURES**

#### **DME OPERATION:**

1. TEST/ON-OFF Switch -- SET to ON.
2. DME Mode Selector Switch -- SET to NAV 1 or NAV 2.
3. NAV 1 and NAV 2 VHF Navigation Receivers -- ON; SET FREQUENCY selector switches to VOR/DME station frequencies, as required.

#### **NOTE**

When the VOR frequency is selected, the appropriate DME frequency is automatically channeled. Therefore, the system does not provide independent operation of the DME for reception of the DME Morse Code identifier.

4. GS/TTS Switch -- SET as desired.
5. TEST/ON-OFF Switch -- HOLD to TEST:
  - a. Distance-to-Station Display readout is 188.8.
  - b. Knots/Minutes Display readout is 888.
6. TEST/ON-OFF Switch -- RELEASE to ON; display readouts return to normal.

## **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 MARKER BEACON (Type R-402A)

## SECTION 1 GENERAL

The system consists of a 75 MHz marker beacon receiver, three indicator lights, a speaker/phone selector switch, a light dimming control, an ON/OFF/VOLUME control, and a 75 MHz marker beacon antenna. In addition, a HI-LO-TEST switch is provided on all airplanes except the 152 series airplanes for sensitivity selection and test selection. On 152 series airplanes, a HI-LO sensitivity selector switch is provided with a separate press-to-test button.

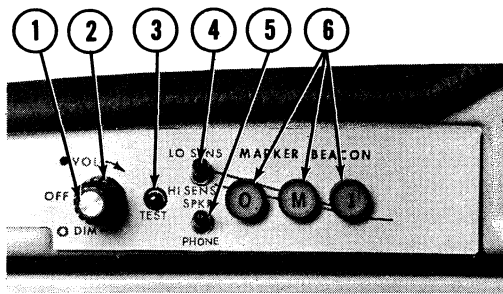
This system provides visual and aural indications of 75 MHz ILS marker beacon signals as the marker is passed. The following table lists the three most currently used marker facilities and their characteristics.

## MARKER FACILITIES

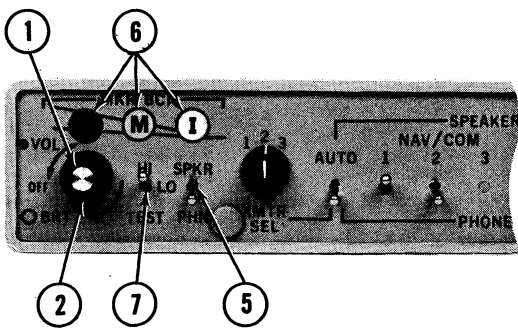
| MARKER | IDENTIFYING TONE                    | LIGHT* |
|--------|-------------------------------------|--------|
| Inner  | Continuous 6 dots/sec (300 Hz)      | White  |
| Middle | Alternate dots and dashes (1300 Hz) | Amber  |
| Outer  | 2 dashes/sec (400 Hz)               | Blue   |

\* When the identifying tone is keyed, the respective indicating light will blink accordingly.

Operating controls and indicator lights are shown and described in Figure 1.



TYPICAL INSTALLATION  
ON ALL 152 MODEL SERIES



TYPICAL INSTALLATION  
ON ALL MODELS EXCEPT  
152 MODEL SERIES

Figure 1. Cessna 400 Marker Beacon Operating Controls and Indicator Lights (Sheet 1 of 2)



# CESSNA 400 MARKER BEACON (TYPE R-402A)

1. **OFF/VOLUME CONTROL** - The small, inner control turns the set on or off and adjusts the audio listening level. Clockwise rotation turns the set on and increases the audio level.
2. **DIM/BRT CONTROL** - The large, outer control provides light dimming for the marker lights. Clockwise rotation increases light intensity.
3. **TEST SWITCH** - (152 Model Series Only) When the press-to-test switch button is depressed, the marker beacon lights will illuminate, indicating the lights are operational (the test position is a lamp test function only).
4. **LO/HI SENS SWITCH** - (152 Model Series Only) In the LO position (Up), receiver sensitivity is positioned for ILS approaches. In the HI position (Down), receiver sensitivity is positioned for airway flying.
5. **SPEAKER/PHONE SWITCH** - Selects speaker or phone for aural reception.
6. **MARKER BEACON INDICATOR LIGHTS** - Indicates passage of outer, middle and inner marker beacons. The OUTER light is blue, the MIDDLE light is amber and the INNER light is white.
7. **HI/LO/TEST SWITCH** - (All Models Except 152 Model Series) In the HI position (Up), receiver sensitivity is positioned for airway flying. In the LO position (Center), receiver sensitivity is positioned for ILS approaches. In the TEST position (Down), the marker lights will illuminate, indicating the lights are operational (the test position is a lamp test function only).

**Figure 1. Cessna 400 Marker Beacon Operating Controls and Indicator  
Lights (Sheet 2 of 2)**

## SECTION 2

## LIMITATIONS

There is no change to the airplane limitations when this avionics 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:**

1. OFF/VOL Control -- VOL position and adjust to desired listening level.
2. LO/HI SENS Switch -- SELECT HI position for airway flying or LO position for ILS approaches.
3. SPKR/PHONE Switch -- SELECT speaker or phone audio.
4. TEST Switch -- PRESS and ensure that marker beacon indicator lights are operative.
5. BRT Control -- SELECT BRT (full clockwise). ADJUST as desired when illuminated over marker beacon.

## 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 TRANSPONDER** **(Type RT-459A)** **AND** **OPTIONAL ENCODING ALTIMETER** **(Type EA-401A)**

### **SECTION 1**

#### **GENERAL**

The Cessna 400 Transponder (Type 459A), 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 radar scope more readily.

The 400 Transponder consists of a panel-mounted unit and an externally-mounted antenna. The transponder receives interrogating pulse signals on 1030 MHz and transmits coded pulse-train reply signals on 1090 MHz. It is capable of replying to Mode A (aircraft identification) and Mode C (altitude reporting) interrogations on a selective reply basis on any of 4,096 information code selections. When an optional panel mounted EA-401A Encoding Altimeter (not part of 400 Transponder System) is included in the avionic configuration, the transponder can provide altitude reporting in 100-foot increments between -1000 and +35,000 feet.

All Cessna 400 Transponder operating controls, with the exception of the optional altitude encoder's altimeter setting knob, are located on the front panel of the unit. The altimeter setting knob is located on the encoding altimeter. Functions of the operating controls are described in Figure 1.

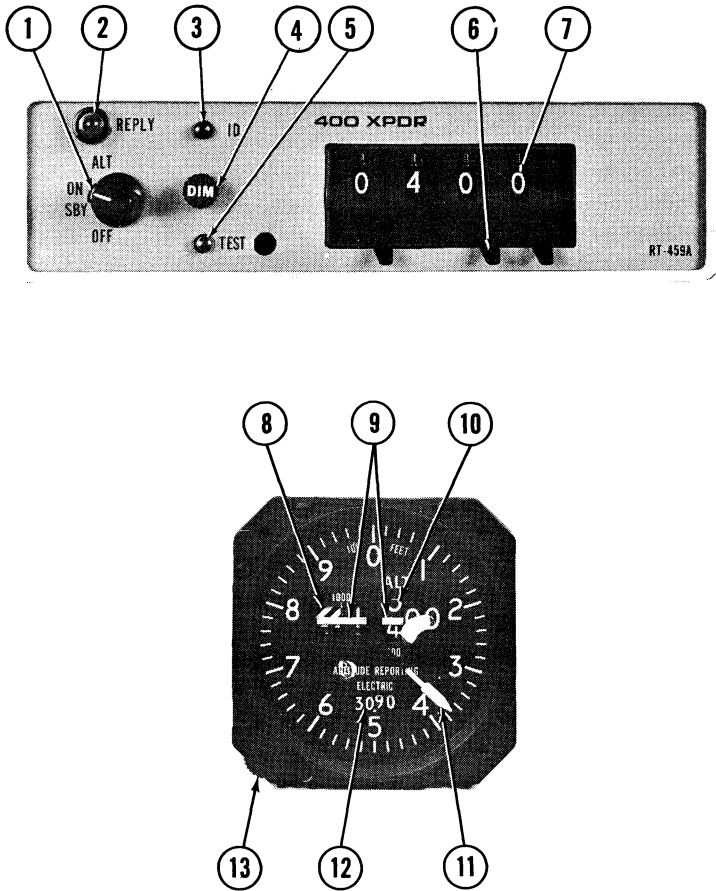


Figure 1. Cessna 400 Transponder and Encoding Altimeter  
Operating Controls (Sheet 1 of 2)

1. FUNCTION 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.
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 SWITCHES (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 altimeter to indicate that readout is not reliable.
10. 100-FOOT DRUM TYPE INDICATOR - Provides digital altitude readout in 100-foot increments between 0 feet 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 28.1 to 30.99 inches of mercury on the standard altimeter or 946 to 1049 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 standard altimeter or 950 to 1050 millibars on the optional altimeter.

Figure 1. Cessna 400 Transponder and Encoding Altimeter  
Operating Controls (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**

TO TRANSMIT AN EMERGENCY SIGNAL:

- (1) Function Switch -- ON.
- (2) Reply-Code Selector Switches -- SELECT 7700 operating code.
- (3) ID Switch -- DEPRESS then RELEASE to effect immediate identification of aircraft on ground controller's display.

TO TRANSMIT A SIGNAL REPRESENTING LOSS OF ALL COMMUNICATIONS (WHEN IN A CONTROLLED ENVIRONMENT):

- (1) Function Switch -- ON.
- (2) Reply-Code Selector Switches -- 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.
- (3) ID Switch -- DEPRESS then RELEASE at intervals to effect immediate identification of aircraft on ground controller's display.

## **SECTION 4**

### **NORMAL PROCEDURES**

BEFORE TAKEOFF:

- (1) Function Switch -- SBY.

TO TRANSMIT MODE A (AIRCRAFT IDENTIFICATION) CODES IN FLIGHT:

- (1) Reply-Code Selector Switches -- SELECT assigned code.

- (2) Function Switch -- ON.
- (3) DIM Control -- ADJUST light brilliance of reply lamp.

NOTE

During normal operation with function switch in ON position, REPLY lamp flashes indicating transponder replies to interrogations.

- (4) ID 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 Switches -- SELECT assigned code.
- (4) Function Switch -- ALT.

NOTE

When directed by ground controller to "stop altitude squawk", turn Function 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 Switch -- SBY and wait 30 seconds for equipment to warm-up.

- (2) Function 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 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.

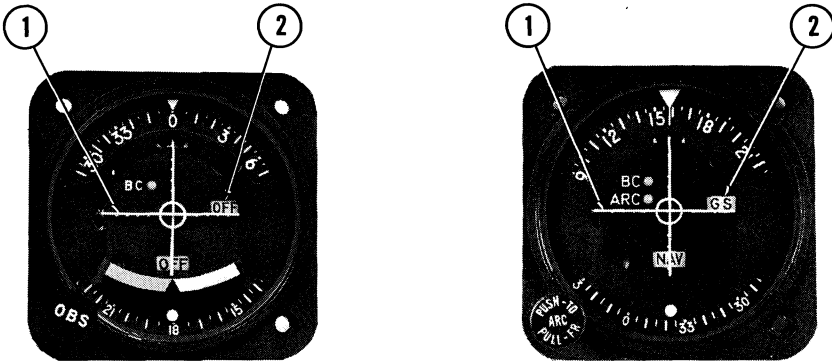
Operation of the Cessna 400 Glide Slope system is controlled by the associated navigation system. The functions and indications of typical 300 series glide slope indicators are pictured and described in Figure 1. The 300 series glide slope indicators shown in Figure 1 depict typical indications for all Cessna-crafted glide slope indicators. However, refer to the 400 Nav/Com or HSI write-ups if they are listed in this section as options for additional glide slope indicators.

#### **SECTION 2**

#### **LIMITATIONS**

There is no change to the airplane limitations when this avionic equipment is installed. However, the pilot should be aware that on many Cessna airplanes equipped with the windshield mounted glide slope antenna, pilots should avoid use of  $2700 \pm 100$  RPM on airplanes equipped with a two-bladed propeller or  $1800 \pm 100$  RPM on airplanes equipped with a three-bladed propeller during ILS approaches to avoid oscillations of the glide slope deviation pointer caused by propeller interference.

TYPICAL 300 SERIES GLIDE SLOPE INDICATORS



1. GLIDE SLOPE DEVIATION POINTER - Indicates deviation from normal glide slope.
2. GLIDE SLOPE "OFF" OR "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 "OFF" or "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 Series VOR/LOC/ILS Indicator

## **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:

- (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 "OFF" or "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**

## **OPTIONAL UNSLAVED HORIZONTAL SITUATION INDICATOR (HSI) (TYPE IG-832C)**

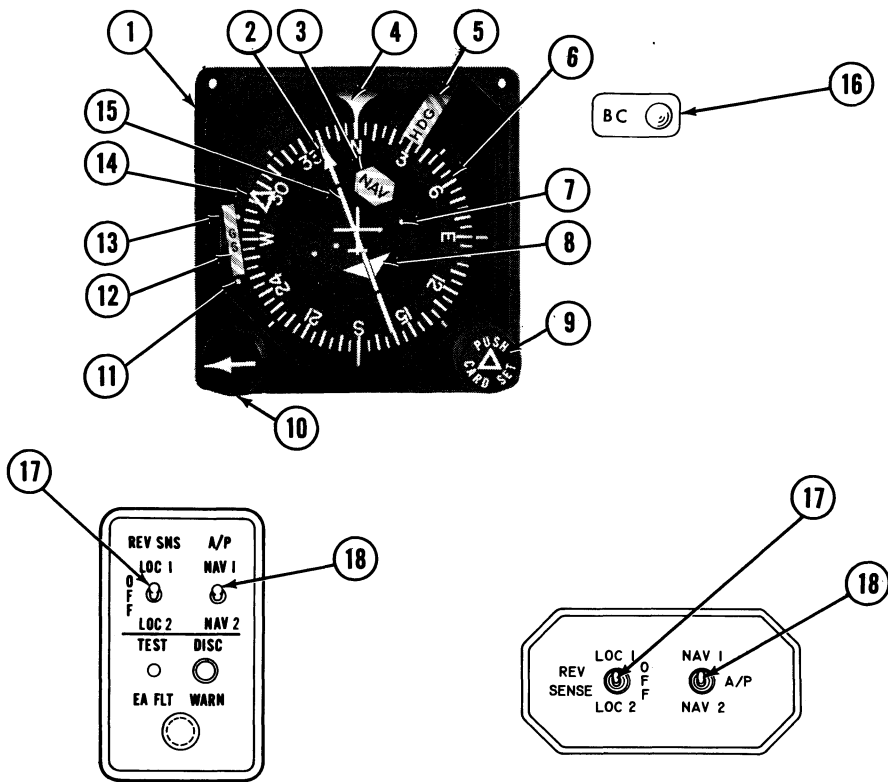
### **SECTION 1 GENERAL**

The IG-832C Horizontal Situation Indicator (HSI) is an additional navigation indicator option which provides a heading reference with respect to an unslaved directional gyro, a heading reference bug, VOR course selection, and a pictorial presentation of the airplane position relative to VOR and localizer courses and glide slopes. This indicator is used with Cessna 300 and 400 Nav/Com radios. When dual Nav/Com radios are installed, the HSI is coupled to the number 1 NAV/COM and a standard 300 or 400 series VOR/LOC course deviation indicator is coupled to the number 2 NAV/COM.

This system consists of a Horizontal Situation Indicator (HSI-Type IG-832C) and a remote mounted VOR/LOC Converter (Type B-445A). The indicator is unslaved and course datum is not available. When the HSI is installed with a 300A, 400A or 400B Autopilot system, a BC light is installed on the instrument panel, adjacent to the HSI, to alert the pilot of back-course operation. Each control and indicator function is described in Figure 1.

### **SECTION 2 LIMITATIONS**

There is no change to the airplane limitations when this instrument is installed.



**USED WITH 400B AUTOPILOT  
ON 210 SERIES MODELS**

**USED WITH 400A AUTOPILOT  
ON 337 SERIES MODELS**

1. **HORIZONTAL SITUATION INDICATOR (HSI)** - Provides a pictorial presentation of aircraft deviation relative to VOR radials and localizer beams. It also displays glide slope deviations and gives heading reference with respect to magnetic north when compass card is set to agree with compass.
2. **OMNI BEARING POINTER** - Indicates selected VOR course or localizer course on compass card (6). The selected VOR radial or localizer heading remains set on the compass card when the compass card (6) is rotated.
3. **NAV FLAG** - When flag is in view, indicates that the NAV receiver signal being received is not reliable.

**Figure 1. Horizontal Situation Indicator (HSI) (Type IG-832C)**  
(Sheet 1 of 3)

4. **HEADING REFERENCE (LUBBER LINE)** - Indicates aircraft magnetic heading on compass card (6).
5. **HEADING WARNING FLAG (HDG)** - When flag is in view, heading display is invalid due to the heading system power being interrupted or the HSI vacuum powered gyro being low.
6. **COMPASS CARD** - Rotates to display heading of airplane with reference to lubber line (4). Must be set to agree with aircraft compass using Card Set Knob (9).
7. **COURSE DEVIATION DOTS** - Indicates aircraft displacement from VOR, or localizer beam center. A full scale (2 dots) course deviation bar (15) displacement represents the following deviations from beam center:
  - a. VOR =  $\pm 10^\circ$  approx.
  - b. LOC =  $\pm 2-1/2^\circ$  approx.
8. **TO/FROM INDICATOR FLAG** - Indicates direction of VOR station relative to selected course.
9. **HEADING SELECTOR AND CARD SET KNOB (PUSH ▲ CARD SET)** - When rotated in normal (out) position, positions heading "bug" (14) on compass card (6) to indicate selected heading for reference or for autopilot tracking. When pushed in and rotated, sets compass card (6) to agree with magnetic compass. The omni bearing pointer (2), heading bug (14), and deviation bar (15) rotate with the compass card (6).

NOTE

The compass card (6) must be reset periodically to compensate for precessional errors in the gyro.

10. **COURSE SELECTOR (4) KNOB** - When rotated, positions omni bearing pointer (2) on the compass card (6) to select desired VOR radial or localizer course.
11. **GLIDE SLOPE SCALE** - Indicates displacement from glide slope beam center. A glide slope deviation bar displacement of 2 dots, represents full scale (0.7°) deviation above or below glide slope beam centerline.
12. **GLIDE SLOPE POINTER** - Indicates on glide slope scale (11) aircraft displacement from glide slope beam center.
13. **GLIDE SLOPE FLAG** - When in view, indicates glide slope receiver signal is not reliable.
14. **HEADING BUG** - Indicates selected reference heading relative to compass card (6).
15. **COURSE (OMNI) DEVIATION BAR** - Bar is center portion of omni bearing pointer and moves laterally to pictorially indicate relationship of aircraft to selected course. It relates in degrees of angular displacement from VOR radials or localizer beam center (see Item 7).

Figure 1. Horizontal Situation Indicator (HSI) (Type IG-832C)  
(Sheet 2 of 3)

16. BACK-COURSE LIGHT (BC) (Installed in a remote position, as shown, with 300A, 400A and 400B autopilots only.) - The remote amber BC light will illuminate when back-course operation is selected by the REV SNS LOC 1 switch (17) mounted on the left-hand instrument panel or the BC function of 300A autopilot.

### **CAUTION**

When back-course operation is selected, the course (omni) deviation bar (15) on the HSI does not reverse. However, selection of back-course operation will always cause the localizer signal to the autopilot to reverse for back-course operation.

17. BACK COURSE REVERSE SENSE (REV SNS) LOC 1 OR LOC 2 SELECTOR SWITCH - With AP switch ON (on 400A or 400B Autopilot control units) and either LOC 1 or LOC 2 selected, localizer signals to the Cessna 400A or 400B Autopilots will reverse for back-course operation. With autopilot ON or OFF, the course (omni) deviation bar on the HSI will not reverse but the standard CDI pointer will reverse depending on the position of the REV SNS switch.
18. AUTOPILOT (A/P) NAV 1 OR NAV 2 SELECTOR SWITCH - (Installed with 400A and 400B Autopilots only) Selects appropriate signals from the desired navigation receiver to be coupled to the autopilot.

Figure 1. Horizontal Situation Indicator (HSI) (Type IG-832C)  
(Sheet 3 of 3)



## SECTION 3

### EMERGENCY PROCEDURES

There is no change to the airplane emergency procedures when this instrument is installed.

## SECTION 4

### NORMAL PROCEDURES

Normal procedures for operation of this system differ little from those required for the more conventional Course Deviation Indicators. However, several small differences are worth noting.

The rectilinear movement of the omni deviation bar in combination with the rotation of the compass card in response to heading changes, provides an intuitive picture of the navigation situation at a glance when turned to an omni station. When tuned to a localizer frequency, the omni bearing pointer must be set to the inboard front course for both front and back-course approaches to retain this pictorial presentation.

When the HSI system is installed with a Cessna 300A (Type AF-395A), Cessna 400A (Type AF-530A) or Cessna 400B (Type IF-550A) Autopilot, a back-course indicator light labeled BC, is mounted adjacent to the HSI and will illuminate amber when the reverse sense (REV SNS) switch (mounted in the upper portion of the pilot's instrument panel on 337 Models or is mounted in the autopilot's accessory unit on 210 Models) is placed in the ON (LOC 1) position to alert the pilot that back-course operation is selected. The HSI needle will not be reversed but the LOC signals to the autopilot will be. Light dimming for the BC light is provided for low ambient light conditions.

For normal procedures with autopilots, refer to the 300A, 400A and 400B Autopilot Supplements in this handbook if they are listed in this section as options.

## SECTION 5

### PERFORMANCE

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



# **SUPPLEMENT**

## **CESSNA NAVOMATIC 200A AUTOPILOT (Type AF-295B)**

### **SECTION 1 GENERAL**

The Cessna 200A Navomatic is an all electric, single-axis (aileron control) autopilot system that provides added lateral and directional stability. Components are a computer-amplifier, a turn coordinator, an aileron actuator, and a course deviation indicator(s) incorporating a localizer reversed (BC) indicator light

Roll and yaw motions of the airplane are sensed by the turn coordinator gyro. The computer-amplifier electronically computes the necessary correction and signals the actuator to move the ailerons to maintain the airplane in the commanded lateral attitude.

The 200A Navomatic will also capture and track a VOR or localizer course using signals from a VHF navigation receiver.

The operating controls for the Cessna 200A Navomatic are located on the front panel of the computer-amplifier, shown in Figure 1. The primary function pushbuttons (DIR HOLD, NAV CAPT, and NAV TRK), are interlocked so that only one function can be selected at a time. The HI SENS and BACK CRS pushbuttons are not interlocked so that either or both of these functions can be selected at any time.

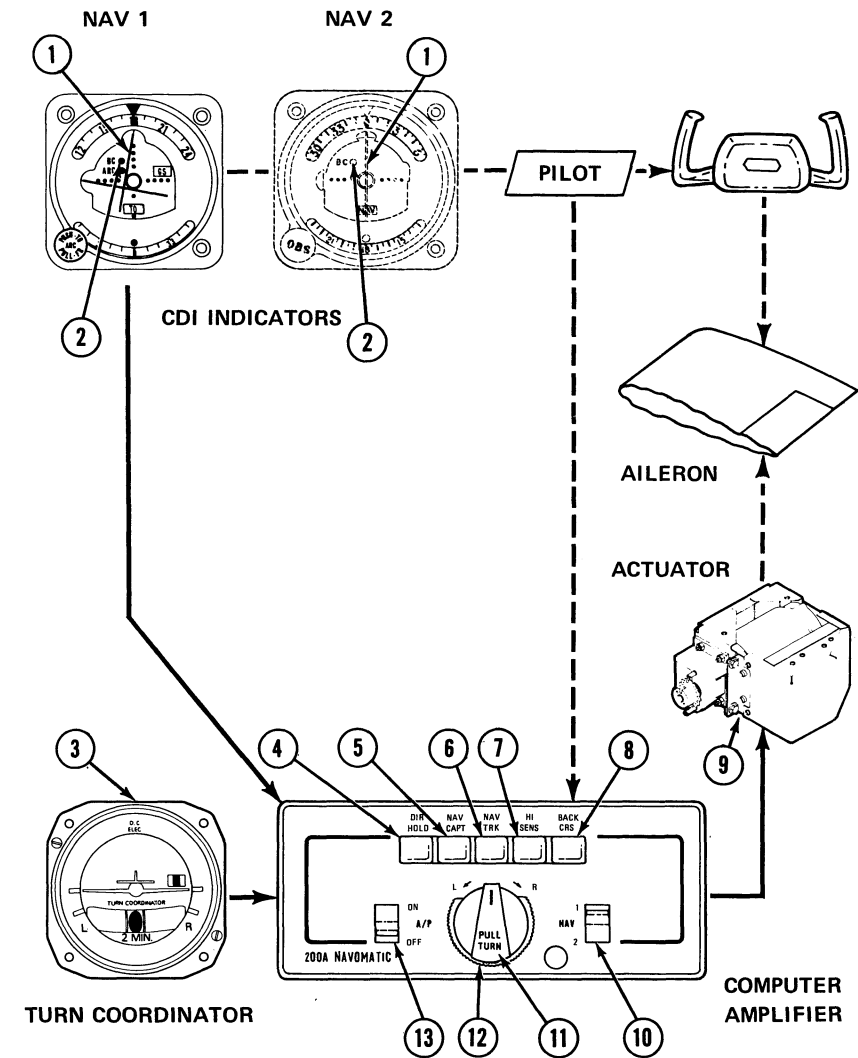


Figure 1. Cessna 200A Autopilot, Operating Controls and Indicators  
(Sheet 1 of 2)

1. **COURSE DEVIATION INDICATOR** - Provides VOR/LOC navigation inputs to autopilot for intercept and tracking modes.
2. **LOCALIZER REVERSED INDICATOR LIGHT** - Amber light, labeled BC, illuminates when BACK CRS button is pushed in (engaged) and LOC frequency selected. BC light indicates course indicator needle is reversed on selected receiver (when turned to a localizer frequency). This light is located within the CDI indicator.
3. **TURN COORDINATOR** - Senses roll and yaw for wings leveling and command turn functions.
4. **DIR HOLD PUSHBUTTON** - Selects direction hold mode. Airplane holds direction it is flying at time button is pushed.
5. **NAV CAPT PUSHBUTTON** - Selects NAV capture mode. When parallel to desired course, the airplane will turn to a pre-described intercept angle and capture selected VOR or LOC course.
6. **NAV TRK PUSHBUTTON** - Selects NAV track mode. Airplane tracks selected VOR or LOC course.
7. **HI SENS PUSHBUTTON** - During NAV CAPT or NAV TRK operation, this high sensitivity setting increases autopilot response to NAV signal to provide more precise operation during localizer approach. In low sensitivity position (pushbutton out), response to NAV signal is dampened for smoother tracking of enroute VOR radials; it also smooths out effect of course scalloping during NAV operation.
8. **BACK CRS PUSHBUTTON** - Used with LOC operation only. With A/P switch OFF or ON, and when navigation receiver selected by NAV switch is set to a localizer frequency, it reverses normal localizer needle indication (CDI) and causes localizer reversed (BC) light to illuminate. With A/P switch ON, reverses localizer signal to autopilot.
9. **ACTUATOR** - The torque motor in the actuator causes the ailerons to move in the commanded direction.
10. **NAV SWITCH** - Selects NAV 1 or NAV 2 navigation receiver.
11. **PULL TURN KNOB** - When pulled out and centered in detent, airplane will fly wings-level; when turned to the right (R), the airplane will execute a right, standard rate turn; when turned to the left (L), the airplane will execute a left, standard rate turn. When centered in detent and pushed in, the operating mode selected by a pushbutton is engaged.
12. **TRIM** - Used to trim autopilot to compensate for minor variations in aircraft trim or weight distribution. (For proper operation, the aircraft's rudder trim, if so equipped, must be manually trimmed before the autopilot is engaged.)
13. **A/P SWITCH** - Turns autopilot ON or OFF.

Figure 1. Cessna 200A Autopilot, Operating Controls and Indicators  
(Sheet 2 of 2)

## **SECTION 2**

### **LIMITATIONS**

There is no change to the airplane limitations when this avionic equipment is installed. However, the following autopilot limitation should be adhered to during airplane operation:

**BEFORE TAKE-OFF AND LANDING:**

1. A/P ON-OFF Switch -- OFF.

## **SECTION 3**

### **EMERGENCY PROCEDURES**

**TO OVERRIDE THE AUTOPILOT:**

1. Airplane Control Wheel -- ROTATE as required to override autopilot.

#### **NOTE**

The servo may be overpowered at anytime without damage.

**TO TURN OFF AUTOPILOT:**

1. A/P ON-OFF Switch -- OFF.

## **SECTION 4**

### **NORMAL PROCEDURES**

**BEFORE TAKE-OFF AND LANDING:**

1. A/P ON-OFF Switch -- OFF.
2. BACK CRS Button -- OFF (see Caution note under Nav Capture).

#### **NOTE**

Periodically verify operation of amber warning light(s), labeled BC on CDI(s), by engaging BACK CRS button with a LOC frequency selected.

**INFLIGHT WINGS LEVELING:**

1. Airplane Rudder Trim -- ADJUST for zero slip ("Ball" centered on Turn Coordinator).
2. PULL-TURN Knob -- CENTER and PULL out.
3. A/P ON-OFF Switch -- ON.
4. Autopilot TRIM Control -- ADJUST for zero turn rate (wings level indication on Turn Coordinator).

**NOTE**

For optimum performance in airplanes equipped as float-planes, use autopilot only in cruise flight or in approach configuration with flaps down no more than 10° and airspeed no lower than 75 KIAS on 172 and R172 Series Models or 85 KIAS on 180, 185, U206 and TU206 Series Models.

**COMMAND TURNS:**

1. PULL-TURN Knob -- CENTER, PULL out and ROTATE.

**DIRECTION HOLD:**

1. PULL-TURN Knob -- CENTER and PULL out.
2. Autopilot TRIM Control -- ADJUST for zero turn rate.
3. Airplane Rudder Trim -- ADJUST for zero slip ("Ball" centered).
4. DIR HOLD Button -- PUSH.
5. PULL-TURN Knob -- PUSH in detent position when airplane is on desired heading.
6. Autopilot TRIM Control -- READJUST for zero turn rate.

**NAV CAPTURE (VOR/LOC):**

1. PULL-TURN Knob -- CENTER and PULL out.
2. NAV 1-2 Selector Switch -- SELECT desired VOR receiver.
3. Nav Receiver OBS or ARC Knob -- SET desired VOR course (if tracking omni).

**NOTE**

Optional ARC knob should be in center position and ARC amber warning light should be off.

4. NAV CAPT Button -- PUSH.
5. HI SENS Button -- PUSH for localizer and "close-in" omni intercepts.

6. BACK CRS Button -- PUSH only if intercepting localizer front course outbound or back course inbound.

### **CAUTION**

With BACK CRS button pushed in and localizer frequency selected, the CDI on selected nav radio will be reversed even when the autopilot switch is OFF.

7. PULL-TURN Knob -- Turn airplane parallel to desired course.

#### **NOTE**

Airplane must be turned until heading is within  $\pm 5^\circ$  of desired course.

8. PULL TURN Knob -- CENTER and PUSH in. The airplane should then turn toward desired course at  $45^\circ \pm 10^\circ$  intercept angle (if the CDI needle is in full deflection).

#### **NOTE**

If more than 15 miles from the station or more than 3 minutes from intercept, use a manual intercept procedure.

### **NAV TRACKING (VOR/LOC):**

1. NAV TRK Button -- PUSH when CDI centers and airplane is within  $\pm 5^\circ$  of course heading.
2. HI SENS BUTTON -- DISENGAGE for enroute omni tracking (leave ENGAGED for localizer).
3. Autopilot TRIM Control -- READJUST as required to maintain track.

#### **NOTE**

Optional ARC function, if installed, should not be used for autopilot operation. If airplane should deviate off course, pull out PULL TURN knob and readjust airplane rudder trim for straight flight on the Turn Coordinator. Push in PULL TURN knob to reintercept course. If deviation persists, progressively make slight adjustments of autopilot TRIM control towards the course as required to maintain track.

## **SECTION 5 PERFORMANCE**

There is no change to the airplane performance when this avionic equipment is installed.



# **SUPPLEMENT**

## **CESSNA NAVOMATIC 300A AUTOPILOT (Type AF-395A)**

### **SECTION 1 GENERAL**

The Cessna 300A Navomatic is an all electric, single-axis (aileron control) autopilot system that provides added lateral and directional stability. Components are a computer-amplifier, a turn coordinator, a directional gyro, an aileron actuator and a course deviation indicator(s) incorporating a localizer reversed (BC) indicator light.

Roll and yaw motions of the airplane are sensed by the turn coordinator gyro. Deviations from the selected heading are sensed by the directional gyro. The computer-amplifier electronically computes the necessary correction and signals the actuator to move the ailerons to maintain the airplane in the commanded lateral attitude or heading.

The 300A Navomatic will also intercept and track a VOR or localizer course using signals from a VHF navigation receiver.

The operating controls for the Cessna 300A Navomatic are located on the front panel of the computer-amplifier and on the directional gyro, shown in Figure 1. The primary function pushbuttons (HDG SEL, NAV INT, and NAV TRK), are interlocked so that only one function can be selected at a time. The HI SENS and BACK CRS pushbuttons are not interlocked so that either or both of these functions can be selected at any time.

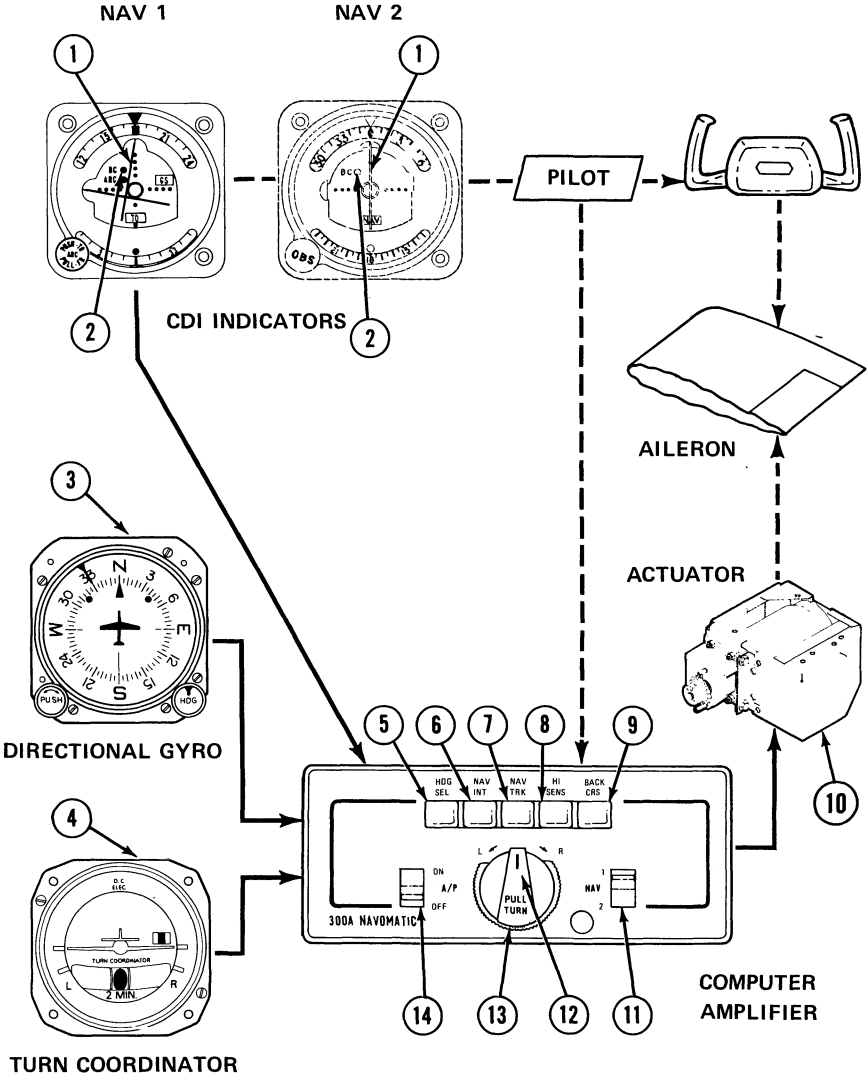


Figure 1. Cessna 300A Autopilot, Operating Controls and Indicators  
(Sheet 1 of 2)

1. **COURSE DEVIATION INDICATOR** - Provides VOR/LOC navigation inputs to autopilot for intercept and tracking modes.
2. **LOCALIZER REVERSED INDICATOR LIGHT** - Amber light, labeled BC, illuminates when BACK CRS button is pushed in (engaged) and LOC frequency selected. BC light indicates course indicator needle is reversed on selected receiver (when tuned to a localizer frequency). This light is located within the CDI indicator.
3. **DIRECTIONAL GYRO INDICATOR** - Provides heading information to the autopilot for heading intercept and hold. Heading bug on indicator is used to select desired heading or VOR/LOC course to be flown.
4. **TURN COORDINATOR** - Senses roll and yaw for wings leveling and command turn functions.
5. **HDG SEL PUSHBUTTON** - Aircraft will turn to and hold heading selected by the heading "bug" on the directional gyro.
6. **NAV INT PUSHBUTTON** - When heading "bug" on DG is set to selected course, aircraft will turn to and intercept selected VOR or LOC course.
7. **NAV TRK PUSHBUTTON** - When heading "bug" on DG is set to selected course, aircraft will track selected VOR or LOC course.
8. **HI SENS PUSHBUTTON** - During NAV INT or NAV TRK operation, this high sensitivity setting increases autopilot response to NAV signal to provide more precise operation during localizer approach. In low-sensitivity position (push-button out), response to NAV signal is dampened for smoother tracking of enroute VOR radials; it also smooths out effect of course scalloping during NAV operation.
9. **BACK CRS PUSHBUTTON** - Used with LOC operation only. With A/P switch OFF or ON, and when navigation receiver selected by NAV switch is set to a localizer frequency, it reverses normal localizer needle indication (CDI) and causes localizer reversed (BC) light to illuminate. With A/P switch ON, reverses localizer signal to autopilot.
10. **ACTUATOR** - The torque motor in the actuator causes the ailerons to move in the commanded direction.
11. **NAV SWITCH** - Selects NAV 1 or NAV 2 navigation receiver.
12. **PULL TURN KNOB** - When pulled out and centered in detent, airplane will fly wings-level; when turned to the right (R), the airplane will execute a right, standard rate turn; when turned to the left (L), the airplane will execute a left, standard rate turn. When centered in detent and pushed in, the operating mode selected by a pushbutton is engaged.
13. **TRIM** - Used to trim autopilot to compensate for minor variations in aircraft trim or lateral weight distribution. (For proper operation, the aircraft's rudder trim, if so equipped, must be manually trimmed before the autopilot is engaged.
14. **A/P SWITCH** - Turns autopilot ON or OFF.

Figure 1. Cessna 300A Autopilot, Operating Controls and Indicators  
(Sheet 2 of 2)

## SECTION 2

### LIMITATIONS

There is no change to the airplane limitations when this avionic equipment is installed. However, the following autopilot limitation should be adhered to during airplane operation:

BEFORE TAKE-OFF AND LANDING:

1. A/P ON-OFF Switch -- OFF.

## SECTION 3

### EMERGENCY PROCEDURES

TO OVERRIDE THE AUTOPILOT:

1. Airplane Control Wheel -- ROTATE as required to override autopilot.

#### NOTE

The servo may be overpowered at any time without damage.

TO TURN OFF AUTOPILOT:

1. A/P ON-OFF Switch -- OFF.

## SECTION 4

### NORMAL PROCEDURES

BEFORE TAKE-OFF AND LANDING:

1. A/P ON-OFF Switch -- OFF.
2. BACK CRS Button -- OFF (see Caution note under Nav Intercept).

#### NOTE

Periodically verify operation of amber warning light(s), labeled BC on CDI(s), by engaging BACK CRS button with a LOC frequency selected.

**INFLIGHT WINGS LEVELING:**

1. Airplane Rudder Trim -- ADJUST for zero slip ("Ball" centered on Turn Coordinator).
2. PULL-TURN Knob -- CENTER and PULL out.
3. A/P ON-OFF Switch -- ON.
4. Autopilot TRIM Control -- ADJUST for zero turn rate (wings level indication on Turn Coordinator).

**NOTE**

For optimum performance in airplanes equipped as float-planes, use autopilot only in cruise flight or in approach configuration with flaps down no more than 10° and airspeed no lower than 75 KIAS on 172 and R172 Series Models or 85 KIAS on 180, 185, U206 and TU206 Series Models.

**COMMAND TURNS:**

1. PULL-TURN Knob -- CENTER, PULL out and ROTATE.

**HEADING SELECT:**

1. Directional Gyro -- SET to airplane magnetic heading.
2. Heading Selector Knob -- ROTATE bug to desired heading.
3. Heading Select Button -- PUSH.
4. PULL-TURN Knob -- CENTER and PUSH.

**NOTE**

Airplane will turn automatically to selected heading. If airplane fails to hold the precise heading, readjust autopilot TRIM control as required or disengage autopilot and reset manual rudder trim (if installed).

**NAV INTERCEPT (VOR/LOC):**

1. PULL-TURN Knob -- CENTER and PULL out.
2. NAV 1-2 Selector Switch -- SELECT desired receiver.
3. Nav Receiver OBS or ARC Knob -- SET desired VOR course (if tracking omni).

**NOTE**

Optional ARC knob should be in center position and ARC warning light should be off.

4. Heading Selector Knob -- ROTATE bug to selected course (VOR or localizer - inbound or outbound as appropriate).
5. Directional Gyro --SET for magnetic heading.
6. NAV INT Button -- PUSH.
7. HI SENS Button -- PUSH for localizer and "close-in" omni intercepts.
8. BACK CRS Button -- PUSH only if intercepting localizer front course outbound or back course inbound.

### **CAUTION**

With BACK CRS button pushed in and localizer frequency selected, the CDI on selected nav radio will be reversed even when the autopilot switch is OFF.

9. PULL-TURN Knob -- PUSH.

#### **NOTE**

Airplane will automatically turn to a 45° intercept angle.

#### **NAV TRACKING (VOR/LOC):**

1. NAV TRK Button -- PUSH when CDI centers (within one dot) and airplane is within  $\pm 10^\circ$  of course heading.
2. HI SENS Button -- Disengage for enroute omni tracking (leave engaged for localizer).

#### **NOTE**

Optional ARC feature, if installed, should not be used for autopilot operation. If CDI remains steadily off center, readjust autopilot TRIM control as required to maintain track.

## **SECTION 5**

## **PERFORMANCE**

There is no change to the airplane performance when this avionic equipment is installed.

# **SUPPLEMENT**

## **CESSNA 400 AUTOPILOT**

### **(Type AF-420A)**

## **SECTION 1**

### **GENERAL**

Cessna 400 Autopilot (Type AF-420A) is a two axis automatic flight control system that governs the position of the ailerons and elevators to provide automatic roll and pitch stability as commanded by the selected mode of operation. The system also provides for tracking of any magnetic heading, automatic intercept and tracking of VOR radials and includes manual turn and pitch command, altitude hold, and NAV 1 or NAV 2 receiver selection. There is no ILS coupler in the autopilot system.

The major components in a standard 400 autopilot system consist of a control unit mounted in either the lower center stack of the instrument panel or lower console, a panel-mounted vacuum driven unslaved directional gyro, and an aileron and elevator actuator. On some aircraft an optional slaved compass system is offered consisting of a slaved directional gyro incorporating a built-in slaving indicator that monitors heading displacement error between the flux detector and the slaved DG, a remote mounted flux detector and a slaving accessory unit.

The control unit (flight controller) contains most of the operating controls for the autopilot. In addition, controls for the directional gyro are mounted on the front of the gyro and an A/P NAV 1/NAV 2 selector switch is installed adjacent to the control unit to allow the autopilot to operate in conjunction with either navigation receiver.

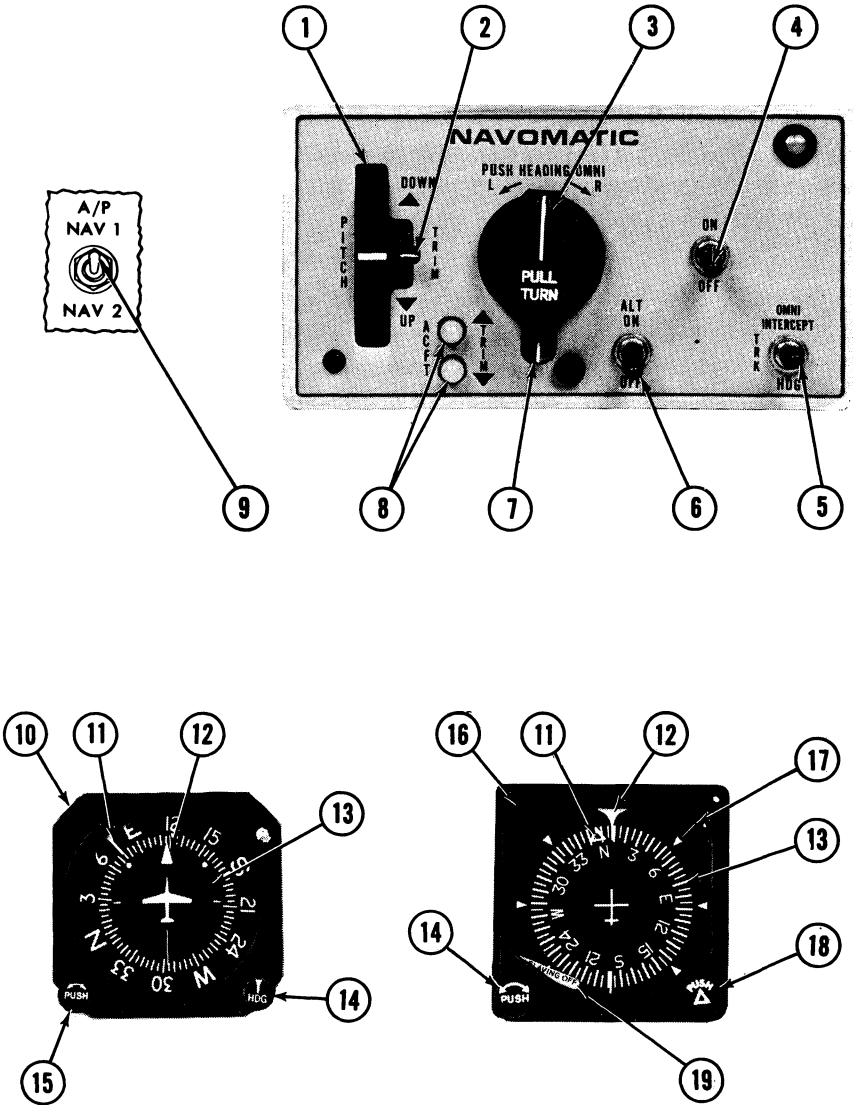


Figure 1. Cessna 400 Autopilot (Type AF-420A) (Sheet 1 of 3)



1. **PITCH CONTROL** - Controls pitch attitude of airplane. When rotated toward UP, airplane will pitch up. When rotated toward DWN, airplane will pitch down. Pitch attitude depends on displacement of control from DETENT (level flight) position. (Must be coordinated with aircraft elevator trim.)
2. **PITCH TRIM** - Used only when PITCH control is in detent to trim airplane for level flight.
3. **PULL-TURN CONTROL KNOB** - When pulled out and turned, airplane can be banked right (R) or left (L). When in detent and pushed in, intercepts and maintains selected heading or VOR radial.
4. **ON-OFF SWITCH** - Controls primary power to Navomatic 400.
5. **FUNCTION SWITCH** - Selects mode of operation. In HDG position heading hold circuits are engaged. In OMNI INTERCEPT position, omni coupler is engaged. In TRK position, omni coupler is engaged, but turn rate is limited to that appropriate to two dots course deviation.
6. **ALT ON-OFF** - When at ALT ON, with PITCH control in detent, maintains the selected altitude. Movement of the PITCH control from level flight detent disengages the altitude hold circuit.
7. **LATERAL TRIM** - Used when PULL-TURN control knob is pulled out and in detent to trim aircraft for wing level attitude.
8. **AIRCRAFT TRIM LIGHTS** - These lights illuminate as the pitch actuator corrects toward the selected attitude or when the aircraft is out of trim to a degree that the pitch actuator is not able to correct to the attitude selected by the PITCH control. When the upper light is illuminated, the aircraft elevator trim wheel should be rotated forward for more nose down trim. When the lower light is illuminated, a need for additional nose up trim is indicated.
9. **AUTOPILOT (A/P) NAV 1 OR NAV 2 SELECTOR SWITCH** - Selects the desired navigation receiver.
10. **UNSLAVED DIRECTIONAL GYRO** - When properly set to agree with the magnetic compass, the DG will provide a stable visual indication of aircraft heading to the pilot and also provides electrical heading information to the autopilot.
11. **HEADING INDEX (BUG)** - Displays selected heading relative to the compass card.
12. **LUBBER LINE** - Provides airplane heading reference index.
13. **COMPASS CARD** - Rotates to display heading of airplane with reference to lubber line (12) on directional gyros.

Figure 1. Cessna 400 Autopilot (Type AF-420A) (Sheet 2 of 3)

14. **HEADING SELECTOR KNOB (HDG)** - When pushed in, the heading bug (11) may be positioned to the desired magnetic heading by rotating the HDG selector knob. Also used to select VOR course when the autopilot is installed with Nav/Com radios without course datum.
15. **GYRO ADJUSTMENT KNOB (PUSH)** - When pushed in, allows the pilot to manually rotate the gyro compass card (13) to correspond with the magnetic heading indicated by the compass. The unslaved gyro's (10) compass card (13) must be manually reset periodically to compensate for precessional errors in the gyro. The slaved directional gyro's (16) compass card (13) will automatically realign itself due to the slaving features. However, the slaved DG may be manually reset at any time in order to accelerate precession adjustment.
16. **OPTIONAL SLAVED DIRECTIONAL GYRO** - When properly set to agree with the magnetic compass, the slaved DG will provide a magnetically stabilized visual indication of aircraft heading and also provides electrical heading information to the autopilot. The slaved DG eliminates the need to manually compensate for precessional errors in the gyro.
17. **GYRO SLAVING INDICATOR** - Displays visual indication of heading indicator and flux detector synchronization. When slaving needle is aligned with the DG 45° right index, it shows that the heading indicator agrees with the aircraft magnetic heading. Off-center pointer deflections show the direction of heading indicator error relative to aircraft magnetic heading. The gyro adjustment knob (15) may be used at any time to more rapidly accomplish synchronization of the heading indicator reading with magnetic heading as indicated by the slaving indicator.
18. **HEADING SELECTOR KNOB (PUSH/▲)** - When pushed in the heading bug (11) may be positioned to the desired magnetic heading by rotating the PUSH/▲ selector knob. Also used to select VOR course when an autopilot is installed with Nav/Com radios.
19. **SLAVING OFF WARNING FLAG** - When out of view, indicates presence of slaving voltage. When in view, indicates absent or low slaving voltage.

Figure 1. Cessna 400 Autopilot (Type AF-420A) (Sheet 3 of 3)

## **SECTION 2**

### **LIMITATIONS**

There is no change to the airplane limitations when this avionic equipment is installed. However, the following autopilot limitations should be adhered to during airplane operation:

#### **OPERATING LIMITATIONS:**

1. ON-OFF Switch -- OFF for takeoff and landing.
2. Maximum Airspeed for Autopilot Operation -- REFER to Autopilot Limitations Placard on instrument panel of airplane.
3. Possible Altitude Loss with Autopilot Malfunction -- REFER to Autopilot Limitations Placard on instrument panel of airplane.

## **SECTION 3**

### **EMERGENCY PROCEDURES**

#### **IN CASE OF AUTOPILOT MALFUNCTION:**

1. Airplane Control Wheel -- OPERATE as required to manually override the autopilot.

#### **NOTE**

The servos may be manually overpowered at any time without damage. However, this practice should be kept to a minimum since slip clutch wear will result from extended periods of manual overpower.

2. Autopilot ON-OFF Switch -- OFF.

#### **NOTE**

If electrical malfunction persists, turn aircraft master or avionics power switch OFF.

## **SECTION 4**

### **NORMAL PROCEDURES**

#### **BEFORE TAKEOFF AND LANDING:**

1. Autopilot ON-OFF Switch -- OFF.

IN-FLIGHT WINGS LEVELING:

1. Airplane Elevator and Rudder Trim -- ADJUST.
2. Avionics Power Switch -- ON.
3. PULL-TURN Knob -- PULL out and center in detent.
4. PITCH Control -- ADJUST to centered position.
5. PITCH TRIM Lever -- ADJUST to centered position.
6. ON-OFF Switch -- ON.
7. Lateral Trim Lever -- ADJUST to level wings.
8. PITCH TRIM Lever -- ADJUST for longitudinal trim.

ALTITUDE HOLD:

1. PITCH Control -- DETENT position.
2. OFF-ALT ON Switch -- ALT ON.

COMMAND TURNS:

1. PULL-TURN Knob -- PULL and ROTATE.

CLIMB OR DESCENT:

1. Aircraft Power and Trim -- ADJUST.
2. PITCH Control Wheel -- Rotate UP or DOWN.
3. Lateral Trim Lever -- ADJUST to level wings.
4. PITCH Trim Lever -- ADJUST if aircraft trim light is illuminated.

NOTE

If trim light remains illuminated readjust the aircraft elevator trim wheel.

HEADING SELECT:

1. PUSH Knob on DG -- SET to aircraft magnetic heading.
2. HDG Knob on DG -- ROTATE "bug" to desired heading.
3. Function Switch -- SET to HDG.
4. PULL-TURN Knob -- PUSH.

NOTE

Airplane will turn automatically to selected heading.

OMNI COUPLING:

1. PULL-TURN Knob -- PULL out.
2. A/P NAV 1/NAV 2 Selector Switch (On Instrument Panel) -- SELECT desired Nav receiver.

3. Nav Indicator OBS (or ARC) Knob -- SET VOR course.
4. HDG Knob DG -- ROTATE "bug" to agree with OBS on CDI.
5. Function Switch -- SET to OMNI INTERCEPT.
6. PULL-TURN Knob -- PUSH.

**NOTE**

Airplane will automatically intercept at 45° and then track the selected omni course.

7. Function Switch -- SET to TRK for VOR station passage and smoother tracking of omni radials.

## **SECTION 5**

### **PERFORMANCE**

There is no change to the airplane performance when this avionics equipment is installed.

